



**MINISTRY OF EXTERNAL AFFAIRS
GOVERNMENT OF INDIA**

**E-TENDER AND CONTRACT DOCUMENTS
FOR
CONSTRUCTION OF INTEGRATED CHECK POST
AT
NEPALGUNJ IN NEPAL
: MAIN PACKAGE-1**

Part-1 : Technical Bid

TENDER No : RITES/AP/ICP/NEPALGUNJ/Tender/2020/01

MARCH- 2020

CONSULTANTS



(A Govt. Of India Enterprise)

Airports Division

RITES Bhawan-II, Plot No.-144, Sector-44,

Gurgaon-122 003 (Haryana)

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RITES LTD.
E-TENDER AND CONTRACT DOCUMENT
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SECTION 1

NOTICE INVITING TENDER AND INSTRUCTIONS TO TENDERERS

SECTION 1

NOTICE INVITING TENDER AND INSTRUCTIONS TO TENDERERS

1.0 GENERAL

1.1 Tender Notice

Percentage cum Item rate tenders are invited through E-Tendering system by RITES Ltd., a Public Sector Enterprise under the Ministry of Railways, acting for and on behalf of **Ministry of External Affairs, Government of India** (Employer) as an Agent/Power of Attorney Holder, from working Indian contractors, who are a Partnership Firm registered with Registrar of Firms in India, a Private Limited Company or a Public Limited Company registered with Registrar of Companies in India (excluding companies who are subsidiaries of any foreign company), a Corporation incorporated in India and who have executed works within the last five years reckoned from the scheduled date of opening of tender for Railways / CPWD / MES / DOT / RITES / State PWD / any other Central/State Government Department / Central/State Government Undertaking or their subsidiaries / Municipal Body / Autonomous Body of Central/State Governments / Public Ltd. Companies listed on Stock Exchange in India or Abroad or subsidiaries of such companies for the work of **“Construction of Integrated Check Post at Nepalgunj in Nepal : Main Package-1”**.

(Note: Throughout these bidding documents, the terms ‘bid’ and ‘tender’ and their derivatives are synonymous)

1.2 Estimated Cost of Work

The work is estimated to cost **Rs. 142,04,90,577 /-** (**Rupees One Hundred Forty Two Crore Four Lakh Ninety Thousand Five Hundred and Seventy Seven only**). The estimate is generally based on CPWD Delhi Schedule of Rates 2018 enhanced by 11.27% (excluding the element of GST on Works Contract Service) and Wet Riser and Sprinkler System DSR 2019 (excluding the element of GST on Works Contract Service) and on market rates for non-schedule items. This Estimate, however, is given merely as a rough guide.

1.3 Time for Completion

The time allowed for completion will be **24 (Twenty Four) months** from the date of start which is defined in Schedule F under Clause 5.1(a) of Clauses of Contract.

1.4 Brief Scope of Work

The ICP project aims at facilitating improved border trade and people contact by creating appropriate facilities for cargo and passenger traffic.

Nepalgunj falls in Banke district of Nepal. The proposed new ICP is located about 1.3 km North-West of existing check-post. The length of approach road is about 2.2 km in Nepal. The proposed road takes-off from the Surkhet-Nepalgunj highway in Nepal.

This tender package is a part of overall Integrated Check-Post (ICP) development

plan. The work will be carried out as explained in various documents of the bidding documents, all read in conjunction.

The bidders should satisfy themselves before bidding about the accessibility of the site. Any access road need to be constructed for carriage of men/machinery/material etc. to the project site shall be sole responsibility of the contractor and nothing extra shall be payable on this account. Bidders are encouraged to ascertain the local conditions before Pre-bid queries/ submission of bids

Generally following facilities / works are included in this tender package.

- A) Construction of Integrated check post consisting of buildings, sheds, internal / external services, roads, parking, special systems etc.
- B) Construction of 2.2 km approach road from existing road (connecting Ratna Rajmarg H12 : Surkhet-Nepalgunj) in Nepal to the proposed ICP location.

The facilities are broadly listed hereunder but the list is however indicative only :

Salient Features of ICP at Nepalgunj– Nepal

- i) Pavements
 - a. Flexible pavements for access roads (2.2 km length approx., over 2m average earth filling)
 - b. Pre-cast C.C. block Pavements in ICP
 - ii) Buildings and Prefabricated Sheds
 - RCC Buildings:**
 - Admin Cum Foreign Passengers Area & Common Facility Block
 - Custom Office/ Quarantine block
 - Officer's Barrack , Jawan Barrack, Mahila Barrack,
 - Dinning Hall Cum Kitchen
 - Toilet Blocks
 - Electric substation and Pump house
 - Animal Quarantine
 - Entrance gate
 - Boundary Wall
 - Watch Towers
 - Overhead tank
 - Prefabricated sheds:**
 - Warehouse Import & Warehouse Export
 - Ware house Parking
 - Porter Area
 - Animal shed
 - Fumigation Shed
 - Processing sheds export & Import
 - iii) Storm water drainage
 - iv) Water Supply & distribution System
 - v) Sewerage collection, treatment and disposal system
 - vi) ESS & Transformer and DG set
 - vii) Area Lighting & boundary lighting
 - viii) Fire Fighting system
 - ix) Miscellaneous equipment and systems
 - Weigh bridges- 80 T
 - Surveillance system (CCTV)
-

- PA system
- Telephone connectivity including EPABX
- Lan connectivity
- Landscaping
- Signages

KEY BUILDING FEATURES & SPECIFICATIONS					
S. No.	Buildings	Area (in sqm)	No. of Storey's	Floor Height (in M)	Total Height (in M)
A) RCC BUILDINGS					
1	ANIMAL QUARANTINE	225	Single	3.5	6.95
2	MAHILA BARRACK	227	Single	4.1	7.25
3	TOILET BLOCK - 2 NO (Area=122.2 sqm each)	244	Single	3.15	4.5
4	ELECTRIC SUBSTATION	309	Single	4.0	4.9
5	UG TANK WITH PUMP HOUSE	222	Single	3.05	
6	WATCH TOWER - 4 NO, Area 65 sqm (each) excluding area of open staircase	260	G+3	3.0	12.9
B) RCC BUILDINGS WITH PARTLY STEEL TRUSS ROOF					
1	ADMIN CUM FOREIGN PASSENGERS AREA & COMMON FACILITY BLOCK (DOUBLE STOREYED)	1850	G+1	G.F. - 4.5 F.F. - 3.5	11.45
2	CUSTOM OFFICE/QUARANTINE BLOCK (DOUBLE STOREYED)	2127	G+1	3.5	10.6
3	OFFICER'S BARRACK (DOUBLE STOREYED)	1120	G+1	4.15	11.75
4	JAWAN BARRACK (DOUBLE STOREYED)	1631	G+2	4.15	15.9
5	DINING HALL CUM KITCHEN	609	Single	4.15	7.6
6	ENTRANCE GATE-01 ground floor area 296 sqm, first floor area = 60 sqm	356	G+1	3.6	11.0
7	ENTRANCE GATE-02	95	Single	3.6	4.2
C) SHEDS & OTHER MISC. STRUCTURES (DESIGN & BUILD)					
1	FUMIGATION SHED	184	Single	6.0	
2	PORTER AREA- 2 NO	1500	Single	4.5	Pre Engineered Steel structure
3	PROCESS AREA (IMPORT SIDE)	3856	Single	6.0(min)	
4	PROCESS AREA-WAREHOUSE PARKING (IMPORT SIDE)	2000	Single	6.0(min)	
5	PROCESS AREA (EXPORT SIDE)	3856	Single	6.0(min)	
6	WAREHOUSE IMPORT -2nos, 1520sqm (each) Without loading platform	3040	Single	7.0(min)	
7	WAREHOUSE EXPORT 1370 sqm (each) mezzanine floor =160.4 sqm (each) Without loading platform	1366	Single	7.0(min)	
8	ANIMAL SHED	152	Single	4	

1.5 Availability of Site

The site for the work is available with employer “**Ministry of External Affairs, Government of India**”.

1.6 Deadline for submission of bids: 15.00 Hrs. on 07/04/2020

The Employer may extend the deadline for submission of Tenders by issuing an amendment in writing in accordance with Para 6.3 in which case all rights and obligations of the Employer and the Tenderer previously subject to the original deadline will be subject to new deadline.

CRITICAL DATA SHEET

Published Date	05.03.2020
Bid Document Download / Sale Start Date	05.03.2020
Pre-bid Query Receipt Start Time & Date	18.00 Hrs on 05.03.2020
Pre-bid Query Receipt End Time & Date	13.00 Hrs on 16.03.2020
Pre-bid meeting dated & Time	11.30hrs on 18.03.2020
Bid submission Start Date & Time	15.00 Hrs 27.03.2020
Bid submission End Date & Time	15.00 Hrs on 07.04.2020
Bid Opening Date & Time	15.30 Hrs on 08.04.2020

*‘Bid opening date and time’ should not be less than 24 hours of the ‘Bid submission End Date & Time’

2.0 QUALIFICATION CRITERIA TO BE SATISFIED

2.1 The Qualification Criteria to be satisfied are given at **Annexure I** enclosed.

2.2 The Qualification Criteria to be satisfied will depend on the category of works, whether Small, Normal or Large. Small Works are those costing up to and including Rs. 3 Crore, Normal Works are those costing above Rs. 3 Crore and up to and including Rs. 100 Crore each and Large Works are those costing more than Rs. 100 Crore. The work for which the Tender is being invited falls under the category of **Large (more than 100 crore)**.

2.3 The work for which this Tender has been invited falls in **NEPAL** under **Normal area**.

- 2.4 In this tender Joint Venture (**JV**) is **not allowed**.
- 2.5 The documents to be furnished by the Bidder to prove that he is satisfying the qualification Criteria laid down should all be in the Bidder's name, except in cases where through the name has changed, the owners continued to remain the same and in cases of amalgamation of entities.
- 3.0 FORMAT AND CHECK LIST FOR SUBMISSION OF INFORMATION ON QUALIFICATION CRITERIA**
- 3.1 The information to be furnished and the documents to be enclosed shall be as per Para 28.0 hereinafter. Documents/information complete in all respects, in support of meeting the Qualification Criteria should be submitted in one go. Submission of additional documents shall not be permitted. Only clarifications and filling of gaps/missing information in the submitted documents, may be permitted.
- 4.0 CONTENTS OF TENDER DOCUMENT**
- 4.1 Each set of Tender or Bidding Document will comprise the documents listed below and addenda issued in accordance with Para 6:
- PART-1: - Technical Bid Packet**
{Read with Correction Slip no. 1 to 2 E-Tendering (incorporated in the document)}
- | | |
|-----------|--|
| Section 1 | Notice Inviting Tender and Instructions to Tenderers including Annexures |
| Section 2 | Tender and Contract Form [DELETED] |
| Section 3 | Special Conditions |
| Section 4 | Schedules A to F |
| Section 5 | Technical Specifications |
| Section 6 | Drawings |
- PART-2: - FINANCIAL BID PACKET**
Schedule of Quantities (Bill of Quantities)
- PART-3: - General Conditions of Contract**
(Read with Correction Slip no. 1)
- | | |
|------------|--|
| Section 7 | Conditions of Contract |
| Section 8 | Clauses of Contract |
| Section 9 | RITES Safety Code |
| Section 10 | RITES Model Rules for Protection of Health and Sanitary Arrangements for Workers |
| Section 11 | RITES Contractor's Labour Regulations |
- 4.2 Part-3: General Conditions of Contract (Compilation of section 7 to 11) as also Correction Slips to GCC are available on RITES website www.rites.com under the link 'Tenders'.
- 4.3 Part-3 of the tender, i.e., General Conditions of Contract (Compilation of Section 7 to 11) is not uploaded as a part of this tender document because as stated in sub-Para 4.2 above, the same is available separately on RITES' website and can be seen/downloaded from there. **The bidder need not submit/upload Part 3 of the tender as a part of his offer. So far as Part-1 is concerned, the bidder is required to submit/upload only the documents mentioned in**
-

Para 28.0 of Section 1 thereof. Rest of the Part-1 need not be uploaded. The bidder must, nevertheless, read the same. It shall be presumed that the bidder has read the contents of Part 1: Technical Bid Packet and Part 3: General Conditions of Contract and upto date Correction Slips thereto and the same will be binding upon him. The successful bidder will be required to sign the complete tender document i.e., Part 1, Part 2, Part 3 and Correction Slips, if any, thereto.

5.0 INSTRUCTIONS ON ACCESSING/PURCHASING OF BID DOCUMENTS AND SUBMISSION THEREOF

5.1 To participate in the E-Bid submission for RITES, it is mandatory for the bidders to get their firms registered with E-Procurement Portal <https://etenders.gov.in/eprocure/app>.

5.2 The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

5.3 REGISTRATION

- a) Bidders are required to enrol on the e-Procurement module of the Central Public Procurement Portal (URL: <https://etenders.gov.in/eprocure/app>) by clicking on the link "**Online Bidder Enrolment**" on the CPP Portal which is free of charge.
- b) As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
- c) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.
- d) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India with their profile.
- e) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC's to others which may lead to misuse.
- f) Bidder can log in to the site through the secured log-in by entering their user ID/Password and the password of the DSC/e-Token.

5.4 SEARCHING FOR TENDER DOCUMENTS

- a) There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, Organization Name, Location, Date, Value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as Organization Name, Form

- of Contract, Location, Date, Other keywords etc. to search for a tender published on the CPP Portal.
- b) Once the bidders have selected the tenders they are interested in, they may download the required documents/tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS/E-mail in case there is any corrigendum issued to the tender document.
 - c) The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification/help from the Helpdesk.

5.5 PREPARATION OF BIDS

- a) Bidder should take into account any corrigendum published on the tender document before submitting their bids.
- b) Bidder is advised to go through the tender advertisement/NIT and the tender document carefully to understand the documents required to be submitted as part of the bid. Bidder may please note the number of covers in which the bid documents have to be submitted, the number of documents – including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.
- c) Bidder, in advance, should get ready the bid document to be submitted as indicated in the tender document/schedule and generally, they can be in PDF/XLS/RAR/JPG formats. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.
- d) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN Card copy, Annual Reports, Auditor Certificates etc.) has been provided to the bidders. Bidders can use "My Space" or "Other Important Documents" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

5.6 SUBMISSION OF BIDS

- a) Bid can be submitted only during validity of registration of bidder with CPPP E- Procurement Portal.
- b) Bidder should log into the site well in advance for bid submission so that they can upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
- c) The Bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
- d) Bidder has to select the payment option as "offline" to pay the cost of tender document and EMD as applicable and enter details of the instruments.

- e) Bidder should prepare the financial instruments of the Cost of Tender Documents and EMD as per the instructions specified in Para 7.0 (f) hereinafter. The original should be posted/couriered/given in person to the concerned official, so as to reach him within a week from the date of opening. The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. If the date of issue of DD/any other accepted instrument, physically sent, is on or before the bid submission end date, the same shall also be accepted even if the details are different from the scanned copy uploaded along with the bid. Otherwise the uploaded bid will be rejected.
- f) Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. If the price bid has been given as a standard BOQ format with the tender documents, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the BOQ file, open it and complete the Sky Blue coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BOQ file is found to be modified by the bidder, the bid will be rejected.
- g) The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.
- h) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 Bit encryption technology. Data storage encryption of sensitive fields is done. Any bid document that is uploaded to the server is subjected to symmetric encryption using a system generated symmetric key. Further this key is subjected to asymmetric encryption using buyers/bid openers public keys.
- i) The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
- j) Upon the successful and timely submission of bids (i.e. after clicking "Freeze Bid Submission" in the portal), the portal will give a successful bid submission message & a bid ID to the bid. A bid summary will be displayed with the bid ID and the date & time of submission of the bid with all other relevant details.
- k) The bid summary has to be printed and kept as an acknowledgement of the submission of the bid. The acknowledgement may be used as an entry pass for any bid opening meetings.

5.7 ASSISTANCE TO BIDDERS

- a) Any queries relating to the process of online bid submission or queries

relating to CPP Portal in general may be directed to the 24x7 CPP Portal Help Desk Number 0120-4200462, 0120-4001002, 0120-4001005, 0120-6277787, E-mail id: support-eproc@nic.in

- b) Bidders information useful for submitting online bids on the CPP Portal may be obtained at:
<https://etenders.gov.in/eprocure/app?page=BiddersManualKit&service=page>
- c) It is mandatory for all bidders to have Class-III Digital Signature Certificate (DSC) in the name of the person along with name of Company who will digitally sign the bid from any of licensed Certifying Agency (CA). Bidders can see the list of licensed CAs from the link <https://www.cca.gov.in>
- d) Bidder shall ensure use of registered Digital Signature Certificate (DSC) only and safety of the same.
- e) In case the Digital Signature Certificate (DSC) holder who is digitally signing the bid and the person having Authority to Sign as per Para 11 are different, even then all the terms and conditions of the tender document will be binding upon the bidder.

5.8 PRE BID MEETING AND CLARIFICATIONS ON TENDER DOCUMENTS

The Tenderer or his official representative is invited to attend a pre-bid meeting which will take place at the Office of **General Manager (Airports), RITES Limited, First Floor, RITES BHAWAN – II, Plot No. – 144, Sector – 44, Gurgaon – 122 003 (Haryana) Ph 0124 - 2728113, 2728111 Fax 0124 - 2571633** on **18-03-2020** at **11:30 Hrs.** The purpose of the meeting will be to clarify the issues raised and to answer supplementary questions on such issues.

A prospective Tenderer requiring any clarification on the Tender Document may notify through queries, online only within the specified period (refer Para 1.6-Critical Date Sheet hereinbefore). Request for clarifications including request for Extension of Time for submission of Bid, if any, must be received not later than 16-03-2020 at 13.00 Hrs. Details of such queries raised and clarifications furnished **in the form of Pre Bid Minutes** will be uploaded in CPP website <https://etenders.gov.in/eprocure/app> without identifying the names of the bidders who had raised the queries. Any modification of the Tender Document arising out of such clarifications will also be uploaded on CPP website.

Non-attendance at the Pre-bid Meeting will not be a cause for disqualification of a tenderer.

6.0 AMENDMENT OF TENDER DOCUMENT

- 6.1 Before the deadline for submission of tenders, the Tender Document may be modified by RITES Ltd. by issue of addenda/corrigendum.
- 6.2 Addendum/Corrigendum, if any, will be hosted on website <https://etenders.gov.in/eprocure/app> and shall become a part of the tender document. All tenderers are advised to see the website for addendum/corrigendum to the tender document which may be uploaded up to 7 days prior to the deadline for submission of tender as finally stipulated.

- 6.3 To give prospective tenderers reasonable time in which to take the addenda/corrigenda into account in preparing their tenders, extension of the deadline for submission of tenders may be given before bid submission end date and time as considered necessary by RITES. Sometimes due to administrative reasons, the deadline for submission of tenders may be extended latest by the deadline for opening of tender as stipulated including extension given earlier. All tenderers are advised to see the website for extension of deadline for submission of tenders.
- 6.4 Tenderer who has downloaded the tender from Central Public Procurement Portal (CPPP) website <https://etenders.gov.in/e procure/app> shall not tamper/modify the tender form including downloaded Price Bid Template in any manner. In case if the same is found to be tampered/modified in any manner, tender will be completely rejected and EMD would be forfeited and tenderer is liable to be banned from doing business with RITES Ltd.

7.0 PREPARATION AND SUBMISSION OF BIDS

- (a) Part-1 and Part-2 of tender document may be downloaded from CPPP and Part-3 from RITES website <https://www.rites.com> under the link 'Tender' – 'RITES GCC for Works' well before the deadline for submission of bids. The bids (Part-2 only) along with the information and documents specified in Para 28 hereinafter, shall be submitted online following the instructions appearing on the screen. Documents specified in Para 28 of Section 1, Part-1 are required to be uploaded along with Part-2 (Financial Bid); the rest of Part-1 and the whole of Part-3 of the tender document need not be submitted online but it shall be deemed to have been submitted. Users are requested to map their system as per the System settings available on the link <https://etenders.gov.in/e procure/app?page=BiddersManualKit&service=page> on the CPP portal.
- (b) After downloading/getting the tender document/schedules from <https://etenders.gov.in/e procure/app> the Bidder should go through them carefully and then submit the documents as asked, otherwise bid will be rejected. It is construed that the bidder has read all the terms and conditions before submitting their offer. Bidders are advised that prior to bid submission they should read the bid submission manual available on CPP Portal <https://etenders.gov.in/e procure/app?page=BiddersManualKit&service=page> website
- (c) Bidders may ensure that all the pages of the documents mentioned in Para 28 must be signed & stamped by authorised signatory and serially numbered. In case, it is found that bidder has not complied with the same, the documents shall be deemed to be signed and stamped as this is a digitally signed e-tender.
- (d) The bids shall be submitted online following the instructions appearing on the screen. Bidders may insert their e-Token/Smart Card in their computer and Log onto CPP portal <https://etenders.gov.in/e procure/app> using the User-Id and Password chosen during registration. Then they may enter the password

of the e-Token/Smart Card to access the DSC.

- (e) Prior to bid submission, bidder should get ready with the documents to be uploaded as part of the bid as indicated in the tender document/schedule. Generally, they can be in Excel/PDF/RAR/JPG formats. No other format is accepted. If there is more than one PDF document, then they can be clubbed together in a Zip file for uploading. There is no limit for uploading file. Bids shall be submitted online only at CPP website <https://etenders.gov.in/eprocure/app>.

Tenderer/Contractor are advised to follow the instructions provided in the 'Instructions to the Contractors/Tenderer for the e-submission of the bids online through the Central Public Procurement Portal for e procurement at <https://etenders.gov.in/eprocure/app>.

Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.

Intending tenderers are advised to visit CPPP website <https://etenders.gov.in/eprocure/app> till the closing date of submission of tender to check if there is any extension of deadline of submission of tender.

(f) Cost of Tender Document & Earnest Money Deposit (EMD)

During bid submission the bidder has to select the payment option as offline to pay the Cost of Tender Document and EMD and enter details of the instruments. In case of exemption from payment of cost of tender document and EMD as a matter of Govt. Policy, the scanned copy of document in support of exemption will have to be uploaded by the bidder during bid submission. In case the bidder is registered as a vendor under the category of Micro, Small and Medium Enterprises (MSME), he must state his Udyog Aadhar Memorandum (UAM) number as registered on CPPP. The onus of proving that the bidder is exempted from payment of cost of tender document and/or EMD lies on the bidder. In this connection, it should be noted that mere opening of bid does not mean that the bid has to be considered by RITES as a valid bid. If later, it is discovered from the uploaded documents that bidder is not exempted from payment of cost of tender and/or EMD, his bid shall be treated as non-responsive. It may be noted that the benefits under Public Procurement Policy for Micro and Small Enterprises (MSEs) Order, 2012 are applicable to only Supply and Service Contracts.

- i. **Cost of Tender Document:** The Cost of Tender Document is **Rs. 12,000/- (Rupees Twelve Thousand Only)** which is non refundable. It shall be in the form of a Banker's Cheque / Pay Order / Demand Draft issued by any Scheduled Commercial Bank drawn in favour of **Pay & Accounts Officer, Ministry of External Affairs, New Delhi** payable at Delhi. No other mode of payment will be acceptable.
- ii. **Earnest Money Deposit (EMD)** – The bids shall be accompanied by total Earnest Money Deposit (EMD) of **Rs. 1,42,00,000/- (Rupees One Crore Forty Two Lakh only)** in the forms specified in Para 9 hereinafter.

Bidders are required to upload scanned copy of acceptable instruments for EMD and Cost of Tender document in different files (Either in PDF or Zip format) during on-line submission of Bid. These documents shall be deposited in "ORIGINAL" in a sealed envelope within a week from the date of opening to: **GM (Airports), 1st Floor, RITES Office Complex – II, RITES BHAWAN , Plot No. - 144, Sector - 44, Gurgaon - 122 003 (Haryana)** failing which the bid shall be rejected and the bidder shall be debarred from tendering in RITES Ltd. for a period of 02 (two) years unless the lapse is condoned by the Accepting Authority at the request of the bidder for valid reasons. The envelope should bear the tender details (Tender No., Tender Name etc.)

- (g) The bid should be submitted online in the prescribed format. No other mode of submission is accepted.
- (h) Bid shall be digitally signed by a representative of the bidder and submitted "on- line". No hard copy of the documents (except those specifically asked for in the tender document) are required to be submitted.
- (i) The bidders will have to accept unconditionally the online user portal agreement which contains the Terms and Conditions of NIT including General and Special Terms & Conditions and other conditions, if any, along with on-line undertaking in support of the authenticity regarding the facts, figures, information and documents furnished by the bidder on-line in order to become an eligible bidder.
- (j) The bidder has to digitally sign and upload the required bid documents one by one as indicated. Bidders to note that the very act of using DSC for downloading the bids and uploading their offers shall be deemed to be a confirmation that they have read all sections and pages of the tender/bid document including terms and conditions without any exception and have understood the entire document and are clear about tender requirements which will be binding upon the bidder.
- (k) The bidders are requested to submit the bids through online e-tendering system before the deadline for submission of bids (as per Server System Clock displayed on the portal). RITES will not be held responsible for any sort of delay or the difficulties faced during online submission of bids by the bidders at the eleventh hour.
- (l) The bidder may seek clarification online only within the specified period. The identity of bidder will not be disclosed by the system. RITES Ltd. will clarify the relevant queries of bidders as far as possible. The clarifications given will be visible to all the bidders intending to participate in that tender. The clarifications may be asked from the day of "Pre Bid Query Receipt Start Date and Time" till "Pre Bid Query Receipt End Date and Time".

8.0 TENDER VALIDITY

- 8.1 The Tender shall be valid for a period of **180 days** from the due date for submission of Tender or any extended date as indicated in sub para below.
- 8.2 In exceptional circumstances, during the process of evaluation of tenders and

prior to the expiry of the original time limit for Tender Validity, the Employer may request that the Tenderers may extend the period of validity unconditionally for a specified additional period. The request and the tenderer's response shall be made in writing/ e- mail. A Tenderer may refuse the request without forfeiting his Earnest Money. A Tenderer agreeing to the request will not be permitted to modify his Bid but will be required to extend the validity of the Earnest Money for the period of the extension.

9.0 EARNEST MONEY

9.1 The Tender should be accompanied by earnest money of **Rs. 1,42,00,000/- (Rupees One Crore Forty Two Lakh only) (1% of the estimated cost)** in following forms :

i) **Rs. 25,00,000/- (Rupees Twenty Five Lakhs Only)** in any one of the forms given below :

Banker's Cheque / Pay Order / Demand Draft issued by any Scheduled Commercial Bank drawn in favour of **Pay & Accounts Officer, Ministry of External Affairs, New Delhi payable at Delhi.**

ii) The balance amount of Earnest Money amounting to **Rs. 1,17,00,000/- (Rupees One Crore Seventeen Lakh only)** may be furnished either in the form of Banker's Cheque / Pay Order / Demand Draft as mentioned in (i) above or in the form of Bank Guarantee of any Scheduled Commercial Bank or State Bank of India in accordance with the form given at Annexure-VIII in favor of **Pay & Accounts Officer, Ministry of External Affairs, New Delhi.**

9.2 Any Tender not accompanied by scanned copies of the instruments for payment of Earnest Money and Cost of tender document in an acceptable form (or, if applicable, the scanned copy of documents in support of exemption) shall be rejected by the Employer as non-responsive.

9.3 Refund of Earnest Money

The Earnest Money of the Tenderers whose Technical Bid is found not acceptable will be returned without interest soon after scrutiny of Technical Bid has been completed by the Employer subject to provisions of Para 9.4 (b). The Earnest Money of the Tenderers whose Technical Bid is found acceptable but who are neither the lowest nor the second lowest will be returned without interest within 07 days of opening of Financial Bid. The Earnest Money of the remaining unsuccessful bidders will be released within seven days of the Accepting Authority's decision on acceptance or otherwise of the tender subject to provisions of Para 9.4 (b). The bidder shall submit RTGS/NEFT Mandate Form as per Performa given in **Annexure VII**, dully filled in.

9.4 The Earnest Money is liable to be forfeited

(a) if after bid opening, but before expiry of bid validity or issue of Letter of Acceptance, whichever is earlier, any Tenderer

i. withdraws his tender; or

ii. makes any modification in the terms and conditions of the tender which

are not acceptable to the Employer

- (b) in case any information/document which may result in the tenderer's disqualification is concealed by the Tenderer or any statement/information/document furnished by the Tenderer or issued by a Bank/Agency/Third Party and submitted by the tenderer, is subsequently found to be false or fraudulent or repudiated by the said Bank/Agency/Third Party.
- (c) in the case of a successful Tenderer, if the Tenderer
- fails to furnish the Performance Guarantee within the period specified under Clause 1 of "Clauses of Contract" or
 - fails to commence the work without valid reasons within the period as specified in Schedule F after the date of issue of Letter of Acceptance or from the first date of handing over of the site, whichever is later.
 - In case of forfeiture of Earnest Money as prescribed hereinabove, the Tenderer shall not be allowed to participate in the retendering process of the work.

10.0 MODIFICATION/ SUBSTITUTION/ WITHDRAWAL OF BIDS

- 10.1 The Tenderers shall submit offers which comply strictly with the requirements of the Tender Document as amended from time to time as indicated in Para 6.0 above. Alternatives or any modifications by the tenderer shall render the Tender invalid.
- 10.2 The bidder can modify, substitute, re-submit or withdraw its E-bid after submission but prior to the deadline for submission of bids. No Bid shall be modified, substituted or withdrawn by the bidder on or after the deadline for submission of bids. Withdrawal of bid after the deadline for submission of bids would result in the forfeiture of EMD.
- 10.3 Any modification in the Bid or additional information supplied subsequently to the deadline for submission of bids, unless the same has been explicitly sought for by RITES, shall be disregarded.
- 10.4 For modification of E-bid (Technical Bid), bidder has to detach its old bid from CPP portal and upload / re-submit digitally signed modified bid.
- 10.5 For withdrawal of bid, bidder has to click on withdrawal icon at CPP portal and can withdraw its E-bid.
- 10.6 After the bid submission on the portal, an acknowledgement number will be generated by the system which should be printed by the bidder and kept as a record of evidence for online submission of bid for the particular tender and will also act as an entry pass to participate in the bid opening.
- 10.7 The time settings fixed in the server side & displayed at the top of the tender site, will be valid for bid submission, in the e-tender system. The bidders should follow this time during bid submission.

10.8 All the data being entered by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered will not be viewable by unauthorized persons during bid submission & will not be viewable by any one until the date & time specified for bid opening.

10.9 The bidder should logout of the tendering system using the normal logout option available in the portal and not by selecting the (X) exit option in the browser.

11.0 AUTHORITY TO SIGN

The applicant shall be a Partnership Firm registered with Registrar of Firms in India, a Private Limited Company or a Public Limited Company registered with Registrar of Companies in India (excluding companies who are subsidiaries of any foreign company), a Corporation incorporated in India.

a) **Deleted**

b) **Deleted**

c) If the applicant is a firm in partnership registered with Registrar of Firms in India, the Documents should be signed by all the partners of the firm above their full type written names and current addresses. Alternatively, the Documents should be signed by the person holding Power of Attorney for the firm in the Format at **Annexure III**.

d) If the applicant is a Private Limited Company or a Public Limited Company Registrar of Companies in India (excluding companies who are subsidiaries of any foreign company), or a Corporation incorporated in India the Documents shall be signed by a duly authorized person holding Power of Attorney for signing the Documents in the Format at **Annexure III**.

e) **Deleted**

11.1 Points to be kept in mind while preparing the bid

While filling in Qualification Information documents and the Financial Bid, following should be kept in mind:

i. There shall be no additions or alterations except those to comply with the instructions issued by the Employer or as necessary to correct errors, if any, made by the Tenderers.

ii. Conditional Offer/ Tender will be rejected. Unconditional rebate/discounts in the Financial offer will however be accepted.

iii. The Employer reserves the right to accept or reject any conditional rebate/discounts. While evaluating the Bid Price, the conditional rebates/discounts which are in excess of the requirements of the bidding documents or otherwise result in accrual of unsolicited benefits to the Employer, shall not be taken into account.

iv. The bidder has to quote value only in figures in the BOQ.

- v. In case of Item Rate Tenders, the bidders have to compulsorily quote rates of all the BOQ items as also all items of Item Rate Schedule.
- vi. In case of Item Rate Tenders, if the same item figures in more than one section/part of Schedule of Quantities, the Tenderer should quote the same rate for that item in all sections/parts. If different rates are quoted for the same item, the least of the different rates quoted only shall be considered for evaluation of that item in all sections/parts of the Schedule of Quantities.
- vii. In case of item wise BOQ, the bidder is required to quote his rate for all items. For the items not quoted by the bidder, it will be presumed that the bidder has included the cost of that/those item(s) in the rates of other items and the rate for such item(s) shall be considered as Zero and the tender will be evaluated by the Employer accordingly and the work executed by the successful bidder accordingly.
- viii. In case of Percentage Rate BOQ, the bidder has to select Excess (+) or Less (-) and enter the valid percentage for that BOQ.
- ix. Deduction/recovery/credit items, if any, are placed in a separate sub-head and in a separate sheet of BOQ. In case of credit items/recovery items/deduction items for which the bidder has to pay the amount to Employer, the bidder is not allowed to make negative entry and the rate quoted by the bidder shall be taken as negatively default. The amount so calculated shall be considered as negative and deducted from the total of other sub-heads of BOQ to work out the total bid amount.

11.2 INTEGRITY PACT

- (i) The Bidder/Contractor is required to enter into an Integrity Pact with the Employer, in the Format at Annexure VI. The Integrity Pact enclosed as Annexure VI will be signed by RITES for and on behalf of Employer as its Agent/Power of Attorney Holder at the time of execution of Agreement with the successful Bidder. While submitting the Bid, the Integrity Pact shall be signed by the duly authorized signatory of the Bidder/Lead Member of JV. In case of failure to submit the Integrity Pact duly signed and witnessed, along with the Bid, the Bid is likely to be rejected.
- (ii) In case of any contradiction between the Terms and Conditions of the Bid document and the Integrity Pact, the former will prevail

Provided always that provision of this Para 11.2 - Integrity Pact (IP), shall be applicable only when so provided in Para 11.2A below which will also stipulate the names and addresses of the Independent External Monitors as well as the Name, designation and address of the official nominated by the Employer to act as the Liaison Officer between the Independent External Monitor and the Engineer-in-Charge as well as the Contractor/bidder.

11.2A Whether Para 11.2 (Integrity Pact) shall be applicable: **YES**

In case Integrity Pact is applicable, (when estimated cost put to tender is above Rs. 10 Crore or more), the following Independent External Monitors who have been appointed by the Central Vigilance Commission, shall monitor implementation of IP -:

Name and Address of IEM 1 :

Sh. Aditya Prakash Mishra, (IRSE, Retd.),
Flat No.-24, Aster-1, Vatika City,
Sohna Road, Sector-49, Gurgaon – 122 003

Name and Address of IEM 2 :

Sh. Abhay Kumar Khanna, IRAS (Retd.),
S-410, UGF, GK-II, New Delhi-110048

Name, Designation and Address of **MITES' Liaison Officer**

Sh. Alok Garg, ED (HW&Ports) / MITES,
Plot No. 1, Sector – 29, Gurgaon - 122 001 (Haryana)

- 11.2B The Guidelines on Banning of Business Dealings as per **Annexure-A to Annexure VI** are applicable to all contracts.

12.0 TENDER OPENING, EVALUATION AND CLARIFICATIONS

- 12.1 The Employer will open all the Tenders received, in the presence of the Tenderers or their representatives who choose to attend at **15:30 Hrs.** on 08.04.2020 in the office of **GM (Airports), 1st Floor, MITES Office Complex – II, MITES BHAWAN, Plot No. - 144, Sector - 44, Gurgaon - 122 003 (Haryana)** In the event of the specified date of the opening being declared a holiday by the Employer, the Tenders will be opened at the appointed time and location on the next working day.
- 12.2 Opening of bids will be done through online process. MITES reserves the right to postpone or cancel a scheduled bid opening at any time prior to its opening. Information of the same will be displayed at <https://etenders.gov.in/e procure/app CPP portal>.
- 12.3 Bid opening committee will open the bids online in the presence of bidders or their authorized representatives who choose to attend on opening date and time. Also, the bidders can participate online during the bid opening process from their remote end through their dashboard. The bidder's representatives, who are present, shall sign in an attendance register. At the time of technical bid opening, each bidder will be able to view on-line through CPPP, the technical bids of the bidders who have participated in the tender and whose bids have been opened.
- 12.4 Bids will be opened as per date/time as mentioned in the Tender Critical Date Sheet unless the same is extended. On completion of Technical Bid Opening, each bidder will be able to view the technical bid documents of the bidders whose bids have been opened. Similarly, on the completion of Financial Bid Opening each bidder will be able to view the Financial as well as technical bid documents of the bidders whose bids have been opened.
- 12.5 MITES shall subsequently examine and evaluate the bids in accordance with the provision set out in the tender document.
- 12.6 The results of technical and financial qualification of bidders will be available on the CPP Portal at <https://etenders.gov.in/e procure/app> and intimated to the bidder

through system generated email or SMS.

- 12.7 It will be the bidder's responsibility to check the status of their Bid on-line regularly after the opening of bid till award of work.
- 12.8 The bids will be evaluated for qualifying criteria as mentioned in Para 2 hereinbefore. RITES shall not be responsible for any postal delay in receipt of all original documents including the cost of tender document and EMD. In case of non-receipt of these documents in original within the specified period, the bid will be treated as non-responsive.
- 12.9 Request for clarification/deficient documents from the bidder can be asked for either through the system or through E-mail. A system generated SMS alert will be sent to the bidder when clarifications/deficient documents are called through the system. In such a case, no separate communication will be sent in this regard. Non-receipt of email and/or SMS will not be accepted as a reason of non-submission of deficient documents or confirmatory documents within prescribed time. The date and time of submission of deficient documents cannot be extended.
- 12.10 After evaluation of Technical-Bid, the bidder will be able to view uploaded Tender Committee evaluation results as also the date and time of Financial Bid Opening.
- 12.11 The bidder will be able to view (through his Login Id) BOQ Sheets of other bidders, Comparative Chart and Financial Evaluation Summary uploaded by Tender Evaluation Committee. Without login, bidder will be able to view only Comparative Chart.

12.12 SINGLE PACKET SYSTEM – D E L E T E D

12.13 TWO PACKET SYSTEM

- (a) Envelope 1 of Packet I containing scanned copy of Earnest Money along with Mandate Form as per Annexure VII, Cost of Tender Document of all the Tenderers and Authority to Sign as per Para 11.0 will be opened first and checked. If Earnest Money and cost of Tender Document are not furnished as per tender stipulations, the Envelope 2 of PACKET-I (Technical Bid) and PACKET-II (Financial Bid) will not be opened and the bid will be considered as non-responsive and rejected unless the bidder has established that it is exempted from payment of Cost of Tender Document and Earnest Money Deposit. The Envelope 2 of PACKET-I (Technical Bid) of other Tenderers who have furnished scanned copies of Earnest Money and cost of Tender document as per tender stipulations will then be opened.
- (b) The Employer will scrutinize the Technical Bids accepted for evaluation to determine whether each Tenderer
- (i) has submitted 'Authority to sign' as per Para 11.0 above and Integrity Pact (where applicable) duly signed and witnessed as per Para 11.2 above;
- (ii) meets the Qualification Criteria stipulated in Para 2.0

- (c) If required, the Employer may ask any such Tenderer for clarifications on his Technical Bid through CPPP or through E-mail. The tenderer shall furnish the same online only in case clarifications are sought through CPPP and through E-mail if clarifications are sought through E-mail. If a Tenderer does not submit the clarification/document requested, by the specified time, the bid of such Tenderer is likely to be rejected. PACKET-II (Financial Bid) of Tenderers whose Technical Bids are not found acceptable will not be opened. Such tenderers will be informed about non-acceptance of their Technical Bid through system generated SMS/E- mail. The tenderers whose Technical Bids are found acceptable will be advised accordingly and will also be intimated through e-mail the time and date and place where and when PACKET-II (Financial Bid) will be opened.
- (d) At the appointed place, time and date, in the presence of the Tenderers or their representatives who choose to be present, the Employer will open the online PACKET-II (Financial Bid).

12.14 Mere Opening of Bid to be No Guarantee of its Validity

It may be noted that mere opening of a bid does not mean that the bid has to be considered by RITES as a valid bid. All bids will be evaluated to decide whether the bids are responsive or non- responsive.

12.15 DELETED

13.0 INSPECTION OF SITE BY THE TENDERERS

Tenderers are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their Tenders, as to the nature of the ground and sub-soil (as far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their Tender. A Tenderer shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charges consequent on any misunderstanding or otherwise shall be allowed. The Tenderer shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity, access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a Tenderer implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant etc. will be issued to him by the Employer and local conditions and other factors having a bearing on the execution of the work. The bidders may contact **GM (Airports), 1st Floor, RITES Office Complex – II, RITES BHAWAN, Plot No. - 144, Sector - 44, Gurgaon - 122 003 (Haryana), Ph. 0124 2728 104** regarding inspection of site.

14.0 EMPLOYER'S RIGHT ON ACCEPTANCE OF ANY TENDER

- (i) If required, the Employer may ask any Tenderer the breakdown of unit rates. If the Tenderer does not submit the clarification by the date and time set in the Employers request for clarification, such Tender is likely to be rejected.

- (ii) The competent authority on behalf of the Employer does not bind himself to accept the lowest or any other Tender and reserves to himself the authority to reject any or all the Tenders received without the assignment of any reason. All Tenders in which any of the prescribed conditions is not fulfilled or any condition is put forth by the Tenderer shall be summarily rejected.

15.0 CANVASSING PROHIBITED

Canvassing whether directly or indirectly, in connection with tenders is strictly prohibited and the tenders submitted by the Contractors who resort to canvassing will be liable to rejection.

16.0 EMPLOYER'S RIGHT TO ACCEPT WHOLE OR PART OF THE TENDER

The competent authority on behalf of the Employer reserves to himself the right of accepting the whole or any part of the tender and the Tenderer shall be bound to perform the same at the rates quoted.

17.0 MISCELLANEOUS RULES AND DIRECTIONS

- 17.1** The Tenderer shall not be permitted to tender for works if his near relative is posted as Associated Finance Officer between the grades of AGM(F) and J.M (F) in the concerned SBU Unit of RITES or as an officer in any capacity between the grades of GGM/GM and Engineer (both inclusive) of the concerned SBU of the Employer. He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Officer of Engineer rank and above in the organization of the Employer. Any breach of this condition by the Tenderer would render his Tender to be rejected.

No Officer of Engineer rank and above employed in Engineering or Administrative duties in an Engineering Department of the Organisation of the Employer is allowed to work as a contractor for a period of one year after his retirement from the Employer's service without the previous permission of the Employer in writing. The contract is liable to be cancelled if either the Contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Employer as aforesaid before submission of the tender or engagement in the Contractor's service.

- 17.2** If required by the Employer, the Tenderers shall sign a declaration under the officials Secret Act 1923, for maintaining secrecy of the tender documents drawings or other records connected with the work given to them. The unsuccessful Tenderers shall return all the drawings given to them.
- 17.3** In the case of any Item rate tender where unit rate of any item/items appears unrealistic, such tender will be considered as unbalanced and in case the Tenderer is unable to provide satisfactory explanation, such a tender is liable to be disqualified and rejected.
- 17.4** Price/rates quoted by the contractor in respect of the contract shall be exclusive of GST. In case GST is found to be applicable, the same shall be paid additionally as provided under Clause 37 of General Condition of Contract read with the relevant special condition of contract.

- 17.5** Each Bidder shall submit only one Bid either as a Partner in a Partnership firm or as a Director of a Limited Company/Corporation. Any Bidder who has submitted a Bid for a work, shall not be a witness for any other Bidder for the same work. Failure to observe the above stipulations would render all such Tenders submitted as a Bidder and/or as a witness, liable to summary rejection.
- 17.6** The Contractor shall be fully responsible for all matters arising out of the Performance of the Contract and shall, at his own expense, comply with all laws/acts/enactments/orders/regulations/obligations whatsoever of the Government of India, State Government, Local Body and any Statutory Authority.
- 17.7** In case the bidder does not quote his rate for any item(s) in Item Rate Tender or Mixed Tender containing one or more Item Wise Schedules, it will be presumed that the bidder has included the cost of that/those item(s) in the rates of other items and the rate for such item(s) shall be considered as Zero and the tender will be evaluated by the Employer accordingly and the work executed by the successful bidder accordingly.
- 17.8** In case of credit items/recovery items/deduction items for which the bidder has to pay the amount to RITES/Employer, the rate quoted by the bidder shall be taken as negative (bidder is allowed to make positive entry only) and the negative amount so calculated shall be considered to work out the total bid amount.
- 17.9** **Labour laws :-**
The manpower / labour engaged on the works shall be from Indian OR Nepalese citizens only.
- The recruitment of labour, administrative staff, technical staff and other personnel for the project shall be confined to nationals of either country (India OR Nepal). However, skilled, unskilled or semiskilled labour shall, to the extent availability, be confined to the nationals of Nepal. The executing agency shall issue identity cards to such employees and also arrange for their security during the execution of the project.
- 17.10** **Exemption of Taxes by Government of Nepal :-**
- a) Exemption from payment of all custom duties, taxes including VAT & cesses on any material or equipment imported from India by the executing agency.
 - b) Refund of VAT and related taxes in respect of any material or equipment purchased or procured in Nepal for the project. The executing agency shall submit the necessary requests with VAT bills to the Inland Revenue Office of Govt. of Nepal for reimbursement and Inland Revenue Office of Govt. of Nepal will reimburse the paid VAT within the prescribed time, in accordance with the VAT act and regulations of Govt. of Nepal.
 - c) Double tax avoidance agreement signed between the two countries on 18 January, 1987 shall be applicable in the case of income tax for any Indian national or Indian firm employed by Govt. of India as a consultant or contractor in connection with the project.
 - d) Emphasis should be given that material for the project is manufactured in India OR Nepal. Nevertheless, special kind of material and equipment shall be imported from other countries, if required.

17.11 Master List

Contractor shall submit Master List in two stages to obtain approval of GON for custom free import of material, machinery and equipments, he proposes to import from India for the project. The Initial Master List shall be submitted by the contractor within 07 days after issue of LOA comprising of the details of material, machinery and equipments, he proposes to import from India for initial mobilization for the project and sufficient for progressing the work in the initial three months. The Second and Detailed Master List shall be submitted by the contractor within 30 days after issue of LOA comprising of the details of complete material, machinery and equipments, he proposes to import from India for completion of the project. Prior to submitting the master list contractor shall consult with concerned Nepalese authorities in order to ensure that the master list submitted by the contractor is in accordance with the format/rules/regulations of Government of Nepal. Master list submitted by the contractor shall be forwarded by consultant through Employer for approval of Govt. of Nepal. Further responsibility for liaisoning with Govt. of Nepal for early approval of Master List by shall be of the Contractor.

17.12 Custom clearance of individual consignments

Subsequent to approval of master list, Custom clearance of individual consignments of material machinery and equipment from Indian as well as Nepalese custom shall be the responsibility of the Contractor.

18.0 SIGNING OF CONTRACT AGREEMENT

18.1 The Tenderer whose tender has been accepted will be notified of the award by the Employer by issue of a 'Letter of Acceptance' prior to expiration of the Bid Validity period.

The Letter of Acceptance will be sent to the Contractor in two copies one of which he should return promptly, duly signed and stamped. The Letter of Acceptance will be a binding Contract between the Employer and the Contractor till the formal Contract Agreement is executed.

18.2 Within the period as specified in Clause 1 of 'Clauses of Contract', from the date of issue of Letter of Acceptance, the successful Tenderer shall deliver to the Employer, Performance Guarantee and Additional Performance Guarantee (where applicable) in the format prescribed.

18.3 The Tenderer whose Tender is accepted shall be required to submit at his cost stamp papers of appropriate value as per the provisions of Indian Stamp Act within 15 days of the date of issue of Letter of Acceptance.

18.4 At the same time the Employer notifies the successful Tenderer that his Tender has been accepted, the Employer will direct him to attend the Employer's office within 28 days of issue of Letter of Acceptance for signing the Agreement in the proforma at Annexure V. The Agreement will however be signed only after the Contractor furnishes Performance Guarantee and Additional Performance Guarantee (where applicable) and hence, where justified, the period of 28 days stipulated above will be extended suitably.

18A Amendment to Contract

The conditions and clauses of this contract cannot be varied except through a written Supplementary Agreement with mutual consent of both the parties to the contract.

19.0 PRE-QUALIFICATION PERFORMA

The bidder shall fill the pre-qualification **Performa at Annexure IX**. The bid will be evaluated only considering those details and corresponding documents as mentioned in **Annexure IX** and no other details/certificate/document will be taken in to consideration while evaluating the bid to decide whether the bidder is qualified or not. For similar work experience the details of only those works mentioned in **Annexure IX** may be given in **Performa no. 1 attached to Annexure-I**.

20.0 BRIEF NOTICE INVITING E-TENDERS

GM (AP), RITES Ltd invites on behalf of **Ministry of External Affairs, Government of India** Online percentage rate + item rate bids in Two Packet System for the following work. No other mode of submission shall be accepted.

S. No.	NIT No.	Name of Work & Location	Cost of Tender Document	Estimated Cost put to Bid	Earnest Money	Period of Completion	Last Date & Time of submission of Bid, EMD, Cost of Tender Document and Other Documents as specified in the Press Notice	Time & Date of Opening of Bid
1	2	3	4	5	6	7	8	9
1.	RITES/AP/ICP/Nepalgunj I/Tender/2020/01	Construction of Integrated Check Post at Nepalgunj in Nepal : Main package-1	12,000/-	Rs. 142,04,90,577/-	Rs. 1,42,00,000/- (1% of the estimated cost put to tender)	24 months	15.00hrs on 07.04.2020	15.30 hrs on 08.04 .2020

21.0 The bid document consisting of tender drawings, specifications, the schedule of quantities of various types of items to be executed and the set of terms and conditions of the contract to be complied with and other necessary documents can be seen on CPP Portal <https://etenders.gov.in> free of cost.

22.0 After submission of the bid the bidder can re-submit revised bid any number of times but before last time and date of submission of bid as notified.

23.0 While submitting the revised/modified Financial bid, the bidder can

revise/modify the rate of one or more item(s) any number of times (he need not re-enter rate of all the items) but before last time and date of submission of bid as notified.

24.0 The bid submitted shall become invalid if:

- (i) The bidder is found ineligible.
- (ii) The bidder does not upload all the documents as stipulated in the bid document including the undertaking about deposition of physical EMD and Cost of Tender Document of the scanned copy of EMD and Cost of Tender Document uploaded.
- (iii) If any discrepancy is noticed between the documents as uploaded at the time of submission of bid and hard copies as submitted physically by the lowest bidder in the office of bid opening authority.
- (iv) The bidder does not deposit physical instruments of EMD and Cost of Tender Document within a week of opening of technical bid.

25.0 Those contractors not registered on the website mentioned above, are required to get registered beforehand. If needed they can go to CPP Portal <https://eprocure.gov.in/eprocure/app?page=BiddersManualKit&service=page> bidders manual kit.

26.0 The intending bidder must have valid Class-III digital signature to submit the bid.

27.0 On opening date, the bidder can login and see the bid opening process. After opening of bids he will be able to view the competitors' bid documents.

28.0 List of Documents to be scanned and uploaded within the period of bid submission: -

- 1) Banker's Cheque/ Pay Order/ Demand Draft towards cost of Tender Document in accordance with Para 7.0 (f) hereinbefore.
OR
Document in support of exemption from payment of cost of Tender Document and Udyog Aadhar Memorandum (UAM) number.
- 2) "Banker's Cheque/Pay Order/Demand Draft" and "Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Commercial Bank or the State Bank of India" towards Earnest Money Deposit (EMD) in accordance with Para 9 hereinbefore.
OR
Document in support of exemption from payment of EMD and Udyog Aadhar Memorandum (UAM) number.
- 3) Authority to Sign (if required as per Para 11.0 hereinbefore) in the format given at Annexure III/Annexure IV as applicable.
- 4) RTGS/NEFT details as per Annexure- VII.
- 5) Self-attested copy of Documents in support of meeting the criterion of

- Annual Financial Turnover in accordance with Para 1 of Annexure I.
- 6) Self-attested copy of Certificates in support of meeting the criterion of Similar Work Experience in accordance with Para 2(a) of Annexure I.
 - 7) Details of Similar Works completed in the format given at Performa 1 in Annexure I.
 - 8) Self-attested copy of Certificates in support of meeting the criterion of Construction Experience in key activities/specified components in accordance with Para 2(b) of Annexure I.
 - 9) Self-attested copy of Documents (Audited Balance Sheets, Profit & Loss Statements and Auditor's Reports) in support of meeting the Profitability criterion in accordance with Para 4 of Annexure I.
 - 10) Self-attested copy of Documents in support of meeting the criterion of Net Worth in accordance with Para 5 of Annexure I.
 - 11) Declaration by the Bidder in the format given in Performa 3 of Annexure I.
 - 12) Integrity Pact as per Annexure VI
 - 13) Self-attested copy of Guidelines on Banning of Business Dealings as per Annexure-A.
 - 14) Annexure IX duly filled in.
 - 15) Self-attested copy of a certificate, confirming that the applicant is working contractor or has executed any work within the last five years reckoned from the date of opening of tender, issued by Railways, CPWD, MES, DOT, RITES, State PWD or any other Central/State Government Undertaking, Municipal Body of Central/State Government or Public Limited Company listed in Stock Exchange in India & Abroad.
 - 16) Self-Attested Copy of Partnership Deed/Memorandum and Articles of Association of the firm, Certificate of Registration with Registrar of Companies in India.
 - 17) Self-Attested copy of Corrigendum(s), if any.
 - 18) Self-attested copy of any other document if specified in the correction slips to the Tender Document.
 - 19) Self-certified copy of the Joint Venture Agreement/Memorandum of Understanding as per Annexure II & Annexure IV (where Joint Venture is allowed).
 - 20) Power of Attorney in favour of Lead Member as the Lead Member of JV executed by the authorized representatives of all the members of JV (where Joint Venture is allowed).
 - 21) Self-attested copy of a certificate, confirming that the Partners including

Lead Partner duly signed by the Authorized representative of each Partner/Member of Joint Venture is a working contractor or has executed any work within the last five years reckoned from the date of opening of Tender, issued by Railways, CPWD, MES, DOT, RITES, State PWD or any other Central/State Government Undertaking, Municipal Body, Autonomous Body of Central or State Government or Public Limited Company listed on NSE/BSE (where Joint Venture is allowed)

- 22) Self-attested copy of **GST registration Certificate (As applicable)**.
- 23) Details of pending contract litigation(s) as per format placed at **Perfoma-4** of Annexure I alongwith Self-attested copy of documents establishing details included in the Performa-4.
- 24) Details of past contract performance and litigation(s) as per format placed at **Perfoma-5** of Annexure I alongwith Self-attested copy of documents establishing details included in the Performa-5
- 25) Details of any litigation or arbitration resulting from contracts completed or ongoing under its execution as per format placed at **Perfoma-6** of Annexure I alongwith Self-attested copy of documents establishing details included in the Performa-6

Note: - Any clarification / deficient document(s) sought by RITES Ltd. as per Clause/Para shall be submitted by the bidder online only.

- 29.0 List of Documents to be submitted physically by Lowest (L1) Bidder within a week of the opening of Financial Bid: -
- 1) Self-attested copy of PAN/TAN issued by income Tax Department.
 - 2) Self-attested copy of registration under Labour Laws like PF, ESI etc.
 - 3) Self-attested copy of ISO 9000 Certificate. (if any)
 - 4) Self-attested copies of all the documents specified in Para 28.0 above.
- 30.0 RITES Ltd. may approach any Bank, Individual, Employer, Firm or Corporation, whether mentioned in the documents submitted by bidders or not, to verify the credentials and general reputation of the bidder and where JV is allowed the credentials and general reputation of lead member & each Member of Joint Venture.

ANNEXURE – I

QUALIFYING CRITERIA FOR WORKS CONTRACTS

1. ANNUAL FINANCIAL TURNOVER

The bidder should have achieved annualized average financial turnover of not less than **Rs. 7102 lakhs** during last three Financial Years.

Notes:

- a) The financial turnover will be taken as given under the head “Income” in audited Profit and Loss Account and excluding non-recurring income, income from other sources and stock. It is clarified that the Financial Turnover means relevant revenue as recorded in the Income side of Profit and Loss Account. It does not mean Profit.
- b) Closing stocks in whatsoever manner should not form part of turnover.
- c) Weightage of 7% (compounded annually) shall be given for equating the financial turnover of the previous years to the current year.
- d) For considering the Financial Years, for example for a work for which the Tender is being opened in Financial Year 2020-21, the last three Financial Years will be 2019- 20, 2018-19 and 2017-18. For a Tender opened on (say) 05.09.14 (F.Y. 2014-15), with weightage of 7% compounded annually, the weightages to be applied on the Turnover of the previous three Financial Years will be: F.Y. 2013-14 = 1.070; F.Y. 2012-13 = 1.145; F.Y. 2011-12 = 1.225
- e) The Bidder should furnish Annual Financial Turnover for each of the last 3 Financial Years in tabular form and give reference of the document (with page no.) relied upon in support of meeting the Qualification Criterion.
- f) The Bidder should submit self-attested copy of Auditor’s Report along with Balance Sheet and Profit and Loss Statement along with Schedules for the relevant Financial Year in which the minimum criterion is met. Provisional Audit Reports or certified statements will not be accepted.
- g) If the Audited Balance Sheet for the immediately preceding year is not available in case of tender opened before 30th Sept., audited Balance Sheets, Profit and Loss Statements and other financial statements of the three Financial Years immediately preceding the previous Financial Year may be adopted for evaluating the credentials of the Bidder.

2. WORK EXPERIENCE

a) Similar Works Experience

- (i) **For works in Normal Areas (other than Difficult Areas)** - The Bidder should have satisfactorily completed in his own name or proportionate share as a member of a Joint Venture, at least one similar work of minimum value of **Rs. 11364 Lakhs** OR at least two similar works each of minimum value of **Rs. 8523 Lakhs** OR at least

three similar works each of minimum value of **Rs. 5682 Lakhs** during the last 5 (five) years prior to the last stipulated date for submission of the Bid. Works completed prior to the cutoff date shall not be considered.

(ii) For Works in Difficult Areas : DELETED

Similar Works

Similar Works shall mean the work of :

Construction of Land Port Terminal / Airport Terminal / Sea Port Terminal / Integrated Check Post / Hospital Building / Star Hotels / Institutional Buildings / Assembly Building (Auditorium / Secretariat / Convention Centre etc.) carried out in India / abroad under a single contract (including additional work carried out under the contract).

In case the Bidder (Indian Company) wishes to rely on a work completed abroad, the value of such completed work in foreign convertible currency shall be converted into Indian Rupees. The conversion rate shall be decided by RITES based on the rates of currency on the date of completion of work (the bidder to also submit the currency conversion rate as on completion date of the Credential Certificate relied upon by the bidder for the purpose of work experience). Further, such a bidder (Indian Company) should have also completed at least one construction work of value minimum 25% of estimated cost of work, in India in the last five years.

(Client certificates for experience should show the nature of work done, the value of work, date of start, date of completion as per agreement, actual date of completion and satisfactory completion of work.)

Notes:

- I. A weightage of 7% (compounded annually from the date of completion of the work to the submission of the Bid) shall be given for equating the value of works of the previous years to the current year.
- II. Only such works shall be considered where physical completion of entire work is over or commissioning of work has been done, whichever is earlier.
- III. The Bidder should submit the details of such similar completed works as per the format at Proforma-1 enclosed.
- IV. Works carried out by another Contractor on behalf of the Bidder on a back to back basis will not be considered for satisfaction of the Qualification Criterion by the Bidder.
- V. Credential certificates issued by Government Organizations/Semi Government Organizations of Central or State Government; or by Public Sector Undertakings/ Autonomous Bodies of Central/State Government or their subsidiaries/by Public Ltd. Companies listed in Stock exchange in India or Abroad or subsidiaries of such companies shall only be accepted for assessing the eligibility of a Tenderer. Certificates issued by one of the aforesaid organizations

as a lead member (having equity stake of 51% or more) of a Joint Venture (JV) for a work executed for the JV, will also be acceptable. In case of PPP projects, if the bidder has executed a work for a concessionaire who is one of the aforesaid organizations, then the certificate issued by such concessionaire or by the public authority concerned, will also be acceptable.

VI. The cutoff date shall be calculated backwards from the last stipulated date for submission/opening of Tender i.e. for a Tender which is being opened on 06.08.2014, the cutoff date shall be 07.08.2009.

b) **Construction Experience in Key Activities/Specified Components:-**

To qualify for award of the contract, each bidder in his own name or as a member of a Joint Venture should have, in the last five years prior to the last stipulated date for submission of the bid, executed the following key activities in any one work individually carried out in India.

“Pavement works of National Highway / Airports / Ports etc. of minimum value of Rs. 25 crore”.

Notes:

- Credential certificates issued by Government Organizations/Semi Government Organizations of Central or State Government; or by Public Sector Undertakings/ Autonomous Bodies of Central/State Government or their subsidiaries/by Public Ltd. Companies listed in Stock exchange in India or Abroad or subsidiaries of such companies shall only be accepted for assessing the eligibility of a Tenderer. Certificates issued by one of the aforesaid organizations as a lead member (having equity stake of 51% or more) of a Joint Venture (JV) for a work executed for the JV, will also be acceptable. In case of PPP projects, if the bidder has executed a work for a concessionaire who is one of the aforesaid organizations, then the certificate issued by such concessionaire or by the public authority concerned, will also be acceptable.
- When key activities/specified components are expressed/specified in monetary terms, a weightage of 7% (compounded annually from the date of completion of the work to the submission of the Bid) shall be given for equating the value of works of the previous years to the current year.
- The work satisfying the criterion for a particular key activity may be different from a work satisfying the criterion for another key activity.
- The Bidder should furnish with his Bid a tabular statement giving contract- wise quantities/amount of key activities/Specialized components executed in the last 5 years which meet the Qualification Criterion along with documentary proof in support thereof (indicating page nos.).
- Even if a work has not been completed but if the specified quantity of the key activity has been completed, the same shall be taken into consideration for the purpose of this criterion.

- Any work executed by the Bidder as a member of a Joint Venture will be accepted provided there is documentary proof in support of the same either in the MOU/Agreement of the JV or in a declaration by the other Members of that JV or the Client confirming that the specialized work was actually executed by the Bidder.

3. SERVICING OF LOAN / CREDIT LIMIT

The bidder should furnish a declaration that he has not failed to service the principal amount or interest or both of a loan amount / credit limit from any Bank or Financial Institution during a period of one year prior to the deadline for submission of bids.

Notes:

- a) In case a bidder has defaulted in servicing his loan/credit limit during past one year, he shall be disqualified.
- b) The declaration may be included in the Declaration to be submitted in Performa 3 to this Annexure.

4. PROFITABILITY

The Bidder should be a profit (net) making firm and should have made profit during the :

- a) last year immediately preceding the deadline for submission of bids
AND
- b) any two of the past three Financial Years immediately preceding the deadline for submission of bids.

If the audited Balance Sheet for the immediately preceding year is not available in case of tenders opened before 30th September, Audited Balance Sheets of the three financial Years immediately preceding the previous Financial Year shall be considered.

The Bidder should furnish figures of net profit of last 3 years in a tabular form and submit attested copies of Auditor's Reports along with audited Balance Sheets and Profit and Loss Statements for the last three Financial Years. Specific reference with page no. of document which proves satisfaction of this Qualifying Criterion should be indicated in the tabular statement.

5. NET WORTH AND PENDING CONTRACT LITIGATION

The Bidder should have Positive* Adjusted Net Worth of at least 15% of the estimated cost.

Notes:

- a) Bidder shall submit details of pending contract litigation(s) as per format placed at **Perfoma-4** alongwith documents establishing details included in the Performa-4.
- b) Positive* Adjusted Net Worth shall be computed from the bidder's audited balance sheet of the last financial year ending on a date not prior to 18 months from the due date of submission of the tender (or, if the date is extended, such extended date of submission.
- c) Litigation value shall be deemed to be 25% of the aggregate value pending

litigation across all contracts and net of provisions, this value will be deducted from the net worth to arrive at the adjusted net worth.

- d) * Net worth – [25% Litigation value – provisions already made] = positive (at least 15% of the estimated cost)

6. PAST CONTRACT PERFORMANCE AND LITIGATION

There shall be no instance of contract non-performance as a result of Applicant's default during the last 5 (five) years prior to the last stipulated date for submission of the Bid.

Notes:

- a) Contract non-performance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the applicant have been exhausted.
- b) Bidder shall submit details of past contract performance and litigation(s) as per format placed at **Perfoma-5** alongwith documents establishing details included in the Perfoma-5.
- c) The cutoff date shall be calculated backwards from the last stipulated date for submission/opening of Tender i.e. for a Tender which is being opened on 06.08.2014, the cutoff date shall be 07.08.2009.

7. CONTRACT LITIGATION HISTORY

The aggregate amount of court/arbitration awards related to contractual litigation against the Applicant, if any, during the last 5 (five) years prior to the last stipulated date for submission of the Bid, shall not exceed 25% of the Net Worth as per the latest financial statements.

Notes:

- a) The bidder shall provide accurate information in the **Perfoma-6** about any litigation or arbitration resulting from contracts completed or ongoing under its execution during the last 5 (five) years prior to the last stipulated date for submission of the Bid alongwith documents establishing details included in the Perfoma-6.
- b) The cutoff date shall be calculated backwards from the last stipulated date for submission/opening of Tender i.e. for a Tender which is being opened on 06.08.2014, the cutoff date shall be 07.08.2009.

8. REQUIREMENT OF MACHINERY / EQUIPMENT

Should possess minimum following plant and machinery (not more than 5 years old) in serviceable condition.

- | | |
|--|-------------------|
| i) Concrete Batching Plant 02 nos.
(Minimum 30 cum/hour capacity) | : Owned |
| ii) Transit Mixer 04 nos. | : Owned / Leased. |
| iii) Concrete Pump 02 nos. | : Owned / Leased |
| iv) Excavator / JCB 02 nos. | : Owned / Leased |
| v) Dumper 10 nos. | : Owned / Leased |
| vi) Soil compactor 02 nos. | : Owned / Leased |
| vii) Vibratory Road roller 02 nos. | : Owned / Leased |
| viii) DG Set (125 kVA) 02 nos. | : Owned / Leased |

An undertaking should also be submitted by the agency in the prescribed format at **Performa-7**.

9. POINTS TO NOTE ON SATISFACTION OF QUALIFYING CRITERIA IN CASE OF BOTH LARGE AND NORMAL WORKS

a) Sub-Contractor's Experiences and Resources

Sub-Contractors' Experiences and Resources will not be taken into account in determining the Bidder's compliance with the qualifying criteria.

b) Experiences and Resources of the Parent Company and other subsidiary companies

If the Bidder is a wholly owned subsidiary of a company, the experience and resources of the owner/parent company or its other subsidiaries will not be taken into account. However, if the Bidder is a Company, only the Experience (and not the Financial Resources) of its subsidiaries will be taken into consideration.

10. DISQUALIFICATION ON CERTAIN GROUNDS

Even though the Bidders may meet the above qualifying criteria, they are subject to be disqualified if they have

- a) Concealed any information/document which may result in the Bidder's disqualification or if any statement/information/document furnished by the Bidder or issued by a Bank/Agency/Third party and submitted by the Bidder, is subsequently found to be false or fraudulent or repudiated by the said Bank/Agency/Third Party. In such a case, besides Bidder's liability to action under para 9.4 of Instructions to Tenderers, the Bidder is liable to face the penalty of banning of business dealings with him by RITES.
- b) Records of any contract awarded to them, having been determined during the past three years prior to the dead line for submission of bids.
- c) Been declared as Poor Performer by RITES and their name is currently in the 'Negative List' of RITES.
- d) Their business banned or suspended by any Central/State Government Department/ Public Undertaking or Enterprise of Central/State Government and such ban is in force.
- e) Not submitted all the supporting documents or not furnished the relevant details as per the prescribed format.

A declaration to the above effect in the form of affidavit on stamp paper of Rs. 10/- duly attested by Notary/Magistrate should be submitted as per format given in **Proforma 3** enclosed.

Proforma-1

**LIST OF SIMILAR WORKS SATISFYING QUALIFICATION CRITERION
COMPLETED DURING THE LAST 5 YEARS**

S. No	Client's Name and Address	Name of the Work & Location	Scope of Work carried out by the Bidder	Agreement/ Letter of Award No. and date	Contract Value		Date of Start	Date of Completion		Reasons for delay in Completion if any	Ref. of document (with page no.) in support of meeting Qualification Criterion
					Awarded	Actual on Completion		As per LOA/ Agreement	Actual		

SEAL AND SIGNATURE OF THE BIDDER

Note:

- In support of having completed above works, attach self-attested copies of the completion certificate from the owner/client or Executing Agency/Consultant appointed by Owner/Client indicating the name of work, the description of work done by the Bidder, date of start, date of completion (contractual & actual) and contract value as awarded and as executed by the Bidder. "Contract Value" shall mean gross value of the completed work including cost of materials supplied by the Owner/Client but excluding those supplied free of cost.
- Credential certificates issued by Government Organizations/Semi Government Organizations of Central or State Government; or by Public Sector Undertakings/Autonomous Bodies of Central/State Government or their subsidiaries/by Public Ltd. Companies listed in Stock exchange in India or Abroad or subsidiaries of such companies shall only be accepted for assessing the eligibility of a Tenderer. Certificates issued by one of the aforesaid organizations as a lead member (having equity stake of 51% or more) of a Joint Venture (JV) for a work executed for the JV, will also be acceptable. In case of PPP projects, if the bidder has executed a work for a concessionaire who is one of the aforesaid organizations, then the certificate issued by such concessionaire or by the public authority concerned, will also be acceptable.

3. In case of a Certificate from a Public Limited Company or its subsidiary, the Bidder should also submit documentary proof that the Public Ltd. Company was listed in Stock Exchange in India or Abroad when the work was executed for it.
4. Information must be furnished for works carried out by the Bidder in his own name or proportionate share as member of a Joint Venture. In the latter case details of contract value including extent of financial participation by partners in that work should be furnished.
5. If a Bidder has got a work executed through a Subcontractor on a back to back basis, the Bidder cannot include such a work for his satisfying the Qualification Criterion even if the Client has issued a Completion Certificate in favour of that Bidder.
6. Use a separate sheet for each partner in case of a Joint Venture.
7. Only similar works completed during the last 5 years prior to the last stipulated date for submission of Bid, which meet the Qualification Criterion need be included in this list.
8. Only those works mentioned in Annexure IX shall be given in this Performa.

Proforma 2

Solvency Certificate from a Nationalized or A Scheduled Bank

- D E L E T E D -

Proforma 3

DECLARATION BY THE BIDDER

(Affidavit on Non-Judicial Stamp Paper of Rs.10/- duly attested by Notary/Magistrate)

This is to certify that We, M/s....., in submission of this offer confirm that: -

- i) We have visited the site of work and seen the working conditions, approach road/path, availability of water, electricity, construction labour, construction materials and other relevant requirements connected with the work.
- ii) We have neither concealed any information/document which may result in our disqualification nor made any misleading or false representation in the forms, statements and attachments in proof of the qualification requirements;
- iii) During the past three years prior to the deadline for submission of bids, no contract awarded to us has been determined.
- iv) No Central/State Government Department/Public Sector Undertaking or Enterprise of Central/State Government has banned/suspended business dealings with us as on date.
- v) We have submitted all the supporting documents and furnished the relevant details as per prescribed format and we agree to submit, without delay additional information/documents which may be demanded by RITES Ltd.
- vi) List of Similar Works satisfying Qualification Criterion indicated in Proforma 1 does not include any work which has been carried out by us through a Subcontractor on a back to back basis.
- vii) The information and documents submitted with the Tender and those to be submitted subsequently by way of clarifications are correct and we are fully responsible for the correctness of the information and documents submitted by us.
- viii) We have not failed to service the principal amount or interest or both of a loan account/credit limit from any Bank or Financial Institution during a period of one year prior to the deadline for submission of bids.
- ix) *The original instruments of EMD and Cost of Tender Document, in physical form shall be deposited by us with RITES Ltd. within a week from the date of opening of Technical Bid failing which RITES Ltd. may reject the bid and also take action to debar us from participating in Tenders invited by RITES Ltd. for a period of two years.

OR

*We are exempted from payment of cost of Tender Document and EMD and the certified copies of original documents in support of such exemption shall be deposited by us with RITES Ltd. within a week from the date of opening of Technical Bids and original documents produced on demand, failing which RITES Ltd. may reject the bid and also take action to debar us from participating in Tenders invited by RITES Ltd. for a period of two years.

(* Delete whichever is not applicable)

- x) We understand that in case any information/document which may result in our disqualification is concealed by us or any statement/information/document furnished by us or to be furnished by us in connection with this offer, or issued by Bank/Agency/Third Party is subsequently found to be false or fraudulent or repudiated by the said Bank/Agency/Third Party, business dealings with us may be banned.

SEAL, SIGNATURE & NAME OF THE BIDDER

Signing this document

Performa 4

Pending Litigation, in accordance with Annexure-1, Qualification Criteria for Works Contracts

<input type="checkbox"/> No pending litigation in accordance with Annexure-1 , Qualification Criteria for Works Contracts, Sub para - 5
<input type="checkbox"/> Pending litigation(s) in accordance with Annexure-1 , Qualification Criteria for Works Contracts, Sub para – 5 as indicated below :

Year of dispute	Amount in dispute (currency)	Contract Identification	Total Contract Amount (Rs.)	Amount of specific provision already made, if any
<i>[insert year]</i>	<i>[insert amount]</i>	Contract Identification: <i>[indicate complete contract name, number, date, value and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i> Party who initiated the dispute: <i>[indicate "Employer" or "Contractor"]</i> Status of dispute: <i>[Indicate if it is being treated by the Adjudicator, under Arbitration or being dealt with by the Judiciary]</i>	<i>[insert amount]</i>	<i>[insert amount in Rs.]</i>

Performa 5

Past Contract Non-Performance, in accordance with Annexure-1, Qualification Criteria for Works Contracts

- | |
|--|
| <input type="checkbox"/> Contract non-performance did not occur since the date specified in Annexure-1 , Qualification Criteria for Works Contracts, Sub para - 6 |
| <input type="checkbox"/> Contract(s) non-performance since the date specified in Annexure-1 , Qualification Criteria for Works Contracts, Sub para – 6 as indicated below : |

Year	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (Rs.)
<i>[insert financial year]</i>	<i>[insert percentage]</i>	Contract Identification: <i>[indicate complete contract name, number, date, value and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i> Party who initiated the dispute: <i>[indicate "Employer" or "Contractor"]</i> Result of dispute: <i>[Indicate if resolution was treated by the Adjudicator, under Arbitration or dealt with by the Judiciary and whether resolved in favour or against the Applicant]</i>	<i>[insert amount]</i>

Performa 6

Litigation History, in accordance with Annexure-1, Qualification Criteria for Works Contracts

<input type="checkbox"/> No litigation since the date specified in Annexure-1 , Qualification Criteria for Works Contracts, Sub para - 7
<input type="checkbox"/> Litigation award(s) since the date specified in Annexure-1 , Qualification Criteria for Works Contracts, Sub para – 7 as indicated below :

Year of award	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (Rs.)
<i>[insert financial year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name, number, date, value and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for non-performance: <i>[Indicate main reason(s)]</i>	<i>[insert amount]</i>

Performa 7

UNDERTAKING FOR DEPLOYMENT OF T&P

Name of Work: "Construction of Integrated Check Post at Nepalgunj in Nepal : Main package-1".

Name of Contractor / Firm:

I/we have applied for issue of tender for the work of "Construction of Integrated Check Post at Nepalgunj in Nepal : Main package-1" and hereby undertake that:-

- i) I/ we have gone through the tender documents and drawings in its entirety, visited the site and have understood the nature of work to be executed.
- ii) I / we will deploy adequate T&P in working condition with adequate standby arrangement for efficient / timely execution of the work.
- iii) I/we have submitted the details of T&P owned by us and undertake to procure or take on lease the balance T&P for the work as per requirement of the work matching with the work programme.
- iv) I/we will abide by any instructions by MEA for such procurement/arrangement of T&P on lease as is considered necessary for efficient / timely execution of work.

Date:

Signature of Contractor:

Witness:

ANNEXURE II

**MEMORANDUM OF UNDERSTANDING EXECUTED BY MEMBERS OF THE JOINT
VENTURE
(On each firm's Letter Head)**

DELETED

ANNEXURE III

**FORMAT FOR POWER OF ATTORNEY TO AUTHORISED SIGNATORY
POWER OF ATTORNEY**

(To be executed on non-judicial stamp paper of the appropriate value in accordance with relevant Stamp Act. The stamp paper to be in the name of the firm/company who is issuing the Power of Attorney)

We, M/s..... (name of the firm/company with address of the registered office) hereby constitute, appoint and authorize Mr./Ms..... (Name and residential address) who is presently employed with us and holding the position of and whose signature is given below as our Attorney to do in our name and our behalf all or any of the acts, deeds or things necessary or incidental to our bid for the work (name of work), including signing and submission of application/proposal, participating in the meetings, responding to queries, submission of information/documents and generally to represent us in all the dealings with MEA/RITES or any other Government Agency or any person, in connection with the works until culmination of the process of bidding, till the Contract Agreement is entered into with MEA/RITES and thereafter till the expiry of the Contract Agreement.

We hereby agree to ratify all acts, deeds and things lawfully done by our said Attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid Attorney shall always be deemed to have been done by us.

(Add in the case of a Joint Venture)

Our firm is a Member/Lead Member of the Joint Venture of,
..... and

Dated this the day of 20.....

.....
(Signature and name of authorized signatory being given Power of Attorney)

.....
(Signature and name in block letters of *All the partners of the firm, *Authorized Signatory for the Company)

(*Strike out whichever is not applicable)

Seal of firm/ Company

Witness 1:

Witness 2:

Name:

Name:

Address:

Address:

Occupation:

Occupation:

Notes:

- In case the Firm/Company is a Member of a Joint Venture, the authorized signatory has to be the one employed by the Lead Member.
- The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

ANNEXURE IV

FORMAT FOR POWER OF ATTORNEY TO LEAD MEMBER OF JOINT VENTURE-

DELETED

ANNEXURE IV A

**(FORM OF LETTER OF ACCEPTANCE)
(By REGD POST / ACK.DUE)**

NO. : _____ Dated : _____
To _____

(Name & Address of the Contractor)

Dear Sirs,

Sub: TENDER No. _____ FOR THE WORK OF _____

Ref: Your Tender dated _____ and letters dated _____ and this office letter Nos. _____ dated _____ in reply to the same.

This is to notify you that your Tender for the work under reference has been accepted by the Competent Authority of **MINISTRY OF EXTERNAL AFFAIRS, Government of India (Employer)**, for a total Contract Price of Rs. _____ (Rupees _____ only)

Pursuant to Clause 1 of the Contract, you are required to furnish irrevocable Performance Guarantee for an amount equivalent to 5% (Five percent) of the Contract Price and an Additional Performance Guarantee for an amount of Rs. _____ (if applicable). The Guarantee Bonds aggregating for an amount of Rs. _____ are required to be submitted within ___ days of issue of this Letter of Acceptance. Bank Guarantees issued by the following Banks will not be acceptable _____ (Names of Banks _____)

The time of _____ months allowed for execution of the work will be reckoned from the date of start as defined in Schedule F or from the first day of the handing over of the site, whichever is later, in accordance with phasing, if any, indicated in tender document.

You are requested to contact _____ (complete designation and address of the Project Coordinator) for carrying out the contract.

You are also requested to attend this office within Twenty Eight days from the date of issue of this letter for execution of the formal agreement. It may be noted that no payment shall be made for any work carried out by you till the Agreement is executed and till such time the Performance Guarantee and Additional Performance Guarantee (where applicable) has/have been submitted by you.

This Letter of Acceptance is being sent to you in duplicate and you are requested to return without delay one copy of the letter duly signed and stamped, as a token of your acknowledgement.

Kindly note that this Letter of Acceptance thereof shall constitute a binding Contract between us pending execution of formal Agreement.

Your letters as well as this office letters referred to above shall form part of the Contract.

Yours faithfully,

**MINISTRY OF EXTERNAL AFFAIRS,
Government of India**

Copy to : 1. RITES Ltd.

ANNEXURE V

FORM OF AGREEMENT
(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

Agreement No. dated

THIS AGREEMENT is made on _____ day of _____ Two thousand _____ between **Ministry of External Affairs, New Delhi** hereinafter called the Employer (which expression shall, wherever the context so demands or requires, include their successors in office and assigns) on one part and M/s. _____ hereinafter called the Contractor (which expression shall wherever the context so demands or requires, include his/ their successors and assigns) of the other part.

WHEREAS the Employer is desirous that certain works should be executed viz.

..... (brief description of work) and has by Letter of Acceptance dated accepted a tender submitted by the Contractor for the execution, completion, remedying of any defects therein and maintenance of such works at a total Contract Price of Rs. (Rupees only)

NOW THIS AGREEMENT WITNESSETH as follows: -

1. In this Agreement words and expressions shall have the same meaning as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents in conjunction with addenda/corrigenda to Tender Documents shall be deemed to form and be read and construed as part of this agreement viz.

The Letter of Acceptance dated

Priced Schedule (Bill) of Quantities

Notice Inviting Tender and Instructions to Tenderers.

RITES Tender and Contract Form [**DELETED**]

Special Conditions

Schedules A to F

Technical Specifications

Drawings

Amendments to Tender Documents (List enclosed)

General Conditions of Contract (read with Correction Slip no. 01) comprising of

- (i) Conditions of Contract
- (ii) Clauses of Contract
- (iii) RITES Safety Code
- (iv) RITES – Model Rules for the protection of Health and Sanitary arrangements for Workers

(v) RITES – Contractor’s Labour Regulations

3. In consideration of the payment to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute, complete, remedy defects therein and maintain the works in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay to the Contractor in consideration of the execution, completion, remedying of any defects therein and maintenance of the works, the contract price or such other sum as may become payable under the provisions of the contract at the time and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused their respective common seals to be hereinto affixed (or have herewith set their respective hands and seals) the day and year first above written.

SIGNED, SEALED AND DELIVERED BY

<p>For the Bidder In the capacity of On behalf of M/s (The Contractor)</p> <p>In the presence of</p> <p>Witness (Signature, Name & Designation) 1. 2.</p>	<p>..... Representing Joint Secretary (DPA-III), Ministry of External Affairs, DPA-III, Delhi (The Employer)</p> <p>In the presence of</p> <p>Witness (Signature, Name & Designation) 1. 2.</p>
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INTEGRITY PACT

Between

RITES LTD. acting for and on behalf of and as an Agent/Power of Attorney Holder of **Ministry of External Affairs, Government of India** hereinafter called the "Employer"
AND hereinafter referred to as "The Bidder/Contractor"

Preamble

The Employer intends to award, under laid down organizational procedures, contract/s for "**Construction of Integrated Check Post at Nepalgunj in Nepal : Main Package-1**". The Employer values full compliance with all relevant laws and regulations, and economic use of resources, and of fairness and transparency in his relations with the Bidder/s and/or contractor/s.

In order to achieve these goals, the Employer will appoint an Independent External Monitor (IEM) who will monitor the Tender process and execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Employer

- (1) The Employer commits himself to take all measures necessary to prevent corruption and to observe the following principles: -
 - i) No employee of the Employer, personally or through family members, will in connection with the tender or for the execution of the contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - ii) The Employer will, during the tender process, treat all Bidders with equity and reason. The Employer will in particular, before and during the tender process, provide to all Bidders the same information and will not provide to any Bidder confidential/additional information through which the Bidder could obtain an advantage in relation to the tender process or the contract execution.
 - iii) The Employer will exclude from the process all known prejudiced persons.
- (2) If the Employer obtains information on the conduct of any of his employees which is a criminal offence under the IPC (Indian Penal Code)/PC (Prevention of Corruption) Act, or if there be a substantive suspicion in this regard, the Employer will inform its Chief Vigilance Officer and in addition can initiate disciplinary action.

Section 2 – Commitments of the Bidder/Contractor

- (1) The Bidder/Contractor commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

- i) The Bidder/Contractor will not directly or through any other person or firm, offer, promise or give to any of the Employer's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
 - ii) The Bidder/Contractor will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions, to restrict competitiveness or to introduce cartelization in the bidding process.
 - iii) The Bidder/Contractor will not commit any offence under the relevant IPC/PC Act; further the Bidder/Contractor will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Employer as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
 - iv) The Bidder/Contractor will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
 - v) Foreign bidders shall disclose the name and address of agents and representatives in India.
 - vi) Indian Bidders shall disclose their foreign principals or associates.
- (2) The Bidder/ Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder/Contractor, before award or during execution has committed a transgression through a violation of Section 2 above, or in any other form such as to put his reliability or credibility in question, the Employer is entitled to disqualify the Bidder/Contractor from the tender process or take action as per the procedure mentioned in the "Guideline on Banning of Business Dealing" annexed and marked as Annexure "A".

Section 4 – Compensation for Damages

- (1) If the Employer has disqualified in terms of the provisions in Section 3, the Bidder/Contractor from the tender process prior to the award of contract, the Employer is entitled to demand and recover the damages equivalent to Earnest Money Deposit/Bid Security.
- (2) If the Employer has terminated the contract during execution in terms of the provisions under Section 3, the Employer shall be entitled to demand and recover from the Contractor the damages equivalent to Earnest Money Deposit, Security Deposits already recovered and Performance Guarantee, which shall be absolutely

at the disposal of the Employer.

Section - 5 Previous transgression

- (1) The Bidder/Contractor declares that no previous transgression occurred in the last 3 years with any other Company in any country conforming to the Anti-Corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- (2) If the Bidder/Contractor makes incorrect statement on this subject, he can be disqualified from the tender process or action can be taken as per the procedure mentioned in "Guideline on Banning of Business Dealing".

Section - 6 Equal treatment of all Bidders/Contractors/Sub-Contractors

- (1) The Bidder/Contractor undertakes to demand from all partners/sub-contractors (if permitted under the conditions/clauses of the contract) a commitment to act in conformity with this Integrity Pact and to submit it to the Employer before signing the contract.
- (2) The Bidder/Contractor confirms that any violation by any of his partners/sub-contractors to act in conformity with the provisions of this Integrity Pact can be construed as a violation by the Bidder/Contractor himself, leading to possible Termination of Contract in terms of Section 4.
- (3) The Employer will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section 7- Criminal charges against violating Bidders/Contractors/Sub-Contractors

If the Employer obtains knowledge of conduct of a Bidder, Contractor or Partners/Sub-Contractor, or of an employee or a representative or an associate of a Bidder, Contractor or Sub- Contractor, which constitutes corruption, or if the Employer has substantive suspicion in this regard, the Employer will inform the same to its Chief Vigilance Officer.

Section -8 Independent External Monitor/Monitors

- (1) The Employer shall appoint competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
- (2) The Monitor is not subject to instructions by the representatives of the parties and will perform his functions neutrally and independently. He will report to the CMD/RITES Ltd.
- (3) The Bidder/Contractor accepts that the Monitor has the right of access without restriction to all Project documentation of the Employer including that provided by the Contractor. The Contractor will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Partners/Sub-Contractors. The Monitor is

under contractual obligation to treat the information and documents of the Bidder/Contractor/Partners/Sub-Contractor with confidentiality.

- (4) The Employer will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Employer and the Contractor. The parties offer to the Monitor the option to participate in such meetings.
- (5) As soon as the Monitor notices or has reason to believe that violation of the agreement by the Employer or the Bidder/Contractor, has taken place, he will request the Party concerned to discontinue or take corrective action, or to take any other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner or refrain from action or tolerate action. The role of Monitor will be advisory and his advise will not be legally binding.
- (6) As far as possible, the Monitor will submit a written report to the CMD/RITES Ltd. within 10 days from the date of reference or intimation to him by the Employer and should the occasion arise, submit proposal for correcting problematic situations.
- (7) If the Monitor has reported to the CMD/RITES Ltd. of a substantiated suspicion of an offence under relevant IPC/PC Act, and the CMD/RITES Ltd. has not, within reasonable time, taken visible action to proceed against such offender or reported it to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Central Vigilance Commissioner.
- (8) Issues like Warranties / guarantee etc. shall be outside the purview of IEMs.
- (9) The word Monitor would include both singular and plural.

Section – 9 Pact Duration

- (1) This pact begins when both parties have legally signed it. It expires for the Contractor when his Security Deposit is released on completion of the Maintenance Period and for all other Tenderers six months after the Contract has been awarded.
- (2) If any claim is made/lodged during this time the same shall be binding and continue to be valid despite the lapse of this pact specified above, unless it is discharged/determined by CMD/RITES Ltd.

Section 10 Other Provisions

- (1) This agreement is subject to Indian Law. Place of performance and jurisdiction shall be as stated in the Contract Agreement.
- (2) Changes and supplements as well as termination notices need to be made in writing.
- (3) If the Contractor is a partnership or Joint Venture, this agreement must be signed by the Partner in charge/Lead Member nominated as being incharge and who holds the Power of Attorney signed by legally authorised signatories of all the partners/Members. The Memorandum of Understanding /Joint Venture Agreement will incorporate a provision to the effect that all Members of the Joint Venture will comply with the provisions in the Integrity Pact to be signed by the Lead Member on

behalf of the Joint Venture. Any violation of Section 2 above by any of the Partners/Members will be construed as a violation by the Joint Venture leading to possible Termination of Contract in terms of Section 3.

- (4) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- (5) A person signing the IP shall not approach courts while representing the matters to IEMs and he/she will await their decision in the matter.
- (6) In case of sub-contracting, the principal contractor shall take the responsibility of the adoption of IP by the sub-contractor.

<p> RITES LIMITED Agent/Power of Attorney Holder For and on behalf of Ministry of External Affairs, Government of India (The Employer) Place: Date: In the presence of Witness (Signature, Name & Designation) 1. 2. </p>	<p> For the Bidder..... In the capacity of On behalf of M/s (The Contractor) Place: Date: In the presence of Witness (Signature, Name & Designation) 1. 2. </p>
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ANNEXURE-A

Guidelines on Banning of Business Dealings

1. Introduction

- 1.1 RITES, being a Public Sector Enterprise and 'State', within the meaning of Article 12 of Constitution of India, has to ensure preservation of rights enshrined in Chapter III of the Constitution. RITES has also to safeguard its commercial interests. It is not in the interest of RITES to deal with Agencies who commit deception, fraud or other misconduct in the execution of contracts awarded / orders issued to them. In order to ensure compliance with the constitutional mandate, it is incumbent on RITES to observe principles of natural justice before banning the business dealings with any Agency.
- 1.2 Since banning of business dealings involves civil consequences for an Agency concerned, it is incumbent that adequate opportunity of hearing is provided and the explanation, if tendered, is considered before passing any order in this regard keeping in view the facts and circumstances of the case.

2. Scope

- 2.1 The procedure of (i) Suspension and (ii) Banning of Business Dealing with Agencies, has been laid down in these guidelines.
- 2.2 It is clarified that these guidelines do not deal with the decision of the Management not to entertain any particular Agency due to its poor/inadequate performance or for any other reason.
- 2.3 The banning shall be with prospective effect, i.e., future business dealings.

3. Definitions

In these Guidelines, unless the context otherwise requires:

- i) 'Bidder/Contractor/Supplier' in the context of these guidelines is indicated as 'Agency'.
- ii) 'Competent Authority' and 'Appellate Authority' shall mean the following:
 - a) The Director shall be the 'Competent Authority' for the purpose of these guidelines. CMD, RITES shall be the 'Appellate Authority' in respect of such cases.
 - b) CMD, RITES shall have overall power to take suo-moto action on any information available or received by him and pass such order(s) as he may think appropriate, including modifying the order(s) passed by any authority under these guidelines.
- iii) 'Investigating Department' shall mean any Department, Division or Unit investigating into the conduct of the Agency and shall include the Vigilance Department, Central Bureau of Investigation, the State Police or any other department set up by the Central or State Government having powers to investigate.

- iv) 'Banning Committee' shall mean a Committee constituted for the purpose of these guidelines by the competent authority. The members of this Committee shall not, at any stage, be connected with the tendering process under reference.

4. Initiation of Banning/Suspension

Action for banning/suspension business dealings with any Agency should be initiated by the department/unit having business dealings with them after noticing the irregularities or misconduct on their part.

5. Suspension of Business Dealings

- 5.1 If the conduct of any Agency dealing with RITES is under investigation by any department, the Competent Authority may consider whether the allegations under investigation are of a serious nature and whether pending investigation, it would be advisable to continue business dealing with the Agency. If the Competent Authority, after consideration of the matter including the recommendation of the Investigating Department/Unit, if any, decides that it would not be in the interest to continue business dealings pending investigation, it may suspend business dealings with the Agency. The order to this effect may indicate a brief of the charges under investigation. The order of such suspension would operate for a period not more than six months and may be communicated to the Agency as also to the Investigating Department.

The Investigating Department/Unit may ensure that their investigation is completed and whole process of final order is over within such period.

- 5.2 As far as possible, the existing contract(s) with the Agency may be continued unless the Competent Authority, having regard to the circumstances of the case, decides otherwise.
- 5.3 If the Agency concerned asks for detailed reasons of suspension, the Agency may be informed that its conduct is under investigation. It is not necessary to enter into correspondence or argument with the Agency at this stage.
- 5.4 It is not necessary to give any show-cause notice or personal hearing to the Agency before issuing the order of suspension. However, if investigations are not complete in six months time, the Competent Authority may extend the period of suspension by another three months, during which period the investigations must be completed.

6. Grounds on which Banning of Business Dealings can be initiated

- 6.1 If the security consideration, including questions of loyalty of the Agency to the State, so warrants;
- 6.2 If the Director/Owner of the Agency, proprietor or partner of the firm, is convicted by a Court of Law for offences involving moral turpitude in relation to its business dealings with the Government or any other public sector enterprises or RITES, during the last five years;
- 6.3 If there is strong justification for believing that the Directors, Proprietors, Partners,

owner of the Agency have been guilty of malpractices such as bribery, corruption, fraud, substitution of tenders, interpolations, etc.;

- 6.4 If the Agency employs a public servant dismissed/removed or employs a person convicted for an offence involving corruption or abetment of such offence;
- 6.5 If business dealings with the Agency have been banned by the Govt. or any other public sector enterprise;
- 6.6 In case any information/document which may result in the tenderer's disqualification is concealed by the Tenderer or any statement/information/document furnished by the Tenderer or issued by a Bank/Agency/third party and submitted by the tenderer, is subsequently found to be false or fraudulent or repudiated by the said Bank/Agency/Third Party.
- 6.7 If the Agency uses intimidation/threatening or brings undue outside pressure on the Company (RITES) or its official in acceptance/performances of the job under the contract;
- 6.8 If the Agency indulges in repeated and/or deliberate use of delay tactics in complying with contractual stipulations;
- 6.9 Based on the findings of the investigation report of CBI/Police against the Agency for malafide/unlawful acts or improper conduct on his part in matters relating to the Company (RITES) or even otherwise;
- 6.10 Established litigant nature of the Agency to derive undue benefit;
- 6.11 Continued poor performance of the Agency in several contracts;

(Note: The examples given above are only illustrative and not exhaustive. The Competent Authority may decide to ban business dealing for any good and sufficient reason).

7. Banning of Business Dealings

- 7.1 A decision to ban business dealings with any Agency shall apply throughout the Company.
- 7.2 If the Competent Authority is prima-facie of view that action for banning business dealings with the Agency is called for, a show-cause notice may be issued to the Agency as per paragraph 8.1 and an enquiry held accordingly.

8. Show-cause Notice

- 8.1 In case where the Competent Authority decides that action against an Agency is called for, a show-cause notice has to be issued to the Agency. Statement containing the imputation of misconduct or mis-behaviour may be appended to the show-cause notice and the Agency should be asked to submit within 30 days a written statement in its defence. If no reply is received, the decision may be taken ex-parte.
- 8.2 If the Agency requests for inspection of any relevant document in possession of RITES, necessary facility for inspection of documents may be provided.

- 8.3 On receipt of the reply of the Agency, or in case no reply is received within the prescribed time, the Competent Authority shall refer the case along with relevant details to the Banning Committee, which shall examine the reply of the Agency and other facts and circumstances of the case and submit its final recommendation to the Competent Authority for banning or otherwise. In case the action contemplated against the Agency includes forfeiture of EMD also besides Banning of Business Dealings, the Banning Committee will also examine whether Clause 9.4 of Tender and Contract Document is attracted and recommend forfeiture or otherwise of EMD considering all facts and circumstances of the case. A final decision on forfeiture or otherwise of the EMD and for Company-wide banning or otherwise shall be taken by the Competent Authority. The Competent Authority may consider and pass an appropriate speaking order:
- i) For completely exonerating the Agency; or
 - ii) For forfeiture of EMD but for not banning of business dealings with the Agency; or
 - iii) For forfeiture of EMD and banning the business dealing with the Agency.
- 8.4 The decision should be communicated to the Agency concerned along with a reasoned order. If it decided to ban business dealings, the period for which the ban would be operative may be mentioned.

9. Appeal against the Decision of the Competent Authority

- 9.1 The Agency may file an appeal against the order of the Competent Authority banning business dealing, etc. The appeal shall lie to Appellate Authority. Such an appeal shall be preferred within one month from the date of receipt of the order banning business dealing, etc.
- 9.2 Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the Agency as well as the Competent Authority.

10. Review of the Decision by the Competent Authority

Any petition/application filed by the Agency concerning the review of the banning order passed originally by Competent Authority under the existing guidelines either before or after filing of appeal before the Appellate Authority or after disposal of appeal by the Appellate Authority, the review petition can be decided by the Competent Authority upon disclosure of new facts/circumstances or subsequent development necessitating such review.

11. Circulation of the names of Agencies with whom Business Dealings have been banned.

- 11.1 Depending upon the gravity of misconduct established, the Competent Authority of RITES may circulate the names of Agency with whom business dealings have been banned, to the Ministry of Railways and PSUs of Railways, for such action as they deem appropriate.
- 11.2 If Ministry of Railways or a Public Sector Undertaking of Railways request for more information about the Agency with whom business dealings have been banned a copy of the report of Inquiring Authority together with a copy of the order of the Competent Authority/Appellate Authority may be supplied.

12. Restoration

- 12.1 The validity of the banning order shall be for a specific time & on expiry of the same, the banning order shall be considered as "withdrawn".
- 12.2 In case any agency applies for restoration of business prior to the expiry of the ban order, depending upon merits of each case, the Competent Authority which had passed the original banning orders may consider revocation of order of suspension of business/lifting the ban on business dealings at an appropriate time. Copies of the restoration orders shall be sent to all those offices where copies of Ban Orders had been sent.

ANNEXURE VII

MANDATE FORM

To
 RITES Ltd.

.....

Dear Sir,

Authorization for payments through Electronic Fund Transfer System (RTGS/NEFT)

We hereby authorize MEA / RITES Ltd. to make all our payments, including refund of Earnest Money, through Electronic Fund Transfer System (RTGS/NEFT). The details for facilitating the payments are given below:

(TO BE FILLED IN CAPITAL LETTERS)

1	NAME OF THE BENEFICIARY	
2	ADDRESS WITH PIN CODE	
3	(A) TELEPHONE NO. WITH STD CODE	
	(B) MOBILE NO.	
4	BANK PARTICULARS	
A	BANK NAME	
B	BANK TELEPHONE NO. WITH STD CODE	
C	BRANCH ADDRESS WITH PIN CODE	
D	BANK FAX NO. WITH STD CODE	
E	11 CHARACTER IFSC CODE OF THE BANK (EITHER ENCLOSE A CANCELLED CHEQUE OR OBTAIN BANK CERTIFICATE AS APPENDED)	
F	BANK ACCOUNT NUMBER AS APPEARING IN THE CHEQUE BOOK	
G	BANK ACCOUNT TYPE (TICK ONE)	SAVING CURRENT LOAN CASH CREDIT OTHERS
H	IF OTHERS, SPECIFY	
5	PERMANENT ACCOUNT NUMBER (PAN)	
6	E-MAIL ADDRESS	

I / We hereby declare that the particulars given above are correct and complete. If the transaction is delayed or credit is not effected at all for reasons of incomplete or incorrect information, I / We would not hold RITES Ltd. responsible. Bank charges for such transfer will be borne by us.

Date:
 SIGNATURE (AUTHORISED SIGNATORY)
 Name

BANK CERTIFICATION

It is certified that the above-mentioned beneficiary holds bank account No..... with our branch and the Bank particulars above are correct.

Date:
 SIGNATURE (AUTHORISED SIGNATORY)
 Name and OFFICIAL STAMP

ANNEXURE VIII

Format of Bank Guarantee for Earnest Money Deposit

BG No. Date: dd/mm/yyyy format

1. In consideration of you, Development Partnership Administration-III, Ministry of External Affairs, Government of India, Jawaharlal Nehru Bhawan, New Delhi -110011 (hereinafter referred to as the "Authority" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) having agreed to receive the proposal of [**Name of company**], (hereinafter referred to as the "Bidder" which expression shall unless it be repugnant to the subject or context thereof include its successors and assigns), for appointment as Construction Agency for [**name of assignment**] pursuant to the **Tender Notice dated [date]** issued in respect of the Assignment and other related documents including without limitation the NIT, Technical and Financial Bid for services (hereinafter collectively referred to as "Tender Documents"), we [**Name of the Bank**] having our registered office at [**registered address**] and one of its branches at [**branch address**] (hereinafter referred to as the "Bank"), at the request of the Bidder, do hereby in terms of relevant clause of the Tender Documents , irrevocably, unconditionally and without reservation guarantee the due and faithful fulfillment and compliance of the terms and conditions of the Tender Documents by the said Bidder and unconditionally and irrevocably undertake to pay forthwith to the Authority an amount of Rs. [in figures] ([in words]) (hereinafter referred to as the "Guarantee") as our primary obligation without any demur, reservation, recourse, contest or protest and without reference to the Bidder if the Bidder shall fail to fulfill or comply with all or any of the terms and conditions contained in the said Tender Documents.
2. Any such written demand made by the Authority stating that the Bidder is in default of the due and faithful fulfillment and compliance with the terms and conditions contained in the Tender Documents shall be final, conclusive and binding on the Bank. We, the Bank, further agree that the Authority shall be the sole judge to decide as to whether the Bidder is in default of due and faithful fulfillment and compliance with the terms and conditions contained in the Tender Documents including, Document including without limitation, failure of the said Bidder to keep its Proposal valid during the validity period of the Proposal as set forth in the said Tender Documents, and the decision of the Authority that the Bidder is in default as aforesaid shall be final and binding on us, notwithstanding any differences between the Authority and the Bidder or any dispute pending before any court, tribunal, arbitrator or any other authority.
3. We, the Bank, do hereby unconditionally undertake to pay the amounts due and payable under this Guarantee without any demur, reservation, recourse, contest or protest and without any reference to the Bidder or any other person and irrespective of whether the claim of the Authority is disputed by the Bidder or not, merely on the first demand from the Authority stating that the amount claimed is due to the Authority by reason of failure of the Bidder to fulfill and comply with the terms and conditions contained in the Tender Documents including without limitation, failure of the said Bidder to keep its Proposal valid during the validity period of the Proposal as set forth in the said Tender Documents for any reason whatsoever. Any such demand made on the Bank shall be conclusive as regards 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. [**in figures**] ([**in words**]).

4. This Guarantee shall be irrevocable and remain in full force for a period of 180 days from the Proposal Due Date and a further claim period of 30 days or for such extended period as may be mutually agreed between the Authority and the Bidder, and agreed to by the Bank, and shall continue to be enforceable until all amounts under this Guarantee have been paid.
5. The Guarantee shall not be affected by any change in the constitution or winding up of the Bidder or the Bank or any absorption, merger or amalgamation of the Bidder or the Bank with any other person.
6. In order to give full effect to this Guarantee, the Authority shall be entitled to treat the Bank as the principal debtor. The Authority shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee from time to time to vary any of the terms and conditions contained in the said Tender Documents or to extend time for submission of the Proposals or the Proposal validity period or the period for conveying of Letter of Acceptance to the Bidder or the period for fulfillment and compliance with all or any of the terms and conditions contained in the said Tender Documents by the said Bidder or to postpone for any time and from time to time any of the powers exercisable by it against the said Bidder and either to enforce or forbear from enforcing any of the terms and conditions contained in the said Tender Documents or the securities available to the Authority, and the Bank shall not be released from its liability under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the said Bidder or any other forbearance, act or omission on the part of the Authority or any indulgence by the Authority to the said Bidder or by any change in the constitution of the Authority or its absorption, merger or amalgamation with any other person or any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of releasing the Bank from its such liability.
7. Any notice by way of request, demand or otherwise hereunder shall be sufficiently given or made if addressed to the Bank and sent by courier or by registered mail to the Bank at the address set forth herein.
8. We undertake to make the payment on receipt of your notice of claim on us addressed to [Name of bank along with branch address] and delivered at our above branch which shall be deemed to have been duly authorized to receive the said notice of claim.
9. It shall not be necessary for the Authority to proceed against the said Bidder before proceeding against the Bank and the guarantee herein contained shall be enforceable against the Bank, notwithstanding any other security which the Authority may have obtained from the said Bidder or any other person and which shall, at the time when proceedings are taken against the Bank hereunder, be outstanding or unrealized.
10. We, the Bank, further undertake not to revoke this Guarantee during its currency except with the previous express consent of the Authority in writing.
11. The Bank declares that it has power to issue this Guarantee and discharge the obligations contemplated herein, the undersigned is duly authorized and has full power to execute this Guarantee for and on behalf of the Bank.
12. For the avoidance of doubt, the Bank's liability under this Guarantee shall be restricted to Rs. [in figures] ([in words]). The Bank shall be liable to pay the said

amount or any part thereof only if the Authority serves a written claim on the Bank in accordance with paragraph 8 hereof, on or before **[date]**.

Signed and Delivered by **[name of bank]**

By the hand of Mr. /Ms. [name], it's **[designation]** and authorized official.

(Signature of the Authorized Signatory)

(Official Seal)

Notes:

1. The Bank Guarantee should contain the name, designation and code number of the officer(s) signing the Guarantee.
2. The address, telephone number and other details of the Head Office of the Bank as well as of issuing Branch should be mentioned on the covering letter of issuing Branch.

ANNEXURE IX

PRE-QUALIFICATION PERFORMA

Name of work				
Tender No.				
Name of the Bidder				
Details of Cost of Tender Document paid by Banker's Cheque/Pay	Name & Address of Issuing Bank	Amount	Date of Issue	Instrument placed at
Details of EMD paid by "Banker's Cheque/Pay Order/Demand Draft" and "Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Commercial Bank or the State Bank of India"				

Annual Financial Turnover

S. No.	Financial Years	Turn Over (Rs. In Lacs)	Documents placed at:	Remarks
1	2018-19			
2	2017-18			
3	2016-17			

Profitability

S. No.	Financial Years	Profit with (+) sign or Loss with (-) sign (In Lacs)	Documents placed at:	Remarks
1	2018-19			
2	2017-18			
3	2016-17			

Similar Work Experience

S. No.	Name of work	Name of Client	Actual Date of Start	Actual Date of Completion	Actual Completion Cost	Completion Certificates placed at:	Remarks
1							
2							
3							
4							

Construction Experience in Key Activities/Specified Components (if applicable)

S. No.	Key Activity/Component	Quantity of Key Activity/Component Executed	Amount of Key Activity/Component Executed	Name of work	Name of Client	Actual Date of Completion of Key Activity / Component	Certificate placed at:	Remarks
1								
2								
3								
4								

Net Worth

S. No.	Financial Years	Net Worth (in Rs.)	Documents placed at:	Remarks
1	2018-19			

Other Documents to be submitted along with Tender Documents:

S. No.	Particulars	Documents placed at:	Remarks
1	Declaration by the Bidder as per Proforma-3		
2	Self-attested copy of Partnership Deed/Memorandum and Articles of Association of the Firm/Certificate of registration with Registrar of Companies in India		
3	Self-attested copy of Written Power of Attorney of the signatory of the Tender on behalf of the tenderer. (Annexure-III or Annexure IV as applicable)		
4	Self-attested copy of a certificate, confirming that the applicant is working contractor or has executed any work within the last five years reckoned from the date of opening of tender, for Railways, CPWD, MES, DOT, RITES, State PWD or any other Central/State Government Department, Central/State Government Undertaking or their subsidiaries, Municipal Body, Autonomous Body of Central/State Governments or Public Ltd., Companies listed on Stock Exchange in India or Abroad or subsidiaries of such companies		
5	List of similar works satisfying qualification criterion completed during the last 5 years as per Proforma-1		
6	Integrity Pact as per Annexure-VI		
7	Self-attested copy of Guidelines on Banning of Business Dealings as per Annexure-A		
8	Self-attested copy of Corrigendum/Minutes of Pre-Bid Meeting, if any.		

S. No.	Particulars	Documents placed at:	Remarks
9	RTGS/NEFT details Annexure- VII as per		
10	Self-attested copy GST Registration Certificate or undertaking, as applicable		
11.	Pending contract litigation(s) as per format placed at Perfoma-4 of Annexure I alongwith Self-attested copy of documents establishing details included in the Performa-4		
12.	Past contract performance and litigation(s) as per format placed at Perfoma-5 of Annexure I alongwith Self-attested copy of documents establishing details included in the Performa-5		
13.	Litigation or arbitration resulting from contracts completed or ongoing under its execution as per format placed at Perfoma-6 of Annexure I alongwith Self-attested copy of documents establishing details included in the Performa-6		
14.	Self-attested copy of any other document if specified in the correction slips to the Tender Document.		

ANNEXURE X

List of 60 Districts covered under IAP

S. No.	State	District
1	Andhra Pradesh	Adilabad
2	Andhra Pradesh	Khammam
3	Bihar	Arwal
4	Bihar	Aurangabad
5	Bihar	Gaya
6	Bihar	Jamui
7	Bihar	Jehanabad
8	Bihar	Nawada
9	Bihar	Rohtas
10	Chhatisgarh	Bastar
11	Chhatisgarh	Bijapur
12	Chhatisgarh	Dantewada
13	Chhatisgarh	Jashpur
14	Chhatisgarh	Kanker
15	Chhatisgarh	Kawardha
16	Chhatisgarh	Koriya
17	Chhatisgarh	Narayanpur
18	Chhatisgarh	Rajnandgaon
19	Chhatisgarh	Surguja
20	Jharkhand	Bokaro
21	Jharkhand	Chatra
22	Jharkhand	Garhwa
23	Jharkhand	Gumla
24	Jharkhand	Hazaribagh
25	Jharkhand	Kodarma
26	Jharkhand	Latehar
27	Jharkhand	Lohardaga
28	Jharkhand	Pachim Singhbhum
29	Jharkhand	Palamu
30	Jharkhand	Purbi Singhbhum

S. No.	State	District
31	Jharkhand	Ram Garh
32	Jharkhand	Saraikela
33	Jharkhand	Simdega
34	Madhya Pradesh	Anuppur
35	Madhya Pradesh	Balaghat
36	Madhya Pradesh	Dindori
37	Madhya Pradesh	Mandla
38	Madhya Pradesh	Seoni
39	Madhya Pradesh	Shahdol
40	Madhya Pradesh	Sidhi
41	Madhya Pradesh	Umaria
42	Maharashtra	Gadchiroli
43	Maharashtra	Gondiya
44	Orissa	Balangir
45	Orissa	Debagarh / Deogarh
46	Orissa	Gajapati
47	Orissa	Kalahandi
48	Orissa	Kandhamal / Phulbani
49	Orissa	Kendujhar / Keonjhar
50	Orissa	Koraput
51	Orissa	Malkangiri
52	Orissa	Mayurbhanj
53	Orissa	Nabarangapur
54	Orissa	Nuapada
55	Orissa	Rayagada
56	Orissa	Sambalpur
57	Orissa	Sonapur
58	Orissa	Sundargarh
59	Uttar Pradesh	Sonbhadra
60	West Bengal	Paschim Medinipur

SECTION 2

TENDER AND CONTRACT FORM FOR WORKS

-DELETED-

- B L A N K -

SECTION 3

SPECIAL CONDITIONS

SECTION 3

SPECIAL CONDITIONS

The following Special Conditions shall be read in conjunction with Conditions of Contract and amendments/corrections thereto. If there are any provisions in these Special Conditions which are at variance with the provisions in the above mentioned documents, the Provisions in these Special Conditions shall take precedence.

(I) Special Conditions relating to existing Clauses of Contract:

GENERAL : In section 7 to 11 of the tender document (PART-3),

- i) Wherever RITES or RITES Ltd. is written it shall also be deemed to include Ministry of External Affairs for all context and matters related to this work.
- ii) Wherever "Security Deposit" is mentioned in the tender document, it shall be read as "Retention Money".
- iii) Wherever Arbitration & Conciliation Act 1996 is mentioned in tender document, it shall also be deemed to include the upto date amendments thereof.

1.0A PERFORMANCE GUARANTEE

Performance Guarantee
(Clause No.1 of GCC)

1.1A Add at the end of para i):

"This guarantee shall be in favor of Pay & Accounts Officer, Ministry of External Affairs, New Delhi."

1.0B RECOVERY OF SECURITY DEPOSIT

Recovery of security deposit
(Clause No.1A of GCC)

1.1B Clause 1A : Recovery of Retention Money

The tendere(s) whose tender(s) may be accepted (hereinafter called the Contractor) shall permit the Employer at the time of making any payment to him for work done under the Contract to retain 5% of each invoice (gross work done) as Retention Money till the sum so retained will amount to Retention Money of 5% of the tendered value of the work. Earnest Money {**First part of EMD amounting Rs. 25.00 Lakhs** submitted by the successful tenderer in the form of Banker's Cheque / Pay Order / Demand Draft in terms of para 9.1 i) of Section-1 and **the second part of EMD amounting Rs. 117.00 lakhs** submitted by the successful tenderer in the form of Fixed Deposit Receipts or Guarantee Bonds in terms of para 9.1 ii) of Section-1} shall be returned to the successful tenderer after submission of Performance Guarantee and receipt of its confirmation from the issuing bank. Such **deductions** will be made and held by the Employer by way of Retention Money unless he/ they

has/ have deposited the amount of Retention at the rate mentioned above in cash or Fixed Deposit Receipts. In case a Fixed Deposit Receipt of any Bank is furnished by the Contractor to the Employer as part of the Retention Money and the Bank is unable to make payment against the said Fixed Deposit Receipt, the loss caused thereby shall fall on the Contractor and the Contractor shall forthwith on demand furnish additional security to the Employer to make good the deficit”.

1.0C COMPENSATION FOR DELAY

(Clause No. 2 of GCC)

1.1C Replace third para of Clause 2 in its entity with the following:

“Compensation for delay of work @ 2% of tendered value per month of delay to be computed on per day basis”

1.0D COMPUTERISED MEASUREMENT BOOKS AND PAYMENT ON INTERMEDIATE CERTIFICATES TO BE REGARDED AS ADVANCE

(Clause No.6A and Clause No.7 of GCC)

1.1D The second para of clause 7 under heading “Payment on intermediate Certificates to be regarded as Advances“ starting from “75% of bill amount may be paid” to “in case delay in payment” is replaced with the following :

“Payment on account of amount admissible of IPC / Running Account Bill(s) shall be made by the client (MEA) after approval of competent authority (Division / IFD) within 45 working days (excluding the day of submission) of presentation of the bill by the Contractor to the Engineer-in-Charge or his Engineer together with the account of the material issued by the Employer, or dismantled materials, if any duly certified by M/s RITES. The time limit of 45 days mentioned above will be adhered to by the Engineer-in-Charge as far as possible and the contractor will not be entitled to any compensation or claims or damages by way of interest etc. in case of delay in payment.”

1.2D Last para of clause 7 of GCC “Since the contract made available by the Employer” is deleted.

1.3D Annexure K as mentioned in clause 6A and clause 7 of GCC is placed as part of Section-3.

2.0 PAYMENT OF CONTRACTOR’S BILLS

Payment of Contractor’s Bill to Banks

(Clause No.9A of GCC)

2.1 All payment towards Running Account Bills and Final Bill to the Contractor will be made only through RTGS/NEFT to the Bank account nominated by the contractor for this purpose. All required information and documents shall be provided by the Contractor in this regard. Necessary bank charges towards the same shall be borne by the Contractor.

3.0 MATERIALS

Materials to be provided by the Contractor
(Clause No.10A of GCC)

3.1 Materials Generally

- 3.1.1 The materials and manufactured goods shall be the best of their respective kinds and as described in the specifications, drawings and Bill of Quantities. The Contractor shall submit for the approval of the Engineer-in-Charge, within a reasonable time after receipt of the order to commence the Works, a list of the names and addresses of the manufacturers, the trademarks and types of all materials and articles he proposes to employ together with all specifications and descriptions and samples that may be required in this connection before any orders are placed. Within a reasonable time, the Engineer-in-Charge shall issue written decision on the Contractor's proposals. If any of the manufacturer's, materials, etc. have been rejected, then the Contractor must propose acceptable alternatives within one week of such rejection. The Engineer-in-Charge's decision shall be final and binding on the Contractor.
- 3.1.2 The Contractor shall submit to the Engineer copies of all orders for materials.
- 3.1.3 Where a particular proprietary product, supplier or supplier's catalogue is referred to in the specifications or in the Bills of quantities and the material specified is not available, other equal and approved product shall be permitted in use subject to downward price adjustment if called for. Upward price adjustment in such cases will not be accepted.
- 3.1.4 If, during the course of the Contract, certain materials required for use in the Works should be unobtainable despite the best efforts of the Contractor, then the Contractor may offer substitute materials for the approval of the Engineer-in-Charge. These substitute materials, although not complying fully with the specifications, must nevertheless be suitable and appropriate for use in the Works. Acceptance or refusal of such substitute materials shall be at the sole discretion of the Engineer-in-Charge. In the event of acceptance of the substitute materials a suitable price reduction shall be made in respect of decrease in quality or value but no price addition shall be made in respect of increase in quality or value. In the event of refusal of the substitute materials, the Contractor shall not be relieved of any of his obligations under the Contract and shall be solely liable for any delay or loss occasioned by his failure to provide materials as specified.
- 3.1.5 **Samples**
The Contractor shall furnish for approval, with reasonable promptness, samples of all materials and workmanship. The Engineer shall check and confirm approval of such samples with reasonable promptness if they conform with the design concept of the Works and with the requirement given in the contract documents. The work shall be in accordance with approved samples. The procedure for submission and approval of samples shall be as follows:

- (a) All material samples in duplicate shall be delivered to the Engineer's office at the Contractor's cost. Samples shall be properly labeled with
- Name of Project
 - Name of Contractor
 - Name of Product
 - Name of Manufacturer
 - Reference No. of BOQ
 - Date of Submission
 - Date of Fabrication/ Casting – if applicable
- (b) Samples shall be accompanied by technical specification/ manufacturer's catalogue
- (c) In case the Contractor intends to keep an approved sample in his possession he shall submit additional samples for the Engineer's approval.
- (d) Samples shall be furnished well in advance to give the Engineer reasonable time for his consideration.

Testing of Materials and Site Laboratories

- 3.1.6 The Contractor shall procure all the materials well in advance so that there is sufficient time for testing of the materials and clearance of the same before incorporation in the work.
- 3.1.7 All the materials to be used in and on every part of the works shall be subjected to Mandatory tests from time to time as prescribed in the MoRT&H/CPWD or other specifications as stipulated. These Mandatory tests / norms are the minimum requirement and the Engineer may supplement these with additional tests / checks according to the site condition. Materials for such extra tests shall made available by the Contractor free of cost. In the case of Non-Mandatory or Extra tests, if the test results show that the Material / workmanship is not to the required standard, the cost of test shall be borne by the Contractor. If the test result is satisfactory, the cost of test will be borne by the Employer, except that the cost of sample will always be borne by the Contractor. The samples for tests shall be in all cases selected by the Engineer and supplied by the Contractor as part of the Contract. If at any time, any material so tested, fails to meet the acceptance criteria, the same shall be removed from the site of works and other materials substituted there for. In the absence of any specified test / acceptance criteria, the decision of the Engineer shall be final and binding as to whether the said material or materials shall be used on the works, or forthwith removed and other materials substituted.
- 3.1.8 The Contractor shall produce on demand from the Engineer the manufacturing certificates certifying that the materials conform to the technical specifications.
- 3.1.9 The Contractor has to establish at his own cost, a testing laboratory/ field laboratory with equipments and instruments as given in **Annexure – "H" enclosed with Special Conditions of Contract** to conduct regular and routine tests on materials, measurements of temperature and any other tests stipulated in the technical specifications of the items to be executed in the Contract. On completion of works, the site laboratory shall be dismantled and site cleared unless the Employer directs otherwise. The Site laboratory shall be manned by Technically competent staff to be

appointed and paid by the Contractor at his cost.

- 3.1.10 The Contractor shall permit the Engineer or his authorized representative to be present during any or all the tests. Before issuing the notification to the Engineer in charge that the work has been completed, the Contractor shall make under the direction and in the presence of Engineer such tests and inspections as have been specified or as the Engineer shall consider necessary to determine whether or not in the Works the full intent of requirements of the plans and specifications has been fulfilled. In case the work does not meet the full intent of the specifications it shall be rectified by the Contractor at no extra cost and the Contractor shall bear all the expenses for any further tests considered necessary.
- 3.1.11 For any tests as directed by the Engineer that have to be carried out at an outside laboratory, the cost of such tests, materials, transport etc. shall be borne by the Contractor/ Employer as stipulated in Para 3.1.7 above.
- 3.1.12 List of Mandatory Tests to be carried and other details of Mandatory Tests to be carried out have been stipulated in MoRT&H specifications (for pavement works) & CPWD specifications (for civil and electrical works).

4.0 PRICE VARIATION CLAUSE 10CC– INSTRUCTIONS

4.1 Add the sub-clause (d) under para iv) of Clause 10CC

(d) Adjustment for Bitumen Component -

Price adjustment for increase or decrease in the cost of bitumen shall be paid in accordance with the following formula:

$$V_b = [(W \times X_b)/100] \times \{(B_i - B_o)/B_o\}$$

V_b = Increase or decrease in the cost of work during the month under consideration due to changes in the rates for bitumen:

B_o = The official retail price of bulk bitumen at the nearest refinery for the place, as valid on the last stipulated date of receipt of tenders including extension, if any.

B_i = The official retail price of bulk bitumen at nearest refinery for the place, for the period under consideration to which a particular Interim Payment Certificate is related.

X_b = Percentage of bitumen component of the work.

The contractor shall furnish the basic data, initially and periodically during the course of work about the B_o & B_i also.

5.0 DRAWINGS AND SPECIFICATIONS

Work to be executed in accordance with specifications, drawings, orders etc. (Clause No. 11 of the GCC).

5.1 Issue and custody

- 5.1.1 The Contractor shall receive from the Engineer-in-charge through the Engineer two set of drawings approved for construction. These drawings will be generally same as issued at tender stage. However these drawings may have additional details from construction / working/ execution point of view and to facilitate ease of

installation, erection or construction. Additional detailing not in any way vitiate the Contract nor allow the Contractor to claim extra compensation. Deviation or alteration to basic drawings only shall be treated as variation. Any additional copies of Drawings if requested by the Contractor shall be provided on making extra payment.

5.1.2 The Contract shall be executed in triplicate and the Employer, the Engineer and the Contractor shall be entitled to one executed copy each for his use. The Contractor on the signing thereof shall be furnished by the Engineer-in-charge, copies of Drawings as mentioned in Para 5.1.1 above.

5.1.3 The Contractor shall keep one copy of all Drawings at the works site and the Employer. Engineer-in-charge/ Engineer shall at all reasonable time have access to the same. Before the issue of the final certificate to the Contractor, he shall forthwith return to the Engineer all Drawings and other documents issued.

5.2 Errors and Omissions in Drawings or Specifications

Any apparent errors or omissions in drawings or specifications or instructions issued by the Engineer in-charge or the Engineer shall be brought to the notice of the Engineer by the Contractor as soon as the documents have been made available to him. The Engineer shall correct such errors or omissions with the approval of the Engineer in-charge. The Contractor shall neither be eligible for any additional cost, time etc. on this account nor shall he be permitted to take any advantage thereof.

5.3 Shop drawings for aluminum doors and windows

Engineer shall supply the concept drawings for aluminum doors and windows to the contractor. It shall be the sole responsibility of the contractor to submit shop drawings of aluminum doors and windows for approval of the Engineer-in-charge or his authorized representative atleast three months prior to the planed execution of the same on ground as per contractor's work program. The Engineer-in-charge or his authorized representative shall either give approval or suggest modifications / provide observations to the contractor within 30 days of the submissions by the contractor. The contractor shall then be required to incorporate observations / modifications, if any, suggested by the Engineer-in-charge or his authorized representative within 15 days thereafter and submit the revised submission for approval. The Engineer-in-charge shall give approval of revised submission within 15 days thereafter

6.0 Deviations, Substituted Items, Pricing

Deviation, Extra Items and Pricing
(Clause No. 12.2 of the GCC)

The first paragraph under the heading 'Deviation, Substituted Items, Pricing' shall be read as under :

'In the case of substituted items, the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the

following para.”

7.0 LEVIES / TAXES / CESSES PAYABLE BY THE CONTRACTOR

(Clause No. 37 of the GCC)

- i) Add at the beginning of the clause;
"In case GST is found to be applicable in respect of the subject contract;"
- ii) Replace para (iv) at the end of Clause 37 with the following :

“The taxes etc. payable by the contractor in Nepal shall be governed by the Memorandum of Understanding between Government of India & Government of Nepal and prevailing rules and regulation in Nepal.

The contractor shall deposit royalty, if any as per the Nepalese rules & regulations, and obtain necessary permit for supply of coarse & fine aggregate, coarse & fine sand, Granular Sub Base material, Earth etc. from concerned Nepalese authorities.

Contractor may be required to pay local taxes like royalty on mines & minerals, levy of local taxes, cess, VAT in accordance with prevailing Nepalese laws which shall be reimbursed by the govt. of Nepal as per their procedure on submission of proof of payment in the prescribed formats. The contractor shall make himself aware of the existing tax structure / rules & regulation prevalent in Nepal.

Tax deduction at source will be done by the employer towards income tax and any other tax as required by the law, from the running account and final bills.”

8.0 ROYALTY PAYABLE ON MINOR MINERALS – EMPLOYER TO BE INDEMNIFIED

(Clause No. 37A of the GCC)

Where ever “state government” is written in the clause it shall be read as “concerned authorities of Nepalese government”.

9.0 CONDITION FOR REIMBURSEMENT OF LEVY/TAXES/CESS IF LEVIED AFTER RECEIPT OF TENDER

(Clause No. 38 of the GCC)

Add the following at the end of the clauses :

“Refund of VAT and related taxes in respect of any material or equipment purchased or procured in Nepal for the project. The executing agency shall submit the necessary requests with VAT bills to the Inland Revenue Office of Govt. of Nepal for reimbursement and Inland Revenue Office of Govt. of Nepal will reimburse the paid VAT within the prescribed time, in accordance with the VAT act and regulations of Govt. of Nepal.”

10.0 RELEASE OF SECURITY DEPOSIT / RETENTION MONEY AFTER CLEARANCE BY STATE GOVERNMENT AUTHORITY FOR MINERAL EXTRACTION
(Clause No. 45A of the GCC)

Add the following at the end of the clause:

Where ever "state government department" is written in the clause it shall be read as "concerned authorities / department of Nepalese government".

(II) ADDITIONAL SPECIAL CONDITIONS (General):

1.0 STORES AND MATERIALS

No storage accommodation will be made by Employer for materials arranged by contractor. The contractor is required to store the construction materials for use in the work in locations strictly as per the instructions of the Engineer-in-charge. No excavated earth or building materials shall be stacked on areas where other buildings, roads, services or compound wall are to be constructed.

Nothing extra shall be payable for any extra lead involved in stacking the materials at a reasonable distance away from the work place, on account of operational requirements and runway lights installations etc.

2.0 CONSUMPTION OF CEMENT/BITUMEN/ STEEL

Proper record of daily consumption of bitumen, cement and steel etc., shall be maintained at the site of work for each item as directed by the Engineer-in-charge. The contractor shall submit time to time or on demand by the Engineer-in-charge, purchase vouchers of bitumen, cement, steel, sand ,stone aggregates or of any other item or material in reference to this project as desired by the Engineer-in-charge.

The contractor shall submit original / verified photocopy of purchase vouchers of bitumen, cement or any other material procured by him relating to this project to the Engineer-in -charge time to time or as demanded by him.

No payment/compensation will be made to the contractor for damage caused by rains, snow fall, floods, tornadoes, earthquakes, subversion, riots or other natural calamities during the execution of the works. The damage to work shall be made good by the contractor at his own cost and no claim on this account shall be entertained.

3.0 The contractor shall adjust his labour, staff, plant, machinery etc., according to the requirement of work from time to time and no claim shall be entertained on account of idle labour, plant, machinery, etc., due to any reason whatsoever.

4.0 SURVEYING AND MEASURING EQUIPMENTS

Equipment for surveying and Measurements of the work shall be made available by the contractor for his use at his own cost. The same shall also be made available to the Engineer-in-charge without any charges for use on this work.

5.0 TESTS

All tools, instruments, plants and labour/operating personnel for the test shall be provided by the contractor at his own cost. For any tests as directed by the Engineer-in-charge, that have to be carried out at an outside laboratory, the cost of such tests, materials, transport etc., shall be borne by the contractor.

In case there is any discrepancy in frequency of testing as given in list of mandatory tests and that in individual sub-heads of work as per MoST&H specifications Vth Revision / CPWD specifications Vol. I-II (2009), the higher of the two frequencies of testing shall be followed, and nothing extra shall be payable to the contractor on this account.

6.0 Law governing the Contract

a) The Contract shall be governed by the law for the time being in force in the Republic of India.

b) Court Jurisdiction

The Courts in the **City of New Delhi** alone shall have the jurisdiction to entertain any application or other proceedings in respect of anything arising under this Agreement and any award or awards made by the Arbitrator hereunder shall be filed in the concerned Courts in the aforesaid City only.

7.0 SITE FOR PLANTS EQUIPMENT STACKING OF MATERIALS AND LABOUR

a) Contractor will have to install his hot mix plant of capacity 60-90 TPH for production of bituminous mix and Batch mix plant for production of cement concrete, at site approved by Engineer-in-Charge in case the land is provided by the Employer.

b) The contractor shall stack materials at the site of work strictly as per instructions of Engineer-in-Charge.

The contractor shall be responsible for routine maintenance of T&P and any damage and delay due to breakdown shall be responsible of the contractor.

Nothing extra shall be payable for any extra lead involved in stacking the materials at a reasonable distance away from the work place on account of operational requirements and runway lights installations etc.

8.0 PROVISIONAL SUMS

Each Provisional Sum shall only be used, in whole or in part, in accordance with the Engineer's instructions, and the Contract Price shall be adjusted accordingly. The total sum paid to the Contractor shall include only such amounts, for the work, supplies or services to which the Provisional Sum relates, as the Engineer-in-Charge shall have instructed.

For each Provisional Sum, the Engineer- in-Charge may instruct t:

(a) for which there shall be included in the Contract Price:

- (i) the actual amounts paid (or due to be paid) by the Contractor, and
 - (ii) a sum for overhead charges and profit, calculated as a percentage of these actual amounts by applying the relevant percentage rate (if any) stated in the appropriate Schedule.
- (b) The Contractor shall, when required by the Engineer, produce quotations, invoices, vouchers and accounts or receipts in substantiation.

(III) Additional Special Conditions (Electrical Supply Items):

The contractor shall be responsible for all incidental & non-incidental expenses on the supplies & services procured under this contract.

- The Tenderer shall be responsible for the safe custody of the materials during the validity of this contract and shall make his own arrangements for the same.
- The Tenderer shall provide a replacement guarantee of **TWENTY FOUR MONTHS, in the form of a certificate**, from the certified date of completion of the work, for the quality of supplied items against manufacturing defects and for stability of the works executed against failure due to any defective workmanship or usage of defective material or equipments for the work.
- **The payment schedule for the Electrical items will be as under:**
 1. **On supply of items in good condition at site** (which comply with the specifications & conditions/special conditions of the contract) : 65% of the BOQ rate.
 2. **On Installation** : 20% of the BOQ rate.
 3. **On Testing & Commissioning** : 15% of the BOQ rate

Annexure - K (1 of 3)

TOP Sheet of RA / Final Bill

Ministry of External Affairs,
Govt. of India

Name of Work :

Name of Employer :

Name of Contractor:

Reference to Letter of Award :

Schedule Date of Start of Work :

Schedule Date of Completion of
Work :

Serial No. of Bill :

Date of Preparation of Bill:

Serial No. of Previous Bill :

S. No.	Description	Amount (Rs.)	
		Minus	Plus
1)	Total value of work actually measured		
2)	Total Escalation / price variation		
3)	Total upto date advance payment for the work measured and paid upto previous bill as per details given below :		
4)	Total Secured Advance		
A)	DEDUCTIONS Income Tax : @% on gross work done Upto last bill This bill Total		
B)	GST : @% on gross work done Upto last bill This bill Total		
C)	Labour cess : @% on gross work done Upto last bill This bill Total		
D)	Security Deposit : @ 5% on gross work done		

E-tender for Construction of Integrated Check Post at Nepalgunj in Nepal : Main Package-1

	Upto last bill			
	This bill			
	Total			
Details of EMD submitted by contractor with tender				
	Total amount of EMD submitted			
	EMD Adjusted upto previous RA bill			
	EMD Adjusted in this RA bill			
	Balance EMD to be adjusted in next RA bill(s)			
Adjustment of Security deposit as a part of EMD as per contract Clause 1A of Contract Agreement				
	Upto last bill			
	This bill			
	Total			
E)	Recovery of Mobilisation advance			
	Upto last bill			
	This bill			
	Total			
F)	Recovery of Interest on Mobilisation advance			
	Upto last bill			
	This bill			
	Total			
G)	Others			
	Upto last bill			
	This bill			
	Total			
			Total (Rs.)	

NET AMOUNT (Rs.)

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Signature of Contractor

Annexure - K (2 of 3)

Ministry of External Affairs,
Govt. of India

Name of Works :
 Name of Employer :
 Name of Contractor :
 LOA No. and Date :
 Schedule Date of Start of Work :
 Schedule Date of Completion of Work :
 S. No. of Bill :
 Date of Submission of Bill :
 Serial No. of Previous Bill :

Summary Sheet of RA / Final Bill			
..... R.A. BILL			
	Previous	This Bill	Cumulative
(A) Work done			
Schedule-1			
Schedule-2			
Schedule-3			
Schedule-4			
Schedule-5			
Schedule-6			
Sub total			
Escalation / price variation			
Sub total			
Secured Advance			
Total (A)			
(B) Deductions :			
Income Tax : @ ...% of (A)			
GST : @% of (A)			
Labour Cess : @% of (A)			
Security Deposit : @% of (A)			
Adjustment of Security deposit as a part of EMD as per contract Clause 1A of Contract Agreement			
Recovery of Mobilisation advance			
Recovery of Interest on Mobilisation advance			
Others			
Prepaid Bills			
Total recovery (B)			
Net payable = (A-B)			

Net payable amount in this Bill
--

Certificate:

1. Certified that the work has been executed as per approved G.F.C. drawings, contract Agreement & C.P.W.D. specifications.
- 1.The contractor has carried out work as per G.F.C. drawings, contract agreement & specifications.
- 2.The contractor has arranged water and electricity for the work at his own cost.
- 3.The contractor deployed technical staffs at site as per clause of contract.
4. No complaint received at site.

Signature of Contractor

Annexure - K (3 of 3)

CMB.....

Name of Work

Annexure - K (3 of 3)

Bill Form of RA / Final Bill

Ministry of External Affairs,
Govt of India

Name of Work:

Name of Contractor:

Reference to Letter of Award:

Schedule Date of Completion of Work:

Serial No. of Bill:

Serial No. of Previous Bill:

S. No. as per BOQ	BOQ Item No.	DESCRIPTION	Foundation / Non Foundation	UNIT	BOQ QTY.	BOQ RATE (Rs.)	QTY. EXECUTED AS PER MB			AMOUNT FOR QTY. EXECUTED			Remark
							As per Previous Bill	As per this bill	Total	As per Previous Bill	As per this Bill (Rs.)	Total (Rs.)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Total Amount										0.00	0.00	0.00	

Certificate:

1. The contractor has executed the work as per approved G. F. C. drawings, contract agreement & specifications.
2. The contractor has arranged water and electricity for the work at his own cost.
3. The contractor deployed technical staffs at site as per clause of contract.
4. No complaint received at site.

Signature of Contractor

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SECTION 4

PROFORMA OF SCHEDULES

SECTION 4

PROFORMA OF SCHEDULES

Schedule 'A'

Schedule of quantities (As per Bill of Quantities attached) (BOQ to be attached with Financial Bid)

Schedule 'B'

Schedule of materials to be issued to the contractor (Refer Clause 10 of Clauses of Contract)

S. No.	Description of Items	Quantity	Amount in Rs. at which the material will be charged to the Contractor	Place of Issue
1	2	3	4	5
- Not Applicable -				

Schedule 'C'

Tools and Plants to be hired to the Contractor (Refer Clause 34 of Clauses of Contract)

S. No.	Description	Hire Charges per Day	Place of Issue
1	2	3	4
- Not Applicable -			

Schedule 'D'

Extra schedule for specific requirements / documents for the work, if any - Not Applicable

Schedule 'E'

Schedule of components of Cement, Steel, Other materials, POL, Labour etc. for Price Escalation. (Refer Clause 10 CC of Clauses of Contract)

(To be worked out and filled by NIT Approving Authority. The Components and their percentages may be modified depending on the nature of work)

Clause 10 CC

Component of Cement (Xc) expressed as percent of total value of work	}	12%
Component of steel (XS) expressed as percent of total value of work	}	09%
Component of other materials (XM) (except cement & steel) expressed as per cent of total value of work	}	51%
Component of Bitumen (XB) expressed as per cent of total value of work	}	01%
Component of labour (Y) expressed as percent of total value of work	}	25%
Component of P.O.L (Z) expressed as percent of total value of work	}	02%
Total	}	100 %

Schedule 'F'

Reference to General Conditions of Contract

Name of Work:	Development of Integrated Check Post at Nepalgunj (Nepal) along Indo-Nepal International Border : Main Package-1
Estimated cost of work:	Rs. 142,04,90,577/- (Rupees One Hundred Forty Two Crore Four Lakh Ninety Thousand Five Hundred and Seventy Seven only)
Earnest money:	Rs. 1,42,00,000/- (Rupees One Crore Forty Two Lakh only)
Performance Guarantee (Ref. Clause 1)	5% of Tendered Value
Security Deposit: (Refer clause 1A)	5% of Tendered Value
Notice Inviting Tender and Instruction to Tenderers	
Officer inviting tender:	General Manager, Airports Division, RITES Limited

CONDITIONS OF CONTRACT

Definitions

2 (iv) Employer	Ministry of External Affairs, Government of India
2 (v) Engineer-in-Charge	General Manager, Airports Division, RITES Limited
2 (vii) Accepting Authority	Joint Secretary, DPA-III, MEA, GOI
2 (ix) Percentage on Cost of materials and Labour to cover all overheads and profits	15%
2 (x) Standard Schedule of Rates	MoSRT&H for pavement works CPWD-DSR 2018 for Civil works & CPWD DSR (E&M) 2018 (Internal & External) for Electrical works, CPWD-DSR2019-Wet risers & Sprinklers corrected and amended upto date of receipt of tender.
2(xiii) Date of commencement of work:	15 days (Fifteen Days) from the date of issue of LOA or the first day of handing over of site or the date of approval issued

by the Govt. of Nepal of initial master list for custom free import of contractor's material, equipment and machinery etc. whichever is later.

9 (a) (ii) General Conditions of Contract:

RITES General Conditions of Contract **July 2019** Edition as modified & corrected upto Correction Slip issued upto **date of receipt of tender**

CLAUSES OF CONTRACT

Clause 1

1 (i) Time allowed for submission of P.G. from the date of issue of Letter of Acceptance (subject to maximum of 15 days)

15 days (Fifteen Days)

Maximum allowable extension beyond the period provided in (i) above (subject to maximum of 07 days)

07 days (Seven Days)

Clause 2

Authority for fixing compensation under Clause 2

Joint Secretary, DPA-III, MEA, GOI

Clause 2 A:

Whether Clause 2A shall be applicable

Yes

Clause 5:

5.1 (a) Time allowed for execution of work

24 months (Twenty Four months) from the date of start

Date of start:

15 days (Fifteen Days) from the date of issue of LOA or the first day of handing over of site or the date of approval issued by the Govt. of Nepal of initial master list for custom free import of contractor's material, equipment and machinery etc. whichever is later

5.1 (b) TABLE OF MILESTONE(S):

S. No.	Description of Milestone (Financial)	Time allowed in days (from date of start)	Amount to be withheld in case of non achievement of milestone
1	1/8 th (of the whole work)	1/4 th (of the whole work)	In the event of not achieving the necessary progress as assessed from the running payments, 1% of the tendered value of work will be withheld for failure of each milestone.
2	3/8 th (of the whole work)	1/2 (of the whole work)	
3	3/4 th (of the whole work)	3/4 th (of the whole work)	
4	Full	Full	

Clause 5 A

Shifting of stipulated date of completion:

Competent Authority

Joint Secretary, DPA-III, MEA, GOI

Clause 6 A

Whether Clause 6 or 6A applicable:

6A is applicable

Clause 7

Gross work to be done together with net \

Payment/adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment:

Rs. 400 Lakhs

Clause 10 A

i) Whether Material Testing Laboratory is to be provided at site.

Yes

ii) If "YES" list of equipments to be provided

Refer Annexure H (Section-5) and Annexure-B-1 (Section-7)

Clause 10 B

Whether Clause 10 B (ii), (iv), (v) & (vi) applicable

Yes

Whether Clause 10 B (iii) applicable

No

Clause 10 CC

Whether Clause 10 CC applicable

Yes

Clause 11

Specifications to be followed

(i) For CIVIL CPWD DSR Items as per CPWD specification 2009 Vol-1 & Vol-2 with corrections slips issued upto 25-09-2019

(ii) For CIVIL Pavement work items MoRT&H (Ministry of Road Transport and Highways) specifications for Road and Bridge work (Fifth Revision) with correction slips issued upto 25-09-2019

(iii) For ELECTRICAL CPWD DSR (E&M) Items as per following CPWD (E&M) specifications

CPWD General Specifications

Part I	Internal	2013
Part II	External	1994
Part III	Lifts & Escalators	2003
Part IV	Substations	2013
Part V	Wet Riser and Sprinkler Systems	2019
Part VI	Fire Detection and Alarm System	2018
Part VII	D.G. Sets	2013
Part VIII	Gas based Fire Extinguisher System	2013
Heating, Ventilation & Air Conditioning Works		2017

(iv) For Non DSR Items and items of Specialised nature
Technical Specifications under Section No. 5

Clause 12

Clause 12.2	Deviation Limit beyond which	i) For Non-foundation items
12.3 & 12.5	Clauses 12.2, 12.3 & 12.5 shall apply	Plus 25%
		Minus No limit
		ii) For Foundation Items
		Plus 100%
		Minus No limit

Note: For Earthwork, individual classification quantity can vary to any extent but overall Deviation Limits will be as above.

Clause 12.5

Definition of Foundation item if other than that described in Clause 12.5 **NOT APPLICABLE**

Clause 16

Competent Authority for deciding reduced rates **Joint Secretary, DPA-III, MEA, GOI**

Clause 17

Maintenance Period **12 months**

Clause 18

List of machinery, tools & plants to be deployed by the Contractor at site **As per list of machinery equipment under para 8 annexure-1 of Section-1 and Hot mix plant**

Clause 25

Appointing Authority **Joint Secretary, DPA-III, MEA, GOI**

Whether Clause 31A or 32 is applicable **Clause 32 is applicable**

Clause 36 (i) & (iii)

Minimum Qualifications & Experience required and Discipline to which should belong

Designation	Minimum Qualification	Minimum working experience	Discipline to which should belong	Number
Principal Technical Representative (Project Manager)	Graduate Engineer Or	15 years experience in construction projects	CIVIL	1
	Retired Assistant Engineer possessing at least recognized Diploma Holder in Engineering	15 years experience in construction projects		
Deputy Project	Graduate Engineer	10 years experience in	CIVIL	1

Designation	Minimum Qualification	Minimum working experience	Discipline to which should belong	Number
Manager-I	Or	Pavement works.		
	Recognized Diploma Holder in Engineering	15 years experience in Pavement works.		
Deputy Project Manager-II	Graduate Engineer	05 years experience in building works	CIVIL	1
	Or Recognized Diploma Holder in Engineering	10 years experience in building works		
Deputy Project Manager-III	Graduate Engineer	05 years experience in electrical works related to buildings and installation of power supply equipment	Electrical	1
	Or Recognized Diploma Holder in Engineering	10 years experience in electrical works related to buildings and installation of power supply equipment		

Clause 36 (iv)

Recovery for non - deployment of Principal Technical Representative/Deputy Technical Representative / Project/ Site / Planning / Billing Engineer:

Designation	Rate of Recovery per month (in Rs.) for non-deployment
Principal Technical Representative	Rs. 55,000/-
Deputy Technical Representative	Rs. 50,000/-
Engineer (Degree Holder)	Rs. 45,000/-
Engineer (Diploma Holder)	Rs. 45,000/-

Clause 42

- i) a) Schedule/statement for determining theoretical quantity of cement & bitumen on the basis of Delhi Schedule of Rates printed by CPWD DSR 2018
- ii) Variation permissible on theoretical quantities
 - a) Cement
 - For works with estimated cost put to tender not more than Rs. 5 Lakhs 3% plus / minus
 - For works with estimated cost put to tender more than Rs. 5 Lakhs 2% plus / minus

- b) Bitumen 2.5% plus only & nil on minus side
 c) Steel Reinforcement and Structural Steel 2% plus/minus
 Sections for each diameter, section and Category
 d) All other materials NIL

RECOVERY RATES FOR QUANTITIES BEYOND PERMISSIBLE VARIATION

S. No.	Description of Item	Rates in figures and words at which recovery shall be made from the Contractor	
		Excess beyond permissible variation	Less use beyond the permissible variation
1	Cement	NOT APPLICABLE	
2	Steel Reinforcement		
3	Structural Sections		
4	Bitumen issued free		
5	Bitumen issued at stipulated fixed price		

Clause 46

Clause 46.10

Details of temporary accommodation including number of rooms and their sizes as well as furniture to be made available by the Contractor

As specified under para 2 of specification of Prime Cost Items in Section-5

Whether Clause 46.11.1A applicable

No

Whether Clause 46.13A applicable

Yes

Clause 46.17

City of Jurisdiction of Court:

NEW DELHI.

Clause 47.2.1

Sum for which Third Party Insurance to be obtained:

Rs. 5.00 Lakh
per occurrence with the number of occurrences limited to four.

Clause 55

Whether clause 55 shall be applicable.

No

If yes, time allowed for completion of Sample Floor / Unit

Not applicable

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SECTION 5

TECHNICAL SPECIFICATIONS

SECTION 5

TECHNICAL SPECIFICATIONS

STANDARD SPECIFICATIONS ISSUED BY CPWD

1.1 Civil Engineering Works

CPWD Specification 2009 Vol. I & II with correction slips issued upto 25-09-2019. These Specifications have replaced CPWD Specifications 1996 along with Correction Slips issued on them. These Specifications cover all types of Building Works. The specifications are available as a Priced Document issued by CPWD and also in soft copy PDF Format in CPWD website.

1.2 Electrical Engineering Works

Part No.	Description	Year of issue
I	Internal	2013
II	External	1995
III	Lifts and Escalators	2003
IV	Sub Stations	2013
V	Wet Riser and Sprinkler Systems	2019
VI	Fire Detection and Alarm System	2018
VII	D.G. Sets	2013
VIII	Gas based Fire Extinguisher System	2013
	Heating, Ventilation & Air Conditioning Works (HVAC)	2017

The above documents are available as Priced Document issued by CPWD and also in soft copy PDF Format in CPWD website.

2.0 STANDARD SPECIFICATIONS ISSUED BY MINISTRY OF ROAD TRANSPORT AND HIGHWAYS

Specifications for Road and Bridge works (Fifth Revision) April 2013 have been published by Indian Road Congress as a priced document. These Specification cover exhaustively various Road and Bridge works.

3.0 STANDARD SPECIFICATIONS ISSUED BY INDIAN RAILWAYS

Railway Board vide their letter No. 2009/LMD/01/03 dated 14/01/2010 have advised that they have approved issue of "Indian Railways Unified Standard Specifications or Materials and works with corresponding Indian Railways Unified Standard Schedule of items (for rates of Materials and works)". These documents are to be published by Northern Railway on behalf of Railway Board after the Zonal Railways have made out "Schedule of Rates" as applicable to them based on "Standard Analysis of Rates of items". These Specification however cover only Building and Road works generally on the lines of CPWD and Ministry of Surface Transport. They do not cover Track works which are governed by Manuals and RDSO/Indian Railway Specifications. Pending publication of Unified Standard Specifications, the specifications issued by the zonal Railways will be applicable.

4.0 SPECIAL SPECIFICATIONS (NOT COVERED BY ANY STANDARD SPECIFICATIONS)

The works will be executed as indicated in the nomenclature of each item, general specification as contained in section-5 and Particular specifications as given in this section. Particular specification contained herein shall apply to following works :

- i) Particular specifications for space frame for buildings/sheds
- ii) Particular specifications for Pre Engineered Steel Buildings / Sheds
- iii) Facia brick tiles
- iv) Particular specifications for Water Treatment Plant, Sewerage Treatment Plant & Fire fighting etc.
- v) Particular specifications for Non Schedule Internal and External Electrification Items

In the absence of any definite provision in the MoRTH specifications or in particular specifications contained herein reference may be made to the latest CPWD specifications with upto date amendment / correction slips, Bureau of Indian Standards codes, IRC, MoRTH, BS, ASTM and AASHTO in that order. Wherever these are silent, the construction and completion of the works shall conform to sound engineering practice and in case of any dispute arising out of the interpretation of the above, the decision of the Engineer-in-charge shall be final and binding on the contractor.

In addition, the abbreviations CPWD, IS, IRC, MoRTH, BS, ASTM, AASHTO shall be considered to have the following meaning :

CPWD :	Central Public Works Department.
MoRTH:	Ministry of Road Transport & Highways, Government of India.
BIS :	Bureau of Indian Standards
IRC :	Indian Road Congress.
BS :	British Standard of the British Standards Institutes.
ASTM :	American Standard of the American Society of Testing materials.
AASHTO:	American Association of State Highway and Transportation officials.

All the codes of practice, Standards and specification applicable shall be the latest editions with all correction slips etc. or as directed by the Engineer-in-charge.

TECHNICAL SPECIFICATIONS OF SPACE STRUCTURE

Space Structure and other miscellaneous works:-

- 1.1 Tubular space structure system is to be provided. The space structure of shape and design as shown in drawing including sub-structure required for sheeting is to be provided at site. The forged steel cones/props/tube end connectors/high strength bolts and solid forged spherical node connectors are to be provided as per approved space structure system and drawings. Detailed design and drawing of super structure & foundation/under structure as per general arrangement drawing shall be provided by the contractor duly vetted by IIT before the start of work including shop drawings for approval by RITES before proceeding for construction.

1.2 DESIGN CRITERIA

The structure shall be designed to resist as a minimum requirement as specified in IS 800:2007.

In addition to the loads specified in IS 875, other loads according to the good engineering practice shall be considered where necessary. These shall include but are not limited to dynamic conditions, earth pressure, environmental conditions and erection loads.

Design Codes

Seismic Load As per IS 1893 -2002(Zone 5)

Wind Load IS -875

Design IS -800 -2007(LIMIT STATE)

Design Loads

Live Load :-

Live Load shall be as per IS-875.

Dead load:-

Self Weight of the Structure including purlins, Sheeting, Girts Bracings, weight of turbo ventilators to be added as dead load.etc.

Wind Load:-

Wind Speed shall be as per considered to be 55 m/s

The design life of structure shall be taken as 50 years.

Earthquake load:-

Seismic forces shall be as per IS: 1893, Zone V.

Following collateral or service loads shall be considered on PEB structure, in addition to the normal dead loads, live loads, gantry loads & wind loads –

- a. Utility racks to support piping and cable trays and other collateral loads
 - b. Air Conditioning Ducting, false ceiling etc
 - c. Fire Sprinklers
 - d. Electrical Fittings/Fixtures
 - e. any other future equipment load.

1.3 PRODUCT SPECIFICATION

- 1 Supplying, providing, fabricating, welding, handling, assembling and fixing in position, erecting at site at all heights tubular space structure system to support roof and consisting of electric resistance or induction butt welded tubes/pipes conforming to IS: 1161/1239/3589/4923 ERW Steel pipes of SAIL/Shah Alloys/TATA/Jindal/APL or approved equivalent and forged/machined mild steel cones/ props/ tube end connectors, solid forged spherical node connectors, High tensile bolts, support system, stubs and mild steel base plate and other structural members conforming to IS: 2062 as per approved space structure system and including transportation, cutting, threading, machining, leads and lifts up to all heights, tools and plants and necessary scaffolding etc. required for all operations involved.

1.4 MATERIALS

- 1 Structural steel pipes/tubes to be used shall be electric resistance or induction butt welded (ERW 310 GRADE) as per IS 1161/1239/3589/4923 of Indian make, bolts to be high tensile bolts as per IS 1363/1364 of minimum 10.9 grade.
- 2 Pipes shall be designated by their normal bore. These shall be light, medium or heavy as specified depending upon the wall thickness.
- 3 Pipes shall be clean finished and reasonably free from scale. They shall be free from cracks, surface flaws, lamination and other defects. The ends shall be cut clean and square with axis of the pipe unless otherwise required per design/drawing.
- 4 SOLID NODES: Only full solid spherical nodes as per design should be used throughout the work. The node shall be made of EN8/EN9. The nodes shall be manufactured in the form of Solid Sphere by hot forging medium carbon steel conforming to BS EN 10083 part-2, C45 (+N), (previously known as DIN 17200, C45) to ASTM B 633, Type 2, and SC3.
- 5 SOLID PROPS/ SOLID TUBE END CONNECTORS/ SOLID CONES:-The material of the props/ cones should be MS duly welded to tubular member with CO2 Welding. The Steel cones /conical tips shall conform to ASTM A 36/BS EN 10083, C-30 or DIN St 37-2 standard as applicable to ASTM B633, Type 2 SC3.
- 6 Bolt should be high strength as per design with minimum 10.9 grade. The Special Bolts positioned inside the conical tips shall be free to rotate. A round hexagonal Sleeve (similar to a nut) shall house the end bolts. Bolts shall conform to ASTM F568M/ASTM A490/ISO 898 part 1, Grade/ Property Class 10.9.
- 7 PAINTING- All the components of space structure shall be painted with one coat of epoxy primer and one coat of Polyurethane paint.

	General Surfaces
Primer coat	A two component Epoxy zinc phosphate Primer with minimum volume solids of 70% having VOC less than 250 gm/ltr. Total DFT – Min. 75 microns

Finish Coat	Two component High Gloss Acrylic Polyurethane Finish Paint with approximate Volume solids of 70-77%, having VOC < 250 gm/ltr, with gloss retention of minimum 80% after 2000 hours exposure to UV A Fluorescent lamp as per ASTM D523. The DFT in one or more coat shall be 75-100 microns.
-------------	--

DFT Measurement should be in accordance with SSPC SPA 2.

Epoxy Primer

Volume Solids	70 %(Min)
VOC	Less than 250g/liter
Typical Thickness	75 microns
Theoretical Coverage	9.6 Sq m/ litre at 75 microns

Polyurethane Paint

Volume Solids	70%-77%
VOC	Less than 250g/liter
Typical Thickness	75 - 100 μ (3-4 mils) per coat
Theoretical Coverage	9.5-12.0 m ² /litre @ 75 μ dft

All Paints delivered to the shop shall be ready mixed in original sealed containers, as packed by the paint manufacturers.

Painting shall not be carried out when the temperature is below 4 degrees C, or above 50 degrees C, less than 3 degrees C above the dew point, or when the relative humidity is above 80%.

Paint shall be applied in accordance with manufacturer's recommendation, as supplemented by these specifications. The work shall be generally follow IS: 1477 – (part-II).

For Brush Application: Proper brush shall be selected for a specific work piece. Round or oval brush which confirms to IS: 487 are better suited for irregular surfaces, whereas flat brushes which confirm to IS: 14 are convenient for large flat areas.

For Spray Application: The spraying equipment shall be compatible with the paint material and provided with necessary gauges and controls. The equipment shall be cleaned of dirt, dried paint, foreign matter and solvent before use.

1.5 Erection and Fixing:

- 1 All the operations like supplying of tubes, cutting, fabricating, welding, machining, threading, assembling and erection and any other activities required for execution of job as per the drawing and instruction of engineer-in-charge. All space structure work shall be carried out by specialized agency having requisite experience of similar works with all safety precautions and following sound

engineering practices to give well finished work to the satisfaction

- 2 All material before being assembled shall be straightened, if necessary, unless required to be curvilinear form and shall be free from twist and shall be assembled in such manner that they are neither twisted nor damaged.
- 3 Welding shall be done in accordance with IS-816-code of practice for use of metal arc welding for general construction in mild steel.
- 4 IS: 820 - Code of Practice for the use of welding in tubular construction.
- 5 Shearing, chipping or gas cutting may prepare profile of fusion faces. In all cases the faces should be dressed by chipping, filling or grinding and made regular.
- 6 The surface to be welded and adjoining metal for distance of at least 20mm must be clean free of rust, scale, paint etc.
- 7 Each bead of metal shall have the slag removed by light hammering and wire brushing before the next bead is deposited. The weld must show a good clean contour and on a cut specimen good fusion with parent metal. Before applying paint the weld shall be carefully chipped and wire brushed.
- 8 Welding procedure shall be based on the specific analysis of any given heat of steel.
- 9 These procedures shall call for one or all the following:
Proper bead shape:
Minimized penetration to prevent dilution of the weld metal with the alloy elements Preheating, controlled inter-pass temperature and controlled heat input.
Welding shall be performed only by qualified and tested welders specifically trained and experienced for the type of job required to execute the welding work. Welder should have minimum five years of experience in the job of similar nature.
Use of standard weld symbols as adopted by IS: 813 are mandatory. Pre-qualified joints which are detailed, prepared and welded in accordance with the requirement of IS: 816 shall invariable be used.
Structural welding shall not commence until joints elements are bolted or tacked in intimate contact and adjusted to dimensions shown with allowance for any weld shrinkage that is expected. Welding sequence shall be planned and controlled to minimize undue stress increase or undue distortions on restrained members. Heavy sections and those having a high degree of restraint shall be welded with low hydrogen type electrodes. Concave bead shape shall be avoided.

1.6 APPROVED MAKES :-

- GEOMETRICS
- HINDUSTAN ALCOX LIMITED
- SPECO ENGINEERING PVT. LTD.
- AMIYA, KOLKATA
- METALKARMA
- JM SPACEFRAMES
- TRIOCON, CHENNAI

1.7 OTHER CONDITIONS

- a. The work is inclusive of all accessories, machineries, fittings/fixtures, sealants, welding works whether specifically mentioned or not.

- b. The work is inclusive of structural design of PEB steel superstructure.
- c. The work is inclusive of structural design of RCC foundations, RCC understructure, RCC mezzanine floor and any other RCC/Steel design element not specifically covered, as per the general arrangement drawings issued to contractor.
- d. The work is inclusive of preparation of shop drawings for approval by RITES before start of construction.
- e. The work is inclusive of Design Vetting/Proof Checking of the complete structure (RCC & Steel PEB) from IIT or any other approved institute.
- f. The scope of work includes Designing, Supplying, providing, fabricating, welding, handling, assembling and fixing in position, erecting at site at all heights.
- g. The work includes transportation of material, factory inspection costs, cutting, threading, machining, leads and lifts up to all heights, tools and plants etc. required for all operations involved.
- h. It shall be the responsibility of the Contractor to verify the placing and fixing of Anchor Bolts. An Inspection Engineer is required to be deployed during the execution of this activity without any additional cost, to verify the levels, alignment and correct positioning of bolts.

1.8 PAYMENT STAGES :

No.	Stage	Payable at %age of amount quoted
1.	On receipt of PEB material at the site	50%
2.	On erection and assembly of PEB structure.	30%
3.	On completion of roof & wall sheeting	10%
4.	On completion of work and handing over	10%

SPECIFICATIONS FOR PRE-ENGINEERED STEEL BUILDING / SHED (S) AS DESCRIBED BELOW:

The building/shed will consist of all components required to construct the primary and secondary framing (wind bents, wall & roof purlins) plus the wall and roof cladding. The contractor will complete the work on **Design & Build basis**. The contractor will get the shed designed from the approved suppliers/firms with STAAD PRO software and get the designs approved from RITES LTD. **The contractor will then get its designs proof checked from a reputed IIT (as approved by RITES LTD) and on approval shall proceed for construction.**

The contractor will also give a **10 year leak proof guarantee** for the pre-engineered buildings / sheds from the date of completion/handover. In case of leakage the same will be repaired free of cost. The pre-engineered buildings shall be designed according to the following codes :

Design Codes

Seismic Load As per IS 1893 -2002 (Zone 5)

Wind Load IS -875

Design IS -800 -2007(LIMIT STATE)

Design Loads

Live Load 0.75 kN/m²

Dead Load 0.15 kN/m²

Wind Speed 47m/s

A. General Features

Type : TCCS (Tapered Column Clear Span)

Width : as per Drawing

Length : as per Drawing

Eave height : 7.0m clear under the knee

Width module : 1

Roof slope : min 1 in 10

Bay spacing : min 6.0 M

Front End Frame : Standard Post & Beam System

Back End Frame : Standard Post & Beam System

Type of bracing on roof & wall : Diagonal Rod / Angle Bracing (as per design)

Wall panel : as per detailed product specification as under.

Girts : Sidewall girts and end wall girts are mounted on the exterior face of the main column.

Fasteners : Mechanically galvanised Hex-washer head self-drilling fasteners with integral EPDM seals.

Accessories : Flashing, trims, eave gutters & downspouts.

Canopy : A canopy/soffit of size 3(W) x (Length as per drawing) X 5.0m (H) will be provided on one side wall.

Self propelled turbo-ventilation- As per manufactures' specifications / drawing.

Doors : Aluminium Panel

Windows : Aluminium Glazed

Flooring : Shed Area : Tri mix / VDF, Office Area ; Vitrified tiles.

Paint Finish : All primary and secondary members shall be supplied with factory applied one coat of Zinc Chromate red oxide primer finished with 2 coats of synthetic enamel paint applied at site. All internal walls painted with Emulsion paint and external walls in Weather coat paint.

Special conditions: All walls clad to full height above 3.0m high brick masonry wall.

Building Layout: as per Drawing enclosed

B. Detailed Product Specification

(1) Roof Lighting panel: 2 mm thick FRP day lighting panels for 2% of roof area for Passenger Terminal Building and Cargo Building and 4% for toilet blocks, rummaging shed, warehouse

(2) The Roof sheeting for Passenger Terminal Building and Cargo Building Roofing : Double Skin Roofing System with top 0.50mm TCT Hi-Rib Colour Coated Galvalume sheet and & bottom sheet 0.47mm TCT Hi-Rib Bare Galvalume sheet with 50mm thick x 24 kg/m³ density Glass Wool Insulation and sub-girts

(3) The Roof sheeting for other buildings: toilet block, rummaging shed, warehouse: Single Skin 0.50mm hi-rib colour coated galvalume profile panel

Structural Members:

Frame: Supply of Primary (Built-up) sections are fabricated from hot rolled steel plates conforming to ASTM A 572M Grade 50 or equivalent with minimum yield strength of 345 MPa. Flanges are welded to the web by a continuous single side fillet weld deposited by an automatic submerged arc welding process. The Built up frame shall be shot blast & primed with one coat of primer paint applied as per standards.

Supply of Galvanized secondary members are cold-formed from steel coils conforming to ASTM A 653M Grade 50 or equivalent , with zinc coating to Z275 designation (275 g/m²) on both surfaces & having a minimum yield strength of 345 MPa.

Roofing panel :

Supply of MR-24 type monolithic/seamless roofing system, factory pre-punched profiled sheet of nominal 600 mm effective cover width with two major corrugations, 50 mm high (80 mm including seam). The flat of the panel shall contain cross flutes 430 mm on the pan centre perpendicular to the major corrugations over the entire length of the panel. The feed material is manufactured from 0.60 mm Base Metal thickness (BMT), min. 345 MPa yield strength coated with hot dip metallic Aluminum /Zinc alloy coating, Zinalume AZ150 as 150 gms/ sq.mt total on both sides of Aluminum (55%) & Zinc (43.50 %) & Silicon (1.50%), conforms to ASTM792M or AS1397, or, any other equivalent roofing system . The steel manufacturers test certificate for the chemical and mechanical properties of steel shall be submitted for approval by the concerned authority prior to installation. The sheet shall have brand marking of the manufacturer on the back of the sheet at every 1 m c/c for confirming genuinity of the material. Specially designed roof clips shall be used to hold roof panels to the supporting structural member. The clip is designed to move freely in both directions to take care of thermal expansion and contraction. The supporting structural member (galvanized purlins) shall be factory pre-punched as per design requirements. Panel side laps shall be field-seamed by roof runner seaming machine which is self-propelled and portable electrical lock-seaming machine. The machine field forms the final 180 degrees of a 360 degree double-lock standing seam, all side lap sealant shall be factory applied butyl rubber hot metal sealant. The insulation shall be vinyl membrane supported fiberglass blanket of thickness 50 mm with density 12 kg/m³ (or as per design requirement) shall be approved by concern authority. The panel end lap shall be joined by mean of a two piece clamped connection consisting of a bottom reinforcing plate and top panel strap. Accessories such as ridge capping, flashing; trims, gutter and down pipe shall be used for fixing roof system which shall be approved by Engineer-in-charge. Scrubolt type fastener shall be used for fixing roof system.

Wall Panels:

Shadowrib 900 type panels are roll formed from nominal 0.45 mm base metal thickness of minimum yield strength of 550 MPa, coated with an aluminum /zinc alloy (i.e. Zinalume Steel), AZ150 (min 150 gm/m² total on both side), conforms to Australian standard AS1397, pre-painted with Colorbond steel quality paint coat as per AS/NZS 2728 Class 3 or any other equivalent panel. The paint finish thickness shall have a total coating thickness of nominal 35 µm, comprising of nominal 20 µm on exterior face and nominal 5 µm reverse coat on interior face over nominal 5 µm epoxy primer coat on both surfaces of approved colour shade by concern authority. The steel manufacturer's test certificate for the chemical and mechanical properties of steel shall be submitted for approval by the concerned authority prior to installation. The sheet shall have brand marking of the manufacturer giving product details on the back of the sheet at every 1 meter c/c for confirming genuinity of the material.

Profile dimensions:

SHADOWRIB rib profile of 900 mm effective cover width, min. 38 mm deep ribs at pitch of min. 300 mm centre to centre distance with two stiffeners between the ribs.

OR

Any other equivalent material.

Trims & Gutters: Wall flashing and trims (gable, corner, framed opening, accessories, etc.) are manufactured from same color, finish and thickness as wall panels

Roof flashing and trims (parapet flashing, transition trims, expansion joint trims and ridge caps) are manufactured from same color, finish and thickness as roof panels.

Eave gutters and downspouts are cold-formed from the same material as wall panels

Water-resistant louvers shall be manufactured from high strength ZINCALUME steel .

Protection accessories:

SKYWEB II type protection netting shall be provided.

Other Accessories:

Anchor bolts are manufactured from rods conforming to ASTM A 36M Grade 36 or equivalent with minimum yield strength of 240 MPa and an ultimate strength of 400 MPa.

Bracing rods, used in sidewalls of buildings supporting cranes are solid plain round steel bars conforming to ASTM A36 M or equivalent with minimum yield strength of 240 MPa.

Flange braces used to stabilize the inner flanges of main frame columns and rafters are 50 mm x 50 mm x 4 mm steel angles conforming to ASTM A 36M (or equivalent) with a minimum yield strength of 240 MPa

Roof Fixing Clip: Specially designed roof clips shall be used to hold MR-24 roof panels to the supporting structure member. The clip shall be design to move freely in both direction to take care of thermal expansion and contraction. The supporting structural member (galvanized Purlin) shall be factory pre-punched as per design requirements.

Panel End lap: The panel lap shall be joined by means of a two-piece clamped connection consisting of a bottom reinforcing plate and a top panel strap as per approved design and to the satisfaction of Engineer-In-Charge. All other special accessories should also be factory fabricated including flashings, ridge cap,gutter, downpipe etc.

Sealant: Special grade of silicon sealant non-hardening, neutral cure type of approved make and grade shall be applied at all side laps and endlaps (with flowable mastic) as approved by engineer-in-charge.

Bead mastic is an extruded elastomeric butyl rubber based sealant supplied in rolls on silicon release paper conforming to Federal Specification TT-C-1796 A Type II Class B (or equivalent).

Flowable mastic (caulking sealant) is a neutral cure silicone rubber sealant that is chemically inert and non corrosive. It is UV resistant and suitable for exterior applications against weathering and rainwater. When cured it is non-toxic and will accommodate high thermal and shrinkage changes in structural movement joints.

Foam closures match the panel profile. They are made of expanded polyurethane or similar material.

Fasteners: The panel clip shall be fastened to structural members with Scrubolt fastener or equivalent material. The size of the fastener shall be as per the manufacturers' recommendation and as approved by engineer-in-charge.

Insulation: The insulation shall be vinyl membrane supported fiberglass blanket of thickness 50 mm with density min 12 kg/m³ (or as per design requirement) and as approved by engineer-in-charge.

Specification for Skylight (Translucent sheeting) :

The panel shall be nominal 2mm thick composed of a translucent, thermosetting polyester resin with a thoroughly impregnated glass fiber reinforcing mat with an integrally bonded translucent film on the weathering face. The profile should match with cladding profile. The fixing shall be done with specially designed Lap seal and weather-tight washer for fixing the translucent sheeting. The profile and properties shall be approved by Engineer-in-charge before installation.

The work also includes design of following:

- Rigid frame structural for columns, rafters with end plates, purlins, girts.
- Wind Operated Turbo Ventilators
- All necessary flashings, trims, eave gutters & downspout
- Roofing & cladding sheets
- Structural hardware & sheeting fasteners
- End lap sealant
- Bracing
- Anchor bolts and templates
- 2 mm thick FRP day light panel
- Framed opening
- Canopy system
- Interior partition wall, Doors and fixtures
- Wall vents, doors, windows and louvers
- Civil, mechanical and electrical installations and materials
- Concrete embed plates of weld plate of any kind
- Design of Foundations, Slabs etc and other masonry design.
- All civil, electrical and PHE works.
- Setting of Anchor Bolt – (Physical setting or fixing)
- Grouting - Grouting under column base plates with high strength grout.
- Crane beam, brackets, crane rails and crane

- Electricity & Water required during work at site.
- Proof checking by a reputed IIT (as approved by RITES LTD).

Erection and Fixing:

- The installation shall be done in accordance to the standard practices as specified by the manufacturer and as approved by the concern authority. All sheets and accessories must be stored and finally erected without any damage.
- The contractor will be required to submit design calculation in support of the proposed profile of the sheet and standard loading etc. to the satisfaction of RITES LTD. The contractor shall also submit methodology for fixing and also a maintenance manual for routine maintenance.
- Special flashing, ridge capping and trims shall be fixed as per manufacturer's recommendation. The shape and girths shall be as per design requirement and shall be approved by RITES LTD.
- Panel clips shall be positioned by matching the hole in the clip with the factory-punched holes in the secondary structural members.
- Panel shall be positioned and properly aligned by matching the factory punched holes in the panel end with the factory punched holes in the eave structural member and by aligning the panel with the panel clip.
- Panel side lap shall be field-seamed by a self-propelled and portable electrical lock-seaming machine. The machine field forms the final 180 degrees of a 360 degree double-lock standing seam; all side lap sealant shall be factory applied.
- Panel endlap, when required, shall be at least 150mm sealed with neutral-cure sealant and fastened together by clamping plates. Sealant shall contain hard nylon beads which prevent it from flowing out due to clamping actions. The panel lap shall be joined by means of a two-piece clamped connection consisting of a bottom reinforcing plate and a top panel strap. The panel endlap shall be located directly over, but not fastened to, a supporting secondary roof structural member and be staggered, so as to avoid a four panel lap splice condition.
- The contractor shall ensure that panel erector is familiarized with the erection procedure and all the supporting members are straight, level and true before starting panel erection. Panels shall be erected according to approved shop drawings by RITES LTD.

Measurement:

- The pre-engineered shed (length & breadth) shall be measured from outer face of columns on both sides. No separate payment for canopy(s) / projection(s) shall be made.
- No separate payment will be made for the laps of sheet and accessories, bolts, nuts, washers, adjustable bolts and supports for gutters and other fixtures. These are assumed to be included in the quoted rates.
- Civil works like foundation, columns, plinth beams, Brick walls, plaster, door/windows, flooring, electrical/water supply/ sanitary works, fixture/fittings, etc. shall be measured and paid separately.

Note: The contractor shall prepare the shop drawings based on the drawings

supplied by the Engineer-in-Charge or the concern authority. These shall be submitted in five sets sufficiently in advance to the concern authority for approval.

Stages of Payment (for this item only) :

No.	Stage	Payable at %age of amount quoted
1.	On receipt of the material at the site	30%
2.	On erection and assembly of the Bldg/Shed frame.	20%
3.	On receipt of roof and wall sheeting material at site.	20%
4.	On erection and assembly of Bldg/Shed roof/wall sheeting.	20%
5.	On completion of work and handing over	10%

1. Primary Steel:-

All primary steel members shall be solid web built-up section in manufactured out of 345 Mpa steel plates. Welding of web to flange shall be SAW type on alternate sides and tac welded alternative side.

2. Cold formed section:-

These shall be Z/C shaped cold formed section out of 345 Mpa Galvanised 275 GSM steel as per IS:277.

3. Misc:-

Rod bracing, flange bracing, misc. steel components such as clips etc shall be out of 240/250 Mpa steel conforming to IS 2062.

4. Structural Hardware:-

All primary steel connections shall be established using high tensile Gr. 8.8 fasteners. Anchor bolts and misc. steel connections shall be done by Galvanised Gr. 4.6 fasteners.

5. Roofing + Insulation:-

SS-2000 Standing Seam profiled panels having wide pans with 460 mm cover width, 50 mm pan depth, manufactured out of 0.65mm TCT Hi-tensile Bare Galvalume Steel (AZ-150, 150 gsm/m² zinc - aluminium alloy coating mass, 550Mpa yield strength) with with 50mm thick x 12 kg/m³ density Glass Wool Insulation with vinyl membrane and laid over GI weld mesh 50x50x1.6mm.

6. Wall Cladding:-

Single Skin 0.50 mm TCT Hi-Rib having cover width 1020mm, Colour Coated Galvalume, AZ150, 550Mpa profiled panels above 3.0m high brick wall in both end wall and in both side wall above 4m (3m brick wall and 1m louver).

Pre Engineered Building/Shed (approved supplier) :

- TATA BLUESCOPE STEEL / BUTLER BUILDING SYSTEMS
- KIRBY Engineering
- Interarch
- Supertech (India) Pvt. Ltd.,
- Lloyed Insulations India limited
- Everest Industries limited
- M/s Cladding Proejcts Private Limited

Foundation & other Civil Components Design :

- From the empaneled lists of RITES/ CPWD/ Railways.

Specifications for Providing and laying burnt clay face brick tiles (as per approved pattern 17-20 mm nominal thickness of 230x75 mm size & of approved make like Jindal mechno bricks , Pioneer Bricks , Gee Tiles)

- (i) Compressive strength should not be less than 10N/mm²
- (ii) Water Absorption should be less than 15% by weight
- (iii) Efflorescence should be nil/slight as per BIS 3495

Method of Installation

Method of Installation Clay tiles are being installed using a variety of techniques. Ceramic tile installation techniques are often used to install the Clay tile units.. Below are the procedures that could be used to install Clay tile:

Step 1

Clear all dirt, oil, grease, or other contaminants and remove all loose plaster, paint and scale on wall. Chip the existing painted wall surfaces with a chipping hammer and brush away all the flaky bits. Ensure that all surfaces are structurally sound.

Step 2

Apply a scratch coat to cover and level any uneven wall surfaces if necessary and allow it to set prior to applying the adhesive mortar. Prepare the adhesive mortar according to the manufacturer's instructions. Be careful that you add appropriate amount of water/latex in order to achieve good workability. Apply the mortar and level with a flat side of a trowel to about 10mm thick, comb the surface with the notched side of the tooth trowel and remove the excess mortar.

Step 3

Press the Clay tile firmly and evenly onto the wall surface so that the mortar behind the veneer squeezes out around its sides. Use a gentle wiggling action whilst pressing to ensure a strong bond between the veneer and wall surface.

Step 4

Use a small brush (about 8mm diameter and wet constantly) to smooth the mortar in the gaps between the veneers while the mortar is still wet. If you want to grout the joints, use a grouting pallet tool to carefully fill in the joints with mortar. If you prefer colored joints, oxide colorants can be mixed with the mortar. Take care not to dirty the veneer surface as cleaning is a hassle. Use a round or flat pointing tool to finish the joints when the mortar is thumbprint hard. Do not work on the joints too soon or the mortar will smear. Lastly, brush away any loose or excess dry mortar.

WATER TREATMENT SYSTEM & ACCESSORIES

This section of the contract involves the design, supply, installation, testing and commissioning of the complete Water Treatment plant for domestic water.

All installation work shall comply with the latest rules and regulations.

The work embraced by these specifications covers the design, submission to authorities, supply, delivery on site, installation, testing, commissioning and maintenance of the Water treatment system installation of the building.

The scope of work shall include the following (list is indicative and not exhaustive):

Complete Raw Water Treatment System. The Contractor shall be responsible for carrying out water analysis for the raw water from borewell and design all system components/equipment so as to achieve the potable water quality as per specified Standards SP:35 (S&T 1987) & IS 10500.

The Raw Water Treatment System as a minimum shall consist of feed pumps, filters with back wash provisions with all accessories complete with all controls, softener, PH automatic control and monitoring system, electrical panels, cabling, etc.

All the pipework between the raw water tanks, treated water tanks and all the interconnecting pipework amongst the Water Treatment pumps and other equipment.

Electrical equipment and installation work including the necessary wiring etc. in Control panel.

Painting and labelling of pipe work and equipment;

Provision of all hold down bolts, spigots struts and the like required to be built in during construction;

Provision of dry contacts to BMS indicating the status of the pumps and pressure vessel in form of hardware interfacing panels inside each control panels of all pumps.

Provision of all level switches, flow switches and other sensing devices for status indication.

All interfacing work with other trades.

Testing and commissioning and balancing of the complete Water Treatment system;

Provisions of operating instructions and maintenance manuals;

Provision of spare parts;

Training of the employer's staff for proper operation of the entire systems;

Liaison with Local Authorities to obtain all necessary certificates and approvals, including the completion of all submission drawings, forms and payment of any fees and charges. All the costs for all the tests required by Local Authorities shall be included. To attend to any Authorities inspection regardless of whether this inspection is carried out

after the defect liability period;

Provisions of the necessary installation which include pumping works, pipework within the pumping unit up to suction and discharge manifolds, conduit and control wiring, etc. to form a workable system required;

All other works and systems as specified in the Contract document and or shown on the drawings.

All cutting, patching, framing up, furring in, chasing and making good associated with the building construction for the passage of pipes, conduits and the like including providing GI pipes sleeves of required size corresponding to pipe dia, wherever pipes crossing fire rated walls and floors and sealing with glass wool in between and fire sealant compound on either end. Details on shop drawings shall also be provided.

2. GENERAL

Equipment offered for supply and installation shall include the following:

All minor items and incidental work, equipment accessories and materials may not be specifically mentioned but are required for the proper completion of the installations in accordance with the true intent and meaning of this Specification.

All necessary safety devices for the protection of personnel against injury and the protection of plant and equipment against damage including relief valves, belt guards, fan inlet and/or discharge guards, safety railing, effective earthing of electrical components, electrical interlocks, warning lights and alarms.

Readily accessible, dust-proof lubricating facilities on all moving parts and equipment including provision for cleaning all lubricating lines and bearings and charging same with the correct lubricants after installation but prior to testing and commissioning.

Clearly visible and robust manufacturer's name-plates permanently fitted each and every item of equipment and showing the manufacturer's name, type and/or model number, serial number, and all essential operating data such as speed, capacity, voltage, current draw, etc. The Contractor also shall allow provision for the inspection of all plant and equipment by the manufacturer or his licensed representative, at least twice during the course of the installation.

3. FILTRATION

3.1 Scope

The scope of this section comprises the supply, installation and commissioning of FRP composite vessel filter.

3.2 MS Vessel Filter

The filter shall be constructed of MS sheet material with inner FRP lining and other material as per manufacturer's standard.

The filter shall be provide with manhole cover, hand hole, flanged outlet for piping / valve connection and adequate tripod with skid self supporting structure for making the

installation completed. The filter shall also be provided with vacuums breaking connection / accessories to avoid any collapse of internal lining. All filters shall be provided with lifting lugs. The filter bed depth shall be 1050 mm.

3.3 Face Piping

Each filter shall be provided with interconnecting face piping comprising of inlet, outlet, and backwash complete with valves.

3.4 Accessories

Each filter shall be provided with following accessories :-

- a. Air release valve with connecting piping.
- b. 100 mm dia dial bourden type gunmetal pressure gauges with brass isolation ball valve and connection piping on inlet and outlet.
- c. Sampling valves (ball valves) on raw water inlet and filtered water outlet.
- d. Individual drain connection with brass fullway ball valve for each filter.

3.5 Filter Media

The filter media shall comprise of gravel / silica of various grade in varying thickness. The cut-section of the filter along with filter media detail shall be subject to approval by the Consultant.

3.6 Test Kits (Optional)

Provide one test kit with initial requirement of reagent:

- a. PH meter (electronic)
 - b. Turbidity meter
- Detail of equipment with technical literature shall be supplied with the tender.

3.7 Piping

The pipes and fittings in the domestic Water Treatment plant room shall be GI class 'C' (heavy class) conforming to IS: 1239 (Part-I) for pipes and IS:1879 (Part 1 to 10) for malleable cast iron fittings.

4. PUMPS

Pumps shall be horizontal, centrifugal, single stage directly coupled to motor. Provision of pump with pump head & base of cast iron and other parts in SS 304 shall be made for pumps required in System. Impeller shall be hydraulically balanced and keyed to shaft. Pump shall be mounted on a concrete foundation, projecting at least 15 CM above finished floor level. The pumps base shall be set on a vibration elimination pad. The pump shall be lubricated in strict accordance with the manufacturer's instructions and shall be factory aligned prior to shipment. All motors and bases shall be painted with approved finish shop coat of paint. The pump shall be selected for the lowest operating noise level and shall be complete with flexible connections, valves, and pressure

gauges. The pumps shall include cost of foundation channel complete.

5. ALUM / SODA ASH DOSERS

All dosers shall be of the electronic metering plunger type confirming to the requirements specified in the Bill of Quantities. They shall be complete with low level switch, low level alarm, tank and interconnecting piping.

6. WATER QUALITY

The domestic water treatment basis of design is as per raw water analysis. Contractor shall get the raw water analysis done at his own expense (in accordance to IS:10500 prior to submission of the water treatment scheme.

The contractor shall ensure domestic water of potable water standard after the treatment system. The acceptable standard of potable water shall be in accordance to SP:35 S & T : 1987 as per acceptable limits.

The technical tolerances for water shall be as follows:

S. No.	Characteristic	Tolerance
i.	PH value	7.5 to 8.5
ii.	Total alkalinity (as CaCO ₃), mg/1, Max	50 to 500
iii.	Aluminium (as A1), mg/1, Max	0.1
iv.	Total residual chlorine, mg/1 a. At inlet, Max b. At outlet, Min	0.5 0.2
v.	Oxygen absorbed in 4 hours at 27 deg.C mg/1, Max	1.0
vi.	Chloride (as Cl), mg/1, Max	500
vii.	Iron, mg/1, Maxx	0.1
viii.	Heavy metals (as pb), mg / 1, Max	0.1
ix.	Colour, Hazen units, Max	10
x.	Turbidity, NTU, Max	10
xi.	Odour	Odourless
xii.	Taste	Palatable

7. LEVEL SWITCH IN WATER TANKS

The Contractor shall supply and install controller in the water tanks as indicated below and shown on the drawings.

Raw Water Tanks at Ground Level

High level alarm (over-flow);
Low level alarm;
Low level cut-out for raw water pumps;
Earthing probe.

Treated Water Tank at Ground Level

High level alarm (over-flow);
Low level alarm;

Low water level cut-out domestic water pumps;
Earthing probe.

Each probe shall be of the correct length for the particular application and tank location. Electrodes shall be of polished stainless steel 20 mm OD. Electrode holders shall be weatherproof in all respect.

The earthing probes shall be connected and wired to the building earth systems of the building.

The level switch set shall operate with a stepped down voltage at 24V maximum. Stepped down transformers shall be provided for each set of control probes and shall be installed inside centralized control cubicles inside pump room.

8. PUMP INDICATOR

The following audible and visible indication shall be provided at the pump local control panels as applicable:

- a. Red "overflow level" indicator with buzzer for the associated water tanks;
- b. Amber "extra high water level" indicator for the associated water tank;
- c. Amber "high water level" indicator;
- d. Amber "low water level" indicator;
- e. Red "pump trip" indicator for each pump;
- f. Green "pump on" indicator for each pump;
- g. "Pump electrical supply healthy" indicator for each pump;
- h. Amber "remote/local" status indicator.

9. CHEMICAL & BACTERIOLOGICAL / MICROBIOLOGICAL TEST PARAMETER OF RAW WATER

The above mentioned parameters shall be tested in accordance to :

IS : 10500 – 1991, Amendment No : 2-2003

The Chemical and Physical Parameter (30 Parameter) shall be as follows :

Colour, Odour, Turbidity

Total Hardness, pH, Total Iron, Chloride, Dissolved Solids, Calcium, Magnesium, Copper, Hexavalent Chromium, Manganese, Sulphate, Nitrate, Fluoride, mercury, Cadmium, Selenium, Arsenic, Cyanide, Lead, Zinc, Aluminium, Boron, Phenolic Compounds, Detergents, Mineral Oil, Alkalinity, Silica.

Note : It is desired to also obtain probable composition of Total Solids if the TDS parameter exceeds 1000 ppm.

The bacteriological / Microbiological Test Parameter shall be as follows :-

MPN Coliform Organism, Cloiform Bacteria, E. Coli (Typical Faecal Organism).

The above tests shall be carried out by the contractor prior to submitting the technical submittal of the water treatment plant equipment. Contractor shall also submit the test

report of raw water & treated water after the commissioning of the plant. The cost of the tests (one pre equipment & two post equipment installation / commissioning) is deemed to be included in the quote.

The contractor shall submit the data sheets, layout and adequacy report from reputed engineer college for approval of Engineer-in Charge, before executing the work.

SEWAGE TREATMENT PLANT

- The sewage treatment plant is proposed to treat the sewage coming out of toilet and kitchen at Check post. The sewage is conveyed through sewerage system to primary settling tank & equalization tank from where it is pumped to main treatment unit. Treated waste water is disinfected prior to disposal or re-use.

Design Parameters:-

CPHEEO manual describes the characteristics of domestic sewage as given, design of sewage treatment plant is made accordingly.

Parameters	Unit	Design Concentrations
Total BOD5	Mg/L	250-400
Total Suspended solids	Mg/L	140-200
COD	Mg/L	500-800
pH		6.5- 8.5

The purification performance expected by SBR are as follows:

Parameters	Unit	Average annual concentration at the effluent
Organic matter (Carbonaceous BOD5)	Mg/L	< 10
Suspended solids	Mg/L	< 10
pH		6.5- 8.5

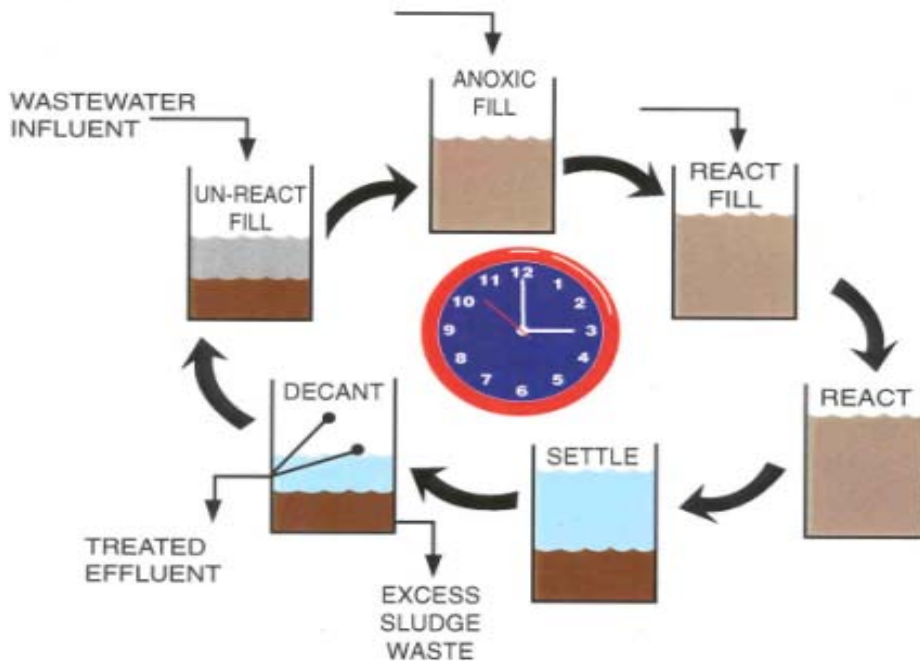
Treatment Concept

Sequencing Batch Reactor (SBR) is a special form of activated sludge treatment process in which all the steps like aeration, settle and decant processes happen only in one tank. Clarifier is not required in this case. This is a fully automated system controlled through programmable logic controller.

The objective of sewage treatment is to remove undesirable components from the sewage by employing Sequencing Batch Reactor Treatment methods. Bar Screening and Oil & Grease removal is the pre-treatment to the sewage. This leads to equalization tank & SBR tank. This makes use of a Primary Settling Tank (PST) followed by a SBR process. The flow is equalized inside the equalization tank and can be processed into the one-tank SBR reactor by batch treatment regardless of the peak flow conditions.

Some of the sludge from the SBR tank is recycled to Primary Settling Tank tank to maintain the MLVSS. Surplus sludge have to be taken out through the Waste Activated Sludge pump after every 6 months. Effluent from the SBR tank is disinfected by chlorination for their final disposal to nearby inland surface water or for recycling the water to horticulture. The SBR process is fully automated process

Basic Sequence



“Time” controls the biological reactions

The SBR sequence with 1-SBR operation consists of the following consecutive steps (note that sequence starts with start of filling in a reactor):

Static Fill: This non aerated step encourages the formation of floc-forming bacteria and reduces the production of filamentous bacteria.

Aerate / React: This step starts either when maximum fill time is completed or when Top Water Level (TWL) is reached in this reactor. This step serves to complete reaction without filling wastewater and therefore reduce soluble BOD that is present in the SBR. Waste Activated Sludge (WAS) could be extracted in mixed liquor state from SBR during this step (if required).

Settle: Aeration is stopped in order to avoid any mixing in the SBR and allow quiescent settle of biological flocs to the SBR bottom section. Typically, 45 to 60 minutes are required for this step.

Decant: Using floating pump decanter, the SBR supernatant (free of solids) is extracted from the SBR and this constitutes the SBR treated water effluent. Decant step ends when Bottom Water Level (BWL) is reached in the SBR. Waste Activated Sludge (WAS) could be extracted in settled state from SBR during this step (if required).

Idle: At low flow conditions (below average design flow), an Idle period (no aeration, no filling) is allowed until the Maximum cycle time set by operator is completed. The sequence then starts over with Static Fill step.

The wastewater is assumed to be a domestic sewage, and has gone through a preliminary and primary treatment. It is also assumed that the wastewater does not contain high level of toxic that is likely to affect the biological activities and settling characteristics.

Sequencing Batch Reactors are provided for BOD5 and TSS removal. In each reactor, filling, aeration, settle and decant periods will follow an optimal sequence. The design is based on rectangular concrete SBR basins to be constructed by others with dimensions and operation levels.

Treatment Unit

Following the concept of sewage treatment, following units are put in the treatment of sewage.

- Sump
- Primary Settling Tank
- Equalization Tank
- Sequencing Batch Reactor Tank
- Treated Water Tank.
- Waste Activated Sludge Tank
- Programmable Logic Controller

Sump

Volume of Waste water 60 cum / per day

MOC R.C.C (Client Scope)

The sump will be provided two chambers with the provision of baffle wall to trap the oil and grease coming with the sewage. At the inlet to the sump, a bar screen is proposed to arrest the floatables and other extraneous material.

Pumps: Two sumps submersible pumps (1 working, 1 stand by) each of the capacity of 5 m³/hr at 10 m head for lifting the sewage from invert level of sump through a 100mm pipe into the Primary Settling Tank of S.T.P.

Pump House: A 4m x 4m pump house is proposed for two pumps (1W + 1S). Outlet of the pump will be provided with sluice valves. The necessary space for providing and fixing electrical panels, starters and for pump operators will be available inside the pump house. A H.O.T. crane of 1.0 tone capacity will be provided for hoisting and lifting of pumps. Pump House shall be provided by client free of cost.

Primary Settling Tank

Dimensions of the Primary Settling Tank (PST) @ Average flow	
Number of tank (#)	1
MS Tank-	
Internal surface > sandblasting SSPC-SP 10 and epoxy 10-12 mils.	

External surface > sandblasting SSPC-SP 6 and primer.	
Length	AS/BOQ
Diameter of Tank	AS/BOQ

Equalization Tank

Dimensions of the Equalization tank	
Number of tank (#)	1
MS Tank- Internal surface > sandblasting SSPC-SP 10 and epoxy 10-12 mils. External surface > sandblasting SSPC-SP 6 and primer.	
Length	AS/BOQ
Diameter of Tank	AS/BOQ

Sequencing Batch Reactor Tank

Dimensions of SBR	
Number of tank (#)	1
MS Tank- Internal surface > sandblasting SSPC-SP 10 and epoxy 10-12 mils. External surface > sandblasting SSPC-SP 6 and primer.	
Length	AS/BOQ
Diameter of Tank	AS/BOQ

Treated Water Tank

SBR decanted water will enter into treated water tank, In this tank filtered water will be disinfected using UV Disinfection system and maintain minimum velocity to prevent solids depositing after this treated water can be used further for gardening and flushing purposes.

Volume- 60m³

MOC- FRP

Waste Activated Sludge Pump

In SBR tank, WAS pump will be used to withdraw waste activated sludge (WAS) at a sludge concentration of about 0.83%. A sludge pump is put for recycling the sludge into the SBR tank to maintain the Mixed Liquor Volatile Suspended Solid (MLVSS).

Programmable Logic Controller

Programmable Logic Controller provides a transparent operating tool to the operator to allow easy process and control troubleshooting. The system includes a Programmable Logic Controller (PLC) and an operator interface system comprising of up to date standard PC with monitor which serves to display process status, to allow operator to change operation parameters and also to log alarm. The system includes as well an SBR Process Control Logic Description. Main Control panel, Allen-Bradley Micrologix, power supply, control logic programming and control relays. This control panel also includes selector switches (hand/auto) and general alarm reset button for decanters and automated valves.

2. EQUIPMENT

The following give the minimum requirements of the different components of the system. The figures indicated are for contractor's references. It shall be the Contractor's responsibility to select equipment for the plant proposed by them so that the capacities and performance of the Sewage Treatment Plant meet with the criteria set out in this specification.

All equipment and components of the system shall be of top quality construction and shall be corrosion resistant.

2.1 Coarse Screening Equipment

Bar screen shall be of 304 stainless steel construction of size 1000mm x 600mm x 900mm. Drip trays shall be provided for holding and drainage of the screenings. A manual by-pass screen of 30mm opening with stainless steel drip tray shall be provided. An isolation valve shall be provided to divert the flow to the by pass screen when the screen requires service.

2.2 Sewage Pumps

Working and standby Sewage pumps shall be provided.

Each shall be of submersible type c/w guide base to facilitate ease of removal, lift chain and automatic discharge connection. Pump casing and impeller shall be of cast iron material. Shaft shall be of stainless steel material.

2.3 Sludge Pumps

Two numbers of sludge transfer and disposal pumps (one duty and one standby) shall be provided. Each shall be screw type and automatic discharge connection. The material construction shall be the same as the sewage pumps and feed to filter press for final disposal.

2.4 Tertiary Treatment

This tertiary treatment shall be provided for the sewage used for irrigation and cooling tower make-up water tank system.

The tertiary treatment plant shall comprise of UV Disinfection System. This shall be sized to accommodate 100% of the sewage discharge flow rate and shall achieve the performance as outlined and described in Design Criteria.

Details of the equipment layout proposal shall be submitted for review by the Construction Manager with tender documents.

2.5 Electrical Control

The operation of the treatment process shall be fully automatic.

A completely assembled and pre-wired control panel with mimic diagram consisting of weatherproof cabinet shall be furnished. The control panel shall contain all metering and status indicators, motor starters, program timers, on-off-auto change-over switches and duty selectors for equipment.

Proper control sequence shall be designed according to system requirement and manufacturer standards,

2.6 Other Equipment

Any other necessary accessories, such as buffer, riser, scum removal devices, partition, control panel, collection devices, etc. for all the tanks and pumps (where necessary) shall be provided in order to provide a fully working systems.

2.7 Piping Materials

CPVC piping (Schedule-40)- Pumped effluent (submerged) & tank overflow pipe line.

GI (Heavy) - Interconnecting pipe line after delivery header of pump / filter. Nut bolts should be of SS for all the equipments.

2.8 Valves

The Contractor shall supply and install all isolating valves and control valves as indicated on the drawings and as required for the proper and efficient operation and maintenance of the entire systems.

All valves supplied shall be suitable for the working pressure and test pressure of the system as specified elsewhere in this specification.

Regulating valves shall be of similar materials as that specified for cast iron gate valves.

All regulating valves shall be lock shield type.

All valves shall be full line size.

Each valve shall have a purpose made reference number plate for label engraved or stamped indicating the manufacturer's catalogue number, pressure and temperature ratings. Valves shall be arranged so that clockwise rotation of the spindle will close the valve.

Furnish all valves and accessory materials necessary in the piping whether or not shown on drawings as flows. All valves shall be packed with an approved packing and threads shall be coated with oil and graphite. Packing should be replaced when found deteriorated on site.

Where possible locate all valves at convenient positions of operation from the floor with valve stems upright. Valves that are flanged shall have flanges to the table specified for the pipe work.

Plastic or metal plates (rustless) shall be provided to indicate the open / close status as well as the use of each valve in the pump and tank rooms.

3. PIPE SUPPORTS

3.1 General Support

Tender drawings indicate schematically the size and location of pipes. The Contractor, on the award of the work, shall prepare detailed working drawings, showing the cross-sections, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air valves, and all pipe supports.

He must keep in view the specific openings in buildings and other structure through which pipes are designed to pass.

Piping shall be properly supported on, or suspended from , on stands, clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchor, clamps and hangers, and be responsible for their structural stability.

Pipe work and fittings shall be supported by hangers or brackets so as to permit free expansion and contraction. Risers shall be supported at each floor with Galvanised steel clamps. To permit free movement of common piping support shall be from a common hanger bar fabricated from Galvanised steel sections.

Piping shall be supported from the building structure, which shall support the sum of the load of a water-filled pipe and a minimum of 120 kg applied at the point of hanging.

All piping brackets shall be constructed as shown on the standard detail drawings.

Vertical pipe work shall be supported at intervals of at least one per floor level.

Horizontal pipe work shall also be supported by adjustable flat iron or clevis type hangers hung by hot rolled steel rods of the following diameters and spacing subject to the Construction Manager / Architect's approval:

Nominal Pipe Size	Distance between Supports	Diameter of Rod
25 mm	1.8 m	10
32 mm	2.4 m	10
40 mm	2.7 m	10
50 mm	2.7 mm	10
65-80 mm	3.0 m	12
100 mm	3.0 m	16
150-200 mm	3.6 m	18

The end of the steel rods shall be threaded and not welded to threaded bolt.

Hangers shall be supported by means of approved fasteners. Wood plugs shall not be used. Unless allowed by the structural engineer, power fixings may be used for pipe work of diameter less than 50 mm. Expansion fasteners may be used for vertical pipe work under 100 mm diameter.

All pipe work shall be carried out in a proper workman like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized in consultation with other agencies work, so that area can be carried out in one stretch.

Requirement of Cut-outs in the structural slab or wall for installing the various pipes shall be clearly identified in the detailed shop drawing to be prepared by the STP contractor.

Pipe sleeves, larger diameter than pipes, shall be provided wherever pipes pass through walls and slab and annular space filled with fibreglass and finished with retainer rings.

The contractor shall make sure that the clamps, brackets, saddles and hangers provided for pipe supports are adequate or as specified / approved by Consultants. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints where required.

All pipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burrs removed before laying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matter. Where reducers are to be made in horizontal runs, eccentric reduces shall be used for the piping to drain freely. In other locations, concentric reduces may be used.

Automatic air valves shall be provided at all high points in the piping system for venting. All valves shall be of 15mm pipe size and shall be associated with an equal size gate valves.

Discharge from the air valves shall be piped through a pipe to the nearest drain or sump. All pipes shall be pitched towards drain points.

Pressure gauges shall be provided as shown on the approved drawings. Care shall be taken to protect pressure gauges during pressure testing.

4. INSTALLATION

The Contractor shall check the associated civil work prior to the installation of any item of machinery and advise the Construction Manager, in writing, of any deviation of such work from the specified details.

The machinery shall be accurately installed to correct dimensions, alignments, levels, etc., all as indicated on the final drawings. The machinery shall be mounted on flat steel packing pieces of thickness suitable to take up variations in level of the concrete foundations. Suitable packing pieces shall be located adjacent to each holding down bolt and shall be properly bedded by grinding the concrete surface to a smooth, level finish. The machinery shall be aligned and leveled and the nuts of the holding down bolts tightened with a spanner of normal length. The base plates shall be packed with grout after the machinery has been run and checked by the Construction Manager for stability and vibration.

Installation shall include the provision and fixing of all necessary holding down bolts, washers, nuts etc. The length of all bolts shall be such that when fitted with a nut and tightened the threaded portion of the bolts shall protrude from the top face of the nut by a distance not exceeding half the bolt diameter.

Exposed bolt heads and nuts shall be hexagonal.

All equipment and materials of the same type shall be products of the same manufacturer. Locally made equipment will not be accepted unless otherwise specified. All similar items of plant and their component part shall be completely interchangeable. Spare parts shall be manufactured from materials similar to the originals and shall fit all similar items of plant.

Where machining may be needed before fitting renewable parts, the machining fits with their tolerance shall be shown on the drawings accompanying the instruction manuals.

All motors and/or revolving parts shall be truly balanced both statically and dynamically so that when running at normal speeds and any load up to the maximum there shall be no significant vibration due to lack of balance. All parts which can be worn or damaged by dust shall be totally enclosed in dust-proof housings.

5. MAINTENANCE FACILITIES

Permanent work platform and catwalk shall be designed by the Contractor and provided by the Contractor for access to elevated equipment. The catwalk and platform for access shall allow a minimum width of 600/750 mm.

Catwalk to maintenance platform shall be provided with railings and guards designed for safe movement of personnel in a restricted space including provision for gaining access and to accommodate maintenance personnel.

Hand railing and guards shall be designed by the Contractor and provided by the Contractor for all concrete tanks to allow safe movement of personnel.

Permanent I-beams, lifting eyes, etc. shall be provided by the Contractor over major equipment which requires lifting for overhaul and maintenance.

Waterproof power sockets required for servicing shall be provided by the Contractor. The number and locations shall be proposed by the Contractor and approved by the Construction Manager / Engineer.

Power supply to these sockets shall be taken from control panel of the sewage treatment system.

The design of all permanent work platforms, hand rails, etc. shall be submitted to the Construction Manager / Client's representative for approval. The loading and fixing method of lifting facilitate shall also be submitted to the Construction Manager / Engineer for approval and checking within 4 weeks on award of Contract or receipt of letter of intent.

6. TESTING

The performance of the system shall be demonstrated by taking hourly samples of the raw sewage and final sewage over a twelve hour period. The sample shall be taken at periods approximately the flow rates specified by the plant. The sample shall be combined and a 5-day BOD shall be run, the results of which must verify the capacity of the treatment plant prior to acceptance.

7. TRAINING

Provided training facilities courses to ensure that the employer's staff associated with the project may acquire full knowledge and appreciation of all aspects of the design, day-to-day operation, breakdown and routine maintenance, and fault diagnosis of all plant, equipment and systems.

Training to the employer's staff shall be held as appropriate at the Contractor's or manufacturer's premises and on site. A detailed syllabus for each of the training courses specified or proposed and the timing of the courses shall be submitted for approval. The Contractor shall recommend the desirable qualifications and experience of the trainees to optimally benefit from the courses.

The Contractor shall be deemed to have include in his tender price the cost of providing training facilities as specified.

In addition to the above, the Contractor shall submit to the Construction Manager a list describing such other spares and special tools, their number, price and where appropriate the anticipated frequency of replacement as soon as is practicable.

The contractor shall submit the data sheets, layout and adequacy report from reputed engineer college for approval of Engineer-in Charge, before executing the work

TECHNICAL SPECIFICATIONS FOR FIRE FIGHTING WORKS

1.0 GENERAL:

- 1.1 The work shall be carried out in the accordance with the drawings and design as would be issued to the Contractor by the Design Consultant duly signed and stamped by him. The Contractor shall not take cognizance of any drawings, designs, specifications etc. **not** bearing Design Consultant signature and stamp. Similarly the Contractor shall not take cognizance of instructions given by any other Authority except the instructions given by the Project Manager's Representative in writing.
- 1.2 The work shall be executed and measured as per metric dimensions given in the Bill of Quantities, drawings etc.
- 1.3 The Contractor shall acquaint himself fully with the partial provisions for supports that may be available in the structure and utilize them to the extent possible. In any case the Contractor shall provide all the supports regardless of provisions that they have been already made. Nothing extra shall be payable for situations where insert plates (for supports) are not available or are not useful.
- 1.4 Shop coats of paint that may be damaged during shipment or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with paint to match the finish over the adjoining shop painted surface.
- 1.5 The Contractor shall protect / handle the material carefully and if any damage occur while handling by the Contractor then the sole responsibility shall be of the Contractor. Such damages shall be rectified/recovered by the Contractor at no extra cost whatsoever.
- 1.6 The Contractor shall, within twenty one (21) days of receipt of the Notice of Award for the Project, where applicable, complete the submission of shop drawings to the Project Manager's Representative for approval by the Design Consultants in order to conform to the contract schedule.

1.7 Measurements:

All measurements shall be taken in accordance with relevant IS codes, unless otherwise specified.

2.0 APPLICABLE CODES AND STANDARDS:

All equipment, supply, erection, testing and commissioning shall comply with the requirements of Indian Standards and code of practice given below as amended upto the date of submission of Tender. All equipment and material being supplied shall meet the requirements of BIS and other relevant standard and codes.

MS Tube upto 150mm	-	IS:1239
MS Tubes above 150mm	-	IS:3589
Malleable Iron Fittings	-	IS:1239 - 1982 (Part-

I&II)

Cast Iron Sluice Valves	-	IS: 780 - 1984
Check Valves	-	IS:5312 - 1984
Internal/External Fire Hydrant Valve		IS:5290 - 1993
Rubberized Fabric Lined Hose	-	IS: 636 - 1988
Couplings, Branch Pipe, Nozzles	-	IS: 903 - 1993
First Aid Fire Hose (Rubber)	-	IS:5132 - 1969
First Air Hose Reel Drum	-	IS: 884 – 1985

3.0 **BASIC CONCEPT OF DESIGN**

Type of the Building	--	Mixed land use
Categories as per NBC	--	Moderate Hazard
Max. Height of Building	--	Less than 10mtr.

Building is classified as Mixed land use as per NBC with height less than 10mtr. The firefighting arrangement shall be designed as per the requirement of local guidelines, NBC, NFPA, guideline issued by **Local fire Authority** & engineering design standard.

The entire firefighting installation shall be compliant with the most stringent codes / standard for the entire PREMISE to ensure the highest safety standard and uniformity of system. Further, before property is opened to work, the firefighting shall be fully operated and tested under simulated conditions to demonstrate compliance with the most stringent standards, codes and guidelines. Following functional system shall be provided; strictly in compliance with the listed reference standards:

a.	Piping System	:	Piping system confirming to IS: 1239, IS: 3589 (for pipe size > 150NB) & IS 10221 M.S /GI. Heavy Class for Hydrant and sprinkler system (Pipe material to be verify with Fire NOC)
b.	Fire water static Storage	:	Fire water static storage has been provided in accordance to NBC requirement.
c.	Fire Pumping system	:	Pumping system comprising of independent pumps for hydrant, sprinkler & jockey application has been provided.
d.	Hydrant system	:	External & internal hydrant complete with hose reel.
e.	Sprinkler system	:	Sprinkler rating and type shall be selected for respective areas as per NBC & guidelines issued by local fire authority
f.	Hand held fire Extinguishers	:	Strategically placed at designated areas.

3.1 System Description

The firefighting system shall be provided as per National Building Code of India 2005 (Part IV), as per local Chief Fire Officer guidelines/approval, guidelines of other relevant I.S codes and it shall be consisting of as follows: :-

- (a) Fire main of 150 mm dia. Connected to internal & external hydrants.
- (b) Wet - riser system with landing hydrant valves and fire hose cabinet.
- (c) Sprinkler system as per NBC

3.1.1 Fire water storage

Fire water storage tank for Fire Protection System has been provided at under-ground level of 150 KL capacity.

In addition to this, as a mandatory application as mentioned in NBC-2005 guidelines, an additional static fire water tank of 20 capacity shall be provided. Part of centralized OH tank.

Fire department connection shall also be provided on the external wall of the property near the main entrance. These shall comprise of 4 Nos. 63 mm dia male outlets with double landing valves capable of directly feeding the ring mains through non return valves or directly filling the static fire storage tanks. These shall be mounted in specially identified boxes.

3.1.2 Fire pumping system

The fire pumping system shall comprise of electrical pump for hydrant / sprinkler system, diesel engine driven pump & jockey pump for hydrant & sprinkler system in pump room at site located as shown in site plan and another electric pump for hydrant / sprinkler system near OH tank.

- (a) Electric Pump Capacity 2280 LPM, 70 Mt head.
- (b) Diesel Engine Driven Pump Capacity 2280 LPM 70 Mt head.
- (c) Jockey Pump Capacity 180-LPM 70 Mt head.
- (d) Electric Pump Capacity 900-LPM 20 Mt head.

Electrical pump shall provide adequate flow for catering requirement of hydrant / sprinkler system. Diesel engine driven fire pumps shall be provided for ensuring operation & performance of the system in case of total electrical power failure. Jockey pumps shall compensate for pressure drop and line leakage in the hydrant and sprinkler installation.

Individual suction lines shall be drawn from the fire suction header and connected to independent fire suction of pumps. The electric fire pumps, diesel engine driven fire pumps and the jockey pumps shall all draw from this single common suction header.

Delivery lines from various pumps shall also be connected to a common header in order to ensure that maximum standby capacity is available. The ring main shall remain pressurized at all times and Jockey pumps shall make up minor line losses. Automation required to make the system fully functional shall be provided.

4.0 QUALITY ASSURANCE AND QUALITY CONTROL:

- 4.1 The work shall conform to high standard of design and workmanship, shall be structurally sound and aesthetically pleasing. Quality standards prescribed shall form the backbone for the quality assurance and quality control system.
- 4.2 At the site, the Contractor shall arrange the materials and their stacking/ storage in appropriate manner to ensure the quality. Contractor shall provide equipment and manpower to test continuously the quality of material, assemblies etc. as directed by the Project Manager's Representative. The test shall be conducted continuously and the result of tests maintained. In addition the Contractor shall keep appropriate tools and equipment for checking alignments, levels, slopes and evenness of surface.
- 4.3 The Project Manager's Representative shall be free to carry out such tests as may be decided by him at this sole direction, from time to time, in addition to those specified in this Document. The Contractor shall provide the samples and labour for collecting the samples. Nothing extra shall be payable to the Contractor for samples or for the collection of the samples.
- 4.4 The test shall be conducted at the site laboratory that may be established by Project Manager's Representative or at any other Standard Laboratory selected by Project Manager's Representative. Contractor shall keep the necessary testing equipment such as hydraulic testing machine, smoke testing machine, gauges and other necessary equipment required.
- 4.5 The Project Manager's Representative shall transport the samples to the laboratory.
- 4.6 Testing charges shall be borne by the Project Manager's Representative.
- 4.7 Testing may be witnessed by the Contractor or his Authorised Representative. Whether witnessed by the Contractor or not, the test results shall be binding on the Contractor.
- 4.8 Prior to shipment, complete unit shall be tested under actual load conditions for performance and proper functioning of component parts.

5.0 EXCLUSIONS:

Civil Works for Water Tank.
Pumps to be installed at below ground levels

6.0 SCOPE

The scope of this section consists of but is not necessarily limited to supply, installation, testing and commissioning of the fire protection system. The philosophy of the system is as follows :

- a. The Fire Suppression System shall comprise the Fire Hydrants System, the Sprinkler System(Wet type), Hand Appliances.
- b. Water from the RCC Fire Water Storage tanks, shall be supplied for the uses listed below.
 - i. Fire Hydrant System (Pressurised) both for the internal landing valves and the hose reels at landings.

- ii. Sprinkler System (Wet Type).
- c. The Hydrant System and the Sprinkler System, under normal conditions, shall be lowest pressurized by means of the electric motor driven Jockey Pump.
- d. The Hydrant & sprinkler System shall be provided with two pump sets, one of which will be diesel engine driven and the other electric motor driven.
- e. The starting and stopping of the Jockey pump shall be automatic based on the pressure switches at preset low and high pressure.
- f. The electric motor driven Pump starts automatically at a preset pressure by means of a pressure switch. As soon as the main electric Pump starts, the Jockey Pump Stops. If for any reason the electric motor driven main Pump does not start at the preset pressure or is unable to maintain the pressure, the diesel engine driven Pump starts at the preset pressure.
- g. The main Pump, whether electric motor driven or the diesel engine driven shall be stopped only manually.
- h. Contractor shall ensure that all false ceiling voids greater than 800 mm are provided with sprinklers.
- i. Contractor shall ensure Hydro Testing for the complete system.
- j. The Contractor shall obtain the necessary approval of the drawings and the schemes from the local authority as called for.
- k. The contractor shall design and after approval of Project Manager display near each staircase landing at floor levels, a glass covered framed floor plan clearly showing the locations of all landing valves, hose reels, hand appliances, as well as the DO's and DON'T's for the personnel and the exit direction in case of an emergency. The dimensions of the floor plan, its scale, lettering size, colour scheme etc shall be as directed by the Project Manager.

7.0 PIPE WORK

7.1 General Requirements

All materials shall be of the best quality conforming to the specifications and subject to the approval of the Consultants.

Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

Pipes shall be securely fixed to walls and ceilings by suitable clamps and supports (galvanised after fabrication) at intervals specified. Only approved type of anchor fasteners shall be used for RCC slabs and walls / floors etc.

Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a

neat workman like manner.

Pipe accessories such as gauges, meters, control devices, etc. shall have the same working pressure rating as the associated pipe work. All pipe work shall be free from burrs, rust and scale and shall be cleaned before installation. All personnel engaged on welding operations must possess a certificate of competence issued by an acceptable / recognized authority.

7.2 Piping

Pipes of following types are to be used:

Mild steel black pipes as per IS:1239 heavy grade(for pipes of sizes 150 mm N.B. and below) suitably lagged on the outside to prevent soil corrosion. M.S. pipes buried below ground shall also be suitably be lagged with 2 layers of PYPKOTE/COTAK polythene sheet over 2 coats of bitumen.

Steel pipelines upto 150 mm dia shall be as per IS: 1239, Part-II (heavy grade) while pipelines above 150 mm dia shall be as per I.S.:3589.

All pipe clamps and supports shall be fabricated from MS steel sections and shall be factory galvanized before use at site. Welding of galvanised clamps and supports shall not be permitted.

Pipes shall be hung by means of expandable anchor fastener of approved make and design. The hangers and clamps shall be fastened by means of galvanised nuts and bolts. The size/diameter of the anchor fastener and the clamps shall be suitable to carry the weight of water filled pipe and dead load normally encountered.

Hangers and supports shall be thoroughly galvanised after fabrication. The selection and design of the hanger & support shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipeline movements as necessary. All guides, anchor braces, dampener, expansion joint and structural steel to be attached to the building/structure trenches etc. shall be provided. Hangers and components for all piping shall be approved by the Consultants.

The piping system shall be tested for leakages at 2 times the operating pressure or 1.5 time shut-off pressure, which ever is highest including testing for water hammer effects.

Flanged joints shall be used for connections for vessels, equipment, flanged valves and also on two straight lengths of pipelines of strategic points to facilitate erection and subsequent maintenance work.

For pipes underground installation the pipes shall be buried at least one meter below ground level and shall have 230 mm x 230 mm masonry or concrete supports at least 300 mm high at 3m intervals. Masonry work to have plain cement concrete foundation (1 cement: 4 coarse sand : 8 stone aggregate) of size 380x380x75 thick resting on firm soil.

Mains below ground level shall be supported at regular intervals not exceeding 3.0

metres and shall be laid at least 2.0 metre away from the building.

7.3 Piping Installation & Support

Tender drawings indicate schematically the size and location of pipes. The Contractor, on the award of the work, shall prepare detailed working drawings, showing the cross-sections, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air valves, and all pipe supports.

He must keep in view the specific openings in buildings and other structure through which pipes are designed to pass.

Piping shall be properly supported on , or suspended from , on stands, clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchor, clamps and hangers, and be responsible for their structural stability.

Pipe work and fittings shall be supported by hangers or brackets so as to permit free expansion and contraction. Risers shall be supported at each floor with Galvanised steel clamps. To permit free movement of common piping support shall be from a common hanger bar fabricated from Galvanised steel sections.

Pipe hangers shall be provided at the following maximum spacing:

Pipe Dia (mm)	Hanger Rod Dia (mm)	Spacing between Supports (m)
Up to 25	6	2
32 to 50	8	2.5
65 to 80	8	2.5
80 to 100	10	2.5
125 to 150	10	3.0
200 to 300	12	3.5

The end of the steel rods shall be threaded and not welded to the threaded bolt.

All pipe work shall be carried out in a proper workman like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized in consultation with other agencies work, so that area can be carried out in one stretch.

Cut-outs in the floor slab for installing the various pipes area are indicated in the drawings. Contractor shall carefully examine the cut-outs provided and clearly point out wherever the cut-outs shown in the drawings, do not meet with the requirements.

Pipe sleeves, larger diameter than pipes, shall be provided wherever pipes pass through walls and slab and annular space filled with fibreglass and finished with retainer rings.

The contractor shall make sure that the clamps, brackets, saddles and hangers provided for pipe supports are adequate or as specified / approved by Consultants. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints where required.

All pipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burrs removed before laying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matter. Where reducers are to be made in horizontal runs, eccentric reduces shall be used for the piping to drain freely. In other locations, concentric reduces may be used.

Automatic air valves shall be provided at all high points in the piping system for venting. All valves shall be of 15mm pipe size and shall be associated with an equal size gate valves.

All pipes shall be pitched towards drain points.

Pressure gauges shall be provided as shown on the approved drawings. Care shall be taken to protect pressure gauges during pressure testing.

7.4 Pipe Fittings

Pipe fittings mean tees, elbows, couplings, unions, flanges, reducers etc and all such connecting devices that are needed to complete the piping work in its totality.

Forged steel screwed type fitting shall be used for pipes of 50 mm dia & below. Fabricated fittings shall not be permitted for pipes diameters 50mm and below.

Fabricated fittings used on pipe size 65 mm & above shall be fabricated, welded in workshops. They shall be inspected by Project Manager before dispatch from the workshop. The welding procedures of the workshop should have been approved by the rules for sprinkler system and applicable to hydrant and sprinkler system. For "T" connection, pipes shall be drilled and reamed. Cutting by gas or electrical welding shall not be permitted.

7.5 Procedure For Pypkote / Cotak Application

- a. Surface Preparation - The pipe surface shall be cleaned by a wire brush.
- b. Application of Primer - Pypkote / Coatek primer is to be applied on pipes immediately after cleaning. This is to prevent any further accumulation of rust on the pipe. This is a cold applied primer and is applied by brush.
- c. Application of Pypkote / Coatek 4 mm Tape - After the primer is applied on the pipe, it is allowed to dry for about 30 min. till it becomes touch dry. Before adhering the tape to the pipe, it is advisable to gently heat the primer coated pipe by a run of LPG torch. Remove the bottom polyethylene from the tape & then heat bottom surface of the tape by LPG torch or any heat source & start wrapping the tape to the pipe by heating the primer coated pipe & by removing the bottom polyethylene from the tape before wrapping better adhesion between the tape & pipe is obtained. Overlaps are maintained with a minimum of 12.5 mm.
- d. Tape coating of weld joints - The tape is applied over the weld joints after the necessary welding & testing methods of the joints is completed. The procedure for application of tape shall be the same as bare pipe procedure. Overlaps on each side of the weld joints shall be 50 mm. A final coat of White wash with water based cement paint is done immediately over the entire coated pipe.

7.6 Jointing

Welded Joints

All pipes above 65mm dia and above shall be jointed with welded joints. Joints between MS pipes and fittings shall be made with the pipes and fittings having "V" groove and welded with electrical resistance welding in an approved manner. But welding without "V" groove shall not be permitted.

Screwed Joints

All joints in the pipe line with screwed fittings shall be seal welded after testing and the weld plus the adjoining portion shall be given two coats of zinc rich primer.

Flanged joints (65 mm dia and above)

Flanged joints with flanges conforming to IS: 6392 shall be provided on

- a. Straight runs at intervals not exceeding 25-30m on pipe lines of 50 mm dia and above and as directed by the Project Manager.
- b. For jointing all types of valves, appurtenances, pumps, connections with other type of pipes, to water tanks and other places necessary and as required for good engineering practice and as shown/noted on the drawings.
- c. Flanges shall be with GI bolts and nuts and 3mm insertion gasket of natural rubber conforming to IS: 11149.

Unions (upto 50 mm dia)

Approved type of dismountable unions shall be provided on pipe lines of 50 mm dia and smaller dia, in locations similar to those specified for flanges.

8. AIR VESSEL

The air vessel shall be provided to compensate for slight loss of pressure in the system and to provide an air cushion for counter-acting pressure, surges, whenever the pumping sets come into operation. Air vessel shall conform to IS:3844. It shall be normally half full of water, when the system is in normal operation. Air vessel shall be fabricated with 8 mm thick M.S. plate with dished ends and suitable supporting legs. It shall be provided with one 100 mm dia flanged connection from pump, one 25 mm drain with valve, one water level gauge and 25 mm sockets for pressure switches. The air vessel shall be tested to pressure for 12 hours at 2 times the operating pressure or 1.5 times the shut-off.

9. FIRE BRIGADE CONNECTION

The storage tank shall be provided with a 150 mm fire brigade pumping connection to discharge at least 2275 litres / minute into it. This connection shall not be taken directly into the side of the storage tank, but arranged to discharge not less than 150 mm above the top edge of the tank such that the water flow can be seen. The connection shall be fitted with stop valve in a position approved by the Project

Manager. An overflow connection discharging to a drain point shall be provided from the storage tank.

The fire brigade connection shall be fitted with four numbers of 63mm instantaneous inlets in a glass fronted wall box at a suitable position at street level, so located as to make the inlets accessible from the outside of the building. The size of the wall box shall be adequate to allow hose to be connected to the inlets, even if the door cannot be opened and the glass has to be broken. Each box shall have fall of 25mm towards the front at its base and shall be glassed with wired glass with "FIRE BRIGADE INLET" painted on the inner face of the glass in 50 mm size block letter. Each such box shall be provided with a steel hammer with chain for breaking the glass. In addition to the emergency fire brigade connection to the storage tank, a 150mm common connection shall be taken from the four 63mm instantaneous inlets direct to hydrant main so that the fire brigade may pump to the hydrants in the even of the hydrant pumps being out of commission. The connection shall be fitted with a sluice valve and reflux valve. Location of these valve shall be as per the approval of the Project Manager.

10. SYSTEM DRAINAGE

The system shall be provided with suitable drainage arrangement with drain valves complete with all accessories.

11. VALVES

11.1 Butterfly Valve

The butterfly valve shall be suitable for waterworks and rated for PN 1.6. The body shall be of cast iron in circular shape and of high strength to take the water pressure. The disc shall be heavy duty cast iron with anti corrosive epoxy or nickel coating. The valve seat shall be of high grade elastomer or nitrile rubber. The valve in closed position shall have complete contact between the seat and the disc throughout the perimeter. The elastomer rubber shall have a long life and shall not give away on continuous applied water pressure . The shaft shall be EN 8 grade carbon steel. The valve shall be fitted between two flanges on either side of pipe flanges. The valve edge rubber shall be projected outside such that they are wedged within the pipe flanges to prevent leakages. Valve above 150mm dia shall be provided with Gear assembly as specified in BOQ. Codes for different material used in valves shall be as under:

- a. General Design and Manufacture: EN593/API609
- b. Valve face to face ISO 5752
- c. Top flange drilling: ISO 5211
- d. Valve Inspection & testing: API 598
- e. Flange Standard Conformity -ANSI 150/ANSI125/BS 10TAB D&E IS6392 NP 06/1.0/1.6

11.2 Ball Valve

The ball valve shall be made forged brass and suitable for test pressure of pipe line. The valve shall be internally threaded to receive pipe connections. The ball shall be made from brass and machined to perfect round shape and subsequently chrome plated. The seat of the valve body-bonnet gasket and gland packing shall be of Teflon. The handle shall be provided with PVC jacket. The handle shall also indicate

the direction of 'open' and 'closed' situations. The gap between the ball and the teflon packing shall be sealed to prevent water seeping. The handle shall also be provided with a lug to keep the movement of the ball valve within 90°. The lever shall be operated smoothly and without application of any unnecessary force.

11.3 Non-Return Valve

All Non-Return valves used in pump's delivery shall be suitable for water works cast iron double flanged with cast iron body and gunmetal internal parts conforming to IS:5312.

MATERIAL OF CONSTRUCTION

Body Disc Cover : Cast Iron
Hinge Pin : SS AISI 316
Disc Face : SS AISI 316
End connection:BS 10 Table D, E & F

11.4 Wafer Type Check Valve

All check valve used before flow switches shall be spring loaded dual plate check valves with following specifications:

Body:CI, Plate:SS304, Stop pin:SS316, Hinge Pin:SS316, Spring:SS316, Seat:EPDM,

11.5 Suction Strainers

Flanged 'Y' strainers are suitable for water. The design is compact and full flow, with large filtration area for low pressure drop and more debris collection. It is provided with drain Ball valve for frequent blow off. Element is strengthened for rigidity and long life and fitted in machined seats. Flanges provided are as per ANSI B16.5 150#, DIN10 suitable for working pressure or upto 250 PSI (16 KG/cm²), Hydraulically tested to 30Kg/cm².

11.6 Foot Valve

Used in suction side of pump to avoid flow reversal from pump to UG tank in case on negative suction. Manufacturing Standard : IS 4038. Pressure Rating : PN 2

MATERIAL OF CONSTRUCTION

Housing, Seat, Strainer, Door, Strainer : Cast Iron IS:210, Gr. FG 200
Door Plate : Cast Iron IS:210, Gr. FG 200 / MS IS:2062, Gr.Fe 410 WA
Hinge Pin : SS ASTM A 276, Type 410
Door Face : Natural Rubber with reinforcement of cotton canvas
End Flange:IS:1538, Table 4 & 6

12. PRESSURE SWITCH

The pressure switches shall be employed for starting and shutting down operation of pumps automatically, dictated by line pressure. The Pressure Switch shall be diaphragm type. The housing shall be die cast aluminium, with SS 304 movement, pressure element and socket. The set pressure shall be adjustable. The Switch

shall be suitable for consistent and repeated operations without change in values.

It shall be provided with IP:55 water and environment protection.

13. PRESSURE GAUGE

Pressure gauge shall be provided near all individual connections of the hydrant system with isolation valves and near each flow switch assembly of the sprinkler system. Pressure gauge shall be 100 mm dia gunmetal bourdon type with gunmetal isolation ball valve, tapping and connecting pipe and nipple. The gauge shall be installed at appropriate height for easy readability.

14. PAINTING

All Hydrant and Sprinkler pipes shall be painted with post office red colour paint. All M S pipes shall first be cleaned thoroughly before application of primer coat. After application of primer coat two coats of enamel paint shall be applied. Each coat shall be given minimum 24 hours drying time. No thinners shall be used. Wherever required all pipe headers shall be worded indicating the direction of the pipe and its purpose such as "TO RISER NO.1" etc. Painting shall be expertly applied, the paint shall not over run on surfaces not requiring painting such as walls, surfaces etc. Nuts and bolts shall be painted black, while valves shall be painted blue.

15. EXCAVATION

Excavation for pipe lines shall be in open trenches to levels and grades shown on the drawings or as required at site. Pipe lines shall be burried with a minimum cover of 1 meter or as shown on drawings. Wherever required Contractor shall support all trenches or adjoining structures with adequate timber supports, shoring and strutting.

On completion of testing in the presence of the Project Manager and pipe protection, trenches shall be backfilled in 150 mm layers and consolidated.

Contractor shall dispose off all surplus earth as directed by the Project Manager.

16. ANCHOR / THRUST BLOCK

Contractor shall provide suitably designed anchor blocks in cement concrete/steel support to cater to the excess thrust due to work hammer and high pressure Thrust blocks shall be provided at all bends, tees and such other location as determined by the Project Manager.

Exact location, design, size and mix of the concrete blocks/steel support shall be as shown on the drawings or as directed by the Project Manager prior to execution of work.

17. FIRE HYDRANTS

17.1 External Hydrants

Contractor shall provide external hydrants. The hydrants shall be controlled by a cast iron wheel. Hydrants shall have instantaneous type 63mm dia outlets. The hydrants shall be single outlet conforming to IS:5290 with bend and riser or required

height to bring the hydrant to correct level above ground.

Contractor shall provide for each external fire hydrant two numbers of 63mm dia. 15 m long controlled percolation hose pipe with SS male and female instantaneous type couplings machine wound with copper wire (hose to IS:636 type certification) , SS branch pipe with nozzle to IS:903. This shall be measured and paid for separately.

Each hose cabinet shall be conspicuously painted with the letters "FIRE HOSE".

17.2 Internal Hydrants

Contractor shall provide on each landing and other locations as shown on the drawings double headed SS landing valve with 100 mm dia inlet as per IS:5290, with shut off valves having cast iron wheels as shown on the drawings. Landing valve shall have flanged inlet and instantaneous type outlets as shown on the drawings.

Instantaneous outlets for fire hydrants shall be standard pattern and suitable for fire hoses.

Contractor shall provide for each internal fire hydrant station two numbers of 63 mm dia. 15 m long rubberized fabric lined hose pipes with SS male and female instantaneous type coupling machine would with copper wire (hose to IS:636 type A and couplings to IS:903 with IS certification), fire hose reel, SS branch pipe with nozzle to IS:903. This shall be measured and paid for separately.

Contractor shall provide standard fire hose reels of 20mm dia high pressure rubber hose 30 m long with gunmetal nozzle, all mounted on a circular hose reel of heavy duty mild steel construction having cast iron brackets. Hose reel shall be connected directly to the wet riser with an isolating valve. Hose reel shall conform to IS:884 and shall be mounted vertically.

Each internal hydrant hose cabinet shall be provided with a drain in the bottom plate. The drain point shall be lead away to the nearest general drain.

Each internal hydrant hose cabinet containing items as above shall also be provided with a nozzle spanner and a Fireman's Axe. The cabinet shall be recessed in the wall as directed. This shall be measured and paid for separately.

Each hose cabinet shall be conspicuously painted with the letters "FIRE HOSE".

18. Hose Reel

Hose reel shall conform to IS : 884, heavy duty, 20 mm dia length shall be 30 metre long fitted with SS chromium plated nozzle, mild steel pressed reel drum which can swing upto 170 degree with wall brackets of cast iron finished with red and black enamel complete.

19. Fire Hose

All hose pipes shall be of 63 mm diameter RRL as required, conforming to IS : 636.

The hose shall be provided with SS delivery coupling. The hose shall be capable of withstanding a bursting pressure of 35.7 Kg/Sq.cm without undue leakage or sweating. Hose shall be provided with instantaneous spring-lock, type couplings.

20. Branch Pipe, Nozzle

Branch pipes shall be of SS with loaded tin bronze ring at the discharge and to receive the nozzle and provided at the other with a loaded tin bronze ring to fit into the instantaneous coupling. Nozzle shall be of spray type of diameter of not less than 16 mm and not more than 25 mm. Nozzle shall be of loaded tin bronze branch pipe and nozzle shall be of instantaneous pattern conforming to Indian Standard -

21. Hose Cabinet

Hose cabinet shall be provided for all internal and external fire hydrants. External Hose cabinets shall be fabricated from 14 gauge MS powder coated sheet of fully welded construction with hinged double front door partially glazed (3 mm glass panel) with locking arrangement, stove enamelled fire red paint (shade No. 536 of IS:5) with "FIRE HOSE" written on it prominently (The word 'FIRE HOSE' shall be in letters of at least 35mm in height. The words shall be painted white on red back ground). Cabinet surfaces in contact with the walls shall not be powder coated but instead given two coats of anti-corrosive bitumastic paint.

21.1 Internal Hose Cabinet

Hose cabinet shall be of glass fronted with hinged door & lock. The cabinet shall be made of Aluminium hollow box section, powder coated to shade No. 536 of IS:5. The hose cabinet shall be of size to accommodate the following and size is as per BOQ:

- i. Landing Valves (Single headed)
- ii. Hose pipe
- iii. Hose reel (30 mtr.)
- iv. Branch pipes, nozzles (1 sets)
- v. Fire man's axe and hand appliances

21.2 External Hose Cabinet

The hose cabinet shall be of size to accommodate the following:

- i. Single/Double headed yard hydrant valve
- ii. Hose pipe (2 length of 15 m)
- iii. Branch pipes, nozzles (1 sets)
- iv. Fire man's axe

22. SPRINKLER SYSTEM

22.1 General Specification

The scope of work shall include supply, commissioning, testing of the system as a whole. The sprinkler heads are to be fixed into heavy quality black steel pipes, conforming to IS 1239 or any other approved specification. The size of pipe will vary from 20 mm to 150mm to suit the hydraulics of the system.

The System shall conform to CFO Rules for the installation of sprinkler systems in general for 'Ordinary Hazard' category-in respect of design, density and spacing of

sprinkler heads. Reduction in pipe sizes shall not be made by use of bushings.

All piping shall be done by means of welding, screwed & flanged jointing as per codes. Due care shall be taken that sprinklers are not applied with paint at the time of applying paint to piping and fittings.

All control, drain, test and alarm valves shall be provided with signs to identify their purposes, functions, direction of flow the satisfaction of the Consultants.

22.2 **Automatic Sprinkler**

Sprinkler heads shall be made of brass sufficiently strong, in compression to withstand any pressure, surge or hammer likely to occur in the system. The yoke & body shall be made of high quality gun metal brass with arms streamlined to ensure minimum interference with the spread of water. The deflector of suitable design shall be fitted to give even distribution of water over the area commanded by the sprinkler. The bulb shall contain a liquid having a freezing point below any natural climatic figure and a high coefficient of expansion. The temperature rating of the sprinkler shall be stamped on the deflector & the colour of the liquid filled in the bulb shall be according to the temperature rating as per NFPA standard.

The sprinkler heads shall be of type & quality approved by the local fire brigade authority. The inlet shall be screwed.

The sprinklers shall have 15mm nominal size of the orifice for ordinary hazard. The orifice size shall be marked on the body or the deflector of the sprinkler.

Metal guards for protection of sprinkler against accidental or mechanical damage shall be provided as desired by the Project Manager.

Contractor shall submit detailed submittal and discharge spray pattern for the Sprinkler for the approval of consultant.

Operating Temperature

The Operating temperature at which the quartzoid bulb of the sprinkler head shall actuate, shall be 68 degree C or as specifically mentioned.

Sprinkler Installation

Sprinkler heads shall be located in positions shown on the drawings. While slight relocation may result from building construction features or interference from other services, the maximum spacing between sprinkler heads and coverage area shall not exceed those stipulated in the IS:15105 regulations and the NFPA 13-1994 Rules.

Allowance shall be made for such relocations within a radius of 1500 mm of the indicated positions without additional cost. The Fire Protection Services Trade shall co-ordinate with the ceiling Trade to set out the sprinkler locations to suit the site location of the unit grid. In general, all sprinklers shall be located at the centre of the ceiling unit and a provision of about 10% more sprinklers and pipe work than required in IS and NFPA Rules shall be included in this sub-contract. Chrome plated wire mesh guards shall be used to protect the sprinkler heads which are liable to accidental or mechanical **(at no extra cost)** damage.

Flow Requirements

The flow requirement for sprinkler heads shall be specifically approved for the designated area of installation.

22.3 Orifice Plates

For restricting pressure at lower levels in the sprinkler system, orifice plates of appropriate sizes shall be fitted at different floor levels, at the branching points from Riser Main.

The Diameter of such orifice shall not be less than 50% of the dia of pipe into which it is to be fitted, which shall not be less than 50mm dia. These orifice plates must be of stainless steel with plain central hole without burrs, and the thickness shall be 3mm for pipe size upto 80 mm, 6 mm for pipes from 80 to 150 mm dia and 9 mm for pipes greater than 150 mm dia. Such orifice plate must have a projecting identification tag.

The orifice plate shall fitted not less than two pipe internal diameters down stream of the outlet from any elbow or brand.

Contractor shall submit the design and identify location on drawing before installation.

22.4 Installation Control Valves

Each installation shall be provided with a set of installation control valves comprising:-

- a. An Alarm Valve.
- b. A Water Motor Alarm & Gong.
- c. Installation valves shall be installed on the sprinkler circuits as shown on the drawings.
- d. Contractor shall submit detailed shop drawings showing the exact location, details of installation of the valves/alarm in all respects.
- e. Installation valve shall comprise of a cast iron body with gunmetal trim, and double seated clapper check valves, pressure gauges, test valve and orifice assembly and drain valve with pressure gauges, turbine water gong including all accessories necessary and required and as supplied by original equipment manufacturer and required for full and satisfactory performance of the system. A cast iron isolation valve with lock and chain at the inlet of the installation valve shall be provided.

22.5 Inspection And Test Valve Assembly

Inspection and testing of the automatic starting of the sprinkler system shall be done by providing an assembly consisting of Inspector's drain valve with in-built gunmetal sight glass, bye-pass valve and orifice assembly as per approved drawing.

22.6 Flow Switch

Flow switch shall have a paddle made of flexible and sturdy material of the width to fit within the pipe bore. The terminal box shall be mounted over the paddle/ pipe

through a connecting socket. The Switch shall be potential free in either N O or N C position as required. The switch shall be able to trip and make / break contact on the operation of a single sprinkler head. The terminal box shall have connections for wiring to the Annunciation Panel. The flow switch shall have connections for wiring the seat shall be of S.S to the Annunciation Panel. The flow switch shall have IP: 55 protection. The flow switch work at a triggering threshold bandwidth (flow rate) of 4 to 10 GPM. Further, it shall have a 'Retard' to compensate for line leakage or intermitted flows.

22.7 Flexible Connectors

The flexible hose system is a complete unit in itself which includes a corrugated stainless steel flexible drop with nipple, reducer, square bar and brackets, which are fitted to the ceiling tile support rails to locate and secure the sprinkler in the correct position. Not only does this reduce the installation time but also makes the installation process a 'mess-free' activity by eliminating cutting and threading activities on site

Material of Construction

Nipple	Carbon Steel Zinc Plated
Flexible	AISI 304
Square Bar	Mild Steel Zinc Plated
Bracket	Mild Steel Zinc Plated
Reducer	Carbon Steel Zinc Plated
Max Working Pressure	12 bar
Style	Braided
Approval	UL Listed

22.8 Two Piece Flush Escutcheon.

Sprinkler escutcheons are ornamental plates used with frame-style pendent and sidewall sprinklers. The escutcheons are installed between the sprinklers and the ceiling or wall for a pleasing appearance.

Material: Carbon Steel
Finish: White Powder Coated.
Approval: UL/FM Listed.

22.9 System Design

The entire sprinkler installation shall be designed to make it a hydraulically balanced system. The pressure requirement at typical floors shall be designed between 2.5 bar and 3.5 bar.

23. HAND HELD FIRE EXTINGUISHERS

23.1 Scope

Work under this section shall consist of furnishing all labour, materials, appliances and equipment necessary and required to install fire extinguishing hand appliances as per relevant specification of various authorities.

Without restricting to the generality of the foregoing, the work shall consist of the following:

Installation of fully charged and tested fire extinguishing hand appliances of A B C powder type as required and specified in the drawings and schedule of rates.

23.2 General Requirements

Hand appliances shall be installed in easily accessible locations with the brackets fixed to the wall by suitable anchor fasteners.

Each appliance shall be provided with an inspection card indicating the date of inspection, testing, change of charge and other relevant data.

All appliances shall be fixed in a true workmanlike manner truly vertical and at correct locations.

Distribution / installation of fire extinguisher to be in accordance to IS:2190.

23.3 Measurement

Fire extinguishers shall be counted in numbers and include installation of all necessary items required as given in the specifications.

23.4 ABC Type Dry Powder Extinguisher

The Extinguisher shall be filled with ABC grade 40, Mono Ammonium Phosphate 40% from any approved manufacturer.

The capacity of the extinguisher when filled with Dry Chemical Powder (First filling) as per IS 15683-2006, shall be 5 Kg +/-2% or 10 Kg +/- 3%.

The distribution of fire extinguishers to be as per IS 2190 – 1992.

It shall be operated upright, with a squeeze grip valve to control discharge. The plunger neck shall have a safety clip, fitted with a pin, to prevent accidental discharge. It shall be pressurised with Dry Nitrogen, as expellant. The Nitrogen to be charged at a pressure of 15 Kg/cm² Body shall be of mild steel conforming to relevant IS Standards. The neck ring shall be also mild steel and welded to the body. The discharge valve body, shall be forged brass or leaded bronze, while the spindle, spring and siphon tube shall be of brass. The nozzle shall be of brass, while the hose shall be braided nylon. The body shall be cylindrical in shape, with the dish and dome welded to it. Sufficient space for Nitrogen gas shall be provided inside the body, above the powder filling.

The Neck Ring shall be externally threaded - the threading portion being 1.6 cm. The filler opening in the neck ring shall not less than 50 mm. Discharge nozzle shall be screwed to the hose. The design of the nozzle shall meet the performance requirement, so as to discharge at least 85% of contents upto a throw of 4 mtrs, continuously, at least for 15 seconds. The hose, forming part of discharge nozzle, shall be 500 mm long, with 10 mm dia internally for 5 Kg capacity and 12 mm for 10 Kg capacity. It shall have a pressure gauge fitted to the valve assembly or the cylinder to indicate pressure available inside. The extinguisher shall be treated with anti-corrosive paint, and it shall be labelled with words ABC 2.5 cm long, within a

triangle of 5 cm on each face. The extinguisher body and valve assembly shall withstand internal pressure of 30 Kg/cm² for a minimum period of 2 minutes. The pressure gauge shall be imported and suited for the purpose.

23.5 Water Type Extinguisher (Gas Pressure Type)

The Extinguishing medium shall be primarily water stored under normal pressure, the discharge being affected by release of Carbon Dioxide Gas from a 120 gms cylinder. The capacity of Extinguisher, when filled upto the indicated level, shall be 9 ltr +/- 5%. The skin thickness of the Cylinder shall be minimum 4.0 mm, fabricated from Mild Steel sheet, welded as required, with dish and dome, being of same thickness, and of size not exceeding the diameter of body. The diameter of body to be not less than 150 mm and not exceeding 200 mm. The neck shall be externally threaded upto a minimum depth of 16 mm, and leaded tin bronze. The cap shall be of leaded tin bronze, and screwed on the body upto a minimum of 1.6 cm depth, with parallel screw thread to match the neck ring. The siphon tube to be of brass or G.I. and the strainer of Brass. The cartridge holder, knob, discharge fittings and plunger to be of Brass/Leaded tin bronze, and plunger of stainless steel, spring of stainless steel. The cap to have handle fixed to it. The discharge hose shall be braided nylon, of 10 mm dia and 600 mm long, with a nozzle of brass fitted at end.

The extinguisher shall be treated for anti-corrosion internally and externally, and externally painted with Fire Red paint. The paint shall be stove enamelled/powder coated. The cartridge shall be as per IS, and have 60 gm net carbon dioxide gas for expelling. The extinguisher, body and cap shall be treated to an internal hydraulic pressure of 25 Kg/cm². It shall have external marking with letter A, of 2.5 cm height, in block letters within a triangle of 5 cm each side. The extinguisher shall be upright in operation, with the body placed on ground and discharge tube with nozzle held in one hand to give a throw of not less than 6 mtr, and continue so for atleast 60 secs. The extinguisher body shall be clearly marked with ISI stamp (IS 15683-2006).

23.6 Carbon Dioxide Extinguisher

The Carbon Dioxide Extinguisher shall be as per IS: 15683:2006

The body shall be constructed of seamless tube conforming to IS:7285 and having a convex dome and flat base. Its dia shall be maximum 140 mm, and the overall height shall not exceed 720 mm.

The discharge mechanism shall be through a control valve conforming to IS:3224. The internal siphon tube shall be of copper aluminium conforming to relevant specifications. Hose Pipe shall be high pressure braided Rubber hose with a minimum burst pressure of 140 Kg/cm² and shall be approximately 1.0 meter in length having internal dia of 10 mm. The discharge horn shall be of high quality unbreakable plastic with gradually expanding shape, to convert liquid carbon dioxide into gas form. The hand grip of Discharge horn shall be insulated with Rubber of appropriate thickness. The gas shall be conforming to IS:307 and shall be stored at about 85 Kg/cm². The expansion ratio between stored liquid carbon dioxide to expanded gas shall be 1:9 times and the total discharge time (effective) shall be minimum 10 secs and maximum 25 secs. The extinguisher shall fulfill the following test pressures:

Cylinder: 236 Kg/cm²

Control Valve: 125 Kg/cm²
Burst Pressure of Hose: 140 Kg/cm² minimum

It shall be an Upright type. The cylinder, including the control valve and high pressure Discharge Hose must comply with relevant Statutory Regulations, and be approved by Chief Controller of Explosives, Nagpur and also bear IS marking. The Extinguisher including components shall be IS marked.

23.7 Mechanical Foam Type Extinguisher

The capacity of Extinguisher, when filled upto the indicated level, shall be 9 ltr +/- 5%. The skin thickness of the Cylinder shall be minimum 4.0 mm, fabricated from Mild Steel sheet, welded as required, with dish and dome, being of same thickness, and of size not exceeding the diameter of body. The diameter of body to be not less than 150 mm and not exceeding 200 mm. The neck shall be externally threaded upto a minimum depth of 16 mm, and leaded tin bronze. The cap shall be of leaded tin bronze, and screwed on the body upto a minimum of 1.6 cm depth, with parallel screw thread to match the neck ring. The siphon tube to be of brass or G.I. and the strainer of Brass. The cartridge holder, knob, discharge fittings and plunger to be of Brass/Leaded tin bronze, and plunger of stainless steel, spring of stainless steel. The cap to have handle fixed to it. The discharge hose shall be braided nylon, of 10 mm dia and 600 mm long, with a nozzle of brass fitted at end.

The extinguisher shall be treated for anti-corrosion internally and externally, and externally painted with Fire Red paint. The paint shall be stove enamelled/powder coated. The extinguisher, body and cap shall be treated to an internal hydraulic pressure of 25 Kg/cm². It shall have external marking with letter C, of 2.5 cm height, in block letters within a triangle of 5 cm each side. The extinguisher shall be upright in operation, with the body placed on ground and discharge tube with nozzle held in one hand to give a throw of not less than 6 mtr, and continue so for atleast 60 secs. The extinguisher body shall be clearly marked with ISI stamp (IS 15683-2006).

24. FIRE PUMPS AND ALLIED EQUIPMENTS

24.1 Scope

Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install electrically operated and diesel driven pumps and as required by drawings and specified hereinafter or given in the schedule of rates.

- a. Electrically operated pumps with motors and diesel engine driven pumps with diesel engine, common base plates, coupling, coupling guard and accessories.
- b. Automatic starting system with all accessories, wiring and connections and pressure switches.
- c. Motor control centre.
- d. Annunciation system with all accessories wiring and connections.
- e. Pressure gauges with isolation valves and piping, bleed and block valves.
- f. Suction strainers and accessories.
- g. Vibration eliminator pads and foundation bolts.
- h. Leak-off drain shall be led to the nearest floor drain.

24.2 General Requirements

Pumps shall be installed true to levels on suitable concrete foundations. Base plate shall be firmly fixed by properly grouted foundation bolts.

Pumps and motors shall be truly aligned by suitably instruments. Record of such alignment shall be furnished to the Project Manager.

All pump connections shall be standard flanged type with number of bolts as per relevant standard requirement for the working pressure. Companion flanges shall be provided with the pumps Manufacturers' instructions regarding installation, connections and commissioning shall be strictly followed.

Contractor shall provide necessary test certificates, type test certificates, performance curves and NPSH curves of the pumps from the manufacturer when called for. The contractor shall provide facilities to the Project Manager & Consultant for inspection of equipment during manufacturing and also to witness various tests at the manufacturer's works without any cost to the Project Manager or Consultant.

Seismic isolation and clamping for each pump and flexible connection on the suction as well as the discharge side shall be provided.

The contractor shall submit with this tender a list of recommended spare parts for three years of normal operation and quote the prices for the same as a separate submittal / annexure.

24.3 Electric Fire Pump

The electric fire pump shall be suitable for automatic operation complete with necessary electric motor and automatic starting gear, suitable for operation on 415 volts, 3 phase, 50 Hz. A.C. system. Both the motor and the pump shall be factory assembled on a common base plate, fabricated M.S. channel type or cast iron type.

Drive

The pump shall be direct driven by means of a flexible coupling. Coupling guard shall also be provided.

Fire Pump

The fire pump shall be horizontal split casing single stage centrifugal type. It shall have a capacity to deliver 2280 lpm as specified, and developing adequate head so as to ensure a minimum pressure of 3.5 Kg/Sq.cm at the highest and the farthest outlet.

The pump shall be capable of giving a discharge of not less than 150 per cent of the rated discharge, at a head of not less than 65 per cent of the rated head. The shut off head shall be within 120 per cent of the rated head.

The pump casing shall be of cast iron to grade FG 200 to IS: 210 and parts like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be of stainless steel. Provision of mechanical seal shall also be made. Bearings of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

The pump shall be provided with a plate indicating the suction lift, delivery head, discharge, speed and number of stages. The pump casing shall be designed to withstand 1.5 times the working pressure.

Provision of Jockey Pump shall be made. The pump shall be vertical SS type and of detail as in schedule of quantity. Contractor shall verify that the capacity of the Jockey pump shall not be less than 3% (Minimum 180 LPM) and not more than 10% of the installed pump capacity.

Motor

The motor shall be squirrel cage A.C. induction type suitable for operation on 415 volts 3 phase 50 Hz. system. The motor shall be totally enclosed fan cooled type conforming to protection clause IP 55. The class of insulation shall be F. The synchronous speed shall be 1450 RPM as specified. The motor shall be rated for continuous duty and shall have a horse power rating necessary to drive the pump at 150 per cent of its rated discharge with at least 65 per cent rated head. The motor shall conform to I.S.325-1978.

Motor Starter

The motor starter shall be as per detail in MCC. The unit shall include suitable current transformer and ammeter of suitable range on one line to indicate the current. The starter shall not incorporate under voltage, no voltage trip overload or SPP.

The starter assembly shall be suitably integrated in the power and control panel for the wet riser system & sprinkler system.

24.4 Diesel Fire Pump

General

The diesel pump set shall be suitable for automatic operation complete with necessary automatic starting gear, for starting on wet battery system and shall be complete with all accessories. Both engine and pump shall be assembled on a common base plate.

Drive

The pump shall be only direct driven by means of a flexible coupling. Coupling guard shall also be provided. The speed shall be 1500 RPM as specified.

Fire Pump

The fire pump shall be horizontal split casing centrifugal single stage. It shall have a capacity to deliver as specified, and developing adequate head so as to ensure a minimum pressure of 3.5 Kg/Sq.cm at the highest and the farthest outlet. The pump shall be multi stage as specified. The pump shall be capable of giving a discharge of not less than 150% of the rated discharge at a head of not less than 65% of the rated head. The shut off head shall be within 120% of the rated head. The pump casing shall be of cast iron to grade FG 200 to IS 210 and parts like impeller, shaft sleeves, wearing-ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be stainless steel. Provision of mechanical seal shall also be

made. The pump casing shall be designed to withstand 1.5 times the working pressure. Bearing of pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

Diesel Engine

Engine Rating - The engine shall be cold starting type without the necessity of preliminary heating of the engine cylinders or combustion chamber (for example, by wicks, cartridge, heater, plugs etc.). The engine shall be multi cylinder/vertical 4 stroke cycle, aircooled, diesel engine, developing suitable HP at the operating speed specified to drive the fire pump. Continuous capacity available for the load shall be exclusive of the power requirement of auxiliaries of the diesel engine, and the after correction for altitude, ambient temperature and humidity for the specified environmental conditions. This shall be at least 20% greater than the maximum HP required to drive the pump at its duty point. It shall also be capable of driving the pump at 150% of the rated discharge at 65% of rated head. The engine shall be capable of continuous non-stop operation for 8 hours and major overhaul shall not be required before 3000 hours of operation. The engine shall have 10% overload capacity for one hour in any period of 12 hours continuous run. The engine shall accept full load within 15 seconds from the receipt of signal to start. The diesel engine shall conform to BS 649/IS 1601/IS 10002, all amended up to date.

- a. **Engine Accessories** - The engine shall be complete with the following accessories:-

Fly wheel dynamically balanced.

Direct coupling for pump and coupling guard.

Corrosion Resistor.

Air cleaner.

Fuel service tank support, and fuel oil filter with necessary pipe work.

Elect. starting battery (2X24 v).

Exhaust silencer with necessary pipe work.

Governor.

Instrument panel housing all the gauges, including Tachometer, hour meter and starting switch with key (for manual starting).

Necessary safety controls.

- b. **Fuel System** - The fuel shall be gravity fed from the engine fuel tank to the engine driven fuel pump. The engine fuel tank shall be mounted either over or adjacent to the engine itself or suitably wall mounted on bracket. The fuel filter shall be suitably located to permit easy servicing.

All fuel tubing to the engine shall be with copper, with flexible hose connections where required. Plastic tubing shall not be permitted.

The fuel tank shall be of welded steel construction (3 mm. thick) and of capacity sufficient to allow the engine to run on full load for at least 8 hours. The tank shall be complete with necessary wall mounted supports, level indicator (protected against mechanical injury) inlet, outlet, overflow connections and drain plug and piping to the engine fuel tank. The outlet shall be so located as to avoid entry of any sediments into the fuel line to the engine.

As semi rotary hand pump for filling the daily service tank together with hose pipe 5

- mtr. Long with a foot valve etc. shall also form part of the scope of supply.
- c. **Lubricating Oil System-** Forced feed Lub. Oil system shall be employed for positive lubrication. Necessary Lub. oil filters shall be provided, located suitably for convenient servicing.
 - d. **Starting System-** The starting system shall comprise necessary batteries (2x24v), 24 volts starter motor of adequate capacity and axle type gear to match with the toothed ring on the fly wheel. Bi metallic relay protection to protect starting motor from excessively long cranking runs suitably integrated with engine protection system shall be included within the scope of the work. The capacity of the battery shall be suitable for meeting the needs of the starting system. The battery capacity shall be adequate for 10 consecutive starts without recharging with cold engine under full compression. The scope shall cover all cabling, terminals, initial charging etc.
 - e. **Exhaust System** - The exhaust system shall be complete with silencer suitable for indoor installation and silencer piping including bends and accessories needed for a run of 5 metre from the engine manifold.(Adjustment rates for extra lengths shall also be given). The total back pressure shall not exceed the engine manufacture's recommendation. The exhaust piping shall be suitably supported.
 - f. **Engine shut down mechanism-** This shall be auto/ manually operated and shall return automatically to the starting position after use.
 - g. **Governing System-** The engine shall be provided with an adjustable governor to control the engine speed within 5% of its rated speed under all conditions of load up to full load. The governor shall be set to maintain rated pump speed at maximum pump load.
 - h. **Engine Instrumentation-** Engine instrumentation shall include the following:-
 - i) Lub. oil pressure gauge.
 - ii) Lub. oil temperature gauge.
 - iii) Water pressure gauge.
 - iv) Water temperature gauge.
 - v) Tachometer.
 - vi) Hour meter.
 - vii) The instrumentation panel shall be suitably resident mounted on the engine.
 - viii) Engine Protection Devices- Following engine protection and automatic shut down facilities shall be provided:-
 - a) Low lub.oil pressure.
 - b) High cooling water temp.
 - c) High lub.oil temperature.
 - d) Over speed shut down.
 - i. **Pipe Work** - All pipe lines with fittings and accessories required shall be provided for fuel oil, lub.oil and exhaust systems, copper piping of adequate sizes, shall be used for Lub.oil and fuel oil. M.S. piping will be permitted for exhaust.
 - j. **Anti Vibration Mounting-** Suitable vibration mounting duly approved by Project Manager shall be employed for mounting the unit so as to minimize transmission of

vibration to the structure. The isolation efficiency achievable shall be clearly indicated.

- k. **Battery Charger**-Necessary float and boost charger shall be incorporated in the control section of the power and control panel, to keep the battery in trim condition. Voltmeter to indicate the state of charge of the batteries shall be provided.

24.5 Pump Sets Assembly

On the main fire sprinkler and hydrant headers near pump sets a 150 mm dia bypass valve located in an accessible location shall be provided along with a rate of flow rota meter calibrated in 1 pm and able to read 200% of the rated pump capacity. The delivery shall be connected to the fire tank. Each and every pump set assembly shall be provided with suction valve (only for positive suction head), discharge valve, non-return valve and 150 mm dia Bourdon type pressure gauge with isolation valve.

24.6 Flexible Connectors

On all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors shall be provided. Connectors should be suitable for maximum working pressure of each pipe line on which it is mounted and tested to a test pressure of 1:5 time the operating pressure. Length of the connector shall be as per manufacturers standard.

24.7 Interlocking

The following inter-locking between the two main fire pumps (i.e. wet riser pump & sprinkler pump), the jockey pump and the diesel engine driven pump.

Only one category of pumps will work at a time i.e. either jockey pump or main fire pumps (wet riser and sprinkler, wet riser and sprinkler can come up at a time) or diesel driven pump.

	JOCKEY PUMP	WET RISER PUMP	DIESEL DRIVEN PUMP
i.	ON	OFF	OFF
ii.	OFF	ON	OFF
iii.	OFF	OFF	ON
iv.	OFF	ON	ON
v.	OFF	OFF	ON
vi.	OFF	OFF	OFF
vii.	OFF	ON	OFF

Pressure Switches mounted on the pressure vessel would be set as under (all figures in kg/cm²).

Operating Conditions for the Service Pumps

Fire Service Pump	Nos.	Cut in Pressure	Cut Out Pressure	Remarks
Jockey pump	One	6.5 Kg/cm ²	7.0Kg/cm ²	To auto start and auto stop on pressure switch on air vessel to stop.
Main pump	One	6.0 Kg/cm ²	Push button	To auto start on pressure

			manual	switch on air vessel and manual off.
Diesel Fire Pump	One	5.0 Kg/Cm ²	Push button manual	To auto start on pressure switch on air vessel and manual off.

24.8 Annunciation Panel

One solid state electronic annunciation panel, fully wired with visual display and audible alarm unit shall be provided to indicate :

- a. Flow condition in any flow switch indicating the area of distress and fire alarm.
- b. Starting and stopping of each hydrant / sprinkler pump.
- c. Starting and stopping of each jockey pump.
- d. Failure of Hydrant / Sprinkler pump to start.
- e. High level in fire water storage tank compartment.
- f. Low level in fire water storage tank compartment.
- g. Low level in HSD day tank of the fire pump.

The panel shall be factory fabricated, wired and tested. All details shall be submitted with the tender.

The annunciation panel shall be located in the security office / reception on the ground floor or as instructed by the Project Manager.

24.9 Vibration Isolation

The pump set shall be mounted on rolled steel channels and 150 mm thick inertia block spring and ribbed neoprene vibration isolation mounting shall support the inertia block onto a 100 mm thick concrete plinths. The spring mountings shall have a maximum deflection of 15 mm. Reference shall be made to the section on "Noise and Vibration" for further technical requirements.

COMMISSIONING & GUARANTEE

1. SCOPE OF WORK

Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.

On award of work, Contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment to be supplied and installed under this contract.

All tests shall be made in the presence of the Consultants or his representative or any inspecting authority.

At least five working days notice in writing shall be given to the inspecting parties before performing any test.

Water flow rates of all equipment and in pipe lines through valves shall be adjusted

to design conditions.

Complete results of adjustments shall be recorded and submitted.

Contractor shall ensure proper balancing of the hydraulic system and for the pipes / valves installed in his scope of work by regulating the flow rates in the pipe line by valve operation. The contractor shall also provide permanent Tee connection (with plug) in Fire water lines for ease of installing pressure gauge, temperature gauge & rota meters. Contractor shall also supply all required pressure gauge, temperature gauge & rotameter for system commissioning and balancing. The balancing shall be to the satisfaction of Consultant / Project Manager.

Three copies of all test results shall be submitted to the Engineer in A4 size sheet paper within two weeks after completion of the tests.

2. PRE-COMMISSIONING

On completion of the installation of all pumps, piping, valves, pipe connections, insulation etc. the Contractor shall proceed as follows:

- a. Prior to start-up and hydraulic testing, the Contractor shall clean the entire installation including all fitments and pipe work and the like after installation and keep them in a new condition. All pumping systems shall be flushed and drained at least once through to get rid of contaminating materials. All pipes shall be rodded to ensure clearance of debris, cleaning and flushing shall be carried out in sections as the installation becomes completed.
- b. All strainers shall be inspected and cleaned out or replaced.
- c. When the entire systems are reasonably clean, a pre-treatment chemical shall be introduced and circulated for at least 8 hours. Warning signs shall be provided at all outlets during pretreatment. The pre-treatment chemical shall remove oil, grease and foreign residue from the pipe work and fittings; Pre-condition the metal surfaces to resist reaction with water or air. Establish an initial protective film; After pre-treatment, the system shall be drained and refilled with fresh water and left until the system is put into operation. Details and procedures of the pre-treatment shall be submitted to the Consultant/Client for approval.
- d. Check all clamps, supports and hangers provided for the pipes.
- e. Check all the equipment, piping and valves coming under hot water system and operate each and every valve on the system to see if the valves are functioning properly. Thereafter conduct & hydro test of the system.
- f. Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specification. If any leakage is found, rectify the same and retest the pipes.

Fire Protection System

- a. Check all hydrant valves by opening and closing : any valve found to be open shall be closed.

- b. Check all the piping under hydro test.
- c. Check that all suction and delivery connections are properly made for all pump sets.
- d. Check rotation of each motor after decoupling and correct the same if required.
- e. Test run each pump set.
- f. All pump sets shall be run continuously for 8 hours (if required with temporary piping back to the tank).

Commissioning and Testing

- a. Pressurise the fire hydrant system by running the jockey pump and after it attains the shutoff pressure of the pump , then.
- b. Open bypass valve and allow the pressure to drop in the system. Check that the jockey pump cuts-in and cuts-out at the preset pressure. If necessary adjust the pressure switch for the jockey pump. Close by-pass valve.
- c. Open hydrant valve and allow the water to below into the fire water tank in order to avoid wastage of water. The main fire pump shall cut-in at the preset pressure and shall not cutout automatically on reaching the normal line pressure. The main fire pump shall stop only by manual push button. However the jockey pump shall cut-out as soon as the main pump starts.
- d. Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.
- e. When the fire pumps have been checked for satisfactory working on automatic controls, open fire hydrant valves simultaneously and allow the hose pipes to discharge water into the fire tank to avoid wastage.
- f. Check each landing valve, male and female couplings and branch pipes, for compatibility with each other. Any fitting which is found to be incompatible and do not fit into the other properly shall be replace by the Contractor. Each landing valve shall also be checked by opening and closing under pressure.
- g. Check all annunciations by simulating the alarm conditions at site.

Sprinkler System

- a. Start the sprinkler pump and develop the required pressure in the sprinkler pipes.
- b. Open the test valve to test the automatic starting of the pump. If necessary, make necessary adjustments in the setting of pressure switch. The sprinkler water gong alarm shall also operate when the test valve is open. This operation is to be done for each and every section of the sprinkler system and the alarm for each section (via flow switch) shall be checked for operation.
- c. After satisfactory operation of the pump the Contractor shall set up mock fire and test the system
- d. Check all annunciations by simulating the alarm conditions at site.

3. STATUTORY AUTHORITIES' TESTS AND INSPECTIONS

As and when notified in writing or instructed by the Consultants, the Contractor shall

submit shop drawing and attend all tests and inspections carried out by Local Fire Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the CFO as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect.

The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest architectural plans submitted to and kept by these Authorities.

The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Architect/Consultants for checking before submission.

The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, one to be made within six months after the award of the Contract but not less than six weeks before the inspection. The Consultants may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary.

The Contractor shall notify the Consultants at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Consultants without delay.

4. FINAL ACCEPTANCE TESTS

Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a program to be agreed with the Consultants.

Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Contractor shall adjust, modify and if necessary replace the equipment without further payment in order that the required performance is obtained.

Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

5. REJECTION OF INSTALLATION / PLANT

Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Consultants either in whole or in part as he considers necessary/appropriate.

Adjustment and/or modification work as required by the Consultants so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Consultants.

After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Consultants/Employer.

6. WARRANTY AND HANDOVER

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

7. HANDING OVER OF DOCUMENTS

All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Owner's site representative and all testing and commissioning documents shall be handed over to the Owner's site representative.

The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Owner's site representative.

8. CHECK LIST FOR COMMISSIONING

Fire Protection System

Check all hydrant & other valves by opening and closing. Any valve found to be open shall be closed.

Check all clamps, supports and hangers provided for the pipes.

All the pump sets shall be run continuously for 30 minutes (with temporary piping back to tank from the nearest hydrant, using canvas hose pipes).

Fire Hydrant System - Pressurise the fire hydrant system by running the jockey pump and after it attains the shutoff pressure of the pump, then Open bypass valve and allow the pressure to drop in the system. Check that the jockey pump cuts-in and cuts-out at the preset pressure. If necessary adjust the pressure switch for the jockey pump. Close by-pass valve. Open hydrant valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump shall cut-in at the preset pressure and shall not cutout automatically on reaching the normal line pressure. The main fire pump shall stop only by manual push button. However the jockey pump shall cut-out as soon as the main pump starts. Operate booster pump continuously for 30 minutes with piping back to underground tanks from the hydrant nearest to plant room.

Check each landing valve, male and female couplings and branch pipes, for compatibility with each other. Any fitting which is found to be incompatible and do not fit into the other properly shall be replaced by the Contractor. Each landing valve shall also be checked by opening and closing under pressure.

Check air vessels for proper functioning.

The contractor shall submit the data sheets, layout for approval of Engineer-in

Charge, before executing the work

SPECIAL CONDITIONS & GENERAL TECHNICAL SPECIFICATIONS FOR EXTERNAL AND INTERNAL ELECTRICAL WORKS

1. General:

The following special conditions shall be read in conjunction with general conditions of contract. If there are any provisions in these special conditions, which are at variance with the provisions in the above-mentioned documents, the provisions in these special conditions shall take precedence.

2. Working Agency:

The electrical work shall be done by "A" Class Electrical Contractor approved by Govt. having similar nature and value of work executed.

3. Inspection & approval of the work by local authority:

The contractor has to obtain all clearances & approvals from any statutory authority/local bodies pertaining to electrical installations. The contractor shall obtain all information relating to local regulations, Bye- laws, applicable if any and all laws relate to his work or profession and his having to execute work as required. Contractor shall obtain approval of the installation from the relevant inspection authorities at all stages and on completion of the installation work. Any fee payable to the statutory authority for obtaining approvals is required to be paid by the contractor. However the necessary reimbursement of the fee deposited by the contractor to any statutory authority (as mentioned above) will be made on production/submission of the valid documentary proof/evidence.

4. Training:

The contractor has to provide training to the client staff and also operate the system (if required) for a period of one month from the date of handing over free of cost.

5. Pre-delivery Inspection & approval:

The contractor shall offer the pre-delivery inspection of all the materials at manufacturers work to the Engineer-in-charge. The intimation for such inspections shall be given at least 15 days in advance from the date of proposed inspection. CLIENT/RITES representative may inspect any/all the materials required in this project.

The contractor shall make all facilities and expenditure for two persons of tours & travels by air and local journey by taxi, stay and local journey for inspection of material at manufacturer/site premises as per their entitlement of RITES/Client representative. The contractor shall include all expenditure towards inspection for two persons in their rates. All the testing facilities, Tools and Tackles and all the consumables including the fuel etc. shall be provided by the contractor and nothing extra shall be paid on this account.

6. Tender drawings and Shop Drawings:

The work shall be executed as per latest working drawings to be prepared by the contractor after award of work and submitted to the Engineer-in-charge for approval.

The Drawings & data provided are for guidance to the contractor. The exact dimensions, location, distance & levels etc. shall be governed by the space conditions. The tender drawings are indicative and are for the guidance of the contractor. The drawings appended with the tender documents are intended to show the space allotted for various equipment, bus duct, cable and pipe routes etc. besides general electrical layout. The equipment offered shall be suitable for installation in the spaces shown in these drawings / available at site. The contractor shall prepare and submit for approval detailed shop/working drawings of all works on award of the work. Two set of all such working drawings shall be submitted for approval, including such changes as may have been suggested by the Engineer-in-charge as required at the earliest - within 15 days of awarding of the work.

The contractor shall also take parallel action (after award of work) for submission of applications along with the drawings, documents & details etc. to various Statutory Bodies/Authorities for obtaining their approval/clearances.

The contractor shall re-submit 4 sets of all the drawings within 7 days from date of receiving comments if any from the client after incorporating the comments.

7. Completion Drawings:

After completion of work, the contractor shall have to submit the following set of drawing.

4 set of hard copies + 3 soft copies (in 'Auto CAD' applicable version) in CD of the following layout drawings (Indicating complete Equipment like switch boards, panels, cabinets, Bus-trunking, Ducting, cable laying, piping, other works installed & single line diagrams of electrification of installations etc. for final record & maintenance.

8. Documents to be furnished on completion of installation

- a) Completion Drawings as per contract.
- b) Manufacturer's catalogues of all equipment and accessories, operation and maintenance manuals of all major equipment, detailing all adjustments, operation and maintenance procedure.
- c) Manufacturer's Guarantee /Warrantee certificates of all the equipment's& materials etc.
- d) Clearances/approval of various Statutory Bodies/Authorities for this system.
- e) Any other information the Engineer-in-charge may deem fit.

No completion certificate will be issued until the above drawings and documents are submitted to the Engineer-in-charge.

9. Performance Testing at Site:

After completion of erection at site & a preliminary warm up period, acceptance trial run of a minimum period of 7 days duration shall be conducted at site. The trial shall be conducted in the presence of the Engineer-in-charge and the test results shall be recorded in an approved format. The contractor at his cost shall provide all Testing facilities like testing Engineers, assistants, instruments, materials and consumables etc. as required for the test. Tests proving the satisfactory performance of all operating switch gears, transformers and safety functions and controls shall be carried out. All calibrated instruments, materials, load configuration, fuel, lubricating oil and labour

required for carrying out of the test shall be provided by the contractor free of cost. The contractor shall give ample notice of the test to the Engineer-in-charge.

The contractor shall be fully responsible for the maintenance including watch and ward of all the Electrical installations provided by him until the works are handed over to client. Thereafter, the work can be handed over to the Client along with all inventories, completion plans etc. as required.

10. Co-Ordination:

The Contractor shall co-operate with any other agency working in the same project, compare plans, specifications and the time schedules and so arrange his work that there will be no interference. The Contractor shall forward to the Engineer-in-charge all correspondence and drawings so exchanged. Failure to check plans for conditions will render the contractor responsible for bearing the cost of any subsequent change found necessary or damages done. However, contractor shall afford necessary facilities to execute the work simultaneously with other agencies executing the works like Civil, architect, horticulture, external services and other building works for the same project shall entertain no claim on this account.

The electrical work shall be executed in close Coordination with the progress of building work. This being the essence of the contract, an activity chart clearly showing critical areas should be furnished before commencing the work for proper monitoring and coordination.

11. Handing Over The Works On Completion:

On satisfactory completion of all the works as per the provision of the contract, the contractor shall hand over the works to the client. The contractor shall ensure that all the testing commissioning & trial run operation of all the system are simultaneously carried out so as to make the same functional immediately on completion.

It shall be the responsibility of the contractor to obtain clearances from all the Statutory Bodies like Electrical Inspector & Fire Officer etc. as required for the installations prior to commissioning & handing over the same after completion of work.

All material to be used on works shall bear I.S. Certification work unless otherwise the make specified in the item or special conditions appended with the tender document. In case I.S. marked materials or the materials mentioned in the tender document are not used due to non-availability, the materials used shall conform to I.S. code or CPWD Specifications applicable for this contract. In such cases the Engineer-in-charge shall satisfy himself about the quality of such materials and give his approval in writing. Only articles classified as "First Quality" by the manufacturers shall be used unless otherwise specified. All materials not having I.S. marking shall be tested as per provision of the Mandatory Tests in CPWD Specifications and the relevant IS specifications. The Engineer-in-charge may relax the condition regarding testing if the quantity of materials required for the work is small. For the products bearing ISI certification work, no further testing is required at site. In all such cases of use of IS certified materials, proper proof of procurement of materials from authentic manufactures shall be provided by the contractor to the satisfaction of Engineer-in-charge.

Other agencies doing work of Civil, Plumbing, Air conditioning or other building work, horticulture work etc. for this project will also simultaneously execute the works and the contractor shall afford necessary facilities for the same. The contractor shall leave such necessary holes, openings, etc. as may be required for the electric, sanitary, air-conditioning, fire-fighting, PA system, telephone system, C.C.T.V. system etc. and nothing extra over the agreement rates shall be paid for the same.

The work shall be carried out in a manner complying in all respects with the requirements of relevant bye-laws of local body under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-charge and nothing extra shall be paid on this account.

For items, where so required, samples shall be prepared before starting the particular items of work for prior approval of the engineer-in-charge and nothing extra shall be payable on this account.

12. Clarifications of Discrepancies:

In case of any discrepancy between technical specifications, approved drawings and BOQ, or disputes in respect thereof, the interpretation of the Engineer-in-Charge shall be final and binding on the contractor.

13. Codes & Standards

The installation shall conform in all respects to Indian standard Code of Practice for Electrical Wiring Installation IS – 732 as amended up to date, CPWD specifications and 'National Electric Code'. It shall also be in conformity with the current I.E. Rules and Regulations and requirements of the local Electric Supply Authority and Fire Insurance regulations in-so-far-as these become applicable to the installation.

Electrical work in general shall be carried out as per following CPWD Specifications with upto date amendments.

- General Specifications for Electrical Works. (Part I - Internal) -2013.
- General Specifications for Electrical Works. (Part II -External) -1995
- General Specifications for Electrical Works. (Part IV –Sub-station) -2013
- Code of Practice for Fire Alarm System & 2189-1999
- CPWD specification for Fire Alarm & detection System amended as on date.
- CPWD specification for Heating, Ventilations & Air Conditioning works (Part VI – 2004)
- CPWD specification for DG Sets complying to CPCB-2 norms (Part VII – 2013)
- General Specifications for Electrical Works.(Part –VII – DG Sets)- 2013

Wherever this specifications calls for a higher standard of material and or workmanship than those required by any of the above mentioned regulations and specification then the specification here under shall take precedence over the said regulations and standards. In general, the materials equipment and workmanship not covered by the above, shall conform to the Indian Standards (latest edition) unless otherwise called for.

The design engineering and manufacturing shall be in accordance with established standards/codes (with amendments up to date), sound engineering practices, specifications and shall conform to the statutory regulations applicable in the country. Some of the relevant Standards/Codes are listed below:

Indian Electricity Act, 2003
Indian Electricity Rules, 1956

Any other standard may be followed provided it is equivalent or more stringent than the standards specified above the following order of precedence shall govern.

- a) Specification, particular specification if any, and drawings.
- b) Indian regulations / IS codes and standard, CPWD specification.

A. TECHNICAL SPECIFICATION FOR H.V & M.V ELECTRICAL EQUIPMENT

A-1. TECHNICAL SPECIFICATION FOR H.V. SWITCHBOARD

This specification covers HV switchgear Panels suitable for 11000 volts 50 Hz. 3 phase 3 wire alternating current solidly earthed electric supply system, complete with all accessories and inbuilt power pack unit as per this specification.

The panels shall be complete with interlocking features, automatic safety shutters, internal connections for interconnections of the panels, bus bar chamber, ON and OFF indicators, earthing sockets, with all the instruments and relays in position and duly wired up with copper conductor cables and any other accessories to complete the supplies in all respects.

The entire equipments shall be tropically finished.

PARTICULARS OF ELECTRIC SUPPLY

- | | |
|-----------------------------|---|
| A. Main supply | 11000 volts 3 phase 50 Hz. AC. |
| B. Supply for trip circuits | 24 volts from power pack |
| C. Supply for indicating | 110 volts from 11000/110 V potential transformer. |

DETAILS OF HT VCB PANEL 11000 VOLTS 630 AMPS

The panel shall be indoor type, metal clad, extensible horizontal draw out type complete with interlocking features, automatic safety shutters, handle for arising and lowering the switchgear and rollers for the rolling out, draw out truck etc. and manually operated, trip free type, Vacuum circuit breaker; incorporating mechanical as well as Electrical ON/OFF LED indicator. The closing mechanism shall be as per the following:-

Independent Manual spring assisted, and Spring charged electrically & manually closed, and shall consist of :

- I. Triple pole vacuum circuit breaker, 11000 volts 630 amps capacity (as required), rupturing capacity 18.4KA at 11 KV (Symmetrical).
- II. 630 amps rating (as required) air insulated but encapsulated, high conductivity Copper bus bars of uniform cross-section for electrical purposes, suitably insulated with sleeves and extensible type on the both ends
- III. ON & OFF (RED and GREEN) indicating light.
- IV. Isolating plug contacts.
- V. CT chamber with Three - Current transformers dual ratio, rating as per attached data-sheet., 15 VA burden for protection, 15 VA burden for metering, accuracy 5P10 for protection and class 0.5 for metering as per "Schedule of Quantities" and Data-sheets.
- VI. Ammeter range suitable to CT's offered dial size 144mm x 144mm with selector switch.
- VII. 3x11000 /110 volts resin cast potential transformer withdraw able type with automatic shutters, 100VA burden and accuracy class-1 with protective fuses. The secondary for PT shall have terminals on terminals block where from 110 volts power supply can be extended to adjoining panels through an extra set of HRC fuses provided for the purposes.
- VIII. Voltmeter range 0-15 KV dial size 144mm x 144mm with selector switch.

- IX. Cable box complete with accessories to suit 11 KV 3 phase XLPE (E) cable shall be mounted on the panel for incoming cable.
- X. Test terminal block, fuses, circuit labels, Indication light etc. as per standard practice.
- XI. Necessary strip heaters to prevent absorption of moisture during winter and monsoon.
- XII. Under voltage, over voltage, auxiliary and master trip relays as required.
- XIII. Necessary trip supply healthy indicator lamp and switch and other standard accessories.
- XIV. HT panel shall be provided Anti pumping devices, Auxiliary relays for Temperature scanner & door interlock of transformer.

TYPE TEST:

Test certificates with all the details to IS- carried out on similar type shall be furnished along with the tender, without which the offer may not be considered for acceptance.

INSTALLATION:

Proper leveling of all the Breaker panels to be done.

All Panels /accessories are efficiently earthed and connected to the required number of earth electrodes.

Clearances in the front, rear and sides of the Panels shall be as per drawings & specifications.

Automatic safety shutters, Door interlock, handle interlock in all the panel shall be operative.

TESTING AND COMMISSIONING:

- Insulation Resistance,
- Earth continuity,
- The operation of the Protection devices shall be tested by means of secondary & primary injection test & the Primary injection test will be preferred of relay through CTs.
- Breaker operation.
- The entire Switch Board / Panel shall be withstanding high voltage test after installation.
- Any other tests as may be required by the inspector shall be conducted.

A-2. TECHNICAL SPECIFICATIONS FOR DRY TYPE TRANSFORMER

CODES AND STANDARDS

Transformers shall comply with the latest editions of Indian Standards no. IS 2026 Part I to Part V (Power Transformers) and IS 11171 (Dry Type Power Transformers). In case the provisions of Indian Standards are not directly applicable to Dry Type Transformers, the provision of Latest IEC - 726 & any other relevant IEC shall apply. Transformer losses shall be as per IS: 1180. Latest Standards as applicable shall be followed for Insulating Materials, Bushing, Installation and Maintenance of Transformers.

SERVICE CONDITIONS

Maximum Ambient Temperature : 50 deg C
Minimum Ambient Temperature : 0 deg C
Relative Humidity : 100%
Installation : Highly corrosive, dusty, humid and tropical

RATING AND TYPE

The Transformer shall be of 11/0.433KV, and Cast Resin dry type. The transformer shall have core type construction, 3 phase and shall be suitable for Indoor / Outdoor service under the climatic conditions prevailing at site. The transformer shall be capable of withstanding thermal & mechanical effects of Short circuit at terminals of any winding with full voltage maintained on other winding as per IS 2026.

NATURE OF ELECTRIC SUPPLY:

Primary : 11000 Volts, 3-phase, 3 wire 50 C/S.
Secondary : 433 Volts, 3 phase, 4 wire 50 c/S
Solidly earthed neutral.

NATURE OF LOAD:

Mixed load of lights, fans and motive power and shall be suitable for balance & unbalance load. Power factor at full load 0.8 (Approx.)

EARTHING:

The star point on the low voltage side shall be brought out for solid earthing. The transformer tank & cable end box should be provided with two suitable earth terminals for earthing.

WINDINGS:

The windings shall be manufactured from electrolytic grade copper conductors and fully insulated for rated voltage by HIGH QUALITY INSULATED nomex calendared paper. The high and low voltage windings shall be totally encapsulated and should be Cast under vacuum in moulds with fiber glass reinforced epoxy resin laminate. Both HV & LV windings of each phase shall be separately cast as a rigid tubular coil with no mechanical & electrical connection between their co-axial arrangements. The transformer shall be free of partial discharges at least up to 1.1 times the rated voltage. The windings shall absorb no moisture under the worst tropical conditions.

CORE:

The core shall be built up with high grade, non-aging low loss & high permeability CRGO Silicon Steel Lamination. CRGO sheet shall be coated with inorganic material like carlite or equivalent insulation to reduce eddy current to minimum. After shearing, the laminations shall be treated to remove all burrs & shall be annealed to remove all the residual stresses.

Core framework and clamps shall be arranged and tightened to securely hold laminations in order to prevent any settling or displacement in case of heavy shocks during transport, handling or short circuits. All the iron parts, except the core shall be galvanized and treated with high temperature resistant paint. Core fastening bolts shall be insulated to reduce losses and avoid hot spots. Transformer shall be designed to withstand 10% over fluxing corresponding to rated voltage.

Suitable lugs shall be provided for lifting the complete core & coil assembly of the transformer.

INSULATION

Inter-turn and inter coil insulation shall be designed such that di-electric stress is uniformly distributed throughout the windings under all operating conditions. The winding shall be provided with Class 'F' insulation or better.

TEMPERATURE RISE

The temperature rise of the windings shall not exceed 90 Deg C by resistance on continuous full load above maximum ambient temperature of 50 Deg C and in no case shall reach value that may damage the core itself or other adjacent parts.

TAP CHANGING

Off Circuit Bolted Tap changing Links shall be provided on High voltage side for tapping from +5% to -10% of the input voltage in steps of 2.5%. Inspection window with glass and neoprene gasket shall be provided on the transformer enclosure to view the tapping position.

VECTOR GROUP

Transformer shall have vector group of Dyn 11.

IMPEDANCE

The desired Impedance shall be as mentioned in the IS 2026.

FLUX DENSITY

The maximum flux density at any point in the core and the winding shall not exceed 1.6 Tesla on the normal rated tap voltage & frequency.

CURRENT DENSITY

The maximum current density at any point in the winding shall not exceed 2.5 Amps per sq. mm at the rated full load, voltage and frequency.

COOLING

The transformer shall be designed for natural cooling (AN).

ENCLOSURE:

Transformers shall be provided with a sheet steel enclosure with adequate provision for ventilation. The degree of protection of enclosure shall be IP-21 for indoor installations & IP - 44 for outdoor installations. The sheet steel thickness of enclosure shall be minimum 2 mm & shall be treated for anticorrosive painting.

END TERMINATION

HV End:

Cable end box with terminals and bus bars shall be provided, suitable to receive one run of 11KV (E) 3Cx 240 sq. mm, Aluminium conductor, Armoured, XLPE cable. Cable entry shall be from bottom / sides.

LV End:

Terminals/bus bars shall be suitable to receive BUS DUCT. The complete details shall be given on finalization of the order. Alternatively, termination shall be through the side / top of the enclosure to the bus duct. The flange details for mounting of the bus duct shall be given after finalization of the order.

UNDERCARRIAGE

Transformers shall be supported on structural base equipped with bi-directional rollers suitable for moving the fully assembled transformers.

ACCESSORIES

The following fittings shall be provided on the Dry Type Transformers:

- i) Rating & Terminal marking plate
- ii) 4 nos. bi-directional flat rollers
- iii) 2 nos. earthing terminals with lugs on the transformer base channel on diagonally opposite ends
- iv) Lifting arrangement
- v) Extra Neutral bushing brought out of Enclosure
- vi) 1 no. PT-100 sensor in each LV windings wired up to the Winding temperature indicator Scanner. The instrument shall have two sets of adjustable contacts for alarm & trip. Instrument shall have scanner to read and show temperature of all the three phases sequentially.
- vii) On the doors of the enclosure a set of the sensor / device shall be provided with the potential free auxiliary contacts to make the interlocking between the transformer door and the incoming HT breaker:
- viii) High Tensile Steel bolts and nuts exposed to the atmosphere shall be either galvanized / zinc passivated or preferably Stain less steel bolts to make them as rust free.
- ix) The incoming HT breaker should not be get closed if the transformer doors are open.
- x) The transformer doors should not be getting open if the incoming HT breaker is in closed (ON) position.

TESTS

Transformers shall be subjected to routine & type tests as specified in IS 2026, IS 11171 IEC - 726 & given below:

Routine tests

- a) Turns ratio measurement at various taps
- b) HV and LV winding resistance
- c) Checking of vector group
- d) Insulation Resistance Test
- e) No Load Loss & No Load current measurement
- f) Measurement of Load losses
- g) Impedance voltage
- h) Separate source voltage withstand test
- i) Induced over voltage withstand test

Type Test:

Test certificates to IS-2026 carried out on similar type shall be furnished along with the tender, without which the offer may not be considered for acceptance.

- a) Heat Run Test.
- b) Impulse voltage withstand test.

Technical and other particulars to be furnished by the tenderer

All the tenderers shall furnish the technical particulars of their offer in the form shown in below. Tenders not accompanied by this form duly filled in shall not be considered complete and are liable to be ignored.

- (a) Rated KVA of transformer.
- (b) Rated voltage ratio

- (c) Voltage ratios corresponding to tapplings other than the principal tapping.
- (d) Load loss at rated current and rated voltage on the principal tapping corrected to the appropriate reference temperature.
- (e) Impedance voltage at rated current (on the Principal tapping).
- (f) Short circuit impedances at least on the extreme tapping if the tapping range of the tapped winding exceeds 5 per cent.
- (g) Diagram of connections and connection symbol, and

NOTE: Transformers complete with all accessories and shall be as per relevant latest IS etc.

INSTALLATION:

Installation shall conform to Indian Standard Code of Practices IS: 1886-1967 and meet with the approval of the Electrical Inspectorate and other statutory bodies.

Transformers shall be positioned with acceptable clearance all round & its wheels shall be either locked or provided wheel stoppers.

Visual inspection shall be conducted for mechanical damage to any part or parts, leaking tanks, tubes or bushings. Suitable steps shall be taken to rectify the defects immediately.

The star point of L V winding shall be earthed by means of two separate and distinct earth conductors copper strip.

COMMISSIONING:

The following pre-commissioning tests shall be conducted and test results recorded.

- a) Continuity of the windings.
- b) Operations of sensors shall be proper.
- c) Setting of temperature sensor & Tap
- d) Insulation resistance between windings and also between windings and earth & other test as required checking the healthiness of the transformer.

After energizing, transformer shall be kept on 'No Load' for a period of 24 hours before load is switched. Thereafter Transformers shall be brought up to full load over a period of one hour.

A-3. TECHNICAL SPECIFICATION FOR SILENT DIESEL GENERATOR SET

Scope:

Work covered by this contract shall include supply, transportation, delivery, installation, testing and commissioning of automatic start direct coupled Diesel Generator Sets and shall include but not limited to the following.

- Radiator cooled engine with alternator mounted on a rigid fabricated steel base frame with resilient anti-vibration mountings.
- Daily and outdoor storage fuel tank with oil piping and filters.
- Air intake filter.

- Exhaust piping with thermal insulation and with residential type silencer.
- Obtaining necessary permission from relevant Dept. for installation and operation of DG Sets.
- Obtaining statutory approvals from Chief Electrical Inspector.
- Obtaining approvals from Pollution Authorities as required.
- Associated civil works

The Contractor's scope of work shall include supplying and fixing of complete work as set down in these tender documents, material and components not specifically stated in the tender documents but which are necessary for satisfactory installation and operation of the system shall be deemed to have been included in the Contractor's scope of work.

Ambient Conditions:

DG sets and auxiliaries shall be capable of operating continuously and delivering the rated output at ambient conditions prevailing at site. The anticipated maximum and minimum extremes at site are as below:

Maximum - Ambient temperature + 50°C RH 90%
Minimum - Ambient temperature - 5°C RH 90%

Supply System:

The equipment supplied shall be suitable for operation on a 415V, 3 phase, 4 wire, and 50 Hz systems.

Standards:

The equipment offered shall conform to the latest revision of relevant standards. Tenders shall clearly state the standards to which the equipment conforms.

Engine And Accessories:

Engine:

The engine shall have the following characteristics:

Type - Suitable for generating set application, multi-cylinder, solid injection, cold starting.

Cycle - Four stroke

Speed - 1,500 r.p.m.

Speed variation - Within 2% for operation between 1% and 10%

Method of starting- Battery

Net site output -As per schedule of quantities. The output shall be based on base duty application i.e. continuous operation around the clock with varying loads.

The engine rating shall be stated in the tender in accordance with the latest revision of relevant INDIAN STANDARDS.

Accessories for Engine:

The accessories to be provided with the engines shall include the following:

- Flywheel to suit flexible coupling.
- Flexible coupling with guard.
- Air cleaner dry type
- Corrosion resistor
- Fuel pump
- Governor –electronic
- Fuel filter
- Lube oil filter
- Heavy duty batteries with leads and battery charger.
- Exhaust silencer residential type
- Interconnection wiring cabling and piping as required
- Cooling system

Fuel Consumption:

The engine shall be suitable for satisfactory operation on HSD as per standards. The tenderer shall declare the guaranteed fuel consumption in liters per BHP/hr. at 75%, 80%, 100% load under the maximum output after de-rating to ambient conditions.

Such guaranteed fuel consumption is also to be expressed for convenience in subsequent checking of performance in liters per net kWh output from the alternator at full load and at 0.8 and unity power factor.

If guaranteed fuel consumption is exceeded, the contractor shall make such amendments or alternators as are necessary to bring the consumption within the guaranteed figures.

Minimum guaranteed fuel consumption on 100% load should be specified.

Lubricating Oil Consumption

The tenderer shall state the guaranteed lubricating oil consumption in liters per hour.

Governing

The governor shall be of electronic type with governing class A direct.

Mounting

The engine and direct coupled alternator shall be rigidly secured to a common truly rigid fabricated steel base frame of substantial and proven design. The DG sets shall be installed on isolated inertia foundation to be provided. Ant vibration mountings shall be provided between the base frame and the foundation. The tenderer shall confirm the

type of mountings and mounting arrangements provided and state the guaranteed vibration isolation efficiency in the tender.

Approved vibration isolation shall also be provided between DG sets and all rigid piping connected to the DG set such that transmission of vibration to the piping system is less than 1%.

Air Filters

The engine air intake shall be fitted with substantial clearable air cleaner of the dry type. The filter shall be suitable for operation under dusty conditions for periods of not less than 200 hours between cleaning operations.

Crank Case Breather

The crankcase breather outlet of the engine shall be fitted with a filter cap capable of preventing entry of dust.

Fuel and Lubricating oil Filters

Filter for fuel and lubricating oil systems shall be of dual type to permit removal of one strainer if necessary whilst the engine is running. Lubricating oil filters shall be of an efficient full flow type of ample capacity and suitable for use with detergent oils. They shall be capable of removing all foreign matter above a particle size of 5 microns and shall also operate for at least 200 hours between cleaning operations.

Lubricating Oil System

The engine shall be of the totally enclosed type and fitted with a positive pressure system of lubrication to all working parts. There shall be no moving parts which require lubrication by hand prior to the starting of the engine or whilst in operation.

Engine Controls

(a) Speed control

Control shall be so arranged that a 12-1/2% increase over normal rated speed shall cut off fuel supply, thus stopping the engine.

(b) Overload Protection

The engine shall be adequately protected against operating under overload conditions. The requirements shall be met by the provision of a fixed overload limit stop on the pump rack control rod to prevent the set being subjected for a load exceeding the site rating plus 1%.

(c) Excess Starting Time

The starting circuit for the automatic mains failure diesel generator sets shall be arranged to attempt upto three starting cycles, each not exceeding 1 seconds duration with a similar OFF period between each cycle. If the set fails to start upon completion of the third attempt the starting circuit shall be locked out until it is restored manually. An alarm shall be given and "Set failed to start" indication given on the panel.

(d) Low Lubricating Oil Pressure

Pressure switches shall be fitted such that in the event of a fall in the lube oil pressure, an alarm and indication shall be actuated. In addition, the engine shall be automatically shut down in the event of lube oil pressure dropping to a predetermined low value.

(e) High Water Temperature

An alarm shall be given if the water temperature exceeds the safe limits and the engine shall be shut down when a pre-determined set water temperature is reached.

(f) Fuel Level Operation

In the daily service fuel tank, a float control shall be provided to allow the flow of fuel from main fuel tank under gravity.

A clearly visible graduated fuel level indication shall be provided in the day as well as main tank.

(g) Exhaust System

The engine shall provide with an exhaust pipe carried out of the substation building and fitted with a residential type silencer to reduce the noise level to the minimum. Height of exhaust shall be as per the requirement of Pollution Control Authorities.

Exhaust piping shall be fabricated from class 'A' MS pipes of size suitable to limit backpressure to permissible limit as per CPCB-2 norms. Flanged joints in the exhaust piping shall be covered with removable moulded asbestos sectional mufflers or similar composition.

Exhaust piping shall be fitted with a flexible section or an expansion joint. Inspection chambers at the bends shall be provided for removal of carbon soot.

Alternator:

Rating

The alternators shall have the following rating and characteristics:

Type - Drip Proof Screen protected for power generation

Speed - 1500 R.P.M.

Net Site Output -AS per Schedule of quantities.

Voltage Regulation - Within $\pm 1.0\%$ of the rated voltage from no load to full load

Overload - More than 10% of the nominal for 1 hour every 12 hours without excessive heating

Harmonics –Max 1% between phase and neutral and total max 3%

Voltage - 400V $\pm 1.0\%$, 3 phase at 50 Hz

Construction

A direct coupled, screen protected drip proof type, self-excited and self-regulated alternator shall be provided with the diesel engine. The combined engine alternator unit shall be mounted on a common rigid fabricated base frame, and the alternator shall be continuously rated. The alternator shall have its windings star connected with the neutral connection brought out to a separate terminal. The alternator shall fully comply with the latest Standard in respect of winding insulation and fast response to maintain steady voltage.

Temperature Rise

The Max temperature rise of the various components of the alternator shall not exceed those permitted under IS with full output and under the ambient temperature conditions as specified.

Rating and Regulation

The alternator shall be directly coupled to the diesel engine through a flexible coupling and shall be suitable to deliver the rated output at 0.8 P.F. lagging, on a 3 phase 4 wire 415 volts 50 cycle system. The alternator shall be of the self-regulated and self-excited type in a screen protected, drip proof enclosure. The alternator shall be with static excitation system and the voltage regulation from no load to rated load shall be within 1% of rated voltage.

Alternator Insulation

The alternator should have class H insulation to withstand tropical conditions.

Auto Mode

- (a) A line voltage monitor shall monitor supply voltage on each phase. When the main supply fails completely or falls below set value or any phase, the monitor module shall initiate startup of diesel engine. To avoid initiation due to momentary dips or system disturbance, a time delay adjustable between 0.5 to 5 seconds shall be incorporated in the startup initiation.
- (b) Under this event, main breakers of DG set will be opened & breakers of transformer will be closed.
- (c) Suitable adjustable timers shall be provided which will make it feasible to vary independently ON-OFF setting periods from 0-10 seconds. If the alternator does not build up voltage after the first or any start, as the case may be, further starting attempt will not be made and the starting facility will be reset.
- (d) When the main supply is restored and is healthy as sensed by the line voltage monitor setting both for under voltage and unbalance, and after the quality is monitored by a suitable time which can be set between 1 minute to 10 minutes, the alternator supply circuit breaker shall open before mains circuit breaker closes.
- (e) The diesel alternator set reverts to stand by for next automatic operation.

Manual Mode

Under manual mode it shall be possible for the operator to start up the generator set by pressing the (START) push button.

- (a) Three attempt starting facility shall also be operative for the start up function.
- (b) The “CLOSE and “TRIP” operation of Mains, Alternator and Bus-coupler circuit breakers as required shall be manual by pressing the appropriate push button on the panel. Closure shall be feasible only after alternator has built up full voltage. If the load is already on “MAINS” pressure on “CLOSE” button shall be ineffective.
- (c) When running under manual mode, if the mains supply has failed, the load shall automatically get transferred to the alternator immediately overriding the stipulation of pressure on “CLOSE button.
- (d) Engine shut down, other than due to faults shall be manual by pressing a “STOP” button.

Test Mode

- (a) When under “TEST” mode pressure of “TEST” button shall complete the start up sequence simulation and start the engine.
- (b) Engine shall build up voltage but the set shall not close alternator circuit breaker when the load is on the mains. Monitoring performance for voltage/frequency etc should be feasible without supply to load.
- (c) If during TEST run the power supply fails, the load shall automatically get transferred to alternator.
- (d) Bringing the mode selector to auto position shut down the sets.

Fuel Oil System

Daily Service Fuel Tank

Daily service fuel tank shall be provided of rated capacity.

The tank shall be waterproof and dust proof and shall be fabricated from not less than 2mm MS sheet.

A float operated fuel level indicator, fuel draw off connection, drain cock and overflow connection shall be provided on the tank. A removable cover of ample size with lock shall allow free access to the interior. The tank shall be mounted on steel supports. An on-line fuel filter shall be provided at the inlet of tank.

Fuel Transfer Hand Pump

A semi-rotary hand transfer pump shall be provided with necessary piping as required for filling the main fuel tank to be installed outside the substation at a height for gravity flow.

Engine Auxiliary Motors and Wiring

The contractor shall supply, install and test all engine auxiliaries. This shall include the supply and installation of all electrical and control wiring between the Main LV Switchboard and the individual auxiliaries. Wiring shall be with copper conductor PVC insulated wires in flexible/rigid conduits including loop earthing or armored cables.

Starting Battery and Protection

A 24 volt heavy duty battery of adequate capacity, Complete with battery charging equipment shall be supplied and installed by the supplier to energize electric starting equipment. The battery shall be contained in an approved steel frame. The charging unit shall be contained in the control cubicle and be, complete with ammeter and voltmeter, fuses, charging rate adjustment and interconnection

Radio Interference

All equipment provided under this specification shall be so designed that it will not cause interference with radio equipment. In the event of the inherent characteristics of the equipment being such that radio interference is possible, efficient devices to nullify the same shall be provided. Suppressors shall be as per the relevant standards.

Piping

Piping Materials

Unless otherwise specified, pipes shall be medium class MS as per standards suitable for welded joints. Wherever so specified, class B GI pipes with screwed joints could be used for pipes up to 50mm dia. Pipes shall be given one primary coat of rust inhibiting paint being installed.

Fitting shall be new and from approved manufactures, Fitting shall be of pressure rating suitable for the piping system. Flanges shall conform to standards. Supply of flanges shall include bolts, nuts, washers, gaskets etc; as required. All equipment and valve connections shall be through flanges.

Gate valves and Check valves shall conform to standards. Gate valves shall have non-rising spindles unless otherwise specified. Valves up to 40 mm dia shall have gunmetal body and valves of more than 40 mm dia. cast iron body unless otherwise specified. Valves shall be suitable for test pressure as per piping system requirements and as per standards. Butterfly valves shall conform to standards. The valves shall be suitable for flow in either direction and seal in both directions. The valves shall be of integral moulded design.

Pressure gauge shall be duly calibrated not less than 100mm dia and of appropriate range and with shut off gauge cock etc.

Gauges shall be provided at the following locations:

- a) Suction and discharge of pumps
- b) Inlet and outlet of heat exchangers

Thermometer shall be either 100mm dia dial or direct reading industrial type of appropriate range duly calibrated. Thermometer shall be provided on supply and return of heat exchangers.

Piping Installation

The contractor shall submit detailed working drawings showing the piping route, typical sections, location and detail of fitting, valves strainers and instruments.

Pipes shall be supported from wall mounted or ceiling suspended supports at an interval of maximum 2 mtrs unless otherwise stated/approved using 12mm thick ribbed rubber pad or any other approved resilient material.. Pipes supports shall be of steel, adjustable for height and primer coated with rust preventive paint and finish with 2 coats of enamel paint of approved colour. Pipe hangers shall be fixed on walls and ceilings by means of dash fasteners.

Pipe sleeves of 50mm or larger diameter shall be provided wherever pipes pass through wall and the annular space filled with felt and finished with retaining rings.

Insulated piping shall be supported in such a manner as not to put undue pressure on the insulation.

Testing

All piping shall be tested to hydrostatic test pressure of at least one and a half times the maximum operating pressure, but not less than 7Kg/sq cm for a period of not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Engineer.

The Engineer-in-charge shall be notified well in advance by the contractor of his intention to test a section of piping and all testing shall be witnessed by the Engineer-in-charge or his authorized representative. The contractor shall make sure that proper noiseless circulation of fluid is achieved through all coils and other heat exchange equipment in the system concerned. If proper circulation is not achieved due to air bound connections, the contractor shall rectify the defective connections. He shall bear all the expenses for carrying out the above rectification.

No insulation shall be applied to piping until the completion of the pressure testing to the satisfaction of the Engineer-in-charge.

After the piping is installed, tested and run for at least ten days of eight hours each, the piping shall be given two finish coats of approved color.

General

The DG sets with support systems shall be complete with all equipment, visual and audible alarms, indications and controls required for fully reliable and safe operation of the DG sets whether specifically stated in these specifications or not. It is essential that the operation of all protection equipment be completely reliable in all respects.

Whenever the engine is shut down due to over speed, low lubricating oil pressure, high water temperature or excess starting time, the circuit breaker shall also be tripped and the starting systems of the engine shall be locked out until the respective protective relay is reset.

Performance Testing At Site

After completion of erection at site and a preliminary warm up period and acceptance trial run of minimum 10 hours duration, 2 hour at 60%, 3 hour at 80% and 4 hours at 100%, followed by 1hour at 110% shall be conducted at site for each DG set for providing performance to the stipulated site ratings. The trial shall be conducted in the presence of the Engineer-in-charge and the test results shall be recorded in an approved format. Test results shall be recorded at 30-minute intervals. All facilities, labour instruments, material and consumables including fuel and lubricating oil required for the test shall be provided by contractor at his cost. Load as required shall be arranged by the Contractor for Performance Testing of the DG sets. Tests proving the satisfactory performance of all operating gear and safety functions and controls shall be carried out.

Performance test at site shall include (but not limited) the following:

S.I No	Test	Acceptance criteria
1.	Fuel consumption at 75%, 80% and 100% load	± 5% of guarantee performance. Actual DG set efficiency as determined in the manufactures works tests shall be used as the basis of calculation of specific fuel consumption ratio.
2.	Lubeoil consumption at 75% 80% and 100% load	± 5% of guaranteed performance
3.	Voltage variation	433 V ±1%
4.	Voltage regulation	± 1%
5.	Frequency regulation	50 Hz ± 0.5%
6.	Max water temp	± 5% of guaranteed performance
7.	Max Lube oil temp	± 5% of guaranteed performance
8.	Max Lube oil pressure	± 5% of guaranteed performance

Contractor shall carry out any further tests/trials that Engineer may desire to satisfy themselves that the Generator Set and associated equipment fully comply with the conditions as set out in these Specifications.

All calibrated instruments, materials, load configurations, fuel, lubricating oil and labour required for carrying out of the test shall be provided by the Contractor free of cost. The Contractor shall give ample notice of the test to the Engineer-in-charge.

A-4 TECHNICAL SPECIFICATION FOR HT – HT AVR (AUTOMATIC VOLTAGE REGULATOR)

Constructional Feature : Oil Immersed, Naturally Cooled, On-Load, Stepless, Rolling Contact, Brentford Type Automatic Voltage Regulator.

Mode of Operation: Manual Motorized Automatic

Service	: Outdoor/ INDOOR
Capacity:	1600 KVA
Input:	9to 12 KV, 3 Phase, 50 Hz. suitable for balanced supply.
Output:	Stabilized at 11 K V \pm 1%, 3 Phase, 50 Hz. suitable for balanced / unbalanced load.
Equipment consists of:	[<input checked="" type="checkbox"/>] A. Step down - Double Winding [<input checked="" type="checkbox"/>] B. Regulator Unit – Auto wound, delta connected with rolling contacts capable of moving along with winding through Automatic/ Motorized/manual mechanism for regulation of output Voltage [<input checked="" type="checkbox"/>] C. Buck Boost Unit – Double winding [<input checked="" type="checkbox"/>] D. Automatic Control Unit
Transformer Oil	: Items A, B, C shall be supplied with first filling of Oil, conforming to IS 335 / latest edition,wherever applicable.
Terminals	: Input : [<input checked="" type="checkbox"/>] Bare Bushing/ Cable box Output : [<input checked="" type="checkbox"/>] Cable box
Temperature Rise	: 50°C rise of Top Oil over an ambient of 50°C.
Tank	: All the units shall be housed inside the sheet steel tanks. The number of tanks will be 2 (two)

Fittings & Accessories:-
Unit (A)&(C) in single tank:

	AS APPLICABLE
(i) Rating Plate	: 1 No.
(ii) Earthing Terminals	: 2 Nos.
(iii) Bi-directional Roller	: 4 Nos.
(iv) Jacking pads	: 4 Nos.
(v) Lifting Lugs	: 4 Nos.
(vi) Drain Valve cum bottom filter valve with plug	: 1 No.
(vii) Top Filter Valve	: 1 No.
(viii) Bottom Sampling Valve	: 1 No.
(ix) Silica gel Breather	: 1 No.
(x) Inspection Cover	: As per requirement
(xi) Air Release Plug	: do
(xii) Pressed Steel Radiators	: As per requirement
(xiii) Radiator Shut off Valves	: do
(xiv) Double float Buchholz Relay with Alarm & Trip Contact.	: 1 No.
(xv) Buchholz Relay Shut Off Valve	: 1 No.
(xvi) Conservator fitted with oil filling Hole & Drain Plug	: 1 No.

(xvii) Plain Oil Level Gauge	: 1 No.
(xviii) Explosion Vent with diaphragm	: 1 No.
(xix) OTI with A/T Contacts	: 1 No.
(xx) WTI with A/T Contacts	: 1 No.
(xxi) Thermometer Pockets	: 2 Nos.
(xxii) P.T for output voltage measurement and relay sensing.	: 1 No.
(xxiii) Marshalling Box	: 1 No.

Fittings & Accessories:- (Please tick out the items)

Unit 'B':

AS APPLICABLE

(i) Bi-directional Plain Rollers	: 4 Nos.
(ii) Lifting Lugs	: 4 Nos.
(iii) Earthing Terminals	: 2 Nos.
(iv) Rating Plate	: 1 No.
(v) Diagram Plate	: 1 No.
(vi) Drain Valve	: 1 No.
(vii) Oil filling hole	: 1 No.
(viii) Thermometer Pocket	: 1 No.
(ix) Plain oil level gauge	: 1 No.
(x) Silicagel Breather	: 1 No.
(xi) Remote Metering Panel	: 1 No.
(xii) Marshalling box	: 1 No.
(xiii) Pressed Steel Radiators	: As per requirement
(xiv) Inspection Cover	: As per requirement
(xv) Radiator Shut-off Valve	: As per requirement
(xvi) OTI with A/T contacts	: 1 No.

Unit 'D' : Sheet Steel enclosure, self-powered unit, mounted with 'B' comprising the following:

(i) Sensing Relay	: 1 No.
(ii) Step Syn. Geared Motor	: 1 No.
(iii) Voltmeter for output voltage Measurement	: 1 No.
(iv) Other Accessories	: 1 Lot

A-5. TECHNICAL SPECIFICATION OF L.V. PANELS AND DISTRIBUTION PANELS

GENERAL:

The Panel design shall be of single/double front cubicle with horizontal bus-bars mounted at top, extensible on either side. The breaker, instruments and auxiliary equipments shall be accessible from front. The cable terminations shall be accessible from the rear side. Medium voltage power & motor control centers shall be in sheet steel cubicle type enclosure, floor mounted, free standing type, totally enclosed & compartmentalized design and shall meet the single line diagram (SLD).

CONSTRUCTION:

The Panels shall be free standing type, with sheet steel enclosure having following features.

The panels shall be made out of minimum 2.0-mm thick CRCA sheet steel. The internal frame shall be made of channels. The panels shall be dust & vermin proof duly powder coated in approved colour, by seven-tank process. The degree of protection shall not be less than IP52 as per relevant IS code. The sheet steel shroud & partitions shall be of minimum 1.6-mm thickness. All sheet steelwork forming the exterior of the panels shall be smoothly finished, leveled, having rounded corners & free from any flaws. All doors to be fixed with dust-excluding neoprene gasket with fasteners designed to ensure proper compression of the gaskets. Where ever covers are provided instead of doors, sufficient and generous overlap shall be ensured between sheet steel surface with gaskets & closely placed fasteners to preclude the entry of dust.

The following minimum clearances have to be maintained after taking into consideration connecting clamps & bolts etc.:

- | | |
|------------------------------|---------|
| i) Between Phases | -32 mm. |
| ii) Between Phases & Neutral | -26 mm. |
| iii) Between Phases & Earth | -26 mm. |
| iv) Between Neutral & Earth | -26 mm. |

Each section shall be divided into 3 compartments, enclosing either Air Circuit Breakers or MCCBs or On Load Change over switch fuse units or Switch Fuse / Fuse Switch Units or Auxiliary equipments. Maximum of 2 tier ACB compartments shall be provided in one section. All functional units such as MCCB shall be arranged in multi-tier formation & each such unit shall be fully compartmentalized. A vertical cable alley of at least 300 mm width shall be provided to serve one / two vertical sections of feeders. Cable alley shall have hinged doors & suitable cable clamping arrangement with slotted angles shall be provided in the cable alley. Similarly, vertical bus bars shall be housed in between two feeder compartments in a separate bus chamber. The openings between the bus chambers & feeder compartments shall be covered with Bakelite / hylam sheet of minimum 2.0 mm thickness. The vertical bus bar chambers shall be provided with removable bolted covers on the front and the back. All the interconnecting links to the feeders shall be shrouded so as to avoid accidental contact, by means of phenolic barriers. Each compartment shall have its own individual door with concealed hinges & the door shall have interlocking facility with the feeder unit, also arrangement for by- passing this facility shall be provided.

All insulating materials used in the construction of the panels shall be of non-hygroscopic materials, duly treated to withstand the effect of high humidity & high temperatures.

A standard transportable shipping section shall contain maximum three sections with length not exceeding 3 m and weight not exceeding 2.5 tones.

BUSBARS:

The busbars shall be of 31MVA rupturing capacity, suitable for 3 phases, 4 wires, 415 Volts, 50 Hz AC supply. The bus bars shall be made of high conductivity & high strength aluminium conforming to the requirement of E91E of IS 5082. The busbars shall have uniform cross section throughout the length & shall be designed for carrying rated current continuously throughout the length. The cross-section of the neutral

busbar shall be same as that of the phase busbar for busbars of capacity up to 200 Amp; for higher capacities, the neutral busbar shall not be less than half (50%) the cross-section of that of the phase busbars. The busbars & links shall be designed for a maximum temperature of 75 degree celsius.

Bus-bars shall be supported on suitable non-hygroscopic, non-combustible, material such as DMC / SMC at sufficiently close intervals to prevent busbar sag. Ridges shall be provided on these supports to prevent tracking between adjacent busbars. Large clearances & creepage distances shall be provided on the busbar system to minimize the possibility of fault. All busbar joints shall be provided with high tensile steel bolts (electroplated with Nickel / Cadmium), spring washers & nuts so as to ensure good contact. The joints shall be formed with fishplates on either side of the busbars to provide adequate contact area. Bus supports shall be provided on either sides of the joints (max. unsupported distance from the joint shall be 400 mm).

Power shall be distributed to feeders in dual section by a set of vertical busbars (phase & neutral). Individual module shall be connected to this vertical busbar through sleeved connections. All busbars shall be insulated with PVC tapes / tubes (heat shrink type) with colour coding (Red / Blue / Yellow / Black).

The busbars & the connections to the functional circuits from the busbars & their supports shall be able to withstand thermal & dynamic stresses without any damage or deformation, due to the system short circuits. The neutral and the earth bar should also be capable of withstanding the above level.

The contractor shall furnish calculations along with his drawings establishing the adequacy of busbars both for continuous duty & short circuit rating. The panel manufacturer should have CPRI test certificate for IP52 & short circuit rating.

AIR CIRCUIT BEAKERS

The standard draw out ACB shall have two parts namely:

- i) Draw out carriage with TP / FP incoming & outgoing power terminals & Controls sliding contacts.
- ii) Basic breaker with mechanism & releases mounted on sliding rails. The sliding contacts shall be provided for control circuit.
- iii) When the ACB is in test position, the power circuit shall be disconnected and control circuits shall be engaged through sliding contacts.
- iv) This test position shall permit a ready inspection of all the mechanism, interlocks, automatic devices and electrical indicators.
- v) Automatic safety shutters shall be provided for personal safety against accidental live contact to terminal when the breaker is fully drawn out.
- vi) The incoming terminals of the breakers shall be connected to the bus-bar by suitable links. The outgoing terminals shall be extended in the cable chamber for direct Bus Trunking / cable connections. These shall be identified by colored PVC tape / paint, wherever required link extension to form bus-duct entry from top shall

also be provided. Adequate shrouding and caution notice plate shall be provided to prevent the accidental contact to live terminals.

- vii) The ACBs shall be mounted on the channel frame and shall be partitioned at the top by insulated barrier on the either side by sheet metal barrier with necessary cutout for power linking for control wiring. The control equipment, fuses, timers, contactors, etc., shall be laid out in standard fashion on a painted base plate and fixed with screws to the frame at appropriate location.
- viii) Each ACB module compartment shall be provided with front access door made out of 14SWG (2 mm.) sheet steel. All closing and opening operation of ACB (mechanically or electrically) of draw out ACB up to test position shall be performed from the front without opening the door. The breaker can be left in TEST position with the door fully closed.
- ix) Basic instrument such as ammeter, voltmeter with selector switch, Lights and Meters such as KW, Hz, PF, if specified, shall be provided in a separate module compartment. Meters/relays shall be identified with feeder identification name plates when they are located away from feeder module.
- x) Suitable inscription plates shall be provided to identify the feeders, function of the doors mounted devices and caution plate shall be provided at appropriate locations.
- xi) Cubicle illuminating Light, 240V, 6A, 3 pin plug and socket shall be provided with MCB for protection in cable chamber a standard item in each compartment.
- xii) Suitable M.S. removable, un-drilled gland plates shall be provided. For single core cables non magnetic gland plates shall be provided.

Safety Interlocks

The following safety interlock shall be provided for each module:

- i) When ACB is ON door cannot be opened - electrically or mechanically. (Defeat interlock to be provided.)
- ii) Padlocking in OFF position (locks to be provided)
- iii) Castle interlocks for feeder co-ordination as per B.O.Q. / Drawings.
- iv) ACB shall be fitted with all the accessories & safety devices mainly, automatic safety shutters, arc chutes, auxiliary contacts, CT s with dual ratio / multiple taps etc.
- v) Detachable arc chutes shall be provided on all the poles & having tool less removal/fitting & interlocking with breaker operation.

The Air Circuit Breaker shall be Horizontal draw out or non-draw out type as indicated in the Schedule of Quantities.

- The air circuit breakers shall comply with IS – 13947 and type tested & certified form recognized test authorities like CPRI.

- The air circuit breakers shall have 100% certified rating when mounted in the panel. (All de-rating factors shall be clearly indicated by the contractor in his offer).
- The air circuit breakers shall be (as indicated in the schedule of quantities) either manually operated or with motor operated store charged, spring closing mechanism in which case the motor shall be suitable for 230V A.C. supply. The motorized mechanism shall charge a closing spring upon circuit connection. This charged spring may be electrically or manually released affecting the closer of the breaker. The closing spring shall automatically be recharged for the next closing command. An Operator shall also be in position to manually charge the closing spring. The spring condition 'Charged' or 'Free' shall be visible through the indicator.
- The draw-out type ACBs shall have 3 distinct positions – Service / Test /Isolated.
- Rated service breaking capacity (ICS) =100% ICU =ICW shall be minimum 50kArms for one second at 415 volts, 50 Hz and rated short time withstand (ICW) should be equal as ICS latest type test certificates shall be provided on similar rating.
- ACB shall be fully rated at ambient temperature of 50 degree Celsius.
- ACB opening and closing time should be as minimum as possible.
- ACB should be provided with self-powered microprocessor based releases along with required CTs & wiring having mainly following inbuilt features along with other standard features as per BIS or as per BOQ.
 - i) Over load, short circuit & earth fault protection with high set.
 - ii) Displays for all the parameters on front.
 - iii) Computer compatible on front and fitted with RS-485 port & should be operable from the fascia of releases and from computer.
 - iv) Discrimination.
 - v) Measurement & display of phase & neutral currents.
 - vi) Neutral protection / Relay.
 - vii) Indication through LEDS.
 - viii) Annunciation.
 - ix) Event recording & fault history.
 - x) Time delay Current setting 50% to 100%.
- Electrical and Mechanical life of the ACB shall be minimum 20000 operations for ACB rating up to 2500 Amps & 10000 operations for ACB rating 3200 A & above.
- Displays information of all electric accessories on front fascia of ACB.
- Easy tool less fixing of releases from front along with other accessories.
- Easy on site conversion of electric spring charging, fixed to draw out version, Quick termination of control wires.
- ACB terminal sizes shall be as per IS-13947 should be suitable for aluminium and copper links directly.

- Depth & Height should be uniform for all the rating of ACB.
- Manual ON- OFF with indication.
- ACB should be provided with door interlock.
- Pole design should be such to ensure lower watt loss & energy saving watt loss to be informed by supplier for approvals.
- ACB for DG set shall be provided with reverse power relay.
- The breaker shall meet IP 53 /54 Protection.
- All 4pole ACB to have full rated neutral pole.
- ACB can be tested from remote & from local on test position of ACB i.e. operation & electrical interlock etc.
- Fault lock out/anti-pumping device shall be provided on each breaker so that it could not be re-closed after tripping on fault without manual resetting being done.
- The incoming and the outgoing breakers shall be provided either with microprocessor / static trip release as per BOQ, integrally mounted on the breakers / or other suitable relays. This release / relays should have the following adjustments:
 - i) Over current pick-up.
 - ii) Inverse tripping time at 6 times the current setting.
 - iii) Short time delay pick-up at various current settings.
 - iv) Short time delay - instantaneous.
 - v) Earth fault pick-up at various current settings.
 - vi) Earth fault delay - instantaneous.
- The incoming breaker shall also have an under-voltage the voltage of which shall be calibrated for pick-up and drop off in accordance with IS 2576 – 1977.
- The breakers being used as bus couplers shall be without integral release.
- The air circuit breaker being used as incomer shall have the following accessories, indications, and meters, provided on its housing and as per BOQ;
 - i) Phase indicating Lights.
 - ii) Power factor meter 0.5-1-0.5 range or as per BOQ.
 - iii) 0-500 V range voltmeter with selector switch or as per BOQ.
 - iv) Ammeter of suitable range and C.T.s as indicated on the drawings with selector switch or as per BOQ.
 - v) Indicating Lights for the following;
 - a) Red for ACB ON.
 - b) Green for ACB OFF.
 - c) Orange for Auto Trip.
 - d) Blue for Spring Charged.
 - vi) Spring return T-N-C breaker operating switch,

- a) Yellow for trip alarm cancellation.
 - b) Blue for Non Trip alarm cancellation.
- The air circuit breaker being used on outgoing feeder shall have the following accessories, indications, meters, provided on its housing and as per BOQ;
 - i) Ammeter of suitable range and C.T.s as indicated on the drawings with selector switch or as per BOQ.
 - ii) Indicating Lights for the following;
 - a) Red for ACB ON.
 - b) Green for ACB OFF.
 - c) Orange for Auto Trip.
 - d) Blue for Spring Charged.
 - iii) Spring return T-N-C breaker operating switch.
 - iv) 3 No. Phase indicating Lights.
 - The air circuit breaker being used as Bus Coupler shall have the following accessories, indications, meters, provided on its housing;
 - i) Indicating Lights for the following;
 - a) Red for ACB ON.
 - b) Green for ACB OFF.
 - ii) Spring return T-N-C breaker operating switch.

MOULDED CASE CIRCUIT BEAKERS

- Moulded Case Circuit Breakers shall be incorporated in the Panels where ever specified. MCCB's shall conform to IS13947-2, EC-947-2-1989 in all respects. MCCB's shall be suitable for three phase 415 Volts.
- The MCCB cover and case shall be made of high strength heat treatment and flame retardant thermo-setting insulating material. extending type Operating handle shall be quick make/quick break, trip-free type and shall have suitable ON ,OFF & TRIP indicators .MCCB's shall have common operating handle for simultaneous operation and tripping of all poles. Door rotary mechanism with door interlock facility & extendable handle. MCCB's shall be provided with phase barriers
- Suitable extinguishing device shall be provided for each contact. Tripping unit shall be of thermal-magnetic type provided in each pole and connected by a common trip bar such that tripping of any one pole operates all the poles to open simultaneously. The thermal-magnetic device shall have IDMT characteristics for sustained over loads and short circuits.
- Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances.
- The MCCBs shall have a Breaking capacity of not less than 25kA RMS at 415 volts or otherwise specified. For all MCCBs $I_{cs}=I_{CU}=100\%$.

- Original test certificates of all MCCB's as per IEC and IS shall be furnished.

MEASURING INSTRUMENTS FOR METERING

GENERAL

- Direct reading electrical instruments shall be in conforming to IS 1248. The accuracy of direct reading shall be 1.0 for voltmeter and 1.5 for ammeters. Other type of instruments shall have accuracy of 1.5. The errors due to variations in temperature shall be limited to a minimum. The meter shall be enclosed in a dust tight housing. The housing shall be of steel or phenolic mould. The design and manufacture of the meters shall ensure the prevention of fogging of instruments glass. Instruments meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible without removal of the seal. The meters shall be provided with white dials and black scale markings.
- The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside. The direction of deflection shall be from left to right.
- Suitable selector switches shall be provided for all ammeters and voltmeters intended to be used on three phase supply.
- The specifications herein after laid down shall also cover all the meters, instruments and protective devices required for the electrical works. The ratings-type and quantity of meters, instruments and protective devices shall be as per the schedule of quantities.

AMMETERS

Digital ammeter shall be with solid state circuit having bright Red 3 1/2 digit LED display readable from distance .The single phase & three phase parameters should be displayed & read by selection selector switch .The meters should be with built in transducers and field settable standard of full scale for amperage. Class of accuracy shall not be less than 1.0.

- Analogue ammeters shall be moving iron or moving coil type. The moving part assembly shall be with jewel bearing. The jewel bearing shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks, the ammeters shall be manufactured and calibrated as per the latest edition of IS: 1248. Ammeters shall be instrument transformer operated and shall be suitable for 5A secondary of instrument transformer. The scales shall be calibrated to indicate primary current, unless otherwise specified.
- All digital & analogue ammeters shall be instrument transformer operated and shall be suitable for 5A secondary of instrument transformer. The ammeters shall be capable of carrying sustained overloads during fault condition without damage or loss of accuracy.

VOLTMETERS

- Digital Voltmeter shall be with solid state circuit having bright Red 3 1/2 digit LED display readable from distance .The single phase & three phase parameters should be displayed & read by selection selector switch .The meters should be with built in transducers and field settable standard of full scale for voltage. Class of accuracy shall not be less than 1.0.
- Analogue Voltmeter shall be of moving iron or moving coil type. The range for 415 volts, 3 phase voltmeters shall be 0 to 500 volts. Suitable selector switch shall be provided for each voltmeter to read voltage between any two lines of the system. The voltmeter shall be provided with protection fuse of suitable capacity.

CURRENT TRANSFORMERS

- Current transformers shall be in conformity with IS: 2705 (Part I, II & III) in all respects. All current transformers used for medium voltage applications shall be rated for 1kv. Current transformers shall have rated primary current, rated burden and class of accuracy as required. However the rated secondary current shall be 5 A unless otherwise specified. The acceptable minimum class of various applications shall be as given below:

Measuring : Class 1.
Protection: Class 5 P10.

- Current transformers shall be capable of withstanding without damage, magnetic and thermal stresses due to short circuit fault of 50KA on medium voltage system. Terminals of the current transformers shall be marked permanently for easy identification of poles. Separate CT shall be provided for measuring instruments and protection relays. Each C.T. shall be provided with rating plate.
- Current transformers shall be mounted such that they are easily accessible for inspection, maintenance and replacement. The wiring for CT's shall be copper conductor, FRLS insulated wires with proper termination lugs and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.
- The current transformers to be selected for this panel will have at least 20% extra VA capacity available over the normal capacity based on the following details:
 - For ammeters : 3VA
 - For current coils of KW & KWH : 5VA
 - For current coils of PF. meters : 5VA
 - For all recorders : 5VA
 - For all normal wiring : 2VA
 - For current coil of protection relays : 10VA
- Under no circumstances the VA rating of the CT's will be less than 15 VA.

MISCELLANEOUS

- Control switches shall be of the heavy duty rotary type with escutcheon plates clearly marked to show the operating position. They shall be semi-flush mounting with only the front plate and operating handle projecting.

- Indicating Lights shall be of the multiple LED type of low watt consumption, provided with series resistor where necessary, and with translucent light covers. Bulbs & lenses shall be easily replaced from the front.
- Push buttons shall be of the momentary contact, push to actuate type fitted with self reset contacts & provided with integral escutcheon plates marked with its functions.

CABLE TERMINATIONS

- Cable entries and terminals shall be provided in the switch board to suit the number, type and size of aluminium conductor power cables and copper conductor control cable specified.
- Provision shall be made for top or bottom entry of cables as required through separate removable gland plates. Generous size of cabling chambers shall be provided, with the position of cable gland and terminals such that cables can be easily and safely terminated.
- Barriers or shrouds shall be provided to permit safe working at the terminals of one circuit without accidentally touching that of another live circuit.
- Cable risers shall be adequately supported to withstand the effects of rated short circuit currents without damage and without causing secondary faults.

CONTROL WIRING

- All control wiring shall be carried out with 1000/660V grade single core PVC/FRLS cable conforming to IS 694/ IS 8130 having stranded copper conductors of minimum 1.5sq.mm for potential circuits and 2.5sq.mm for current transformer circuits. Wiring shall be neatly bunched, adequately supported and properly routed to allow for easy access and maintenance. Wiring shall be identified by numbering ferrules at each end. All control fuses shall be mounted in front of the panel and shall be easily accessible.

TERMINAL BLOCKS

- Terminal blocks shall be 500Volts grade. Insulating barriers shall be provided between adjacent terminals. Terminal blocks for Power Circuits shall have a suitable current rating (minimum of 10Amp) and of the stud type. as per the cable schedule and shall be shrouded. Provisions shall be made for label inscriptions.
- Terminals for control circuits shall be of spring loaded, screw-less type.

LABELS

- Labels shall be of anodized aluminium, with white engraving on black background. They shall be properly secured with fasteners.

TESTS AT MANUFACTURES WORK

- All routine tests specified in IS: 8623-1993 shall be carried out and test certificates submitted to the Engineer In charge.

TESTING AND COMMISSIONING

- Commissioning checks and tests shall be included all wiring checks and checking up of connections. Primary/Secondary injection tests for the relays adjustment/setting shall be done before commissioning in addition to routine megger test. Checks and test shall include the following.
 - a) Operation checks and lubrication of all moving parts.
 - b) Interlocking function check.
 - c) Insulation test: When measured with 1000V megger, the insulation resistance shall not be less than 100 mega ohms.
 - d) Trip tests & protection gear test.
 - e) Continuity test

A-6.TECHNICAL SPECIFICATION FOR SOLAR POWER PLANT

Introduction

In grid-connected solar photo-voltaic (PV) systems, solar energy is fed into the building loads that are connected to the grid through a service connection with surplus energy being fed into the grid and shortfall being drawn from the grid. Production of surplus energy may happen when solar energy produced exceeds the energy consumption of the building. This surplus is fed into the grid. During the night, or when during the day energy demand in the building exceeds solar energy generation, energy is drawn from the grid. Grid-connected solar PV systems have no battery storage and will not work during grid outage. For buildings with grid-connected solar PV systems, the service connection meter needs to be of the bidirectional type, whereby import kWh and export kWh are separately recorded.

A grid-connected solar PV system consists of the solar panels, solar panel mounting structure, one or more solar grid inverters, protection devices, meters, interconnection cables and switches.

Components and parts used in solar PV systems should conform to the BIS or IEC or other international specifications, wherever such specifications are available and applicable.

Quality and Workmanship

Solar PV modules are designed to last long. It is therefore essential that all system components and parts, including the mounting structures, cables, junction boxes, distribution boxes and other parts also have a long life cycle. Therefore all works shall be undertaken with the highest levels of quality and workmanship. During inspection special attention will be given to neatness of work execution and conformity with quality and safety norms. Non-compliant works will have to be redone at the cost of the Installer.

A-7 Battery Charger with Batteries

Batteries:

The Battery shall be lead acid stationary type with Plane or Tubular positive plates 24 volts consisting of 12 cells of 2 V each, minimum 60 AH each with capacity @ 10 hours rate of discharge to and voltage of 1.85 volt per cell supplied complete with inter cell connectors acid level indication floats dry charger conforming to IS: 1651 double row two tier execution arranged in wooden stand and insulators with following accessories: -

- | | | |
|--|---|------|
| ➤ Syringe type hydrometer | - | 1 No |
| ➤ Spanner | - | 1 No |
| ➤ Acid resistive funnel | - | 1 No |
| ➤ Acid resistant jug of two pints capacity | - | 1 No |
| ➤ Rubber syringe | - | 1 No |
| ➤ Connectors from battery of charger | - | 1 No |
| ➤ Voltmeter (-3.0 to + 3 V) with lead | - | 1 No |

Electrolyte shall be filled as per manufactures instructions. Inter row connections shall be made with lead Charging discharging and recharging cycles of batteries shall be carried out under supervision of the Engineer in charge. Suitable device for discharging shall be provided by the contractor.

Battery Charger

The battery charger shall be natural air cooled, solid state type with full wave, fully controlled, bridge configuration. Charger shall be provided with automatic voltage regulation, current limiting circuitry, smoothing filter circuit and soft start feature. The voltage control shall be step less, smooth and continuous. It shall be self-protecting against all AC and DC transients and steady state abnormal current and voltages. The Charger AC input and DC output shall be electrically isolated from each other and also from panel ground. Isolation shall also be provided between power and control circuits. Self-contained battery charger with housing suitable for 24 volts minimum 60 AH with incoming supply 230 V AC floating supply voltage 2.18 V per cell. The Charger Panel shall be made of sheet metal of thickness not less than 2mm and shall conform to protection IP: 44. Switches, Meters and Relays, etc. shall be flush mounted on the front of the panel. The charger shall be designed for continuous output of 10 A complete with following accessories:

- AC input toggles switch with fuse.
- Pilot lamp to indicate AC mains ON
- Variac for step less DC output.
- Double wound impregnated naturally air cooled single phase transformer.
 - a) Ballast choke to give trickle charge.
 - b) Float cum boost charger.
- Single phase full wave bridge connected silicon rectified stack.
- Moving coil ammeter and voltmeter of Dc output.
- DC fuses.

A-8. TECHNICAL SPECIFICATION FOR CAPACITORS

Power factor correction capacitors shall conform in all respects to BS. The capacitors shall be suitable for 3 phase 500 V Hz and shall be available in units of 5 to 100 KVAR size to form a bank of capacitors of desired capacity. All these units shall be connected in parallel by means of solid aluminum bus bars of adequate current carrying capacity. Each capacitor bank shall be provided with a terminal chamber and cable gland suitable for PVC insulated aluminum conductor armoured cables. Two separate earthing terminals shall be provided for earth connection for each bank.

Capacitor of 500 V shall be suitably rated in series with 189 Hz Harmonic block reactor to offer requisite rating of 5 to 100 KVAR at 433 Volts. Capacitor so chosen shall be able to suppress the harmonics generated in the system due to various utilities viz. computers, drivers and four cent lamps etc and shall avoid resultant unbalancing of load.

The capacitor bank shall be subject to routine tests as specified in relevant Indian standards and the test certificate shall be furnished the capacitor shall be suitable for indoor use up to ambient temperature of + 50 & - 20 degree C. The permissible over loads shall be as given below:-

- a) Voltage overload shall be 10% for continuous operation and 15% for 6 hours in 24 hours cycle.
- b) Current overload 15% for continuous and 50% for 6 hours in 24 hours cycle.
- c) Overload 30% for continuous and 45% for 6 hours in 24 hour cycle.

The capacitor bank shall be floor mounting type. Capacitor shall be of aluminum foil and craft paper hermetically sealed in sturdy corrosion –proof sheet steel 2mm thick containers and impregnated with non-inflammable synthetic liquid. Every element of capacitor unit shall be provided with its own built in silvered fuse. Capacitor shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50V or less with in 1 minute after capacitor is connected from the source of supply. The loss factor of capacitor shall not exceed permissible value as per BS. The capacitors shall with stand voltage of 2500 V AC supply for 1 minute. Insulation resistance between capacitor terminals and containers when test voltage of 500V is applied shall not be less than 50M Ohms.

The capacitor control panel shall generally comprise the following:-

- i) Automatic power factor correction relay time relay.
- ii) Step controller with reversing motor.
- iii) Time delay and no volt relays.
- iv) Protection fuses.
- v) Contractor for individual capacitors of suitable rating.
- vi) Change over switch for either automatic operation of manual operation with push control.
- vii) CT's with ammeter and selector switch.
- viii) Voltmeter with selector switch.

Above shall be housed in sheet steel enclosure cubical type free standing front operated with lockable doors. The panel shall be fabricated from CRCA sheet steel of 1.6mm thick and shall be folded and braced as necessary to be provided a support for all components joints of any kind in sheet steel be seem welded. Panel shall have IP 42 or more protection and to be equipped with necessary heat dissipation arrangement. It

shall be totally enclosed design completely dust tight and vermin proof. Neoprene gaskets between all adjacent units and beneath all covers shall be used for the purpose.

A-9.TECHNICALSPECIFICATION FOR L.T CABELS

GENERAL

L.T. Cables shall be supplied, inspected, laid tested and commissioned in accordance with drawings, specifications, relevant Indian Standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written on the drums.

MATERIALS

The L.T. Power cables shall be XLPE insulated PVC sheathed type aluminum conductor armored cable conforming to IS : 7098 : 1988 (Part-I) with up to date amendments where as control cable shall be XLPE insulated and PVC sheathed copper conductor armored / unarmored cable conforming to IS:7098 (Part-I) 1988.

INSTALLATION OF CABLES

Cables shall be laid directly in ground, pipes, masonry ducts, on cable tray, surface of wall/ceiling etc. as indicated on drawings and/or as per the direction of Engineer-In-Charge. Cable laying shall be carried out as per CPWD specifications.

JOINTS IN CABLES

The Contractor shall take care to see that the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoiding of cable joints. This apportioning shall be got approved from Engineer-In-Charge before the cables are cut to lengths.

TESTING OF CABLES

Prior to installation, burying of cables, following tests shall be carried out. Insulation test between phases, phase & neutral, phase & earth for each length of cable.

- (a) Before laying.
- (b) After laying.
- (c) After Jointing

On completion of cable laying work, the following tests shall be conducted in the presence of the Engineer-In-Charge.

- a. Insulation Resistance Test (Sectional and overall).
- b. Continuity Resistance Test.
- c. Earth Test.

All tests shall be carried out in accordance with relevant Indian Standard code of practice and Indian Electricity Rules. The Contractor shall provide necessary instruments, equipments and labour for conducting the above tests & shall bear all expenses of conducting such tests.

A-10.TECHNICAL SPECIFICATION OF LIGHTING FIXTURES

Lighting Fixtures – General (Internal)

- Luminaries shall be supplied as per the design specified in the Schedule of Quantities. Luminaries shall be complete in all respects with basic mounting channel, connector block, internal wiring and decorative attachments, if any.
- All the LED's are Restriction of Hazardous Substance (ROHS) compliance
- All LED's fixture shall be compliance with LM79 & LM80 report and contractor will submit the report at the time when material brought at site.
- Three year warranty of all the LED light, fixture, driver etc. complete in all respect.
- The light fixtures shall be assembled and installed in position complete and ready for service in accordance with the detailed drawings, manufacturer's instructions and to the satisfaction of the Engineer In charge.

- All the materials used in the construction of luminaries shall be of such quality, design and construction that will provide adequate protection in normal use, against mechanical, electrical failure/faults and exposure to the risk of injury or electric shock & shall withstand the effect of exposure to atmosphere.
- Erection of fixtures shall include assembling of all components of the fixtures such as drivers, decorative attachments, etc.
- External and road light fittings shall be weather proof fittings of approved design so as to effectively prevent the admission of moisture. An insulating distance piece of moisture proof material shall be inserted between the lamp holder nipple and the fitting. Flexible cord conductors and cord grip lamp holders must not be used where exposed to weather.

FLOOD LIGHT FIXTURES (External)

- The flood light fixtures shall be of the totally enclosed weatherproof and dust proof type manufactured from aluminum alloy with a stove enameled finish having minimum rating of IP-65. The fixture shall give an asymmetric distribution to suit the installation and be complete with aluminum reflector, lamp holders, heat resisting glass and internal heat resistant wiring. The fixtures shall be equipped with:
 - a) LED Fixture
 - b) Aviation obstruction lights.
- All the LED's are Restriction of Hazardous Substance (ROHS) compliance
- All LED's fixture shall be compliance with LM79 & LM80 report and contractor will submit the report at the time when material brought at site.
- Three year warranty of all the LED light, fixture, driver etc. complete in all respect.
- Internal baffles to aviation standards shall be incorporated in the lanterns to screen light emission in unwanted directions. It shall also have the means to facilitate

horizontal and vertical adjustments and looking. Control gears for LED Light fixture shall be provided in remote weatherproof boxes.

- The obstruction light fixture shall be equipped with a Neon spiral lamp/LED fixture. In case the main one burns out another will work. All components shall be of cast aluminum alloy and yellow epoxy painted and suitably protected against corrosion and the lantern shall be waterproof. Intensity shall not be less than 3000 candela.

CABLE JOINTS

- Cable joints will not be permitted in straight runs of cable.
- Junction boxes shall be used for all tee offs as only two / three cables are permitted within or on any one pole.

EARTHING

- SWG GI earth wire shall be laid with the feeder cables. This GI wire shall be connected to the earth bar of the appropriate feeder pillar, and shall be bonded to each metal streetlight pole.
- Earth connections will be installed on terminal poles and as indicated on the drawings

JUNCTION BOXES

- Supply and install a totally weatherproof, outdoor with slanting top or inside the poles for outdoor uses, corrosion resistant cable joint junction box.
- Suitably rated block connectors (60 Amps) shall be used internally for all connections. Cables shall be made off using compression glands. Unused spouts shall be sealed with blanking plugs. The junction box must contain a 6 Amp 10 kA 'C' curve MCB mounted on DIN rail alongside 4# 60 Amps terminal blocks. Two earth studs suitable for connection of three 10 mm² cable lugs shall also be provided. A 2.5 mm² 3 core PVC/FRLS cable is to be used from the terminal box to the lamp. The openings shall be fitted with a steel cover retained by 1No lockable lock & key and with two nos. bolts.
- The out junction box shall be made out from 1.6mm thick CRCA sheet steel, duly painted with Epoxy primer & paint in approved shade, adequately sized for the number and size of cables to be terminated, mounting clamp fixing arrangement by providing 25x6mm MS strips on back of the Pole Box, two clamps with hardware for mounting of pole box on the pole.

CABLES & EXCAVATIONS

Cables and excavations shall be as specified elsewhere in the relevant specifications.

This section of the documents shall comprise of the supply and installation complete including earthing, testing and commissioning of Flood Lighting for parking areas and approach road through galvanized steel high masts with lowering lantern carriage and tubular poles with fixed luminaires all as specified and/or indicated on the drawings. The work shall generally be carried out in accordance with the CPWD Specifications.

The distribution boards for this section of the works shall be as specified in other sections of this specification.

Individual high mast shall have a dedicated earthing system.

The contractor shall submit for the engineer's approval full physical, mechanical and electrical details of the equipment he proposes to use prior to placement of order. Full details of concrete foundation for high mast columns as recommended by the manufactures shall also be submitted for approval.

All concrete foundation shall be provided by others, under a civil engineering contract unless, specified otherwise. The contractor shall be required to provide the civil engineering contractor with the approved details of masts foundation, foundation bolts, template and associated installation instructions together with accurate mast locations and cable sleeve requirements plus the sleeves required inclusive bends and boxes.

SUPPLY SYSTEM

The supply system for the external lighting installation will be 415/220 V, 3 –phase, 4-wire 50 HZ with neutral solidly earthed. The main distribution panel feeding external lighting supply from the Electric Sub Station shall be fed to the feeder pillars located near the load centers to minimize the voltage drop and for even distribution. The feeder pillars shall be rain and dust proof and suitable for operation in humid atmosphere. They shall be made of at least 2.0 mm sheet steel having hinged lockable doors. They shall have pedestals of suitable height which are grounded on concrete foundation raised above the ground level by 300 mm. Feeder pillars shall be painted with one coat of water proof paint and two finished coat of spray stove enamel paint of Grey colour. Feeder pillars shall be complete with cable boxes, glands, and clamps, for incomer and outgoing cables. All cables entries shall be from below. All switchgears shall be as per BOQ. Incomer shall be a MCCB. All openings in the feeder pillar and distribution boards etc. shall be vermin and rodent proof. The operation of all external lighting shall be actuated through photosensitive switches capable of setting at a predetermined level.

General illumination requirements

- General illumination requirements on the road network and parking areas shall be 15 lux and shall be achieved with LED light fixture lamps.
- A minimum average of 15 lux vertical luminance in relevant directions.
- Each high mast shall be provided with lightning protection to comply with relevant Indian Standards including providing an earth station adjacent to each mast with an inspection chamber etc.
- Each high mast shall also be provided with a twin obstruction light mounted on an up stand fixed to the lantern carriage.
- Important: Power supply to mast and aviation obstruction lighting lamps shall be actuated through photocell in a manner that even if mast lighting is switched off manually, power to obstruction lights would remain on, so that they could be activated during dark.

High Masts

- The high mast shall be continuously tapered presenting a good visual appearance. The high mast shall be designed confirming to IS: 875 for 47 m/s wind speed. Design shall be such that oscillations caused on account of wind speed are damped as far as possible and an adequate allowance is made for the stress due to these oscillations. Full calculations on the design shall be made available by the manufacture. Masts shall be constructed from mild steel plates cut and folded to form a multi sided polygonal section, telescope jointed. Steel used for the construction shall comply with INDIAN STANDARDS of appropriate grade. Welding shall be of the best possible quality and in accordance with standards. A door opening of adequate size in the base of each mast shall be provided to permit clear access to equipment mounted therein complete with a close fitting vandal resistant weatherproof lockable door.
- The base flange shall be free from lamination and welded to the mast the connection shall develop fully the strength of the section. Supplementary gussets shall also be provided between bolt holes.
- A cable entry of not less than 25 cm. diameter shall be provided centrally in each base plate to coincide with the cable duct in the mast foundation. Any space left between the underside of the mast base plate and the top of the foundation shall be dry packed with cement mortar.
- Masts shall be delivered to site in manageable section and joined onsite. The manufacture shall supply detailed instruction relating to site assembly. Bolted connections shall not be permitted.
- Holding down bolts shall be supplied complete with anchor plates for casting into the foundation. They shall be guaranteed performance medium tensile steel bolts. A precision made steel template with tubed holes to ensure correct vertical and horizontal bolt alignment shall also be provided. The entire mast shall be hot dip galvanized internally and externally in accordance with IS specification unless manufactured from intrinsically non-corrosive steel.
- For installation and maintenance purposes it shall be possible to raise or lower the lantern carriage using a double drum winch in the base of mast.
- The steel wire rope supporting the canteen carriage shall be in tension at all times. The top pulley assembly shall be of large diameter, pulleys appropriate to the multicore flexible cable being used. Sufficient pulleys shall be provided to cater for the requisite number of riser cables as well as steel wire ropes. They shall be of non-corrodible material and shall run on self-lubricating bearing with stainless steel axles. Arrangement shall exist to ensure that the electric cables and steel wire ropes are separated before passing over their respective pulleys and close fitting guides shall protect the pulleys to prevent ropes and cables leaving the pulleys grooves. The pulley shall be housed in a chassis integral with a sleeve which slips over the top of the mast and is secured axially and in azimuth. Guides and stops shall be provided for docking the lantern carriage and an anchor point shall be securely welded to the assembly to receive the safety maintenance equipment. Chassis assembly shall also be hot dip galvanized and shall be covered by an approved weather proof cover.

- Winches of the double drum type shall be worm driven with a gear ratio of not less than 50:1. Winches shall be self-lubricating by means of an oil bath. At least four turns of rope shall remain on the drum when the lantern carriage is fully lowered. Dimensions of the winch shall be such to enable its installation or removal through the door opening. Winch drums shall be grooved to ensure a tidy rope lay. A test certificate issued by an independent laboratory shall be supplied with each winch. The capacity and operating speed of the winch shall be clearly marked on each winch on an indelible label together with the specification of the recommended lubricant. The winch shall be capable of operation by hand or by means of a power tool. The driving spindle shall be positively locked when not in use by automatic means.
- Steel wire ropes shall be flexible stainless steel of at least 7/19 size/construction. Thimble and terminals shall be of compatible material. The winch drive portable power tool shall be multi-speed reversible tool incorporating a torque limiting device which can be readily adjusted and locked. A remote control switch shall be incorporated to allow the equipment to be operated from a distance of 5 meters. Suitable arrangement shall be made to support the power tool accurately and securely during operation. The power tool shall be radio suppressed. Handless shall provide for hand operating the winches and they shall incorporate a torque limiter which can be readily adjusted and locked. A limit switch shall be provided adjacent to the winch to cut off the supply to the operating tool when the lantern carriage is approximately 30 cm from the locked position. Winch shall also be capable of manual operation over the whole raising and lowering cycle if necessary.
- The lantern carriage shall be of durable steel construction fitted with lantern and lamp control gear fixing and junction box mounting plates. It shall be in two halves jointed by bolted flanges to permit removal from the erected mast. It shall incorporate arrangements to prevent damage to the galvanized finish of the mast and such arrangements shall preferably not require rollers or other moving parts. It should be capable of carrying load not less than 215 kgs.
- Junction boxes of heavy duty weather proof type shall be provided and positioned on lantern carriages each to accommodate the termination of a multi-core flexible supply cable riser. Each junction box shall contain adequate live, neutral and earth terminals to facilitate outgoing final wiring connections to a maximum of three fixtures per phase or to obstruction lights. The load shall be properly balanced. The junction boxes shall be provided with MCB/HRC fuses for protection of each fixture. The metal work of all fixtures, carriage and control gear shall be efficiently earthed by means of separate earth conductors. The wiring of the lanterns and associated control gear shall be carried out with multi-core copper flexible 600 V grade high temperature insulated and sheathed cable of 6 mm² size. Each multi-core cable shall terminate in the base compartment with a metal cased multi-pin plug and socket coupler fitted with a guard ring and at the mast head at terminals provided in the junction boxes via nylon glands. Two sets of extension leads shall be provided to facilitate testing equipment when the carriage has been lowered. The base compartment shall house switches, cable terminal boxes and other related equipment. A 12 mm diameter stainless steel stud shall be attached to the mast structure within the base compartment to provide a lightning and cable earthing point.

- The mast shall be fitted with lightening protection comprising an air terminal at the mast head, hard drawn down tape or conductor bonded to each section of the mast and test link, all efficiently bonded to an adjacent earthing station.

B. SPECIAL CONDITIONS & GENERAL TECHNICAL SPECIFICATION FOR CCTV, TELEPHONE, LAN SYSTEM, FIRE ALARM AND PUBLIC ADDRESS SYSTEM

1. SCOPE

In general, the contractor shall supply, store, erect, test and commission all the equipment required. The Contractor shall furnish all the materials, labour, tools and equipments for the CCTV, Telephone, Lan System, Fire Alarm and Public Address system Work, as shown in the accompanying drawings and in the bill of quantities and specifications hereinafter described.

2. WORKING AGENCIES

The Contractor shall deploy specialized working agencies as mentioned in approved list of makes.

3. INSPECTION & APPROVAL OF THE WORK BY LOCAL AUTHORITY

On completion of this work, the contractor shall obtain and deliver to the owners the certificates of inspection and approval by officer of local Authority / Administration. The contractor shall include in his rates all charges necessary for getting approval. Any / all statutory clearances & approvals required for commencement of CCTV, Telephone, Lan System, Fire Alarm and Public Address system work must be provide by agency itself. The quoted rates are deemed to be inclusive of any / all the charges in this respect and nothing extra will be payable on this account.

4. DRAWINGS

The drawings, specifications and bills of quantities shall be considered as a part of this contract and any work or materials shown on the drawings and not called for in the specifications or vice-versa, shall be executed as if specifically called for in both. The work shall be executed as per approved working drawings, subject to any minor changes, if found essential to co-ordinate installation of this work with other trades. All such changes shall be without any additional major cost to the owners. The data given in the documents and drawings are approximate & their complete accuracy is not guaranteed. The drawings and data furnished are meant for guidance & assistance to the contractor. The exact dimension, location, distance and levels etc. will be governed by the space conditions.

5. WORKING DRAWINGS & SHOP DRAWINGS

The contractor shall prepare and submit two copies tracing print and three set of blue print with soft copy to the CONSULTANT / owners for approval detailed working drawings.

6. AS BUILT DRAWINGS

After the completion of work and before issuance of certificate of virtual completion, the

contractor shall submit to the CONSULTANT / employers layout drawings drawn on tracing sheet & 5 sets of blue print and approved scale indicating the complete installation along with soft copies on C.D. 's (5 Sets)

7. INSPECTION OF MATERIALS

The CONSULTANT / owners shall have access to the manufacture's premises for inspection of any items of the tender for which contractor has made arrangement with manufacture / suppliers. All such inspection shall not need any prior intimation by the owners or architects.

The contractor shall make all facilities and expenditure for two persons of tours & travels by air, stay and local journey by taxi for inspection of material at manufacturer/site premises as per their entitlement of CONSULTANT/Client representative. The contractor shall include all expenditure towards inspection for two persons in their rates. All the testing facilities, Tools and Tackles and all the consumables including the fuel etc. shall be provided by the contractor and nothing extra shall be paid on this account.

8. TESTING AT MANUFACTURER WORKS:

The SYSTEM shall be tested as per the direction of Engineer-in-charge. All the necessary consumable will be borne by the contractor. The necessary statutory testing has to be carried at manufacturer's premises before dispatch.

9. FIRE FIGHTING ARRANGEMENTS

The Contractor shall at his own expenses provide at suitable, prominent and easily accessible places requisite number of fire extinguishers and buckets some filled with sand and some with water.

10. CONTROL AND MONITORING

For execution, control and monitoring of work and as well as for performing routine field tests of construction material such as coarse aggregate, fine aggregate, cement, bricks, concrete etc. the Contractor shall have to set up a lab for required tests at site and the costs are to be covered within the rates quoted by him and no separate charges for the same will be paid. For field tests the contractor must have the following equipments in the lab at site and a qualified experienced lab technician to be deputed to conduct the tests: -

- a: A set of standard sieves. (For Coarse and fine aggregates)
- b: Measuring Cylinders.
- c: Slump Cones.
- d: Adequate number of standard moulds (15 cm cubes)
- e: A.I.V. Machine
- f: Weighing balance
- g: Slide Caliber and screws gauge
- h: Compression Testing Machine
- i: Oven / hot plate

Any other apparatus if deemed necessary and called for by the Architect/Consultant shall also be provided by the Contractor at his own expense.

Materials should be tested in the field in presence of Architects/Employer's representatives. In addition to that, the contractors shall get the materials tested in local Govt. Labs or Labs approved by Architect / Consultant at his / their own cost and the results should be preserved carefully & attached with the respective running bills.

B-1. TECHNICAL SPECIFICATIONS FOR FIRE ALARM SYSTEM

GENERAL DESCRIPTION

- a) Provide Fire Detection and Alarm System in accordance with NFPA 72 (Latest edition) and requirements of the Contract Documents. Provide a complete operable and intelligent analog addressable Fire Alarm and Detection System with associated communication and notification systems. The system shall include interfaces for foreign systems, as described herein and in accordance with the Contract Documents, and all applicable Codes, Standards and local Regulations, and be approved by Fire Services.
- b) All Plant furnished shall be new and the latest state-of-the-art, products of a single Manufacturer engaged in the manufacturing of analog fire detection devices for at least 5 years.
- c) All software licenses shall be supplied as part of the contract. Renewable & subscription license are not acceptable.
- d) The system shall be supplied, installed, tested, and approved by the local Authority Having Jurisdiction, and turned over to the Contractor in an operational condition.
- e) The subcontractor shall contract with a single supplier for the fire alarm Plant, engineering, programming, inspection and tests, and shall provide a "UL Listing Certificate" for the complete system.
- f) Drawings: The Drawings shall serve to indicate the general arrangement of the various Plant and their generic functional interconnections. However, layout of Plant, accessories, specialties, conduit system and wiring, are diagrammatic and do not necessarily indicate every required device, fitting, etc., required for the complete installation.

SCOPE:

A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

Basic Performance:

Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 6 (Class A) Signaling Line Circuits (SLC).

Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.

Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.

On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating

power or the ability to report an alarm.

Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone whichever is greater.

Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.

NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.

Two-way telephone communication circuits shall be supervised for open and short circuit conditions.

DRAWINGS & TECHNICAL SUBMITTALS

General:

Two copies of all submittals shall be submitted to the Architect/Engineer for review.

All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

Shop Drawings:

Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

Show annunciator layout, configurations, and terminations.

Manuals:

Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

Software Modifications

Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

WARRANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

National Fire Protection Association (NFPA) - USA:

NFPA 13	Sprinkler Systems
NFPA 16	Foam/Water Deluge and Spray Systems
NFPA 17	Dry Chemical Extinguishing Systems
NFPA 17A	Wet Chemical Extinguishing Systems
NFPA 2001	Clean Agent Extinguishing Systems
NFPA 72	National Fire Alarm Code
NFPA 76	Telecommunication Facilities
NFPA 318	Clean Room Applications
NFPA 101	Life Safety Code
NFPA 90A	Air conditioning & ventilation system

Underwriters Laboratories Inc. (UL) - USA:

- UL 268 Smoke Detectors for Fire Protective Signaling Systems
- UL 864 Control Units for Fire Protective Signaling Systems 9th Edition Listed
- UL 268A Smoke Detectors for Duct Applications
- UL 521 Heat Detectors for Fire Protective Signaling Systems
- UL 464 Audible Signaling Appliances
- UL 38 Manually Actuated Signaling Boxes
- UL 346 Waterflow Indicators for Fire Protective Signaling Systems
- UL 1971 Visual Notification Appliances
- UL 228 Door Holders

NATIONAL BUILDING CODES

IS CODES

The Video Display Terminal (VDT) shall comply with Swedish magnetic emission and X-radiation guidelines MPR 1990:10.

APPROVALS:

The system shall have proper listing and/or approval from the following nationally recognized agencies :UL Underwriters Laboratories Inc (9th Edition)

The fire alarm control panel shall meet UL Standard 864 9th Edition (Control Units)
The system shall be listed by the national agencies as suitable for extinguishing release applications. The system shall support release of high and low pressure CO2.

PRODUCTS

EQUIPMENT AND MATERIAL, GENERAL:

All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

CONDUIT AND WIRE:

Conduit:

Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.

Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.

Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.

Conduit shall be 3/4-inch (19.1 mm) minimum.

Wire:

All fire alarm system wiring shall be new.

Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.

All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE:

The main FACP Central Console shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, panel modules including initiating circuits, control circuits, and notification appliance circuits, local and remote operator terminals, printers, annunciators, and other system controlled devices.

1. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:
 - a. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
 - b. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to monitor and control modules.
 - c. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.
 - d. Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.
2. When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
 - a. The system alarm LED shall flash.
 - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.

- c. The 640-character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
 - e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
3. When a trouble condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
 - a. The system trouble LED shall flash.
 - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
 - c. The 640-character backlit LCD display shall indicate all information associated with the trouble condition, including the type of trouble point and its location within the protected premises.
 - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
 - e. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (trouble notification appliances and/or relays) shall be activated.
4. When a supervisory condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
 - a. The system trouble LED shall flash.
 - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
 - c. The 640-character backlit LCD display shall indicate all information associated with the supervisory condition, including the type of trouble point and its location within the protected premises.
 - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
 - e. All system outputs assigned via preprogrammed equations for a particular point in trouble shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.
5. When a security alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

- a. The system security LED shall flash.
 - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
 - c. The 640-character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
 - e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
6. When a pre-alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
- a. The system pre-alarm LED shall flash.
 - b. A local piezo-electric audible device in the control panel shall sound a distinctive signal.
 - c. The 640-character backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 - d. Printing and history storage equipment shall log and print the event information along with a time and date stamp.
 - e. All system outputs assigned via preprogrammed equations for a particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

Operator Control

Acknowledge Switch:

Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition. In addition, the FACP shall support Block Acknowledge to allow multiple trouble conditions to be acknowledged with a single depression of this switch.

Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

Signal Silence Switch:

Depression of the Signal Silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition. The selection of notification circuits

and relays that are silence able by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

Drill Switch:

Depression of the Drill switch shall activate all programmed notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

System Reset Switch:

Depression of the System Reset switch shall cause all electronically latched initiating devices to return to their normal condition. Initiating devices shall re-report if active. Active notification appliance circuits shall not silence upon Reset. Systems that de-activate and subsequently re-activate notification appliance circuits shall not be considered equal. All programmed Control-By-Event equations shall be re-evaluated after the reset sequence is complete if the initiating condition has cleared. Non-latching trouble conditions shall not clear and re-report upon reset.

Lamp Test:

The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

Scroll Display Keys:

There shall be Scroll Display keys for FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. Depression of the Scroll Display key shall display the next event in the selected queue allowing the operator to view events by type.

Print Screen:

Depression of the PRINT SCREEN switch shall send the information currently displayed on the 640-character display to the printer.

System Capacity and General Operation

- 1) The control panel shall be capable of expansion via up to 10 SLC modules. Each module shall support a maximum of 318 analog/addressable devices for a maximum system capacity of 3180 points. The system shall be capable of 3072 annunciation points per system regardless of the number of addressable devices.
- 2) The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 6 inch or 640-character liquid crystal display, individual, color coded system status LEDs, and a QWERTY style alphanumeric keypad for the field programming and control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either the owner or installing company.
- 3) All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.

The FACP shall be able to provide the following software and hardware features:

- a) Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.
- b) Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.
- c) Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
- d) Action: If programmed for action, and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounders installed will automatically activate with general evacuation on alarm level.
- e) The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
- f) Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
- g) NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meet the requirements of NFPA 72.

- h) Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.
- i) On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop.
- j) History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.
- k) Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.
- l) The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
- m) Drill: The system shall support means to activate all silenceable fire output circuits in the event of a practice evacuation or "drill". If enabled for local control, the front panel switch shall be held for a minimum of 2 seconds prior to activating the drill function
- n) Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
- o) Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions
- p) Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
- q) Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
- r) Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
- s) Print Functions: The system shall provide means to obtain a variety of reports listing all event, alarm, trouble, supervisory, or security history. Additional reports

shall be available for point activation for the last Walk Test performed, detector maintenance report containing the detector maintenance status of each installed addressable detector, all network parameters, all panel settings including broad cast time, event ordering, and block acknowledge, panel timer values for Auto Silence, Silence Inhibit, AC Fail Delay time and if enabled, Proprietary Reminder, and Remote Reminder timers, supervision settings for power supply and printers, all programmed logic equations, all custom action messages, all non-fire and output activations (if pre-programmed for logging) all active points filtered by alarms only, troubles only, supervisory alarms, prealarms, disabled points and activated points, all installed points filtered by SLC points, panel circuits, logic zones, annunciators, releasing zones, spal zones, and trouble zones.

- t) Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
- u) Resound based on type for security or supervisory: The system shall indicate a Security alarm when a monitor module point programmed with a security Type Code activates. If silenced alarms exist, a Security alarm will resound the panel sounder. The system shall indicate a Supervisory alarm when a monitor module point programmed with a supervisory Type Code activates. If there are silenced alarms, a Supervisory alarm will resound the panel sounder.
- v) Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.
- w) Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen. Graphic shall display when all systems are normal.
- x) Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector to up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result or product of all cooperating detectors chamber readings.
- y) Tracking/Latching Duct : The system shall support both tracking and latching duct detectors.
- z) ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.

- aa) NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.
- bb) Security Monitor Points: The system shall provide means to monitor any point as a type security.
- cc) One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.
- dd) Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.
- ee) Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.
- ff) 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.
- gg) 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.
- hh) 10 trouble equations per device: The system shall provide support for up to 10 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.
- ii) Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit

activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.

- jj) Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone with four abort options to satisfy any local jurisdiction requirements.
- kk) Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector or indicating panel module input. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

Central Processing Unit

- 1) The Central Processing Unit shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the Central Processing Unit.
- 2) The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
- 3) The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
- 4) The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
- 5) Consistent with UL864 standards, the CPU and associated equipment are to be protected so that voltage surges or line transients will not affect them.
- 6) Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The transmission scheme used shall employ dual transmission or other equivalent error checking techniques.
- 7) The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
- 8) The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.

- 9) The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.
- 10) The CPU shall provide one high-speed serial connection for support of network communication modules.
- 11) The CPU shall provide double pole relays for FIRE ALARM, SYSTEM TROUBLE, SUPERVISORY, and SECURITY. The SUPERVISORY and SECURITY relays shall provide selection for additional FIRE ALARM contacts.

Display

- 1) The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters
- 2) The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
- 3) The system display shall provide a 6 inch or 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide ten Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, and CPU FAILURE.
- 4) The system display shall provide a QWERTY style keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.
- 5) The system display shall include the following operator control switches: ACKNOWLEDGE, SIGNAL SILENCE, RESET, DRILL, and LAMP TEST. Additionally, the display interface shall allow scrolling of events by event type including, FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. A PRINT SCREEN button shall be provided for printing the event currently displayed on the 640-character LCD.

Loop (Signaling Line Circuit) Control Module:

- 1) The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices and additional capacity for Loop Cable Isolators. This includes 159 intelligent detectors, 159 monitor or control modules
- 2) The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
- 3) The Loop Control Module shall provide power and communicate with all intelligent addressable detectors and modules on a single pair of wires. This SLC Loop shall be capable of operating as a NFPA Style 6 (Class B) circuit.

- 4) The SLC interface board shall be able to drive an NFPA Style 6 twisted shielded circuit up to 12,500 feet in length. The SLC Interface shall also be capable of driving an NFPA Style 6, no twist, no shield circuit up to 3,000 feet in length. In addition, SLC wiring shall meet the listing requirements for it to exit the building or structure. "T"-tapping shall be allowed in either case.
- 5) The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

Enclosures:

- 1) The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
- 2) The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
- 3) The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left hand hinging.
- 4) The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

Power Supply:

- 1) The Addressable Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
- 2) The Addressable Main Power Supply shall provide sufficient power to the CPU, using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.
- 3) The Addressable Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 25-200 amp-hours within a 48-hour period.
- 4) The Addressable Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
- 5) The Addressable Main Power Supply shall be power-limited per 1995 UL864 requirements.

Digital Voice Command Center

- 1) The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.
- 2) Function: The Voice Command Center equipment shall perform the following functions:
 - a) Operate as a supervised multi-channel emergency voice communication system.
 - b) Operate as a two-way emergency telephone system control center.
 - c) Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
 - d) Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
 - e) Provide all-call Emergency Paging activities through activation of a single control switch.
 - f) As required, provide vectored paging control to specific audio zones via dedicated control switches.
 - g) Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.
 - h) Provide a software utility capable of off-line programming for the VCC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the VCC shall not inhibit the emergency operation of other nodes on the fire alarm network.
 - i) Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SCL controlled switching.
 - j) The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.
 - k) The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

Addressable Digital Audio Amplifiers

- 1) The Digital Audio Amplifiers will provide Audio Power for distribution to speaker circuits.
- 2) Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).
- 3) The audio amplifier shall include an integral power supply, and shall provide built-in LED indicators for the following conditions:
- 4) The audio amplifier shall provide the following built-in controls:
 - Amplifier Address Selection Switches
 - Signal Silence of communication loss annunciation Reset

- Level adjustment for background music
 - Enable/Disable for Earth Fault detection
 - Enable/Disable for Earth Fault detection
 - Switch for 2-wire/4-wire FFT riser
- 5) Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
 - 6) Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).
 - 7) System shall be capable of backing up digital amplifiers.

Audio Message Generator (Prerecorded Voice)/Speaker Control:

- 1) Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.
- 2) Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.
- 3) A built-in microphone shall be provided to allow paging through speaker circuits.
- 4) System paging from emergency telephone circuits shall be supported.
- 5) The audio message generator shall have the following indicators and controls to allow for proper operator understanding and control:

Controls with associated LED Indicators:

- 1) Speaker Switches/Indicators
 - a. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
 - b. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.
- 2) Emergency Two-Way Telephone Control Switches/Indicators
 - a. The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.
 - b. The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

Remote Transmissions:

- 1) Provide local energy or polarity reversal or trip circuits as required.
- 2) The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.
- 3) Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.

- 4) Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

Auxiliary Addressable Power Supply

- 1) The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24VDC power. The power supply shall also include and charge backup batteries.
- 2) The addressable power supply for the fire alarm system shall provide up a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 5 amps of 24 volt DC general power. The power supply shall have an additional .5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 7.0 - 25.0 amp hour batteries.
- 3) The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as two Class "A" and two Class "B" or four Class "B" only circuits. All circuits shall be power-limited per UL 864 requirements.
- 4) The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
- 5) The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
- 6) The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means. Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire.
- 7) The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
- 8) The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of eight or sixteen hours shall be Dip-switch selected.
- 9) The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be Dip-switch selectable.
- 10) The addressable power supply mounts in either the FACP back box or it's own dedicated surface mounted back box with cover.

- 11) Each of the power supply's four output circuits shall be DIP-switch selected for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
- 12) The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of an end-of-line resistor. When the power supply's output circuit is selected as General 24VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
- 13) When selected for Notification Appliance Circuits, the output circuits shall be individually DIP-switch selectable for Steady, March Time, Dual Stage or Temporal.
- 14) When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
- 15) The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
- 16) An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

System Circuit Supervision:

- 1) The FACP shall supervise all circuits to intelligent devices, annunciators and conventional peripherals and annunciate loss of communications with these devices. The CPU shall continuously scan above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate that device or devices are not responding and print the information in the history buffer and on a printer.
- 2) Sprinkler system valves, standpipe control valves, PIV and main gate valves shall be supervised for off-normal position.

Field Wiring Terminal Blocks:

- 1) All wiring terminal blocks shall be the plug-in/removable type and shall be capable of terminating up to 12 AWG wire. Terminal blocks that are permanently fixed to the PC board are not acceptable..

Field Programming

- a) The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.
- b) It shall be possible to program through the standard FACP keyboard all system functions.
- c) All field defined programs shall be stored in non-volatile memory.

- d) Two levels of password protection shall be provided in addition to a key-lock cabinet. One level shall be used for status level changes such as point/zone disable or manual on/off commands (Building Manager). A second (higher-level) shall be used for actual change of the life safety program (installer). These passwords shall be five (5) digits at a minimum. Upon entry of an invalid password for the third time within a one minute time period an encrypted number shall be displayed. This number can be used as a reference for determining a forgotten password.
- e) The system programming shall be "backed" up on a 3.5" floppy diskette utilizing an upload/download program. This system back-up disk shall be completed and given in duplicate to the building owner and/or operator upon completion of the final inspection. The program that performs this function shall be "non-proprietary", in that, it shall be possible to forward it to the building owner/operator upon his or her request.

The installer's field programming and hardware shall be functionally tested on a computer against known parameters/norms which are established by the FACP manufacturer. A software program shall test Input-to-Output correlations, device Type ID associations, point associations, time equations, etc. This test shall be performed on an IBM-compatible PC with a verification software package. A report shall be generated of the test results and two copies turned in to the engineer(s) on record.

It shall be the responsibility of the equipment supplier /installer to ensure that all equipment supplied will fit in locations designated on plans and in the specifications.

Specific System Operations

- a) Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the system keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window.
- b) Alarm Verification: Each of the Intelligent Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system or anytime after system turn-on. Alarm verification shall not require any additional hardware to be added to the control panel. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
- c) System Point Operations:
 - 1.0 Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
 - 1.1 System output points shall be capable of being turned on or off from the system keypad or the video terminal.

- d) Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:
- a. Device Status.
 - b. Device Type.
 - c. Custom Device Label.
 - d. Software Zone Label.
 - e. Device Zone Assignments.
 - f. Analog Detector Sensitivity.
 - g. All Program Parameters.
- e) System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system statuses:
- f) System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed, one event at a time, and the actual number of activations may also be displayed and or printed
- g) The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.
- h) Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
- i) If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
- j) The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

Network Repeater Panel

A NRP shall be provided to display all system intelligent points. The NRP shall be capable of displaying all information for all 200,000 possible points on the network. Network display devices, which are only capable of displaying a subset of network points, shall not be suitable substitutes.

The NRP shall include a minimum of 6 inch or 640 characters, backlit by a long life, solid state LCD display. It shall also include a full QWERTY style keypad with tactile feel. Additionally, the network display shall include ten soft-keys for screen navigation and the ability to scroll events by type. i.e. Fire Alarm, Supervisory Alarm, Trouble, etc.

The network control annunciator shall have the ability to display up to eight events in order

of priority and time of occurrence. Counters shall be provided to indicate the total number of events by type.

The NRP shall mount in any of the network node fire alarm control panels. Optionally, the network display may mount in a backbox designed for this use. The network shall support a minimum of 103 network control annunciators (not to exceed total node capacity) and shall connect to the network over either a wire or fiber interface.

The network control annunciator shall have an event history buffer capable of storing a minimum of 1000 events in non-volatile memory. Additionally, the NRP shall have a fire alarm history buffer capable of storing a minimum of 200 events in non-volatile memory. Systems that do not protect fire alarm events from being overwritten by other events are not suitable substitutes.

The NRP shall include two optically isolated, 9600 baud, industry standard EIA-232 ports for UL864 listed printers and CRT's. These peripheral devices shall print or display network activity.

The network control annunciator shall include control switches for system wide control of Acknowledge, Signal Silence, System Reset, Drill, and local Lamp Test. A mechanical means by which the controls switches are "locked out", such as a key, shall be available.

The NRP shall include long life LEDs to display Power, Fire Alarm, Pre-Alarm, Security Alarm, System Trouble, Supervisory, Signals Silenced, Disabled Points, Other (non-fire) Events, and CPU Failure.

The network control annunciator shall include a Master password and up to nine User passwords. Each password shall be up to eight alpha-numeric characters in length. The Master password shall be authorized to access the programming and alter status menus. Each User password may have different levels of authorization assigned by the Master password.

The NRP shall allow editing of labels for all points within the network; control on/off of outputs; enable/disable of all network points; alter detector sensitivity; clear detector verification counters for any analog addressable detector within the network; clear any history log within the network; change the Time/Date settings; initiate a Walk Test.

The network control annunciator shall support an optional Windows™ based program utility. This utility shall allow the user create an NRP database, upload/download an NRP database, and download an upgrade to the NRP executive. To ensure program validity, this utility shall check stored databases for errors. A compare function shall be included to identify differences between databases.

For time keeping purposes the NRP shall include a time of day clock.

Each NCA shall support up to 32 additional 80 character remote display annunciators for displaying network activity. These "Terminal Mode" displays will mimic the activity appearing on the corresponding NRP.

Network Control Station

1.1 SCOPE

- A. A PC based graphical facilities monitoring system shall be installed in accordance to the project specifications and drawings.
- B. The PC based graphical facilities monitoring system shall include, but not be limited to, one or more PC based graphical workstations, all input/output devices, network communications media, control equipment, auxiliary control devices, power supplies, and wire / fiber optic media as shown on the drawings and specified herein.
- C. A supervised interface to fire alarm control panels shall be made available.
- D. The system shall employ an advanced technology network to monitor and control various fire, security, and CCTV and other facility information over a LAN Works network.
- E. The system shall include an interface to digital alarm communicator receivers for wide area network monitoring.
- F. The system shall allow a mixture of different technologies and manufacturers' equipment to operate on the same network and provide the operator with a consistent look and operation for all monitored equipment.
- G. The system shall support a variety of topologies and media and shall provide an industry standard open architecture transport layer protocol.
- H. Using standard RS 232 ports on existing and future monitoring and control systems used by the facility, the system shall connect to and interpret status change data transmitted from the ports and provide graphic annunciation, control, history logging and reporting as specified herein.
- I. Proprietary network systems that cannot interface to existing addressable fire alarm systems at the facility or systems requiring the use of a "dry contact" or "voltage monitoring" interface shall not be accepted.
- J. The system shall be electrically supervised and monitor the integrity of all conductors.

1.2 Smart Facility Manager Capable of transforming fire panel data into relevant & intuitive information with ease of accessibility.(If required for maintenance purpose third year onwards)

- Designed on IOT framework
- Should be capable of transmitting intelligent information using smart hardware & software integration.
- Supports Seamless Integration with Fire Panel/s
- Application should support cloud based (SaaS) Technology for any-time any-where access.
- User-friendly Web based GUI & Mobile App interface for ease of accessibility.

- Capable of communicating critical alerts as E-mail/SMS/App notification
- Support Multi-mode communication over wired & wireless protocols
- System capable of drawing powerful analytics from core component to the detector level
- Enable easy and secure data collection
- Remote monitoring and analyses of fire panel data
- Intelligent reporting functionality
- Automatic diagnostic alerts as App notification

Comprehensive Dashboard capabilities

- Real time view of fire system effectiveness
- Supports Multi-location unified view using App or web based login
- Proactive system based alerts to Identify potential fire safety risks
- System level information to help perform predictive maintenance
- Maintain & Optimize device inventory
- Analyse system performance & uptime

Generate actionable insightful information

- ✓ Fault Handling Report
 - Effective measurement of turnaround time (TAT) of various issues.
 - Capable of drawing detailed report at individual fault level.
- ✓ Testing Report
 - Detail testing report for all the testing activities performed during the maintenance cycle.
- ✓ Device Replacement Report
 - Proactive alerts along with active insights on the faulty devices & detectors which need attention or replacement helping customers save time and reducing fire risk.
- ✓ Device Contamination Report
 - Real time statistics of device contamination showing dirt levels along with detector efficiency
- ✓ Panel & System Report
 - List of panel faults with trouble date and time stamped, beyond the panel memory of 5000 events can store upto 100,000 events

- ✓ Custom Report
 - Create customized report on the go with selection of multiple parameters from detector, fire panel & time
- ✓ 24/7 login based remote monitoring capability & readiness
- ✓ Audit & Compliance
 - Demonstrate compliance to industry standards with digital reports.
 - Digital reporting to mitigate human-error
- ✓ Data Security & reduced risk
 - Proven experience of secure connectivity with facilities around the globe using cloud-based technologies
 - Solution should be compliant with global standards & practise for Cloud & SAAS.
 - Capable of early identification of issues, reducing risk and promoting business continuity
- ✓ Accurate & efficient maintenance
 - Capable of Pin-pointing issues & uncover abnormalities faster
 - Analytics to help optimise system performance
- ✓ Resource optimisation
 - Empower facility manager to make smarter decisions on where to dedicate time & deploy resources
- ✓ Capable of real-time intelligent aggregation of data from multiple panels with a holistic view, across multiple buildings, multiple floors, multiple fire panels

Cloud Platform compliances

- CDSA – CPS
- CSA CCM
- ISO/IEC 27001
- PCI DSS
- AICPA SOC 1 / SOC 2 / SOC 3
- ISO/IEC 27017/27018
- ISO 22301
- iDA - MTCS

1.3 WORKSTATION

- A. The system shall be a Facilities Monitoring System.

- B. The system shall operate on an UL listed Intel Pentium III processor operating at no less than 800 MHz on the Microsoft® Windows® XP Professional platform.
- C. The workstation shall have: no less than 256 megabytes of RAM, a hard drive with no less than 20 Gigabytes of storage space, a minimum of 8 megabytes of video RAM, a CD-R/W for system backup, internal supervisory CPU watchdog board with audible annunciator, 100 Base-T Ethernet NIC card, a 104 key keyboard, and a mouse type pointing device.
- D. The workstation shall come equipped with all necessary gateway modules to allow connection to the network it monitors as standard equipment. All workstations shall support Ethernet communications when multiple workstations are required.
- E. The workstation shall support an SVGA monitor and be supplied with a 17" flat screen LCD monitor.
- F. The computer shall be capable of networking to additional computers and these computers shall be capable of operating as workstations and/or gateways for local area or wide area networks.
- G. Alarm annunciation shall appear on all workstations and may be silenced at each local workstation.
 - 1. Only one workstation and operator shall be in command of the system for global alarm acknowledgement at any time.

1.4 MONITORING NETWORK

- A. The network shall have the ability to use fiber optic cable (single-mode and multi-mode), wire (twisted pair copper media in a style 4 or style 7 configuration), or combination wire/fiber communications with support of up to 103 nodes.
 - 1. Wire networks shall support 12 AWG, 1 Pair Shielded to 24 AWG, 4 Pair Unshielded following the manufacturer's guidelines.
 - 2. Fiber optic networks shall support 62.5/125µm cable 8dB limit (50/125µm cable 4.2dB limit).
 - 3. Wire to fiber conversions using repeaters.
- B. MONITORINGNETWORK point Data speed to 12 Mbps on wire and 100 Mbps on fibre
- C. True peer-to-peer communications.

1.5 INTEGRATION NETWORK

- A. The integration network shall be capable of monitoring a minimum of 100 nodes (NIONs and routers) on an integration gateway consisting of, but not limited to:
 - 1. Intelligent or conventional fire alarm control panels.
 - 2. Competitor's intelligent or conventional fire alarm control panels.
- B. Up to 99 gateways shall be connected via Ethernet for a total local area combination of up to 12672 (99x128) nodes.
- C. Local area networks shall consist of a free topology network using twisted pair copper media in a bus, star, T-tap, or ring style 7 configurations at 78 Kilo baud. Transmit/receive twin fiber (multi-mode 62.5/125 µm) strand FT-10 point-to-point topology and bi-directional FO-10 networks shall also be available. Wide area networks shall be supported by the use of network expansion routers.
 - 1. Free topology (FT-10 style) wire network run allows multiple T-taps within a 1,500-foot (457.2 m) radius; 8,000 foot (2438.4 m) point-to-point using twisted pair; or 6,000-foot (1828.8 m) bus topology.
 - 2. Free topology (FT-10 style) fiber network can also use fiber-optic cabling. Operates at 78.5 K baud.
 - 3. Fiber optic (FO-10 style) network allows bus or ring topology using only fiber-optic cabling; node-to-node distance of over 10,000 feet (3048 m) with message regeneration. FO-10 style operates at 1250 Kbaud and utilizes multi-mode bi-directional fiber media (single fiber strand) in a bus or loop configuration.
- D. Provide routers, repeaters or bridges where required to increase distance, alter network configuration or change media or to extend to remote facilities over alternate communications media including UL listed dial-up PSTN telephone, leased line, multimode fiber or Ethernet connectivity.
 - 1. Dial-up units shall dial a local number and stay connected. Upon loss of carrier, a supervisory alarm shall be indicated at the workstation and the units shall automatically redial to connect.

2. Network expansion routers shall support public switched telephone circuits, two-wire or four-wire leased lines, and CAT5 Ethernet networks.
- E. Network interface software shall be by the same manufacturer as the hardware portion of this specification.
- F. The integration network shall utilize Network Input / Output Nodes (NIONs) to interface between the individual buildings' systems to be monitored by the integration network. The NIONs shall act as a translator from the building system's specific panel communications protocol to the integration network protocol as well as serve as a transceiver from the building system panel to the integration network.
1. NIONs shall be available in configurations that will allow transparent communications via RS 232 serial data ports with intelligent fire alarm control panels, security systems, and CCTV systems.
 2. NIONs shall be available in configurations that will allow monitoring of dry contacts, switched voltages, conventional security devices, access control panels and conventional fire alarm control panels using scheduled, automated and manual control.
 3. NIONs shall be UL listed to Standard 864 and 1076 and be provided with their own enclosure or be available in chassis mount configurations.
 4. NIONs shall operate at 24 VDC and obtain their power from the monitored control panel or a UL listed battery backed auxiliary power supply. All terminals shall be transient protected to 2400V and LEDs shall be provided for status, service and diagnostics.
- G. Digital Alarm Communicator Receiver Network
1. The system shall provide a digital alarm communicator receiver (DACR) gateway with a RS 232 interface to the following digital alarm communicator receivers for wide area event reporting: Ademco 685, Silent Knight 9500 and 9800, Radionics 6600.
 2. Each gateway shall support up to 10 digital alarm communicator receivers for alarm and trouble information from reporting devices.
- H. Workstation Network:
1. Computers shall be networked using Ethernet supporting the use of TCP/IP protocol for local area systems.
 2. The network shall be capable of supporting multiple clients (e.g., workstations, configuration applications, automated response applications) and up to ninety-nine (99) gateways.
 3. A UL listed Ethernet Hub shall be provided for connection of multiple workstations, gateways, clients, and/or network printers.
 4. System shall be UL listed to communicate between clients and gateways over a business computer network (shared IP).
- I. System Expansion. Additional software and hardware modules shall be currently available by the system manufacturer to provide for:
1. CCTV with on-screen Pan/Tilt/Zoom and live video on-screen.

2. Supported systems shall include the following CCTV switch manufacturers, Pelco, Burle/Phillips and Vicon. The ability to support all listed CCTV switch units simultaneously on the same system shall be supported.

Signaling Line Circuits (SLC)

Each FACP or FACP network node shall support up to two SLCs. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors, 159 intelligent modules (monitor or control) of 318 devices. The addition of the optional second loop shall double the device capacity, supporting a total of 600 devices. Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.

CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

Serial Interfaces

The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.

One EIA-232 interface shall be used to connect an UL-Listed 40 or 80 column printer. Printers that are not UL-Listed are not considered acceptable substitutes.

One EIA-232 interface shall be used to connect a UL-listed CRT terminal. This interface shall include special protocol methods that allow off-site monitoring of the FACP over standard dial-up phone lines. This ancillary capability shall allow remote readout of all status information, including analog values, and shall not interfere with or degrade FACP operations when used. It shall allow remote FACP Acknowledge, Reset, or Signal Silence in this mode. It shall also allow adjustment of detector sensitivity and readout of the history file.

The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.

The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

Notification Appliance Circuit (NAC) Module

The Notification Appliance Circuit module shall provide four fully supervised Class A or B (NFPA Style Z or Y) notification circuits. An expansion circuit board shall allow expansion to eight circuits per module.

The notification circuit capacity shall be 3.0 amperes maximum per circuit and 6.0 amperes maximum per module.

The module shall not affect other module circuits in any way during a short circuit condition.

The module shall provide eight green ON/OFF LEDs and eight yellow trouble LEDs.

The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.

Each notification circuit shall include a custom label inserted to identify each circuit's location. Labels shall be created using a standard typewriter or word processor.

The notification circuit module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL listed for use with up to 12 AWG wire.

Each circuit shall be capable of, through system programming, deactivating upon depression of the signal silence switch.

INTERACTIVE FIREFIGHTERS' TOUCH SCREEN DISPLAY Panel (wall Mounted)

The network will interface and report the individually monitored system's alarm status via a user-friendly Touch Screen Graphical User Interface (GUI) based software.

The Touch Screen software shall operate under Microsoft® Windows® XP Embedded platform as manufactured by Microsoft Corporation.

The Touch Screen GUI based software must be capable of graphically representing the facility being monitored with floor plans and icons depicting the actual locations of the fire alarm device locations.

The Touch Screen software shall use a 1280 pixel x 1024 pixel GUI 17 inch display capable of showing a large primary floor plan display, a site plan representative of an aerial view of the facility, the first active fire alarm on the system.

The Touch Screen software shall permit automatic navigation to the screen containing an icon that represents the first fire alarm device in alarm in the event of an off-normal condition.

The fire alarm device icon shall be visible only when it is in an alarm (or active) condition.

The Touch Screen software shall display the activated smoke detectors in a time sequence to track smoke progression.

The Touch Screen software shall allow the importation of externally developed floor plans in Windows Metafile (WMF), JPEG (JPG), Graphics Interchange Format (GIF) and Bitmap (BMP) format.

The Touch Screen software shall provide a intuitive and easy way to navigate to different screens representing floors and areas within a facility.

The system shall provide for continuous monitoring of all fire alarm conditions regardless of the current activity displayed on the screen.

The software shall display "YOU ARE HERE" along with icons representing standard building objects (stairs, elevators, etc) to be shown on the floor plan.

The Touch Screen software shall allow icons that represent hazardous materials stored in a facility.

The Touch Screen software shall provide a screen that displays preprogrammed building contact information.

The Touch Screen software shall provide a screen the displays building occupancy and other general building information.

The Touch Screen software shall allow a site plan to be imported that shows an aerial view of the facility.

The Touch Screen software shall display all active fire, supervisory, and security events within an event list.

Water flow Operation

An alarm from a water flow detection device shall activate the appropriate alarm message on the main panel display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.

Supervisory Operation

An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.

Signal Silence Operation

The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.

Sprinkler and Standpipe Valve Supervisory Switches:

Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.

The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.

The switch housing shall be finished in red baked enamel.

The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

Non-Alarm Input Operation

Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

Combo Zone

A special type code shall be available to allow water flow and supervisory devices to share a common addressable module. Water flow devices shall be wired in parallel, supervisory devices in series.

SYSTEM COMPONENTS - ADDRESSABLE DEVICES

Addressable Devices - General

Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159. However electronic addressing will be accepted only if all the devices can be fully programmed for sensitivity settings, pre alarm level etc from the panel with no extra programming tools and computer shall be used.

Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.

Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be

placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.

The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.

Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.

The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device .

Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.

A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

Programmable Electronic Exit Point Directional Sounders:

Shall follow NFPA 72 2007 edition recommendation.

Electronic sounders shall operate on 24 VDC nominal.

Electronic sounders shall be field programmable without the use of special tools, at a sound level of at least 90 dBA measured at 10 feet from the device.

Shall be capable to broadcast pre programmed Voice Message also

Shall be flush or surface mounted as shown on plans.

Shall produce broad band directional sound with 20 Hz to 20 Khz frequency band to guide occupants to safe exists even in complete darkness.

Strobe lights shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:

The maximum pulse duration shall be 2/10 of one second.

Strobe intensity shall meet the requirements of UL 1971.

The flash rate shall meet the requirements of UL 1971.

Field Wiring Terminal Blocks

For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.

Addressable Manual Fire Alarm Box (manual station)

Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

Intelligent Multi-Co-Operative Sensing type Photoelectric Smoke Detector

The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall be in position to work in advance multi Co-Operative Sensing, on command from the control panel, send data to the panel representing the analog level of smoke density.

Intelligent Thermal Detectors

Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

Intelligent Multi Criteria Acclimating Detector

The intelligent multi criteria Acclimate detector shall be an addressable device that is

designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.

The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).

The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.

Two Wire Zone Monitor Module for Conventional Devices, Flow switches etc.

Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

Addressable Control Module

Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered polarized audio/visual notification appliances.

The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.

Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.

The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

Addressable Relay Module

Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

Isolator Module

- a) Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
- b) If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
- c) The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
- d) The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- e) The isolator module shall not consume any detector or device address from the loop capacity.

BATTERIES:

The battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.

The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

If necessary to meet standby requirements, external battery and charger systems may be used.

The Unit shall be UL / FM / VDS approved.

EXECUTION

INSTALLATION:

Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more

than 48 inches (122 mm) above the finished floor.

TEST:

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

Verify activation of all water flow switches.

Open initiating device circuits and verify that the trouble signal actuates.

Open and short signaling line circuits and verify that the trouble signal actuates.

Open and short notification appliance circuits and verify that trouble signal actuates.

Ground all circuits and verify response of trouble signals.

Check presence and audibility of tone at all alarm notification devices.

Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

FINAL INSPECTION:

At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

INSTRUCTION:

Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

The entire Fire alarm System components shall be of same make and Listed. The data sheets of each equipment shall be submitted along with offer.

B-2.TECHNICAL SPECIFICATIONS FOR EPABX SYSTEM

General

The specification covers requirements of a 19" Rack mountable state-of-the-art EPABX system suitable for catering to the needs of Government Office requirements. It should support all Traditional TDM connections. It is essential that the system should be based on latest Packet switching technology for voice. The system should be running on minimum 32 bit Network RISC based processor. All the slots available for insertion of various trunk/subscriber line card should be universal i.e it should be possible to increase or decrease the trunk line or subscriber line capacity of the system as per requirement.

System Specifications

1. The EPABX would be 100% Non-blocking Switching system supporting all Traditional TDM connections. The system should be configured as per BOQ Analog extensions and as per BOQ Trunk lines expandable upto 300 lines.
2. The system should be fully open Architecture server based platform, with support for open operating systems like Linux etc. It should be based on minimum 256 bit processor supporting TDM switched technology and Traditional connections. It should be 19" Rack mountable and preferably provide a built-in LAN port for application integration if required in the future
3. The system shall provide a non-blocking voice path. The number of time slots should be double the number of ports of the system.

System Features and Facilities System Architecture

The offered system should be modular in design, the architecture of the EPABX shall be capable of seamless migration to its maximum capacity by simply adding peripheral cards on the same set of control cards without compromising on any function/ features of this system or any degradation of service. The EPABX shall support all Traditional connections. The system shall have universal ports for line/Trunk cards wherein any peripheral card can be inserted in any slot of the peripheral shelf, thereby enhancing the flexibility of the configuration.

Central Processing Unit

The Central Processing Unit of the EPABX will be a 32-bit RISC based Microprocessor with in-skin serial port and USB port for traffic management. The Main software system should be a hardened Linux operating system.

Storage Media

The system shall provide state-of-the art Flash EPROM for higher reliability and fast booting.

Trunks

The offered system shall be ISDN ready. The system platform shall be ready in all respect

and only the necessary BRI and PRI cards need to be added for functionality. The system shall be capable of accepting atleast 2 PRI cards and also different types of signals for 2W/4W ENM signaling. The system shall support Level DID on Tie-line trunks. The system to be equipped with Hardware / modules required for SIM card functionality through CO lines.

Operating System

The operating system of EPABX should be reliable or proprietary make and be protected against loss/alteration of memory due to power failure/unauthorized command or due to any other faulty condition.

Caller Line Identification (CLI) on Analog extensions

The offered system shall have the capability to offer CLI on Analog extensions for all internal calls. The system shall also offer CLI on Analog Trunks. The CLI shall provide Name and Number on the display of the analog extension. This feature has become mandatory and is treated as a security feature. It should also support CLI based routing of calls.

Conference

The offered system shall have minimum 32 party Meet Me conference bridge by using same set of control cards and CPU. It shall be possible for conference users to initiate the conference with any combination of internal stations and outside circuits to talk to each other at the same time on the conference circuit. The conference call facility initialized by one of the extension users or by an attendant should be able to opt out on that conference without breakup of ongoing conference (unsupervised conference). It should also support split in conference, Barge-in conference and meet me conference also in which outside callers (atleast 4 nos) should be able to join the conference by entering passwords without any manual intervention

Music on Hold

The system shall support in-built Music-on-Hold. It should also be able to interface with an external music device

Message Wait Indication (Voice Mail cum Auto Attendant)

The system shall have the facility to light a message waiting lamp when provided on the Telephone instruments in case of a voice mail message.

Diagnostic and Enhanced Maintenance Facility

The system shall have in-built diagnostic features such as detection of faulty intercom lines. The offered system shall preferably have remote maintenance facility.

Operator Console

The offered system should be capable of connecting upto 4 operator consoles. The operator should be able to monitor the status of trunks/extensions and should be capable of attending /holding atleast 16 trunk calls at one time. The offered console should be equipped for monitoring status of extensions. The operator console should have LED

indication for differentiating between the used and self used lines. Following facilities shall be available:

1. Status Display for all trunk lines and extensions
2. Visual Display of Called and Calling Stations
3. Key Pad Dialling
4. Interface for Headset operations
5. Busy Overdrive
6. Subscriber Identity
7. Call Querying
8. Call Splitting
9. Trunk to Trunk access/ Transfer
10. Trunk to CO transfer
11. Transfer to Trunk calls to other console
12. Breaking into busy extension with an interruption tone
13. Serial calling abbreviated dialling
14. External Line hold
15. Call Parking
16. Selective pick up of calls on hold
17. Indication of waiting calls
18. Camp on busy
19. Routing of calls
20. Night Service
21. Un-screened call transfer

Analog Telephone sets Type-I

Analog telephones with the following features:

1. 16 Digit LCD display
2. DTMF keypad
3. Real time clock with year
4. Hands free speaker
5. Date and month display
6. Feature keys, last number redial key, flash & mute, volume (+) and (-)
7. Redial memory

Analog Telephone sets Type-II

Analog telephones with the following features:

1. Minimum 50 Station Phonebook
2. Minimum 20 one touch and 10 speed dialer
3. Corded phone with caller ID and hands free speakerphone
4. Auto redial
5. Minimum 20 redial memory
6. Ringer indicator, minimum 30 centimeters long curl cord, programmable flash time setting, programmable tone and pulse setting, 3 step ringer volume and dial lock

Main Distribution Frame

The offered system shall be provided with MDF & IDF having LSA Plus disconnection module back-mounting frame and wire manager on good quality powder coated MS box with lock & keys. The MDFs should be equipped with IPMs on all outdoor circuits to protect exchange/cards from surge voltage & current. The system shall be provided with integrated system modules

B-3. TECHNICAL SPECIFICATIONS FOR CCTV SYSTEM

SCOPE:

The specification of Video Surveillance System covers technical specification and requirement of IP Video Surveillance Systems consisting of Indoor IP dome cameras, Indoor IP Bullet cameras, outdoor IP P/T/Z dome cameras, Video Management Software, Recording servers, switches, colour monitor etc for surveillance of the facility from a centralized location.

Video Surveillance System shall be an IP enabled system. The system shall be able to work on a fibre optic backbone network.

SYSTEM DESCRIPTION

- A. The Video Management Software should be a fully digital IP-based video surveillance system.
- B. The VMS should work with the latest compression technologies viz MPEG-4 and H.264 and should be capable to interface with IP cameras streaming both compressions.
- C. Video Surveillance System shall consist of outdoor IP Dome cameras, recording Servers and PC's and associated Ethernet cable, fiber cable, video cable, power cable, twisted pair cable etc. Bidder should consider all necessary network equipment and accessories to provide a LAN / WAN infrastructure dedicated for video surveillance on a fibre optic backbone network which should be not less than 1 Gbps speed.
- D. The software should provide a single GUI that monitors, records, and offers analysis functionality to deliver the timely, accurate information required for effectively responding to any challenge.
- E. The VMS shall have client station software. The client should offer multi-monitor options, and have drag and drop options and the ability to switch any particular camera onto any monitor through drag operation.
- F. It should be possible to set up a video wall from the software.
- G. Each camera shall have a video at 1080P and 25 frames for viewing the videos during live as well as for recording purpose.

GENERAL REQUIREMENTS:

- I. IP CCTV System OEM products must have UL, EN; CE; ROHs, FCC and Valid Cyber Security certification. Any offered products should not have CCC certification.
- II. The Video Management software, NVR, Joystick and Cameras should be of the same make.
- III. All software and firmware upgrades shall be free of cost. All the IP cameras shall be freely accessible and programmable from the control room.
- IV. The system should be capable of integrating with Access Control System and BMS if required in future.
- V. IP CCTV System OEM need to confirm in their letterhead that any component/ hardware / parts / assembly / software including firmware used in the offered solution (hardware / software) do not comply to GB28181, GB/T 28181-2011;

GB/T28181-2011; GBT 28181- 2011; GBT28181-2011 standards. Also, the IP CCTV System doesn't have CCC.

- VI. Security/IP CCTV System & Components OEM should have its direct registered presence in India for more than 10 years.(not as joint venture, partnership firms or through any other association) They should have their own registered Offices; The CCTV OEM for CCTV shall have its own/authorized CCTV service/repair facility in atleast two metropolitan regions for last 5 years with one Service centre being in Delhi NCR. The OEMs must also have its own R&D Centre as per ISO; Six Sigma; CMMI level 5 quality standards in India.
- VII. The CCTV OEM should have its toll free number in India for any technical support query from the SI or end customer which is very much required for such a big project.
- VIII. Manufacturer (OEM) should have service centre in India.
- IX. Every control room of surveillance system shall be capable of getting connected to the optical or other communication backbone.
- X. The power supply available shall be 220 V / 50 Hz AC +/- 10%. All modules of the surveillance system should work using this power supply only with requisite converters, if required.
- XI. All the cameras and other modules of Video Surveillance System shall be modular in construction. In case of up gradation of such modules in future, it shall be possible to upgrade them without replacing the entire modules.

TECHNICAL REQUIREMENTS:

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
1. 1080P Resolution IP Varifocal Indoor Dome		
Camera Characteristics		
PoE Class	3	
Audio	1 in/1out	
12VDC / 24VAC	Yes(optional)	
IP 66/67	IP 67	
IK10	Yes	
IR Range	50m	
Regulatory		
CE & FCC	Yes(FCC Class A, EN60950-22)	
UL	Yes	
C-Tick	Yes	
General		
Imaging Device	1/2.7" 2Megapixel progressive scan CMOS	
Imager Type	CMOS	
Imager Readout	Progressive scan	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
Maximum Resolution	2MP - 1920x1080 with 60FPS	
ONVIF	Profile S & G	
Minimum Illumination (May vary depending on the lens)	Color: 0.01Lux @f/1.6 B/W: 0Lux @f/1.6(IR on)	
Day/Night Method	Mechanical ICR (ON / OFF / AUTO selectable)	
Signal-to-Noise Ratio	50 db minimum	
Auto Iris Lens Type	DC IRIS	
Electronic Shutter Range	Auto/Manual, 1/3(4) ~1/10000s	
White Balance Range	2,000 – 8500	
Dynamic Range	120 db minimum	
Back light compensation	BLC / HLC /WDR(120dB)	
Digital Noise Reduction	3D Dig Noise Reduction (ON / OFF selectable)/2D	
Alarm Triggers	Alarm I/O	
Analog video output	Twin outputs	
Analytics	Motion Detection/Scene change (covering, defocusing)/Face detect	
Privacy Zone	4 configurable windows	
Motion Detection	Off/ On / By Schedule	
Log Function	Log file with specified fields	
Character Overlay	Character overlay with specified fields	
Image Settings	Compression,3D digital noise reduction (ON/OFF) color, brightness, sharpness, contrast, white balance, exposure control, exposure zones, backlight compensation, fine tuning of behavior at low light, rotation, and all other Image Settings in Web UI	
Electrical		
Network	RJ-45 (10/100Base-T)	
Power Input	PoE/12VDC/24VAC	
Power Consumption	Max 12.2W (with IR on, motorized lens working)	
Audio Input	1 channel Line in	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
Audio Output	1 channel Line out	
Local Storage	Micro SDHC Max 128GB	
Alarm Input	2 in	
Alarm Output	1 out	
IR Illuminator	Required	
Mechanical		
Lens	2.7-12 mm motorized and auto focus lens F1.4 FOV depending on different resolution H: 99°~34°	
Focus	Auto Focus	
Camera angle adjustment Positioning	Pan = 0~360, Tilt = -85~65	
Video		
Video Encoding	H.265 and MJPEG bit rate control (CBR and VBR)	
Video Streams	Main Stream: 1080P/720P(1~50/60fps)	
	Sub Stream: D1/CIF (1 ~ 25/30fps)	
	Third Stream: 720P (1 ~ 3/4fps)	
Frame Rate	Selectable for each independent stream	
	1080P - 60 (full) ~ 1 fps	
	720P - 60 (full) ~1 fps	
Resolution	1080P(1920x1080)	
	1.3M(1280x 960)	
	720P (1280x 720)	
	D1(704x 576/704x 480)	
	CIF (352x 288/352x 240)	
Supported Protocols	TCP/IP, UDP, ICMP, IPv4, IPv6, SNMP v2c/v3, QoS, HTTP, HTTPS, LDAP (client), SSH, SSL, SMTP, FTP, RTSP, UPnP, DNS, NTP, RTP, RTCP, PPOE, Bonjour	
Supported browser	IE10, Safari, Firefox, Chrome	
Snapshot	Full resolution snapshot	
Local recording	Snapshot, video clip on alarm, video loop	
Audio		
Audio Encoding	G.711a/ G.711u/ AAC	
Audio Streaming	Dual-Channel	
User		
Unicast	20users	
Multicast	Unlimited users , Compression H.265	
Situational awareness and	Viewing: analytic sees motion, Digital PTZ Recording: whole area, set zones of interest	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
PTZ stream config	(ROI)	
Security Access	Multiple user access levels with password protection IP filtering, HTTPS, IEEE 802.1x, signed certificate, Data Encryption, Valid Cyber Security Certificate	
Environmental		
Operating Temperature	-40°C~+60°C	
Heater/Fan	2W Heater	
Operating Humidity	10% to 100%, condensing	
2. 1080P Resolution IP Varifocal Outdoor Bullet Camera		
Camera Characteristics		
PoE Class	3	
Audio	1 in/1out	
12VDC / 24VAC	Yes(auto-selection)	
Housing Integrated or External		
IP 66/67	IP 67	
IK10	IK10	
IR Illuminator (Internal or External)		
IR Range	60m	
Regulatory for Camera, Housing & IR Illuminator		
CE / FCC	Yes(EN60950-22)	
UL	Yes	
C-Tick	Yes	
General		
Imaging Device	1/2.7" 2Megapixel progressive scan CMOS	
Imager Type	CMOS	
Imager Readout	Progressive scan	
Maximum Resolution	2MP - 1920x1080	
ONVIF	Profile S & G	
Minimum Illumination (May vary depending on the lens)	Color: 0.01Lux @f/1.6 B/W: 0Lux @f/1.6(IR on)	
Day/Night Method	Mechanical ICR (ON / OFF / AUTO selectable)	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
Signal-to-Noise Ratio	50 db minimum	
Auto Iris Lens Type	DC IRIS	
Electronic Shutter Range	Auto/Manual, 1/3(4) ~1/10000s	
White Balance Range	2,000 – 8500	
Dynamic Range	120 db minimum	
Back light compensation	BLC / HLC /WDR(120dB)	
Digital Noise Reduction	3D Dig Noise Reduction (ON / OFF selectable)/2D	
Alarm Triggers	Alarm I/O	
Analog video output	twin outputs	
Analytics	Motion Detection/Scene change (covering, defocusing)/Face detect	
Privacy Zone	4 configurable windows	
Motion Detection	Off/ On / By Schedule	
Log Function	Log file with specified fields	
Character Overlay	Character overlay with specified fields	
Image Settings	Compression,3D digital noise reduction (ON/OFF) color, brightness, sharpness, contrast, white balance, exposure control, exposure zones, backlight compensation, fine tuning of behavior at low light, rotation, and all other Image Settings in Web UI	
Electrical		
Network	RJ-45 (10/100Base-T)	
Power Input	PoE/12VDC/24VAC	
Power Consumption	Max 16W (with IR on, motorized lens working)	
Audio Input	1 channel Line in	
Audio Output	1 channel Line out	
Local Storage	Micro SDHC Max 128GB	
Alarm Input	2 in	
Alarm Output	1 out	
IR Illuminator	4	
Mechanical		
Lens	2.7-12 mm motorized and auto focus lens F1.4 FOV depending on different resolution H: 99°~34°	
Focus	Auto Focus	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
Camera angle adjustment Positioning	Pan = 0-360, Tilt = 0-90	
Video		
Video Encoding	H.265 and MJPEG bit rate control (CBR and VBR)	
Video Streams	Main Stream: 1080P/720P(1~50/60fps)	
	Sub Stream: D1/CIF (1 ~ 25/30fps)	
	Third Stream: 720P (1 ~ 3/4fps)	
Frame Rate	Selectable for each independent stream	
	1080P - 60 (full) ~ 1 fps	
	720P - 60 (full) ~1 fps	
Resolution	1080P(1920x1080)	
	1.3M(1280× 960)	
	720P (1280× 720)	
	D1(704× 576/704× 480)	
	CIF (352× 288/352× 240)	
Supported Protocols	TCP/IP, UDP, ICMP, IPv4, IPv6, SNMP v2c/v3, QoS, HTTP, HTTPS, LDAP (client), SSH, SSL, SMTP, FTP, RTSP, UPnP, DNS, NTP, RTP, RTCP, PPOE, Bonjour	
Supported browser	IE10, Safari, Firefox, Chrome	
Snapshot	Full resolution snapshot	
Local recording	Snapshot, video clip on alarm, video loop	
Audio		
Audio Encoding	G.711a/ G.711u/ AAC	
Audio Streaming	Dual-Channel	
User		
Unicast	20users	
Multicast	Unlimited users	
Situational awareness and PTZ stream config	Viewing: analytic sees motion, Digital PTZ Recording: whole area, set zones of interest (ROI)	
Security Access	Multiple user access levels with password protection IP filtering, HTTPS, IEEE 802.1x, signed certificate, Data Encryption, Valid Cyber Security Certificate	
Environmental		
Operating Temperature	-40°C~+60°C	
Operating Humidity	10% to 90%, noncondensing	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
3. 1080P Resolution IP PTZ SPEED DOME Camera		
Camera Characteristics		
PoE Class	Hi-POE	
Audio	1 in/1out	
24VAC	Yes	
IP 66/67	IP 67 or better	
IR Illuminator	Internal or External (UL Listed for safety)	
Regulatory		
CE / FCC	Yes (FCC Class A, EN60950-22)	
UL	Yes (60950-1,60950-22)	
IK10	Yes	
Rohs	Yes	
GENERAL		
Imaging Device	1/2" or better	
Imager Type	CMOS	
Imager Readout	Progressive scan	
Maximum Resolution	2MP - 1920x1080	
ONVIF	Profile S	
Minimum Illumination (May vary depending on the lens)	Color: 0.005Lux @f/1.6 B/W: 0.0005Lux@f/1.6 0Lux (IR on)	
Day/Night Method	Mechanical ICR (ON / OFF / AUTO selectable)	
Signal-to-Noise Ratio	50 db minimum	
Auto Iris Lens Type	DC IRIS	
Electronic Shutter Range	Auto/Manual, 1/1~1/30000s	
White Balance	Auto, ATW, Indoor, Outdoor, Manual	
True Wide Dynamic Range	120 db	
Back light compensation	BLC / HLC /WDR	
Digital Noise Reduction	DNR (2D/3D)	
Alarm Triggers	Alarm I/O	
Analog video output	BNC (1.0Vp BNC(1.0Vp/75Ω), PAL / NTSC	
Tracking Trigger Mode	Manual/Auto	
Privacy Zone	24 configurable windows	
Motion Detection	Off/ On / By Schedule	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
Log Function	Log file with specified fields	
Character Overlay	Character overlay with specified fields	
Electronic Image Stabilization	Required	
ELECTRICAL		
Network	RJ-45 (10/100Base-T)	
Power Input	24VAC/3A ($\pm 25\%$), Hi-POE	
Power Consumption	40W (IR on)	
Audio Input	1 channel Line in	
Audio Output	1 channel Line out	
Local Storage	Micro SDHC up to 128GB	
Alarm Input	7 in	
Alarm Output	2 out	
IR Illuminator (Internal or External)	Required	
MECHANICAL		
Lens	6 \pm 2 mm -135 mm or better (30x Optical Zoom), F1.4-F4.8 FOV H: 61.2 $^{\circ}$ ~2.32 $^{\circ}$	
Focus Mode	Auto/Semi Auto/Manual	
NTSC/PAL switch	Support NTSC/PAL switch IN WEB UI	
Pan Range	360-degree endless rotation	
Pan Speed	Manually 240 degrees per second; preset speed 240 degree per second	
Preset Accuracy	0.1 degree per second	
Tilt Range	-10~90 degree (auto flip)	
Tilt Speed	Manually 120 degrees per second; preset speed 200 degree per second	
Smart Zoom	3D positioning	
Number of Preset	245	
Video Encoding	H.264 and MJPEG bit rate control (CBR and VBR)	
Video Streams	Main Stream: 1080P(1~25/30fps)/720P(1-50/60fps)	
	Sub Stream: D1/CIF (1 ~ 25/30fps)	
	Third Stream: 720P/D1/CIF (1 ~ 25/30fps)	
Frame Rate	Selectable for each independent stream	
	1080P - 30 (full) ~ 1 fps	
	720P - 60 (full) ~1 fps	
Bit Rate	H.264:56K~8192Kbps, MJPEG:56K~20480Kbps	
Resolution	1080P(1920x1080)	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
	720P (1280× 720)	
	D1(704× 576/704× 480)	
	CIF (352× 288/352× 240)	
Supported Protocols	TCP/IP, UDP, ICMP, IPv4, IPv6, SNMP v2c/v3, QoS, HTTP, HTTPS, LDAP (client), SSH, SSL, SMTP, FTP, RTSP, UPnP, DNS, NTP, RTP, RTCP, PPOE, Bonjour	
Supported browser	IE10, Safari, Firefox, Chrome	
Snapshot	Full resolution snapshot	
Audio		
Audio Encoding	G.711a/ G.711u/PCM	
Audio Streaming	Dual-Channel	
User		
Unicast	20users	
Security Access	Multiple user access levels with password protection IP filtering, HTTPS, IEEE 802.1x, signed certificate, Data Encryption	
Environmental		
Operating Temperature	-40°C~+70°C	
Operating Humidity	0% to 90%, non-condensing	
4. Video Management Server		
	System with distributed architecture to collect, manage and present video from all the cameras and supports emerging technologies in the industry, like 4K resolution, H.265 video compression codec, multi-imager/lens cameras and 360° fisheye cameras. NVMMS shall have option to support database redundancy and 1+1 and N+M NSM failover features for unforeseen/maintenance scenarios for increased system reliability NVMMS shall support NSM's from a multiple location licensed for 300 cameras & 8 users clients. The NVMMS should support network joystick controller, GPU rendering support for H.264 and H.265 decoding , video on demand, Adaptive video throttling, rule engine, operator role management, server based Video Motion Detection (VMD), edge storage backfill support, bookmark with manual comment, bookmark based search, timeline search, Preview search, synchronous playback from all NSMs, monitor wall support, surrounding camera mode, Cybersecured with features such as	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
	Digital Signing, General Data Protection Regulation (GDPR) compliance, HTTPS & SSL base, smart web client, secured firewall configuration, password expiry, non-recoverable password; support ANDROID &iOS phones, seamless integration with integrated security platform which provides HSDK&API for further integration with 3rd party systems. NVMMS shall support iLIDS certified Analytics like intrusion/LoiteTrace. Make :- Honeywell. Bosch, Milestone	
	Network Storage Manager	
Type	Network Storage Manager(NSM) supporting ONVIF Profile S & G, PSIA, real time streaming protocol (RTSP) standards, emerging technologies in the industry, like 4K resolution, H.265 video compression codec, 3D PTZ control, 360° Fisheye camera and multi-imager/lens camera support, and intelligence events. System proposed shall have scalability of 4 to 128 cameras per NSM with sufficient licenses to record all the cameras in this requirement. Must Supply 128 Channel License. NSM shall support simultaneous recording, live monitoring, playback/search of recorded video for up to 4K resolution on all cameras, taking snapshots and viewing presets for PTZ cameras and system management. NSM shall have integrated Dashboard to easily monitor the health and recording status, Flexible retention time / archive time for cameras, Smart Motion detection, Role-based operator privileges supporting Windows and local users, Video Archiving, Multi-stream support, Advanced security features with encryption support for communication between desktop client to NSM and secure https login for Web Client and Mobile apps, Event history and operator log reporting with export to PDF, Crystal Reports, MS Excel/MS Word. NSM Shall support scheduled backfilling of the recordings from the edge storage/SD card of cameras to the NSM using ONVIF Profile G for robust recording against temporary network failure, N+1/N+M recorder failover and failback automatically or manually to have maximum system uptime and recording continuity.	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
Storage Capacity	Each NVR storage unit should be provided with usable minimum 120 TB from day one after RAID 5 configuration, with provision of future expansion minimum 144 TB using additional expansion slots or SAS	
Optical Drive	DVD +/- RW OR OEM Recommended	
Fault Tolerance	RAID-5 or better	
Network Connections	Dual Gigabit Ethernet (RJ-45 port) – 10/100/1000 Mbps.	
Operating System	Linux	
Memory	Minimum 8GB DDR3	
Video Compression	H.265, H.264, MJPEG/MPEG	
Recording Support	The offered NVR must be able to support simultaneous recording of 128 IP cameras at 720p resolution @ 25/30 fps	
No. of playback streams	Bidder to specify (minimum 30)	
Throughput	Suitable for meeting the intended recording and playback requirements (Minimum 500 Mbps)	
Recording Resolution	4K, 5MP, 3MP, 1080P, 720P, 960H, D1	
Network Protocol Support	HTTP/HTTPS, TCP/IP, RTSP, UDP, NTP, DHCP, IPC Search	
On-board diagnostics	Web based support for system configuration & Diagnostics	
Minimum Function / Features	<ul style="list-style-type: none"> • Minimum 500Mbps incoming bandwidth and 500Mbps outgoing bandwidth • Up to 128 channels 1080P @ 4Mbps, 256 channels 720P @ 2Mbps real-time recording • 24 bay HDDs, up to 144TB storage with SATA interface • Hardware RAID 0, 1, 5, 6, 10, to protect video data • N+1 redundancy to ensure continuous operation • Support SAS to expand storage space, up to 144TB • ONVIF Profile S Conformance • Network failure recovery (NFR) function between IP cameras (with edge storage) and NVR to minimize the risk of video loss • Intelligent event-trigger recording and alarm linkage, flexible schedule alarm configuration • Remote IP camera setup and image enhancement 	

TECHNICAL SPECIFICATIONS		
FEATURE	DESCRIPTION	COMPLIANCE Y/N
	<ul style="list-style-type: none"> • Automatic IP search and “One-Click” IP camera import • Disk space quota for different IP cameras to help store critical video for longer time • E-signature (watermark) verification by ONVIF Player to protect against video tampering • Dual Ethernet bonding supports three work mode: Standalone, Failover, Load balance • Redundant power supply • Virtual Disk for more flexible disk management • Defog function reduces blurring and improves image clarity • Electronic Image Stabilizer (EIS) minimizes blurring and compensates camera shaking to deliver improved image quality • Hot swap technology for quick and easy HDD replacement 	
Accessories	Under bidder’s scope: All required cables, connectors & interfaces, mounting arrangement, software’s etc. for successful installation, commissioning of NVR and integration of the same with existing IAF LAN	
Documentation	Installation guide, Operation & Maintenance Manuals, Installation CD/DVD for licensed software	
Input Voltage	100~240 VAC, 50/60 Hz. Dual Power with battery. Any power converter that is required to power the NVR has to be supplied by Bidder.	
Compatibility	The supplied NVR must be compatible in all respects to the cameras being supplied at the locations	
Power Consumption	Bidder to specify	
Operating temperature	10°C ~ 40°C or better	
Operating Humidity	20% to 80% RH, non-condensing	
HDD	Hot swap, 24 bays SATA HDD, up to 144TB storage, 1 SAS up to 144TB	
Product Safety	To comply with CE, FCC, Type Test, CCC; UL/EN standards.	
Details required with offer	Bidder to submit the details of complete offered solution (Item make, model/part code, block diagram etc.) as stated above along with the offer	

PC Work Station For Clients Stations:

VMS-Client shall require following minimum hardware and operating system configuration:

- Processor: Intel ® i7 750 2.66 GHz
- System Memory (RAM): 8 GB
- Optical Drive: DVD-R
- Hard Disk Drives: 500G, Ensure 20G available space
- Network Interface Card (NIC): Dual or compatible pair of NICs, with each port having 1 Gbps capacity.
- Human Interface: 102-key keyboard and a mouse pointing device
- Graphics Adapter: NVIDIA 1GB Independent Graphic Card
- Operating System: Original software CDs and startup installation diskettes for:
 - Windows® 10 Professional 64-bit (WOW64mode)
 - .Net Framework 4.0

Digital Keyboard with Joystick:

1. It should be a fully programmable keyboard controller with LCD screen.
2. It should have following features:
 - A. The Joystick should have interactive / intuitive buttons & Status display LCD.
 - B. It should be fully programmable with customized menus.
 - C. Integral back-lit LCD touch screen.
 - D. Ergonomic design with padded wrist rest.
 - E. Variable-speed joystick with integral zoom control.
 - F. Multiple interface options (RS-232, RS-485 and TCP/IP).
 - G. Two jog/shuttle controls.
 - H. Dedicated keys for commonly used functions.
 - I. Dynamic menu selection.
 - J. All programming should be stored in flash memory.
3. It should comply with the following specifications:
 - Input Voltage: 10-16VDC
 - Power: 10 Watts
 - Control: Elastomeric push-button switches, 320x240 graphics LCD with touch-screen- Proportional 3-axis joystick, 2 Jog/Shuttle switches, and LCD
 - Pan/Tilt Functions: Rate-proportional pan left, pan right, tilt up, tilt down
 - Lens Functions: Zoom in, zoom out, focus near, focus far, iris open, and iris close
 - Control Ports: COM1 - RJ-12 connector (RS-485 only) COM2 - RJ-12 connector (RS-485) or 10BaseT Ethernet RJ-12 connector (RS-232) COM3 - DB-9 connector (RS-232 only)
 - Keyboard Port: 6-pin mini-DIN for QWERTY keyboard
 - Communication Speeds: 9600 to 38.4K baud
 - Control Output Modes: RS-232, RS-485 or TCP/IP
 - Operating Distances: 4000' (1219 m) maximum w/ RS-485 and 32 devices 50' (12.7 m) maximum w/ RS
 - Ambient Temperature: 32°F to 122°F (0°C - 50°C)
 - Ambient Humidity: 0% to 95% (non-condensing)

IP platform will support five clients.

LAYER -2 MANAGEABLE SWITCH-8 Port

Sl.No	Technical Specifications	Compliance
1.	8 10/100/1000 Base-T and additional 2 1G Base-X ports	
2.	Should support PoE as per IEEE 802.3af and 802.3at with PoE budget of 120W or more	
3.	Layer 2/3 Features: Should support STP, RSTP, MSTP, IGMP v1/v2/v3 snooping, loop protection, STP root guard, Voice VLAN, loop protection, MLD snooping (MLDv1 and v2), IEEE 802.3ac, IEEE 802.1v, 16k MAC Table or more, PVST+ compatibility mode, RIP, static routing, capable to support IEEE 802.1Q, UDLD/equivalent	
4.	Resiliency: Should support IEEE 802.17/equivalent for sub 50ms ring protection	
5.	Security: Should support ACL, DHCP (relay and client), IP Source guard, DAI, Private VLAN, Authentication (MAC, Web and IEEE 802.3x), sflow, SSLv2 and SSLv3, TACACS+, LAG, IP precedence and DiffServ marking based on layer 2, 3 and 4 headers	
6.	Management: CLI, GUI, USB interface for taking backup of software release files configurations, Digital optical monitoring, Time Domain Reflectometry/ equivalent, DHCPv6, DNSv6, Telnetv6 and SSHv6, NTPv6 client and server, RMON 4 groups, SNMPv3, LLDP-MED, IEEE 802.3az, IPv4 and IPv6 support, SDN openflow v1.3 ready	
7.	Should support single IP management of min 24 switches for ease of management.	
8.	The switch shall have pro-active intelligence to create an ICMP polling for service reachability based on IP address and configure pro-active action upon loss or re-establishment of the service reachability	
9.	Should support functionality to continuously monitor the received optical power of fibre ports and send SNMP trap when received optical power crosses predefined threshold level to avoid physical intrusion on fibre links	
10.	Event-based triggers allow user-defined scripts to be executed upon selected system events based on Time, Date, day and Event based	
11.	Should inherently support operating temperature range of 0-50C	
12.	Should support UL, cUL, UL-EU, UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, EN60825-1, AS/NZS 60950	

LAYER -2 MANAGEABLE SWITCH-16 Port

Sl.No	Technical Specifications	Compliance
1.	16 10/100/1000 Base-T and additional 2 1G Base-X ports	
2.	Should support PoE as per IEEE 802.3af and 802.3at with PoE budget of 240W or more	

Sl.No	Technical Specifications	Compliance
3.	Layer 2/3 Features: Should support STP, RSTP, MSTP, IGMP v1/v2/v3 snooping, loop protection, STP root guard, Voice VLAN, loop protection, MLD snooping (MLDv1 and v2), IEEE 802.3ac, IEEE 802.1v, 16k MAC Table or more, PVST+ compatibility mode, RIP, static routing, capable to support IEEE 802.1Q, UDLD/equivalent	
4.	Resiliency: Should support IEEE 802.17/equivalent for sub 50ms ring protection	
5.	Security: Should support ACL, DHCP (relay and client), IP Source guard, DAI, Private VLAN, Authentication (MAC, Web and IEEE 802.3x), sflow, SSLv2 and SSLv3, TACACS+, LAG, IP precedence and DiffServ marking based on layer 2, 3 and 4 headers	
6.	Management: CLI, GUI, USB interface for taking backup of software release files configurations, Digital optical monitoring, Time Domain Reflectometry/ equivalent, DHCPv6, DNSv6, Telnetv6 and SSHv6, NTPv6 client and server, RMON 4 groups, SNMPv3, LLDP-MED, IEEE 802.3az, IPv4 and IPv6 support, SDN openflow v1.3 ready	
7.	Should support single IP management of min 24 switches for ease of management.	
8.	The switch shall have pro-active intelligence to create an ICMP polling for service reachability based on IP address and configure pro-active action upon loss or re-establishment of the service reachability	
9.	Should support functionality to continuously monitor the received optical power of fibre ports and send SNMP trap when received optical power crosses predefined threshold level to avoid physical intrusion on fibre links	
10.	Event-based triggers allow user-defined scripts to be executed upon selected system events based on Time, Date, day and Event based	
11.	Should inherently support operating temperature range of 0-50C	
12.	Should support UL, cUL, UL-EU, UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, EN60825-1, AS/NZS 60950	

LAYER -2 MANAGEABLE SWITCH-24 Port

Sl. No	Technical Specifications	Compliance
1.	24 10/100/1000 Base-T and additional 4 1G Base-X ports	
2.	Should support PoE as per IEEE 802.3af and 802.3at with PoE budget of 370W or more	
3.	Layer 2/3 Features: Should support STP, RSTP, MSTP, IGMP v1/v2/v3 snooping, loop protection, STP root guard, Voice VLAN, loop protection, MLD snooping (MLDv1 and v2), IEEE 802.3ac, IEEE 802.1v, 16k MAC Table or more, PVST+ compatibility mode, RIP, static routing, capable to support IEEE 802.1Q, UDLD/equivalent	

Sl. No	Technical Specifications	Compliance
4.	Resiliency: Should support IEEE 802.17/equivalent for sub 50ms ring protection	
5.	Security: Should support ACL, DHCP (relay and client), IP Source guard, DAI, Private VLAN, Authentication (MAC, Web and IEEE 802.3x), sflow, SSLv2 and SSLv3, TACACS+, LAG, IP precedence and DiffServ marking based on layer 2, 3 and 4 headers	
6.	Management: CLI, GUI, USB interface for taking backup of software release files configurations, Digital optical monitoring, Time Domain Reflectometry/ equivalent, DHCPv6, DNSv6, Telnetv6 and SSHv6, NTPv6 client and server, RMON 4 groups, SNMPv3, LLDP-MED, IEEE 802.3az, IPv4 and IPv6 support, SDN openflow v1.3 ready	
7.	Should support single IP management of min 24 switches for ease of management.	
9.	Should support Unidirectional Link Detection (UDLD) or equivalent to detect unidirectional links caused by incorrect fibre optic wiring or port faults and disable on fibre optics interfaces	
10.	The switch should support in built Layer 1 monitoring capability for end to end security monitoring to avoid any eve drops or security breach on the Fiber uplink links.	
11.	Should inherently support operating temperature range of 0-50C	
12.	Should support UL, cUL, UL-EU, UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, EN60825-1, AS/NZS 60950	

LAYER -3 MANAGEABLE SWITCH

Sl. No	Specifications	Compliance
1	Switch with following port density: a) 24x100/1000 Base-X b) Additional 4x10G SFP+ ports with 1G SFP support c) Should be equipped with internal RPS	
2	Should support Virtual Switching System (VSS) / equivalent technology for higher availability of Layer 2 and Layer 3 including video applications. Vendors should offer required cables/modules from day-1	
3	The Virtual Switching System (VSS) / equivalent technology shall support virtualization of switch locally or over geographically diversified locations	
4	Layer 2/3 Features: Should support 4K VLAN id's and 4K active VLAN, s, RSTP, MSTP, IGMP v1/v2, v3, IGMP/ MLD proxy,	
5	Layer 3 Features: Should support Static routing, RIP, Ring, OSPF, OSPFv3, PIM v4 SM, DM and SSM, PIMv6-SM based on network requirements	
6	Standards: IEEE 802.3ac, IEEE 802.3az, IEEE 802.1v, IEEE 802.1Q, IEEE 802.1s, IEEE 802.1w, IEEE 802.1D, VRRPv3, PVST+ compatibility mode, IEEE 802.3az Energy Efficient Ethernet(EEE)	

Sl. No	Specifications	Compliance
7	The Switch must support IEEE 802.17 or equivalent Ring resiliency / Ring protection technology for Sub 50Ms convergence time	
8	Security: Should support ACLs, DHCP snooping, IP source guard and Dynamic ARP Inspection (DAI), MAC address filtering and MAC address lock-down, Tri-authentication: MAC-based, web-based and IEEE 802.1x, DHCPv4 (server, relay and client)	
9	Management : CLI, GUI, USB interface for taking backup of software release files configurations, DDM – Optical digital diagnostic monitoring as per SFF – 8472 or equivalent standards, TDR, Netflow/sflow or equivalent, SDN open flow v1.3 ready	
10	Should support Unidirectional Link Detection (UDLD) or equivalent to detect unidirectional links caused by incorrect fibre optic wiring or port faults and disable on fibre optics interfaces	
11	The switch should support in built Layer 1 monitoring capability for end to end security monitoring to avoid any eve drops or security breach on the Fiber uplink links.	
12	For ease of integration all switches, SFP's should of same OEM	

CABLES

Sl. No.	Connectivity	Cable Type
1	Camera to L2 Switch	UTP CAT 6
2	L2 Switch to L3 Switch in control room	Single Mode Fiber/ UTP CAT 6
3	L3 Switch to Video Wall Switches	UTP CAT 6
4	From L3 switches to NVR/ NAS Box	UTP CAT 6
5	From power source to PTZ camera	3x1.5 sq mm PVC Insulated power cable

INSTALLATION OF UTP CABLE

- a) Cables should be dressed and terminated in accordance with the manufacturer's recommendations and/ or best industry practices.
- b) Pair untwist at the termination should not exceed one-half an inch.
- c) Bend radius of the cable in the termination area should not be less than 4 times the outside diameter of the cable.
- d) The cable jacket should be maintained as close as possible to the termination point.
- e) Cables should be neatly bundled and dressed to their respective panels or blocks. Each panel or block should be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- f) The distance between UTP data cable and any power cable should be more than 4 inches.
- g) Each cable should be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within

the bundle, where the label is obscured from view should not be acceptable.

h) Cables should be installed in continuous lengths from origin to destination (no splices).

i) Horizontal distribution cables should be bundled into groups of not greater than 40 cables. Cable bundle quantities in excess of 40 cables may cause deformation of the bottom cables within the bundle.

j) Cables should not be attached to ceiling grid or lighting support wires.

k) Any cable damaged or exceeding recommended installation parameters during installation should be replaced by the contractor prior to final acceptance at no cost.

l) A self-adhesive label or PVC marker ferrules should identify the Cables. A cable label should be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate. Similar label or marker ferrules should also be placed on a section of the cable near to the patch panel termination.

m) Pulling tension on 4-pair UTP cables should not exceed 25-pounds for a single cable or cable bundle. The pathway should be adequately sized so as not to exceed the 80% cross-section fill of cables. The pathway should be securely installed in the facility.

n) Care should be taken when pulling cables into trucking to avoid damage due to snagging. Trucking partitions should be used to separate the data cables from power, and bridges should be used where data cables have to cross the mains.

MATERIALS

Conduits

(i) All metallic conduit pipes shall be of MS and be ISI marked. The wall thickness shall be not less than 1.6 mm for conduit upto 32 mm dia and less than 2 mm for conduits above 32 mm dia.

(ii) The maximum number of PVC insulated cables conforming to ISI: 694-1990 that can be drawn in one conduit as per standard norms. Conduit sizes shall be selected accordingly in each room.

(iii) No conduit less than 20 mm in diameter shall be used. Flexible conduits will only be permitted for interconnections between switchgear, DB's and conduit terminations in wall. All flexible conduits used in the system should be Halogen free, flame retardant and self extinguishing polyamide conduits.

Conduit Accessories

- The conduit wiring system shall be complete in all respects, including their accessories.
- All conduit accessories shall be of solvent cement plastering type and under no circumstances pin grip type of clamp grip type accessories shall be used.
- Bends, couplers, etc. shall be solid type in recessed type of works and may be solid or inspection type as required.
- Saddles for surface conduit work on wall shall not be less than 0.55 mm (24 gauge) for conduit up to 25 mm dia. and not less than 0.9 mm (20 gauge) for larger diameter.
- The minimum width and the thickness of clips used for fixing conduit to steel joints, and clamps shall be per standard norms.

Outlets

• The switch box or regulator box shall be made of metal on all sides, except on the front. In case of cast boxes, the wall thickness shall be at least 2 mm and in case of welded mild steel sheet boxes, the wall thickness shall not less than 1.2 mm (18 gauge) for boxes upto a size of 20 cm x 30 cm, and above this size 1.6 mm (16 gauge) thick MS boxes shall be used. The metallic boxes shall be duly painted with anticorrosive paint before erection.

• An earth terminal with stud and 2 metal washers shall be provided in each MS box for termination of protective conductors and for connection to socket outlet/ metallic body of fan regulator etc.

• Clear depth of the box shall not be less than 60 mm, and this shall be increased suitably to accommodate mounting of fan regulators in flush pattern. The fan regulators can also be mounted on the switch box covers, if so stipulated in the tender specifications, or if so directed by the Engineer-in-charge.

• Except where otherwise stated, 3 mm thick phenolic laminated sheets as per clause shall be fixed on the front with brass or cadmium plated iron screws as approved by the Engineer-in charge.

Installation

- Common aspects for recessed and surface conduit works

Conduit joints

- The conduit work of each circuit or section shall be completed before the cables are drawn in.
- Conduit pipes shall be joined by means of couplers and accessories only.
- Cut ends of conduit pipes shall have no sharp edges, nor any burrs left to avoid damage to the insulation of conductors while pulling through such pipes.

Bends in conduit

- All necessary bends in the system, including diversion, shall be done either by neatly bending the pipes without cracking with a bending radius of not less than 7.5 cm, or alternatively by inserting suitable solid or inspection type normal bends, elbows or similar fittings, or by fixing cast iron inspection boxes, whichever is most suitable.
 - No length of conduit shall have more than four bends from outlet to outlet.
- Additional requirements for recessed conduit work.

i) Making

- a. The chase in the wall shall be neatly made, and of ample dimensions to permit the conduit to be fixed in the manner desired.
- b. In the case of buildings under construction, the conduit shall be buried in the wall before plastering, and shall be finished neatly after erection of conduit.
- c. In case of exposed brick/ rubble masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work.

ii) Fixing conduits in chase

- a. The conduit pipe shall be fixed by means of staples hooks or by means of saddles, not more than 60 cm part, or any other approved means of fixing.
- b. All joints of conduits pipes shall be treated with some approved preservative compound to secure protection.

iii) Fixing conduits in RCC work

- a. The conduit pipe shall be laid in position and fixed to the steel reinforcement bard by steel binding wires before the concreting is done. The conduit pipes shall be fixed firmly to the steel reinforcement bars to avoid their dislocation during pouring of cement concrete and subsequent tamping of the same.
- b. Fixing of standard bends or elbow shall be avoided as far as practicable, and all curves shall be maintained by bending the conduit pipe itself with a long radius which will permit easy drawing in of conductors.
- c. Location of inspection/ junction boxes in RCC work should be identified by suitable means to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes.

iv) Fixing inspection boxes

- a. Suitable inspection boxes of the minimum requirement shall be provided to permit inspection, and to facilitate replacement of wires, if necessary.
- b. These shall be mounted flush with the wall or ceiling concrete. Minimum 65 mm depth junction boxes shall be used in roof slabs and the depth of the boxes in other places shall be as per IS: 2667 – 1977.

v) Fixing switch boxes and accessories

Switch boxes shall be mounted flush with the wall. All outlets such as switches socket outlets, etc. shall be flush mounting type, unless otherwise specified in the Additional Specifications.

vi) **Bunching of cables**

- a. Cables shall be always be bunched so that the outgoing and return cables are drawn into the same conduit.
- b. In case of three phase loads, separate conduits shall be run for each phase from the distribution boards to the load points, or outlets as the case may be.

B-4. TECHNICAL SPECIFICATIONS FOR PUBLIC ADDRESS/ VOICE ALARM SYSTEM

System Design

The design for the Digital Public Address/Voice Alarm System should meet the user and system requirements below. Its key features and design basis are as described in the next chapters.

User Requirements

The broadcasting system uses the same device to play the background music, business announcement and emergency broadcast. It has an emergency call microphone in the fire control center for evacuating the crowds in specific zones when accident happens and a paging microphone in the broadcasting center to broadcast announcements and search notices.

The background music, business announcement and emergency broadcast share the same loudspeakers. In ordinary situation, the loudspeakers are for playing background music and business announcement, but for emergency broadcast instead during the fires. The broadcasting devices located in the broadcasting center or the specified location according to the user's requirement. The placement of the devices should meet the operating environment requirement and save up floor space. Meanwhile, the emergency broadcast can achieve the linkage of the adjacent layers. Users can select the layers to be linked.

System Design Requirements

Maturity

As the development of modern science and technology, all kinds of the advanced technologies have been applied in the intelligent buildings to save the labor costs, to improve the efficiency and to ensure the intelligence for the modern buildings.

The modern technologies support the public address applications in the intelligent buildings. The global mature and advanced technologies are critical for designing the public address system, and only the broadcasting system incorporating mature and industry-leading technology and high-technology products can ensure the intelligence for buildings. In the system design, advanced concepts, technologies and methods need to be adopted; system structure, product designs and wiring easiness also need to be considered.

Functionality and Reliability

Besides the technical advancement mentioned above, functional design, system structure, system performance, manufacturing process and after-sales support are also important as to ensure the reliability and stability of the system operation, maximizing the mean error-free time.

A mature technical platform and the rigorous manufacturing process are the bases of functions' realization. During the runtime, system should be able to discover and eliminate all the functional faults in time. The core components can achieve auto backup. System administrators can easily access the failures and work logs.

Manageability

Intelligent buildings need to realize intelligence distribution and resource sharing. The central control units of the broadcasting systems connected with standard Ethernet

distribute in different zones of the building for usage convenience. The system administrators can collect the system resources in the network and centralize the monitoring management. The resulting efficiency and equipment cabling cost reduction can not be achieved by the traditional decentralized management. Therefore, a digital address system that can be extended via Ethernet and can achieve central monitoring management is ideal.

Key Design Bases and Indices

Key Design Bases

- XXX Bid Document
- Architectural Plan
- Civil Architectural Electrical Design Code (JGJ/T16-92)
- Code for Engineering Design of Generic Cabling System for Building and Campus (GB/T50311-2000)
- Standard for Design of Intelligent Building (GB/T50314-2000)
- Code for Design of Automatic Fire Alarm System (GBJ116-92)
- Automatic control system for fire protection (GB16806-2006)
- Technical Code for Public Address System Engineering (GB50526-2010)

Key Design Indices

Sound Field Intensity

The intensity of the sound field is close related to the background noise. In terms of the noise criterion for different environments, the noise criterion in general buildings is 25 ~45db except the parking lot with noise criterion around 55 ~56db. The uniformity of the sound field is the uniformity on the sound pressure level, and its range of variation should better be around 8db. Sound intelligibility is the subjective assessment standard of the sound articulation. The performance indices for the loudspeaker: the frequency response is the key factor that affects the intelligibility. The frequency response of the ceiling loudspeaker within 100Hz ~ 14 KHz is appropriate. The specific indices for the various loudspeakers should accord to the frequency response of the amplifier, which should be better than the loudspeaker's. The selection and location for the loudspeakers are mainly determined by factors like maximum sound pressure level, sound field uniformity, transmission frequency characteristic and space size. In terms of the technical standards, Indices of Acoustic Characteristics for Sound Reinforcement System & Civil Architectural Electrical Design Code, the system is designed by third level of the sound reinforcement for the voice and music. The indices are as follows:

- Vacant auditoria stable overall sound pressure level $\geq 85\text{dB}$ (Within 250 ~ 4000Hz average sound pressure level)
- transmission frequency characteristic: 250 ~ 4000Hz, tolerance +4 ~ 10dB
- Sound Field Non-uniformity $\leq 8\text{dB}$
- The sound pressure of the listening point on the vertical axis along the single loudspeaker's projecting direction can be calculated by: $LP=L0+10\lg PS-20\lg r$
- LP: auditory point sound pressure level(dB), L0: loud speaker sound pressure level (dB SPL), PS: sound pressure power of sound source, also the loudspeaker rated power (W), r: vertical distance of the speakers and the listening point

- Background Music: The sound source location of the background system should not be aware by the listeners. The goal for the design is that the tone quality of the music is tender and clear. The design indices: the sound pressure inside is uniform. The average sound pressure = noise level + (3~5) db. The frequency band is 100 ~ 12000Hz, and the playback is straight.
- Emergency broadcast: The emergency system is designed to make the listener hear clear and correct sound. The design indices: The sound pressure inside is uniform. The average sound pressure = 88 ~94 db. The frequency band is 100 ~ 6000Hz and the playback is straight.
- As described above, the noise level can determine the average sound pressure for this design: Background music sound pressure = 60 ~ 70 dB, and Emergency broadcast sound pressure = 88 ~94dB.

Power Amplifier

- $P=K1 \cdot K2 \cdot \Sigma P0$
- P —Total electric power amplifier device output (W); P0— max. electric power of $Ki \cdot Pi$ when every branch broadcasts at the same time
- Pi — the speakers rated capacity of the i-th branch; Ki — sync coefficient of the i-th branch
- Service broadcasting programs, $Ki=0.2\sim0.4$; Background music system, $Ki=0.5\sim0.6$
- The business of broadcasting, $Ki=0.7\sim0.8$; Fire accident broadcasting, $Ki=1.0$ (the maximum electric power broadcast should be in line with the national standards)
- $K1$ —Line attenuation compensation coefficient: When line attenuation is 1db, $K1$ is 1.26; line attenuation is 2db, $K1$ is 1.58
- $K2$ — the aging factor, 1.2~1.

System Function

System Design Composition and Principle

The system has placed broadcasting devices in every plant room. The distributed control device (DCS) is integrated with many functions and supports the connection via Ethernet. It has 8 loudspeaker output circuits to connect the loudspeaker in zones and 4 network connection interfaces to connect to 4 network paging control panel or Ethernet. Each DCS can connect up to 4 amplifier channels. It has a built-in 1G memory to store the audios such as digital voice messages and the alarm tone of the emergency broadcast. This device can operate independently without the PC. It encompasses the functions like the audio playing, zone control, fault monitoring, log recording, volume control and amplifier switchover.

The control device for the system customized NPM. It has the LCD touch screen for operations, like zone selecting, calling, audio sourcing selecting, emergency broadcast, monitoring and internal communication. The functions of the Programmable network paging console NPM can be configured using the configuration software.

The system management software installed in the central control room has a user-friendly operation interface, enabling the Electronic Map, Devices and Zones statuses' graphic monitoring. Users can set shortcuts and broadcasting programs via the software, as well as

proceed background music playing, audio announcement, equipment status view, log view and time-based broadcast configurations..

Key Features

Distributed Control

This distributed design for the system is based on the building structure to facilitate the connection of the loudspeakers in several nearby zones, which will make the control of the loudspeakers easier. The selected system devices should use the TCP/IP technologies and build on the standard network platform to ensure the extensibility, compatibility for multiple technology platforms and advancement of the system.

Faults detection and Isolation

The Faults detection function for the broadcasting system can automatically examine the host system, power amplifier, power source, communication, and detect the open circuit, short circuit and grounding fault to generate the fault alarm and log.

When the grounding fault or short circuit occurs, the amplifier or the main controller of the system should isolate the circuit to ensure the operation of the main devices and normal circuits.

Background Music Audio Source

The broadcasting system can use audio sources from devices such as the CD, radio and MP3 to provide the zones with different audio sources, which can meet the various requirements for different zones. In the tolerant power range, different zones using the same audio source can share an amplifier, reducing the system cost. The background music inputs methods are multiple: both network and local inputs are allowed.

Service Broadcasting

The paging microphone allows users to make paging and broadcast search notices by zone. The paging microphone has a color LCD touch screen. Users can configure the functions directly on the screen. Users can select the zone and audio source, adjust the volume, and enable the emergency broadcast by pressing the button on it. Paging microphones can intercommunicate. 255 broadcast priorities levels available. When the connected distributed control unit is out of order, a paging microphone can continue the intercommunication with other microphones in the network and proceed the remote broadcasting configuration on other control units.

Time Synchronization

Within the system, the controller can specify any main device as the main time source, or choose a third party system to be the time source. Other devices synchronize their time with the main time source to make sure the time is consistent in the system.

Timed Broadcast

The timed broadcast function of the broadcasting system allows users to set the periods for playing different music or service broadcasts in different zones.

Emergency broadcast

The broadcasting system can be linkage of the fire system to achieve the alarm function in the adjacent layers. The layers for linkage can be configured with the software as the requirements. Users can record the voice message for the emergency broadcast and save it in the host system. The emergency broadcast can start automatically (when linkage of the fire system) and manually. The broadcasting system has its own 1 PPT emergency microphone, which could be used to play emergency broadcasts and evacuate the crowds

in specific zones.

When the fire alarm rings, the system can display the fires in planar graph and show the fire zones. According to the fire status, users can call the emergency microphone to make the fire zones enter alarm and evacuation two modes.

Priority

The broadcasting system allows users to set the priorities. Generally, the priority for the broadcast is in the order: Emergency Broadcast > Service Broadcast >Background Music, and for the microphone is Emergency Microphone > Service Broadcast Microphone.

Automatic Amplifier Shift

The system has standby amplifiers. When a main amplifier fails to function, the standby amplifier replaces it automatically. After the main amplifier recovers, the system will use it instead of the standby amplifier in an automatic way.

Broadcast Record

The DCS can record sufficient voice message (up to 1GB), and its contents can be customized. The voice message contains the emergency broadcasts for fires, such as evacuation and all-clear information, which are played by the digital speech synthesis system automatically (linkage of the fire alarm system) or manually. Four languages for the voice message are available. Users can select one of the languages to record the information.

Internal Communication

The call stations can communicate with each other using the simple communication functions.

The paging microphone in the broadcasting center has a color LCD touch screen. Users can configure the functions according to the actual requirements.

The call station's calling zone can be authorized. Each call station can call the local authorized zones. Several call stations can call the same zone, and one call station can call the zones of other call stations.

System Electronic Map

The system interface has several optional views. The electronic map can display statuses of all broadcast zones within the building structure. Users can operate on the broadcasting zones using the electronic map. Maps can be layered into three levels.

Background Music Broadcast

The background music broadcasting functions and local audio sources can be specified in different zones. The administrator can configure the background music according to the time and occasion. The system will automatically switch to the emergency broadcast under emergency.

Program Source

The broadcasting control center has various audio sources, including the professional digital players for background music, CD, FM/AM tuner, remote control microphone for zone calling and high-capacity digital record and playback devices.

Log

The system can record the device fault log and operation log. Users can search information in the logs using time, devices, operators and log types as search criteria.

Power Source Forced Switchover

The key devices, like DCS and amplifiers, have main power source and 24V standby power source. When the main power source fails to function, the standby power source is responsible for the power supply.

Distributed Call Station

The distributed call station can call the specified zones. The call station has remote control function, which can control emergency broadcast, zone audio sources and external devices.

Automatic Volume Control

The volume of the system can adjust automatically responding to different levels of environment noise in the crowded areas.

Local & Remote Monitoring

Users can monitor audio sources status via local distributed control units and remote call stations.

Emergency broadcast

- Emergency broadcast Requirement
 - Forced Switchover (Auto/Manual): Once the emergency broadcast is triggered by a remote control microphone or other external devices (fire alarm system), the other functions (like background music and general broadcast) will be paused, but the system will play the recorded voice message (alarm and evacuation information) for fire emergency or the information from the emergency microphone until the all-clear.
 - The system will switch to emergency broadcast in 3 seconds.
 - The signal tones and voice messages (alarm and evacuation information) of the Emergency broadcast system are stored on the voice storage flash or SD card, which will not be ageing or lost. Users can play them in all zones.
 - Emergency broadcast system should have system testing function as a standard configuration. The testing for the system can enable the operator to ensure the normal operation for the system all the time. The testing of emergency broadcast should be enabled via the software instead of playing the actual emergency broadcasts and causing public's panic.
 - Emergency broadcast system should achieve the automatic amplifier shift. Once an amplifier fails to function, the standby amplifier replaces the breakdown amplifier automatically without changing the input and output circuits of the amplifier manually.
 - Emergency broadcast system should have two pre-recorded emergency broadcast messages. The system should be able to edit and record the alarm and evacuation message. The priorities of the emergency broadcast can be programmed. DCS should be with a PTT emergency microphone, with which operators can announce real-time evacuation notices when emergency happens.

- Users can listen to stored or audios about to play to avoid playback error message which may lead to crowd panic.
- Language kinds should meet the user's requirements. There should be spaces left for the tags to facilitate users to stick related prompts for management.
- System can automatically record voice messages sent by emergency microphone. Users can listen to and broadcast the voice message.
- The linkage signals of the emergency broadcast uses the volt-free contact. All signals are from the fire control center. The number of the cables is the same as the fire control centers number.
- Can achieve the linkage of the adjacent layers. Users can select the layers to be linked via software configuration.
- When system switches to fire alarm mode, fire floor plan will pop up in the operating interface, directly showing where the fire happens. Operators can select specific zones and activate the warning and evacuation broadcast on the operating panel.
- The loudspeakers allow the 3-wire forced volume control switchover.
- Circuit Detection

It is able to detect every zone's status to ensure the working order of the circuits and report faults in time. When a short-circuit error takes place, the device isolates the zone where error happens to protect the amplifiers and to cut off its impact on other zones.

Device Selection

The system should be based on the TCP/IP network technologies with high level of integration and flexible configuration to meet various requirements. It is designed for the emergency broadcast and background music application enabling fire emergency broadcast functions like automatic fire warning, voice message presetting, emergency calling, emergency call recording and circuit monitoring, and service broadcasting functions like zone background music broadcasting, zone call broadcasting, timed music broadcasting and monitoring. The device is accordance with the Automatic Control System for Fire Protection (GB16806) and Standard EN 54-16.

With public address and voice alarm system integrated into one, the system should solve the duplication of investment and security risks and other problems caused by two individual systems. The distributed intelligent systems of the should be capable of accessing the 10/100M Ethernet network and multiple audio sources from the network. It supports connections in the Ethernet and the networking for several other control systems to perform centralized and distributed management via software. This product should be suitable for medium-scale and large-scale buildings.

Technical Characteristics

High Integration

The controller should be able to integrate audio source storage, network audio reception,

voice broadcasting, audio matrix, volume control, monitoring, troubleshooting and main/standby amplifier switch functions together.

Safety

The system should be GB16806/EN54-16 compliant and can work in severe environment. It can be used to broadcast in case of emergency to disperse and evacuate people. It is a great guarantee for people's life security

Ethernet Based Extension

The central controller should be able to connect over the Ethernet without any external device. The configurable Network Paging Microphone could be placed anywhere in the Ethernet, which will enable the following:

- The method of distributed installation can save the cost of wiring.
- If the band width is sufficient, it can use current internal network.
- Provide plentiful network audio sources.
- Centralized management of the system via system software.
- Control the local or global broadcasting by the manner of permissions.
- Easy to upgrade.

Multitask Processing Mechanism

To simplify the operations, the system adopts multitask processing mechanism, thus it can process multiple tasks and make it possible to broadcast multiple audio source and broadcast in multiple zones.

Multiple Audio Sources Support

The system supports the audio sources from emergency microphone, network audio, ancillary line input, build-in audio/music files and web microphones.

Network Digital Audio Transmission Technology

Multiple digital audio signals, including PC-connected microphones, external audio files, DCS local audio files, etc., can be transmitted through the network, realizing the audio input diversity and output parallelism. 10M/100M Standard Ethernet is adopted as the transmission media. If the band width is sufficient, the devices can use and share the existing network with other systems, reducing costs on network laying.

Prioritized Control

The system supports 255 priorities. Users can configure it in any way they want and realize all kinds of prioritized broadcasting controlling.

Automatic Volume Control Function

In places of crowded people and loud noises, users can install a noise detector, which can help control the broadcasting volume automatically to ensure sound's intelligibility.

Local and Network Monitoring Function

With the built-in loudspeaker of controller or Configurable Network Paging Console, users can monitor each zone's broadcasting. The monitoring volume can be adjusted.

Touch screen

Programmable network paging console (NPM) is equipped with a touch screen. Users can operate on the touch screen to configure multi-zones settings without the need to extend hardware key modules, saving floor space on the desktop.

Troubleshooting Feature

The ASD troubleshooting technology can support the system to automatically detect the failure of the main power, standby power, amplifier circuit, amplifier protection/power, software, communications and loudspeakers etc. It can also locate the failure for maintainers to repair or replace the fault units.

Loudspeaker Circuit Detection

The SIM loudspeaker circuit detecting technology helps monitor loudspeaker circuits' statuses. When short-circuit or open-circuit faults are found, the device will send a warning automatically. The software can display all the circuit faults for maintenance's convenience. Usually a loudspeaker's short-circuit fault will activate the amplifier protection, affecting the working order in other zones. SIM solves this problem by automatically isolate the short-circuited zone where fault is found.

Matrix Allocation Function

This system includes the audio source matrix and power matrix to provide two kinds of work mode: low-cost power zones, and amplifiers & zones, which can meet the requirement for low-cost applications or high power zones.

Auto-backup

RiskFree auto-backup technology focuses on realizing the main units', including servers' and amplifiers', backup and switchover functions. A server machine is paired up with a standby one, while a standby amplifier can serve as the backup machine of one, two or three main amplifiers. When faults are detected on the main machines, the system will switch over to the standby one.

Input/output Triggering

This system has input/output interfaces which can be triggered by dry contacts. Engineer staffs can configure the contact input to achieve the broadcasting control by the external device (linkage of the fire system). The contact output can be used to control the external devices for the volume, forced switchover and so on. The contact output interface can be linked of the broadcasting operations.

Voice Recording

Besides in the system server, the controller should have a 1GB solid-state storage to store the alarm voice, service voice and other audio files. Users need to upload the audio files to the device using the specified configuration software.

Voice Alarm

This system is designed in accordance with the EN54-16 Standard and national standard GB16806. It is full-featured for the fire alarm. When the fire occurs, the system will play the preset voice information. Then it can play the evacuation information for the zones with fires and the fire alarms for the nearby zones. The system can set several kinds of language for voice information, which can be played using the operation panel.

Automatic Recording

When users make broadcasting using the emergency microphone, the system can automatically record the broadcast for 30 minutes or more. The recorded broadcast can be

played as the audio source.

Broadcast Delay

Users can configure the time delay function in the broadcasting system. After making broadcasts, users need to wait for the time delay set previously, then the pre-recorded program will be played. This function can be utilized as in the following situation: When fire occurs, the system will pause for the administrator to confirm the fire alarm signal, and then play the emergency broadcasts. It can avoid crowd panic results from mis-operations.

OneClick Technology

To increase operation's convenience, OneClick technology is developed with which broadcasting can be started by clicking only one key. The operation shortcut can be configured with system management software and network paging console.

Internal Communication

The Programmable network paging console should have built-in loudspeakers and microphones for internal communication. Users need to configure this function before using it.

Multichannel Digital Power Amplifier

Multi-channel digital power amplifiers with CLASS-D technology design should be used in the system. Its output efficiency is more than 80%, which can reduce the power costs. Besides low power consumption, it is small in size. In this case, several amplifiers can be put in the same chassis to save the space. This kind of power amplifier has the features as below:

- CLASS-D Amplifier saves the energy with high efficiency.
- Channel number can be 1, 2 or 4
- 100V or 70V output is used for each channel.
- Support balanced input or unbalanced audio input mode.
- Cooling mode is forced air-cooling mode.
- Able to limit output voltage automatically.

Flexible Configuration

This system allows users to customize the configurations flexibly using the specific software. The engineering technicians and maintainers can configure the built-in audio sources, keys' functions, troubleshooting, audio source play modes, broadcasting priorities and contact input/output and other customized operations the OneClick functions. With careful configurations, the system can meet the needs of both background music broadcasting and emergency alarms. The configuration software for this system is used to configure the hardware. The default configuration for the device contains only the basic functions. Users need to work on each settings, including basic parameters, troubleshooting, broadcast preset and key events and so forth.

Configuration Software features:

- Project File Management
 - It includes:
 - Create project, save project, open project, and check the latest project file;
 - Manage the subsystem and configuration files
- Property Setting
 - The property setting is to set the basic property and broadcasting functions. The basic property settings include the zone settings, DCS settings and NPM settings.
- Broadcasting Setting

The broadcasting function allows users to set the event- triggered, time-triggered and fire alarm broadcasting.

- **Output Configuration**

After the error checking and building, system can generate the configuration files according to the configured project files.

- **Audio Source Conversion**

It allows users to convert the audio files according to the sampling rate, digitalizing bit and channel number into the audio files in specified formats for the system.

- **Network Communication**

It allows users to upload the configuration files, audio files and playlists to the devices like DCS and NPM via the network. The devices will reboot to make the configuration take effect after they receive the configuration files.

System Management Software

The system management software can run on the Windows XP/Windows Vista/ Windows 7 operation system. It can communicate with the system via the Ethernet. The operation is as simple as below:

- **System Configuration**

- Configure the components and functions of the system management software.
- Configure the devices for the server.
- Configure the electronic map or operation interface.
- Configure audio sources and preset broadcasting operations.
- Drag the maps, icons and buttons to modify the layout on the server operation interface.
- Configure the managing scope and authorities for software on the client end.
 - User Management**

It can add, edit and delete users and manage access control of the users.

- **Broadcasting Control**

The broadcasting control function allows users to manage all the broadcasting businesses and to manage the broadcasting management client ends.

- **System State Management**

The software can obtain broadcasting states of each device in the system. The buttons and icons representing devices or zones will be green when all functions are normal, and will turn red when fire occurs.

- **System Warning**

System Warning Function allows for centralized management of device failure states in the system, and recording the fault log automatically in the log module. When the system detects failure, the interface of the system management software will give out audible & visual alarm. Failed device unit is yellow. Users can accurately locate the failure unit using the interface of the system management software.

- **Log Management**

System can record and store all system operations histories and failure events for future analysis. Work log and failure log will be stored in separate memories and cannot be deleted manually. Only the logs of the latest one year will be stored. Users can query the logs according to time, workgroup, device, etc. and export the result logs.

- Voice Synthesis

The system management software provides the interfaces for the third party voice synthesis software. It can convert the text words into voice for playing.

- Audio Management

It allows users to perform centralized management of the audio files on the server, and to play them on the network. The audio management function can convert the audio source files in different format into the specified formats of the system. It can put the audio files to the specified broadcasting zones by configuring the preset broadcasting operation.

Device Description

Digital Integrated System Manager / controller

The Digital Integrated System Manager is hereinafter referred to as the DCS.

The DCS is control equipment in the system designed for extending the number of loudspeaker zones, and can support multiple sound source files for broadcasting. The system integrates with functions such as the sound source file storage system, the network audio broadcasting system, the loudspeaker zone control system, and the system for monitoring and diagnosing faults.

The DCS offers various features, which are listed below:

- Supports the manual selection of sound source files, zone buttons, and can be directly operated.
- Supports emergency microphone input for emergency broadcast in the event of, for example, a fire evacuation.
- Includes different indicator lights that identify system running states.
- Performs remote paging and broadcasting operation through the Configurable Network Paging Console.
- Includes 8 zone outputs. The number of zones can be configured through the software.
- 4 auxiliary inputs that can connect to external sound source equipment such as a CD player or tuner
- 4 auto volume control input ports that can set the phantom power supply and gain of each input.
- Auto loudspeaker circuits' short-circuit and open-circuit detection.
- A fuse protects the main power supply. In the case of a power supply short circuit within the DCS, the system automatically disconnects the main power supply.
- Built-in loudspeaker that can monitor the zones and sound sources, as well as monitor the network audio through the NPM.
- Contains 1GB of built-in flash memory that can store recorded voice files so as to fulfill functions such as voice information broadcasting and voice synthesis

- Can simultaneously broadcast four types of sound sources, such as voice audio sources and external input or network audio sources.
- Can automatically record operation and fault logs, and can store up to 10,000 logs of each log type (operation and fault log types).
- Supports switching between the main and backup power amplifiers, and is capable of configuring the standby mode.
- Contains a self-test function.
- Supports automatic fault diagnosis.
- Supports broadcasting volume adjustment.
- Can define the zone and sound source functions. Button function description labels are also easy to install.
- An audio matrix enables broadcasting any audio source in any zone.
- Supports fire emergency broadcast mode so as to improve personnel evacuation efficiency in case of an emergency.
- Supports broadcasting designated recorded voice audio at a designated time so as to allow for unattended broadcasting.
- Capable of system extension through an Ethernet network.

Parameter	Value
Power Supply	
Main power supply	~100-240V, 50/60Hz
Backup power supply	DC 21.5V-28.5V
Main power fuse	T2AL 250V
Max. input power	120 W
Rated power	50 W
Audio Input	
Auxiliary input	0dB
Input impedance	20 kΩ
Frequency response	60Hz-16KHz
PTT microphone input	-51dB
SNR	>85dB
Audio Output	
Audio output channels	4 ↑
Output signal	0dB
Record output	0dB
AVC Input	
Channels	4 ↑

Parameter	Value
Input signal	-50dB/0dB, configured by switch
Input impedance	20KΩ
Phantom power	DC 24V, configured by switch
Frequency response	60Hz-16KHz
SNR	>65dB
Loudspeaker Circuit	
Output channels	8, with circuit fault detection function
Max. output load power	250W
Trigger Input / Output	
Trigger input ports	8
Trigger output ports	8 (NO, NC and COM)
Max. working voltage	AC 250V/DC 30V
Max. working current	2.5A
Others	
Monitoring loudspeaker	10W/8W
Ethernet speed	10M/100M
Ethernet interface number	4
Storage space	1GB
Work Condition	
Humidity	< 95%, without condensing
Working temperature	-10°C~+55°C
Storage temperature	-40°C~+70°C
Specification	
Dimension (W×H×D)	482 mm×88 mm ×420mm
Mount dimension (W×H×D)	580mm×235mm ×552mm
Net weight	9.3Kg
Gross weight	12.5Kg

4X125W / 2X250W/1X250W High Efficiency Power Amplifier

The DA has the following main characteristics:

- Energy-efficient CLASS-D power amplifier
- Contains 1/2/4 independent channels
- Each channel has 100V or 70V of output
- Supports balanced or unbalanced audio input
- The DA is cooled through forced air-cooling

- Provide automatic re-settable over current, overload, overheating, overvoltage, under-voltage and DC protection

1X500W

Parameters	Values
Rated output power	1X250W
Main power supply voltage	AC 220V -15%~+10% 50~60Hz
Backup power supply voltage	AC 220V -15%~+10% 50~60Hz
Main power supply fuse	T10AL 250V
Loudspeaker output	100V / 70V
Frequency response	70~15KHz (+1dB ~ -3dB)
Input sensitivity and impedance	1.414V _{RMS} & 20K ohm
Output voltage/impedance	100V/40ohm, 70V/19.6ohm
Signal-to-noise ratio (SNR)	□90dB
Nonlinear distortion	□ 0.1% (1KHz, 1/3 rated output power)
Number of channels	1
Environment humidity	95%, without condensing
Working temperature	0 to +40□C
Storage temperature	-10□C to +55□C
Product dimensions (width × height × depth)	88mm × 440mm × 440mm

2X250W

Parameters	Values
Rated output power	2X250W
Main power supply voltage	AC 220V -15% - +10% 50~60Hz
Backup power supply voltage	AC 220V -15% - +10% 50~60Hz
Main power supply fuse	T10AL 250V
Loudspeaker output	100V / 70V
Frequency response	70-15KHz (+1dB to -3dB)

Parameters	Values
Input sensitivity and impedance	1.414V _{RMS} & 20K ohm
Output voltage/impedance	100V/40ohms, 70V/19.6ohms
Signal-to-noise ratio (SNR)	□ 90dB
Nonlinear distortion	□ 0.1% (1KHz, 1/3 rated output power)
Number of channels	2
Environment humidity	□ 95%, without condensing
Working temperature	0 to +40□C
Storage temperature	-10□C to +55□C
Product dimensions (width × height × depth)	88mm × 440mm × 440mm

Configurable Network Paging Console

The Configurable Network Paging Console is hereinafter referred to as the “NPM”

The network paging microphone (NPM) connects to the system and related devices to transmit audio and control information through the Ethernet network. The NPM is used for paging, controlling broadcasts, monitoring zones, and for using the bidirectional intercom function.

The NPM has the following characteristics:

- Lightweight and innovative patent outward design. Support embedded desktop installation
- Simple and intuitive user interface
- Can connect with up to 20 units. Button numbers can be added via software configuration
- Built-in monitor loudspeakers. Can utilize functions like zone monitoring and two-way intercom between stations.
- Digital audio processing to avoid acoustic fidelity distortion
- Can intercommunicate with other paging microphones and DCS in the network even when the connected DCS is not running
- 3 shortcut buttons: microphone talk mode switch, select all function and emergency broadcast
- Has one audio input and output port for playing BGM from a CD source or for recording an output

Parameters	Values
Power supply voltage	DC 12V
AUX input	0 dB

AUX input impedance	10 K Ω
Frequency response	60 Hz – 16 KHz (local input signal)
Microphone input	-51 dB
Audio output	0 dB
Monitoring loudspeaker	2 W/8 Ω
Monitoring sound pressure level	Higher than 65 dB and lower than 115 dB (1 m in front of where the audio is being output)
Operating temperature	-10 $^{\circ}$ C to +55 $^{\circ}$ C
Storage temperature	-40 $^{\circ}$ C to +70 $^{\circ}$ C
Humidity	\leq 95%, without condensation

Pure Final Stage Power Amplifier

Pure final stage power amplifier 360W/460W/660W can be used in this system, which has the following characteristics:

- Real-time display of the temperature and volumes on the LCD;
- Build-in RCA and XLR ports with high-quality balanced input/output interfaces specially added;
- 100V or 70V constant-pressure output and 4-16 Ω constant-impedance;
- Output volumes can be digitally adjusted. It has 32 digital volume levels and can be adjusted by the two volume keys.
- 5.8 Unit LED display facilitates you to examine the device status.
- Perfect output short circuit protection and over-temperature protection; Automatic press limit control for long-time over loading output;
- Cool fan can be warm booted. The complete new design of the build-in short air duct cooling system structure for amplifiers can ensure the high stability performance.
- Remote fault reset function such as overloading or short circuit protection.

Parameters	360W	460W	660W
Rated output power	360W	460W	660W
Output type	4-16 ohms(Ω) Constant impedance output		
	70V/100V Constant pressure output		
Line Input	10k ohms(Ω) 0.775V (0 dB) , unbalanced BALANCE: 10k ohms(Ω)10V, balanced		
Line Output	10k ohms(Ω) 0.775V (0 dB) , unbalanced		

Volume control	32 levels, digital control; can remote control through the PC		
Frequency response	50 Hz ~ 18k Hz (± 2 dB)		
THD (Total harmonic distortion)	<0.5% at 1kHz, 1/3 Rated output power		
SNR (Signal-to-noise ratio)	>85 dB		
Damping	200		
Rate of rise of voltage	15V/uS		
Adjusting rate of output	< 3 dB, No signal static state to full load state		
Cooling	DC 12V FAN Forced air-cooling		
Protection	AC FUSE×10A	AC FUSE×12A	AC FUSE×15A
	AC FUSE×1, Load short circuit, overheating		
Power supply cable	(3×1.5 mm ²)×1.5M (standard))		
Power supply	AC 220V ± 10% 50-60Hz		
Power consumption	485W	620W	880W
Product dimensions	133(H)×496(W)×483(D) mm		
Packing dimensions	225(H)×610(W)×585(D) mm		
Net weight	15.5kg	18kg	19.7kg
Gross weight	17.1kg	20kg	22kg

Volume Controllers

Volume Controllers have the following four types: 6W, 30W, 60W and 120W respectively. The features are as follows:

- Build-in 24V DC forced cut-off relay;
- 5 volume levels control;
- Applicable to 3-wire, 4-wire and 6-wire systems;
- Standard 86X86 installation base-shell.

Parameters	Values
Rated power	6W/30W/60W/120W
Supply voltage	100V
Frequency response	50Hz~20KHz

Attenuation	5X2dB + off
Current consumption	20mA, 24V DC

Integrated Audio source

The Integrated CD player supports the MP3 music files on removable disks, SD cards, DAB digital broadcastings and FM tuners.

- Two single CD\USB\SD and DAB\FM line outputs can play music applications in two areas.
- The volumes of the two line outputs can be adjusted separately.
- CD\USB\SD has three play modes: single play, all play and repeated play.
- DAB\FM can preset 10 channels of programs.
- RS485 remote control interface.

Parameters	Values	
Power supply	~ 220V 50Hz	
Power consumption	< 13W	
Input	DAB/FM DAB 50 Ohm unbalanced antenna terminals USB port, SD port	
Output	RCA audio output for DAB/ FM synthesizer tuner (910mV) RCA audio output for CD/USB/SD L and R channels (910mV)	
Channel	2	
Product dimensions	482(W) × 44(H) × 252(D) mm	
Packing dimensions	520(W) × 142(H) × 351(D) mm	
CD-DA Audio		
Output level(mV)	850mV	
Frequency response(dB)	1dB	
THD (Total harmonic distortion)	0.08%	
SNR(Signal-to-noise ratio) (dB)	80dB	
Channel Separation(dB)	70dB	
MP3/WMA Audio		
Channel Separation(dB)	70dB	

Parameters	Values
Frequency response(dB)	17Hz~127Hz(-1dB, +2dB) 127Hz~10KHz(□1dB) 20KHz(□2dB)
THD (Total harmonic distortion)	0.15%
SNR(Signal-to-noise ratio) (dB)	80dB
DAB	
Band frequency range (MHz)	174MHz~240MHz
SNR(Signal-to-noise ratio) (dB)	60dB
THD (Total harmonic distortion)	0.2%
Channel Separation(dB)	55dB
Input Impedance(Ohm)	50Ohm
FM	
Band frequency range (MHz)	87.5MHz~108MHz
SNR(Signal-to-noise ratio) (dB)	48dB
Parameters	Values
THD (Total harmonic distortion)	1%
Channel Separation(dB)	25dB

Loudspeakers

Ceiling Loudspeaker

6W Metal Ceiling Speaker with 6/3/1.5W taps

Parameters	Values
Max power	9 W
Rated power	6 W

Power taps @ 100V	6W / 3W / 1.5W
Sound pressure level at 6W/1W (4kHz,1m)	96dB / 88 dB
Frequency range (-10dB)	80 Hz -20 kHz
Dispersion angle (1kHz/-6dB)	160°
Rated input voltage	100 V / 70 V
Rated impedance	1.7 kΩ / 3.3 kΩ
Connection	Plastic terminal blocks
Dimensions(Φ x H)	Φ180 mm x 55 mm
Hole cut-out size	150 mm
Size of speaker	5"
Weight	0.71 kg
Color	White (RAL 9010)
Weight of Magnet	117 g

6W Ceiling speaker with metal grille and 6/3W taps

Parameters	Values
Max power	9W
Rated power	6W
Power taps @ 100V	6W / 3W
Sound pressure level at 6W/1W (4kHz,1m)	98 dB / 90 dB
Frequency range (-10dB)	80 Hz -20 kHz
Parameters	Values
Dispersion angle (1kHz/-6dB)	160°
Rated input voltage	100 V / 70 V
Rated impedance	1.7 kΩ / 3.3 kΩ
Connection	Push terminal

Dimensions(Φ x H)	Φ 180mm x 55 mm
Hole cut-out size	150 mm
Size of speaker	5"
Weight	0.6 kg
Color	White (RAL 9010)
Weight of Magnet	93 g

Wall Loudspeaker

6 W wall mount speaker with 6/3 W taps

Parameters	Values
Rated power	6 W
Power taps @ 100V	6 W / 3 W
Sound pressure level at 6W/1W (1kHz,1m)	96 dB / 88 dB
Frequency range (-10dB)	110 Hz -13 kHz
Rated impedance	1.7 k Ω / 3.3 k Ω
Connection	Cable
Dimensions (W x H x D)	260 x180 x 120 mm
Weight	1.08 kg
Color	White (RAL 9010)
Weight of Magnet	115 g

Horn Loudspeaker

15 W Horn Loudspeaker with IP66 protection

Parameters	Values
Max power	25 W
Rated power	15 W
Power taps @ 100V	15 W / 7.5 W
Sound pressure level at 6W/1W (1kHz,1m)	110.3 dB / 98.5 dB
Frequency range (-10dB)	500 Hz - 5 kHz
Dispersion angle (1kHz/-6dB)	140°
Rated input voltage	100 V / 70 V
Rated impedance	500 Ω / 1 k Ω
Connection	Cable
Dimensions (diameter x height)	225 X 165 X 240mm
Weight	1.38 kg
Color	White (RAL 9010)
Case material	ABS

Sound projection speaker

20W Unidirectional Sound projector with IP55 protection

Parameters	Values
Max power	30 W
Rated power	20 W
Power taps @ 100V	20/10/5W
Sound pressure level at 6W/1W (1kHz,4m)	106 dB / 94 dB
Frequency range (-10dB)	150 Hz -15 kHz
Rated input voltage	100 V / 70 V
Rated impedance	500 Ω / 1 k Ω / 2 k Ω
Connection	Plastic terminal
Dimensions (W x H x D)	170 x170 x 63 mm
Size of speaker	6.5 "
Weight	1.28 kg
Color	White

C. Special Conditions of Contract & General Technical Specifications for Cold Storage / Refrigeration unit Work and Weigh Bridge.

1. SCOPE

In general, the contractor shall supply, store, erect, test and commission all the equipment required. The Contractor shall furnish all the materials, labour, tools and equipments for the cold storage Work, as shown in the accompanying drawings and in the bill of quantities and specifications hereinafter described.

2. WORKING AGENCIES

The Contractor shall deploy specialized working agencies as mentioned in approved list of makes.

3. INSPECTION & APPROVAL OF THE WORK BY LOCAL AUTHORITY

On completion of this work, the contractor shall obtain and deliver to the owners the certificates of inspection and approval by officer of local Authority / Administration. The contractor shall include in his rates all charges necessary for getting approval. Any / all statutory clearances & approvals required for commencement of cold storage work and clearance of cold storage during installations and after completion of cold storage work (License, if any) are to be arranged by the agency. The quoted rates are deemed to be inclusive of any / all the charges in this respect and nothing extra will be payable on this account.

4. DRAWINGS

The drawings, specifications and bills of quantities shall be considered as a part of this contract and any work or materials shown on the drawings and not called for in the specifications or vice-versa, shall be executed as if specifically called for in both. The work shall be executed as per approved working drawings, subject to any minor changes, if found essential to co-ordinate installation of this work with other trades. All such changes shall be without any additional major cost to the owners. The data given in the documents and drawings are approximate & their complete accuracy is not guaranteed. The drawings and data furnished are meant for guidance & assistance to the contractor. The exact dimension, location, distance and levels etc. will be governed by the space conditions.

5. WORKING DRAWINGS & SHOP DRAWINGS

The contractor shall prepare and submit two copies tracing print and three set of blue print with soft copy to the CONSULTANT / owners for approval detailed working drawings.

6. AS BUILT DRAWINGS

After the completion of work and before issuance of certificate of virtual completion, the contractor shall submit to the CONSULTANT / employers layout drawings drawn on tracing sheet & 5 sets of blue print and approved scale indicating the complete installation along with soft copies on C.D. 's (5 Sets)

7. INSPECTION OF MATERIALS

The CONSULTANT / owners shall have access to the manufacture's premises for inspection of any items of the tender for which contractor has made arrangement with manufacture / suppliers. All such inspection shall not need any prior intimation by the owners or architects.

The contractor shall make all facilities and expenditure for two persons of tours & travels by air, stay and local journey by taxi for inspection of material at

manufacturer/site premises as per their entitlement of CONSULTANT/Client representative. The contractor shall include all expenditure towards inspection for two persons in their rates. All the testing facilities, Tools and Tackels and all the consumables including the fuel etc. shall be provided by the contractor and nothing extra shall be paid on this account.

C-1. TECHNICAL SPECIFICATIONS FOR COLD STORAGE

- Prefabricated PUF Panels to prepare a room of suitable size.
- Cold Room temperature + 2 to +5 Deg. Celsius
- Wall & ceiling insulation 80mm with 0.5mm internal PPGI and external PPGI of 0.5mm sheet with 40Kg.+2 density Kg. per cum. (PPGI- Pre Painted GI Sheet)
- Pre-fabricated PUF slab of 60mm with tar felt & bitumen for floor with top layer of Kota stone.
- Sliding type Door without strip heater of PUF panel of suitable size in cold store room with 0.5mm sheet thickness. Internal PPGI and external PPGI finish. (PPGI- Pre Painted GI Sheet).
- Heat Load: Please indicate the Heat Load in kW, minimum Refrigeration suitable capacity of 22 kW @ -5 deg. C evaporating and +45 deg. C Condensing temperature required (i.e. 36 ambient temperatures). Air cooled condensing unit with Scroll Compressor. Refrigerant R-404a. Each unit having cooling capacity not less than 11kW as per above conditions.
- Evaporator unit matching with condensing unit complete with coil section and suitable Air defrosting arrangement. Having minimum No. of Fans 3; Min. fan Dia.: 450 mm; Min. Air Flow: 15500 CMH. Refrigerant R-404a. Cooling capacity of each unit should not be less than 11kW as per above conditions. For effective air circulation in the room and uniform temperature at each point.
- Split Type Units with 1 no. of standby.
- Refrigeration units are automatic without any operator
- Safety equipment's are incorporated,
HP/LP cut out & Thermostat controlled unit.
Electrical safety for under voltage/ over voltage/ single phase reversal etc.
Safety release lever to open the cold room from inside in case some person is locked inside the cold room.
- Design at ambient temperature of 36 Deg. C.
- Long life door lock and handle
- Digital Thermometer
- Kick Plates both side.
- Vapor proof LED Light for minimum 200 lux level.

- PVC Strip curtains 1 no. with 50% over lapping
- Safety alarm
- Refrigerant piping with copper pipes, Drain piping and Suction Line Insulation.
Maximum of 10 m for Suction line
Maximum of 10 m for Liquid line with first ref. Charge
Quantity 3 Lot. (2 W + 1 S)
- Refrigerant controls that includes.
 - a) Thermostatic expansion valve.
 - b) Liquid line and filter drier
 - c) HP/LP switches
 - d) Protection by thermostats
- Three phase voltage stabilizer, voltage range 352 to 480 Volts.

C-2. TECHNICAL SPECIFICATION FOR WEIGH BRIDGE (PIT LESS TYPE)

The Weigh Bridge shall consist of a Platform which shall be mounted on load cells. The No. of load cells may vary from 4,6& 8 depending on the size of the platform.

The load cells shall be double ended shear beam type which shall have a protection level of IP-68 which means the load cells shall be totally unaffected by Dust, Water & Hostile atmosphere.

The outputs of these load cells shall be connected to a junction box, which shall have a sealing conforming to IP_65. from the junction box the load cell cable shall be connected to a digitizer.

The Digitizer should be state-of-art system, which should be micro-controller based and works on a SIGMA – DELTA converter based analog to digital conversion.

The digitizer shall have a RS232C port for linking to a computer.

The computer should be complete with all the software required to operate the Weigh Bridge. And a 80 column Dot Matrix Printer shall be connected to computer to give the printout details as follows:

- a) Date
- b) Time.
- c) Serial No.
- d) Vehicle No.
- e) Commodity.
- f) Party name.
- g) Tare Wt.
- h) Gross Wt.
- i) Net Wt.

The entire record as above shall be also stored in the memory and the summary of the Weigh Bridge operation may be taken at any time in the following manner.

- a) Date-wise

- b) Truck-wise
- c) Commodity-wise
- d) Party-wise
- e) All

Any number of operators should be permissible to be assigned to the Weigh Bridge with their independent user name and pass word. Thus monitoring the operation of the Weigh Bridge under each operator separately.

SALIENT FEATURES

- 1) The only weighbridge with SIGMA-DELTA converter based digitizer, the best available technology in the world today.
- 2) Load cells are ladder-trimmed to the last Micro-Volt, ensuring high level of performance and steady calibration.
- 3) Load cell protected to IP-68, which means, water and dust has no influence on performance.
- 4) Load cells field tested and proven for more than two decades.
- 5) In-Built lightning protection.
- 6) High-level of security provided and hence totally tamper – proof.
- 7) Installation and support handled y the finest technical crew available.
- 8) Over 1000 installations.
- 9) Requires the lowest or no maintenance. Our clients will vouch by this.

SPECIFICATIONS

Item: electronic weigh bridge
Capacity: 80 t
Platform size: 18 x 3 meter
Accuracy: 10 kg
No.of loadcells: 8
Loadcell: double ended shear beam type
Loadcell protection: ip-68
Operating voltage: 230v single phase

LOAD CELL SPECIFICATION

- a) Type of load cell -- Double ended Shear Beam
- b) Load cell sensitivity -- 3mV/V
- c) Maximum Load cell output -- 30m V
- d) Load Cell Excitation -- 10V dc
- e) Load Cell protection -- IP-68
- f) Safe Over Load -- 200%
- g) Ultimate Over Load -- 300%
- h) Installation Resistance -- Above 1000M ohms at 30v dc+

DIGITIZER SPECIFICATION

- a) Model -- DH340A9 or equivalent with prior approval from engineer-in-charge
- b) Range -- 60,000 counts.
- c) Excitation output -- 10v dc to Load Cell.
- d) Display -- 5 Digits, 13mm, 7segment LED.

- e) Operation Voltage -- 230V, 50HZ, Single Phase, AC.
- f) Operation Temperature -- 5 to 55 Deg. C'
- g) Input -- mV from Load Cell.
- h) Outputs. –
 - i) RS232C FOR PC
 - ii) BCD output for Out Door Display.
- i) Programmable features –
 - i) Resolution.
 - ii) Over-range
 - iii) Decimal Point.
 - iv) Zero limit.
 - v) Calibration.
 - vi) Time Constant.
 - vii) Tare.
 - viii) System re-set.
 - ix) Security -- Combination of Password & Hardware lock.

LIST OF MAKES OF MATERIALS (ELECTROMECHANICAL ITEMS)		
1	MOULDED CASE CIRCUIT BREAKER (MCCB)	L&T /SCHNEIDER /SIEMENS / ABB / LEGRAND
2	LT PANELS & LT BOARDS, FEEDER PILLARS	SHIVALIC/ SPC/ RISHA / Adlec / Tricolite /PRECISION SYSTEM/NAPTUNE.
3	CABLE TRAY	VENUS / RICO /AKG/SLOTECO/STEELWAYS/MEM/PILCO
4	PUSH BUTTON, INDICATING LIGHT SELECTOR SWITCHES	L&T/ SIEMENS/ SHENIEDER/ ABB / LEGRAND/BCH
5	RELAYS	L&T / SIEMENS / ABB / SCHNEIDER / BHEL / GE / LEGRAND/ALSTOM
6	CAPACITORS	L&T / NEPTUNE / ABB / SIEMENS / SHENIEDER / EPCOS
7	CONTACTORS	L&T / SCHNEIDER / SIEMENS / ABB / BHEL / LEGRAND
8	THIMBLES / LUGS	DOWELLS / JAINSON/TRIBITY TOUCH/COMET
9	PVC CONDUIT & ACCESSORIES- ISI MARKED	POLYPACK/AKG(NORPACK)/BEC/PRECESION
10	WEATHER PROOF JUNCTION BOXES	GEWISS / HENSEL
11	CONNECTORS / TERMINALS	WAGO / ELEMEX / PHOENIX/CONNECT WELL
12	CABINETS & RACKS	APWPRESIDENT/ ORTRONICS/ RITTAL/ LEGRAND
13	TELEPHONE SWITCHES & ROUTERS	CISCO/ HP-PROCURVE/ NORTEL
14	LIGHT FIXTURES	GE/PHILIPS/WIPRO/CROMPTON/HAVELLS
15	LT CABLE JOINTING KIT	RAYCHEM (EPKT)/M-SEAL /BIRLA 3M/MAHINDRA
16	11KV HT - AUTOMATIC VOLTAGE REGULATOR (AVR)	ANDREW YULE & COMPANY Ltd. OR equivalent make
17	Obstruction light for high mast	PHILIPS / GE / BAJAJ / CROMPTON /HAVELLS
18	HIGH MAST	BAJAJ/VOLMONT
19	STREET LIGHT POLE	BAJAJ/VALMONT
20	PVC INSULATED PVC SHEATHED AL. CONDUCTOR 1.1 kV GRADE ARMoured / UNARMoured CABLE	CMI limited / FINOLEX / HAVELLS / POLYCAB / GLOSTER /KEI/UNIVERSAL
21	STEEL CONDUIT (ISI MARKED)	BEC / AKG / PRECISION/RMCON

22	PVC INSULATED CU. CONDUCTOR WIRE	SKYTONE / FINOLEX / KEI / UNIVERSAL CABLE / NICCO / CRYSTAL CABLE/ HAVELLS / GLOSTER / POLYCAB
23	MODULAR TYPE SWITCHES AND SOCKET OUTLETS - 6/16 A, FAN REGULATORS	SIMON (HM) OR EQUIVALENT MODEL/ ANCHOR/ LEGRAND/ HAVELLS/WIPRO (NORTH WEST)/MDS/BCH/HAGAR
24	SINGLE PHASE/THREE PHASE INDUSTRIAL TYPE SOCKET OUTLET & PLUG	SIMON (HM) OR EQUIVALENT MODEL/ ANCHOR/ LEGRAND/ HAVELLS/WIPRO (NORTH WEST)/MDS/BCH/HAGAR
25	BUS DUCT	C&S/ L&T /SCHNEIDER /SIEMENS / ABB / LEGRAND
26	MCB Distribution Board	LEGRAND/ HAGER /L&T/ SIEMENS/ABB
27	MINIATURE CIRCUIT CREAKER (MCB)	LEGRAND/ HAGER /L&T/ SIEMENS/ABB
28	AMMETERS, VOLTMETERS, CTs, PTs, Digital Multi-function meter	ABB/GE/SCHNEIDER/AE/ L&T / MECO/CGL/KAPPA
29	CABLE GLAND	COMET / DOWELLS/STEPWELL/ SIEMENS / HMI
30	XLPE INSULATED PVC SHEATHED AL. CONDUCTOR 1.1 kV GRADE ARMOURED / UNARMOURED CABLE	CMI limited / FINOLEX / HAVELLS / POLYCAB / GLOSTER /KEI/UNIVERSAL
31	COMPUTER	HP/DELL/IBM/SONY
32	LIGHTENING ARRESTER	ALTEC / TRINITY TOUCH / ABB/ OBLUM/EIPRO/ ALSTOM/ GE/ ATLAS
33	STEEL CONDUIT ACSSORIES	SHARMA / RAMA / MK/BEC
34	PHENOLAMIC LAMINATED SHEET (WHITE)	HYLAM / FORMICA / GREEN LAM
35	SPLIT AC	HITACHI/DAIKIN /CARRIER/BLUESTAR/LG
36	CEILING FAN	BAJAJ / CROMPTON /USHA/HAVELLS
37	EXHAUST FAN	BAJAJ / CROMPTON /USHA/HAVELLS
38	TELEPHONE TAG BLOCKS	KRONE/ MK/ LEGRAND
39	HT PANEL	SIEMENS/ABB/ CROMPTON/L&T/AREVA/BHEL
40	TRANSFORMER	RAYCHEM /ABB /NGEF/BHARAT BIJLEE LTD. / BHEL / CROMPTON/VOLTAMP/KIRLOSKAR
41	DG ENGINE	CUMMINS/CATERPILLAR/KIRLOSKAR/ASHOK LEY LAND
42	ALTERNATOR	CUMMINS –STAMFORD/ LEROY SOMER/ CATERPILLAR/KIRLOSKAR
43	HT CABLE	SKYTONE/UNIVERSAL/ KEI/HAVELLS/GLOSTER
44	SOLAR SYSTEM	INDOSOLAR/TATA/WAREE/VIKRAM SOLAR/ALPEX/JAKSON/LANCO
45	AIR CIRCUIT BREAKERS / Bus Coupler	L&T / SIEMENS/ SCHNEIDER/ ABB/GE

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46	HT CABLE JOINTING KIT	RAYCHEM (EPKT)/M-SEAL /BIRLA 3M/MAHINDRA
47	GI PIPE	Jindal- Hissar /Tata
48	Weigh Bridge	AVERY/ RICELAKE / STATWEIGH INDIA PVT. LTD.
49	P.A System	BOSCH / JBL / HONEYWELL/ATEIS
50	CCTV System	BOSCH / PELCO/ HONEYWELL/AXIS /SONY
51	FIRE DETECTION & ALARM SYSTEM	BOSCH/ EDWARD/ HONEYWELL/SIEMENS/JOHNSON CONTROL
52	MAIN FIRE PANEL	BOSCH/ EDWARD/SIEMENS/HONEYWELL- NOTIFIRE
53	LED Television	Sony/LG/Panasonic
54	GAS SUPPRESSION SYSTEM	FIRE TREX/TRACE FIRE/SAFE FIRE/SEVO FLEX/UTC
55	Layer -2 & Layer -3 Switch for network	HP/CISCO/Extreme/DELL
56	1000 Base Transceiver module	HP/CISCO/Extreme/Syrotech
57	CAT-6 cable	Schneider/Nexans/ Finolex/Legrand/D- LINK/HAVELLS
58	Cat-6 UTP patch cord	D-Link/Digilink/ Tyco/Amp/ Legrand
59	CAT 6 I/O Port	COMMSCOPE/PANDUIT/MOLEX/SCHNEIDER/ Legrand
60	Single / Double port face plate	COMMSCOPE/PANDUIT/MOLEX/SCHNEIDER/ Legrand
61	Modular toolless type patch panel (loaded) with all associated accessories.	Schneider /APW President / MOLEX / Rittal/ Legrand
62	Optical fibre cable	Finolex/Schneider/Sterlite/Delton/Birla/ Legrand
63	24U port LIU of 19" Slide-in Modular optic drawers	Schneider /APW President / MOLEX / Rittal/ Legrand
64	Pigtail/ Adapter Plate/ Splice tray	COMMSCOPE/PANDUIT/MOLEX/SCHNEIDER/ Legrand
65	L I U / DRAWER	ORTRONICS/ SCHNEIDER / SYSTIMAX/MOLEX/LEGRAND
66	Duplex Fiber Patch Cord	COMMSCOPE/PANDUIT/MOLEX/SCHNEIDER/ Legrand
67	Media Converter	Syrotech/D-Link/ TP-Link
68	PoE Injector	Ubiquiti/Trionix/D-Link/TP-Link
69	HDPE Pipe	Ganpati/Duraline/Veervision
70	EPBAX Rack along with all associated accessories	Comrack /Dynamic / APW President / HCL / Rittal / Legrand
71	EPPBX	ALCATEL/ AVAYA / CISCO/ EPYGI / NEC / TADIRAN TELECOM
72	Wireless Access Point	Brocade/CISCO/HP/Extreme/D-Link

73	Wireless Access Point Management Controller	Brocade/CISCO/HP/Extreme/D-Link
74	Analog telephone set	Avaya /Alcatel /NEC /Beetel
75	MDF with accessories	Krone Type or Similar
76	IDF with accessories	Krone Type or Similar
77	Armoured polyethylene jelly field telephone cable	Finolex/Delton/CMI/HAVELLS/POLYCAB/GLOSTER /LEGRAND
78	RG-6 & RG-11	D-Link/ Legrand/ SKYTONE/ HAVELLS/PHINOLEX
79	UPS and other associated accessories.	APC/SOSOMECE/EATON/VERTIV/AVO
80	Raceways	MK/LEGRAND/ANCHOR
81	Cold Storage / Refrigeration unit	Carrier/Bluestar/Rinac

NOTE:

1. Material where no make / brand have been mentioned, ISI marked sample shall be submitted by the contractor for approval of Engineer-in-charge.
2. Contractor shall seek approval of specific make from Engineer in charge before commencement of work / manufacturing.

The contractor has to do the detailed design for the complete system before start of E&M works for approval of engineering incharge / client. The three set of drawings shall be submitted for approval. After completion of work as built drawings/ documents will be submitted in 7set including soft copy of documents / manuals for maintenance.

LIST OF APPROVED MAKES OF MATERIALS (CIVIL WORK)		
S. No.	Description of Material	Name of Approved Make
1	Bitumen 60/70	Indian oil, Hindustan Petroleum, Bharat Petroleum, Essar Oil Ltd.
2	Emulsion	Hindustan coal, Essar oil, Indian oil
3	Cement (43,OPC)	ACC, Vikram, Ultratech, Prism, Birla Cement, Shree Cement, Grasim, JP, Laffarge, Dalmia
4	White Cement	J.K WHITE, BIRLA WHITE
5	Reinforcement (TMT)	TATA, SAIL, RashtriyalspatNagam Ltd., Jindal, Shyam steel
6	Structural Steel	TATA, SAIL, RashtriyalspatNagam Ltd, Jindal, Shyam steel
7	G I Sheet	TATA, SAIL, Jindal
8	Waterproofing Compound	CICO, PIDILITE, STP, FOSROC, Sikka
9	Aluminium Section for Doors, Windows Ventilators	INDAL, HINDAL, JINDAL, HINDALCO
10	uPAC Doors & Windows	FENESTA/TSIL/ECUBE WINDOORS/ADO INDIA
11	Aluminium Doors, Windows Fitting	EARL BEHARI, Everest, Sigma
12	Mortice lock	Godrej, Link
13	Door Closer/Floor Spring	DOORKING, EVERITE, HARDWYN
14	Prelaminated particle board	Novapan, Bhutan board, Nepal board, Green ply, Archid ply
15	Flush Door	Swastik (Kitply), GREENPLY, DURO, CENTURY
16	Clear Glass/Float Glass	Modi, ASIAHI, Saint Gobain, Atul
17	Mirror Glass	Saint Gobain, Modi, Indo ASIAHI
18	Glazed Tiles	1st Quality of Kajaria, Jonhson(i)Ltd, Somany, Orient,
19	Ceramic Tiles	1st Quality Kajaria, Spartec, Somany, Orient, Johanson
20	Vitrified Tiles	BELL, Naveen diamonite of Murudeshwar Ceramic Ltd, Granimite of Restile Ceramic Ltd, Orient, Johanson, Kajaria,
21	Synthetic Enamel Paints	ICI, Berger Paint, Asian Paint, Nerolac
22	Waterproofing Cement Paint	Snowcem India make only.
23	Plastic Emulsion Paint	ICI, Berger Paint, Asian Paint, Nerolac
24	Oil bond Distemper	ICI, Berger Paint, Asian Paint, Narolac

LIST OF APPROVED MAKES OF MATERIALS (CIVIL WORK)		
S. No.	Description of Material	Name of Approved Make
25	Road Marking Paint	Nerolac brand No 452/002 and Asian Paint APCOTRAK WEB
26	Pre Engineered Building/Shed	TATA BLUESCOPE KIRBY ENGINEERING INTERARCH SUPERTECH (INDIA) PVT. LTD., LLOYED INSULATIONS INDIA LIMITED EVEREST INDUSTRIES LIMITED CLADDINGS
27	Space Frame	GEOMETRICS HINDUSTAN ALCOX LIMITED SPECO ENGINEERING PVT. LTD. AMIYA, KOLKATA METALKARMA JM SPACEFRAMES TRIOCON, CHENNAI
28	Aluminium Composite Panels	Oropanel, GLAZETECH Industries (P) Ltd. OR Equivalent
Note:	Any other material to be incorporated in the work not covered in above mentioned list shall be of ISI certified reputed manufacturer as approved by Engineer-in-Charge	

LIST OF APPROVED MAKES OF MATERIALS FOR PLUMBING SYSTEM

S. NO.	MATERIAL DESCRIPTION	NAME OF MANUFACTURER
1	G.I. pipes (Up to 150 mm dia)	Jindal Hissar/API APPOLO/TATA/NEZONE/SWASTIC/ JAIN/SURYA
2	Sanitary ware	Neycer , Parryware, Hindware, HINDUSTAN SANITARY WARE, CLASSIC, CERA Jaquar /Bolan
3	CP fittings	Parko, Marc , EssEss, Jal, PLUMBER, JAQUAR,
4	MDPE pipes	Kimplas/Reliance
5	Pressure Sand filter	ION Exchange/Thermax
6	Water Softener	ION Exchange/Thermax
7	Chlorine solution dosing	Asia LMI/ANT
8	Cable Trays	OBO/Slotco

S. NO.	MATERIAL DESCRIPTION	NAME OF MANUFACTURER
9	Level indicator	Valve-AIP/Lehry, Tube-Transparent/RM or equivalent
10	Water flow meter	Lehry/Sant/Enolgas/DASMESH/CAPSSTAIN
11	Synthetic enamel paint	J&N/Asian Paint/Nerolac
12	Non return valves	AIP/Lehry/Deepak
13	Y Strainers	WJ/Strainwell
14	MSEP screen	Fabricated from MS sheet of TATA, SAIL, Jindal
15	Air diffusion	Rheau/OTT
16	UPVC PIPES & Fittings	SFMC/Astral/AASHIRWAD/JAIN IRRIGATION/URIPLAST/SUPREME
17	CPVC Pipes/UPVC PIPES	SFMC/Astral/AASHIRWAD/PRINCE/ FINOLEX
18	G.I.Fittings (Malleable)	UNIK / KENT/ZENITH/SURYA
19	G.I./ M.S Forged Steel fittings IS:1239 (Part-II)	VS / DRP / True Forge / Simless
20	Stoneware pipes & Gully Trap	Anand/Perfect/BURNMAKE
21	Horizontal Soil/Waste hanging supports	Chilly/Lovely
22	Gunmetal Valve (Fullway valve)	
	(a) Class-I	Zoloto / Leader / Sant
	(b) Class-II	Leader / Sant
23	Ball valve	CIM/TIMME/AIP/LEHREY/LEADER/AUDCO/ ZOLOTO
24	Butterfly Valve	Audco / KSB / CRI/LEHREY/KEYSTONE/KIRLOSKAR/ CASTLE
25	Air Release Valve	Kirloskar / IVC / RBM/RB/ZOLOTO
26	C.I double flanged sluice valve	Kirloskar / Leader/ZOLOTO
27	C.I Disk Type non return valves (65mm dia and above – Dual plate type)	Kirloskar / Leader / Inter Valve / KSB
28	Float valve (gunmetal) upto 40mm	Leader / Sant
29	Float valve (C.I) 50mm and above	Leader / Sant / Sarker
30	FRP Manhole Covers	Thermodrain/PU
31	Plastic Encapsulated Foot Rest	KGM Or Equivalent
32	Grating for Floor Trap & Floor Drain	Vijay / GMGR
33	C.I Strainer more than 65mm dia.	Leader / Kartar
34	Insulation	
	a) For Internal	Super Cera / Kaiflex
	b) For External	Pykote / Makpolykote
35	Water Supply/Sump Pumps	Grundfoss/Wilo
36	Motors for Water supply/Sump Pumps	Kirloskar, KSB, Crompton Greaves,Wilo
37	STP De-Canter	Premiertech/C-Tech
38	Magnetic Float Switch	Waveteck/ waree
39	Motor Control Panel	Advance/Adlec/Application
40	RCC Pipes	KK/Pragati/Laxmi/INDIA HUME PIPES/JAIN SPUN
41	Swichgear for Motor Control Panel	Schnieder/ABB
42	Cables	Finolax/ Polypack
43	Water Level controller	Minilac/Waree

S. NO.	MATERIAL DESCRIPTION	NAME OF MANUFACTURER
44	Poly propylene Pipes & Fittings	Valasir/Poloplast/Wavin
45	Maxi/Mini Vents, Maxi Filtra	Studor/Mcalpine
46	P or S Trap	Poloplast/Mcalpine/Wavin
47	Irrigation System	Toro/Hunter/Harvell
48	Water Treatment Plant	ION Exchange/Thermax
49	RO Plant	Pentair/Kent

LIST OF APPROVED MAKES FOR FIRE FIGHTING SYSTEM

S. NO.	MATERIAL DESCRIPTION	NAME OF MANUFACTURER
1	G.I./ M.S Forged Steel fittings IS:1239 (Part-II)	VS / DRP / True Forge / Simless
2	MS Pipe	Jindal/Hissar/Appolo API/TATA/ASIAN/SURYAPRAKASH
3	Primer	Nerolac/Berger/Asian Paints
4	Anti rust tape	Cotak/Pypkote/Makpolykote
5	Non return valves	AIP/Lehry/Deepak/AUDCO/INTERVALVE /LEADER
6	Pressure gauge	Wika/H Guru/Fiebig/A.N. INSTRUMENTS
7	Flanges	ISI Marked
8	Installation valve	HD/TYCO/Viking
9	Branch pipe	Safedge/Lifeguard/Omex/NEWAGE/WINCO
10	Fire brigade inlet	Safedge/Lifeguard/Omex/NEWAGE
11	Fire brigade suction	Safedge/Lifeguard/Omex
12	Fire Man's Axe	Safedge/Lifeguard/Omex
13	Air Cushion Tank	Fabricated from Approved MS pipe
14	Air Vessel	Fabricated from SAIL MS sheet
15	Liquid level controller	Lehry/Minilac
16	Pressure switch	Indfoss/Switzer
17	M.S. structural	Hilti Fasteners with TATA MS Angles/Tees
18	Exhaust pipe	Jindal, Hissar/Appolo API/TATA with Rockwool Insulation
19	Inspector test and drain valve	HD/TYCO/Viking
20	Exit signs	Agni/Lifeguard/Omex
21	Ball valve	Enolgas/RB/AIP/Lehrey/CIM/ZOLOTO /LEADER
22	Butterfly Valve	EnolgasP/RB/AIP/Lehrey
23	Air Release Valve	Enolgas/RB/CIM/SANT/ZOLOTO
24	Fire Extinguishers	Safedge/Lifeguard/Omex/SAFEX/CEASE FIRE/KANEX/KANADIYA
25	Fire fighting first-aid hose reel	Safedge/Lifeguard/Omex/SAFEX/CEASE FIRE/KANEX/KANADIYA
26	Hose Reel	Safedge/Lifeguard/Omex/SAFEX/CEASE FIRE/KANEX/KANADIYA
27	Rubber Tubing	Safedge/Lifeguard/Omex/SAFEX/CEASE FIRE/KANEX/KANADIYA
28	Thermo Plastic Hose Reels	Safedge/Lifeguard/Omex/SAFEX/CEASE FIRE/KANEX/KANADIYA
29	R.R.L. Hose	Safedge/Lifeguard/Omex/SAFEX/CEASE FIRE/KANEX/KANADIYA
30	Fire Fighting Equipment not covered else where	Safedge/Lifeguard/Omex/SAFEX/CEASE FIRE/KANEX/KANADIYA
31	Landing Valves	Safedge/Lifeguard/Omex/SAFEX/CEASE FIRE/KANEX/KANADIYA

S. NO.	MATERIAL DESCRIPTION	NAME OF MANUFACTURER
32	Welding rods	Adore/Ishab/L & T/ADVANI
33	Flow Switch	System Sensor/Grinnel/INDFOS
34	Motor Control Panel	Application/Adlec/Tricolite
35	Fire Fighting Pumps	Lubi/BP Pumps/Grundfoss/KSB/KIRLOSKAR
36	Motor for Fire Pumps	ABB/Siemens/KIRLOSKAR/CROMPTON GREEVES
37	Sprinklers/Escutcheon plate/Flexible Pipes	Tyco/HD/Viking
38	Cables/Wires	Finolax/Polycab/TORRENT/HAVELLS/INCAB /GLOSTER
39	Cable Glands	Dowells/Gripwell/HMI
40	Dash fasteners	Hilti/Fischer
41	Clamps	Chilly/Lovely/Camery
42	Y Strainers	WJ/Strainwell/AUDCO/INTERVALVE/LEADER
43	Foot Valve	Kirloskar/LEADER/NORMAX/WORTHVALVE/ ZOLOTO

NOTES :

- 1 Contractor has the option to use any of the Approved Makes as mentioned above. However to maintain look & uniformity, contractor shall use one make itemwise throughout the project in consultation with Engineer.

In case, any other item/ material required to complete the work for which makes are not specified above, the Contractor shall take prior approval of the Engineer.-in-charge at

- 2 site.

ANNEXURE - H

**LIST OF TEST APPARATUS LIKELY TO BE REQUIRED / PROVIDED AT
SITE LABORATORY**

List of Minimum Equipment to be provided in the field Testing Laboratory by the contractor at his own cost.

1. Sieve Analysis : Sets of I.S. and B.S sieves comprising of sizes 125 mm, 90 mm, 65 mm, 63 mm, 60 mm, 53 mm, 45 mm, 40 mm, 26.5 mm, 25 mm, 22.4 mm, 20 mm, 13.2 mm, 12.5 mm, 11.2 mm, 10 mm, 5.6 mm, 4.75 mm, 2.8 mm, 2.36 mm, 2 mm, 1.18 mm, 900 micron, 600 micron, 425 micron, 300 micron, 150 micron, 90 micron and 75 micron.
2. Sieve shaker capable of 200 mm and 300 mm dia sieves, manually operated with timing switch assembly.
3. Apparatus for determining Angularity number (Elongation & Flakiness index). As per IS: 2386 (Part i)
4. Aggregate Impact test machine. As per IS:5640
5. Los angles abrasion test machine. As per IS:2386 (Part iv) (Optional)
6. Specific Gravity test for aggregate by Basket method.
7. Enamel trays
 - (i) 300 mm x 250 mm x 40 mm - 2 nos.
 - (ii) Circular plates of 250 mm dia - 4 nos.
8. Other miscellaneous items :
 - a) Oven – Electrically operated, thermostatically controlled, range upto 200°C, sensitivity 1°C
 - b) Water bath – electrically and thermostatically controlled with adjustable shelves, sensitivity 1°C.
 - c) Porcelain bowls.
 - d) Electronic/digital Balance
 - i) 20 kg Capacity with 1 grams accuracy
 - ii) 5 kg Capacity with 0.1 gram accuracy
 - e) Pan balances.
 - f) Graduated glass cylinders of 200 C.C. and 500 C.C. capacity.
 - g) Glass measuring jar.
 - h) Beakers, Towels, glass plates etc.
 - i) Steel tapes – 3m, 5m and 30m (two no. each)
 - j) Vernier Calipers and Micrometer Screw 25mm gauge.
 - k) Foot rule, Wire gauge (circular type) disc. and Plumb bob.
 - l) Spirit minimum 30 cms long with 3 bubbles for horizontal / vertical measurement.
 - m) Magnifying glass.
 - n) Screw driver 30 cms long.
 - o) Ball pen hammer, 100 gms.
 - p) Plastic bags for taking samples.
 - q) Glass Beaker 100 cc
 - r) Thermometers.
 - i) Mercury-in-glass thermometer range 0 to 250 C(6 Nos)
 - ii) Mercury-in-steel thermometer with 30 cm stem, range upto 300 C (1 Nos)
 - iii) Digital thermometer (2 Nos.)

- s) Kerosene or Gas stove or, electric hot plate.
- t) First aid Box

- 9. For Control of Profile and Surface Evenness
 - a) Digital/ Auto Level complete with all accessories (2 Set)
 - b) Total Station with all accessories (1 Set)
 - c) 3 meter straight edge and measuring wedge (2 Set)

- 10. C.C. Cube strength testing machine

The laboratory set-up must be complete including a set of reference standards, adequately staffed and operational to the satisfaction to the Engineer.

The Contractor shall be responsible for the provision of adequately experience and qualified laboratory staff, in sufficient number to be able to meet all testing requirement to the approval of the Engineer, and for the supply of all transportation of staff, testing equipment and sample necessary to allow the testing to be performed in a time scale compatible with the needs of the site.

Contractor shall arrange to maintain the laboratory in satisfactory manner and will carry stocks of spare equipment and laboratory consumables until the issue of Taking over Certificate.

In addition to the above, the Contractor shall arrange any other equipment for carrying out testing required for quality control as per the specifications.

Specification of Prime Cost Items

1. SCOPE

This Section covers the provision of office and residential accommodation for the Engineer's supervisory staff. This accommodation shall include the necessary temporary furnished site office and rented quarters for employees and the provision of all the necessary services.

2. SITE OFFICE (FREE OF COST)

The contractor shall provide temporary furnished office accommodation for Controlling Site Engineer & his staff & maintain, watch & ward round the clock as directed, free of cost of suitable size with false ceiling, tile flooring, plastic emulsion paint on walls along with electrical fixtures & ceiling fans. The office shall be well ventilated & properly furnished along with working toilet & a pantry. The Accommodation so provided shall include 4 rooms with size of 1 room being 12ft by 14ft and size of remaining 3 rooms being 10 ft * 12 ft each for RITES Engineers & a meeting room 15 ft * 14 ft. The other details are as under :

1. 2 Room shall be with attached toilet & each shall be furnished with executive table of size 3ft * 5 ft. with side rack, fully upholstered executive chair, upholstered visitor chairs, 7 feet high steel almirah / pull out storage unit, laptop (i5 configuration) with internet facility, AC 1.50 ton capacity and complete standby power back up in each room. One A3 size colour printer and one A4 size colour printer shall also be provided in these the rooms.
2. Other two room shall have a common toilet & shall be furnished with office tables with side rack, officer chairs fully upholstered & upholstered visitor chairs, steel almirah / pull out storage unit, one PC/laptop with internet facility, room cooler and standby power back up in each room.
3. A Meeting room with attached toilet shall have 10-12 seater table with chairs & AC of 2 ton capacity and complete standby power back up.
4. All furniture, fixtures & electrical equipment shall be branded.

3. HOUSING

(a) Rented accommodation: The Contractor shall provide suitable rented houses, approved by the Engineer-in-Charge, as per the following broad comforts, in the nearest town to the site location :

- i) The Contractor shall provide five furnished houses for the entire contract period for the Engineer's employees, One house of approx. 120m² area, for the Project In charge, one house of approx. 90m² area and house of approx. 75m² area for the other employees.
- ii) Each house shall have adequate bedrooms, a living /dining-room, bathroom and kitchen. Each house shall have a clear height from floor to ceiling of at least 2.74m and floors shall be of concrete or other suitable material.
- iii) The provisions of such accommodation shall be paid under definition of "Provisional Sum" as indicated in Clause 8.0 of Additional Special Conditions. Payment shall be made under item reference **B.O.Q Item No. 6.1 (Schedule VI)**, "rented accommodation".

Each house shall be provided with the following :

- i) A bath and shower with drain and inside flush toilet.

- ii) A wash basin with drain pipe.
- iii) A kitchen-sink unit with basin and draining boards and a cupboard with shelves.
- iv) Cold-water pipes from a suitable source to the bath, shower, wash basin, toilet and sink units, complete with taps where required.
- v) Electric lights in all rooms and passages, with plug points in the kitchen, living-room and all bedrooms. The house shall be fully wired and connected to a 220/250 volt AC power source.
- vi) Good-quality locking arrangements on all doors.

The terms of any lease for such accommodation shall be subject to the Engineer-in-Charge's approval and shall contain provisions, where the Owner agrees, for an extension of the lease on pre-agreed terms during any extended time for completion of the Contract, as well as provision for the lease to be taken over by the Engineer or another Contractor in the event of default by or insolvency of the Contractor.

The terms of any lease for rented accommodation the Contractor shall pay the electricity charges, water charges, maintenance charges (if any), monthly during the entire period of the Contract or till such time, when the Engineer-in-charge no longer requires them.

Notwithstanding the Engineer-in-Charge's approval of the conditions of the lease, the Contractor shall be solely responsible for providing the accommodation for the full period required and for suitable substitute accommodation should the alternative accommodation be no longer available. The houses on being released shall revert to the Contractor.

4. PROVISION OF RENTED VEHICLES

The Contractor shall, if so ordered, supply rented/owned vehicles (not more than two years old) and maintain them for the use of the Engineer and his staff. The average usage/running of vehicle shall be 2400 km (approx.)

The vehicles to be provided shall be Mahindra Scorpio / Tata Safari / Chevrolet Tavera or equivalent. The Engineer shall approve all the vehicle(s) prior to supply. They should all be of a light colour, fitted with radial tyres, alarms and immobilisers. The vehicle(s) shall be air-conditioned.

The vehicle(s) shall be covered by full comprehensive insurance and registered for immediate use. Prior to delivery of the rented vehicle(s) and within 7 days of receipt of the Letter of Acceptance, the Contractor shall provide equivalent alternative vehicle(s) for the use of the Engineer and his staff, until such time as the aforementioned rented/owned vehicle(s) is/are made available. No additional payment will be made for this arrangement. The driver(s) supplied by the contractor shall be experienced in driving the type of vehicle supplied, and shall speak and understand the English language.

Unless otherwise specified, the vehicles shall be either rented/owned by the Contractor and be licensed and comprehensively insured by the Contractor for use on the public highway within the country by any licensed driver authorised by the Engineer together with authorised passengers and the carriage of goods and samples. Vehicle(s) may be driven by the Engineer's supervisory staff or the driver (s) provided by the Contractor or other personnel (authorised to do so by the Engineer). The Contractor shall provide sufficient insurance cover to allow, vehicles to be driven by more than one person.

The Contractor shall provide fuel, oil, maintenance including replacing defective parts, tyres and the like, whenever required, in conformity with the vehicle manufacturer's recommendations or as may be necessary as aforementioned until release by the

Engineer. Ownership of the vehicle(s) shall revert to the 'Contractor' on completion of the Works or when no longer required by the Engineer.

The vehicle(s) shall be checked to ensure that they are recording kilometres correctly and if the variation is more than 5% then the kilometres travelled each month shall be adjusted.

The Contractor shall provide a replacement for any vehicle by a similar vehicle after it has completed 1,00,000 km if, in the opinion of the Engineer, such vehicle cannot be maintained in a satisfactory condition.

The Contractor shall provide competent and licensed drivers approved by the Engineer for the vehicles indicated above. Sufficient drivers shall be available at night and at weekends whenever work is being carried out on site.

4. GENERAL

(a) At the time when the Contract is awarded, the Engineer shall furnish the Contractor with full details, in writing, regarding the number and type of all housing units required, The Contractor shall not rent any housing on the basis of what is specified or scheduled without written confirmation by the Engineer.

(b) Housing supplied by the Contractor shall be ready for use within four weeks of the date of such instruction, but the Contractor may not proceed with the permanent Works before the required offices and laboratories have been erected by him. If the houses for the Engineer's site personnel are not ready for occupation when the permanent Works are commenced, the Contractor shall provide suitable temporary board and lodging at his own cost. If any further accommodation is required during the currency of the Contract, the Engineer shall inform the Contractor at least one month before such additional accommodation is to be provided.

(c) The Ownership of all offices, housing, and Motor Vehicles provided by the Contractor as prime cost items shall, when they are no longer required by the Engineer, revert to the Contractor upon written advice of the Engineer and shall be removed from the Site.

(d) The Contractor shall ensure that all accommodation complies with the appropriate statutory provisions operative in the area concerned.

5. MEASUREMENT AND PAYMENT

Prime cost (P.C.) items

The schedule of Quantities may contain prime cost (P.C.) items, so designated, which are entered as a preliminary allowance to cover the cost of work, materials, goods and services to be provided by a nominated subcontractor, or the cost of articles or goods to be purchased by the Contractor in execution of a written order by the Engineer, who may specify a particular source of supply or brand of article.

No expenditure or appointment of a subcontractor in respect of a P.C. item will be authorized unless upon the written instructions of the Engineer. The amount authorized by the Engineer shall be entirely at his discretion and may be more, equal to or less than the amount entered in the schedule of Quantities.

Payment for a prime cost item shall be as follows:

- (i) The amount actually paid by the Contractor to the subcontractor or supplier, as the case may be, in execution of the Engineer's written order, plus
- (ii) A percentage, as tendered by the Contractor, of the amount in (i) above to cover all his charges and profits, or a percentage as provided for.

The Contractor shall not be entitled to any further payments or to a fee, commission, rebate, discount or similar payment or consideration from the supplier or subcontractor and shall disclose and subtract such amounts from the amount claimed under (i) above.

Spec. Ref.	Item	Description	Payment	Unit
1502	5.1	Provision of rented residential accommodation, as desired by the Engineer		
	(a)	Providing rented accommodation for Engineer's staff including electricity, water supply as specified till end of the contract or when no longer required by the Engineer.	This is a prime cost item. Payment to the Contractor under this item shall be made as the amount actually paid by the Contractor to the subcontractor or supplier, as the case may be, in execution of the Engineer's written order.	Provisional Sum
	(b)	Contractor's attendance on items 5.1 (a)	A percentage, as tendered by the Contractor to cover all his charges, overheads and profit will be paid as specified in sub-clause (ii) above.	%
1503	5.2	Motor vehicles		
	(a)	Provision of rented/owned Motor Vehicles (type of vehicle as specified) The tendered rate shall include full compensation for supply, delivery, insurance, licensing, running costs such as fuel / drivers salary / maintenance.	This is a prime cost item. Payment to the Contractor under this item shall be made as the amount actually paid by the Contractor to the subcontractor or supplier, as the case may be, in execution of the Engineer's written order.	Provisional Sum
	(b)	Contractor's attendance on items 5.2 (a)	A percentage, as tendered by the Contractor to cover all his charges, overheads and profit will be paid as specified in sub-clause (ii) above.	%

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SECTION 6

DRAWING

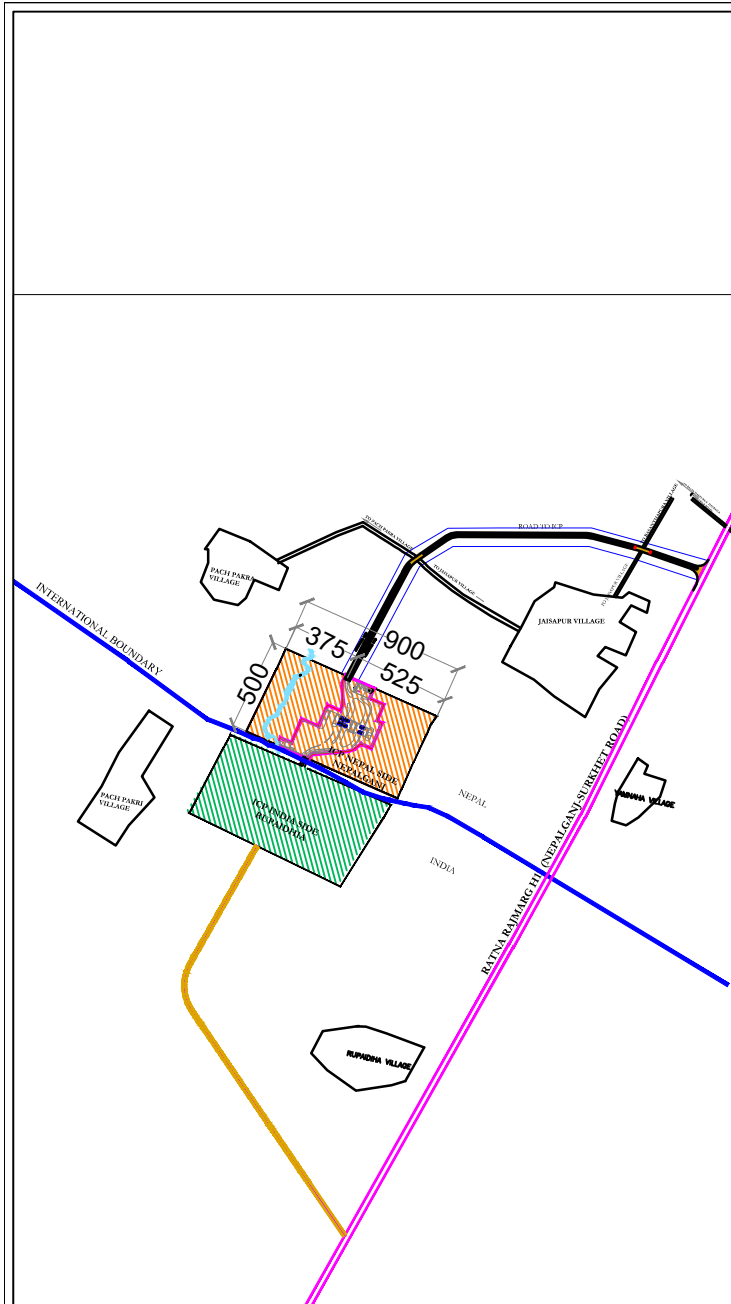
SECTION 6

Drawings

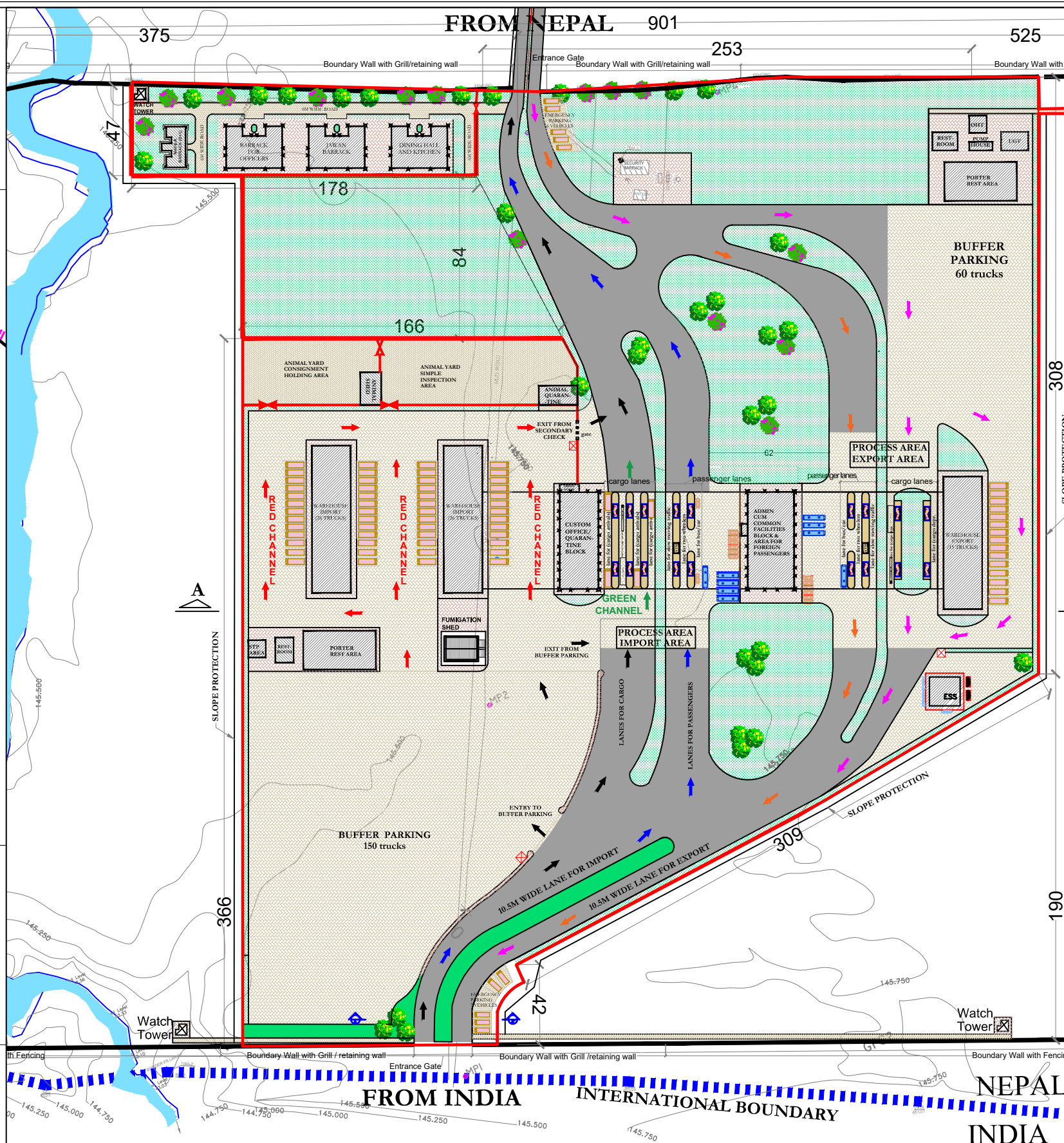
List of Drawings Enclosed :

ICP Nepalganj List of Tender Drawings		
S. No.	DRAWING TITLE	DRAWING NO.
1	SITE LAYOUT PLAN	RITES/AP/N/Arch/SITE LAYOUT PLAN/01
2	TOPOGRAPHIC SURVEY PLAN	RITES/AP/N/Gen./TOPO.SURVEY/01
3	PAVEMENT SECTION	RITES/AP/N/R&P/Pavement/01
4	TYPICAL PAVEMENT SECTION OF ACCESS ROAD	RITES/AP/N/R&P/PAV. A. ROAD/01
5	ADMIN CUM COMMON FACILITIES BLOCK & AREA FOR FOREIGN PASSENGERS - GROUND FLOOR PLAN	RITES/AP/N/Arch/ADMIN/01
6	ADMIN CUM COMMON FACILITIES BLOCK & AREA FOR FOREIGN PASSENGERS - FIRST FLOOR PLAN, ELEVATION & SECTION	RITES/AP/N/Arch/ADMIN/02
7	CUSTOM OFFICE / QUARANTINE BLOCK - GROUND & FIRST FLOOR PLAN	RITES/AP/N/Arch/CQB/01
8	CUSTOM OFFICE / QUARANTINE BLOCK - TERRACE FLOOR PLAN, ELEVATION & SECTION	RITES/AP/N/Arch/CQB/02
9	PROCESS AREA	RITES/AP/N/Arch/PROCESS AREA
10	WAREHOUSE IMPORT-1	RITES/AP/N/Arch/WI-1/01
11	WAREHOUSE EXPORT	RITES/AP/N/Arch/Warehouse Export/01
12	ANIMAL SHED	RITES/AP/N/Arch/AS/01
13	PORTER REST AREA	RITES/AP/N/Arch/PRA/01
14	FUMIGATION SHED	RITES/AP/N/Arch/FS/01
15	OFFICER'S BARRACK	RITES/AP/N/Arch/OFFICER'S BARRACK/01
16	ADMIN CUM COMMON FACILITIES BLOCK & AREA FOR FOREIGN PASSENGERS - FOUNDATION PLAN & DETAIL	RITES/AP/N/STR/ADMIN/01
17	CUSTOM OFFICE / QUARANTINE BLOCK - FOUNDATION PLAN & DETAIL	RITES/AP/N/STR/CUSTOM & QUARANTINE/01
18	CHAIN LINK FENCING CROSSING THROUGH NALLAH (1.50M. TO 2.00M. DEPTH) - FOUNDATION PLAN & DETAIL, COLUMN DETAIL BELOW PB & PB DETAIL	RITES/AP/N/STR./CHAIN LINK FENCING-01
19	OPEN DRAIN CHANNEL LAYOUT SITE PLAN	RITES/AP/N/PHE/DRAINAGE
20	EXTERNAL ELECTRIFICATION	RITES/AP/N/ELEC./EE/01
21	ELECTRICAL SINGLE LINE DIAGRAM	RITES/AP/N/ELEC./SLD

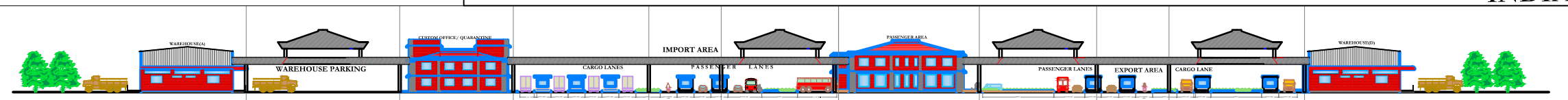
- B L A N K -



KEY PLAN

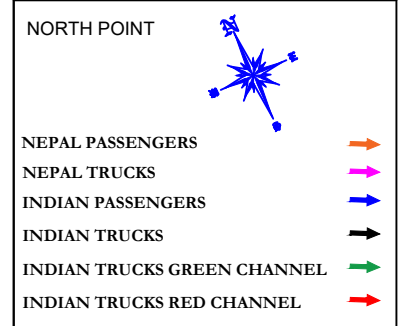


LAYOUT PLAN



SECTIONAL ELEVATION AA

- NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
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ICP NEPALGANJ

AREA STATEMENT		
S.NO	DESCRIPTION	AREA UNIT
TOTAL SITE AREA		
		44.36 HECTARES
PHASE I DEVELOPMENT AREA		
		176343 SQM
SITE PLAN		
PROPOSED BUILDINGS/SHEDS AREA		
ADMIN CUM FOREIGN PASSENGERS AREA & COMMON FACILITY BLOCK (DOUBLE STOREYED)		
1		1850 SQM
CUSTOM OFFICE/QUARANTINE BLOCK (DOUBLE STOREYED)		
2		2126.5 SQM
3	WAREHOUSE IMPORT	3040 SQM
4	WAREHOUSE EXPORT	1366 SQM
5	ANIMAL QUARANTINE	225 SQM
6	ANIMAL SHED	152.2 SQM
7	OFFICER'S BARRACK (DOUBLE STOREYED)	1119.62 SQM
8	JAWAN BARRACK (DOUBLE STOREYED)	1630.62 SQM
9	DINING HALL CUM KITCHEN	608.62 SQM
10	MAHILA BARRACK	226.74 SQM
11	FUMIGATION SHED	184 SQM
12	PORTER AREA - 2 NO	1500 SQM
13	TOILET BLOCK - 2 NO	244.4 SQM
14	ELECTRIC SUBSTATION	308.85 SQM
15	UG TANK & PUMP HOUSE	224.5 SQM
16	PROCESS AREA (IMPORT SIDE)	3856 SQM
17	PROCESS AREA-WAREHOUSE PARKING (IMPORT SIDE)	3000 SQM
18	PROCESS AREA (EXPORT SIDE)	3856 SQM
19	WATCH TOWER - 4 NO	260 SQM
20	ENTRANCE GATE-01	356 SQM
21	ENTRANCE GATE-02	95.4 SQM
TOTAL		25230.5 SQM
ANIMAL YARD		5000 SQM

- COMPLETION STAGE CONSTRUCTION STAGE
 TENDER STAGE CONCEPTUAL STAGE

CLIENT
 MINISTRY OF EXTERNAL AFFAIRS
 (GOVT. OF INDIA)

CONSULTANT
RITES
 THE INFRASTRUCTURE PEOPLE
 AIRPORTS DIVISION
 (ISO - 9001 CERTIFIED)

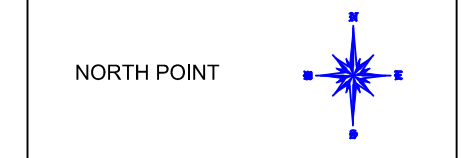
JOB TITLE
 DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
 SITE LAYOUT PLAN

Job. No.	Scale	Date	Rev.	Rev. No.	Rev. Date	Rev. Description
		JAN-2018				
DRAWN		DEALT		P.CORD.		APPROVED BY



- NOTES:-**
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
 2. WRITTEN DIMENSIONS ARE TO BE FOLLOWED. DRAWINGS ARE NOT TO BE SCALED.
 3. ANY DISCREPANCY IN THE DRAWING SHALL BE BROUGHT TO THE NOTICE OF THE ENGINEER.
 4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS.
 5. THE NORTH DIRECTION SHOWN IS MAGNETIC NORTH DIRECTION.
 6. THE SYMBOLS USED ARE SYMBOLIC AND MAY VARY WITH THE ACTUAL DIMENSION AT SITE.
 7. THE BENCH MARK VALUE IS TAKEN FROM THE TRACK LEVEL OF MAIN LINE AT THE CENTER LINE OF RUPADIHA ROAD RAILWAY STATION MAIN BUILDING. THE VALUE OF BENCH MARK IS TAKEN AS 147.260M AMSL. ALL LEVELS ARE REDUCED FROM THIS BENCH MARK.



LEGENDS

Boundary/Compound Wall	
Building	
Drain/ Nala/ River	
Electric Post	
Electric Transformer	
Gate	
Kilometer Post	
Lamp Post	
Manhole	
Signal Post	
Temple	
Tree	
Temporary Bench Mark	
CONTROL POINT	
Telephone Post	

Total ICP Area (Fenced) = 443365.70 Sqm
 = 44.336 Hectares

<input type="checkbox"/> COMPLETION STAGE	<input type="checkbox"/> CONSTRUCTION STAGE
<input checked="" type="checkbox"/> TENDER STAGE	<input type="checkbox"/> CONCEPTUAL STAGE

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MINISTRY OF EXTERNAL AFFAIRS
 (GOVT. OF INDIA)

CONSULTANT

RITES
 THE INFRASTRUCTURE PEOPLE
 AIRPORTS DIVISION
 (ISO - 9001 CERTIFIED)

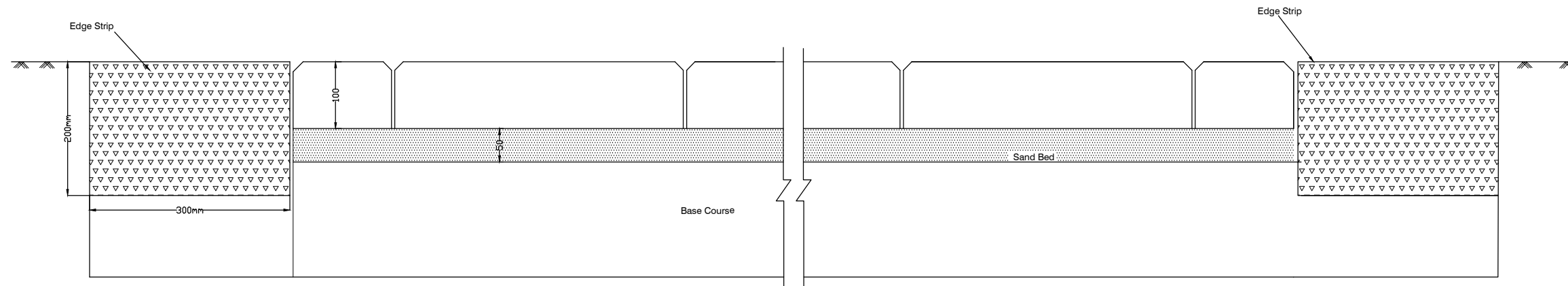
JOB TITLE
DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
TOPOGRAPHIC SURVEY PLAN

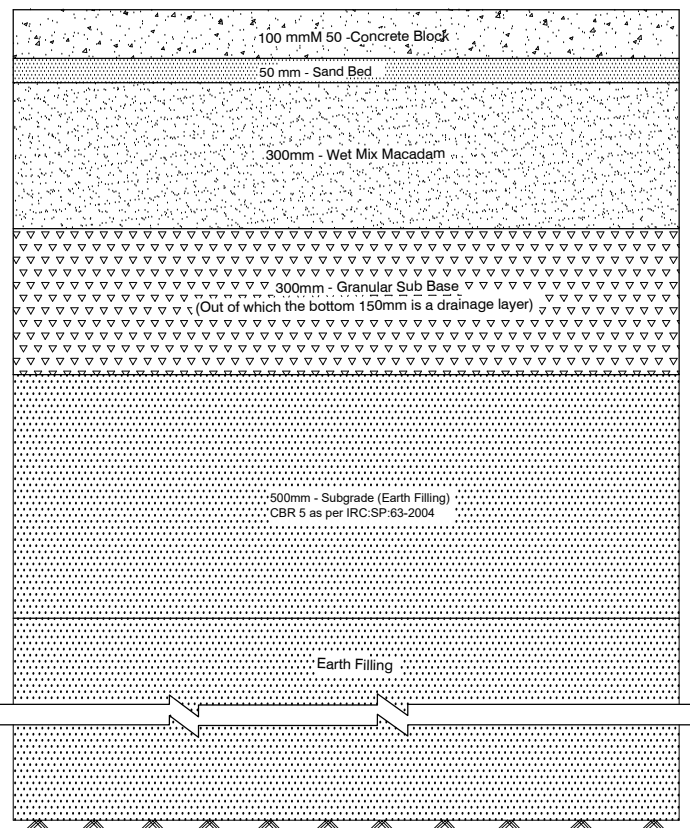
Job. No.	Drg. No.
Scale	REVISION
MARCH 2016	01
DATE	REVISION
	SUFFIX
DRAWN	DEALT
	P.CORD.
	APPROVED BY

NOTES:-

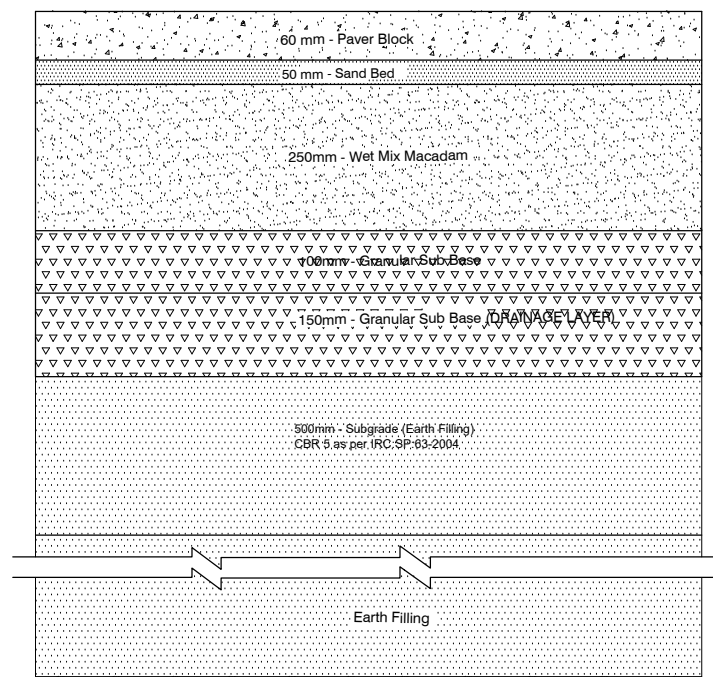
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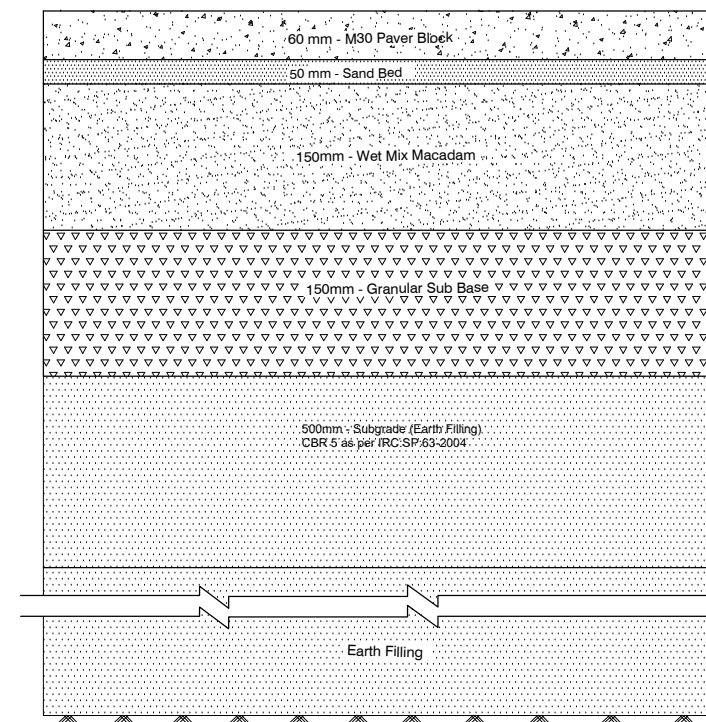
SECTION FOR TRUCK PARKING AREA



Truck Parking Area



car parking area



PEDESTRIAN AREA

- COMPLETION STAGE CONSTRUCTION STAGE
 TENDER STAGE CONCEPTUAL STAGE

CLIENT

MINISTRY OF EXTERNAL AFFAIRS
(GOVT. OF INDIA)

CONSULTANT



AIRPORTS DIVISION
(ISO - 9001 CERTIFIED)

JOB TITLE

DEVELOPMENT OF INTEGRATED
CHECK POST AT NEPALGUNJ ALONG
INDO-NEPAL BORDER

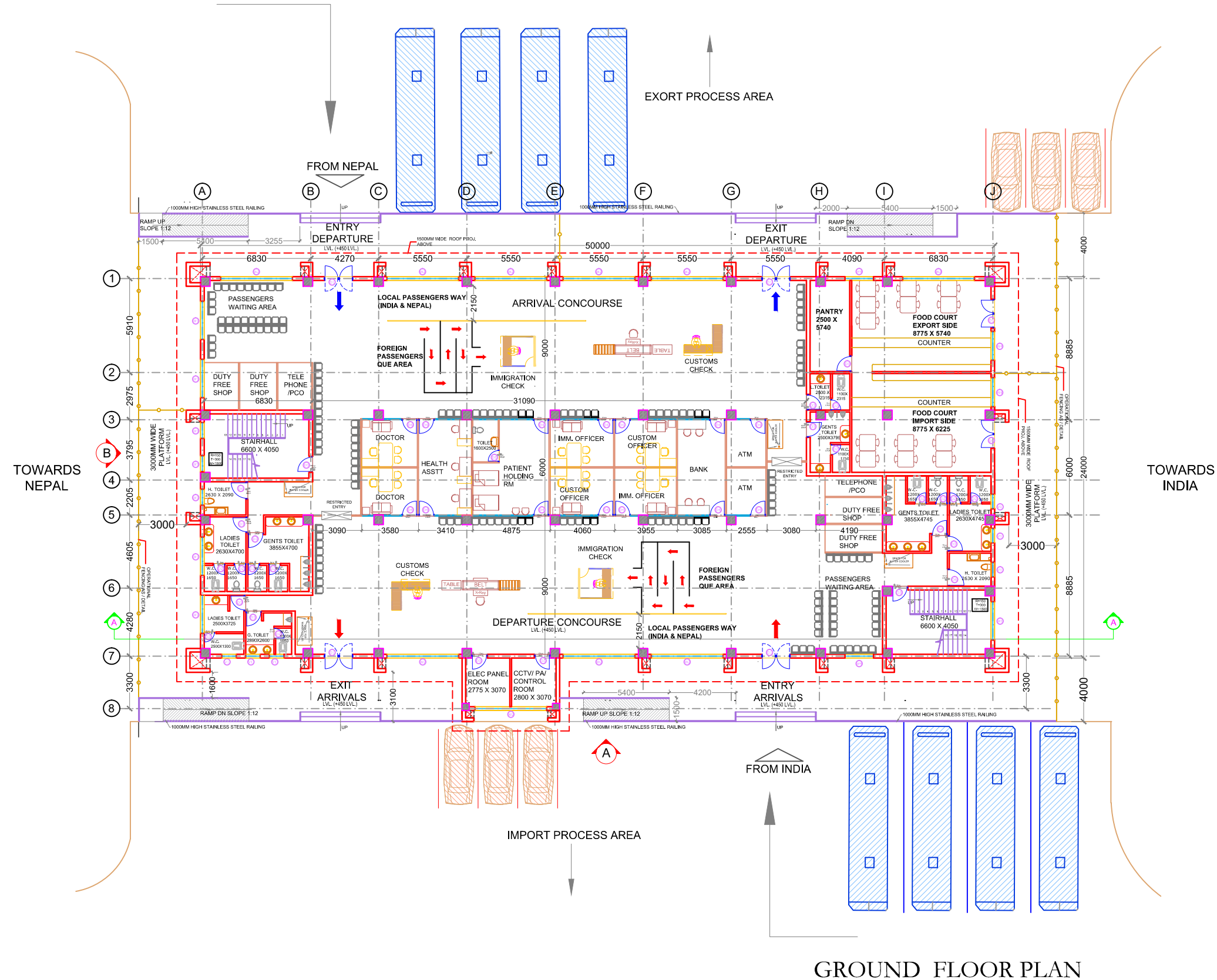
DRAWING TITLE

PAVEMENT SECTION

Job. No.	Drp. No.
Scale	Revision
Date	Suffix

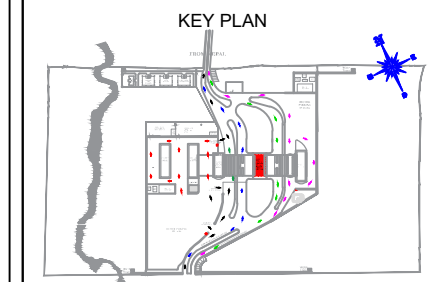
1	2	3	4	5	6	7	8	9	10
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DRAWN	DEALT	P.CORD.	APPROVED BY
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GROUND FLOOR PLAN

- NOTES:-**
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TOTAL PLINTH AREA ON GROUND FLOOR = 1241.00 SQM
 TOTAL AREA ON FIRST FLOOR = 600.00 SQM
 TOTAL COVERED AREA = 1850.00SQM

PEAK HOUR TRAFFIC			
S.N	PEAK HOUR	2014	2035
1	LOCAL PASSENGERS	695	1625
2	FOREIGN PASSENGERS	24 (assumed 2 times of 2014)	47
3	TRUCKS	24	47
3a	IMPORT TRUCKS		43
3b	EXPORT TRUCKS		4

SCHEDULE OF OPENINGS										
S.N	TYPE	WIDTH	HEIGHT	C. LVL.	L. LVL.	ABBR.	REMARKS			
1	D1	1800	3900	00	3900	GDVDS	HL framed double door with Glass			
2	D2	750	2100	00	2100	PDSS	HL framed partition board door single shutter			
3	D3	1000	2100	00	2100	PDSS	HL framed partition board door single shutter			
4	D4	1000	2100	00	2100	FDSS	HL framed flush door single shutter			
5	D5	750	2100	00	2100	FDSS	HL framed flush door single shutter			
6	D6	1100	2100	00	2100	PDSS	HL framed partition board double door			
7	D7	1800	2700	00	2700	GDVDS	HL framed (Double door) with Glass			
8	W1	2400	2700	750	3900	GWV	HL framed glazed window with ventilator			
9	W2	4500	2700	750	3900	GWV	HL framed glazed window with ventilator			
10	W3	1000	2700	750	3900	GWV	HL framed glazed window with ventilator			
11	W4	1800	2700	750	3900	GWV	HL framed glazed window with ventilator			
12	W5	4500	1950	750	2700	GWV	HL framed glazed window with ventilator			
13	W6	2400	1950	750	2700	GWV	HL framed glazed window with ventilator			
14	W7	1000	1950	750	2700	GWV	HL framed glazed window with ventilator			
15	W8	1800	1950	750	2700	GWV	HL framed glazed window with ventilator			
16	V1	900	600	2850	3900	V2 EF	HL framed with glazing & exhaust fan			

SCHEDULE OF FINISHES				
S.NO.	AREA	FLOOR	WALL	CEILING
1.	PASSENGER AREA	Granite Stone cladding upto 1.2 M. textured paint above	Granite Stone cladding upto 1.2 M. textured paint above	Fake Ceiling - Armstrong Ceiling Tiles as per tender spec.
2.	OFFICES ALL ADMIN AREA FOOD COURT	Verified Tile Flooring (as per approved sample)	Verified tile cladding 100mm high textured paint above	Fake Ceiling - Armstrong Ceiling Tiles as per tender spec.
3.	PASSAGE STAIRCASE	10mm Granite stone flooring	10mm granite stone cladding upto 1950 height & OSD above.	Fake Ceiling - Armstrong Ceiling Tiles as per tender spec. OSD in staircase
4.	TOILETS	Non-slip tile flooring	Wall Tiles (as per approved sample) upto 2.1 m height all around in both colors (Dark shades upto 900m height, OSD in matching shade above	OSD

- COMPLETION STAGE
- CONSTRUCTION STAGE
- TENDER STAGE
- CONCEPTUAL STAGE

SUFFIX	DATE	INITIALS	DETAILS
REVISIONS			

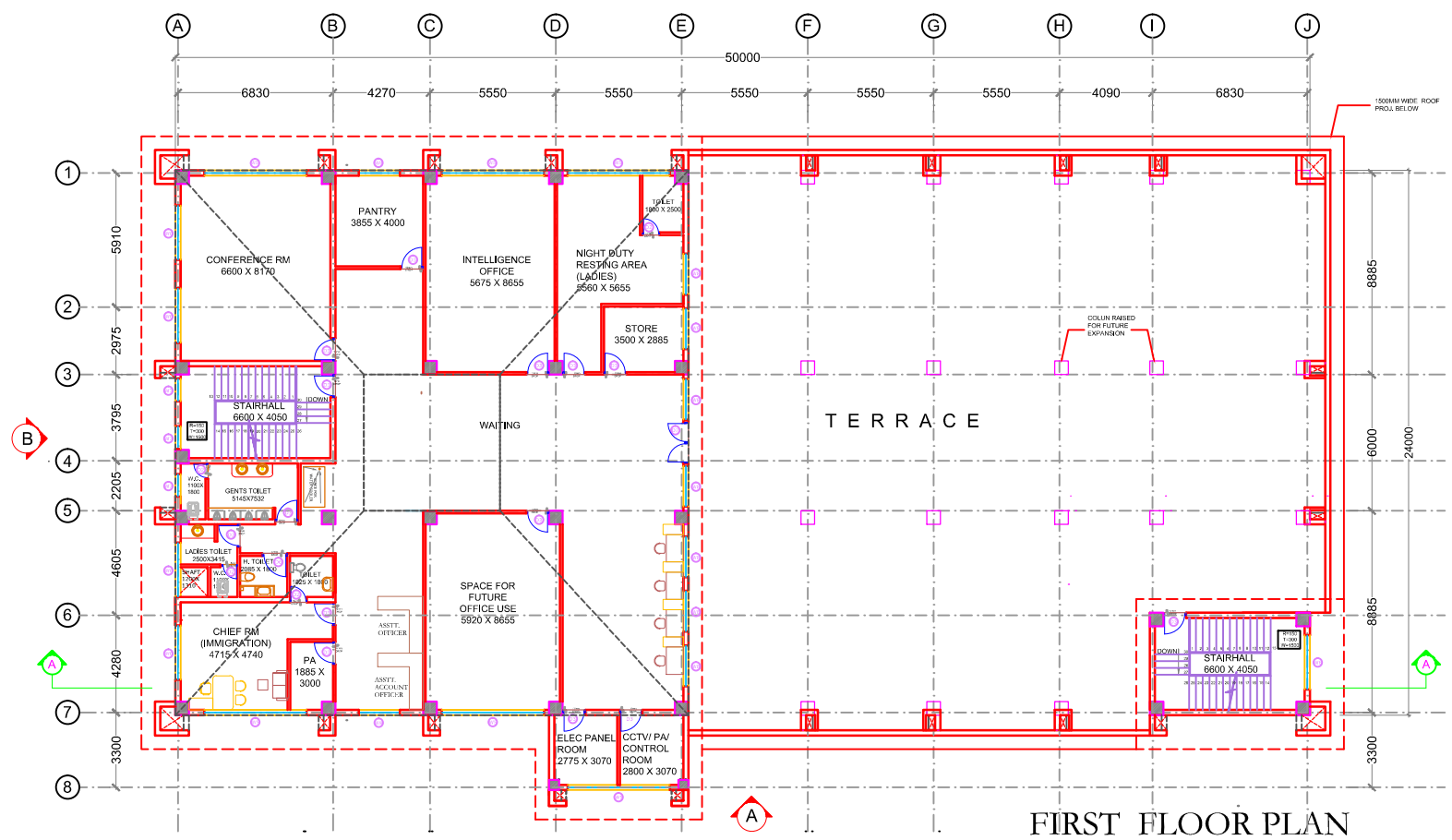
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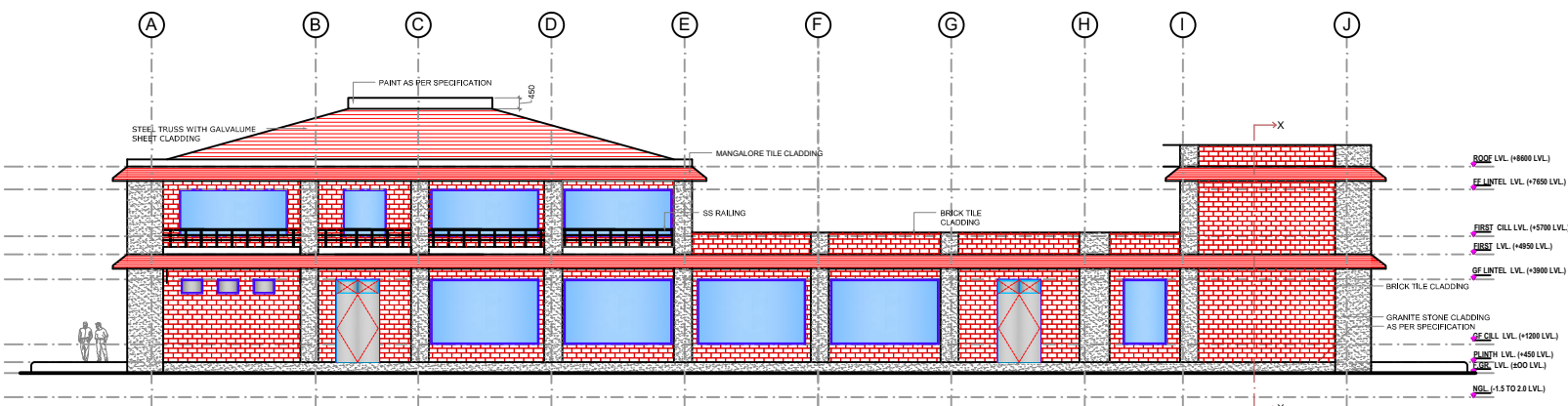
JOB TITLE
 DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
 ADMIN CUM COMMON FACILITIES BLOCK & AREA FOR FOREIGN PASSENGERS GROUND FLOOR PLAN

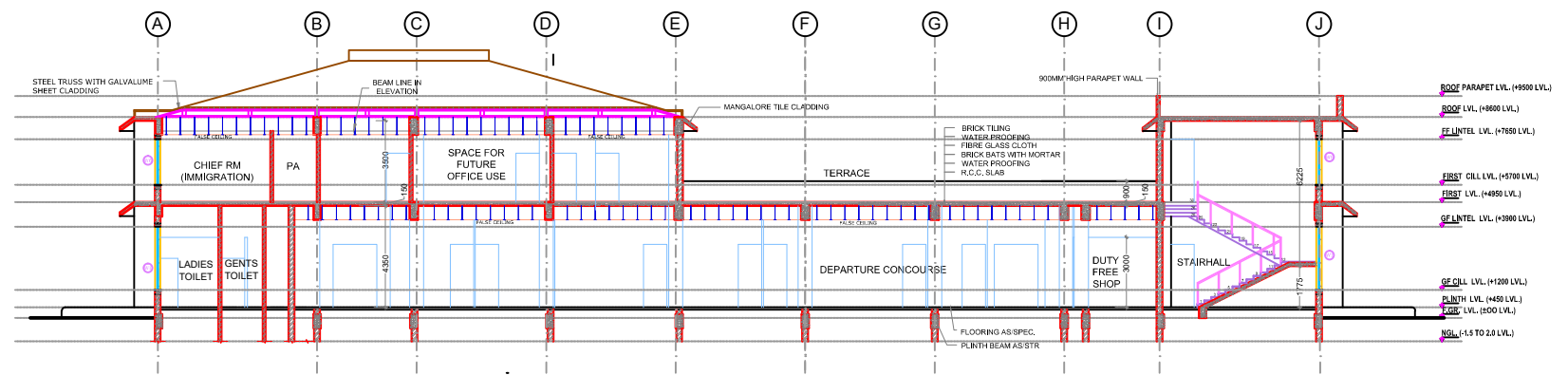
Job No.	RITES/AP/N/Arch/ADMIN/01		
Scale	Date	Revision	Suffix
NTS	JAN 2020		
DRAWN	DEALT	P.CORD.	APPROVED BY



FIRST FLOOR PLAN

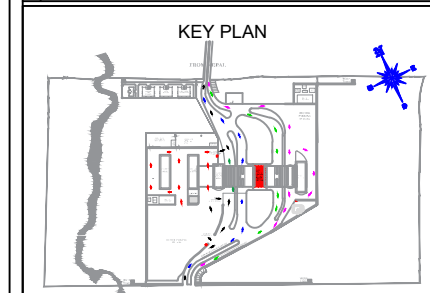


ELEVATION A



SECTION AA

- NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
 2. WRITTEN DIMENSIONS ARE TO BE FOLLOWED. DRAWINGS ARE NOT TO BE SCALED.
 3. ANY DISCREPANCY IN THE DRAWING SHALL BE BROUGHT TO THE NOTICE OF THE ENGINEER.
 4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS.



TOTAL PLINTH AREA ON GROUND FLOOR = 1241.00 SQM
 TOTAL AREA ON FIRST FLOOR = 600.00 SQM
 TOTAL COVERED AREA = 1850.00 SQM

PEAK HOUR TRAFFIC			
S.N	PEAK HOUR	2014	2035
1	LOCAL PASSENGERS	695	1629
2	FOREIGN PASSENGERS	2	4 (assumed 2 times of 2014)
3	TRUCKS	24	47
3a	IMPORT TRUCKS		43
3b	EXPORT TRUCKS		4

SCHEDULE OF OPENINGS						
S.N	TYPE	WIDTH	HEIGHT	C. LVL.	L. LVL.	REMARKS
1	D1	1800	3000	00	3900	GDVDS AL framed (Double door) with Glass
2	D2	750	2100	00	2100	PDSS AL framed particle board door single shutter
3	D3	1000	2100	00	2100	PDSS AL framed particle board door single shutter
4	D4	1000	2100	00	2100	FDSS AL framed Run door single shutter
5	D5	750	2100	00	2100	FDSS AL framed Run door single shutter
6	D6	1100	2100	00	2100	PDSS AL framed particle board door single shutter
7	D7	1800	2700	00	2700	GDVDS AL framed (Double door) with Glass
8	W1	2400	2700	750	3900	GWV AL framed glazed window with ventilaor
9	W2	4500	2700	750	3900	GWV AL framed glazed window with ventilaor
10	W3	1000	2700	750	3900	GWV AL framed glazed window with ventilaor
11	W4	1800	2700	750	3900	GWV AL framed glazed window with ventilaor
12	W5	4500	1950	750	2700	GWV AL framed glazed window with ventilaor
13	W6	2400	1950	750	2700	GWV AL framed glazed window with ventilaor
14	W7	1000	1950	750	2700	GWV AL framed glazed window with ventilaor
15	W8	1800	1950	750	2700	GWV AL framed glazed window with ventilaor
16	V1	900	600	2850	3900	V2 EF AL framed with glazing & exhaust fan

SCHEDULE OF FINISHES				
S.NO	AREA	FLOOR	WALL	CEILING
1	PASSENGER AREA	Granite Stone Flooring (as per approved sample)	Granite Stone cladding upto 1.2M. textured paint above	Falce Ceiling- Armstrong Ceiling Tiles as per tender spec.
2	OFFICES ALL ADMIN AREA FOOD COURT	Verified Tile Flooring (as per approved sample)	Verified the skirting 100mm high textured paint above	Falce Ceiling- Armstrong Ceiling Tiles as per tender spec.
3	PASSAGE STAIRCASE	10mm Granite stone flooring	10mm granite stone cladding upto 1900 height & OSD above.	Falce Ceiling- Armstrong Ceiling Tiles as per tender spec. OSD in staircase
4	TOILETS	Non-slip tile Flooring	Wall Tiles (as per approved sample) upto 2.1m height and around in lower colour (Dark shade upto 150m height). OSD in matching shade above	OSD

- COMPLETION STAGE
- TENDER STAGE
- CONSTRUCTION STAGE
- CONCEPTUAL STAGE

SUFFIX	DATE	INITIALS	DETAILS

REVISIONS

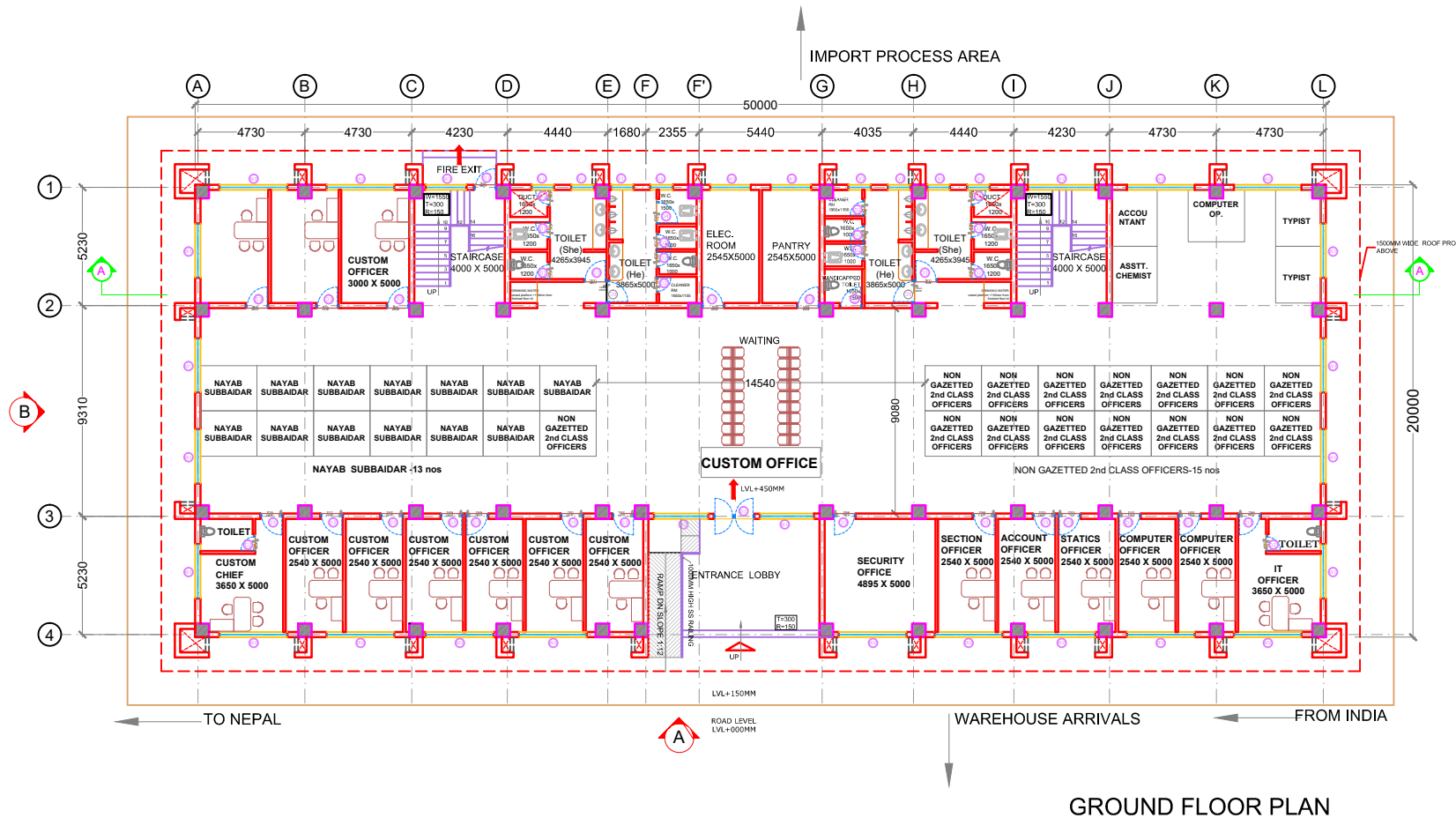
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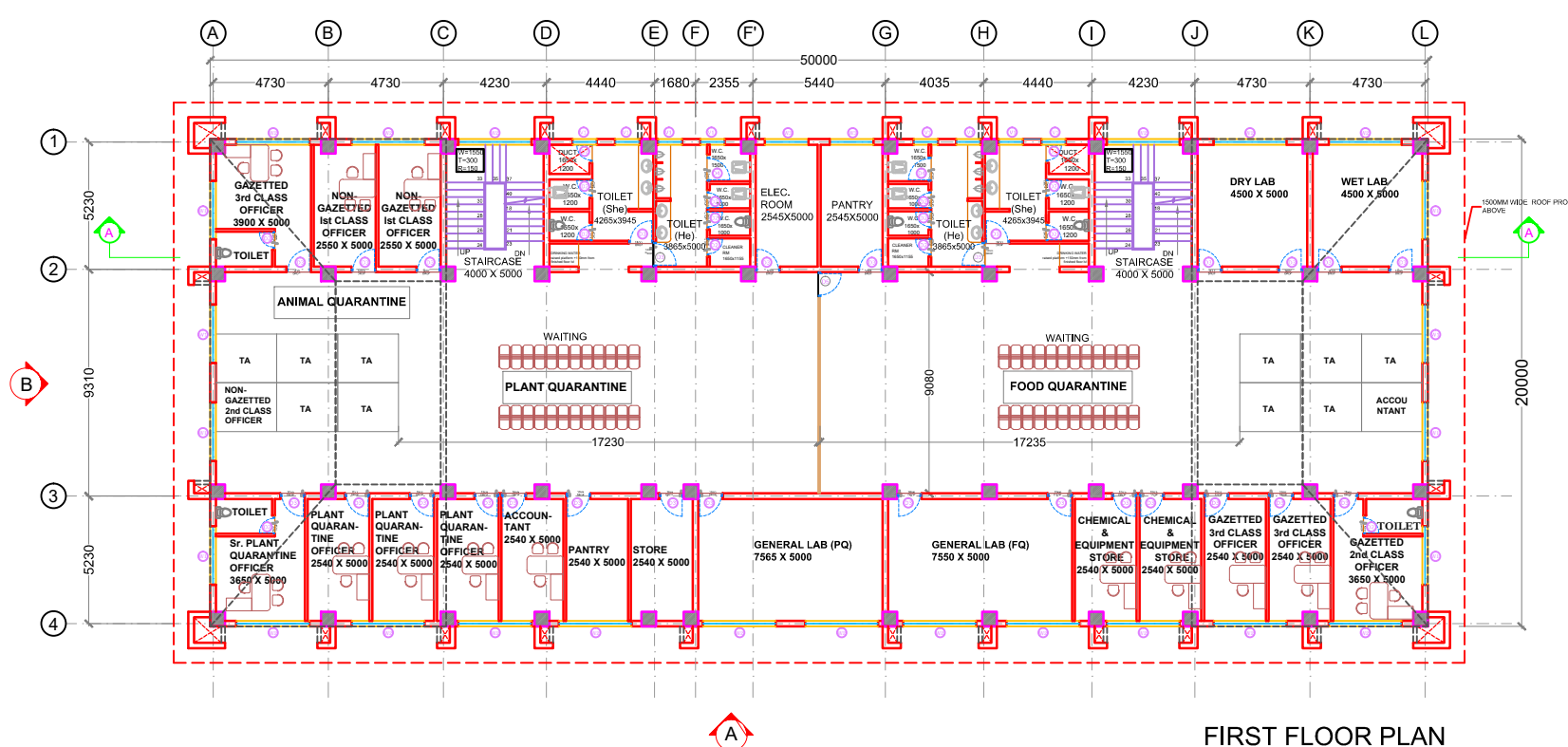
JOB TITLE
 DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
 ADMIN CUM COMMON FACILITIES BLOCK & AREA FOR FOREIGN PASSENGERS FIRST FLOOR PLAN, ELEVATION & SECTION

Job No.	RITES/AP/N/Arch/ADMIN/02		
Scale	Date	Revision	Suffix
NTS	JAN 2020		
DRAWN	DEALT	P.CORD.	APPROVED BY

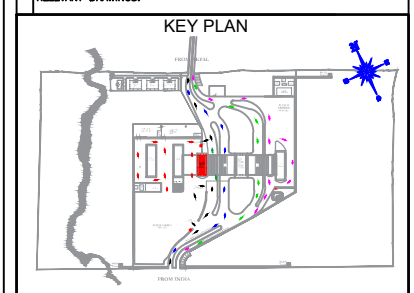


GROUND FLOOR PLAN



FIRST FLOOR PLAN

- NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
 2. WRITTEN DIMENSIONS ARE TO BE FOLLOWED. DRAWINGS ARE NOT TO BE SCALED.
 3. ANY DISCREPANCY IN THE DRAWING SHALL BE BROUGHT TO THE NOTICE OF THE ENGINEER.
 4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS.



TOTAL PLINTH AREA ON GROUND FLOOR = 1000.00 SQM
 TOTAL AREA ON FIRST FLOOR = 1022.50 SQM
 TOTAL COVERED AREA = 2022.50 SQM

SCHEDULE OF OPENINGS

S.N.	TYPE	WIDTH	HEIGHT	C. LVL.	L. LVL.	ABBR.	REMARKS
1.	D1	1800	2700	00	2700	GDVDS	Al framed double door with glass
2.	D2	750	2100	00	2100	PDSS	Al framed particle board door single white
3.	D3	1000	2100	00	2100	PDSS	Al framed particle board door single white
4.	DA	1100	2100	00	2100	PDSS	Al framed particle board door
5.	DB	1200	2100	00	2100	PDSS	Al framed Alum door single white
6.	W1	2400	1950	750	2700	GWV	Al framed aluminum window with ventilation
7.	W2	3000	1950	750	2700	GWV	Al framed aluminum window with ventilation
8.	W3	1800	1950	750	2700	GWV	Al framed aluminum window with ventilation
9.	V1	1000	600	2100	2700	V2 EF	Al framed with glazing & construction

SCHEDULE OF FINISHES

S.NO.	AREA	FLOOR	WALL	CEILING
1.	WAITING AREA	100% 80000 Heavy Duty Vitrified Tiles (as per approved sample)	100% 10mm thick gypsum board with 100mm high textured light stone	False Ceiling Armstrong Ceiling Tiles as per tender spec.
2.	OFFICES ALL ROOM AREA	Vitrified Tiles Flooring (as per approved sample)	Vitrified tile skirting 100mm high textured light stone	False Ceiling Armstrong Ceiling Tiles as per tender spec.
3.	STAIRCASE	100% Granite stone flooring	100% granite stone skirting upto 1000 height & OSD above.	False Ceiling Armstrong Ceiling Tiles as per tender spec OSD in staircase above above.
4.	TOILETS	Non-slip tile flooring	100% Tiles (as per approved sample) up to 2100 height all around in wall (Dark stone upto 1000 height, OSD in meeting above above.	OSD

- COMPLETION STAGE
- TENDER STAGE
- CONSTRUCTION STAGE
- CONCEPTUAL STAGE

SUFFIX	DATE	INITIALS	DETAILS

REVISIONS

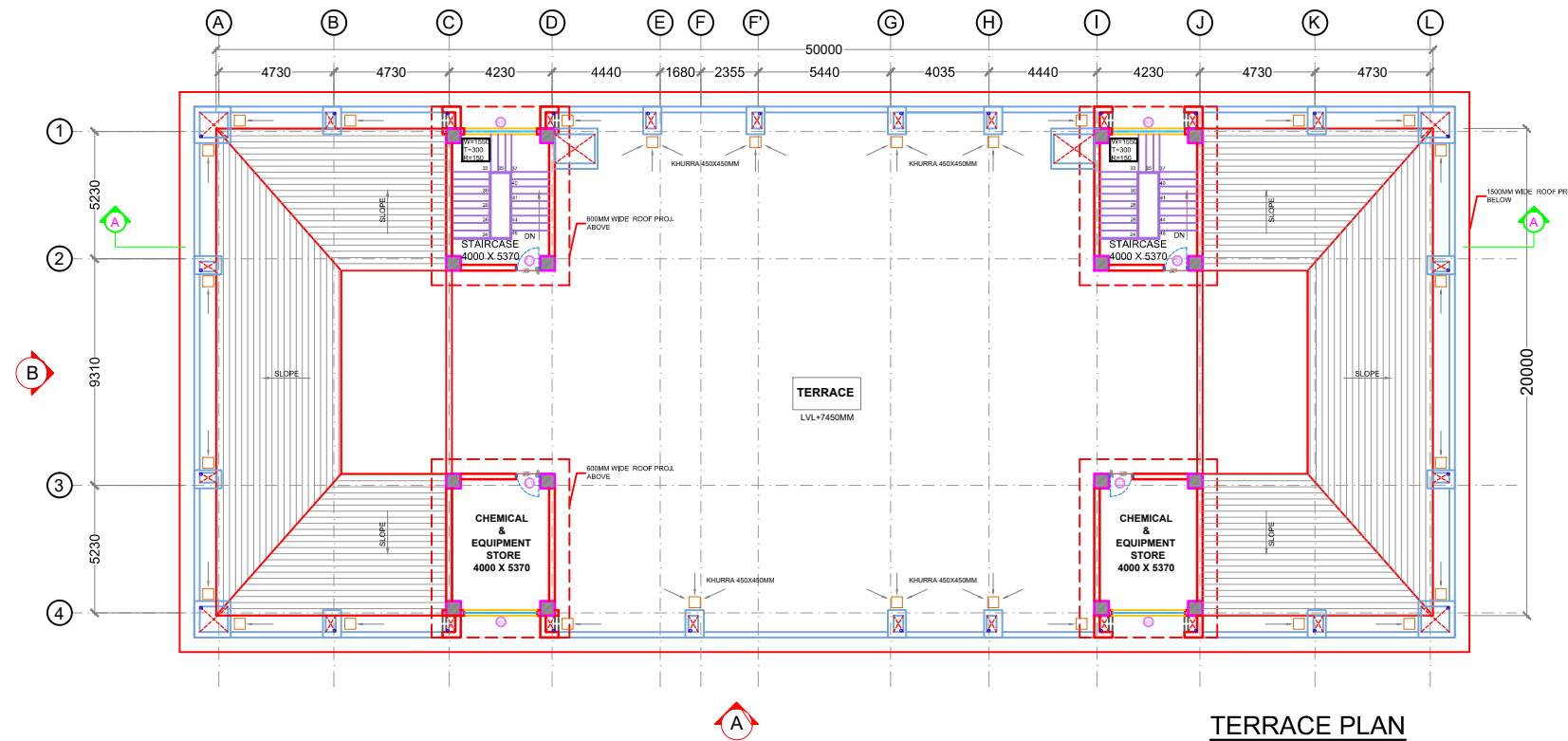
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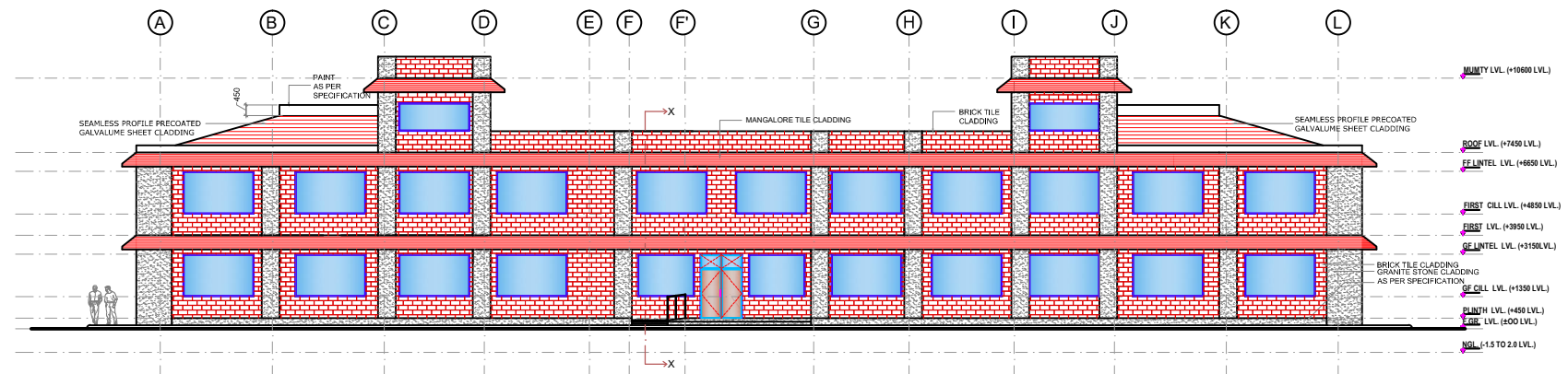
JOB TITLE
 DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
 CUSTOM OFFICE / QUARANTINE BLOCK
 GROUND & FIRST FLOOR PLAN

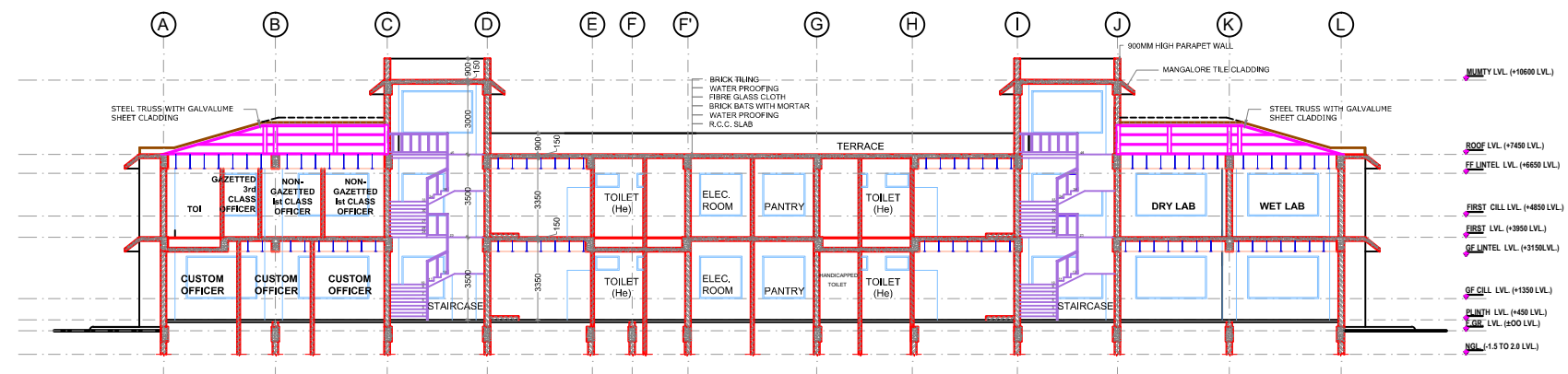
Job No.	RITES/APN/Arch/COB/01
Scale	
NTS	
DRAWN	DEALT
P. COORD.	APPROVED BY



TERRACE PLAN

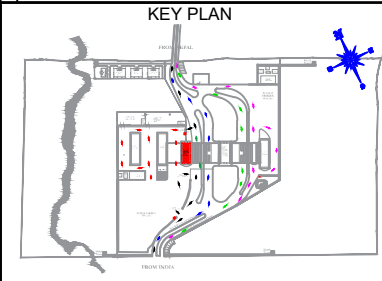


ELEVATION A



SECTION AA

- NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
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TOTAL PLINTH AREA ON GROUND FLOOR = 1000.00 SQM
 TOTAL AREA ON FIRST FLOOR = 1022.50 SQM
 TOTAL COVERED AREA = 2022.50 SQM

SCHEDULE OF OPENINGS

S.N.	TYPE	WIDTH	HEIGHT	C. LVL.	L. LVL.	ABBR.	REMARKS
1.	DT	1800	2700	00	2700	GDVDS	Al framed double door with glass
2.	D2	750	2100	00	2100	PDSS	Al framed particle board door single swing
3.	D3	1000	2100	00	2100	PDSS	Al framed particle board door single swing
4.	DA	1100	2100	00	2100	PDSS	Al framed particle board door single swing
5.	D5	1000	2100	00	2100	PDSS	Al framed flush door single swing
6.	W1	2400	1950	750	2700	GWV	Al framed glass window with ventilation
7.	W2	3000	1950	750	2700	GWV	Al framed glass window with ventilation
8.	W3	1800	1950	750	2700	GWV	Al framed glass window with ventilation
9.	V1	1000	600	2100	2700	V2 EF	Al framed vent with glazing & construction

SCHEDULE OF FINISHES

S.NO.	AREA	FLOOR	WALL	CEILING
1.	WAITING AREA	800 X 800mm Heavy Duty Vitrified Tile Flooring (as per approved sample)	100 mm Thk. concrete finished with 15mm plaster on per side (then in appd. finish)	False Ceiling Armstrong Ceiling Tiles as per tender spec.
2.	OFFICES	Vitrified Tile Flooring (as per approved sample)	Vitrified tile skirting 100mm high finished with stone	False Ceiling Armstrong Ceiling Tiles as per tender spec.
3.	STAIRCASE	10mm Granite stone flooring	10mm granite stone - finished upto 1500 height & OSD above.	False Ceiling Armstrong Ceiling Tiles as per tender spec OSD in staircase
4.	TOILETS	Non-slip tile flooring	100 mm Thk. concrete (as per approved sample) with 20 mm height of plaster on per side (then in appd. finish) OSD in waiting, store above.	OSD

- COMPLETION STAGE
- TENDER STAGE
- CONSTRUCTION STAGE
- CONCEPTUAL STAGE

SUFFIX	DATE	INITIALS	DETAILS

REVISIONS

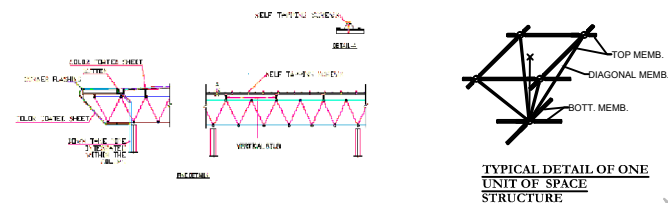
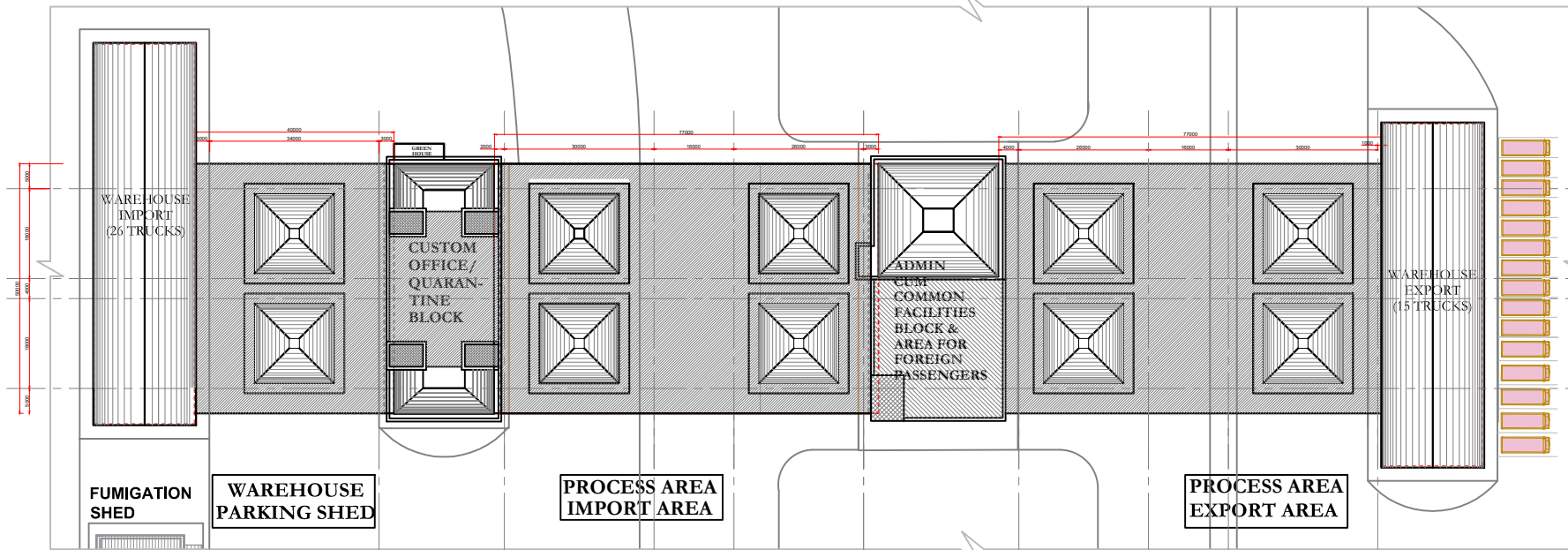
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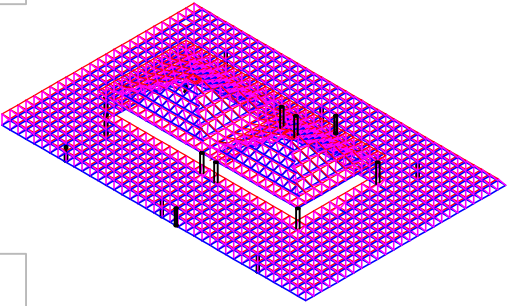
JOB TITLE
 DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
 CUSTOM OFFICE / QUARANTINE BLOCK
 TERRACE PLAN ,ELEVATION & SECTION

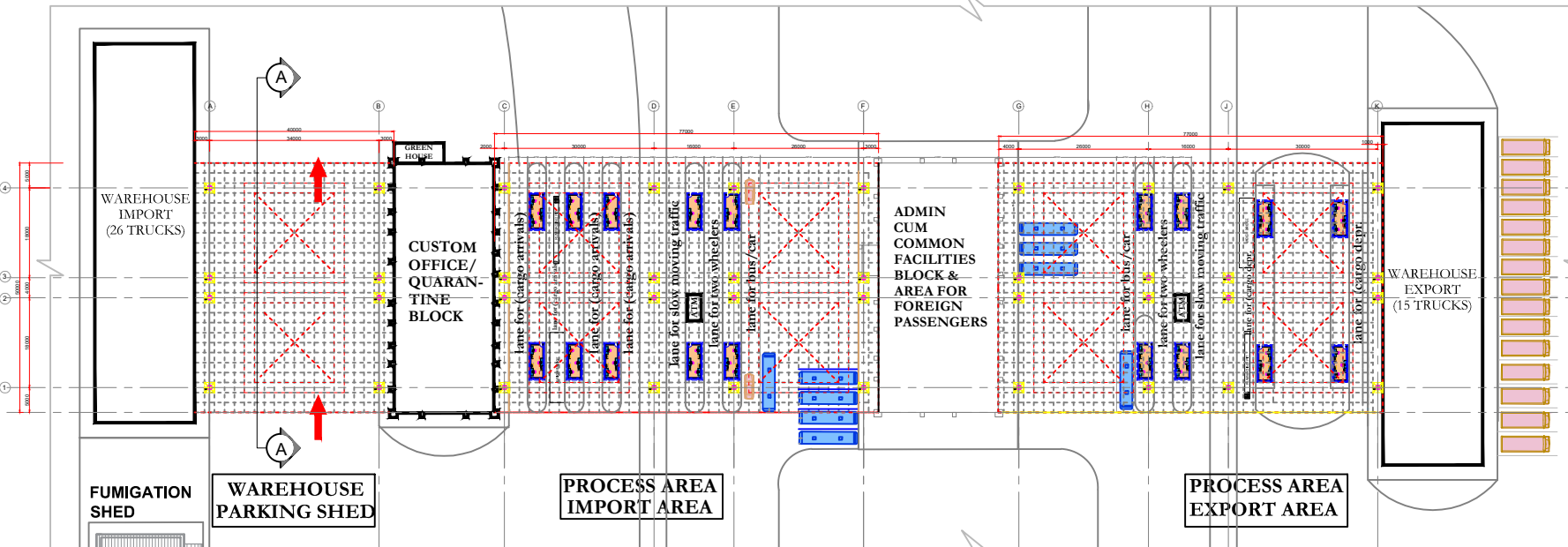
Job No.	RITES/AP/N/Arch/COB/02
Scale	As per drawing
Drawn	
Checked	
Approved	



WAREHOUSE PARKING SHED, PROCESS AREA (IMPORT AREA), PROCESS AREA (EXPORT AREA) PEB STRUCTURE ROOF PLAN



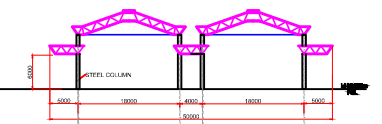
ISOMETRIC VIEW



WAREHOUSE PARKING SHED, PROCESS AREA (IMPORT AREA), PROCESS AREA (EXPORT AREA) PEB STRUCTURE FLOOR PLAN

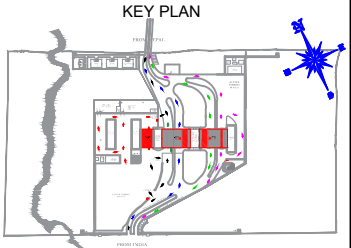


ELEVATION AT A



SECTION AA

- NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
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AREA DETAIL
 PROCESS AREA (IMPORT SIDE)= 3856 SQM
 PROCESS AREA (EXPORT SIDE)= 3856 SQM
 WAREHOUSE PARKING SHED = 2000 SQM

- COMPLETION STAGE
- TENDER STAGE
- CONSTRUCTION STAGE
- CONCEPTUAL STAGE

SUFFIX	DATE	INITIALS	DETAILS

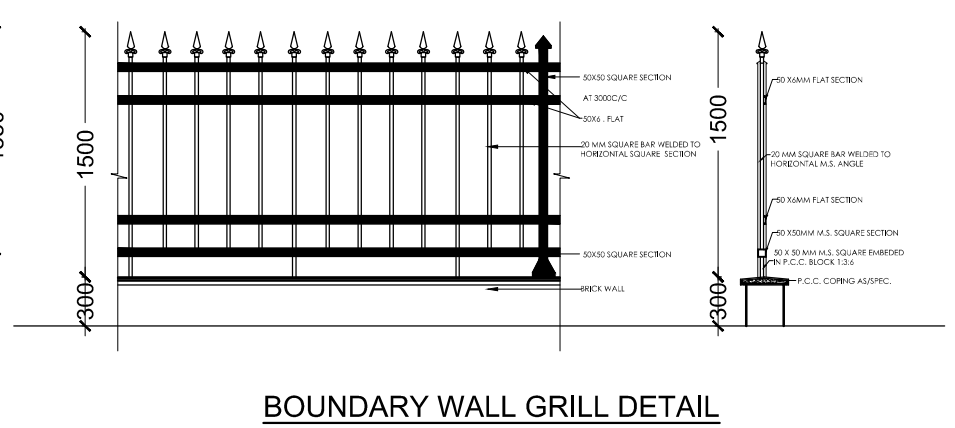
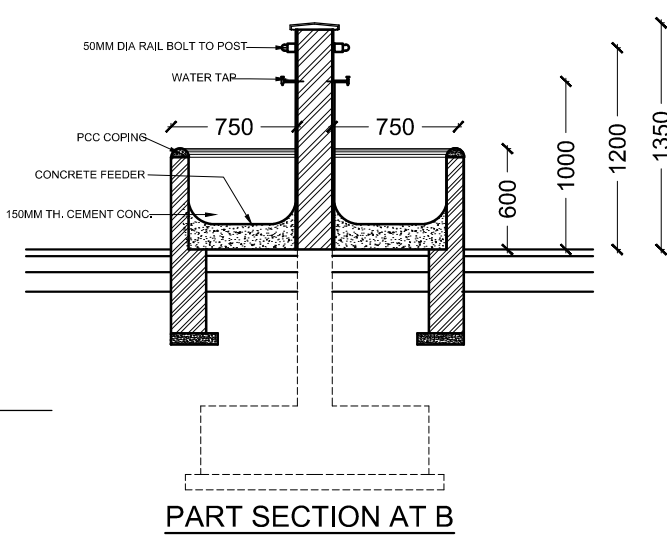
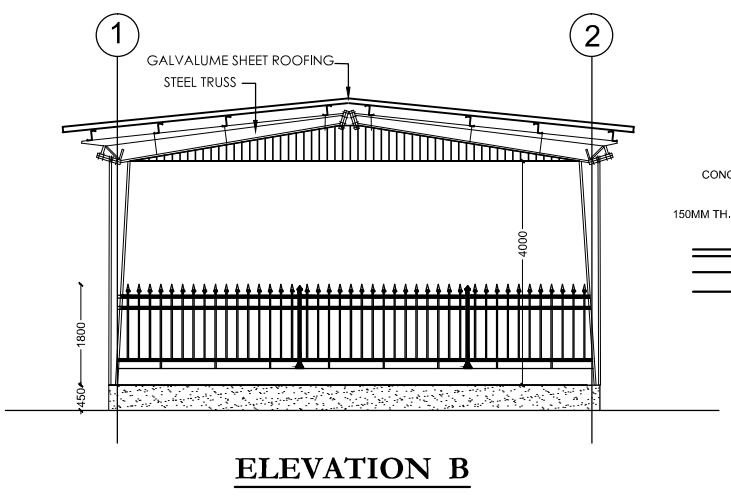
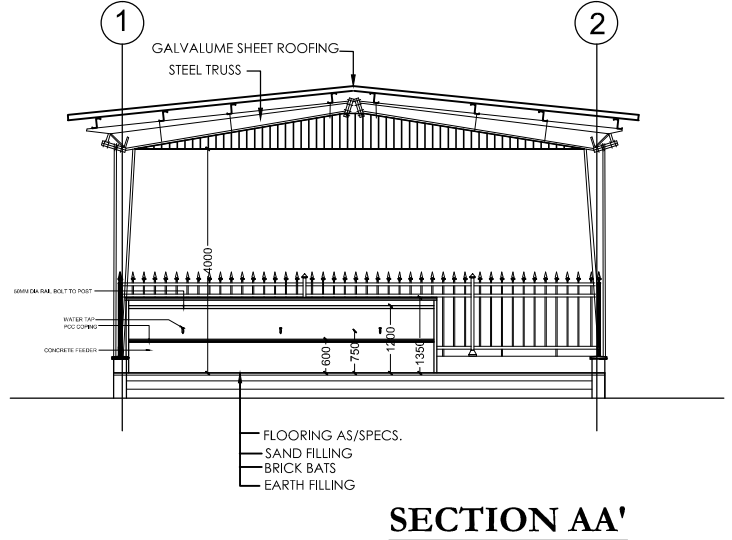
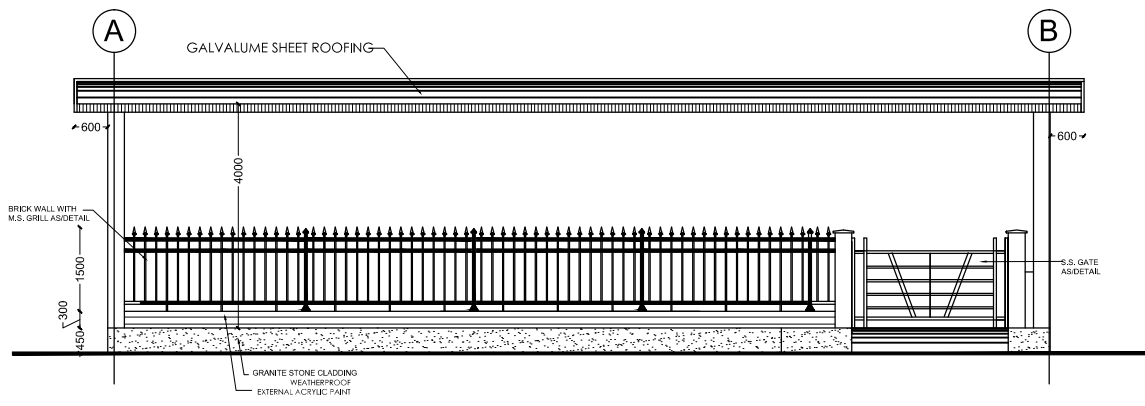
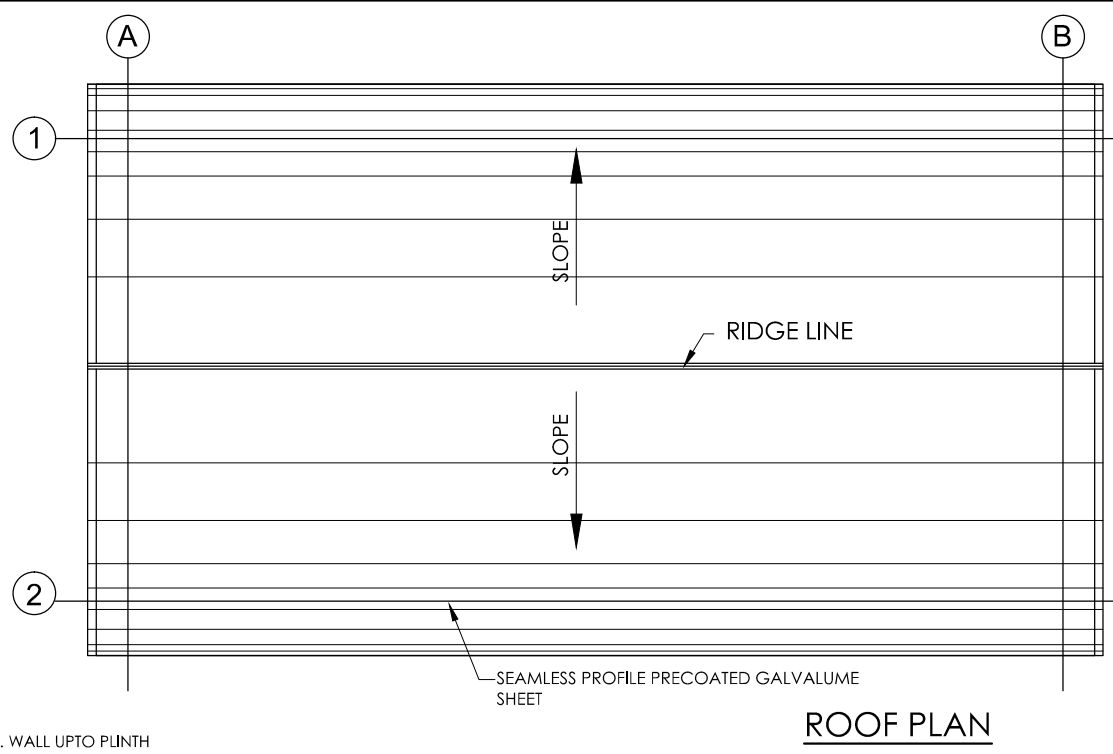
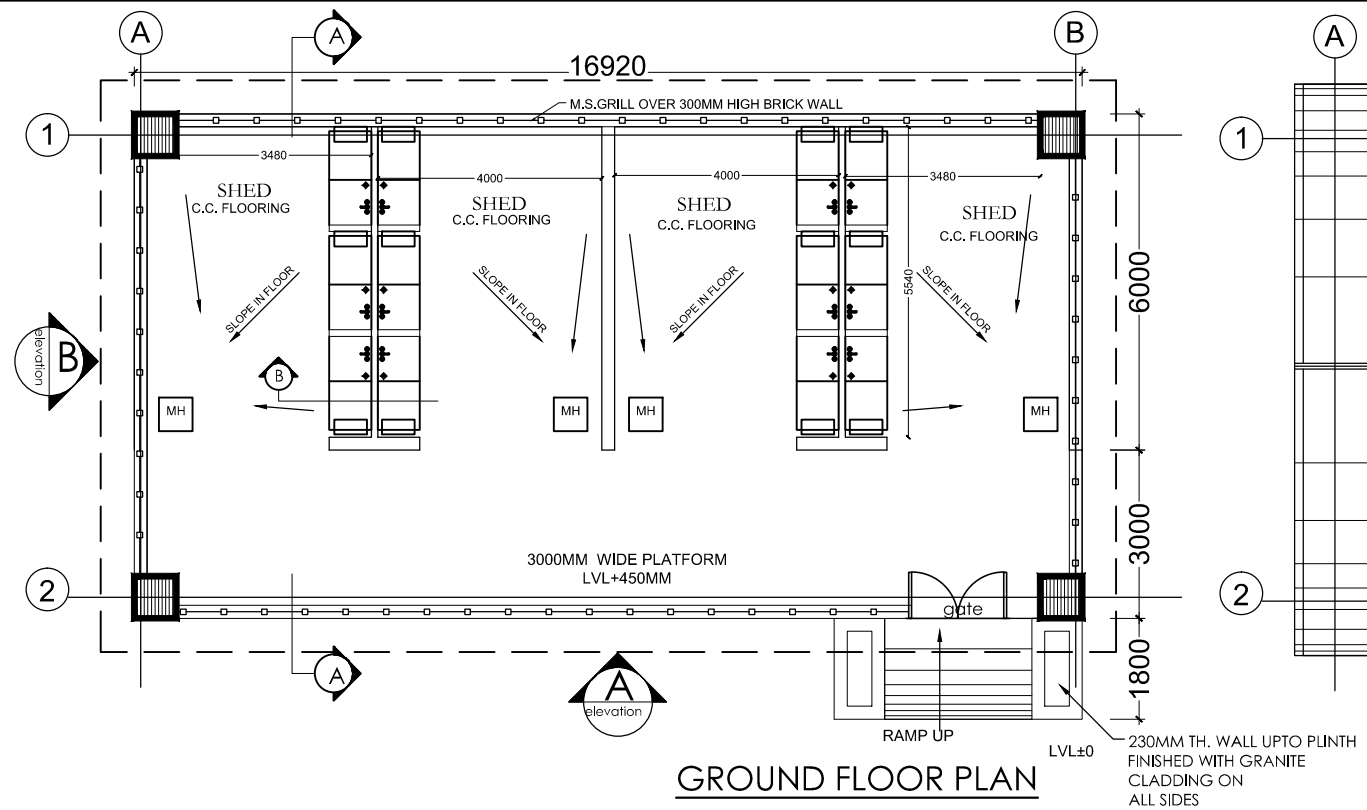
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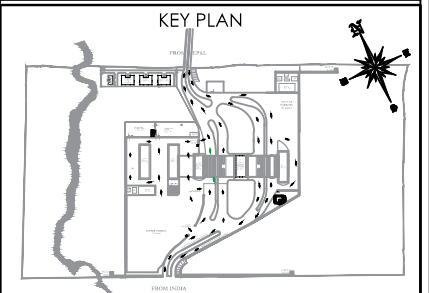
JOB TITLE
 DEVELOPMENT OF INTEGRATED
 CHECK POST AT NEPALGUNJ ALONG
 INDO-NEPAL BORDER

DRAWING TITLE
 PROCESS AREA

Job No.		Proj. No.	
Scale		Revision	
NTS			
DRAWN		P. COORD.	
DEALT		APPROVED BY	



NOTES:-
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AREA DETAIL
 TOTAL PLINTH AREA ON GROUND FLOOR = 152.2 SQM

SCHEDULE OF OPENINGS

S.NO.	TYPE	WIDTH	HEIGHT	SILL LVL.	L. LVL.	REMARKS
1.	DW	2700	2700	00	2700	G.D.W.D.S.
2.	D1	1000	2100	00	2100	P.D.S.D.S.
3.	D2	1000	2100	00	2100	P.D.S.D.S.
4.	D3	3500	2100	00	2100	P.D.S.D.S.
5.	D4	3500	2100	00	2100	P.D.S.D.S.
6.	D5	750	2100	00	2100	P.D.S.D.S.
7.	W1	2400	1800	900	2700	G.W.V.I.
8.	W2	1800	1800	900	2700	G.W.V.I.
9.	W3	3200	1800	900	2700	G.W.V.I.
10.	W4	2400	1800	900	2700	G.W.V.I.
11.	V1	1000	400	2100	2700	V3.E.E.

SCHEDULE OF FINISHES

S.NO.	AREA	FLOOR	INTERNAL WALL
1.	SHED	C.C. FLOORING	100 mm KOTA STONE SKIRTING & OSD ABOVE

EXTERNAL FINISH: Granite Stone dado level. Weatherproof external acrylic paint on external walls.

- COMPLETION STAGE
- TENDER STAGE
- CONSTRUCTION STAGE
- CONCEPTUAL STAGE

SUFFIX	DATE	INITIALS	DETAILS
REVISIONS			

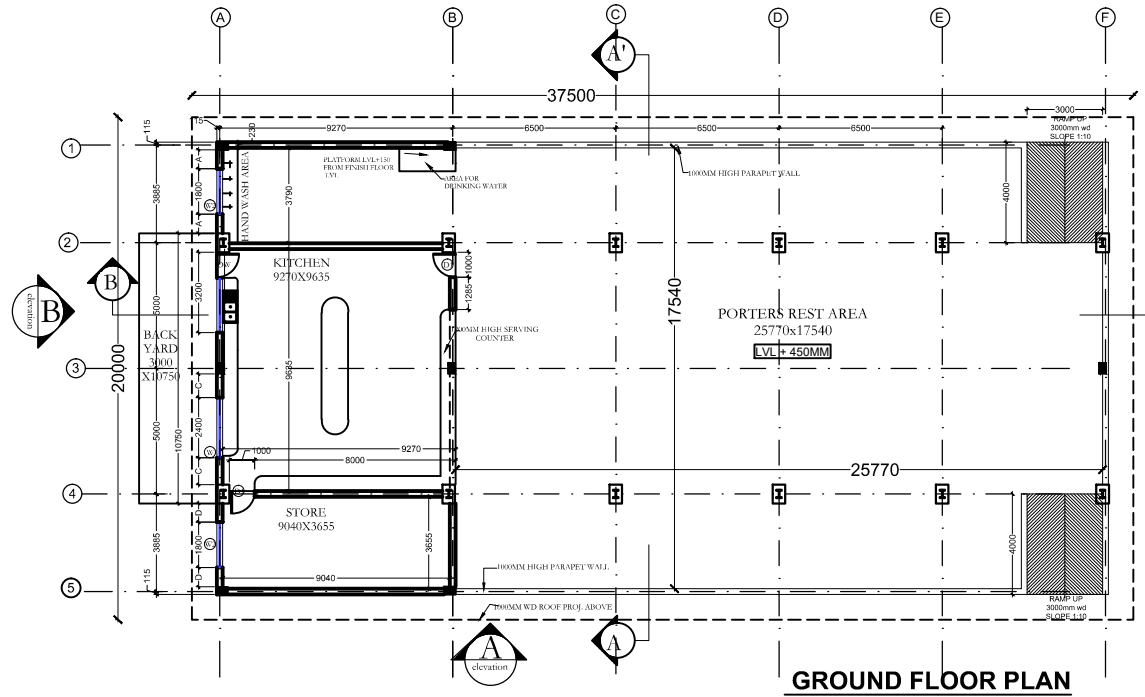
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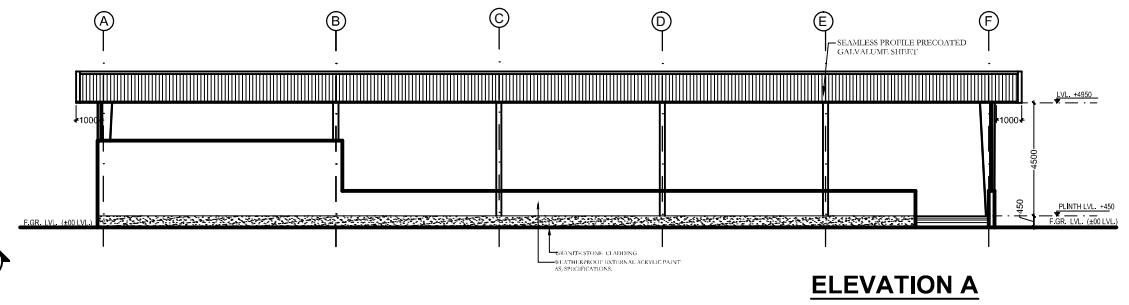
JOB TITLE
DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
ANIMAL SHED

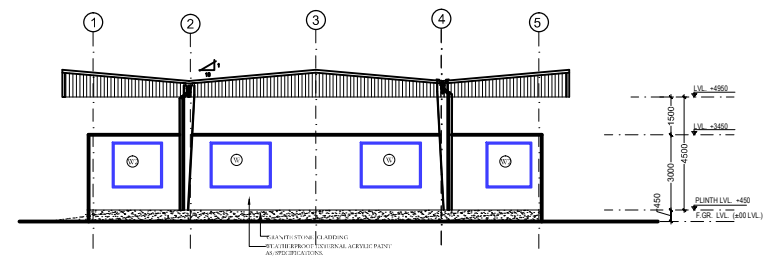
Job. No.	Dig. No.
Scale	Revision
DATE	BY
DRAWN	APPROVED BY



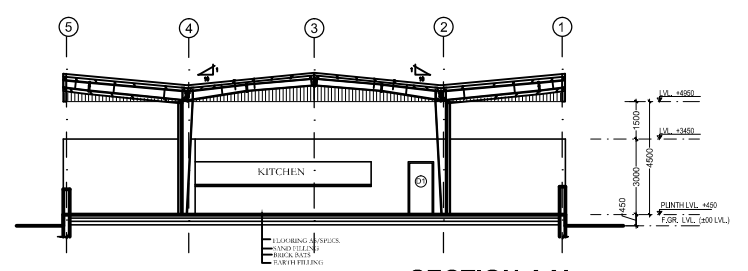
GROUND FLOOR PLAN



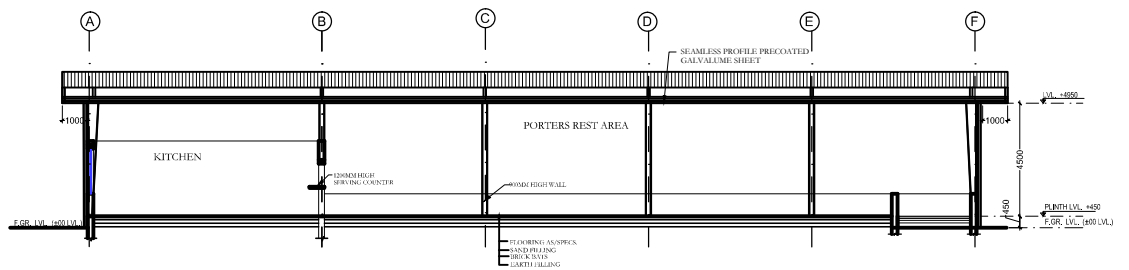
ELEVATION A



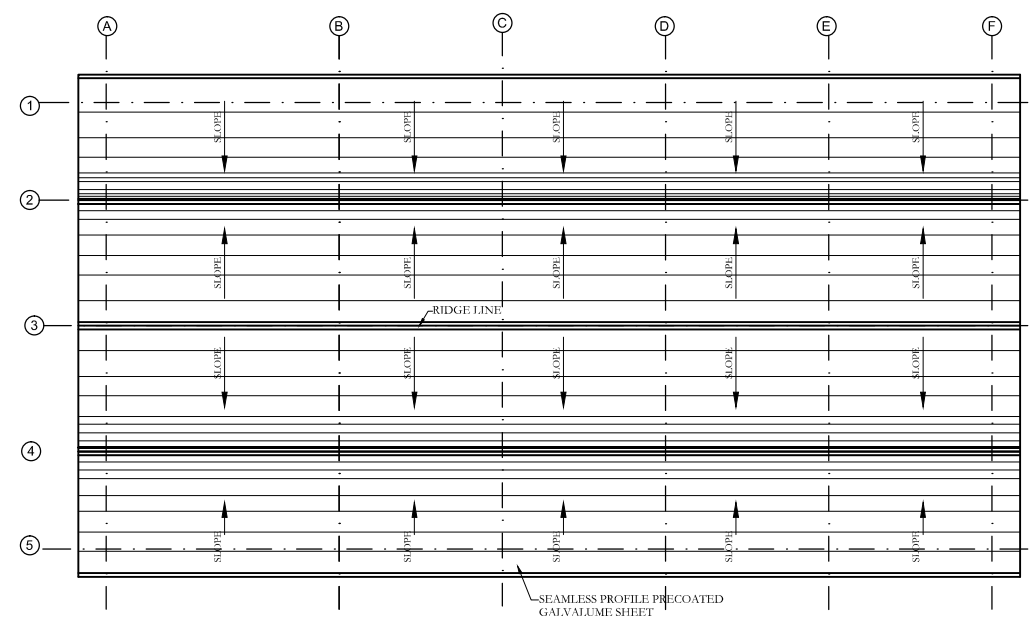
ELEVATION B



SECTION AA'

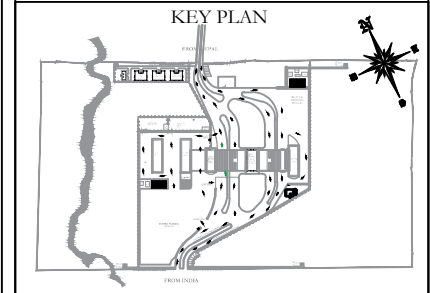


SECTION BB'



ROOF PLAN

NOTES:-
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 THIS DRAWING SHALL BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS.



AREA DETAIL

SCHEDULE OF OPENINGS

S.NO.	TYPE	WIDTH	HEIGHT	SILL LVL	L LVL	FINISH	REMARKS
1.	DO	3000	2100	60	2100	PPSS	As per approved drawings
2.	W	2500	1800	900	2700	GWV	As per approved drawings
3.	WT	1800	1800	900	2700	GWV	As per approved drawings
4.	DPW	3300	2700	60		PPSS	As per approved drawings

SCHEDULE OF FINISHES

S.NO.	AREA	FLOOR	INTERNAL WALL	EXTERNAL WALL FINISH
1.	REST AREA	12mm Granite stone flooring (as size not to exceed 600x300mm).	12mm granite stone cladding upto 1500 height & restone pane above.	Granite Stone cladding upto level. Waterproof external paint on external walls.
2.	KITCHEN	600x600 Vitrified Tiles (as per approved sample)	300x450 Wall Tiles (as per approved sample) upto 2.1 m height all around, and above counter top, OBD above.	
3.	STORE	62mm thick CC flooring with concrete hardener topping (D&K item no. 11.53).	Kota Stone Dado upto 1.1 m height, OBD above.	

- COMPLETION STAGE
- TENDER STAGE
- CONSTRUCTION STAGE
- CONCEPTUAL STAGE

SUFFIX	DATE	INITIALS	DETAILS

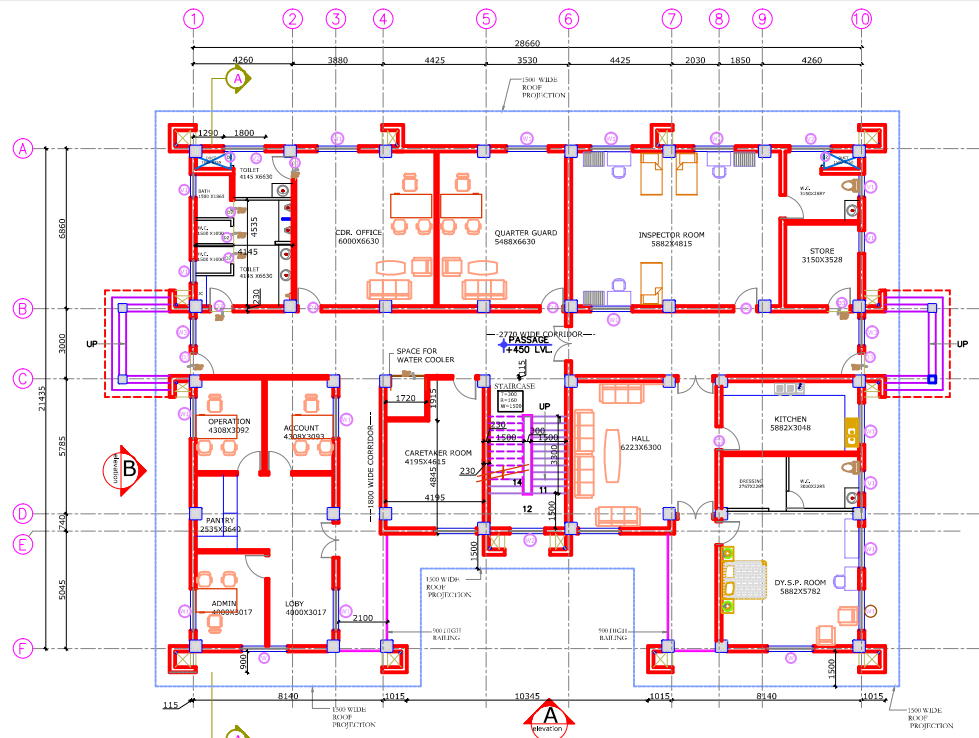
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 MINISTRY OF EXTERNAL AFFAIRS
 (GOVT. OF INDIA)

CONSULTANT
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 AIRPORTS DIVISION
 (ISO - 9001 CERTIFIED)

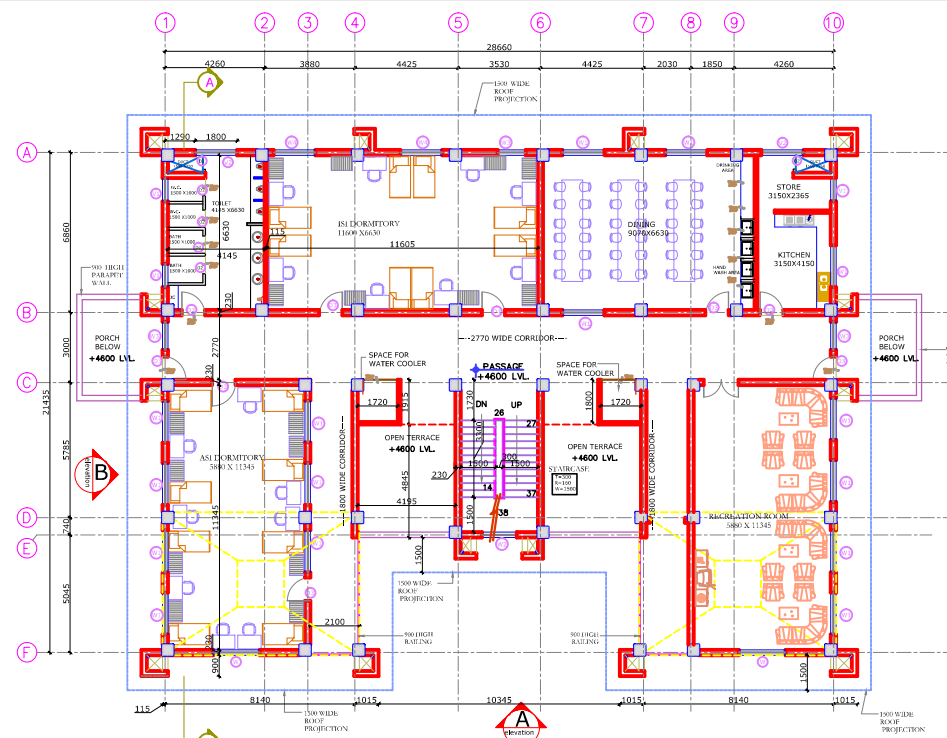
JOB TITLE
 DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
 PORTER REST AREA

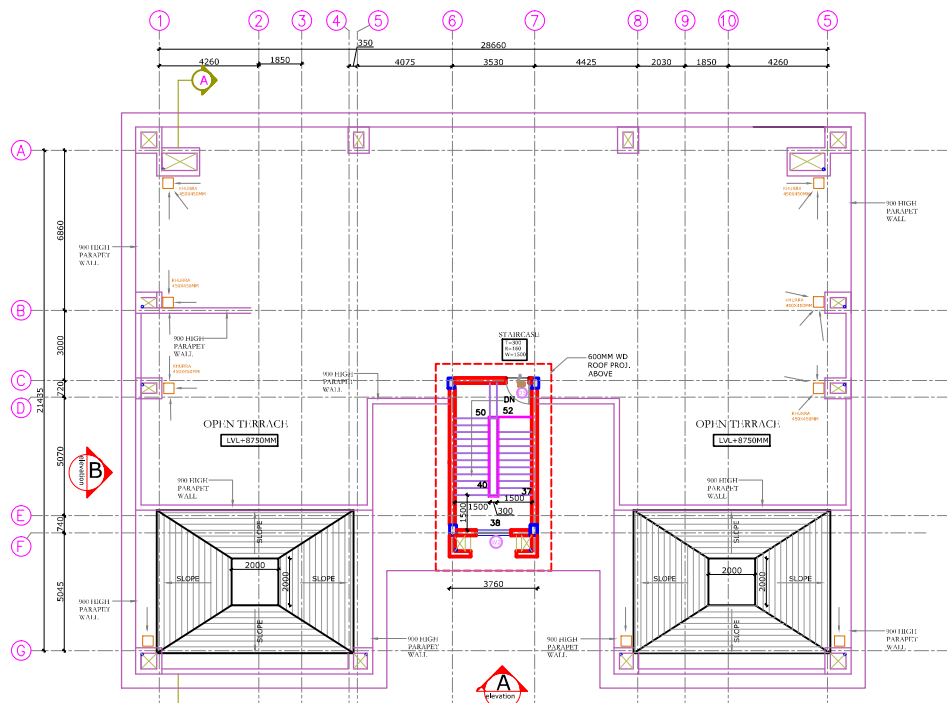
Job No.	Dwg. No.
Scale	RITES/AP/Arch/PRA/01
DATE	Revision Suffix
DRAWN	APPROVED BY



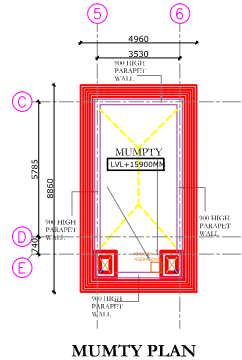
GROUND FLOOR PLAN



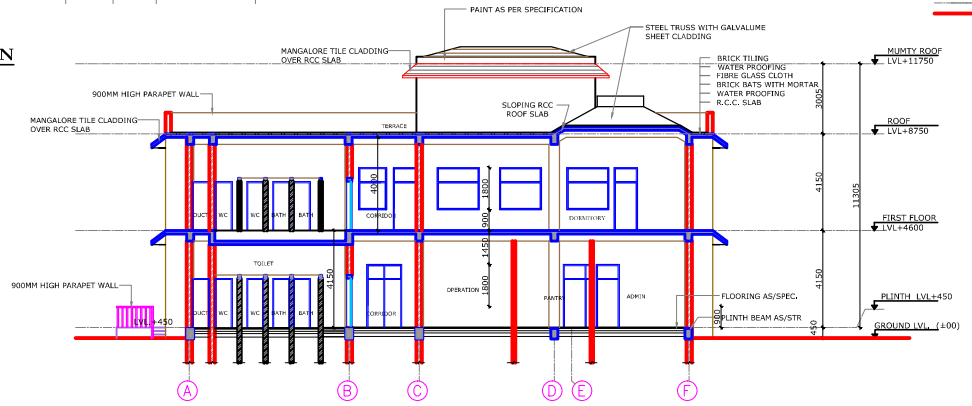
FIRST FLOOR PLAN



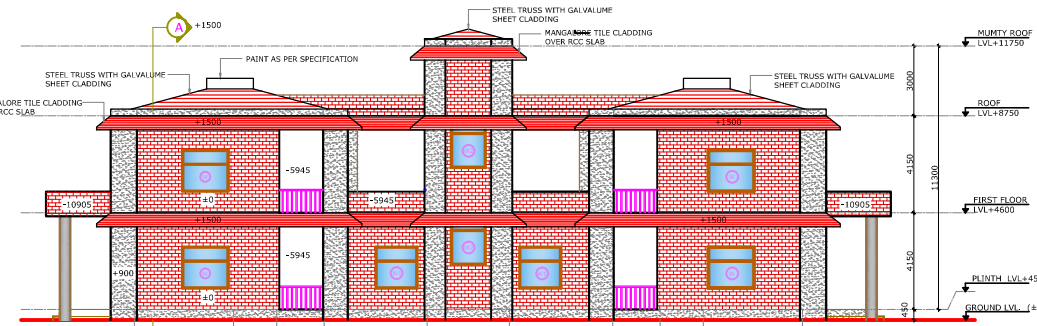
TERRACE PLAN



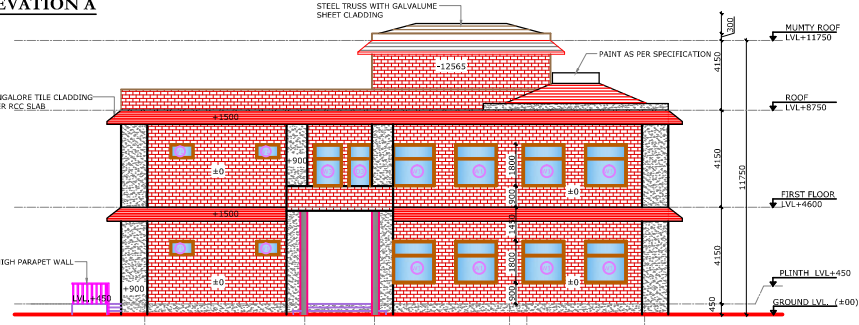
MUMTY PLAN



SECTION-AA

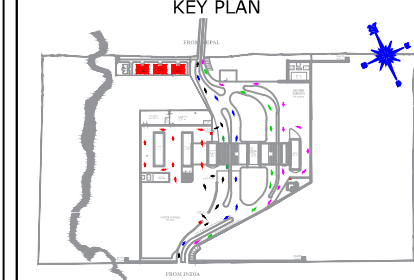


ELEVATION A



ELEVATION-B

- NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
 2. WRITTEN DIMENSIONS ARE TO BE FOLLOWED. DRAWINGS ARE NOT TO BE SCALED.
 3. ANY DISCREPANCY IN THE DRAWING SHALL BE BROUGHT TO THE NOTICE OF THE ENGINEER.
 4. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS.



TOTAL PLINTH AREA ON GROUND FLOOR = 584.01 SQM
 COVERED AREA ON FIRST FLOOR=511 SQM
 COVERED AREA ON MUMTY=24.61 SQM

SCHEDULE OF OPENINGS

S.NO	TYPE	WIDTH	HEIGHT	SILL LVL.	L. LVL.	REMARKS
1.	D1	1500	2700	00	2700	GDOS
2.	D2	750	2100	00	2100	PDOS
3.	D3	1500	2100	00	2100	PDOS
4.	W	2000	1800	900	2700	GDWV
5.	W1	1800	1800	900	2700	GDWV
6.	W2	1500	1800	900	2700	GDWV
7.	W3	1200	1800	900	2700	GDWV
8.	W4	1800	1650	1050	2700	GDWV
9.	V1	1000	600	2100	2700	VEF
10.	V2	1800	600	2100	2700	VEF

SCHEDULE OF FINISHES

S.NO	AREA	FLOOR	WALL	CEILING
1.	DORMITORIES DINING	600 X 600mm Vitrified Tile Flooring (as per approved sample)	100 mm TB Skirting, OBD Paint finish above as per tender item in appd shade.	OBD
2.	CORRIDOR STAIRCASE	15mm Granite stone flooring	15mm Granite stone cladding upto 1500 height & OBD above.	OBD
3.	KITCHEN	600x600 Vitrified Tile (as per approved sample)	200 X 300 Wall Tiles (as per approved sample) upto 2.1 m height all around, OBD above	OBD
4.	TOILETS	Non-slip tile Flooring	Wall Tiles (as per approved sample) upto 2.1 m height all around in two colors (Dark shade upto 90cm height), OBD in matching shade above	ORD
5.	STORE	60mm thick CC Flooring with concrete basecoat topping	Kera Stone Dado upto 1.2m height, OBD above	OBD

- COMPLETION STAGE
- CONSTRUCTION STAGE
- TENDER STAGE
- CONCEPTUAL STAGE

SUFFIX DATE INITIALS DETAILS

REVISIONS

CLIENT

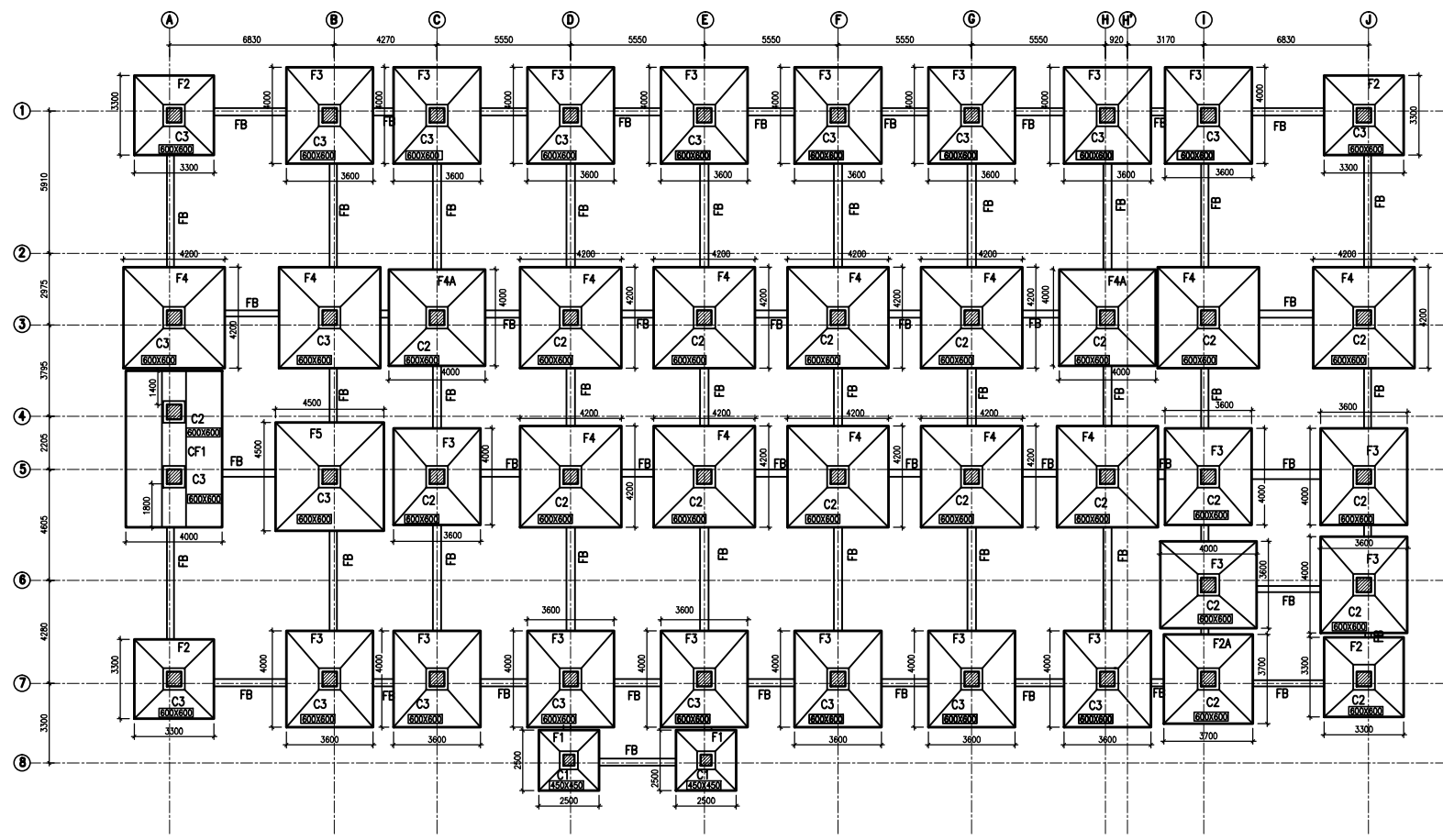
MINISTRY OF EXTERNAL AFFAIRS
(GOVT. OF INDIA)

CONSULTANT
IRITES
 THE INFRASTRUCTURE PEOPLE
 AIRPORTS DIVISION
 (ISO - 9001 CERTIFIED)

JOB TITLE
 DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
 OFFICER'S BARRACK

Job No.	Dig. No.
Scale	Revision Suffix
NTS	
DRAWN	DEALT
	P.CORD.
	APPROVED BY



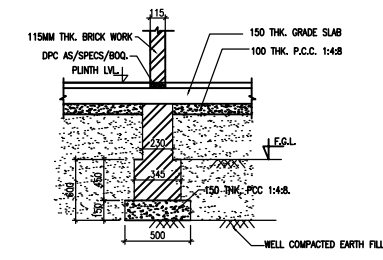
FOUNDATION PLAN

FOOTING SCHEDULE (REFER TYP. DETAIL)

FTG. No.	SIZE		THICKNESS	REINFORCEMENT	
	L	W		REINF. 'A' (ALONG LENGTH)	REINF. 'B' (ALONG WIDTH)
F1	2500	2500	500	300	12 ϕ 150c/c
F2	3300	3300	700	400	12 ϕ 25c/c
F2A	3700	3700	700	400	12 ϕ 25c/c
F3	4000	3600	800	450	12 ϕ 100c/c
F4	4200	4200	900	500	12 ϕ 100c/c
F4A	4000	4000	900	500	12 ϕ 100c/c
F5	4500	4500	900	500	16 ϕ 20c/c

SCHEDULE OF COMBINED FOOTINGS WITH CENTRAL BEAM (REFER FOUNDATION PLAN)

FTG. No.	FOOTING SIZE		CENTRAL BEAM			PROJECTED SLAB	
	WIDTH	LENGTH	SIZE	REINFORCEMENT	THICKNESS	REINFORCEMENT	
CF1	AS/PLAN	1000	850	8-25 ϕ	6-20 ϕ	(6L)10 ϕ 150c/c	450 300

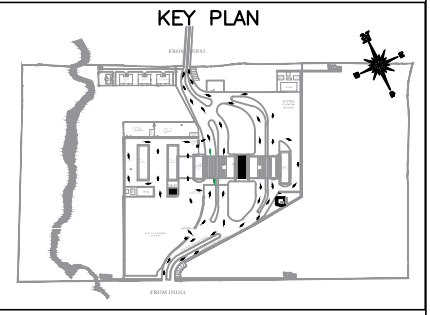


TYP. DETAIL OF 115MM BRICK WALL

COLUMN SCHEDULE (FOUNDATION TO TERRACE)

TIES	(a+b)		(a+b+c+d+e)		(a+b+c+d+e)	
	FOR MAIN BARS	FOR SPACING OF TIES REFER TYP. COL.	FOR MAIN BARS	FOR SPACING OF TIES REFER TYP. COL.	FOR MAIN BARS	FOR SPACING OF TIES REFER TYP. COL.
COL. SEC.						
COL. SIZE	450X450	600X600	600X600	600X600	600X600	600X600
CONC. MIX	M 25	M 25	M 25	M 25	M 25	M 25
COLUMN MARKING	C1	C2	C3	C3	C3	C3

- NOTES:-**
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
 - THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH OTHER ARCHITECTURAL DRAWINGS. ANY DISCREPANCY BETWEEN ARCHITECTURAL DRAWING AND STRUCTURAL DRAWING SHALL BE RECONCILED BEFORE EXECUTION. ANY DISCREPANCY NOTED SHOULD IMMEDIATELY BE BROUGHT TO THE NOTICE OF ARCHITECT/ENGINEER PRIOR TO EXECUTION.
 - DULY WRITTEN DIMENSIONS ARE TO BE FOLLOWED. NEITHER THE BARS SHALL BE COUNTED NOR THE DIMENSIONS SCALED FROM DRAWINGS.
 - WATER FOR CONSTRUCTION PURPOSE SHALL CONFORM TO CLAUSE 5.4 OF I.S.-456-2000.
 - REINFORCED CEMENT CONCRETE SHALL BE DESIGN MIX M25 CONFORMING TO I.S. 456-2000 SHALL BE USED FOR ALL RCC WORK.
 - REINFORCEMENT IN SHORT SPAN SHALL BE PLACED IN BOTTOM LAYER IN SLABS.
 - ALL STEEL REINFORCEMENT SHALL BE OF Fe 500 D TYPE CONFORMING TO I.S. 1786 AND HAVING MINIMUM YIELD STRENGTH OF 500 N/SQ.MM
 - LAP LENGTH/DEVELOPMENT LENGTH FOR MAIN REINFORCEMENT BARS AS PER I.S.-456-2000 SHALL BE 49 X dia OF BAR FOR M25 GRADE OF CONCRETE. LAPS SHALL BE STAGGERED - NOT MORE THAN 50% BARS SHALL BE LAPPED AT ONE SECTION. LAPS SHALL BE AVOIDED UP TO 0.25 X L FROM SUPPORT IN BEAMS AND SLABS.
 - CLEAR COVER TO ALL MAIN REINFORCEMENT BAR SHALL BE : FOR SLAB - 20MM, COLUMNS - 50MM, BEAMS - 30MM, FOUNDATIONS - 75MM FILLED WITH 1:4:8 P.C.C.
 - CONSTRUCTION JOINT SHALL BE MADE VERTICAL BY PROPER TEMPLATE WITH SLOTS FOR ACCOMMODATING REINFORCEMENT BARS. THE JOINT SHALL BE TREATED IN ACCORDANCE WITH I.S.-11817.
 - THE CONSTRUCTION JOINT SHALL BE PLANNED AND APPROVED BY THE ENGINEER-IN-CHARGE & SHALL NOT BE PROVIDED IN CANTILEVER BEAM & SLAB
 - FOUNDATION HAS BEEN DESIGNED FOR A NET S.B.C. OF 9.00 T/m² @ 1.2 M FROM N.G.L. AS PER G.T. REPORT AND SEISMIC ZONE-V AS PER I.S. 1893-2016.
 - PLINTH FILLING & BACK FILLING IN FOUNDATION TRENCHES TO BE DONE IN LAYERS AND SHOULD BE WELL COMPACTED AND SHALL BE SIMULTANEOUSLY CARRIED OUT INSIDE & OUTSIDE THE BUILDING.
 - CENTER OF FOOTING AND CENTRE OF COLUMN SHALL BE KEPT SAME.
 - THE REINFORCEMENT DETAILING SHALL BE AS PER LATEST I.S. CODE 13920.
 - ALL BRICKS IN THE MASONRY SHALL HAVE CHARACTERISTIC STRENGTH OF 7.5 N/SQ.MM. (UNLESS OTHERWISE SPECIFIED) LAID IN CEMENT MORTAR AS/SPECS/BOQ.



- COMPLETION STAGE
- CONSTRUCTION STAGE
- TENDER STAGE
- CONCEPTUAL STAGE

Suffix | Date | Initials | Details

REVISIONS

Client

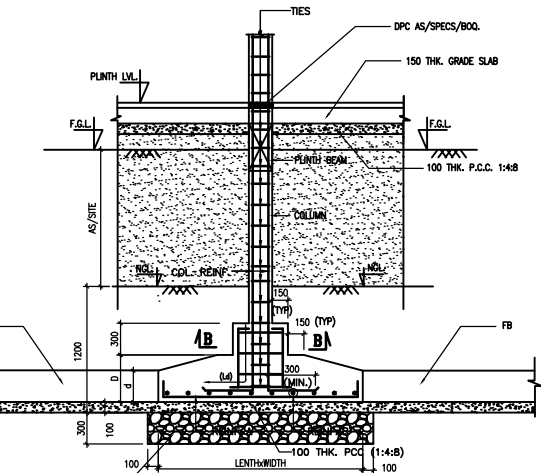
MINISTRY OF EXTERNAL AFFAIRS
(GOVT. OF INDIA)

Consultants
IRITES
THE INFRASTRUCTURE PEOPLE
AIRPORTS DIVISION
(ISO - 9001 CERTIFIED)

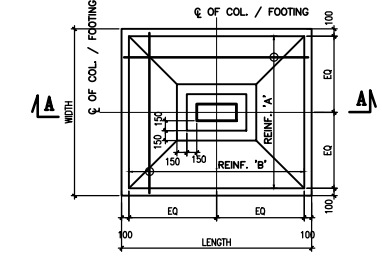
Job Title
DEVELOPMENT OF INTEGRATED
CHECK POST AT NEPALGUNJ ALONG
INDO-NEPAL BORDER

Drawing Title
ADMIN CUM COMMON FACILITIES BLOCK &
AREA FOR FOREIGN PASSENGERS
FOUNDATION PLAN

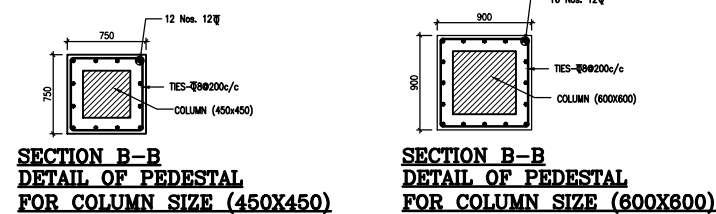
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N.T.S.	IRITES/AP/N/STR/ADMIN/01	1 OF 1
Date	Revision	Suffix
JANUARY 2020		
ENGINEERING ASSOCIATES		
DRAWN	DEALT	CHECKED BY: P.CORD, ENGINEER IN CHARGE



TYPICAL FOOTING SECTION (BOTH SIDE)

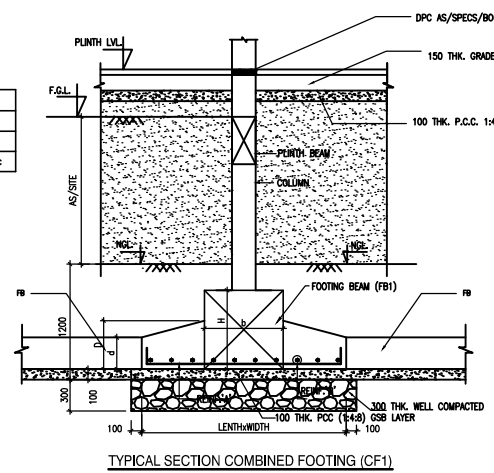


TYP. PLAN OF FOOTING

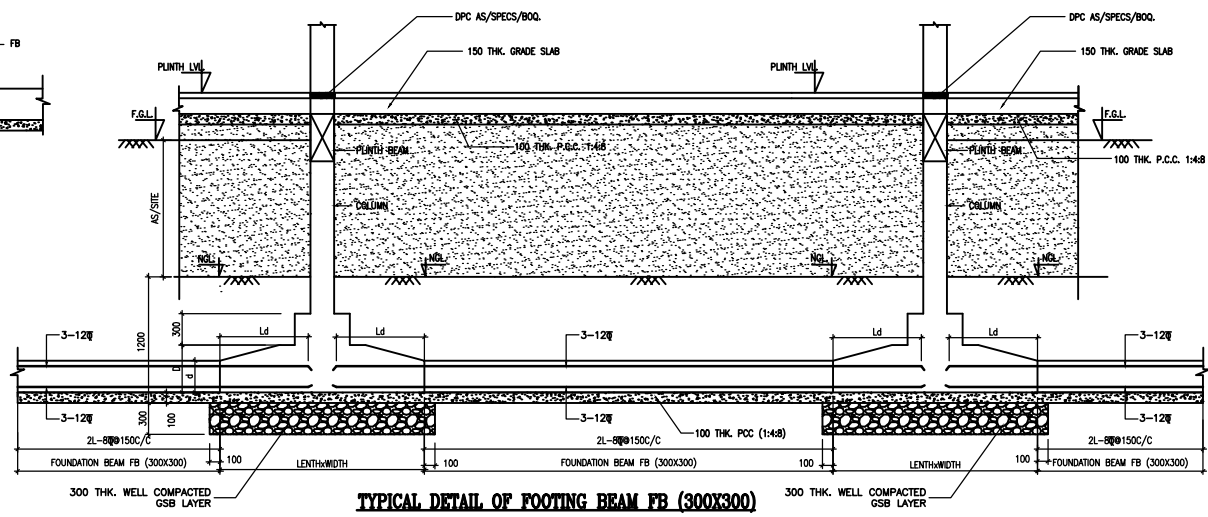


**SECTION B-B
DETAIL OF PEDESTAL
FOR COLUMN SIZE (450X450)**

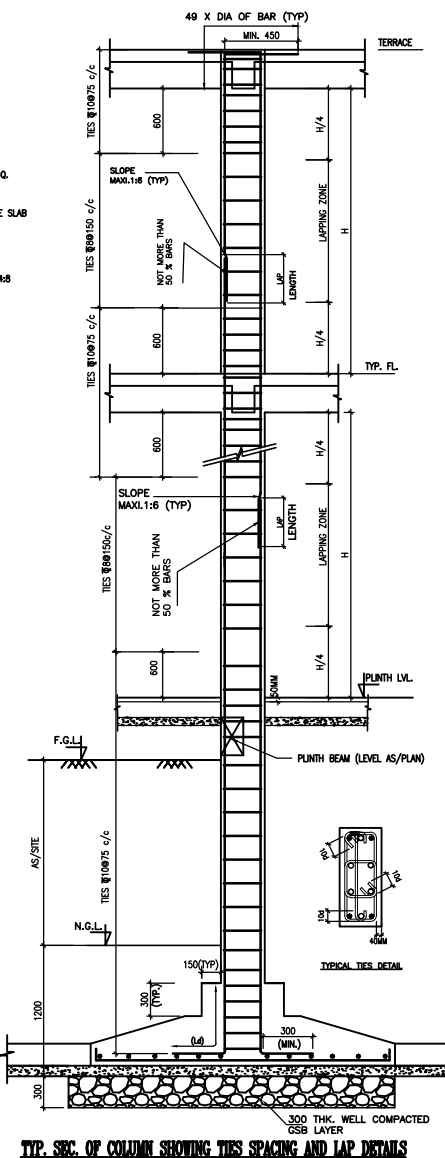
**SECTION B-B
DETAIL OF PEDESTAL
FOR COLUMN SIZE (600X600)**



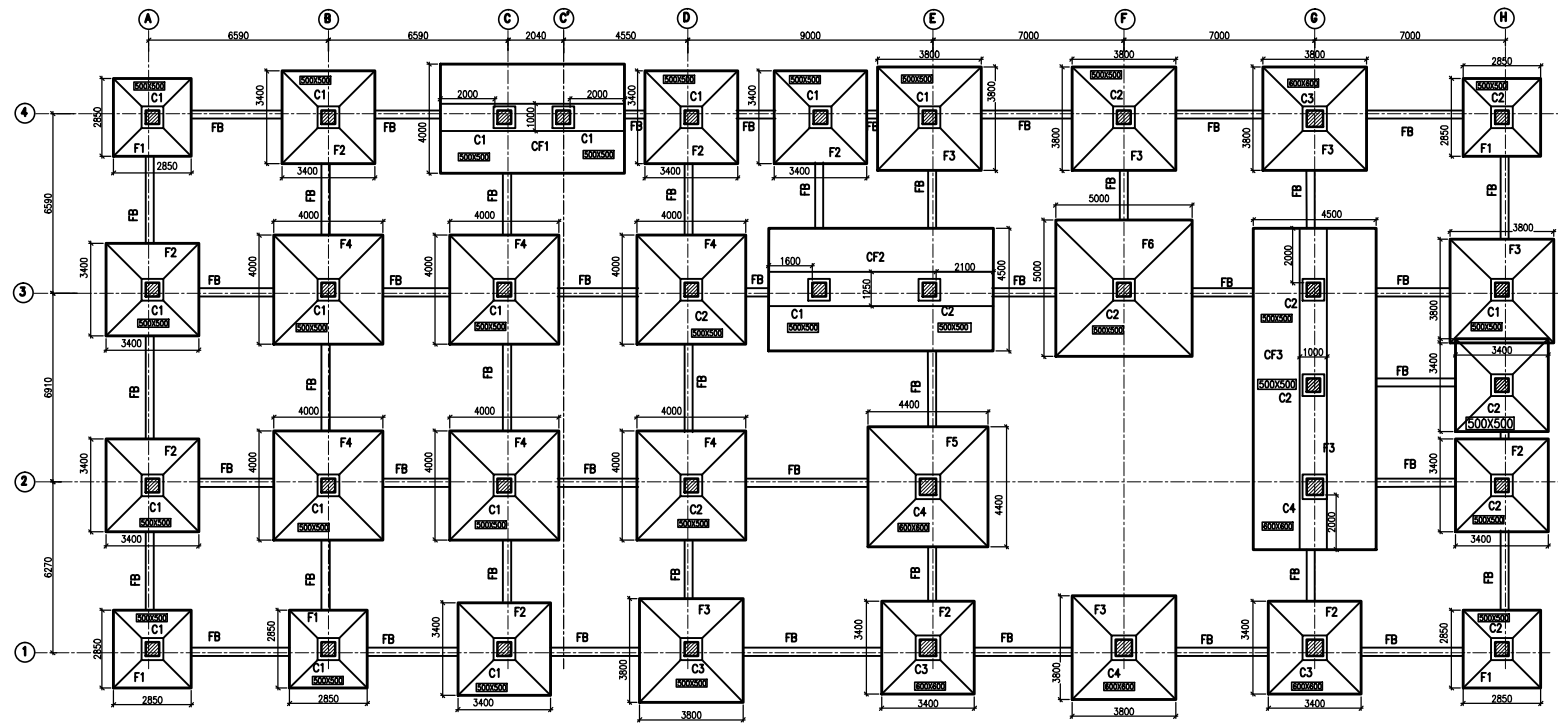
TYPICAL SECTION COMBINED FOOTING (CF1)



TYPICAL DETAIL OF FOOTING BEAM FB (300X300)



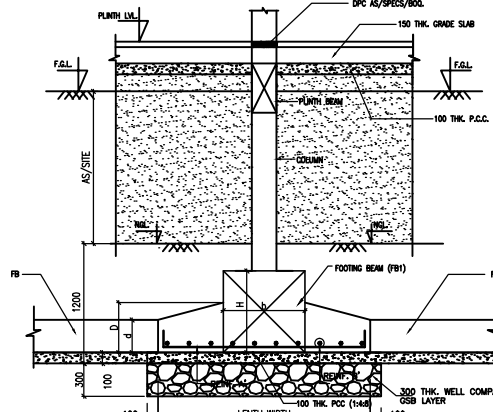
TYP. SEC. OF COLUMN SHOWING TIES SPACING AND LAP DETAILS



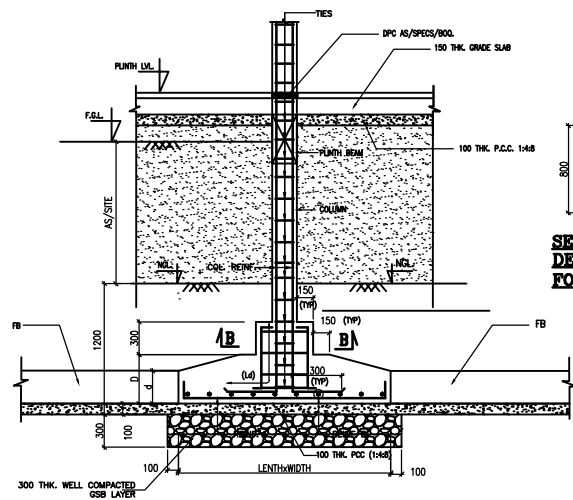
FOUNDATION PLAN

SCHEDULE OF COMBINED FOOTINGS WITH CENTRAL BEAM (REFER FOUNDATION PLAN)

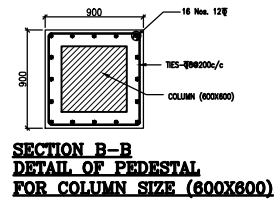
FTG. No.	WIDTH/LENGTH	CENTRAL BEAM				PROPOSED SLAB			
		SIZE	REINFORCEMENT	THICKNESS	REINFORCEMENT	SIZE	REINFORCEMENT	THICKNESS	REINFORCEMENT
CF1	AS/PLAN	1000	8-25	8-20	(6L)10@200/c	450	300	120	12@200/c
CF2	AS/PLAN	1250	8-25	8-25	(6L)10@200/c	500	300	120	12@200/c
CF3	AS/PLAN	900	8-25	8-20	(6L)10@200/c	450	300	120	12@200/c



TYPICAL SECTION COMBINED FOOTING (CF1, CF2 & CF3)



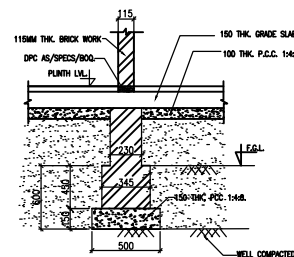
**SECTION B-B
DETAIL OF PEDESTAL
FOR COLUMN SIZE (600X500)**



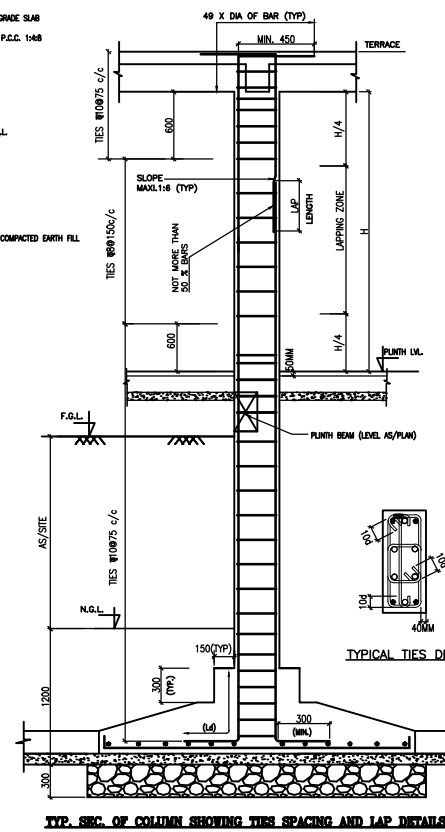
**SECTION B-B
DETAIL OF PEDESTAL
FOR COLUMN SIZE (600X800)**

FOOTING SCHEDULE (REFER TYP. DETAIL)

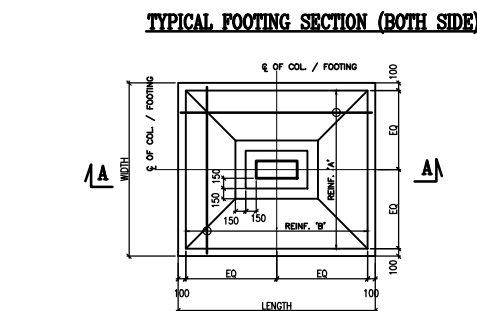
FTG. No.	SIZE		THICKNESS	REINFORCEMENT	
	L	W		REIN. 'A' (ALONG LENGTH)	REIN. 'B' (ALONG WIDTH)
F1	2850	2850	500	12@250/c	12@250/c
F2	3400	3400	750	12@250/c	12@250/c
F3	3800	3800	850	12@200/c	12@200/c
F4	4000	4000	900	12@200/c	12@200/c
F5	4400	4400	900	16@200/c	16@200/c
F6	5000	5000	1000	20@200/c	20@200/c



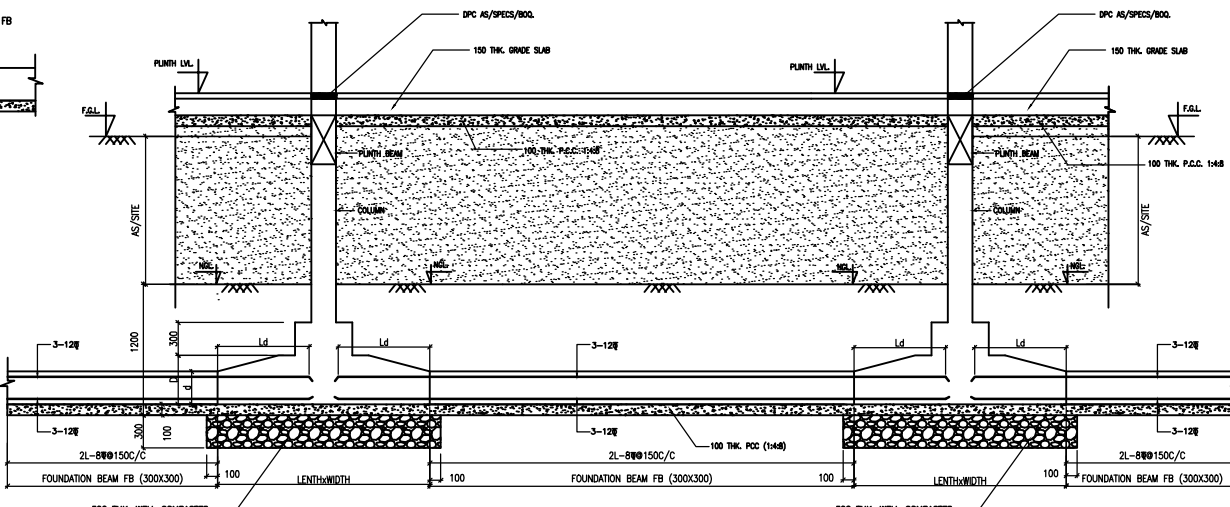
TYP. DETAIL OF 115MM BRICK WALL



TYP. SEC. OF COLUMN SHOWING TIES SPACING AND LAP DETAILS



TYP. PLAN OF FOOTING



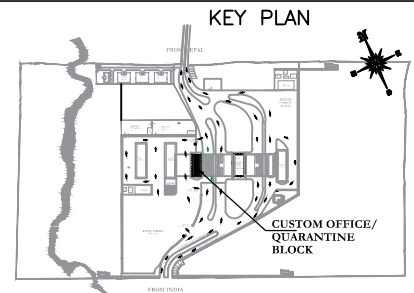
TYPICAL DETAIL OF FOOTING BEAM FB (300X300)

COLUMN SCHEDULE (FOUNDATION TO TERRACE)

TIES	FOR SPACING OF TIES REFER TYP. COL. SECTION			
	(a+b+c)	(a+b+c+d)	(a+b+c+d+e)	(a+b+c+d+e+f)
MAIN BARS	*4-25 *8-20	*12-25	*16-20	*16-25
COL. SEC.				
COL. SIZE	500X500	500X500	600X600	600X600
CONC. MIX	M 25	M 25	M 25	M 25
COLUMN MARKING	C1	C2	C3	C4

NOTES:-

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- REINFORCED CEMENT CONCRETE SHALL BE DESIGN MIX M25 CONFORMING TO I.S. 456-2000 SHALL BE USED FOR ALL RCC WORK.
- REINFORCEMENT IN SHORT SPAN SHALL BE PLACED IN BOTTOM LAYER IN SLABS.
- ALL STEEL REINFORCEMENT SHALL BE OF Fe 500 D TYPE CONFORMING TO I.S. 1786 AND HAVING MINIMUM YIELD STRENGTH OF 500 N/SQ.MM
- LAP LENGTH/DEVELOPMENT LENGTH FOR MAIN REINFORCEMENT BARS AS PER I.S.-456-2000 SHALL BE 49 X dia OF BAR FOR M25 GRADE OF CONCRETE. LAPS SHALL BE STAGGERED. NOT MORE THAN 50% BARS SHALL BE LAPPED AT ONE SECTION. LAPS SHALL BE AVOIDED UP TO 0.25 X L FROM SUPPORT IN BEAMS AND SLABS.
- CLEAR COVER TO ALL MAIN REINFORCEMENT BAR SHALL BE : FOR SLAB - 20MM, COLUMNS - 50MM, BEAMS - 30MM, FOUNDATIONS - 75MM
- ANY LOOSE POCKET/PATCH BELOW FOUNDATION SHALL BE CLEARED & FILLED WITH 1:4:8 P.C.C.
- CONSTRUCTION JOINT SHALL BE MADE VERTICAL BY PROPER TEMPLATE WITH SLOTS FOR ACCOMMODATING REINFORCEMENT BARS. THE JOINT SHALL BE TREATED IN ACCORDANCE WITH I.S.-11817.
- THE CONSTRUCTION JOINT SHALL BE PLANNED AND APPROVED BY THE ENGINEER-IN-CHARGE & SHALL NOT BE PROVIDED IN CANTILEVER BEAM & SLAB
- FOUNDATION HAS BEEN DESIGNED FOR A NET S.B.C. OF 9.00 T/m2 @ 1.2 M FROM N.G.L. AS PER G.T. REPORT AND SEISMIC ZONE-V AS PER I.S. 1893-2016.
- PLINTH FILLING & BACK FILLING IN FOUNDATION TRENCHES TO BE DONE IN LAYERS AND SHOULD BE WELL COMPACTED AND SHALL BE SIMULTANEOUSLY CARRIED OUT INSIDE & OUTSIDE THE BUILDING.
- CENTER OF FOOTING AND CENTRE OF COLUMN SHALL BE KEPT SAME.
- THE REINFORCEMENT DETAILING SHALL BE AS PER LATEST I.S. CODE 13920.
- ALL BRICKS IN THE MASONRY SHALL HAVE CHARACTERISTIC STRENGTH OF 7.5 N/SQ.MM. (UNLESS OTHERWISE SPECIFIED) LAID IN CEMENT MORTAR AS/SPECS/BOQ.



- COMPLETION STAGE
- CONSTRUCTION STAGE
- TENDER STAGE
- CONCEPTUAL STAGE

Suffix | Date | Initials | Details

REVISIONS

Client

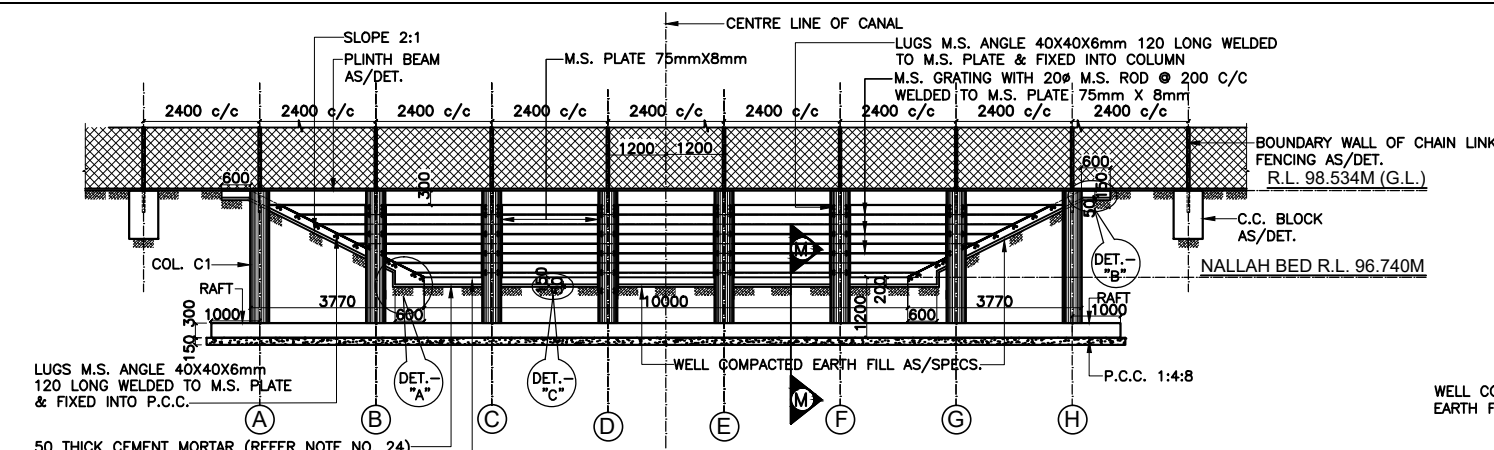
MINISTRY OF EXTERNAL AFFAIRS
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AIRPORTS DIVISION
(ISO - 9001 CERTIFIED)

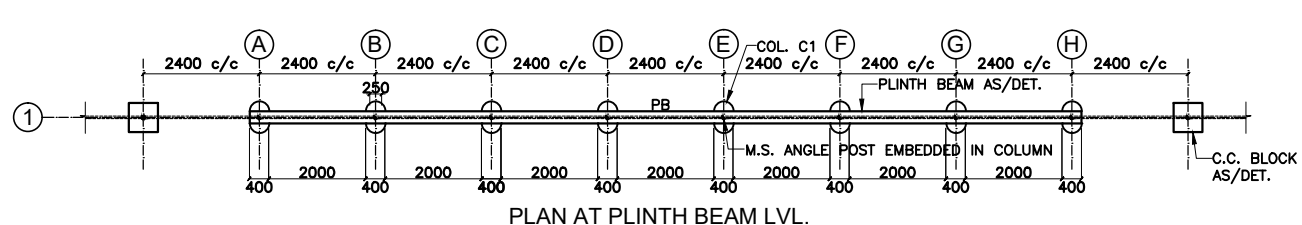
Job Title
DEVELOPMENT OF INTEGRATED
CHECK POST AT NEPALGUNJ ALONG
INDO-NEPAL BORDER

Drawing Title
CUSTOM OFFICE/QUARANTINE BLOCK
FOUNDATION PLAN & DETAIL

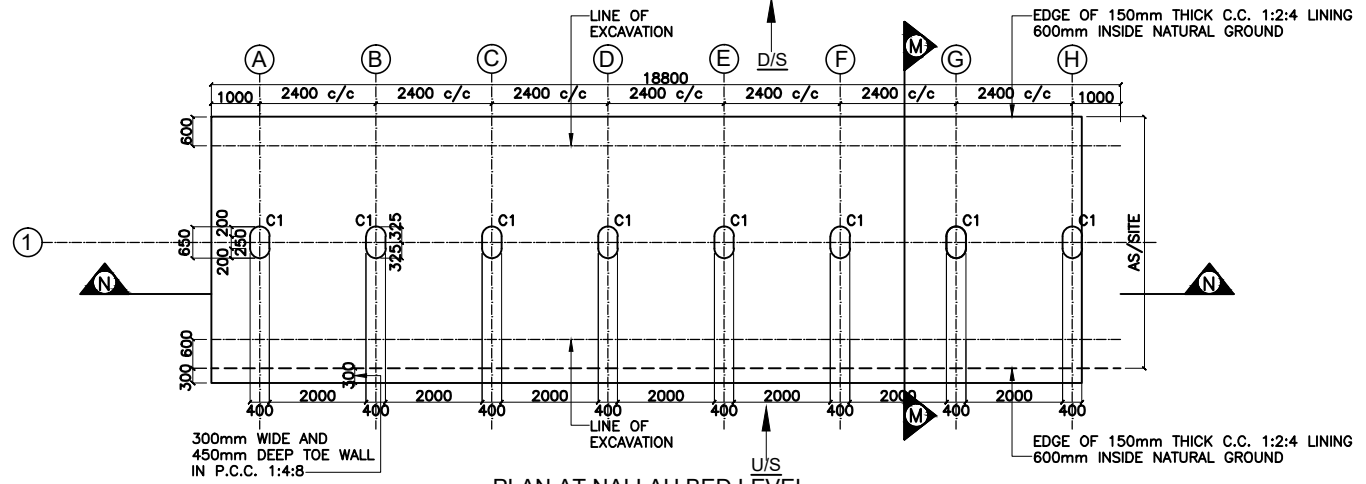
Job. No.	DRG. No.	Sheet No.
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Scale	Date	Revision Suffix
DRAWN	DEALT	CHECKED BY:CORD. ENGINEER IN CHARGE



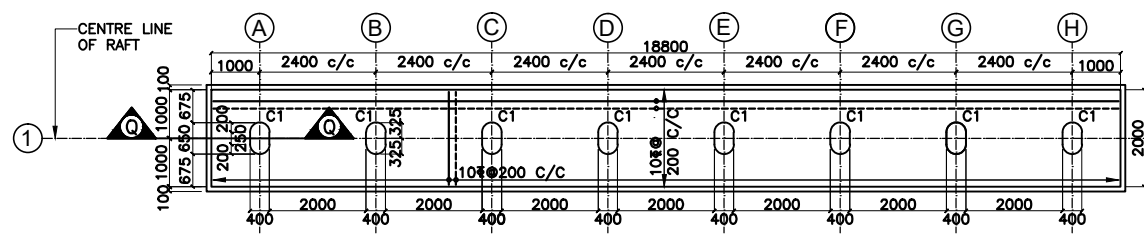
SECTIONAL ELEVATION OF BOUNDARY WALL THROUGH NALLAH SECTION (N-N)



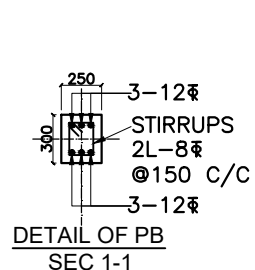
PLAN AT PLINTH BEAM LVL.



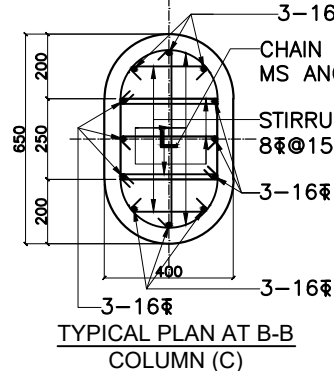
PLAN AT NALLAH BED LEVEL



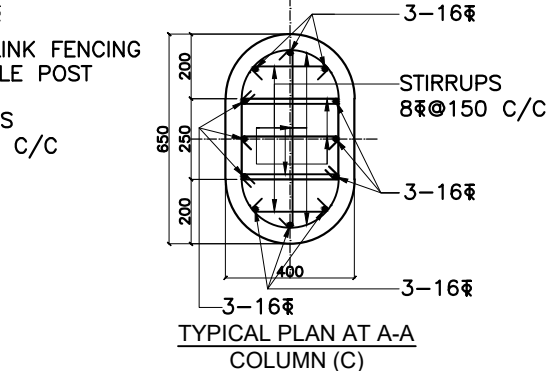
FOUNDATION PLAN (NALLAH PORTION)



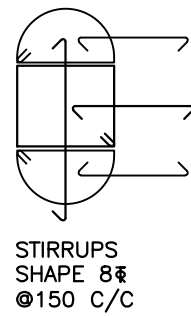
DETAIL OF PB SEC 1-1



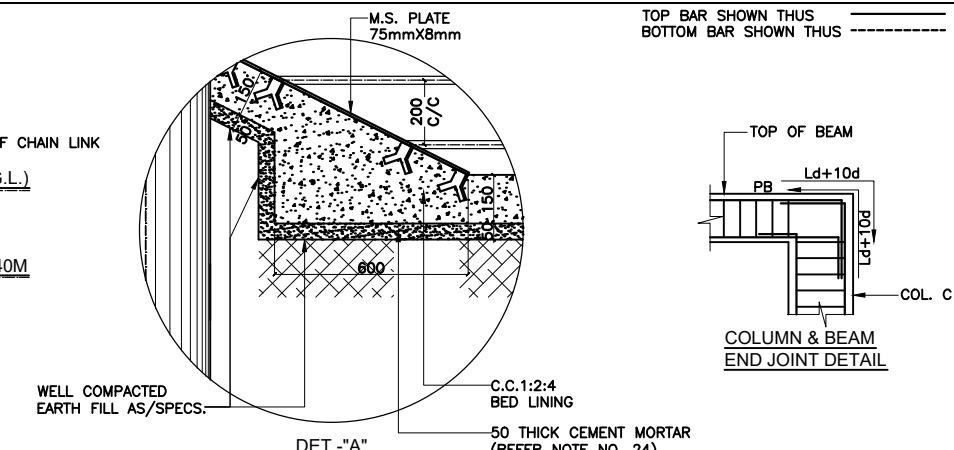
TYPICAL PLAN AT B-B COLUMN (C)



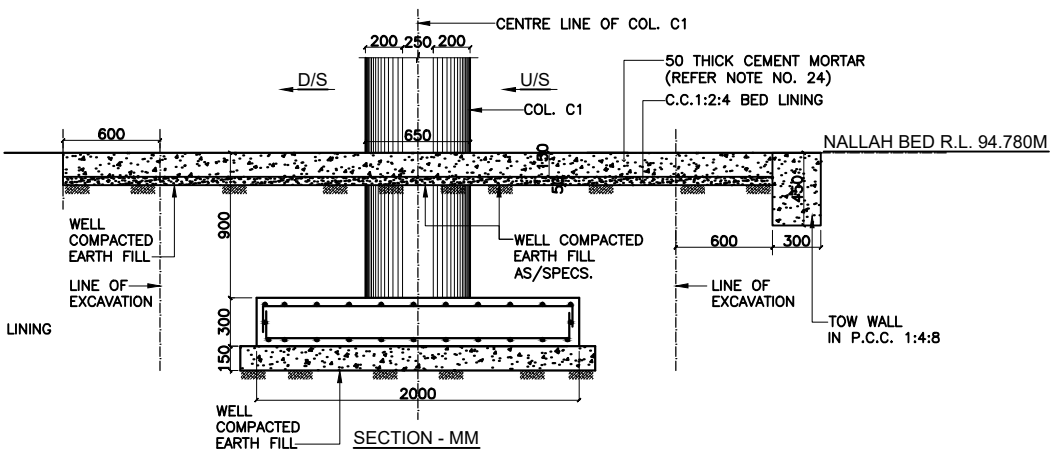
TYPICAL PLAN AT A-A COLUMN (C)



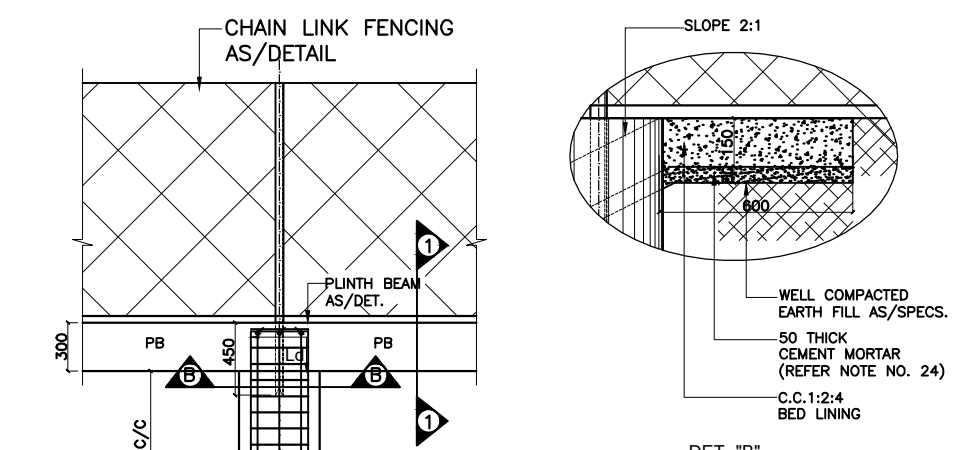
STIRRUPS SHAPE 8 bars @ 150 c/c



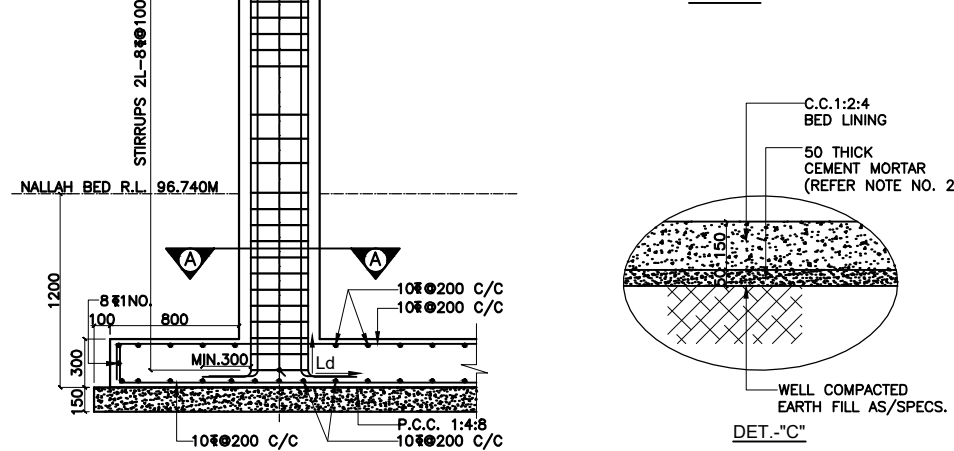
DET.-A



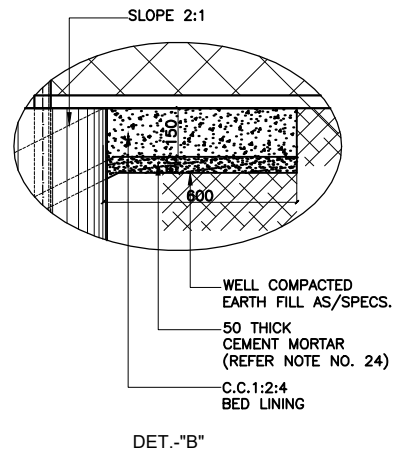
SECTION - MM



DET.-B



TYPICAL SECTION OF FOUNDATION (PART) ALONG GRID 1 (NALLAH PORTION) SECTION Q-Q



DET.-C

- GENERAL NOTES:
- ALL DIMENSIONS ARE IN MM U.O.S.
 - THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH RELEVANT ARCHITECTURAL /ENGINEERING DRAWINGS AND ANY DISCREPANCY NOTED SHOULD IMMEDIATELY BE BROUGHT TO THE NOTICE OF ENGINEER PRIOR TO EXECUTION.
 - IN CASE OF ANY DISCREPANCY IN DIMENSION, THE DIMENSION OF ARCHITECTURE DRAWING PREVAIL.
 - THE STRUCTURAL DESIGN INCLUDING SAFETY FROM NATURAL HAZARDS SPECIALLY SEISMIC BASED ON SOIL CONDITIONS, HAS BEEN DULY INCORPORATED IN DESIGN OF THE BUILDING & ITS FOUNDATION.
 - ALL MAIN WALLS ARE OF 230 MM.
 - CLEAR COVER TO ALL MAIN REINFORCEMENT BAR SHALL BE: FOR SLAB - 20MM, COLUMNS - 50MM, BEAMS - 30MM, FOUNDATIONS - 75MM.
 - ALL STEEL REINFORCEMENT SHALL BE OF HIGH YIELD STRENGTH DEFORMED BARS CONFORMING TO I.S.: 1786-1985 WITH MIN. YIELD STRESS / 0.2% PROOF STRESS OF 500 N/ SQ. MM (GRADE Fe 500).
 - REINFORCED CEMENT CONCRETE SHALL BE DESIGN MIX M-25 CONFORMING TO I.S.: 456-2000 FOR RAFT AND PLINTH BEAM & M-30 FOR COLUMN ABOVE RAFT UP TO P.B. BOTTOM.
 - CENTER OF FOOTING AND CENTER OF COLUMN SHALL BE KEPT SAME.
 - WATER FOR CONSTRUCTION PURPOSE SHALL CONFORM TO CLAUSE 5.4 OF I.S.-456-2000.
 - REINFORCEMENT IN SHORT SPAN SHALL BE PLACED IN BOTTOM LAYER IN SLABS.
 - LAP SHOULD NOT BE PROVIDED.
 - WITHIN A JOINT.
 - WITHIN A DISTANCE 2 D FROM JOINT FACE.
 - WITHIN A DISTANCE 1/4 LENGTH OF MEMBER FROM THE JOINT FACE.
 - NOT MORE THAN 50% OF BAR SHALL BE SPLICED AT ONE SECTION.
 - THE REINFORCEMENT DETAILING SHALL BE AS PER IS: 13920.
 - LAP LENGTH/DEVELOPMENT LENGTH(LD) FOR MAIN REINFORCEMENT BARS AS PER I.S.-456-2000 SHALL BE: 49X DIA FOR M25 GRADE OF CONCRETE AND 46X DIA FOR M-30 CONCRETE. LAPS SHALL BE STAGGERED. NOT MORE THAN 50% BARS SHALL BE LAPPED AT ONE SECTION. LAPS SHALL BE AVOIDED UP TO 0.25 X L FROM SUPPORT IN BEAMS AND SLABS.
 - ALL BRICKS IN THE MASONRY SHALL HAVE CHARACTERISTIC STRENGTH OF 7.5 N/SQ.MM (UNLESS OTHERWISE SPECIFIED) LAID IN 1:6 (1 CEMENT : 6 SAND) MORTAR.
 - PLINTH FILLING & BACK FILLING IN FOUNDATION TRENCHES TO BE DONE IN LAYERS AND SHOULD BE WELL COMPACTED AS PER CPWD SPECS.
 - NO FOUNDATION SHALL REST ON LOOSE SOIL STRATA IN CASE LOOSE SOIL FOUND ARCHITECT/CONTRACTOR MUST BE CONSULTED.
 - NET SAFE BEARING CAPACITY OF SOIL IS CONSIDERED 7.50 T/M² AS PER SOIL INVESTIGATION REPORT.
 - THE STRUCTURE HAS BEEN DESIGNED FOR SEISMIC ZONE IV AND WIND PRESSURE AS PER IS: 875 (3).
 - THE R.L. OF G.L. AND R.L. OF NALLAH BED HAVE BEEN PROVIDED BY Sr.DGM/C (PC) ICP RUPADHIA WIDE MAIL DATED 14.05.2017. FOUNDATION DETAIL OF CHAIN LINK FENCING THROUGH NALLAH HAVE BEEN PROVIDED AS DISCUSSED BY Sr.DGM/C (PC) AS/SITE CONDITION. CANAL LINING SECTION EXCEPT PORTION AS SHOWN IN THIS DRAWING NOT DECIDED AS IT WILL BE EXECUTED IN FUTURE.
 - FOR DETAIL OF CHAIN LINK FENCING (REFER DRG. NO. RITES/AP/R/ARCH-01/BOUNDARY DATED JULY 2016).
 - ALL WELDING SHALL CONFORM TO IS : 816 AND WELDING MATERIAL SHALL BE AS PER RELEVANT IS CODE.
 - A LAYER OF 1:10 CEMENT SAND HAND MIXED MORTAR HAVING AN AVERAGE THICKNESS OF 12MM SHALL BE PLASTERED OVER THE FINALLY FINISHING SUB-GRADE & IMMEDIATELY OVER IT A 38MM THICK LAYER OF 1:6 CEMENT SAND MACHINE MIXED MORTAR SHALL BE LAID.

<input type="checkbox"/> COMPLETION STAGE	<input type="checkbox"/> CONSTRUCTION STAGE
<input checked="" type="checkbox"/> TENDER STAGE	<input type="checkbox"/> CONCEPTUAL STAGE

SUFFIX	DATE	INITIALS	DETAILS

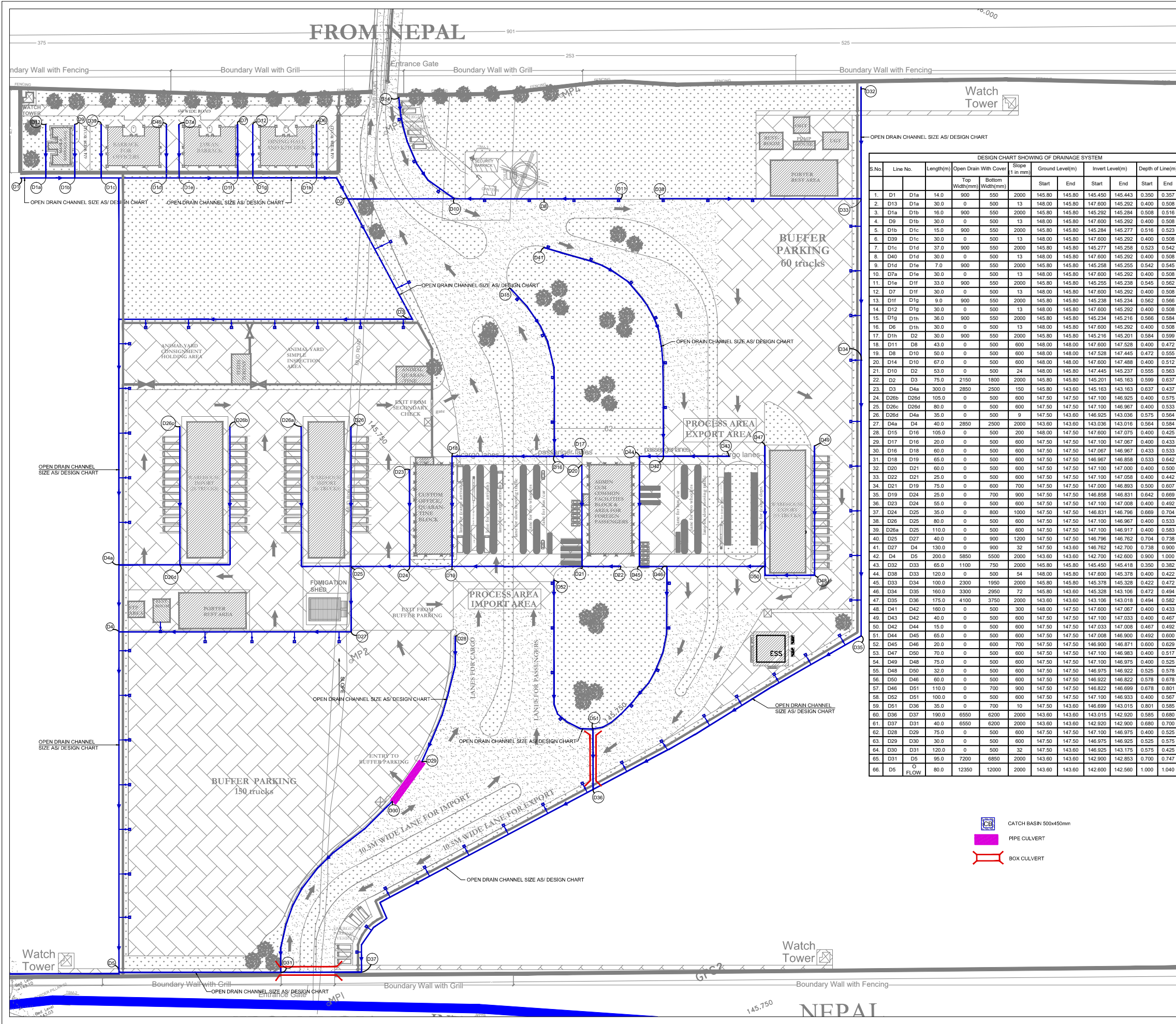
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(GOVT. OF INDIA)

CONSULTANT
RITES
THE INFRASTRUCTURE PEOPLE
AIRPORTS DIVISION
(ISO - 9001 CERTIFIED)

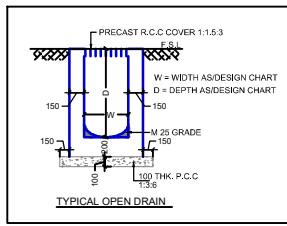
JOB TITLE
DEVELOPMENT OF INTEGRATED CHECK
POST AT NEPALGUNJ ALONG
INDO-NEPAL BORDER

DRAWING TITLE
CHAIN LINK FENCING
CROSSING THROUGH NALLAH
(1.50M. TO 2.00M. DEPTH)
FOUNDATION PLAN & DETAIL, COLUMN
DETAIL BELOW PB & PB DETAIL

Job No.	Drp. No.
Scale	RITES/AP/IN/STR./CHAIN LINK FENCING-01
NTS	Revision Suffix
DRAWN	DEALT
	P. CORD.
	APPROVED BY



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 2. WRITTEN DIMENSIONS ARE TO BE FOLLOWED. DRAWINGS ARE NOT TO BE SCALED.
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DESIGN CHART SHOWING OF DRAINAGE SYSTEM

S.No.	Line No.	Length(m)	Open Drain With Cover		Slope (1 in mm)	Ground Level(m)		Invert Level(m)		Depth of Line(m)		
			Top Width(mm)	Bottom Width(mm)		Start	End	Start	End	Start	End	
1.	D1	D1a	14.0	900	550	2000	145.80	145.80	145.450	145.443	0.350	0.357
2.	D13	D1a	30.0	0	500	13	148.00	145.80	147.600	145.292	0.400	0.508
3.	D1a	D1b	16.0	900	550	2000	145.80	145.80	145.292	145.284	0.508	0.516
4.	D9	D1b	30.0	0	500	13	148.00	145.80	147.600	145.292	0.400	0.508
5.	D1b	D1c	15.0	900	550	2000	145.80	145.80	145.284	145.277	0.516	0.523
6.	D39	D1c	30.0	0	500	13	148.00	145.80	147.600	145.292	0.400	0.508
7.	D1c	D1d	37.0	900	550	2000	145.80	145.80	145.277	145.258	0.523	0.542
8.	D40	D1d	30.0	0	500	13	148.00	145.80	147.600	145.292	0.400	0.508
9.	D1d	D1e	7.0	900	550	2000	145.80	145.80	145.258	145.255	0.542	0.545
10.	D7a	D1e	30.0	0	500	13	148.00	145.80	147.600	145.292	0.400	0.508
11.	D1e	D1f	33.0	900	550	2000	145.80	145.80	145.255	145.238	0.545	0.562
12.	D7	D1f	30.0	0	500	13	148.00	145.80	147.600	145.292	0.400	0.508
13.	D1f	D1g	9.0	900	550	2000	145.80	145.80	145.238	145.234	0.562	0.566
14.	D12	D1g	30.0	0	500	13	148.00	145.80	147.600	145.292	0.400	0.508
15.	D1g	D1h	36.0	900	550	2000	145.80	145.80	145.234	145.216	0.566	0.584
16.	D6	D1h	30.0	0	500	13	148.00	145.80	147.600	145.292	0.400	0.508
17.	D1h	D2	30.0	900	550	2000	145.80	145.80	145.216	145.201	0.584	0.599
18.	D11	D6	43.0	0	500	800	148.00	148.00	147.600	147.528	0.400	0.472
19.	D8	D10	50.0	0	500	800	148.00	148.00	147.528	147.445	0.472	0.555
20.	D14	D10	67.0	0	500	800	148.00	148.00	147.600	147.488	0.400	0.512
21.	D10	D2	53.0	0	500	24	148.00	145.80	147.445	145.237	0.555	0.563
22.	D2	D3	75.0	2150	1800	2000	145.80	145.80	145.201	145.163	0.599	0.637
23.	D3	D4a	300.0	2850	2500	150	145.80	143.60	145.163	143.163	0.637	0.437
24.	D28a	D28a	105.0	0	500	800	147.50	147.50	147.100	146.925	0.400	0.575
25.	D28c	D28a	80.0	0	500	800	147.50	147.50	147.100	146.967	0.400	0.533
26.	D28d	D4a	35.0	0	500	9	147.50	143.60	146.925	143.036	0.575	0.564
27.	D4a	D4	40.0	2850	2500	2000	143.60	143.60	143.036	143.016	0.564	0.584
28.	D15	D16	105.0	0	500	200	148.00	147.50	147.600	147.075	0.400	0.425
29.	D17	D16	20.0	0	500	800	147.50	147.50	147.100	147.067	0.400	0.433
30.	D16	D18	60.0	0	500	800	147.50	147.50	147.067	146.967	0.433	0.533
31.	D18	D19	65.0	0	500	800	147.50	147.50	146.967	146.858	0.533	0.642
32.	D20	D21	60.0	0	500	800	147.50	147.50	147.100	147.000	0.400	0.500
33.	D22	D21	25.0	0	500	800	147.50	147.50	147.100	147.050	0.400	0.442
34.	D21	D19	75.0	0	600	700	147.50	147.50	147.000	146.893	0.500	0.607
35.	D19	D24	25.0	0	700	800	147.50	147.50	146.831	146.796	0.642	0.689
36.	D23	D24	55.0	0	500	800	147.50	147.50	147.100	147.008	0.400	0.482
37.	D24	D25	35.0	0	800	1000	147.50	147.50	146.831	146.796	0.689	0.704
38.	D26	D25	80.0	0	500	800	147.50	147.50	147.100	146.967	0.400	0.533
39.	D28a	D25	110.0	0	500	800	147.50	147.50	147.100	146.917	0.400	0.583
40.	D25	D27	40.0	0	900	1200	147.50	147.50	146.796	146.782	0.704	0.738
41.	D27	D4	130.0	0	900	32	147.50	143.60	146.782	142.700	0.738	0.900
42.	D4	D5	200.0	5850	5500	2000	143.60	143.60	142.700	142.600	0.900	1.000
43.	D32	D33	65.0	1100	750	2000	145.80	145.80	145.450	145.418	0.350	0.382
44.	D38	D33	120.0	0	500	54	148.00	145.80	147.600	145.378	0.400	0.422
45.	D33	D34	100.0	2300	1950	2000	145.80	145.80	145.378	145.328	0.422	0.472
46.	D34	D35	160.0	3300	2950	72	145.80	143.60	145.328	143.106	0.472	0.494
47.	D35	D36	175.0	4100	3750	2000	143.60	143.60	143.106	143.018	0.494	0.582
48.	D41	D42	180.0	0	500	300	148.00	147.50	147.600	147.067	0.400	0.433
49.	D43	D42	40.0	0	500	800	147.50	147.50	147.033	147.033	0.400	0.467
50.	D42	D44	15.0	0	500	800	147.50	147.50	147.033	147.008	0.467	0.482
51.	D44	D45	65.0	0	500	800	147.50	147.50	147.008	146.900	0.482	0.600
52.	D45	D46	20.0	0	600	700	147.50	147.50	146.900	146.871	0.600	0.629
53.	D47	D50	70.0	0	500	800	147.50	147.50	147.100	146.983	0.400	0.517
54.	D49	D48	75.0	0	500	800	147.50	147.50	147.100	146.975	0.400	0.525
55.	D48	D50	32.0	0	500	800	147.50	147.50	146.975	146.922	0.525	0.578
56.	D50	D46	60.0	0	500	800	147.50	147.50	146.922	146.822	0.578	0.678
57.	D46	D51	110.0	0	700	900	147.50	147.50	146.822	146.699	0.678	0.801
58.	D52	D51	100.0	0	500	800	147.50	147.50	147.100	146.933	0.400	0.567
59.	D51	D36	35.0	0	700	10	147.50	143.60	146.699	143.015	0.801	0.585
60.	D36	D37	190.0	6550	6200	2000	143.60	143.60	143.015	142.920	0.585	0.680
61.	D37	D31	40.0	6550	6200	2000	143.60	143.60	142.920	142.900	0.680	0.700
62.	D28	D29	75.0	0	500	800	147.50	147.50	147.100	146.975	0.400	0.525
63.	D29	D30	30.0	0	500	800	147.50	147.50	146.975	146.925	0.525	0.575
64.	D30	D31	120.0	0	500	32	147.50	143.60	146.925	143.175	0.575	0.425
65.	D31	D5	95.0	7200	6850	2000	143.60	143.60	142.900	142.853	0.700	0.747
66.	D5	D5	80.0	12350	12000	2000	143.60	143.60	142.800	142.560	1.000	1.040

- COMPLETION STAGE
- CONSTRUCTION STAGE
- TENDER STAGE
- CONCEPTUAL STAGE

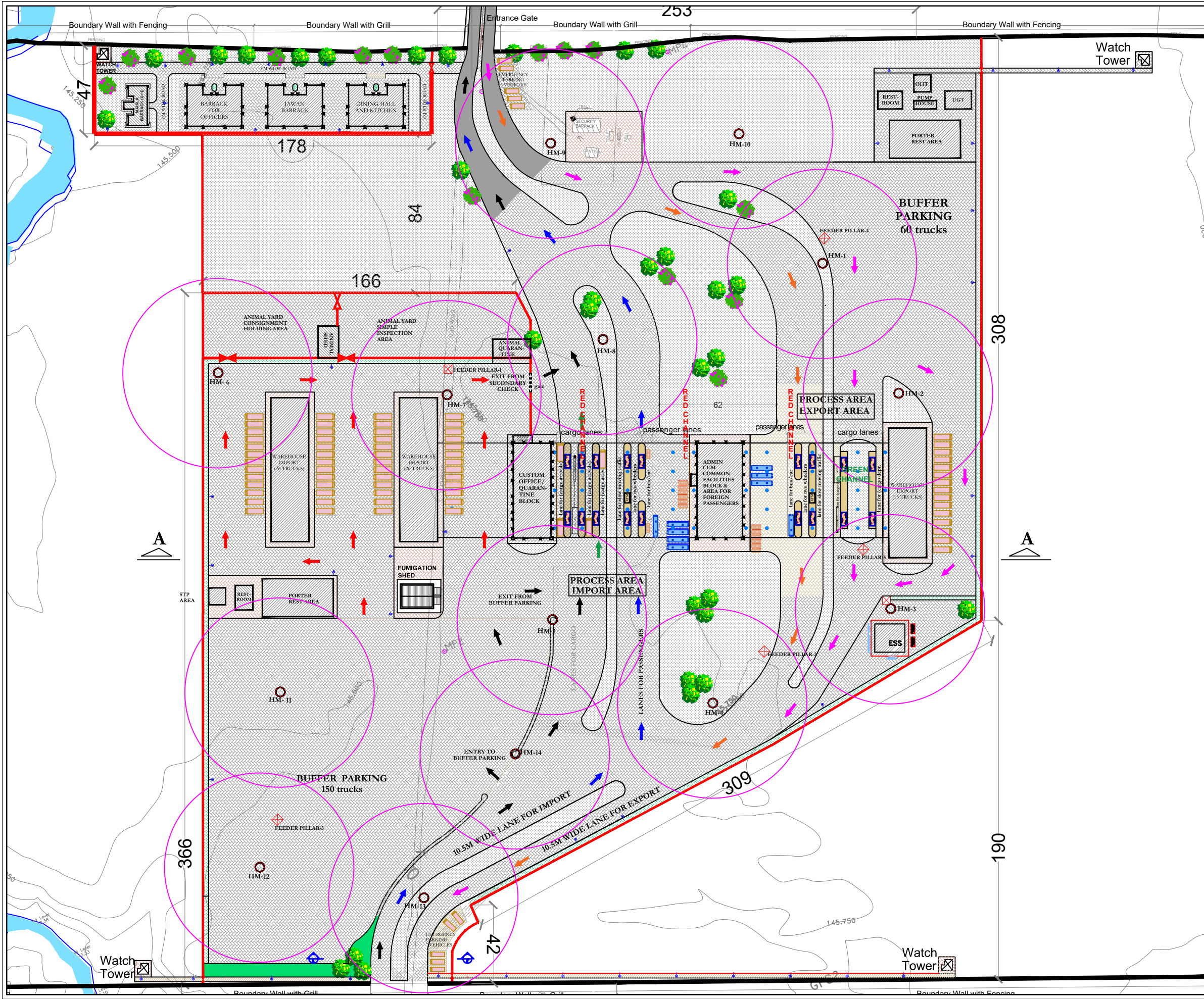
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MINISTRY OF EXTERNAL AFFAIRS
 (GOVT. OF INDIA)

CONSULTANT
RITES
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AIRPORTS DIVISION
 (ISO - 9001 CERTIFIED)

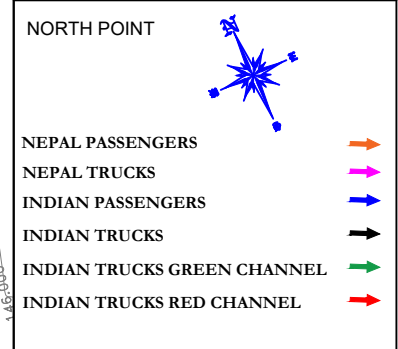
JOB TITLE
DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
OPEN DRAIN CHANNEL LAYOUT SITE PLAN

JOB NO.	DRG. NO.
SCALE	DATE
N.T.S	REVISION SUFFIX
DRAWN	DEALT
CHECKED BY	P.CORD, ENGINEER IN CHARGE



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LEGEND

SYMBOL	DESCRIPTION
	10 MTR. STREET LIGHT POLE
	30 MTR. HIGH MAST

- | | |
|--|---|
| <input type="checkbox"/> COMPLETION STAGE | <input type="checkbox"/> CONSTRUCTION STAGE |
| <input checked="" type="checkbox"/> TENDER STAGE | <input type="checkbox"/> CONCEPTUAL STAGE |

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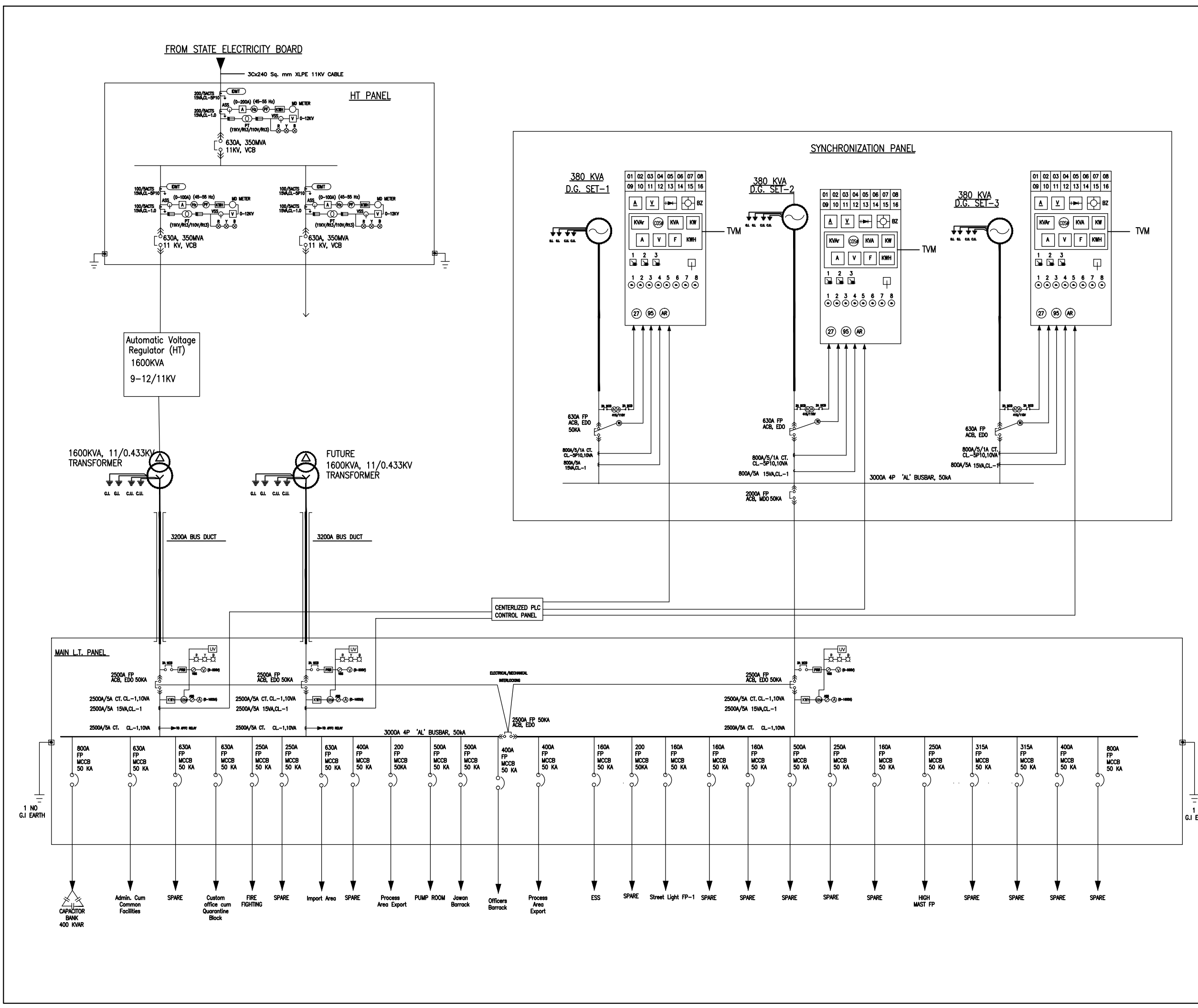
CONSULTANT

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 (ISO - 9001 CERTIFIED)

JOB TITLE
 DEVELOPMENT OF INTEGRATED CHECK POST AT NEPALGUNJ ALONG INDO-NEPAL BORDER

DRAWING TITLE
 EXTERNAL ELECTRIFICATION

Job. No.	Date	Scale	Drp. No.	RITES/PP/N/ELEC/EE/01	Revision	Suffix
DRAWN	DEALT		P.COORD.	APPROVED BY		



NOTES:-

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LEGEND:-

SYMBOL	DESCRIPTION
⊕	THREE PHASE DIFFERENTIAL RELAY
⊖	TRIP CIRCUIT SUPERVISION RELAY
⊙	AUXILIARY RELAY
⊠	PHASE INDICATION LIGHTS
⊡	PROGRAMMABLE LOGIC CONTROL
⊕	UNDER VOLTAGE RELAY
⊖	VACUUM CIRCUIT BREAKER (VCB)
⊖	MFC FUSE
⊖	MINIATURE CIRCUIT BREAKER (MCCB)
⊖	MOULDED CASE CIRCUIT BREAKER (MOCB)
⊖	MOTOR PROTECTION CIRCUIT BREAKER (MPCB)
⊖	AIR CIRCUIT BREAKER (ACB)
⊖	AUTO/MANUAL SWITCH
⊖	EARTHING POINT
⊖	EARTH PIT
⊖	FREQUENCY METER
⊖	POWER FACTOR METER
⊖	VELOCITY METER
⊖	KILO VOLT AMPERE METER
⊖	KILO VOLT AMPERE REACTIVE METER
⊖	KILOWATT HOUR METER
⊖	VOLT METER
⊖	AMMETER
⊖	VOLT METER SELECTOR SWITCH
⊖	AMMETER SELECTOR SWITCH
⊖	DC VOLT METER
⊖	DC AMMETER
⊖	INSTANTANEOUS OVER CURRENT RELAY
⊖	OVER VOLTAGE RELAY
⊖	MASTER TRIP RELAY
⊖	TRIP COIL

COMPLETION STAGE CONSTRUCTION STAGE
 TENDER STAGE PRELIMINARY DESIGN STAGE

SUFFIX	DATE	INITIALS	DETAILS
REVISIONS			
CLIENT			
MINISTRY OF EXTERNAL AFFAIRS GOVERNMENT OF INDIA			
CONSULTANT			
 THE INFRASTRUCTURE PEOPLE AIRPORTS DIVISION (ISO - 9001 CERTIFIED)			
JOB TITLE			
DEVELOPMENT OF INTEGRATED CHECKPOST AT NEPALGUNJ (NEPAL) ALONG INDO-NEPAL BORDER			
DRAWING TITLE			
ELECTRICAL SINGLE LINE DIAGRAM			
Job. No.	Scale	Drp. No.	North point
NTS	DEC 2019	NTS	
DRAWN	DEALT	CHECKED BY	P.CORD. APPROVED BY