



STRUCTURAL STEELWORK, PLATEWORK, MECHANICAL INSTALLATION AND PIPING

PREAMBLE TO BILLS OF QUANTITIES

A. GENERAL

1. The Bills of Quantities set out the work in accordance with the rules described herein.
2. Unless otherwise stated, the description of each item shall be deemed to include manufacturing, conveying and delivering, unloading, storing, unpacking, hoisting, setting, fitting and fixing in position, cutting, waste, patterns, models and templates, plant, temporary works, return of packings, establishment charges, profit and other obligations arising from the conditions of contract.
3. Unless otherwise stated all work shall be measured net as fixed in position. All wants shall be deducted and no allowance shall be made for waste, nor passings and laps except where otherwise stated.
4. Quantities shall be rounded off to the nearest whole unit, unless the value of fractional quantities is of relative significance, in which circumstances one or two decimals may be added. Remeasurement of quantities will be done to the same number of decimals as used in the tender bills.
5. Quantities have been measured **provisionally** in the Bills of Quantities for tender.
6. Quantities will be remeasured primarily from the Engineer's construction drawings, secondary from other technical information approved or issued by the Engineer and site measurements where measurement from drawings is not possible.
7. Variations resulting from an Engineer's instruction, shall be measured and valued as follows:
 - 7.1 Items of additional work of similar character and executed under similar conditions shall be priced at the rates in the Bills of Quantities.
 - 7.2 Items of additional work not of a similar character or not executed under similar conditions shall be priced at comparable rates and adjusted to suit the changed circumstances.

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- 7.3 Where rates are not applicable and cannot be adjusted in terms of 7.2 above to value a variation for additional work, the items of work shall be priced at new rates which take into account the labour, material and plant necessary for executing the work as well as an allowance for contractor's overheads and profit which overheads and profit shall relate to those included in the contract sum for items of a similar character.
- 7.4 In exceptional cases and following agreement with the Engineer prior to the execution of the works, additional works may be valued on dayworks, but then only if dayworks sheets are duly submitted, agreed on and signed on a daily basis.
8. Rates are to include for supply and installation, unless otherwise noted. Separate rates for supply and installation shall be given where provision had been made in the bills:
- S Supply portion including for procurement, transport, storing, wastage and everything necessary to supply the item up to the point prior to erection.
- E Installation portion including for installing the item in position and any testing, commissioning or other obligations associated with rounding off the installation of the item.
9. Rates shall be tendered for proprietary equipment as stated. No alternatives shall be allowed without prior agreement and the written consent of the Engineer. The phrase "or other approved" shall not relieve the Contractor from the responsibility to obtain such agreement and consent.
10. The *General Conditions of Contract*, the *Special Conditions of Contract*, the *Specifications* and the *Drawings* are to be read in conjunction with the Bills of Quantities.
11. The quantities contained in these Bills are **not to be used for ordering purposes**. No claims whatsoever arising due to these Bills being used for ordering will be entertained.
12. Rates inserted in the Bills of Quantities shall allow for all **abnormal working hours** as may be necessary to execute the works.
13. A price or rate is to be entered against each item in the Bills of Quantities, whether the quantities are stated or not. An item against which no price is entered will be considered to be covered by the other prices or rates in the Bill of Quantities.
14. The Contractor will check item extensions and total additions. The **rates** stated in these Bills of Quantities **shall predominate**, and if there are any errors in the extensions, any such errors shall be adjusted accordingly and be reflected in an adjusted Tender Value subject to the understanding that if there is any obvious mistake in the rate of any item, in the opinion of the Engineer, the

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Contractor will be called upon by the Engineer to adjust the said rate(s) and the Tender Value accordingly.

15. Rates and prices will be in [*.. insert currency ...*].

16. The following units of measurement and abbreviations shall be used:

| Unit | Abbreviation | Unit | Abbreviation |
|-------------------|-----------------|--------|--------------|
| Millimetre | mm | Tonne | t |
| Metre | m | Sum | Sum |
| Square Millimetre | mm ² | Item | Item |
| Square Metre | m ² | Number | No |
| Hectare | ha | Hour | hr |
| Cubic Metre | m ³ | Week | wk |
| Kilogram | kg | | |
| Deci cubic metre | dm ³ | | |

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B. PRELIMINARIES AND GENERAL

1. The Contractor is to allow in this section for all costs that cannot be suitably included in the unit rates for measured works elsewhere in the Bills of Quantities.
2. Tenderers will submit a detailed breakdown of the lump sum prices for items in this bill if so requested by the Engineer.
3. Payment will be made as and when obligations for a particular item has been fulfilled. Generally payment will be calculated as follows:

3.1 Fixed Charge

Payment against each item as and when obligations are fulfilled.

3.2 Time-related

Payment against each item as and when obligations are fulfilled and proportioning the value to the contract period elapsed to the total contract duration.

3.3 Value-related

Payment against each item as and when obligations are fulfilled and proportioning the value to the value of measured works completed to the contract sum excluding Preliminaries and General, Provisional Sums, Prime Cost amounts and dayworks.

4. Descriptions are brief: It is the Contractor's responsibility to decide on and assure that sufficient infrastructure, management and resources are employed to fulfil all contractual obligations. The Contractor will supply breakdowns and details for pricing of Preliminary and General items upon request to the satisfaction of the Engineer.
5. The value for **Preliminaries and General** will fully take into account the nature of the works being in [*..describe whether existing or new and whether security or open access..*]

C. STRUCTURAL STEELWORK, PLATEWORK AND LINERS

1. Basic principles and Computation of Quantities

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1.1 Steel members and platework as well as hardwearing steel liners will be measured by mass of steel. Sundry items will be measured in units best suited to the nature of the item.

1.2 The mass of steelwork and platework as well as hardwearing steel liners will be calculated in accordance with the *Structural Steel Tables* as published by the *South African Institute of Steel Construction* (latest revision). When no mass is stated in the mass list, the mass will be calculated from a steel density of **7 850 kg/m³**. The mass of base and cap plates, cleats, gussets, battens and stiffeners will be added to the mass of the member to which it relates.

1.3 Gussets, cleats and other items of flat plate less than **0,5 m²** in size, shall be measured as the smallest rectangular section from which it can be fabricated. Platework in chutes, bins, tanks, sumps and any mechanical item, shall be measured net.

1.4 Tolerances for rolling margins and other permissible deviations will not be taken into consideration in the mass calculation.

1.5 No deductions will be made for holes for fasteners, bolt holes, milling or planing and no additions will be made for rolling margin, weld metal, shop fasteners, temporary braces, lifting lugs, binding wire, waste, packing material or shims other than spacers specifically designed, dimensioned and detailed on the Engineer's drawings, which would be measured separately.

1.6 All bolts, nuts and washers for site bolting of structural steelwork and platework, whether cadmium plated high tensile or hot dipped or electric galvanised mild steel will be measured separately and will not be added to the mass for supply, transport and corrosion protection of the respective bolted items.

1.7 Rates for bolts are to include for procurement, supply, site measurement, corrosion protection, delivery to site and storage. The mass of erection bolts will be added to the separately measured items for steelwork to provide for pricing of shop detailing and erection.

1.8 Rates for steelwork are to include for procurement, supply, shop detailing, site measurement, fabricating, delivery to site, erection and trial erection deemed necessary by the Contractor, including drilling holes, welding, shop and site fastenings and all necessary crange, scaffolding, access ways, temporary supports, temporary bracing and the like. Separate items are stated for:

- Shop detailing
- Supply
- Transport
- Erection
- Corrosion protection

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- 1.9 Should the mass of the steel actually used in the Works vary in any way from the above mass lists, the variance shall be for the Contractor's account and the listed masses will be strictly adhered to in all calculations affecting the mass of steel.
- 1.10 The unit rates for miscellaneous items shall specifically include for the described item, which description will be deemed to include all waste, weld metal, bolts, templates, hard stamping bagging, tagging, etc.
- 1.11 In calculation of the tonnage of platework to be erected no cognisance of the mass of any non-ferrous or hardwearing liner shall be made. The erection cost of non-ferrous and hardwearing liners shall be specifically included in the assembly or install items for such, irrespective whether the lining is carried out before or after erection of platework items.
- 1.12 No distinction shall be made for supports at differing levels or in differing positions. Rates are to be inclusive of installing supports at all levels and positions.
- 1.13 Support steelwork to items of platework shall be classified as structural steelwork unless forming an integral part of the fabricated item.
- 1.14 Steel for the construction of stairs would be measured as **stair stringers** only if it requires mitring or other cutting to angles other than right angles. Steel members requiring only straight cutting or profiling normally associated with beams and ties, would be measured as **walkways** or other descriptions as applicable.

D. SHEETING AND CLADDING

- 1. Separate items for roof sheeting and side cladding, further separated for different sheet profiles, finishes and materials' thicknesses will be stated. Descriptions will be deemed to include for all straight and raking cutting and waste, fasteners, quality control procedures and erection aids to ensure complete watertight installation.
- 2. Translucent sheeting will be measured as extra over to regular sheeting. The net translucent area will be measured.
- 3. Flashings, covers and labours to sheeting will be measured per running metre, with widths specifically stated or categorized, separated for different sizes, profiles, numbers of bends and finishes. Descriptions shall be deemed to include for fasteners, measuring and fitting in situ and everything to leave flashings complete installed and watertight.

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E. HANDRAILS AND GRATING

1. Hand- and knee rails will be measured per metre of material installed. Bends, closed ends and all other shaping and bending will be measured separately as extra over to handrail material.
2. Stanchions shall be measured in number, and descriptions will be deemed to include for all necessary bolts, nuts and washers and welding as appropriate, except expansion bolts to concrete, which shall be measured separately in number.
3. Grating will be measured as the net area on plan, with kickflats measured separately, notwithstanding whether integrated with the grating or not. Separate items shall be stated for ordinary grating and grating in banded panels. No deductions will be made to the area of grating for holes and openings not exceeding **0,5 m²** each. Rates for grating will include for all necessary measurement, fabrications control, inspections, straight and raking cutting and fitting on site. Circular cutting shall be measured separately only if required on site.
4. Stair treads shall be stated separately in number and descriptions shall be deemed to include for all necessary bolts and fixings complete.

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F. CONCRETE, FORMWORK AND REINFORCEMENT

The works involving reinforced concrete shall be measured in accordance with the latest issue of **SABS 1200 G**, as amended by [*.. client ..*] specifications.

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G. PIPING

1. Screwed and socketed piping is measured over the in-line fittings which are measured separately as ***“extra over”***.
2. Flanged, butt welded and socket weld piping is measured between fittings.
3. Closers will not be measured on screwed and socketed piping.
4. Valves and other miscellaneous items will be measured separately and not included in the length of piping.
5. All rates shall include for labelling and/or tagging and bagging where necessary.
6. Rubberlining to pipes will be scheduled separately. Items to be rubberlined are scheduled separately for different rubberlining specifications and the items are measured by area, length or number depending on the nature of the item.
7. Rate for rubberlining shall specifically include for procurement of all materials, surface preparation and application in accordance with the specification, including all plant, scaffolding, tools, equipment, labour, consumables and the like.
8. Rubberlining of fittings, flanges and valves are added to the length of piping of the associated diameter with the length being determined on the same principle as for painting to pipe fittings under the Painting and Corrosion Protection Section.
9. Piping is scheduled according to materials’ specification, piping specification and nominal bores or outside diameters as stated.
10. No distinction shall be made for piping in standard and non-standard lengths. Piping shall be measured by net running length erected. Allowances for non-standard lengths to conclude a pipe run, that is, closures shall be made under the appropriate items.
11. Rates for piping shall include for supply, fabrication, loading and transporting to site, unloading and erecting complete, at all levels, including multiple handling and the provision of temporary supports, where necessary and testing and commissioning in accordance with the specification.
12. Rates for screwed piping shall include in addition for measuring on site, cutting to the required length, cutting threads, sockets and for the supply of PTFE jointing tape.

13. Closures

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13.1 Separate items for each separate pipe and size specification will be scheduled for closures.

13.2 No closures have been measured on pipes of 50 mm diameter or less and such must be included in the rates.

13.3 Rates are to include for supply, loading and transporting to site, unloading, measuring on site, cutting to suit, checking, waste associated with the closure piece, loading and transporting to and from painting facilities, temporary spools or supports while closures are being painted, unloading and installing complete.

13.4 The rates shall specifically include preparation of the end for jointing, etc but specifically exclude the cost of the joint or supply of jointing material such as sockets, flanges, etc.

14. Butt welds

Rates are to include for all welding, grinding, making good damaged protective coatings, dye penetrant testing between weld runs and for all radiographic X-ray or other testing specified. Generally no distinction shall be made between shop or site welds, except butt welds on ends of closure pieces or where an item is specifically scheduled.

15. Fittings

15.1 Separate items will be scheduled to distinguish between different types of fittings.

15.2 All fittings in flanged pipelines are measured unflanged, with flanges measured separately.

15.3 Rates for fittings shall include for supply, fabrication, loading and transporting to site, unloading and erecting complete at all levels, including multiple handling as indicated in the bills of quantities.

16. Cut in and branch weld

Distinction will be made for the size of branch welded in but not for the material type or wall thickness of the parent pipe or for the angle at which the branch is welded to the parent pipe.

Rates shall include for cutting into the parent pipe, shaping, profiling branch pipe, all bevelling and weld preparations and internal and external welding.

17. Flanges

17.1 Distinction will be made for the different types and sizes of flanges.

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17.2 Rates for flanges shall include for supply, loading and transporting to site, unloading and installing complete.

17.3 Flanges supplied welded to one end of closure piece or both ends of standard length pipes will be measured as flange to end of pipe. Separate items shall be provided for flanges to ends of closures, etc.

18. Special flanges

Special flanges are those flanges which have to be fabricated to an elliptical shape, an outlet to a smaller diameter pipe, non-standard connections to items of equipment, etc.

19. Gasket and Bolt Sets

19.1 Separate items are provided for different types of bolt and gasket sets.

19.2 Rates are to include for the supply of bolts, nuts and washers and for gaskets on un-lined pipe where no gaskets are required in terms of the gasket and bolts and the tightening up of the joint to be required torque.

20. Sundry Equipment

20.1 Separate items are provided for sundry equipment such as valves, spray nozzles, rubber bellows, filters, flow indicators, gland seal hoses, strainers, hose connectors, etc.

20.2 Rates are to include for supply, loading and transporting to site, unloading and installing complete.

20.3 Rates for rubber bellows are to include for the supply and installation of one standard and one special flange each.

21. Temporary spools

Rates shall include for supply, fabrication, loading and transporting to site, unloading, removing valve or instrument from the installed position and providing safe storage, installing spool complete, including bolting upflanges and remove at a later stage after testing, re-install valve or instrument complete, including bolting up flanges and deposit the spool in the free issue store.

22. Fabricated pipe supports and other general steelwork supports

22.1 Separate items are scheduled for:

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(a) Supports which will be fully designed, dimensioned and positioned by the Engineer. (b) Supports which are standard/typical design by the Engineer but the Contractor will be responsible for positioning, site verification of actual dimensions and detailing and the rates shall include for the same.

(c) Supports which, with approval by the Engineer, are required to provide additional stability to the pipeline. These supports will require full design, dimensioning and positioning by the Contractor and the rates shall include for the same.

22.2 Supports in either of the three categories above will be further scheduled into mass categories suitable to group relevant sizes of pipe supports together.

22.3 Angle or channel steel section continuous pipe supports shall be measured by length and divided into the member size. Rates shall include for procurement, fabrication, delivery to site, site measurement, temporary supports, erection and strapping of piping with stainless steel wire of size and at centres as included in the descriptions.

22.4 Brought-out items, such as U-bolts, clamps, hangers, chemical and expansion bolts, anchors, etc are to be measured separately and not included in the mass of steelwork.

23. Hangers, U-bolts, hoop irons and clamps

23.1 Separate items are scheduled for:

- (a) Hanger rods, separated for rod diameter and diameter of pipe to be served and divided into suitable length categories. Clamps and brackets are included as described. Rates shall include for threaded ends, nuts, washers and drilling holes.
- (b) U-bolts, divided into pipe sizes. Rates shall include for threaded ends, nuts and washers.
- (c) Clamps and hoop irons shall be measured by diameter and size of steel member. Rates shall include for fabrication, welding, drilling holes and fastenings.

23.2 All rates for hanger rods, U-bolts, clamps and hoop irons shall include for site measurement for verification of final dimensions and multiple erection where necessary.

H. PAINTING AND CORROSION PROTECTION

- 1. Works are scheduled separately for different corrosion protection specifications and for the article to be painted or protected. The items are measured by area, length or number depending on the nature of the item.

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2. Rates shall specifically include for procurement of all materials, surface preparation in accordance with the specification and application of the corrosion protection specification, including all plant, scaffolding, tools, equipment, labour, consumables and the like.
3. The area for painting interrupted surfaces such as eggcrate flooring, corrugated surfaces, mesh, cable racking, etc will be measured over the flat surface as if it were flat. Both sides are to be measured.
4. Painting of fittings, flanges and valves are added to the length of piping of the associated diameter with the length being determined as follows:

Length in metre to be added to steel pipework for:

| PIPE BORE | BENDS, ETC | TEES, ETC | REDUCERS | FLANGES | VALVES |
|------------------|-------------------|------------------|-----------------|----------------|---------------|
| 15 | 0.05 | 0.08 | 0.05 | 0.10 | 0.15 |
| 20 | 0.05 | 0.08 | 0.05 | 0.10 | 0.15 |
| 25 | 0.05 | 0.08 | 0.05 | 0.10 | 0.15 |
| 50 | 0.30 | 0.42 | 0.16 | 0.10 | 0.25 |
| 80 | 0.45 | 0.51 | 0.17 | 0.10 | 0.40 |
| 100 | 0.60 | 0.57 | 0.19 | 0.10 | 0.50 |
| 150 | 0.80 | 0.72 | 0.22 | 0.10 | 0.60 |
| 200 | 0.64 | 1.34 | 0.18 | 0.10 | 0.70 |
| 250 | 0.80 | 1.50 | 0.21 | 0.10 | 0.80 |
| 300 | 0.96 | 1.68 | 0.23 | 0.10 | 0.90 |
| 350 | 1.12 | 1.86 | 0.26 | 0.10 | 1.15 |
| 400 | 1.28 | 2.04 | 0.28 | 0.10 | 1.30 |
| 450 | 1.45 | 2.21 | 0.31 | 0.10 | 1.45 |
| 500 | 1.61 | 2.39 | 0.33 | 0.10 | 1.60 |
| 550 | 1.77 | 2.56 | 0.36 | 0.10 | 1.85 |
| 600 | 1.93 | 2.74 | 0.38 | 0.10 | 2.00 |
| 900 | 2.30 | 3.20 | 0.60 | 0.10 | 2.40 |

Note: Note that nipples, sockets, reducing bushes, long-screws and unions are deemed to be included in the piping quantities and no additional allowance is made.

I. MECHANICAL EQUIPMENT

1. In general all rates are to include for a receiving and dispatching control system so that all items are received with all necessary miscellaneous items for purposes of full installation. The

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Contractor will be fully responsible for ensuring that all necessary contents are available before erection starts.

2. Approximate masses and overall sizes are given in the Bills of Quantities against each item to be erected. No adjustment is to be made to rates should these masses or sizes vary when the actual work is carried out, unless it can be proven that such variation materially affects the plant resources and sequence of operations that would be originally required.
3. The unit rate shall specifically include for: taking delivery of items from the stores, transporting onto site, assembling items supplied in kits, hoisting items into position, levelling, aligning and final fixing. The rate shall include for all necessary transport vehicles, crantage, rigging equipment, labour, supervision, temporary bracing and lifting lugs, including making good on removal, temporary packing pieces, site surveying of foundations and fixing bolts for level and alignment, holding down bolts, erection bolts, etc and touch-up of all protective coatings before final cost application.
4. The rates shall include for co-ordination by the Contractor with the vendor's representative to establish exact erection sequences for the items and providing access and assistance to such representative on the site during the erection procedure. The cost of the vendor's representative being on site during the critical phase of the erection will be borne by the Company. Any other involvement between the Contractor and the vendor will be for the Contractor's account and no costs whatsoever will be entitled by the Company for such.
5. The rates shall include for stripping down motors, vee belts, pulleys, guards, etc to check direction before cold commissioning, first fill of oils, fuel and lubricants (free use). All mechanical equipment will be issued complete with final coats of protective coatings, the unit rate for installation must allow for repairs and touch-up to all damaged coatings, whether a result of handling during erection or during delivery to site.
6. The measurable length of conveyor belt shall be the net overall length of belt as fixed. Only the minimum number of vulcanised joints per belt prescribed by the Engineer will be measured.

J. ALTERATION WORK AND CHANGE-OVERS

1. SHEETING AND CLADDING

- (a) Separate items for roof sheeting and side cladding, but not separated for different sheet profiles, finishes and materials' thicknesses.
- (b) Translucent sheeting will be measured separately.

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- (c) Flashings, covers and labours to sheeting are not mentioned separately and the effect thereof in removing sheeting will be included in the rate for sheeting removal.

2. HANDRAILS AND GRATING

- (a) Removal of hand- and knee rails with typical stanchions are measured in linear metre for the length of railing as one would walk past it.
- (b) Grating will be measured as the net area on plan, including kickflats.
- (c) Stair treads are included in the linear metre dimensions stated for stair flights.

3. PIPING

- (a) Removal of piping shall be measured separately only if such removal is specifically ordered by the Engineer. Piping is generally assumed to be of negligible consequence, but necessary loosening or cutting is to be allowed for rates for the structural elements removal to which it is affixed.
- (b) Piping shall be separated per diameter, but measured in linear metre across fittings and valves, and the rate shall include for removal of everything associated with the pipeline, including fixings.

4. MECHANICAL EQUIPMENT

- (a) Approximate masses and overall sizes are given in the Bills of Quantities against each item to be erected. No adjustment is to be made to rates should these masses or sizes vary when the actual work is carried out, unless it can be proven that such variation materially affects the plant resources and sequence of operations that would be originally required.
- (b) The unit rate shall specifically include for all loosening, disconnecting, temporary stiffening or stuffing and mothballing requirements for items set aside for salvage. The rate will also cover taking out of position, loading, carting away and off-loading or dumping and taking along all parts and fixings associated with the equipment.
- (c) The rates shall include for co-ordination by the Contractor with the vendor's representative to establish exact decommissioning sequences for the items and providing access and assistance to such representative on the site during the erection procedure. The cost of the vendor's representative being on site during the critical phase of the erection will be borne by the Company. Any other involvement between the Contractor and the vendor will be for the Contractor's account and no costs whatsoever will be entitled by the Company for such.
- (d) The measurable length of conveyor belt shall be the net overall length of belt as fixed. Rates for removal shall include for rolling of belts into a neat roll for easy handling. Only one cut per belt

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must be assumed, unless application is made and a concession granted by the Engineer for more cuts.

5. ALTERATION WORK AND CHANGE-OVERS

- (a) The Contractor shall prior to the commencement of any work to existing, submit to the Engineer for his approval the method and sequence of work to be done.
- (b) During the execution of the contract care is to be taken not to damage any existing structure, pipelines, services and equipment that is not removed. Any damage to such is to be rectified to original conditions at the expense of the Contractor.
- (c) When structures, pipelines, services, equipment, etc are likely to impede the Contractor's progress, relocation of the structures, pipelines, services, equipment, etc are only to be carried out under express direction of the Engineer. Such likely impediment of progress is to be brought to the Engineer's notice as soon as it becomes evident.
- (d) Rates for removal of conveyor gantries in whole sections will include for cutting piping, cabling and cable racking to suit the sections to be removed. The mass of piping, cables and racking is not included in the mass calculation.

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