

2. METHOD OF MEASUREMENT

Preamble

1. General

a) The rates and prices entered against the several items in the Bill of Quantities are those referred to in the Contract as the rates and prices and shall cover the execution, completion and maintenance in every respect as shown and described in the Contract, with or without such modifications, either by way of additions or deductions or such alteration as may be ordered in writing during the progress of Works and include but not by way of limitation all matters and things, particularly referred to in the Contract.

b) The quantities given in the Bill of Quantities are approximate only and shall be so regarded in accordance with the Conditions of the Contract. The Employer does not expressly nor by implication agree that the actual amount of work to be performed will correspond with the quantities in the Bill of Quantities. No payment will be made on account of anticipated profits for work covered by the Contract which is not performed, nor will any adjustment in the unit rates set forth in the Bill of Quantities be made because of an increase or decrease in the actual quantity from the estimated quantity indicated therein except as otherwise provided in Clauses of the Conditions of the Contract.

c) The rates and lump sums in the Bill of Quantities shall cover all costs of every kind whatsoever, including but not by way of limitation, all office charges, supervision, transport, materials and labour, the provision, maintenance use, and efficient repair of all plant, equipment and appliances of every kind, the construction and maintenance of all temporary works of every description and the performance of all services that may be required for the proper execution, completion and maintenance of the works in full and complete in accordance with the provision of the Contract and the undertaking and discharge of all obligations and responsibilities therein defined.

d) Where a discrepancy exists between the unit rate and the extended total amount, the unit rate shall be taken as correct and the total amount adjusted accordingly.

e) The general and special directions, stipulations, particulars, description of work and materials, etc and all other matters in the Contract affecting the rates shall be deemed to be repeated in the Bill of Quantities according to Method of Measurement and the several rates shall include the same as

though specifically mentioned.

f) All measurements shall be taken net except when otherwise specified and shall be applicable to finished work only as completed and no allowance shall be made for bulking, shrinkage or waste, notwithstanding any trade custom to the contrary. Payment for finished work will be made at the applicable unit price in the Bill of Quantities.

g) The items listed in the Bill of Quantities do not necessary contain full descriptions of the required work or materials. Reference to the relevant sections of the contract documentation should be made before entering prices against each item in the priced bill of quantities. Full reference should be made to this Preamble, the Drawings, Specifications, Conditions of Contract, Contract Data, all other pertinent documents and site conditions.

h) The Contractor shall be deemed to have fully considered all the conditions, obligations and requirements of the Contract before entering the respective rates against the items in the Bill of Quantities.

i) The Sections of Bill of Quantities are numbered in accordance with the corresponding Sections of the Specification. The Items in each section of the Bill of Quantities shall be read in conjunction with the Measurement and Payment Clauses in the relevant Sections of the Specification. In each part of the Bill of Quantities, the relevant or relevant sections are indicated using the clause number. This is intended to guide the contractor and does not relieve them of their obligations and duties as indicated in the conditions of contract.

j) If there is a discrepancy between the rate and Total Price entered for any Item in the Bill of Quantities, the rate will be taken as correct.

k) The Bill of Quantities shall be read in conjunction with the Instructions to Tenderers, Conditions of Contract, Specification and Drawings.

l) The quantities given in the Bill of Quantities are estimated and provisional and are given to provide a common basis for tendering. The basis of payment will be the actual quantities of works ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and lump sums quoted in the Bill of Quantities where applicable, and otherwise at such rates and lump sums as the Engineer approves within the terms of the Contract.

m) The rates and lump sums in the Bill of Quantities shall, except in so far as it is otherwise provided under the Contract, include all plant, labour, supervision, materials, erection, maintenance, insurance, profit, together with all general risks, liabilities and obligations set out or implied in the Contract.

2. Currency and Units

a) The currency used in this Bill of Quantities is the US Dollar.

b) Sizes and quantities entered in the Bill of Quantities are generally in SI units. Figures involving decimals, including sums of money, are written with a full stop in the decimal position and commas between each successive group of three digits to the left of the decimal position. The rates and sums shall be entered to a maximum of two decimal places, e.g. 9,999.00.

c) The following abbreviations have been used.

Cubic meters	m ³	Millimeter	mm	Number	No
Square meters	m ²	Diameter	dia	Hectare	ha
Metric tonne	t	Linear meter	m		
Kilogramme	kg				

3. Dimensions and Description

a) Unless indicated otherwise, dimensions are stated in item descriptions generally in the sequence of length, width and height.

b) Depths are from finished ground level or formation level(excavation) as shown in the drawings.

4. Provisional Items

a) An item or groups of items, which are designated provisional, shall be used only on the direction of the Engineer or his designated represented, and if not used, either wholly or in part the amount not used shall be deducted from the Contract price.

b) Notwithstanding the provisions of the conditions of Contract, claims in respect of overhead charges, or other cost, which may result from the mission of works covered by such provisional items, shall not allowed.

5. Dewatering of works

a) Unless explicitly stipulated to the contrary, maintenance of the whole of the works free from water

of any source shall be deemed to be included for in the rates and prices of the Bill of Quantities. No separate item will be provided.

6. Temporary works

a) The rates and prices quoted by the contractor shall include all costs needed for mobilization (all expenses incurred by the mobilization to the site of all personal, tools, facilities, equipment etc), safety works to protect the site from perennial and flood water, works needed to provide access to the site, expenses incurred for testing of materials and works under this contract and demobilization expenses of all labour, plant, temporary works and facilities from the site, and cleaning and restoring the site to the condition existing prior to mobilization unless otherwise the items for these works are not provided in the Bill of Quantities.

7. Dayworks

a) Any work ordered in writing by the Engineer to be carried out by Daywork shall be paid for at the rates entered hereunder, subject to the following conditions:

The rates entered for labour shall be deemed to include overhead charges and profit, site supervision and staff, insurance, use and maintenance of small hand tools and appliances, non-mechanical plant and equipment, such as trestles, stages, bankers, scaffolding, temporary track, wagons, skips, tarpaulins, and all similar items, unless these are used or set up exclusively

The time of gangers working with their gangs shall be paid for under the appropriate items, but the cost of foremen and walking gangers shall be deemed to be covered by the rates entered for the labour under their supervision.

Materials used in carrying out Dayworks that are not listed under the appropriate Schedule in the Tender Documents shall be charged at invoice cost less all trade discount with the exception of cash discount up to 5 per cent plus 15 percent for handling and profit.

The rates entered for plant shall only apply to plant that the Contractors have available on the site. Such rates shall be deemed to include overhead charges and profit, site supervision and staffs, wages of drivers and operators, hire charges, consumable stores, fuel, maintenance and insurance.

Mechanically operated plant shall be paid for at the rates entered only for the net working hours during which the plant is engaged on Daywork and excluding standing or idle time.

Method of Measurement of Quantities

All work items shall be measured and paid according to the Method of Measurement described hereunder. The method defines different classes of work, gives method of item description in the Bill of Quantities, defines measurement units and method of measurement and specifies inclusion and exclusions in each class of work.

Method of Measurement		
Class of Work	Method of Measurement	Inclusions and Exclusions
General	Temporary works No quantity measurement and payment will be made for the provision of temporary works such as maintenance of irrigation /drainage/water supplies disrupted during construction, traffic management and any temporary protection works unless otherwise the items for these works are not provided.	
Site Clearance	The unit of measurement for general site clearance shall be square meters (m ²). Site clearance shall be measured according to the design lines shown on the drawings or as indicated by the Engineer. Unless otherwise stated, works under this section shall relate to the removal of superficial obstructions and debris down to the depth indicated in the corresponding item in the Bill of Quantities.	Site clearance shall indicate the stripping, removal and disposal of all existing debris, waste materials including demolished structures and desilting materials, grasses, shrubs and trees of any size, grubbing up of roots, backfilling the root holes, etc. and the removal and disposal of all such materials
Earthworks General	The earthworks outline, unless detailed otherwise on the drawings, is defined as the finished earthworks levels (i.e. the formation level) and dimensions prior to top soiling and construction of the overlaying carriageway, hard-shoulder, pavement,	General excavation does not include drilling, boring or other works associated with piling. The rate shall include for shoring, under-pinning of adjacent structures, de-watering and any

foundation and the like. The unit of measurement shall be cubic meters. No measurement or payment will be made for over-excavation, except where done at the direction of the Engineer.

Excavation has been classified in to following types:

a) Natural ground

b) Rock

The Contractor shall assess the required depth of excavation at each section of work from drawings of structure.

For the purpose of reusing the excavated materials in filling, the following classification shall also be used.

a) Suitable material

b) Unsuitable material

In the case of unauthorized over-excavation, the Engineer may require that the volume of over-excavation be filled and compacted with selected fill or concrete and no payment shall be made for this.

The tendered prices for earthworks shall include for all associated work such as setting out in plan and in level, side sloping, timbering, shoring, strutting, storm water protection, dewatering, draining, trimming to line and level or grade, removing tree roots and obstructions as specified, disposal of soil and surplus material, testing to confirm compliance with the specification and all other contingent works not billed specifically.

All excavations shall be measured net to the lines and levels specified on the drawings or otherwise by the Engineer. Where not

other measures deemed necessary by the Engineer to ensure safe working conditions, excavation any depth, loading into transport, multiple handling and haulage to temporary stockpiles, trimming of slopes, trimming, watering and compaction of final formation level when in cutting.

Natural ground includes, top soil, soft material, ordinary soil, soft rock etc., other than rock. It includes both common and borrows excavation.

Rock is defined as any material that cannot be excavated by hand tools. An isolated volume of artificial hard material or rock occurring within natural ground material shall not be measured separately unless its volume exceeds 1.0 cu. m.

specified by the Engineer to the contrary sides of excavations shall be taken as vertical. The depth of excavation shall be taken as the depth from the actual cleared ground level to the formation level specified by the Engineer or, in the case of trench excavation for sewer, water, drainage or other pipes or culverts to the invert level specified by the Engineer. The Contractor shall be deemed to have allowed in his rates for any additional excavation.

- a) Necessary to accommodate the thickness of pipes or culverts and the specified bedding.
- b) Necessary to accommodate the joints of pipes or culverts.
- c) Due to inadvertent over break.
- d) Due to over break in rock specified elsewhere for trench excavation for pipelines.

Earthworks for structures	The volume of measured excavation for a structure or foundation shall be the volume occupied by or vertically above any part of the structure or foundation.	The item rate coverage for structural excavation shall be as for general excavation detailed above including trimming, compaction and preparation of final founding level.
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Filling	The unit of measurement shall be cubic meters. No measurement for payment will be made for over-filling or filling of excavation except where done at the direction of the Engineer.	The rate shall include excavation, collection of material from temporary stockpile or borrow pit, delivery to site, spreading, watering, mixing and compaction in specified layer thickness,
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testing, re-scarifying and re-compaction if required, trimming to specified slopes and profiles and preparation of formation level.

Fill material from borrow area	<p>The unit of measurement shall be cubic meters.</p> <p>The volume of imported earth fill from borrow area shall be measured as the net compacted volume of embankment formed to lines and levels given in the Contract Drawing, or as directed by the Engineer. Minus the volume of suitable material excavated from structured or other works and backfilled.</p>	<p>The rate for imported material shall be taken to include the coverage detailed for general fill, the identification of borrow areas, proving the suitability of the material, payment of any royalties, excavation of material, transportation and deposition.</p>
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Filling general	<p>The unit of measurement shall be cubic meters. The item description for backfilling should state the type of material according to the following classifications:</p> <p>a) Material from borrow pits;</p> <p>b) Suitable material from excavations;</p>	<p>Backfilling shall be deemed to include procurement, placing, watering, mixing, moisture control and compaction to lines and levels as shown on the Contract Drawings and in accordance with the Specification.</p> <p>Filling suitable material from excavation includes in addition to the above for screening debris and boulders and transporting from stockpiles.</p>
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Filling around Structures	<p>The volume of backfill around a structure up to original ground level shall be</p>	<p>The rate shall include the coverage for general backfill and</p>
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measured as the volume of excavation provision of water for calculated for the structure minus the compaction where specified. volume of the structure. Volumes shall be measured below original ground level or finished ground level where this is below the original ground level.

Volume of fill around the structure above the original ground level shall be measured from the Survey Cross Section.

**Tipped/Placed
Rock and Filter
Material**

The unit of measurement shall be cubic meters. Measurement shall be by volume to the lines and levels as shown on the Contract drawings or as directed by the Engineer for the various classes of tipped or placed rock and filter material described in the specifications.

The rate is deemed to include the excavation or quarrying of the material, grading according to the specifications, transport to site, placement and compaction. No overhaul shall be paid for tipped rock or filter material.

The rate is deemed to include haulage, any double handling and deposition to approved tips off site including any charges levied by providers of tips.

**Disposal of
Material**

The unit of measurement shall be cubic meters. The volume shall be measured net with no allowance made for bulking.

**Gabion Baskets
and materials**

The unit of measurement shall be in numbers. Measurement shall be in numbers within the lines and limits shown on the Contract Drawings or as directed by the Engineer.

The rate shall include the excavation or quarrying of suitable stone, supply of gabion baskets and mattresses, supply of wire, transport of stone and wire to the site, excavation for and

preparation of the base on which the gabions are to be placed, assembling the wire crates, filling with selected stone, bracing and the like.

Concrete

The unit of measurement shall be cubic meters for various concrete mixes described in the Specification. Measurement for payment for concrete required to be placed directly against surfaces or excavation will be made to the same lines for which payment for excavation is made.

Measurement for all other concrete will be made to the dimensions shown on the Contract Drawings or as modified by the Engineer.

The item description shall state whether the concrete is reinforced or not and shall state the class of concrete; e.g. Class A, Class B etc.

The item description shall classify the concrete work as follows:

- a) Blinding
- b) Base slab
- c) Wall coping
- d) Pre-cast units
- e) Walls & Piers
- f) Supported beam and slab

Concrete work shall be considered to include the procurement and transport of component materials to site, batching, mixing, mix designs, placing, trial panels, testing, compaction, surface finishes and curing. It shall also include the cost of providing, fixing and striking specified formwork type, scaffolding, access walkways, lighting, making chases, recesses, chamfered edges and holes and the like. It shall not include work related to the supply and fixing of any steel reinforcement.

The measured volume of concrete shall occupied by:

Reinforcement

Cast-in components, openings and ducts where the volume of each is less than 0.5 cu m.

Provision of pre-cast units shall also be considered to include transportation of the units from their place of manufacture to their final location.

Weep holes	Weep holes shall be measured in number.	Rate includes formers, pipe as shown on drawings.
Joints	The unit of measurement for contraction and expansion joints shall be square meters. Joints are measured as a composite item to include board, filler and sealant.	The rates shall include for the full surface preparation, formwork, false work, and cutting and jointing, supply of any special fittings at angles and junctions, supply and installation of compressible fiberboard, filler and joint sealant.
Waterstops	The supply and installation of waterstops shall be measured in linear meters along their center line.	Coverage includes supplying and fixing in position.
Steel reinforcement bars	<p>The unit of measurement of steel reinforcement bars shall be tonne.</p> <p>Measurement of steel reinforcement bars will be by the theoretical unit weight, taken as 0.00785 kg per square millimeter of cross-sectional area per linear meter of bars actually furnished and placed in accordance with the Contract drawings or at the direction of the Engineer.</p> <p>The item description shall state if the reinforcement is mild or high yield steel and give the diameter of the reinforcement according to the following ranges:</p> <p>(a) Up to and including 16mm diameter.</p> <p>(b) 20mm and above</p> <p>Steel mesh reinforcement shall be measured in square meters. The nominal bar diameter</p>	<p>Steel reinforcement bars shall be considered to include procurement and transportation to site, storage, bending, and cutting, fixing and cleaning.</p> <p>Measurement shall only be made for chairs, supports, hooks and laps where specifically shown on the drawings or stated in the Specification.</p> <p>No measurement shall be made for spacers, binders or wastage or any additional laps, hooks, chairs etc. introduced by the Contractor to suit his method of working or comply with the general requirement of the Specification</p>

and BS reference or similar shall be stated in the item description. and Drawings unless expressly ordered by the Engineer.

Masonry

The unit of measurement shall be cubic meters.

Measurement for stone or block work masonry will be made to neat lines of the structure as shown on the Contract Drawings or as directed by the Engineer. The item description shall state the following:

- (a) If the masonry is stone, block or perforated block, or ashlar
- (b) The thickness of the wall or lining.
- (c) Whether the stone is to be random rubble or squared rubble, un-coursed or coursed, or dressed special.
- (d) The type of pointing required, if any.

The item description shall further classify the masonry as follows:

- (a) Type A
- (b) Type B

The rate for stone masonry shall be considered to include, excavation or quarrying of stone and transportation to site. Block work masonry shall be considered to include procurement or manufacture of blocks and their transportation to site.

All rates for masonry shall include the provision and mixing of bedding and grouting mortar, dressing and placing of stone or blocks setting, jointing, grouting up all ties and dowels, building in of pipes/ducts, scaffolding and curing.

Openings, recesses, pipes, ducts and embedded item, where the volume of each is greater than 0.5 cu m shall be deducted. No volume deduction shall be made for weep holes etc.

Pointing of Masonry

The unit of measurement shall be square meters. Joints on the face of all stone masonry exposed to view shall be neatly finished. The mortar in the joints of the stone masonry shall first be removed to a depth of three (3) cm. The joints shall then be cleaned thoroughly with a wire brush of

The rate for pointing shall be considered to include, excavation or quarrying of sand and transportation to site.

All rates for pointing shall include the provision of material for pointing, picking, washing,

all loose materials and filled with cement mortar with mix portion of one port-land cement and three parts of sand by volume (1:3). The surface of the face stone shall be cleaned of all mortar upon completion of the finishing operation.

Pipe work and Ducts General	<p>The unit of measurement for pipe work and ducts shall be in numbers. Measurement shall be made by numbers of the pipe or duct including fittings, valves and specials. The item description shall specify the pipe material, length, internal diameter and type of bedding and surround.</p> <p>The item description shall also specify the depth of the pipe or duct by making reference to the following:</p> <ul style="list-style-type: none"> a) Up to 1.5m in depth b) 1.0m-2.0m in depth c) 2.0m-3.0m in depth d) Greater than 3.0m in depth 	<p>The rate for pipe work and ducting shall be considered to include trench excavation, the supply of all materials to site, storage, double handling, preparation of trench base, laying, cutting, jointing and testing of the pipeline, protective painting and wrapping (if any), provision of draw ropes, sealing plugs, identification markers, thrust blocks, formwork, trench shoring, de-watering, backfilling of trench, disposal of surplus excavated material and provision of all pipe fittings and ancillary items such as jointing compounds, gaskets, nuts and bolts and the like.</p>
Geotextiles	<p>Geotextile and filter cloths shall be measured in square meters on the basis of the net area laid in accordance with the requirement of the Drawings and Specification.</p>	<p>The rate shall be deemed to include for all necessary overlaps, fastenings, clips staples and the like, preparation of surfaces and testing.</p>

Plastering

The unit of measurement for plastering shall be square meters (sq. m).

The item description shall state:

- a) Thickness of plaster
- b) The ratio of mortar mix used for plastering.
- c) Place of appreciation and component of work.

Measurement of plastering will be made to neat lines of the structures as shown on the Contract Drawings or as directed by the Engineer.

The plastering work shall include procurement of materials, mixing, wetting and cleaning /roughening of surface, hacking of masonry joints, application and curing in accordance with the Contract Drawings and Specifications.