TENDER DOCUMENT

Technical Bid

RENOVATION OF EXISTING REGIONAL OFFICE (GROUND FLOOR, FIRST FLOOR, TERRACE FLOOR, PAVERS & EXTERIOR PAINTING) FOR SAPTHAGIRI GRAMEENA BANK AT GUDIWADA, VIJAYAWADA (D)

DATE OF ISSUE: - 21/10/ 2022 TO 14/11/ 2022

TENDER SUBMISSION ON: - 14/11/2022 AT 3.00 P.M.

TENDER OPENING: 14/11/2022 AT 3.30 P.M

COMPLETION PERIOD - 6 Months

Saptagiri Grameena Bank
(Sponsored by Indian Bank)

SAPTHAGIRI GRAMEENA Bank

Head office, Chitoor

HEAD OFFICE, VISHAL MART BUILDING, 3RD FLOOR, VELLORE ROAD, CHITOOR-517 001, Ph: 08572233598

Architects
KANAMADI AND ASSOCIATES
#58, First Floor, 11th Cross, Malleswaram, Bangalore -560 003
Ph: 080 23347210, Email: kanamadiassociates@gmail.com

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Sl. No.	CHECK LIST
The 1st cover or envelope should contain following details:	
1.	Work order & Completion certificate on similar works executed as stated in the Pre-qualification criteria of point no. 2
2.	CA certificate & Audited balance sheet on average annual financial turnover as stated in the Pre-qualification criteria of point no. 1
3.	No Tender fee **Rs. 6,000.00** (Non-Refundable)
4.	DD of **Rs. 61,500.00/-** towards EMD (Refundable)
5.	Pre-Contract INTEGRITY PACT duly signed in stamp paper of Rs.200/-
The 2nd sealed cover or envelope should contain only PRICE BID	

NOTICE INVITING TENDER

Sapthagiri Grameen Bank, Head Office, Chitoor invites sealed & super scribed tenders from eligible contractors under two bid systems (Technical & Price Bid) for Renovation of Existing Regional Office (Ground floor, first floor, Terrace Floor & Pavers & Exterior painting) for Sapthagiri Grameena Bank at Gudivada, Vijayawada (D).

Tender documents can be downloaded from bank's official website https://www.saptagirigrameenabank.in tenders' section.

1. Last Date and Time for submission of Technical & Price Bids:14/11/2022. up to 03:00 PM
2. Date and Time of Opening of Technical Bid: 14/11/2022 at 03:30 PM
3. In the event of the date/s mentioned above being declared subsequently as holiday/s for the Purchaser's Office, the due date for meeting, submission and opening of bids will be the next working day at the same venue and time.
4. In order to provide reasonable time to the Prospective Bidders to take necessary action in preparing their Tenders / Bids as per the Addendums / Amendments, Bank may, at its discretion extend the deadline for the submission of Tenders / Bids and other allied time frames, which are linked with that deadline.
5. Earnest Money Deposit: An amount of **Rs.61,500.00/-** by DD drawn in favor of "Sapthagiri Grameena Bank" payable at Chitoor, towards EMD should be enclosed along with the Technical Bid only. Tenders without EMD shall be liable for rejection. No interest shall be payable on EMD.
6. Firms registered with NSIC (National Small Industries Corporation) & MSME are exempted from submission of EMD amount. A copy of Valid NSIC certificate/MSME Certificate is to be submitted for the same.
7. Technical Bids received without enclosure of EMD will be summarily rejected. Please note that Bank will not be responsible for any delay in submission of Tender.
8. Acceptance / Rejection of the Tender is entirely at the discretion of the bank.
9. Tenders received after the deadline for submission will not be considered.
10. Unsealed tenders received are liable for rejection.
11. Any modification/corrigendum shall be uploaded on Bank's website only.
    Pre bid meeting will be conducted on 04/11/2022 at 03:00 PM, bidders may attend the meeting at HEAD OFFICE, VISHAL MART BUILDING, 3RD FLOOR, VELLORE ROAD, CHITOOR-517 001, Ph: 08572233598

General Manager,
Sapthagiri Grameena Bank
Head Office, Chitoor

PRE-QUALIFICATION CRITERIA

1. The average annual turnover of the bidder should be at least Rs.75.00 lakhs during the last 3 financial years, ending 31st March 2022. (Audited balance sheets and CA certificate to be enclosed).

2. The bidder should have successfully completed similar works during the last 7 years (i.e. prior to 31.06.2022) in Central/State Govt. departments., Public Sector Undertakings, Banks, reputed private sector, multinational companies & institutions in either of the following:

1. One work costing a minimum of Rs. 50.00 lakhs and above
OR
2. Two works of each costing a minimum Rs. 35.00 lakhs and above
OR
3. Three works of each costing a minimum Rs. 25.00 lakhs and above

NOTE: Similar works means Interior furnishing works

Document proof to be submitted:

(1) Copies of Work orders (2) Completion Certificates (self-attested) issued from the respective Organizations to be submitted related to the similar works executed during the relative period stated above (3) CA Certificate (4) Balance sheet schedule for last 3 consecutive financial years.

Conditions:

1. Bank has the discretion to increase/decrease the duration of days.

2. Any party or its associated company if had been in the holiday list / Black-listed by any Central / State Government agencies or any Central / State PSU company and such name appears in the list of the above mentioned central / state Government agencies or central / state PSU as on date is disqualified and would not be considered. A self-declared certificate to be submitted as per the pro-forma enclosed to the Technical bid that the vendor is not blacklisted by above-mentioned Agencies.

3. Tender fee and EMD details are as follows:

Work	Tender fee in the form of DD (Rs)	EMD in form of DD (Rs)	Estimated cost of the project in Rs.
Renovation of Existing civil work for Regional Office (Ground, First & Terrace floor) for Sapthagiri Grameena Bank at Gudivada, Vijayawada (D)	**Rs. 6,000.00**	**Rs. 61,500.00**	Rs. 61.71 lakhs (Excluding GST)

"Note: The tenders which are not enclosed with the specified amount of EMD in the form of DD will be summarily rejected. (Cheques will not be accepted)"

INSTRUCTION TO BIDDERS:

1. The bidders should in their own interest visit the site & familiarize themselves with the site conditions before quoting.

2. No materials shall be provided by the Bank for the execution of the work.

3. Submission & processing of tenders.

i) The tender to be submitted in two parts, part I containing the Technical bid & part II containing the price bid.

ii) Complete tender documents including both part I & part II duly signed by the bidders should be submitted in separate sealed covers super scribed as “Technical bid” &” Price bid” by the due date. Rates shall be filled only in price bid part contained in the price bid envelope. Prices should be filled up in the price bid part II. Bidders shall fill up their rates only in the price bid and not in any other manner.

iii) Bidders are advised not to deviate from the stipulated technical specifications, commercial terms & conditions like terms of payment, warranty, arbitration, escalation clause etc. In case it is unavoidable, Bidders are advised to list out the deviations in a separate sheet and enclose the same in envelope no.1 containing the Technical bid.

iv) Part I i.e. Technical bid only will be opened on the due date & time in the presence of bidders /their authorized representatives.

v) Scrutiny /evaluation of the technical bids will be done by the Bank in consultation with the Architect/consultant or any other agency as deemed necessary. In case it is found that the technical bid is not in line with the stipulated specifications, requirements and/or contains many deviations, the Bank reserves the right to reject the technical bid of such firm without making any reference to the bidder. The Price bid of only those who qualified in the technical bid will be opened and **price bids of those who do not qualify in the technical bid will not be opened.**

vi) Necessary clarifications required by the Bank shall have to be furnished by the bidder within the stipulated time, failing which his bid may be rejected without making any further reference.

vii) Part II i.e. the price bid of qualified bidders will be opened in the presence of bidders /their authorized representatives.

viii) Bank however reserves the right to accept/reject any tender or call for fresh tenders without assigning any reason whatsoever.

ix) The Bank reserves the right to reject any or all proposals. Similarly, it reserves the right NOT to include any Bidder in the final short-list, if found or otherwise proved to have furnished wrong details / documents, at any point of time.

x) The tender shall be submitted in two separate sealed envelopes i.e. Envelope No:1 'Technical Bid' and Envelope No:2 'Price Bid.' The sealed envelope containing Technical bid should be super scribed as "Technical Bid" and the sealed envelope containing price bid should be super scribed as "Price Bid" respectively. The two sealed envelopes, one containing Technical Bid and second containing Price bid should be placed in a single envelope No.3, duly sealed and super scribed on the outside with the narration "Tender for Renovation of Existing Regional Office (Ground floor, first floor, Terrace Floor & Pavers & Exterior painting) for Sapthagiri Grameena Bank at Gudivada, Vijayawada (D)". The tender should be submitted on or before 14/11/2022 up to 3.00 PM, in the "Tender Box" kept at Sapthagiri Grameena Bank, Head Office, Vishal Mart, 3rd Floor, Vellore Road, Chittoor 517 001.

Alternatively, the tenders may be submitted through Registered/Speed Post to reach the below mentioned address on or before the due date and time indicated above. The responsibility of submitting tenders to the below mentioned address on or before the due date and time is that of applicant and any tenders received after due date and time shall not be accepted. The Bank will not be responsible for any delay or late submission of the tender or any loss arising there from in any manner whatsoever.

Address for communication:

The General Manager,
Head Office, Vishal Mart,
3rd Floor, Vellore Road,
Chitoor 517 001.

4. Earnest Money Deposit: Bidders must deposit the specified amount of EMD as detailed in the notice-inviting tender at the time of submission of tender. The EMD of unsuccessful bidders will be refunded without any interest soon after the decision to award the work to successful bidder.

5. Earnest Money of the successful bidders will be retained as part of security deposit and will be returned 14 days after the end of defect liability period. EMD will be forfeited, if the bidder fails to start the work within the period of 14 days from the date of award of work and fail to execute an agreement.

6. Initial Security Deposit: Successful bidder whose tender is accepted is required to submit Initial Security Deposit equal to 2% of the accepted value of the tender (inclusive of EMD) within 14 days of date of award of work by way of Demand Draft in favour of Sapthagiri Grameena Bank payable at Chitoor.

7. Total Security deposit shall comprise of 5% of the final contract value (i.e. final bill amount) which includes:

i. Earnest Money Deposit

ii. Initial Security Deposit

ii. Retention money

8. Validity: The L1 price shall remain valid for period of 180 days from the date of finalizing L1. The bidders shall not be entitled during the period of validity without the consent in writing of the Bank to revoke or cancel tender or to vary the tender given or any terms thereof.

9. The successful bidder shall be required to execute an agreement in requisite stamp paper within 14 days from the date of award of work. In the event of failure to execute the agreement within the stipulated period, EMD amount will be forfeited.

10. Bank reserves the right to modify any of the pre-qualification criteria.

11. The evaluation of the tenders will be based on pre-qualification criteria detailed in the tender document, tenders of firm, which meet the pre-qualification criteria will only, be considered.

12. The successful bidder shall bear the expenditure towards stamps and related expenditure involved in registering of the contract.

13. The Bidder is expected to examine all Specifications, Instructions, and Terms & Conditions given in the Tender Documents. Failure to furnish all information required in the tender Documents or submission of a Bid not substantially responsive to the tender Documents in every respect will be at the Bidders risk and may result in rejection of the Bid.

14. Any clarification required will have to be obtained one week prior to the date of opening of the Technical Bid. For any technical clarifications, please feel free to contact our Architect M/s.Kanamadi & Associates (Phone: 080-23347210) and our Bank's officials …….., Chief Manager on Ph.8886644003

15. All the pages of the tender document shall be signed & stamped by authorized representatives of the Bidder.

Place:

Date: **Signature of bidder with seal**

TENDER TERMS AND CONDITIONS

a	General Description:	Renovation of Existing Civil work for Regional Office (Ground, First & Terrace Floor) for Sapthagiri Grameena Bank at Gudivada, Vijayawada (D)
b	Earnest Money Deposit	**Rs. 61,500.00** DD drawn in favour of Sapthagiri Grameena Bank payable at Chitoor.
c	Initial security deposit	2% of the accepted value of the tender within 14 days of date of award of work, by way of Demand Draft favoring Sapthagiri Grameena Bank payable at Chitoor
d	Date of commencement:	3rd. day from the date of award of work
e	Period of completion:	90 days from the date of award of work
f	Retention Money to be deducted from interim/running Bills	8% of gross value of each running bill shall be deducted
g	Total Security deposit from final bill	5% of final contract value shall be deducted and refunded after completion of defect liability period of 12 months provided the contractor has satisfactorily carried out all the works and attended to all defects in accordance with the conditions of the contract, including site clearance.
h	Defects Liability Period	12 (Twelve) months from the date of completion.
i	Liquidated Damages	1% of the contract value of the work per week subject to a ceiling of 15%
j	Interim bill	Value not less than 25% of the contract value in each bill.
k	Period of honoring the interim certificates:	Interim bill amount shall be honored within 15 days after receipt of the Architects certificate and checking by the concerned authority subject to the deduction of 8% of the bill.
l	Period of honoring the final bill:	15 days from the receipt of the Architects Certificate.
m	Statutory deductions	TDS, GST-TDS and others if any, will be deducted at the time of payment as per the prevailing terms
n	Mobilization Advance	Will not be considered
o	Validity of Tender	180 days from the date of finalizing L1

GENERAL CONDITIONS OF TENDER:

1. Definitions:

In construing these conditions and the specifications, Schedule of Quantities and Contract Agreement, the following words, shall have the meanings herein assigned to them except where the subject of context other requires:

a. 'Owner' or 'Bank' shall mean Sapthagiri Grameena Bank include his/their heirs, legal representatives, assignees and successors.

b. 'Contractors' or 'Bidder' shall mean the person, or persons, firm or company *whose* tender has been accepted by the Bank and shall include his/their heirs and legal representatives and the permitted assigns.

c. 'Consultant' (herein referred to as Consultants) shall mean the Electrical/Engineer/Architect Consultant appointed by Bank from its empanelled list to supervise the execution of the works.

d. 'Banks Engineer' shall mean person employed by the Bank for the said work.

e. 'Works' shall mean the works to be executed and recorded in accordance with the Contract and shall include all extra or additional altered or substituted works as required and recorded for the performance of the Contract

f. 'Site' shall mean 'Sapthagiri Grameena Bank, *where* the works are to be executed or carried out and other lands or places provided by the Bank for the purposes of the Contract.

g. 'Project' shall mean entire work specified in the tender documents inclusive of extra items/ extra quantities (if any) executed during the contract period.

h. 'Contract' shall mean the articles of agreement, the conditions of tender, specifications, schedule of quantities, drawings, duly signed by the owner and the contractor.

i. 'Virtual Completion Certificate' shall mean the certificate issued by the Consultant/Owner to the Contractor after successful completion of the project.

j. 'Contract Value' shall mean total value of quantities of items in the schedule of rates of the contract valued at the accepted rates at time of award of contract.

2. Price:

Price quoted should be firm without any escalation until the completion of the work. The rates quoted include the cost of transportation of material to the site and the fixing or placing in position for which the item of work is intended to be operated. The rates quoted by the Contractor shall be firm throughout the contract period and there shall be no upward revision of the rates quoted by the contractor for any reason whatsoever. No price variation will be allowed for any other reasons till the completion of the work.

3. Total Security Deposit

Total Security deposit comprise of a) Earnest Money Deposit b) Initial Security Deposit c) Retention Money

(a) Earnest Money Deposit:

The bidder shall furnish EMD mentioned in the form of Demand draft drawn in favor of Sapthagiri Grameena Bank. No tender shall be considered unless the EMD is so deposited in the required form. No interest shall be paid on this EMD. The EMD of the unsuccessful bidder shall be refunded soon after the decision to award the contract is taken without interest. The EMD shall stand absolutely forfeited if the bidder revokes his tender at any time during the period when he is required to keep his tender open acceptance by the bank or after it is accepted by the bank the

contractor fails to enter into a formal agreement or fails to submit the Performance Bank Guarantee as stipulated or fails to commence the work within the stipulated time.

(b) Initial Security Deposit:
Successful bidder whose tender is accepted is required to submit Initial Security Deposit equal to 2% of the accepted value of the tender (inclusive of EMD) within 14 days of date of award of work by way of Demand Draft in favour of Sapthagiri Grameena Bank payable at Chitoor.

(c) Retention Money
Besides the EMD as deposited by the contractor in the above said manner, the retention money shall be deducted at the rate of 8% from the each running bill and will be released on the final payment. Defect liability period shall commence from the date of issue of Virtual Completion Certificate by the Architect/Consultant.

4. Language Errors, Omissions and Discrepancies
In case of errors, omissions and/or disagreement between written and scaled dimensions on the drawings or between the drawings and specifications etc., the following order shall apply.

i. Between scaled and written dimension (or description) on a drawing, the latter shall be adopted.

ii. Between the written or shown description or dimensions in the drawings and the corresponding one in the specification the former shall be taken as correct.

iii. Between written description of the item in the specifications and descriptions in bills of quantities of the same item, the latter shall be adopted.

iv. In case of difference between rates written in figures and words, the rate in words shall prevail.

v. Between the duplicate/subsequent copies of the tender, the original tender Shall be taken as correct.

5. Scope of Work

Scope of works include Interior furnishing works.

The contractor shall carry out, complete and maintain the said work in every respect strictly in accordance with this contract and with the directions of and to the satisfaction of the Bank to be communicated through the architect/consultant. The architect/consultant at the directions of the Bank from time to time issue further drawings and/or written instructions, details directions and explanations which are hereafter collectively referred to as Architect's/Consultant's instructions in regard to the variation or modification of the design, quality or quantity of work or the addition or omission or substitution of any work, any discrepancy in the drawings or between the BOQ and/or drawings and/or specifications, the removal from the site of any material brought thereon by the contractor and the substitution of any other materials thereof, the demolition, removal and/or re-execution of any work executed by him, the dismissal from the work of any person employed/engaged thereupon.

6. Letter of Acceptance

Within the validity period of the tender the Bank shall issue a letter of acceptance either directly or through the architect by registered post or otherwise depositing at the address of the contractor as given in the tender to enter into a Contract for the execution of the work as per the terms of the tender. The letter of acceptance shall constitute a binding contract between the bank and the contractor.

7. Contract Agreement

On receipt of intimation of the acceptance of tender from the Bank/Architect the successful bidder shall be bound to implement the contract and within five days thereof he shall sign an agreement in a non-judicial stamp paper of appropriate value.

8. Ownership of drawings

All drawings, specifications and copies thereof furnished by the Bank through its architect/ consultants are the properties of the Bank. They are not to be used on other work.

9. Detailed drawings and instructions

The Bank through its architects/consultants shall furnish with reasonable promptness additional instructions by means of drawings or otherwise necessary for the proper execution of the work. All such drawings and instructions shall be consistent with the contract documents, true developments thereof and reasonably inferable there from. The work shall be executed in conformity therewith and the contractor prepare a detailed work schedule indicating therein the date of start and completion of various activities on receipt of the work order and submit the same to the bank through the Architect/Consultant.

10. Liquidated Damages

Time is the essence of the contract. If the contractor fails to complete the work and clear the site on or before the dates fixed for completion, then the contractor shall without prejudice be liable to pay liquidation damage (LD) at 1% of the contract value for every **week that the whole or the part** of work remains incomplete. However, the total amount of LD to be paid under this condition shall not exceed 15% of the contract value.

11. Materials, Appliances and Employees

Unless or otherwise specified the contractor shall provide and pay for all materials, labour, water, power, tools, equipment transportation and any other facilities that are required for the satisfactory execution and completion of the work. Unless or otherwise specified all materials shall be new and both workmanship and materials shall be best quality. The contractor shall always enforce strict discipline and good order among his employees and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him. Workman whose work or behavior is found to be unsatisfactory by the Bank/Architect/Consultant he shall be removed from the site immediately.

<u>Water and Electricity:</u>

Contractor will arrange water, electricity, and telephone connection at site at his own cost. In case, such services are already existing at site, the contractor should

bear the monthly charges regularly for using such services.

12. Permits, Laws and Regulations

Permits and licenses required for the execution of the work shall be obtained by the contractor at his own expenses. The contractor shall give notices and comply with the regulations, laws, and ordinances rules, applicable to the contractor. If the contractor observes any discrepancy between the drawings and specifications, he shall promptly notify the bank in writing under intimation of the Architect/Consultant. If the contractor performs any act which is against the law, rules and regulations he shall meet all the costs arising there from and shall indemnify the bank any legal actions arising there from.

13. Setting out Work

The contractor shall set out the work and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions, and alignment of all parts thereof and get it approved by the architect/consultant before proceeding with the work. If at any time any error in this respect shall appear during the progress of the works, irrespective of the fact that the layout had been approved by the architect/consultant the contractor shall be responsible for the same and shall at his own expenses rectify such error, if so, required to satisfaction of the bank.

14. Protection of works and property

The contractor shall continuously maintain adequate protection of all his work from damage and shall protect the bank's properties from injury or loss arising in connection with contract. He shall make good any such damage, injury, loss due to his fault or negligence except which are due to causes beyond his control.

He shall take adequate care and steps for protection of the adjacent properties. The contractor shall take all precautions for safety and protection of his employees on the works and shall comply with all applicable provisions of Government and local bodies' safety laws and building codes to prevent accidents, or injuries to persons or property of about or adjacent to his place of work. The contractor shall take insurance covers as per clause 26 at his own cost. The policy may be taken in joint names of the contractors and the bank and the original policy may be lodged with the bank.

15. Inspection of Work

The Bank/Architect/Consultant or their representatives shall at all reasonable time have free access to the work site and/or to the workshop, factories or other places where materials are lying or from where they are obtained and the contractor shall give every facility to the Bank, Architect/Consultant and their representatives necessary for inspection and examination and test of the materials and workmanship. No person unless authorized by the Bank/Architect/Consultant except the representative of Public authorities shall be allowed on the work at any time. The proposed work either during its construction stage or its completion can also be inspected by the Chief Technical Examiner's

organization a wing of Central Vigilance Commission.

16. Assignment and subletting

The whole of work included in the contract shall be executed by the contractor and he shall not directly entrust and engage or indirectly transfer assign or *subcontract* the contract or any part or share thereof or interest therein without the written consent of the bank through the architect and no *undertaking* shall relieve the contractor from the responsibility of the contractor from active superintendence of the work during its progress.

17. Quality of Materials, Workmanship & Test

(i) All materials and workmanship shall be best of the respective kinds described in the contract and in accordance with Architect/Consultant instructions and shall be subject from time to time to such tests as the architect/consultant may direct at the place of manufacture or fabrication or on the site or an approved testing laboratory. The contractor shall provide such assistance, instruments, machinery, labour and materials.

(ii) Samples

The contractor without any extra charges shall supply all samples of adequate numbers, size, shades & pattern as per specifications. If certain items proposed to be used are of such nature that samples cannot be presented or prepared at the site detailed literature/test certificate of the same shall be provided to the satisfaction of the Architect/ consultant. Before submitting the sample/literature the contractor shall satisfy himself that the material/equipment for which he is submitting the samples/literature meet with the requirement of tender specification. Only when the samples are approved in writing by the architect/consultant the contractor shall proceed with the procurement and installation of the material/equipment. The approved samples shall be signed by the Architect/Consultant for identification and shall be kept on record at site office until the completion of the work for inspection/comparison at any time. The Architect/Consultant shall take reasonable time to approve the sample. Any delay that might occur in approving the samples for reasons of its not meeting the specifications or other discrepancies inadequacy in furnishing samples of best qualities from various manufacturers and such other aspects causing delay on the approval of the materials/equipment's etc. shall be to the account of the contractor.

(iii) Cost of tests

a) The cost of making any test shall be borne by the contractor if such test is intended by or provided for in the specifications or BOQ.

(iv) Cost of test not provided for

If any test is ordered by the Architect/Consultant, which is either:

(a) If so intended by or provided for or (in the cases above mentioned) is not so particularized or through so intended or provided for but ordered by the Architect/Consultant which is either to be carried out by an independent person at any place other than the site or the place of manufacture or fabrication of the materials tested or any Government/approved laboratory, then the cost of such test shall be borne by the contractor.

18. Obtaining Information related to execution of work

No claim by the contractor for additional payment shall be entertained which is consequent upon failure on his part to obtain correct information as to any

matter affecting the execution of the work nor any misunderstanding or the obtaining incorrect information or the failure to obtain correct information relieve him from any risks or from the entire responsibility for the fulfillment of contract.

19. Contractor's superintendence

The contractor shall give necessary personal superintendence during the execution of the works and as long, thereafter, as the Architect/consultant may consider necessary until the expiry of the defects & liability period, stated hereto.

20. Quantities

i) The bill of quantities (BOQ) unless or otherwise stated shall be deemed to have been prepared in accordance with the Indian Standard Method of Measurements. The rate quoted shall remain valid for variation of quantity against individual item to any extent subject to maximum variation of the contract value by 25%. The entire amount paid under Clause 21 hereof as well as amounts of prime cost and provisional sums, if any, shall be excluded.

ii) Variation exceeding 25%: The items of work executed in relation to variation exceeding 25% shall be paid based on provisions of clause 22(e) hereof.

21. Works to be measured

The Architect/Consultant may from time to time intimate to the contractor that he required the work to be measured and the contractor shall forthwith attend or send a qualified representative to assist the Architect in taking such measurements and calculation and to furnish all particulars or to give all assistance required by any of them. Such measurements shall be taken in accordance with the Mode of measurements detailed in the specifications. The representative of the Architect/Consultant shall take joint measurements with the contractor's representative and the measurements shall be entered in the measurement book.

The contractor or his authorized representative shall sign all the pages of the measurement book in which the measurements have been recorded in token of his acceptance. Both representatives shall duly attest all the corrections. No over writings shall be made in the M book. In case if the contractor does not attend or neglect or omit to depute his representative to take measurements then the measurements recorded by the representative of the Architect/consultant shall be final. All authorized extra work, omissions and all variations made shall be included in such measurements.

22. Variations:

No alteration, omission or variation ordered in writing by the Architect/Consultant shall vitiate the contract. In case the Bank/Architect/Consultant thinks proper at any time during the progress of works to make any alteration in, or additions to or omission from the works or any alteration in the kind or quality of the materials to be used therein, the Architect/Consultant shall give notice thereof in writing to the contractor or shall confirm in writing within seven days of giving such oral instructions the contractor shall alter to, add to, or omit from as the case may be in accordance with such notice but the contractor shall not do any work extra to or make any alteration or additions to or omissions from the works or any deviation from any of the provisions of the contract, stipulations, specifications or contract drawings without previous consent in writing of the Architect/Consultant and the value of such extras, alterations, additions or omissions shall in all cases be determined by the Architect/Consultant and the same shall be added to or deducted from the contract value, as the case may be.

23. Valuation of Variations

No claim for an extra shall be allowed unless it shall have been executed under the authority of the Architect/Consultant with the concurrence of the Bank as herein mentioned. Any such extra is herein referred to as authorized extra and shall be made in accordance with the following provisions.

a) i)The net rates or prices in the contract shall determine the valuation of the extra work where such extra work is of similar character and executed under similar conditions as the work priced herein. ii)Rates for all items, wherever possible should be derived out of the rates given in the priced BOQ.

b)The net prices of the original tender shall determine the value of the items omitted, provided if omissions do not vary the conditions under which any remaining items of works are carried out, otherwise the prices for the same shall be valued under sub clause (c) hereunder.

c)Where the extra works are not of similar character and/or executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items or works are carried out, then the contractor shall within 7 days of the receipt of the letter of acceptance inform the Architect/Consultant of the rate which he intends to charge for such items of work, duly supported by analysis of the rate or rates claimed and the Architect/Consultant shall fix such rate or prices as in the circumstances in his opinion are reasonable and proper, based on the market rate.

d)Where extra work cannot be properly measured or valued the contractor shall be allowed day work prices at the net rates stated in the tender of the BOQ or, if not, so stated then in accordance with the local day work rates and wages for the district; provided that in either case, vouchers specifying the daily time (and if required by the Architect/Consultant) the workman's name and materials employed be delivered for verifications to the Architect/Consultant at or before the end of the week following that in which the work has been executed.

e)It is further clarified that for all such authorized extra items where rates cannot be derived from the tender, the contractor shall submit rates duly supported by rate analysis worked on the "market rate basis" for material, labour, hire/running charges of equipment and wastages etc…, plus 15% towards establishment charges, contractor's overheads and profit. Such items shall not be eligible for escalation.

24. Final Measurement

The measurement and valuation in respect of the contract shall be completed within one month of the virtual completion of the work.

25. Virtual Completion Certificate (VCC)

On successful completion of entire works covered by the contract to the full satisfaction of the Bank, the contractor shall ensure that the following works have been completed to the satisfaction of the bank.

a) Clear the site of all scaffolding, wiring, pipes, surplus materials, contractor's labor, equipment and machinery.

b) Demolish, dismantle and remove the contractor's site office, temporary works, structures including labour sheds/camps and constructions and other items and things whatsoever brought upon or erected at the site or any land allotted to the contractor by the bank and not incorporated in the permanent works.

c)Remove all rubbish, debris etc from the site and the land allotted to the contractor by the bank and shall clear, level and dress, compact the site as required by the bank.

d)Shall put the bank in undisputed custody and possession of the site and all land allotted by the bank.

e) Shall hand over the work in a peaceful manner to the bank.
f)All defects/imperfections have been attended and rectified as pointed out by the bank to the full satisfaction of bank.
Upon the satisfactory fulfillment by the contractor as stated above, the contractor shall be entitled to apply to the Architect/Consultant for the certificate. If the Architect/Consultant is satisfied of the completion of the work, relative to which the completion certificate has been sought, the Architect/Consultant shall within fifteen (15) days of the receipt of the application for virtual completion certificate, issue a VCC in respect of the work for which the VCC has been applied. This issuance of a VCC shall be without prejudice to the bank's rights and contractor's liabilities under the contract including the contractor's liability for defects liability period nor shall the issuance of VCC in respect of the works or work at any site be construed as a waiver of any right or claim of the Bank against the contractor in respect of works or work at the site and in respect of which the VCC has been issued.

26. Work by other agencies

The Bank/Architect/Consultant reserves the rights to use premises and any portion of the site for execution of any work not included in the scope of this contract which it may desire to have carried out by other persons simultaneously and the contractor shall not only allow but also extend reasonable facilities for the execution of such work. The contractor however shall not be required to provide any plant or material for the execution of such work except by special arrangement with the bank. Such work shall be carried out in such manners not to impede the progress of the works included in the contract.

27. Insurance of Works

27.1. Without limiting his obligations and responsibilities under the contract the contractor shall insure in the joint names of the bank and the contractor against all loss or damages from whatever cause arising other than the excepted risks, for which he is responsible under the terms of contract and in such a manner that the bank and contractor are covered for the period stipulated in clause 29 of GCC and are also covered during the period of maintenance for loss or damage arising from a cause, occurring prior to the commencement of the period of maintenance and for any loss or damage occasioned by the contractor in the course of any operations carried out by him for the purpose of complying with his obligations under clause.
a) The works for the time being executed to the estimated current Contract value thereof, or such additional sum as may be specified together with the materials for incorporation in the works at their replacement value.
b) The constructional plant and other things brought on to the site by the contractor to the replacement value of such constructional plant and other things.

c) Such insurance shall be affected with an insurer and in terms approved by the bank which approval shall not be unreasonably withheld, and the contractor shall whenever required produce to the Architect/Consultant the policy of insurance and the receipts for payment of the current premiums.

27.2. Damage to persons and property

The contractor shall, except if and so far as the contract provides otherwise indemnify the bank against all losses and claims in respect of injuries or damages to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution and maintenance of the works

and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation of damages for or with respect to:

a) The permanent use or occupation of land by or any part thereof.

b)The right of Bank to execute the works or any part thereof, on, over, under, in or through any lands.

c)Injuries or damages to persons or properties which are unavoidable result of the execution or maintenance of the works in accordance with the contract.

d)Injuries or damage to persons or property resulting from any act or neglect of the Bank, their agents, employees or other contractors not being employed by the contractor or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the contractor, his servants or agents such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the Bank, their employees, or agents or other employees, or agents or other contractors for the damage or injury.

27.3. Contractor to indemnify Bank

The contractor shall indemnify the bank against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the provision sub clause 26.2 of this clause.

27.4. Contractor's superintendence

The contractor shall fully indemnify and keep indemnified the bank against any action, claim, or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claim made under or action brought against bank in respect of such matters as aforesaid the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expenses to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify the bank if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Architect/Consultant in this behalf.

27.5. Third Party Insurance

a) Before commencing the execution of the work the contractor but without limiting his obligations and responsibilities under clause 25 of GCC shall insure against his liability for any material or physical damage, loss, or injury which may occur to any property including that of bank, or to any person, including any employee

of the bank, by or arising out of the execution of the works or in the carrying out of the contract, otherwise than due to the matters referred to in the provision to clause 27 thereof.

b) Minimum Amount of Third-Party Insurance

Such insurance shall be affected with an insurer and in terms approved by the bank which approval shall not be reasonably withheld and for at least the amount stated below. The contractor shall, whenever required, produce to the Architect/Consultant the policy or policies of insurance cover and receipts for payment of the current premiums.

c) The minimum insurance cover for physical property, injury, and death is Rs.5.0 lakh per occurrence with the number of occurrences limited to four. After each occurrence contractor will pay additional premium necessary to make insurance valid for four occurrences always.

27.7. Accident or Injury to Workmen

a) The Bank shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workmen or other person in the employment of the contractor or any subcontractor, save and except an accident or injury resulting from any act or default of the bank or their agents, or employees. The contractor shall indemnify and keep indemnified bank against all such damages and compensation, save and except as aforesaid and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

b) Insurance against accidents etc…, to workmen

The contractor shall insure against such liability with an insurer approved by the bank during the whole of the time any person employed by him on the works and shall, when required, produce to the architect/consultant such policy of insurance and receipt for payment of the current premium. Provided always that, in respect of any persons employed by any subcontractor the contractor's obligation to insure as aforesaid under this sub clause shall be satisfied if the sub-contractor shall have insured against the liability in respect of such persons in such manner that bank is indemnified under the policy but the contractor shall require such subcontractor to produce to the Architect/Consultant when required such policy of insurance and the receipt for the payment of the current premium.

c) Remedy on Contractor's failure to insure

If the contractor fails to effect and keep in force the insurance referred to above or any other insurance which he may be required to effect under the terms of contract, then and in any such case the bank may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the bank as aforesaid and also deduct 15% of contract value from any amount due or which may become due to the contractor, or recover the same as debt from the contractor.

d) Without prejudice to the other rights of the Bank against contractors, in respect of such default, the Bank shall be entitled to deduct from any sums payable to the contractor the amount of any damages costs, charges, and other expenses paid by the bank and which are payable by the contractors under this clause. The contractor shall upon settlement by the insurer of any claim made against the insurer pursuant to a policy taken under this clause, proceed with due diligence to rebuild or repair the works destroyed or damaged. In this event all the monies received from the insurer in respect of such damage shall be paid to the contractor and the contractor shall not be entitled to any further payment in respect of the expenditure incurred for rebuilding or repairing of the materials or goods destroyed or damaged.

28. Commencement of Works

The work should be started from 3rd day of issue of work order. In case, contractor fails to undertake the work at site within 7 days from the date of issue of work order, the Bank reserve the rights to entrust the work to any other contractor at its discretion and earnest money deposit of defaulter contractor will be forfeited.

29. Time for completion

Time is the essence of the contract and shall be strictly observed by the contractor. The entire work shall be completed within a period of 45 days from the date of award of work. If required in the contract or as directed by the Architect/Consultant, the contractor shall complete certain portions of work before completion of the entire work. However, the completion date shall be reckoned as the date by which the whole work is completed as per the terms of the contract.

30. Extension of Time

If, in the opinion of the Architect/Consultant, the work be delayed for reasons beyond the control of the contractor, the Architect/Consultant may submit a recommendation to the bank to grant a fair and reasonable extension of time for completion of work as per the terms of contract. If the contractor needs an extension of time for the completion of work or if the completion of work is likely to be delayed for any reasons beyond the due date of completion as stipulated in the contract, the contractor shall apply to the bank through the Architect/Consultant in writing at least 10 days before the expiry of the scheduled time and while applying for extension of time he shall furnish the reasons in detail and his justification if any, for the delays. The architect/consultant shall submit their recommendations to the bank in the prescribed format for granting extension of time. While granting extension of time the contractor shall be informed the period extended time which will qualify for levy of liquidated damages. For the balance period in excess of original stipulated period and duly sanctioned extension of time by the bank the provision of liquidated damages as stated under clause 9 of GCC shall become applicable. Further contract shall remain in force even for the period beyond the due date of completion irrespective whether the extension is granted or not.

31. Rate of progress

Whole of the materials, plant and labour to be provided by the contractor and the mode, manner and speed of execution and maintenance of the works are to be of a kind and conducted in a manner to the satisfaction of the Architect/Consultant. Should the rate of progress of the work or any part thereof be at any time be in the opinion of the Architect/ Consultant too slow to ensure the completion of the whole of the work by the prescribed time or extended time for completion the Architect/Consultant shall thereupon take such steps as considered necessary by the Architect/Consultant to expedite progress so as to complete the woks by the prescribed time or extended time. Such communications from the Architect/Consultant neither shall relieve the contractor from fulfilling obligations under the contract nor he shall be entitled to raise any claims arising out of such directions.

32. Work during nights and holidays

Subject to any provision to the contrary contained in the contract no permanent work shall save as herein provided be carried on during the night or on holidays without the permission in writing of the Architect/Consultant, save when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the work in which case the contractor shall immediately advise the Architect/Consultant. However the provision of the clause shall not be applicable in the case of any work which becomes essential to carry by rotary or double shifts in order to achieve the progress and quality of the part of the works being technically required and continued with the prior approval of the Architect/consultant at no extra cost to the bank. All work at night after obtaining approval from competent authorities shall be carried out without unreasonable

noise and disturbance.

33. Compensation for delay/ Liquidity Damages:
Time is the essence of the contract. If the contractor fails to complete the work and clear the site on or before the dates fixed for completion, then the contractor shall without prejudice be liable to pay liquidation damage (LD) at 1 % of the final value of the contract for every week that the whole or the part of work remains incomplete. However, the total amount of LD to be paid under this condition shall not exceed 15% of the final value of the contract.

34. No compensation for restrictions of work
If at any time after acceptance of the tender bank shall decide to abandon or reduce the scope of work for any reason whatsoever and hence not require the whole or any part of the work to be carried out, the Architect/Consultant shall give notice in writing to that effect to the contractor and the contractor shall act accordingly in the matter.

The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the work fully but which he did not derive in consequence of the foreclosure of the whole or part of the work.

Provided that the contractor shall be paid the charges on the cartage only of materials actually and bona fide brought to the site of the work by the contractor and rendered surplus as a result of the abandonment, curtailment of the work or any portion thereof and then taken back by the contractor, provided however that the Architect/Consultant shall have in such cases the option of taking over all or any such materials at their purchase price or a local current rate whichever is less. In case of such stores having been issued from bank stores and returned by the contractor to stores, credit shall be given to him at the rates not exceeding those at which were originally issued to the contractor after taking into consideration and deduction for claims on account of any deterioration or damage while in the custody of
The contractor and in this respect the decision of Architect/Consultant shall be final.

35. Suspension of work
i)The contractor shall, on receipt of the order in writing of the Architect/Consultant (whose decision shall be final and binding on the contractor) suspend the progress of works or any part thereof for such time and in such manner as Architect/ Consultant may consider necessary so as not cause any damage or injury to the work already done or endanger the safety thereof for any of following reasons.

a) On account any default on the part of the contractor, or

b) For proper execution of the works or part thereof for reasons other than the default of the contractor, or

c) For safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Architect/Consultant.

ii) If the suspension is ordered for reasons (b) and (c) in sub Para (i) above:
The contractor shall be entitled to an extension of time equal to the period of every such suspension. No compensation whatsoever shall be paid on this account.

36. Action when the whole security deposit is forfeited

In any case in which under any clause or clauses of this contract, the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit the Architect/Consultant shall have the power to adopt any of the following course as they may deem best suited to the interest of the bank.

a) To rescind the contract of which rescission notice in writing to the contractor by the Architect/Consultant shall be conclusive evidence) and in which case the security deposit of the contractor shall be forfeited and be absolutely at the disposal of bank.

b) To employ labour paid by the bank and to supply materials to carry out the work, or any part of the work, debiting the contractor with the cost of the labour and materials (the cost of such labour and materials as worked out by the Architect/ Consultant shall be final and conclusive against the contractor) and crediting him with the value of the work done, in all respects in the same manner and at the same manner and at the same rates as if it had been carried out by the contractor under the terms of this contract the certificate of Architect/Consultant as to the value of work done shall be final and conclusive against the contractor.

c) To measure up the work of the contractor, and to take such part thereof as shall be unexecuted, out of his hands, and to give it to another contractor to complete in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him (of the amount of which excess the certificates in writing of the Architects/ Consultant shall be final and conclusive) shall be borne by original contractor and may be deducted from any money due to him by bank under the contract or otherwise, or from his security deposit or the proceeds of sale thereof, or sufficient part thereof.

In the event of any of above courses being adopted by the bank the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any material or entered into any engagements or make any advances on account of, or with a view to the execution of the work or the performance of the contract and in case the contract shall be rescinded under the provision aforesaid, the contractor shall not be entitled to recover or to be paid any sum or any work thereto for actually performed under this contract, unless, and until the Architect/Consultant will have certified in writing the performance of such work and the value payable in respect thereof, and he shall only be entitled to be paid the value so certified.

37. Owner's Right to Terminate the Contract

If the contractor being an individual or a firm commit any 'Act of Insolvency' or shall be adjudged an insolvent or being an incorporated company shall have an order for compulsory winding up voluntarily or subject to the supervision of Government and of the Official Assignee of the liquidator in such acts of insolvency or winding up shall be unless within seven days after notice to him to do so, to show to the reasonable satisfaction of the Architect/Consultant that he is able to carry out and fulfill the contract, and to give security therefore if so required by the Architect/Consultant.

Or if the contractor (whether an individual firm or incorporated Company) shall suffer execution to be issued or shall suffer any payment under this contract to be attached by or on behalf of any of the creditors of the contractor.

Or shall assign or sublet this contract without the consent in writing of the bank through the Architect/Consultant or shall charge or encumber this contract or any payment due to which may become due to the contractor there under.

a) Has abandoned the contract; or

b) Has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for 14 days after receiving from the bank through the Architect/Consultant written notice to proceed, or

c) Has failed to proceed with the works with such diligence and failed to make such due progress as

would enable the works to be completed within the time agreed upon, or has failed to remove the materials from the site or to pull down and replace work within seven days after written notice from the bank through the Architect/ Consultant that the said materials were condemned and rejected by the Architect/ Consultant under these conditions; or has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this contract to be observed and performed by the contractor for seven days after written notice shall have been given to the contractor to observe or perform the same or has to the detriment of good workmanship or in defiance of the bank's or Architect's/Consultant's instructions to the contrary subject any part of the contract. Then and in any of said cases the bank and or the Architect/Consultant, may not withstanding any previous waiver, after giving seven days notice in writing to the contractor, determine the contract, but without thereby affecting the powers of the Bank or the Architect/Consultant or the obligation and liabilities of the contractor the whole of which shall continue in force as fully as if the contract had not been so determined and as if the works subsequently had been executed by or on behalf of the contractor. And, further the bank through the Architect/Consultant, their agents or employees may enter upon and take possession of the work and all plants, tools, scaffoldings, materials, sheds, machineries lying upon the premises or on the adjoining lands or roads, use the same by means of their own employees or workmen in carrying on and completing the work or by engaging any other contractors or persons to complete the work and the contractor shall not in any was interrupt or do any act, matter or thing to prevent or hinder such other contractor or other persons employed for completing and finishing or using the materials and plant for the works.
When the works shall be completed or as soon thereafter as convenient the Bank or the Architect/Consultant shall give a notice in writing to the contractor to remove his surplus materials and plants and should the contractor fail to do so within 14 days after receipt thereof by him the bank sell the same by public auction after due publication and shall adjust the amount realized by such auction. The contractor shall have no right to question any of the act of the bank incidental to the sale of the materials etc.

38. Certificate of Payment

The contractor shall be entitled for payment as per the certificates issued by the Architect/ Consultant. The certificate of the Architect will be scrutinized by concerned

engineer of bank who will pass the bill for payment. Payment will be made to the contractor within 10 working days from the date of passing of the Bill by the concerned engineer of bank. The Bank shall deduct the statutory recoveries and other dues including the retention amount from bill passed for payment.

Provided always that the issue of any certificate by the Architect/Consultant during the progress of works or completion shall not have effect as certificate of satisfaction or to relieve the contractor from his liability under this clause.

The Architect/Consultant shall have power to withhold the certificate if the work or any part thereof is not carried out to their satisfaction.

The Architect/Consultant may by any subsequent certificate make any corrections required in previous certificate.

The Bank shall reserve its liberty to modify the certificate of payment as issued by the Architect/Consultant from time to time while making the payment as deemed fit and necessary.

The contractor shall submit interim bills only after taking actual measurements and properly recorded in the Measurement book (M.B).

The contractor shall not submit interim bills less than 25% of contract value (i.e. the actual value of work done by him equal to the 25% billed amount) and the minimum interval between two such bills shall be 10 days. The final bill may be submitted by contractor within a period of one month from the date of virtual completion and Architect/Consultant shall issue the certificate of payment within a period of 15 days. The bank shall pay the amount of final bill within a period of 15 days from the date of issue of certificate provided there is no dispute in respect of rates and quantities. The contractor shall submit the interim bills in the prescribed format with all details.

39. Payment to Contractors:

Payment will be released only after completion of the work to the satisfaction of the Bank. However, interim bills after certification of architect will be considered subject to ceiling as mentioned clause 37 of the tender. This is an item rate tender. The quantities given in the schedule of items are approximate & payment shall be made only for the quantities executed as per the actual measurement. The contractor is not entitled for any sort of compensation towards the materials procured & stored in excess of the measured quantity, if any.

40. Settlement of Disputes and Arbitration

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications, design, drawings and instructions herein before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications,

estimates, instructions, orders or these conditions or otherwise concerning the work or the execution or failure to execute the same, whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter:

i)If the contractor considers that he is entitled to any extra payment or compensation in respect of the works over and above contracted works undertaken at the request of bank and duly certified by the Architect which have been disallowed by bank. The contractor shall forthwith give notice in writing of his claim, or dispute to the bank and endorse a copy of the same to the Architect, within 30 days from the date of disallowance thereof or the date of deduction or recovery. The said notice shall give full particulars of the claim, grounds on which it is based and detailed calculations of the amount disputed. Thereafter the dispute shall be taken up in

arbitration.

It is also a term of this contract that no person other than a person appointed by such General Manager aforesaid should act as arbitrator who shall be a PWD engineer of the Government of Andhra Pradesh with rank not less than the rank of an Executive Engineer.

The arbitration shall be conducted in accordance with the provisions of the Arbitration & Conciliation Act 1996 or any statutory modification or reenactment thereof and the rules made there under. The fee claimed by the arbitrator shall be shared equally by the parties. The decision of the Arbitrator is final and binding on the parties. The Courts at Chitoor alone shall have jurisdiction in respect of settlement of all disputes arising out or in connection with the contract.

41. Method of Measurement

Unless otherwise mentioned in the schedule of quantities or in mode of measurement, the measurement will be on the net quantities or work produced in accordance with up to date. Rules laid down by the Bureau of Indian Standards. In the event any dispute/disagreement the decision of the Architect/Consultant shall be final and binding on the contractor.

42. Maintenance of Registers

The contractor shall maintain the following registers at site of work and should produce the same for inspection of Bank/Architect/Consultant whenever desired by them. The contractor shall also maintain the records/registers as required by the local authorities/Government from time to time.

i. Register for secured advance ii. Register for hindrance to work iii. Register for running a/c bill

iv. Register for labour.

43. Force Majeure

43.1. Neither contractor nor Bank shall be considered in default in performance of their obligations if such performance is prevented or delayed by events such as war, hostilities revolution, riots, civil commotion, strikes, lockout, conflagrations, epidemic, accidents, fire, storms, floods, droughts, earthquakes or ordinances or any act of god or for any other cause beyond the reasonable control of the party affected or prevented or delayed. However a notice is required to be given within 30 days from the happening of the event with complete details, to the other party to the contract, if it is not possible to serve a notice, within the shortest possible period without delay.

43.2. As soon as the cause of force majeure has been removed the party whose ability to perform its obligations has been affected, shall notify the other of such cessation and the actual delay incurred in such affected activity adducing necessary evidence in support thereof.

43.3. From the date of occurrence of a case of force majeure obligations of the party affected shall be suspended during the continuance of any inability so caused. With the cause itself and inability resulting there from having been removed, the agreed time of completion of the respective obligations under this agreement shall stand extended by a period equal to the period of delay occasioned by such events.

43.4. Should one or both parties be prevented from fulfilling the contractual obligations by a state of force majeure lasting to a period of 6 months or more the two parties shall mutually decide regarding the future execution of this agreement.

44. Local Laws, Acts, Regulations

The contractor shall strictly adhere to all prevailing labour laws inclusive of contract

labour (regulation and abolition act of 1970) and other safety regulations. The contractor shall comply with the provision of all labour legislation including the latest requirements of all the Acts, laws, any other regulations that are applicable to the execution of the project. He shall provide access and inspection of the registers to the concerned inspecting authority of the state and central government. Any compliance required to be carried out shall be forthwith complied with by the contractor and informed to the Bank. i)Minimum Wages Act, 1948 (Amended) ii)Payment of Wages Act 1936 (Amended) iii)Workmen's Compensation Act 1923 (Amended) iv)Contract Labour Regulation and Abolition Act 1970 and Central Rules 1971 (Amended) v)Apprentice Act 1961 (Amended) vi)Industrial Employment (Standing Order) Act 1946 (Amended) vii)Personal Injuries (Compensation Insurance) Act 1963 and any other modifications viii)Employees' Provident Fund and Miscellaneous Provisions Act 1952 and amendment thereof

45. SAFETY CODE: SAFETY MEASURES AT SITE:

All personnel at site should be provided with Helmets and Safety Boots with some Identification Mark. Visitors also should be provided with Helmets. It should be ensured that these are used properly. First Aid Box should be kept at site with all requisite materials. No one should be allowed to inspect / work at a height without Safety Belt / Helmet.

46. WARRANTY:

The materials supplied should have unconditional comprehensive warranty of 12 months from the date of issue of Virtual completion certificate. During the warranty period of 12 months, the contractor has to provide service support for the above items & attending to all repairs & replacement of defective parts if any shall be borne by the contractor without any extra cost to the bank.

47. On successful completion of entire works covered by the contract to the full satisfaction of the Bank, the contractor shall ensure that the following works have been completed to the satisfaction of the bank:

a) Clear the site of all scaffolding, wiring, pipes, surplus materials, contractor's labor, equipment and machinery. b) Demolish, dismantle and remove the contractor's site office, temporary works, structures including labor sheds/camps and constructions and other items and things whatsoever brought upon or erected at the site or any land allotted to the contractor by the Owner and not incorporated in the permanent works.

c) Remove all rubbish, debris etc. from the site and the land allotted to the contractor by the Owner and shall clear, level and dress, compact the site as required by the Bank.

d) Shall put the Bank in undisputed custody and possession of the site and all land allotted by the Owner.

e) Shall hand over the work in a peaceful manner to the Owner.

f) All defects / imperfections have been attended and rectified as pointed out by the Owner to the full satisfaction of Owner. +The quantities indicated are approximate. On award of work and approval of the scheme, the contractor has to work out the actual quantities of each item of work and intimate to the Owner. No increase in cost shall be given for any additional quantities of any item given in the tender.

48. Special Instructions:

i. All materials to be used in execution of project shall be of first class quality, recommended make, I.S.I. marked and shall be approved by Owner before its application.

ii. The contractor shall be paying all testing charges required for testing of

materials and samples as and when taken by Owner/ The Contractor shall arrange necessary labour and transportation to facilitate testing of samples/materials. Frequency of testing materials/samples shall be as per related I.S. codes.

iii. The work should be carried out in truly professional manner, neatly finished with proper line, level and plumb. Cleanliness and finishing of the job is of utmost importance. Hence the job should be done most carefully with best workmanship. For all finishing jobs samples should be approved from the owner before completely executing the work.

iv. The Owner/ should be immediately informed for any discrepancy in drawings, specifications and instructions in the execution of job at site before actual execution of particular item having discrepancy.

v. Any item found to be having been executed with poor workmanship or materials of inferior quality then the contractor shall have to rectify /reconstruct the work as specified by Owner/ No extra charge will be admissible in such case. If Contractors fails to do so, the Owner reserved the right to rectify/reconstruct the work through some other agency at the expenses of contractor.

vi. The schedule of activities as submitted by the contractor shall have to be strictly adhered to. Regular progress reports shall have to be submitted by the contractor giving all details for monitoring of the schedule.

vii. The Contractor shall take charge of site and if site clearance is involved, he shall attend to it. (If such type of unforeseen and unavoidable situation occurs, in that case actual labour employed for such job shall be paid including overheads and profit).

viii. Special care is to be taken for cleanliness of the site. After the end of day's work, the site should be cleaned immediately.

ix. The contractor shall have to co-operate with the agencies executing other works in the same area.

x. While executing the work, the contractor shall ensure safety and security of the property of the Owner so as to avoid theft etc.

Place:

Signature of bidder with seal

Mandatory information –Technical bid

(To be furnished on the letterhead of the applicant)

Important:

1. Please type or write in capital letters.

2. The contractors, vendors and who intend to apply for more than one trade have to apply foreach trade separately

3. **Attach copies of the supporting documents**.

4. Attach extra sheets with Sr. No if the space found insufficient.

5. Applications of those agencies who do not furnish above information will be summarily rejected.

1.1	Name of the applicant / organization	
1.2	Address of the Registered Office	

1.3	Address of office at HeadOffice. (With Phone Nos, Fax Nos& Email ID & Contact Person) and address ofoffice Chitoor	
1.3.1	Contact no.	
1.3.2	Fax no.	
1.3.3	Email id	
1.3.4	Contact Person	
2	Year of establishment	
3	Type of the organization (Whether sole proprietorship, Partnership, Private Ltd. or Ltd. Co. etc.) (Enclose certified copies ofdocuments as evidence)	
4	Name & qualification of the Proprietor / Partners / Directors of the Organization / Firm a) b) Enclose certified copies ofdocument as evidence	

5	Details of registration – Whether Partnership firm, Company, etc. Name of Registering Authority, Dateand Registration number. Enclose certified copies ofdocument as evidence	
6	Whether registered with Government / Semi – Government / Municipal Authorities of any other Public Organization and if so, in which class and sincewhen? (Enclose certified copies of document as evidence)	
7	a. No. of years of experience in the field and details of work in any otherfield. b. Whether ISO certified,furnish the Details.	
8	Area of business activities other than construction, if any, and place of business.	
9	Registration of firm underShop & Establishment Act 1948	
10	Address of Head office through which the proposedwork of the Bank will be handled	
10.1	Name & Designation of officer in charge.	
11	Yearly turnover of the organization during last 3 years (year wise) (Avg. turnover of last 3 years as per the respective categorysupported by the audited balance sheet and	

	Profit & Loss A/c (Audited) for thelast –3- years.	
11.1	Average turnover in FY	
11.2.1	2018-19	
11.2.2	2019-20	
11.2.3	2020-21	
12	Name & Address of Bankers	
13	Enclose copy of latest income tax clearance certificate.	
14	PAN No.	
15	Details of registration	
16	Service Tax/GST Registration No.	
17	Excise No.	
18	Detailed description and value of works done (Proforma-1) and works on hand (Proforma-2)	
19	Empanelment with other Companies/PSUs	
20	Other infrastructural information to be used/ referred for this project (Proforma-4) List of availableplants, machineries equipment’s etc.	
21	Furnish the names of –3- responsible persons along with their designation,	

	address, Tel. No. etc., for whose organization, you have completed the above-mentioned jobs and who will be able to certify about the performance of your organization.	
21.1	Name	
	Address	
	Contact no.	
	Email id	
	Organization	
21.2	Name	
	Address	
	Contact no.	
	Email id	
	Organization	
21.3	Name	
	Address	
	Contact no.	
	Email id	

	Organization	
22	Whether any Civil Suit / litigation arisen in contracts executed / beingexecuted during the last 10years. If yes, please furnishthe name of the project, employer, Nature of work, Contract value, work order and brief details of litigation. Give name of court, place, and status of pending litigation.	Attach a separate sheet if required.
23	Information relating to whether any litigation is pending before any Arbitrator for adjudication of any litigation or else any litigation was disposed off during the last ten years by an arbitrator. If so, the details of such litigation are required to be submitted.	
24	Have you been ever disqualified or levied penalty by the bank in past for non fulfilment of the contractual obligations. If yes, please provide details.	
25	Have you in past carried out any works for Sapthagiri Grameena Bank or its subsidiaries? If yes, give details.	
26	GST Number	

PROFORMA – 1

LIST OF PROJECTS EXECUTED BY THE ORGANISATION DURING THE LAST 7 YEARS
(Minimum Value of Work done not less than 40 % of the respective category)

No	Name of work/ project with address.	Name &full postal addres sof the owner. Specify	Contract Amount (`)	Stipulated time of completion (Years)	Actual time of completion (years)	Any other relevant information. Actual amount of the Project,if increased, give reasons.	Enclose client's certificate for satisfactory completion.
1	2	3	4	5	6	7	8

1. Information has to be filled up specifically in this format**. "Please do not write remark "Asindicated in Brochure".**

PROFORMA – 2

LIST OF IMPORTANT WORKS ON HAND

(Minimum Value of Work done not less than 40 % of the respective category)

Sl. No.	Name of work/ project with address.	Name & full postal address of the owner. Specify whether Govt. undertaking along with name, address and contact nos.of –2- persons (Engineers or top officials of the organization)	Contract Amount (`) with copy of Work Order & completion certificate from project in-charge.	Stipulated time of completion (Years)	Present status of the project	Any other relevant information.
1	2	3	4	5	6	7

N**ote:-**Information has to be filled up specifically in this format.

PROFORMA – 3

DETAILS OF KEY PERSONNEL, GIVING DETAILS ABOUT THEIR TECHNICAL QUALIFICATION &EXPERIENCE INCLUDING THEIR IN-HOUSE ESTABLISHMENT.

Sr. No	Name and designation	Age	Qualification	Experience	Nature of works handled	Name of the projects handled along with amounts	Date from which employed inyour organization.	Indicate details of experiencee for similar projects.
1	2	3	4	5	6	7	8	9

1. **Information has to be filled up specifically in this format.**

2. **Indicate other points, if any, to show your technical competence to indicate any importantpoint in your favour.**

PROFORMA – 4

Details of Infrastructure in Office

Sr.No.	Items	Numbers	Details
1	Office Premises, Area,etc.		
2	Fax M/c		
3	Email id		
4	Telephones		
5	Other instruments		
6	Details of WorkshopSetup		
	(i)		
	(ii)		
	(iii)		

I/We confirm that to the best of our knowledge this information mentioned by me/us in Annexure A (Proforma 1,2,3 &4) is authentic and accept that any deliberate concealment will amount to disqualification by the Bank at any stage.

DECLARATION ACCEPTING TERMS AND CONDITIONS OF THE TENDER

Date_____

To:
Sapthagiri Grameena Bank,
HEAD OFFICE, VISHAL MART
BUILDING, 3RD FLOOR,
VELLORE ROAD, CHITOOR-
517 001

Dear Sirs,

Ref. Tender for Renovation of Existing Civil for Regional Office (First floor) for Sapthagiri Grameena Bank at Gudivada, Vijayawada (D)

We, the undersigned have examined the above-mentioned Tender document, including amendment/corrigendum no._____, dated____(if any), the receipt of which is hereby confirmed. We now undertake to execute the works in conformity with your above-referred document for the sum as finalized after tendering process, attached herewith in a separate envelope and made part of this tender.

If our tender is accepted, we undertake to execute the works mentioned above, in accordance with the time schedule specified in the tender document

We further confirm that, if our tender is accepted, we shall provide you with a security deposit of required amount in an acceptable form, for due performance of the contract. We agree to keep our tender valid for the period mentioned in the tender. We also accordingly confirm to abide by this tender up to the aforesaid period and this tender may be accepted any time before the expiry of the aforesaid period. We further confirm that, until a formal contract is executed, this tender read with your written acceptance thereof within the aforesaid period shall constitute a binding contract between us.

We further understand that you are not bound to accept the lowest or any tender you may receive against your above-referred tender enquiry.

We confirm that we do not stand deregistered/banned/blacklisted by any Govt. Authorities.

We confirm that we fully agree to the terms and conditions specified in above mentioned Tender document, including amendment/ corrigendum if any

(Signature & seal with date)

(Name and Designation) Duly authorized to sign Tender for and on behalf of M/s.___

Place:

Date:

FORMAT OF AGREEMENT TO BE EXECUTED WITH L1 CONTRACTOR

This agreement is made and executed at Chitoor, on this_____day of_ _____ 20__ between Sapthagiri Grameena bank, a body corporate constituted under the Banking Companies (Acquisition & Transfer of undertaking) Act 1970 having its HEAD OFFICE, VISHAL MART BUILDING, 3RD FLOOR, VELLORE ROAD, CHITOOR-517 001, represented by___ and hereinafter called the 'Employer' and_____No__ _____ represented by its director/partner/proprietor/_____and hereinafter called the 'Contractor'. The term `The Employer' and `The Contractor' shall mean and include its successors and assignees.

Whereas the Employer is desirous to carry out Interior furnishing works of Chitoor, Head Office.

And whereas the Employer called for the tenders for the work enumerated in the tender documents annexed to this agreement.

And whereas the contractors have quoted their rates as given in the tender to the Employer on……..for the works enumerated in the tender documents amounting to Rs…….. (Rupees ……..) only.

The value of the offer stands as below:

Total amount quoted on	Rs.
Rebate offered: __% on	Rs.
Contract Value:	Rs.

And the parties having agreed upon the terms and conditions on which the contractors have to carry out the works for the Employer, the parties execute this agreement incorporating the agreed terms.

The contractors have agreed to execute the works enumerated in the tender booklet at the rates quoted therein less____% (percent) rebate.

CLAUSES

1. It is hereby agreed that the Employer will not pay any mobilization advance towards the work.

2. It is agreed that the contractors will submit the interim bills for values of 25% of the tendered amount.

3. It is hereby agreed and declared that all the provisions of the said specifications, conditions of contract enumerated in the tender booklet have been carefully read and understood by the contractors and the schedule of rates including the general instructions and the specifications contained in the tender schedule shall be binding upon the contractors and upon the employer as if the same had been incorporated herein and shall be read and as part of these presents except to

the extent such terms and modified under this agreement.

4. These articles of agreement shall be the main and dominant contract document between the parties and shall be read, interpreted and understood in the context of and supplemented by the provisions referred to in other clauses in this agreement and the schedule of contract form as signified and accepted by the contractors appended as an enclosure to this agreement.

5. The decision of the Employer shall be final and the contractors shall not object to the decision of the employer in this case.

6. The rates quoted by the contractors in the tender booklet shall include all direct and contingent expenses

7. The contractors shall be solely and entirely responsible for the procurement and collection of all the required building materials required for the execution of the entire works in all respects.

8. The site has been handed over to the contractors on _.

9. After the discussions with the employer, the contractors hereby agreed to complete the works in all respects before **6 months**. If the contractors do not hand over the building in all respects before 6 Months, they have to pay a penalty to the employer as per liquidated damages clause in the tender.

10. The contractors should submit their bills in stages

11. The contractors shall submit the bar chart and it should adhere to that particular date. If there is delay on stages of the work, the contractors have to pay the penalty as decided by the employer.

12. The rates quoted by the contractors shall be excluding of all the taxes as prevailing at on date and if there are any new taxes levied by the Government, the difference of tax shall be borne by the Employer.

13. The contractors shall be responsible for all the damages to the property and for any injury or loss, caused to the work or workmen and persons, animals or things employed by them. They shall effect insurance cover, as necessary and keep the employer fully indemnified and entirely free from all responsibilities in this regard. All repairs and damages caused by the contractors to the existing building during the construction period shall be carried out by the contractors at their own cost and expenses to the satisfaction of the employer/Architects.

14. In all the running bills certified by the architects, a retention amount of 8% of running bill amount excluding EMD will be held by the employer and will be released on final payment. The total security deposit (including EMD) at 5% of the final contract value will be deducted and released after completion of defects liability period of 12 Months. Any defects pointed out by the employer/architects during this period shall be made good by the contractors. In case, if the contractor fail to do so, then the employer shall have the authority to get the work done by other means and the expenditure incurred will be deducted from the security deposit or any other dues.

15. This contract is neither a fixed lumpsum contract nor a piece work contract, but is a contract to carry out the above mentioned work to be paid for, according to actual measured quantities at the rates contained in the schedule of rates and probable

quantities or as provided in the said conditions.

16. The employer hereby agrees to make the payments of the running bills within 15 days after certification from the architects.

17. The contractors have paid Demand Draft for a sum of Rs.61500./- by way of Earnest money deposit and this shall not carry any interest. The successful contractor agrees to submit the Initial security deposit equal to 2% of the accepted value of the tender (inclusive of EMD) within 14 days of date of award of work by way of Demand Draft in favour of Sapthagiri Grameena Bank payable at Chitoor.

18. It has been agreed upon that a percentage of the value of each running bill of the contractors shall be deducted from the bills towards the income tax at the prevailing rates. The same amounts will be remitted to the income tax departments and the TDS original certificate will be passed on to the contractors.

19. No escalation in rates will be considered for the completion of this project.

20. Rates quoted in the Schedule of quantities by the bidder shall remain valid throughout the execution and until completion of work within accepted period of completion as well as during authorized extension in period. If Bank decides to place work order for additional scope of work in the same premises or to amend the original work order for additional scope of work in the same premises, the contractor shall be bound to accept the same, at rates agreed in the original work order; provided such work order or amendment is issued prior to completion of the work contained in the original work order.

21. It has been agreed to accept the conditions of contract set forth

22. All statutory requirement such as labour act, state and central government insurance etc…, shall be the responsibilities of the contractors.

23. No other amounts whatsoever is payable by the employer towards lead and lift charges and all incidental charges, taxes local or general royalty payable to the government or local bodies etc…, of the region or on any other account.

24. All the materials should conform to ISI standard specifications and such standards as may be prescribed by the architects.

25. The contractors should make arrangements to provide barricading, and day and night watchman during the tenure of this contract at their own expenses.

26. In case of any conflict in the specifications, and the drawings, the decision of the architect shall be final and binding on the contractors. Should there be any disagreement between the architects and the contractors, the decision of the employer shall be final.

27. The rates quoted by the contractors in the tender booklet shall include all the cost of materials, labour transport charges, conveyance, and lifting charges, for materials required for successful completion of the work and any other incidental charges and all taxes that may be payable by the contractors.

28. Necessary pillars shall be constructed by the contractors for bench mark at no extra cost to the employer as directed by the architects.

29. Payments of any compensation damages to any of the laborers employed by the contractors shall be the inclusive responsibility of the contractors and the

contractors shall take care to insure their laborers. Compliance to all statutory obligations under state and central laws in this behalf shall be the responsibility of the contractors.

30. An order book shall be maintained in the work spot and the contractors shall sign in the order book in token of having one through the instructions issued by the inspecting officer and carryout the construction promptly and correctly.

31. The contractors shall take precautions against the damages for accident. No compensation will be allowed to the contractors for their tools, plant, materials lost or damages from any cause. The contractors shall be liable to make good the structure or plant damaged by any other cause at their own cost. The employer will not pay contractors any expenses or charges or repairing any damaged portion of the work done during the construction.

32. The contractors shall keep on site of works a qualified engineer as required as per the rules of regulations as their authorized representatives who will receive all the instructions fro m the employer architects or his authorized agent.

33. The employer/architects shall have the right to direct the contractors to progress the various items of works to the manner prescribed by the employer's engineer/ architect. The test of strength of the concrete shall be done by the contractors at their own cost.

34. All disputes and differences of any kind whatever arising out of or connecting with or touching with the contract of the carrying out of the works whether during the progress of the works or after completion and whether before or after the determination, abandonment or breach of the contract, shall be referred to and settled as per Clause 38 of the General conditions of Contract Arbitration and jurisdiction clause.

35. Should any matter pertaining to this contract were to be referred to a court of law, the courts in **Chitoor city** only shall have jurisdiction. Whenever it is not expressly provided or agreed upon, then any expenses will be met and or services provided by the contractors.

In witness whereof the employer and the contractors above mentioned have here to set their hands on the day, month and year first above mentioned.

Signed for and on behalf of the of the Contractor

Signed for and on behalf Bank

For M/s For SAPTHAGIRI GRAMEENA BANK

Witnesses: 1.

2.

From

……

DECLARATION

I/we,……
.

hereb
y declare that our firms/company is not blacklisted/debarred/no litigation pending with any of the Nationalized/PSUs/PSBs/State/Central Government.

If the information is found to be incorrect during the tender/execution of the project, we will be liable for legal action, forfeiture of EMD and the pending bills for payment.

Yours Sincerely,

PRE-CONTRACT INTEGRITY PACT

General

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on _ day of the month of_____YYYY, between, on one hand, Sapthagiri Grameena Bank, a body corporate constituted under the Banking Companies (Acquisition & Transfer of undertaking) Act 1970 having its Head Office at Vishal Mart Building, 3rd Floor, Vellore Road, Chitoor- 517 001) hereinafter referred to as the "BUYER" which expression unless repugnant to the context or meaning thereof shall mean and include its successors and assigns) of the First Part and M/s_____ _____represented by Shri._____ General Manager (hereinafter called the "BIDDER/SELLER" which expression shall mean and include unless the context otherwise requires, his successors and permitted assigns of the Second Part.

WHEREAS the BUYER proposes to procure _____ (Name of the equipment/item/service) and BIDDER/SELLER is willing to offer/has offered the equipment/item/service and

WHEREAS the BIDDER is a private company/public company/Government undertaking/partnership/registered export agency, constituted in accordance with the relevant law in the matter and the BUYER is a Public Sector Bank performing its functions on behalf of the President of India.

NOW, THEREFORE
To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:-

Enabling the BUYER to obtain the desired said equipment/item/service at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement and

Enabling BIDDER to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the BUYER will commit to prevent corruption, in any form, by its officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follow:

1. Commitments of the BUYER

1.1. The BUYER undertakes that no officials of the BUYER, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.

1.2. The BUYER will during the pre-contract stage, treat all BIDDERs alike and will provide to all BIDDERS the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that

particular BIDDER in comparison to other BIDDERs.

1.3. All the officials of the BUYER will report to the Bank/appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

2. In case any such preceding misconduct on the part of such official(s) is reported by the BIDDER to the BUYER with full and verifiable facts and the same is prima facie found to be

correct by the BUYER, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the BUYER and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the BUYER the proceedings under the contract would not be stalled.

3. <u>Commitments of BIDDERs</u>

4.

The BIDDER commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following:-

4.1. The BIDDER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BUYER, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.

4.2. The BIDDER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BUYER or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the Bank/Government for showing or forbearing to show favour or disfavor to any person in relation to the contract or any other contract with the Bank/Government.

4.3. *BIDDERs shall disclose the name and address of agents and representatives and Indian BIDDERs shall disclose their foreign principals or associates. Foreign Bidder: Name and address of agents and Representatives in India. Indian Bidder: Name and address of Foreign Principals / Associates

4.4. *We hereby disclose the payments to be made by us to agents/brokers or any other intermediary, in connection with this bid/contract.

4.5. * Bidder is engaged in defense supplies as Manufacturer / Integrator / Authorized Government sponsored export entity: Yes / No

If yes, we confirm we have not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way of recommend to the BUYER or any of its functionaries, whether officially or unofficially to the

award of the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.

4.6. The BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the BUYER or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.

4.7. The BIDDER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.

4.8. The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

4.9. The BIDDER shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the BUYER as part of the business relationship, regarding plans, technical proposals and business details, including

information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care lest any such information is divulged.

4.10. The BIDDER commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.

4.11. The BIDDER shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.

4.12. If the BIDDER or any employee of the BIDDER or any person acting on behalf of the BIDDER either directly or indirectly, is a relative of any of the officers of the BUYER, or alternatively, if any relative of an officer of the BUYER has financial interest/stake in the BIDDER's firm, the same shall be disclosed by the BIDDER at the time of filing of tender. *The term relative for this purpose would be defined in Section 6 of the Companies Act 1956.*

4.13. The BIDDER shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the BUYER.

5. Previous Transgression

5.1. The BIDDER declares that no previous transgression occurred in the last three years immediately before signing of the Integrity Pact, with any other company in any country in respect of any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or Public Sector Banks in India or any Government Department in India that could justify BIDDER's exclusion from the tender process.

5.2. The BIDDER agrees that if it makes incorrect statement on this subject, BIDDER can be disqualified from the tender process or the contract, if already awarded can be terminated for such reason.

6. Earnest Money (Bid Security)

6.1. While submitting commercial bid, the BIDDER shall deposit an amount Rs.61500./-(to be specified in RFP) as Earnest Money/Bid Security, with the BUYER through any of the following instruments:

i) Bank Draft or Pay Order in favour of Sapthagiri Grameena Bank

ii) A confirmed guarantee by an Indian Nationalised Bank/Scheduled Commercial Bank other than RRBs/ Co-operative Banks, promising payment of the guaranteed sum to the BUYER on demand within three working days without any demur whatsoever and without seeking any reasons whatsoever. The demand for payment by the BUYER shall be treated as conclusive proof of payment.

iii) Any other mode or through any other instrument (to be specified in the RFP)

6.2. The Earnest Money/Security Deposit shall be valid upto to submission of Bank Guarantee covering warranty period/post warranty period for performance of the Contract.

6.3. In case of the successful BIDDER a clause would also be incorporated in the Article pertaining to Performance Bond in the Purchase Contract that the provisions of Sanctions for Violation shall be applicable for forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

6.4. No interest shall be payable by the BUYER to the BIDDER on Earnest Money/Security Deposit for the period of its currency.

7. Sanctions for Violations

7.1. Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) shall entitle the BUYER to take all or any one of the following actions, wherever required:-

i) To, immediately, call off the pre-contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceedings with the other BIDDER(s) would continue.

ii) The Earnest Money/Security Deposit (in pre-contract stage) and/or Security Deposit/Performance Bond (after the contract is signed) shall stand forfeited either

fully or partially, as decided by the BUYER and the BUYER shall not be required to assign any reason thereof.

iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER

iv) To recover all sums already paid by the BUYER, and in case of an Indian BIDDER with interest thereon at 2% higher than the prevailing Base Rate of Sapthagiri Grameena Bank, while in case of a BIDDER from a country other than India with interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to the BIDDER from the BUYER in connection with any other contract for any other office/department/section/stores, such outstanding payment could also be utilized to recover the aforesaid sum and interest.

v) To encash the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the BUYER, along with interest.

vi) To cancel all or any other Contracts with the BIDDER. The BIDDER

shall be liable to pay compensation for any loss or damage to the BUYER resulting from such cancellation/rescission and the BUYER shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.

vii) To debar the BIDDER from participating in future bidding processes of the Government of India/Public Sector Banks for minimum period of five years, which may be further extended at the discretion of the BUYER.

viii) To recover all sums paid in violation of this Pact by BIDDER(s) to any middleman or agent or broker with a view to securing the contract.

ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the BUYER with the BIDDER, the same shall not be opened.

x) Forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact

7.2. The BUYER will be entitled to take all or any of the actions mentioned at para 6.1 (i) to (x) of this Pact also on the Commission by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER), of an offence as defined in Chapter IX of the Indian Penal code, 1860 or Prevention of Corruption Act 1988 or any other statute enacted for prevention of corruption.

7.3. The decision of the BUYER to the effect that a breach of the provision of this Pact has been committed by the BIDDER shall be final and conclusive on the BIDDER. However, the BIDDER can approach the Independent Monitor(s) appointed for the purpose of this Pact.

8. Fall Clause

8.1. The BIDDER undertakes that it has not supplied/is not supplying similar product/systems or subsystems at a price lower than that offered in the present bid in respect of any other Ministry/Department of the Government of India or PSU/PSB and if it is found at any stage that similar product/systems or subsystems was supplied by the BIDDER to any ministry/Department of the Government of India or a PSU/PSB at a lower price, then that very price, with due allowance for elapsed time, will be applicable to the present case and the difference in the cost would be returned by the BIDDER to the BUYER, if the contract has already been concluded.

9. Independent Monitors

9.1. The BUYER has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance Commission.

9.2. The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact

9.3. The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.

9.4. Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement, including minutes of meetings

9.5. As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the BUYER.

9.6. The BIDDER(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the BUYER including that provided by the BIDDER. The BIDDER 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 Subcontractors. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER/Subcontractor(s) with confidentiality.

9.7. The BUYER 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 parties. The parties will offer to the Monitor the option to participate in such meetings.

9.8. The Monitor will submit a written report to the designated Authority of BUYER/Secretary of the Department/General Manager, within 8 to 10 weeks from date of reference or intimation to him by the BUYER / BIDDER and should the occasion arise, submit proposals for correcting problematic situations.

9.9. In case of sub-contracting, the Principal contractor shall take the responsibility of the adaptation of Integrity Pact (IP) by the Sub- contractor

10. Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the BUYER or its agencies shall be entitled to examine all the documents including the Books of Accounts of the BIDDER and the BIDDER shall provide necessary information and document in English and shall extend all possible help for the purpose of such examination.

11. Law and Place of Jurisdiction

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the BUYER.

12. Other Legal Actions

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

13. Validity

13.1. The validity of this Integrity Pact shall be from date of its signing and extend up to 5 years or the complete execution of the contract to the satisfaction of both BUYER and the BIDDER/SELLER, including warranty period, whichever is later. In case BIDDER is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract.

13.2. Should one or several provisions of this Pact turn out to be invalid, the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

14. The parties signing the Integrity Pact (IP) shall not approach the courts while representing the matters to IEMs and he/she will await IEMs decision in the matter.

15. The parties hereby sign this Integrity Pact at_____ on ___

BUYER
Name of the Officer:
Designation:
Dept:

BIDDER
CHIEF EXECUTIVE OFFICER

Witness
1. _____

2. _____

Witness
1. _____

2. _____

* Provisions of these clauses would need to be amended / deleted in line with the policy of the BUYER in regard to involvement of Indian agent of foreign suppliers.

CIVIL WORKS TECHNICAL SPECIFICATION

1. EARTH WORKS

EXS – 1: Excavation

The places where excavation is directed to be done shall be cleared of all shrubs, weeds, grass and vegetation including roots. Where necessary and if so, directed the excavated earth must be deposited in layers of 15 cms and the clods should be broken. During excavation if so directed 'dead-men' (of volume not more than 5% of the excavation volume shall be left at the places directed for verification of the dimensions of excavation. These dead men shall be removed, and earth deposited at places shown before full rate is paid. Alternately or in addition to 'dead-men' if so directed block levels at intervals as directed will be jointly taken and recorded by the contractor's representative and clients/Architect/Consulting Engineer's representative before starting of excavation and after completion. Recording of block levels or leaving of dead men may be avoided in the case of narrow foundations and trenches if so, directed by the Architect/Consulting Engineer.

Measurement shall be taken, and the quantities calculated in accordance with ISI code 1200 (latest issue)

The rate quoted shall include bailing or otherwise removing all water which may accumulate in the excavation from all causes, trimming of all sides plumber otherwise as directed. Dismantling removing and stacking as directed existing water pipes and or soil pipes within the excavation portion.

In the case of soft rock and hard rock, if required by the Architect/Consulting Engineer, the excavated stuff shall be properly stacked or disposed of in places as directed. The quantity of these stacks shall be measured, and payment will be based if necessary on the net quantities after deducting voids from the measured quantities as per table below

Soft rock 35%
Hard rock 40%

Excavation in hard rock: Rock, which is in solid beds, which can only be removed either by blasting or by wedging or chiseling, shall be treated as hard rock. A boulder or detached rock measuring one cubic meter or more, shall also be treated as hard rock if the same cannot be removed without blasting, wedging or chiseling

Where hard rock is met with and blasting operations are considered necessary. The contractors shall intimate about the same to the clerk of works/engineer. The contractor shall obtain license from district/public authorities for carrying out blasting work as well as for obtaining transporting and storing explosives as per 'explosive' rules 1940 or as amended.

Blasting operations shall be carried out under supervision of a responsible licensed operator of the contractor during certain specified hours, preferably during lunch break as approved in writing by the Architect/Consulting Engineer. The operator shall be conversant with the rules of blasting.

The operator should have the valid blasting license. Proper precautions for safety of persons shall be taken. Red flags shall be prominently displayed around the area to be blasted and all people on work

except those who light the fuses shall be withdrawn to a safe distance of not less than 300 meters from the blast. Blasting shall not be done within 100 meters of an existing masonry or any other kind of structure unless special precautions are taken by heavy blanketing etc. on the special approval of Architect/Consulting Engineer.

Where blasting is not practicable or prohibited, excavation shall be done by wedging or chiseling and it shall be restricted to the quantity required to enable the necessary foundation etc. to be put in, in case the dimension of trenches exceed those shown in drawings the excess quantity shall not be paid for.

Excavation shall be to the exact length, width and depth shown or figures in the drawing or as directed by the Architect/Consulting Engineer, if excavated to greater length, width or depth than shown or required the extra work occasioned thereby shall be done at contractor's expenses. However, extra width where necessary for providing working space for further work will be permitted and paid for such extra will be limited to the allowance provided in ISI code 1200. Extra depth shall be brought up by plain cement concrete filling 1:5:10 proportion and extra length and width filled in by rammed earth or murrum or if the Architect/Consulting Engineer think it necessary for stability of the work by 1:5 concrete as directed at contractor's cost. Water accumulated within the trenches during the progress of work from whatever causes shall be bailed or pumped out at the contractor's own expenses. Foundations or trenches shall be kept free of water while masonry or concrete works are in progress.

2 and 3. PCC, RCC FORMWORK AND REINFORCEMENT WORKS

CS – 1 : Concrete General

Proportion of ordinary cement concrete will be expressed as M10, M15, M20 etc. in the specification. The first figure will be the quantity of cement by volume, the second figure will be dry coarse sand (fine aggregate) by volume and third figure will be the quantity of course aggregate by volume. Cement shall be measured by weight. The weight is to be derived on the basis that 1 cubic metre of cement will weigh 1440 kgs or one full bag of 50 kgs. will be assumed to be 35 ltrs. When the sand is wet or moist suitable correction for bulking is to be given while proportioning. Architect/Consulting Engineer may allow measuring cement by volume.

Unless otherwise specified the rates for all RCC will be exclusive of reinforcements. Reinforcements will be paid for separately.
Unless otherwise stated, for all RCC work the size of coarse aggregate will be 20mm and down size.

CEMENT CONCRETE PLAIN AND REINFORCED

A) Cement

Cement shall comply in every respect with the requirements of the latest publication of IS: 269 and unless otherwise specified, ordinary Portland cement shall be used. No other make of cement but that approved by the Architect/Consulting Engineer/ Employer will be allowed on works and the source of supply not be changed without approval of the Architect/Consulting Engineer in writing. Test certificates to show that the cement used fully complies with the relevant I.S specifications shall be submitted to the Architect/Consulting Engineer and not withstanding this the Architect/Consulting Engineer may at their discretion order that the cement brought to site and which they may consider damaged or of doubtful quality for any reasons. Whatsoever shall be retested in an approved testing

laboratory and fresh certificate of its soundness shall be produced. Cement ordered for retesting shall not be used for any work pending results of retest. Cement shall be stored and neatly packed in piles not exceeding 10 bags high in weatherproof sheds with raised wooden plank flooring to prevent deterioration by dampness or intrusion of foreign matter. It shall be stored in such a way as to allow the removal and use of cement in chronological order of receipt, i.e. the first received being first used. Cement deteriorated and/or clotted shall not be used on work but shall be removed at once from the site. Daily record of cement received and consumed shall be maintained by the contractor in an approved from and a copy submitted to the Architect/Consulting Engineer/Employer once a week.

B) Fine Aggregates

Sand shall conform to IS: 383. It shall pass through I.S sieve 4.75mm (3/16 B.S) test sieve, leaving a residue not more than 5% it shall be from a natural source or crushed stone screedings. It shall be washed if directed to reduce the percentage of deleterious substances to acceptable limits. Sand shall not contain any trace of salt and sand containing any trace of salt shall be rejected.

The fine aggregate for concrete shall be graded within limits as specified in IS:383 and the fineness modules shall range between 2.60 to 3.20. The fine aggregate shall stacked carefully on a clean hard dry surface so that it will not get mixed up with deleterious foreign materials. If such a surface is not available a platform of planks or corrugated sheets or brick floor or concretes floor shall be prepared. Sand shall be added in the desired proportion as required for the strength specified, with suitable correction for bulking.

C) Coarse Aggregates

Coarse aggregate shall conform to IS: 383. It shall consist of crushed or broken stone 95% of which shall be retained on 4.75mm is test sieve. It shall be obtained from crushed granite, trap, basalt or similar approved stone from approved quarry. Coarse aggregate shall be chemically inert when mixed with cement and shall be angular in shape and free from soft friable thin porous laminated or flaky pieces. It shall be free form dust and other foreign matter. Gravel/shingle of desired grading may be permitted as a substitute in part or full in plain cement concrete if the Architect/Consulting Engineer are otherwise satisfied about the quality of aggregate.

D) Mixing of Concrete

Machine Mixed: Aggregates shall be accurately measured out in boxes and mixed dry along with required cement. Water shall then be added in measured quantity and mixing shall be continued until there is uniform distribution of the materials and the mass is uniform in colour and consistency but in no case shall the mixing be done for less than 2 minutes. Only hopper loading mixer shall be used.

Hand Mixing: When hand mixing is permitted with the approval of the Architect/Consulting Engineer, it shall be carried out on water tight mixing platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. If required by the Architect/Consulting Engineer 10% extra cement has to be used if hand mixing is done

Consistency : Only sufficient water giving due allowance for the moisture content of aggregate shall be added to the cement and aggregates during mixing to produce a mixture of sufficient workability to enable it to be well consolidated, to be worked into the corners of the shuttering and around the reinforcements where there is reinforcement to give the specified finish and to have specified strength. Normally for every 50 kg of cement total water including moisture content of aggregate

should not be more than 34 litres for 1:3:6 mix 32 litres for 1:2:4 mix 30 litres for 1:1/2:3 and 27 litres for 1:1:2 (w/c as per mix design).

If difficulty be experienced in placing the concrete of specified mix and approved consistency between and below reinforcement bars, in the bottom of beams and similar situations, the concrete shall have improved workability by increasing the proportion of water and corresponding additional quantity of cement and using aggregates of smaller size than specified as directed by Architect/Consulting Engineer for which no extra be paid.

The consistency shall be determined by making trial mixtures with dried aggregates or when so instructed by test of laboratory made test cubes under the direction of Architect/Consulting Engineer. Consistency may be measured by slump test using a standard cone or the Architect/Consulting Engineer may direct the use of any other means of testing the consistency.

If the apparatus used for slump test is a standard cone, when filled. It shall be raised vertically clear of the concrete and the measurement of the slump shall be 300mm minus the height of the slumped cone of concrete. Care shall be taken to prevent vibration of the samples being tested. The following slumps shall be adopted for different kind of works.

	WITH VIBRATOR	**WITHOUT VIBRATOR**
1. Mass concrete in RCC foundation footings and retaining walls	10mm to25mm	80mm
2. Beams slabs and columns simply reinforced	25mm to 40mm	100mm to 125mm
3. Thin RCC section or section with congested steel	40mm to 50mm	125mm to 150mm

PLACING AND COMPACTING

Method of placing shall be such as to preclude segregation and as far as practicable the placing shall be continuous.

Special care shall be taken in accordance with IS 456-2000 while laying concrete under extreme weather. Concrete during the operation of placing shall be thoroughly worked around the reinforcements, embedded fixtures, spaded against corners of the form work by punning, rodding or by any other approved means and thoroughly compacted by mechanical vibrators. The number and type of vibrator to be used shall be subject to the approval of the Architect/Consulting Engineer, and in general immersion type vibrators shall be used.

Consolidation by using immersion vibrator will be in accordance with IS code 3558.

Sufficient number or reserve vibrators in good working condition shall be kept on hand at all times, so as to ensure that there is no slacking or interruption in compacting.

Admixtures : The use of admixtures may be allowed only if approved by the Architect/Consulting Engineer and their decision in this regard shall be final.

Transporting : Concrete shall be conveyed from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of any of the ingredients. If segregation does occur during transport the concrete shall be remixed before being placed. Normally not more than 30 minutes shall lapse between mixing & consolidation in position.

Curing : All cement concrete after laying shall be protected from damages till it sets and shall be cured thereafter for not less than 21 days. The work shall be protected from drying wind and direct sun rays. Water used for curing shall be free from sediments of any kind and generally fit for drinking.

Strength of Ordinary Concrete : The contractors have to see that proper materials are used and proportion and the correct water cement ratio just sufficient for the workability are maintained to see that the following minimum strength of concrete are obtained. To verify this test cubes from the concrete used should be made and tested. The frequency of testing and the acceptability criteria will be according to IS 456.

Compressive strength of 15cm cubes at 28 days of curing shall be N/mm^2

M10	10 N/mm^2
M15	15 N/mm^2
M20	20 N/mm^2

Six cubes shall be taken from any mix select at random by the Architect/Consulting Engineer. Three of them should be tested after 7 days and 3 after 28 days. Three strength at 7 days must be 2/3 of the strength at 28 days. The criteria for an acceptance is only the strength at 28 days as per codal specifications.

CS - 2 : Concrete Form Work and Centering

The form work shall conform to the shape lines an dimensions as shown on the drawings and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete and shall be sufficiently water tight to prevent loss of cement slurry from the concrete form work or centering shall be constructed of steel or 12mm thick plywood specially made for concrete shuttering and adequately designed to support the full weight of wet concrete deflection limited to 3mm and retain it for during laying, consolidation and setting of concrete.

All props shall be straight and of full height and no joints shall be allowed. Propos shall be braced with bamboo's or wooden battens in both directions at intervals of 1500mm and where additional staging is necessary extra care shall be taken to use bigger size props with bracings at necessary levels. All props shall be supported on sole plates and double wedged. At the time of removing props theses wedges shall be gently eased and not knocked out.

All rubbish, chippings, shaving and saw dust shall be removed from the interior of the forms before the concrete is placed. The form work in contract with the concrete shall be cleaned and thoroughly wetted and treated with non-staining mineral oil or any other approved material. Care shall be taken that oil or such similar materials are kept out of contract with the reinforcement.

Openings may be given with the approval of Architect/Consulting Engineer at convenient places for washing down all the rubbish. These are to be closed before concreting.

All formwork shall be removed without shock or vibration and shall be eased off carefully in order to allow the structure to take up its load gradually. Forms shall not be disturbed until concrete had

adequately hardened to take its own weight and superimposed load coming on it and in no circumstances shall forms be struck until the concrete reached a strength of a least twice the stress to which the concrete may subjected at the time of striking. The side forms shall be so fixed that while removing them the supporting forms & posts are not disturbed.

In the case of folded plates and shell roofs the contractors should take approval for the pattern of centering and shuttering along with programmed for de-shuttering. The tolerances of shuttering and stripping time will be as set forth in ISI 456. If directed, forms shall be given an upward camber to ensure that the beams do not have any sag. Any honeycombing of minor nature shall be repaired neatly with cement Mortar 1:2.

Any work showing signs of damage through premature of careless removal of centering or shuttering, shall be reconstructed by the contactor at his own cost. Surface that has to remain exposed after removal of forms shall be carefully examined and any fins, burrs projections etc. that are detected shall be removed.

If centering and shuttering is to be paid for separately measurement will be taken according to IS 1200. The unit area for payment will be one square metre.

CS-3 : Controlled Concrete

Controlled concrete shall be taken to mean that there shall be full field control of (1) predermined grading of all aggregates that go into concrete (2) predetermined proportion of course aggregate, fine aggregate, cement and water for the required strength.

Strength shall mean the acceptable field strength after 28 days of curing on the tests conducted on cubes form concrete taken during concreting in the manner set forth in IS 4556. A statement of acceptable field strength is noted below.

Grade of concrete: Compressive strength of 15cm cubes at 28 days after mixing conducted in accordance with relevant ISI code : IS 456-2000

Grade of Concrete	**Compressive strength N/mm^2**
M10	10
M15	15
M20	20
M25	25
M30	30
M35	35
M40	40

To arrive at the proportion to be adopted to obtain the required grade of concrete the mix proportion should be designed based on laboratory tests conducted using the aggregates actually available at site and which would be used for making concrete. The design mix should give suitable workability to enable it to be well consolidated to be worked into the corners of the shuttering and around the reinforcements.

Where difficulty is likely to be encountered in placing and compacting concrete and where there is crowding of reinforcements a separate mix is to be designed for required strength and used without

extra cost the mix design along with the workability obtainable with the designed mix should be furnished to the Architect/Consulting Engineer beforehand and their approval obtained A laboratory is to be established at the site assess the moisture content of aggregate as frequently as necessary and as instructed by the Architect/Consulting Engineer based on which correction is to be applied to the quantity of water to be used for mixing

All aggregate are to conform strictly to ISI specification ISI 383. The aggregates will be tested as frequently as directed by the Architect/Consulting Engineer to see that their specification is the same as adopted in the mix design. They must be stored on clean platform made for the purpose. Concrete shall be weigh batched

The dials of weigh batching unit to be used shall be checked with standard weights periodically. The conversion of weight to volume will not be allowed. Despite the design for several mixes the following quantities of cement are the minimum to be used for the different graded of the concrete:

M15	-	5.80 Bags per Cum
M20	-	6.40 Bags per Cum
M25	-	7.00 Bags per Cum
M30	-	7.76 Bags per Cum
M35	-	8.47 Bags per Cum
M40	-	9.18 Bags per Cum

Depending upon the quality of materials used in concrete, the above-mentioned consumptions may marginally vary.

4. MASONRY WORKS

MS - 1 : Size Stone Masonry

Size stones shall be of hard granite, basalt or trap stone obtainable from approved quarry. The stone shall be clean and wetted before they are used.

Height of course shall not be less than 15 cms and all courses shall be of uniform height. Unless otherwise instructed the depth of higher courses should not be more than depth of lower courses. Bed and sides shall be hammer or chisel dressed from the face 75mm and 35mm respectively.

No face stone shall be less in depth than in height or shall tail into the work to a length less than the height. Stones shall break joints at least half the height of the course. Faces of stones shall be hammed dressed and brushing not be more than 25mm. thickness of joints shall not be more than 20mm edges of face stones of exposed faces shall be chiseled true to both longitudinal and vertical lines. Exposed faces of corner stones to be 2 line dressed 50mm wide Bond or through stone shall be provided not exceeding 2.00 mtr apart in each course and shall be staggered. Bond stone shall be from the front to the back of the walls. For wall upto 60cms thick under, bond stones shall be in one piece and for walls over 60 cms thick they shall either be in one piece (if available locally) or be in the series of headers, each header overlapping the adjoining one by not less than 150mm bond or through stones shall be marked as directed to enable their being easily detected even after having been built in position. The interior or filling shall be with flat bedded stones laid in mortar, chips, spells shall be used to avoid thick mortar joints and shall not exceed 10% of the quantity of stone masonry. Care is to be take that no dry work or hollow spaces shall be left any where in the masonry.

MS – 2 : Uncoursed Rubble Masonry

The stones are received from quarry are to be set in work after knocking off weak corners and edges with mason's hammer. They are to be laid carefully so as to break joint as much as possible and shall be safely bedded in mortar. No joint shall exceed 20mm chips of stone and sparls shall be wedged in to the work wherever necessary to avoid thick beds or joints of mortar. No dry work or hollow spaces shall be allowed every stone whether large or small shall be set flush in mortar, smaller stones used in filling being carefully selected to fit snugly the interstices between the larger ones. The face stone shall be selected from the mass of quarry stones for proper size good beds and uniform colour and shall be laid as far as possible without pinning in front. One through stone shall be provided for every sq.mtr of facing and shall run back into work at least 600mm or full depth of work if it is less than 600mm. The quoins for exposed corners unless otherwise specified shall be of selected stone neatly dressed with **hammer and chiseled to** form required angle and laid header and stretcher alternatively The masonry has to be kept wet for 10 days. In the case of cement mortar the properties specified is on volt metric basis. But cement shall be weighed on the assumption that one cublic metre of cement weighs 1440 kgs. The Architect/Consulting Engineer may also reduced the cement to be measure by volume but on the same assumption.

MS - 3 : Random Rubble Masonry

The face stone shall be laid absolutely without pinning on the face. Every stone shall be carefully fitted so as to form neat and close joints and if necessary the edges shall be dressed with chisel so as to ensure close joints work. The thickness of joint will be as specified for each work and in no case more than 20mm. The thickness of joint should be uniform on the face variation being within 25% Mortar in joints should be scraped 12mm deep for pointing.

The stones shall be roughly chisel dressed to ensure equal size on face as far as possible. They shall be of uniform colour and they shall be carefully laid and solidly bedded in mortar and shall tail back and bond well into the backing and shall not be of greater than either breadth of face or length of tall into the work.

One header or through stone shall be inserted for every square metre of face & shall run right through the wall if it is not more than 600mm thick. If more than 600mm a line of headers shall be laid from face to back which shall overlap each other at least 150mm stones shall be arranged to break joints as much as possible and long vertical lines of jointing shall be avoided in face work. The quoins unless otherwise specified shall be of selected stones neatly dressed with hammer chisel to form required angle and laid header and stretcher alternatively. The masonry has to be kept wet for 10 days.

In the case of cement mortar, the proportion specified is on volume basis. But cement shall be weighed on the assumption that one cubic meter of cement weights 1440 kgs.

Architect/Consulting Engineer may also require the cement to be measured by volume but on the same assumption.

5 REINFORCED CEMENT CONCRETE WORK

1 GENERAL

Reinforced cement concrete work may be cast-in-situ or Precast as may be directed by Engineer-in-Charge according to the nature of work. Reinforced cement concrete work shall comprise of the following which may be paid separately or collectively as per the description of the item of work.
(a) Form work (Centering and Shuttering)
(b) Reinforcement
(c) Concreting: (1– Cast-in-situ), (2 – Precast)

2 MATERIALS

a) Water, cement, fine and coarse aggregate shall be as specified under respective clauses of chapter 03 mortars and chapter 04 concrete work as applicable.
5.1.2 Fly Ash admixed cement concrete (FACC) and fly ash Blended cements in Cement Concrete (PPCC) in RCC structures.
5.1.2.0 Fly ash Blended Cements conforming to IS 1489 (Part I) may be used in RCC structures as per guidelines given below :

2 GENERALS

(i) IS 456- 2000 Code of Practice for Plain and Reinforced Concrete (as amended up to date) shall be followed in regard to Concrete Mix Proportion and its production as under :
(a) The concrete mix design shall be done as “Design Mix Concrete” as prescribed in clause-9 of IS 456 mentioned above.
(b) Concrete shall be manufactured in accordance with clause 10 of above mentioned IS 456 covering quality assurance measures both technical and organizational, which shall also necessarily require a qualified Concrete Technologist to be available during manufacture of concrete for certification of quality of concrete.
(ii) Minimum M -25 grade of concrete shall be used in all structural elements made with RCC both in load bearing and framed structure.
(iii) The mechanical properties such as modulus of elasticity, tensile strength, creep and shrinkage of fly ash mixed concrete or concrete using fly ash blended cements (PPCs) are not likely to be significantly different and their values are to be taken same as those used for concrete made with OPC.
(iv) To control higher rate of carbonation in early ages of concrete both in fly ash admixed as well as PPC based concrete, water/binder ratio shall be kept as low as possible, which shall be closely monitored during concrete manufacture.
If necessitated due to low water/binder ratio, required workability shall be achieved by use of chloride free chemical admixtures conforming to IS 9103. The compatibility of chemical admixtures and super plasticizers with each set OPC, fly ash and /or PPC received from different sources shall be ensured by trials.
(v) In environment subjected to aggressive chloride or sulphate attach in particular, use of fly ash admixed or PPC based concrete is recommended. In cases, where structural concrete is exposed to excessive magnesium sulphate, flyash substitution/content shall be limited to 18% by weight. Special type of cement with low C3A content may also be alternatively used. Durability criteria like minimum binder content and maximum water /binder ratio also need to be given due consideration in such environment.

6. STEEL REINFORCEMENT

The steel used for reinforcement shall be any of the following types:
(a) Mild steel and medium tensile bars conforming to IS 432 (Part I)
(b) High strength deformed steel bars conforming to IS 1786
(c) Hard drawn steel wire fabric conforming to IS 1566
(d) Structural steel conforming to Grade A of IS 2062
(e) Thermo-mechanically treated (TMT) Bars.

6.1 Elongation percent on gauge length is 5.65 A where A is the cross-sectional areas of the test piece.
6.2 Mild steel is not recommended for the use in structures located in earthquake zone subjected to severe damage and for structures subjected to dynamic loading (other than wind loading) such as railway and highway bridges.

6.3 Welding of reinforcement bars covered in this specification shall be done in accordance with the requirements of IS 2751.

6.4 Thermo Mechanically treated reinforcement bars:
(a) There is no BIS code for TMT bars. The available code BIS 1786 pertains to HSD Bars. Therefore, there should be no stipulation that TMT bars should conform to relevant BIS code.
(b) The TMT bars are being produced under valid licence from either of the firms namely Tempcore, Thermex Evcon Turbo & Turbo Quench. These firms have acquired patents and are giving licences to various producers to produce TMT Bars.
(c) The TMT bars shall conform to IS 1786 pertaining to Fe 415 D or Fe 500 D or Fe grade of steel as specified.
(d) In design and construction of reinforced concrete building in seismic zone III and above, steel reinforcement of Grade Fe 415 D shall be used. However, high strength deformed steel bars, produced by thermomechanical treatment process of grade Fe 415, Fe 500 and Fe 550 having elongation more than 14.5. % and conform to other requirements of Fe 415 D, Fe 500 D and Fe 550 D respectively of IS 1786 may also be used for reinforcement. In future, latest provision of IS 456 and IS 13920 or any other relevant code as modified from time to time shall be applicable.

6.5 Stacking and Storage
Steel for reinforcement shall be stored in such a way as to prevent distorting and corrosion. Care shall be taken to protect the reinforcement from exposure to saline atmosphere during storage, fabrication and use. It may be achieved by treating the surface of reinforcement with cement wash or by suitable methods. Bars of different classifications, sizes and lengths shall be stored separately to facilitate issue in such sizes and lengths to cause minimum wastage in cutting from standard length.

7 FORM WORK (CENTRING & SHUTTERING)

7.1 Form Work
Form work shall include all temporary or permanent forms or moulds required for forming the concrete which is cast-in-situ, together with all temporary construction required for their support.

7.2 Design & Tolerance in Construction
Form work shall be designed and constructed to the shapes, lines and dimensions shown on the drawings with the tolerance given below.

(a) Deviation from specified dimension of cross +12 mm

section of columns and beams	-6 mm
(b) Deviation from dimensions of footings	
(i) Dimension in Plan	(+ 50 mm (-12 mm
(ii) Eccentricity in plan	0.02 times the width of the footing in the direction of deviation but not more than 50 mm.
(iii) Thickness	+ 0.05 times the specified thickness.

(**Note**- These tolerances apply to concrete dimensions only, and not to positioning of vertical steel or dowels).

7.3 Material for Form Work
(a) Propping and Centering: All propping and centering should be either of steel tubes with extension pieces or built up sections of rolled steel.

7.4 (a) Centering/Staging : Staging should be as designed with required extension pieces as approved by Engineer-in-Charge to ensure proper slopes, as per design for slabs/ beams etc. and as per levels as shown in drawing. All the staging to be either of Tubular steel structure with adequate bracings as approved or made of built up structural sections made form rolled structural steel sections.

(b) In case of structures with two or more floors, the weight of concrete, centering and shuttering of any upper floor being cast shall be suitably supported on one floor below the topmost floor already cast.

(c) Form work and concreting of upper floor shall not be done until concrete of lower floor has set at least for 14 days.

7.5 Shuttering*:* Shuttering used shall be of sufficient stiffness to avoid excessive deflection and joints shall be tightly butted to avoid leakage of slurry. If required, rubberized lining of material as approved by the Engineer-in-Charge shall be provided in the joints. Steel shuttering used or concreting should be sufficiently stiffened. The steel shuttering should also be properly repaired before use and properly cleaned to avoid stains, honey combing, seepage of slurry through joints etc.

(a) Runner Joists: RSJ, MS Channel or any other suitable section of the required size shall be used as runners.

(b) Assembly of beam head over props. Beam head is an adopter that fits snugly on the head plates of props to provide wider support under beam bottoms.

(c) Only steel shuttering shall be used, except for unavoidable portions and very small works for which 12 mm thick water proofing ply of approved quality may be used.

7.6 Form work shall be properly designed for self weight, weight of reinforcement, weight of fresh concrete, and in addition, the various live loads likely to be imposed during the construction process (such as workmen, materials and equipment). In case the height of centering exceeds 3.50 metres, the prop may be provided in multi-stages.

7.7 Suitable camber shall be provided in horizontal members of structure, especially in

cantilever spans to counteract the effect of deflection. The form work shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per metre (1 to 250) or as directed by the Engineer-in-Charge, so as to offset the subsequent deflection, For cantilevers the camber at free end shall be 1/50th of the projected length or as directed by the Engineer-in-Charge .

7.8 Typical arrangement of form work for 'beams, columns and walls' are shown in Figures 5.1 to 5.8 and form secured by wall ties is shown in Fig. 5.3.

7.9 The form faces have to be kept at fixed distance apart and an arrangement of wall ties with spacer tubes or bolts is considered best. A typical wall form with the components identified is given in Fig. 5.1, 5.2 & 5.3. The two shutters of the wall are to be kept in place by appropriate ties, braces and studs, some of the accessories used for wall form are shown in Fig. 5.3.

7.10 Removal of Form work (Stripping Time) : In normal circumstance and where various types of cements are used, forms, may generally be removed after the expiry of the following periods:

Type of Form work	Minimum period Before Striking Form work for OPC 33 grade	Minimum period Before Striking Form work for OPC 43 grade	Minimum period Before Striking Form work for PPC
(a) Vertical form work to columns, walls, beams	16-24 h	16-24 h	24-36 h
(b) Soffit form work to slabs (Props to be refixed immediately after removal of formwork)	3 days	3 days	4 days
(c) Soffit form work to beams (Props to be refixed immediately after removal of formwork	7 days	7 days	10 days
(d) Props to slabs: (1) Spanning upto 4.5m (2) Spanning over 4.5m	7 days 14 days	7 days 14 days	10 days 20 days
(e) Props to beams and arches: (1) Spanning upto 6m (2) Spanning over 6m	14 days 21 days	14 days 21 days	20 days 30 days

Note 1: For other types of cement, the stripping time recommended for ordinary Portland cement may be suitably modified. Generally, If Portland pozzolana or low heat cement or OPC with direct addition of fly ash has been used for concrete; the stripping time will be 10/7 of the period stated for OPC with 43 grade cement above.

Note 2: The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slabs, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

Note 3: For rapid hardening cement, 3/7 of above periods for OPC 33 grade will be sufficient in all cases except for vertical side of slabs, beams and columns which should be retained for at least 24 hours.

Note 4: In case of cantilever slabs and beams, the centering shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength.

Note 5: Proper precautions should be taken to allow for the decrease in the rate of hardening that occurs with all types of cement in cold weather and accordingly stripping time shall be increased.

Note 6: Work damaged through premature or careless removal of forms shall be reconstructed within
24 hrs.

8.0 REINFORCEMENTS

8.1 General Requirements

Steel conforming to para 5.1.3 for reinforcement shall be clear and free from loose mill scales, dust, loose rust, coats of paints, oil or other coating which may destroy or reduce bond. It shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. Prior to assembly of reinforcement on no account any oily substance shall be used for removing the rust.

8.2 Assembly of Reinforcement: Bars shall be bent correctly and accurately to the size and shape as shown in the detailed drawing or as directed by Engineer-in-Charge. Preferably bars of full length shall be used. Necessary cutting and straightening is also included. Overlapping of bars, where necessary shall be done as directed by the Engineer-in-Charge. The overlapping bars shall not touch each other and these shall be kept apart with concrete between them by 25mm or 11/4 times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be bound together at intervals not exceeding twice the dia. of such bars with two strands annealed steel wire of 0.90 mm to 1.6 mm twisted tight. The overlaps/ splices shall be staggered as per directions of the Engineer-in-Charge. But in no case the overlapping shall be provided in more than 50% of cross sectional area at one section.

8.3 Bonds and Hooks Forming End Anchorages: Reinforcement shall be bent and fixed in accordance with procedure specified in IS 2502, code of practice of bending and fixing of bars for concrete reinforcement. The details of bends and hooks are shown below for guidance.
(a) U-Type Hook In case of mild steel plain bars standard U type hook shall be provided by bending ends of rod into semicircular hooks having clear diameter equal to four times the diameter of the bar.

Note: In case of work in seismic zone, the size of hooks at the end of the rod shall be eight times the diameter of bar or as given in the structural drawings.
(b) Bends Bend forming anchorage to a M.S. plain bar shall be bent with and internal radius equal to two times the diameter of the bar with a minimum length beyond the bend equal to four times the diameter of the bar.

8.4 Anchoring Bars in Tension *:* Deformed bars may be used without end anchorages provided, development length equipment is satisfied. Hooks should normally be provided for plain bars in tension. Development length of bars will be determined as per IS: 456.

8.5 Anchoring Bars in Compression : The anchorage length of straight bar in compression shall be equal to the 'Development length' of bars in compression as specified in IS: 456. The projected length of hooks, bend and straight lengths beyond bend, if provided for a bar in compression, shall be considered for development length.

8.6 Binders, stirrups, links etc. : In case of binders, stirrups, links etc. the straight portion beyond

the curve at the end shall be not less than eight times and nominal size of bar.

8.7 Welding of Bars

Wherever facility for electric **arc** welding or **gas pressure welding** is available, welding of bars shall be done in lieu of overlap. The location and type of welding shall be got approved by the Engineer-in-Charge. Welding shall be as per IS 2751 and 9417.

8.8 Placing in Position

Fabricated reinforcement bars shall be placed in position as shown in the drawings or as directed by the Engineer-in-charge. The bars crossing one another shall be tied together at every intersection with two strands of annealed steel wire 0.9 to 1.6 mm thickness twisted tight to make the skeleton of the steel work rigid so that the reinforcement does not get displaced during deposition of concrete.

Exposure	Nominal Concrete cover in mm not less than
Mild	20
Moderate	30
Severe	45
Very severe	50
Extreme	75

Notes : 1. For main reinforcement upto 12 mm diameter bar for mild exposure the nominal cover may be reduced by 5 mm.

2. Unless specified otherwise, actual concrete cover should not deviate from the required nominal cover by + 10 mm.

3. For exposure condition ‘severe’ and ‘very severe’ reduction of 5 mm may be made, where concrete grade is M35 and above.

4. Nominal cover to meet specified period of fire resistance shall not be less than as given in Table 16A of IS 456.

Nominal Size mm	Cross sectional Area Sq.mm	Mass weight kg/ per meter
6	28.3	0.222
8	50.3	0.395
10	78.6	0.617
12	113.1	0.888
16	201.2	1.58
20	314.3	2.47
25	491.1	3.85
28	615.8	4.83
32	804.6	6.31
36	1018.3	7.99
40	1257.2	9.86

Note: These are as per clause 6.2 of IS 1786.

8.9 Rate

The rate for reinforcement shall include the cost of labour and materials required for all operations described above such as cleaning of reinforcement bars, straightening, cutting, hooking bending, binding, placing in position etc. as required or directed including tack welding on crossing of bars in lieu of binding with wires.

9 READY MIXED CONCRETE (as per IS 4926)

9.1 Materials

9.2 Selection and Approval of Materials : Materials used should satisfy the requirements for the safety, structural performance durability and appearance of the finished structure, taking full account of the environment to which it will be subjected. The selection and use of materials shall be in accordance with IS 456. Materials used shall conform to the relevant Indian Standards applicable. Where materials are used which are not covered by the provisions of the relevant Indian Standard, there should be satisfactory data on their suitability and assurance of quality control. Records and details of performance of such materials should be maintained. Account should be taken of possible interactions and compatibility between IS 4926 and materials used. Also, prior permission of the purchaser shall be obtained before use of such materials.

9.3 Cement : Cement used for concrete shall be in accordance with the requirements of IS 456.

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9.4 Mineral Admixtures : Use of mineral admixtures shall be permitted in accordance with the provisions of IS 456.

9.5 Aggregates : Aggregates used for concrete shall be in accordance with the requirement of IS 456. Unless otherwise agreed testing frequencies for aggregates in plant shall be as given IS 4926.

9.6 Chemical Admixtures

(i) Use of chemical admixtures shall be permitted in accordance, with the provisions of IS 456 and IS 9103.

(ii) It shall be the responsibility of the producer to establish compatibility and suitability of any admixture with the other ingredients of the mix and the determine the dosage required to give the desired effect.

(iii) Admixtures should be stored in a manner that prevents degradation of the product and consumed within the time period indicated by the admixture supplier. Any vessel containing an admixture in the plant or taken to site by the producer shall be clearly marked as to its content.

(iv) When offering or delivering a mix to a purchaser it should be indicated if such a mix contains an admixture or combination of admixtures or not. The admixtures may be identified generically and should be declared on the delivery ticket.

(v)The amount of admixture added to mix shall be recorded in the production record. In special circumstances, if necessary, additional dose of admixture may be added at project site to regain the workability of concrete with the mutual agreement between the producer and the purchaser.

9.7 Water *:* Water used shall be in accordance with the requirement of IS 456. Unless otherwise agreed, the testing frequencies for water shall be as given in Annex A. The use of re-cycled water is encouraged as long as concrete of satisfactory performance can be produced and steps are taken to monitor the build up of chlorides in any recirculated water and that any subsequent adjustments to the mix design are made to ensure that any overall limit on chloride contents is satisfied. The addition of any recycled water shall be monitored and controlled to meet these requirements.

The total amount of water added to the mix shall be recorded in the production record. The water content of concrete shall be regulated by controlling its workability or by measuring and adjusting the moisture contents of its constituent materials. The producer's production staffs and truck-mixer, drivers shall be made aware of the appropriate responses to variations in concrete consistency of a particular mix caused by normal variations in aggregate moisture content or grading.

9.8 General Requirements

1. Basis of Supply : Ready-mixed concrete shall be supplied having the quality and the quantity in accordance with the requirement agreed with the purchaser or his agent. Notwithstanding this, the

concrete supplied shall generally comply with requirements of IS 456. All concrete will be supplied and invoiced in terms of cubic meters (full or part) of compacted fresh concrete. All proportioning is to be carried out by mass except water and admixture, which may be measured by volume.

2 Transport of Concrete : Ready-mixed concrete shall be transported from the mixer to the point of placing as rapidly as practicable by methods that will maintain the required workability and will prevent segregation, loss of any constituents or ingress of foreign matter or water. The concrete shall be placed as soon as possible after delivery, as close as is practicable to its final position to avoid re-handling or moving the concrete horizontally by vibration. If required by the purchaser the producer can utilize admixtures to slow down the rate of workability loss, however this does not remove the need for the purchaser to place the concrete as rapidly as possible. The purchaser should plan his arrangements so as to enable a full load of concrete to be discharged within 30 minutes of arrival on site. Concrete shall be transported in a truck-mixer unless the purchaser agrees to the use of no agitating vehicles. When non-agitating vehicles are used, the mixed concrete shall be protected from gain or loss of water.

3 Time in Transport *:* The general requirement is that concrete shall be discharged from the truck-mixer within 2 h of the time of loading. However, a longer period may be permitted if retarding admixtures are used or in cool humid weather or when chilled concrete is produced. The time of loading shall start from adding the mixing water to the dry mix of cement and aggregate or of adding the cement to the wet aggregate whichever is applicable. Ready-mixed concrete plant shall have test facilities at its premises to carry out routine tests as per the requirement of the standard.

9.9Sampling and Testing of Ready-Mixed Concrete

1 Point and Time of Sampling : For the assessment of compliance of ready-mixed concrete, the point and time of sampling shall be at discharge from the producer's delivery vehicle or from the mixer to the site or when delivered into the purchaser's vehicle. It is critical that the sampling procedure and equipment used enables as representative a sample as possible to be taken of the quantity of concrete delivered (see Annex A). The sampling may be carried out jointly by the purchaser and the supplier with its frequency mutually agreed upon. However, it will not absolve the supplier of his responsibility from supplying in concrete as per the requirement given in this standard or otherwise agreed to where so permitted in the standard.

2 Workability : The test for acceptance is to be performed upon the producer's delivery vehicle discharge on site or upon discharge into the purchaser's vehicle. lf discharge from the producers' vehicle is delayed on site due to lack of preparedness on behalf of the purchaser then the responsibility passes to the purchaser after a delay of more than 30 min. The workability shall be within the following limits on the specified value as appropriate: Slump ± 25 mm or 1/3 of the specified value, whichever is less. Compacting factor : ± 0.03, where the specified value is 0.90 or greater, ± 0.04, where the specified value is less than 0.90 but more than 0.80, ± 0.05, where the specified value is 0.80 or less. Flow table test may be specified for concrete, for very high workability (see IS 9103) Acceptance criteria for spread (flow) are to be established between the supplier and the purchaser.

3 Specified Strength

(i) Compliance shall be assessed against the requirements of IS 456 or another agreed Indian Standard. The purchaser may perform his sampling and testing or may enter into an arrangement with the producer to provide his testing requirements.

(ii) Unless otherwise agreed between the parties involved, the minimum testing frequency to be applied by the producer in the absence of a recognized ready- mixed concrete industry method of

production control should be one sample for every 50 m3 of production or every 50 batches, whichever is the greater frequency. Three test specimens shall be made up for each sample for testing at 28 days (see also IS 456).

9.10 Production and Delivery

1 Materials Storage and Handling

(i) Cement : Separate storage for Different types and grades of cement shall be provided. Containers may be used to store cement of different types provided these are emptied before loading new cement. Bins or silos shall be weatherproof and permit free flow and efficient discharge of the cement. Each silo or compartment of a silo shall be completely separate and fitted with a filter or alternative method of dust control. Each filter or dust control system shall be of sufficient size to allow delivery of cement to be maintained at a specified pressure, and shall be properly maintained and prevent undue emission of cement dust and prevent interference with weighing accuracy by build-up of pressure. Cement shall be stored and stacked in bags and shall be kept free from the possibility of any dampness or moisture coming in contact with them and where cement can be stored and retrieved without undue damage to the bags. The bags are to be protected from becoming damp either from the ground or the weather. The cement is to be used in the order it is delivered (see also IS 4082). In case, the cement remains in storage for more than 3 months, the cement shall be retested before use and shall be rejected, if it fails to conform to any of the requirements given in the relevant Indian Standard.

(ii) Dry Pulverized Fuel Ash and Other Mineral Admixtures : Suitable separate arrangement for storage of pulverized fuel ash, silica fume, metakeolin, rice husk ash, ground granulated blast furnace slag such as for cement, shall be provided, in the plants utilizing these materials.

(iii) Aggregates (Coarse and Fine) : Stockpiles shall be free draining and arranged to avoid contamination and to prevent intermingling with adjustment material. Handling procedures for loading and unloading aggregates shall be such as to reduce segregation to a minimum. Provision shall be made for separate storage for each nominal size and type of aggregate and the method of loading of storage bins shall be such as to prevent intermingling of different sizes and types. Fine aggregates shall be stacked in a place where loss due to the effect of wind is minimum (see also IS 4082 and IS 456).

(iv) Water : An adequate supply shall be provided and when stored on the plant such storage facilities shall be designed to minimize the risk of contamination.

(v) Chemical Admixtures : Tanks or drums containing liquid admixtures shall be clearly labeled for identification purposes and stored in such a way to avoid damage, contamination or the effects of prolonged exposure to sunlight (if applicable). Agitation shall be provided for liquid admixture, which are not stable solutions.

2 Batching Plants and Batching Equipment : Hoppers for weighing cement, mineral admixtures, aggregates and water and chemical admixture (if measured by mass) shall consist of suitable container freely suspended from a scale or other suitable load-measuring device and equipped with a suitable discharging mechanism. The method of control of the loading mechanism shall be such that, as the quantity required in the weighing hopper is approached the material may be added at controllable rate and shut off precisely within the weighing tolerances specified in Annex C. The weighing hoppers for cement, mineral admixtures aggregate shall be capable of receiving their rated load, without the weighed material coming into contact with the loading mechanism. Where the rated capacity of a batching plant mixing cycle is less than 2.0 m3, additional precautions shall be taken to ensure that the correct number of batches are loaded into the truck mixer. The weighing hoppers shall be constructed so as to discharge efficiently and prevent the build up of materials. A tare

adjustment, up to 10 percent of the nominal capacity of the weigh scale, shall be provided on the weighing mechanism so that the scale can be adjusted to zero at least once each day. Dust seals shall be provided on cement hoppers between the loading mechanism and the weigh hopper, and shall be fitted so as to prevent the emission of cement dust and not affect weighing accuracy. The hopper shall be vented to permit escape of air without emission of cement dust.

Vibrator or other attachment, where fitted, shall not affect the accuracy of weighing. There shall be sufficient protection to cement and aggregate weigh hoppers and weighing mechanisms to prevent interference with weighing accuracy by weather conditions or external build-up of materials. Where chemical admixture dispensers are used, they shall be capable of measurement within the tolerance in annex C and calibrated container or weigh scales shall be provided to check the accuracy of measurement at least once a month. Where a continuous mixer with ribbon loading is used the batching procedure specified by the manufacture of the plant shall be followed. Each control on the batching console and weigh-dial or display shall be clearly labeled with its function and where concerned with the batching of materials, the materials type. When more than one type or grade of cement is being used, the weighing device and discharge screw or other parts of the transfer system shall be empty before changing from on type of cement to another.

When more than one type or grade of cement is being used, the weighing devised and discharge screw or other parts of the transfer system shall be empty before changing from on type of cement to another. When pulverized fuel ash and other mineral admixtures are batched through the cement weigh system, the weighing device and discharge screw or other parts of the transfer system shall be empty when the weighing system has returned to zero reading or completed the batch. Where a back weigh system is utilized to weigh materials a system shall be in place so as to prevent materials being loaded during the process of weighing.

3 Measurement of Materials : Cement and mineral admixture materials shall be measured by mass in a hopper or compartment separate from those used for other materials and on a scale of appropriate sensitivity, measurement being taken from a zero reading. Aggregates shall be measured by mass, allowance being made for the free moisture content of the aggregates. The added water shall be measured by volume or by mass. Any liquid chemical admixture (or paste) shall be measured by volume or by mass and any solid admixture by mass. When weighing materials any build up in the hopper during the day must be tared out or allowed for in the batch weights. After measurement all materials shall be discharged into the mixer without loss. The accuracy of the measuring equipment shall be within + 2 percent of the quantity of cement and mineral admixtures being measured and within + 3 percent of the quantity of aggregate, chemical admixture and water being measured. The plant operator shall be provided with a clear display of the quantities of materials to be batched for each mix and batch size with information identifying the display to be selected for each designed and prescribed mix to be produced. Analogue scale displays for the weighing of cement, mineral admixtures, aggregates and water shall be readily discernable from the operating position. For digital readouts the numerals shall be readily discernable from the operating position. Fully automatic production systems shall be fitted with control equipment to allow the correct operation of the plant to be monitored during weighing and batching. Automatic control systems on batching plants shall not commence batching until all hoppers have been emptied and /or tared and the scales zeroed unless such systems are designed to take account of buildup in their programming. All scales shall be tested and calibrated as per Annex C.

4 Mixing

(i) Washing Out Water : Before loading concrete materials or mixed concrete into either a stationary mixer or truck mixer any water retained in the mixing drum for washing out purposes shall be completely discharged.

(ii) Stationary or Central Mixers : Stationary mixers shall not be loaded in excess of the manufacturer's rated capacity. The mixing time shall be measured from the time all the materials required for the batch, including water, are in the drum of the mixer. The mixing time shall not be less than that recommended by the manufacturer. Where a continuous mixing plant is used, the complete mixing time shall be sufficient to ensure that the concrete is of the required uniformity.

(iii) Truck Mixers : When a truck mixer is used for the partial or complete mixing of concrete, mixing shall be considered to commence from the moment when all the materials required for the batch, including water, are in the rotating drum of the mixer. Truck or agitators shall not be loaded in excess of the manufacturer's rated capacity. In order to produce a satisfactory mix, and where there is no data available to establish different period and speed of revolutions, mixing shall continue for not less than 60 revolutions of the truck mixer drum at a rate of not less than 7 revolutions/min. All completely truck mixed concrete shall be visually inspected for uniformity prior to leaving the plant. When a truck mixer or agitator is used for transporting concrete which has been mixed before leaving the plant, the concrete shall be agitated during transit and remixed at the site for at least 2 min so that the concrete is of the required uniformity. Where water is added to the concrete in the truck mixer through the truck mixer water meter and when such water is being accounted for in the total water within the mix, it shall be ensured that the truck mixer water meter is in operational condition and properly calibrated. Where a water meter is not available, water must be measured in a suitable container before being added to the truck mixer.

(iv) Condition of Mixers : Stationary and truck mixers shall be maintained in an efficient and clean condition with no appreciable build up of hardened concrete or cement in the mixing drum, on the mixing blades, or on the loading hopper or discharge chutes.

5 Delivery Ticket : Immediately before discharging the concrete at the point of delivery, the producer or his representative shall provide the purchaser with a preprinted delivery ticket for each delivery of concrete on which is printed, stamped or written the minimum information detailed invoicing as per Annex D.

6 Quality Control

Quality control of ready-mixed concrete may be divided into three components, forward control, immediate control and retrospective control.

7 Forward control *:* Forward control and consequent corrective action are essential aspects of quality control. Forward control includes the following.

(i) Control of purchased material Quality

(ii) Control of Materials storage

(iii) Mix design and mix design modification

(iv) Transfer and Weighing Equipment : The producer shall be able to demonstrate that a documented calibration procedure is in place. The use of elector-mechanical weighing and metering systems, that is, load cells, flow meters, megameters, etc, is preferable over purely mechanical system, that is, knife edge and lever systems.

(v) Plant mixers where present and truck mixers used shall be in an operational condition.

8 Immediate Control : Immediate control is concerned with instant action to control the quality of the concrete being produced or that of deliveries closely following. It includes the production control and product control.

(i) Production Control : The production of concrete at each plant shall be systematically controlled. This is to ensure that all the concrete supplied shall be in accordance with these requirements

and with the specifications that has formed the basis of the agreement between the producer and purchaser. Each load of mixed concrete shall be inspected before dispatch and prior to discharge. The workability of the concrete shall be controlled on a continuous basis during production and any corrective action necessary taken. For each load, written, printed or graphical records shall be made of the mass of the materials batched, the estimated slump, the total amount of water added to the load, the delivery ticket number for that load, and the time the concrete was loaded into the truck. Regular routine inspections shall be carried out on the condition of plant and equipment including delivery vehicles.

(ii) Product Control : Concrete mixes shall be randomly sampled and tested for workability and where appropriate, plastic density, temperature and air content. Where significant variations from target values are detected, corrective action shall be taken. It is important to maintain the water cement ratio constant at its correct value. The amount of added water shall be adjusted to compensate for any observed variations in the moisture contents in the aggregates. Suitable adjustments should also be made in masses of the aggregates due to this variation (see IS 456). Any change in water content due to change in aggregate grading shall be taken care of by forward control by suitable modifications to mix design.

9 Retrospective Control : Retrospective control is concerned with those factors that influence the control of production. Retrospective control may cover any property of materials or concrete, such as aggregate grading, slump, or air content, but is particularly associated with 28-day cube strength because by its very nature it is not property which can be measured ahead of, or at the time of, manufacture.

10 Mix Performance : The producer shall be responsible for ensuring that suitable control procedures are in place ensure the following.

(i) Design Mixes : A quality control system shall be operated to control the strength of design mixes to the levels required as per IS 456 and shall be based on random tests of mixes which form the major proportion of production. The system shall include continuous analysis of results from cube tests to compare actual with target values together with procedures for modifying mix proportions to correct for observed differences. Compressive strength testing shall be carried out using a machine that meets the requirements of IS 14858.

(ii) Prescribed Mixes : Periodic and systematic checks shall be made to ensure that the cementitious material contents of prescribed mixes comply with their mix descriptions.

11 Stock Control of Materials : The producer shall operate a materials stock control procedure to enable verification of total quantities used and to confirm that only approved materials have been received.

12 Complaints : The producer shall have a procedure in place to enable the diagnosis and correction of faults identified from complaints.

13 Order Processing

A competent person to interpret the specified requirements and relate these to mix design criteria shall systematically review specification and orders supplied by the purchaser. These shall be formally recorded together with any modification to the specification resulting from subsequent agreed documentation to ensure that the plant operator is given the correct instructions for batching and mixing. When mixes or materials are offered as alternatives to requested mixes or where there is

no specification supplied by the purchaser, orders whether received verbally or in writing, shall be agreed with the purchaser and the fact recorded. Alternatives to the mix description or compliance requirements in the purchaser's specification shall be clearly identified in the quotation.

14 Records

Records shall be maintained by the producer to provide confirmation of the quality and quantity and quantity of concrete produced. The records shall be retained for the purposes of these requirements for a period of at least one year. They shall cover the following aspect:

(a) Production and delivery:

(i) Batching instruction

(ii) Batching Records,

(iii) Delivery tickets, and

(iv) Equipment calibration and plant maintenance.

(b) Materials and production control:

(i) Concrete production and materials purchase, usage and stocks, and

(ii) Certificates or test results for materials.

(c) Production quality Contol: Control test results.

9.11 PLACING CONCRETE BY PUMPING

1 General

Concrete conveyed by pressure through either rigid pipes or flexible hoses and discharged directly into the desired area is termed as pumped concrete. Method of applying pressure to concrete is by pumps. Pumps to be used shall be either of the two types as mentioned below:-

(A) Piston type pumps

(B) Squeeze pressure type pumps.

Compressed air pressure pumps shall not be used in the works.

2 Pumping Equipments

2.1 Piston Pumps : Piston pump to be used in the works shall consist of a receiving hopper for mixed concrete, an inlet valve, an outlet valve, and the pump shall be a twin-piston pump.

The two pistons shall be so arranged that one piston retracts when the other is moving forward and pushing concrete into the pipe line to maintain a reasonably steady flow of concrete. Single piston pumps shall not be acceptable.

Inlet and outlet valve shall be any one of the following types:-

- Rotating plug type
- Sliding plate type
- Guided plunger type
- Swing type
- Flapper type
- Or any combination of the above.

The pistons shall be mechanically driven using a crank or chain or hydraulically driven using oil or water. The receiving hopper shall have a minimum capacity of 1.0 cum and the hopper shall be fitted with remixing rotating blades capable of maintaining consistency and uniformity of concrete. The primary power for pumps may be supplied by gasoline, diesel, or electric motors. The primary power unit and the pump unit may be truck, trailer or skid mounted.

2.2 Squeeze Pressure Pumps : Squeeze pressure pumps shall consist of a receiving hopper fitted with re-mixing blades. Re-mixing blades shall be such that these can push the concrete into the flexible hose connected at the bottom of the hopper. The flexible hose shall pass through a metal drum around the inside periphery of the drum and come out through the top part of the drum.

The drum shall be maintained under a very high degree of a vacuum during operation. The drum shall be so fitted with hydraulically operation metal rollers., which when rotating, create a squeeze

pressure on the flexible hose carrying concrete and forces the concrete out into the pipe line.

2.3 Effective Range and Discharge of Pumps : Effective range of pumps to be used in the work shall be decided after studying the site conditions. However, the minimum horizontal range shall not be less than 150 metres and minimum vertical range shall not be less than 50 metres. Selection of pumps bases on discharge capacity shall be decided after studying the requirements for the project. Discharge capacity shall be worked out by the contractors and approval obtained from the Engineer-in-Charge. As a guide line figure the contractor may assume a discharge capacity of 15 cubic metre/hour/pump.

2.4 Pipe Lines : All concrete carrying pipe lines shall generally be rigid pipe lines. Flexible pipe lines may only be used at bend curves in lines or at discharge ends if required. Placements of flexible units shall be done judiciously and connected to the pipe lines only when it meets the approval of the Engineer-in-Charge.

(i) Rigid Line/ Hard Line/ Slick line *:* Such lines shall be made either of steel or plastic. Aluminum alloy pipes shall not be used. Minimum pipeline diameter shall be 100 millimeters and shall have normal maximum length of 3 metre in each section connected through couplers.

(ii) Flexible Pipe Line : Flexible lines shall be made out of rubber or spiral wound flexible metal or plastic. The pipe shall again be such that they are in sections of 3 metre length each and connected through couplers. These pipes shall be such that they are interchangeable with rigid lines. While installing flexible units, care shall be taken that there are no links in the pipeline, which is a normal tendency with these pipes having diameter 100 mm and above.

2.5 Couplers : Couplers to be used for connecting pipe line sections (either hard or flexible) shall have adequate strength to withstand stresses due to handling, misalignments, poor support to pipe lines etc. For horizontal runs of pipes and for vertical run upto 30 metre height the couplers shall be rated for a minimum pressure of 35 kg/ cm square. Couplers used for rising runs between 30 metre and 50 metre heights shall have a minimum pressure rating of 50 kg/cm square. Couplers shall be designed to allow for replacement of any pipe section without displacing other sections. These shall provide for the full internal cross section. These shall provide for the full internal cross section with no constructions or service. Which may disrupt the smooth flow of concrete. For pipelines of size 150mm and above, double togged type coupler with a thick rubber gasket and secondary wedge-take-up is recommended. Types of couplers that may be used shall be any of the following:-

- Grooved end coupler
- One piece extended lever swing type couplers
- And full flow oil line type couplers.

2.6 Other Accessories : Other accessories which shall be catered for, are as under:-

(a) Back up pump of rigid and flexible pipes of varying lengths of similar rating/specifications
(b) Curved sections of rigid pipes
(c) Swivel joints and rotary distributors
(d) Pin and gate valves to prevent back flow in pipe lines
(e) Switch valves to direct the flow into another pipe line
(f) Connection devices to fill forms from the bottom up
(g) Splints, rollers, and other devices for protection of conduit over rock concrete Reinforcing steel and form and to provide lifting and lashing points in the pipe line.
(h) Transitions for connecting different sizes of pipe sections
(i) Air vents for downward pumping.
(j) Clean out equipment.

For concreting of columns, walls and scattered small placement, recommendation is made for

special cranes or power controlled booms carrying pipe lines with a pendant type concrete delivery hose.

2.7 Lubricating of Pipe Line

Before pumping concrete into the pipeline, the line shall be lubricated with a properly designed mortar/grout lubricant. This shall be ensured by starting the pumping operation with a properly designed mortar, or with a batch of regular concrete with the coarse aggregate omitted. The quantity of mortar required as lubricant is dependent on the smoothness and cleanliness of the pipelines. As a guide line, for a 100 mm diameter pipe line of 100 metre length, 0.08 cum to 0.10 cum of mortar should normally be adequate, but this shall not be taken as specified, and the contractor shall establish his requirements. The quantity of mortar that comes out of the delivery end of the pipeline shall not be used in place of the concrete work. However, with the approval of Engineer-in-Charge, this mortar may be used as bedding mortar against construction joints. The rest of the mortar shall be wasted. Lubrication shall be maintained as long as the pumping of concrete continues.

9.12 GUIDELINES FOR FIELD PRACTICE

1 General Precautions

(i) Proper planning of concrete supply, pump locations, line layout, placing sequence and the entire pumping operation will result in savings of time and expense.

(ii) The pump shall be placed as near the placement area as practicable. The surrounding area of the pump shall be free of obstructions to allow for movement of concrete delivery trucks. The surface must be strong enough to withstand the loaded trucks operating on it. If the surface is a suspended slab, the truck route shall be adequately supported in consultation with the Engineer in-Charge.

(iii) Pipe lines from the pump to the placing area shall be laid with minimum number of bend. For large placement areas, alternate lines shall be installed for rapid connection when required. A flexible pipe at the discharge end will permit placing over a large area directly without re-handling of pipelines. The pipeline shall be firmly supported.

(iv) If more than one size of pipe must be used, the smaller diameter pipe shall be placed at the pump end and the larger diameter at the discharge end.

(v) When pumping downwards, an air release valve shall be provided at the middle of the top bend to prevent vacuum or air buildup. Similarly, while pumping upwards, a no-return valve shall be provided near the pump to prevent the reverse flow of concrete.

(vi) It is essential that direct radio/telecommunication be maintained between the pump operator and the concrete placing crew. Good communication between the pump operator and the batchingplant is also essential. The placing rate shall be estimated by the pump operator so that concrete can be ordered at an appropriate delivery rate.

(vii) The pump shall be started for a check run and operated without concrete to ensure that all moving parts are in operation properly. Before placing concrete, the pump shall be run with some grout/mortar for lubricating the line.

(viii) When concrete is received in the hopper, the pump shall be run slowly until the lines are completely full and the concrete is steadily moving. A continuous pumping must be ensured, because, if the pump is stopped, concrete in the line may be difficult to move again.

(ix) When a delay occurs because of concrete delivery or some form repair works or for any other reason, the pump shall be slowed down to maintain some movement of concrete in the pipe

line. For longer delays, concrete in the receiving hopper shall be made to last as long as possible by moving the concrete in the lines occasionally with intermittent strokes of the pump. It is sometimes essential to run a return line back to the pump so that concrete can be re-circulated during long delays.

(x) If after a long delay, concrete cannot be moved in the line, it may be necessary to clean out the entire line. However, quite often only a small section of pipe line may be plugged and requires cleaning. The pump operator who know such details as the length of line, age of concrete in the line etc., should be depended upon to aid in deciding the appropriate section to be cleaned.

(xi) When the form is nearly full, and there is enough concrete in the line to complete the placement, the pump shall be stopped and a “go devil” inserted at the appropriate time so that concrete ahead of the go-devil shall be forced completion of the work. The go-devil shall be forced through the pipeline to clean it out. Use of water pressure is a safer method. The go-devil shall be stopped at the discharge end to ensure that water does not spill on the placement area, if air pressure is used, extreme care shall be taken and the pressure must be carefully regulated. A trap shall be installed at the end of the line to prevent the go-devil being ejected as a dangerous projectile. An air release valve shall also be installed in the line to prevent air pressure build up.

(xii) It is essential to clean the line after concrete placing operation is complete. Cleaning shall be done in the reverse direction from the form work end to the pump-end where the concrete in the line can be dumped in bucket. After removal of all concrete, all pipe lines and other equipments shall be cleaned thoroughly and made ready for the next use.

2 Submittals

Along with their bid the contractors shall be required to submit the following information regarding the equipments proposed to be used by them:-

(i) Type, number, capacity, range, mounting, nature of primary power used and the operating weight of pump and mounting.

(ii) Manufacturer’s specifications for pipe lines giving pressure ratings, sizes and material for straight and curved sections.

(iii) Manufacturer’s certificates.

3 Sampling and Testing (Materials)

3.1 Aggregates

(i) Supplier of aggregates shall furnish the following information before the material is delivered to site:-

- Precise location of source from where the material is to be supplied.
- Trade group of principal rock type as per table 5.7 below :
- Presence or reactive minerals

ANNEXURE – A
(Clause 5.9.3)
SAMPLING OF CONCRETE

After the truck mixer has re-mixed its delivery on site, allow at least the first one-third of a m3 of concrete to be discharged prior to taking any samples. Take at least 4 incremental samples from the remainder of the load avoiding sampling the last cubic metre of concrete. Thoroughly re-mix this composite sample either on a mixing tray or in the sampling bucket and proceed with the required testing.

ANNEXURE – B
(Clauses 5.9.4.2 & 5.9.4.3)
CONCRETE MIX INFORMATION TO BE SUPPLIED BY THE PURCHASER

RMC : ……..
Contractor : …….
Site : …….
MIX CODE
Grade (N/mm2)
(Characteristic strength)
Minimum Cement Content (kg./m3)
Mineral Additives
(Pulverized fuel ash/Slag/Others)
(kg/m3)
Maximum Free water Cement Ratio
Nominal Maximum Aggregate size
Cement Type and Grade (if preferred)
Target workability (Slump) (mm)
Target workability at site
Maximum Temperature of Concrete at the time of placing
Class of sulphate Resistance (if applicable)
Exposure condition (if applicable)
Class of finish (if applicable)
Mix Application
Method of Placing
Any other requirements (early strength workability retention, permeability testing, chloride content restriction, maximum cement content, etc.)
Concrete Testing (Frequency)
Material's Testing (any non-routine requirements)
Alternatives to be offered: Yes/No
Method of Curing to be used by contractor
Quantity (m3)

Note : Additional proforma for further information may be used, such as for specific test rates to be achieved for concrete or raw materials, exact method statements of the contractors proposed site practice.

ANNEXURE – C
(Clauses 5.9.6.2 and 5.9.6.3)
CALIBRATION AND WEIGHING EQUIPMENT ACCURACY

C-1. The following limits shall apply to all ready-mixed concrete plants :

(a) The accuracy, sensitivity and arrangement of the weighing devices shall be such as to enable the materials to be batched within the following tolerances :

(1) Cement, mineral : Within + 2 percent of the quantity of the constituent
Admixtures being measured.

(2) Aggregate, chemical : Within + 3 percent of the quantity of the constituent
admixtures and water being measured.

(b) Analogue scales shall have scale increments not exceeding 5 kg. for cement and mineral admixtures, 25 kg. for aggregate and 2 kg. for water.

(c) Preset controls shall be calibrated in increments not exceeding 5 kg. for cement and mineral admixtures, 10 kg. for aggregate and 2 kg. for water.

(d) For continuous mixer plants calibration shall be in increments not exceeding 10 kg./m3 for cement and mineral admixtures, 25 kg./m3 for aggregates and 10 l/m3 for water.

(e) Digital readous shall have a scale increments not exceeding 2 kg. for cement and mineral admixtures, 10 kg. for aggregate and 10 for water.

(f) At the time of installation, or reconditional the accuracy of the indicated mass at any point on the scale shall be within 0.25 percent of the full scale reading.

(g) Any other time during the masonry operation the accuracy shall be within 0.50 percent of the full scale reading.

(h) Chemical Admixture dispensers shall have scale increment for exceeding.

Ranger of scale in kg/l	Scale increment in Kg/l
0.1 – 0.5	0.01
0.5 - 1.0	0.02
1.0 – 10.	0 0.2
more than 10.0	0.40

(i) All weighing and measuring equipment shall be tested and calibrated over its full working range at the following intervals :

(1) Mechanical /knife edge systems : At least once every two month

(2) Electrical /load cell systems : At least once every three months
Adequate and identified facilities shall be provided for the application of the test loads.

(j) In the case of batch weighing systems testing and calibration shall be based on the application test loads to the weigh hoppers.

(k) Checks on continuous weigh systems shall be based on comparison of preset quantities with those actually produced.

9.13 DAMP PROOF COURSE

1 Cement Concrete Layer

This shall consist of cement concrete of specified proportions and thickness. The surface of brick or stone masonry work shall be levelled and prepared before laying the cement concrete. Edge of damp proof course shall be straight, even and vertical. Side shuttering shall consist of steel forms and shall be strong and properly fixed so that it does not get disturbed during compaction and the mortar does not leak through. The concrete mix shall be of workable consistency and shall be tamped thoroughly to make a dense mass. When the sides are removed, the surface should come out smooth without honey coming.Continuity shall be maintained while laying the cement concrete layer and laying shall be terminated only at the predetermined location where damp proof course is to be discontinued. There shall be no construction joints in the Damp Proof Course.

2 Curing

Damp proof course shall be cured for at least seven days, after which it shall be allowed to dry.

APPENDIX D
SLUMP TEST
(Clause 4.2.2)

Apparatus: Mould shall consist of a metal frustum of cone having the following internal dimensions:
Bottom diameter……..20 cm
Top diameter……10 cm
Height……30 cm
The mould shall be of a metal other than brass and aluminium of at least 1.6 mm (or 16 BG) thickness. The top and bottom shall be open and at right angles to the axis of the cone. The mould shall have a smooth internal surface. It shall be provided with suitable foot pieces and handles to facilitate lifting it from the moulded concrete test specimen in a vertical direction as required by the test. A mould provided with a suitable guide attachment may be used Tamping rod shall be of steel or other suitable material 16 mm in diameter 60 mm long and rounded at one end.

Procedure: The internal surface of the mould shall be thoroughly cleaned and free form superfluous moisture and any set concrete before commencing the test. The mould shall be placed on a smooth horizontal, rigid and non-absorbent surface viz. levelled metal plate. The operator shall hold the mould firmly in place while it is being filled with test specimen of concrete. The mould shall be filled in four layers, each approximately one quarter of height of mould. Each layer shall be tamped with twenty five strikes of the rounded end of the tamping rod. The strokes shall be distributed in a uniform manner over the cross section of the mould and for the second and subsequent layers shall penetrate into the underlying layer. The bottom layer shall be tamped through out its depth. After the top layer has been rodded, the concrete shall be struck off level with trowel or the tamping rod, so that the mould is exactly filled. Any mortar which shall leak out between the mould and the base plate shall be cleaned away. The mould shall be removed from the concrete immediately after filling by raising it slowly and carefully in a vertical direction. The moulded concrete shall then be allowed to subside and the slump shall be measured immediately by determining the difference between the height of the mould and that of the highest point of specimen. The above operations shall be carried out at a place free from vibration or shock, and within a period of two minutes after sampling.
Result: The slump shall be recorded in terms of millimeters of subsidence of the specimen during the test. Any slump specimen which collapses or shears off laterally give incorrect result. If this occurs, the test shall be repeated with another sample. The slump test shall not be used for very dry mixes as the results obtained are not accurate.

9.14 Size of Stones
Normally stones used should be small enough to be lifted and placed by hand. Unless otherwise indicated, the length of stones for stone masonry shall not exceed three times the height and the breadth on base shall not be greater than three-fourth of the thickness of wall, or not less than 150 mm. The height of stone for rubble masonry may be upto 300 mm. The selection and grading of stones for rubble masonry is largely done at site and the smaller stones are used in the hearting of wall.

9.14.1 Random Rubble Masonry shall be uncoursed or brought to courses as specified Uncoursed random rubble masonry shall be constructed with stones of sizes as referred to in para 7.0
and shapes picked up random from the stones brought from the approved quarry. Stones having sharp corners or round surfaces shall, however, not be used.

9.14.2 Random rubble masonry brought to the course is similar to uncoursed random rubble masonry except that the courses are roughly levelled at intervals varying from 300 mm to 900 mm in height according to the size of stones used.

9.14.3 Dressing

Each stone shall be hammer dressed on the face, the sides and the beds. Hammer dressing shall enable the stones to be laid close to neighbouring stones such that the bushing in the face shall not project more than 40 mm on the exposed face.

(i) Face stone: At least 25% stones shall be headers tailing into the work at least 2/3rd the thickness of wall in super structure masonry. Such stones shall not be less than 200 sq. cm in cross sections.

(ii) Hearting Stones: The hearting or interior filling of a wall face shall consist of rubble stones not less than 150 mm in any direction, carefully laid, hammered down with a wooden mallet into position and solidly bedded in mortar. The hearting should be laid nearly level with facing and backing.

(iii) Quoin Stone*:* Quoin stone shall be less than 0.03 cum in volume.

(iv) Jamb stones: The jambs shall not be made with stones specified for quoins except that the stones which were required to be provided at 1 metre centre to centre on both the exposed faces shall here be provided only on the jamb and the length shall be equal to the thickness of the wall for wall upto 60 cm and a line of headers shall be provided for walls thicker than 60 cm as specified for bond.

9.14.4 (A) Courses

The masonry shall be carried out in regular courses of height not exceeding 50 cm and masonry on any day will not be raised more than 60 cm in height when using mortars having compressive strength less than 20 kg./sq. cm at 28 days and 100 cm when using mortars exceeding this strength.

9.14.5 (B) Thickness of Joints

The joint thickness shall not exceed 30 mm at any point on the face. Chips of the stone and spalls shall be wedged into seating bed of face stones to avoid excessive bed thickness. No pinning shall be allowed to avoid excessive joint thickness.

9.14.6 Mortar

The mortar used for joining shall be as specified.

9.14.7 Laying

Stone shall be laid on their natural bed and shall be solidly bedded full in mortar with close joints, chips of stone spalls be wedged into the work wherever necessary. No dry work or hollow spaces shall be allowed and every stone whether large or small shall be carefully selected to fit snugly the interstices between the large stones. Masonry shall be built breaking joints in all the three directions. Bond stone and headers shall be properly laid into the work and shall be marked by the contractor with white lead paint. The bond stones shall be provided as specified in para 7.1.8. The masonry work in wall shall be carried up true to plumb or to specified batter. Random rubble masonry shall be brought to the level courses at plinth, window sills, lintel and roof levels. Levelling shall be done with concrete comprising of one part of the mortar as used for masonry and two parts of graded stone aggregate of 20 mm nominal size. The masonry in structure shall be carried uniformly. Where the masonry of one part is to be delayed, the work shall be raked back at an angle not steeper than 45°.

9.14.8 (A) Raking out joints

All the joints on the faces to be pointed or plastered shall be racked out with racking tool to a depth of 20mm while the mortar is still green.

9.14.9 Bond Stones

Though bond stones shall be provided in walls upto 600 mm thickness, a set of two or more bond stones overlapping each other by at least 150 mm shall be provided in a line from face to back. In case of highly absorbent types of stones (porous lime stone and sand stone etc.) the bond stone shall extend about two-third into the wall, as through stones in such walls a set of two or more bond stones overlapping each other by at least 150 mm shall be provided. Each bond stone or a set of bond stones shall be provided for every 0.5 m2 of the wall surface and shall be provided at 1.5 m to 1.8 m apart clear in every course. In case of highly absorbent types of stones (porous lime stone and sand stone etc.) single piece bond stones may give rise to dampness. For all thicknesses of such walls a set of two or more bond stones overlapping each other by at least 15 cm shall be provided. Length of each such bond stone shall not be less than two-third of the thickness of the wall. Where bond stones of suitable lengths are not available pre-cast cement concrete block of 1:3:6 mix (1 cement : 3 coarse sand: 6 graded stone aggregate 20 mm nominal size) of cross section not less than 225 square centimeters and length equal to the thickness.

At least one bond stone or a set of bond stones shall be provided at 1.5 m to 1.8 m apart clear in every course. (Bond stones shall be marked suitably with paint as directed by the Engineer-in-Charge).

9.14.10 Quoin and Jamb Stones

The quoin and jamb stones shall be of selected stones neatly dressed with hammer or chisel to form the required angle. Quoin stones shall not be less than 0.01 cum in volume. Height of quoins and jamb stones shall not be less than 15 cm. Quoins shall be laid header and stretcher alternatively.

9.14.11 Joints

Stones shall be so laid that all joints are fully packed with mortar and chips. Face joints shall not be more than 20 mm thick. The joints shall be struck flush and finished at the time of laying when plastering or pointing is not to be done. For the surfaces to be plastered or pointed, the joints shall be raked to a minimum depth of 20 mm when the mortar is still green.

9.14.12 Scaffolding

Single scaffolding having one set of vertical support shall be allowed. The supports shall be sound and strong, tied together by horizontal pieces, over which the scaffolding planks shall be fixed. The inner end of the horizontal scaffolding member may rest in a hole provided in the masonry. Such holes, however, shall not be allowed in pillars under one metre in width or near the skew back of arches. The holes left in masonry work for supporting scaffolding shall be filled and made good with cement concrete 1 : 3 : 6 (1 cement : 3 coarse sand : 6 stone aggregate 20 mm nominal size).

9.14.13 Curing

Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days. In case of masonry with fat lime mortar curing shall commence two days after laying of masonry and shall continue for at least seven days thereafter.

9.14.14 Protection

Green work shall be protected from rain by suitable covering. The work shall also be suitably protected from damage, mortar dropping and rain during construction.

9.14.15 Measurements

9.14.16 The length, height and thickness shall be measured correct to a cm. The thickness of wall shall
be measured at joints excluding the bushing. Only specified dimensions shall be allowed; anything extra
shall be ignored. The quantity shall be calculated in cubic metre nearest to two places of decimal.

9.14.17 The work under the following categories shall be measured separately.
(i) From foundation to plinth level (level one) :
(a) work in or under water and or liquid mud,
(b) work in or under foul positions.
(i) Above plinth level and upto floor five level.
(ii) Above floor five level to every floor/floors or part thereof.
(iv) Stone masonry in parapet shall be measured together with the corresponding item in the wall of the storey next below.

9.14.18 No deduction shall be made nor extra payment made for the following :
(i) Ends of dissimilar materials (that is joists, beams, lintels, posts, girders, rafters purlins, trusses, corbels, steps etc.) upto 0.1 sqm in section.
(ii) Openings each upto 0.1 sqm in area. In calculating the area of openings, any separate lintels or sills shall be included alongwith the size of opening but the end portions of the lintels shall be excluded and the extra width of rebated reveals, if any, shall also be excluded.
(iii) Wall plates and bed plates, and bearing of chajjas and the like, where the thickness does not exceed 10 cm and the bearing does not extend over the full thickness of the wall.
Note: The bearing of floor and roof shall be deducted from wall masonry.
(iv) Drain holes and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.
(v) Building in masonry, iron fixture, pipes upto 300 mm dia, hold fasts of doors and windows etc.
(vi) Forming chases in masonry each upto section of 350 sq cm.
Masonry (excluding fixing brick work) in chimney breasts with smoke of air flues not exceeding 20 sq dm (0.20 sq m) in sectional area shall be measured as solid and no extra payment shall be made for pargetting and coring such flues. Where flues exceed 20 sq dm (0.20 sq m) sectional area, deduction shall be made for the same and pargetting and coring flues shall be measured in running metres stating size of flues and paid for separately. Aperture for fire place shall not be deducted and no extra payment made for splaying of jambs and throating.

9.14.19 Apertures for fire places shall not be deducted and extra labour shall not be measured for splaying of jambs, throating and making arch to support the opening.

7.1.15 Rate

The rate shall include the cost of materials and labour required for all the operations described above and shall include the following :
(a) Raking out joints for plastering or pointing done as a separate item, or finishing flush as the work proceeds.
(b) Preparing tops and sides of existing walls for raising and extending.
(c) Rough cutting and waste for forming gables cores, skew backs or spandrels of arches, splays at eaves and all rough cutting in the body of walling unless otherwise specified.
(d) Bond stones or cement concrete bond blocks.
(e) Leading and making holes for pipes etc.
(f) Bedding and pointing wall plates, lintels, sills etc. in or on walls, bedding roof tiles and corrugated sheets in or on walls.
(g) Building in ends of joists, beams, lintels etc.

9.15 DOOR, WINDOW AND VENTILATOR FRAMES

9.15.1 Timber for door, window and ventilators frames shall be as specified. Timber shall be sawn in the direction of the grains. All members of a frame shall be of the same species of timber and shall be straight without any warp or bow. Frames shall have smooth, well-planed (wrought) surfaces except the surfaces touching the walls, lintels, sill etc., which may be left clean sawn. Rebates, rounding or moulding shall be done before the members are jointed into frames. The depth of the rebate for housing the shutters shall be 15 mm, and the width of the rebates shall be equal to the thickness of the shutters. A tolerance of ± 2 mm shall be permitted in the specified finished dimensions of timber sections in frames.

9.15.2 Joints

The Jamb posts shall be through tenoned into the mortise of the transoms to the full thickness of the transoms and the thickness of the tenon shall be not less than 2.5 cm. The tenons shall closely fit into the mortise without any wedging or filling. The contact surface of tenon and mortise before putting together shall be glued with polyvinyl acetate dispersion based adhesive conforming to IS 4835 or adhesive conforming IS 851 and pinned with 10 mm dia hard wood dowels, or bamboo pins or star shaped metal pins. The joints shall be at right angles when checked from the inside surfaces of the respective members. The joints shall be pressed in position. Each assembled door frame shall be fitted with a temporary stretcher and a temporary diagonal brace on the rebated faces.

9.15.3 Fixing of Frames

The frames shall be got approved by the Engineer-in-Charge before being painted, oiled or otherwise treated and before fixing in position. The surface of the frames abutting masonry or concrete and the portions of the frames embedded in floors shall be given a coating of coal tar. Frames shall be fixed to the abutting masonry or concrete with holdfasts or metallic fasteners as specified. After fixing, the jamb posts of the frames shall be plugged suitably and finished neat. Vertical members of the door frames shall be embedded in the floor for the full thickness of the floor finish and shall be suitably strutted and wedged in order to prevent warping during construction. A minimum of three hold fasts shall be fixed on each side of door and window frames one at centre point and other two at 30 cm from the top and bottom of the frames. In case of window and ventilator frames of less than 1 m in height two hold fasts shall be fixed on each side at quarter point of the frames. Hold fasts and metallic fasteners shall be measured and paid for separately.

9.15.4 Measurements

Wood work wrought, framed and fixed shall be measured for finished dimension without any allowance for the wastage or for dimensions beyond specified dimension. However, in case of members having mouldings, roundings or rebates and members of circular or varying sections, finished dimensions shall be taken as the sides of the smallest square or rectangle from which such a section can be cut. Length of each member shall be measured over all to the nearest cm so as to include projection for tenons. Width and thickness shall be measured to the nearest mm and the quantity shal be worked out in unit of upto three places of decimal.

9.15.5 FLUSH DOOR SHUTTERS (Fig. 9.3)

1 Flush door shutters shall have a solid core and may be of the decorative or non-decorative (Paintable type as per IS 2202 (Part I). Nominal thickness of shutters may be 25, 30 or 35 mm. Thickness and type of shutters shall be as specified.

2 Width and height of the shutters shall be as shown in the drawings or as indicated by the Engineerin- Charge. All four edges of the shutters shall be square. The shutter shall be free from twist or warp in its plane. The moisture content in timbers used in the manufacture of flush door shutters shall be not more than 12 per cent when tested according to IS 1708.

3 Core

The core of the flush door shutters shall be a block board having wooden strips held in a frame constructed of stiles and rails. Each stile and rail shall be a single piece without any joint. The width of the stiles and rails including lipping, where provided shall not be less than 45 mm and not more than 75 mm. The width of each wooden strip shall not exceed 30 mm. Stiles, rails and wooden strips forming the core of a shutter shall be of equal and uniform thickness. Wooden strips shall be parallel to the stiles. End joints of the pieces of wooden strips of small lengths shall be staggered. In a shutter, stiles and rails shall be of one species of timber. Wooden strips shall also be of one species only but it may or may not be of the same species as that of the stiles and rails. Any species of timber may be used for core of flush door. However, any non-coniferous (Hard wood) timber shall be used for stiles, rails and lipping.

4 Face Panel

The face panel shall be formed by gluing, by the hot-press process on both faces of the core, either plywood or cross-bands and face veneers. The thickness of the cross bands as such or in the plywood shall be between 1.0 mm and 3.0 mm. The thickness of the face veneers as such or in the plywood shall be between 0.5 mm and 1.5 mm for commercial veneers and between 0.4 mm and 1.0 mm for decorative veneers, provided that the combined thickness of both is not less than 2.2 mm. The direction of the veneers adjacent to the core shall be at right angles to the direction of the wooden strips. Finished faces shall be sanded to smooth even texture. Commercial face veneers shall conform to marine grade plywood and decorative face veneers shall conform to type I decorative plywood in IS 1328.

5 Lipping

Lipping, where specified, shall be provided internally on all edges of the shutters. Lipping shall be done with battens of first class hardwood or as specified of depth not less than 25 mm. For double leaved shutters, depth of the lipping at meeting of stiles shall be not less than 35 mm. Joints shall not be permitted in the lipping.

6 Rebating

In the case of double leaves shutters the meeting of stiles shall be rebated by 8 mm to 10 mm. The rebating shall be either splayed or square type as shown in drawing where lipping is provided. The depth of lipping at the meeting of stiles shall not be less than 30 mm.

7 Opening for Glazing

When required by the purchaser opening for glazing shall be provided and unless otherwise specified the opening for glazing shall be 250 mm in height and 150 mm or 200 mm in width unless directed otherwise. The bottom of the opening shall be at a height of 1.4 m from the bottom of the shutter. Opening for glazing shall be lipped internally with wooden batten of width not less than 25 mm. Opening for glazing shall be provided where specified or shown in the drawing.

8 Venetian Opening

Where specified the height of the venetian opening shall be 350 mm from the bottom of the shutter. The width of the opening shall be as directed but shall provide for a clear space of 75 mm between the edge of the door and venetian opening but in no case the opening shall extend beyond the stiles of the shutter. The top edge of the opening shall be lipped internally with wooden battens of width not less than 25 mm. Venetian opening shall be provided where specified or shown in the drawing.

9 Tolerance

Tolerance on width and height shall be + 3 mm and tolerance on nominal thickness shall be ± 1.2 mm. The thickness of the door shutter shall be uniform throughout with a permissible variation of not more than 0.8 mm when measured at any two points.

10 Adhesive

Adhesive used for bonding various components of flush door shutters namely, core, core frame,

lipping, cross-bands, face veneers, plywood etc. and for bonding plywood shall conform to BWP type, phenol formaldehyde synthetic resin adhesive conforming to IS 848.

11 Tests

Samples of flush door shutters shall be subjected to the following tests:
(a) End Immersion Test
(b) Knife Test
(c) Glue Adhesion Test
One end of each sample shutter shall be tested for End Immersion Test. Two specimens of 150 x 150 mm size shall be cut from the two corners at the other end of each sample shutter for carrying out Glue Adhesion Test. Knife Test shall be done on the remaining portion of each sample shutter. Test shall be done as laid down in Appendix F of Chapter 9.

12 Measurements

Length and width of the shutters shall be measured to the nearest cm in closed position covering the rebates of the frames but excluding the gap between the shutter and the frame. Overlap of two shutters shall not be measured. All work shall be measured net as fixed and area calculated in square metres to nearest two places of decimal. No deduction shall be made for providing venetian opening and opening for glazing.

13 Rates

The rate includes the cost of material and labour involved in all the operations described above. Extra rate shall be payable for providing rebates in double leaved shutters. Glazing when provided shall be measured & paid for separately as specified in 9.6.10.2.

9.16 UPVC- DOOR FRAMES

1 Material

Polyvinyl chloride Resin suspension grade is the basic raw material for forming PVC compound. PVC resin then is mixed with chemicals like Calcium, Stearate, Hydrocarbon Wax, Titanium Dioxide, Calcium Carbonate, Acrylic processing aids. Further, additives like impact modifiers, pigments, epoxy plasticizer, UV stabilizer, lubricants, chemical blowing agent etc. are added. The purpose of adding the chemicals and additives is to impart cellular structure, strength, surface finish, colour and resistance to fading by light rays. These chemicals are mixed in the desired proportion and shall be used in the formulation of PVC material and for free and smooth extrusion of PVC profiles.

2 UPVC Door Frame

UPVC door frame shall be made of PVC material conforming to IS 10151. The door frame shall be made from extruded UPVC section having overall dimensions of 48 x 40 mm or 42 x 50 mm having wall thickness of 2.0 mm + 0.2 mm. Corners of the door frame to be jointed by M.S. galvanized brackets. Joints mitred and plastic welded. The hinge side vertical outer frames shall be reinforced by galvanized M.S. Tube of size 19 x 19 mm of wall thickness 1 mm + 0.1 mm and a tie rod shall be provided at the bottom of the frame. The frame shall be fabricated in factory as per nomenclature of the item and directions of Engineer-in-Charge. (Fig. 9.18).

3 Fixing of Frames

The frames are to be fixed in prepared openings in the walls. All civil work and tiling should be completed before the fixing of the frames. The frames are to be fixed directly on the plastered wall. In case tiling is to be done in the place the frames are to be fitted, a 50 mm strip should be left untiled at the location where the frames are to be fitted. The frames are erected in the prepared opening such that the vertical members of the door frame are embedded 50 mm in the floor. The frame shall be fitted truly in plumb. A minimum of three anchor bolts or screws of size 65/100 shall be used to fix each vertical member. One bolt shall be fixed at 200 mm from the top member and one bolt shall be fixed at 200 mm from the floor. The third anchor bolt shall be fixed in the center. The top horizontal

member shall be fixed using two 65/100 size anchor bolts or screws at a distance of 200 mm from both the corners.

4 Measurements

The outer length of the vertical and horizontal members of UPVC door frame shall be measured in running metres including embedded length in floor corrected upto a cm.

5 Rate

The rate includes the cost of the materials and labour involved in all the operations described above. The cost of anchor bolts or screws for joining the frame is included in the rate. Any other hardware, which may be required, shall be paid for separately.

5 UPVC- DOOR FRAMES

5.1 Material

Polyvinyl chloride Resin suspension grade is the basic raw material for forming PVC compound. PVC resin then is mixed with chemicals like Calcium, Stearate, Hydrocarbon Wax, Titanium Dioxide, Calcium Carbonate, Acrylic processing aids. Further, additives like impact modifiers, pigments, epoxy plasticizer, UV stabilizer, lubricants, chemical blowing agent etc. are added. The purpose of adding the chemicals and additives is to impart cellular structure, strength, surface finish, colour and resistance to fading by light rays. These chemicals are mixed in the desired proportion and shall be used in the formulation of PVC material and for free and smooth extrusion of PVC profiles.

5.2 UPVC Door Frame

UPVC door frame shall be made of PVC material conforming to IS 10151. The door frame shall be made from extruded UPVC section having overall dimensions of 48 x 40 mm or 42 x 50 mm having wall thickness of 2.0 mm + 0.2 mm. Corners of the door frame to be jointed by M.S. galvanized brackets. Joints mitred and plastic welded. The hinge side vertical outer frames shall be reinforced by galvanized M.S. Tube of size 19 x 19 mm of wall thickness 1 mm + 0.1 mm and a tie rod shall be provided at the bottom of the frame. The frame shall be fabricated in factory as per nomenclature of the item and directions of Engineer-in-Charge. (Fig. 9.18).

5.3 Fixing of Frames

The frames are to be fixed in prepared openings in the walls. All civil work and tiling should be completed before the fixing of the frames. The frames are to be fixed directly on the plastered wall. In case tiling is to be done in the place the frames are to be fitted, a 50 mm strip should be left untiled at the location where the frames are to be fitted. The frames are erected in the prepared opening such that the vertical members of the door frame are embedded 50 mm in the floor. The frame shall be fitted truly in plumb. A minimum of three anchor bolts or screws of size 65/100 shall be used to fix each vertical member. One bolt shall be fixed at 200 mm from the top member and one bolt shall be fixed at 200 mm from the floor. The third anchor bolt shall be fixed in the center. The top horizontal member shall be fixed using two 65/100 size anchor bolts or screws at a distance of 200 mm from both the corners.

5.4 Measurements

The outer length of the vertical and horizontal members of UPVC door frame shall be measured in running metres including embedded length in floor corrected upto a cm.

5.5 Rate

The rate includes the cost of the materials and labour involved in all the operations described above. The cost of anchor bolts or screws for joining the frame is included in the rate. Any other hardware, which may be required, shall be paid for separately.

5.6 FIBRE GLASS REINFORCED PLASTIC (FRP) DOOR FRAMES

5.6.1 Door Frames shall be three legged of cross section 90 mm x 45 mm having single rebate of size 32 mm x 15 mm to receive shutter of 30 mm thickness. The frame shall be made of laminate of thickness of 2 mm and shall be filled with wooden blocks of exterior grade MDF or seasoned and treated hard wood inside the laminate in all the three legs of the frame. The frame to be moulded by either hand lay up or resin transfer moulding process. The process shall consist of laying gelcoat at 1000 gms./m2 and laid over with layer of FRP Mat (CSM mat) gelcoat and FRP (CSM Mat) are defined in IS 14856. The CSM mat shall be bonded with Isophatholic resin in the ratio not less than 1:2 (One part of Mat to two parts of Isopathlic resin and fillers & additives) by weight. The edge shall be sealed with gelcoat and FRP mat to obtain smooth finish. Sufficient roving shall be laid in the corner to have smooth curve while laying the CSM mat. (Fig. 9.23).

5.6.2 FRP door shall be manufcturred as per specifications laid down in IS 14856, nomenclature of items & direction of Engineer-in-Charge.

5.6.3 Tolerance

Tolerance of size of frame to be + 2 mm and on size of rebate to be + 1 mm.

5.6.4 Finish

The surface of the moulded frame shall be free from any visible defects such as small pores, crazing, blistering, wrinkling, impurities, defective impregration, colour blots and aggregate defects, as mentioned in IS 14856. Scattered pin holes duly repaired and finished by applying resin and not noticeable shall be acceptable. Frame laminate shall be flat and shall have smooth and level surface. Laminate shall be finished in colour & shade as approved by Engineer-in-Charge.

5.7 FIBRE GLASS REINFORCED PLASTIC (F.R.P.) SHUTTERS

5.7.1 F.R.P. Shutters shall be manufactured conforming to the specifications as per IS 14856 and nomenclature of item & direction of Engineer-in-Charge. (Fig. 9.24A & 9.24B).

5.7.2 Blocks of any seasoned hardwood of bulk density not less than 450 kg./m3 at 12 per cent moisture content or any other material of sufficient thickness and length shall be provided inside the shutter at suitable place to hold fittings and fixtures such as aldrops, tower bolt, handle, sliding door bolt, mortice lock etc. Blocks for hinges shall be provided at three locations, unless otherwise specified by the purchaser. One at the centre and other two at 200 mm from the top and the bottom of the shutter. Blocks shall be provided at predetermined places in the shutter so as to fix hinges mortice locks, tower bolts, aldrops, door closures, etc. The finished surface shall be buffed and polished with wax.

5.7.3 Location of Fittings and Accessories

The lock rail of door shutters shall be so placed that is centre line is at a height 850 + 5 mm from the bottom of the shutter. Door shutter shall be fixed to the frame with three hinges, unless otherwise specified by the purchaser, of the type specified. These locations shall be, one at centre and other two at 200 mm from the top and the bottom of the shutter, where blocks have already been provided and suitable indication by depressing the profile has been made. Screws for fixing the hinges shall be screwed in with screwdrivers & not hammered. The length of screw should be 8/30 mm. The hinges used shall be stainless steel or aluminum.

9.17 STEEL WORK IN BUILT UP SECTION (WELDED)

1 The steel work in built up sections (welded) such as in trusses, form work etc. is specified in this clause.

2 Laying out

It shall be as specified in 10.3.1.

3 Fabrication
Straightening, shaping to form, cutting and assembling, shall be as per 10.3.2 as far as applicable, except that the words “riveted or bolted” shall be read as “welded” and holes shall only be used for the bolts used for temporary fastening as shown in drawings.

4 Welding : Welding shall generally be done by electric arc process as per IS 816 and IS 823. The electric arc method is usually adopted and is economical. Where electricity for public is not available generators shall be arranged by the contractor at his own cost unless otherwise specified. Gas welding shall only by resorted to using oxyacetylene flame with specific approval of the Engineer-in-charge. Gas welding shall not be permitted for structural steel work Gas welding required heating of the members to be welded along with the welding rod and is likely to create temperature stresses in the welded members. Precautions shall therefore be taken to avoid distortion of the members due to these temperature stresses. The work shall be done as shown in the shop drawings which should clearly indicate various details of the joint to be welded, type of welds, shop and site welds as well as the types of electrodes to be used. Symbol for welding on plans and shops drawings shall be according to IS 813. As far as possible every efforts shall be made to limit the welding that must be done after the structure is erected so as to avoid the improper welding that is likely to be done due to heights and difficult positions on scaffolding etc. apart from the aspect of economy. The maximum dia of electrodes for welding work shall be as per IS 814. Joint surfaces which are to be welded together shall be free from loose mill scale, rust, paint, grease or other foreign matter, which adversely affect the quality of weld and workmanship.

5 ***Precautions :*** All operation connected with welding and cutting equipment shall conform to the safety requirements given in IS 818 for safety requirements and Health provision in Electric and gas welding and cutting operations.

9.17.1 Operation, Workmanship and process of Welding is described in Appendix B,

9.17.2. Inspection and testing of welds shall be as per IS 822.

9.17.3 ***Assembly :*** Before welding is commenced, the members to be welded shall first be brought together and firmly clamped or tack welded to be held in position. This temporary connection has to be strong enough to hold the parts accurately in place without any disturbance. Tack welds located in places where final welds will be made later shall conform to the final weld in quality and shall be cleaned off slag before final weld is made.

9.17.4 ***Erection :*** The specification shall be as described in 10.3.3 except that while erecting a welded structure adequate means shall be employed for temporary fastening the members together and bracing the frame work until the joints are welded. Such means shall consists of applying of erection bolts, tack welding or other positive devices imparting sufficient strength and stiffness to resist all temporary loads and lateral forces including wind. Owing to the small number of bolts ordinarily employed for joints which are to be welded, the temporary support of heavy girders carrying columns shall be specially attended. Different members which shall be fillet welded, shall be brought into as close contact as possible. The gap due to faulty workmanship or incorrect fit if any shall not exceed. 1.5 mm if gap exceeds 1.5 mm or more occurs locally the size of fillet weld shall be increased at such position by an amount equal to the width of the gap.

9.17.5 ***Painting :*** Before the member of the steel structures are placed in position or taken out of the workshop these shall be painted as specified in para 10.2.2.

9.17.6 Measurements

The mode of measurements shall be the same as specified in 10.2.4 except that weight of welding material shall not be added in the weight of members for payment and nothing extra shall be paid for making and filling holes for temporary fastening of members during erection before welding.

9.17.7 Rate
The rate shall include the cost of all labour and materials involved in all the operations described above.

9.18 COLLAPSIBLE STEEL GATES
9.18.1 These shall be of approved manufacture and shall be fabricated from the mild steel sections.
9.18.2 The gates shall consist of double or single collapsible gate depending on the size of the opening. These shall consist of vertical double channels each 20 x 10 x 2 mm. at 10 cm. centre to centre braced with flat iron diagonals 20 x 5 mm and top and bottom rails of T- iron 40 x 40 x 6 mm @ 3.5 kg/m with 40 mm dia. ball bearings in every fourth double channel, unless otherwise specified. Wherever collapsible gate is not provided within the opening and fixed along the outer wall surface, T- iron at the top may be replaced by flat iron 40 x 10 mm. The collapsible gate shall be provided with necessary bolts and nuts, locking arrangement, stoppers and handles. Any special fittings like spring, catches and locks, shall be so specified in the description of item where so required. The gate shall open and close smoothly and easily.

9.18.3 Fixing
T- iron rails shall be fixed to the floor and to the Lintel at top by means of anchor bolts embedded in cement concrete of floor and lintel. The anchor bolts shall be placed approximately at 45 cm centres alternatively in the two flanges of the T- iron. The bottom runner (T- iron) shall be embedded in the floor and proper groove shall be formed along the runner for the purpose. The collapsible shutter shall be fixed at sides by fixing the end double channel with T-iron rails and also by hold- fasts bolted to the end double channel and fixed in masonry of the side walls on the other side. In case the collapsible shutter is not required to reach the lintel, beam or slab level, a Tee-section suitably designed may be fixed at the top, embedded in masonry and provided with necessary clamps and roller arrangement at the top. All the adjoining work damaged in fixing of gate shall be made good to match the existing work, without any extra cost.

9.18.4 Painting
All the members of the collapsible gate including T-iron shall be thoroughly cleaned off rust, scales, dust etc. and given a priming coat of approved steel primer conforming to IS 2074 before fixing them in position.

9.18.5 Measurements
The height and breadth shall be measured correct to a cm. The height of the gate shall be measured as the length of the double channels and breadth from outside to outside of the end fixed double channels in open position, of the gate. The area shall be calculated in square meters, correct to two places of decimal.

9.18.6 Rate
The rate shall include the cost of materials and labour involved in all the operations described above.

9.18 M.S. SHEET SLIDING SHUTTER
9.18.1 These shall be manufactured as per drawings and specification. These shall be fabricated from mild steel sheets.

9.18.2 The shutters shall be double or single leaf shutter as specified. The shutters shall be fabricated of specified size of M.S. angle iron frame diagonally braced with the same size of M.S. angle riveted / welded together with 3mm gusset plate at junction to form a rigid frame. M.S. sheet of 1 mm thickness or as specified shall be fixed to the frame with rivets/welds as approved by the Engineer-in-charge. These shall also be provided with top and bottom guide rails of specified size angles or T- irons and 25 mm diameter pulley or with 25 mm diameter ball bearing at the bottom and guide block with steel pulleys at the top. The shutters shall also be provided with locking arrangement, handles, stoppers, and holdfasts, other fittings as specified in the description of the item. The guide rails shall be sufficiently long and continued along the wall on both ends so that the sliding shutters can rest against the walls, giving full opening when so required.

9.18.3 Fixing

The guide rails shall be fixed to the floor by means of anchor bolts embedded in the cement concrete floor. The steel section at the top shall be suitably supported from the walls. Two channel sections shall be suitable fixed vertically below the extreme clamps in the wall and floor to avoid the shutter from going out of the supports at top and bottom. A suitable clamping arrangement will be provided at either end of the opening to avoid the shutters from rolling back into the opening.
All the adjoining work damaged in fixing shall be made good to match the existing work.

9.18.4 Painting

All members of the sliding shutters including fittings shall be thoroughly cleaned of rust, scales, dust etc. and given a priming coat of approved steel primer i.e. Red oxide zinc chrome primer conforming to IS 2074 before fixing them in position.

9.18.5 Measurements

The height and width shall be measured correct to a cm and its area for payment shall be calculated in square meters correct to two places of decimal. The height of the shutter shall be measured from outside to outside of the guide rail and width outside to outside of the shutter including the vertical position channels in sides, when shutter closed.

9.18.6 Rate

The rate shall include the cost of materials and labour involved in all the operation described above. It also includes the cost of the full length of guide rails.

9.19 ROLLING SHUTTERS

9.19.1 Rolling shutters shall conform to IS 6248. These shall include necessary locking arrangement and handles etc. These shall be suitable for fixing in the position as specified i.e. outside or inside on or below lintel or between jambs of the opening. The door shall be either push and pull type or operated with mechanical device supplied by the firm. Shutters upto 10 sq. metre shall be of push and pull type and shutters with an area of over 10 sq. metre shall generally be provided with reduction gear operated by mechanical device with chain or handle, if bearings are specified for each of operation, these shall be paid for separately.

9.18.2 ***Shutter:*** The shutter be built up of interlocking lath section formed from cold rolled steel strips. The thickness of the sheets from which the lath sections have been rolled shall be not less than 0.90 mm for the shutters upto 3.5 m width. Shutters above 9 metres width should be divided in 2 parts with provision of one middle fixed or movable guide channel or supported from the back side to resist wind pressure. The lath section shall be rolled so as to have interlocking curls at both edges and a deep corrugation at the centre with a bridge depth of not less than 12 mm to provide sufficient curtain of stiffness for resisting manual pressures and normal wind pressure. Each lath section shall be continuous single piece without any welded joint. When interlocked, the lath sections shall have a

distance of 75 mm rolling centers. Each alternate lath section shall be fitted with malleable cast iron or mild steel clips securely riveted at either ends, thus locking in the lath section at both ends preventing lateral movement of the individual lath sections. The clips shall be so designed as to fit the contour of the lath sections.

9.18.3 ***Spring:*** The spring shall be of coiled type. The spring shall be manufactured from high tensile spring steel wire or strips of adequate strength conforming to IS 4454- Part I.

9.18.4 ***Roller and Brackets :*** The suspension shaft of the roller shall be made of steel pipe conforming to heavy duty as per IS 1161. For shutter upto 6 metre width and height not exceeding 5 metre, steel pipes of 50 mm nominal bore shall be used. The shaft shall be supported on mild steel brackets of size 375 x 375 x 3.15 mm for shutters upto a clear height of 3.5 metre. The size of mild steel brackets shall be 500 x 500 x 10 mm for shutters of clear height above 3.5 m and upto 6.5 m. The suspension shaft clamped to the brackets shall be fitted with rotatable cast iron pulleys to which the shutter is attached. The pulleys and pipe shaft shall connected by means of pretensioned helical springs to counter balance the weight of the shutter and to keep the shutter in equilibrium in any partly open position.

9.18.5 When the width of the opening is greater than 3.5 mtr. The cast iron pulleys shall be interconnected with a cage formed out of mild steel flats of at least 32 x 6 mm and mild steel dummy rings made of similar flats to distribute the torque uniformly. Self aligning two row ball bearing with special cast iron casings shall be provided at the extreme pulley and caging rings shall have a minimum spacing of 15mm and at least 4 number flats running throughout length of roller shall be provided.

9.18.6 In case of shutters of large opening with mechanical device for opening the shutter the roller shall be fitted with a purion wheel at one end which in contact with a worm fitted to the bracket plate, caging and pulley with two ball bearing shall be provided.

9.18.7 ***Guide Channel :*** The width of guide channel shall be 25 mm the minimum depth of guide channels shall be as follows:

Clear width of shutters	*Depth of guide channel*
Upto 3.5 m	65 mm
3.5 m upto 8 m	75 mm
8 m and above	100 mm

9.18.8 The gap between the two legs of the guide channels shall be sufficient to allow the free movement of the shutter and at the same time close enough to prevent rattling of the shutter due to wind.

9.18.9 Each guide channel shall be provided with a minimum of three fixing cleats or supports for attachment to the wall or column by means of bolts or screws. The spacing of cleats shall not exceed 0.75 m. Alternatively, the guide channels may also be provided with suitable dowels, hooks or pins for embedding in the walls.

9.18.10 The guide channels shall be attached to the jambs, plumb and true either in the overlapping fashion or embedded in grooves, depending on the method of fixing.

9.18.11 ***Cover :*** Top cover shall be of mild steel sheets not less than 0.90 mm thick and stiffened with angle or flat stiffeners at top and bottom edges to retain shape.

9.18.12 Lock plates with sliding bolts, handles and anchoring rods shall be as per IS 6248.

9.18.13 Fixing
The arrangement for fixing in different situations in the opening shall be as per IS 6248.

9.18.14 Brackets shall be fixed on the lintel or under the lintel as specified with rawl. Plugs and screws bolts etc. The shaft along with the spring shall then be fixed on the brackets.

9.18.15 The lath portion (shutter) shall be laid on ground and the side guide channels shall be bound with ropes etc. The shutter shall then be placed in position and top fixed with pipe shaft with bolts and nuts. The side guide channels and cover frames shall then be fixed to the walls through the plate welded to the guides. These plates and bracket shall be fixed by means of steel screws bolts, and rawl plugs concealed in plaster to make their location invisible. Fixing shall be done accurately in a workmen like manner that the operation of the shutter is easy and smooth.

9.18.16 Measurements
Clear width and clear height of the opening for rolling shutter shall be measured correct to a mm.
The clear distance between the two jambs of the opening shall be clear width and the clear distance between the sill and the soffit (bottom of lintel) of the opening shall be the clear height.
The area shall be calculated in square metres correct to two places of decimal.

9.18.17 Rate
The rate shall include the cost of materials and labour involved in all the operations described above including cost of top cover and spring except ball bearing and mechanical device of chain and crank operation, which shall be paid for separately.

9.19 ROLLING GRILLS – SHUTTERS

9.19.1 Rolling grill shutter is meant to provide visibility or ventilation or both, the degree of protection and safety is less as compared to a rolling shutter. The situations where a certain amount of ventilation combined with safety is required rolling shutter-cum-grill may be provided in which the rolling shutter may have a rolling grill portion either at the top or at the bottom or at both places. In addition, the rolling grill portion may also be provided in the middle of the shutter. The total height of the grill portion in all the segments of rolling shutter-cum-grill shall not exceed 1.0 m and the height of the grill portion in any individual segment shall not be more than 0.5 m.

9.19.2 Rolling grills shutters are similar in design, construction and operation to rolling shutters and all the provisions of Para 10.8 shall be applicable to rolling grills shuters except in respect of the shutter portion, and shall conform to IS 6248.

9.19.3 Shutters
Rolling grill shutter and the rolling grill portion of the rolling shutter-cum-grill shall be fabricated with 8 mm diameter mild steel round bars. Straight bars and bars bent to the required profile are placed alternatively and held in position with 20 mm wide and 5 mm thick mild steel flat links. Straight bars shall be spaced not exceeding 150 mm centre to centre and the bars bent to required profile shall be placed symmetrically between two consecutive straight bars. Unless otherwise specified or directed by the Engineer-in-charge, bars placed alternatively with straight bars shall be bent to form a

corrugated profile such that the pitch of the corrugation is 100 to 120 mm and the depth of corrugation is 80 to 100 mm. all the bent bars shall have uniform profile. Straight bar along with the adjoining bent bars on it both sides shall be held in position by passing the bars through holes in the links. Each link shall have three holes and the length of the links shall be such that the distance from the centre of the hole to the nearest edge of the flat is not less than the diameter of the hole. The corner of the links shall be rounded. All links shall be of uniform size and shape. The spacing of the links measured along the straight bar shall be the same as centre to centre distance between two consecutive crests/ troughs of the bars bent to the required profile. Each bar and link shall be continuous single piece without any joint.

9.19.4 Measurement & Rate

The measurement and rate shall be as specified in 10.8.3 and 10.8.4 respectively. In case of Rolling Shutter-cum-Grill, where the area of the grill portion is half or less than half the area of opening, it shall be measured and paid as rolling shutter and where the area of grill portion is more than half the area of opening, it shall be measured and paid as rolling grill.

9.19.5 STEEL DOORS, WINDOWS, VENTILATORS AND COMPOSITE UNITS (Fig. 10.4)

Hot rolled steel sections for fabrication of steel doors, windows, ventilators and fixed lights shall conform to IS 7452. Shapes weights and designations of hot rolled sections shall be as per IS 7452. Appendix 'D' indicates the purpose or the situation where the sections are normally used. Tolerance in thickness of the sections shall be + 0.2 mm. The fabricated steel doors, windows, ventilators and composite units shall confirm to IS 1038 with up-to-date amendments and shall be IS marked (IS 1038).

9.19.6 The steel doors and windows shall be according to the specified sizes and design. The size of doors and windows shall be calculated, so as to allow 1.25 cm clearance on all the four sides of opening to allow for easy fitting of doors windows and ventilators into opening. The actual sizes of doors, windows and ventilators shall not vary by more than + 1.5 mm from those given in the drawing.

9.19.7 Fabrication

1 ***Frames :*** Both the fixed and openable frames shall be made of sections which have been cut to length and mitred. The corner of fixed and openable frames shall be welded to form a solid fused welded joint conforming the requirements given below. All frames shall be square and flat. The process of welding adopted shall be flush but welding or can be any other process as agreed to between the supplier and the purchaser which shall fulfil the requirements given in clause 6.1.1 of IS 1038, metal arc welding or any other suitable method. The section for glazing shall be tennoned and riveted into the frames and where they intersect the vertical tie shall be broached and horizontal tee threads through it, and the intersection closed by hydraulic pressure.

2 *Requirements of Welded Joints*

(i) **Visual Inspection Test:** When two opposite corners of the frame are cut, paint removed and inspected, the joint shall conform to the following:-

(a) Welds should have been made all along the place of meeting the members and tack welding shall not be permitted.

(b) Welds should have been properly grounded and

(c) Complete cross section of the corner shall be checked up to see that the joint is completely solid and there are no cavities visible.

(ii) **Micro and Macro Examinations:** From the two opposite corners obtained for visual test, the flanges of the sections shall be cut with the help of a saw. The cut surface of the remaining portions shall be polished, etched and examined. The polished and etched faces of the weld and the base metal shall be free from cracks and cavity and reasonably free from under cutting overlaps, gross porosity and entrapped slag.

(iii) **Fillet Weld Test:** The fillet weld in the remaining portion of the joint shall be fractured by hammering. The fractured surfaces shall be free from slag inclusion porosity, crack penetration defects and fusion defects.

3 ***Doors :*** The hinges shall be of 50 mm projecting type, Non projecting type hinges may also be used, if approved by Engineer-in-Charge. The hinge pin shall be of electro-galvanized steel or aluminum alloy of suitable thickness and size. Door handles shall be approved by the Engineer-in-Charge. A suitable latch lock for door openable both from inside and outside shall be provided. In the case of double doors, the first closing leaf shall be the left hand leaf locking at the door from the push side. The first closing shutter shall have a concealed steel bolt at top and bottom. The bolts shall be so constructed as not to work loose or drop by its own weight. Single and double leaf shutter door may be provided with a three way bolting device. Where the device is provided in the case of double leaf shutters, concealed brass or steel bolts shall not be provided.

4 ***Windows***

(a) For fixed windows, the frames shall be fabricated as per 10.10.2.1.1.

(b) Side hung windows.

For fixing steel hinges, slots shall be cut in the fixed frame and hinges inserted inside and welded to the frame at the back. The hinges shall be of projecting type with thickness not less than 3.15 mm and length not less than 65 mm and width not more than 25 mm. Non projecting type hinges may also be allowed if approved by the Engineer-in-Charge. The diameter of hinge pins shall not be less than 6 mm. The hinge pin and washer shall be of galvanized steel or aluminum alloy of suitable thickness. For fixing hinges to inside frame, the method described above may be adopted but the weld shall be cleaned, or the holes made in the inside frame and hinge riveted. The handle of side hung shutters shall be pressed brass, cast brass, aluminium or steel protected against rusting and shall be mounted on a steel plate. Thickness of handle shall not be less than 3 mm in case of steel or brass and 3.5 mm in case of aluminium. The handle plate shall be welded, screwed and/ or revitted to the opening frame in such a manner that it should be fixed before the shutter is glazed and should not be easily removable after glazing. The handle shall have a two point nose which shall engage with a brass or aluminium alloy striking plate on the fixed frame in a slightly opened position as well as closed position. The boss of handle shall incorporate a friction device to prevent the handle from dropping under its own weight and the assembly shall be so designed that the rotation of the handle may not cause it to unscrew from the pin.

9.20 PRESSED CERAMIC TILE FLOORING (VITRIFIED TILE FLOORING)

9.20.1 Operations as described in 11.15.1 to 11.15.6 shall be followed except the tiles shall conform to Table 12 of IS 15622 (Tiles with water absorption E ≤ 0.08 per cent Group BIa) and the joint thickness in flooring shall not be more than 1mm.

9.20.2 Rate

The rate for flooring shall include the cost of all materials and labour involved in all the operations described above. Nothing extra shall be paid for the use of cut (sawn) tiles in the work.

9.21 PRESSED CERAMIC TILE FLOORING (VITRIFIED TILE FLOORING)

9.21.1 Operations as described in 11.15.1 to 11.15.6 shall be followed except the tiles shall conform to Table 12 of IS 15622 (Tiles with water absorption E ≤ 0.08 per cent Group BIa) and the joint thickness in flooring shall not be more than 1mm.

9.21.2 Rate
The rate for flooring shall include the cost of all materials and labour involved in all the operations described above. Nothing extra shall be paid for the use of cut (sawn) tiles in the work.

11.18.4 Curing and Finishing
The joints shall be cleaned off the grey cement grout with wire/coir brush or trowel to a depth of 2 mm to 3 mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement added with pigments if required to match the colour of tiles. The work shall then be kept wet for 7 days. After curing, the surface shall be washed and finished clean. The finished work shall not sound hollow when tapped with a wooden mallet.

11.18.5 Measurements
Length shall be measured correct to a cm. Height shall be measured correct to a cm in the case of dado and 5 mm in the case of riser and skirting. The area shall be calculated in square metre, correct to two places of decimal. Length and height shall be measured along the finished face of the skirting or dado including curves where specials such as coves, internal and external angles and beads are used. Where cornices are used the area of dado shall be measured excluding the cornices. Nothing extra will be paid for cutting (sawn) the tiles to sizes. Areas where coloured tiles or different types of decorative tiles are used will be measured separately to be paid extra over and above the normal rate for white tiles.

11.18.6 Rates
The rate shall include the cost of all material and labour involved in all the operations described above, for tiles of sizes upto 0.14 sqm. unless otherwise specified in the description of the item. The specials such as coves, internal and external angles and beading shall be measured and paid for separately. The rate shall not include cost of cornices which shall be measured and paid for in running meters separately.

12 PLASTERING
12.1 LIME PLASTERS – 15 MM THICK The plaster shall not exceed 15 mm total thickness. This shall consist of a single coat of lime mortar including where necessary the setting coat of pure white lime putty.

12.1.1MATERIALS Lime mortar 1:2 or other specified proportion conforming to the requirements of Clause 3.1.

12.1.2 SURFACE PREPARATION New brickwork or stone masonry shall have been finished with recessed joints to receive plastering see clauses 6.2.7 and 7.2.3 respectively. In the case of stone masonry, the bushings on the wall to be plastered, shall be removed to within 12 mm projection. Where so specified for dense and smooth surfaces a suitable bonding treatment shall be applied to manufacturer's instructions before plastering. All soft joints in old stone masonry or brick work shall be ranked out to a depth of not less than 12 mm. The walls shall be brushed clean of all dust, thoroughly wetted and surface dried before plaster is applied.

12.1.3 APPLICATION Plastering of walls shall commence after completion of ceiling plastering if any. The plastering shall be started from the top and worked down towards the floor. All put-log-holes (i.e. holes left for scaffolding) shall be properly filled in advance of the plastering. To ensure an even

thickness and a true surface, gauges of plaster 15 mm x 15 mm, or broken clay tiles set in mortar shall be first established on the entire surface at about 2 metre intervals both vertically and horizontally. The thickness of the plaster specified excludes the key i.e. the grooves or open joints in the brick work. The minimum thickness of the plaster over any portion of the surface shall not vary from the specified thickness by more than 3 mm. Mortar shall be applied between the gauges to slightly more than the requires thickness i.e. slightly proud of the gauges. The plaster shall be well pressed into the joints, levelled and brought to a true surface by working on a wooden straight edge reaching across gauges, with small upward and sideways movement. Finally the surface shall be finished true with a wood float or trowel according to the type of finish required. If a sandy granular texture is needed, the surface shall be wood floated. If a smooth finish is needed, trowelling shall be done to the extend required; during this process the setting coat of pure white lime putty shall be applied on the surface to facilitate finishing. All moulded work, apart from the cover shall be formed and run in lime cement mortar 1:1:15 all ornaments, mitres etc. neatly formed. These shall be finished with lime putty as described above. All arrises shall be plastered in lime cement mortar 1:1:15 and finished with lime putty for wedges of not less than 25 mm along each face of the arris- All necessary dubbing behind, rounding of corners at the junctions of the walls plastering of cornices etc. shall be done. In suspending work at the end of the day, the plaster shall be left cut clean to line both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scraped, cleaned and wetted with lime putty before plaster is applied to the adjacent areas, to enable the tow to be properly jointed together. Plastering work shall be closed at the end of the day on the body of the wall not nearer than 150 mm to any corners or arrises. It shall not be closed on the body of features such as plaster band and cornices, nor at corners or arrises. Horizontal joints in plaster work shall not be formed on parapet tops and copings, as these invariably lead to leakages. No portion of the surface shall be left out initially to be patched up later on. Any cracks which appear on the surface and all portions which sound hollow when tapped or are found to be soft or otherwise defective shall be cut out in rectangular shape and redone as directed by the officer-in-charge.

12.1.4 FINISH The plaster shall be finished to a true and plumb surface and to the degree of smoothness required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5m long and with plumb bobs. The gap between the straight edge and any point on the plastered surface shall not exceed 3 mm. All horizontal lines and surface shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

12.1.5 CURING Curing shall be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of seven days. During this period, it shall be suitably protected for all damages, at the contractor’s expense by such means as the officer-in-charge may approve.

12.2 LIME CEMENT PLASTER 15 mm THICK The plaster shall not exceed 15 mm in total thickness it shall consist of a single coat of lime cement mortar including where necessary the setting coat of pure white lime putty.

12.2.1 MATERIAL Lime cement mortar 1:1: 15 or other specified proportions conforming to the requirements of clause 3.3

12.2.2 SURFACE PREPARTION AND APPLICATION Preparation of surface of the masonry/brickwork , and the application and curing shall be as specified in clause 13.1

12.2.3 SURFACE FINISH Unless otherwise specified all surfaces of lime cement plaster for external rendering shall be wood floated; internal plastering shall be troweled and finished with a setting coat of lime putty.

12.3 15mm THICH CEMENT PLASTER ON MASONRY/BRICK WORK The plaster shall not exceed 15 mm total thickness comparing a single coat of cement mortar and the setting coat of neat cement slurry.

12.3.1 MATERIALS The cement mortar 1:3 or other specified proportion conforming to the requirements of clause 3:2

12.3.2 SURFACE PREPARATION AND APPLICATION The surface preparation, application and curing shall be similar to the procedure specified in clause 13.1 taking account of the following details: The setting coat of neat cement slurry shall be applied within an hour of the completion of plastering. It shall be troweled smooth without showing signs of trowel marks or waviness or folds. Where a smooth finish is not specified, the surface shall be finished off with a rough wood float to the texture approved by the officer-in-charge.

12.4 18mm THICK COLOURED CEMENT PLASTER – 2 COAT WORK This shall consist of 2 coats. The base coat shall be cement mortar 12 mm thick with a surface coat of colored cement mortar 6 mm thick.

12.4.1 MATERIALS Cement mortar 1:3 or other specified proportion conforming to the requirements of Clause 3:2. An approved water proofing additive shall be used where specified.

12.4.2 SURFACE PREPARATION AND APPLICATION Surface preparation, application and curing shall be similar to the procedure in clause 13.1 taking account of the following details: The base coat of cement mortar shall where specified include 3% by weight of an approved waterproof additive. The base coat shall be left roughened with a wire brush to provide a key for the surface coat. The surface coat shall consist of a mortar of colored cement and sand mix as specified applied to thickness of 6 mm. It shall be applied not earlier than 24 hours of applying the base coat. It shall finish with a rough texture to accord with the approved sample are or as directed by the officer-in-charge.

12.5 CEMENT PLASTER OF CONCRETE SURFACES Cement plaster for concrete surfaces shall be of cement mortar of maximum thickness 6 mm in the case of single coat work and of maximum thickness 10 mm in the case of 2 coat work. The thickness of the plaster on the soffit of suspended floors shall be the minimum possible.

12.5.1 MATERIALS Cement mortar 1:3 or other specified proportion conforming to the requirements of clause 3:2

12.5.2 SURFACE PREPARATION Projecting burss of formed surfaces shall be removed and the surface scrubbed with wire branches. The surface shall than be prepared as follows: i. A first coat of spatter dash shall be applied over smooth clean concrete surface if so directed by the officer-in-charge. The dashing shall consist of 1 part of cement and 2 parts of clean fairly coarse and mixed to a thick slurry and kept well stirred. It shall be applied using a strong whipping motion normal to the face of wall. On setting and hardening the spatter dash shall give a good key for the subsequent coat to be applied. Where directed by the officer-in-charge the surface shall be hacked with a pointed tool at spacings of not more than 50 mm the hacks being not less than 3 mm deep. The surface shall then be cleaned of all mould oil, grease etc, by scrubbing with water containing detergent and washing off with plenty of clean water. The surface shall be allowed to dry before application of plaster.

12.5.3 APPLICATION (a) Soft Plaster Floor rendering and finishes of a suspended floor shall have been completed before commending plaster its soffit. In the case of flat roofs, the weather proofing

and other work shall have been completed so that the soffit plaster is not disturbed by subsequent operations on the floor or the roof. The concrete surface shall be wetted in acrance and allowed to dry before application of plaster. To ensure an even thickness and a true surface, suitable gauges shall be established at about 1.5 metre intervals in both directions as described in Clause 13.1.3 and the plaster applied and finished smooth as described therein with a floating coat of lime putty. The finished soffit shall not show trowel mark, waves or folds and shall be true and plane. The mortar shall be used within an hour of adding water to the dry mix. (b) In the case of concrete surface other than soffits of suspended Floors, the plaster shall be finished to a true and plumb surface and to the proper degree of smoothness required. All horizontal surfaces shall be tested with a levelling instruments and all jambs and corners with a plumb bob as the work proceeds. All internal surfaces shall be finished smooth with a floating coat of lime putty and external surfaces wood floated rough to the texture desired, all to the satisfaction of the officer-in-charge.

12.5.4 CURING Shall be as in 12.1

12.6 20 MM THICK 2 COAT WORK 2 coat work 20 mm thick shall comprise a first coat of 12 mm thickness, and a second coat of 8 mm thickness including the final lime putty.

12.6.1 MATERIALS The cement mortar, of specified proportions conforming to the relevant clauses of Chapter 3.

12.6.2 SURFACE PREPARATION Surface preparation shall be as for 15 mm thick lime plaster clause 131.2

12.6.3 APPLICATION The first coat (Scratch coat) 12 mm thick. This shall be as per clause 13.1.3 except that the thickness of plaster is 12 mm as measured from the face of the brick work or stonework to the plastered surface. It shall be carried to the full length of the wall or to natural breaking points like doors and windows. The scratch coat shall be cross scratched to provide a mechanical key for the subsequent - 132 - coat. The surface shall be kept continuously damp for at least 2 days following its application. It shall then be allowed to dry before application of the second coat. The second coat 8 mm thick Before starting to apply the second coat the surface of the scratch coat shall be campened evenly by using fog spray to get uniform suction. The second coat shall be 8 mm thick and pressed well into the first coat. It shall be brought to a true even surface, with a trowel and the surface finished smooth with a setting of pure white lime putty.

12.6.4 FINISHING AND CURING Finishing and curing shall be s per clause 13.1.4 and 13.1.5 All plaster work shall be kept damp continuously for a minimum period of 7 days after the application of the finishing coat. Should the plaster crack through neglect of curing or because of any other fault, the work shall be removed and redone at the contractor’s expense. 12.7 20 MM THICK ROUGH CAST PLASTER (Note: This is a good water proof covering generally for external work) It shall consist of 2 coats: the first coat shall be 12 mm thick of either lime cement mortar 1:1:5 or cement mortar 1:3. The second coat which is the finishing coat shall be at least 8 mm thick and made up of a mixture of cement and stone chips in specified proportions dashed over the freshly plastered first coat. Where directed, a sample panel of rough cost work shall be done first and approval of the officer-in-charge obtained.

12.7.1 MATERIALS Cement mortar 1:3 or lime cement mortar 1:1: 5 conforming to the relevant clauses of Chapter 3.

12.7.2 PREPARATION OF THE SURFACE This shall conform to the requirements of clause 13.1.2
12.7.3 APPLICATION The first coat of plaster 12 mm thick shall be applied and left rough to receive

the finishing coat. The finishing coat or rough cast shall consist of a mixture of one part of cement and three parts of stone chips 6 to 10 mm size. It shall be mixed well to a paste of proper consistency and flung on the first coat with large sized trowels to form an even rough coat. The second coat shall be applied while the first coat is still soft and unset. The plastering shall be cured for at least 7 days

12.8 LATH AND PLASTER

12.8.1 MATERIALS Metal Lath Metal lathing for plasters' work shall be expanded metal lathing of the gauge specified and conforming to BS 1369: or other approved reinforcement, nailed and fixed to studs, brackets etc. The material shall be protected by one coat of bituminous paint or by galvanising. Cement Mortar Cement mortar 1:3 shall conform to requirements of clause 3:2

12.8.2 PROCEDURE The expanded metal shall be fixed with the 'long way' of the mesh across the supports. Sheets shall be lapped not less than 25 mm at the sides and ends. Sides shall be wired together with galvanized wire of not less than 18 S.W.G every 75 mm between supports. Before plastering operations are commenced the metal lathing shall be thickly coated with cement slurry. The cement mortar shall be applied in not less than three coats and finished smooth with pure white lime putty. No lime plaster shall be in direct contact with any metal work.

12. PAINTING GENERAL a) Materials Paints, oils, varnishes etc, of approved manufacturer shall be used. Ready mixed paint as received from the manufacturer shall be used without any admixture. If for any reason, thinning of ready mixed paint in necessary the brand of thinner recommended by the manufacturer or as instructed by the officer-in-charge shall be used. Approved paints, oils, or varnishes shall be brought to the site in their original containers in the sealed condition. - 147 - Where directed, sample areas shall be provided of each type of coating including preparation of surfaces, and not approved by the officer-in-charge before proceeding with the painting. b) Preparation Painting shall not be started until the preparations have been inspected by the officer-in-charge and approval given by him to commence the painting work. Painting shall not be carried out in adverse weather conditions as condensation may occur on surface being painted. Painting except the priming coat, shall generally be commenced after practically finishing all other building work. The rooms shall be thoroughly swept out and the entire building cleaned at least one day in advance of starting the paint work. b) Preparation of surface Preparation of wood, steel and other surfaces, both new and painted shall conform to the relevant sub clauses on this specification – See Clause 15.9.1 to 15.9.6 Priming coat shall be applied by brush unless otherwise approved.

13. c) Application of finishing coats shall be by brush spray or roller as specified and approved by the officer-in-charge. Paints uses shall be brought to the requisite consistency by adding a suitable thinner recommended by the paint manufacturer. Each coat shall be allowed to dry thoroughly this should be facilitated by thorough ventilation. Each coat except the last coat, shall be lightly rubbed down with sand paper or fine pumice stone and dust cleaned off before the next coat is laid. The paint shall be stirred thoroughly in its containers before pouring into smaller containers. Whilst applying also, the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. No left over plant shall be put back into the stock tins. When not in use, the containers shall be kept properly. Brushing The paint shall be laid on evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternatively into the opposite direction two or three times and then finally laying off in the direction two or three times and then finally laying off in the direction of the grain in the case of wood work. In this process, no brush marks shall be left after the laying-off is finished. The full process of crossing and laying off will constitute

one coat. Spraying Where stipulated, the painting shall be done by spraying. The spray machine used may be a high pressure (small air aperture) type, or a low pressure (large air gap) type, depending on the nature and location of work to be carried out. Skilled and experienced work men shall be employed for this class of work. Spray painting shall be done only when dry conditions prevail.