ROLE OF QUANTITY SURVEYOR

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1. HISTORICAL DEVELOPMENT
2. QUANTITY SURVEYOR AS A SPECIALIST
3. FUNDAMENTAL DUTIES OF A QUANTITY SURVEYOR
4. THE ROLE OF QUANTITY SURVEYOR IN CONSTRUCTION INDUSTRY
5. THE ROLE IN A GOVERNMENT ORGANIZATION
6. ROLE OF QUANTITY SURVEYOR IN PLANNING/ DESIGN/ CONSTRUCTION

HISTORICAL DEVELOPMENT

1933------Institution of civil engineers, London published report on engineering quantities

1953------standard method of measurement issued

1967------establishment of a working party to identify research needs in construction needs

1976------Civil engineering standard method of measurement published

1985------CESMM 2 published

1988------CESMM 7 published

QUANTITY SURVEYOR AS A SPECIALIST

- **REQUIRES SPECIAL SKILLS IN THE CHANGED AND COMPLEX CONTRACT ADMINISTRATION**
- **TECHNICAL AND SEMI LEGAL SKILLS REQUIRED**
- **BUILDING ECONOMICS ACQURIED GREATER IMPORTANCE**
- **CONSTANT MONITORING/ APPRAISAL TO TOP MANAGEMENT ON CONTRACT MATTERS**
- **CONSTRUCTION ENGINEER DO NOT POSSESS THE ABOVE SKILLS**

FUNDAMENTAL DUTIES OF QUANTITY SURVEYOR

- ADVISE THE OWNER AT PRELIMINARY STAGE ON COST
- STUDY ADMINISTRATIVE APPROVAL/ DPR
- ADVISE ON THE TYPE OF CONTRACT SYSTEM
- PREPARE SCHEDULE OF WORK/ BILL OF QUANTITIES
- PREPARE SPECIFICATIONS
- LIST OF DRAWINGS
- CONDITIONS OF CONTRACT
- PRICE LUMSUM ITEMS OF WORK
- SELECTION OF CONTRACTORS
- ISSUE/ RECEIPT OF TENDERS
- EVALUATION OF TENDERS/ ACCEPTANCE

FUNAMENTAL DUTIES OF QUANTITY SURVEYOR (CONTD)

- PERFORMANCE GUARANTEES
- DEVIATIONS/ VARIATIONS
- FIXING RATES
- EXTENSION OF TIME
- PAYMENTS
- TERMINATION OF CONTRACT
- DISPUTES AND THEIR RESOLUTION

ROLE OF QUANTITY SURVEYOR IN CONSTRUCTION INDUSTRY

- ALL DUTIES STATED ABOVE
- TAKING MEASUREMENTS
- MONITORING AND VARIANCE REPORTS

ROLE IN A GOVERNMENT ORGANIZATION

- TENDERING BASED ON ADMINISTRATIVE APPROVAL
- CONTRACT ADMINISTRATION
- DISPUTE RESOLUTION BY ADR/ ARBITRATION
- DEFECT LIABILITY
- RELEASE OF PERFOMANCE GUARANTEES
- TECHNICAL EXAMINATION

MENSURATION
AND
QUANTITY SURVEYING

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HISTORICAL DEVELOPMENT

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Mensuration & Quantity Survey

- 1985----CESMM 2 Published in Britain
- 1987----SP 27 Hand Book of Method of Measurement of Building works
- 1988----CESMM 7 published in Britain
- 1991----CESMM 3 published in Britain (Civil engineering standard method of measurement)

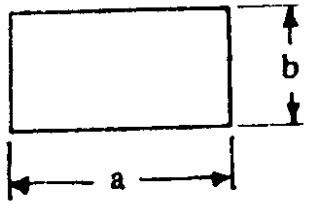
Mensuration & Quantity Survey

Mensuration formulae:

MENSURATION

AREAS

1. Rectangles

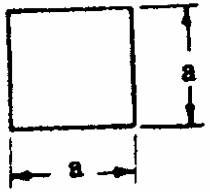


(i) $A = ab$

(ii) $d = \sqrt{a^2 + b^2}$

where A = area; a = length; b = breadth; d = diagonal.

2. Squares

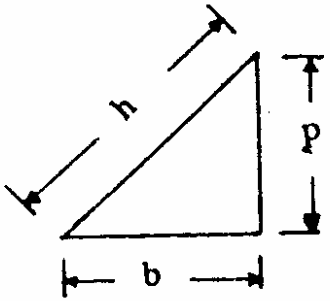


(i) $A = a^2$

(ii) $d = a\sqrt{2}$

where A = area; a = side; d = diagonal.

3. Right-angled triangles



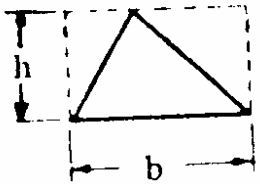
(i) $h = \sqrt{b^2 + p^2}$

(ii) $b = \sqrt{(h - p)(h + p)}$

(iii) $p = \sqrt{(h - b)(h + b)}$

Where h = hypotenuse; b = base; p = perpendicular.

4. Triangles



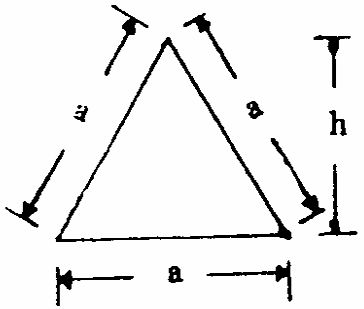
(i) $A = \frac{1}{2}bh$

where A = area; b = base; h = height.

(ii) $A = \sqrt{s(s - a)(s - b)(s - c)}$

where A = area; a, b and c are the three sides;

and $s = \frac{a + b + c}{2}$

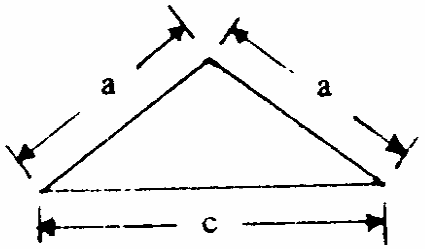


5. Equilateral triangles

(i) $h = \frac{a\sqrt{3}}{2}$

(ii) $A = a^2 \times \frac{\sqrt{3}}{4}$

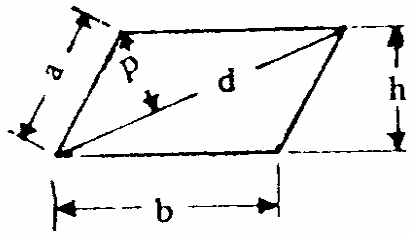
where h = height; a = side; A = area.



6. Isosceles triangles

$$A = \frac{c}{4}\sqrt{4a^2 - c^2}$$

where A = area; a = side; c = base.



7. Parallelograms

(i) $A = bh$

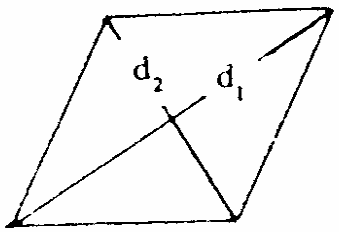
where A = area; b = base; h = height.

(ii) $A = dp$

where A = area; d = diagonal; p = offset of diagonal.

(iii) $A = 2\sqrt{s(s-a)(s-b)(s-d)}$

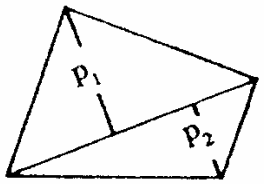
where A = area; d = diagonal; a and b are two adjacent sides; and $s = \frac{a + b + d}{2}$



8. Rhombus

$$A = \frac{1}{2} d_1 d_2$$

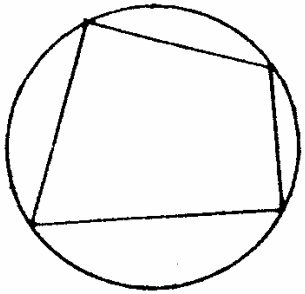
where A = area; d_1 and d_2 are two diagonals.



9. **Quadrilaterals**

$$A = \frac{1}{2} d (p_1 + p_2)$$

where A = area; d = diagonal; p_2 and p_1 are the offsets of the diagonal.

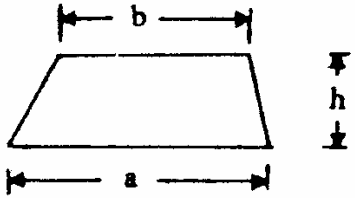


10. **Quadrilaterals inscribed in circles**

$$A = \sqrt{(s - a)\ (s - b)\ (s - c)\ (s - d)}$$

where A = area; a, b, c, d are the sides;

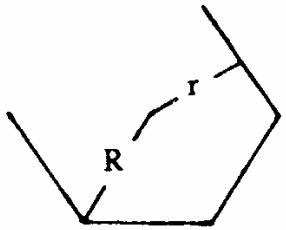
$$\text{and } s = \frac{a + b + c + d}{2}$$



11. **Trapezoids**

$$A = \frac{1}{2} (a + b) h$$

Where A = area; a and b are the parallel sides; h = the perpendicular distance between the parallel sides.



12. **Regular polygons**

(i) $A = \frac{n}{2} \times ar$

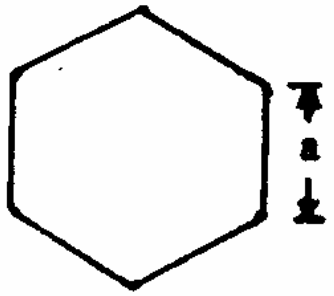
(ii) $A = \frac{na}{2} \sqrt{R^2 - \left(\frac{a}{2}\right)^2}$

(iii) $A = a^2 \times \frac{n}{4} \cot \frac{180^\circ}{n}$

(iv) $A = r^2 \times n \tan \frac{180^\circ}{n}$

(v) $A = R^2 \times \frac{n}{2} \sin \frac{360^\circ}{n}$

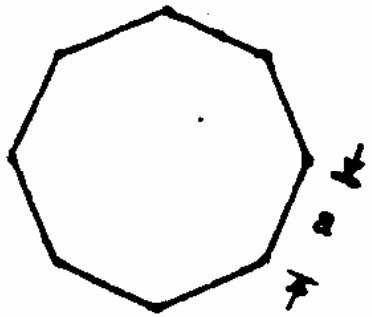
where A = area; n = number of sides; a = side; r = radius of inscribed circle; R = radius of circumscribed circle.



13. Regular hexagons

$$A = \frac{3a^2\sqrt{3}}{2}$$

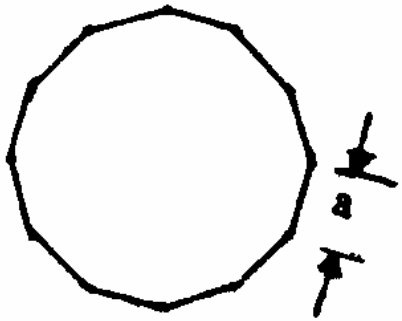
where A = area; a = side.



14. Regular octagons

$$A = 2\,a^2\,(1+\sqrt{2})$$

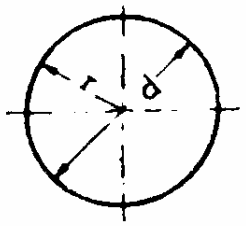
where A = area; a = side.



15. Regular dodecagons

$$A = 6\,a^2\sqrt{\frac{7}{4}+\sqrt{3}}$$

where A = area; a = side.

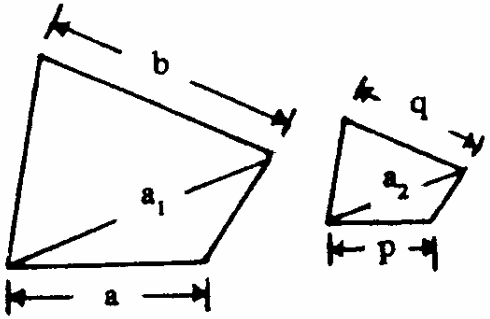


16. Circles

(i) $C = \pi d$

(ii) $A = \pi r^2$

where C = circumference; d = diameter; A = area; r = radius.



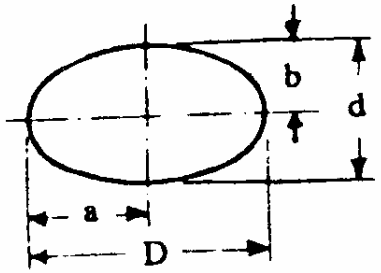
17. Similar figures

(i) $a : b = p : q$

where a and b are lengths in one figure, corresponding to p and q respectively in the other.

(ii) $A_1 : A_2 = (a_1)^2 : (a_2)^2$

where A_1 and A_2 are the areas of the two figures; a_1 and a_2 are corresponding lengths, one in each figure.

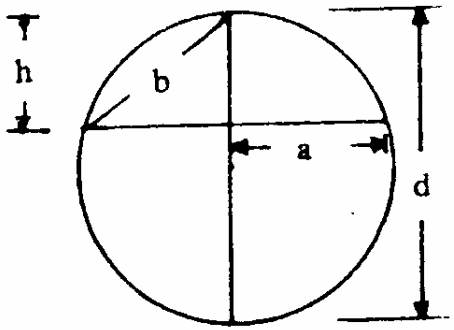


18. Ellipses

$A = \pi ab$ $\qquad$ $C = DM$

Where A = area; a = semi-major axis; and b = semi-minor axis; C = circumference; M = multiplier.

If value of $\frac{d}{D}$ = 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 or 0.9 then the corresponding multiplier (M) will be 2.1010, 2.1930, 2.3013, 2.4221, 2.5527, 2.6912, 2.8361, and 2.9866 respectively.

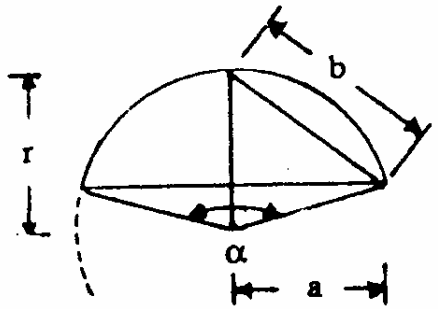


19. Chords of circles

(i) $a = \sqrt{h(d-h)}$

(ii) $A = \sqrt{dh}$

where a = semi-chord of the arc; b = chord of the semi-arc; d = diameter of the circle; h = height of arc.

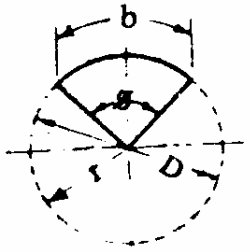


20. Arcs of circles

(i) $L = \frac{\alpha^0}{360} \times 2\pi r$

(ii) $L = \frac{8b - 2a}{3}$

where L = length of the arc; α^0 = central angle of the arc; r = radius of the circle; a = semi-chord of the arc; b = chord of the semi-arc.

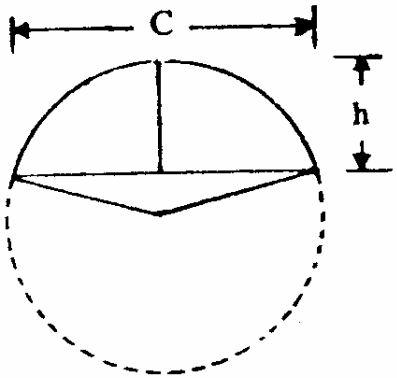


21. Sectors of circles

(i) $A = \frac{ø^0}{360} \times \pi r^2$; $A = \frac{br}{2}$

(ii) $b = \frac{\pi D ø}{360}$

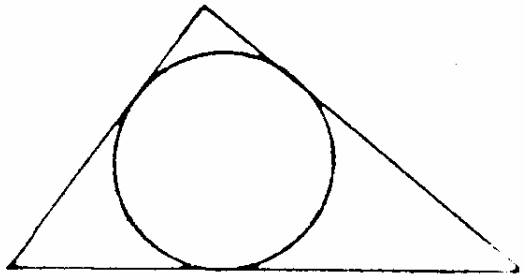
where A = area; $ø^0$ = angle of the sector; b = length of the arc of the sector; r = radius of the circle; D = diameter.



22. Segments of circles

$$A = \frac{4}{3} h \sqrt{\frac{1}{4} C^2 + \frac{2}{5} h^2}$$

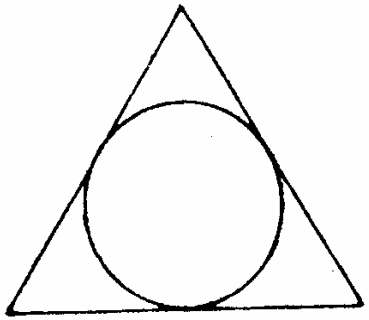
where A = area; h = height of the segment; C = chord of the segment.



23. Circles inscribed in triangles

$$r = \frac{\Delta}{s}$$

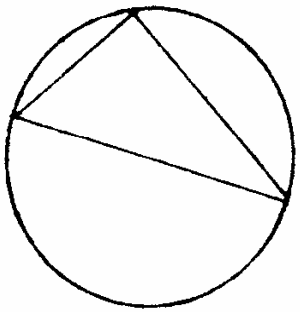
where r = radius of the inscribed circle; Δ = area of the triangle; s = semi-perimeter of the triangle.



24. Circles inscribed in equilateral triangles

$$r = \frac{a}{2\sqrt{3}}$$

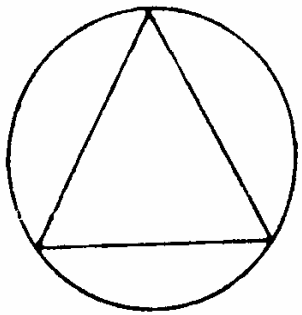
where r = radius of the inscribed circle; a = side of the triangle.



25. Circles circumscribed about triangles

$$R = \frac{abc}{4\Delta}$$

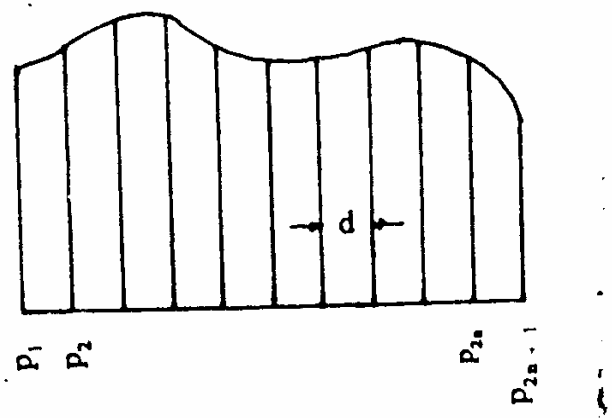
where R = radius of the circumscribing circle; Δ = area of the triangle; a, b and c are the three sides of the triangle.



26. Circles circumscribed about equilateral triangles

$$R = \frac{a}{\sqrt{3}}$$

Where R = radius of the circumscribing circle; a = side of the triangle.



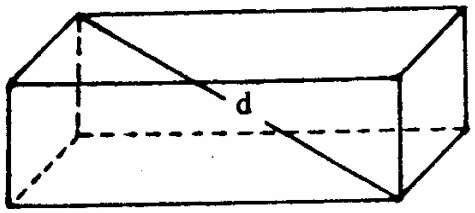
27. Simpson's Rule

$$A = \frac{d}{3}\left[P_1 + P_{2n+1} + 2\ (P_3 + P_5 + \ldots\ldots + P_{2n-1}) + 4\ (P_2 + P_4 + \ldots\ldots + P_{2n})\right]$$

where A = area; d = common distance; 2_n = number of equal parts into which the base line is divided; P_1, P_2..... P_{2n+1} are the ordinates taken in order.

SOLIDS

28. Rectangular solids



(i) $V = abc$

(ii) $V = A_1c = A_2b = A_3a$

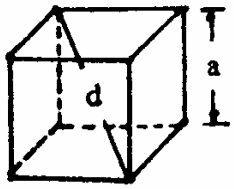
(iii) $V = \sqrt{A_1\ A_2\ A_3}$

(iv) $S = 2\ (ab + bc + ca)$

(v) $d = \sqrt{a^2 + b^2 + c^2}$

where V = volume; S = whole surface; a = length; b = breadth; c = depth; A_1 = area of base; A_2 = area of side; A_3 = area of end; d = diagonal.

29. Cubes

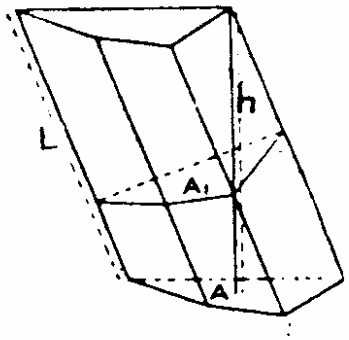


(i) $V = a^3$

(ii) $S = 6a^2$

(iii) $d = a\sqrt{3}$

30. Prisms and cylinders



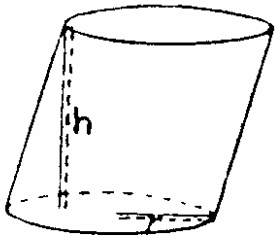
(i) $V = Ah$

(ii) $V = A_1L$

(iii) $S = pL + 2A$

Where V = volume; S = whole surface;
A = area of base; A_1 = area of cross-section;
h = height; L = length; p = perimeter of cross-section.

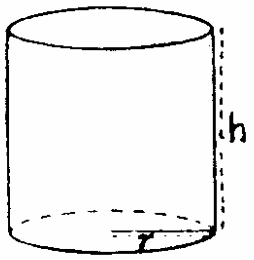
31. Circular cylinders



$V = \pi r^2h$

where V = volume; r = radius of base;
h = height.

32. Right circular cylinders

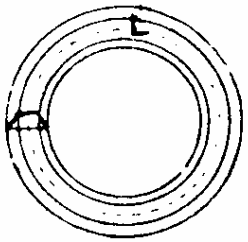


(i) $V = \pi r^2h$

(ii) $S = 2\pi r\ (h + r)$

where V = volume; S = whole surface;
r = radius of base; h = height.

33. Rings

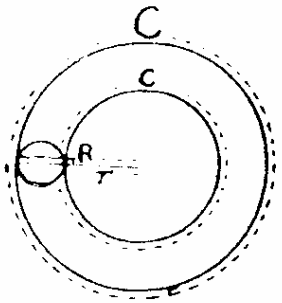


(i) $V = AL$

(ii) $S = pL$

where V= volume; S = whole surface; A = area of cross-section; L = length of mean circumference; p = perimeter of cross-section.

34. Cylindrical rings



(i) $V = \frac{\pi^2}{4}(R + r)(R - r)^2$

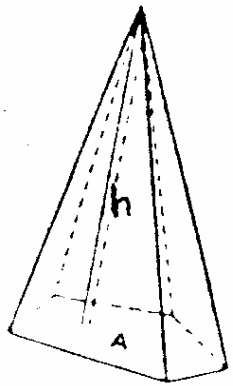
(ii) $V = \frac{1}{32\pi}(C + c)(C - c)^2$

(iii) $S = \pi^2 (R^2 - r^2)$

(iv) $S = \frac{1}{4}(C^2 - c^2)$

where V= volume; S = whole surface; R = outer radius; r = inner radius; C = outer circumference; c = inner circumference.

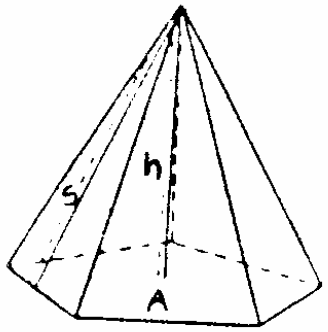
35. Pyramids and Cones



$$V = \frac{1}{3}Ah$$

where V = volume; A = area of base; h = height.

36. Right regular pyramids

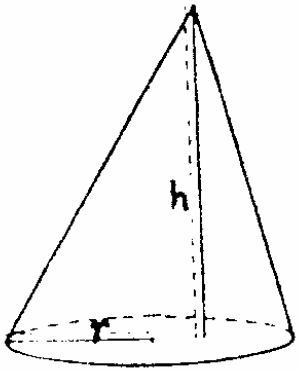


(i) $V = \frac{1}{3}Ah$

(ii) $S = \frac{1}{2}ps + A$

where V = volume; S = whole surface; A = area of base; p = perimeter of base; s = slant height.

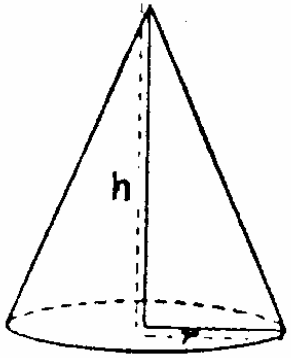
37. Circular cones



$$V = \frac{1}{3}\pi r^2 h$$

where V = volume; r = radius of base; h = height.

38. Right circular cones

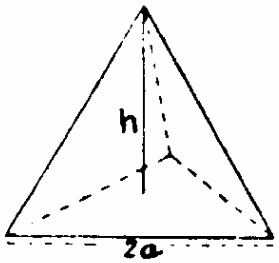


(i) $V = \frac{1}{3}\pi r^2 h$

(ii) $S = \pi r (\sqrt{h^2 + r^2} + r)$

where V = volume; S = whole surface; h = height; r = radius of base.

39. Regular tetrahedrons



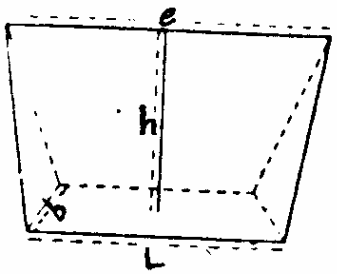
(i) $V = \frac{2\sqrt{2}}{3} a^3$

(ii) $S = 4a^2\sqrt{3}$

(iii) $h = 2a\sqrt{\frac{2}{3}}$

where V = volume; S = whole surface; 2a = edge; h = height.

40. Wedges on rectangular bases

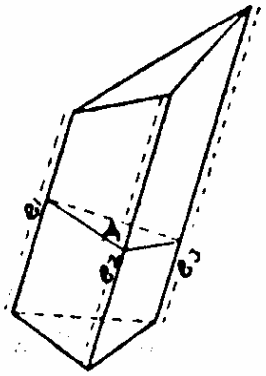


(i) $V = \frac{bh}{6}(2L + e)$

(ii) $V = \frac{A}{3}(2L + e)$

where V = volume; L = length of base; b = breadth of base; e = edge; A = area of cross-section; h = perpendicular height.

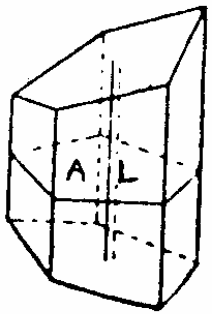
41. Wedges on trapezoidal base, or oblique frustra of triangular prisms



$$V = \left(A \frac{e_1 + e_2 + e_3}{3}\right)$$

where V = volume; A area of cross-section; e_1, e_2, e_3 are the lengths of the three parallel edges.

42. Oblique frustra of any right regular prism



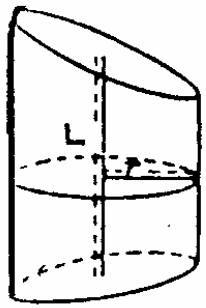
(i) $V = AL$

(ii) $S = PL$

where V = volume; S = lateral surface; A = area of cross-section; L = mean length; p = perimeter of cross-section; and

$$\text{mean length} = \frac{\text{sum of lengths of parallel edges}}{\text{number of parallel edges}}$$

43. Oblique frustra of right circular cylinders

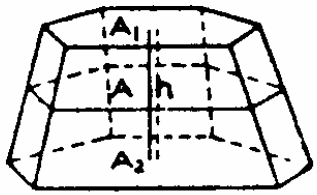


(i) $V = \pi r^2 L$

(ii) $S = 2\pi r L$

where V = volume; S = curved surface; r = radius of cross-section; L = mean length.

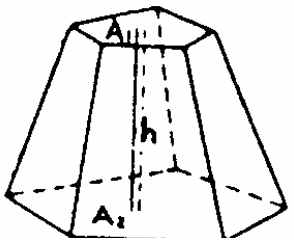
44. Prismoids



$$V = \frac{h}{6}(A_1 + A_2 + 4A)$$

where V = volume; h = height; A_1 and A_2 are the areas of the ends; A = area of mid-section parallel to the ends.

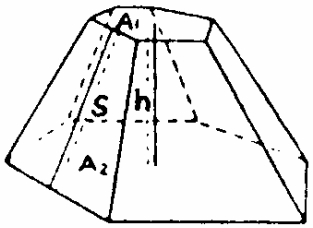
45. Frustra of pyramids and cones



(i) $$V = \frac{h}{3}(A_1 + A_2 + \sqrt{(A_1 A_2)}$$

where V = volume; h = height; A_1 and A_2 are the areas of the ends.

46. Frustra of right regular pyramids

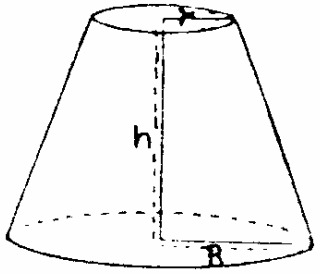


(i) $V = \frac{h}{3}(A_1 + A_2 + \sqrt{(A_1 A_2)})$

(ii) $V = \frac{1}{2}s(P + p)$

where V = volume; h = height; A_1 and A_2 are the areas of the ends; P and p are the perimeters of the ends; s = slant height.

47. Frusta of right circular cones



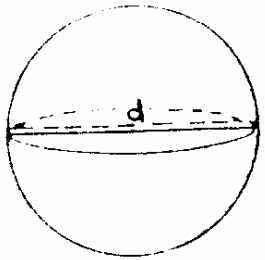
(i) $V = \frac{\pi h}{3}(R^2 + r^2 + Rr)$

(ii) $S = \frac{1}{2}s(C + c)$

(iii) $S = \pi s(R + r)$

where V = volume; S = curved surface; R and r are the radii of the ends; C and c are the circumferences of the ends; s = slant height; h = perpendicular height.

48. Spheres



(i) $V = \frac{\pi d^3}{6}$

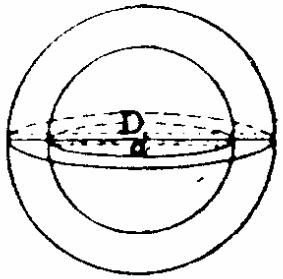
(ii) $V = \frac{4}{3}\pi r^3$

(iii) $S = \pi d^2$

(iv) $S = 4\pi r^2$

where V = volume; S = surface; d = diameter; r = radius.

49. Spherical shells



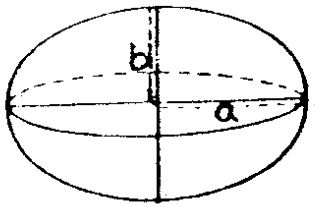
(i) $V = \frac{\pi}{6}(D^3 - d^3)$

(ii) $V = \frac{4\pi}{3}(R^3 - r^3)$

(iii) $V = \pi D^2 h$ | (nearly), when the thickness of the shell is very small compared to the outer diameter.

where V = volume; R = outer radius; r = inner radius; D = outer diameter; d = inner diameter; h = thickness of the shell.

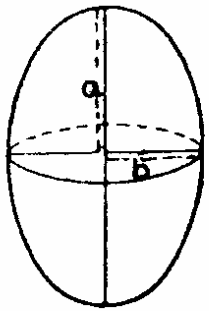
50. Oblate spheroids



(i) $V = \frac{4}{3}\pi a^2 b$

where V = volume; a = semi-major axis; b = semi-minor axis.

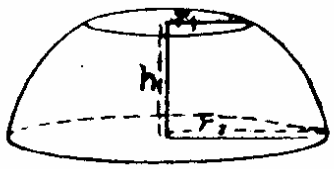
51. Prolate spheroids



$$V = \frac{4}{3}\pi a b^2$$

where V = volume; a = semi-major axis; b = semi-minor axis.

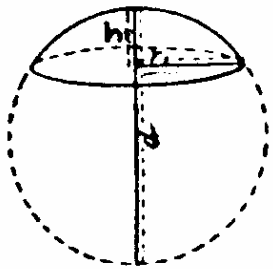
52. Zones of spheres



(i) $V = \frac{\pi h}{3}\left[3(r_1^2 + r_2^2) + h^2\right]$

(ii) $S = \pi d h$

where V = volume; S = curved surface; r_1 and r_2 are the radii of the two ends; h = height; d = dia of sphere.



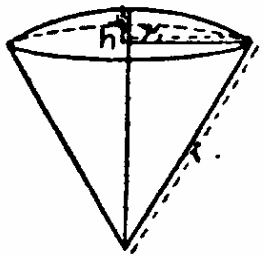
53. **Segments of spheres**

(i) $V = \frac{\pi h}{6}(3r_1^2 + h^2)$

(ii) $V = \frac{\pi h^2}{6}(3d - 2h)$

(iii) $S = \pi dh$

where V = volume; S = curved surface; r_1 = radius of the base of the segment; h = height; d = dia of the sphere.



54. **Sectors of Spheres**

(i) $V = \frac{2}{3}\pi r^2 h$

(ii) $V = \frac{1}{3}rs$

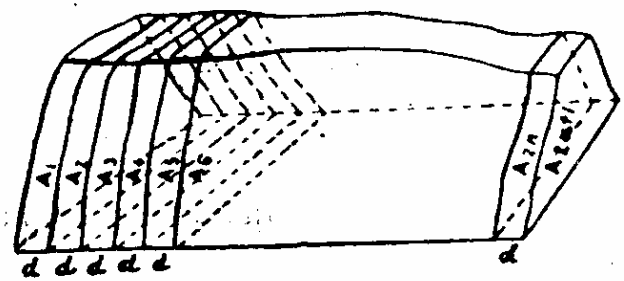
(iii) $S = \pi r + \left[2h + \sqrt{(2rh - h^2)}\right]$

where V = volume; S = whole surface; r = radius of the sphere; h and s are the height and curved surface of the segment of the sphere that forms the base of the sector. $s = 2\pi rh$

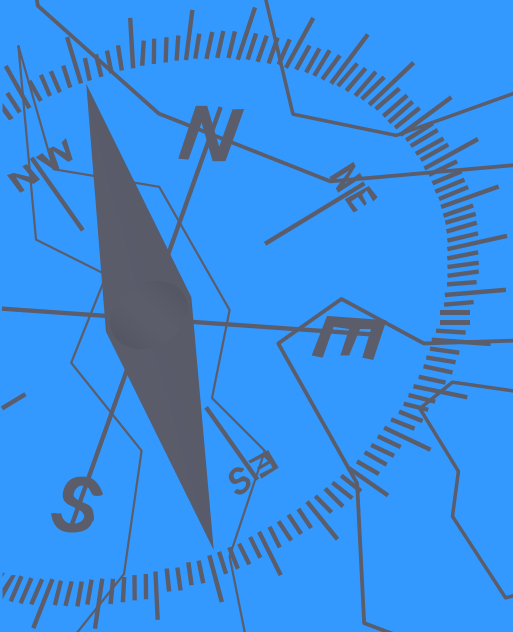
55. **Irregular solids whose opposite ends are plane figures lying in parallel planes.**

$$V = \frac{d}{3}\left[A_1 + A_{2n+1} + 2(A_3 + A_5 + \ldots + A_{2n-1}) + 4(A_2 + A_4 + \ldots + A_{2n})\right]$$

where V = volume; 2_n = number of equal parts into which the length of the solid is divided by planes parallel to its ends; d = common distance between the parallel planes $A_1, A_2, A_3 \ldots A_{2n}, A_{2n+1}$ are the areas of the transverse sections of the figure made by the parallel planes taken in order.



QUANTITY SURVEY METHODS IN BUILDINGS



By

V.R.K.Murty

Quantity Survey Methods

- Introduction
- Formats for measurement
- Systems of measurements
- Order of taking Measurements
- IS Codes
- Standard methods of Measurement
- Abstracting and billing
- Conclusion

Methods of Measurement

- Centre line method
- In and out method
- Important mensuration formulae and their application
- Standard formats for recording measurements.

Formats for measurement

- Horizontal formats

S.No	Description	Nos	L	B	D	Quantity
1	Excavation for Column footing	8	2.0	1.50	1.20	28.80m^3

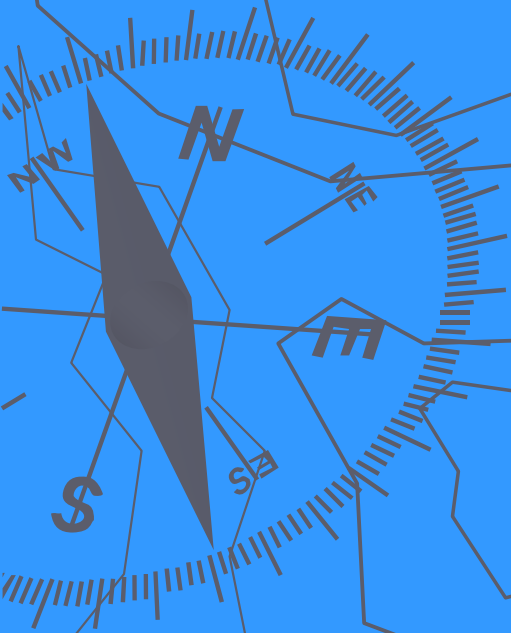
Formats for measurement

Vertical format as followed by Institution of Surveyors

Timsing	Dimensions	Squaring	Rough /waste
2/4/	2.00 1.50 1.20	28.80 m^3	Details of dimensions, sketches

Systems of Measurement

- Trade system - Measurements trade wise
- Group system – Measurements for all trades simultaneously



Order of taking measurements

- Earth work
- Foundations (Pile/ Well foundations)
- Concrete works
- Brick work
- Stone masonry
- Form work
- Wood work and joinery
- Steel work and iron work

Order of taking measurements

- Hard ware
- Glazing
- Paving, floor finishes, dado and skirting
- Roof covering
- Ceiling and lining
- Plastering and pointing
- White washing, colour washing, distempering and other finishes
- Painting, polishing, varnishing

Order of taking measurements

- Demolition and dismantling
- Water supply, plumbing and drains
- Water and sewage lines
- Road work including airfield pavement

IS Codes

- IS 1200 Parts I – XXVIII Method of measurement of building and civil engineering works

- SP 27 Hand book of method of measurement of building works

Standard methods of measurement

Earth work:

- Length - Nearest 0.01m, nearest 0.1m for lengths > 25m
- Area – 0.01 Sqm
- Volume – 0.01 cum
- Classification: Soft/ loose soil, hard soil, SDR, HR, other classifications to suit local conditions

Standard methods of measurement

Earth work:

Types of excavation:

- Surface dressing
- Rough excavation
- Surface excavation
- Excavation over areas (>1.5m in width & 10 sqm in plan)
- Excavation in trenches (< 1.5m in width & n.exe 10sqm)
- Post holes (0.5cum)
- Return fill and ram (RFR)
- Lead and lift

Standard methods of measurement

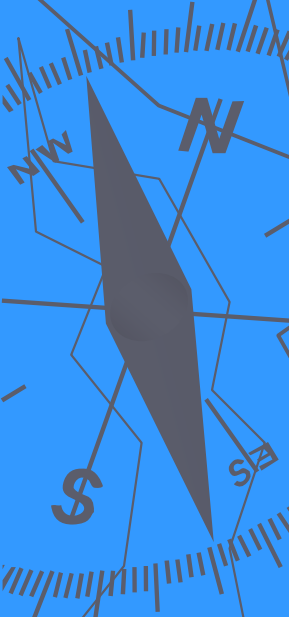
Earth work:

- Lead- 50,100,150,200,250,500,1000,1500m additional 500m up to 5 Km, there after 1 Km intervals
- Lift _ 1.5m intervals
- Embankments – 10% deduction for solid contents, 5% in case machinery is used
- Rock stacks – 50% deduction

Standard methods of measurement

Earth work:

- Authorized width: For pipes, pipe dia without socket plus 40 Cm, for depth >1m 10 Cm for every 1 m depth



Standard methods of measurement

Concrete: Classification if in-situ concrete

- Foundations, footings, bases of columns
- Walls
- Slabs supported on walls, beams, columns
- Chajjas
- Lintels, Shelves, beams
- Stair cases
- Balusters, newels, railing
- Arches
- Domes, vaults

Standard methods of measurement

Concrete: Classification of in- situ concrete

- Foundations, footings, bases of columns
- Walls
- Slabs supported on walls, beams, columns
- Chajjas
- Lintels, Shelves, beams
- Stair cases
- Balusters, newels, railing
- Arches
- Domes, vaults

Standard methods of measurement

Concrete:

- Shell roof, arch, folded plates
- Chimney shafts
- Canal lining
- Blast walls, retaining/ return walls
- Concrete filling for precast components
- Kerb, steps
- String/ lacing courses
- Cornices, moulds
- Louvers, fins, facias

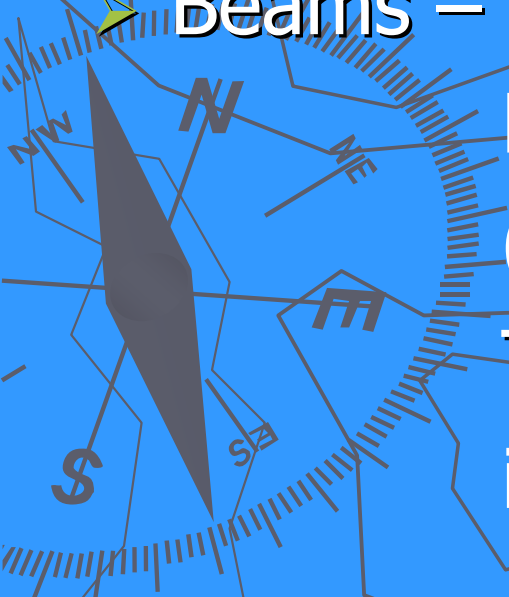
Standard methods of measurement

Concrete: Measurements:

- Columns – Top of column base to underside of 1st floor & from top of floor slab to underside of 2nd floor slab
- Beams – Face to face of column (length)

  Bottom of slab to bottom of beam (depth)

  Top of slab to top of beam (depth of inverted beam)



Standard methods of measurement

Concrete: Measurements:

- Chajjas – Inclusive of bearing (without lintel) Clear with lintel/ beam
- Cavity walls – Plane along centre line of cavity
- Channel – Rm
- Tensioning strands – Kg (between anchorages)

Standard methods of measurement

Concrete: Measurements:

- Expansion joints – Rm
- Water proofing – Kg
- Guniting – Sqm
- Grout holes – Rm (grout pipes –kg)
- Water pressure test – each holes
- Holding bolts – Nos
- Cutting in concrete – Rm (grooves, chages)
  Cm (holes/ mortices)
- Toothing/ bonding - Sqm

Standard methods of measurement

Concrete: Measurements:

No deduction for:

- Ends of dissimilar materials (joists)
- Openings – 0.1 sqm each
- Moulding/ drips/ champers – Up to 10 cm deep
- Small voids – Up to 40 cm^2 each
- Volume occupied by reinforcement

Standard methods of measurement

Brick work - Measurements:

- More than one brick thick – m^3
- Less than one brick thick, honey comb work, cavity walls, broken glass coping, DPC toothing bonding – m^2
- Brick edging, cills, cornices – Rm
- Greater than three brick thick – actual measurement to nearest cm
- Greater than ¼ brick as ½ brick

Standard methods of measurement

Brick work - Measurements:

No deductions for:

- Ends of dissimilar materials
- Openings up to 0.1 m^2
- Bearings of slabs, chajjas where thickness < 10cm & bearing does not extend to full thickness
- Concrete blocks, hold fasts, holding down bolts
- Chases < 50cm girth
- Volume occupied by box girders
- Honeycomb work measured solid

Standard methods of measurement

Stone work – Measurements:

- Battered, tapered and curved walls measured net in m^3
- Bond stones- Volume shall be deducted
- Dimensions to nearest 0.01m, 0.01m^2,0.01 m^3
- No deductions – same as for brick work

Standard methods of measurement

Woodwork and Joinery– Measurements:

- Battens < 5cm2, Scantlings – 5- 20 cm2
- Length – Neatest 1cm
- width and thickness – Nearest 2mm at least cross section
- Varying cross section – Section at the largest cross section
- Framed members – Length of member including embedded length in the joint

Standard methods of measurement

Builders hard ware- Measurements:

- Tower bolt (barrel) – Length barrel
- Tower bolt (Semi barrel) – Length of bolt
- Locking bolt – Length of bolt
- Butt hinge – length of joint/ knuckle
- Parliament hinge – Width between flanges and height of hinge
- Handle – grip length
- Piano hinges – Overall width of flaps when open

Standard methods of measurement

Steel/ aluminum, Iron work–Measurements:

- Weight of steel sections as per IS weights
- If weight not given @ 7850 kg/m^3
- Weight of cleats, brackets, packing pieces, bolts, nuts, washers, gussets- overall dimensions
- Rivets – Weight of rivet + head
- Welding metal weight not added
- Weight to nearest kg, length nearest 0.5cm
- Deduction – hole> 0.02m^2, opening > 0.1m^2

Standard methods of measurement

Steel/ aluminum, Iron work - Measurements:

- Authorized laps, cranks, chairs, spacers shall be measured extra
- Weight of tying wire, weight of of welds not measured
- Expanded metal: Unit M^2, authorized laps measured, openings > $0.2M^2$ shall be deducted

Standard methods of measurement

Steel/ aluminum, Iron work - Measurements:

- Steel rolling shutters: Height – Bottom of lintel to FFL/ cill, Width- Inclusive of side guides
- Collapsible gates: Height – FFL to top of gate Width – out to out in open position
- Steel doors/ windows/ ventilators: Height/ width – Out to out of frame to nearest 0.5 cm
- Pressed steel frames: Rm, Filling of frame width concrete measured separately

Standard methods of measurement

Roof covering:

- Measured net as fixed without any allowance for laps. Openings up to 0.4 M^2 not deducted. Portions of roof covering overlapped by ridge or hip shall be included. Circular openings shall be classified as holes
- GI/Aluminium/FRP sheets: 2 Corrugations for side lap
- AC sheets: ½ corrugation for side lap
- Accessories: Rm

Standard methods of measurement

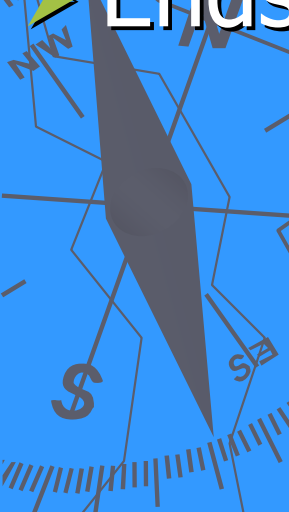
Ceilings/ linings – Measurements:

- Measured net as flat in M^2
- Circular surfaces measured separately
- Supporting members measured separately
- No deduction up to 0.4 M^2

Standard methods of measurement

Floor finishes – Measurements:

- Measured net in M^2 (Excluding expansion joints) and in M^3 for thickness above 25 cm
- No deduction up to 0.2M^2 openings
- Ends of dissimilar materials up to 0.1M^2



Standard methods of measurement

Plastering/Pointing – Measurements:

- Measured net in M^2
- Thickness > 10mm done in separate layers and top coat is called as floating/ setting coat
- Minimum thickness at any point on the surface
- Does not include dubbing out
- Wall plastering: Between walls/ partitions for length, Height from top of floor/ skirting/ dado to the ceiling. Depth of moulds, cornices shall be deducted. Sides of pilasters, projections added to wall plaster.

Standard methods of measurement

Plastering/Pointing – Measurements:

- Deductions: No deduction for openings up to 0.5M^2
- Openings > 0.5 M^2 but < 3 M^2 – When both faces are plastered with same plaster deduction for one face only. When both faces plastered with different types of plaster deduction will be on the side of the frame on which width of reveal is less. If both reveals are equal 50% on each side. When width of frame equals to thickness of wall full deduction on both sides. For openings > 3 M^2 deduction for the opening and plastering for jambs/ cills

Standard methods of measurement

Plastering/Pointing – Measurements:

- Ceilings – Measurement between walls, partitions (mouldings, cornices deducted)
- Beams – Plastered sides of beams added to ceilings
- Stairs – Measured as ceiling plaster
- Pointing: Same as plastering
- V/U grooves measured in Rm

Standard methods of measurement

Colour washing, Distempering, Cement based painting – Measurements:

- On walls, ceiling measured separately
- Measurements will be that of plastered surfaces
- Deductions: No deduction ends of joists < $0.5M^2$. No deduction for conduits, electrical wiring. Cornices and other wall features shall be girthed and included in general area.

Standard methods of measurement

Colour washing, Distempering, Cement based painting – Measurements:
Corrugated surfaces measured flat and increased as follows:

- Corrugated steel sheets - 14%
- Corrugated asbestos sheets – 20%
- Semi corrugated AC sheets – 10%

Standard methods of measurement

Glazing:

- Glass panes measured to nearest 0.5 cm
- Irregular shaped/ circular shall be measured as smallest rectangle/ square from which the shape could be cut
- If ground glass ordered allowance in thickness for loss due to grinding to be given
- Measurements for doors/ windows/ ventilators fixed glazing measured up to 0. 5M^2 and exceeding 0.5 M^2

Standard methods of measurement

Painting - Measurements:

- Areas of uneven surfaces converted into equivalent areas
- Height shall be from the bottom of lowest rail to top most rail
- Doors and windows of composite sections measured separately with application of appropriate coefficient, centre line of common rail being dividing line
- Where shutter is provided with clearance > 15cm such opening will be deducted

Standard methods of measurement

Painting - Measurements:

Measurement coefficients for undulating surfaces:

- Corrugated asbestos sheets – 20%
- Semi corrugated asbestos sheets – 10%
- Corrugated steel sheets – 14%

Standard methods of measurement

Painting - Measurements:

Sl no	Description	Multiplying factor
1.	Panelled/ledged joinery	1.3(Each side)
2.	Flushed joinery	1.2(Each side)
3.	Flush shutter	1.2(Each side)
4.	Fully glazed/ gauzed	0.8(Each side)
5.	Partly panelleed/glazed	1.0(Each side)
6.	Fully venetianed/louvered	1.8(Each side)
7.	Weather boarding	1.2(Each side)

Standard methods of measurement

Painting - Measurements:

Sl no	Description	Multiplying factor
8.	Wood shingle roofing	1.10(Each side)
9.	Boarding with cover fillets	1.05(Each side)
10.	Tile & slate battening	0.80(All over)
11.	Trellis	2.00(All over)
12.	Guard bars/ grills/XPM	1.00(All over)
13.	Gates/open palisades	1.00(All over)

Standard methods of measurement

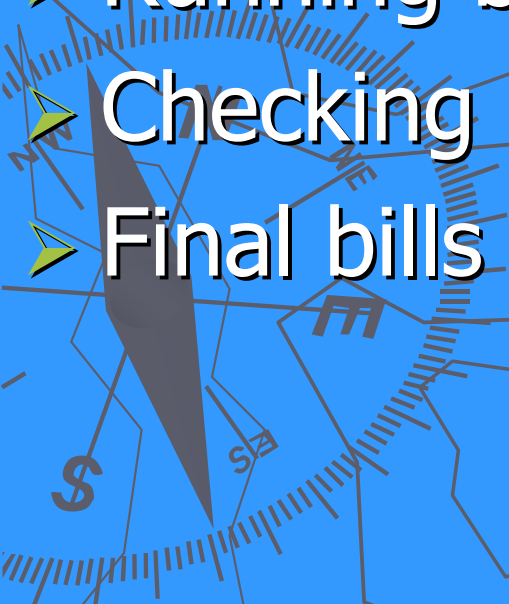
Painting - Measurements:

Sl no	Description	Multiplying factor
14.	carved or enriched work	2.00(Each side)
15.	Steel rolling shutters	1.10(Each side)
16.	Plain steel sheet doors	1.10(Each side)
17.	Fully glazed steel door	0.50(Each side)
18.	Partly glazed steel doors	0.80(Each side)
19.	Partly panelled/ glazed	0.80(Each side)
20.	Collapsible gate	1.50(All over)

Standard methods of measurement

Abstracting and billing:

- Measurement books
- Bill of quantities
- Running bills
- Checking bills
- Final bills



Standard methods of measurement

Conclusion: Measurements and billing is an important aspect of any construction industry/ organization. There is a need to standardize the procedures all over the country and all concerned should be familiar with the standard methods of measurements. With the participation of international firms it is all the more necessary.

Thank You