	SECTION IV	
	TECHNICAL SPECIFICATIONS	
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SECTION 1.00 EARTHWORK

Scope

This section covers the works specification of earthwork in excavation in all kinds of soils including murrum, hard murrum, soft rock (without blasting),hard rock (without blasting), rock (with blasting), filling excavated earth in plinths, sand filling in plinth, rubble soling, and brick on edge soling .

Applicable Codes

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable .In all cases, the latest revision of the codes shall be referred to.

a)	IS - 4081 Safety code for blasting and related drilling operations
b)	IS - 1200 Method of measurement of building works.
c)	IS - 3764 Safety code for excavation work
d)	IS - 3385 Code of practice for measurement of Civil Engineering works.
e)	IS – 2720 Part II Determination of moisture content. Part VIII Determination of moisture content dry density relation using light compaction. Part XXVIII Determination of dry density of soils, in-place by the sand replacement method. Part XXVIII Determination of dry density of soils, in-place by the sand replacement method. Part XXIX Determination of dry density of soils, in-place, by the core cutter method.
	Drawings Engineer will furnish all necessary drawings showing the areas to be excavated, filled, sequence of priorities etc. Contractor shall follow strictly such drawings.

	General Contractor shall provide all tools, plants, instruments, qualified supervisory personnel, labor, materials, and temporary works, consumables, any and everything necessary, whether or not such items are specifically stated herein, for completion of the Work. Contractor shall carry out the survey of the site before excavation and set properly all lines and establish levels for various works such as earthwork in excavation for leveling, basement, foundations, plinth filling, roads, drains, cable trenches, pipelines etc. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference/grid lines at 5 m intervals or nearer as determined by Engineer based on ground profile. These shall be checked by Engineer and thereafter properly recorded. The area to be excavated/filled shall be cleared of fences, trees, plants, logs, slumps, bush, vegetations, rubbish slush etc. and other objectionable matter. If any roots or stumps of trees are found during excavation, they shall also be removed. The material so removed shall be burnt or disposed off as directed by Engineer. Where earth fill is intended, the area shall be stripped of all loose/soft patches, top soil containing deleterious matter/ materials before fill commences. Relics, Objects of Antiquity, Etc. All gold, silver, oil minerals archaeological and other findings of importance, all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or upon the site shall be the property of owner and Contractor shall dully preserve the same to the satisfaction of GUJARAT University and from time to time deliver the same to such person or persons as GUJARAT UNIVERSITY may from time to time authorize or appoint to receive the same.
1.01	Excavation in all types of soil, including murrum, for foundations of wall, columns, plinth beams, basement, raft, ducts, trenches, underground sumps, septic tanks, soak well, manhole chambers, gully chambers, including shoring, strutting, bailing out water/pumping off water if required and disposing off excavated earth 50 mtr away from the construction line, re-filling the trenches, foundation pits, ramming, watering consolidating in 15 cms to 20 cms layers as directed , removing and stacking simultaneously the excavated stuff any where within the campus area complete as directed up to 1.50 M from exiting GL
A)	Classification Any earthwork will be classified under any of the following categories:-
i)	**All kinds of soils** These shall include all kinds containing kankar, sand, silt, moorum and/or shingle, gravel, clay, loam peat, ash, shale etc. which can generally be excavated by spade, pick-axe and shovel and which is not classified

	under soft and decomposed rock, and hard rock defined below. This shall also include embedded rock boulders not bigger than 1 meter in any dimension and not more than 200 mm in any one of the other two dimensions.

ii)	**Soft Rock** This shall include rock, boulders, slag, chalk, slate, hard mica schist, laterite etc. which are to be excavated with or without blasting or could be excavated with picks, hammer, crow bars, wedges. This shall also include excavation in macadam and tarred roads and pavements. This shall also include rock boulders not bigger than 1 meter in any dimension and not more than 500 mm in any one of the other two dimensions Rubble masonry to be dismantled will also be measured under this item.
iii)	**Hard Rock** This shall include rock which cannot be easily excavated with pick-axes, hammer, crow bars and wedges but has to be either heated where blasting is prohibited or has to be blasted. They shall be stacked separately for measurement.
(B)	The earth work in excavation shall be done as per the Architect and structural consultant's drawings up to required depths and levels and alignments in all sorts of soils. The depth of the foundation will be as per the Engineer's instructions. The lining work should be done by the Contractor. Roots or trees met with during the excavation shall be cut and smeared with coal tar. Excavated earth shall be stacked at least 3 m away from the trenches or as per the Engineer's instructions, so that it may not damage the sides of the excavated trenches. The sides of the excavated trenches shall be vertical and in straight line and bottom uniformly leveled watered, consolidated and ready for termite treatment. The maximum lead for stacking the earth shall be 100 m, unless otherwise categorically specified in the item description.
(C)	In firm soil if the excavation is deeper than 2 m the sides of the trenches shall be made bigger by allowing steps of 50 cm on either side so as to keep the slope 0.25 to 1. In loose soft or slushy soil the width of the step shall be suitably increased or the sides sloped or shoring and strutting may be done as per the Engineer's instructions.
(D)	For excavation for drain work, the sides and the bottoms should be to the required slope, shape and gradient. The cutting shall be done from top to bottom. Under no circumstances shall undermining or under cutting be allowed. The final surface shall be neatly leveled and well compacted. The earth from the cutting shall be directly used for filling either in plinth or on grounds.
(E)	For excavation in trenches for pipes nothing extra shall be payable for the lift irrespective of the depth unless specifically mentioned otherwise in the Schedule of Quantities.
(F)	If the trenches are made deeper than specified level due to oversight or

	negligence of the Contractor the extra depth shall be filled up by lean concrete of mix 1:5:10(1 cement; 5 coarse sand and 10 coarse aggregate of nominal size 40mm) and if the trench is made wider than shown in the drawings the Contractor has to make good at his own cost. The foundation trenches shall be free from water and muck, while the foundation work is in progress.

(G)	The trenches which are ready for concreting shall be got approved by the Engineer.
(H)	The excavated stacked earth shall be refilled in the trenches and sides of foundation in 150 mm layers and the balance surplus shall be first filled in layers in plinth and the remaining surplus shall be disposed off by uniform spreading within the site/ outside the site as directed by the Engineer.
(I)	Adequate protective measures shall be taken by the Contractor to see that the excavation for the building foundation does not affect the adjoining structure's stability and safety. Contractor will be responsible if he has not taken precaution for the safety of the people, property or neighbor's property caused by his negligence during the constructional operations.
(J)	To the extent available, selected surplus spoils from excavated materials shall be used as backfill. Fill material shall be free from clods, salts, sulphates, organic & other foreign material. All clods of earth shall be broken or removed. Where excavated material is mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murum or earth to fill up the voids and the mixture used for filling.
(K)	As soon as the work in foundations has been accepted and measured, the spaces around the foundations, structures, pits, trenches etc. shall be cleared of all debris and filled with earth in layers 15 cm to 20 cm, each layer being watered, rammed and properly consolidated before the succeeding one is laid. Each layer shall be consolidated to the satisfaction of Engineer.
(L)	Mode of measurement for Earth work in excavation including back filling
i)	**Lead**
	Lead for deposition/disposal of excavated material, shall be as specified in the respective item of work. If the lead is not specified in the respective item , a basic lead of 500 m shall be considered for quoting rates. Only leads beyond 500m shall be considered as extra lead and the Contractor shall be compensated for the same. For the purpose of measurement of lead the area to be excavated or filled or area on which excavated material is to be deposited/disposed off shall be divided into suitable blocks and for each of the blocks, the distance between centerlines shall be taken as the lead which shall be measured, as far as practically possible, by the shortest straight line route on the plan and not the actual route taken by Contractor. No extra compensation is admissible on the grounds that the lead including that for borrowed materials had to be

	transported over marshy or katcha land/route.
ii)	All excavation shall be measured net. Dimensions for purpose of payment shall be reckoned on the horizontal area of the excavation at the base for foundations of the walls, columns, footings, tanks, rafts or other foundations structure to be built, multiplied by the mean depth from the surface of the ground in accordance with the drawings. Excavation inside slopes shall not be paid for. Contractor may make such allowances in his rates to provide for excavation in side slopes keeping in mind the nature of the soil and safety of excavation. In soft/slushy soil or in firm soil if the excavation is deeper than 2m the sides of the trenches shall be made bigger by allowing steps of 50cm on either side so as to keep slope 0.25 : 1. This shall be paid as per original tender rate. However, if concreting is proposed against the additional/extra excavation made by the Contractor shall be made good by the Contractor with concrete of the same class as in the foundations at his own cost.
iii)	Backfilling as per specification the side of foundations of columns, footings, structures, walls, tanks rafts, trenches etc. with excavated materials will not be paid for separately. It shall be clearly understood that the rate quoted for excavation including backfilling shall include stacking of excavated material as directed, excavation/stacking of selected stacked material, conveying it to the place of final backfill, compaction etc. as specified. As a rule material to be back filled shall be stacked temporarily within the basic lead of 500 meters unless otherwise specified in the item.
iv)	The rates quoted shall also include for dumping of excavated materials in regular heaps, bunds, riprap with regular slopes as directed by Engineer within the lead specified and leveling the same so as to provide natural drainage. Rock/soil excavated shall be stacked properly as directed by Engineer. As a rule, all softer material shall be laid along the center of the heaps, harder and more weather resisting materials forming the casing on the sides and the top. Excavated soft rock or hard rock shall be stacked separately.
(v)	The bailing out of water shall also be executed by the Contractor at his own cost.
1.02	Excavation in all types of soil, including murrum, for foundations of wall, columns, plinth beams, basement, raft, ducts, trenches, underground sumps, septic tanks, soak well, manhole chambers, gully chambers, including shoring, strutting, bailing out water/pumping off water if required, and disposing off excavated earth 50 mtr away from the construction line, re-filling the trenches , foundation pits, ramming, watering consolidating in 15 cms to 20 cms layers as directed , removing and stacking simultaneously the excavated stuff any where within the campus area complete as directed - For depth exceeding 1.5 m but up to 3.0 m The general specification shall be same as for the item 1.01 given above.
1.03	Excavation in all types of soil, including murrum, for foundations of wall, columns, plinth beams, basement, raft, ducts, trenches, underground sumps, septic tanks,

	soak well, manhole chambers, gully chambers, including shoring, strutting, bailing out water/pumping off water if required and disposing off excavated earth 50 mtr away from the construction line, re-filling the trenches , foundation pits, ramming, watering consolidating in 15 cms to 20 cms layers as directed , removing and stacking simultaneously the excavated stuff any where within the campus area complete as directed for depth exceeding 3.0 M but not exceeding 4.5 M The general specification shall be same as for the item 1.01 given above.
1.04	Filling in plinth with selected excavated earth and rock stuff available within site in layers of thickness 200mm including screening if required, watering, ramming and compaction
(A)	Plinth above in layers 15 - 20 cm, watered and compacted with mechanical compaction machines. When filling reaches the finished level, the surface shall be flooded with water, if directed by the Engineer, for at least 24 hours, allowed to dry and then the surface again compacted as specified above to avoid settlements at a later stage. The finished level of the filling shall be trimmed to the level/slope specified.
(B)	Where specified in the item description given in the Schedule of Quantities that the compaction of the plinth fill shall be carried out by means of 10/12 tones rollers smooth wheeled, sheep-foot or wobble wheeled rollers. As rolling proceeds water sprinkling shall be done to assist consolidation. Water shall not be sprinkled in case of sandy fill.
(C)	**Mode of Measurement** In filling & refilling, clods bigger than 50 mm shall not be allowed. Only consolidated measurements of filling paid. Earth dumped in plinth during excavation shall not be paid as filling. Only the excavated stuff stacked outside the building & used in filling shall be paid under relevant item of the tender. Trenches on both side of masonry wall up to Ground level shall be filled up with excavated earth with no extra cost. Payment for filling in plinth with selected excavated material will be made as specified/directed. Payment for this work will be made based on measurement of plinth/dimensions filled. The plinth/ground levels shall be surveyed beforehand for this purpose. The lead shall be 500 M. It shall be measured in cum.
1.05	Filling in ground other than plinth with selected excavated earth and rock stuff available within site , for land development etc. within the site, to required level, spreading in layers of thickness 200mm, including screening if required/as directed,
(A)	No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by Engineers.
(B)	Filling shall be carried out as indicated in the drawings and as directed by Engineer. If no compaction is called for, the fill may be deposited to the full height in one operation and leveled. If the fill has to be compacted, it shall be

	placed in layers not exceeding 600 mm and leveled uniformly and compacted before the next layer is deposited.
(C)	Field compaction is called for, test shall be carried out at different stages of filling and also after the fill to the entire height has been completed. This shall hold good for embankments as well.
(D)	Contractor shall protect the earth fill from being washed away by rain or damaged in any other way. Should any slip occur, Contractor shall remove the affected material and make good the slip at his own cost.
(E)	The fill shall be carried out to such dimension and levels as indicated on the drawings after the stipulated compaction. The fill shall be considered as incomplete if the desired compaction has not been obtained.
(F)	Mode of Measurement It shall be measured in cum. The rate shall include all operations such as lead and transport, filling and consolidating as directed.
1.06	Providing and filling in plinth & other than plinth, for land development with selected earth/murum **brought from approved outside site sources**, in multiple layers of 200mm thickness including freight, transportation, loading, unloading, screening if required, watering, ramming, consolidating with compactor
(A)	Filling shall be carried out with approved material as described in 1.01 (J). The material and source shall be subject to prior approval of Engineer The approved area, from where the fill material is to be dug, shall be brought from within 10 kms. radial distance from site and shall be cleared of all bushes, roots plants, rubbish etc. top soil containing salts, sulphate and other foreign material shall be removed. The materials so removed shall be burnt or disposed off as directed by Engineer. The Contractor shall make necessary access roads to those areas and maintain the same, if such access road does not exist, at his cost.
(B)	If any material is rejected by Engineer, Contractor shall remove the same forthwith from the site at no extra cost to the owner. Surplus fill material shall be disposed off by uniform spreading within the site as instructed by the Engineer.
(C)	The compaction shall be carried out as specified in the item no. 1.03 for filling in plinth
(D)	**Mode of Measurement** Backfilling, plinth filling etc. with borrowed earth will be paid for under specified items. The quoted rate shall include all operations such as clearing, excavation, lead and transport, fill, compaction etc. as specified. Actual quantity of consolidated filling or actual quantity of excavation in the borrow pits (less such top soil which has been excavated and not used for filling & boulders and rocks shall not allowed for filling) whichever is less shall be measured and paid for in cubic meters. The lead, lift etc. shall be as indicated in the schedule of

	quantities.
1.07	Excavating & Filling with selected excavated earth available within campus & carting the same to site including plinth filling & land development etc. within the site, to required level, spreading in layers of thickness 200mm, including screening if required/as directed, watering, ramming, consolidating using compactor including testing cost for suitability of available earth/rock & compaction of each layer, cost of transportation, loading & unloading anywhere within site complete as directed. Note:- The item includes for filling in road, hard park, pathway, land development etc. also in required level and camber/slope followed by consolidation using road roller of 8 to 12 MT capacity.
	Mode of Measurement
	It shall be measured in cum.
1.08	Providing and filling approved local sand free from debris, pebbles etc. in trenches, plinth, under sub base surrounding areas including screening, watering and consolidation, transportation, loading, unloading, spreading etc.
(A)	At places backfilling shall be carried out with local coarse sand if directed by Engineer. The sand used shall be kept flooded with water for 24 hours to ensure maximum consolidation. Any temporary work required to contain sand under flooded condition shall be to Contractor's account. The surface of the consolidated sand shall be dressed to require level or slope. Construction of floors or other structures on sand fill shall not be started until Engineer has inspected and approved the fill.
(B)	**Mode of measurement** Actual quantity of consolidated sand filling shall be measured and paid in cubic meters.
1.09	Providing and laying in a compact manner 150 mm thick metal soling in plinth in two layers using average 60 to 80 mm size stones similar to which used for concrete and RCC works, including test of materials, filling in the voids with largest possible similar stones, covering and levelling the surface with sand/ layer of murrum, dry compaction followed by watering, topping up with sand / murrum and consolidation with mechanical plate compactor etc.
a)	Rubble/metal used for packing under floors, foundations etc. shall be hard, durable rock, free from veins, flaws and other defects and approved by Engineer-in-charge prior to use. The size of the rubble/metal shall be 60 to 80 mm or 100 mm to 150mm unless otherwise specified in the item description in the Schedule of Quantities and the quality shall be got approved by the Engineer.
b)	Rubble/metal shall be laid closely in position on the well compacted approved sub-grade. All interstices between the stones shall be wedged in with smaller stones of suitable size well driven to ensure tight packing and complete filling of interstices. Such filling shall be carried out simultaneously with the placing in position of rubble/metal stone and shall not lag behind.
c)	Small interstices shall be filled with murrum/sand as directed, well watered and rammed/consolidated mechanically to the satisfaction of engineer-in-charge.

	Mode of Measurement: The unit of measurement shall be Cum of the work done as per the drawings and/or as specified in the Schedule of Quantities. No deductions for voids.
1.10	Carting away the excavated surplus earth /rock stuff/ debris generated out of dismantling of brick work / concrete as specified in the schedule of the quantities out side of the site as specified in SOQ including loading at site, transportation, unloading, spreading etc complete as directed. Contractor shall maintain full record of measurement and the quantities in respect of total quantity of earth work in excavation, quantity back filled in trenches / pits after laying concrete / masonry foundations etc and quantity of surplus earth carted away and the same to reconciled intermittently during execution.
	Mode of measurement: Quantity carted away shall be measured in Cum. Length, breadth and depth of the pit shall be measured where full quantity of excavated earth is carted away
1.11	Supplying the chemicals & carrying out pre-construction Anti-termite treatment (IS 6131 part 2) with chlorpyriphos 20 EC with 1 % concentration (IS 8944) OR Imidacloprid 30.50SC with 0.075% concentration (IS 15443) at the various stages of construction in stages and as recommended by the chemical manufacturer to safeguard the building against termite including execution and submission of guarantee for a period of 5 years against any subterranean pests infestation. This work is to be got executed through an approved specialized agency as per their specifications. (Measurement shall be as per out to out plan dimension in Sqm at plinth level of the building treated). Stages of treatment: -.
	CHEMICALS The following chemical shall be used for the soil treatment with the concentration shown against it in aqueous emulsion. “Imidacloprid”
A	Treatment A). Treatment for RCC foundations and basement :- After the backfilling up to GL, the peripheral walls shall be treated at its both side up to 500mm depth at the rate of 7.5 Ltr/SqM.
B	Treatment at the junction of the wall and floor (filling). :- After the plinth filling is completed, both the sides of the walls at the junction of the wall and filling to be treated at the rate of 7.5 Ltr/SqM..
C	Floor treatment :-
	The top surface of the consolidated earth within plinth walls shall be treated with Chemical emulsion at the rate of 5 Ltr / SqM.
D	Treatment of soil along the perimeter of building. :- After the building is complete, the earth along the external perimeter of the building shall be treated for a depth of minimum 300mm & width upto 750mm with Chemical emulsion at the rate of 7.5 Ltr/SqM.
	Treatment of soil along external perimeter.
E	Treatment of Soil surrounding Pipes, Wastes and Conduits and any other service line going inside the building.

	Pre construction anti termite treatment by using “Imidacloprid” 30.50% SC. type chemical (Bayer or Tata make) etc. complete as above.
1	Considering preventive steps for termite treatment, A) you shall Conducts a survey before treatment. B) You shall submit the comprehensive annual termite inspection report against termites by providing early detection of termite activity
2	The rates are inclusive of Materials & labour and all taxes.
3	You shall responsible from serious damages of client property due to termite.
4	Necessary deductions of the 10% Retentions of the total item cost.
5	You shall submit the 5 (Five) years warrantee bond with final bill.
6	The 10% Retention amount shall be withheld till completion of guarantee period of 5 years.

SECTION 2.00 CONCRETE WORK

I. Applicable Codes

The following codes and standards are made a part of the Specifications. All standards, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to herein , this specification shall prevail.

(a)	**Materials**	
1	IS 269 :	Specification for ordinary, rapid hardening and low heat Portland cement.
2	IS 455 :	Specification for Portland blast furnace slag.
3	IS 1489 :	Specification for Portland - pozollana cement.
4	IS 4031 :	Methods of physical tests for hydraulic cement.
5	IS 650 :	Specification for standard sand for testing of cement.
6	IS 383 :	Specification for coarse and fine aggregates from natural sources for concrete.
7	IS 2386(Parts I to VIII):	Methods of test for aggregates for concrete.
8	IS 516 :	Methods of test for strength of concrete.
9	IS 1199 :	Methods of sampling and analysis of concrete.

10	IS 2396(I) IS 5640	Flakiness Index of aggregates
11	IS 3025 :	Methods of sampling and test (physical and chemical water used in industry)
12	IS 432(Part I & II) :	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
13	IS 1139 :	Specification for hot rolled mild steel and medium tensile steel deformed bars for concrete reinforcement
14	IS 1566 :	Specification for plain hard drawn steel wire fabric for concrete reinforcement.
15	IS 1785 :	Specification for plain hard drawn (Part I) steel wire for Pre-stressed concrete.
16	IS 1786 :	Specification for cold twisted steel bars for concrete reinforcement.

17	IS 2090 :	Specification for high tensile steel bars used in pre-stressed concrete
18	IS 4990 :	Specification for plywood for concrete shuttering work.
19	IS 2645 :	Specification for integral cement water-proofing compounds.
(b)	Equipment	
1	IS 1791 :	Specification for batch type concrete mixers
2	IS 2438 :	Specification for roller pan mixer
3	IS 2505 :	Specification for concrete vibrators immersion type
4	IS 2506 :	Specification for screed board concrete vibrators
5	IS 2514 :	Specification for concrete vibrating tables.
6	IS 3366 :	Specification for pan vibrators
7	IS 4656 :	Specification for form vibrators for concrete.
8	IS 2722 :	Specification for portable swing weigh-batchers for concrete (single and double bucket type)
9	IS 2750 :	Specification for steel scaffoldings
(c)	**Codes of Practice**	
1	IS 456 :	Code of practice for plain and reinforced concrete.
2	IS 1343 :	Code of practice for pre-stressed concrete
3	IS 457 :	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures

4	IS 3370 : (Part I to IV)	Code of practice for concrete structures for storage of liquids
5	IS 3935 :	Code of practice for composite construction
6	IS 3201 :	Criteria for design and construction of precast concrete trusses.
7	IS 2204 :	Code of practice for construction of reinforced concrete shell roof
8	IS 2210 :	Criteria for the design of RC shell structures and folded plates.
9	IS 2751 :	Code of practice for welding of mild steel bars used .for reinforced concrete construction.
10	IS 2502 :	Code of practice for bending and fixing of bars for concrete reinforcement.
11	IS 3558 :	Code of practice for use of immersion vibrators for consolidating concrete.

12	IS 3414 :	Code of practice for design and installation of joints in buildings
13	IS 4014 : (Part I&II)	Code of practice for steel tubular, scaffolding.
14	IS 2571 :	Code of practice for laying in situ- cement concrete flooring.
(d)	**Construction Safety**	
1)	IS 3696 :	Safety code for scaffolds and ladders
(e)	**Measurement**	
1)	IS 1200 : IS 3385 :	Method of measurement of building works. Code of practice for measurement of civil engineering works.
	The above mode of measurements shall be applicable only if it is not given specifically in the tender document.	
II	General	
	The quality of materials, method and control of manufacture and transportation of all concrete work irrespective of mix, whether reinforced or otherwise shall conform to the applicable portions of this specification. Engineer shall have the right to inspect the source/s of material/s, the layout and operation of procurement and storage of materials, the concrete batching and mixing equipment, and the quality control system. Such an inspection shall be arranged and engineer's approval obtained, prior to	

	starting of concrete work.
III	Materials
	The ingredients to be used in the manufacture of standard concrete shall consist solely of standard type Portland cement, clean sand, natural coarse aggregate, clean water and admixtures.
(A)	Cement
a)	If the Contractor is instructed to supply cement , then the following points shall be applicable:
i)	Unless otherwise specified the cement shall be of grade 53 ordinary Portland cement in 50 kg bags. The use of bulk cement will be permitted only with the approval of Engineer
ii)	A certified report attesting to the conformance of the cement to IS specifications by the cement manufacturer's chemist shall be furnished to engineer.

iii)	Cement held in storage for a period of ninety (90) days or longer shall be tested. Should at any time Engineer have reasons to consider that any cement is defective, then irrespective of its origin, and/or manufacturers test certificate, such cement shall be tested immediately at contractor's cost at a National Test Laboratory/approved laboratory and until the results of such tests are found satisfactory, it shall not be used in any work. Contractor shall not be entitled to any claim of any nature on this account.
(B)	Aggregates
a)	Aggregate in general designates both fine and coarse inert materials used in the manufacture of concrete. Fine aggregate is aggregate all of which passes through 4.75 mm IS sieve . Coarse aggregate is aggregate most of which is retained on 4.75 mm sieve
b)	All fine and coarse aggregates proposed for use in the work shall be subject to Engineer's approval and after specific materials have been accepted the source of supply of such materials should not be changed without prior approval of Engineer.
c)	Aggregates shall, except as noted above, consist of natural sands, crushed stone and gravel from a source known to produce satisfactory aggregate for concrete and shall be chemically inert, strong, hard, durable against weathering, of limited porosity and free from deleterious materials that may cause corrosion of the reinforcement or may impair the strength and/or durability of concrete. The grading of aggregates shall be such as to produce a dense concrete of specified strength and consistency that will work readily into position without segregation and shall be based on the mix design and preliminary tests on concrete specified later.
d)	Sampling and testing
	Samples of the aggregates for mix design and determination of suitability

	shall be taken under the supervision of Engineer and delivered to the laboratory, well in advance of the scheduled placing of concrete. Records of tests which have been made on proposed aggregates and on concrete made from this source of aggregates shall be furnished to Engineer in advance of the work for use in determining aggregate suitability. The costs of all such tests, sampling etc. shall be borne by contractor
e)	Storage of Aggregates
	All coarse and fine aggregates shall be stacked in stock separately in stock piles in the material yard near the work site in bins properly constructed to avoid inter mixing of different aggregates. Contamination with foreign materials and with earth during storage and while heaping the materials shall be avoided. The aggregate must be of specified quality not only at the time of receiving at site but more so at the time of loading into mixer. Rackers shall be used for lifting the coarse aggregates from bins or stock piles. Coarse.
	aggregate shall be piled in layers not exceeding 1.20 meters in height to prevent coning or segregation. Each layer shall cover the entire area of the stock pile before succeeding layers are started. Aggregates that have become segregated shall be rejected.

f)	Specific Gravity	
	Aggregate except as noted above, and for other than light weight concrete shall consist of natural or crushed sand shall conform to IS 383. The sand shall be clean sharp, hard, strong and durable and shall be free from dust, vegetable substances, adherent coating, clay, alkali, organic matter, mica, salt or other deleterious substances, which can be injurious to the setting qualities/strength/ durability of concrete.	
(C)	Machine made Sand	
	Machine made sand will be acceptable, provided the constituent rock/gravel composition shall be sound, hard dense, non-organic uncoated and durable against weathering.	
i)	Screening and Washing	
	Sand shall be prepared for use for such screening or washing, or both, as necessary, to remove all objectionable foreign matter while separating the sand grains to the required size fractions.	
ii)	Foreign Material Limitations	
	The percentages of deterious substances in sand delivered to the mixer shall not exceed the following:	
i)	Material finer than 75 micron IS sieve	3.00 15.00
ii)	Shale	1.00 -
iii)	Coal and lignite	1.00 1.00

iv)	Clay lumps	1.00	1.00
v)	Total of all above substances including items (i) to (iv) for uncrushed sand and items iii)	5.00	2.00

iii) Gradation

Unless otherwise directed or approved, the grading of sand shall be within the limits indicated hereunder:

IS Sieve Designation	Percentage passing for			
	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	55-90	75-100	90-100
600 micron	15-34	35-59	60-79	80-100
300 micron	5-20	8-30	12-40	15-50
150 micron	0-10	0-10	0-10	0-15

Where the grading falls outside the limits of any particular grading zone of sieves other than 600 micron IS sieve, by total amount not exceeding 5 percent, it shall be regarded as falling within that grading zone. This tolerance shall not be applied to percentage passing the 600 micron IS sieve or to percentage passing any other sieve on the coarser limit of grading zone I or the finer limit of grading zone IV.

iv) **Fineness Modulus**

The sand shall have a fineness modulus of not less than 2.2 or more than 3.2. The fineness modulus is determined by adding the cumulative percentages retained on the following IS sieves sizes 4.75mm, 2.36 mm, 1.18 mm 600 micron, 300 micron and 150 micron and dividing the sum by 100.

(D) **Coarse Aggregate**

a) Coarse aggregate for concrete, except as noted above and for other than light weight concrete shall conform to IS 383. This shall consist of natural or crushed stone and gravel and shall be clean and free from elongated, flaky or laminated pieces adhering coatings, clay lumps, coal residue, clinkers slag, alkali, mica, organic matter or other deleterious matter
.

b) **Screening and Washing**

Natural gravel and crushed rock shall be screened and/or washed for the removal of dirt or dust coating, if so demanded by Engineer.

c) **Grading**

	Coarse aggregate shall be graded in both cases the grading shall be within the following limits.								
IS Sieve Designation	% passing for single sized aggregate of nominal size					%passing for graded aggregate of nominal size			
	40	20	16	12.5	10	40	20	16	12.5
63mm	100	-	-	-	-	100	-	-	-
40mm	85-100	100	-	-	-	95-100	100	-	-
20mm	0-20	85-100	100	-	-	30-70	95-100	100	-
16mm	-	-	85-100	-	-	-	-	90-100	-
12.5mm	-	-	-	85-100	-	-	-	-	90-100
10mm	0.5	0-20	0-30	0-45	85-100	10-35	25-55	30-70	40-85
4.75mm	-	0-5	0-5	0-10	0-20	0-5	0-10	0-10	0-10
2.36mm	-	-	-	-	0-5	-	-	-	-

The pieces small be angular in shape and shall have granular or crystalline surfaces, Friable, flaky and laminated pieces, mica and shale, if present, shall be only in such quantities that will not, is the opinion of Engineer affect adversely the strength and/or durability of concrete. The maximum size of coarse aggregate shall be 75 mm for class A concrete 40 mm for class B concrete and 20mm for class C concrete. The maximum size of coarse aggregate shall be the maximum size specified above, but in no case greater than 1/4 of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of the form. Plums above 150 mm and upto any reasonable size can be used in plain mass concrete work of large dimensions up to a maximum limit of 20% of volume of concrete when specifically approved by Engineer. For heavily reinforced concrete members the nominal maximum size of the aggregate shall be 5 mm less than the minimum clear distance between the reinforcing main bars or 5mm less than the minimum cover to the reinforcement whichever is smaller. The amount of fine particles occurring in the free state or as loose adherent shall not exceed 1% when determined by laboratory sedimentation tests as per IS 2386. After 24 hours immersion in water, a previously dried sample shall not have gained more than 10% of its oven dry weight in air, as determined by IS 2386.

d)	**Foreign Materials Limitations**		
	The percentages of deleterious substance in the coarse aggregate delivered to the mixer shall not exceed the following:		
		Percent by weight	
		Uncrushed	**Crushed**
i)	Material finer than 75 micron IS sieve	3.00	3.00
ii)	Coal and lignite	1.00	1.00

iii)	Clay lumps	1.00	1.00
iv)	Soft fragments	3.00	-
v)	Total of all the above substances	5.00	5.00
(E)	Water		
a)	Water used for both mixing and curing shall be free from injurious amounts of deleterious materials. Potable waters are generally satisfactory for mixing and curing concrete.		
b)	In case of doubt, the suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in IS-456. The sample of water taken for testing shall be typical of the water proposed to be used for concreting, due account being paid to seasonal variation. The sample shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water.		
c)	Average 28 days compressive strength of at least three 15 cm concrete cubes prepared with water proposed to be used shall not be less than 90% of the average strength of three similar concrete cubes prepared with distilled water.		

d)	The initial setting time or test block made with the appropriate set cement and the water proposed to be used shall not be less than 30 minutes and shall not differ by more than plus minus 30 seconds form the initial setting time of control test block prepared with the appropriate test cement and distilled water. The test blocks shall be prepared and tested in accordance with the requirements of IS 4031.
e)	Where water can be shown to contain an excess of acid, alkali sugar or salt, engineer may refuse to permit its use. As a guide, the following concentrations represent the maximum permissible values:
i)	To neutralize 200 ml sample of water, using phenophthalein as indicator, it should not require more than 2 ml of 0.1 normal NaOH. The details of test shall be as given in IS 3025.
ii)	To neutralize 900 ml sample of water using methyl arrange as an indicator, it should not require more than 10 ml of 0.1 normal HCl. The details of test shall be given in IS 3025.
iii)	Percentage of solids when tested in accordance with the method indicated below shall not exceed the following :

	Percent	Method of Test(Ref. to clause no. in IS 3025-1964
Organic	0.02	10 and 11 (organic solids = total solids minus ignited residue)
Inorganic Sulphate (as SO4	0.30	11 (Ignited residue)

Alkali Chlorides (as Cl)		0.05	20
		0.10	24
(F)	**Brick aggregates**		
	The brickbats shall be of new bricks well burnt, hard, durable and broken to sizes, well graded. It shall be free from dust, the size shall be of 37mm and down. It shall be free from earth and other impurities.		
(G)	**Reinforcement Steel**		
	If the contractor is instructed to supply reinforcement steel, the following points shall be applicable:-		
a)	Unless otherwise specified the reinforcement bars shall be Thermo Mechanically Treaded (TMT) bars confirming to the specifications of IS 1786.		
b)	The certified report attesting conformance of the material to IS specifications by manufacturer's Testing laboratory shall be furnished to the engineer in charge.		
c)	Reinforcement bars are arranged by contractor, as shown and specified on the drawings. Wire mesh or fabric shall be in accordance with IS 1566. Substitution of reinforcement will not be permitted except upon written approval from Engineer.		
d)	All reinforcement shall be clean, free from grease, oil, paint, loose mill scale, loose rust, dust, bituminous material or any other substances that will destroy or reduce the bond. All rods shall be thoroughly cleaned before being fabricated. Pitted and defective rods shall not be used.		
IV	Form Work.		
a)	The formwork shall consist of shores, bracings, sides of beams and columns, bottom of slabs etc, including ties anchors, hangers inserts etc, complete which shall be properly designed and planned for the work. False work shall be so constructed that necessary adjustment can be made to compensate for take up and settlements. Wedge may be used at the top or bottom of timber shores but not at both ends to facilitate vertical adjustment or dismantling of the formwork.		
b)	Design of formwork		
	The design of the formwork as well as its construction shall be the responsibility of Contractor. If so instructed, the drawings and/or calculation for the design for the formwork shall be submitted to Engineer for approval before proceeding with work, at no extra cost. Engineer's approval shall not however relieve Contractor of the full responsibility for the design and construction of the formwork. The design shall take into account all the load vertical and lateral that the forms will be carrying live and vibration loadings.		
c)	Type of formwork		
	Formwork may be of timber, plywood metal, plastic or concrete. For special finishes the formwork may be lined with plywood, steel sheets oil tempered hard board etc. Sliding forms and slip forms may be used with the approval of Engineer.		

d)	Form work requirements
i)	Forms shall conform to the shapes, lines, grades and dimensions including camber of the concrete as called for on the drawings. Ample studs, braces, ties, straps, etc. shall be used to hold the forms in proper position without any distortion whatsoever until the concrete is set sufficiently to permit removal of forms. Forms shall be strong enough to permit the use of immersion vibrators. In special cases form vibrators may also be used. The shuttering shall be close boarded. Timber shall be well seasoned, free from sap,. shakes, loose knots, worm holes, warps or other surface defects in contact with concrete. Faces coming in contact with the concrete shall be free from adhering grout, plaster, paint, projecting nails, splits or other defects. Joints shall be sufficiently tight to prevent loss of water or any fine material from concrete.
ii)	Plywood shall be used for exposed concrete surfaces; where called for. Sawn and wrought timber may be used for unexposed surfaces. Inside faces of forms for concrete surfaces which are to be rubbed finished shall be planed to remove irregularities or unevenness in the face. Formwork with linings shall be permitted.

iii)	All new and used form timber shall be maintained in a good condition with respect to shape, strength, rigidity, water tightness, smoothness and cleanliness of surfaces. Form timber unsatisfactory in any respect shall not be used and if rejected by Engineer shall be removed from the site.
iv)	Shores supporting successive members shall be placed directly over those below or be so designed and placed that the load will be transmitted directly to them. Trussed supports shall be provided for shores that cannot be secured on adequate foundations.
v)	Formwork, during any stage of construction showing signs of distortion or distorted to such a degree that the intended concrete work will not conform to the exact contours indicated on the drawings, shall be repositioned and strengthened. Poured concrete affected by the faulty formwork, shall be removed completely and the formwork be corrected prior to placing of new concrete.
vi)	Excessive construction camber to compensate for shrinkage, settlement may impair the structural strength of members and shall not be permitted.
vii)	Forms shall be so designed that their removal will not damage the concrete. Face formwork shall provide true vertical and horizontal joints, conform to the architectural features of the structure as to location of joints and be as directed by engineer.
viii)	Where exposed smooth or rendered concrete finishes are required the forms

	shall be constructed with special care so that the resulting concrete surfaces require a minimum finish.
e)	Formwork For Slope Surfaces
i)	Forms for sloped surfaces shall be built so that the formwork can be placed board-by-board immediately ahead of concrete placement so as to enable ready access for placement, vibration inspection and repair of the concrete.
ii)	The formwork shall also be built so that the boards can be removed one by one form the bottom up as soon as the concrete has attained sufficient stiffness to prevent sagging. Surfaces of construction joints and finished surfaces with slopes steeper than 4 horizontal: 1 vertical shall be formed as required herein.
f)	Formwork For Curved Surfaces
i)	The contractor shall interpolate intermediate sections as necessary and shall construct the forms so that the curvature will be continuous between sections. Where necessary to meet requirements for curvature, the form timber shall be built up of laminated splines cut to make tight, smooth form surfaces.

ii)	After the forms have been constructed, all surface imperfections shall be corrected and all surface irregularities at matching faces of form material shall be dressed to the specified curvature.
g)	Formwork For Exposed Concrete Surfaces
i)	Where it is desired, directed or shown on the drawings to have original fair face finish of concrete surface without any rendering or plastering, formwork shall be carried out by using wood planks, plywood or steel plates of approved quality and as per direction of the Engineer.
ii)	The contractor shall use one type of material for all such exposed concrete faces and the forms shall be constructed so as to produce uniform and consistent texture and pattern on the face of the concrete. Patches or forms for these surfaces will not be permitted. The formwork shall be placed so that all horizontal formworks are continuous across the entire surface.
iii)	To achieve a finish which shall be free of board marks, the formwork shall be faced with plywood or equivalent material in large sheets. The sheets shall be arranged in an approved pattern. Wherever possible, joints between sheets shall be arranged to coincide with architectural features, cills, window heads or change in direction of the surface. All joints between shuttering plates or panels shall be vertical or horizontal unless otherwise directed. Suitable joints shall be provided between sheets. The joints shall be arranged and fitted so that no blemish or mark is imparted to the finished surfaces.
iv)	To achieve a finish which shall give the rough appearance of concrete cast

	against sawn boards, formwork boards unless otherwise stated shall be of 150 mm wide, securely jointed with tonge and grooved joints if required to prevent grout loss with tie rod positions and direction of boards carefully controlled. Sawn boards shall be set horizontally, vertically or at an inclination shown in the drawings. All bolt holes shall be accurately aligned horizontal and vertically and shall be filled with matching mortar recessed 5mm back from the surrounding concrete face.
v)	Forms for exposed concrete surfaces shall be constructed with grade strips (the underside of which indicated top of pour) at horizontal construction joints, unless the use of groove strips is specified on the drawings. Such forms shall be removed and reset from lift to lift , they shall not be continuous from lift to lift. Sheeting of reset forms shall be tightened against the concrete so that the forms will not be spread and permit abrupting irregularities or loss of mortar. Supplementary form ties shall be used as necessary to hold the reset forms tight against the concrete.
vi)	For fair faced concrete, the position of through bolts will be restricted and generally indicated on the drawings.
vii)	Chamfer strips shall be placed in the corners of forms for exposed exterior corners so as to produce 20 mm beveled edges except where otherwise shown in the drawings. Interior corners and edges at formed joints shall not be beveled unless shown on the drgs. Moldings for grooves, drip courses and bands shall be made in the form itself.

viii)	The wood planks, plywood and steel plates used in formwork for obtaining exposed surfaces shall not be used for more than 3 times in case of wood planks, 6 times for plywood and 10 times for steel plates respectively. However, no forms will be allowed for reuse, if in the opinion of the Engineer it is doubtful to produce desired texture of exposed concrete.
ix)	In order to obtain exposed concrete work of uniform colour it shall be necessary to ensure that the sand used for all exposed concrete work shall be of approved uniform colour. Moreover the cement used in the concrete for any complete element shall be from single consignment.
x)	No exposed concrete surface shall be rendered or painted with cement or otherwise. Plastering of defective concrete as a means of achieving the required finish shall not be permitted, except in the case of minor porosity on the surface, the Engineer may allow a surface treatment by rubbing down with cement and sand mortar of the same richness and colour as for the concrete. This treatment shall be made immediately after removing the formwork.
xi)	The contractor shall also take all precautionary measures to prevent breaking and chipping of corners and edges of completed work until the building is handed over.
h)	Bracings struts and props

i)	Shuttering shall be braced, strutted ,propped and so supported that it shall not deform under weight and pressure of the concrete and also due to the movement of men and other materials. Bamboos shall not be used as props or cross bearers.
ii)	The shuttering for beams and slabs shall be so erected that the shuttering on the sides of the beams and under the soffit of slabs can be removed without disturbing the beam bottoms. Re-propping of beams shall not be done except when props have to be reinstated to take care of construction loads anticipated to be in excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken whereby the props can be gently lowered vertically while striking the shuttering. If the shuttering for a column, is erected for the full height of the column, one side shall be left open and built up in sections as placing of concrete from the sides to limit the drop of concrete to 3M or as directed by engineer.
j)	Moulds Oil
	Care shall be taken to see that the faces of form wok coming in contact with concrete are perfectly cleared and two coats of moulds oil or any other approved material applied before fixing reinforcement and placing concrete. Such coating shall be insoluble in water, non-staining and not injurious to the concrete. It shall not become flaky or be removed by rain or wash water. Reinforcement and/or other items to be cast in the concrete shall not be placed until coating of the forms is complete, adjoining concrete surface shall also be protected against contamination from the coating arterial.
k)	Chamfers and fillets
	All corners and angles exposed in the finished structure shall be formed with molding to form chamfers or fillets on the finished concrete. The standard dimension of chamfers and fillers, unless otherwise specified shall be 20 mmx20 mm. Care shall be exercised to ensure accurate moldings. The diagonal face of the moldings shall be planned or surfaced to the same texture as the forms to which it is attached.
l)	Wall ties
	Wire ties passing through the walls shall not be allowed. In their place bolts through sleeves be used.
m)	Reuse of forms
	Before reuse, all forms shall be thoroughly scraped, cleaned, nails removed, holes that may leak suitably plugged and joints examined and when necessary, repaired and the inside retreated to prevent adhesion,. to the satisfaction of Engineer. Warped lumber shall be resized. Contractor shall equip himself with enough shuttering material to complete the job in the stipulated time.
n)	Removal of forms
i)	Contractor shall record on the drawings and in a special register the date upon which the concrete is placed in each part of the work and the date on which the

	shuttering is removed there from. The Contractor shall remove the shuttering after obtaining the approval of the Engineer.
ii)	In no circumstances shall forms be struck until the concrete reaches a strength of at least twice the stress due to self weight and any construction/erection loading to which the concrete may be subjected at the time of striking formwork.
iii)	In normal circumstances (generally where temperatures are above 20 Deg. Cent.) forms may be removed after expiry of the following periods:-

		Ordinary Portland cement concrete	**Rapid hardening Portland cement concrete**
a)	Walls columns and. vertical sides beams	24 to 48 hrs as directed by the Engineer	24 hrs
b)	Slabs left under	3 days	2 days
c)	Beam soffits props left under	7 days	4 days
d)	Removal of props to slabs: i)Spanning up to 4.5 m ii)Spanning over 4.5 m	 7 days 14 days	 4 days 8 days
e)	Removal of props to beams & arches i)Spanning up to 6 m ii) Spanning over 6m	 14 days 21 days	 8 days 12 days
iv)	Striking shall be done slowly with utmost care to avoid damage to arises and projections and without shock or vibration, by gently easing the wedges. If after removing the form work, it is found that timber has been embedded in the concrete, it shall be removed and made good as specified earlier.		
v)	Reinforced temporary openings shall be provided as directed by Engineer to facilitate removal of formwork which otherwise may be inaccessible.		
vi)	Tie rods, clamps, form bolts etc. which must be entirely removed from walls or similar structures shall be loosened not sooner than 24 hours nor later than 40 hrs. after the concrete has been deposited. Ties, except those required to hold forms in place, may be removed at the same time. Ties,. withdrawn from walls and grade beams shall be pulled towards the inside face cutting ties back from the faces of walls and grade beams will not be permitted.		

vii)	For liquid retaining structures no sleeves for through bolts shall be used nor shall through bolts be removed as indicated above. The bolts, in this case, shall be cut at 25 mm depth from the surface and then the hole shall be made good by sand, cement mortar of the same proportions as the concrete just after striking the formwork.
2.01	Providing and laying plain cement concrete 1:4:8 (1cement: 4 coarse sand,8 graded stone aggregate of nominal size 37 mm and down
	The coarse aggregate, cement and coarse sand shall be of quality as specified in the materials section. The other procedures are same as that specified in item no. 2.01.
2.00	Design Mix Ready mixed controlled cement concrete
	Ready-Mixed Concrete and Pumping of Concrete The item refer to ready mix concrete required for R.C.C./P.C.C. works as mentioned in item description under Schedule procured from reputed manufacturer approved by Engineer. The material shall be conforming to controlled cement concrete. (Standard Specifications of PWD, Vol-I) The material requirement shall be completed according to Standard Specifications booklet refer Pages for controlled cement concrete. The item include manufacturer with ingredients, control temperature, transportation, pumping, placing, vibration and curing of Ready Mix Concrete and all taxes, excise duty, sales tax, octroi, insurance etc. Levied by Govt./Semi-Govt./local authority and cost of ready mix concrete and any penalty, additional charges for controlling temperature up to casting or any other charges levied by the manufacturer. 3. Proportioning of the mix/mix design shall be decided by reputed government approve institute and given to the contractor/RMC manufacturer to achieve strength specified in item and shall be get approved by Engineer. The proportioning of ingredients, use of ingredients and mix designs parameters for various slumps shall be got approved by Engineer prior to mix design Ready-mixed concrete may be manufactured in a central automatic weight Batching plant and transported to the job in agitating transit mixer. The maximum size of coarse aggregate shall be limited to one-third of the smallest inside diameter of the hose or pipes used for pumping. Provision shall be made for elimination of over-sized particles by screening or by careful selection of aggregates. To obtain proper gradation it may be necessary to combine and blend certain fractional sizes to aggregates. Uniformity of gradation throughout the entire job shall be maintained .The quantity of coarse aggregate shall be such that the concrete can be pumped, compacted and finished without difficulty. Fine aggregates : The gradation of fine aggregate shall be such that 15 to 30 percent should pass the 0.30 mm screen and 5 to 10 percent should pass 0.15mm screen so as to obtain a pump able concrete. Sands that are deficient in either of these two

	sizes should be blended with selected finer sands to produce these desired percentages. With this gradation, sands having a fineness modulus between 2.4 and 2.8 are generally satisfactory. However, for uniformity, the fineness modulus of the sand should not vary more than 0.2 from the average value used in proportioning. Water, Admixtures and slump : The amount of water required for proper concrete consistency shall take into account the rate of mixing, length of haul, time of unloading and ambient temperature conditions. Additions of water to compensate for slump loss should not be resorted to nor should the design maximum water-cement ratio be exceeded. Additional dose of retarder /plasticizer/ super plasticizer shall be used with prior approval of Engineer to compensate the loss of setting time and slump at contractor's cost. Re tempering water shall not be allowed to be added to mixed batches to obtain desired slump. Transportation : The method of transportation used should efficiently deliver the concrete to the point of placement without significantly altering its desired properties with regard to water-cement ratio, slump, and homogeneity. The revolving-drum truck bodies of approved make shall be used for transporting the concrete. The number of revolutions at mixing speeds, during transportation, and prior to discharge shall be specified and agreed upon. Reliable counters shall be used on revolving drum truck units. Standard mixer uniformity tests, conforming to ASTM standards C 94-69 "Standard Specifications for Ready Mix Concrete", shall be carried out if desired by Engineer to determine whether mixing is being accomplished satisfactorily. Pumping of concrete : Only approved pumping equipment, in good working condition, shall be used for pumping of concrete. Concrete shall be pumped through a combination of rigid pipe and heavy-duty flexible hose of approved size and make. The couplings used to connect both rigid and flexible pipe sections shall be adequate in strength to withstand handling loads during erection of pipe system, misalignment, and poor support along the lines. They should be nominally rated for at least 3.5 Mpa pressure and greater for rising runs over 30 m. Couplings should be designed to allow replacement of any section without moving other pipe sections, and should provide full cross section with no construction or crevices to disrupt and smooth flow of concrete. All necessary accessories such as curved sections of rigid pipe, swivel joins and rotary distributors, pin and gate valves to prevent backflow in the pipe line, switch valves to direct the flow into another pipe line, connection devices to fill forms from the bottom up, extra strong couplings for vertical runs, transitions for connecting different sizes of pipe, air vent for downhill pumping, clean-out equipment etc. Shall be provided as and where required. Suitable power-controlled booms or specialized crane shall be used for supporting the pipe line. Field control : Sampling at three point RMC plant site ,truck discharge and point of final placement shall be employed to determine if any changes in the slump and other significant mix characteristics occur. However, for determining strength of

concrete, cubes shall be taken from the placement end of line. The contractor / RMC supplier should nominate a technically qualified representative at site for sampling, testing and placing of concrete.

Planning :

Proper planning of concrete supply, pump locations, line layout, placing sequence and the entire pumping operation shall be made. The concrete production, transportation and placing shall be planned in such a manner that duration between addition of water during mixing and placing of concrete in desired location is well within time limits prescribed by the RMC manufacturer, however, this is subjected to fulfilment of slump and other properties of concrete as specified in tender. On failure to adherer to the time schedule by the supplier the Engineer may reject the concrete. The pump wherever used should be as near the placing area as practicable, and the entire surrounding area shall have adequate bearing strength to support concrete delivery pipes .Lines from pump to the placing area should be laid out with a minimum of bends. For large placing areas alternate lines should be installed for rapid connection when required. Standby power and pumping equipment should be provided to replace initial equipment, should breakdown occur. The placing rate should be estimated so that concrete can be ordered at an appropriate delivery rate. As a final check, the pump should be started and operated without concrete to be certain that all moving parts are operating properly. A grout mortar should be pumped in to the lines to provide lubrication for the concrete, but this mortar shall not be used in the placement. 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 and shall be forced through the line by water under pressure to clean it out. The go-devil should be stopped at a safe distance from the end of the line so that the water in the line will not spill into the placement area. At the end of placing operation, the line shall be cleaned in the reverse direction.

Compaction:

External, Internal (needle) and surface (screed board) vibrators of approved make shall be used for compaction of concrete a) External/internal vibrators shall be used for compaction of concrete in foundations, columns etc. For sections such as slabs, the concrete shall be compacted by external, internal and surface type vibrators, depending on the thickness of layer to be compacted. 25mm, 40mm and 60mm diameter internal vibrators may be used. The concrete shall be compacted by use of appropriate diameter vibrator by holding the vibrator in position until : i) Air bubbles cease to come to surface ii) Resumption of steady frequency of vibrator after short period of dropping the frequency, when the vibrator is first inserted. Iii) The tone of the vibrator becomes uniform iv) Flattened, glistening surface, with coarse aggregates particles blended into it, appears on the surface. After the compaction is completed, the vibrator should be withdrawn slowly from concrete so that concrete can flow in to the space previously occupied by the vibrator. To avoid segregation during vibration, the vibrator shall not be dragged through the concrete nor used to spread the concrete. The vibrator shall be made to

penetrate into layer of fresh concrete below if any, for a depth about 150mm.The vibrator shall be made to operate at regular pattern of spacing. The effective radii of action will overlap, approximately half a radius to ensure complete compaction. V) To secure even and dense surfaces free from aggregate pockets, vibration shall be supplemented by tamping or rodding by hand in the corners of forms and along the form surfaces while the concrete is plastic. Vi) A sufficient number of spare vibrators shall be kept readily accessible to the place of deposition of concrete to assure adequate vibration in case of breakdown of those in use.25mm diameter immersion vibrators shall be used in thin sections up to 125mm, 40mm diameter immersion vibrators in fairly wide sections like beams, slabs, columns etc. And 60mm diameter vibrators in foundations, pile caps or such large section members. Screed vibrators shall also be used for slab concreting. Vii) Plain concrete also shall be vibrated whenever and wherever directed by EIC to achieve full compaction, using needle and screed vibrators as necessary.

Curing:

Curing shall be started at the earliest by spreading wet jute cloth (hessian) and cover top with impervious sheet and subsequently cured with spraying water. In inaccessible area to start with, curing be started by spraying curing compound before starting membrane curing. The slab to by cured by making shallow water ponds During extreme hot weather, the concreting shall be done as per procedures set out in IS:7861, Parts I & II. Fine and coarse aggregates for concreting shall be kept shaded and the concrete aggregates sprinkled with water for a sufficient time before concreting, in order to ensure that the temperature of these ingredients is as low as possible prior to batching. The mixer and batching equipment shall be also shaded and if necessary painted white in order to keep their temperatures as low as possible. The placing temperature of concrete shall be as low as possible in warm weather and care shall be taken to protect freshly placed concrete form overheating by sunlight in the first few hours of its laying. The time of day selected for concreting shall also be chosen so as to minimize placing temperatures. In case of concreting in exceptionally hot weather the Engineer may in his discretion specify the use of ice either flaked or used directly in the mix, or blocks, used for chilling the mixing water. In either case no extra payment shall be made to the contractor on this account.

Construction joints:

Construction joints in all concrete work shall be made as directed by the Engineer. Where vertical joints are required, these shall be shuttered as directed and not allowed to take the natural slope of the concrete. Before fresh concrete is placed against a vertical joint, the old concrete shall be chipped/sand blasted, cleaned and moistened 25 hours before placing the concrete. All standing water should be removed and dried with compressed air. Neat cement slurry shall be applied on the chipped/sand blasted surface and mortar of the same water cement ratio as the concrete and 10mm thick applied. If required as directed by site in charge special construction chemical of reputed brand shall be used for joining bonding old concrete component with new concrete component Where

	required suitable expansion joints shall also be provided as directed by the Engineer. The time of day selected for concreting shall also be chosen so as to minimize placing temperatures. In case of concreting in exceptionally hot weather the Engineer may in his discretion specify the use of ice either flaked and used directly in the mix or blocks used for chilling the mixing water. In either case the cost of ice both flaked and used directly in the mix or blocks used for chilling the mixing water. In either case the cost of ice and additional labor involved in weighing and mixing etc. Shall be borne by the contractor and nothing will be paid on this account. **Defective Concrete:** Should any concrete be found honeycombed or in any way defective, such concrete shall on the instruction of the Engineer be cut out by the Contractor and made good at his own expenses. **Exposed Faces, Holes and Fixtures:** On no account shall concrete surfaces be patched or covered up or damaged concrete rectified or replaced until the Engineer or his representative has inspected the works and issued written instructions for rectification. Failure to observe this procedure will render that portion of the works liable to rejection; in which case it will be treated as a work which has failed to meet specified strength requirements and dealt with according to instruction. Holes for foundation or other bolts or for any other purposes shall be molded, and steel angles, holdfasts or other fixtures shall be embedded, according to the drawing or as instructed by the Engineer. **Cracks:** If cracks develop in concrete construction which in the opinion of the Engineer may be detrimental to the strength of the construction, the contractor at his own expense shall test the slab or other construction as specified in Special Conditions. If under such test loads the cracks develop further, the Contractor shall dismantle the construction, carry away the debris, replace the construction and carry out all consequential work thereto, without any extra payment. 7.2 If any cracks develop in the concrete construction, which in the opinion of the Engineer, are not detrimental to the strength of the construction, the contractor at his own expense shall grout the cracks with polymer cement grout of approved quality at his own expense and risk and shall make good to the satisfaction of the Engineer the surface finish which in the opinion of the Engineer has suffered damage either in appearance or stability owing to such cracks. The Engineer's decision as to the extent of the liability of the Contractor in the above matter shall be final and binding. **SUBMISSION OF DOCUMENTS FROM RMC MANUFACTURER** Following document shall be submitted by the RMC manufacturer to Indian oil Corporation Limited through the contractor along with checklist for RMC specified in the tender document. 1. Design Mix 2. Manufacturer's Test Certificate for cement and plasticizer

	3. Lab test certificates for all ingredient of concrete. 4. Delivery docket sheet mentioning the grade of concrete, quality of ingredient used, slump, transit mixer vehicle no. Placement, location, time of concrete production and placing etc. The contractor can be allowed to use Ready Mix Concrete (RMC) with the permission of Engineer-in- Charge, provided that the manufacturer assures that for RMC supplied for the particular work contains the minimum cement content and it is in conformity of approved design mix. The manufacturer of RMC remaining unused beyond 3 hours shall be rejected and removed from site.
	Mix Design
a)	All concrete in the works shall be of design mix as defined in IS 456, unless it is a nominal mix concrete such as 1:3:6, 1:4:8 or 1:5:10. Whether reinforced or otherwise, all design mix concrete works to be carried out under this specification shall be divided into the following classifications:

	MINIMUM COMPRESSIVE STRENGTH OF 15 CM CUBES AT 7 AND 28 DAYS AFTER MIXING, CONDUCTED IN ACCORDANCE WITH IS 516					
Class	**Preliminary test N/SQ.MM**		**Work test N/SQ.MM**		**Max. size of aggregate mm.**	**Minimum Cement Content per cum**
	at 7 days	**at 18 days**	**at 7 days**	**at 28 days**		
M 42	35.0	54.0	27.0	46.0	20	550 kg
M 35	31.0	45.0	23.5	39.0	20	470 kg
M 30	28.0	42.0	20.0	33.0	40 or 20	350 kg
M 25	23.5	35.0	17.0	28.0	40 or 20	325 kg

b)	It shall be very clearly understood that whenever the class of concrete such as M 20 is specified it shall be the Contractor's responsibility to ensure that minimum crushing strength stipulated for the respective class of concrete is obtained at works. The maximum total quantity of aggregate by weight per 50 kg of cement shall not exceed 325 kg except when otherwise specifically permitted by Engineer.
c)	To fix the grading of aggregates, water cement ratio, workability and the quantity of cement required to give preliminary and works cubes of the

	minimum strength specified, the proportions of the mix shall be determined by weight/volume. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. Mix proportioning shall be carried out according to Indian Standard Specifications.
d)	Whenever there is a change either in required strength of concrete or water cement ratio or workability or the source of aggregates and/or cement, preliminary tests shall be repeated to determine the revised proportions, of the mix to suit the altered conditions.
e)	While fixing the value for water cement ratio for preliminary mixes, assistance may be derived from the graph (appendix IS 456 showing the relationship between the 28 day compressive strengths of concrete mixes with different water cement ratios and the 7 days compressive strength of cement tested in accordance with IS 269.
	Preliminary tests
a)	Test specimens shall be prepared with at least two different water/cement ratios for each class of concrete, consistent with workability required for the nature of the work. The materials and proportions used in making preliminary tests shall be similar in all respects to those to be actually employed in the works as the object of these tests is to determine the proportions of cement, aggregates and water necessary to produce concrete of required consistency and to give the specified strength. It will be the Contractor's sole responsibility to carry out these tests and he shall therefore furnish to Engineer a statement of proportions proposed to be used for the various concrete mixes.
b)	Materials shall be brought to the room temperature and all materials shall be in a dry condition. The quantities of water, cement and aggregates for each mix shall be determined by weight/volume to an accuracy of 1 part in 1000 parts.
c)	Mixing shall be done by a mixer machine as per IS 516 in such a manner as to avoid loss of water. The cement and fine aggregate shall first be mixed dry until the mixture is uniform in colour. The coarse aggregate shall then be added,. mixed and water added and mixed thoroughly for a period of not less than 3 minutes until the resulting concrete is uniform in appearance. Each mix of concrete shall be of such a quantity as to leave about 10% excess concrete after molding the desired number of test specimens.
d)	The consistency of each mix of concrete shall be measured immediately after mixing, by the slump test in accordance with IS 1199. If in the slump test, care is taken to ensure that no water or other materials is lost, the materials used for the slump test may be remixed with the reminder of the concrete for making the specimen test cubes. The period of re-mixing shall be as short as possible yet sufficient to produce a homogeneous mass.
e)	Compression tests of concrete cubes shall be made as per IS 516 on 15 cm cubes. Each mould shall be provided with a metal base having a plane

	surface so as to support the mould during filling without leakage. The base plate shall be preferably attached the to mould by springs or screws. The parts of the mould when assembled shall be positively and rigidly held together. Before placing concrete the mould and base plate shall be cleaned and oiled. The dimensions and internal faces of the mould shall be accurate within the following limits: Height and distance between the opposite faces of the mould shall be of specified size plus minus 0.2mm.The angle between the adjacent internal faces and between internal faces and top and bottom planes of mould shall be 90 Deg. plus/minus 5 Deg. The interior faces of the mould shall be plane surfaces with a permissible variation 0.03mm
f)	Concrete test cubes shall be molded by placing fresh concrete in the mould and compacted as specified in IS 516.
g)	Curing shall be as specified in IS 516. The cubes shall be kept in moist air of at least 90% relative humidity at a temp. of 27 Deg. Cent. plus minus 2 Deg. Cent. for 24 hours plus minus half hour from the time of adding water to the dry ingredients. Thereafter they shall be removed from the moulds and kept immersed in clean, fresh water and kept at 27 Deg. Cent. plus minus 2 Deg. Cent. temp. until required for test. Curing water shall be renewed every seven days. A record of maximum and minimum temperatures at the place of storage of the cubes shall be maintained during the period they remain in storage.
h)	Testing of specimens The strength shall be determined based on not less than five cubes test specimens for each age and each water cement ratio. All these laboratory test results shall be tabulated and furnished to Engineer. The test result shall be accepted by Engineer if the average compressive strengths of the specimens are tested subject to the condition that only one out of the five consecutive test may give a value less than the specified strength for that age. The Engineer may direct the Contractor to repeat the tests if the results are not satisfactory and also to make such changes as he considers necessary to meet the requirements specified. All these preliminary tests shall be conducted by the Contractor at his own cost in an approved laboratory. Proportioning consistency, batching and mixing of concrete Proportioning
a)	Aggregate
	The proportions which shall be decided by conducting preliminary test shall be by volume. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete mixing. The supply of properly graded aggregate of uniform quality shall be maintained over the period of work, the grading of aggregates shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stocked in separate stock piles. The grading of coarse and fine aggregate shall be checked as frequently as

	possible as determined by Engineer, to ensure maintaining of grading in accordance with the samples used in preliminary mix design. The material shall be stock piled well in advance of use.
b)	Cement
	The cement shall be measured by volume.
c)	Water
	Only such quantity of water shall be added to the cement and aggregates in the concrete mix as to ensure dense concrete, specified surface finish, satisfactory workability, consistent with the strength stipulated for each class of concrete. The water added to the mix shall be such as not to cause segregation of material or the collection of excessive free water on the surface of the concrete. The water cement (W/C) ratio is defined as the volume of water in the mix (including the surface moisture of the aggregates) divided by the volume of cement in the mix. The actual water cement ratio to be adopted shall be determined in each instance by the Contractor and approved by the Engineer.
d)	Proportioning by water/Cement ratio The W/C ratio specified for use by Engineer shall be maintained. The Contractor shall determine the water content of the aggregates as frequently as directed by Engineer as the work progress and as specified in IS 2386 (Part-III) and the amount of water added at the mixer shall be adjusted as directed by Engineer so as to maintain the specified W/C ratio. To allow for the variation in volume of aggregates due to variation in their moisture content suitable adjustments in the volume of aggregates shall also be made
e)	Consistency and slump Concrete shall be of a consistency and workability suitable for the conditions of the job. After the amount of water required is determined, the consistency of the mix shall be maintained throughout the progress of the corresponding parts of the work and approved tests e.g. slump tests, compacting factor tests, in accordance with IS 1199 shall be conducted from time to time to ensure the maintenance of such consistency.
f)	The following tabulation gives a range of slumps which shall generally be used for various types of construction unless otherwise instructed by the Engineer.

SLUMPS FOR VARIOUS TYPES OF CONSTRUCTION
Only sufficient quantity of water shall be added to concrete during mixing to produce a mix of sufficient workability to enable it to be well consolidated, to

be worked in to the corners of the shuttering and around the reinforcement, to give the specified surface finish, and to have the specified surface strength. The following slumps shall be adopted for different kinds of works:-

Name of Work	When vibrator used	When vibrator not used
Mass concrete in foundations, footings retaining walls and pavements.	10mm to 25mm	50mm to 75mm
Thin sections of floors of less than 75mm thick	25mm to 40mm	75mm to 100mm
For Reinforced cement concrete work:		
Mass concreting in foundations, footings retaining walls and pavements	10mm to 25mm	80mm
Beams, slabs, columns	25mm to 40mm	100mm to 125mm
Thin shells, folded plates etc.	40mm to 50mm	125mm to 150m

Sampling and testing concrete in the field	
a)	Facilities required for sampling materials and concrete in the field shall be provided by the Contractor at no extra cost. The following equipment with operator shall be made available at Engineer's request (all must be in serviceable condition):
i)	One concrete cube testing machine suitable for 15 cm machine suitable for 15 cm cubes of 100 tones capacity with proving calibration ring.
ii)	Twelve cast iron cube moulds of 15 cm size
iii)	One Lab. balance to weigh up to 5 kg with sensivity of 10gm
iv)	One set of sieves for coarse and fine aggregates
v)	One set of slump cone complete with tamping rod
vi)	A set of measures from 5litre to 0.1litre
vii)	One electric oven with thermostat up to 120 Deg. Cent.
viii)	One flakiness gauge
ix)	One elongation index gauge

x)	One sedimentation pipette
xi)	One Pyconometer

xii)	Two calibrated glass jar of 1litre capacity Arrangement can be made by the contractor to have the cubes tested in an approved laboratory in lieu of a testing machine at site at his expense, with the prior consent of the Engineer.
b)	At least 6 test cubes of each class of concrete shall be made for every 15.0 cu.m. of concrete or part thereof. Such samples shall be drawn on each day for each type of concrete. Of each set of 6 cubes, three shall be tested at 7 days age and three at 28 days age. The laboratory test results shall be tabulated and furnished to Engineer. Engineer will pass the concrete if average strength of the specimens tested is not less than the strength specified, subject to the condition that only one out of three consecutive tests may give a value less than the specified strength but this shall not be less than 90% of the specified strength. The cubes shall be tested on 7th and 28th day from the day of casting of the cubes.
	Admixtures
a)	Admixtures may be used in concrete only with the approval of Engineer based upon evidence that, with the passage of time, neither the compressive strength nor its durability reduced. Calcium chloride shall not be used for accelerating setting of the cement for any concrete containing reinforcement, or embedded steel parts. When calcium chloride is permitted to be used, such as in mass concrete works, it shall be dissolved in water and added to the mixing water in an amount not to exceed 1.5% of the volume of the cement in concrete. When admixtures are used, the designed concrete mix shall be corrected accordingly. Admixtures shall be used as per manufacturer's instructions and in the manner and with the control specified by Engineer.
b)	Air entraining agents
	Where specified and approved by Engineer, neutralized vinyl resin or any other approved air-entraining agent may be used to produce the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM standard 6260, air entraining admixtures for concrete. The recommended total air content of the concrete is 4% plus minus 1%. The method of measuring air content shall be a per IS 1199.
c)	**Water reducing admixtures**
	Where specified and approved by Engineer water reducing lignosulfonate mixture shall be added in quantities specified by Engineer. The admixtures shall be added in the form of a solution.

d)	**Retarding admixtures** Where specified and approved by Engineer, retarding agents shall be added to the concrete mix in quantities specified by Engineer.--`a

e)	**Water proofing agent** Where specified and approved by Engineer, water proofing agent conforming to IS:2645 shall be added in quantities specified by Engineer.
	Optional tests
a)	Engineer may order tests to be carried out on cement, sand, coarse aggregate and water in accordance with the relevant Indian Standards. Tests on cement shall include (i) fineness test ii) test for normal consistency (iii) test for setting time (iv) test for soundness (v) test for tensile strength (vi) test for compressive strength (vii) test for heat of hydration by experiment and by calculations in accordance with IS:269. Tests on sand shall include (i) sieve test (ii) test for organic impurities (iii) decantation test for determining clay and silt content (iv)specific gravity test (v) test for unit weight and bulk age factor .Tests on coarse aggregate shall include (i) test for sieve analysis (ii)specific gravity and unit weight of dry loose and rodded aggregate (iii) soundness and alkali aggregate reactivity (iv) pictographic examination (v)deleterious materials and organic impurities (vi)test for aggregate crushing value. Any or all these tests would normally be ordered to be carried out only if Engineer feels the materials are not in accordance with the specifications or if the specified concrete strengths are not obtained and shall be performed by contractor at site or at an approved test laboratory. If the tests are successful, GUJARAT University shall pay for all such optional tests otherwise the Contractor shall have to pay for them.
b)	If the works cubes do not give the stipulated strengths Engineer reserves the right to ask contractor to dismantle such portions of the work, which in his opinion are unacceptable and re-do the work to the standard stipulated at contractor's cost.
c)	Load test on members or any other tests
i)	In the event of any work being suspected of faulty material or workmanship or both, Engineer requiring its removal and reconstruction may order the contractor that it should be load tested in accordance with the following provisions.
ii)	The test load shall be 125 % of the maximum superimposed load for which the structure was designed. Such test load shall not be applied before 56 days after the effective hardening of the concrete. During the test, struts strong enough to take the load shall be placed in position leaving a gap under the members. The test load shall be maintained for 24 hours before removal.
iii)	If within 24 hours of the removal of the load, the structure does not show a recovery of at least 75 percent of the maximum deflection shown during the

	24 hours under load the test loading shall be repeated after a lapse of at least 72 hours. The structure shall be considered to have failed to pass the test if the recovery after the second test is not at least 75 percent of the maximum deflection shown during the second test. If the structure is certified as failed by Engineer, the cost of the load test shall be borne by the contractor.
iv)	Any other tests e.g. taking out in approved manner concrete cores, examination and tests on such cores removed from such parts of the structure as directed by Engineer, sonic testing etc. shall be carried out by contractor if so directed.
v)	Should the results of any test prove unsatisfactory, or the structure shows signs of weakness, undue deflection or faulty construction the contractor shall remove and rebuild the member or members involved or carry out such other remedial measures as may be required by GUJARAT University. the Contractor shall bear the cost of so doing, unless the failure of the member or members to fulfill the test conditions is proved to be solely due to faulty design. Concrete in alkali soils and alkaline water Where concrete is liable to attack from alkali salts or alkaline water, special cements containing low amount of tricalcium aluminates shall be used, if so specified in the drawings. Such concrete shall have a minimum 28 days compressive strength of 250 kg per sq.cm and shall contain not less than 370 kg of cement per cubic meter of concrete in place. If specified, additional protection shall be obtained by the use of a chemically resistant stone facing or a layer of plaster of Paris covered with suitable fabric, such as jute thoroughly impregnated with tar. Preparation prior to concrete placement
a)	Before the concrete is actually placed in position, the insides of the form work shall be inspected to see that they have been cleaned and oiled. Temporary openings shall be provided to facilitate inspection, especially at bottom of columns and walls forms to permit removal of saw dust, wood shavings, binding wire, rubbish dirt etc. Openings shall be placed or holes drilled so that these materials and water can be removed easily. Such openings/holes shall be later suitably plugged.
b)	The various agencies shall be permitted ample time to install drainage and plumbing lines in floor and trench drains, conduits, hangers, anchors, inserts, sleeves, bolts, frames and other miscellaneous embedment to be cast in the concrete as indicated on the drawings or as is necessary far the proper execution of the work Contractor shall cooperate fully with all such agencies and shall permit the use of scaffolding form work etc. by other agencies at no extra cost.
c)	All embedded parts, inserts etc. supplied by GUJARAT University. or Contractor shall be correctly positioned and securely held in the forms to prevent

	displacement during depositing and vibrating of concrete.
d)	Anchor bolts shall be positioned and kept in place with the help of proper manufactured templates . The use of all such templates, fixture etc.. shall be deemed to be included in the rates.
e)	Slots, openings, holes, pockets etc. shall be provided in the concrete work in the positions indicated in the drawings or as directed by Engineer.
f)	Prior to concrete placement all work shall be inspected and approved by Engineer and if found unsatisfactory, concrete shall not be poured until after all defects have been corrected at Contractor's cost. Cat ladders shall be provided on the reinforcement to facilitate labour movement.
g)	Approval by Engineer for all materials and work as required herein shall not relieve contractor from his obligation to produce finished concrete in accordance with the drawings and specifications.
h)	No concrete shall be placed in wet weather or on water covered surface. Any concrete that has been washed by heavy rains, the work shall be entirely removed, if there is any sign of cement and sand having been washed from the concrete mixture. To guard against damage which may be caused by rains, the works shall be covered with tarpaulins immediately after the concrete has been placed and compacted. Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water is removed. To avoid flow of water over/around freshly placed concrete, suitable drains and sumps shall be provided.
i)	Immediately before concrete placement begins, proposed surfaces except framework, which will come in contract with the concrete to be placed, shall be covered with a bonding mortar..
	Transportation
a)	All buckets, containers or conveyors used for transporting concrete shall be mortar tight. Irrespective of the method of transportation adopted, concrete shall be delivered with the required consistency and plasticity without segregation or loss of slump. However, chutes shall not be used for transport of concrete without the written permission of Engineer and concrete shall not be re-handled before placing.
b)	Concrete must be placed in its final position before it becomes too stiff to work. On no account, water shall be added after the initial mixing concrete which has become stiff or has been contaminated with foreign materials shall be rejected and disposed off as directed by Engineer.
c)	All equipment used for mixing, transporting and placing of concrete shall be maintained in clean condition. All pans, buckets. hoppers, chutes,

	pipelines and other equipment shall be thoroughly cleaned after each period of placement.
	Procedure for placing of concrete
a)	Before any concrete is placed, the entire placing programme, consisting of equipment, layout proposed procedures and methods shall be submitted to engineer for approval if so demanded by Engineer and no concrete shall be placed until Engineer's approval has been received. Conveyor for conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete during depositing without segregation of materials, considering the size of the job and placement location.
b)	Concrete shall be placed in its final position before the cement shall normally be compacted in its final position within thirty minutes of leaving the mixer and once compacted it shall not be disturbed.
c)	Concrete, in all cases, be deposited as nearly as practicable directly in its final position, and shall not be re-handled or caused to flow in a manner which will cause segregation, loss of materials, displacement of reinforcement, shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible , and in narrow forms, contractor shall provide suitable drop and elephant trunks to confine the movement of concrete. Special care shall be taken when concrete is dropped from a height especially if reinforcement is in the way, particularly in columns and thin walls.
d)	Except when otherwise approved by Engineer, concrete shall be placed in shovels or other approved implements and shall not be dropped from a height more than 1 M or handled in a manner which will cause segregation.
e)	The following specification shall apply when placing of concrete by use of mechanical equipment is specifically called for while inviting bids or is warranted considering the nature of work involved. The control of placing shall begin at the mixer discharger, concrete shall be discharged by a vertical drop into the middle of the bucket or hopper and this principle of a vertical discharge of concrete shall be adhered to throughout all stages of delivery until the concrete comes to rest in its final position.
f)	Central bottom dump buckets of a type that provides for positive regulation of the amount and rate of deposition of concrete in all dumping position, shall be employed.
g)	In placing concrete in large open areas, the bucket shall be spotted directly over the position designated and than lowered for dumping. The open bucket shall clear the concrete already in place and the height of drop shall not exceed 1 M. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing or in any manner which results in separation of ingredients or disturbance of previously placed concrete will not be permitted.

h)	Concrete placed in restricted forms by wheel barrows, buggies, cars, short chutes or hand shoveling shall be subject to the requirement for vertical delivery of limited height to avoid segregation and shall be deposited as nearly as practicable in its final position.

i)	Where it is necessary to use transfer chutes, specific approval of Engineer must be obtained to the type, length, slopes, baffles, vertical terminals and timing of operations, the discharge and without segregation. To allow for the loss of mortar against the sides of the chutes, the first mix shall have less coarse aggregate. During cleaning of chutes the waste water shall be kept clear of the forms. Concrete shall not be permitted to fall from the end of the chutes by more than 1 M. Chutes when approved for use shall have slopes not flatter than 1 : 3 and steeper than 1 : 2 chutes shall be of metal or metal lined and of rounded cross section. The slopes of all chutes sections shall be approximately the same. The discharge end of the chutes shall be maintained above the surface of the concrete in the forms.
j)	Concrete may be conveyed and placed by mechanically operated equipment e.g. pumps or pneumatic placers only with the written permission of Engineer. The slump shall be held to the minimum, necessary for conveying concrete by this method.
k)	When pumping is adopted, before pumping of concrete is started, the pipeline shall be lubricated with one or two batches of mortar composed of one part cement and two parts sand. The concrete mix shall be specially designed to suit pumping. Care shall be taken to avoid stoppages in work once pumping has started.
l)	When pneumatic placer is used, the manufacturer's advice on layout of pipeline shall be followed to avoid blockages and excessive wear. Restraint shall be provide at the discharge box to cater for the reaction at this end. Manufacturer's advice shall be followed regarding concrete quality and all other related matters when pumping or pneumatic placing equipment are used.
m)	Concreting, once started, shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 15 to 90 mm as directed by Engineer. These shall be placed as rapidly practicable to prevent the formation of cold joints or planes of weakness between each succeeding layer within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit shall be spotted progressively along the face of the layer with such overlap as well facilitate spreading the layer to uniform depth and texture with a minimum of shoveling. Any tendency to segregation shall be corrected by shoveling stones into mortar rather than mortar on to stones. Such a condition shall be corrected by redesign of mix or other means, as directed by Engineer.

n)	The top surface of each pour and bedding planes shall be approximately horizontal unless otherwise instructed.
p)	**Compaction**

i)	Concrete shall be compacted during placing the approved vibrating equipment until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate and fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the forms faces and into corners of forms or against hardened concrete at joints is free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and caution exercised not to over-vibrate the concrete to the point that segregation results.
ii)	Vibrators shall conform to IS specifications. Type of vibrator to be used shall depend on the structure where concrete is to be placed. Shutter vibrators to be effective, shall be firmly secured to the formwork which must be sufficiently rigid to transmit the vibration and strong enough not to be damaged by it. Immersion vibrators shall have no load frequency, amplitude and acceleration as per IS 2505 depending on the size of vibrator. Immersion vibrators in sufficient numbers and each of adequate size shall be used to properly consolidate all concrete. Tapping or external vibrating of forms by hand tools or immersion vibrators will not be permitted.
iii)	The exact manner of application and the most suitable machines for the purpose must be carefully considered and operated by experienced men. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn when air bubbles cease to come to the surface. Immersion vibrators shall be withdrawn very slowly. In no case shall immersion vibrators be used to transport concrete inside the forms. Particular attention shall be paid to vibration at the top of a lift e.g. in a column or wall.
iv)	When placing concrete in layers., which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, blending and mixing of the concrete between the succeeding layers
v)	The immersion vibrator shall penetrate the layer being placed and also penetrate the layer below with the under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.
vi)	Care shall be taken to prevent contact of immersion vibrators against reinforcement steel. Immersion vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. They shall also not be allowed to come in contact with forms or finished surfaces.

vii)	Form attached vibrators shall be used only with specific authorization of Engineer.
viii)	The surface vibrators will not be permitted under normal conditions. However for thin slabs vibration by specially designed vibrators may be permitted upon approval of Engineer.

ix)	The formation of stone pockets or mortar bondages in corner and against faces of forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for through bonding, as directed by Engineer.
q)	Placement interval
	Except when placing with slip forms each placement of concrete in multiple lift work, shall be allowed to set for at least 24 hours after the final set of concrete and before the start of a subsequent placement.
r)	Special provision in placing When placing concrete in walls with openings and in floors of integral slab and beam construction and other similar
s)	Placing concrete through reinforcement steel When placing concrete through reinforced steel, care shall be taken top prevent segregation of the coarse aggregate. When the congestion of steel makes placing difficult it may be necessary to temporarily move the top steel aside to get proper placement and restore reinforcing steel to design position.
t)	Bleeding Bleeding of free water, on top of concrete being deposited, in to the forms shall be caused to stop the concrete pour. The conditions causing this defect corrected before any further concreting is resumed. Curing, Protecting, Repairing and finishing
A)	Curing
i)	All concrete shall be cured by keeping it continuously damp for the period of time required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays or ponded water continuously saturated covering of sacks, canvas, hessian or other absorbent materials, or approved effective curing compounds applied with spraying equipment capable of producing a smooth, even textured coat. Extra precautions shall be exercised in curing concrete during cold and hot water as outlined hereinafter. The quality of curing water shall be the same

	as that used for mixing concrete.
ii)	Certain types of finish or preparation for overlaying concrete must be done at certain stage of the curing process and special treatment may be required for specific concrete surface finish.
iii)	Curing of concrete made of high alumina cement and super sulphated cement shall be carried out as directed by Engineer. Unit rate are also inclusive & necessary centering & shuttering work which shall be as per following;

iv)	Fresh concrete shall be kept continuously wet for a minimum period of 10 days from the date of placing of concrete following a lapse of 12 to 14 hours after laying of concrete. The curing of horizontal surfaces exposed to the drying winds shall however begin immediately the concrete has hardened. Water shall be applied uniformly to concrete surfaces within 1 hour after concrete has set. Water shall be applied to formed surfaces immediately upon removal of forms quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.
v)	Curing shall be assured by use of an ample water supply under pressure in pipes with all necessary appliance of hose, sprinklers and spraying devices. Continuous fine mist spraying or sprinkling shall be used, unless otherwise specified or approved by Engineer.
vi)	Whenever, by the judgment of Engineer, it may be necessary to omit the continuous spray method, a covering of clean sand or other approved means such as wet gunny bags which will prevent loss of moisture from the concrete, may be used. No type of covering will be approved which would stain or damage the concrete during or after the curing period. Covering shall be kept continuously wet during the curing period.
vii)	For curing of concrete in pavements, side-walks floors, flat roofs or other level surfaces, the ponding method of curing is preferred. The method of containing the ponded water shall be approved by Engineer. Special attention shall be given to edges and corners of the slabs to ensure proper protection to these area. The ponded area shall be kept continuously filled with water during the curing period.
viii)	Surface coating type compounds shall be used only by special permission of Engineer, curing compounds shall be liquid type white pigmented. Other curing compounds shall be used on surfaces where future blending with concrete, water or acid proof membrane or painting is specified.
ix)	All equipment and materials required for curing shall be on hand and ready for use before concrete is placed.
B)	Protecting fresh concrete Fresh concrete shall be protected from defacements and damage due to construction operation by leaving forms in place for an ample period as specified later in this specification. Newly placed concrete shall be

	protected by approved means such as tarpaulins from rain, sun and winds. Steps as approved by Engineer shall also be taken to protect immature concrete from damage by debris, excessive loading, vibration, abrasion or contact with other materials etc, that may impair the strength and/or durability of the concrete. Workmen shall be warned against and prevented from disturbing green concrete during it setting period. If it is necessary that workmen enter the area of freshly placed concrete, Engineer may require that bridges be placed over the area.
C)	Repair and replacement of unsatisfactory concrete

i)	Immediately after the shuttering is removed, the surface of concrete shall be very carefully inspected and all defective areas called to the attention of Engineer who may permit patching of the defective areas or also reject the concrete unit either partially or entirely. Rejected concrete shall be removed and replaced by contractor at no additional expense to owner. Holes left by from bolts etc. shall be filled up and made good with mortar composed of one part of cement to one and half parts of sand passing 2.36 mm IS sieve after removing any loose stones adhering to the concrete shall be finished as described under the particular items of work.
ii)	Superficial honey combed surfaces and rough patches shall be similarly made good immediately after removal of shuttering in the presence of Engineer and superficial water and air holes shall be filled in. The mortar shall be well worked into the surface with a wooden float. Excess water shall be avoided. Unless instructed otherwise by Engineer the surface of the exposed concrete placed against shuttering shall be rubbed down immediately on removal of shuttering to remove fine or other irregularities and necessary care being taken to avoid damage to the surface. Surface irregularities shall be removed by grinding.
iii)	If reinforcement is exposed or the honeycombing occurs at vulnerable positions e.g. ends of beams or columns it may be necessary to cut out the member completely or in part and reconstruct. The decision of Engineer shall be final in this regard. If only patching is necessary, the defective concrete shall be cut out till solid concrete is reached (or to a minimum depth of 25mm) the edges being cut perpendicular to the affected surface or with small under cut if possible. Anchors, tees or dovetail slots shall be provided whenever necessary to attach the new concrete securely in place an area extending several centimeters beyond the edges and the surfaces of the prepared voids shall be saturated with water for 24 hours immediately before the patching material is placed.
iv)	The use of epoxy for bonding fresh concrete used for repairs will be permitted upon written approval of Engineer. Epoxy shall be applied in strict accordance with the instructions of the manufacturer.

v)	Small size holes having surface dimensions about equal to the depth of the hole, holes left after removal of form bottom, grout insert holes and slots cut for repair of cracks shall be repaired as follows. The hole to be patched shall be roughened and thoroughly soaked with clean water until absorption stops. A 5mm thick layer of grout of equal parts of cement and sand shall be well brushed into the surface to be patched, followed immediately by the patching concrete which shall be well consolidated with a wooden float. The concrete patch shall be built up in 10 mm thick layers. After an hour or more, depending upon weather conditions, it shall be worked off flush with a wooden float and smooth finish obtained by wiping with hessian, a

	steel trowel shall be used for this purpose. The mix for patching shall be of same material and in the same proportions as that used in the concrete being repaired, although some reduction in the maximum size of the coarse aggregates may be necessary and the mix shall be kept as dry as possible. Mortar filling by air pressure (guniting) shall be used for repairing of areas too large and/or too shallow for patching with mortar. Patched surfaces shall be given a final treatment to match the colour and texture of the surrounding concrete. While cement shall be substituted for ordinary cement, if so directed by Engineer, to match the shade of the patch with original concrete.
vi)	The patched area shall be covered immediately with an approved non-staining water saturated material such as gunny bag which shall be kept continuously wet and protected against sun and wind for a period of 24 hours. Thereafter, the patched area shall be kept wet continuously by fine spray of sprinkling for not less than 10 days.
vii)	All materials, procedures and operations used in the repairing of concrete and also the finished repair work shall be subject to the approval of Engineer. All fillings shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the fillings have been cured and finished.
D)	Finishing
i)	The type of finish for formed concrete surface shall be as follows, unless, other wise specified by the Engineer. For surfaces against which backfill or concrete is to be placed, no treatment is required except repairing of defective areas. For surface below grade which will receive waterproofing treatment the concrete shall be free of surface irregularities which would interfere with proper application of the waterproofing material which is specified for use. Unless specified, surfaces which will be exposed when the structure is in

	service shall receive no special finish, except repairing of damage or defective concrete removal of fins and abrupt irregularities, fillings of holes left by form ties and rods and clean up of loose or adhering debris.
ii)	Surfaces which will be exposed to the weather and which would normally be level, shall be sloped for drainage. Unless the drawing specifies such as stair treads, walls shall be sloped across the width approximately 1 in 30 broader surface such as walkways., roads, parking areas and platforms hall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete sub floors to be covered either concrete topping, terrazzo or quarry tile and similar surfaces shall be smooth screened and leveled to produce even surfaces. Surface irregularities shall not exceed 6mm. Surfaces which will not be covered by backfill, concrete or tile toppings such as outside decks, floors of galleries and sumps, parapets, gutters, sidewalks floors and slabs shall be consolidated, screened and floated. Excess water and laitance shall be removed before finishing. Floating may be done with hand or power tools and started as the screened surface has attained a stiffness to permit finishing operation and these shall be the minimum required to produce a surface uniform in texture and free from screed marks or other imperfections. Joints edges panels and forms linings shall be of uniform size and be as large as practicable and installed with closed joints. Upon removal of forms the joint marks shall be smoothed off and all blemishes, projections etc, removed leaving the surfaces reasonably smooth and unmarred.
iii)	Integral cement concrete finish
	When specified on the drawings and integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded as specified on the drawingly as per IS 2571. The surface shall be compacted and than floated with a wood float or power floating machine . The surface shall be tested with a straight edge and any high and low spots eliminated. Floating or trowelling of finish shall be permitted only after all surfaces water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the cement finish to absorb moisture or to stiffen the mix.
v)	**Exposed Concrete finish/Rendering**
	A rubbed finish shall be provided only on exposed concrete surfaces as specified on the drawings . Upon removal of forms, all fins and other projections on the surfaces shall be carefully removed, off-sets leveled and voids and damaged sections be immediately saturated with water and repaired by filling with a concrete or mortar of the same composition as was used in the surface. Then surface shall be thoroughly wetted and rubbed with carborundrum or other abrasive. Cement mortar may be used in the rubbing, but the finished surface shall be brush coated with either cement grout after rubbing. The finished surfaces shall present a uniform and smooth appearance.

	Mode of Measurement
i)	The unit rate for concrete work under various categories shall be all inclusive and no claims for extra payment on account of such items as leaving holes, embedding inserts etc. shall be entertained unless separately provided for in the schedule of quantities. No extra claim shall also be entertained due to change in the number, position end/or dimensions of holes solts or openings sleeves, inserts or on account of any increased lift or scaffolding etc. All these factors should be taken into consideration while quoting the unit rates.
ii)	Payments of concrete will be made on the basis of unit quoted for the respective items in the Schedule of Quantities. No deduction in the concrete quantity will be made for reinforcements, inserts etc. and opening less than 0.05 cu.m. where concrete is measured in cum . Where no such deduction for concrete is made, payment for shuttering work provided for such holes, pockets etc. will not be made.
iii)	Payment for beams will be made for the quantity based on the depth being reckoned from the underside of the slabs and length measured as the clear distance between supports. Payment for columns shall be made for the quantity based on height reckoned up to the underside of slabs.
2.02	Providing and laying in Design Mix Ready mixed controlled cement concrete M 25 concrete up to plinth level. manufactured in fully automatic batching plant and transported to site of work in transit mixer for all types of reinforced cement concrete structural elements, viz. Foundations, floor slab on ground, raft, plinth beams, columns, beams, slabs, flat slabs, sunk slabs, retaining walls, parapet boxes, gutters, fins, stair cases sloping slabs etc., curved / circular surfaces as specified and as per structural design & as directed using 20mm down graded machine crushed black trap stone aggregate including design of concrete mixes, weigh batched proportioning including necessary centering and shuttering (form work shuttering & boxing using plywood shuttering & scaffolding H- frame materials) at any lift and lead as specified finishing concrete surfaces, curing etc. (cost of admixtures, plasticizers necessary lift and lead as specified, pumping or bailing out water, finishing concrete surfaces, curing etc. complete) but excluding of reinforcement steel etc. complete as directed.
2.03	Providing and M- 25 concrete at all heights & all levels above highest plinth level. [for Sill band, lintel band, parapet coping band, mullion etc]. The general specification is same as per item no. 2.02 the design mix Ready mixed controlled cement concrete M25 instead of M20.
2.04	Providing and laying in position Design Mix Ready mixed controlled cement concrete manufactured in fully automatic batching plant and transported to site of work in transit mixer for all types of reinforced cement concrete structural elements, viz. Foundations, floor slab on ground, raft, plinth beams, columns, beams, slabs, flat slabs, sunk slabs, retaining walls, gutters, fins, stair cases sloping slabs etc., curved / circular surfaces as specified and as per structural design & as directed using 20mm down graded machine crushed black trap stone aggregate including design of concrete mixes, weigh batched

	proportioning including necessary centering and shuttering (form work shuttering & boxing using plywood shuttering & scaffolding H- frame materials) at any lift and lead as specified finishing concrete surfaces, curing etc. (cost of admixtures, plasticizers , pumping or bailing out water, finishing concrete surfaces, curing etc. complete) complete but excluding of reinforcement steel etc. complete as directed. With cement concrete conforming to M 30 grade concrete at any depth below ground level but up to plinth level. (Minimum cement content shall be 350 kg. per cum. Contractor shall submit the design mix report as per IS codes to client for their approval) The general specification is same as per item no. 2.02 the design mix Ready mixed controlled cement **concrete M-30** instead of M25.
2.05	'- Do - as per item No.2.04 but for concrete grade M- 30 above highest plinth level upto Ground floor slab.
2.06	'- Do - as per item No.2.04 but for concrete grade M- 30 above highest plinth level Ground floor slab to First floor slab.
2.07	'- Do - as per item No.2.04 but for concrete grade M- 30 above highest plinth level First floor slab to second floor slab
2.08	'- Do - as per item No.2.04 but For concrete grade M- 30 above highest plinth level second floor slab to third floor slab.
2.09	'- Do - as per item No.2.04 but For concrete grade M- 30 above highest plinth level to but from third floor slab to any floor above . (up to all height.)
2.10	Providing and fixing Precast concrete slab perforated type for shelves, ledges, trench / pit / chamber covers/gutter covers (50 to 150 mm thick) etc**. (M-25**)
	Precast concrete shall comply with IS 456 and with the following requirements:
a)	All precast units shall be cast on suitable bed or platform with firm foundation and free from wind. Contractor shall be responsible for the accuracy of the level or shape of the bed or platform. a suitable serial number and the date of casting shall be impressed or painted on each unit.
b)	Side shutters shall not be struck in less than 24 hours after deposition concrete and no precast unit shall be lifted until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected to at the time of lifting.
c)	The lifting and removal of precast units shall be undertaken without shock, vibration or undue bending stresses to or in the units. Before lifting and removal takes place Contractor shall satisfy Engineer or his representative that the methods he proposes to adopt for these operations shall not over stress or otherwise affect seriously the strength of the precast units. The reinforced side of the units shall be distinctly marked.

d)	All precast work shall be protected from the direct rays of the sun for at least 7 days after casting and during that period each unit shall be kept constantly watered or preferably be completely immersed in water if the size of the unit so permits, otherwise curing practice as given in clause 20 shall be followed.
e)	Slots, opening or holes, pockets etc. shall be provided in the concrete work as shown in the drawings or as directed by Engineer. Any deviation from the approved drawings shall be made good by Contractor at his own expense, without damaging any other work sleeves, bolts, inserts, etc. shall also be provided in concrete work where so specified.
g)	Mode of Measurement
2.11	Providing ,fabricating and placing in position Reinforcement steel. For TMT steel bars Fe 500 Grade
	The quality of the steel shall be as mentioned in the materials section. The bars shall be fabricated as per the drawings. Laps and splices for reinforcement shall be as shown on the drawings. Splices in adjacent bars shall be approved by Engineer. The bars shall not be lapped unless the length required exceeds the maximum available lengths of bars at site.
	Bending
a)	Reinforcing bars supplied bent or in coils, shall be straightened before they are cut to size. Straightening of bars shall be done in cold and without damaging the bars. This is considered as a part of reinforcement bending fabricating work.
b)	All bars shall be accurately bent according to the sizes and shapes shown on the detailed working drawings/bar bending schedules. They shall be bent gradually by machine or other approved means. Reinforcing bars shall not be straightened and re-bend in a manner that will injure the material, bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 32mm in diameter which may be bent hot if specifically approved by Engineer. Bars bent hot shall not be heated beyond cherry red colour (not exceeding 845 deg. C.) and after bending shall be allowed to cool slowly without quenching. Bars incorrectly bent shall be used only if the means used for straightening and rebinding shall not injure the material. No reinforcement shall be bent when in position in the work without approval whether or not it is partially embedded in hardened concrete. Bars having kinks or bends other than those required by design shall not be used
	fixing
a)	Reinforcement shall be accurately fixed by any approved means and maintained in the correct position shown in the drawings by the use of block, spacers and chairs as per IS 2502 to prevent displacement during placing and compaction of concrete. Bars intended to be in contact at crossing points shall be strongly bound together at all such points with two

	no. 16 gauge an healed soft iron wire. The vertical distance required between successive layers of bar in beams or other members shall be maintained by providing of mild steel spacer bars at such intervals that the main bars do not perceptibly sag between adjacent spacer bars.
	cover
a)	Unless indicated otherwise on the drawings, clear concrete cover for reinforcement (exclusive of plaster or other decorative finish) shall be as follows:
i)	At each end of reinforcing bar, not less than 25 mm nor less than twice the diameter of the bar whichever is less.
ii)	For a longitudinal reinforcing bar in a column, not less than 40mm, nor less than the diameter of the bar. In case of columns of minimum dimensions of 20 cm or under, with reinforcing bars of 12 mm and less in diameter, a cover of 25 mm may be used
iii)	For longitudinal reinforcing bars in a beam 25 mm nor less than the diameter of the bar.
iv)	For tensile, compressive, shear, or other reinforcement in a slab or wall not less than 12mm nor less than the diameter of such reinforcement
v)	For any other reinforcement not less than 12 mm nor less than the diameter of such reinforcement
vi)	For footings and other principal structural members in which the concrete is deposited directly against the ground, cover to the bottom reinforcement shall be 75 mm. If concrete is poured on a layer of lean concrete the bottom cover may be reduced to 50 mm
vii)	For concrete surfaces exposed to the weather or the ground after removal of forms, such as retaining walls, footing sides and top etc. not less than 50 mm for bars larger than 16 mm dia and not less than 40 mm for bars 16 mm dia or smaller
viii)	Increased cover thickness shall be provided, as indicated on the drawings, for surfaces exposed to the action of harmful chemicals (or exposed to earth contaminated by such chemical, acid, alkali, saline atmosphere, sulphurous smoke, etc.
ix)	For reinforced concrete members, totally or periodically immersed in sea water or subject to sea water spray, the cover of concrete shall be 50mm more than those specified in (i) to (v) above
x)	For liquid retaining structures the minimum cover to all steel shall be 40mm or the diameter of the main bars, whichever is greater. In the presence of sea water and soils and waters of a corrosive character the cover shall be

	increased by 10 mm.
xi)	Protection to reinforcement in case of concrete exposed to harmful surroundings may also be given by providing a dense impermeable concrete with approved protective coatings, as specified by the Engineer.
xii)	The correct cover shall be maintained by cement mortar cover blocks. Reinforcement for footings, beams and slabs on sub-grade shall be supported on precast concrete blocks as approved by engineer. The use of pebbles or stones shall not be permitted**. (COST INCLUDED IN ITEMS)**
	Inspection
	Erected and secured reinforcement shall be inspected, jointly measured and recorded and approved by Engineer prior to placement of concrete
	Mode of measurement.
	Lengths of reinforcement steel shall be measured to the nearest centimeter. Spacers and chairs shall be measured and & converted to weight using IS coefficients. The actual quantity of steel embedded in concrete as calculated and approved by Engineer, irrespective of the level or the height at which the work is done shall be taken. The unit rate for reinforcement shall include all wastages, binding wire. etc. for which no separate payment shall be made. Laps as shown in drawings or as approved by Engineer and minimum number of chairs and spacer bars required to keep the reinforcement in position **shall not be paid** for. The cost of this quantity of steel plus wastage as specified in clause 5.0 of Section VI shall be recovered at issue rate from the Contractor.
2.12	**REINFORCEMENT COUPLERS (parallel thread rebar couplers)** General requirement of material Reinforcement coupler shall have adequate strength, length and internal threads as per manufacturer's design to be able to meet the performance requirement as per IS Code. All reinforcement coupler shall be finished smooth and shall be free from burrs, cracks and other manufacturing defects. The threads shall be clearly formed and shall be free from imperfections. The nominal sizes of reinforcement couplers based on their internal diameter shall correspond to the size of bars covered under IS Code 1786. Each coupler should be identifiable by marks/ brands which indicate name of manufacture or their brand name, class designation, nominal size and grade of reinforcement for which it is intended and BIS standard mark. Performance Requirement: All reinforcement couplers shall meet the performance requirements as per IS Code 16172:2014 Class H couplers in addition to above shall also meet requirement of IS Code 16172:2014. The static tensile test shall constitute acceptance test. Sampling and criteria for conformity: Sampling and criteria for conformity shall be as per Annexure 'F' of IS Code 16172:2014

	Installation procedure/ instructions: The manufacturer/ supplier shall provide written installation instructions. The installation instructions shall be clear and understandable. The described installation procedure of reinforcement coupler
	shall be repeatable and able to achieve its performance under different job site circumstances. **Measurement** :The reinforcement couplers shall be measured in numbers. **Rate :** The rate shall be inclusive of all materials &labour involved in fixing parallel threaded couplers to reinforcement bars.
2.14	**Supplying and mixing water proofing compound** The water proofing compound may be of approved make . It shall be added to cement concrete or cement mortar as instructed by the Engineer. The proportion of the compound to be added shall be as per the Manufacturer's specifications. **Mode of Measurement** The quantity of compound added shall be measured and paid for. The unit shall be as specified in the item specification.
2.15	Providing and grouting the foundation bolts/pockets, base plates, Grouting the pockets with Ready mixed Grouting cement concrete mix of specified brand complete with making holes if necessary, in concrete as directed. The work shall be measured based on the size of pockets actually grouted or size of pockets shown in the approved drawing, whichever is less. Similarly, in case of grouting below the base plate of machine / equipment, measurement shall be based on the area of grout and the thickness as per the drawing or as per actual whichever is less. **Mode of Measurement** It shall be measured in Cum.
2.19	Providing and applying concrete bonding compound S.B.R. Latex / approved or equivalent make to old / new concrete surfaces at all levels, in vertical and horizontal planes as directed by engineer after necessary chipping & cleaning surface dust free.
	Mode of Measurement It shall be measured in Ltr.
2.20	Providing and Fixing of reinforcement steel dowel bar in the existing RCC elements by re-bar method including machine drilling (minimum drilling hole dia. shall be 1.5 times of the dia. of dowel bar to be inserted and up to suitable inset depth as directed), supply of necessary anchoring(Hilti's HIT-HY 200 is designed to be used as an adhesive anchoring system in conjunction with an anchoring element, such as threaded rod, rebar, HIT-Z or internally threaded

	inserts). and work to be carried through the competent agency including all materials, labours, tools, etc. complete as directed for 8 mm dia bars. (Reinforcement shall be paid under relevant item of this tender), complete as directed. (contractor should conduct pull out test as per manufacturer specifications.) (up to all height.)
2.21	-do- as above but for Reinforcement Steel Dowel Bar 10 mm
2.22	-do- as above but for Reinforcement Steel Dowel Bar 12 mm
2.23	-do- as above but for Reinforcement Steel Dowel Bar 16 mm
2.24	-do- as above but for Reinforcement Steel Dowel Bar 20 mm
2.25	-do- as above but for Reinforcement Steel Dowel Bar 25 mm

SECTION 3.00 MASONRY WORKS		
Applicable codes and specifications		
a)	The following codes, standards and specifications are made a part of this specification. All standards, tentative specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.	
IS:1077	-	Common burnt clay building bricks
IS:3102	-	Classification of burnt clay bricks
IS:2180	-	Burnt clay building bricks, heavy duty.
IS:3495	-	Method of sampling and testing clay building bricks
IS:2691	-	Burnt clay facing bricks
IS:2221	-	Code of practice for brick work
IS:2185	-	Load bearing hollow concrete blocks

IS:5498	-	Lime-cement-cinder hollow concrete blocks
IS:3115	-	Lime-cement cinder soiled blocks
IS:1597	-	Code of practice for construction of stone masonry(Part-I).

3.01	Providing and constructing brick masonry in any shape in machine mixed Cement Mortar (CM) 1:6 (1 part cement and 6 part coarse sand) in all works - all walls, wall foundations, trenches, water tank wall, machine foundations, columns with approved quality bricks having minimum crushing strength 35 Kg./Sq.cm (as per IS:349) including all necessary scaffolding, racking out the joints, curing etc. complete as directed in foundation at all levels below ground level and up to highest plinth level.
a)	Bricks used in works shall be bricks of specified crushing strength as described in the Schedule of Quantities. They shall have the following general properties: They shall be sound, hard, homogenous in texture, well burnt in kiln without being vitrified, table molded, deep red, cherry or copper coloured, of regular shape and size and shall have sharp and square edges and paralleled faces. The bricks shall be free from pores, chips, flaws or humps of any kind. Bricks containing ungrounded particles and which absorb water more than 1/5th of their weight when soaked in water for twenty four hours shall be rejected. Over burnt or under burnt bricks shall be liable to rejection. These bricks shall give a clear ringing sound when struck.
b)	Samples of bricks shall be submitted before starting the brickwork to the Engineer for approval. Bricks supplied shall conform to these approved samples. Brick sample shall be got tested as per IS:3495 by Contractor at no extra cost. Bricks rejected by Engineer shall be removed from the site of works within 24 hours.

c)	Mortar
i)	Mix for cement mortar shall be as specified in the respective items of work. Gauge boxes for sand shall be of such dimensions that one complete bag of cement containing 50 kgs. of cement forms one unit. The sand shall be free from clay shale, loam, alkali, and organic matter and of sound, hard, clean and durable practical's . Sand shall be approved by the engineer. If so directed by the engineer sand shall be thoroughly washed till it is free of any contamination.
ii)	For preparing cement mortar the ingredients shall first be mixed thoroughly in dry condition. Water shall then be added and mixing continued to give a uniform mix of required consistency. Cement mortar shall preferably be machine mixed, through mixing in a thorough manner may be allowed. The mortar so mixed shall be used within 30 minutes of mixing. Mortar left unused in the specified period shall be rejected.
iii)	The Contractor shall arrange for test on mortar samples if so directed by the engineer re-tempering of mortar shall not be permitted.
d)	Workmanship
i)	All bricks shall be thoroughly soaked in clean water for at least one hour immediately before being laid. The cement mortar for brick masonry work shall

	be as specified in the respective item of work. Brick work 230 mm thick and over shall be laid in English bond unless otherwise specified. While laying bricks shall be pressed in to the mortar and shoved into final position so as to embed the brick fully in mortar. Bricks shall be laid with frogs uppermost.
ii)	All brick work shall be plumb, square and true to dimensions. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be leveled. The thickness of brick courses shall be kept uniform. For walls of thickness greater than 230 mm both faces shall be kept in vertical planes. No broken bricks shall be used except as closers. Care shall be taken that the bricks forming the top corners and ends of the wall shall be properly radiated and keyed into position. Holes kept in masonry for scaffolding shall be closed before plastering. All interconnected brickwork shall be carried out at nearly one level (so that there is uniform distribution of pressure on the supporting structure) and no portion of the work shall be left more than one course lower than the adjacent work where this is not possible, the work shall be raked back accordingly to bond (and not saw toothed) at an angle not exceeding 45 deg.
iii)	Bricks shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6mm and not more than 10 mm. The face joint shall be raked to a minimum depth of 12mm by raking tools daily during the progress of work when the mortar is still green so as to provide a proper key for the plaster or pointing to be done. Where plastering or pointing is not required to be done the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brickwork shall be cleaned daily and all mortar droppings removed. The surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top. If the mortar in the lower course has begun to set the joints shall be raked out to a depth of 12 mm before another course is laid.

iv)	All brick work shall be built tightly against columns, floor slabs or other structural member.
v)	Where drawings indicate that structural steel columns are to be fireproofed with brick work the brick shall be built closely against all flanges and webs with all spaces between the steel and bricks works filled solid with mortar. Steel members partly embedded in brickwork and not indicated to be fireproofed with concrete shall be covered with not less than 12mm thick mortar unless directed otherwise by engineer.
vi)	The work shall be cured for 15 days.
(e)	Miscellaneous inserts in masonry e.g. sleeves, wall ties, anchors, conduits, structural sheet, steel lintels etc. shall be installed by the Contractor . Furnishing fixing of any of these inserts by the Contractor will be paid for separately under steel work. Openings, arches, etc. shall be provided as shown on the drawings, chasses, pockets etc, shall be provided as shown on the drawings to receive rain water pipes etc. Wall ties and flashings shall be built into the brickwork in accordance with the drawings and specifications.
(f)	Mode of Measurement

i)	Brick work of thickness one brick i.e. 230 mm and above shall be paid in units of cum. In all cases, the quantities measured shall be executed after making necessary deductions for openings etc. as given below:- No deductions shall be done for openings up to 1000 sq.cm ,ends of dissimilar materials, drainage holes, window/door holdfasts, concrete lintel bearings, landing slab bearing, beam bearing, chimney flues, cutouts, iron fixtures, pipes up to 30cm dia.
ii)	It shall be clearly understood that the rates quoted by the Contractor include leaving openings, cutting chases in brickwork as per drawings/ instructions of the Engineer.
iii)	The rate includes necessary single or double scaffolding, centering, soaking of bricks, raking out joints and curing the work all complete.
3.02	Providing and constructing Autoclaved Aerated (Cellular) Concrete block masonry works for all walls of 230 mm thick in polymer based Block joining mortar (3 to 4mm thick)as per manufacturers instructions.
1	Terminology
	For the purpose of this standard, the following definitions shall apply
i	Bond Beam
ii	Nominal Bond Beam - A beam made of reinforced concrete or of U-shaped precast concrete elements subsequently filled solid with reinforced concrete built integrally with a masonry wall, but intended only as a continuous tension member
Iii	Structural Bond Beam - A reinforced concrete beam built integrally with a masonry wall as a structural member and designed in accordance with structural engineering practice, primarily to transmit lateral loading on the wall to other connecting structural elements.
Iv	Concrete Block: A precast concrete masonry unit either solid or hollow.
v	Drying shrinkage: The difference between the length of specimen which has been immersed in water and then subsequently dried to constant length, all under specified conditions, expressed as a percentage of the dry length of the specimen.
vi	Joint reinforcement: The reinforcement embedded in mortar between masonry blocks normally as continuous horizontal element
vii	Moisture movement: The difference between the lengths of the specimen when dried to constant length and when subsequently immersed in water, all under specified conditions, expressed as a percentage of the dry length of the specimen.
2	Materials
a	Masonry Units - The masonry units shall be autoclaved cellular (aerated concrete blocks conforming to IS: 2185 (Part 3) – 1984.
b	Cement - Cement shall conform to IS: 269 - 19761 or IS: 455-1976 or IS: 1489 - 1976.
c	Lime - Lime shall conform to IS: 712 - 1984.The lime shall be of class C, unless

	otherwise specified. All lime other than dry hydrated lime shall be fully slaked in accordance with IS: 1635 - 1975
d	Water - Water shall satisfy the requirements specified in IS: 456- 1978.
e	Sand for mortar shall generally conform to the requirements of IS: 2116 - 1980 or to the requirements of IS: 383 - 1970 (except for particle size grading which shall conform to IS: 2116 - 1980).
f	Fly Ash - Fly ash shall conform to IS: 3812 – 1981.
g	Calcined Clay Pozzolana - Calcined clay pozzolana shall conform to IS: 1344 – 1981
h	Reinforcement - Reinforcement used shall conform to the following:
i	Mild steel Grade 1 or Grade 2 bars conforming to IS: 432 (Part 1) – 1982.
ii	Mild steel bars conforming to IS: 226 – 1975.
iii	Hard drawn steel wire conforming to IS: 432 (Part 2) – 1982
iv	Mild steel wire conforming to IS: 280 - 1978.
v	Welded wire fabric conforming to IS: 1566 – 1982.
vi	High strength deformed bars conforming to IS: 1786 – 1985.
vii	Mortar
i	Cement-lime-sand mortar, cement-sand mortar or lime-pozzolana-sand mortar generally conforming to IS: 2250 - 1981 shall be used.
j	The blocks shall be embedded with a polymer mortar, the strength of which is relatively lower than that of the mix used for making blocks in order to avoid the formation of cracks. Polymer mortar shall used as per manufacturer specification shall be used
k	~~All mortar shall be prepared in accordance with IS: 2250 - 1981. All mortar when mixed shall have a consistency value of 90 to 130 mm when determined in accordance with Appendix B of IS: 2250 – 1981.~~
L	~~As a substitute to lime mixed cement -sand paste, it is advisable to use chemical based mortar. Refer approved brand list for product's manufacture's name, code, etc.~~
3	Design considerations
I	Choice of type of walls: Autoclaved cellular concrete blocks may be employed for both load bearing and non-load bearing internal and external walls. The wall thickness shall be designed in accordance with the provisions of IS: 1905 – 1980. Autoclaved cellular concrete blocks shall not be used in foundations and for masonry below damp-proof course.
ii	Strength & stability: Autoclaved cellular concrete blocks may be employed for both load bearing and non-load bearing internal and external walls. The wall thickness shall be designed in accordance with the provisions of IS: 1905 – 1980.
iii	Avoidance of crack formation The major causes of cracks in the structures of the cellular concrete blocks or partitions and measures for their prevention are described below.
Iv a	Structural Movements Cracks may occur due to alterations in length, curvature or orientation of the structural members enclosing a wall or partition due to load settlement, thermal

	expansion or changes in moisture content. The precautions to be taken for prevention shall be as described below. In the case of framed structures, erection of partitions and panel walls shall be delayed wherever possible until the frame has taken up, as much as possible, any deformation occurring due to structural movements. Floor deformation and movement - The floor upon which a partition is built may deflect under load brought upon it after it is built. Where such deflections tend to create non-continuous bearing, the partition shall be strong enough to span between the points of least floor deflection or shall be capable of adapting itself to the altered conditions of support without cracking. This may be achieved by embedding wires of minimum 3 mm diameter mild steel or galvanized steel or welded wire fabric strip in bed joints in cement mortar 1: 2 after every 900 mm to 1200 mm height.
b	Ceiling deflection and movement - A ceiling above a partition wall may deflect under loads applied after its erection, or through thermal or other movements. To avoid cracking as a result of such deflection, the partition wall shall be separated from the ceiling by a gap or by a layer of resilient material or lean mortar. Where this cannot be done as in the case of plastered finishes, the risk of cracking may be diminished by forming a cut between the ceiling plaster and the wall plaster.
c	Defection or movement of structural abutments - Walls, columns or other structural elements against which a wall or partition abuts may deflect or move because of load, settlement, shrinkage or thermal effects. In order to avoid cracking of walls or partitions as a result of such movements, a slip joint shall be provided where possible, preferably packed with a resilient material or lean mortar.
d	Cracks in partition walls may occur at the corners of door frames and window frames at lintel level or sill level. It may, therefore, be desirable to provide a nominal reinforced concrete bond beam at sill level and vertical reinforced concrete stud at either side of vertical members of frames which may in addition provide sufficient anchorage for the holdfast
E	Control of wall movement accompanying temperature and moisture changes Cracking in concrete masonry walls is often due to tensile stresses which develop when wall movements accompanying temperature and moisture change are restrained by other elements of the building, or when concrete masonry places restraint on the movement of adjoining elements. There are three methods of controlling cracking in concrete masonry structures:
f	Specifying a limit on the moisture content of masonry units at the time of delivery and construction
g	Incorporating steel reinforcement either in the form of nominal bond beams or horizontal joint reinforcement
h	Providing control joints to accommodate the movement In all concrete masonry construction, it is essential to employ only moisture-controlled units. Their use, combined with the provision of control joints, is generally adequate to prevent cracking in, concrete masonry walls. However, bond beams or joint reinforcement, or both in different locations as considered suitable, may also be used in addition to the above.

v	Nominal Bond Beams:
	Bond beams, the use of which as structural members has been referred to in relevant tender item also serve as a. means of crack control. Nominal bond beams shall be built in the same manner as the structural bond beams with a minimum reinforcement of two 8 mm diameter mild steel bars or two 6 mm diameter high strength deformed bars. Their value for this purpose is due to the increased strength and stiffness they provide to a masonry wall. As a means of crack control, the area of influence of a bond beam shall normally be presumed to extend 600 mm above and below its location in the wall. In walls with-out openings they shall be spaced 1200 apart and may be of any length up to a maximum of 18 m. Nominal bond beams shall be discontinuous at control joints, but practice here varies depending upon structural requirements. Dummy joints shall be formed when a bond beam is continuous at a control joint
4	Storage and handling of materials
i	The blocks shall be stored in such a way as to avoid any contact with moisture on the site. They shall be stock piled on planks or other supports free from contact with the ground and covered to protect against wetting. The blocks shall be handled with care and damaged units shall be rejected. Cement, lime, aggregates and other masonry materials shall be stored and hauled as laid down in the relevant Indian Standard specifications for these materials
5	Preparatory Work
i	Wetting of Blocks - These blocks need not be wetted before or during the laying in the walls; in case the climatic condition so required, the top and the sides of the blocks may be slightly moistened so as to prevent absorption of water from the mortar and ensure the development of the required bond with the mortar.
6	Laying of ACC block masonry in super structure
a	Use of Mortar in Masonry
	Mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and loose its plasticity, thereby resulting in poor bond. For most of the work the joints, both horizontal and vertical, shall be 10 mm thick. Except in the case of extruded joint construction, the mortar joints shall be struck off flush with wall surface and when the mortar has started stiffening, it shall be compressed with a rounded or Ushaped tool. This compaction is important, since mortar, while hardening has a tendency to shrink slightly and thus pull away from the edges of the block. The mortar shall be pressed against the units with a jointing tool after the mortar has stiffened to affect intimate contact between the mortar and the masonry unit and obtain a water-tight joint
b	Operations for laying Block Masonry
i	First Course - The first course of cellular concrete block masonry shall be laid with greater care, making sure that it is properly aligned, leveled and plumbed, as this may assist the mason in laying succeeding courses to obtain a straight and truly vertical wall. The first layer of cellular concrete block masonry on plinth should preferably have groove/offset outside so that rain water coming down the wall falls out. Before laying the first course, the alignment of the wall shall be marked on the

	damp-proof course. The blocks for this course shall first be laid dry, that is, without mortar along a string stretched between properly located corners of the wall in order to determine the correct position of the blocks including those of the cross walls jointing it and also adjust their spacing. When the blocks are set in proper position, the two corner blocks shall be removed, a mortar bed spread and these blocks laid back in place truly level and plumb. The string shall then be stretched tightly along the faces of two corner blocks and the faces of the intermediate ones adjusted to coincide with the line. Thereafter, each block shall be removed and relaid over a bed of mortar. After every three or four blocks have been laid, their correct alignment, level and verticality shall be carefully checked.
ii	The construction of walls may be started either at the corners first or started from one end proceeding in the other direction. If the corners of the wall are built first, they shall be built four or five courses higher than the centre of the wall. As each course is laid at the corner, it shall be checked for alignment and level and for being plumb. Each block shall be carefully checked with a level or straight-edge to make certain that the faces of the blocks are all in the same plane. This precaution is necessary to ensure truly straight and vertical walls. The use of a story rod or course pole which is simply a board with markings 200 mm apart provides an accurate method of finding the top of the masonry for each course. Each course, in building the corners, shall be stepped back by a half-block and the horizontal spacing of the block shall be checked by placing a mason's level diagonally across the corners of the blocks
Iii	When filling in the wall between the corners, a mason's line shall be stretched from corner to corner for each course and the top outside edge of each block shall be laid to this line. The manner of handling or gripping the block shall be such as to position the block properly with minimum adjustment. To assure satisfactory bond, mortar shall not be spread too far ahead of actual laying of the block or it will stiffen and loose its plasticity. As each block is laid, excess mortar extruding from the joints shall be cut off with the trowel and thrown back on the mortar board to be reworked into the fresh mortar. If the work is progressing rapidly, the extruded mortar cut from the joints may be applied to the vertical face shells of the blocks just laid. If there be any delay long enough for the mortar to stiffen on the block, the mortar shall be removed to the mortar board and reworked. Dead mortar that has been picked up from the scaffold or from the floor shall not be used
Iv	Closure Block -When installing the closure block, all edges of the opening and all four edges of the closure block shall be buttered with mortar. The closure block shall be carefully lowered into place. If any mortar falls leaving an open joint, the closure block shall be removed, fresh mortar applied and the operation repeated.
c	Provision of Door and window frames
i	Door and window frames shall be attached to the surrounding masonry either by conventional method or with 200 mm flooring nails with screwed ends fixed directly into the block after the frame has been wedged into the opening at every nailing position. The number of nails to give adequate stability will be

	dependent on the dimensions of the frames. The nails should be spaced at maximum 400 mm and the first nail should not be farther than 200 mm from a corner. Frames may be attached to the masonry by holdfasts anchored in the vertical reinforced concrete studs provided to the frames.
ii	Provision for Lintels - Lintels for doors, windows and other openings shall be made of either RCC cast in situ or precast units or shall conform to IS : 9893 - 1981; where openings occur close to one another, continuous lintels may be provided
d	Provision for roof
	The top of the roof course shall be finished smooth with a thin layer of 1: 3 cement mortar and covered with a coat of crude oil or craft or oil paper to ensure free movement of the roof. Where the roof slab projects beyond the external wall face, it shall be provided with a drip.
e	Intersecting wall
	All walls wherever they meet or intersect shall be bonded or tied securely in accordance with
i	Load Bearing Walls - When two load bearing walls meet or intersect and the courses are to be laid up at the same time, a true masonry bond between at least 50 percent of the units at the intersection is necessary. When such intersecting bearing walls are laid up separately, pockets with 200 mm maximum vertical spacing shall be left in the first wall laid. The corresponding course of the second wall shall be built into these pockets
ii	Non Load bearing walls – Meeting of intersecting non-load bearing wall shall be bonded by either of the two methods recommended for load bearing walls.
f	Pilasters & piers
	Pilasters and piers shall be provided wherever necessary in a manner approved by the engineer-in-charge
g	Rendering & other finishes
	External Renderings
	The exterior surface of all cellular concrete block walls shall be made waterproof by treating the walls with different types of renderings, depending upon the intensity of rainfall, nature of exposure, etc.
i	The renderings shall be applied in accordance with IS: 2402-1963. Renderings shall not be applied to the walls when these are wet or in monsoon. The walls shall be treated only after they are fully dried.
ii	Satisfactory performance of any rendering depends entirely on the efficiency of the bond developed between the rendering and the wall surface. Extreme care shall, therefore, be taken to ensure effective bond with the wall by preparing the surface, roughening it if necessary, cleaning the surface of all loose particles and dust, moistening it with water just prior to applying the rendering to prevent absorption of water from it. The sand used for the plaster finish shall be graded from 3 mm downwards. The plaster shall not be finished smooth but provided with a coarse finish by means of a wooden float
iii	In localities where rainfall is heavy or the walls are exposed to sea weather, cellular concrete block masonry shall be rendered with two coats of plaster. First

	coat (backing coat) shall be of 15 mm thickness of 1: 1: 6 cement-lime-sand mortar or 1: 6 cement-sand mortar. Second coat (finishing coat) shall be of 5 to 10 mm thickness of 1: 1: 6 to 1: 2: 9 cement-lime-sand mortar.
iv	In moderate rainfall area, cellular concrete block masonry shall be rendered with at least one coat of 10 to 15 mm thickness of 1 : 1 : 6 cement-lime-sand mortar (or 1 : 6 cement-sand mortar) or two coats of cement paint may be applied directly on concrete block masonry to provide a reasonably impervious surface to withstand rain
v	In areas of scarce rainfall, the exterior surface of concrete block masonry may only be pointed with 1: 3 cement mortar.
vi	Where for architectural or other reasons it is necessary to have the cellular concrete block surface exposed, the walls shall either be built with block having richer facing mixture or treated with two coats of approved quality cement based paint. In either case the walls in heavy or moderate rainfall areas shall be pointed with 1: 2 cement-sand mortar
h	Internal Renderings
	As cellular concrete blocks are of uniform size, walls built with them provide an even surface. Where it is desired to have the block surface exposed, the walls may only be flush pointed and painted with an approved quality of cement paint, emulsion paint or chlorinated rubber paint. Oil based paints are liable to attack by alkali from the blocks and mortar. Otherwise the interior surface of walls may be plastered with one coat of 6 to 12 mm thickness of 1: 2: 9 cement lime-sand mortar or 1: 6 cement-sand mortar. Where a very smooth finish is desired, a second coat of 2 to 3 mm thickness of lime finish may be applied.
	Maintenance
	The exposed walls shall be inspected closely every year before monsoon, and cracks, if any shall be sealed properly with a cement grout and painted with two coats of cement paint.
	Mode of Measurement: Same as per Item spec. no. 3.01
3.03	Providing and constructing Autoclaved Aerated (Cellular) Concrete block masonry works for Partition walls of 100 to 125 mm thick in polymer based Block joining mortar (3 to 4mm thick) as per manufacturer's instructions. Using Autoclaved Aerated (Cellular) Concrete blocks confirming to IS 2185-Part 3 - 1984 and manufactured with cement, lime, sand/fly ash, gypsum for all walls, compound wall, parapet wall, stair cabin wall, gable wall, load walls, curved walls, columns etc. as per drawing in line, level and plumb with necessary independent double raw (legged) scaffolding, as per IS 6041 - 1985 in specified course of approved bond with uniform joint thickness, racking out joints, rubbing and cleaning the surface, curing etc. complete and sill band to be provided at every 1200 mm height of partition wall as per the details given as directed, at all levels above plinth level. for partition walls- 115mm thick. Note: The sill band concrete shall be paid in cubic meter and the reinforcement in Kg. as per the

	relevant items. at all ht & all levels above plinth level. Mode of Measurement: It is measured in Sqm.
3.04	Providing and constructing honeycomb brick masonry work in any shape and for all works with approved quality bricks having minimum crushing strength 35 Kg./Sq.cm in machine mixed Cement Mortar (CM) 1: 4 (1 part cement and 4 part coarse sand) of specified thickness as per details at all levels including racking of joints, scaffolding, curing etc. complete as directed at all levels below and above highest plinth level. Mode of Measurement: It is measured in Cum
3.05	Providing & laying 230 mm thick Brick masonry jali work in Cement Mortar (CM) 1: 3 (1 part cement and 3 part coarse sand) etc. complete as per drawing and design as per architectural drawing with curing, scaffolding etc. complete as directed at all levels & all ht. Mode of Measurement: It is measured in Cum

SECTION 4.00 DOOR- WINDOW & FIXTURES [WOODEN+ ALUMINUM+GLASS]		
Applicable Codes		
IS:4021	-	Timber door, window and ventilator frames
IS:2202	-	Wooden flush door shutters (solid core type) part I
IS:1003	-	Timber paneled and glazed shutters(part I & II)
IS:4020	-	Method of tests for wooden flush doors: Type tests.
IS:1761	-	Transparent sheet glass for glazing and framing purposes
IS:3097	-	Specification for veneered particle boards (Exterior Grade)

4.01	Providing material and labor for fixing in position frames/ shutter for any type of aluminum work for any type of door, window, partition, fixed louvers, made out of any type of aluminum section (Approved make: BANCO/ Domal/Technal)
	Providing and fixing Domal Aluminum sections shall be of mat finish powder coated aluminum (minimum thickness of powder coating 20 micron)/ frame works for doors, windows, ventilators and partitions with extruded built-up standard tubular sections / appropriate Z sections and other sections conforming to IS: 733 and IS: 1285, fixed with rawl plugs and screws or with fixing clips, or with expansion hold-fasteners including necessary filling up of gaps at junctions, at top, bottom and sides with required PVC/Neoprene felt, Silicon sealant of approved make etc. Aluminum sections shall be smooth, rust free, straight, mitered and jointed mechanically wherever required including cleat angle, aluminum snap beading for glazing/paneling, LOCKS FOR WINDOWS CP Brass/stainless steel screws, all complete as per architectural drawings and the direction of the Engineer -in- charge, (Cost of glazing / paneling shall paid separately as per the respective items). Rates applicable for all heights & floor including all labour.(Jindal make)
	Material : Domal Aluminum sections shall be of mat finish anodizing of 65 micron/ powder coated aluminum (minimum thickness of powder coating 65 micron)/ frame works for doors, windows, ventilators and partitions with extruded built-up standard tubular sections / appropriate Z sections and other sections conforming to IS: 733 and IS: 1285, fixed with rawl plugs and screws or with fixing clips, or with expansion hold-fasteners. . Aluminum sections shall be smooth, rust free, straight, mitered and jointed mechanically with EPDM quality gasket and required and locks for windows
	Workmanship : fixing Domal Aluminum sections shall be of powder coated of 65 micron (minimum thickness of powder coating 65 micron)/ frame works for doors, windows, ventilators and partitions with extruded built-up standard tubular sections / appropriate Z sections and other sections conforming to IS: 733 and IS: 1285, fixed with rawl plugs and screws or with fixing clips, or with expansion hold-fasteners including necessary filling up of gaps at junctions, at top, bottom and sides with EPDM gasket, Silicon sealant of approved make etc. Also providing and fixing concealed lock for Aluminum windows work

	Mode of Measurement: The mode of measurement is kg.
4.02	Providing, fixing, designing aluminum fixed louver and Fins (made out of Aluminum Section) of any type of louver section of approved make having minimum 50-micron polyester powder coating on all the surfaces of approved shade, texture & make as per manufacturer's specifications. Contractor shall submit the shop drawing for louver/ fins based on concept design/ drawing and as per elevation. Aluminum louver section shall be fixed on aluminum framing/ carrier/ panel/ GI clip and necessary sub structure with required fasteners, hardware as per approved shop drawing etc complete for all floor, all height including scaffolding as directed by engineer in charge. Louver, framing and sub structure shall be in proper line, level and plumb. Necessary MS work shall be paid in relevant tender item
	Mode of Measurement: The mode of measurement is kg.
4.04	Providing material and labour for fixing SS 304 grade push-pull pair of handle of size 200 mm long x 19mm dia made out of satin (brush) finish hollow pipe of 1.5 mm thick having offset type C-shape/ H-shape/ D-shape of approved make with necessary screws etc. complete for wooden doors/ aluminum doors/ metal doors for all heights, all floors and all level as per approved sample and as directed by Engineer-in-charge. Rate shall be the length of handle should be perfect center to center as below specified. Mode of Measurement: The mode of measurement is No.
4.05	Providing material and labour for fixing SS 304 grade push-pull pair of handle of size 300 mm long x 22mm dia made out of satin (brush) finish hollow pipe of 1.5mm thick having offset type C – shape / H-shape/ D-shape of approved make with necessary screws etc. complete for wooden doors/ aluminum doors/ metal doors for all heights, all floors and all level as per approved sample and as directed by Engineer-in-charge. Rate shall be the length of handle should be perfect center to center as below specified. Mode of Measurement: The mode of measurement is No.
4.06	Providing material and labour for fixing Mortise lock of approved make having 72mm center to center, 55mm Backset 20mm Square for end and 60/ 70mm standard Euro profile Pin Cylinder with both side key /one side key – one side knob operation and SS 304 grade hollow tubular pipe pair of Mortise handle of 22mm dia 150mm long with a pair of SS 304 Escutcheons (key hole plate)for wooden /aluminum/ metal doors with necessary s.s. phillips head screws etc complete for all floor, all height, all level as per approved sample as directed by engineer in charge. The lock shall be with 3 keys. Mode of Measurement: The mode of measurement is No
4.07	Providing and fixing of Hinges with bearing 125mm size x 5 mm thick , Satin SS finish of approved or equivalent make including the cost of screws and

	other incidental charges (Extra over and above) for all heights, all floors and all level as per approved sample and as directed by Engineer-in-charge Mode of Measurement: The mode of measurement is No
4.08	Providing material and labour for fixing 6mm thick Clear Toughen Glass (Approved make: Modi GUARD/Asahi /Saint Gobain/ HNG) as per approved sample of any size, any shape and specified thickness in frame and shutter work with necessary cutting of glass as per drawing & specifications including providing and fixing EPDM Gasket (Approved make: Maharashtra polymer products/Fusion) quality rubber/ silicon sealant (Dow corning 789 or Sil proof GE) / structural sealant and 3M tape on the periphery of the glass as per the required thickness etc. complete at all floors/ all levels/ all heights as per the directions of Engineer in charge. Actual installed quantity shall be measured and paid.(All ht & all level) Mode of Measurement: The mode of measurement is Sq.mt.
4.09	-do – as item no. 4.08 but for 8mm thick Clear Toughen Glass Mode of Measurement: The mode of measurement is Sq.mt.
4.10	-do – as item no. 4.08 but for 10mm thick Clear Toughen Glass Mode of Measurement: The mode of measurement is Sq.mt.
4.11	-do – as item no. 4.08 but for 12mm thick Clear Toughen Glass Mode of Measurement: The mode of measurement is Sq.mt.
4.12	Providing material and labour for fixing 5 mm thick laminate Compact Sheet of any size, any shape, any color, any texture of approved make and as per approved sample. **Material :** Compact sheet shall be made from solid grade compact High Pressure Laminate manufactured under high pressure and temperature with bunch of kraft papers and decorative papers made of Alpha Cellulose Fiber impregnated with thermosetting synthetic resin, it shall be resistant to Scratch, Abrasion, Heat, Chemical, Impact, Graffiti and Water etc.
	Workmanship: Providing & Fixing 5mm thick Compact sheet in aluminium door and partitions. Compact sheet shall be made from solid grade compact High Pressure. Compact sheet shall be fixed in aluminum frame and shutter work with necessary cutting of sheet, sheet on both side colored as per drawing & specifications including providing and fixing EPDM Gasket (Approved make: Maharashtra polymer products/Fusion) quality rubber/ silicon sealant (Dow corning 789 or Sil proof GE) / adhesive tape/ screwing on the periphery of the sheet as per the required thickness etc. complete at all floors/ all levels/ all heights as per the drawing & directed by Engineer in charge. Cut edges of the compact sheet shall be provided with masking tape. Actual installed quantity shall be measured and paid. (All ht & all level)
	Mode of Measurement: It shall be measured in SqM. Area shall be out to out of shutter.
4.13	Providing material and labour for fixing 6mm thick Wired Glass including 1 mm thick ss wire @ every 1 cm horizontal & vertical of any size, any shape and specified thickness in frame and shutter work with necessary cutting of glass as per drawing & specifications including providing and fixing with EPDM quality rubber/ silicon sealant/ structural sealant on the periphery of the glass as per the required thickness etc. Complete at all floors/ all levels/ all heights

	as per the directions of Architect. Actual installed quantity shall be measured and paid. Rate shall be inclusive of all type of wastage. Mode of Measurement: It shall be measured in SqM. Area shall be out to out of shutter
4.14	Providing material and labour for fixing in position SS 304 - 18 x 16 mesh and 32 gauge Mosquito net of any size any shape having 50 micron pure polyester powder coating of approved make and shade for aluminum sliding shutter/ fixed shutter or in front of aluminum louvers as per approved shop drawing prepared by contractor. Jali shall be fixed with SS304 grade screws and fasteners required to tighten the Jali/ Net including fixing channel, EPDM quality rubber/ silicon sealant etc. complete for all floors, all levels, all heights as directed by engineer in charge. Only installed area of mosquito net shall be measured and paid in Sqm without considering any wastage. All aluminum sections shall be paid under relevant tender item. Mode of Measurement: It shall be measured in SqM. Area shall be out to out of shutter
4.16	Providing and fixing ISI marked aluminum extruded section body tubular type universal hydraulic leaf mounted door closer with double speed adjustment with necessary accessories and screws etc. complete. (All ht & all level) Mode of Measurement: The mode of measurement is No
[i]	For Capacity up to - 75 kg of door weight
[ii]	For Capacity from 76 kg to 90 kg door weight
[iii]	For Capacity from 91 kg to 110 kg door weight
4.19	Providing material and labour for fixing factory made and pressed 35mm thick flush door shutter of specified thickness made of ISI marked non decorative type flush door shutters confirming to IS- 2202 (Part 1), core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers (IS 710 Grade) on both faces of shutters having 1 mm thick decorative type laminates of approved make, shade, finish on both faces of shutter fixed with phenol formaldehyde synthetic resin type adhesive conforming to IS 848 including providing and fixing external lipping with 2nd class teak wood battens, exposed (37mm x 12mm)/ concealed (35mm x 12mm) on all edges of door shutter as required with 2 coats of melamine spray polish including 1 coat polishing with primer to all exposed side of lipping, all as per approved drawing, for all floor, all level all height etc. complete as directed by Engineer-in-charge. Measurement including lipping shall be considered for payment. Necessary hardware like hinges, pivot, handle, tower bolts, locks etc. shall be separately measured and paid in the relevant tender items. Cost of laminates shall be paid in relevant tender item.(at all ht & all levels)
	Mode of Measurement
	It shall be measured in sq.m. The outer to outer of the frame shall be measured.
4.20	Providing material and labour for fixing 1 mm thick Laminate sheet of approved make and shade on Non decorative flush door, paneling work, fixed partition, any ply surface etc. with necessary nails, screws, adhesives as per drawings and as per approved sample. Laminate shall be either glossy, matt, Swede or

	any type of texture finish. The rate shall be for all heights, all floors, all places etc complete as directed by engineer in charge. Actual laid area shall be measured and paid without considering any wastage.
	Mode of Measurement
	It shall be measured in sq.m. The outer to outer of the frame shall be measured.
4.21	Providing and Fixing Dry stone cladding with Red Agra stone providing material and labour for fixing stone cladding on wall for all heights with required scaffolding with natural finish AGRA RED stone or other natural stone of 25 mm to 30 mm thick.
	Material Stone shall be of the type as specified in the item. It shall be hard, sound durable and tough free from cracks, decay and weathering and defects like cavities cracks, flaws, holes, veins, patches of soft or loose materials etc. Thickness of stone shall be as specified Stone shall be cut with the gang saw to the required size and shape on all beds and joints so as to free from any waviness and to give truly vertical horizontal surface as required. The exposed face and sides of stones forming joints shall be such that the straight edge laid along the face of the stone is in contact with every point on it. All the visible angle and edges shall be square and free from chipping. The dressed stone shall be of the thickness specified with permissible tolerance of ± 2 mm
	Before starting the work, the contractor shall get the samples of stone approved by Engineer-In-charge. Approved sample shall be kept in custody of Engineer-in-Charge and stones supplied and used on the work shall conform to sample with regard to soundness, colour, veining and general texture. The stone shall be cut by gang saw into slabs of required thickness along the places parallel to the natural bed. When necessary double scaffolding for fixing the stone at greater heights, jib crane or other mechanical appliances shall be used to hoist the heavy pieces of stone and placed them into correct positions. Care shall have to be taken that corners of the stone are not damaged. Stone shall be covered with gunny bags before tying chain or rope is passed over and it shall be handled carefully. No pieces which has been damaged shall be used that work
	Stacking and Storing Stone slabs are thin and brittle and should never be stacked flat across timber supports. They should therefore, be stacked on edge on timber or like runners. Packing pieces inserted between the slabs may be rope or timber. Slabs shall be well covered with plastic sheeting to protect them from any possible staining
	Scaffolding Double scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed
	Fixing The size & shape of the cramps shall be as per drawing and as per directions of Engineer-in-charge. The samples of steel cramps should be approved in advance before starting the stone cladding work. The cramp shall be attached to top and bottom of the stone. The cramps shall have inbuilt adjustment for vertical and horizontal alignment. The cramps used to hold support and

	transfer the load of stone unit to the supporting structured steel shall be designed by the manufacturer and approval of the same shall be obtained from the Engineer-in-Charge
	Mode of Measurement
	It shall be measured in sq.m.
4.21a	Providing and fixing structural steel frame (for dry cladding with 30 mm thick gang saw cut with machine cut edges sand stone) on walls at all heights & all level using M.S. square/ rectangular tube in the required pattern as per architectural drawing, including cost of cutting, bending, welding etc.
	Specification for structural frame work for dry stone cladding are same specifications as for steel work in built up sections (welded or bolted).
	Fixing of Frame
	The properly designed structural frame for withstanding the weight of stone slab are fixed/ supported on wall surface with the help of M.S. brackets/lugs of angle iron/flat etc. which is welded at each junctions of member of frame and also embedded in cement concrete block 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) of size 300 x 230 x 300 mm. The concrete block can be made by cutting the hole of size as mentioned in brick wall and filling the hole with cement concrete including provision of necessary centering/shuttering for holding of concrete. The frame can also be supported on RCC surface with the help of approved expansion hold fastener by drilling the holes in RCC surface Steel cramps are either welded or bolted to the frame (by making necessary holes in frame work) for holding of stone.
	Measurement
	The mode of measurement shall be in kg basis except that the weight of welding material shall not be added in weight of members for payment and nothing extra shall be paid for making holes for temporary fastening of members during erection before welding, which also includes cost of cement concrete block, centering and shuttering and making holes in walls, the cost of expansion fastener and steel clamps which shall be paid for separately
4.21b	Providing and fixing adjustable stainless-steel cramps of approved quality, required shape and size, adjustable with stainless steel nuts, bolts and washer
	The cramps shall be stainless steel of make approved by the Engineer-in-charge. The weight of the stainless-steel clamp (including weight of nut and washer) shall not be less than 260 gms. Necessary holes at suitable locations are to be done on steel frame work for dry stone cladding to be fixed. Necessary recessed are required to be done in stone slab which is required to be supported by clamps. The one end of steel clamp is fixed on frame with nut and bolt and other end is

	inserted into recesses/hole for fixing the dry cladding stone on frame. The rate includes cost of materials and other operations mentioned as above.
	Measurement
	The mode of measurement shall be in Nos. basis
4.23	Providing and Fixing SS 304 Grade Satin Finish 1.8 mm Thickness Aldrops of 16 mm dia x 250 mm including 3 nos. fixing Bracket and 1 no. locking bracket of approved make with necessary SS Bolts etc. complete for all floor, all height, all level as per approved sample and as directed by engineer in charge. Mode of Measurement: It shall be measured in NO.
4.24	Providing material and labour for fixing of SS 304 grade brush finish 250mm height Tower bolt (barrel type with minimum rod size shall be 10mm) of approved make in wooden doors/ aluminum doors/ metal doors with necessary screws etc. Mode of Measurement: It shall be measured in NO.
4.25	Providing and fixing Satin Stainless steel finish grade 316 floor mounted door stopper approved or equivalent make, including the cost of screw. and other incidental charges. Mode of Measurement: It shall be measured in NO
4.26	Extra for providing & making vision panel in flush door shutter/TW shutter including TW lipping, beading and painting / polishing matching to the finish of the shutter etc complete as directed. Mode of Measurement: It shall be measured in SqM.
4.29	Providing, fabricating and fixing Stick type structural glazing walls with extruded aluminum sections in true plumb, line & levels with nylon washers and thermal separators, 6 mm thick reflective heat-strengthened toughened glass Stick on Aluminum Sections with 3M Make Structural Glazing pressure tape together with standard accessories & Silicon Sealant.
	Material 6 mm thick REFLECTASOL / ANTELIO / COOL-LITE Reflective toughen glass Blue / Green / Brown / Bronze as per approved sample, frame work made of rectangular aluminum tube of size as required and pure polyester powder coated min. 65 microns colored, finished thickness. Extruded section shall be of 6063 Alloy Aluminum extrusion is manufactured as per IS 63400, Glazing Sealant Dow CORNING 789/995 Silicone Structural glazing sealant, other required non ferrous, ferrous section, screws, hardware, consumable, accessories, scaffolding , crane tools , tackles plant , machinery required to complete the item in all respect
	Mode of Measurement: It shall be measured in SqM.
	Workmanship The stick type structural glazing shall form uninterrupted fully water, air and weather tight glazed surface in accordance with the architectural elevation and layout drawings. The contractor shall design, engineer, provide and fix the entire system as per these specifications. Framing system, which shall be of structurally and mechanically designed technology for fabrication and erection

	with grid sizes as approved, shall form the glazed surface. The horizontal members shall span in length between vertical members. The perimeter of the frames shall be structurally integrated to form air and water proof movement joint on all four sides of each panel with pressure equalization chambers formed internally. Design and sealing of such joints shall ensure that there is no penetration of rainwater through these Joints under heavy wind pressures. The contractor shall comply with all relevant Indian Standards, Code of Practice and technical literature relating to best practice pertaining to structural glazing. The equivalent International Standards may be used where these are not lower. Nothing in these clauses Shall relieve the contractor of his obligation to provide a higher standard where required and directed. The contractor shall engage a specialized agency/ sub-contractor with proven track record to execute this job.
	Framing System: The framing system shall consist of mullions, transoms etc.; shall be of heavy gauge aluminum extruded sections of approved make and shall be extruded from aluminum alloy HE9WP of IS: 733 of best quality and free from all defects impairing appearance, strength and durability and shall be specially selected to fulfill the requirements. of design criteria stipulated in these specifications. The aluminum framing sections shall be powder coated (min. 65 microns) in approved shade. The coating shall be conform to IS: 1868 and IS: 660/2 and the density shall be 32 MG/sq.m. Fixing bolts, anchors screws and nuts shall be manufactured from stainless steel grade 316. Rivets and pins shall be aluminum alloy of appropriate grade as required. All bolts, anchors and other fastening devices shall be self-locking and shall be torque tightened to achieve maximum torque tension where required. Brackets shall be aluminum of adequate size to meet design parameters. The bracket joint shall be flexible to allow for all movements, deflections and expansion/ contraction. Tough high impact and both side Smooth membrane of Teflon of minimum 1.0 mm thickness shall separate all metal-to-metal joint
	The silicone adhesive structural sealant shall be specially trained tradesman certified and approved by adhesive sealant manufacturer. The procedure laid down by adhesive structural sealant manufacturer shall be strictly followed by these applicators for its application to ensure the high quality. The contractor for strict adherence shall submit all the norms laid down by the silicone manufacturer Sealant: Silicon adhesive structural sealant having excellent properties of adhesion, elasticity, long life (more than 10 years) and of approved make. Two part silicon shall be used
	Open able Shutters: Top/ side hung shutters shall be provided with operating hardware and as per details and requirements of location to facilitate ventilation, cleaning/ maintenance of the glass. Workmanship:
	The fixing arrangement of factory formed infill glazed framing system shall be

	designed by the Structural glazing contractor to withstand all external forces due to worst condition of wind loads as per IS code applicable for the region of the proposed buildings, earthquake forces occurring in the Zone as per the IS code, building frame movement forces due to wind and earth-quake, outside temperature experienced during last 10 years. It shall be designed in accordance with the requirement of the silicon adhesive structural sealant manufacturer and supplier, mentioning the factor of safety obtainable as per the design. In any case the factor of safety shall not be less than 1.5. Framing system shall fulfil the design criteria/ specifications as following and Indian/ international standards
	Vertical Mullions: Contractor to indicate spacing, size and shape to comply with the requirements of the design parameters. Maximum Tensile Strength: 19 Kg/mm2 Maximum allowable deviation in length from a straight line of 0.5mm/ mtr. Maximum allowable deviation from the straight of 1 degree. Maximum twist of Max. Variation in flatness of not more than 0.125 x width/ 25 Horizontal Transom: Contractor to indicate spacing, size and shape. Alloy: Extrusion shall be 6063 T6 Alloy and temper (ASTM B221 alloy G.S.10A-T6) Fixing Bolts: All exposed bolts, nuts, screws shall be of stainless steel 304 or 306 grade. Gaskets: EDPM with shore hardness of 70+/- 5 Glazing tape: 'Nortornm' or approved equivalent
	Drawings and Details: The contractor shall furnish for approval of the owner/ consultant detail drawings of the structural glazing system showing framing system, connections to building RCC frame, main framing grid unitized system comprising of male mullion, female mullion, transoms, all connection details like bracket connection to the building RCC frame, connection between transoms and mullions, etc. (also indicating the sizes of the sections proposed), details of the weatherproofing with EDPM gaskets, infixing details of glass/ glass panels, joint details to withstand severe conditions of winds and rains, insulation of corrosion proof smoke seals of flexible design and construction. The contractor shall produce all necessary test Certificates, documentation etc. Proving all the stipulated parameters of the performance. Wherever required and asked for, the contractor to establish the design and performance criteria shall provide necessary calculations. The contractor shall also submit for owner's/ EIL's approval the Company profile of the proposed sub-contractor/ agency proposed to be engaged by the contractor for executing this job.
	Mode of Measurement & Payment:
	For the purpose of payment, the measurement shall be done on Sq. Meter basis of the executed and finished (in all respects) work of glazing as per detail specification and instruction of engineer in charge up to any height with all lead lift and scaffolding. The Fixing of structural glazing includes the main frame fixing on the masonry wall/RCC concrete surface with necessary brackets,

	fastening straps, nuts, bolts, rivets, washers and other fastening materials shall be in stainless steel . Rates shall include for glazing 6mm Glaverbel bronze/ blue or any other color approved duly heat strengthened / toughened glass.
4.30	Curtain wall system for circular ramp area with single glass unit Designing, fabricating, testing, protection, installing and fixing in position curtain wall system (in circular shape) designed to with stand the wind pressure of site location confirming to IS -875 part III. (The system must pass the proof test at 1.5 times design wind pressure without any failure). The profile system is based on capped curtain wall design and glass is held all around by mechanical pressure plate and cap with microwave cured EPDM gaskets in all four sides of glazing, with necessary brackets of aluminum alloy of 6065 with three dimensional adjustment with serrations and serrated washers to arrest the wind load movement, SS 316 grade anchor bolts, screws and fasteners with non staining weather sealant and 1.5mm thk flashing sealed all around parameter inside and outside to seal the gaps between curtain wall and the building structure all complete required to perform as per specification and drawing in conjunction with BOQ. The system shall be designed for 3 barrier gasket system based on pressure equalization principle with drainage provision at all panel bottom & thermal break gasket barrier between pressure plate and aluminum grid work for improved thermal performance and weather performance, spandrel panel shall have pressure release & condensation drainage provisions, The system shall be able to accommodate building movements, thermal expansions resulting from surface temperatures of up to 80deg cel, temperature differential of 25 deg cel thermal expansions and the seismic movements without creating excessive stress. The system shall be designed to accommodate minimum 10mm vertical movement between floors. All metal joints in the wet area shall be with small joint sealant applied to ensure water tightness, so curtain wall system becomes water tight. The extruded aluminum sections of Alloy 6063 T5/ T6 Curtain wall system for circular ramp area with single glass unit Designing, fabricating, testing, protection, installing and fixing in position curtain wall system (in circular shape) designed to with stand the wind pressure of site location confirming to IS -875 part III. (The system must pass the proof test at 1.5 times design wind pressure without any failure). The profile system is based on capped curtain wall design and glass is held all around by mechanical pressure plate and cap with microwave cured EPDM gaskets in all four sides of glazing, with necessary brackets of aluminum alloy of 6065 with three dimensional adjustment with serrations and serrated washers to arrest the wind load movement, SS 316 grade anchor bolts, screws and fasteners with non staining weather sealant and 1.5mm thk flashing sealed all around parameter inside and outside to seal the gaps between curtain wall and the building structure all complete required to perform as per specification and drawing in conjunction with BOQ. The system shall be designed for 3 barrier gasket system based on pressure equalization principle with drainage provision at all panel bottom & thermal break gasket barrier between pressure plate and aluminum grid work for improved thermal performance and weather performance, spandrel panel shall have pressure release & condensation drainage provisions, The

	system shall be able to accommodate building Movements, thermal expansions resulting from surface temperatures of up to 80deg cel, temperature differential of 25 deg cel thermal expansions and the seismic movements without creating excessive stress. The system shall be designed to accommodate minimum 10mm vertical movement between floors. All metal joints in the wet area shall be with small joint sealant applied to ensure water tightness, so curtain wall system becomes water tight. The extruded aluminum sections of Alloy 6063 T5/ T6
	Mode of Measurement: It shall be measured in SqM.

SECTION 5.00 FINISHING WORKS		
Applicable Codes		
IS:2394	_	Code of practice for application of lime plaster finish.
IS:1477	_	Code of practice for painting of ferrous metals in buildings and allied finishes (part I &II)
IS: 427	_	Distemper, dry colour as required
IS:2395	_	Code of practice for painting concrete, masonry and plaster surfaces
IS:428	_	Distemper, oil emulsion, colour as required.
5.01	'Providing and applying 10 mm thick plain cement plaster finish for ceiling at all heights and below highest plinth level in Cement Mortar (CM) 1:3 (1 part cement: 3 parts sand- 50% coarse and 50% fine) to the beams, ceiling, pardis, bends, moulds, pattas grooves etc, over any brick or concrete surface as specified	
	The surface to be plastered shall be washed with fresh clean water free from all dirt, loose material grease etc. and thoroughly wetted for 6 hours before plastering work is commenced. Concrete surfaces to be plastered will however be kept dry. The wall should not be too wet but only damp at the time of plastering the damping shall be uniform to get uniform bond between the plaster and the wall. The junction between the brick work and RCC should be fixed with chicken wire mesh/PVC strip as directed before plaster. The proportion of the mortar shall be as specified under the respective items of work. Cement shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water, sand and cement shall be as mentioned in the Specifications for Concrete & allied works. The mortar thus mixed shall be used immediately and in no case shall the mortar be allowed to stand for more than 30 minutes after mixing with water. The plaster shall be laid in a single coat . The mortar shall be splashed on the prepared surface with a trowel and finished smooth by trowelling. The plastered surface shall be rubbed with iron plate	

	till the surface shows cement paste. The work shall be in line and level. Curing of plaster shall be started as soon as the applied plaster has hardened enough so as not to be damaged. Curing shall be done by continuously applying water in a fine spray and shall be carried out for at least 7 days. The plaster shall be carried out on jambs, lintel and sill faces top and undersides, etc. as shown in the drawing or as directed by the engineer.
	Mode of Measurement
a)	The quantity of work to be paid for under this item shall be calculated by taking the projected surface of the area plastered after making necessary deductions for openings, doors, windows etc. as given below :-
i)	No deductions shall be made for opening or end steel joints, beams, post girders etc. up to 0.5 sqm area. No addition shall be made for joints, soffits and sills of such openings. This is applicable to both the sides of the wall.
ii)	Where opening exceeds 0.5 sqm. but does not exceed 3 sqm and also when only one side of the wall is treated and other side is not treated, deduction shall be made if the width of the reveal on the treated sides is less than that on the untreated side but if the width of the reveal is more then no deduction nor addition shall be made for reveals for jambs, soffits, sills etc.
iii)	For openings more than 0.5sqm but not exceeding 3 sqm and also when both the sides of the wall is plastered with the similar plaster, deduction shall be made for one face only. But when both the sides treated with different plaster, then deduction shall be made from the side on which the reveal is less and no deduction on the other side.
iv)	For openings whose respective areas exceed 3 sqm deduction shall be made for the full opening of the wall treatment on both faces while at the same time jambs, sills and soffits shall be measured in sqm for payment. In measuring the jambs deduction shall not be made for the area in contact with the frames of doors, windows
v)	If the average thickness of the plaster is more than the specified thickness due to any account nothing extra shall be paid for the same.
vi)	Nothing extra shall be paid for double scaffolding and the rate is applicable for work at all levels.
5.02	'Providing & laying 15mm. thick cement plaster in single coat at all heights above the plinth level and plinth, in C.M. 1:4 (1 cement :4 coarse sand) with cement mala finish. The General specifications as same as for item no. 5.01 but for the thickness of the plaster. The plaster work shall be carried out in 2 layers, the first layer being 8-9 mm thick and the second layer being 6-7mm thick. The proportions of the mortar for both the layers shall be as specified in the item specification. The first layer shall be splashed against the prepared surface with a trowel to obtain an even surface. The second layer shall hen be applied and finished leaving an even and uniform surface, trowel finished unless otherwise directed by the engineer. The plastered surface shall be rubbed with the iron plate till the cement plaster comes on the surface.
	Mode of Measurement
	It is same as specified in item 5.01.
5.02a	Providing and applying 20 mm thick double coat plaster as per pattern and design given by Architect with first coat of 1:4 plaster 12 mm thick followed by 8

	mm thick 1:2 (1 part cement : 2 part of coarse sand) etc.
	The General specifications as same as for item no. 5.01 but for the thickness of the plaster. The plaster work shall be carried out in 2 layers, the first layer being 12-14mm thick and the second layer being 6-7mm thick. The proportions of the mortar for both the layers shall be as specified in the item specification. The first layer shall be splashed against the prepared surface with a trowel to obtain an even surface. The second layer shall hen be applied and finished leaving an even and uniform surface, trowel finished unless otherwise directed by the engineer. The plastered surface shall be rubbed with the iron plate till the cement plaster comes on the surface.
5.03	Providing and applying 25 mm thick water proof cement plaster in two layers of 15 mm under layer and 10 mm thick top layer both in C M 1: 3 (1 part cement: 3 part sand -50% coarse and 50% fine)
	The plaster shall be of specified thickness and of mortar proportions. This shall be applied in 2 coats. The first coat or the base coat should be approximately 19 mm and shall be continuously carried out without break to the full length of wall or natural breaking points such as doors, windows etc. The base coat shall be splashed on to the prepared surface with heavy pressure, brought to true and even surface and then lightly roughened by cross scratch lines, to provide bond for the finishing coat. The mortar proportion for this base coat shall be as specified in the respective item of work. The base coat shall be cured for at least seven days The second coat shall be 6mm thick. Before application of the second coat, the base coat shall be evenly damped. This coat shall be applied from top to bottom in one operation and without joints, finish shall be straight, true and even. The mortar proportions of this coat shall be as specified under the respective item work. Sand to be used for the second coat and for finishing work shall be as specified in the item description. The second coat shall be finished with sponge. Grooves shall be made as per the drawings. The contractor shall use approved waterproofing admixture made by reputed manufacture in the mortar for plaster work. The quantity to be used shall be accordance with the manufacturer's instructions, however subjected to the approval of the Engineer. The use of Calcium chloride shall be prohibited unless specifically allowed by engineer and shall conform to IS:2645.The plaster shall be cured at least for 7 days.
5.05	Providing and applying (with brush only) white washing with lime on new /old work, at all heights below and above highest plinth level , three or more coats to give an even shade.
	Walls to be thoroughly scrapped with sand paper before white wash is applied. White wash shall be prepared from a good quality fat line. Lime shall be slaked with water to the consistency of a cream and allowed to remain under water for 2 days. It shall then be strained through a cloth and 2 kg of clean gum of approved make, as specified in the item specification or by the engineer, shall be added for every cubic meter of lime and indigo up to three gm. per kg of lime dissolved in water shall then be added and stirred well.

	Each coat to be applied with a brush . It shall be applied with a stroke of the brush from the top downwards, another from bottom upwards over the first stroke and similarly one stroke on the right and another from the left over the first brush, before it dries. Minimum 3 coats shall be applied on the plaster surface for desired finish. If the desired finish is not obtained extra coats shall be applied without any extra cost.
	Mode of Measurement
	It shall be measured in sqm. Deductions shall be carried out as per item no.5.01. The rate shall be applicable for carrying out the work at all heights, double scaffolding etc. all complete. Extra 20% shall be added to the area for AC corrugated sheets and 17% for semi-corrugated sheets, Cornices and others.
5.06	Providing and applying (with rollers only) Plastic acrylic emulsion Plastic paint or approved by client in required shed on new/old work in two or more coats to give an even shed.
	Paint to be used for the various items of work should be of approved make viz. British, Asian, Jenson & Nicholson, ICI or Shalimar. The painting work shall be carried out as directed by the engineer. keeping however in view the recommendations of the manufacturer. Where painting with plastic emulsion is specified, all uneven surface shall be thoroughly cleaned of all dust, dirt and sand papered. One primer coat with cement putty and minimum 2 coats of emulsion paint shall be applied. It shall be applied with rollers. Workmanship shall conform to the requirements of IS:2395.
	Mode of Measurement
	The actual quantity of work carried out shall be measured in sq meter. Deduction for opening etc. shall be made as in the case of cement plaster. Reinforcement Steel Dowel Bar
5.07	Providing and applying 2mm thick teree palette Travertino spary finish Texture(Earthen /coral/spectrum/Jotun) paint a special multi coloured combination of specific natural stone
	Raw Material: Various sized naturally coloured marble powder, Copolymer emulsion, Cellulose Thickener, Additives, Biocides, Water **Application tool:** HVLP Spray gun, **Thinner:** Water, **Mixing Ratio:** maximum 1%-2%, **Coverage/Liter:** 65 sq.ft. to 75 sq. ft /25kg bag
	Process: Water and cellulose thickeners are added in the mixer with additives; following which, emulsions are added with various sized marble powder. The contents are then allowed to mix for a calculated time period per batch size. Biocides are added as a part of the process for anti-fungal, anti-algae properties. Quality standards are checked for the batch and material is released through the valve for packaging.
	Application: • Surface must be cleaned of chalk and debris. • A base coat of primer of relevant colour is applied on the plastered

	surface using a roller or a brush. • The material is applied using a spray gun to get the required design. Drying time: Soft dry requires 48 hours and hard dry requires 7 days depending upon weather conditions
	Mode of Measurement & payment • The mode of measurement should be of 1 square meter. • The rate shall include the cost of all materials, labor and scaffolding etc, involved in the operations described under workmanship. • All plastering shall be measured in square meter unless, otherwise specified length, breadth or height shall be measured correct to a centimeter. • Thickness of the plaster shall be exclusive of the thickness of the key i.e. Grooves or open joints in brick work, stone work etc. Or space between laths. Thickness of plaster shall be average thickness with minimum 10 mm. At any point on this surface. • This item includes plastering up to floor two level. • The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted. • Soffits of stairs shall be measured as plastering on ceilings, flowing so fits shall be measured separately. • For jambs, soffits, sills etc. For openings not exceeding 0.5 sq. Mt. Each in area for ends of joints, beams, posts, girders, steps etc. Not exceeding 0.5 sq. Mt. Each in area and for openings exceeding 0.5 sq.mt. And not exceeding 3.0 sq. Mt. In each area deductions and additions shall be made in the following manner: • (a) No deductions shall be made for ends joints, beams posts etc. And openings not exceeding 0.5 sq. Mt. Each and no addition shall be made for reveals, jambs, so fits, sills etc. Of these opening for finish to plaster around ends of joints, beams, posts etc. • (b) Deduction for openings exceeding 0.5 sq. Mt. But not exceeding 3 sq. Mt. Each.
	• shall be made as follows and no addition shall be made for reveals, jambs, so fits etc Sills etc. Of these openings. When both faces of all wall are plastered with same plaster, deduction shall be made for one face only • (ii) When two faces of wall are plastered with different types of plasters or if one faces is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. On which width or reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all is equal, deductions of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case may be. • For openings having door frames equal to projecting beyond the

	thickness of wall, full
	• deduction for opening shall be made from each plastered face of the wall. • In case of openings of area above 3 sq. Mt. Each, deduction shall be made for opening but jambs, so fits and sills shall be measured. The rate shall be for a unit of one sq. Meter including all lead and lift.
5.08	Providing and applying Acrylic based, Anti Fungus Exterior Paint of approved make, shade and make Paints on smooth / sand faced / grit plaster finish as per as specified in the schedule of quantities, over a coat accordance with the manufacturers specifications etc. complete at all heights & all levels.
	The paint to be applied over plastered surface including external plaster. The surface shall be prepared cleaning the surface washing etc. This shall be applied with brush on the plastered wall. The painting work shall be carried out as per the procedure recommended by the manufacturer. The strokes shall be even and it shall be cured at. least for 7 days No patch or brush stroke shall be seen. Two or more coats to be applied in succession one after the other at a gap of 24 hours as per the instructions of the Engineer. A pre coat of primer as per manufacturer's specification shall be applied with out extra cost. providing and applying 2 coats of acrylic based, anti fungus exterior paint of approved shade and make like Asian Paints, Weather Coat of Berger or Shalimar Paints on smooth / sand faced / grit plaster finish as per as specified in the schedule of quantities, over a coat of Cement Paint in accordance with the manufacturers specifications etc. complete
	Mode of Measurement : It shall be measured in sqm.
5.09	'P/F Suspended 12.5mm Perimeter Channel Material, Finish-Galvanized is fixed along the Perimeter of existing wall/ partition with the help of PVC Anchor (6x40) at 600mm c/c for brick wall /RCC wall Comprising of following Ceiling Angle Material, Finish-Galvanized is suspended by fixing it to the soffit cleat, Zinc coating (7 to 8 microns) pull out load- 6.8kN for M30 concrete grade} creating 1220mm x 1220mm grid.
	'The Ceiling Section Finish-Galvanized is then fixed to the Intermediate Channel ,Finish-Galvanized with the help of Gyproc Connecting Clip {Material-High carbon spring steel wire, Finish-Zinc plating4-6 micron} and in direction perpendicular to the Intermediate channel at 457mm c/c.
	'Finally square and tapered edges of the boards are to be jointed and finished so as to have a flush look which includes filling and finishing with Gyproc® Pro-Fill Jointing compound, Gyproc® Joint Paper tape.
	'Serrated section has effective thickness of 2T (2xdepth), better load carrying capacity, enhanced screw retention, Improved acoustic performance & fire resistance as compared to plain steel section. 8. All GypSerra™ metal components are Design Patented in India.

5.10	Providing & Fixing of Lay-in Tile Perforated False Ceiling on 15 mm 'T' Framework/ 15mm Silhouette Grid/frame work of module 600mm x 600mm made out of 0.7mm thick Aluminum Alloy 3105 with Non-woven felt made of glass-reinforced fiber glued over the perforation for sound absorption. The perforations shall be 2.5mm dia 5.5mm c/c. The Tile shall be Polyester based, powder coated & colour as suggested by Architect. Grid system for fixing ceiling tiles shall comprise of Tees. The 15 mm main tee runners shall be suspended at an interval of 1200mm center to center. The 15 mm cross tee runner shall be suspended at 600mm center to center and further supported with 15 mm cross tee at 600mm center to center with interlocking arrangements to form grid of 600mm x 600mm. The main tee shall be supported by means of 4mm G.I. rod from slab/roof. The suspension shall be provided at 1200 to 1500mm center to center. Mode of Measurement: This will be measured in SqM.
5.11	'Mineral fiber Board False Ceiling : Providing & fixing tapered edge Mineral fiber board of 12- 12.5 mm thick false ceiling with necessary powder coated Grid/frame work of module 600mm x 600mm made out of 0.7mm thick Aluminum Alloy AA 3105 as per architects drawing. The Mineral fiber boards are to be joined and finished so as to have a flush look which includes filling and finishing the tapered and square edges of the board with jointing compound, paper tape which includes frame work made of special sections power pressed from Galvanized in accordance with zinc coating and designed and details given as per the Architectures details in line and level. Rate includes necessary service trap door, cut outs for A/C Grills, diffusers light fixtures complete as directed. Cut-out for light and Diffusers will not be deducted from area for payment purpose. Approved Make- Mineral fiber Ltd or approved by client /consultant. As per the specification and Methodology mentioned below.
	'Material specification and Methodology for erecting frame work : - Metal Frame Suspended Ceiling which includes Mineral fiber perimeter channel of size 0.50mm thick (having one flange of 20mm and another flange of 30mm and a web of 27mm) along with the Perimeter of ceiling, Screw fix to brick/ block wall / Partitions with the help of nylon sleeves then Suspending INDIA Mineral fiber intermediate channel of size (0.80mm thick with two equal flanges each 15mm) from the soffit at 900mm Centers with ceiling angle (0.50mm x 10mm x 25mm) fixed to soffit with the help of soffit cleat and Rawl Plug then a INDIA Mineral fiber Ceiling Section 0.50mm thick having web of 80mm and two flanges of 26mm each with laps of 10.5mm are then fixed to the intermediate channel and direction perpendicular to the intermediate channel at 457mm C /c. Single layer of 12mm thick Plaster board. (Strong Core and Strong Paper Bonding) is then screw to Ceiling Section with the help of 25mm Drywall Screw at 300mm interval. Mode of Measurement: This will be measured in SqM
5.12	Providing and fixing high tensile strength acid and alkali resistant latex metal free composition nontoxic Fiber Glass Mesh (FGM) of minimum density of 145

	GSM (Gram per SqM) and 5mm X 5mm meshing size for reinforcement of surfaces during all kinds of plaster works at the junction of masonry work and RCC work or on any other place as directed to receive plaster including fixing the FGM in 300mm wide patta with Cement mortar (1 part cement :1 part fine sand) stretched properly and at all the heights below and above highest plinth level including scaffolding etc complete as directed. Mode of Measurement: This will be measured in SqM.

SECTION 6.00 FLOORING

Application Code		
IS : 1443	_	Code of practice for laying and finishing of cement concrete flooring titles.
IS : 2114	_	Code of practice for laying in situ terrazzo floor finish
IS : 777	_	Glaze earthenware tiles

6.01	Providing and laying hand chieseled green Kota stone of uniform shade of size as per drawing , 20 to 25 mm thick in flooring as per approved pattern over average 30 mm thick cement mortar 1:4 (1 part cement :4 part coarse sand) including spreading neat cement slurry @ 4.4 Kg / sq m with flush pointing of the joints with cement paste mixed with matching green colour, curing, machine polishing hand cleaning with oxalic acid, moping the finished surface of flooring with water for 10 days etc. complete as directed.
	Stone shall be of approved quality, size and uniform thickness, edges shall be chisel dressed and the top surface shall be machine polished with joints running true and parallel from side to side. Stones should be laid on a bed of cement of lime mortar. The pattern of the flooring shall be as per the Architect's drawing. Thickness of mortar bedding shall be as specified in the item specification. The Stone slabs shall be thoroughly wetted with clean water. Neat cement shall be spread over the mortar bed and the slabs shall be placed one by one, Keeping in check the level and line of the flooring. The slabs are then gently tapped with wooden mallet till it is firmly and properly bedded. There should be no voids left. The joints should not be

	more than 2 mm thick. The joints should be struck smooth. If specification terrazzo filling of specified thickness shall be done in the joints between the kota stone slabs. The floor should be kept covered with damp sand or water for a week. Stone should be of sizes as specified. The stone shall be machine polished and then cleaned with oxalic acid. If the contractor is asked to mop the floor with kerosene and water be the engineer, the same be done without any extra cost. The shall be carried our daily at least for 10 times 7 days.
	Mode of Measurement
	This shall be measured in sqm. The rate shall include providing and laying, Curing, machine polishing, cleaning etc. all complete.
6.02	pre-polished machine cut green Kota stone of uniform shade in required size as per drawing, 25 mm thick in skirting & dado
	pre-polished machine cut green Kota stone of uniform shade in required size as per drawing, 25 mm thick in platform, shelves, (at all ht & all level) skirting / dado flush with plaster with a groove or projecting as per detail / approved pattern over a bedding of 12 mm thick cement mortar 1:4 (1 part cement :4 part coarse sand) including spreading neat cement slurry with flush pointing of the joints with cement paste mixed with matching green colour, curing, moulding machine / hand polishing, wax polishing moping the finished surface with water and kerosene for 10 days etc. complete as directed. The joints of skirting / dado to be matched with flooring without any extra cost.
	Mode of measurement.
	This shall be measured in rmt. If mopping of the Kota stone is asked to be carried out instead of wax polishing the same be carried our without extra cost
6.03	Providing and laying machine cut rough kotah green Kota stone of uniform shade of size as per drawing , 20 to 25 mm thick in flooring as per approved pattern over average 30 mm thick cement mortar 1:4 (1 part cement :4 part coarse sand) including spreading neat cement slurry @ 4.4 Kg / sq m with flush pointing of the joints with cement paste mixed with matching green colour, curing, hand cleaning , moping the finished surface of flooring with water for 10 days etc. complete as directed.
	Mode of measurement
	This shall be measured in sqm. The rate shall include providing and laying, Curing, machine polishing, cleaning etc. all complete
6.04	Making Khurras 45 x 45 cm with average minimum thickness of 5 cm cement concrete 1:2:4 (1 cement : 2 coarse sand :4 graded stone aggregate of 20 mm nominal size) over PVC sheet 1m x 1m x 400 micron, finished with 12 mm cement plaster 1:3(1 cement : 3 coarse sand) and a coat of neat cement rounding the edges and making and finishing the outlet complete.

	Mode of Measurement This shall be measured in sqm.
6.05	Providing & laying 500 micron gauge polythene sheet below grade slab, PCC, RCC slab etc. to the required level including supplying , loading and Unloading, storing transportation, laying, sealing of junctions and over laps up to 200mm, all leads and lifts and overlap included all complete Mode of Measurement This shall be measured in sqm.
6.06	18 mm thick pre-polished to mirror finish machine Granite flooring required size (length and width of the stone slab), The Granite stone shall be natural pre polished, to mirror finish, machine cut of best quality uniform thickness, and approved colour, pattern and the size free from any flaws, surface irregularity and of specified origin. The size of the stone and laying pattern shall be as per the architectural drawings / as directed by the engineer. The contractor should mark the layout over cleaned base and lay the slabs over dry sand bed to decide / get the laying pattern approved. The stones shall be kept aside and sand be cleaned. The surface of bed concrete to be cleaned and applied with moisture barrier of epoxy coating of approved quality and make as per manufacturer's recommendations. Exposed edges of the Stones slabs for platform top, treads/cills
	shall be suitably rounded of as per details /directions. **Stone to be fixed on stone fixing chemical adhesive as per manufacturer specification.(no extra shall be paid for variation in thickness in chemical adhesive)** The joints shall be minimum, the slabs shall be accurately without gap however the hair joints to be cleaned and grouted with matching coloured cement, curing , polishing, protection of finished surface by covering with alka thin sheets and coating with plaster of Paris for allowing normal working for other agencies like interior / AC etc. as per the directions, cleaning the same finally etc. complete as directed. Rates shall be inclusive of all the costs.
	Mode of Measurement
	This shall be measured in sqm. The rate quoted for flooring and dado work shall be inclusive of angles and corner pieces, cutting tiles for water points, such a way that the point is in the junction of four tiles, electrical points etc.
6.07	Providing and laying 15-18 mm thick pre-polished to mirror finish machine cut approved quality Granite stone of required size & shape (length and width of the stone slab), colour in approved pattern, single piece in skirting , dado , risers of uniform colour, texture and pattern
	Providing and laying 15-18 mm thick pre-polished to mirror finish machine cut approved quality Granite stone of required size & shape (length and width of the stone slab), colour in approved pattern, single piece in skirting , dado , risers of

	uniform colour, texture and pattern over stone fixing chemical adhesive (Gold star) as per manufacturer specification bed laid to requisite, line, level and slope, fixed with , cleaning the joints with coir brush , Rate also included for providing 3mm wide grooves by using spacer and epoxy grout shall be filled and colour to be matched with shade of stones. Rates applicable for all heights & floor., curing, cleaning the area with water etc complete as directed as per drawing & design provided by Architect & as instructed by Engi-in-charge. The stone used should be in one single long piece up to 1500mm length as per the drawing. Only finished granite work shall be measured & considered for payment. Mode of Measurement: This shall be measured in sqm
6.08	Providing and laying average 15-18 mm thick pre-polished to mirror finish machine cut approved quality Granite stone of required size (length and width of the stone slab), in approved pattern, single piece in facia & drops, door frames, wall lining (veneer work), jambs, cills & soffits of window, door and ventilator openings. Item rate shall also be inclusive of making V groove as per drawing where ever required, full/half round moulding of exposed edges as per drawing, fixing grit aggregates back on stone with chemical adhesive as per manufacturer specification for bonding etc. THK of granite may vary from 18 mm. facias, drops etc. shall be fixed using special (chemical adhesive (Gold star)as per manufacturer specification).Granite stone shall be mirror polished, pre-moulded, pre-polished, machine cut. Single piece granite shall whereas granite for door frame shall be of full length/Height of uniform colour, texture and pattern over stone fixing chemical adhesive as per manufacturer specification bed laid to requisite, line, level and slope, fixed with , cleaning the joints with coir brush , Rate also included for providing 3mm wide grooves by using spacer and epoxy grout shall be filled and colour to be matched with shade of stones. Rates applicable for all heights & floor, curing, cleaning the area with water etc. complete as directed as per drawing & design provided by Architect & as instructed by Engi-in-charge. Mode of Measurement It shall be measured in sqm
6.11	Providing and laying 75 mm thick waterproofing treatment for balcony, sunk slabs, toilets, water tanks, slopping terraces, returns (vatta)
	Providing and laying 75 mm thick waterproofing treatment for balcony, sunk slabs, toilets, water tanks, slopping terraces, returns (vatta) at all levels with brick / stone aggregates etc. complete as directed. at all the levels, with layer of 20 mm thick cement mortar 1:3 (1 part cement : 3 part coarse sand)mixed with water proofing compound of approved make and as specified by the manufacturer, laying brick bats of required size impregnating in to the base mortar bed with gap of 12 mm all around according to slope, level and curing the same, the gaps around brick bats filled with cement mortar 1:3 (1 part cement : 3 part coarse sand) mixed with waterproofing compound as above , 15

	to 20 mm layer above brick bats and finishing top with neat cement @ 2.75 Kg/Sq.M. making square 300 x 300 mm Chequerred finish marks with string , finishing around rain water outlets curing etc. complete including furnishing of guarantee for 5 years. The work should be carried out through an approved specialized agency. (10 % of amount shall be retain by client till completion of guarantee of 5 years) Mode of Measurement: The plan area treated shall be measured in SqM
6.13	Providing, filling and compacting broken pieces of new AAA block in sunken portion of slab, toilet, balcony etc. as per drawing, specification and as directed. Rates also included for 40 mm thick IPS 1:2:4 (1 cement:2 sand: 4: stone aggregate) including curing, etc. completed as per instruction of engineer-in-charge. for all ht. Mode of Measurement It shall be measured in Cum
6.15	Providing and laying cement water-proofing of average 115 mm thick for balcony, terrace etc. at all the levels, with layer of 20 mm thick cement mortar with China Mosaic Preparing the Surface The surface of the slab should be roughened by scrapping when the slab concrete is still green, however, the surface need not be hacked. In case the slab is already cast and surface fairly finished, the same shall be cleaned neatly of all mortar droppings, loose materials etc. with brooms/cloth. Providing and Laying of Slurry under Base Coat The quantity of water required to prepare the slurry with 2.75 kg. of blended cement to be painted over an area of 1 sqm. shall be calculated.
	Depending upon the area of surface that has to be covered, the required quantity of slurry should be prepared using 2.75 kg. blended cement + water per sqm. area to be covered, taking particular care to see that only that much quantity of slurry shall be prepared which can be used within half an hour of preparation i.e. before the initial setting time of cement. The prepared slurry shall be applied over the dampened surface with brushes very carefully, including the joints between the floor slab and the parapet wall, holes on the surfaces, joints of pipes, masonry/concrete etc. The application of the slurry should continue up to a height of 300 mm on the parapet wall and also the groove. The slurry should also be applied up to a height of 150 mm over pipe projections etc. Laying Base Coat 20 mm thick Immediately after the application of slurry and when the application is still green,

	20 mm thick cement plaster as base coat with cement mortar 1:5 (1 blended cement : 5 coarse sand) shall be evenly applied over the concrete surface taking particular care to see that all the corners and joints are properly packed and the application of the base coat shall be continued up to a height of 300 mm over the parapet wall. Laying Brick Bat Coba Brick bat of size 25 mm to 115 mm out of well burnt bricks shall be used for the purpose of brick bat Coba. The brick bats shall be properly dampened for six hours before laying. Brick bats shall be laid to required slope/gradient over the base coat of mortar leaving 15-25 mm gap between two bats. Cement mortar 1:5 (1 blended cement: 5 coarse sand) shall be poured over the brick bats and joints filled properly. Under no circumstances dry brick bats should be laid over the base coat. The haunches/goal at the junction of parapet wall and the roof shall be formed only with brick bat Coba In case the brick bat coba is laid on the base coat immediately on initial set there will be no necessity of applying cement slurry over the base coat before laying the brick bat Coba. However, if the brick bat Coba is to be laid on the subsequent day, cement slurry prepared shall be applied over the top surface of the base coat, then only the brick bat Coba shall be laid. Application of Slurry over Brick Bat Coba After two days of curing of brick bat Coba cement slurry prepared & shall be applied on the surface of brick bat Coba The application of slurry shall be the which should cover the haunches/Gola, and the remaining small portion of parapet wall and also inside the groove Laying Finishing Layer (Protective Coat) Immediately on applying the cement slurry over the surface of the brick bat Coba and when the slurry applied is still green, loth shall be taken up to a height of 300 mm on parapet walls at that height. 20 mm thick layer of cement plaster, without leaving any joints shall be applied with cement mortar 1:4 (1 blended cement: 4 coarse sand) including the haunches/ gola and the small portion on the parapet wall. The groove in the parapet wall over the haunches shall also be filled neatly packing the mortar firmly in the groove. The finished surface shall be allowed to dry for a while and then pattern of 300 mm x 300 mm groove made over the entire surface.
	Curing and Testing the Treatment The entire surface thus treated shall be flooded with water by making kiaries with weak cement mortar, for a minimum period of two weeks. Measurement The measurement shall be taken along the finished surface of treatment

	including the rounded and tapered portion at junction of parapet wall. Length and breadth shall be measured correct to a cm and area shall be worked out to nearest 0.01 sqm. No deduction in measurement shall be made for openings or recesses or chimney stacks, roof lights or khurras of area upto 0.40 sqm., nor anything extra shall be paid for making such openings, recesses etc. For areas exceeding 0.40 sqm., deduction will be made in the measurements for the full openings and nothing extra shall be paid for making such openings Rate The rate shall include the cost of all labour and materials involved in all the operations described above
6.18	Labour charges for providing half round moulding on edges of kotah stone, green marble stone and granite stone by using all tools such as special grinding and art cutter machines including making the edges mirror polished etc. complete as directed.
6.19	Labour charges for providing full round moulding on edges of kotah stone, green marble stone and granite stone by using all tools such as special grinding and art cutter machine including making the edges mirror polished etc. complete as directed.
6.20	labour charges for preparing surface of granite other than readily available mirror finished such as lapatto / leather / river finished / other required finished as per architect
6.21	P & A self adhesive anti skid 3M brand or equivalent 40 mm to 50 mm wide on the finished steps of stair, entrance etc. as per approved colour & detail. This self adhesive tape shall be fixed after 25 mm space from the edge of the step & after cleaning the top surfaces of the finish steps.
6.23	Providing and laying GVT vitrified tiles 1st quality minimum 9-10 mm thick tiles in different sizes as specified by and shade in flooring over to be fixed with tile fixing chemical +adhesive Material: GVT vitrified tiles 1st quality minimum 9-10 mm thick tiles in different sizes as specified by and shade in flooring workmanship Flooring over to be fixed with tile fixing adhesive as per manufacturer specification , cleaning the joints with coir brush , filling the them with epoxy grout material and colour to be matched with shade of tiles , curing, cleaning the area with water or water with mild acid etc. complete as directed as directed as per drawing & design provided by Architect & as instructed by Eng-in-charge .. Rate also included for providing 3mm wide grooves by using spacer and epoxy grout shall be shall be filled . Rates applicable for all heights & floor.

	Mode of Measurement: It shall be measured in Sq. mtrs
6.24	Providing and laying GVT vitrified tiles 1st quality minimum 9-10 mm thick tiles in skirting and dado in different sizes as specified by and shade over tiles fixing chemical adhesive Material: 1st quality minimum 9-10 mm thick tiles in skirting and dado in different sizes as specified by and shade workmanship over tiles fixing adhesive as per manufacturer recommendation bed laid to requisite, line, level and slope, fixed with, cleaning the joints with coir brush, Rate also included for providing 3mm wide grooves by using spacer and epoxy grout shall be filled and colour to be matched with shade of tiles. Rates applicable for all heights & floor, curing, cleaning the area with water or water with mild acid etc. complete as directed as directed as per drawing & design provided by Architect & as instructed by Engi-in-charge. Mode of Measurement: It shall be measured in Sqm
6.25	Providing of 1.8mm to 2mm thick Poly Propylene (PP) floor protection sheets/PP Flute Boards of minimum 250GSM (Gram Per Square Meter) Material: 1.8mm to 2mm thick Poly Propylene (PP) floor protection sheets/PP Flute Boards of minimum 250GSM (Gram Per Square Meter) workmanship laying by keeping overlaps at all the sides for minimum 150mm and fixed the sheets by providing and applying industry quality sticking tape over the vitrified/granite stone/tiles flooring for protection of flooring till the other finishing/furniture works are completed and clearance provided by site engineer for removal and removing carefully etc. completed as directed. Mode of Measurement Measurements shall be paid only for the flooring protected in SqM. Wastages and overlaps shall not be considered for the payment/measurements.
6.26	Providing and fixing for both side polished, single piece minimum 18 mm thick Granite stone pardi with machine cut edges and cut to required shape etc. complete as directed including moulding, polishing etc. complete as directed . Mode of Measurement: It shall be measured in Sqm.
6.28	Providing material and labour for laying Porcelain Mosaic tiles of make by piccolo, Italia or Equivalent in different sizes (25mm x 25mm/ 50mm x 50mm/ 100mm x 100mm) having 8 mm thickness with water absorption less than 0.08% and conforming to IS: 15622, in any colours and shade, in Water body, skirting, riser of steps, laid with cement based high polymer modified quick set tile chemical adhesive (Gold star) conforming to IS: 15477, in average 6 mm

	thickness, including grouting of joints for al depth all level as directed by engineer in charge. The Glass mosaic tile shall be fixed as per approved pattern and design. Sample to be approved by Architect. at all level with scaffolding. Mode of Measurement: It shall be measured in Sqm.
6.29	Grouting of joints of tiles having joint width 3 mm using epoxy grout mix of 0.70 kg of filler of desired shade (hardener 0.10/0.20 kg of resin per kg) including filling and finishing etc. complete as directed at all height. Mode of Measurement: It shall be measured in Sqm.

SECTION-7.00 STEEL WORK		
Applicable Codes.		
IS : 4351	-	Steel door frames
IS : 1038	-	Steel door, Windows and Ventilators
7.01	Providing, fabricating and fixing in position, grill, steel ladder, Safety MS bars to windows/ ventilator of MS rolled sections	
	This work shall be carried out as per the detailed drawing or the Architect. The MS sections shall be of approve quality. The welding shall be perfect and the junctions shall be ground properly. The frames shall be provided with holdfasts and the same shall be grouted with CC blocks of 1:2:4 in brickwork. It shall be painted with one coat of primer and 2 coats of approved synthetic enamel paint.	
	Mode of Measurement	
	The dimensions of the members shall be measured in unit lengths and the same shall be converted in to weights as per the standard steel table. The payment shall be done based on the weight of the item.	
7.02	Providing, fabricating and fixing in position MS inserts such as nosing, corner angles of columns, plates, flats, tee's, protection channels of reception dock, supports, brackets and monorails, hooks, frame around cut-out, MS pipe sleeves etc.	
	Inserts, bolts etc. shall be provided in masonry and concrete works as indicated on the drawing. It is imperative that all inserts, bolts fixtures & fittings shall be provided in their position very accurately. Such inserts in bolts be fixed necessary templates. If due negligence on the part of the	

	contractor, the inserts, bolts fixtures, and fitting etc. are out of alignment the contractor shall be make arrangement to have the inserts and bolts removed and re-fixed in their proper position as directed by the engineer, at no extra cost. The exposed parts shall be painted with one coat of primer and two coats of approved synthetic enamel paint.
	Mode of measurement
	It shall be measured in kg. The measurements at site shall be taken in unit lengths and the same shall be converted into weight using standard steel officious taken in the presence of the engineer.
7.03	Providing, fabricating and fixing MS pipe railing as per the architect's details / as directed using MS pipes / square or hollow section,
	It shall be done with the specified class of MS pipe as per the item in the Schedule of Quantities. The design shall be as per the drawings/instructions. All necessary specials, bends, elbows, tees and holdfasts or clamps shall be provided. If the pipe railing is to be fixed on ground or brick work, it shall be done by embedding the holdfasts, as directed by the Engineer, in concrete blocks PCC 1:2:4 (1 cement, 2 sand, 4 graded coarse aggregate of size 12mm and down). If it is to be fixed to a RCC member, the pipe shall be welded to the steel plate by embedding it in the RCC members.
	Mode of Measurement
	The running length of the railing shall be measured. The vertical shall not be paid separately.

7.04	Providing, fabricating and fixing in position MS sheet door with shutter of CR steel sheet as per architect's design with MS frame work
	The frame shall be of MS as specified above. The door shall be as per the Architect's design. The specified gauge MS sheet door shall be welded to the frame. It should have 3 to 6 hinges depending on the shutter size. It shall have fittings as specified in the item/ Architect's drawings. The door shall be applied with a coat of primer and 2 coats of synthetic enamel paint of quality as specified.
	Mode of Measurement
	This shall me measured in sqm. It the frames are not included in the item then only the shutter area shall be measured and paid for. The rate shall include fabrication, provision, erection of the door, necessary fittings as specified, painting etc. all complete.

SECTION 8.00 ROOFING WORK

8.01	Supplying, fabricating, assembling, hoisting and fixing in position to alignments & levels as per approved drawings, structural steel work in-built up roof truss girders and side claddings with booms, lattice girders roof trusses, gable frame, purlins / built-up purlins, cladding structures, side runners, etc. All structural steel materials such as angles, RS joists, flats, tees, plates, channels etc. shall conform to the latest edition of IS 226. All structural steel shall be free from twist before fabrication. Cutting of members shall be done by shearing, cropping, sawing or gas cutting. Contact surfaces of plates and butt joints shall be accurately machined over the whole area so that the parts connected shall butt over the entire surface of contact. Welding of pieces shall be done with the approval of the Engineer. The components parts shall be assembled in such a manner that they are not damaged in any way and specific cambers as shown in the drawing or as directed by the Engineer, shall be provided. For bolted connection, where necessary washers shall be tapered or otherwise suitably shaped to give satisfactory bearing. The threaded portion of the bolt shall project beyond the nut by at least 1.5 thread. Welding shall be done in accordance with the latest edition of IS 813 and 814, Code of Practice for use of Electric Arc welding for general Construction in mild steel. In welding it must be ensured that the base metal is in fused state when filler metal makes contact with it ; filler metal does not overflow upon any un fused base metal; base metal is not cut along the weld edges; flowing metal floats the slag, oxide and gas bubbles at the surface behind advance pole. For this current shall be adjusted or the electrode size is changed. Welding shall be free from cracks, discontinuity, under or over size welding thickness. Surface to be welded shall be free from loose mill scale, rut, grease, paint and any other foreign material. As far as possible avoid the welding at heights and at difficult positions. Generally fillet welding is preferred. The parts to be welded are brought in as close contact as practicable and rigidly clamped together. Before erection, steel work shall be thoroughly cleaned of rust, loose scale, dust, welding slag, and shall be given one coat of red oxide primer of approved make and one coat of synthetic enamel paint of approved make as specified in the item before erection and final coat of painting after the erection as directed. Steel members shall be hoisted and put in position carefully without any damage to the member and to the building and labour. The trusses shall be lifted at such points that they do not buckle or deform or be unduly stressed. The end of the truss which faces the prevailing wind shall be fixed and the other end may be kept free to move. The steel work shall be securely fastened wherever necessary, temporarily braced, to provide for all loads to be carried by the member during erection including the load due to the erection equipment and its operation. No permanent bolting or welding is done until proper alignment has been obtained. The holes for the rivets shall be determined with the help of templates and drilled. Erection clearance of the cleared ends shall not be more than 1.5mm and without cleaning end clearance shall not be more than3mm. Grouting or embedding of structural steel members

	done after the approval of the alignment, level & position of the members by the Engineer

	Important points
	Before the actual execution of the job, the Contractor shall prepare fabrication drawings for all structural steel work from the structural drawings supplied to him and determine the exact cutting lengths of the members, sizes of gusset plates, welding lengths by marking out on a level platform to full scale. Welding plant, electrodes and other equipment, scaffolding, labour shall be arranged by the Contractor at his cost. Erection equipment of required capacity , sufficient number of spare parts and staff shall be maintained by the Contractor at site at his cost.
	Mode of Measurement
	All structural steel members shall be measured in lengths and are converted into weights as per IS tables. All rivets, bolts shall be measured in kg. and paid for. No deduction shall be made for rivet holes and bolts. Nothing extra shall be paid for wastages.
8.02	-DO- as per item 8.01 but with MS B class pipes as per Item description given in the Schedule of Quantities.
8.04	Providing & fixing M.S. holding down bolts with nut, washer, upper portion of the bolts up to 100 mm portion or as specified threaded to requirement etc. complete as directed.
	The MS holding down bolts of specified dia. length and shape shall be provided as per the drawings in line & level. These shall be fixed to RCC work or brick work by grouting it with concrete. The bolt shall be provided with nuts and washers. The grease shall be applied to the threaded portion with the help of templates. If the bolts need some adjustment it shall be provided with a wooden piece 75x75mm or 50mm dia GI pipe around bolt shall be provided at the time of concreting and shall be removed after initial set.
	Mode of Measurement The length of the bolt is measured and according to the dia of the bolt the length shall be converted into weight using standard steel tables.
8.05	Providing & fixing Structural Decking with shear studs of TATA /JSW make & DECK Profile of 960 mm effective cover width profile with nominal 51 mm deep ribs and nominal pitch of 316 mm center-to-center. The deck profile is having embossment and stiffeners. Embossments on top of the flanges provide the mechanical interlocking between steel and concrete. In the assembled state the profile compromises of intermediate male and female ribs for every interlocking side-lap joint. The sheet will comprise of Base Metal Thickness (BMT) of 0.7 mm with minimum yield strength of 550 MPa. The sheets shall have a hot dipped zinc coating with total mass coating of 275 gms/sq.mt on both sides conforms to Australian Standard AS 1397 and BS EN 10147:2000. at all heights Mode of Measurement

	This shall me measured in sqm

SECTION 9.00 MISCELLANEOUS WORKS	
9.01	The electrical zaris 150mm to 250mm wide and 25mm to 100mm deep with cement mortar 1:3 and finishing the same to match with the surrounding white wash or any other finish, etc. complete as directed. This shall be measured in RM. No patch shall be seen after the zarries are filled up.
9.02	The zaris 25mm to 150mm wide and 50 to 100mm deep with CM (1:3:4) and Finishing with plaster to match with surroundings including chiseling, curing etc. complete as directed. This shall be measured in RM.
9.04	Providing and fixing air vent cowl of PVC as per approved sample for 150/100/75 diameter pipe. The vent cowl shall be of PVC as specified in the item description. It shall be of approved quality. Mode of Measurement The shall be measured in no.
9.05	Providing and making Core Cutting in R.C.C elements of any thickness up to 450mm deep bore using core cutter machines and tools etc complete as directed. For 100mm dia. The shall be measured in no.
9.06	Providing and making Core Cutting in R.C.C elements of any thickness up to 450mm deep bore using core cutter machines and tools etc complete as directed. For 150mm dia. The shall be measured in no.
9.07	Providing and fixing of 100mm dia PVC pipe pieces/sleeves of 500mm long of approved make with pressure rating of 4kg/Sq CM in the brick/stone masonry wall by placing while simultaneously with wall construction or including making holes, fixing the pipe piece and finishing properly to match with surrounding wall finishing, capping one end of the PVC pipe piece with matching sized PVC pipe cap of the same make as that of PVC pipe, fixing it without adhesive solution, including cutting the pipes, wastages, at all levels above and below ground level etc complete as directed Mode of Measurement The shall be measured in no.
9.08	Position suitable PVC water stops for construction/ expansion joints between two RCC members and fixed to the reinforcement with binding wire before pouring concrete & serrated with central bulb (225mm wide, 8-11 mm th.) etc.

	complete as directed. This shall be measured in RM.
9.09	Providing and Fixing heavy duty PVC rungs of around 350 mm long and around 180 mm wide complete as directed.
	Mode of Measurement The shall be measured in no.
9.10	Making cut outs in brick work & finishing with 19mm thick cement plaster cm 1:4 at all heights up to 200 mm dia. This shall be measured in Sqm
9.11	Making cut outs in brick work & finishing with 19mm thick cement plaster cm 1:4 at all heights in brick wall from 201 mm to 300 mm dia This shall be measured in Sqm
9.16	150mm X 150mm size cement concrete & cement finish vata in proportion 1:2:4 (1 cement: 2 course sand : 4 part 10mm or down graded stone aggregates) including making and finishing zaries in wall etc. finish with good surface as directed. This shall be measured in Rmt
9.17	Signage Works SS letter sign: 150mm high SS 304 letter with backlight by LEDs/ SMD lightings behind the text made of 3/4" SS 304 channel (1mm thick) for signage in i, Hindi and English languages and the font style as approved sample or as per design and drawings. It shall be made from ISI Brushed S.S. 304 using Water jet/ CNC cutting machine. It shall be fixed on the wall with chemical anchor fastener at any level any height. All Edges and corners shall be smoothened. Width of the letter shall as per the proportion of the word for depth 1". Stainless Steel Patti shall be argon welded. Duco paint of approved make, shade in required coat with necessary primer and putty shall be applied on external surface of letter. It shall be paid in as per alphabet no. In i/ Hindi language one letter shall considered with its contents (i.e. Kano, Matra etc.) i.e. 'chhi' letter in Guajarati shall be considered as one letter. Height of letters may vary + 3" shall be included in quoted rate. The rate shall be inclusive of scaffolding, drilling, adhesive material etc. complete for all heights.

SECTION 10.00 ROAD WORK	
Materials	
Murrum	It shall be got from approved quarries. It shall be granular and gritty. It shall be free from dust, all rubbish, and any organic materials as well as clods of black cotton soils. The material shall be got approved prior to its use in road construction. The material shall be stacked on a level ground. If the item is only for supplying of murrum, then it shall be measured in cum. The rate shall include digging the murrum, supplying at site, conveying with all lead and lift and stacking the same at site as directed by the Engineer. The rate shall also include all tolls, duties, fees, royalties etc.
Sand	The sand shall be from a river or nala or sea. It shall be clear, sound, properly graded ; free from organic material, silt, clay etc. and it shall be well graded.
Metal	The stone metal shall be hard, sound, durable, stone of close texture as is locally available and reasonably free from decay and weathering. It shall be angular or cubical, and round elongated or flaky metals shall be rejected. No round or oblong pebbles or angular chips shall be allowed. The size of the metal shall be 40mm to 63mm. All disintegrated stone shall be rejected. The metals shall be tested for Abrasion value, Aggregate Impact value and Flakiness Index in standard laboratories before the material is put to use and they shall conform to relevant IS codes as given in page 4.16 of this section. Metal shall be stacked at site on fairly level ground.
Rolling	A power roller shall, as a rule, be not less than 10 tones but if at any time still heavier rollers are required on the works the contractor shall have to bring them as may be directed by the Engineer. A hand roller should not be less than a ton. Rolling shall progress from edges to the center of the road in strips parallel to the center line of the road. Rolling shall be done by lapping uniformly each preceding rear wheel track by at least one half width of the track. On super elevations, rolling shall be started at inner edge and shall progress towards outer edge. During and after rolling, the surface shall be checked for grade and camber, with camber plate. The roller shall be started, worked or stopped without jerks. Rolling shall not normally be done length less than 100 M.
10.01	Surface dressing including preparation of sub grade of road bringing earth work to required grade, slope and camber in the existing surface
	The high portion of ground shall be cut down and/or hollows and depression shall be filled up to 300 mm. The gradient and camber/slope should be maintained as per requirement so as to give an even, neat and tidy look to the work. The measurement will be in sq.m. The area requiring cutting or filling more than 300 mm shall be paid separately under relevant items of earth work and surface dressing item will not be applicable. Earth from

	cutting will be used for filling. The rate for the item shall also include jungle clearing viz plants, shrubs, grass etc. excluding trees.
	Preparation of Sub grade
	The sub grade shall be leveled approximately to the proper level and camber by filling depressions with excavated material and cutting of protuberances. The sub grade shall be made to have as nearly as practicable, a uniform bearing layer and all hard spots therefore be properly excavated and refilled. All soft and spongy parts of the sub grade shall be excavated and refilled with approved materials of 15 cm layers for the same reason. The cost of this excavation will be paid under the item for excavation. The sub grade shall be watered as directed at least 12 hours before a 10 MT roller is put on it. Proper accesses should be prepared for the roller to get to the sub grade and all manholes frames and covers should be removed and replaced by plates of adequate strength free of cost whenever they interfere with the free rolling of the sub grade. After rolling the camber, super elevation and longitudinal slope etc. of the sub grade shall conform in shape to those of the finished road surface. This should be checked with the help of level strings and camber board, if necessary. When sub grade consists of black cotton soil, a thin layer of murrum or coarse sand shall be provided below any base course, watered and rammed and rolled tightly.
	Mode of Measurement
	The work shall be measured in sq.m. The rate quoted shall include jungle clearing, leveling the surface, dressing to the required shape, grade and camber and rolling .
10.02	Providing & laying base course in two layers in compacted thickness of 100 mm (each course 100 mm thick consolidated), using stone aggregates of nominal size 65 mm
	200 mm, nominal size or as specified, metal shall be spread over the prepared base to a thickness of 100 mm in one or two layers as specified, the metal layer dry and wet shall then be rolled and consolidated by a 10 tonne power roller. The thickness of the consolidated layer after completing all the operations described below shall be less than 100mm then blinding material like murrum or red Bajri shall be laid and watered and rolled. Rolling shall start from edge of road and proceed towards the crown in longitudinal strips overlapping on successive strips by at least one half the width of the rear wheel of the roller. The operation shall continue till no visible settlement of the metal or movement under the roller is observed. The gradient and camber shall be checked from time to time by means of level, stacks, strings camber board etc. Any depression or hump shall be corrected by removing completely the metal layer there at the spot and rolling the same satisfactorily.
	Mode of Measurement

	The metal spreading and compaction shall be measured , under single item, in sq.m., the thickness of the layer shall be as specified in the item specification or in cum as specified in the Schedule of Quantities. The rate shall include all the works described above.
10.03	Providing and laying cement concrete of grade M-25 in pavements, roads and kerbs over prepared sub-base in alternate panels of width up to 3.5 and length up to 6.0 M or as per architects' drawing in the line level maintaining slope including form work using MS channels of required height, compacting with needle vibrator and surface vibrator, floating the surface smooth, providing stripped/broom finish evenly, providing and cutting necessary grooves of 6mm wide X 10mm deep and construction/expansion joints of 25mm wide and depth as per drawing with heavy duty cutter machine, finishing the same and as per drawing, providing necessary steel reinforcement, curing etc. complete as per the drawing/as directed. (Reinforcement steel, filling of expansion joint with filler material shall be measured separately in relevant tender items and paid for) (Minimum cement content shall be 325 kg /cmt).
	Mode of Measurement
	The work shall be measured in cum. The rate shall include cost of form work , casting and curing of the slabs. It shall also include the finishing the slab as per the item description.(The charges for cutting of Grooves are included in this item rate & no extra charge will be paid for the same) Reinforcement work shall be measured in respective item of work separately.
10.03a	Labour charge for vacuum de-watered floor finish over and above concrete grid of M20/M25 or any surface as specified, involving levelling with trimix surface vibrator, Vacuum De-watering with trimix vacuum pump, floating and further compaction with trimix skin floater, floating disc, curing, etc. complete as directed.. Mode of measurement: This shall be measured in SqM.
10.04	Interlocking pavement stones of approved quality, shape, size , colour and make having compressive strength of minimum 250 kg/sq.cm and thickness not less than 80mm with smooth / approved finish and edges duly chamfered over a water compacted 50 mm thick natural sand bed to the required line, level and compacting the stones laid by plate vibrator including cost of labour for Surface dressing including preparation of sub grade of road bringing earth work to required grade, slope and camber in the existing surface, including cutting or filling earth up to 300 mm thickness, watering, consolidation with 8-10 MT Power Road Roller, etc.
	Mode of Measurement
	The item shall be measured in SQM.
10.05	Providing and filling of SHALITEX sealing compound of grade A –IS 1834-

	1984 in the contraction/ expansion joints of the RCC roads/hard park
	filling of SHAILITAX sealing compound of Grade A –IS-1834-1984 in the contraction/ expansion joints of R.C.C roads/hard park. The joints shall be of size 18mm wide x 25mm deep. Before applying the sealing compound the sides of the joints should be cleaned of dust and shalitex primer should be applied. The rate should includes labour charges for laying along with heating the compound etc., as per the manufacturer's specification and as directed.(The charges for cutting of grooves will be paid extra)
10.06	Providing and laying pre-cast / cast in- situ kerbing in cement concrete M-20 and 450mm wide, 75 to 100 mm thick and total 250 high, 100-125 mm thick web, edge duly chamfered including necessary excavation, surface dressing, cutting the road, laying PCC 1:5:10 (1 part cement 5 part coarse sand 10 part stone aggregate 20/37 mm and down) 100 mm thick, shuttering / moulds for exposed finish or provide smooth plaster with neat cement finish, curing as per approved drawing etc. complete as directed. Note:-Pre-cast kerb stones may be of sizes other than stipulated above as per the architectural drawings etc. complete as directed. The grade of concrete shall be M25 instead of M20.
	Mode of measurement
	The whole work shall include excavation , cutting roads if necessary, laying of bed concrete, shuttering, excluding reinforcement, casting, exposed concrete finishing and curing the kerb stones. The item shall be measured in RM.
10.07	Providing & fixing mild steel dowel / tie bars of approved make including greasing etc. in concrete road / pavement as per detail etc. complete as directed. Mode of measurement It shall be measured in Kg.
10.08	Providing & laying 40mm dia UPVC pipe of approved make and pressure 6 kg./sq.cm. in sheathing for dowel / tie bars. (a) pressure 6 kg. /sq.cm.(80 grade)in sheathing for dowel/ tie bars in concrete road/ pavements as per details and complete as directed. For 40mm dia. The item shall be measured in RM.
10.09	Providing and filling of sealing compound of approved make and of grade A – IS 1834-1984 in the contraction/ expansion joints of the RCC roads/hard park. The joints shall be of size 10 mm wide X 20 mm deep. Before applying the sealing compound, the sides of the joints shall be cleaned of dust followed by applying shalitex primer. The rate includes all labour charges for laying, heating the compound etc complete as per the manufacturer's specification and as directed. The item shall be measured in RM

SECTION 11.00 WATER SUPPLY WORKS	
Scope of work	
	The scope of work includes providing and laying water supply lines and all items of work described in Schedule of Quantities.
	Drawings
	Checked and approved drawings showing location of sanitary and water supply fixtures will be furnished to the Contractor and all drawing so furnished shall form a part of this specification. The Contractor shall refer these drawings for all information contained thereon which pertains to and required for this work.
	In the case of variations between the drawings and the specifications, or discrepancies in the information furnished by the Engineer, the Contractor shall refer such discrepancies to the Engineer before proceeding with such work.
	All connected works will be measured and paid under respective items of work unless specifically mentioned otherwise
11.01	Providing laying and jointing in true line and level 15mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings as approved by Engineer In Charge. Pipe shall be fixed on the wall with the help of clamp at every two meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent. The item shall be measured in RM
11.02	Do- as above item no. 11.01 but for 20 mm dia pipe
11.03	Do- as above item no. 11.01 but for 32 mm dia pipe
11.04	Do- as above item no. 11.01 but for 40 mm dia pipe
11.05	Do- as above item no. 11.01 but for 50 mm dia pipe
11.06	Supply, Installing, testing and commissioning of concealed forged brass lever operated ball valve full flow with forged brass ball (Machined to mirror smooth finish with hard chrome plated) and spindle with setting and gland of superior quality having minimum working pressure of 16 kg/cm2 etc. including providing of connectors, flanges, nuts, bolts, gaskets, etc. as per provided drawings by architect, technical specification and as directed by the authority EIC. For 32mm dia The item shall be measured in No
11.07	Do- as above item no. 11.06 but for 40 mm dia
11.08	Supply, Installing, testing and commissioning C.I butterfly valve of wafer end type class PN 1.6 as per I.S:13095 or BS:5155, including providing of necessary flanges, nuts, bolts, gaskets etc., complete (including cost of flanges) as per provided drawings by architect, technical specification and as directed by the authority EIC.)32mm nominal bore The item shall be measured in No
11.09	Do- as above item no. 11.01 but for 40 mm dia
11.10	Do- as above item no. 11.01 but for 50 mm dia
11.12	Supply, Installing, testing and commissioning of C.I non return valve,

	class PN 1.6 as per I.S:13095 or BS:5155, including providing of necessary flanges, nuts, bolts, gaskets etc., complete (including cost of flanges) as per provided drawings by architect, technical specification and as directed by the authority EIC. 50mm nominal bore The item shall be measured in Nos
11.13	Providing and installing on terrace, multilayered cylindrical vertical PVC water storage tanks of approved make of capacity from 500 liters to 5000 liters with closed top having manhole and cover with threaded lid & extra insert lid for protection against algae formation, UV stabilized with white coloured outer layer, water tank shall be made from food grade material including shifting the tank from site store, supplying and fixing connection inlets, outlets, air vents, overflow, drain pipes including washers, check nuts, Neosprine gaskets etc. of specified sizes and as per the recommendations of manufacturer including hydraulic testing and painting all the accessories with one coat of primer and two coats of synthetic enamel paint of approved make if required etc. complete as directed. The item shall be measured in Nos.

SECTION 12.00 SANITARY WORKS	
Scope of work	
	The scope of work includes providing and fixing sanitary fixtures, providing and laying drainage lines and all items of work described in Schedule of Quantities.
	Drawings
	Checked and approved drawings showing location of sanitary and water supply fixtures will be furnished to the Contractor and all drawing so furnished shall form a part of this specification. The Contractor shall refer these drawings for all information contained thereon which pertains to and required for this work.
	In the case of variations between the drawings and the specifications, or discrepancies in the information furnished by the Engineer, the Contractor shall refer such discrepancies to the Engineer before proceeding with such work.
	All connected works will be measured and paid under respective items of work unless specifically mentioned otherwise.
12.01	Providing, Installation, testing and commissioning of UPVC pipes of 6 kg./cm2 Type B Self fit conforming to IS: 13592 including all fittings conforming to IS: 14735 with access i.e bends, junctions, cowls, offsets, Y (plain/door), tees (plain/door), fixing with G.I slotted angle with U clamps and anchor fasteners etc., including excavation, refilling and disposal of surplus earth, including cutting holes in walls and floors ,wherever required and making good the same, complete as directed by the Project Manager. The scope shall also include fixing for full length in shaft/ceiling with necessary clamps, supports, connections, protecting fittings and pipes till the final handing over etc, a as per provided drawings by architect & specification and as directed by the authority EIC for all leads, depth and heights for 32mm outer dia. The item shall be measured in RM
12.02	Providing, Installation, testing and commissioning of UPVC pipes of 6 kg./cm2 Type B Self fit conforming to IS: 13592 including all fittings conforming to IS: 14735 with access i.e bends, junctions, cowls, offsets, Y (plain/door), tees (plain/door), fixing with G.I slotted angle with U clamps and anchor fasteners etc., including excavation, refilling and disposal of surplus earth, including cutting holes in walls and floors ,wherever required and making good the same, complete as directed by the Project Manager. The scope shall also include fixing for full length in shaft/ceiling with necessary clamps, supports, connections, protecting fittings and pipes till the final handing over etc., a as per provided drawings by architect & specification and as directed by the authority EIC for all leads, depth and heights for 50mm outer dia. The item shall be measured in RM
12.03	Supply, installation, testing and commissioning of all Pipes and pipe accessories, traps, supply of supports and support fixing, chase cutting and making good the surfaces, coving, core cutting, etc. required shall be in the Scope of the Contractor. All consumables other than materials supplied by

	manufacturer required for fixing the china ware, sanitary ware and CP fittings and fixtures shall be provided by the Contractor to make the item fully operational. Providing, fixing, testing and commissioning ISI Marked UPVC SWR grade soil, waste and vent pipes Type 'B' 6 kg/sq cm conforming to IS: 13592 including all SWR molded fittings conforming to IS: 14735 i.e. bends (plain/door), junctions, cowls, offsets, Y (plain/door), tees (plain/door), clean out plut, etc., with G.I slotted angle with U clamps and anchor fasteners at 1m interval. Ring fit jointing including cutting holes in walls and floors, wherever required and making them good, complete as directed by the Project Manager. The scope shall also include fixing waste pipes to the floor with concrete 1:2:4 bedding for full length and wall/ceiling with necessary clamps, supports, connections, protecting fittings and pipes till the final handing over etc, for all leads, depth and heights as per provided drawings by architect, technical specification and as directed by the authority EIC. (internal) For 80mm outer dia.
	The item shall be measured in RM

12.04	Providing, laying and jointing in true line and level 110 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials. The item shall be measured in RM
12.05	Providing, fixing, testing and commissioning ISI Marked UPVC SWR grade soil, waste and vent pipes Type 'A' 6 kg/sq.cm conforming to IS: 13592 including all SWR molded fittings conforming to IS: 14735 i.e. bends, junctions, cowls, offsets, Y (plain/door), tees (plain/door), clean out plug, etc., with hi-tech clamps and anchor fasteners at 1m interval and jointing with cement solvent including cutting holes in walls and floors, wherever required and making them good, complete as directed by the Project Manager. The scope shall also include fixing waste pipes to the floor with concrete 1:2:4 bedding for full length and wall/ceiling with necessary clamps, supports, connections, protecting fittings and pipes till the final handing over etc, as per provided drawings by architect, technical specification and as directed by the authority EIC. for all leads, depth and heights. (For Vent & ASP only) For 110mm dia. The item shall be measured in RM
12.06	Do- as above item no. 12.05 but for 110 mm dia (Rain Water Down takes) The item shall be measured in RM
12.07	Do- as above item no. 12.05 but for 160 mm dia (Rain Water Down takes) The item shall be measured in RM

12.08	Providing, fixing, testing and commissioning Square Flat Cut Floor drain for 125mm dia including 125x125mm S S grating with frame complete in all respects with necessary arrangements with proper care at all levels, protecting fittings and floor trap till the final handing over etc as per provided drawings by architect, technical specification and as directed by the authority EIC. 110 X 75 mm The item shall be measured in Nos
12.09	Providing, Installing, testing and commissioning UPVC Multi trap/height riser of self cleansing design with or without vent arm with provision for connecting upvc inlet fittings complete including cost of cutting and making good the walls and floors where ever required complete in all respects with necessary arrangements with proper care at all levels, protecting fittings and floor trap till the final handing over etc. as per technical specifications, provided drawings by architect and as directed by the authority EIC. For 110 mm inlet and 110 mm outlet
12.14	'Providing and fixing first quality white glazed counter type Oval wash basin of 560x 470 x 190 mm . star white (Make Cera S2030104) (page no. 148) approved shape as per details of approved make and quality with necessary specials, connecting CP pipes with nuts and all fittings, 32 mm dia. CP Waste coupling 32mm Size Full Thread, Making Holes on Platforms for basin & tap, heavy duty brackets with two coats of aluminum paint over brackets, and 32 mm dia uPVC concealed waste pipe in wall with bend etc. complete as directed ----along with Waste coupling 32mm Size Half Thread with 80mm height The item shall be measured in Nos..
12.16	'Providing and fixing chromium plated brass Bibcock With Wall Flange of approved make with chromium plated flange (disc) etc. for 15 mm dia NB pipeline, complete as directed. The item shall be measured in Nos.
12.17	'Providing and fixing chromium plated brass Single Lever Basin spout -Wall Mounted for 15 mm dia NB pipeline with wall flange etc complete as directed. ---CP Exposed Part Kit of Single Lever Basin Wall Mounted Consisting of Operating Lever, Wall Flange, extra long Nipple & Spout make approved by client. with upper & conceal part (on site fitting) , along with Concealed Body for Single Lever Basin Wall Mounted with Cartridge Sleeve of approved make. The item shall be measured in Nos.
12.18	'Providing and fixing large flat back snow white first quality urinal of Cera make, size375 x 390 x590 mm WITH Necessary MS Clamp , urinal top & bottom kit for water supply & disposal kit including brass CP Urinal spreader with connecting pipe, CP Waste coupling 32mm Size Full Thread , concealed uPVC pipe up to the drain and bend, fixing clamps complete as directed along with- Cera make The item shall be measured in Nos.
12.21	'Providing and fixing stainless steel kitchen sink of Glosy ASIS 304 Grade x 1mm thick with over all size 485 x 410 mm and bowl size 410 x 365 x 165 of

	approved make with MS or CI brackets painted white including cutting holes and making good the walls and floors wherever required with 32 mm dia CP brass Waste Coupling, Single Lever Sink Mixer and M.I. fisher union etc complete as per provided drawings by architect ,technical specification and as directed by the authority EIC(Make: Nirali) The item shall be measured in Nos
12.22	Installing, testing and commissioning Sink cock (wall mounted) with long swinging spout & wall flange with wall mounted model including cutting and making good the walls wherever required as per provided drawings by architect, technical specification and as directed by the authority EIC. The item shall be measured in Nos.
12.23	Supply, Installing, testing and commissioning Angle cock with wall flange with C.P copper connecting pipe 450 mm long and nuts, washer with C.P. brass flange complete, including cutting and making good the walls, wherever required as per provided drawings by architect, technical specification and as directed by the authority EIC. The item shall be measured in Nos
12.24	Providing and Fixing Soap Dish in Polished chrome of approved make and conforming to Manufacturers Standards as per technical specifications, provided drawings by architect, technical specification and as directed by the authority The item shall be measured in Nos.
12.25	Providing and Fixing Soap Dispenser in Polished chrome of approved make and conforming to Manufacturers Standards as per technical specifications, provided drawings by architect, technical specification and as directed by the authority The item shall be measured in Nos
12.30	Constructing manhole with R.C.C top slab in 1:2:4 mix(1cement:2 coarsesand:4 graded stone aggregate 20mm nominal size)foundation concrete 1:3:6 mix(1cement:3 coarse sand:6 brick bats 40 to 50mm nominal size)inside plastering 15mm thick with cement mortar 1:5 (1cement:5 coarse and)finished with a floating coat of neat cement slurry and making channels in cement concrete 1:2:4mix (1cement:2coarses and: 4stone aggregate 20mm nominal size) finished smooth complete including curing & testing (I) In side size 900mmx900mm and 1.50 meter deep including C.I cover with frame size 560mm diameter total weight of cover and frame to be not less than 128Kgs (Weight of cover 64Kg & weight of frame 64Kg) (A) with 230mm thick walls of brick masonry using bricks having crushing strength not less than 35Kg/Sqcm in cement mortar 1:5(1cement:5coarses and) type depth 0.90meter for 150 mm diameter sewer. The item shall be measured in Nos.
12.31	Constructing manhole 900mmx1200mm and 1.50 meter deep including C.I

	cover -DO- same as item 12.30.
12.33	Providing and fixing S.W. gully trap with C.I. grating brick masonry chamber and water tight C.I. cover with frame of 300mmx300mm size (inside) with standard weight. (i)Square mouth traps.(B)150mm x 100mm size P or R type The item shall be measured in Nos.
12.34	External Drainage System Providing and Laying Underground drainage System SN8 complete with all fittings excavation of trench 0.7m wide and depth varying from 0.75m to 2.4m , and refilling the same after laying of drain and concrete encasement in M10 grade concrete with minimum thickness of encasement 100m thk & as per provided drawings by architect, technical specification and as directed by the authority EIC 150mm dia Internal
12.34a	'- do- as above item no 12.34 but for 200 mm dia
12.35	'- do- as above item no 12.34 but for 250 mm dia
12.36	Providing & Laying 300mm dia non-pressure hume pipe The pipe shall be with or without reinforcement as required and of the class as specified. These shall conform to IS:458.The reinforced cement concrete pipes shall be manufactured by centrifugal (or spun) process while unreinforced cement concrete pipes by spun or pressure process. All pipes shall be true to shape, straight, reflect sound and free from cracks and flaws, the external and internal surface of the pipes shall be smooth and hard. The pipes shall be free from defects resulting from imperfect grading of the aggregate pressure pipes) shall withstand a test pressure equivalent to 0.7 kg/sq.cm (7 m head) of water. Concrete used for the manufacture of unreinforced and reinforced concrete pipes and collars shall not be leaner than 1 : 2 : 4 (1 cement : 2 coarse sand :4 graded stone aggregate). The max. size of aggregate should not exceed one third of the thickness of the pipe or 20 mm whichever is smaller. The reinforcement in the reinforced concrete pipes shall extend throughout the length of the pipe. The circumferential and longitudinal reinforcements shall be adequate to withstand the specified hydrostatic pressure and further bending stresses due to the weight of water when running full across a span equal to the length of pipe plus three times its own weight. The minimum cover for reinforcement of spun pipes and for all other pipes shall be as given below:

Pipes thickness	Spun pipes	Pipes other than spun pipe
Less than 30 mm	9	12
30 mm to 75 mm	12	18
75 mm and over	18	18

	In case where the foundation conditions are unusual such as in the proximity of trees or holes under existing or proposed tracks, manholes etc. the pipe shall be encased all-round in 15 cm thick cement concrete 1:5:10 (1 cement : 5 coarse sand 10 graded stone aggregate 40 mm nominal size) or compacted sand or gravel. In cases where the natural foundation is inadequate the pipes shall be laid either in concrete or cradle supported on proper foundations or on any other suitably designed structure. If a concrete cradle bedding is used the depth of concrete below the bottom of the pipe shall be at least 1/4th of the internal dia of the pipe subject to a minimum of 10 cm and a max. of 30 cm. The concrete shall extend up the sides of the pipes at least to a distance of 1/4th of the outside diameter for pipes 300 cm and over in diameter. The pipe shall be laid in this concrete bedding before the concrete has set pipes laid in trenches in earth shall be bedded evenly and firmly and as far up the haunches of the pipes as to safely transit the load expected from, the backfill through the pipe to the bed. This shall be done either by excavating the bottom of the trench to fit the curve of the pipe or by compacting the earth under the curve of the pipe to form an even bed. Necessary provision shall be made for joint wherever required. When the pipe is laid in a trench in rock, hard clay, shale or other hard material the space below the pipe shall be excavated and replaced with an equalizing bed of concrete sand or compacted earth. In no case shall pipe be laid directly on such hard material. When the pipes are laid completely above the ground the foundations shall be made even and sufficiently compacted to support the pipe line without any material settlement. Alternatively the pipe line shall be supported on rigid foundations at intervals. Suitably arrangements shall be made to retain the pipe line in the proper alignment such as by shaping the top of the supports to fit the lower part of the pipe. The distance between the supports shall in no case exceed the length of the pipe. The pole shall be supported as far as possible close to the joints. In no case shall the joint come in the centre of the span. Care shall be taken to see that superimposed loads greater than the total load equivalent to
	the weight of the pipe when running full shall not be permitted. Suitably designed anchor blocks at change of directions and grades for pressure lines shall be provided where required. Jointing of the pipes shall be done as described below:
a)	Collar shall be spaced symmetrically over the two pipes and the space between collar and pipe filled with cement mortar 1:1 thoroughly rammed with caulking tools. The joint shall be finished with a fillet sloping at 45. Joints shall be protected and cured for about 10 days. If specified in the item specification wedge shaped groove in the end of the pipe shall be filled with a special bituminous plastic compound for bitumen soaked spun yarn. The collar shall then be slipped over the end of pipe and next pipe butters well against tee plastic compound by suitably appliance so as to compress the plastic compound in the grooves, care being taken not to disturb concentricity and level of the pipes
	Mode of measurement

	a) Providing and laying of pipe links, rounding off the bed to fit the lower part of the pipe, jointing of pipes all shall be paid in RM under this item. b) The concrete bed and blocks of CC 1:2:4 provided at junction shall be paid under concrete work.
12.37	Providing & Laying 250 mm dia non-pressure hume pipe -DO- same as item 12.36.
12.38	Providing & Laying 150 mm dia non-pressure hume pipe -DO- same as item 12.36.

SECTION V

FORM OF BID

The Appendix forms part of the bid. Bidders are required to fill up all the blank spaces in this Form of Bid and Appendix.

Name of Contract	
Name and address	
Description of Works	

Dear Sirs,

1.0	Having examined the Drawings, Conditions of Contract, Specifications and Schedule of Quantities for the execution of above mentioned works, we, the undersigned offer to execute, complete and maintain the whole of the said works in conformity with the said Drawings, Conditions of Contract, Specifications and Schedule of quantities for the sum of * Rs. _____ or such other sum as may be ascertained in accordance with the said conditions. * The total Bid Price is to be inserted in words and figures by the Bidder. The currency of the Bid shall be in accordance with clause 12.0 of Instructions to Bidders.
2.0	We undertake, if our bid is accepted to commence the Works within **_____ days of receipt of the Letter of Acceptance, and to complete and deliver the whole of the above said works comprised in the Contract within ** _____ days calculated from the last day of the afore said period in which the Works are to be commenced.

3.0	If our bid is accepted we will furnish a Initial security deposit in the form of Demand Draft in favor of "GUJARAT University." Payable on any schedule Bank at Mehsana in amount of 2.0% of the above named sum in accordance with the Conditions of Contract .
4.0	We agree to abide by this bid for the period of 90 days from the date of bid opening prescribed in clause 13 of the Instruction to Bidders, and it shall remain binding upon us and may be accepted at any time before the expiry of that period.
5.0	Unless and until an Agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding Contract between us.
6.0	We understand that you are not bound to accept the lowest or any Bid you may receive. ** To be inserted by the Bidder. The numbers should conform to the timing specified by the GUJARAT University . in the Bidding documents.

APPENDIX TO THE FORM OF BID

	Section No.	Clause No.	
Amount of Performance Security	I	33	5% of the contract value
Bank Draft As EMD	I	14	
Minimum Amount of Third Party Insurance	II	23	Rs. 10 Lakh per occurrence
Period for Commencement, from the Date of Letter of Acceptance		41	** One week (7 days)
Time for Completion		43	****(18)Eighteen- Months**
Rate of Liquidated Damages		47	0.5% of the total value of work done per week
Maximum Limit of Liquidated Damages		47	10% of Contract value
Rate of Bonus		48	NOT APPLICABLE
Maximum Limit of Bonus		48	NOT APPLICABLE
Period of Maintenance (Defect liability Period)		50	**12 months**
Percentage of Retention		60	The Retention Money amount @ 7.5% will be deducted from the each running bill of the contractor including final bill till the 5.0% of contract value deducted towards retention money pursuant to clause 60.1.After that the deduction of Retention Money will not be made. However if the value of work done increased than the contract value, the deduction towards

			retention money will be made as above(at the rate of 5% of additional work done) by CLIENT.
Maximum Limit of Retention Money		60	5% of Contract value
Time with in which the payment would be made after the Certificate		60	___

Dated this ____ day of ____ 2024___.
Signature_____ in the capacity of_____ duly authorized to sign the bid for and on behalf of _____ (in capital letters).

** To be inserted by the Bidder. The numbers should conform to the timing specified by the GUJARAT UNIVERSITY . in the Bidding documents.

Name of Witness	:	
Address	:	
Signature	:	

SECTION VI
Basic Rates
N.A.

Cement, Reinforcement steel, structural steel and M.S. Box section / Round Pipes steel required for execution to be produced by Contractor. The quoted rates shall be inclusive of supply of cement, TMT/CRS Reinforcement steel and structural steel, M.S. Box section / Round Pipes steel wherever required.

No material advance shall be paid as per clause no. 60.1 vi (a) of General specifications

The basic rate of various materials shown in the tender are inclusive of all taxes and F.O.R. at Site.

Though the rates increase or decrease ± up to 10% than the basic rate shown in the tender the contractor will not entitle/recover for basic rate difference. The quoted rate shall absorbed such increase or decrease ± up to 10% in basic rates for which basic rates are given in tender.

If the price of the material for which basic rates are given in the tender increase or decrease more than ± 10% of basic rate, than contractor will be paid/ recovered basic rate difference amount on submission of documents required by GUJARAT University.

Such basic rate difference amount for material will be paid/recovered after calculating as per following

The basic rate difference = Actual cost of the material paid by the contractor(with proof of bill)

- basic rate shown in the tender x (±) 10%.

Basic Rates of following materials (Deleted)

Particulars Unit Basic Rate Incl all taxes at FOR site

~~Sr no.~~	~~Item~~	~~Unit~~
~~1~~	~~Cement OPC 53 grade~~	
~~2~~	~~TMT Reinforcement steel Fe 500~~	
~~3~~	~~Structural steel (TATA)~~	
~~4~~	~~Granite stone(item no 6.06,6.07)~~	
~~5~~	~~Granite stone (item no 6.08)~~	
~~6~~	~~GVT tiles~~	

~~Also necessary test certificate have to be furnished for each consignment of cement and steel supplied at site.~~

~~Nothing extra shall be paid on account of rolling margin & wastage for MS reinforcement, MS structural steel & MS Box section.~~

~~Basic rate of materials shall mean the rate at site including all Taxes, duties, carting loading, unloading, etc complete. . (GST excluding)~~

WASTAGE CEMENT: Since the cement has to be supplied by the contractor, conditions mentioned for wastage of cement shall not be applicable. However theoretical consumption of cement shall be calculated and in the event of any under consumption beyond 2.5% the condition for penal recovery mentioned in the tender shall be applicable. The penalty/ recovery would be at the 1.5 times of basic rate of **Rs. 380=00 per 50kg bag**. Since reinforcement and structural steel has to be supplied by the contractor, the wastage etc. shall be considered for payment.

Note : No price difference shall be paid or recovered to/fro the contractor up to 10 % price variation on either side for basic rates mentioned in tender for some items and structural steel etc. It shall be accountable if it is more than 10 % on either side. For this , contractor have to submit copy of bill and then rates will be checked with main dealer whichever is less is applicable for price difference.

MATERIAL ADVANCE : NOT APPLICABLE

SECTION VI

Tenderer shall quote hereunder the all-inclusive price of labour assumed by him for the purpose of this contract.

Supplying labour	unit	Rate	Amount
i) Unskilled labour male	per day of		
ii) Unskilled labour male	hrs. each		
iii) Skilled labour **male**			
iv) Mason (brick layer)			
v) Carpenter			
vi) Painter			
vii) Fitter (structural steel)			
viii) Welder			
ix) Welders with welding equipment			
x) Chaukidar			

Client shall have the right to ask contractor to supply labour for any work at the rates quoted above

Signature	
Designation	
Company	
Date	

SECTION : VI

SCHEDULE OF RATES FOR MATERIALS

Tenderer shall quote hereunder the all inclusive price of materials delivered, unloaded and stacked at site assumed by him for the purpose of this contract.

Sr.	Brick	Crushing strength (35 kg/sq.cm minimum)	Unit	Rate	Remark
1	a)1st class b)2nd class				
2	Cement	53 grade	MT		
3	Stone / Aggregate **a)** 6mm size to 150mm size				
4	Bajri (Sand)		Cu.m		
5	Primary bitumen		MT		
6	Bitumen felt		Sq.m		
7	Particle boards a) Commercial veneering on both sides b) One side teak and other commercial c) Both side teak		Sq.m Sq.m Sq.m		
8	Structural steel (tested) Tees, Angles, Channels, joints plates Chequered plates, girders, MS box section.		MT		
9	Tiles a) GVT floor 600x600 b) GVT Dado 300 x 450 or 300 x 600		Sq.m Sq.m		

10	GI pipe B class a) 70mm b) 50mm c) 40mm d) 25mm e) 20mm f) 12mm		 MT MT MT MT MT MT		
				Signature	
				Designation	
				Company	
				Date	

SECTION : VII SCHEDULES OF SUPPLEMENTARY INFORMATION

The bidder shall provide the Supplementary Information as annexed in the form of schedules mentioned hereunder. All these supplementary information shall be considered for the bid evaluation, and same in the contract execution. If the requisite information is not supplied by the bidder then the bid shall be considered non-responsive and shall be rejected.

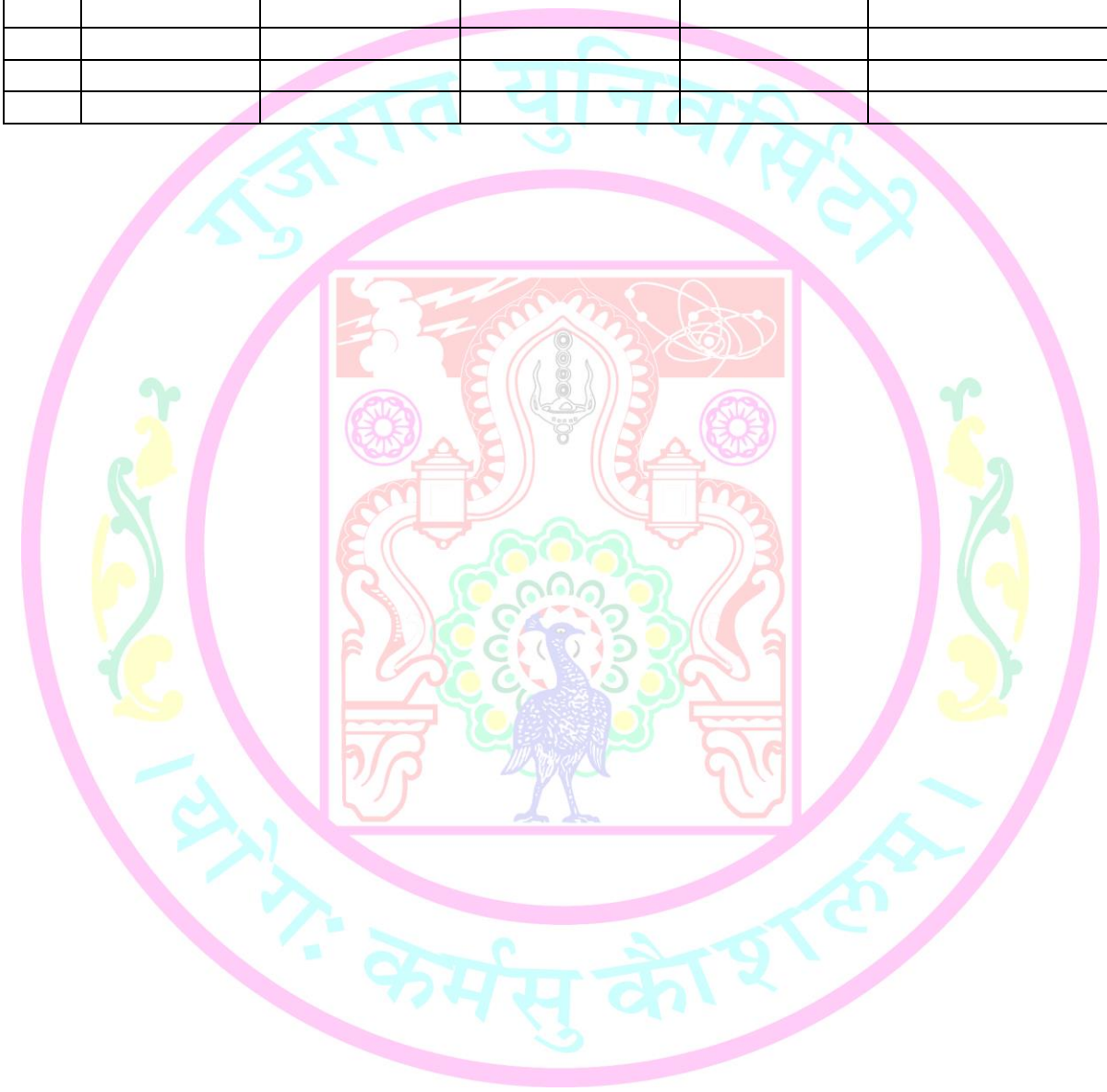
a)	Schedule	I	Major items of Constructional Plant to be deployed by the bidder.
b)	Schedule	II	Key Personnel.
C)	Schedule	III	Nominated Sub-Contractors
d)	Schedule	IV	Major works successfully completed during the last five years.
e)	Schedule	V	Statement of Bonus earned/Liquidity damages paid in the last five years
f)	Schedule	VI	Statement of Arbitration & Disputes in the last five years
g)	Schedule	VII	Financial Business Capability
h)	Schedule	VIII	Works in Hand

SECTION VII : SCHEDULE – I			
Major items of Constructional Plant to be deployed by the bidder.			
Sr. no.	Description of Equipment at site	Nos. available with the Bidder in working condition.	Nos. proposed to be deployed at site
1	Steel Scaffolding		
2	Welding Equipment		
3	Other equipment & machinery for fabrication & erection work		

SECTION VII : SCHEDULE - II KEY PERSONNEL		
1	Technical Personnel	No of persons Employed To be Deployed with the bidder for the Project
a)	**Project Manager.** Engineer (Degree holder)	
b)	Site Engineer (Degree holder)	
c)	Junior Engineer (Degree holder)	
2	Supervisory Personnel	
a)	**Supervisor (Diploma Holders)**	
b)	Foremen	
c)	Technicians	
3	**Other Key Staff**	

SECTION VII: SCHEDULE - III - Nominated Sub-contractors FOR ELECTRICAL, HVAC AND LANDSCAPING WORK				
List of works of value more than 10% of the contract value proposed to be sublet				
Sr. no	Description	Approx. value Rs.	Name of the sub-contractor	Place where similar works previously executed.

SECTION VII : SCHEDULE IV :					
Major works successfully completed during the past five years:					
Sr. no	Name of Place work	Contract Reference	Name of Value of Client Work	Time of completion	Date of completion



SECTION VII : SCHEDULE V :

Statement of Bonus earned/Liquidity damages (L.D.) paid in the past five years:

Sr.no	Name of work	Place	Contract Reference	Name of the Owner	Value of work	Time of Completion Contract/Actual		Bonus/L.D

SECTION VII : SCHEDULE VI :

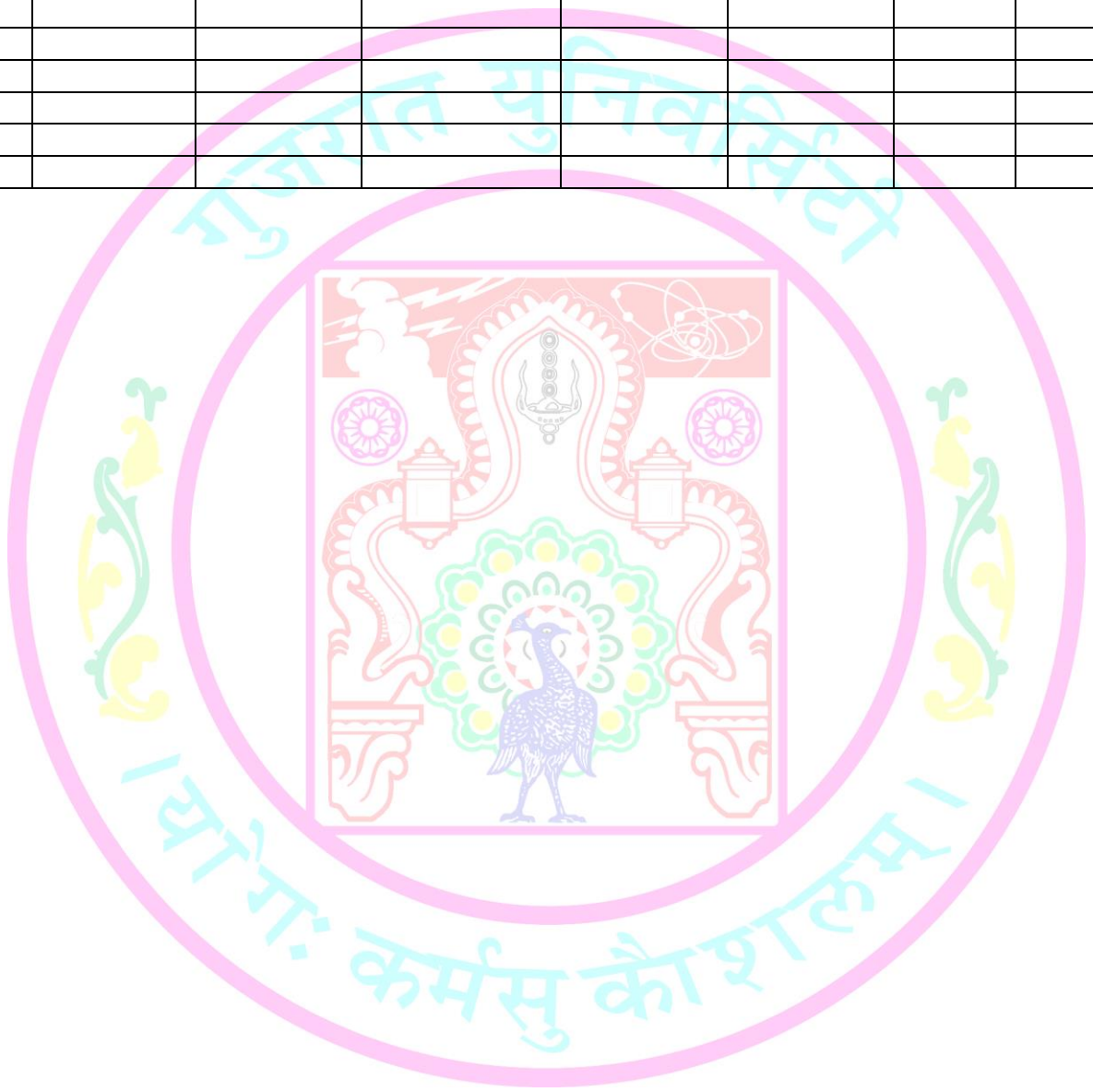
Statement of Arbitration & Disputes in the last five years.

Sr.no	Name of work	Place	Contract Reference	Name of the Client	Value of work	Nature of Dispute	Award of Arbitration

SECTION VII : SCHEDULE - VII		
Financial and Business Capability.		
1	Audited annual accounts/ Accounts audited under section 44AB of Income tax Act of past 3 years (I.E.2019-20-,2020-21,2021-202,2022,2023)	
2	Where accounts are not required to be audited following information shall be given for last three years(I.E.2019-20-,2020-21,2021-202,2022,2023) duly attested by a Charted Accountant/ Manager of a Nationalized bank	
a)	Share Capital Free reserves Other reserves	
b)	Term loans from financial institutions and & Banks	
c)	Current Liabilities Bank cash credits Others (Including sundry creditors)	
d.	Provisions	
e.	Contingent Liabilities including claims not acknowledged	
f.	Fixed Assets Gross Net	
g.	Cash and Bank balances	
h.	Inventories	
i)	Debtors & Advances considered good more than 6 months less than six months	
j	Profit before tax	

	Loss, if any	
3	Other information	
	Name of the Bankers	
	Bank facilities including credit limits	
4	Projected turn over for the next two years	
	Year 1	
	Year 2	

SECTION VII SCHEDULE VIII							
WORKS IN HAND							
Sr. no	Name of work	Contract Reference	Name of Client	Place of contract	Value of contract	Completion	
						Period	Date



SECTION VIII FORM OF AGREEMENT FOR CIVIL & STRUCTURAL WORK

THIS AGREEMENT is made and executed on the day of _____2024___ between the GUJARAT UNIVERSITY. having its registered office at Mehsana(herein after referred to as GUJARAT UNIVERSITY . which expression shall, unless repugnant to the context or meaning thereof, include the successors and assignees of the GUJARAT UNIVERSITY .) of the ONE PART and

M/S._____

_____

_____

_____ (herein after referred to as the Contractor, which expression, shall, unless repugnant to the context or meaning thereof, include the heirs, successors, assignees, executors and administrators of the Contractor) of the OTHER PART.WHEREAS the GUJARAT UNIVERSITY . is desirous that certain Works should be executed, viz _____and has, by Letter of Acceptance dated _____, accepted a bid by the Contractor for the execution, completion and maintenance of such works, NOW THIS AGREEMENT WITNESSTH AS FOLLOWS:

1.0	In this agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2.0	The following documents shall be deemed to form and be read and construed as a part of this agreement, viz
i	this Form of Agreement
ii	the Letter of Acceptance
iii	the said bid and Appendix
iv	the Technical Specifications
v	the Schedule of Quantities
vi	the Drawings
vii	the Schedule of Supplementary information

Viii	Special Conditions of Contract
ix	General Conditions of Contract
x	Schedule of Materials to be issued by GUJARAT UNIVERSITY .
xi	Form of Bank Guarantees
	* The Contractor shall not fill up this form.
3.0	The aforesaid documents shall be taken as complementary and mutually explanatory of one another, but in the case of ambiguities and discrepancies shall take precedence in the order set out above.
4.0	In the consideration of the payment to be made by the GUJARAT UNIVERSITY .to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the GUJARAT UNIVERSITY . to execute, complete and maintain the works in conformity in all respects with the provisions of the Contract.
5.0	The GUJARAT UNIVERSITY . here by covenants to pay the Contractor in consideration of the execution, completion and maintenance of the works the Contract Price at the times and in the manner prescribed by the Contract.

IN WITNESS WHEREOF the parties hereto have caused their respective Common Seals to be hereunto affixed the day, month and year first above written.

Signed, sealed & delivered for and on behalf of the within named GUJARAT UNIVERSITY . by the hands of its Authorized Signatory

	Authorized Signatory	
	GUJARAT University	
	In the presence of :	
	WITNESS:	
1	Signature	
	Name	
	Address	
2	Signature	
	Name	
	Address	

Signed, sealed and delivered for and on behalf of the within named Contractor, the other part.		
	In the presence of	
	WITNESS	
1	Signature	
	Name	
	Address	
2	Signature	
	Name	
	Address	

SECTION IX		
Acceptable Forms of Bank Guarantees		
Table of contents		
Sr. no.	Description	Page number sectional sequential
1.0	solvency Certificate	217
2.0	Contractor's declaration for Final Bill	218
3.0	Water proofing	219
4.0	Anti- termite	221

1 Format of solvency Certificate (On the letter head of issuing bank)	
Ref:	Date:
FORMAT OF SOLVENCY CERTIFICATE FROM THE NATIONALISED / SCHEDULED BANK ONLY.	
This is to certify that to the best of our knowledge & information M/s. /	
Shri_____ having the address as per bank records as_____ a customer of our bank is respectable and can be rated as good for any engagement up to a limit of Rs._____ (Rupees_____). The certificate is issued without any guarantee and responsibility on behalf of the or any bank or any of its Officers.	
Date:	Signature
(Name & designation of the officer with address of Bank & its branch code)	
(Bank'S Official Rubber Stamp)	

2 Format of Contractor's declaration for Final Bill to be given by the Contractor on his letter head.
DECLARATION
We, M/s_____ confirm that our final Bill with respect to (name of the work) for (name of project) covers all the items executed against the Purchaser Order no._____dated_____ We accept the payment of Rs._____(Rupees_____only) Towards final bill for the work as full and final settlement against above Purchase Order. There is no further claim of any type whatsoever from our side against the Purchase Order / Contract referred to above.

Date	Signature & Seal of Contractor
Place	

3. GUARANTEE BOND FOR WATERPROOFING WORKS FOR TERRACE

This agreement made this _____day of two thousand_____between ……..(here in after called "the Guarantor of the one part) and the ……. (here in after called "…… "of the other part.)

Whereas this agreement is supplementary to the contract (hereinafter called "the contract")
Dated_____ made between the Guarantor of the one part and ……..of the other part, where by the Contractor, ……..under took to render the …… etc. in the said contract recited, completely water and leak proof.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said structure will remain water and leak proof for **five years** to be reckoned from the date after the maintenance period prescribed in the contract expires.
NOW THE GUARANTOR hereby guarantees that waterproofing treatment provided by him will render the structures completely leak proof and the minimum life of such waterproofing treatment shall be **five years** to be reckoned from the date after the maintenance period prescribed in the contract expires.
Provider that Guarantor will not be responsible for leakage caused by earthquake structural defects or misuse of roof or other structures or alteration and for such purpose:

A) Misuse of structures shall mean any operation which will damage water proofing treatment, like chopping of fire wood and things of the same nature which might cause damage to the structure.

B) Alteration shall mean construction of an additional story or a part of the or construction adjoining to existing roof whereby water proofing treatment is removed in parts:

C) Damaging or puncturing of the waterproofing treatment provided to Retaining wall or toilet sunk, terrace for providing any P.H / Electric connections etc.
D) The decision of the Engineer –in-Change/CLIENT, with regard to leakage shall be final.

During this period of guarantee the guarantor shall make good all defect and for that matter, in case of any defect being found render the building water proofing to the satisfaction of the Engineer –in – Charge /CLIENT at the cost of guarantor and shall commence the work for such rectification within seven days from in the date

of issue of the notice, from the Engineer –in- Charge/CLIENT ,calling upon him to rectify the defects, failing which the work shall be got done by the Department by some other contractor at the GUARANTOR'S COST and risk. The decision of the Engineer-in –Charge/CLIENT as to the cost payable by the Guarantor shall be final and binding.

That if the Guarantor fails to execute the water proofing or commits breaches hereunder then the Guarantor will indemnify the principal and his successors against all loss, damage, cost, expense or otherwise which may be incurred by the by reason of any default on the part of the GUARANTOR in performance and observance of this supplemental agreement. As to the amount of loss and/or damage and/or cost incurred by the CLIENT, the decision of the Engineer-in-Charge/CLIENT will be final and binding on the parties.

IN WITNESS WHERE OF these presents have been executed by the Obligor_____
and by_____ and for on behalf of the CLIENT on the day. month and year first above written.

SIGNED, sealed and delivered by OBLIGOR in the presence of :
1.
2..
SIGNED FOR AND ON BEHALF OF CLIENT BY----------
----------in the presence of :

1.
2.

4. FORMAT OF GUARANTEE TO BE EXECUTED BY THE FIRM / CONTRACTOR IN RESPECT OF THE WORK OF PRE-CONSTRUCTION ANTI-TERMITE TREATMENT This agreement made this _____ day of _____ two thousand _____ between_____ having its Head Office at _____(herein after called "the Employer") of the one part and _____(herein after called " the Guarantor") of the other part. WHEREAS THIS AGREEMENT is supplementary to a contract (hereinafter called the contract dated _____ and made between the Employer of the one part and the Guarantor of the other part) where by the Firm / Contractor inter alia undertook to render the building / structure completely free from any infestation of termites. And whereas the Guarantor agreed to give guarantee to the effect that the said building / structure shall remain free from any infestation of termites for a minimum period of ten years from the date of completion of preconstruction ant termite treatment carried out as per the relevant I.S. Code. Now the Guarantor hereby agrees to make god all defects and render the building / structure free from any infestation of termites, during this period of guarantee and to the satisfaction of the Employer. The Guarantor also agrees to take up such rectification work at his own cost, and within one week from the date of issue of notice from the Employer, calling upon him to rectify the defects. The decision of the employer as to the cost payable by the Guarantor will be final and binding, in case the Guarantor fails to commence the work as per above notice and the work is got done through some other contractor. That if the Guarantor fails to execute the preconstruction anti-termite treatment or commits breach there under then the Guarantor will indemnify the principal and his successors against all loss, damage caused, expense or otherwise which may be incurred by him by any reason of any default on the part of the Guarantor in performance and observance of this agreement. As to the amount of loss and / or damage and/or cost incurred by the Employer the decision of the Employer will be final and binding.

In witness where of these presents have been executed by the obligator _____ and by _____ and for on behalf of the Employer on the month and year first above written. Signed, and delivered by _____ by the hands of Shri _____ in the presence of _____ Signed and delivered by the hand of _____in the presence of _____

CHECK LIST

Sr. No	Description	Pg. No.
1	Name / Names of project to be considered for meeting minimum eligibility criteria	
2	Nature of each project / work completed.	
3	Value of work of each project / work completed	
4	Location of execution of each project/work	
5	The Bidder, in the same name and style, should be in business at least for **five years**	
i	valid registration	
ii	GST	
iii	Income Tax	
iv	Permanent Account Number (PAN)	
v	EPF	
vi	Insurance	
vii	TDS certificate	
viii	Form 26 AS for the last 3 financial Years	
6	Financial Turn over for last 3 Years	
7	The manpower deployment plan	
i	Project Manager	
ii	Supervisory Manpower Team.	
iii	Sr. Engineers	
iv	Site supervisors	
8	Technical capability	
i	Equipment owned by company	
ii	QAP Plans	