

BID DOCUMENT FOR
POWER GENERATION PLANT

Contractor in respect of the agreed quality assurance programme forming a part of the Contract.

21.0 CONTRACTOR'S LABOUR

The Contractor shall arrange the skilled, semi-skilled and unskilled workmen required for the works for handling erection, testing and commissioning. Fully trained and competent men with previous experience on job shall be employed. They shall hold valid certificate wherever necessary.

The supervisory staff employed by the Contractor and his Sub-Contractor shall ensure proper out-turn of work and discipline on the part of labour put on the job. Safety and co-ordination with Employer and Contractor shall be their prime responsibility.

The Contractor shall furnish labour and progress reports as desired by the Employer. The supervisory staff shall execute the work in the most substantial and workmen like manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of their work.

It shall be the responsibility of the Contractor to engage his workmen in shift or overtime basis for achieving the targets set by the Employer.

22.0 TRAINING OF EMPLOYER'S PERSONNEL

Contractor shall train Employer's personnel on operation and maintenance of the equipment within battery limits. The Bidder in his bid shall indicate the following;

- Training Strategy for the Personnel of Employer
- Type and details of training which he proposes for Senior Supervisory Personnel both outside Ethiopia and at Site and indicating the duration;
- Type and details of training which he proposes to impart to junior level personnel outside Ethiopia and at site.

The cost of such training is to be indicated in price schedule.

23.0 MAJOR EQUIPMENT LIST

For ready reference, Major Equipment list of Existing and Proposed Plant is enclosed as Appendix-I. This list shows equipment for all 4 Lots (Lot 2 and Lot 3 are combined under Lot 2).

24.0 CIVIL ENGINEERING

Reference is made to the Codes of Practice and to the British Standards issued by the British Standards Institution and Conformity to COP or standards shall mean

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conformity to the latest edition published. In this connection following abbreviations are used.

BS - British Standard Specifications.

ES - Ethiopian Standard Specifications.

Wherever the Ethiopian Standards on a particular subject are available, they will govern in place of the concerned British Standards.

Reference is made for Technical Specification in this connection the following abbreviations is used.

BATCODA - Building and Transport Construction Design Authority

The bidders are advised to purchase such Ethiopian Standards/codes.

The Contractor shall furnish all skilled & unskilled labour, plant, equipment, materials etc. required for complete execution of the work in accordance with the drawings enclosed in Volume II under section VI-K and as described herein and/or as directed by the Engineer.

24.1 Specification for Earthwork & Concrete.

24.1.1 Excavation

The places where excavation is required or directed to be done, shall be cleared of all shrubs, weeds, grass and vegetation including roots, where necessary and if so directed, the excavated earth must be deposited in layers of 150-mms and the clods should be broken.

In the case of soft rock and hard rock, if required by the Employer, the excavated stuff shall be properly stacked or disposed of in places as directed.

Excavation in hard rock: Rock which is in solid beds, which can be removed only by blasting or by wedging or chiselling, shall be treated as hard rock. A boulder or detached rock measuring one cubic metre or more, shall also be treated as hard rock if the same cannot be removed without blasting, wedging or chiselling. Where hard rock is met and blasting operations are considered necessary, the CONTRACTOR shall intimate the Employer. The CONTRACTOR shall obtain license from concerned authorities for carrying out blasting work as well as for transporting and storing explosives.

The blasting operations shall be carried out only under the supervision of a responsible licensed operator of the CONTRACTOR during certain specified hours, as approved in writing by the Employer. The operator shall be conversant with the rules of blasting. The operator should have the valid blasting licence.

Where blasting is not practicable or prohibited, excavation shall be done by wedging or chiselling and it shall be restricted to the quantity required to enable the necessary

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foundation etc. to be constructed. In case, the dimension of trenches exceed those shown in drawings the excess quantity shall not be paid for.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.2 Filling.

24.2.1 Fill Material

Fill materials required for fill and back fill shall be subject to the approval of the Employer and it shall be hard from all soft or spongy materials. Clods or rocks over 200-mm in size shall be placed in the upper 150-mm portion of the fill. Fill under floors, trenches and concrete beds shall be free of saltpetre, white ants, etc.

Cane Carrier, Diffuser and Cane Feeder area required filling for an approximate depth of 1.5m.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.2.2 Fill Compaction

The fill shall be spread in layers not exceeding 150-mms thick and each layer shall be watered and thoroughly consolidated with an eight/ten tonne roller. At locations where rolling is not possible, the filling shall be carried out in layers not exceeding 150-mms thick and each layer rammed with heavy rammer and thoroughly consolidated till the required level is reached. The fill shall then be flooded with water for atleast 24 hours, allowed to dry and then rammed and consolidated again. The finished surfaces shall be formed to correct lines, levels, slopes, shapes, paths, etc., Back filling around foundations, walls, etc., as described above and bringing grades upto either original ground level or as required by the drawings when different from original grades. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.2.3 Finish Grading

Finish grading shall be done with fertile top soil over those areas noted as on the plans. Depth of top soil shall be 150-mm minimum. Top soil shall be approved by the Employer before placement. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.2.4 Removal

Removal of excavated material includes the separation of the useful from the useless portion and depositing the former in regular heaps and removal of the latter as directed by the Employer. Surplus earth, if any, and useless soil shall be carted away anywhere in the site and deposited as directed by the Employer. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.3 Concrete Work

Cement Concrete - Plain and Reinforced

24.3.1 Cement

Cement shall comply in every respect with the requirement of the latest publication of Ethiopian Building code standard. No other make of cement than those approved by the Employer will be allowed for use in the work and the source of supply shall not be changed without the approval of the Employer in writing from the Employer.

Test certificates to show that the cement used fully complies with the relevant Ethiopian Standard Code specification shall be submitted to the Employer. Cement ordered for re-testing shall not be used for any work, pending results of re-test. Cement deteriorated and/or clotted shall not be used on work but shall be removed at once from the site. The cost of such deteriorated cement, as a result of its poor preservation, shall be debited to the account of the CONTRACTOR, to be recovered from their payment. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.3.2 Fine Aggregates

Sand shall conform to Ethiopian Building code standard. It shall pass through 3/16 B.S test sieve, leaving a residue not more than 5%. It shall be from a natural source or crushed stone screedings. It shall be washed if directed to reduce the percentage of deleterious substances to acceptable limits. Sand shall not contain any trace of salt if the sand contains any trace of salt the same shall be rejected. The fine aggregate for concrete shall be graded within limits as specified in Ethiopian Building code standard. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.3.3 Coarse Aggregates

Coarse aggregate shall conform to Ethiopian Building code standard. It shall consist of crushed or broken stone, 95% of which shall be retained on 4.75-mm in test sieve. It shall be obtained from crushed granite, trap, basalt or similar approved stones from approved quarry. Coarse aggregate shall be chemically inert when mixed with cement & shall be angular in shape and free from soft friable thin porous laminated or flaky pieces. It shall be free from dust and other foreign matter. Gravel/shingle of desired grading may be permitted as a substitute in part or full in plain cement concrete if the Employer is otherwise satisfied about the quality of aggregate. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.3.4 Water

Water used for mixing concrete shall be fresh, clean, and free from oil, salts, acids, alkali and shall be in accordance with Ethiopian Building code standard. The CONTRACTOR shall produce test results for approval by the Employer for the mixing of water proposed to be used on the job, before casting any concrete. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.3.5 Consistency

Quantity of water to be added during mixing shall take into consideration due allowance for the moisture content of aggregate and shall be sufficient enough to produce a mixture of the required workability to enable it to be well consolidated, to be worked into the corners of the shuttering and around the reinforcements to give the specified finish and specified strength.

24.3.6 Placing and Compacting of Concrete

Method of placing shall be such as to preclude segregation, and as far as practicable, the placing shall be continuous. Special care shall be taken in accordance with Ethiopian Building code standard / British Standard while laying concrete under extreme weather conditions. Concrete, during the operation of placing shall be thoroughly worked around the reinforcements, embedded fixtures, spaded against corners of the form work by pruning, rodding, or by any other approved means and thoroughly compacted by mechanical vibrators. The number and type of vibrator to be used shall be subject to the approval of the Employer, and in general immersion type vibrators shall be used. Consolidation by using immersion vibrator will be strictly in accordance with Ethiopian Building code standard /British Standard. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

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24.3.7 Admixtures

The use of admixtures may be allowed only if approved by the Employer and their decision in this regard shall be final.

24.3.8 Conveying

Concrete shall be conveyed from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of any of the ingredients. If segregation occurs during transport, the concrete shall be remixed before being placed. Normally, the time gap between mixing and consolidation in position, shall not be more than 30-minutes.

24.3.9 Curing:

All cement concrete after laying shall be protected from damages, till they set and shall be cured thereafter for not less than 10-days. The work shall be protected from drying by wind and direct sun rays by continuous wetting. Water used for curing shall be free from sediments of any kind and generally fit for drinking.

24.3.10 Construction Joints

Construction joints in exposed concrete work shall be made only where shown on the drawings or as directed by the Employer and shall be in accordance with the details shown or approved by the Employer. The procedure given in Ethiopian Building code standard/British standard shall be followed for general guidance.

24.3.11 Vertical Joints

Construction joints in concrete floors and walls of basement, water tanks or any other structures in contact with water or earth, shall be provided with PVC water stoppers of approved make coated on either side with hot asphalt. The longitudinal joints, in water stops, shall preferably be hot welded or overlapped at least 200-mm.

24.3.12 Strength of Ordinary Concrete

The CONTRACTOR have to see that proper materials are used and the proportion and the correct water cement ratio just sufficient for the workability are maintained to see that the following minimum strength of concrete are obtained.

To verify this, test cubes from the concrete used should be made and tested. The frequency of testing and the acceptability criteria will be according to Ethiopian Building code standard/British standard.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.3.13 Controlled Concrete

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Controlled concrete shall be taken to mean that there shall be full field control of predetermined grading of all aggregates that go into concrete and predetermined proportion of coarse aggregate, fine aggregate, cement and water for the required strength. Strength shall mean the acceptable field strength after 28-days of curing on the tests conducted on cubes from concrete taken during concreting, in the manner set forth in Ethiopian Building code standard / British standard. Where difficulty is likely to be encountered in placing and compacting the concrete and where there is crowding of reinforcements, a suitable separate mix is to be designed for the required strength and used without extra cost to the Employers. The design of mix with such workability should be furnished to the Employer beforehand for their approval.

24.3.14 Defective Concrete Work

If the results of load test or core test on any concrete structure found unsatisfactory or unacceptable, the concrete work and the structure shall be removed and redone by the Contractor at his own risk and cost as instructed by Engineer.

24.3.15 Quality Control

All the concrete work shall be true to level, plumb and square within the acceptable tolerance. The corners, edges, and arises in all cases shall be unbroken and finished properly and carefully.

24.3.16 Pre-cast Concrete

All pre-cast concrete shall be cast over vibrating tables or by using form vibrators. The concrete mix shall conform in all respects to "Controlled Concrete", described in the appropriate paragraph under this section. Exposed surfaces of pre-cast members shall be finished as called for on the drawings.

24.3.17 Equipment Foundation

The CONTRACTOR shall provide concrete foundations for the various equipment in accordance with the drawings. All concrete for equipment foundations shall be of specified grade as per drawing. Bolts, inserts and other anchoring features shall be left in their correctly assigned position to templates prepared for this purpose at the time of casting. It is essential that the Engineer who is in-charge of the construction of all concrete work, whether plain or reinforced shall be well experienced in this class of work and shall superintend personally the whole construction and pay special attention to:

- a) Quality Control in respect of selection of materials, proportioning & mixing, etc.
- b) Placing and consolidation of concrete.
- c) Accuracy in cutting, bending, placing and binding of reinforcement.
- d) Accuracy in fabrication, assembly and erection of form work.
- e) Casting, handling, transportation and erection of pre-cast members.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.4 Specification for Concrete formwork & Centering

Form work shall be rigidly constructed of Boards as per Ethiopian Building Code Standard/ British standard. Shuttering faces in contact with the concrete shall be free from adhering grout, projecting nails, splits or other defects that are likely to mar the concrete surface. The shuttering shall be erected on battens, beams and steel props properly cross braced so as to make the form work rigid.

Form work shall be erected true to line and levels and to the required shapes as called for and shall be able to carry without deformation the full weight of the wet concrete and live loads. It shall also withstand the effect of vibration without deflection, bulging, distortion or loosening of its component parts. The completed form work shall also be subject to the approval by the Employer before placement of reinforcement. CONTRACTOR shall be responsible for the adequacy of all form work, centring and moulds. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.4.1 Surface Treatment of Shuttering

The surfaces of shuttering coming into contact with concrete shall have plastic coating of approved make. The shuttering shall be thoroughly cleaned and coated before each use.

24.4.2 Removal of Form Work

All form work shall be removed without shock or vibration and shall be eased off carefully in order to allow the structure to take up its load gradually. The tolerances of shuttering and stripping time will be as set forth in Ethiopian Building code standard / British standard.

24.5 Reinforcement.

Steel reinforcement shall be deformed bars of grade conforming to Ethiopian Building code standard / British standard or as called for on the drawings. Bars shall be free from deleterious materials, mill scale, loose rust, oil or paint. Fabrication shall be accurately done to the dimensions, spacing and ensuring minimum cover as called for on structural drawings.

Unless otherwise shown or specified in the drawings, all bars are to be lapped by 50-times the diameter of bar. Not more than 33% (thirty three percent) of the bars shall have lapped joints at the same location. Only where specifically shown on the drawings, reinforcement shall have welded joints. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.6 Masonry work.

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Size stones shall be of hard granite, basalt or trap stone obtainable from approved quarry. The stones shall be clean and wetted before they are used. Bond or through stones shall be provided not exceeding 2.0 m apart in each course and shall be staggered. Bond stone shall be from the front to the back of the walls. The interior or filling shall be with flat bedded stones laid in mortar. Chips, spalls shall be used to avoid thick mortar joints and shall not exceed 10% of the quantity of stone masonry. Care is to be taken that no dry work or hollow spaces shall be left any where in the masonry.

24.6.1 Rough Dressed Stone Wall Facing:

Unless given in detail drawings, rough dressed stone walls shall be built in stone sizes of not less than 300mm high per-course and 400mm wide per stone. The joints of the fair chiselled natural stones shall be finished slightly proud and cleaned off flush at completion.

The joinery shall be raked out to a depth of approximately 15mm as the work proceeds and prepared for painting.

24.6.2 Dressed Stone Wall Facing:

The pattern, type and size of the stone units and the pattern of laying and bonding for dressed stone walls shall be as detailed on drawings.

The joints of dressed stone walls shall be finished slightly proud and cleaned off flush at completion.

The joints shall be raked out to an approximate depth of 15mm as the work proceeds and prepared for pointing.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.6.3 Brick Work:

All brick work should be carried out as shown on the drawings with set backs, projections, cuttings, toothing etc. Brick work shall be kept wet while in progress still mortar has properly set.

Samples of each type of brick taken at random from the load shall be shown to the Employer for their approval before being used in the work. All subsequent deliveries shall be up to the standard of the sample approved.

All junctions of walls and cross walls shall be carefully bonded into the main walls. Greater heights may be built only if permitted by the Employer.

During rains, the work shall be carefully covered to prevent mortar from being washed away, if any mortar or cement be washed away, the work shall be removed and rebuilt at the CONTRACTOR expense.

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For detailed specification refer to the document prepared and issued by BATCODA, 1990.

Sub-Grade Brick Walls:

Sub-grade brick walls shall be built in least porosity and high strength solid bricks only.

Only cement mortar shall be used for sub-grade brick work.

Above Grade Brickwork:

Above grade walls shall be built in bricks selected for their edge and straightness. Above grade walls shall be built in cement or comp-mortar as indicated on drawings or specified in the bill of quantities.

Above grade face walls shall be built in bricks selected for their strength, straightness, uniformity in colour and texture.

The horizontal and vertical joints of brick walls shall be raked out to form adequate key to receive further finish.

The horizontal and vertical joints of brick facing walls shall be raked out to a minimum depth of 10mm and prepared for cement pointing.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.6.4 Concrete Block Works:

The mortar for block walling shall have a maximum thickness of 15mm and shall be evenly distributed between vertical and horizontal joints of blocks.

Sub Grade Block Works:

Sub-grade block works shall be built in class AA hollow block walls or class AA solid block walls and cement mortar only.

Above Grade Walls:

Walls above grade shall be built in blocks of the class and cement or compo-mortar as indicated on drawings or in the bill of quantities. Walls shall be built with selected blocks. The horizontal and vertical joints of blocks shall be raked out to a minimum depth of 10mm and prepared for cement pointing.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.7 Specification for plastering work.

24.7.1 General

The CONTRACTOR shall furnish all materials, labour, scaffolding equipment tools & plants and incidentals necessary and required for the completion of all plaster and wall finishes, subject to approval by Employer.

Plaster as herein specified shall be applied to all internal and external surfaces where called for. Glazed tile dado, terrazzo dado and other wall finishes shall be provided where indicated on drawings and schedule of finishes. All plaster work and other wall finishes shall be executed by skilled workmen in a workmanlike manner and shall be of the best workmanship and in strict accordance with the dimensions on drawings subject to the approval of the Employer.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.7.2 Plaster Work

The primary requirement of plaster work shall be to provide absolutely water tight enclosure, dense, smooth and hard and devoid of any cracks on the interior and/or exterior. All plastering shall be finished to true plane, without any imperfections and shall be square with adjoining work and form proper foundation for finishing materials such as paint etc. Masonry and concrete surfaces which call for applications of plaster shall be clean, free from efflorescence, damp and sufficiently rough and keyed to ensure proper bond, subject to the approval of the Employer.

24.7.3 Materials

Cement	:	As specified under concrete work
water	:	As specified under concrete work
Sand	:	For internal plaster with fine sand
Water Proofing Compound	:	Confirming to Ethiopian Building code / British standard.

24.7.4 Plaster to Walls

Plaster to internal faces and external surfaces wall shall be as per Ethiopian Standard Specification/British standard.

24.7.5 Mortar Mixing

Mortar shall be prepared as specified under 'brick work'. It shall be made in small quantities, as required and applied within 15 minutes of mixing.

24.7.6 Curing

Finished plaster shall be kept wet for atleast 10 days after completion. In hot weather, walls exposed to such shall be screened with matting kept constantly wet or by any other approved means.

24.7.7 Cement Mortar

Cement mortar shall be of proportions specified for each type of work. It shall be composed of cement and sand complying with Ethiopian Standard Code / British standard. The ingredients shall be accurately gauged and shall be evenly mixed together in a mechanical mixer.

24.8 Flooring work.

Before the operation for laying any floor is started, the surface of base concrete shall be thoroughly cleaned of all dirt, loose particles, caked mortar droppings, by scrubbing with coir or steel wire brushes. The surface shall then be cleaned with water and kept wet for 12 hours and surplus water shall be removed by mopping before the topping is laid.

For Bagasse Storage Yard 150mm rubble soling to be laid below concrete for vehicular movement.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.8.1 Granolithic Flooring:

The flooring shall be of specified thickness and shall consist of concrete base as specified and 6mm to 10mm thick granolithic wearing coat. The granolithic flooring shall be laid in alternate panels. The size of panels shall be as decided by the Employer.

Glass strip of 5mm thick x 50mm or equal to thickness of floor concrete to be used for panels of floors.

Floor Hardeners and Admixtures:

Floor hardeners or any other admixtures complying with Ethiopian Standard code/ British standard are to be added to the flooring concrete. The process and application are to be strictly as per the manufactures specification.

24.8.2 Terrazzo Tile Flooring (Marble Mosaic Tile):

The tiles shall conform to Ethiopian Building code standard/British standard having the colour and chips approved by the Employer. The minimum topping of lighter shade tiles shall be made of two parts of marble or granite chipping from an approved quarry and one part cement. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

Marble Work:

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Marble shall be hard, sound, dense and homogeneous in texture with crystalline and coarse grains. It shall be free from stains, cracks, decay and weathering. The place of quarrying, colour and quality and thickness should be as specified. Every stone must be cut to required size and shape chisel dressed on all beds and joints so as to be free from waviness and to give truly vertical, horizontal, radial and circular joints as required. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.8.3 Cement Tile Flooring:

Cement tiles shall conform to Ethiopian Building code standard / British standard. They shall be of the colour approved and conform to Ethiopian Building code standard / British standard. In other aspects the tiles will be set and polished as per Ethiopian Building code standard/ British standard. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.8.4 Glazed or Ceramic Tiles Flooring, Dado & Skirting:

Glazed or ceramic tiles from an approved manufacturer conforming to Ethiopian Building code standard /British standard shall be of specified size and thickness and colour. All specials viz. coves, internal and external angles, corners, beads etc. shall be used wherever directed. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.8.5 Insitu Mosaic Finish For Flooring, Dado & Skirting:

On a base coat of 12 mm thick cement mortar 1:4 proportion a top layer 10 mm thick consisting of marble chips upto 10 mm size of approved colour mixed with paste depending of the base colour required shall be laid and polished as required as per Ethiopian Building code standard /British standard.

For grey base Portland cement shall be mixed with marble powder in 3:1 proportion. And this shall be added marble chips of approved colour and size in proportion of 4 of cement marble powder and 7 of marble chips and thoroughly mixed by adding water gradually to have a uniform plastic mix.

For base other than grey, white cement will be used in place of grey cement with necessary approved pigment of permanent colour shall be used to get the necessary shade.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.9 Painting work.

The specification covers the various types of painting and finishing of all surfaces throughout the interior and exterior of the building. The number of coats required in

various situations and also the types of finish required for the several items of work such as cement based paint, plastic emulsion paint, oil bound distemper etc., are specified in the schedule of quantities and specification. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.9.1 Material

The paint shall generally conform to the chemical composition and other characteristics laid down in the relevant Ethiopian Building code standard/ British standard specification.

The entire materials required for painting work shall be obtained direct from approved manufacturers or their authorised agents and brought to site in original manufacturer's containers with seals unbroken. The manner of taking measurements will be in accordance with Ethiopian Building code standard / British standard.

24.9.2 Synthetic Enamel Paint, Plastic Paints, Oil Paints

Providing two coats of synthetic enamel paint of a approved make colour over one coat of primer on plastered surfaces, wooden surfaces and steel surfaces. Primers to be used shall be according to the manufacturers specification and it should confirm to their relevant Ethiopian Building code standard / British standard.

24.10 Carpentry and Joinery work.

Provide all carpentry and joinery timber, laminated panels, fixing devices paints, posts, glue and other material necessary for a complete and satisfactory fabrication and installation of carpentry and joinery work.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.10.1 Glazing

Provide all necessary glazing, putty, beads, clips, fixing devices and labour required for the satisfactory performance of the work.

Glass shall generally be free from bubbles, specks and other imperfection.

Types: Transparent glass
Sheet glass
Figured glass
Opal glass
Wired glass.
Glass Blocks
Polished plate glass for mirror.

For detailed specification refer to the document prepared and issued by BATCODA, 1990

24.11 Specification for External Sanitary Work.

24.11.1 Manholes, Vent Shaft, Gully Chamber Etc.

Size of manholes: The size specified in the drawing of Quantities shall be internal size of the manhole. Manholes shall be in pre-cast concrete C-20 quality, brick or Class A hollow brickwork. The work shall be done strictly as per standard drawing and following specification.

Bed concrete	:	Shall be in C 20 cement concrete 150mm thick.
Brickwork	:	Shall be with locally available best quality table moulded bricks in 1: 4 cement mortar.
Plaster	:	Inside of the walls shall be plastered with cement plaster and finished with a floating coat of neat cement.
Manhole covers	:	Manhole covers shall be of tough homogeneous cast iron of heavy or light type as specified. The sizes specified are the clear internal dimensions. The work shall be done strictly as per standard drawing and following specification.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.11.2 C.I. Soil, Waste and Vent Pipes and Fittings

C.I. Pipes and fittings: Cast iron soil, waste and vent pipes and fittings shall be of heavy quality conforming to Ethiopian Building code standard/ British standard for spun pipes which is preferred to sand cast soil pipes conforming to Ethiopian Building code standard/ British standard.

The work shall be done strictly as per standard drawing and following specification.

24.11.3 Sluice Valves, Fire Hydrants and Masonry Chambers

Sluice valves: The valve shall be of the specified size and shall be of approved quality.

The valves shall work easily and smoothly under all conditions and shall be watertight when closed under the working pressure as stipulated as in the relevant Ethiopian standard code specification/ British standard.

The diameter of the water way, when the valve is fully opened shall not be less than the diameter of the pipe.

24.11.4 Appurtenances

The other appurtenances of the pipe line are mentioned below:

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Air valves: These are placed at every summit in the pipe line to permit the escape of air when the main is filled, and afterwards air if any is carried into the main (they are also placed on long stretches of nearly level main).

Scour valves: These are placed at the bottom of all depressions for emptying the main or letting out sediment.

Reflux valves: These are fixed on the ascending parts of the main which open in the direction of flow, but automatically close if a burst occurs and the water flows back. They diminish the damage done by the escape of water at a burst.

Safety or relief valves: These are fixed at the down stream ends of long lengths of mains or where water hammer may take place so as to reduce to the normal any excessive pressure that may occur.

Fire hydrants: These shall be of approved design and be fixed as shown on the drawings and as per Employer direction. The cost of hydrant shall include cost of valve and masonry chamber as shown on the drawings with C.I. cover etc. complete with two coats of enamel paint over a coat of primer.

Water meter: It shall consist of meter, 'Y' strainer and other accessories shall be fixed as per the requirement of the Local Water Supply Authority. The cost of meter shall include the cost of testing and sealing by Municipal authorities and fixing including a masonry chamber as shown on the drawing, C.I. cover and locking arrangement complete as directed.

Manhole chambers and surface chambers for housing valves etc. shall be constructed as per standard drawings.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.12 Specification for Internal Sanitary Work.

24.12.1 General

Work Included: Provide all material, as indicated in the drawings and specified herein, labour equipment, tools, temporary supports, and related items required for the satisfactory installation of sanitary works.

Related Works: Earthwork, Concrete, Masonry, Finishing and other related works described elsewhere in this specification shall be considered as equally applicable to this section in so far as the work is related

24.12.2 Drainage (Internal / External)

UPVC (Unplasticised Poly Vinyl Chloride) pipes and fittings for solvent cement weld for foul and surface drainage shall comply with the requirement of BS 5481.

UPVC pipes and fittings for solvent cement weld for cold water with the requirement of BS 3505 and BS 4346, part 2 respectively. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.12.3 Testing

All joints shall be tested to a head of 600mm of water above the top or the highest pipe between the two manholes. Any joint found leaking or sweating shall be remade and taps and valves checked for satisfactory flow as per Ethiopian standard code/ British standard.

24.12.4 Hume Pipe Drains

Pipes: Shall be reinforced concrete or steel and conform to relevant Ethiopian standard code/ British code. They shall be new and perfectly sound, free from cracks, cylindrical, straight and of specified nominal diameter. Each pipe shall have one collar.

For all Steel/Cast iron underground piping necessary wrapping with tar felt coating to be given as per British / Ethiopian standards.

Trenches & refilling: Shall be as described under Earthwork specification.

Concreting: No concreting is ordinarily necessary. In cases where the soil is made up or is very soft, concreting may be resorted to as described under 'Stoneware pipe fittings' without any extra cost.

Laying & jointing: The pipe shall be laid as described under 'Pipes' by placing the collar centrally over the joint.

24.12.5 SANITARY INSTALLATION: Sanitary Fixtures

Ideal Standard Type W.C. Pans, Orrisa Type Pans:

The W.C. pan shall be of white vitreous china, of specified size and pattern complying with BS 5503,977. Pan shall be of approved quality and shall bear the mark of the firm manufacturing it. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

Painting: All fittings and fixtures shall be painted with two coats of enamel paint over a coat of primer.

Angle valve: The cistern shall be fed with 15 mm. (1/2") C. P. (Chromium plated) brass inlet tube angle valve of approved make with necessary length of lead inlet pipe complete with C. P. brass unions unless otherwise specified in the Schedule of Quantities.

The main and distribution pipe fittings and clamps shall be of C. P. brass unless otherwise specified in the Schedule of Quantities. Distribution pipes shall feed the urinals with C. P. brass spreaders of approved make.

Painting: All brackets etc. shall be painted with two coats of enamel paint over a coat of primer.

24.12.6 Lavatory Basin

Fittings: Each lavatory basin shall be provided with a single cold water C. P. brass pillar tap of approved design and make, C. P. brass waste, C. P. brass chain and rubber plug, C. P. brass bottle trap of approved quality and design, with C. P. brass stop cock and water inlet pipe of standard length complete.

Painting: All brackets, pipes etc. shall be painted with two coats enamel paint over a coat of primer.

24.12.7 Sinks

Fittings: Each sink shall be provided with 40 mm. (1.5") C. P. brass waste of approved pattern with C. P. brass chain and 40 mm. rubber plugs and 40 mm. dia. C. P. brass trap and union which shall be connected to 40 mm. diameter waste pipes.

Waste pipe beyond the trap shall be measured separately and paid under appropriate item. Where specified, sinks shall be provided with puff pipe with a brass perforated screw cap.

Painting: All fittings, brackets and pipes shall be painted with two coats of enamel paint over a coat of primer.

24.12.8 Toilet Requisites

Mirrors, Glass Shelf, Towel Rail, Toilet Paper Holder:

All the fittings should comply with Ethiopian standard / British standard specification. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.13 Specification for Internal Water Supply.

24.13.1 Galvanized Steel Pipes & Fittings

Distribution pipe of potable water, internal and external installation shall generally comply with the requirements of BS 1387, medium gauge, having plain or threaded ends to BS 21.

Galvanized steel pipe fittings shall comply to BS 21.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.14 Specification for Steel & Aluminium Work.

Steel products shall be manufactured in grade of steel complying with the requirements of BS 4360 and BS 6363.

Steel products shall be one of the following as specified by the Engineer or that exceeding this standard.

Black steel to be primed during fabrication and surface treated after installation.
Hot dip galvanised steel complying with the requirement of BS 729.

Pre-coated steel profiles, the coating of which satisfies the requirements of BS 2569 for the protection of the material against atmospheric corrosion.

The coating shall also satisfy colour and texture requirements as required by the Engineer. For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.14.1 Steel Window, Doors and Ventilators

All metal work shall be free from defects, impairing strength, durability and appearance and shall be of the best quality for purposes specified made with structural properties to withstand safely, strains, stresses to which they shall normally be subjected.

Casement doors & windows shall be side, bottom or top hinged produced from any one of the following:

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- Galvanised steel profiles.
- Black or pre-painted mild steel profiles.
- Extruded aluminium profiles.

Sliding glass doors and windows shall be fabricated from extruded aluminium profiles and stainless steel tracks. Fixed and sliding interlocks shall be water tight and weather stripped.

Heavy duty sliding door shall be built in profiles produced from steel sections as per BS 4360.

All the size and details are as shown on drawings or other documents.

All steel frames and other steel members shall be enamel painted as provided under "PAINTING" after the installation of the shutters, glazing, etc.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.14.1 Aluminium Doors, Windows, Ventilators Etc.

All sectional details refer to the document prepared and issued by BATCODA, 1990. These shall be fabricated as per the detailed drawings. Frames for windows, ventilators etc. shall be square and flat. Both fixed and open able frames shall be constructed of sections which have been cut to length, mitred and welded at corners, sub-dividing bars shall be tenoned and riveted into the frames. All frames shall have corners fixed to a true right angle. For side hung shutters, hinges normally be of projecting type made of aluminium alloy and riveted/welded to frames and shall have stainless steel pins, handles, peg stays etc. shall be of approved quality aluminium or its alloy conforming to Ethiopian code of specification/ British standard.

Before erecting, the frame coming in contact with the concrete, masonry, plaster or dissimilar metals shall be coated with a coat of zinc chromate conforming to Ethiopian code of specification. The CONTRACTOR shall cover the work with transparent lacquer based on methacrylates or cellulose butyrate to protect the surface from wet cement during installation. This coating shall be removed on completion. Before handing over, the aluminium work shall be washed with mild solution of non-alkali soap and water.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.15 Structural Steel Work.

24.15.1 General

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This specification covers the supply, fabrication, transportation to site and erection on prepared foundations, structural steel work consisting of beams, columns vertical trusses, bracing shear connections etc. Fabrication, erection and approval of steel structures shall be in compliance with Ethiopian Building code standard / British standard. Provide shop primer coat for steel structures. Grouting complete satisfaction of the Engineer-in-charge/ Employer.

Fabrication drawings shall include the following:

All drawings should be prepared as per Ethiopian Building code standard / British standard practise for general engineering drawings.

- Member sizes and details.
- Types and dimensions of welds and bolts.
- Shapes and sizes of edge preparation for welding
- Details of shop & field joints, splices including subassemblies

24.15.2 Materials

Comply with the following standards, or equivalent:

Welded cold formed steel structure hollow sections	BS6363 or equivalent.
Weldable structure steels	BS4360 or equivalent
Structural use of steel in buildings	BS5950 or equivalent
Electrodes for manual metal arc welding	BS639 or equivalent
Black hexagonal bolts, screws and nuts	BS4190 or equivalent
Metal arc welding of carbon manganese steels	BS4620 or equivalent

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.15.3 Fabrication

Fabrication shall be in accordance with the requirements of BS 5950 standard in addition to the following:-

Fabrication shall be done as per approved fabrication drawings adhering strictly to work points and work lines on the same. The connections shall be welded or bolted as per design drawing. The work shall also include fabricating built up sections.

Any defective material used shall be replaced by the CONTRACTOR at his own expenses, care being taken to prevent any damage to the structure during removal.

All the fabricated and delivered items shall be suitably packed to be protected from any damage during transportation and handling. Any damage caused at any time shall be made good by the CONTRACTOR at his own cost. Any faulty fabrication pointed out at any stage of work shall be made good by the CONTRACTOR at his own cost.

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For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.15.4 Grouting Of Pockets

Grouting of pockets and under base plates will be done only after the steel work has been levelled and plumbed and the bases of stanchions are supported by steel shims. The space below the base plate and pockets shall be thoroughly cleaned.

24.16 Roof and Side covering by sheets

Comply with the following standards

Galvanised plain sheets	ESC.D7.001 or equivalent
Galvanised corrugated sheets	ESC.D7.026 or equivalent
Asbestos cement sheets	ESC.D3.501 or equivalent
Steel wire nails	ESG.B4.120 or equivalent
Corrugated aluminium sheet for general purposes	BS 2855 or equivalent
Wrought aluminium and aluminium alloys sheet and strip	BS1470 or equivalent
Aluminium fixing accessories	BS 2465 or equivalent
Fixing accessories for building purposes	BS 1490 or equivalent
Galvanized EGA 500 sheets	BS or Equivalent

Size of corrugation shall be 10/75 mm confirming to Ethiopian Building code/ British standard sheet of 20 gauges.

Ridging, flashing, capping, gable and corners shall be with plain G.I sheets of 18 G.

All fixing accessories be of galvanised sheet and shall confirm to Ethiopian Building code standard/British standard with bitumen washer of approved quality.

Fixing of roof sheet shall be of 10 mm diameter and side sheeting with 8mm diameter G.I hook bolts.

All bolts shall pass through the crown of corrugation and shall be provided with limped or diamond washer, round washer over bitumen felt washer and square nuts.

All washers, nuts and bolts shall be galvanised.

All sheets shall be stitched together with 6 mm G.I.

In case of gable side steel lap, the purlin shall be staggered between alternate crown, and the G.I sheet washer and round washer shall be provided under screw head which shall be always on the out side of building.

For detailed specification refer to the document prepared and issued by BATGODA, 1990.

24.17 Anti-termite Treatment.

All the buildings shall be adequately protected against attack by subterranean termites by suitable chemical treatment measures. The work shall be carried out by a specialist pest control agency approved by the Employer. The work to be carried out by the specialist firm shall carry a guarantee for the satisfactory performance of the treatment for a minimum period of ten (10) years.

The treatment shall be carried out generally in accordance with the stipulations laid down by Ethiopian Building code standard/ British standard subject to the minimum requirements given in this specification.

24.17.1 Minimum Specification

The earth filling immediately under the stone soling (under floors) bottom and side fills of all foundations (excepting foundations) and soil along external perimeter of all buildings shall be chemically treated against termites. The chemicals to be used for the treatment shall be dieldrin, aldrin, heptachlor or chlordane conforming to the requirement and concentration laid down in Ethiopian Building code standard / British standard.

24.17.2 Application

The chemical solution shall be prepared by mixing the chemical with the appropriate quantity of water to obtain a chemical emulsion of the correct concentration as stipulated above. The prepared emulsion shall be applied as described below:

24.17.3 Column Pits, Wall Trenches, Etc.

The bottom surface and sides of the excavations (upto a height of 300 mm. from the bottom) made for column foundations, wall foundations etc. (excepting RCC foundations) shall be treated with the chemical emulsion at the rate of 5 litres per m² of surface area.

24.17.4 Treatment to Back-Fill

After the column foundations, wall foundations etc. come up the back fill in immediate contact with the foundation structure shall be treated at the rate of 15 litres per m² of the surface of the substructure for each side. If water is used for ramming operation is completely by roding earth at 150 mm. centres close to the wall face and spraying the chemical with the above doze. The earth is to be returned in layers and the treatment shall also be carried out in similar stages. The chemical emulsion shall be directed towards the masonry wall surfaces so that the earth in contact with these surfaces is well treated with the chemicals.

In the case of RCC walls and columns, the treatment shall start at the depth of 500 mm. below natural ground level. From this depth the back fill around the RCC columns, walls etc. shall be treated at the rate of 15 litres per m² of the surface.

24.17.5 Top Surface of Plinth Filling

The top surface of the plinth fill (just below the stone soling) shall be treated with chemical emulsion at the rate of 5 litres per m² of the surface before the stone laid. If the filled earth has been well consolidated and does not permit the emulsion to seep through, holes upto 50 to 75 mm deep at 150 mm centres both ways may be made with cowbars to facilitate saturation of the soil with the chemical emulsion.

24.17.6 Junction of Wall and Floor

A channel of size 30 x 30 mm shall be made at all the junctions of walls and columns with the floor (before laying the soling) and rod holes made in the channel upto the ground level at 150 mm. centres. The solution is poured into the channel at the rate of 15 litres per m² of the vertical surface and allowed to soak through the holes fully so that the soil in contact with the chemical. The soil shall be tamped back into the channel and consolidation to original conditions.

24.17.7 External Perimeter of Building

After the building is complete, holes shall be made along the external perimeter of the building at intervals 150 mm and depths of 300mm and the emulsion shall be allowed to soak through these holes fully at the rate of 5 litres per running meter of the perimeter wall.

24.17.8 Soil Surrounding Pipes

Wherever any service pipes enter the soil inside the area of the foundation of any building, the soil surrounding the point of entry of each pipe at the foundation, floor etc. shall be fully soaked with the chemical solution for a distance of atleast one meter from the point of such entry.

24.17.9 Spraying Equipment

To facilitate proper penetration of the chemical into the soil, a pressure pump of adequate capacity and sprayers shall be employed to apply the solution.

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24.18 Fencing

Fencing shall be built in stone, brick, block masonry and in-situ or pre-cast concrete, metal, steel profiles, timber or combinations of any of the following material.

Wire Fences; Wire fences shall be built – in galvanized steel wire mesh (chain link), plain wires, barbed wires as detailed on drawings.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.19 Specification for Road Work.

The Specifications in the earthwork, masonry & concrete sections shall be equally applicable to works under this section.

The bidder shall follow the overall design of cane traffic and cane yard inside factory area as per drawing titled Factory Site Plan and Layout of Mill, Boiler and Bagasse handling, Drg. Nos. 4LO-FSF-001 & 4LO-FSL-002 and design accordingly.

The main cane traffic roads shall be Asphalted of suitable width and form (profile) to ensure a strong wearing surface and proper drainage during adverse climatic conditions. The balance of the cane yard shall be of compacted Gravel construction.

The existing external roads and cane yard entry access are to be retained for the expansion project.

24.19.1 Tools

The CONTRACTOR shall furnish maintain and operate at their expenses all equipment, tools and machinery which are necessary for the proper execution of work on a scale that is adequate to ensure satisfactory rate of progress as specified in the contract

Plant and machinery used on the work shall be designed and constructed in accordance with the general practice for such equipment and shall be of sufficient capacity and of such character to ensure the production of sufficient material to carry the work to completion within the stipulated period.

24.19.2 Sub-Grade

The sub-grade formed and completed shall conform to the true line grade and cross sections shown in the plan and as per specification set forth for each type or surfacing road work. The CONTRACTOR shall examine the existing level & arrive at the necessary excavation required for forming the sub-grade as per specification set forth for the different type of surfacing or road work.

Effective surface drainage of the sub-grade shall be maintained during the construction of the base or surface coat.

24.19.3 Granular Sub-Base Course

The hard core or soling should consist of sound and uniform quality material (basalt or other sound stones) approved by the Employer conforming to Ethiopian standard code/ British standard.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.19.4 Drainage Channel

Drainage Channel shall be constructed accordingly so that water has to flow freely. Drainage shall be complete including compaction & shaping. The drainages shall be provided all around the buildings and side of the roads with necessary slope and it shall be connected to the nearest point of the existing main drain.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.19.5 Gravel Wearing Course

Gravel Wearing course is the top surfacing course made from naturally occurring or crushed gravel and shall be applied to road formation where no concrete or bitumen surfacing is to be applied.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.19.6 Asphalt Paving

Sub-Grade:

The finished section shall conform to the trench section to receive 75 mm thickness of gravel base, or specified thickness of hard core or both depending on the nature of soil. The edge shall be trimmed to a plane perpendicular to the cross section so as to permit the placing of material with a definite edge on the described alignment.

Granular Sub-Base Course:

The hard core or soling should consist of sound and uniform quality material approved by the Employer conforming to Ethiopian standard code/ Building standard.

Base Course:

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The base course shall be in penetration macadam course of 70mm thickness placing 40-70mm rise crushed gravel laid on sub-base/ hard-core. Compact by using 8 passes of a 12 ton roller and adjust final level with \pm 10mm.

The surface shall be treated with AC- 85/100 or other specified hot bitumen at the rate shown in drawings or schedules. The surface, shall while hot, be covered with 8-12mm crushed gravel and rolled unit until gravel is firm in position and no movement is noticed under the roller.

Surface Course:

The surface course to be applied after 10 days (during the time when base-course is open to traffic) shall consist of a 20mm wearing course applied as follows:

Apply hot bitumen as specified at the rate shown in the drawing schedule and spread evenly.

The surface shall, while hot be covered with stone chipping of 8 – 12mm and rolled thoroughly. Check road level for uniformity.

A fine spray of AC-180/200 or other specified shall be applied at the rate shown in drawings or schedules and covered with 3-5mm stone chipping and rolled with a 10-16 ton roller for a minimum pass of 4 times.

The final level shall be checked for required accuracy.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.19.7 Maintenance

The CONTRACTOR shall maintain the surfacing in proper repair for three months after completion by their own expense, whatever additional materials, labour and equipment and incidental that may be necessary for the purpose and shall leave it in a perfectly satisfactory condition, so that the surface shall be true to the specified line, grade and cross section perfectly even and compact. The unit price paid for the consolidation shall be inclusive of such maintenance and should the CONTRACTOR fail to comply with the requirement of this clause in any respect, the Employer shall have power to maintain the road satisfactorily and to make such deduction from the amounts withheld from the CONTRACTOR bill as deemed proper and reasonable.

24.19.8 Marking Edge Lines

Edges lines are intended to guide the workmen in scarifying the surface and spreading metal to the correct width of carriage way and alignment of road. The edge of the existing surface may not always indicate the correct width of proposed surfacing be evenly laid out about the centre line of the road using a set of three ranging rod for the purpose in straight reaches. The edge line shall be marked by string and pegs as well as by scoring a line with a pack.

24.19.9 Scarifying

When the surface is still in a moist condition it shall be systematically disrupted by means of pick axes or sacrifices and the resulting ballast shall be removed and deposited uniformly along the shoulders and adjacent to the carriage way or as directed by the Engineer.

The exposed surface shall then be scarified again at higher spots in order to ensure proper camber and grade and the ballast shall be scraped up and disposed off as stated above. The exposed surface at this stage shall conform to a neat trench section with sharp well defined edge and conforming to the specified camber and exact alignment. The entire operation of construction and materials shall conform to Ethiopian Building code standard / British standard.

In the case semi-grout work, while removing the ballast sufficient bogging shall be left in the scarified surface such that it will work up to about half the thickness of the compacted course.

24.19.10 Shoulders for Edge Support

Where the existing shoulders will not confine the new metal to be spread, shoulders to a width of 600 mm and along the edge of the carriage way shall be formed with ballast or stable soil from borrow pits, at places shown by the Employer or other specified material as directed by the Engineer/Employer. This shall be compacted with watering and rolling so as to conform to the finished level of the course at the edges. The inner edge of this shoulder adjacent to the metal shall be trimmed in continuation of the sides of the trench section formed by scarifying so as to enable the metal to be spread with definite edge on the correct alignment.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.

24.19.11 Landscaping

Land preparation and planting shall be executed at all times under the guidance of an experienced workman, who is thoroughly familiar with land preparation for gardening, plants and their method of planting and the maintenance at work completion.

For detailed specification refer to the document prepared and issued by BATCODA, 1990.