



**Republic of Iraq**



**United Nations Development  
Programme**

## **Vol.III- Bills of Quantities & Method of Measurements**

### **Al- Shifaa Medical Complex**

### **Oncology Building**

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# **METHOD OF MEASUREMENTS**



## **METHOD OF MEASUREMENT**

### **TABLE OF CONTENTS**

Introduction 1

DIVISION 2	SITE WORK GENERAL
DIVISION 3	CONCRETE
DIVISION 4	MASONRY
DIVISION 5	METALS
DIVISION 6	WOOD & PLASTIC
DIVISION 7	THERMAL & MOISTURE PROTECTION
DIVISION 8	DOORS AND WINDOWS
DIVISION 9	FINISHES
DIVISION 10	SPECIALITIES
DIVISION 15	MECHANICAL WORKS
DIVISION 16	ELECTRICAL WORKS

## **Civil and Architectural Works**

### **1. INTRODUCTION**

The rules contained in this Method of Measurement apply equally to both proposed and executed works.

The Bills of Quantities are to be read and construed in association and conjunction with the Drawings, Specification and this Method of Measurement.

Information that is given on the Drawings and/or in the Specification may be identified by cross-references included in the descriptions of work in the Bill of Quantities.

### **2. QUANTITIES**

- Work is measured net as fixed in position except where otherwise stated in a measurement rule applicable to the work.
- Dimensions used in calculating quantities are taken to the nearest 10 mm (i.e. 5 mm and over is regarded as 10 mm as and less than 5 mm is disregarded).
- Quantities are given to the nearest whole unit except that any quantity less than one unit is given as one unit.
- All Quantities in the bills of quantities were calculated for guidance only. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the contractor and verified by the Engineer and valued at the rates or prices quoted in the Bills of Quantities..

### **3. DESCRIPTIONS**

- Headings to groups of items in the Bill of Quantities are to be read as part of the descriptions of the items to which the headings apply.
- Dimensions are stated in descriptions generally in the sequence length, width and height. Where ambiguity could arise, the dimensions are identified.
- Unless otherwise specifically stated in the Bill of Quantities or herein, the following are deemed to be included with the rates of the items:
  - Labour and all costs in connection therewith.
  - Materials, products, goods and all costs in connection therewith
  - Contractor's equipment, including but not limited to construction plant, scaffolding, tools, vehicles and the like, and all costs in

- connection therewith.
- Assembling, fitting and fixing materials, products and goods in position.
- Any method of fixing, fixing to any nature of base or background including preparation and providing fixing materials,
- Breaking down for transport and installation and subsequent re-assembly of composite items manufactured off site.
- Waste of materials.
- Square, raking and curved cutting.
- Work at any location or height; work in small, isolated quantities.
- Protection of all work.
- Protection of all existing structures, utilities, site improvements, trees and vegetation, features, pavements, underground utilities and other facilities on and adjacent to the site, which are to remain upon completion of the work.
- All other enabling tasks, associated and subsidiary components and items of work, which are indicated or reasonably inferred from the Drawings and/or Specification, and necessary to perform and complete the work described.
- Establishment and overhead charges and profit.

Except where items are included in the Bill of Quantities and are priced separately by the Contractor therein, provision of the following are deemed to be included with all work:

- Site administration and security.
- Insurances.
- Bonds and guarantees.
- Water for the works.
- Temporary lighting & water source
- Septic tanks embedded under Pre-fab offices
- Furniture for offices including Split units with remotes printers, one lap top, kitchen and bathrooms
- All required Stationary, and the cost of monthly basis running cost
- Salary of Office boy covering the mobilization, construction and Post construction period including running cost of water for Drinking, Coffee & tea
- Water coolers
- Lighting and power for the works.
- Temporary accommodation for the use of the Contractor, the Engineer.
- Temporary telephones for the use of the Contractor and the Engineer, and the cost of calls.
- Temporary roads, hard standing, crossings and the like.
- Temporary fencing, hoardings, screens, fans, foot- ways, guardrails, gantries and the like.
- Giving notices and making applications, including the payment of fees and charges in connection therewith.

- Safety, health and welfare of workpeople.
- Compliance with traffic regulations.
- Maintenance of public and private roads, services and adjoining property.
- Control of noise and pollution, prevention of fire and compliance with  
all other statutory and general obligations.
- Removing rubbish, protective casings and coverings and cleaning the works on completion.
- Drying the works.
- Design, co-ordination, installation and as-built record and shop drawings and the like.
- Preparation and submittal of reports, records, certificates, notices, designs, details, calculations and other information and data required by the specification.
- Compliance with all other requirements, provisions and obligations contained in the Contract Documents, maintaining, adapting, clearing away and making good are deemed to be included with the items for temporary works

#### 4. UNITS OF MEASUREMENT AND ABBREVIATIONS

All units of measurement shall be based on the Metric System of weights and measurements except where other units are specifically mentioned for standard products.

The following symbols and abbreviations are used in this Method of Measurement and in the Bill of Quantities.

- USD (\$) American Dollar
- L.M Linear meter
- m Linear meter
- M.R Linear meter
- m<sup>2</sup> Square meter
- MS Square meter
- m<sup>3</sup> Cubic meter
- cm Centimeter
- mm Millimeter
- no Number
- No Number
- LS Lump Sum
- Kg Kilogram
- % Percentage
- dn Nominal diameter
- Qty Quantity
- Dwg Drawing
- MOM Method of Measurement
- PC Prime Cost
- PS Provisional Sum
- TON Ton
- Specs Specifications

## 5. DEFINITIONS

- Where items in the Bills of Quantities contain the phrase "**as specified/ as per**" the Contractor shall refer to the Specifications, the Drawings and other Contract Documents for the full description. The Contractor shall include in his rates for complying with this clause whether the phrase "**as specified**" appears in the text or not. The Bills of Quantities are to be read and construed in association and conjunction with the Drawings, Specification and this Method of Measurement. Information that is given on the Drawings and/or in the Specification may be identified by cross-references included in the descriptions of work in the Bill of Quantities.
- The term "**Site**" means the whole site area as defined on the Drawings.
- The terms "**including**", "**is included**", "**include for**" and similar words and phrases are used to indicate that the items in question are not measurable as separate items, are not specifically mentioned in descriptions but the costs of which are included in the measured items.
- The word "**Ditto**" means the repetition of all or part of the preceding items as applicable to complete the sense of the item.
- The term "**extra over**" means that the work so described involves extra cost over the basic work in which it occurs. No deduction of the quantity of basic work is made for the extra over work.
- The words "**Deliver**" or "**Store**" means materials to be delivered to the store(s) against the receipt to be issued by the Employer.
- "**Complete**": Means as indicated on the Drawings, required by the Specifications, required by manufacturer's written instructions, and indicated in the Method of Measurement.
- "**Optional Item(s)**" means an item (if any) which is specified in the Contract as an Optional Item, for the execution of any part of the Works, in which the Employer has the full right to omit this item(s) without being subjected to any financial, legal or contractual claims.
- The description contained in the Schedule of Rates and Bills of Quantities are not comprehensive and are for convenience only and the Contractor is to note that all relevant requirements of the Specifications, Drawings and other Contract Documents are to be taken into account in the measured items.

## 6. MOCK UPS

Mock ups and/or Field samples are not measured as separate items under respective trade or element in which they occur and deemed to be included with respective price.



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## 7. PROTECTION

The Contractor shall allow in his rates for protecting the work of all trades including the work of his Sub-contractors against damage by whatever method is deemed necessary during execution of the works until handing

over to the Employer. Any work damaged before the Works are handed over, is to be replaced or made good at the Contractor's expense and to the entire satisfaction of the Engineer.

## 8. Cleaning & Substantial certificate for the site

At the time of substantial completion, only incidental corrective Work and final cleaning, will be required beyond cleaning needed for the Owner's full use, may remain for final completion. The certificate of Final Completion shall similarly be prepared by the owner Representative and Engineer of Records and be issued to the Contractor when the Contractor's Work is complete and conforms to the requirements of the Contract Documents.

## 9. DELIVERY AND STORAGE

The Contractor shall allow in his rates for all materials to be supplied as an "Extra Stock" or "Spares" or all materials coming out of demolition operations and to be "Stored", for delivering such materials and storing in store(s) against the receipt to be issued by the Employer.

The rates shall include for all multiple handling and transportation.

## **DIVISION 2 -SITE WORK GENERAL**

### **1. DEMOLITION AND REMODELING**

1. Rates for demolition shall include for all works incidental and associated with the demolition works, removal of spoils and salvaged material from site and leaving work site clean, level and tidy.
2. Additions and alternation works are measured net. Rates shall include for all protection to existing adjoining works, finishes, and screening repair areas and for all works needed to hand over the adjoining works and surfaces in their original conditions to the satisfaction of the Engineer.
3. Including relocating, installing and connecting any impeded pipes, cables and connections raised during the demolition works.
4. All dismantled (salvaged) items must be delivered to the Employer and /or the owner.
5. If the owner wishes to take any of the materials/items from the existing site before demolishing, Tenderer shall hand over the selected material/item to the owner at the site location.

### **2. EARTHWORK**

#### **A. Excavation**

1. Excavation generally is measured in **cubic meters**. Excavation for foundations, tie beams and the like are measured separately. Excavation is measured from the existing average over site ground level or from excavated formation level as applicable or natural ground level.
2. All excavations are measured the net dimensions required for the work as shown on the Drawings and the Contractor must make whatever allowance he considers necessary in his rates for working space, for increase of bulk in the excavated materials, for earthwork support and also for the additional width of concrete and earth filling occasioned thereby. He must also make allowance for all increase in bulk in items of filling, removal, etc.

3. The rates for excavation shall include for:
  - a. Excavating in any type of ground whatsoever (including any value of bearing capacity given by tender documents or investigated by testing agency later) including rock and ground below normal ground water level and the use of any necessary plant.
  - b. Breaking out existing foundations and all other obstructions met with, during the progress of the Works.
  - c. Keeping the excavations free from sludge, loose and foreign matter, and of required for leveling, grading and ramming.
  - d. Unless measured separately, the returning, filling of previously excavated areas and consolidation of selected excavated material as required including all necessary spoil heaps and double handling.
  - e. Loading and carting away of surplus (suitable and unsuitable) excavated material as per the requirements of the Specifications.
  - f. Spreading, leveling and consolidating selected excavated materials to make up levels under floors including all spoil heaps and double handling.

#### **B. Filling**

1. Each kind of filling material is given separately.
2. Filling is given in **cubic meters** measured as equal to the void filled after compaction.
3. Sub-grade under asphalt concrete paving shall be given in square meters and to all required thicknesses.

#### **C. Rate of Filling shall include for:**

- a. Watering and compacting in layers as specified.
- b. Additional material necessary to make up levels.
- c. Multiple handling as necessary.
- d. 400mm +400mm thick bed (after compaction), under slab on grade & raft Foundation, Four layers compacted fill type A+B
- e. Temporary retaining boards.
- f. Hand-picking where required.

### **3. AGGREGATE BASE COURSE / SINGLE SIZE AGGREGATES**

#### **A. Measurement:**

1. Crushed Aggregate Base Course wherever required shall be measured by **cubic meters** of aggregate materials furnished, compacted crushed and screened.
2. Single size aggregates wherever required shall be measured by **cubic meter** or by **square meter** stating the thickness.
3. Fine sand wherever required shall be measured by **square meter** stating the thickness.

**B. The unit rate is deemed to include:**

1. Provision of aggregate from approved sources
2. Mixing Aggregate with water.
3. Laying, spreading and raking to correct levels, falls and cambers
4. Placed, spread, compacted and finished for base course.
5. Testing of materials as specified.

**4. PAVEMENT MARKING****A. Measurement**

1. Pavement Markings wherever required are to be measured in **linear meter** including gaps areas wherever occur.
2. Work should be conducted according to drawings and specifications.

**B. The unit rate is deemed to include:**

- Setting out.
- Extra work involved in patterned work and work in multi-colors.
- Work of any width, height and girth.
- Special and non-standard work.
- Finishing exposed edges.
- Cleaning, sealing, grinding and polishing including working overhead and working over and around obstruction.
- Temporary support.
- Shop drawings, samples and results.
- Protection.

**5. STONE CURBS****A. Measurements**

Precast Stone Curbs are measured nett length in place in **linear meter** mentioning set straight or occurred on plan.

**B. The unit rate is deemed to include:**

- Fairface concrete
- All short lengths.
- Cutting, waste materials.
- Cement mortar bed, joint fillers and sealants.
- Rate shall also include for concrete bed, haunching, excavation, painting and back filling where required.
- All formwork and its accessories for fairface concrete.
- All steel works needed according to drawings and specifications.

**6. UNIT PAVERS**

## A. Measurements

- Paving tiles are measured nett area in place in **square meters**.
- Cast in place concrete pavers are measured nett area in place in **square meters**.
- Interlocking concrete tiles is measured nett area in place in **square meters**.
- treads and risers, coping and the like are measured in **linear meter**.

## B. The unit rate is deemed to include:

- Laying paving tiles to falls and cross falls.
- Any type of setting beds.
- Forming joints between tiles.
- Grouting.
- Expansion tile strip.
- Cement mortar and fill.
- Complete the works, including control joints, separation joints, formwork and all as specified.

## 7. FENCES AND GATES

### A. Measurement

1. Hinged/sliding gates (if required) are **enumerated** stating the elevation dimensions.
2. Fences are measured in **Linear meter** stating the height of the fence.

### B. The unit rate is deemed to include:

1. Fabrication, all ends, welding, priming, painting, etc...
2. Hardware and accessories needed.
3. Assembling, bases, fitting and jointing component parts, bolts, nuts, holes, caps, brackets, anchors, pockets,
4. Grouting floor cover flanges, ground rail and wheels, cylindrical locks.

## 8. PARKING BUMPERS

### A. Measurement

1. Precast Concrete Parking Bumpers are **enumerated**.

### B. The unit rate is deemed to include:

1. Anchorage bolts, painting.
2. Steel reinforcement.
3. Fixation and all accessories as indicated and specified .

## 9. PLANTING SOIL

### A. Measurement

1. Planting soil is measured as stated in the Bill of Quantities.

**B. The unit rate is deemed to include:**

- Locating, Procuring.
- Stockpiling on site.
- Mixing of planting soil.
- Laying.
- Planting and ground covers.
- All as specified and indicated.

## **DIVISION 3 – CONCRETE**

### **1. CONCRETE REINFORCEMENT**

### **2. CAST IN PLACE CONCRETE**

#### **A. Generally**

1. Concrete work is generally measured in **cubic meters** to the net volumes, all in accordance with the details and dimensions shown on the Drawings.
2. No deduction is measured for the volume of any conduit, reinforcement or structural steel embedded in concrete. Voids entirely within an area of concrete less than 0.5 m<sup>2</sup> are not deducted.
3. Columns and walls are measured in **cubic meters**, and measured between top of raft slab level to soffit of the beam, except shaft wall. Shaft wall measured in full height throughout from top of the slab level. Beams are only measured separately for drop part only.
4. Unit rate of the work is deemed to include:
  - a. All types of formwork, cutting or forming all grooves, chases, recesses, notches, holes, mortises, pockets, stop ends, construction joints, working around pipes, ducts and obstructions, casting in fixing blocks, hangers all projections, keys and the like.
  - b. Steel reinforcement as per drawings.
  - c. Designing mixes
  - d. Additives as called for in the Specification
  - e. Any method of pouring, placing, compacting and curing
  - f. Pouring on or against earth or unblended hard-core
  - g. Any thickness, cross-sectional area or number of members
  - h. Horizontal, sloping and vertical
  - i. Placing or finishing to falls and cross falls
  - j. Basic finish as struck from formwork (including curved or toughed formwork) and tamped worked finish
  - k. Formwork, lift in Formwork or other form of temporary support to top of sloping upper surfaces of blinding beds
  - l. Day joints (construction joints) and joints required in the forming of bays including Formwork and treatment of reinforcement crossing the joint

- m. All labours on concrete including working around pipes or cables, cutting channels, chases, mortices, pockets and holes and including subsequent grouting or filling and making good fixings and cuttings.
  - n. Drill in holes
  - o. Adhesive material
  - p. Steel dowels
5. Rates for topping concrete shall include for power float surface finish.
6. cyclopean concrete: plain concrete ( $F_{cu} = 20\text{MPa}$ ), 40% large stones including all necessary formwork and shoring system", as shown on drawings and specifications wherever required.

## **B. Formwork**

1. No separate item is included in the Bills of Quantities for formwork, and the contractor is to make due allowance for this item in his rates for concrete.
2. Allowances for formwork shall include for all cutting and waste, timber, rails, fabricating, hoisting, fixing and supporting in position with all necessary struts, braces, battens, supports and distance pieces, for bolting and wedging, for all splayed edges, for all rebated edges, holes, grooves and notching and for easing, striking and removal on completion. It shall also include for coating faces of formwork in contact with concrete with a coat of mould oil or other suitable material to prevent adhesion and for all necessary formwork at expansion, construction, control and isolation joints and all straight, raking and circular cutting and waste are included with unit price.
3. The Contractor shall allow for fixing formwork to all heights above finished floor level.

## **C. Concrete Test Cube/Miscellaneous Items**

1. Rates for concrete shall include for providing and testing concrete cube as described to the satisfaction of the Engineer.
2. All miscellaneous items like, scaffolding at any heights, cutting and patching, anchors, curing compound, admixtures, coordinating with services, etc. are included with unit price.

### **3. Shaft Covers**

#### **The unit rate is deemed to include:**

1. All works including preparation works.
2. All necessary formwork.
3. Pre-cast shaft covers
4. Fixing installation, painting, with all necessary support



5. Scaffolding.
6. Cleaning, application as per manufacturer's recommendation and the like.
7. Work laid in bays where required and as indicated on drawings.

#### 4. **CONCRETE TOPPING**

##### **A. Measurement**

1. Each kind of screed toppings is given separately stating the surface finish.
2. Thickness for screed toppings shall be according to the drawings or according to the manufacturer's recommendations.
3. Work to screed toppings is given separately in **square meters**, measured overall the area in contact with the base. No deduction is made for voids not exceeding 0.50 m<sup>2</sup>.

##### **B. The unit rate is deemed to include:**

8. All works including preparing the surface.
9. All necessary formwork.
10. Trowelling/ smooth finish as appropriate.
11. Cleaning, application as per manufacturer's recommendation and the like.
12. Work laid in bays where required and as indicated on drawings.
13. Keying mixes, bonding agents, adhesives, hardeners and other fixing materials.

#### 4. **LIGHTWEIGHT CONCRETE**

##### **A. Measurement**

1. Foam/lightweight concrete is measured in **square meters** net exposed area.

##### **B. The unit rate is deemed to include:**

1. Providing fillets at all turnings, around pipes, sleeves, ducts, etc.
2. Laying in bays, if necessary, including temporary formwork and dividing strips.
3. Cement screed topping 2 cm thick to receive water proofing membrane.

## **DIVISION 4 – MASONRY**

### **1. Thermo Stone**

#### **A. Measurement**

1. Blockwork Hollow/ Solid/ Lightweight (thermal) is measured according to wall thickness, the net area in place in **square meters**. No deductions have been made for pipe work, cables, conduits, cable trays or ductwork passing through walls. The space occupied by concrete lintels, sills and the like is not to be deducted.
2. Cavity blockwork is measured only from one side to the net area in place given in **square meters**.
3. Ribbed blocks are **enumerated** as furnished.

#### **B. The unit rate is deemed to include:**

1. Supply all necessary materials, manufacture, sampling and testing, haulage, hoisting, scaffolding, testing, curing and erection of blockwork to the dimensions shown on Drawings and as specified.
2. All rough and fair cutting and waste, cutting and pinning to soffits, intersections and ends, bonding with wall ties to reinforced concrete members, forming openings, chases, mortices, leaving temporary openings in walls for structural members and making good.
3. Raking out joints as the work proceeds to- form a key for rendering or pointing as required.
4. Including special mortar ,jointing and pointing
5. Forming grooves for flashings, etc. and leaving weep holes.
6. Admixtures with cement and sand mortar, upon the approval of the Engineer.
7. Forming cavities including wall ties as specified and all extra materials and labour for closing cavities at sills, jambs, etc.
8. Concrete lintels, concrete sills and the like, and grout filling
9. Reinforced concrete bond beams and stiffener columns in walls as detailed in structural drawings, specifications or codes.
10. Providing solid blocks at jambs and sills to doors and windows in lieu of hollow block.
11. Providing solid block instead of hollow blocks at junction between ceiling soffits and walls and for all opening jambs and sills.
12. Providing solid block instead of hollow in the first course of all walls.
13. Fire proofing material and insulation around pipes, ducts, cables, etc., passing through walls, slabs and ceilings.
14. Providing all necessary galvanized mild steel lathing at joints of blockwork and junction between concrete and blockwork
15. Providing all necessary damp proof courses.
16. Joint sealant at connections with ceiling, as specified
17. Including wooden box cover for all duct works crossing the block walls.

## 2. **NAURAL STONE WORKS**

### **A. Measurement : Stone/marble/Granite**

1. Cladding or build is given in **square meters**, on the exposed face. No
2. deduction is made for voids not exceeding 0.10m<sup>2</sup>.
3. Marble/Granite for floors is given in **square meters stating the thickness**.
4. For stairs tread riser, and cistern top is measured in **linear meters** in one single measurement.
5. Copping and window sill are measured in **square meters**, on the exposed face. No deduction is made for voids not exceeding 0.10m<sup>2</sup>.
6. Cornices, band courses, moldings, and the like features are measured in **linear meters**.
7. Stone/marble/Granite Skirting is measured in **linear meters**.

### **B. The unit rate is deemed to include:**

- a. Work at any height above floor level.
- b. All required surface finish to all exposed surfaces.
- c. Sand / aggregate beds, at any thickness.
- d. All type of formwork needed, cement concrete backing at any thickness.
- e. Cement sand mortar bed and backing with thicknesses in accordance with drawings.
- f. Galvanized steel ties, plugs and clips.
- g. Steel angle supports, expansion bolts, stock and the like.
- h. Pre-welded mild steel wire mesh.
- i. All other needed fixing materials and accessories.
- j. Layout and treatment of joints including sealant and/or grouting.
- k. All special pieces as (but not limited to) corners, lintels, jambs and grooves.
- l. Cleaning and Protection.

## **DIVISION 5 – METALS**

### **1. METAL FABRICATION**

#### **Ladders**

##### **A. Measurement**

1. Each kind of work is given separately.
2. Ladders and the like shall be enumerated stating dimensions.

##### **B. The unit rate is deemed to include:**

1. Ladders and the like shall include side channels,
2. Fabrication, Rungs, brackets, frames and chequered plate.
3. Priming, painting.
4. Assembling, fitting and jointing component parts, bolts, nuts, holes, welding, fixing, etc...

### **2. HANDRAILS AND RAILING**

##### **A. Measurement**

1. Each kind of work is given separately, stating the kind of material and finish as delivered.
2. Each type of balustrades and the like is given separately.
3. Each height of balustrades and the like is given separately.
4. Balustrades and the like are given in **linear meters**.

##### **B. The unit rate is deemed to include:**

1. Cover moulds, trims, and the like, where supplied with the unit.
2. Fabrication, Welding and assembling.
3. Flanges, bolts, screws, nuts, washers, plates and the like.
4. Clips, pipe supports and the like.
5. Priming and Painting.

## **DIVISION 6 - WOOD AND PLASTIC**

### **1. Counters**

#### **A. Measurement**

1. Counters shall be measured in **linear meter**, or **enumerated** stating overall dimensions.

#### **B. The unit rate is deemed to include:**

1. Assembling, fitting and jointing together all component parts,
2. All assigned types of wood, veneers and laminates,
3. All metal tube sections, angels, beech wood tops and the like.
4. All welding, fabrication, fixation needed.
5. All hardware, accessories, ironmongery, worktops.
6. All type of topping.
7. Shelving, drawer units, wood treatment, priming, painting.
8. Wood structure backing, skirting where indicated, block and plaster works where indicated,
9. Fixation to floors and/or walls as detailed and required.
10. Priming and painting finishes of any type, color and the like.
11. Connection to all services.

### **2. WOOD VENEER.**

#### **A. Measurement**

1. Wooden skirting shall be measured in **linear meter**, stating overall dimensions.

#### **B. The unit rate is deemed to include:**

1. Fabrication, assembling.
2. Fixation, Adhesive materials and all as detailed and required.
3. Painting as indicated and specified.

## **DIVISION 7 - THERMAL AND MOISTURE PROTECTION**

### **1. SHEET WATERPROOFING**

#### **Water Proofing Membrane:**

##### **A. Measurements**

1. Each type of waterproofing sheets is given separately.
2. Waterproofing membrane have been measured net in **square meter** as laid, openings less than 0.5 m<sup>2</sup> in area has not been deducted.

##### **B. The unit rate is deemed to include:**

1. Supplying all necessary materials, plant, equipment and tools, storage, sampling and testing, haulage, hoisting and execution of all waterproofing, insulation and other works as specified.
2. Preparation of surfaces to be covered, bitumen primer.
3. Cutting as necessary and fitting around pipes and obstructions.
4. Overlaps, forming collars and watertight joints around roof outlets, pipes and ducts passing through roof slab.
5. Preparation and submission of detailed shop drawings and samples to the Engineer for his approval.
6. Skirting and mastic sealant, including dressing over angle fillets, bending, Galvanized steel flashing, tucking-in edges and for all laps, ends, angles and intersections, etc and for additional layer of membrane where needed.
7. Use sand fill for roof on top of waterproof sheets (size 70mm) as per drawings.

### **2. FLUID-APPLIED WATERPROOFING**

#### **Cold-applied Bituminous Coating:**

##### **A. Measurement**

1. Bituminous coatings to be measured the net area in place in **square meters**

##### **B. The unit rate is deemed to include:**

1. Preparation of surfaces.
2. Applying two perpendicular coats as specified.
3. Protection.

### **3. BUILDING INSULATION**

#### **- Extruded Polystyrene:**

##### **A. Measurement**

1. Extruded polystyrene boards measured to the nett area in place in **square meters**.
2. No deduction is made for voids not exceeding 0.50 m<sup>2</sup>.

#### **4. JOINT SEALERS**

##### **A. Measurement**

1. Expansion joint filler materials are given in linear meter or square meter as per the bill of quantities, the unit rate is deemed to include all necessary cutting, fixings and all related works and materials.

##### **B. The unit rate is deemed to include:**

1. Joint cleaning and preparation for work.
2. Monolithic seals closed backing cord, water barriers, and all other associated works as specified.
3. Covers.
4. Fixings, overlapping, fittings.
5. All necessary works as shown on drawing and as per specifications.

#### **5. Thermal and moisture protection (Generally):**

- Each kind of thermal and moisture protection items are given separately stating the type of material.
- The thermal and moisture protection items are given in square meters measured to the area in contact with the base. No deduction is made for voids not exceeding 0.25m<sup>2</sup>.

##### **The unit rate is deemed to include (Generally):**

- Primers, bonding compounds, adhesives and keying mixes.
- Applying coatings by brush or spray
- Sloping and curved work to coatings.
- Work of any width, height or girth.
- Work laid to falls and cross falls, and intersections on sloping work.
- Extra material for lapping membranes including adhesive tape.
- Internal and external angles, fillets and the like.
- Edges, arises and turning into grooves or channels and sealing.
- Cutting, notching and bending membranes.

- Holes for pipes and the like, forming collars and sealing.
- Labour, tools, scaffolding and overhead and profit.

## **6. VAPOR RETARDERS (Polyethylene Sheets)**

### **A. Measurement**

1. Polyethylene sheets are measured to the nett area in place in **square meters**.

### **B. the unit rate is deemed to include:**

1. Preparation of surfaces to be covered.
2. Cutting as necessary and fitting around pipes and obstructions.
3. Overlaps, Taping, forming collars and watertight joints around roof outlets, pipes and ducts passing through roof slab.
4. Fixing and all needed accessories as specified.



## **DIVISION 8 - DOORS AND WINDOWS**

### **GENERAL - NOTES:**

#### **1. STEEL DOORS AND FRAMES**

##### **A. Measurement**

1. Hollow metal doors/ Steel doors/louwer doors/fire rated doors are **enumerated** stating overall dimensions.

##### **B. The unit rate is deemed to include:**

1. All labour to edges, forming openings, hanging and fixings.
2. Frames, wall anchors, expansion bolts, lugs, dowels, grouting frames, sub-frames, blocking pieces required for fixing hardware and all weather-stripping as specified.
3. Hardware, frames, and accessories needed.
4. Rates for all doors shall include for glazing in all types where indicated.
5. Rates for all doors shall include for steel louvers (grills) where indicated.
6. Fire rated accessories, priming and painting.

#### **2. ALUMINUM DOORS**

##### **A. Measurement**

1. Single, double glazed Aluminum doors and the like have been **enumerated** stating the dimensions.

##### **B. The unit rate is deemed to include:**

1. Assembling, cutting and waste and grinding, drilling, counter sinking, bolting and riveting.
2. Shop coating with primer, haulage, protection and storage.
3. Hardware and accessories.
4. Aluminum sub-frames if and where required, hoisting and fixing in position, caulking with mastic, grouting mortices with cement and sand grout.
5. Inspection of aluminum work at workshop by the Engineer if necessary.
6. Ironmongery as required including matching, fixing screws, etc. and shall include for fixing.
7. Approved design and quality weather and drought seals.
8. Fly and insect screens.
9. Aluminum or steel angles, profiles and frames.
10. All necessary fixings, fittings, accessories and related works and materials.
11. Preparation and submission of shop drawings and samples for

Engineer's approval.

#### **6. WOOD DOORS**

**A.** Doors are **enumerated** stating overall dimensions.

**B. Work is deemed to include:**

1. Hardware, accessories, fire rating where indicated/required as shown on drawings.
2. Hanging and fixing.
3. Stainless steel Kick Plate, any type of frame.
4. Steel/wood frames and subframe.
5. Doors shall include for Glazing in all types and beads.
6. Fire rating accessories where needed.
7. Preparing & painting in all types or polishing/varnishing as indicated.
8. Steel/wooden louvers where indicated.

#### **4. ALUMINUM WINDOWS & CURTAIN WALLS**

**A. Measurement**

1. Single, double glazed Aluminum windows/curtain walls and the like have been **enumerated** stating the dimensions.

**B. The unit rate is deemed to include:**

1. Assembling, cutting and waste and grinding, drilling, counter sinking, bolting and riveting.
2. Shop coating with primer, haulage, protection and storage.
3. Hardware and accessories.
4. Aluminum sub-frames if and where required, hoisting and fixing in position, caulking with mastic, grouting mortices with cement and sand grout.
5. Inspection of aluminum work at workshop by the Engineer if necessary.
6. Ironmongery as required including matching, fixing screws, etc. and shall include for fixing.
7. Approved design and quality weather and drought seals.
8. Fly and insect screens.
9. Aluminum or steel angles, profiles and frames.
10. All necessary fixings, fittings, accessories and related works and materials.
11. Preparation and submission of shop drawings and samples for Engineer's approval.

#### **4. DOOR HARDWARE**

**A.** Hardware is included with doors'/Windows' pricing.

**B. The unit rate is deemed to include:**

1. Finish hardware shall include for cutting all holes, channels, pockets and neatly fitting strictly in accordance with the manufacturer's instruction and deemed included for fire rating hardware where required.
2. Fixing, removing, re-fixing after painting, covering, protecting, clearing, testing, oiling, easing, and leaving in perfect operating conditions.
3. Supplying all keys including master keying system and handover to Employer in clearly labeled and as specified.

**5. ACCESS DOORS AND PANELS**

Access Doors and panels are **enumerated** stating overall dimensions.

**B. The unit rate is deemed to include:**

1. Hardware, ironmongery, accessories, fire rating where indicated/required as shown on drawings.
2. Hanging and fixing.
3. Any type of frame, subframe.
4. Painting, priming and protection.
5. All necessary fixings, fittings, accessories and related works and materials.
6. Preparation and submission of shop drawings and samples for Engineer's approval.

**6. COILING DOORS (Roller Shutter Doors) AND GRILLS****A. Measurement**

1. Coiling Doors and grills are measured in **square meters**.

**B. The unit rate is deemed to include:**

1. Hardware, ironmongery, accessories, fire rating where indicated/required as shown on drawings.
2. Hanging and fixing.
3. Any type of frame, subframe.
4. Painting, priming and protection.
5. All necessary fixings, fittings, accessories and related works and materials.
6. Preparation and submission of shop drawings and samples for Engineer's approval.

## **DIVISION 9 - FINISHES**

### **1. PORTLAND CEMENT PLASTER**

#### **A. Measurement**

1. Plaster work is measured in **square meters** to the net area to be covered.
2. All openings and other unfinished areas over 0.5 m<sup>2</sup> have been deducted.

#### **B. The unit rate is deemed to include:**

1. Preparation of surfaces, plastering at any height or shape, plastering accessories like, but not limited to, corner beads, chasing and stop beads, corner reinforced central joints, control joints, metal lath, Expanded Metal Rib Lath, Angle Bead, C-section Aluminum and the like.
2. Curing and protection of plaster.
3. For external plaster work shall include making grooves where needed as indicated in the drawings.
4. Including all scaffolding and preparation works required to complete the works
5. Waterproof admixture is included for water tanks and external plastering.
6. Cement sand plaster materials as specifications section (plaster guides should be for the walls and ceilings).
7. Special plastering for thermo stone solid block
8. All mixes mentioned in specification section.
9. Plastering accessories, joints and anchorages

### **2. TILES**

#### **A. Measurement**

1. Each kind of tiling is given separately.
2. Patterned work and work in multi-colors and any shape.
3. Work to each of the following is given separately:-
  - Floors.
  - Walls.
  - Treads and Riser.
  - Sills, Thresholds.
  - Skirting.
  - Borders.
  - Edges
4. Thickness, dimensions, types and details are stated in descriptions where necessary to identify the work.
5. Thickness stated for tiles is the thickness exclusive of keys, grooves and the like.
6. Work to floors/walls is measured in **square meters** measured on the exposed face.  
No deduction is made for voids not exceeding 0.50m<sup>2</sup>.
7. Work to sills and thresholds are measured in **square meters** measured on the exposed face.

8. Works to treads and risers are measured in **linear meters** on the exposed nosing of the tread slab and covers the slabs of both treads and risers.
9. Work to skirting, borders, and the like is measured in **linear meters**.

**B. The unit rate is deemed to include:**

1. Work at any height above floor level.
2. Setting out.
3. Extra work involved in patterned work and work in multi-colors.
4. Work of any width, height and girth.
5. Special and non-standard tiles and slabs.
6. Slabs and tiling lay to falls and cross falls.
7. Finishing and polishing exposed edges.
8. Sand leveling bed.
9. Adhesive and fixing materials and/or devices.
10. Bedding and fixing including bedding mortars,
11. All cutting including circular cutting, internal and external angles, intersections, joints, division strips and anti slip nosing.
12. Jointing, grouting, cleaning, sealing, grinding and polishing
13. Working overhead and working over and around obstruction.
14. Temporary support
15. Supports for roof paving.
16. Shop drawings, samples and results.
17. Protection.
18. Including all scaffolding and preparation works required to complete the works

**3. ACOUSTIC CEILINGS**

1. Each kind of assemblies is given separately.
2. Work which includes moisture resistant treatment and the like are each so described.
3. Work to each of the Ceilings types are given separately.
4. Thickness of ceiling types is stated in descriptions.
5. Gypsum board, acoustic and mineral fiber false ceilings is measured in **square meters** measured on the horizontal exposed face and over obstructions, vertical surface applied to changes of levels or bulkheads are included, no deduction is made for voids not exceeding 0.50m<sup>2</sup>. No allowance in the measurement is made for lapped joints, shadow line, recesses or additional layers of gypsum board.
6. Work is deemed to include:
  - Suspension system and framed members including method of fixings head and sole plates, protection edge profiles, studs, stiffening sections, furring and channels, fixings for heavy fittings and other fixing materials.
  - Support work and accessories for fittings including bridging, jointing including fair joints, jointing battens, fillets, beads and the like, joint and reinforcing tape.
  - Acoustic blankets, sealants, fire rated sealants.
  - Painting, including fire rated paint.

- Shadow gaps, shadowlines.
- Finishing including plaster for dabs, filling and finishing.
- Work at any height above floor level.
- Work of any width, height, girth or shape.
- Working overhead.
- Working over around obstructions, integral services, into recesses and the like, including additional materials.
- Angels, junctions, abutments and ends of lining of partitions.
- Access panels and holes for pipes services and the like.

#### 4. **CARPETING**

1. Each kind of carpet Tiles is given separately.
2. Carpet tile is measured in **square meters**.
3. Resilient flooring is measured by **square meter**.
4. Work is deemed to include:
  - Carpet tiles, roll carpets, cut pile carpets
  - All necessary fixing materials, adhesive.
  - Underlay needed for respective carpet type.
  - Accessories finishes and all as shown on drawings and specifications.
  - Fire rated treatment.
  - Furnished catalogs and complete installation instructions.
  - All as indicated and specified.

#### 5. **PAINTING**

##### A. Measurement

1. Each kind of paint is given separately.
2. Painting works have been measured net in **square meter**.
3. Work to narrow widths generally is measured together in the main quantities.
4. No deduction if voids not exceeding 0.5 m2.

##### B. The unit rate is deemed to include:

1. All associated works and other requirements necessary for the proper execution and completion of the measured items, including but not limited to:
  - a. All preparatory work in rubbing down, both initially and between coats including full coverage of putty.
  - b. All surfaces treatments required prior to painting or coating, priming, undercoats and the like.
  - c. Masking and protecting adjacent surfaces.
  - d. Cutting-in and otherwise working to adjacent surfaces or materials.
  - e. All specified coats and working in multi colors.
  - f. Supplying all necessary materials, machines, tools, brushes, etc. scaffolding, ladders, storage and protection, additives, mixing, hoisting, sampling and testing, and all other incidental requirements for the proper execution of paint work as specified.

- g. Cleaning loose render and repairing all cracks and holes with patching render properly keyed to existing and sand-papering smooth.
- h. Neutralizing alkaline surfaces of rendered or exposed concrete areas by brushing on, an acid solution and two percent zinc chloride or approved equal and removing all loose particles after drying as directed by the Engineer.
- i. Narrow widths and in short lengths to apertures, jambs, sills, reveals, soffits of lintels, sides and top faces of curbs, panels and strips, etc. All such areas to be included within their respective main items, unless otherwise stated.
- j. Making good all paint work to the satisfaction of the Engineer.
- k. Protection of works.
- l. Accessories finishes and all as shown on drawings and specifications.
- m. Fire rated treatment.
- n. Furnished catalogs and complete installation instructions.

### **Gypsum Board False Ceiling Systems**

- False ceilings as shown on relevant details in this section shall be measured in square meters for the net area covered as measured on plan.
- Bulkheads shall be measured in linear meters, stating the height

#### **The unit rate is deemed to include:-**

- Supply and fix Gypsum board false ceilings horizontally or vertically as specified.
- Hanging System as specified, and as shown on detail Drawings.
- Cut to size where required.
- All necessary Works for the completion of this item.
- Shadow grooves.
- Forming of electromechanical openings.
- Access panels as recommended by the Supplier and as advised by the Engineer
- Painting system finish as per drawings.
  - Accessories finishes and all as shown on drawings and specifications.
  - Fire rated treatment.
  - Furnished catalogs and complete installation instructions.
  - All as indicated and specified.

### **Gypsum Board walls, Cladding and partition**

- Gypsum boards partition /cladding shall be measured in square meters for the net area covered as measured on plan.
- Bulkheads shall be measured in linear meters, stating the height

#### **The unit rate is deemed to include: -**

- Supply and fix fire rated 12.5 mm single, double as per drawing
- rock wool insulation with tape for upper and lower connections,
- studs, tubes, stiffeners, metal, angles,
- skim coats and joint filler,
- openings and preparation with all special accessories for all MEP Works, steel support for wall mounted vanities, Basins, fixtures, and accessories, metal blocking,
- cutting, trimming, fiber jointing tape, internal jointing angels and exposed metal edges where required, fittings, fixings and accessories, complete as shown on drawings and as per Specification
- All necessary Works for the completion of this item.
- Shadow grooves.
- Painting system finish as per drawings.
  - Accessories finishes and all as shown on drawings and specifications.
  - Fire rated treatment.
  - Furnished catalogs and complete installation instructions.
  - All as indicated and specified.

### **PVC flooring**

#### **The unit rate is deemed to include:**

- Supply and install anti-static conductive homogeneous seamless chemical resistant anti-bacterial PVC flooring vinyl sheets
- First Quality 2 mm thick with 100 mm full cover former skirting,
- moisture and fire resistant, complete as per drawings and specifications.

### **Raised floors**

#### **The unit rate is deemed to include:**

- Supply and install Raised Floor with Access panels total thickness 32mm
- and support system 60\*60 cm with total height from FFL 30 cm accessories and all required to complete the work per drawings and specifications.
- Contractor to provide samples and manufacturer catalogues to be approved by the Engineer.



## **DIVISION 10 – SPECIALTIES**

### **1. Partitions**

Partitions are measured in Square Meter.

**The unit rate is deemed to include:**

- Supporting frame and backing
- Fixing.
- Protection, handling, storage on approved site storage.
- Replace - remove any defective finished units.
- Any other items shown on the approved shop drawings and called for in the specifications.

### **2. Toilets, Bath and Laundry Specialties**

- The Work items under this section shall be enumerated

**The unit rate is deemed to include:**

- Storage
- Supply and fixation of equipment
- Fixing the accessories as per the Specifications and as indicated on relevant details.
- Fixing in place
- Accessories
- Protection
- Fixing materials and completion
- All necessary fixing, fittings, pipe connections, electrical connections, and accessories to complete the works

### **3. Walls and Corners Guard**

Walls and Corners Guard is measured in Square Meter.

**The unit rate is deemed to include:**

- Supporting frame and backing
- Fixing.
- Protection, handling, storage on approved site storage.

## **DIVISION 15- MECHANICAL WORKS**

### **PREAMBLES**

The Bills of Quantities shall be read in conjunction with the Technical Specifications, Appendices and Drawings. The documents are to be taken as - explanatory and inter- related to one another.

It is the responsibility of the Contractor to check the locations and quantities of the materials and equipment to be executed in accordance with the contract drawings and specifications.

Any discrepancy between the Drawings and Specifications and Bill of Quantities shall be brought to the notice of The Engineer in writing for his decision as to which is the correct interpretation before the work is commenced. Dimensions and sizes shown on Drawings shall generally take preference over those stated in the Specifications.

The unit rate of the materials and equipment shall be based on the Specification, all components as required for proper operation of the systems and as mentioned under each item concerned in the Specifications, Technical Data and notes on the Schedules of Equipment, Contract Drawings, and all other Contract Documents.

The Unit rate and the rates inserted in the Bills of Quantities respectively shall be comprehensive and shall include for complying in all respects with the requirements of the Technical Specifications, drawings and all other related tender documents. This shall cover all the obligations under the contract and all matters deemed necessary for the proper construction, completion of and remedy of defects in the works.

Specification section number mentioned in the BOQ related only to the main section, but for all required works and cost included, the Contractor must refer to all items mentioned in the specifications and drawings.

In the Bills of Quantities, a unit price or rate shall be inserted against its respective item with quantities only. The value of any item left UN priced shall be deemed to be covered by other rates and prices entered in the Bills of Quantities.

All measurements and evaluation of the executed works called for in the Contract shall be based on the unit price stated in the Bills of Quantities and made according to the specifications. Any work done by the Contractor, but not called for in the Contract or not requested in writing by the Engineer, shall not be included in the measurement and evaluation.

In addition to the above mentioned requirements, the Unit Rate shall include the following which shall also be complementary to the items mentioned in the B.O.Q.-

1. Supply of materials and equipment.
2. Off loading and handling from trucks on site to place of installation.
3. Installation of materials and equipment.
4. All civil work required and connected with the mechanical installations, such as: equipment concrete bases with vibration pads and supports, cutting through walls and slabs for passage of pipes and conduits and ducts, pipe sleeves, chasings in concrete and block walls, and slabs, re-patching, fixings of pipe and duct hangers and supports to structure, wooden frames for air outlets and louvers and wall mounted fans, excavation and backfilling for pipes, riggings, hoisting, water proofing, cleaning, protections and painting.
5. All testing, balancing, adjusting, commissioning and handing over to client complete operational systems and equipment, including material necessary for testing (e.g. Fuel water ... etc).
6. Allowance for cleaning and for proper protection of all equipment, plants, electrical installations and structures during installation.
7. Flushing, cleaning with chemicals and chemical water treatment for the closed system for the HVAC piping network.
8. Disinfections, flushing and water treatment.
9. All labor, materials, tools, scaffolding instruments, electric power supply, fuel and water required for installation, testing, balancing, adjusting, disinfections, flushing, operation and commissioning.
10. Thermal insulation for all equipment, valves trimming and accessories.
11. System identifications, tags, labels, nameplates and charts.
12. Shop-drawings and as-built drawings.
13. Spare parts and consumables for ideal running of all services and equipment for a period of two years after the date of substantial completion of works.
14. Spare parts for equipment as mentioned in the specifications under clause of 'Extra Materials'.
15. Spare parts and tools information for five years. Quantities not including the two years mentioned in item 13 above.
16. Operation and maintenance manuals.
17. Training of Owner's personnel on the operation and maintenance of all mechanical systems.
18. Samples and mockups as required by the Engineer, including field test of materials.
19. Onsite inspection and testing of all materials and workmanship.
20. Maintenance of all items supplied by contractor as per Contract Conditions.
21. Calculating of pump head and fan total static pressure according to approved shop drawings. The figures indicated on design drawings are indicative and should be confirmed by exact calculations. No extra over allowance shall be paid for higher pump head or fan static pressure if it was found necessary to meet system requirements.
22. Sizing of control valves for FCU's & AHU's by approved specialist manufacturer giving full details for the Kv values, pressure drop.
23. Selection of sound attenuator by approved specialist manufacturer to determine required size to suit noise level criteria set by specifications. Provide duct enlargement to suit attenuator size. No extra over allowance shall be paid if attenuator sizes become bigger than the duct that is

connected to.

24. Obtaining the approval of the local authorities for the shop drawings and equipment submittals for the mechanical systems.

## METHOD OF MEASUREMENT

### 1. Pipe work (generally for all kinds of pipes)

Each kind of pipe is given separately, stating the size.

Each diameter of pipe is given separately. Diameters stated are nominal diameter. Pipes are given in meters measured the length over all fittings and branches.

The unit rate is deemed to include:

- Converter in pipes and extensible pipes.
- Flow and return header pipes.
- Pipe work required to be temporarily fixed in position, dismantled for special finishing and subsequently refixed .
- Purpose-made pipes and purpose-made fittings.
- Labor on pipes.
- Providing everything necessary for jointing.
- Joints in the running length.
- Joint of a special of ornamental character and extra demountable couplers in the running length.
- Flanges, unions and di-electric unions.
- Pipe fittings including cutting and jointing pipes to fittings.
- Screwed sockets, tapings, bosses and welding necks welded to pipes and flanges including drilling the pipe flange.
- Special connections, special joints and isolated joints in pipes.
- Expansion loops, expansion compensators, elbow with guides and anchors substantiated by thermal expansion calculations by the supplier all these calculations shall be submitted for the approval of the Engineer according to the contractor shop drawings.
- Expansion compensators, with guides and anchors at every expansion joint of the building structure.
- Plugs, taps and end caps.
- Test plugs (points).
- Painting with anti-corrosion coats for piping and supports.
- Final painting of uninsulated pipes and all supports with approved oil paint of suitable color.
- Drip trays and tundishes.
- Standard pipe supports, non-standard pipe support assemblies spring compensated components.
- Laying and fixing in ducts, trenches, tunnels and chases or embedded in concrete and screeds.
- All pipes fittings, and joints such as elbows, bends,

- tees, reducers, unions, flanges anchoring, sleeves, plates puddle flanges, dirt pockets, sockets and all jointing materials, hangers, supports, rollers and all necessary connections
- Wall, floor and ceiling plates.
  - All automatic air vents with isolating valves drain cocks at bottom of risers and main pipes.
  - All pipe insulations, cladding and protections.
  - All pipes acoustic insulation including claddings trays
  - All pressure gages, temperature gages and thermometers, balancing and measuring taps, test point as shown on drawings or as called for in specifications and as deemed necessary for systems testing, balancing and commissioning.
  - All shock absorbers and joints.
  - All Fire retardant and protection sealants for all pipes crossing fire rated elements.
  - All adapters and dielectric unions for connecting dissimilar materials
  - Excavation and back filling, chasing in walls, making holes, and making good, pipe coating, as required per specifications and drawings.
  - Existing pipes done by first fix contractor inspection flushing testing.
- Pipe work shall be measured in Linear meter (m).

## 2. Ductwork (Generally)

Each kind of ducting is given separately stating the type of material. Each type of ducting given separately.

Ductwork weight shall be calculated based on the dimensions and length of actual installed ducting. Nominal duct thickness and densities according to ASHRAE shall only be considered. Ductwork weight calculations shall not include the weight of joints, hangers, and volume dampers, fire and smoke dampers, supports, and angles. Etc., which shall be included in the unit price.

The unit rate is deemed to include:

- Weight of any materials required for seams or welds for stiffening or jointing.
- Stiffeners, joints and sealing.
- Joints in the running length and transverse joints.
- Providing materials, bolts, nuts, washers and everything necessary for making joints in ducting.
- Cutting and forming openings and jointing ducting to fittings.
- Special connections and special joints in ducting including connections between ducting of differing materials, connections between ducting and equipment, isolated joints and flexible connections between ducting and plant.
- Ducting splitter dampers and turning vanes.
- Volume controls dampers as shown on drawings and where necessary for proper balancing of the system.
- Back draft dampers or shutter.
- Flexible connectors at the building expansion joints.
- Nozzle outlets, test holes with covers, access doors and panels including forming and stiffening of openings.
- Components for supporting and suspension of ductwork including fixing.
- Weather aprons, flashing plates and the like, except where required to be measured separately.
- Cowls and terminals.
- Galvanized metal mesh for the bell mouth termination of return or exhaust ducts.
- Duct test by light
- Cleaning from inside and outside.
- Fire retardant sealants for all ductwork passing through fire rated structures.
- All access doors and panels.
- All fire dampers, smoke dampers, fire, smoke dampers and motorized fire dampers, including Access door
- All Wall sleeve and flanges.
- All measuring tap holes and caps.
- Metal mesh and insect screens for all belmouths fresh air and exhaust air terminals., cowls and louvers.

Ductwork shall be measured in weight (Kg).

### 3. Duct Insulation and Acoustic Duct Liners (Generally)

Work to ducting is given separately.  
Work to ductwork is given in square meters. The unit rate is deemed to include:

- Smoothing the material and working around supports.
- Special protection or finish at openings through wall, and the like.
- Working duct insulation around fittings.
- Working duct insulation and around special fitting and for ancillaries.
- All joints, sealant compounds, bands, vapour barrier and all finishing, coating, and protection with all accessories as called for in the specification.
- All coating, painting, protection and cladding,
- All access doors and openings which are deemed necessary to maintain equipment without damaging the insulation and all accessories as called for in the specifications

Duct insulation & liners shall be measured in square meter (m<sup>2</sup>) for the installed insulated ducting.

### 4. Accessories for Ductwork

Diffusers, registers, grilles, slot diffusers, bar grilles and louvers are enumerated or given in Linear meter with all necessary fixings, fittings, accessories, connections and decoration.

The unit rate is deemed to include:

- Frames and plenum boxes.
- Acoustic lining to plenum boxes.
- Wood frames.
- Supports and hangers.

### 5. Equipment (Generally)

Each kind of equipment is given separately, stating the reference.  
Equipment are enumerated.

The unit rate is deemed to include:

- Factory assembled components and controls.
- Loose equipment supplied by the manufacturer.
- Electrical connections to the nearest isolator.
- Refrigerant, piping, thermal insulation, wiring and

- accessories for air conditioning split equipment.
- Plate work and supporting steel works of concrete work.
- Supports and fixing.
- Concrete foundation and anti-vibration mountings, including anti-vibration materials, sound-insulating material, and acoustic enclosures.

## 6. Water Chillers

The price shall include the unit as shown on drawings, equipment schedules, specifications and the following items:-

Connection to Evaporator and condenser:

- All motorized valves at supply line
- One gate valve,
- One commissioning set,
- Two flexible connections,
- One flow switch,
- Two pressure gauges complete with isolation and drain cock and pigtail connection
- Two thermometers of suitable ranges complete with immersed thermo wells
- One measuring orifice.
- Control panel.
- All vibration isolators installed for the on both the factory skid
- All vibration isolators for the chiller kinetic base,
- Power wiring and conduiting connections to adjacent isolating switches.
- Tapping for all necessary control connections for
- All other components as shown on the Drawings and as called for in the Specifications.

Note: Sizing of valves, strainer, flexible connectors and DRV shall be full line size as indicated on drawings.

Water chillers shall be measured in No (Number).

## 7. Fan Coil Units

The price shall include the unit as shown on drawings, equipment schedules, specifications and the following items:-

Connection to each Coil:

- Gate valve, 1 no.
- Strainer, 1 no.
- Test plugs, 2 no.
- Control valve with actuator, 1 no.
- Double regulating valve, 1 no.



- Drain connection with U-Trap.
- Flexible connections, 2 no.
- Manual air vent.
- Flushing bypass U connection and fitting
- Rubber grommet for ceiling suspension.
- Duct Flexible connector.
- Thermostat for cooling and heating with 3 speed fan switch as shown on drawings complete with conduit and wiring.
- Two Dielectric unions

Note: Sizes of valves, strainer, flexible pipes and DRV shall be full line as indicated on drawings except the control valve shall be sized according to flow and pressure drop.

Fan Coil Units shall be measured in No (Number).

## 8. Fans

The price shall include the unit as shown on drawings, equipment schedules, specifications and the following items:-

### General

The unit price shall also include vibration isolators resilient mountings, skids and hangers, flexible connections on fan inlet and outlet, smoke detectors, filters where required, insect screen, automatic gravity back draft dampers or shutter, pulleys with taper locks, inlet guards, belt guards, lubrication points, sound attenuators to achieve the required NC for the served space and the outdoor, one set of spare belt drives per each fan

All civil works including steel skids, concrete plinth, kinetic base, and floating slabs, as shown on the Drawings and as called for in the Specifications.

All electrical works to nearest isolating switches, as shown on the Drawings and called for in the Specifications.

### Fresh Air Fans

In addition to (General) above fresh air fans shall include a panel filter to EU-3 bag filter to EU-7, fresh air louver, and access openings for maintenance purposes.

### Pressurization Fan

In addition to (General) above pressurization fans shall include the fire officers override switch, pressure transmitter motorized smoke

damper, smoke detector, fresh air louver, access openings for maintenance purposes and the required wiring for the pressure transmitter and the fire officers override switch.

#### Car Park Exhaust Fans

In addition (General) to above Car Park exhaust fans shall also be provided with CO sensors and controllers, interconnection to Fire alarm system.

Fans shall be measured in No (Number).

### 9. Split Air Conditioner (Split Unit)

The unit price shall include the unit as shown on drawings, schedules and specifications and shall include the following:

All refrigeration pipes between the indoor and outdoor units.

Their fittings, insulation and supports. All condensate piping, drain pan, room thermostats and all power and control lines from outdoor to indoor units, and from isolation switches installed by outdoor unit to the equipment.

The price shall also include the concrete base and steel skids for outdoor units, vibration isolators, all interconnecting power and control wiring as shown on the Drawings and as called for in the Specifications.

Split Units shall be measured in No (Number).

### 10. Pumps

The price shall include the unit as shown on drawings, equipment schedules, specifications and the following items:-

All kinds of pumps for all services.

#### General

The unit price of each pump shall also include:

All isolating valves, check valves, strainer (ALL of size equal to the interconnecting pipe size not pump suction/discharge sizes), pressure gauges, two flexible connections, vibration isolators, anti vibration pad, all related electrical works and civil works including plinth inertia bases kinetic floating and as shown on drawings and requested in specifications.

In general all pumps shall be measured in No (Number) unless other ways mentioned.

### Primary Chilled and Heating Water Pumps

The unit price shall include all pumps with all isolating valves, check valves, strainer, pressure gauges, flexible connections, vibration isolators, concrete base, anti vibration pad and pumping skid as shown on the drawings and as called for in the specifications.

Primary Chilled and Heating Water Pumps shall be measured in No

(Number). Variable Speed Secondary Water Pumps

The unit price shall include all pumps with their skids, concrete base, all interconnecting pipe work and headers, control panel, adjustable frequency driver, sensor transmitters, differential pressure sensors installed in locations as per manufacturer recommendations, differential pressure relief valve at the main headers, and all related power control accessories as shown on the drawings and as called for in the specifications.

The unit price of each pump shall also include:

All isolating valves check valves, strainer, pressure gauges, two flexible connections, and vibration isolators, anti vibration pad.

Variable Speed Secondary Water Pumps shall be measured in LS (lump Sum).

### Packaged Set of Water Pumps and Booster Pump set.

The unit price shall include all pumps, factory skid, concrete base, all interconnecting pipe work and headers, control panel, variable speed controller, pressure vessels, pressure sensors installed on locations as per manufacturers recommendations, and all other accessories as per specifications main isolating valves, flexible connections and strainers and concrete base,

The unit price of each pump shall also include:

Two isolating valves check valves, two pressure gauges complete with stop/drain cock and pig tail connection, differential pressure switch, and vibration isolators, anti vibration pad.

Packaged Domestic Water Pump set shall be measured in LS (lump

Sum). Fire Fighting Pumps:

The unit price of fire pump set shall also include complete pumps unit with interconnecting pipe work, pump control panel, Automatic Transfer Switch, pressure switches, all power and control wiring and conduiting.

Each pump to include two valves, one check valve, one drain, two pressure gages, control panel, all wiring connections to main power supply and all components and accessories as called in specifications and shown on the drawings.

Fire Fighting Pumps shall be measured in LS (lump Sum).

### Submersible Pumps

The unit price of Submersible pumps shall include:

- All pumps,
- All isolating valves check valves for each pump.
- All sliding rails and lifting chains
- Pits and valves chambers including covers
- All studs, bolts, nuts, screws and washers
- All adjustable level controller switches and alarms including indication relayed to control panel.
- Weather proof control panel, including indication lights switches, and controllers.
- Access covers, step cast iron and sump vents.
- Local isolators located adjacent to the sump for isolation of units during maintenance

Submersible Pumps shall be measured in LS (lump Sum).

## **11. Air Handling Units (AHU):**

The price shall include the unit as shown on drawings, equipment schedules, specifications and the following items:-

The price shall also include all related valves and trimmings including:

Connection to each Coil:

- One gate valve,
- One commissioning set,
- Control valve,
- One strainer,
- Manual air vent.
- Flushing bypass U connection and fitting
- Two flexible connections
- Two pressure gauges complete with isolation and drain cock and pigtail connection
- Two thermometers of suitable ranges complete with immersed thermo wells
- One measuring orifice
- Two Dielectric unions
- Condensate drain siphon arrangement.

All vibration isolators, flexible connection on fan discharge, orifice plates.

All civil works including concrete plinth, kinetic inertia base, all electrical works from the nearest isolating switch other components as shown on the Drawings and as called for in the Specifications.

Air Handling Units (AHU) shall be measured in No (Number).

**12. Silencers (Sound Attenuators):**

The unit price shall include silencer splitters, baffles, profile steel frames, angle frames, bolting to the served equipment and ducting, protection against corrosion and erosion as per specialized manufacturer recommendations.

Sound Attenuators shall be measured in No (Number).

**13. Air Louvers and Penthouse:**

The unit price shall also include the frames, flashing, top covers, sills, clips, shims, fastening devices, separating panels, anchors, bird screens, 2mm steel wires, galvanized dipping for steel louvers, fix curbing, and epoxy based paint powder coating.

**14. Door Grilles:**

The unit price shall include supply and installation of grilles on prefabricated open doors, and testing and commissioning. The price shall also include coordination with Other Works for the sizes and color selection of the grill. Door Grilles shall be measured in No (Number).

**15. Chemical Dosing Pump Set:**

The price shall include the followings:

The unit price shall include the chemical dosing pump, microprocessor and LCD display, chemical Pot, 200mm diameter and 600mm long, suction assembly with foot/suction valve, suction tube and two-stage level switch, dosing material, one spare part kit for the dosing pump. And all other accessories as shown on drawing and called in specifications.

Chemical Dosing Pump Set shall be measured in No (Number).

**16. Pressurization Set / Expansion Set**

The price shall include the unit as shown on drawings, equipment schedules, specifications and the following items:-

- Break tank complete with ball float valve, isolating valve drain outlet valves and supports.
- Pressurization pump including two isolating valves, check

- valve, pressure reducing valve, suction flow control valve, air purger, automatic air vent with isolating valve, base and vibration isolating pad and flexible connections.
- Expansion tank including two isolating valves, relief valve, with rubber diaphragm (bladder), air and nitrogen filling connection, pressure-regulating valve.
- Base frame.
- Control panel including low and high level switches, low and high level alarms, flow switches, all electrical and control connections.
- Pressure gages
- All other fittings as called for in specifications
- All civil works including steel skids, concrete plinth, kinetic base, and floating slabs, as shown on the Drawings and as called for in the Specifications.

Pressurization Set shall be measured in No (Number).

#### **17. Pressure vessels/Expansion Tanks:**

The price shall include the unit as shown on drawings, equipment schedules, specifications and the following items:-

- Expansion vessels including relief valve, with rubber diaphragm (bladder), air and nitrogen filling connection.
- Isolating valve
- Non Return Valves.
- Pressure relief valve
- Pressure gages
- Pressure sensors
- All pressurizing tap
- Concrete bases and all other related accessories
- All accessories as shown on

drawing Pressure vessels shall be measured in

No (Number).

#### **18. Heating Water Boiler**

The price shall include the unit as shown on drawings, equipment schedules, specifications and the following items:-

The unit price shall include the boiler and burner complete with control with all accessories. The Unit price shall include supply, install, test and commission boilers, valves and trimmings including safety valves, air release vents, one lockable right angle cast steel stop valve, a double regulating valve with measuring orifice drain valve, pressure gauges with combined shut off and drain cock and water siphon, thermometers on the supply and return headers inspectors' test gauge connection with cock , feed water line connections with double check

valve and vacuum breaker, support, vibration isolators, access limit. Labeling, hangers and supports and all related pipe work, electrical connections to nearest valves and controls. All civil works including steel skids, concrete plinth, kinetic base, and floating slabs, as shown on the Drawings and as called for in the Specifications.

Heating Water Boilers shall be measured in No (Number).

**19. Chimney (Smoke Stack and Breaching):**

The unit price shall include the double skinned metal sheets ducting flues, elbows, tees, draught regulators, motorized shut off dampers, clean outs, wall sleeves, condensate collectors, rain caps, and the inner insulation. Complete with all joints, captive fasteners, cowl, holding bands hangers and supports, brass earthing bolts, bracing bracket, base plates, gussets, and holding down bolts, reinforcing angles, flexible connections, draft regulating and relief dampers, expansion with rod and lock screws, concrete foundations and coating and painting and all other accessories as shown on drawings and called for in the specification.

Chimney shall be measured in Linear meter (m).

**20. Above ground main fuel oil storage tank**

The unit price shall include: the tank with sizes as indicated on drawings, vent pipe with cowl.

With steel cover 500 diameter, concrete foundation, corrosion protection primers and final paint coat, earthing and content indicator for of transparent tube with valve and graduated board two dip rods, steel gage ladders, low level sensors, two high level sensors.

Above ground main fuel oil storage tank shall be measured in No (Number).

**21. Above ground Daily fuel oil tank**

The unit price shall include: the tank air vents, overflow line, all valves, dislodge drain line and valve, low level and high level switches and alarms, all wiring and controllers to main pumps, oil content gages, one access opening with covers, all painting, and corrosion resist coating and final painting, earthing, anchoring and steel base frame and support.

Above ground Daily fuel oil storage tank shall be measured in No (Number).

**22. Fuel Filling Chamber:**

The unit price shall also include all materials and works for the construction of manhole such as reinforced concrete, blinding, base, walls, cover, benching, iron steps, plastering, caulking, framework

shuttering etc. as specified and shown on drawings. The price shall also include the fuel filling cup, coupling, and crushed limestone, wiring between the main fuel oil storage tank and the filling chamber, sensor for immanent of over filling of tank, digital level indicator connected to the level sensors in tank, with light and siren alarm for immanent of over filling of tank.

Fuel Filling Chamber shall be measured in No (Number).

### 23. Pex Pipes

In addition to what is mentioned in pipe work, the unit price shall include the pex pipe, pipe sleeves (pipe in pipe), all pipe fittings and joint such as the brass elbows with its UPVC housings, compression fittings, nuts, O rings, nipples and sockets, fixing bends, excavation and back-filling, chasing in walls, pipe protections, testing, cleaning, flushing and commissioning system.

Pex Pipes shall be measured in Linear meter (m).

### 24. Water Manifold Cabinets (W CAB)

The unit price shall include:- the hot and cold water manifolds, steel cabinet with locks decoration to suit the interior finishes, two main isolating valves, all branch valves, and flow regulators and all pipe fittings and joints including sockets, nipples, compression fittings, nuts, O rings, hangers and supports, fixing bands, hammer arrestors & automatic air vents with isolating valves, pressure gages adapters and dielectric unions for connecting dissimilar materials, All related civil works including excavation back-filling, chasing in walls, painting, pipe protection. Testing, cleansing, flushing and commissioning the system and as shown on drawings and called for in specifications.

Water Manifold Cabinets shall be measured in No (Number).

### 25. Water Tanks:

Including GRP; prefabricated fiber glass, Polyethylene PE, or steel

tanks. The unit price shall include:

- Tanks complete with steel saddle base and supports.
- access manholes and covers
- All piping connections to tanks, including water inlets and outlet connections,



- All isolating valves, vents, bird and insect screens
- Level indicator and gauge overflows,
- Water ball floating valves, and / or level switches complete with motorized valves.
- Drain outlets and valves,
- All power and control wiring complete with conduits and sleeves,
- Concrete supports and all other accessories as shown on drawing and called for in the specification.

Water Tanks shall be measured in No (Number).

**26. Water Filters:**

Including: multi media filter, sand filter, carbon filter, and sediment filters.

The price shall include all filter tanks, filters' media, all face piping, under drain systems, all isolating diaphragm valves, and by-pass valves, anti-vacuum valves, pressure relief valves, automatic back wash flow controller, differential pressure switches, gage panels with pressure gages, and controller connected to BMS, All civil works including steel skids, concrete plinth, kinetic base, and floating slabs, as shown on the Drawings and as called for in the Specifications.

Water Filters shall be measured in No (Number).

**27. Water Softener:**

The price shall include all softener columns, brine tank, all face piping, all isolating valves, and by-pass valves, double check valves, anti-vacuum valves, pressure relief valves, pressure sustaining valve, automatic back wash flow controller, cycle controller and flow control, multi-port motor valve, brine injector, automatic electronic water meter, timer, hardness monitor and controller, mixing and balancing valve complete with flow meter, pressure gages, TDS monitor and controller connected to BMS, and all other accessories as shown on drawings and called for in specifications. All civil works including steel skids, concrete plinth, kinetic base, and floating slabs, as shown on the Drawings and called for in the Specifications.

Water Softener shall be measured in No (Number).

**28. Scale Inhibitors:**

The unit price of shall include all isolating and bypass valves, strainer and all related electrical works as shown on drawings and requested in specifications.

Scale Inhibitors shall be measured in No (Number).

**29. Hot Water Storage cylinder:**

The unit price shall also include:

**Tank assembly which includes:**

- 50 mm insulation and cladding.
- Cold-water inlets with gate check valves and vacuum breaker.
- Combined hot water outlet and drain valves.
- Return and drain outlets with gate and double regulating valves.
- Temperature/Pressure relief valves.
- Anti vacuum valve.
- Steel supports.
- Thermometers.
- Pressure gages.
- Inspection manholes.
- Lifting lugs.
- All other accessories as shown in the drawings and called for in the specifications.

**Heating assembly including:**

- Water to Water Plate Heat Exchangers
- 50 mm insulation and 0.5 mm cladding
- Water inlets and outlets isolating valves
- Inlet outlet thermometers
- Pressure gages
- Vacuum breaker and relief valves
- Circulating pumps complete with isolating valves and check valves
- Isolating valves
- Control Valves
- Dirt accumulator
- Anti-stratification, built-in pump complete with two isolating valves and check valve.
- All other accessories as shown in the drawings and called for in the specifications.
- Expansion Tanks

Hot Water Storage Cylinder shall be measured in No (Number).

**30. Water Reservoir Accessories:**

Including fire fighting tanks, domestic water tanks, rain water and irrigation tanks.

The unit price shall include all piping connections to reservoir, floor plates, all water inlets connections, all isolating valves, vents, bird and insect screens, girded Plexiglas gauge set and protector rods with floating

indicators, overflows, water ball floating valves, access openings and doors, stainless steel access openings doors frames and covers, stainless steel cat ladder of each side of the opening, drain outlets and valves, all of conduits and sleeves, and all other accessories as shown on drawing and called in specifications.

Water Reservoir Accessories shall be measured in LS (Lump Sum).

**31. Municipality Water Meter (Totalizer):**

The unit price shall include installation of the municipality water meter . Prices shall also include supply and installation of two isolating valves, Strainer, Check valve, Weatherproof cabinet with insulation and hinged door. All other accessories as shown in the drawing and called for in the specifications.

**32. Fire Hose Reel Cabinet (FHR)**

The unit price shall include hose reel, with powder portable fire extinguisher, CO2 portable fire extinguisher and pressure reducing valve, globe valve and cabinet. All related civil works such chasing in walls, concrete reinforcing, and making good after installation, and as shown on drawings and called for in specifications.

Fire Hose Reel Cabinet shall be measured in No (Number).

**33. Pedestal Fire Hydrant (FH)**

The unit price shall include the pedestal fire hydrant with flange inlet and valves with instantaneous outlets and with brass male couplings, isolating valve installed underground complete with extension tube, operating key and cover fire hose nozzle jets with couplings and cabinets and as shown on drawings and called for in specifications.

Pedestal Fire Hydrant shall be measured in No (Number).

**34. Siamese Connection**

The unit price shall include cabinet with glazed door, 2-way inlet breeching, drain valve, check calve, concrete support and all accessories and component and as shown on drawings and called for in specifications.

Siamese Connection shall be measured in No (Number).

**35. Zone Control Valve**

The unit price shall include:

- Indicating O.S. & Y valve equipped with tamper switch connected to fire alarm system.

- Water flow switch connected to fire alarm system.
- Test connection and valve with sight glass, size 32mm.
- Pressure gauge.
- Drainage outlets, valve size 32mm.
- Union with balancing orifice.

And all other accessories as shown on drawings and called for in specifications.

Zone Control Valve shall be measured in No (Number).

### **36. Alarm Check Valve (With Water Gong)**

The unit price shall include:

- Indicating O.S. & Y valve equipped with tamper switch.
- Control alarm and check valve.
- Motor gong with isolating valve, conducting and drainage pipes.
- Indicating gate valve equipped with tamper switch.
- Water flow switch.
- Complete assembly of test and drain connection with sight glass.
- Two pressure gauges

And all other accessories and components, as called in

specifications. Alarm Check Valve shall be measured in No (Number).

### **37. Landing Valves (LVC):**

The unit price shall include valve, coupling and cap, landing valves cabinets. And all other accessories and components, as called in specifications.

Landing Valves shall be measured in No (Number).

### **38. Clean Agent Fire Suppression System ( FM-200 and CO<sub>2</sub>):**

The unit price shall include:

- The clean agent gas cylinders,
- Automatic control panel
- Automatic gas release solenoid valve.
- All pipe works including fittings, hangers, supports labeling and paintings..etc
- All types of release nozzles.
- Automatic shutters fire and smoke dampers

- All fire and smoke detectors complete with all wiring and conduiting
- Interfacing to the building fire alarm and detection systems
- All electrical and control wiring and all needed accessories for this system as shown on drawings and required in the specifications.
- Preparation of all engineering drawings, and getting the needed authorities approvals.
- All other accessories needed for complete operation of the system.

Clean Agent Fire Suppression System shall be measured in LS (Lump Sum).

### 39. **Wet Chemical Fire Suppression System:**

The unit price shall include:

- Cylinder and valve assembly
- Cylinder actuating controls
- Cylinder pressure supervisory switch
- Pressure switch
- All visual and audible alarms and emergency equipment
- All Nozzles
- All Pipe work
- Tubing and fitting
- All wiring, conduits and accessories etc, as specified and shown on drawings.
- All other accessories needed for complete operation of the system.
- Preparation of all engineering drawings, and coordination with hood manufacturer and getting the needed authorities approvals.

Wet Chemical Fire Suppression System shall be measured in LS (Lump Sum).

### 40. **OS & Y Valve:**

The unit price shall include the valve and lock and tamper switch, which shall be connected to BMS or fire alarm panel as per specification.

### 41. **LPG Cylinders Shelter**

The unit price shall include all banks of cylinders complete with the LPG cylinders completely filled , all pipe headers complete with isolating valves flexible connections pressure gages , gas flow meters, main cut-off solenoid valves, pressure relief outlet with ASME certified pressure relief valve, automatic change over with LPG control panels , earthing, anchoring The Price shall also include the concrete plinth ,anti vandals cages and chains with locks. Louvers . All

necessary wiring and conduitings needed for the BMS.

LPG Cylinders Shelter shall be measured in LS (Lump Sum).

**42. Gas Distribution Cabinet**

The unit price shall include the cabinet itself with the distribution manifold complete with pressure gauge, isolating valve, relief valve, solenoid valve and all other accessories as shown on drawings and called for in specifications.

Gas Distribution Cabinet shall be measured in No (Number).

**43. Gas Leak Detection System**

The unit price shall include the supply & installation of the control panel, remote detectors, all electronic gas leak detector, sirens, panic push buttons, The unit price shall also include all power cables and control wirings and conduitings between all systems components and to fire main alarm panel and all needed accessories for this system as called in specifications and shown on drawings.

Gas Leak Detection System shall be measured in No (Number).

**44. Manholes**

The unit price shall include all materials and works for the construction of manhole such as reinforced concrete, blinding, base, walls, cover, benching, iron steps, plastering, caulking, excavation, backfilling, framework shuttering etc. The price shall also include all related civil works including excavation, backfilling, compacting, protections and making good. and accessories as specified and shown on drawings.

Manholes shall be measured in No (Number).

**45. Grease Interceptor**

The unit price shall include the factory prefabricated grease trap, extension collars, covers, vent pipes, drain pipe connections, enzyme openings, Enzyme dosing materials for two years demand, and all related civil works including, blinding, base, walls, plastering, framework shuttering etc. as shown on drawings and called for in the specification.

Grease Interceptor shall be measured in No (Number).

**46. Solid Interceptor:**

The unit price shall include the factory prefabricated stainless steel

strainers extension collars, covers, vent pipes, drain pipe connections, enzyme openings,

And all related civil works including, blinding, base, walls, plastering, framework shuttering etc. as shown on drawings and called for in the specification.

Solid Interceptor shall be measured in No (Number).

**47. Channel Outlets with gullies and Gratings**

The unit price shall include all channel outlets with end plates, flanges, neoprene gaskets, water seals, fixing ties, levelers, P trap, heavy duty cast iron gratings and all other accessories and related civil works as specified and shown on drawings.

**48. Valve Chamber and Valve Box:**

The unit price shall include all materials and works for the construction of chamber and valve box, such as reinforced concrete, blinding, base, walls, cover iron steps, plastering, framework, shuttering etc. the price shall also include the excavation and backfilling.

Valve Chamber and Valve Box shall be measured in No (Number).

**49. Sanitary Fixtures**

The unit price shall include the complete supply and installation of all of the sanitary fixtures, complete with their mixers, fittings, hanger, and all other accessories.

The unit price shall also include the supply installation and commissioning of the all angle valves, flexible conduits, all types of traps, including the chrome plated bottle traps, P-traps, all flanges and eschetchions. All adaptors and connectors, all types of sealants and fasteners, all electrical wiring and connections from the nearest circuit breaker, as called for in the specification and drawings and as detailed in the architectural and interior design drawings and specifications. If the item is marked with (install only), the unit price shall include all of the above except supplying the fixture itself.

Sanitary Fixtures shall be measured in No (Number).

## **DIVISION 16 – ELECTRICAL WORK**

The Bills of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications, Appendices and Drawings. The documents are to be taken as - explanatory and inter-related to one another.

The bills of quantities, specifications, equipment schedules and drawings and all other contract documents are complementary to each other.

It is the responsibility of the Contractor to check the locations and quantities of the materials and equipment to be executed in accordance with the contract drawings.

Any discrepancy between the Drawings and Specifications and Bill of Quantities shall be brought to the notice of The Engineer in writing for his decision as to which is the correct interpretation before the work is commenced. Dimensions and sizes shown on Drawings shall generally take preference over those stated in the Specifications.

The Unit rate and the rates inserted in the Bills of Quantities respectively shall be comprehensive and shall include for complying in all respects with the requirements of the Technical Specifications, drawings and all other related tender documents. This shall cover all the obligations under the contract and all matters deemed necessary for the proper construction, completion of and remedy of defects in the works.

The unit rate of the materials and equipment shall be based on the specification, all components as required for proper operation of all systems and specified under each item concerned in the specifications, technical data, contract drawings, and all other contract documents.

All measurements and evaluation of the executed works called for in the Contract shall be based on the unit price stated in the Bills of Quantities and made according to the specifications. Any work done by the Contractor, but not called for in the Contract or not requested in writing by the Engineer, shall not be included in the measurement and evaluation.

In addition to the above-mentioned requirements, the unit rate of mentioned items in the B.O.Q shall include the following:

1. Supply of materials and equipment. All equipment shall be manufactured by a world-wide and well-known manufactures, high quality, approved standard and test certificate from independent third party. All materials and equipment to be supported by all details and technical data.
2. Off loading and handling from trucks on site to place of installation.
3. Installation of materials and equipment.
4. All civil work required and connected with the electrical installations, such as: equipment concrete bases and supports, cutting through walls and slabs for passage of pipes and conduits, chasings in concrete and block walls and slabs, repatching, fixings of pipe and supports to structure, excavation and backfilling, riggings, hoisting, water proofing, cleaning, protections and painting.



5. All testing balancing, adjusting, commissioning and handing over to client complete operational systems and equipment including materials necessary for testing.
6. Allowance for cleaning and for proper protection of all equipment plants, electrical installations and structures during installation.
7. All labour, materials, tools, scaffolding instruments, electric power supply and tools required for installation, testing, balancing, adjusting, operation and commissioning.
8. System identifications, tags, labels, nameplates and charts.
9. Shop-drawings and as-built drawings.
10. Spare parts and components for ideal running of all services and equipment during for a period of two years after the date of "Taking Over Certificate " issuance date of the works.
11. Operation and maintenance manuals.
12. The contractor shall provide free training for the employees of the Client, training shall cover all aspects of using running commissioning and maintaining of all electrical works.
13. Samples as required by the Engineer, including field test of materials.
14. Onsite inspection and testing of all materials and workmanship.
15. Maintenance of all items supplied by contractor as per Contract Conditions.
16. The Contractor shall be fully responsible for the coordination and liaison with all Government Departments and Semi Government Departments such as (National Electric Power Company, Civil Defence Department...etc) for obtaining all required approvals, permits and licenses for all electrical systems and service.
17. Marking the positions of and cutting or forming holes, mortises, chases and the like in any surface and making good all work disturbed.
18. Testing and commissioning of all equipment and systems by an approved third party.
19. The Electrical Contractor shall coordinate his work with the master program of the project.
20. Backup copy of any software utilized for all electrical systems.
21. The contractor shall maintain all the safety procedures at the site to protect manpower and machinery.
22. All systems that have direct relation to each other shall be computable and shall be supplied from the same qualified supplier as:
  - Electrical boards and panels.
  - Fire alarm system.
  - Prime generator and Automatic transfer switch (ATS).

- All circuit breakers, contactors, equipment and enclosures (shall be from the same manufacturer).
23. Provision of maintenance and operation manuals and spare parts lists and submitting required number of copies.
  24. Assembling and jointing together component parts of composite units and providing any necessary jointing materials.
  25. Priming or painting off site and proprietary finishes or surface treatments, applied as part of the manufacturing process.
  26. Corrosion protective treatments and coating to fixings, hangers and supporting materials.
  27. Sleeves through walls, ceilings and floors including cover plates.
  28. Brackets and supports.
  29. Plates, labels and tags for the identification of plant, equipment, cables, switches and the like.
  30. Cutting and pinning ends of supports for equipment, ancillaries, fittings, trunking, trays and the like.
  31. Painting on site including colour coding.
  32. Builder's work in connection. Except where required to be measured separately.

## METHOD OF MEASUREMENT:

### 1. PRIME DIESEL GENERATOR

- a. Each kind of prime diesel generator is given separately.
- b. The following components are each given separately.
  - Generating sets (stating rating and speed).
  - Automatic transfer switches.
- c. Generating sets, automatic transfer switches contactors and switches are given in numbers (No.).
- d. Generating sets are deemed to include:
  - Cooling system including radiators, piping, make-up tanks and accessories.
  - Supply, delivery and installation of generator as per specification (including shipping and, handling to site, Loading and un loading, and all custom fees required)
  - European manufacture, certified by third party
  - Starting system (compressed air, battery etc....).
  - Exhaust system including piping, silencers, insulation etc.

- Control and instrumentation panel/cubicle and interconnecting cables, wires and accessories.
  - Supporting structures and fixing materials.
  - Termination of cables to generating sets and control panels including cable, terminal boxes and accessories.
  - Spare parts for 1000 hours running, tools and instruments.
  - Daily fuel tank.
  - Concrete foundation.
- e. Fuel systems are deemed to include:
- Fuel tank and supporting structures.
  - Connection the fuel tank to the mechanical section.
  - Piping, fuel transfer pumps, valves, pipes and related accessories.
- f. Automatic transfer switches are deemed to include:
- Power cable termination's including terminal fittings and accessories.
  - Control and protection cabling between ATS and generator set including all accessories and fittings.
  - Breakers, contactors relays indication lamps... etc.
- g. Contactors and switches are deemed to include cables, wires, conduits and all necessary connections.

## **2. MAIN DISTRIBUTION, SUB-MAIN DISTRIBUTION AND FINAL DISTRIBUTION BOARDS**

- a. Each kind of distribution board is given separately. Stating the reference of equipment.
- b. Distribution boards are given in numbers (No.).
- c. The rate is deemed to include:
- Termination of incoming and outgoing cables to equipment including cable glands, termination's and accessories.
  - Fixing and support structures and materials required for installation of wall or floor mounted equipment as indicated.
  - AC or DC power supply for switchgear control and operation.

## **3. UNINTERRUPTABLE POWER SUPPLS(UPS)**

- a. Each kind of (UPS) is given separately. Stating the reference of equipment.
- b. (UPS)s are given in numbers (No.).
- c. The rate is deemed to include:
- Supply, install, test and commission of UPS system. Termination of incoming and outgoing cables to equipment including cable glands, termination's and accessories.
  - Fixing and support structures and materials required for installation of wall or floor mounted equipment as indicated.
  - Batteries and chargers.
  - Inverters.

## **4. WIRES, CABLES, FEEDERS AND RELATED ACCESSORIES**

- a. Each kind of wire and cable is given separately (except where required to be included with other items), stating the type, size and method of installation.
- b. Wires and cables are given in metres, measured the net length.
- c. The unit rate is deemed to include:
  - Conduits and fittings draw wires and the like (except where conduit work is required to be measured separately).
  - Cables connectors and cable joints (where permitted) including joint boxes, sealing boxes, shrouds and the like and materials and heat for making the joints.
  - Allowance in cable length for cables entering fittings and accessories, equipment or control gear.
  - Necessary components and accessories for fixing cables on walls, ceiling and on cable trays/ladders.

## **5. WIRE WAYS, SUPPORTING SYSTEMS AND RELATED ACCESSORIES**

- a. Trunking and cable trays and cable ladders are given in 'meter' (except where required to be included in the cables unit rates)
- b. Trunking, cable trays and the like are deemed to include Mounting Fittings, including cutting and jointing between sections. Bends, tees, Components for earth continuity.
- c. Adapters and connections between trunking and items of equipment or control gear requiring use of flanges anti/or the forming of apertures.
- d. Pin racks for supporting cable.
- e. Supports including fixing.

## **6. EARTHING & LIGHTNING SYSTEMS**

- a. Each kind of the following earthing systems given separately, stating the type and details, as appropriate.
- b. Earthing system is given as an item.
- c. The price is deemed to include a complete system excluding protective earthing conductors run with branch circuit wiring and connection of the cable armor with suitable cable glands to the earth bar at both ends.

## **7. GENERAL LIGHTING INSTALLATIONS**

- a. Each kind of lighting fixture is given separately, stating the type.
- b. Lighting fixtures are given in numbers (No.).
- c. The rates are deemed to include:
  - Outlets.
  - Wires including protective earthing conductor, conduits.
  - Lamps.
  - Ballasts, igniters, starters ...etc.
  - Fixing and supporting material.
  - Lighting switches or grid switch as per drawings.

## **8. WIRING DEVICES, DISCONNECTS AND LV DISTRIBUTION TRANSFORMERS**

- a. Each kind of wiring device including socket outlets, electrical outlets, switches, disconnecting switches and the like is given separately, stating the type and/or rating.
- b. Each kind of miscellaneous equipment including dimmers and dimmer racks, oil type transformers, contactors and the like is given separately, stating the type, rating and details, where appropriate.
- c. Wiring devices, miscellaneous equipment and the like are enumerated.
- d. Wiring devices, excluding disconnecting switches, are deemed to include:
  - Outlets.
  - Wires including protective earthing conductors, conduits, trunking and other raceways and fittings from outlet back to upstream outlet or controlled circuit (for switches etc.) or to final branch circuit panel board.
  - Fixing and supporting material.
- e. Disconnecting switches are deemed to include:
  - Outlets.
  - Wires or cables including protective earthing conductors, conduits, trunking and other raceways and fittings from outlet to panel board.
  - Cables prices of disconnect switch isolators with 20A and 25A ratings are included in disconnect switch isolator's price.
- f. oil transformer and ring main unit (R.M.U):
 

The rate is deemed to include:

  - Termination of incoming and outgoing cables to transformer including cable glands, termination's and accessories.
  - Supply, delivery and installation of oil transformer and ring main unit (R.M.U) as per specification (including shipping and, handling to site, Loading and un loading, and all custom fees required) ,as per Iraqi technical standard D07 & D026 .
  - European manufacture, certified by third party, as per Iraqi Ministry of electricity.
  - Fixing and support structures and materials required for installation as indicated in drawings and Iraqi local ministry of electricity standard.
  - All needed civil works.
  - All protection elements and devices.
  - Cooling oil for transformer.

## 9. STRUCTURED CABLING SYSTEM

The job includes but not limited to supply, install, test, terminate, labelling, commission and performance warranty of horizontal copper UTP and fiber cables, vertical (backbone) copper UTP and fiber cables, RJ45 outlets (single/ dual wall mounted) with backbox , faceplate, modular RJ45 (wall mount/floor box), UTP CAT6 cable(s), conduits, under raised floor wire cable tray , patch connectivity (copper and fiber), cabinets (open frame and free stand cabinet) , surface floor boxes ,under raised floor enclosure ,pull boxes , connectors ,patch cord (copper and fiber) ,fitting ,telecommunication handholes including all accessories ,telecommunication trench between existing building/hospital and new building/hospital, UPVC ducts and any civil work may be required to complete the job. Each kind of cable,

patch connectivity, patch cord, outlets, surface floor box, cabinet, active low current switches and handholes are given separately and given in numbers (No.).

Cables (UTP CAT6) are included with outlets price. Fibers cable and UPVC duct are given separately and give in length meters.

Cables and UPVC shall be re-measured for actual required length as described in BOQ.

Contractor shall submit the qualification of sub-contractor for Engineer's/employer approval. The price of fibre optic cables is included in the price of data switches itself .

## **10. FIRE DETECTION ALARM SYSTEM AND FIREMAN PHONE**

The job includes but not limited to supply, install, test, terminate, labelling, commissioning and shop drawing approval from civil defence department of fire devices fire alarm and fireman devices system, wiring, conduits, civil work as described in BOQ. The devices given separately and given in numbers (No.), civil work and wiring are given separately and given in points. Contractor shall execute fire alarm and fireman devices system in building/hospital based on approved final partitioning layout. Contractor must provide short circuit line isolator every 20 detection devices.

## **11. PUBLIC ADDRESS AND VOICE EVACUATION SYSTEM**

It must be noted that this system must have an interface with Fire Detection Alarm System and Fire Man Phone, and any needed job for PAVE system to operate properly must be covered, i.e., the item unit rate shall include all PVC conduits, fire rated wires from the panels to the served speaker, galvanized steel trunking, complete with all in and out cables up to the served speaker as per the manufacturer's recommendations, voice control, multiplexer amplifier, microphone, CD ROM, Backup battery, and all other accessories needed in accordance to the relevant codes of practice and highest prevailing engineering standards.

## **12. IP BASED CCTV AND ACCESS CONTROL SYSTEM**

The job includes but not limited to supply, install, test, terminate, labelling and commissioning of IP based CCTV and access control system devices, wiring, conduits, civil work as described in BOQ. The devices given separately and given in numbers (No.), the item unit rate must include all civil works and wiring.

## **13. NURSE CALL SYSTEM:**

The job includes but not limited to supply, install, test, terminate, labelling and commissioning of nurse call devices, wiring, conduits, civil work as described in BOQ. The devices given separately and given in numbers (No.), the item unit rate must include all civil works and wiring.

## **14. IP CLOCK SYSTEM:**

The job includes but not limited to supply, install, test, terminate, labelling and commissioning of IP clock system's devices, wiring, conduits, civil work as described in BOQ. The devices given separately and given in numbers (No.), the item unit rate must include all civil works and wiring.

### **15. QUEUING SYSTEM:**

The job includes but not limited to supply, install, test, terminate, labelling and commissioning of queuing system's devices, wiring, conduits, civil work as described in BOQ. The devices given separately and given in numbers (No.), civil works, conduits and wiring are given separately and given in points.

### **16. AUDIO VIDEO SYSTEM:**

Supply, install, test and commission a fully operative Audio / Video System all complete including necessary containment works wires installations as required, the price of each items below shall include wires, conduits, control module to have an interface with public address and voice evacuation and fire alarm systems, mixing amplifiers, wireless microphone, mini jack, volume controller, CD player and end of line resistors.

### **17. VIDEO CONFERENCE SYSTEM:**

Supply, install, test & commission of following Video Conference system Components including wires, TV outlets, connection galvanized trunks or conduits any needed supporting. The system must be completed in all respects with all necessary accessories as required for completion & successful operation of the system as per drawings, specialist requirements, relevant standard & technical specifications of the tender.

### **18. CONVEYING SYSTEM:**

The elevators shall be enumerated stating the capacity, number of stops and speed.

#### **The unit rate is deemed to include: -**

All work listed in the Specification.

- Supply, delivery and installation of elevator as per specification (including shipping and, handling to site, Loading and un loading, and all custom fees required)
- European manufacture, certified by third party
- All necessary cutting, fixings, fittings, accessories and all necessary related.
- Drive / machine system including motor, motor bedplate, controller, speed governor, brake, sheaves, etc...
- Stain less steel Inner and outer finishes.
- With steel structure columns& beams for existing Shaft
- Stain less steel skirting & guard rail at the bottom

- First quality Marble flooring size 60\*60\*2cm
- Priority of landing
- Proper mechanical ventilation car system
- Interface with public address, voice evacuation system (including ceiling mounted speaker integrated within the car ceiling)
- Provision for CCTV camera
- Emergency landing system with batteries.
- Hygienic Car lighting.
- Communications system.
- Scaffolding inside shafts.
- Providing all test certificates and complete compliance with the certification.
- Auxiliaries, controls, control panels, indicators, elevators call stations and accessories for a complete operational system as specified.
- Wires, cables, conduit, sleeves, wire ways, earthing, brackets, architecture and steel elements required.
- All necessary accessories in shafts including supports such as I-beams, ladders, grilles, ropes, buffers, guide rails, brackets, etc. ... as specified.
- All necessary safety devices and features.
- Submittal of all shop drawings, samples and Material Approvals.
- All necessary equipment and accessories for interface with other systems such as BMS, Fire Alarm and A/V, and in coordination with local authorities' requirements.
- Supporting frame.
- Builders work.
- Testing and commission including 2 years warranty against manufacturing defects, use of the operator and client with all parts necessary during warranty period .
- Storage.
- Protection.
- Spare parts and tools.



- All necessary material, labour and accessories required to have a complete and operational system.

## 19. BUILDER'S WORK

### 19.1 Generally

- a. Builder's work in connection with electrical installations is not given separately (except where specifically required) and is deemed to be included in the rates for electrical installations.
- b. Bases/foundations and supports where not forming an integral part of the building/hospital structure are deemed to be included with the equipment rates.

### 19.2 Cable Trenches

- a. Cable trenches are given separately, stating the type or width and depth.
- b. Cable trenches are given in meters.
- c. The rate is deemed to include:
  - Excavation, including backfilling, disposal of surplus excavated material and earthwork support.
  - Protective tiles and / or tapes.
  - Cable markers.
  - Cable trench chequres plate cover.
  - Coordination with new and existing systems on site.

### 19.3 Cable Duct and Ducts Bank

- a. Cable ducts and duct banks are each given separately, stating the type, number and size of ducts.
- b. Cable ducts and duct banks are given in meters.
- c. The rate is deemed to include:
  - Excavation, including backfilling, disposal of surplus excavated material and earthwork support.
  - Duct couplers, bends and other duct accessories.
  - Duct racks/spacers.
  - Coordination with new and existing systems on site.

### 19.4 Manholes, Hand holes and other Underground Structures:

- a. Manholes and other underground structures (where not forming an integral part of the building/hospital structure or included specifically where appropriate) are each given separately, stating the type and /or size.
- b. Manholes, hand holes and other underground structures are enumerated.
- c. The rate is deemed to include:

- Excavation including backfilling, disposal of surplus excavated material and earthwork support.
- Concrete, reinforcement, formwork and water-proofing.
- Block work, brickwork and rendering.
- Coordination with new and existing systems on site

## 19.5 Shop Drawings

The Contractor shall prepare Shop Drawing for the installation of all electrical systems. These shall be based upon the actual equipment to be installed, selected for use by the Contractor according to manufacturers subsequently approved by the Engineer. The Contractor shall make such adjustments to the design as are necessary to accommodate the technical and physical requirements of the selected equipment in the preparation of the Shop Drawings.

Such adjustments shall at all items ensure that the final performance of the completed installations is achieved as intended.

Shop Drawings shall be checked and coordinated with the work of all trades involved before submission for the approval of the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and co-ordination. Drawings submitted without this stamp of approval may be returned to the Contractor for re-submission.

Drawings shall be initially submitted in the form of a reproducible print made by process approved by the Engineer and accompanied by a letter of transmittal. After return of the Engineer-approved reproducible, the Contractor will furnish the number of additional prints specified by the Engineer.

Each detail drawings shall have a blank area, title block. The title block shall display the following:

- a. Number and title of drawings (s).
- b. Date of drawings or revision.
- c. Name of project and employer.
- d. Name of Contractor and Subcontractor submitting the drawings (s).
- e. Clear identification of contents and location of work.
- f. Specification title and number.
- g. Scale of drawing.

The Contractor shall show the following in the shop drawings: -

- a. Actual conduit routes with circular junction boxes indicating the size of conduit, number and size of wires it is carrying, where it is rising up or bending down etc.
- b. Separate drawing shall be prepared for each small power and lighting.
- c. Light fittings and other ancillary equipment.
- d. Mounting arrangement of light fittings, cables, cable trays, trunking, etc.
- e. Sectional views for coordinating the electrical wiring and other services i.e. air conditioning, drainage and plumbing etc, to the engineer's requirements.

The drawings shall be to a minimum scale of 1:50 and in complex area, such as plant rooms and service ducts, scales of 1:20 and 1:10 shall be employed.

The Contractor shall submit all drawings for checking and appropriate action fifteen working days in advance of construction requirements.

The approval of drawings will be general, but approval shall not be construed as permitting any departure from the Contract requirements, nor relieving the Contractor of the responsibility for any errors, including details, dimensions, materials, etc.