

QSCE 352: Measurement of Superstructure works 2

CLASS: QSCE 3

SEMESTER: 2

CREDIT: 3



1

COURSE CONTENT

Measurement of:

- ▣ FINISHINGS
- ▣ WINDOWS AND DOORS
- ▣ PLUMBING INSTALLATIONS
- ▣ DRAINAGE WORKS



Course Outline

2

Unit 1:



FINISHINGS

Measurement of internal surface finishes to:

- ceilings
- Walls
- Floors

Other finishings to these surfaces include:

- Skirtings
- Picture rails
- Dado rails
- Architraves
- Cornices
- Mouldings

✚ Prepare internal finishing schedules.



Course Outline (Cont'd)

3

Unit 2:

WINDOWS AND DOORS

- Windows
- Doors
- Including frames and lining, ironmongery and adjustments for finishings.

Unit 3:

PLUMBING INSTALLATIONS

- Pipelines
- Water Tanks and Cisterns
- Sanitary Appliances / Fittings



Course Outline (Cont'd)

4

Unit 4:

DRAINAGE WORKS

- Drains - both main and branch pipes;
- Inspection Chamber (or Manhole);
- Septic Tanks, Cesspools or soakaways.



Course Objectives

5

- ***Understand*** the relevant SMM7 clauses for measuring internal finishings.
- To be able to ***measure*** for ceiling, wall and floor finishings.
- ***Prepare*** internal finishing schedules.
- To be able to ***measure*** for skirtings, picture rails, dado rails, architraves and the like.
- ***Measure*** for painting and decorations.
- ***Prepare*** BOQ for internal finishings.



Course Objectives (Cont'd)

6

- ***Understand*** the pertinent SMM7 clauses for window and door measurement.
- ***Measure*** casement and louvred windows.
- ***Measure*** flush, paneled and glazed doors, and frames / linings.
- ***Understand*** the use of dimensioned diagrams.
- ***Prepare*** window and door schedules and subsequent use for taking off.
- ***Measure*** for standard plain, non standard and special glasses.
- ***Prepare*** BOQ for windows and doors.
- ***Understand*** the rational for adjustment of areas of walls and finishings.



Course Objectives (Cont'd)

7

- *Understand* the pertinent SMM7 clauses for window and door measurement.
- *Measure* for cold water supply system.
- *Measure* for sanitary appliances.
- *Measure* for foul drainage above ground.
- To be able to *measure* for drainage works.
- To be able to *interpret* and use typical BOQ's.

Further Reading / References



8

- ☑ Royal Institute of Chartered Surveyors and building Employers federation,
Standard Method of Measurement of Building Works (Seventh edition)
- ☑ Ivor H. Seeley
Building Quantities Explained (Fifth edition)
- ☑ Patrick Keeily and Patrick Mcnamare
SMM 7 Explained and Illustrated
- ☑ Christopher J. Willis and Don Newman
Elements of Quantity Surveying (Eighth edition)
- ☑ Ivor H. Seeley
Advanced Building Measurement

The unit is structured into three (3) sections:

● **SECTION I**

Considers what items or elements to be measured-
brief review of ceiling, floor and wall finishings.

● **SECTION II**

Discusses the clauses in SMM7 for measuring Finishings –
Works sections M and J10.

● **SECTION III**

Deliberate on measuring techniques and worked examples.



SECTION I:

Finishing Items or Elements to be Measured

Finishings

▣ Ceilings

▣ Walls

▣ Floors

■ Ceiling Finishings

▶ Plywoods

▶ Tongued and grooved (timber & plastics)

▶ Plaster boards

▶ Screeding

Areas of ceilings are measured between the wall surfaces; with the area of each type of finish measured separately in m² (where the width > 300mm).



■ Such particulars as the:

- ▣ Kind;
- ▣ Quality;
- ▣ Composition;

■ Where applicable,

- ▣ the mix of materials,
- ▣ method of application,
- ▣ nature of surface treatment and
- ▣ nature of base

must be specified in the description.

Note

The description must be adequate and comprehensive enough to be suitable of use as a specification for the procurement of the material or component and fixing or lasting on site.



■ Wall Finishings

Wall finishings include:

- ▶ Render
- ▶ Plaster
- ▶ Wall paper
- ▶ Terrazzo
- ▶ Tiles (Quarry, Ceramics, Terrazzo and Plastic)

- *The measurement of wall finishings is taken from floor to ceiling.*
- *Apart from walls and isolated columns in width $\leq 300\text{mm}$, wall surfaces are also measured in m^2 .*
- *The girth of each room is usually built up in waste and total girth of rooms of the same category of height and finishing transferred to the dimensions column.*



In general, the:

- ✚ kind, quality and size of materials;
 - ✚ nature of base and surface treatment;
 - ✚ method of treatment and layout of joints
- must be stated in the description**

Note

- ✚ No deductions are made for openings for doors and windows when taking off.
- ✚ These are taken care of under appropriate door and window sections.
- ✚ These openings are taken as negative quantities at the abstract stage.
- ✚ *No deductions are made for voids $\leq 0.50m^2$*

The measurement of the main area of wall finishing of each type is followed by its associated linear item such as skirtings, picture rails, dado rails, architraves, cornices etc.



■ **Floor finishings**

- **Floor finishings come mainly in:**
 - **resilient types such as carpets, linoleum, thermoplastic tiles, rubber and board and strips wood flooring;**
 - **hard monolithic and tile floors such as terrazzo, quarry, ceramics and clay tiles and mosaic and screeding.**
- **Floor finishings are measured in m² irrespective of their widths and classified as:**
 - **Levels or falls only $\leq 15^\circ$ from horizontal;**
 - **To falls and cross falls and to slopes \leq from horizontal;**
 - **To slopes $> 15^\circ$ from horizontal.**



The description must state the:

- ✱ **kind, quality and size,**
- ✱ **shape or thickness of materials,**
- ✱ **method of fixing, and**
- ✱ **nature of base and treatment of joint.**

● **Most floor finishings come in two composite layers.**

For example,

*cement and sand screeded trowelled bed and
carpet finish;*

*cement and sand floated screeded bed and
ceramic tiles.*



Timber skirtings, picture rails, dado rails and the like are measured in meters, giving a dimensioned overall cross-section description (*SMM P20 1.1.0.1-4*). The work is deemed to include ends, angles, mitres, intersections and the like.

**The descriptions should include the:
kind and quality of timber and
whether sawn or wrought and
method of fixing, where not at the discretion of the
contractor.**

(SMM P20. S1-9)

Skirtings and Similar Members



- Timber skirtings, picture rails, dado rails and the like are measured in meters, giving a dimensioned overall cross-section description (*SMM P20 1.1.0. 1-4*).
- The work is deemed to include ends, angles, mitres, intersections and the like.
- The descriptions should include the:
 - kind and quality of timber and
 - whether sawn or wrought and
 - method of fixing, where not at the discretion of the contractor. (*SMM P20. S1-9*)

In situ and tile, slab and block skirtings are measured in metres, stating the height or height and width as appropriate, and are deemed to include fair edges, rounded edges, ends, angles and ramps.



■ Painting and Decoration

- In the traditional bill, paintings are not billed under finishings.
- Paintings and Decoration works include the:
 - ⊕ preparation of surfaces (e.g. rubbing down with glass, emery or sand paper),
 - ⊕ application of the different coats of paint (both emulsion, and oil or gloss polish),
 - ⊕ as well as, supply and hanging of decorative papers and fabrics.
- Painting is measured in m^2 except for works on isolated surfaces $\leq 300mm$ girth which is given in metres or works in isolated area $\leq 0.50m^2$ which is enumerated (*SMM M60. 1.0.1-3.0*).

SECTION II:

Relevant SMM7 Clauses



- ✚ The main work section for measuring Finishings is **M**
- ✚ The ten sub-clauses are:
 - I. **M10** Sand Cement / Concrete / Granolithic screeds flooring
 - M12** Trowelled bitumen / Resin / Rubber-latex flooring
 - M20** Plastered / Rendered / Rough cast coatings
 - M23** Resin bound mineral coatings
 - J10** Specialist waterproof rendering.
 - II. **M21** Insulation with rendered finish
 - III. **M22** Sprayed mineral fibre coatings
 - IV. **M30** Metal lathing / Anchored reinforcement for plastered coatings



V. *M 31* Fibrous plaster

VI. *M40* Stone / Concrete / Quarry / Ceramic tiling / Mosaic

***M42* Wood block / Composition block / Parquet flooring**

VII. *M41* Terrazzo tiling / in situ terrazzo

VIII. *M50* Rubber / Plastics / Cork / Lino / Carpet Tiling / Sheeting

***M51* Edge fixed carpeting**

IX. *M52* Decorative papers / Fabrics

X. *M60* Painting and Clear Finishing

Brief explanation of Relevant Clauses



M10: *Sand /cement / Screeds:*

They are usually termed as 'levelling Screeds' to receive applied floor finishes.

M10: *Concrete screeds or topping:*

They are usually termed as "wearing screeds" which are designed as finished surfaces, such as granolithic flooring or high strength concrete screeds.

M12: *Trowelled bitumen / resin / rubber-latex flooring:*

These are floor finishes applied as liquid coatings, layers or screeds, and curing to a solid floor finish.

M20: *Plastered / Rendered / Roughcast coatings:*

This section deals with applied protective coatings to walls and ceilings which cover gypsum based plaster, lime sand plaster (such as stucco rendering or Portland cement rendering) and roughcast coatings (such as pebble-dash rendering or coarse stuff rendering).

M23: *Resin bound mineral coatings:*

These are applied resin based finishes to walls, soffits and floor finishing screeds

J10: *specialist waterproof rendering:*

Rendering which resists movement of water and salts. They may include specialist chemical damp-proof course installers and proprietary renovating compound.

Measurement Rules (M)



M3 'Work in staircase areas and plant rooms are each given separately'.

This is due to the difficulty of working in these areas.

M6 Width is the width of each face. Each face is dealt with separately in the appropriate width category. Widths are not '*girthed up*'.

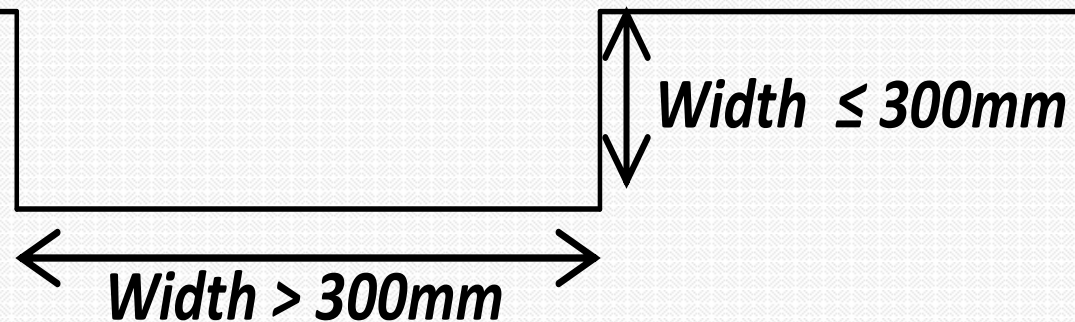


Figure 1: Categories of wall faces

Coverage Rules



C2 *‘Patterned work is deemed to include all extra works involved’.*

Patterned work includes:

- **general patterned work,**
- **isolated panels within a general wall or under surfaces or**
- **work in more than one colour.**

Extra work referred to in this coverage rule is work to fair edges, flush joint, working in strips in work divided into panels etc.

C3 *‘Plastered or other sheet backing is deemed to include joint reinforcing scrim’.*

Scrim is the coarse canvas, cotton or metal mesh used for bridging the joint between board, sheet or slab coverings before they are plastered.

Classification Table



PLAN

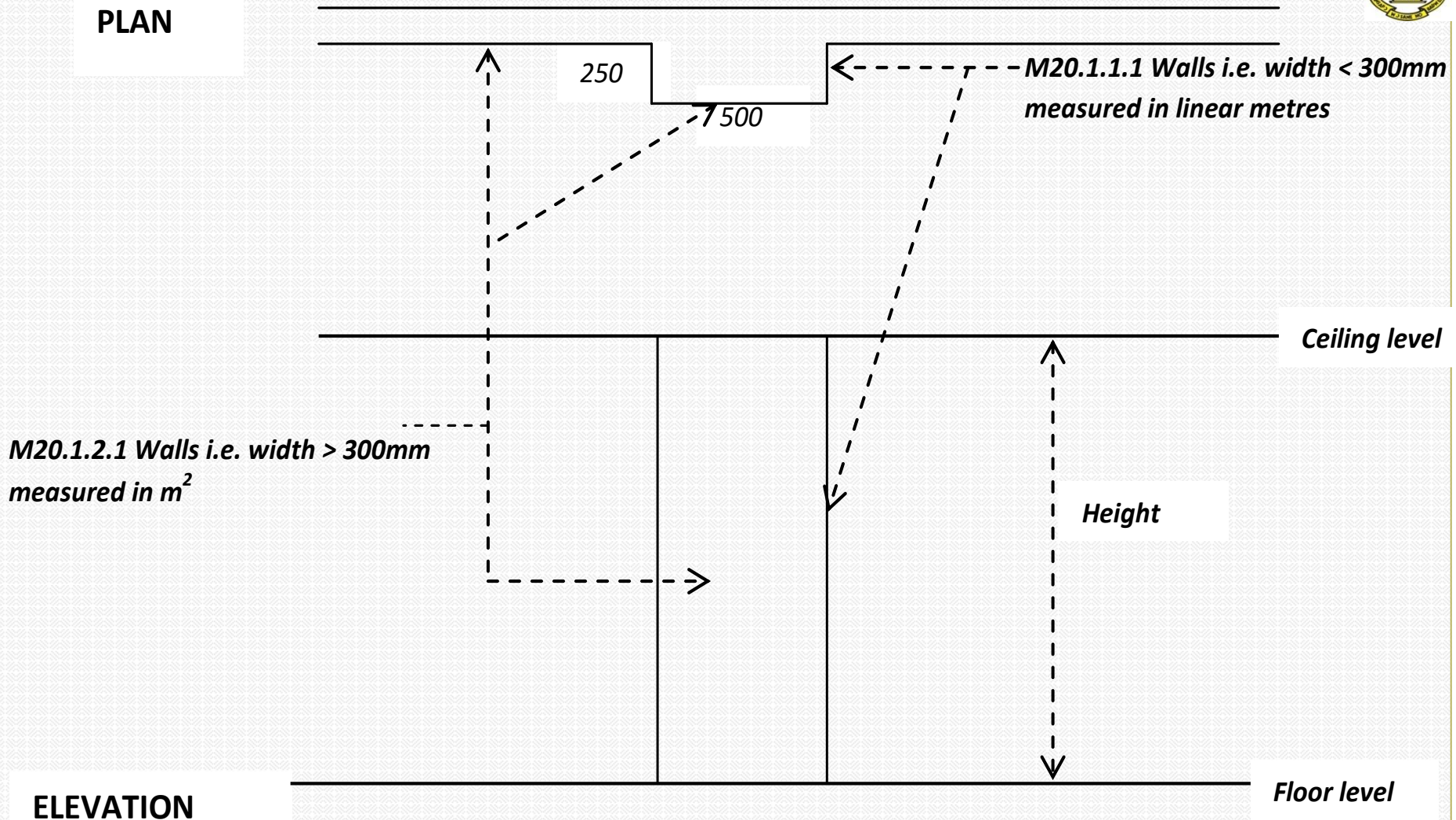


Figure 2: Plan & Elevation of categories of walls



M10.3.*.

M20.2.1.1 or 2

250

500

Attached

M20.2.2.1 or 2

Figure 3: Attached beam

Ceiling level

Floor to ceiling
height up to 3.50m

If floor to ceiling level >
3.50m and < 5.00m

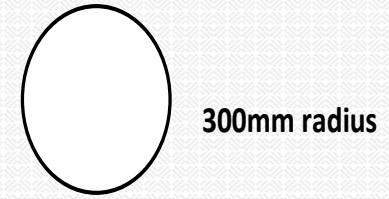
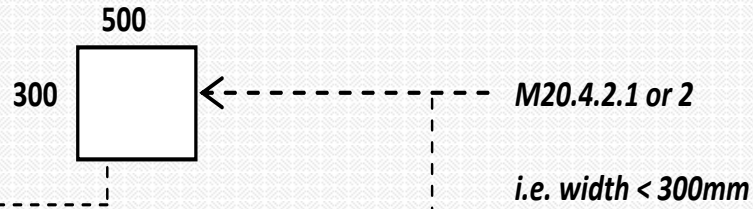
If floor to ceiling level >
5.00m and < 6.50m

Isolated
beam

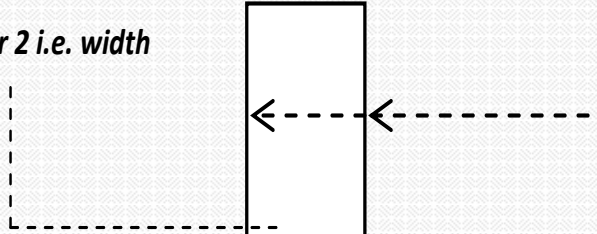
Figure 4: Isolated beams



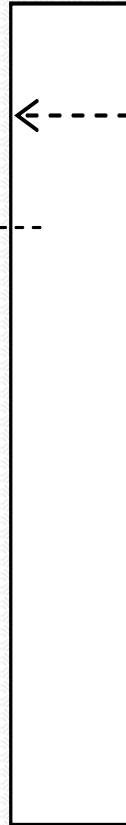
PLAN



*M20.4.1.1 or 2 i.e. width
> 300mm*



ELEVATIONS



RECTANGULAR COLUMNS

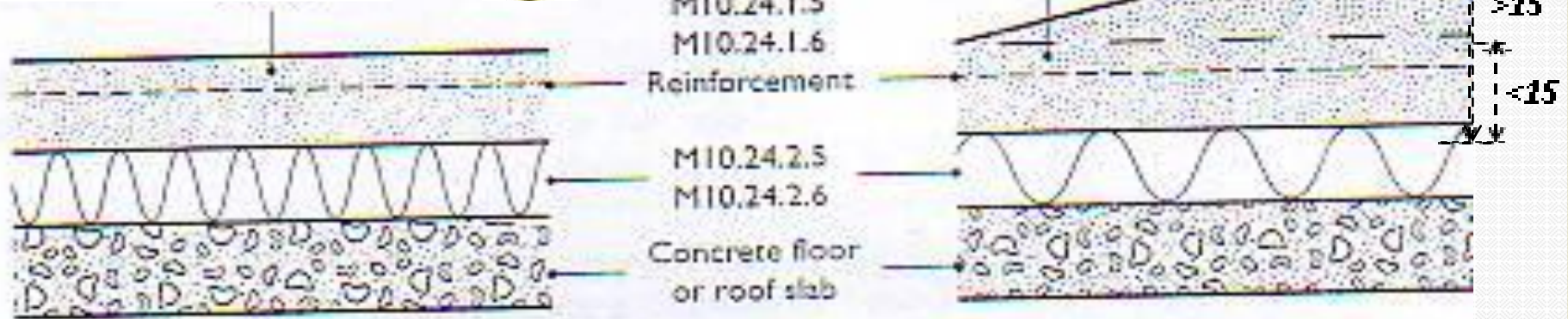


CIRCULAR COLUMNS

Figure 5: Isolated columns

M10.4.**

M10.5-6.*.*



(Section through floor or roof)

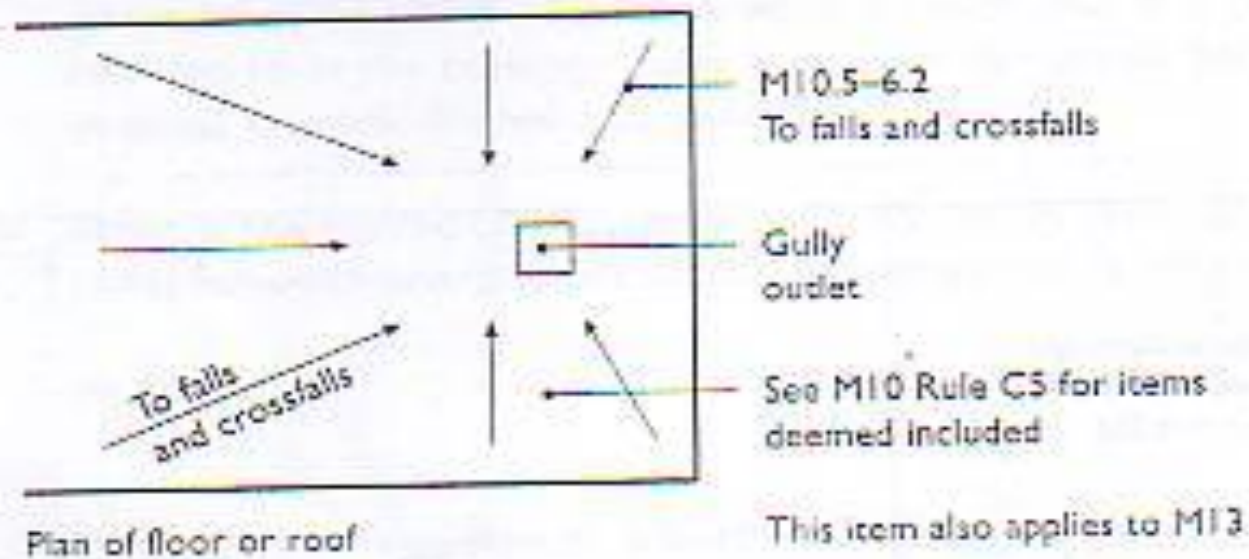
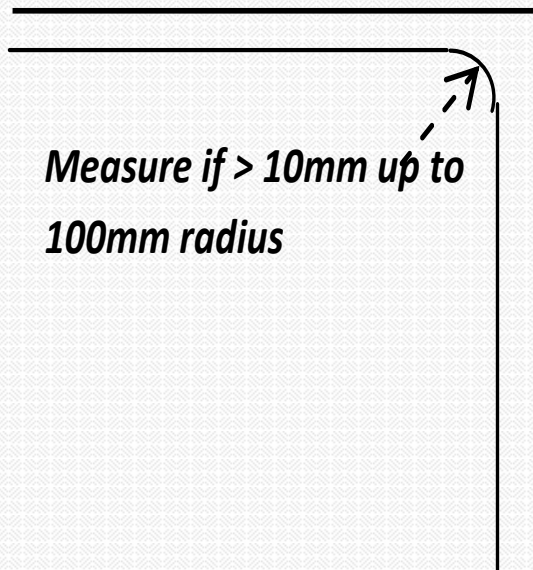
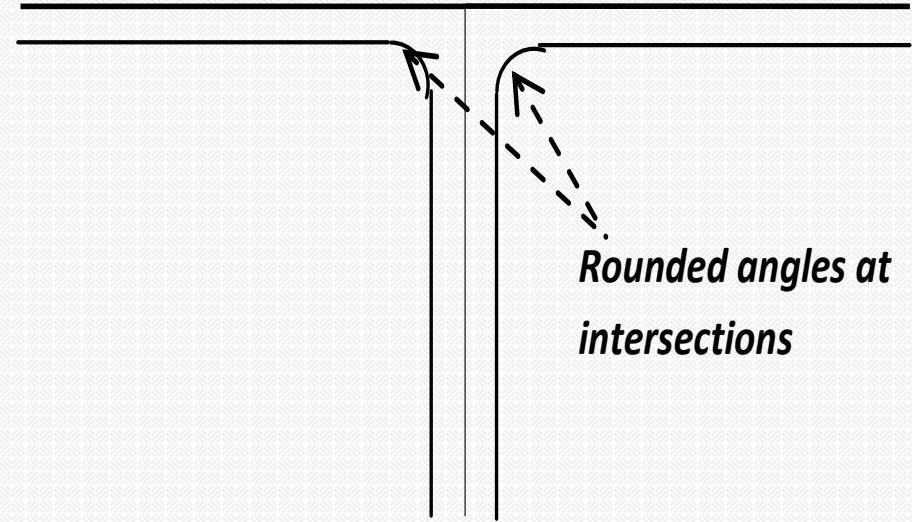


Figure 7: Rounded angles and intersections



*Measure if > 10mm up to
100mm radius*



*Rounded angles at
intersections*

M10.11.o.*

Margins include isolated linear surrounds to dissimilar finishes.

M10.16 Rounded angles and intersections in plaster or render formed in situ.

Note: over 100mm radius should be measured as curved work under M6 rule M5

M10.17.o.*

Coves are concave mouldings formed in situ in plaster or render joining a wall to a ceiling or to a floor.



Ceiling ribs

*Moulding
(formed in situ)*

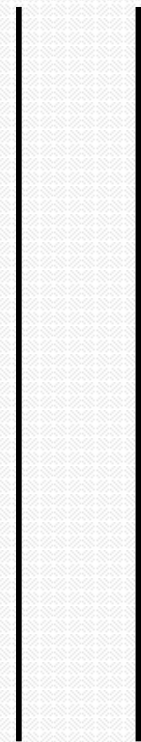
*Cornice (formed in situ)
at junction between
wall and ceiling*

*(formed
in situ)*

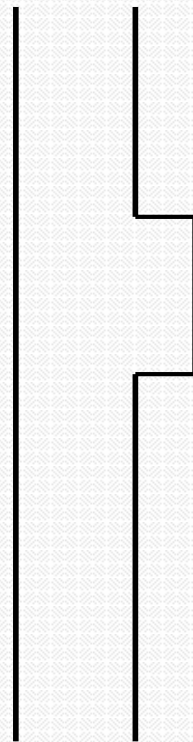
M10.18.0.*

*Trim, usually around
window or door
opening, to cover
joints*

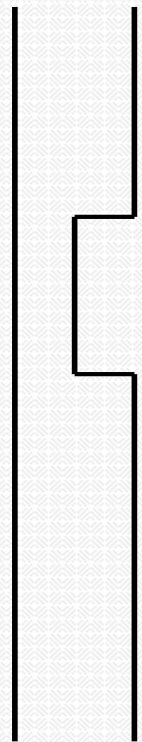
Figure 8: Mouldings



Flush



Raised



Sunk

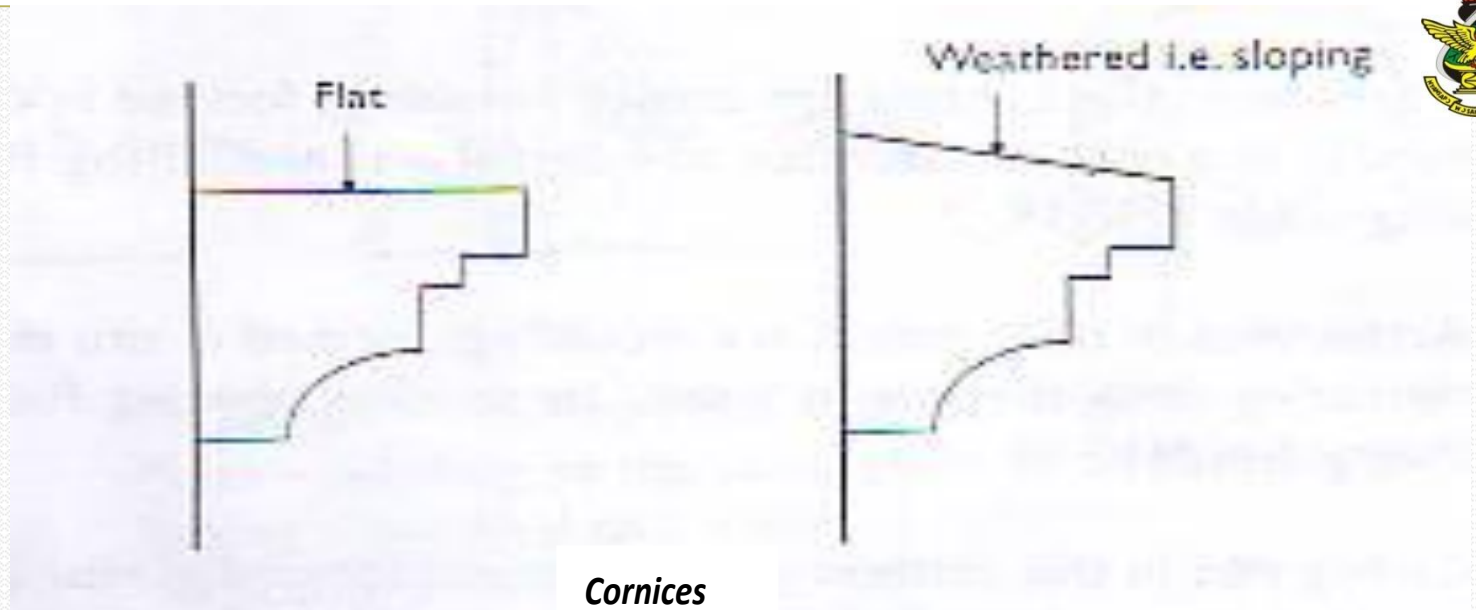
Figure 9: Bands

M10.22.*.*

Band in this context are continuous strips formed in in situ plaster or render to provide a contrast to the main work or elevations and they can be formed flush, raised or sunk



M10.17-22.*.*.7-8



Cornices

Figure 10: Cornices

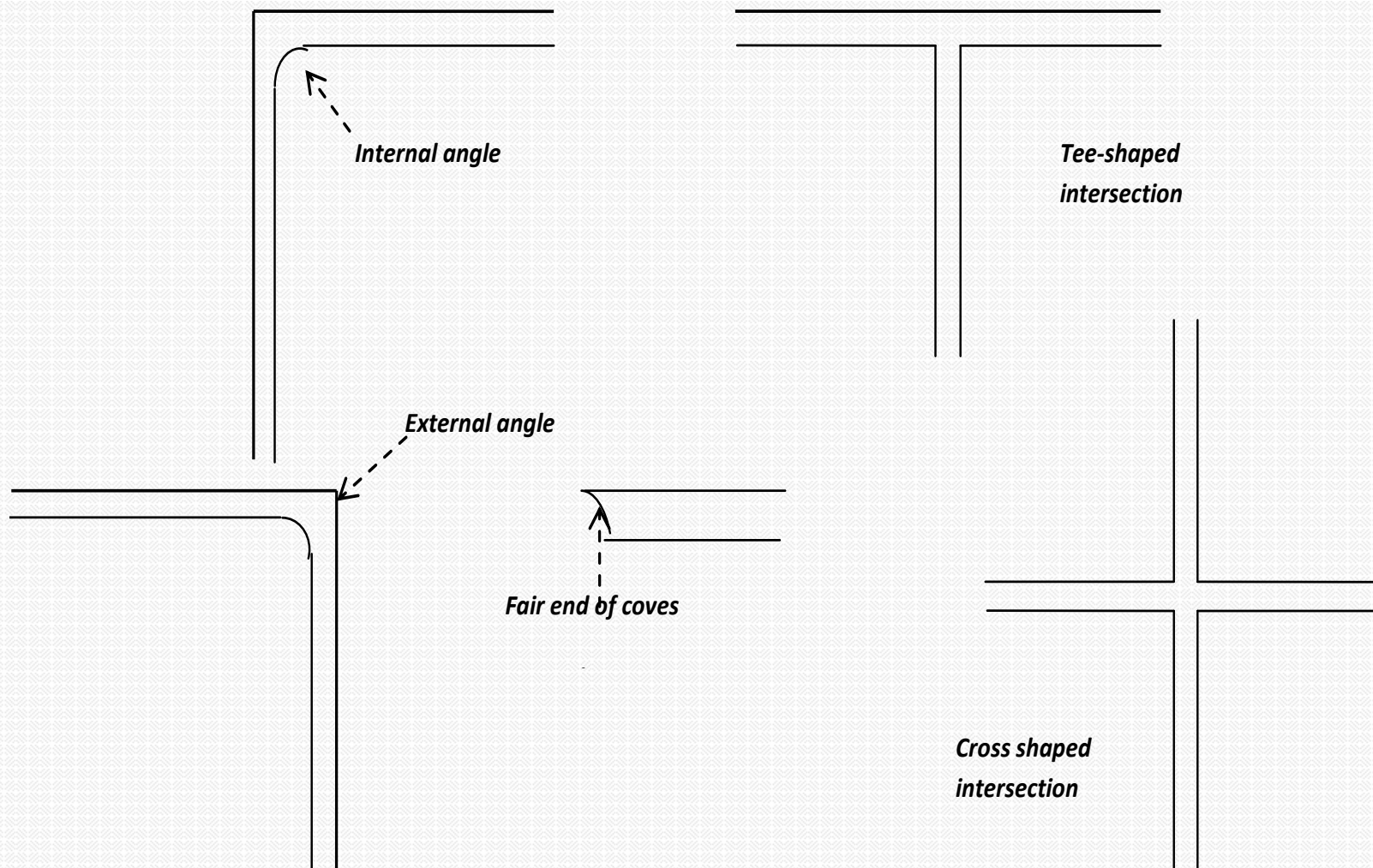


Figure 11: Extra over items



M21 *Insulation with rendered finish*

This section includes proprietary cladding systems comprising an insulant and protective render coating.

M22 *Sprayed monolithic coatings*

This section deals with the application of spray applied jointless coatings to provide fire protection, thermal insulation, condensation / moisture control and sound absorption to both new and existing structures.

M30 *Metal mesh lathing / Anchored reinforcement for plastered coatings*

This section deals with expanded metal and wire mesh laths fixed to framed or solid background as a base and key for plaster, render or sprayed mineral fabric finishes.

M31 *Fibrous Plaster*

The section deals with fibrous plaster which is precast material in fine plaster designed to be manufactured before fixing. Complicated gypsum plaster or plaster of Paris shapes are made in the workshop by casting in gelatin, plaster or fibre glass moulds. They are reinforced with coarse, open canvas and wood laths and sometimes with wire netting and tow and are bought to site for fixing



M40 *Stone / Quarry/ Ceramic tiling / Mosaic*

M42 *Wood Block / Composition Block / Parquet Flooring*

M40 The section deals with pre-finished natural stone, cast or reconstructed stone, Composite stone, Concrete, Quarry and Ceramic tiles, Slab and mosaic covering to new and existing floors, walls and soffits.

M42 This section deals with wood and composite block flooring, parquet and similar wood-based thin tile, strip and block floor coverings, all fixed with adhesives.

M41 *Terrazzo tiling / in situ terrazzo*

This section deals with terrazzo tiling and in situ terrazzo toppings to floors, stairs skirtings, dados, strings etc.

The main difference between this section and M40 is that the former includes the mechanical grinding and polishing of the finish after laying.



M50 *Rubber / Plastics / Cork / Lino / Carpet tiling / Sheeting*

M51 *Edge fixed carpeting*

M50 Deals with flexible and semi-flexible sheets and tiles of rubber, plastics, cork, linoleum and carpet fixed with adhesive, mainly as flooring but also on stairs, walls, columns etc.

M51 This section deals with strip and broadloom pile carpets, edge fixed with carpet gripper to floors, walls and stairs.

M52 *Decorative papers / fabrics.*

This section deals with applying paper, fabric and other similar fine coverings to walls and ceilings.

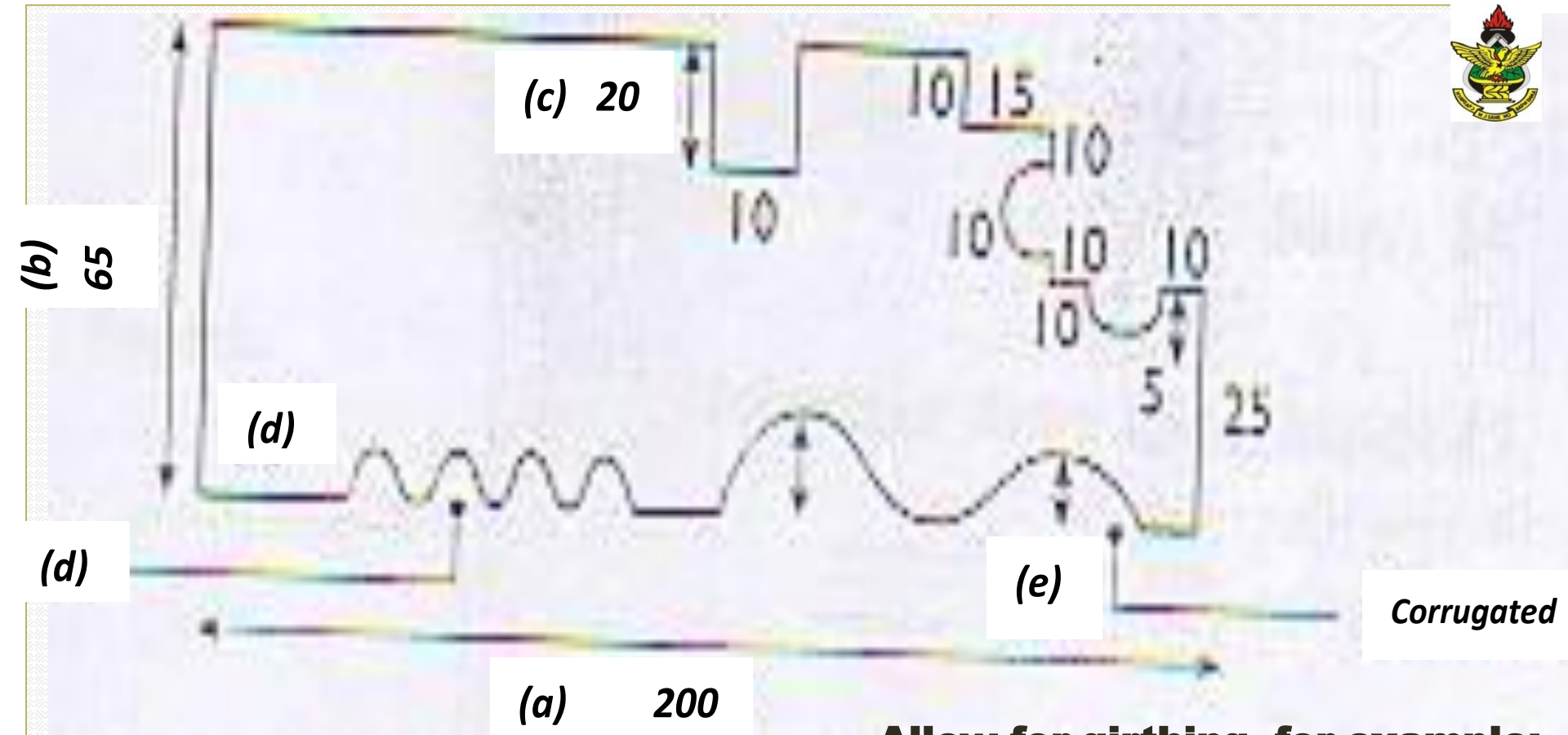


M60 Painting / clear finishing

The section deals with decorative and / or protective painting, staining, varnishing and sealing to surfaces.

Measurement Rules

M1 'Work in staircase areas and plant rooms are each given separately'. This is due to the difficulty of working in these areas.



Allow for girthing, for example:

$$2 \times 200 = 400$$

$$2 \times 65 = 130$$

$$2 \times 20 = 40$$

$$6 \times 2 \times 5 = 60$$

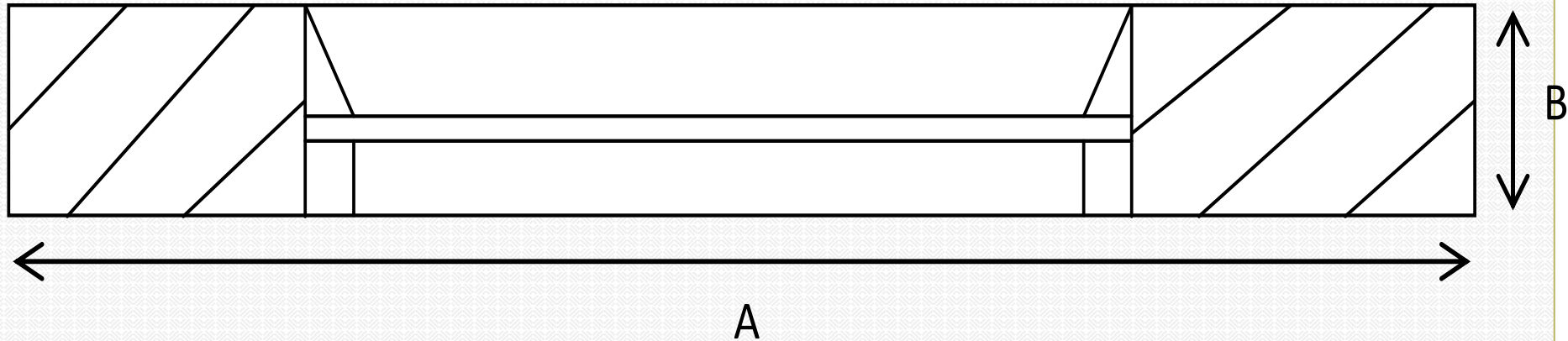
$$2 \times 2 \times 10 = 40$$

$$\text{Total} = 670$$

Figure 12: Irregular Surfaces



Figure 13: Glazed door plan



$$2 \times A + 2 \times B = \text{girth of door} = G$$

$$\text{Height of door} + B = \text{height of door} = H$$

M10 This means that the description of the plain open type of fencing and gates should include the size of the members in the description.

*For example, railings: plan open type girth over 300mm:
40 x 12mm railings and 25 x 25 balusters as detailed on
drawing ... (measured on side only) m²*

Definition Rules



- D2** Work to any surfaces (except ceilings and walls) would be described as multi-coloured work if decorated in more than one colour, e.g. such as picking out features in a different colour
- D3** If more than one colour is applied on either the walls or piers, or the ceilings or beams in a room then work would be described as “multi-coloured work”
- D8** General surfaces include such items as walls, floors, ceilings, skirtings, door and window linings, and frames, sills, flush doors, staircases etc. but excludes all items under M60.2-10.*.*

White surround
(stiles and rails)

D3 If more than one colour is applied on either the walls or piers, or the ceilings or beams in a room then work would be described as “multi-coloured work”



D8 General surfaces include such items as walls, floors, ceilings, skirtings, door and window linings, and frames, sills, flush doors, staircases etc. but excludes all items under M60.2-10.*.*

Figure 14: Multi-coloured Work



Note the following about M60 (Painting / Clear finishing):



Isolated surfaces

- All items under M60 with areas not exceeding 0.50m² irrespective of girth are classified as 'isolated areas.
- All surfaces not exceeding 300mm girth are classified as 'isolate surfaces, girth not exceeding.

SECTION III:

Measurement Techniques and Worked Example



SCHEDULES

- When the scope of work is extensive, it will be advisable to prepare a schedule (table) of the items to form the basis for the measurement.
- All the conglomeration of finishes at the different sections of the building can be appropriately summarized in a simple table.
- One does not, therefore, need all the drawings to take off. The table or schedule will have exclusive information on the descriptions (or specifications) or dimensions.
- The two types of schedules of internal finishings are:
 - ⊕ Schedules of descriptions
 - ⊕ Schedules of dimensions.



Schedule of internal finishing is mostly restricted to only schedule of descriptions. What you must remember however is that, you will need to refer to the drawings for the dimensions if you prepare only schedules of descriptions.

Note:

Schedules are prepared for large buildings with extensive finishings.

Schedules are *not* required for very simple buildings with only limited variety of finishings.

The Architect may prepare the internal finishing schedule, but where unavailable but required, the Q.S. must prepare it before taking off.

Schedules greatly simplify the taking off process and reduce the liability of errors.

Tables 2 and 3 show the typical internal finishing schedules of descriptions and dimensions. All the various locations must be uniquely labeled by numbering or marking in the distinctive way where not provided by the Architect.

Table 1: Schedules of internal finishings (Descriptions)



Locations	Ceilings Finishing	Decoration to Ceiling	Wall Finishing	Decoration to Walls	Cornice	Skirtings	Picture Rail	Floor Finishing	Any other feature



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Order of Measurement

- ✿ The need for orderly, logical and sequential, presentation of items in the section cannot be over emphasized. The least distraction, you lose some items with dire cost consequences.
- ✿ You must work systematically through the building; recording the details of internal finishings in a schedule. For example:
 - Room by room
 - Bottom to top (or top to bottom)
- ✿ The order of measurement of internal finishing on each floor could follow the order:
 - Ceiling
 - Wall
 - Floor

✿ Note:

- ✿ The linear items, such as skirtings, cornices, picture and dado rails should be measured after the main areas of wall finishings.
- ✿ Work in staircase areas and plant rooms are measured separately [Measurement rule 3 (M3)]
- ✿ All the various locations must be uniquely labelled by numbering or marking in a distinctive way where not provided by the Architect.

WORKED EXAMPLE

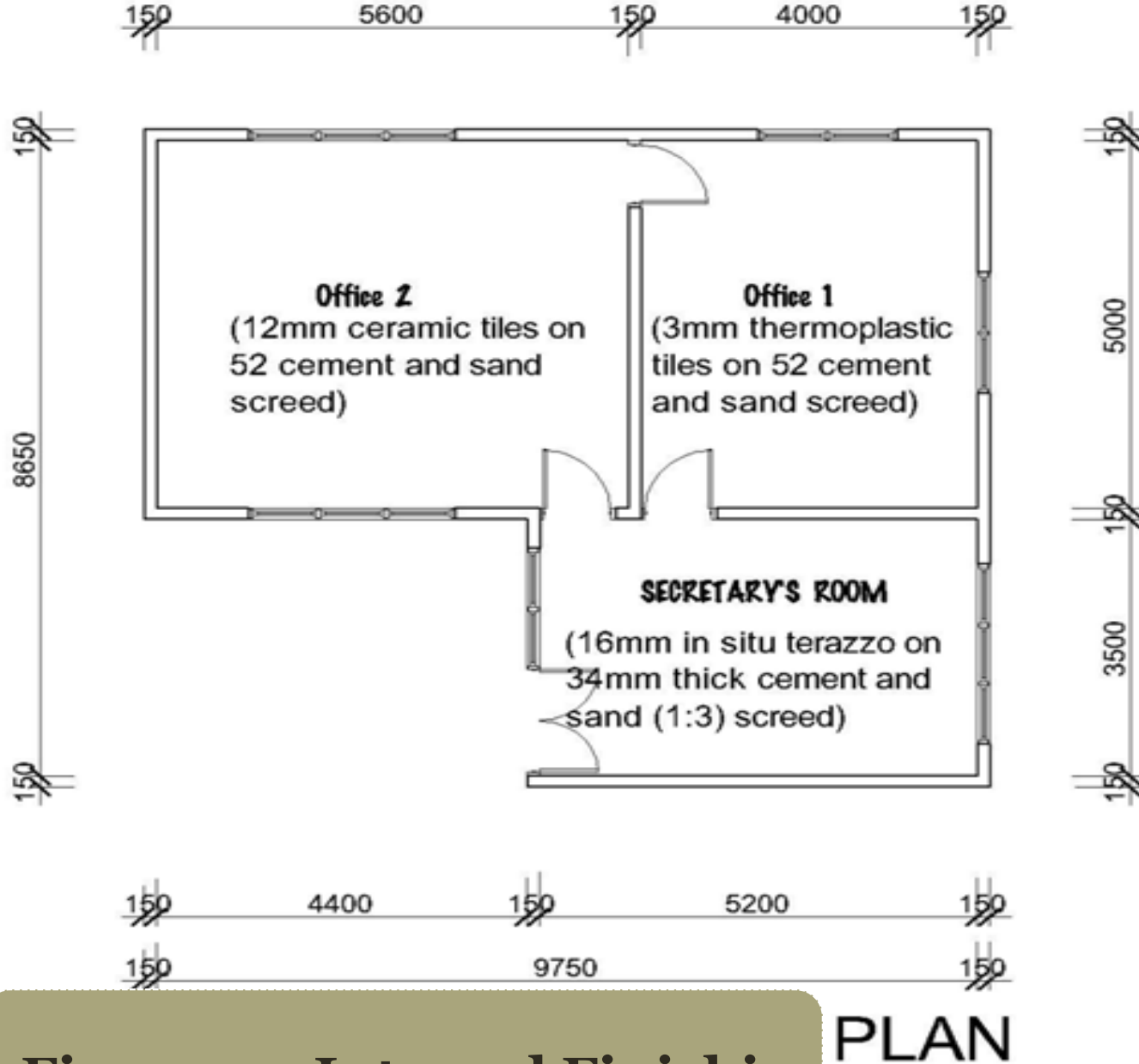


Figure 15 below shows the plan of an office block for A & Z Consult Ltd.

- ✦ Prepare a schedule of Internal Finishings.
- ✦ Take off for the Internal Finishings.

Ceiling finishings

- Office 1
75wid x 15th hdwd t & g with 2 coats of gloss polish
- Office 2
10mm th plasterboard skimmed with 3mm coat of hardwall plaster and 2 coats of emulsion.
- Sec's office
3mm th ord plywood fxd wi buttons on hdwd.and 2 coats of oil paint.



- Skirting to all rooms
150mm x 25mm
moulded hardwood
finished in hard
gloss paint
- 50 x 25mm moulded
hardwood painted
picture rail to offices
- 75mm x 75mm
hardwood polished
cornice
- All wall finishings in
cement and sand render
(1:3)
- Floor to ceiling height
3,400mm

Figure 15: Internal Finishing



Table 3: Schedule of Internal Finishing (Worked Example)

Location	Ceiling Finishing	Decorations to Ceiling	Wall Finishing	Decoration to Wall	Cornice	Skirting	Picture Rails	Floor finishing	Any other feature
Office 1	75wid x 15th hdwd t & g	Kps & 2 cts of high gloss polish	13th render ct & sd (1:3)	Prepare & twice emulsion paint	75 x 75mm hdwd polished	25 x 150mm moulded hdwd plug'd to bk wall	25 x 50 moulded hdwd plug'd to bk wall	229 x 229 x 3mm thermoplasti c floorg as spec'd on 52mm ct & sd trowelled screed (1:4)	
Office 2	10mm th plasterboard skimmed with 3mm coat of hardwall plaster	Prepare & twice emulsion paint	Ditto	Ditto	Ditto	Ditto	Ditto	300 x 300 x 12 th ceramic tiles as spec'd on 52 ct & sd floated screed (1:4)	
Sec's Office	3mm th ord plywood fxd wi buttons on hdwd.	Prepare & 2 cts of oil paint	Ditto	Ditto	Ditto	Ditto	Ditto	16mm th in situ ter (1:1½) as spec'd on 52mm floated screedg (1:4)	

INTERNAL FINISHINGS



Ceilings

5.00

4.00

75 wid x 15th hd. wi. t & g
as spec'd
§

Kps § 2cts pol

(office

5.60

5.00

10mm plaster board
skimmed wi 3mm coat of
hd. wall plaster

(office 2

§

Prepare § twice emuls paint

(do

18.00

3.40

5.20

3.50

3mm th. ord. plywd. fxd..
wi hd. wd. battons.

(sec's office

21.20

3.40

§

2

Prepare § ②

17.40

office 2

5,600

add

5,000

2/10,600

21,200

Sec's office

5,200

add

3,500

2/8,100

17,400

Render, 13th. Ct.

(office 1

§

Paintg gen. surfs, seal § 2^{ce}
emuln paint.

(office



				<u>3.40</u>	(office 1
5.20		3mm th. ord. plywd. fxd..			§
<u>3.50</u>		wi_hd. wd. battons.		21.20	Paintg gen. surfs, seal § 2 ^{ce}
		(sec"s office		<u>3.40</u>	emuln paint.
		§			(office
		2			
		Prepare § ②		17.40	
				<u>3.40</u>	
					(Sec's office
		<u>walls</u>			
				<u>18.00</u>	<u>Skirtings</u>
		<u>Intl. Girths</u>			Skirting, 25 x 150mm,
				<u>21.20</u>	wrot hd. wd., moulded,
		<u>Office 1</u>			fxd wi grds plugd (office 1
		5,000			to bwk.
		(office 2			§
		<u>Add</u> <u>4,000</u>		<u>17.40</u>	
		<u>2/9,000</u>			Paintg gen. isoldt surfs, wid
		<u>18,000</u>			gth ≤ 300mm, kps § ③
		-1-			(Sec's office



Picture Rails

18.00

Pic. rl. 25 x 50 wrot hd. wd. moulded, fxd wi grds plugd to bwk.

5.60

5.00

(office 1

21.20

§ (office 2

17.40

Paintg, gen. isolt'd, furfs, wi gth ≤ 300 kps § (3)

(Sec's office

Ceramic tile flr, lev, as spec'd, fxd wi approved adhesive on fltd screedg (m/s) (office 2

§

Screed to flr, lev, 52mm, ct. sd. (1:4), fltd to rec, cer. tiles on conc

(do

Cornice

18.00

Cornice, 75 x 75mm wrot hd. wd. moulded, fxd wi grds, plugd to bwk.

5.20

3.50

(office 1

(office 2

17.40

§ (Sec's office

In situ ter (1:1½) ct chipg 10 th. as spec'd fxd on fltd screed (m/s)

(Sec's office

§

Screed to flr, lev, 52mm (1:4), fltd to rec. ter. on conc.



Paintg, gen. isolt'd, furfs,
wi gth ≤ 300 kps § (3)

Flr finish

5.00

4.00

Thermoplastic flr., lev,
229 x 229 x 3mm qs
Spec'd fxd wi. adhesive
on trowld scrd (m/s)
(office 1

§

Screed to flr, lev,
52mm ct § sd
(1:4) trowld to rec
thermp. Tiles, on conc

Screed to flr, lev, 52mm
(1:4), ftd to rec. ter. on
conc.

SECTION I: **Windows**

Windows are openings in walls and roofs of buildings that allow light and air, and people to see out. Glass is a common material in windows that allows light into the building. Metals and Timber and even plastics are used for the framing.

There are different types of windows, including:

- Casement
- Sash
- Louvre
- Bay windows
- Wooden jalousie
- Paneled



Windows can be:
Fixed,
Side hung,
Top hung,
Bottom hung,
Vertical pivot,
Horizontal pivot,
Double hung sliding,
Horizontal sliding,
Louvre.

The order of measurement involves:

- *first taking the window and its frame,***
- *then followed by such associated component as***
 - *glazing,***
 - *ironmongery and***
 - *painting .***

Fig. 16a: Conventional Window Types



***Sash side hung
opening out***



FIXED LIGHT

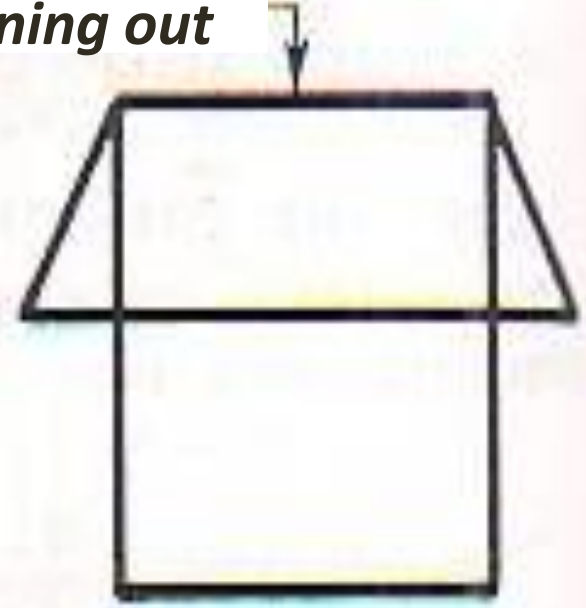
***usually used in
conjunction with
other types***

***Sash top hung
opening out***



SIDE HUNG CASEMENT

***simplest and
cheapest type
of opening window***



***TOP HUNG
CASEMENT***

***usually of small
size for controlled
ventilation***

Fig. 16b: Conventional Window Types



*Sash bottom
hung
opening in
out*



**BOTTOM HUNG
CASEMENT**

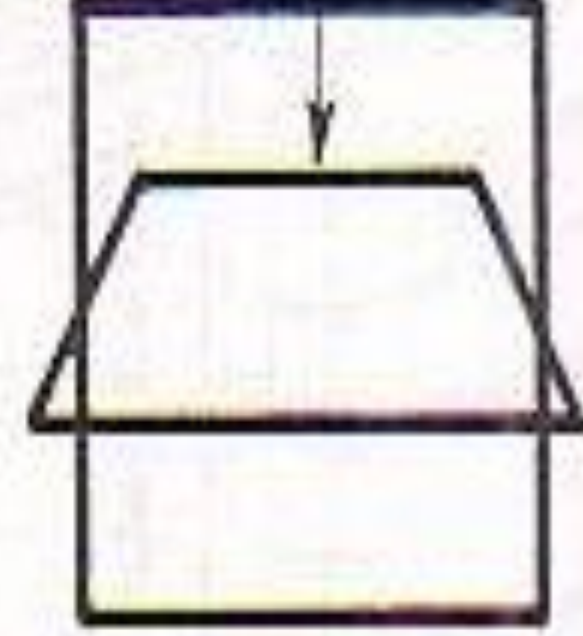
*used as for top
hung casement*

*Sash hung on concrete
pivots*



**VERTICAL
PIVOT**

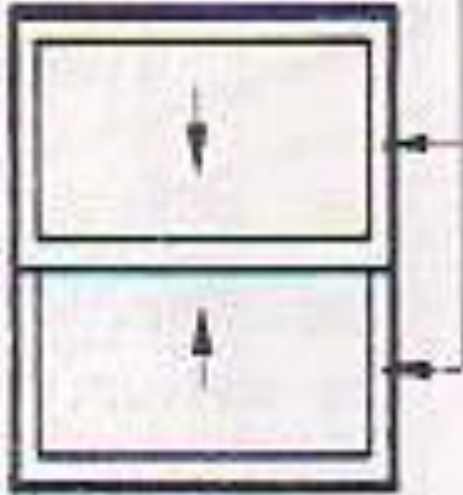
*high performance windows – dearer than
casement types – can be obtained as
reversible for easy cleaning*



**HORIZONTAL
PIVOT**



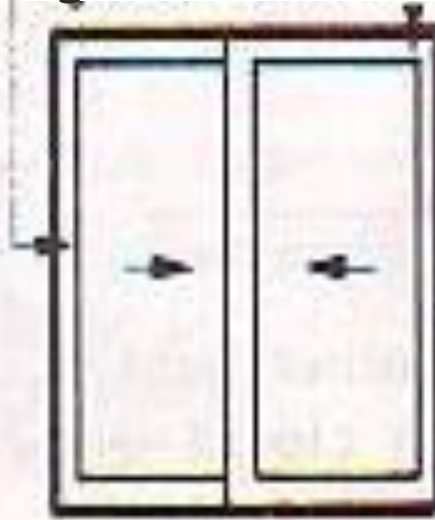
*sashes hung on spring
balances or weights*



**DOUBLE HUNG
SLIDING SASH**

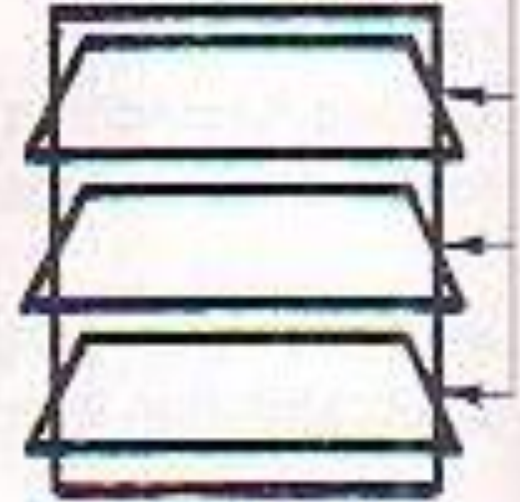
*gives good controlled ventilation
without any forward or backward
projection of sash*

*sashes run on
guide rails*



**HORIZONTAL
SLIDING SASH**

*louvers hung
centre pivots*



LOUVRE

*good ventilation
with only small
projections of
louvres*

Fig. 47c: Conventional Window types

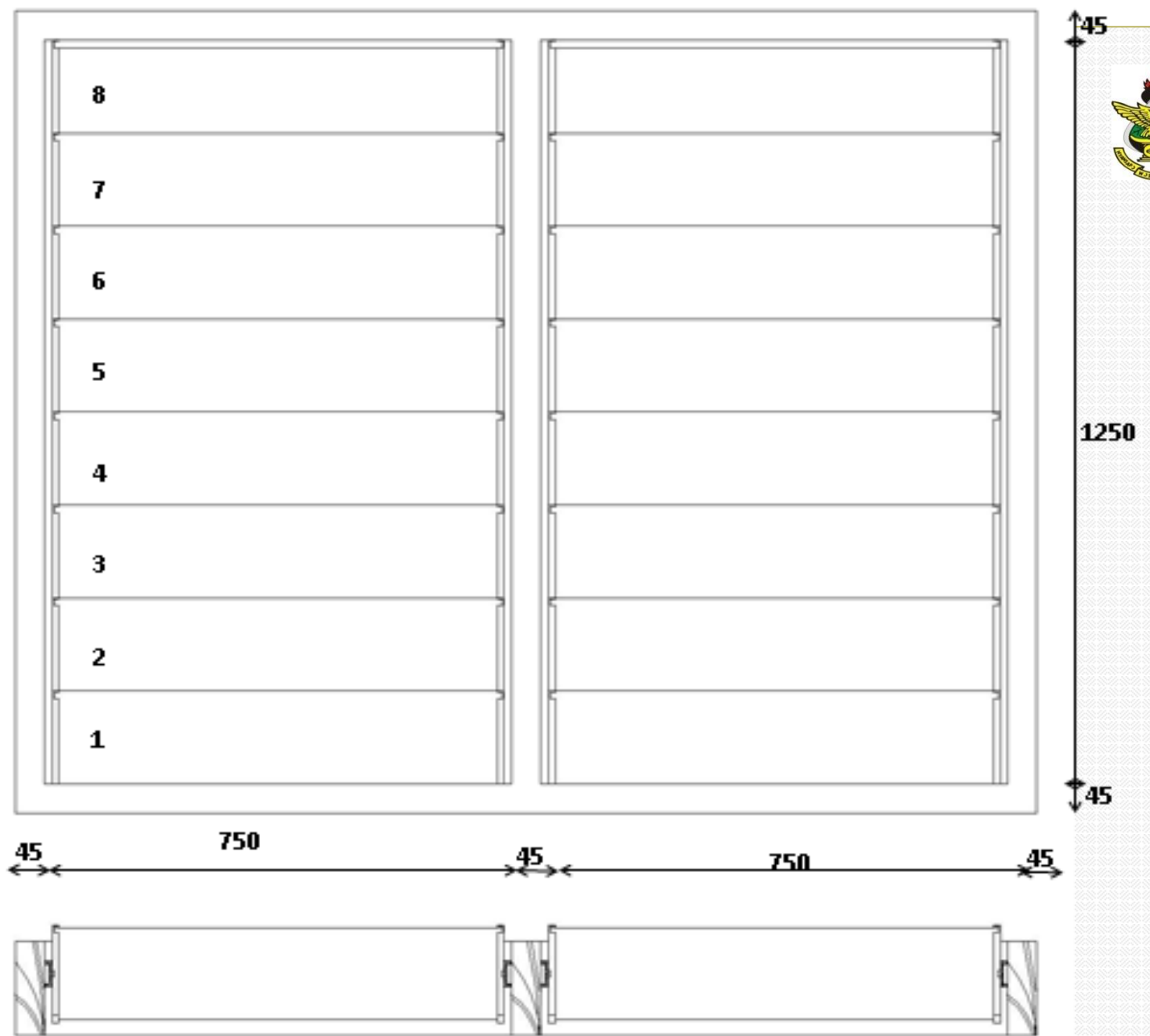


Fig. 17: Framed & Glass Louvred, 2 – Bay Window



The main classes are found under sections:

- **L Windows / Doors / Stairs and**
- **P Building Fabric Sundries.**

In specific terms:

- **L10 Timber windows / Rooflights / Screens / Louvres**
- **L11 Metal windows / Rooflights / Screens / Louvres**
- **L12 Plastic windows / Rooflights / Screens / Louvres**
- **L40 General glazing**
- **P21 Ironmongery**
- **Painting of windows is measured under:**
- **M60 Painting / Clear furnishing**



L10, L11 and L12 deal with composite items or components of:

- + Timber, or of timber cores faced with plastic or**
- + Metal, or metal cores faced with plastics or**
- + Plastics,**

usually fabricated off site, and fixed into openings to give light or ventilation or to see through.

Measurement Rule

M1: Standard Sections are identified. The sections or items indicated are typical items. The items measured are composite and enumerated.

Definition Rule

D1

- Timber sizes can either be exact (or finished) or nominal.**
- All sizes of timber are nominal unless stated as finished sizes.**
- Tender drawings and bill descriptions refer to nominal sizes of the finished members.**
- The exact (furnished) sizes are to be determine from workshop or fabricated drawings.**



Coverage Rules

C1 No allowance is made for working around obstructions in the measurement and the description.

C2(a) Doors supplied with the unit are included. This means that doors contained within units are deemed to be included in the main item but must be identified in the description.

C2(b) Architraves, trims, sills, sub-frames and the like are deemed to be included in the measurement of the window where these form part of the unit.
In the words, accessories and / or sundry components are deemed to be included in the main item where these components are composite with the main item and are generally supplied by the same manufacturer.



- C2(c) Standard ironmongery is deemed to be included in the main item where it is supplied as part of the main item with both main item and ironmongery coming from the same supplier. For clarity the required ironmongery should be identified.**
- C2(d) Factory supply finishes, such as powder coating, are deemed to be included. The levels and / or types of finishes need to be specified.**
- C2(e) Generally, glazing forms a component part of the main item and is therefore deemed to be included.**
- C2(f) Mechanical operation and automatic operating equipment are included in the unit where supplied as part of this main item.**
- C2(g) General fixings and fastenings are deemed to be included.**



Supplement Information

S2 Factory applied preservative should be specified

S3 Surface treatments applied off site (factory applied) should be specified and referenced in the description of the main item.

S4-S7 All specific limitations, construction details and material selected need to be specified and referenced in the main description.



L10.1.-1
L10.2.-1
L10.3.-1

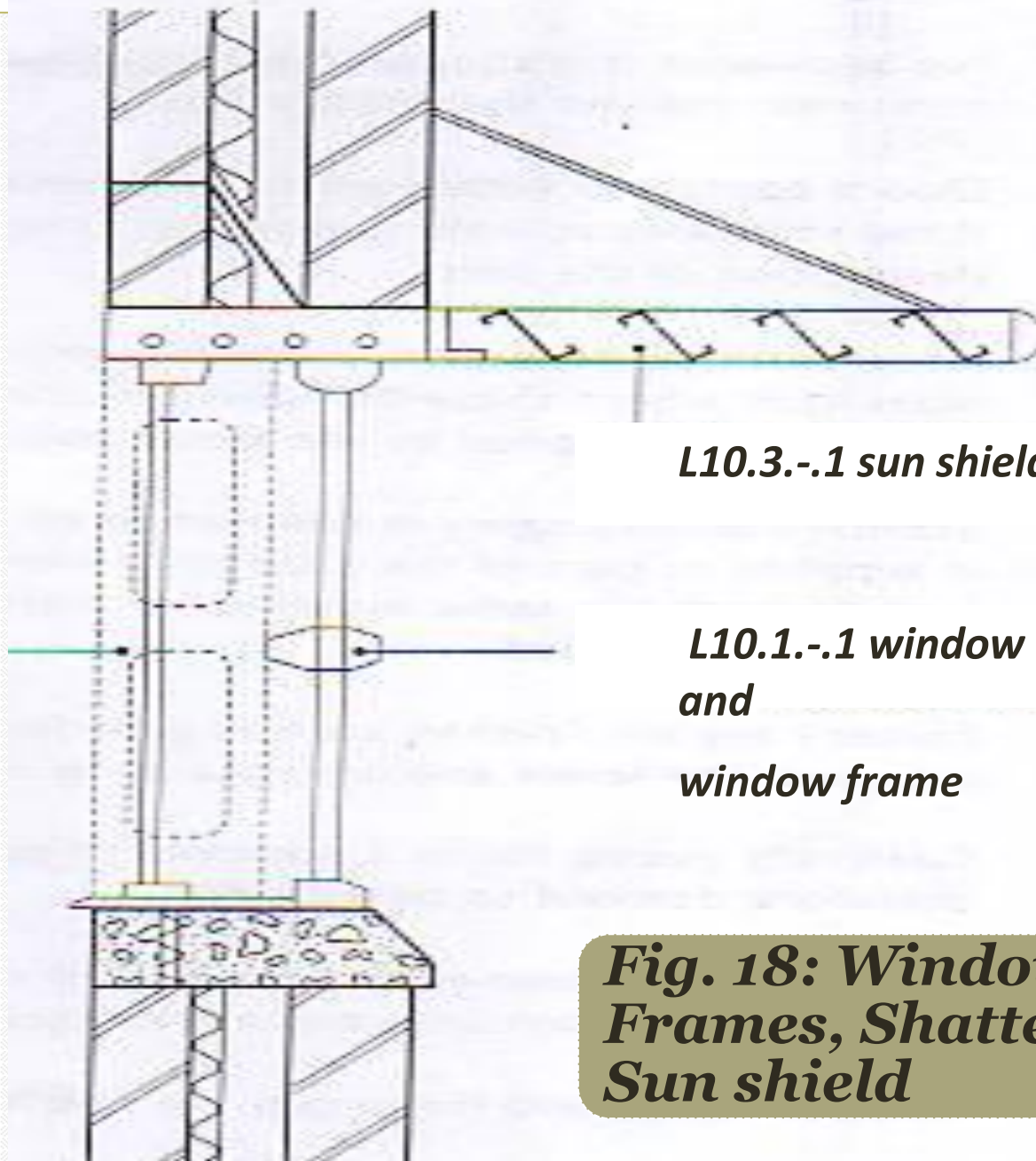


Fig. 18: Windows & Frames, Shatters and Sun shield



L40 General Glazing

- This section deals with all types of glass, glass plastics and glazing with putty, beads or gaskets into prepared openings.
- Glazing supplied as part of a window, door or other components is excluded.

Measurement Rules

- M1** Individuals glazed panes in multi-pane units are measured separately, except where these are sealed units (e.g. double-glazed unit).
- M3** Pane sizes are measured to the size of the smallest rectangular area from which the pane can be derived.

Definition Rule

- D1** Multiple glazed panes (L40.3.*.*.3) are multiple layers of glazing, e.g. double- or triple- glazing.



Fig. 19: Glazed Paned Sizes



P21 Ironmongery

- **This section deals with components and items of metal, plastics or other materials fixed on site as door or window opening or closing devices, fasteners, supports, brackets etc.**
- **This excludes items supplied with a window or order components and excluding items of furniture or equipment in their own rights (e.g. towel rails, toilet rolls holders).**
- **Ironmongery items are enumerated and detailed in the description.**
- **The preparation and fixing are deemed to be included.**
- **The nature of the base therefore needs to be identified to allow the estimator to make due allowance for fixing, etc.**

Order of Measurement



The three (3) prompt approach to measuring windows are:

- the windows
- associated components to windows such as ironmongery glazing and painting
- adjustment for window openings, including deduction of:
 - Walling,
 - Finishes on both faces,
 - Painting on both faces,
 - and measurement for head of openings (lintels and arches), sills and reveals.

The order can be changed:

- ▶ *one can measure first for the adjustment for window opening,*
- ▶ *then followed by the window itself,*
- ▶ *before its associated components*

Mosquito netting and burglar proof are measured in association with the window.



Window Schedules

- There are no standard formats for schedules but a good schedule must contain all necessary information, easy to read, and accurate.
- Schedules are usually presented in a tabulated format which can be related to, and read in conjunction with working drawings.
- Window schedules are prepared by the Architect as part of the working drawings. Where it is not available but the Q.S. deems it as necessity, he must prepare it first before taking off.
- A typical example of window schedule is presented in table below

Table 4: Window Schedule



Sheet 1 of 1				Drawn by:	Date:	Revision:	
Contract Title & Number:				Dwg. Nos.:			
Location	Type	material	Overall size	Glass	Iron mongery	Frame	Sill
Bedroom 1	Metal framed & glass louvre	Alluminium Glass	1250 x 1340 hi	750x 150wide x 5mm thick rounded, plain glass		150 x 45 hard-wood	
Bedroom 2	Purpose made – Drg No. BT/3/09	Hard-wood	1770 x 1600	460x200 1080x300 460x1040 1080x1140 3mm float	1-200mm 1-300mm Alluminium stays 1-alluminium alloy fastener	Timber	timber
Dining							
Lounge							



Nr. 5 lead d. p. c.

215mm brick-on-edge
flat arch

150mm x 215mm precast r.
c. lintel, reinforced with 2nr
12mm m. s. bars

90mm x 43mm Head
65mm x 69mm 6.3mm MS
angle
50mm wood Casement

250mm x 75mm
Artificial Stone sill

90mm x 65mm
Hardwood Sill

150mm x 100mm
2mm Quarry Tile Sill
25mm x 5mm Copper
Water Bar

1,200

SECTION

225 Cavity Wall

scale 1:20

ELEVATION

1,800

PLAN

Fig. 20: Worked Example 6 - Wood Casement Window



WOOD CASEMENT

WINDOW

Wdw. Width

1,800

Add retns. 2/30 60

1,860

1

Wdw. & wdw. fr. as dimmed.
Diagram., wrot sod., consist
of 3nr. 50th. reb. & thro.
Stiles (2nr. side hg. w. butts
(m/s) & ea. Div. into 6nr.
Panels w. reb. & chfd. & grvd.
hd. & jbs. fxd. w.g.w.i.bent
cramps 30x5x200 lg. to bwrk.
& 2nr. 90x63 2^{ce} reb. & 2^{ce}
chfd. mulls. & 90x63 hwd.
sk., 2^{ce} reb. & grvd. sill.



Item

Provide the P.C.Sum of GH¢24
for supply of 2nr. cast. fasteners
& stays.

§

Add for profit.

2/

1

Fix only cast. Fast in alum. alloy
to hwd.

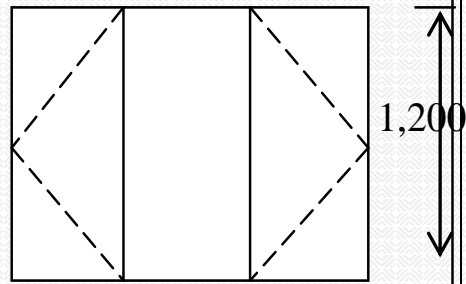
§

Fix only cast stay in alum. Alloy
to hwd.

Glaza.



Glazg.



$$\begin{array}{r}
 \leftarrow 1,800 \rightarrow \\
 2/1,860 \quad 3,720 \\
 2/1,200 \quad 2,400 \\
 \hline
 6,120
 \end{array}$$

3/6/ 0.24
0.34

Cop. water bar 5 x 25 in sills
bedded in mastic

Bed wd. fr, in c.m. (1:3) & pt
o.s. in mastic.

Pr. 75p.s. butts & fxg. to
hwd.

Width ht.
1,860 1,200

Less less
Jbs. 2/50 100 hd 50
Mulls 2/38 76 Sill 30
Stiles 3/2/38 228 404 top rl. 38
6) 1,456 bott rl. 68 181
243 3) 1,019
340

Glazg. w. stand. Plain glass, in
panes area $\leq 0.15 \text{ m}^2$, c.s.g. (O.Q)
3th. to BS 952 & glazg. to wd.
w.l.o. putty & springs.
(In 18nr. panes)



Paintg

1.86

1.20

1.80

1.20

6.12

2/ 0.03

Paintg. glzd. Wdws., wd.,
panes, area $\leq 0.10m^2$, k.p.s.

§ 3

Ditto, ext.

1,860

1,200

2/ 3,060

6,120

Paintg. gen. isold. surfs.,
wd., gth ≤ 300 , appln.
onsite prior to fxg.,
primg. Only.

Adjust. of opg.

Ht

Add bk. wall, th.:102.5,

1.20

1.80

1

multi-col, fcgs a.b.
(reveals

Arch

Arch, flat bk-on-end, ht
on face: 225, width of
exp. soff. 102, fcgs.a.b.

stl L len

1,800

add beargs 2/ 100 200

2,000

Stl. Isold. structl. membr.,
plain, 88.9x88.9x6.27mm
x 8.48kg/m, 2.00m lg
r.s. L to BS4, pt. 1, table 14
as bk. arch. Suppt.



r.s. L to BS4, pt. 1, table 14
as bk. arch. Suppt.

Paintg. structl. met. gen.
isold. surfs., gth ≤ 300 ,
ext., prep. Prime $\S 3$

Precast conc. lintel, 150 x
215 x 2.29m lg. (1:2:4/20
agg) reinf. wi. 2nr 12dia
m.s. bars to BS4449, wi
2nr surfs. (300 %a gth)
keyed for pla., bedded in
g.m. (1:1:6)

dpc, width > 225 , hor., cav.
tray, single layer of nr 5
milled lead, wi. 150 laps,
inc. beddg. on 2nr. bk.
skins in c.m. (1:3) to the
profile shown on fig. 31

Adjust. of opg.

Ht

1,200

Add arch \S lintel 225

sill 75

1,500

2.00

1

2.29

Ddt. Bk.wall, th. 102.5,
comms. a.b.

\S

Ddt. Dittofacewk. o.s.,
multi-col. Fcg. bks. o.b.

\S

Ddt. form cav. to holl.
wall, wi:50,a.b.

Ddt. Pla. to bk. wall a.b.

\S

Ddt. paintg. g. s., 2^{ce}
Emulsn pt. pla. walls

-2-

1.86

1.50

1.86

1.20



Reveals				
	1.86	Add bk. wall, th.	102.5,	
			<u>0.08</u>	comms. in g.m. (1:1:6)
2/ <u>1.20</u>		Closg cavs., width: 50, slates 100 wide, set in c.m. (1:3), vert.	2.23	Dpc, width > 225, hor. & vert., single layer of nr 5 milled lead, inc. beddg in c.m. (1:3)
			<u>0.28</u>	
2/ <u>1.20</u>		Pla. to walls, width ≤ 300 , In 2 cts. a.b., bek., trowld. fin.		
		(reveals	<u>1.86</u>	Sill red quarry tiles, 20th. b. & p. in c.m. (1:3) wi. Flush jts. On screeded bed (m/s) width:100
<u>1.86</u>		Ditto, conc., do.		
		<u>Rdd. L</u>		
		1,860	<u>1.86</u>	Screed to margin, width:
		2/1,200 <u>2400</u>		
		<u>4,260</u>		
<u>4.26</u>		Rdd. L to pla., rad. 10-100		



4.26
0.09

Paintg., gen. surfs., seal
§ 2^{ce} emulsn. Pt. pla. wall

Sill

len

1,800

Add ends 2/100 200

2,000

2.00

Art. st. sill 250 x 75 sk.,
wethd., 175gth. Thro.
20gth § grvd. 30 gth., w.
2nr. stoolgs., >1.50m lg,
bldg, againtd other wk.,
§ b.p. in g.m. (1:1:6).

SECTION II:

Doors

79

- **There are different types of doors which are made from timber, metal, glass and plastics.**
- **All doors can be classified as external or internal. The former are usually thicker and more robust in design than the latter.**
- **Doors include:**
 - **Ledged and braced doors**
 - **Framed ledged and braced doors**
 - **Paneled doors**
- **Doors may be:**
 - **Single leaf,**
 - **Double leaf or**
 - **Multiple leaf**





Typical descriptions for the metal frame and glass louvred blade (fig 48)

Metal Carriers

Pr. al. louvre carriers, as spec'd, wi 12 nr. clips for holdg. Louvre glass (m/s) & fxd to hwd.

Louvre Blades

Standard plain glass, 750x150x5mm th., wi. rdd. Edges to BS..., fxd. in metal clips (m/s)

Relevant SMM7 clauses (L20, M60, P20 & P21)



The main work sections are:

- L: Window / Doors / Stairs**
- M: Surface finishes**
- P: Building fabric sundries.**

The specific sub-sections are:

L20: Timber doors / shutters / hatches.

L21: Metal doors / shutters / hatches

L22: Plastic / Rubber doors / shutters / hatches

M60: Painting / clear finishing.

P20: Unframed isolated trims / skirtings / sundry items

P21: Ironmongery.



L20, L21 and L22.

The section deals with composite items or components of:

- + Timber,
- + Timber faced with plastics,
- + Metal,
- + Metal faced with plastics,
- + Plastics,
- + Rubber,

usually, fabricated off site, fixed into openings or give access to or exist from the building or parts of the building.

Measurement Rules

M2 When measuring doors, each leaf is counted as a Single door, for example, a double door is classed as two (2) doors.



- M3** When measuring metal doors, the approximate weight of the door should be stated. This is particularly true of items which cannot be man handled into positions, e.g. strong room doors, and which may require additional equipment during installation.
- M4** Doors supplied as sets which include frames or linings shall be measured as composite items.
- M5** Enumerated composite sets need not restate the number of units in the description.

Definition Rule

- D1** Just like the windows, all sizes of timber for doors are nominal sizes unless stated as finished sizes. Exact sizes are to be determined from workshop or fabrication drawings. You will recall that tender drawings and bill descriptions refer to nominal sizes of the finished members.



Coverage Rules

- C1** Doors are deemed to include fitting and hanging. This means that both the supply and installation of the door or door set are part of the measurement.
- C2** No allowance is made in the measurement and the description for working around obstruction.
- C3a-g** The following are deemed to be included in the measuring of doors therefore need no separate description.
- C3a** Doors where supplied with the unit. This implies that doors contained within units are deemed to be included in the main item.
- C3b** Accessories and / or sundry components are deemed to be included in the main item where these components are composite with the main item and are generally supplied by the same manufacturer.



- C3c** Standard ironmongery is deemed to be included in the main item where it is supplied as part of the main item with both item and ironmongery coming from the same supplies.
- C3d** Factory supplied finishes, such as powder coating, are deemed to be included. The levels or types of finishes need to be specified.
- C3e** General glazing forms a component part of the main item and is therefore deemed to be included.
- C3f** Automation as mechanical operations are deemed to be included, where supplied as part of the main item and integral thereto.
- C3g** General fixings and fastenings are deemed to be included.



P20.1.1 Picture rail

P20.1.1 Architrave

P20.1.1 Dado rail

P20.1.1 Skirting

Door

Floor level

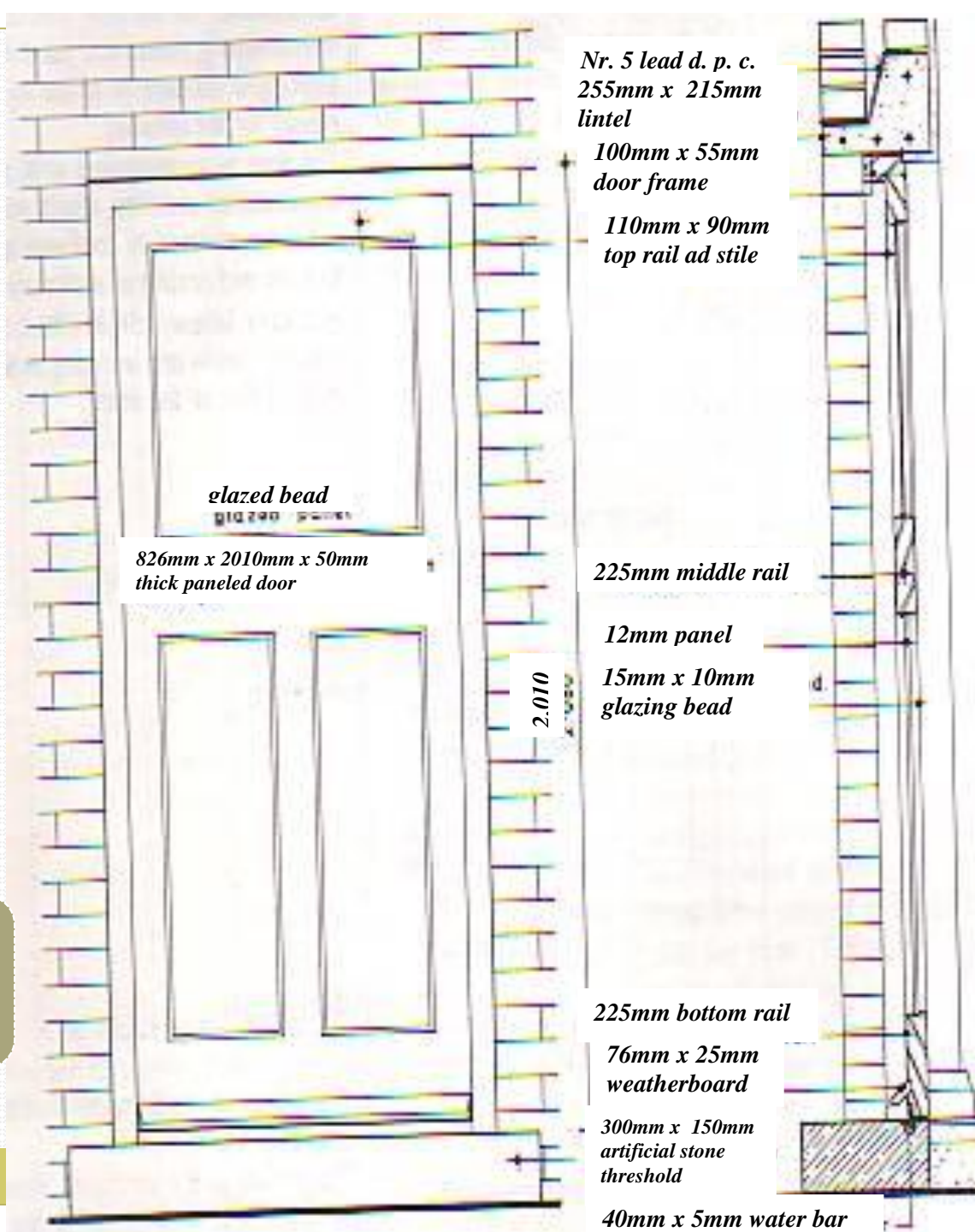


Order of Measurement

- ☐ Doors
- ☐ Painting of doors
- ☐ Ironmongery
- ☐ Frames or lining
- ☐ Architrave
- ☐ Adjustment for openings (blockwall, finishing and painting)
- ☐ Deduction for skirting and dado rails

Table 5: Door Schedule


LOCATION	TYPE	SIZE	FRAME/ TILING	IRONMO NGERY	SKETCH



**Fig. 22: Worked
Example 7 - Wood
Casement Window**

GLAZED & PANELLED DOOR



GLAZED & PANELLED DOOR					
		<u>Door</u>			<u>Glazg</u>
<u>1</u>		Dr. as dimnsd. Diagram. Wrot hwd. 2nr. pans of ext. qual. plywd., chfd. o. s. & plant midd. O. s. w. 1nr. pan reb. for glass (m/s) inc. 15 x 10hwd. glazg. bds., bott. rl. Holl. reb. for water bar (m/s), & 2 ^{ce} sspld. & thro. Weather bd. tgd. To bott. rl.	0.63 <u>0.63</u>		Glazg .w. stand. Plain glass, panes, area; 0.15-4.00m ² fluted sheet glass 4 th to BS952 to .wd .swd. glazg. deads (m/s) Secured w. brads & mastic.
			<u>1½</u>		<u>ironmongery</u> prs . of 100p.s. butts & fxg. To hwd.
			<u>1</u>		fix only mors. Lack & Level furn. In alum. Alloy to hhwd. & Fix only letter plate & knocker in alum. alloy to BS 2011 to hwd., inc. formg. aperture. & Fix only 150lg. brass barrel bolt & soc. to hwd
			2/ <u>2.00</u>		<u>Dr. fr. set (1Nr)</u> Jamb 100 x 55 wrot hwd 2 ^{ce} ____ reb. & mo., fxd w. g.m.s. bent cramps, 30 x 30 x 250gth. & m. s. dowels, 15Ø x 100lg
J. C. Danku 2011			89		



Dr. fr. set (1Nr)

Jamb 100 x 55 wrot hwd 2^{ce} ___ reb. &
mo., fxd w. g.m.s. bent cramps, 30 x
30 x 250gth. & m. s. dowels, 15Ø x
100lg

900

Add horns

2/75 150

1,050

Head 100 x 55, wroth wd, 2^{ce}
reb. & mo

2/ 2.00

1.05

0.83

5 x 40 x 826 lg .g.m.s.
water bar, dedded in c.m
(1;3) in prepd.grve. in st

-1-



		2/2,080 4,160			<u>Adjust. of opg.</u>
		<u>900</u>			
		<u>5,060</u>	0.90	<u>Ddt</u> bk. Wall th.:102.5	
				<u>2.08</u>	comms. In g.m. a.b.
<u>5.06</u>	Bedwd. fr. in c. m.				§
	(1:3) § pt. o. s. in				<u>Ddt</u> ditto facewk. O. s. in
	Mastic				g.m. a. b.
	§				§
	Paintg. gen. isolated				
	surfs., wd., gth. ≤ 300,				<u>Ddt</u> from cav. to holl. wall
	appln. On site prior t				width: 50, a.b.
	fxg., primg. only				§
	<u>Paintg</u>				<u>Ddt</u> pla. to bk. walls a.b.



Paintg

0.83

2.04

Paintg. glazd drs., wd.,
panes, area: 0.10-0.50m²
Partially glazed, k.p.s.

§ 3

§

Ditto, ext.

5.06

Paintg. gen. isolt'd.
surfs. wd., gth ≤ 300,
k.p.s. § 3

§

Ditto, ext.

(fr.

§

Ddt pla. to bk. walls a.b.

§

Ddt Paintg g.s. prep § 2^{ce}
emuls pt. pla. walls a.b.

Lintel

900

Add beargs

2/100 200

1,100

1

Precast conc. Lintel 255 x
215 x 1,100 lg. boot type
(1: 1½: 3/ 20agg) reifd. wi
4nr., 12dia. m.s. bars § 6dia
Stirrups to BS4449, wi 2nr
Surfs (300 %a gth) keyed
for pla. § 2nr. surfs. (190
%a gth) fin smth., § 2nr reb.
ends.



	<u>d.p.c.</u> <u>width</u> outer skin 102 across cav. 165 inner skin <u>102</u> <u>369</u>	2/ <u>2.08</u>	Pla. to walls, width ≤ 300, in 2cts. a.b., bwk., trowld. fin (reveals
	<u>Len</u> 1,100 <u>Add 2/75 150</u> <u>1,250</u>	<u>0.90</u> <u>5.06</u>	Ditto, conc., do (soff. Rdd. L to pla. rad. 10-100
1.25 <u>0.37</u>	Dpc, width > 225, stepped, cav. tray, single layer of Nr 5 milled lead wi. 150 laps inc. bedd2nr. bk. skins in c.m. (1:3)	2/ 0.08 <u>2.08</u> 0.90 <u>0.08</u>	Paintg. gen. surfs., prep & 2 nd emulsn. Pt. pla. to walls (reveals (soff
0.90	<u>Dat Bk. Wall, th.:102.5</u>		<u>Threshold</u>



0.90 <u>0.23</u>	<u>Ddt</u> Bk. Wall, th.:102.5 comms. In g.m. a.b.			<u>Threshold</u> <u>len</u> 900 <u>add ends</u> 2/102 204 <u>1,104</u>
0.90 <u>0.15</u>	<u>Ddt</u> form cav. to holl, wall, width: 50 a.b.	1.10		Art. St. sill 300 x 150 x 1,104 lg. to BS 1217 grvd fin. fair to 2nr. feces § ends §b. § p. in c.m. (1:3)
0.90 <u>0.08</u>	<u>Ddt</u> Bk. Wall, th.: 102.5 facewk. o.s. in g.m. a.b.			<u>Below dpc</u>
	<u>Reveals</u>			
2/ <u>2.00</u>	Closg. cav., width: 50, Slates 100 wide in c.m. (1:3), vert	<u>0.15</u>	0.90	<u>Ddt</u> Bk wall, th. 102.5, comms. in c.m. a.b. § <u>Ddt</u> Ditto, facewk o.s. in c.m. a.b. § <u>Ddt</u> form cav. to holl. Wall, width: 50, a.b.

Typical Description for a Flash Door

*Dr, flush, 2010 x 760 x 45 th,
hwd solid core gloed under
pressure, f. b. s. wí 3th inter
quality plywd, wí 15th hwd
lipping an d edging*

***Note that a dimensioned diagram
is not required.***



The unit is structured into three (3) sections:

● **SECTION I**

Considers what items or elements to be measured-
brief review of pipes and sanitary appliances.

● **SECTION II**

Discusses the clauses in SMM7 for measuring plumbing installations –
Works sections Y, N and P.

● **SECTION III**

Deliberate on measuring techniques and worked examples.



SECTION I:

Plumbing Items or Elements to be Measured

97

- **Plumbing refers to the system of pipe work with associated appliances that supply water to the building.**
- **The measurement will include:**
 - **Connection to water authority's main (communication pipe, stop valve and reinstatement of road / path);**
 - **Underground service and rising main;**
 - **Cold water storage cistern or tank;**
 - **Pipe branches to sanitary appliances;**
 - **Sanitary appliances;**
 - **Discharge pipes;**
 - **Any other work connected with plumbing installation such as painting pipes and testing the installations.**

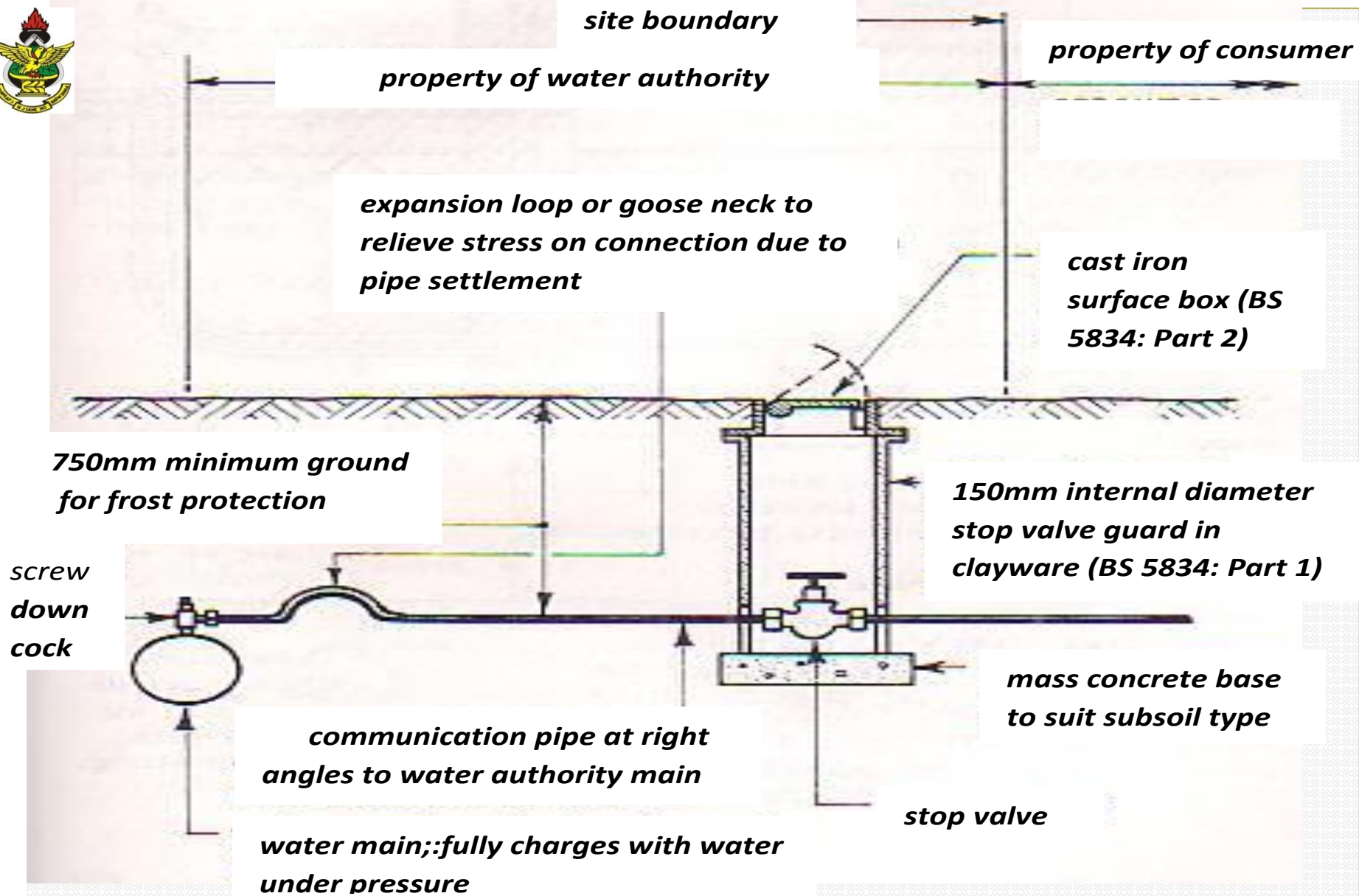


Figure 23: Typical Water Supply Arrangement

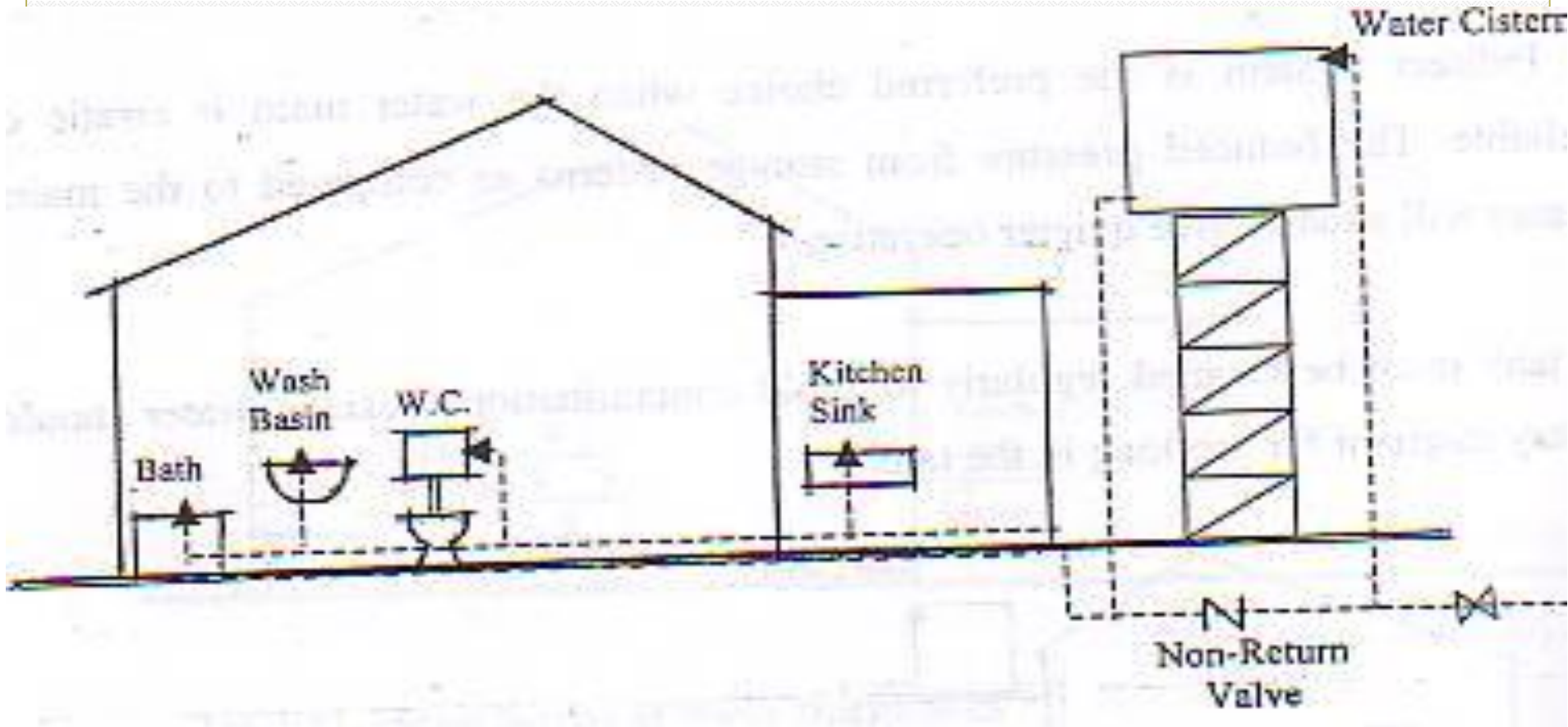


Figure 24: Water Distribution in Building



SECTION II:

Relevant SMM7 Clauses

100

The main work sections in SMM7 that have direct bearings on Plumbing Installations are:

- **Y Mechanical and Electrical Services measurement**
- **N Furniture / Equipment**
- **P Building Fabric Sundries**

Specific clauses include:

- **Y10 Pipelines**
- **Y21 Water Tanks and Cisterns**
- **N13 Sanitary Appliances / Fittings**
- **P30 Trenches / pipe ways / pit for buried engineering services**
- **P31 Holes / chases / covers / supports for services**
- **A53 Work by Statutory authorities**

Measurement Rules



- + M2 The term plant rooms include heating chamber, ventilation machinery rooms, and tank rooms etc. Because of restricted and usually congested working conditions, work in plant rooms is identified separately.**

- + M3 Pipes are measured linearly over all fittings and branches and no deductions are taken for fittings**

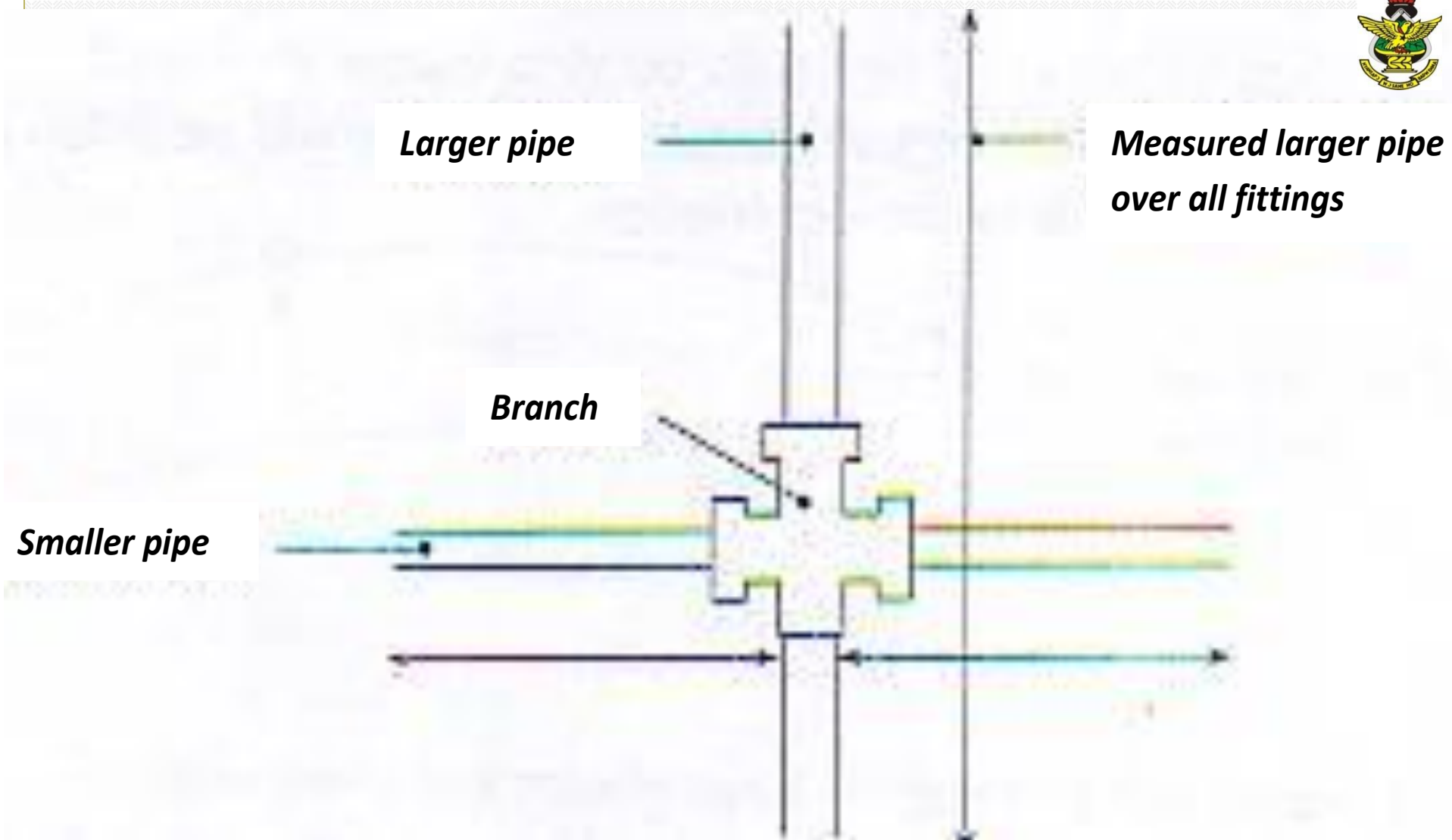


Figure 25: Measurement of Pipes over Fittings and Branches

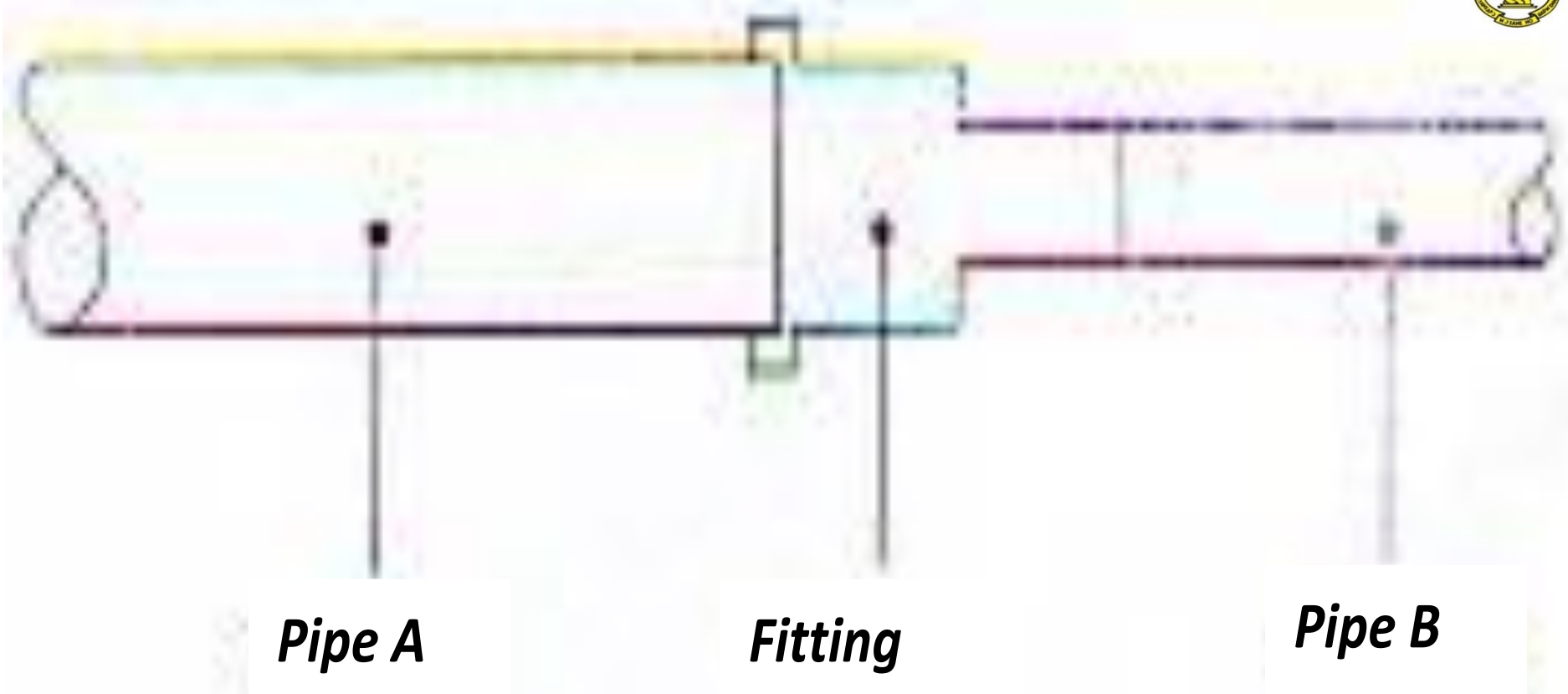


Figure 26: Reducing Pipes

Coverage Rules



- **C1** Details of jointing should be stated in the description.
- **C2** These items are used in the forming of special joints, pipes etc, and are generally used to match existing work.
- **C3** These are joints for joining together individual standard pipe lengths to make up the overall length of pipework required.
- **C5** Cutting pipework to allow connection to fitting is deemed to be included, therefore no allowance needs to be made for these in the measurement or description.

Classification Table



Y10.1.1-4 Generally pipework is *straight* and changes in direction are made with bends.

There is no requirement to state whether pipes are horizontal or vertical or at a high or low level.

Pipework would only be classified as *curve* if, for example, it is required to follow the profile of a curved wall.

Flexible pipes are mainly used for jointing equipment to pipework such as a length of flexible rubber hose type pipework from a rainwater pipe to a water butt or storage tank.



- A typical example of an *extendable* pipe would be a length of rigid pipework which can be extended by attaching other, usually pipework to it, such as a hose pipe for draining off purposes or to stop valve.
- All these pipes;
 - straight,
 - curved,
 - flexible and
 - extendableare measured in metres.
- The background should be stated as:
 - Masonry
 - Timber
 - Metal (and metal faced materials)
 - Vulnerable materials such as glass, marble, mosaic tiled, finishes etc.
- Apart from stating the background, pipes may also be fixed in:
 - Ducts
 - Trenches
 - Chases
 - Floor screeds
 - In situ concrete



Y10.1.5 Header pipes are generally situated above a boiler or series of boilers. There will be a “flow header” and a “return header” and each individual boiler is linked to these pipes by a short branch connecting pipes.

Flow return header pipes are enumerated.

Y10.2.1 Made bends are those bends formed by physically bending the pipe, usually on the site and are generally taken on small bore pipes.

Note

Made bends can be formed mechanically on larger bore pipes up to 50mm diameter by using a pipe bending machine

Y10.2.2 According to definition Rule 2 (D2), special joints and connections are joints which differ from those generally occurring in the running length or are:

- ❖ **Connections to pipes of different profile or materials;**
- ❖ **Connection to existing pipes;**
- ❖ **Connection between pipes and appliances and equipment;**
- ❖ **Connecting ends of flue pipes to boilers, chimneys etc.**



Examples of pipe fittings:

- ✦ **Bends**
- ✦ **Offsets**
- ✦ **swan necks**
- ✦ **y-junctions**
- ✦ **Reducers**
- ✦ **Elbows**
- ✦ **twin elbows**
- ✦ **Tees**
- ✦ **Crosses**
- ✦ **unions**

Y10.2.3.2

One end



End cap

1

Y10.2.3.3

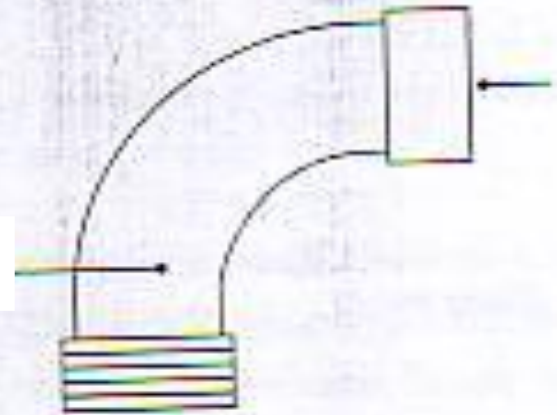
Two ends



1

Elbow

Bend



2

2

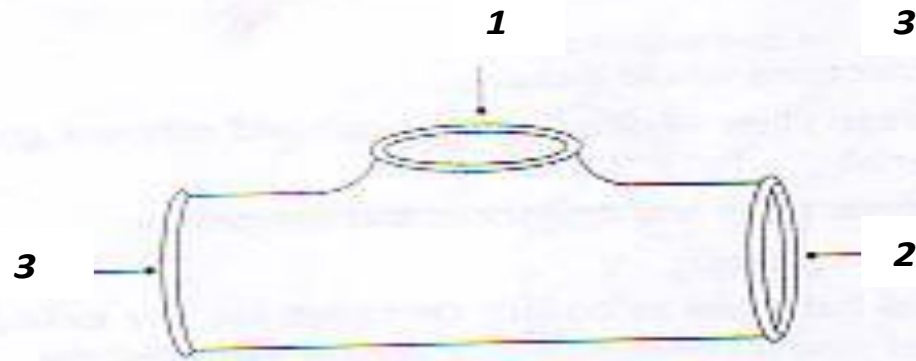
Y10.2.3.4

Three ends

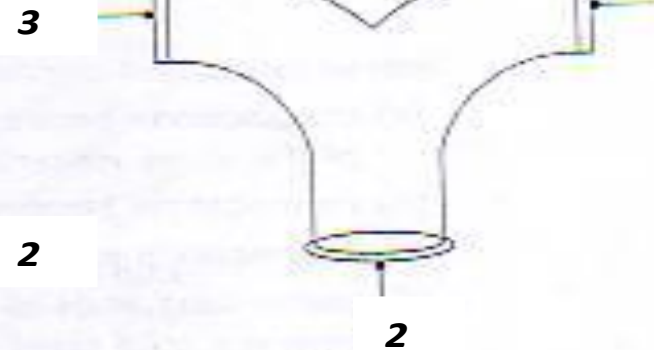
Figure 27a: Pipe Fittings

Y10.2.3.4

Three ends



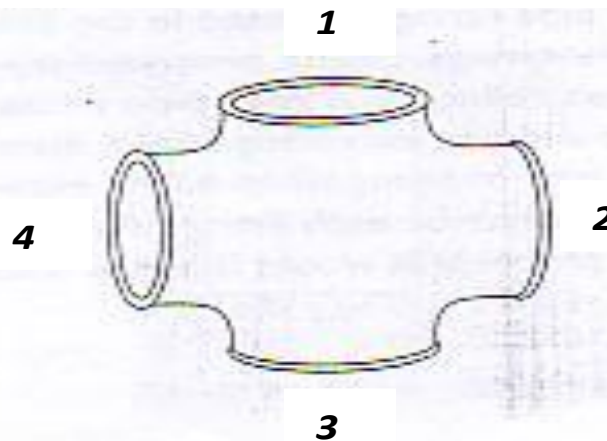
Tee



Twin elbow

Y10.2.3.5

Other examples include cross or branch (four)



Y10.2.4.6

These pipes are similar to Y10.2.3.* Except that this covers fittings to larger pipes





Y10.8 Pipework ancillaries are items which are not measured “extra over” the pipe work like fittings but are described and enumerated.

They include:

- + Draw-off taps**
- + Valves (stop, control, regulating, safety, reducing, mixing etc)**
- + Cocks (drain, stop, air)**
- + Steam traps**
- + Strainers**
- + Gauges and thermometers**
- + Automatic control**
- + Indicating, measuring and reading equipment.**



Y10.9 In general, pipe support are included with the running length of pipe work description (Y10.1.*.1).

Where standard pipes support cannot be used and other method of supports have to be designed to suit the condition, this must be stated in accordance with this clause (Y10.9).

Examples include pipe support and boiler and plant rooms.

Y10.10 Pipe anchors and guides are designed to secure pipe work to the structure to stop movement in the running length where pipe work is subject to great variation in temperature.



Y10.11 Pipe sleeves can be made from:

- metal,
- cardboard or
- plastic piping

built into walls or floors through which other pipes pass. Pipe sleeves are designed to allow the inner pipe to expand or contract without being constrained by the wall or floor

Y21 Water tanks / cisterns are measured under General Pipe Equipment.

N13 Sanitary Appliances / Fittings include W.C, Sinks, Wash basins, Urinals, Bidets, Showers and Baths are enumerated, giving details of type, size, pattern, capacity, method of fixing and any cross reference to the project specifications.

P30 / P31 These clauses are used to measure service trench excavations and cutting of holes and chases for pipes.

Worked Exercise

Figures 28 and 29 show the plan and section of the lavatory and kitchen of a house.

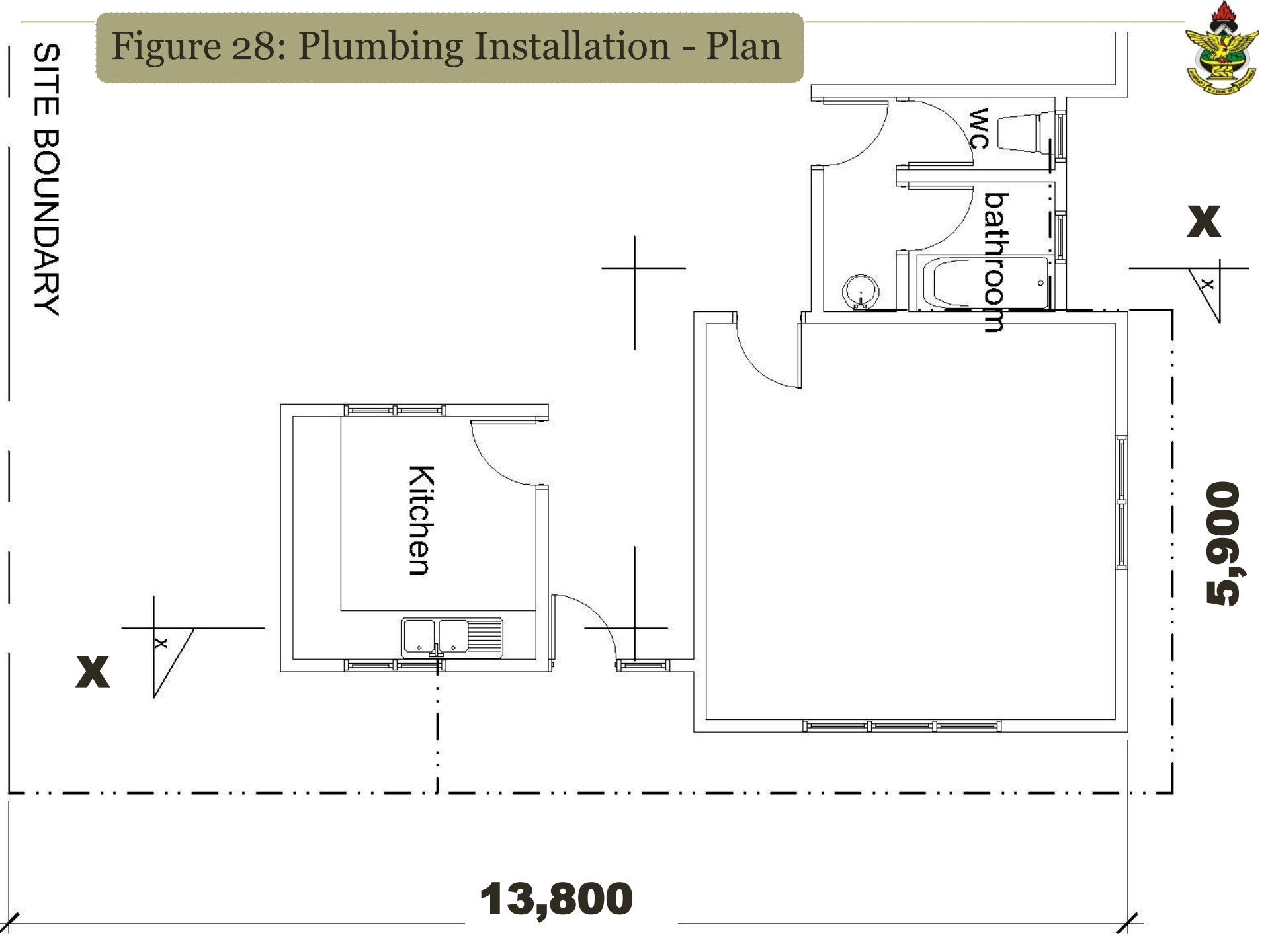
Take off for the Plumbing Installations

NOTES

- Average depth of excavation 600 mm.
- Service pipes 18 PVC.
- Branch pipes 12 PVC.



Figure 28: Plumbing Installation - Plan





Section XX

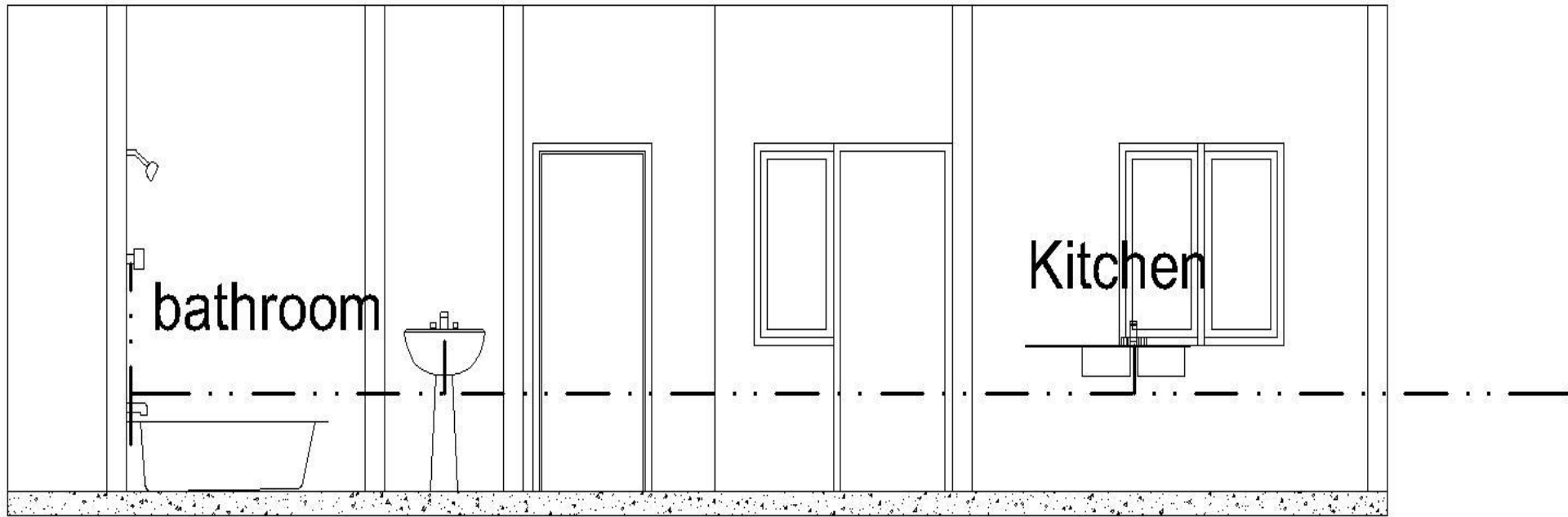


Figure 29: Plumbing Installation - Section

PLUMBING INSTALLATIONS



Conn. to Mains

Branches

Sink

Pipes

Item

Allow the Prov. Sum of
GH \$25.00 for conn. to
main in rd. & bringg.
18 Pvc seerv up to bonndg
of site, inc. provsn. Of stop
value & box by GWCL.

<u>tr</u>	<u>wall</u>
<u>1,500</u>	vert 650
	wall <u>150</u>
	<u>800</u>

1.50

Pipes, st., nom size 12, pvc
& fxg to BS... w. solvent
jt. in trs.

&

Exc. Tr for serv. Nom size
≤ 200, av dp. 500-750

Cold water serv.

1

E. o. pvc pipe, nom size 18,
for special conn. s. j. to
xtg fittg.

Len

13,800

Add 2/450 5900

750

20,450

0.80

Pipes, st., nom. Size 12 pvc,
fxg in chases in masonry.

2

E.o. pvc pipe, nom. size 12
For made bend



20.45

Pipes, st., nom size 18 pvc
to BS...., wi. solvent jt.
in trs.

1

Pipewk ancillary: pillar
tap, nom size 12, chrom
platd, easy cln patt., high
necked to BS 1010 indexed
COLD inc. strt tap conn. &
comp. jt. to pvc pipe.

2/ 1

E.o. pvc pipe, nom. Size
18 for made bend

1

Pipewk ancillary: stop valve,
size 12, brass h. p. scrdn.
Type to BS 1010 wi 2nr.
comp. jts . to cop. Pipe.

-1-



Wash basin

len

hor. 3000

add vert 500

3500

Bath

tr. 1600

wall 600

150

750

1

E.o. pvc pipe, nom size 18
for fittg., 3nr ends

(unequal tee

3.50

Pipes, st., nom size 12, pvc
to BS..., w/ solvent jt.
in chases in masonry

1

E.o. pvc pipe nom size 12,
for made bend

1

E.o. pvc pipe nom size 12
for spec conn to pillar tap

1

Cut circ. Hole thro. 150th.
bk. wall for pipe $\leq 55 > \emptyset$

1

E.o. pvc pipe, nom size 18,
for fittg., in 2nr ends
(reducg bend

1.60

Pipes, st., nom size 18 pvc
to BS...., w/ solvent jt.
in trs.

§

Exc. Tr. For serv., nom
size ≤ 200 , av. dp. 500-750



	size ≤ 200 , av. dp. 500-750	<u>1</u>	E.o. pvc pipe nom size 12 for spec conn to pillar tap (m/s) inc bent connector & comp. jt
<u>0.75</u>	Pipes, st., nom size 12, pvc, fxg. in chases in masonry		
<u>2</u>	E.o. pvc pipe, nom size 12 for made bend		<u>W. C.</u> <u>len</u> 600 150 <u>450</u> <u>1,200</u>
<u>1</u>	Pipework ancillary: stop valve, size 12, brass h. p. scrdn. Type to BS 1010 w/ 2nr. comp. jts. to cop. Pipe.	<u>1.20</u>	Pipe, st., nom size 12, fxg in chases in masonry
<u>1</u>	Cut circ. Hole thro. 150th. blk. wall for pipe $\leq 55 > \phi$	<u>1</u>	E.o. pvc pipe, nom size 12 for spec conn to cistn, inc bent connectoot & comp. jt

San appliances

Supply assembly & fix the ff. san.

appliances (jts to pipes m/s)

1

Sink

Combined drainer & bowl,
stainless stl. Drainer
1067 x 467 & rect bowl
457 x 343 x 178 dp., wí.
waste fittg. Chain, stay &
plug & fxg. to sink unit
(m/s)

Bath

1

Bath, porcelain enam. cast
iron 1700lg to BS1189 wí.
2nr. chr. Pltd. pillar taps,
waste fittg., chain, stay
& plug.

Basin

Waste pipes traps



nom.

1

Pipewk. ancillary: trap,
size 32 drawn pvc
bottle type wí. 38 seal to
BS..., wí scrd jts to waste
o/let on appliance & comp.
jt. to pvc pipe
(wash basin

1

Ditto, nom. size 38, do
(sink

1

Ditto, nom. size 32, pvc wí.
88½ outlet shallow seal &
cleaning plug ea. Side &
wí. scrd jt. to waste o/let on
appliance & comp. jt. to pvc
pipe

(bath



1

Basin

Wash basin ped. in glzd
fire clay, 559 x 406, w/
nr. chr. Pltd. pillar taps
& waste fittg, chain, stay
& plug & fxg. on m. s.
angle bkts. p & s to
masonry & scrg. ped. to
conc flr.

3.00

(bath

Foul pipe above grnd

Pipes, st. nom. size 100, pvc
fxd to drain

Sundries

1

W.C.

w.c. suite, low lev. w/. vit.
ped, dble plastic ring seat,
9 litre glzd. M.s. conclud
bkts., enam. Flush pipe,
inc. scrg to conc., jtg outlet
to pvc discharge pipe (m/s)
p & s cistn. bkts. to
masonry & jtg. Fl. Pipe to
cistn. & arm of ped

Item

Markg the posn for holes
in the struct. For the cold
water supply & foul
drainage above grd. Serv.

Item

Allow for air testg. &
commnsng the cold water
supply & foul drainage
above grd. servs

(End of supple, assembly & fix)

The unit is structured into three (3) sections:

● **SECTION I**

Considers what items or elements to be measured-
brief review of drainages, including manholes and septic tanks.

● **SECTION II**

Discusses the clauses in SMM7 for measuring drainage works –
Works sections R12.

● **SECTION III**

Worked examples.



SECTION I:

Drainage Items or Elements to be Measured

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- **Drains are means of conveying surface water or foul (soil) water below ground level.**
- **The three (3) systems of drainage are:**
 - **Separate**
 - **Combined**
 - **Partially separate**
- **The main items to be measured are:**
 - **Drains - both main and branch pipes and their excavations;**
 - **Connections, gullies and other accessories at the head of the branch drain such as the marscar system;**
 - **Inspection Chamber (or Manhole);**
 - **Venting pipes, fresh air inlet interceptors and connections to sewer;**
 - **Septic Tanks, Cesspools or soakaways;**
 - **Testing drains.**

Typical Example:

Inspection chamber No 1



**Back inlet gully for sink
waste at ground floor level**

**If subsoil is suitable the rainwater
pipes may be allowed to be
connected directly to soakaway**

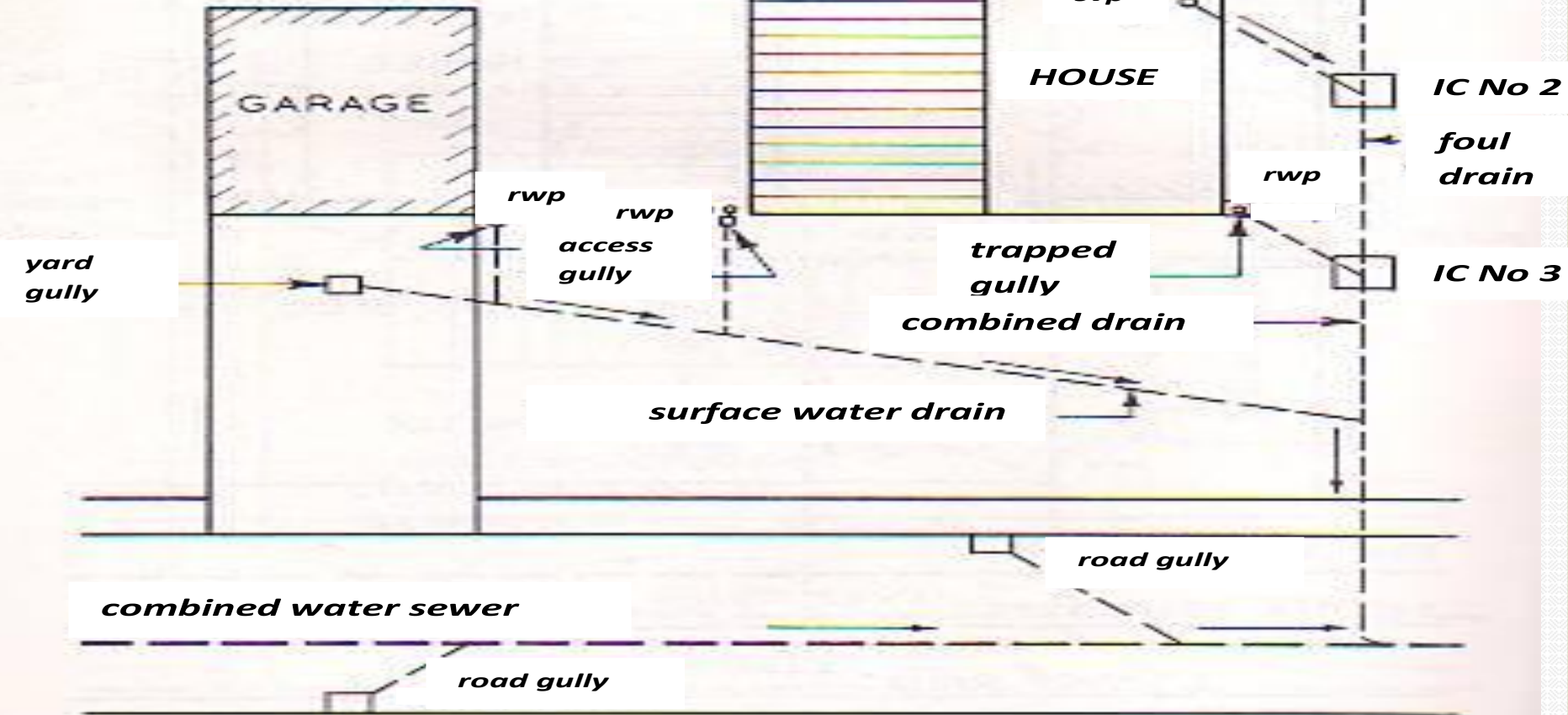


Figure 30: Drainage Installation

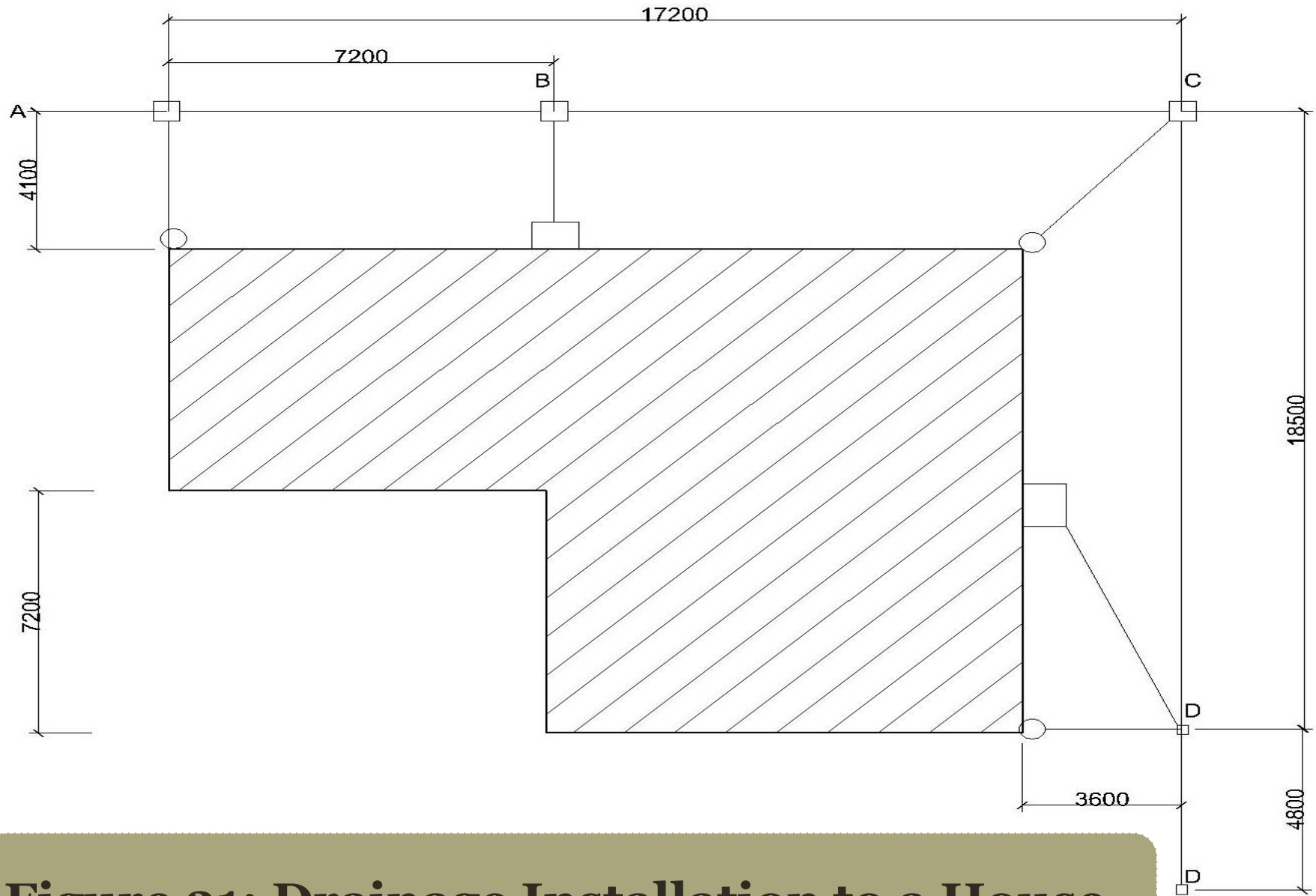


Figure 31: Drainage Installation to a House

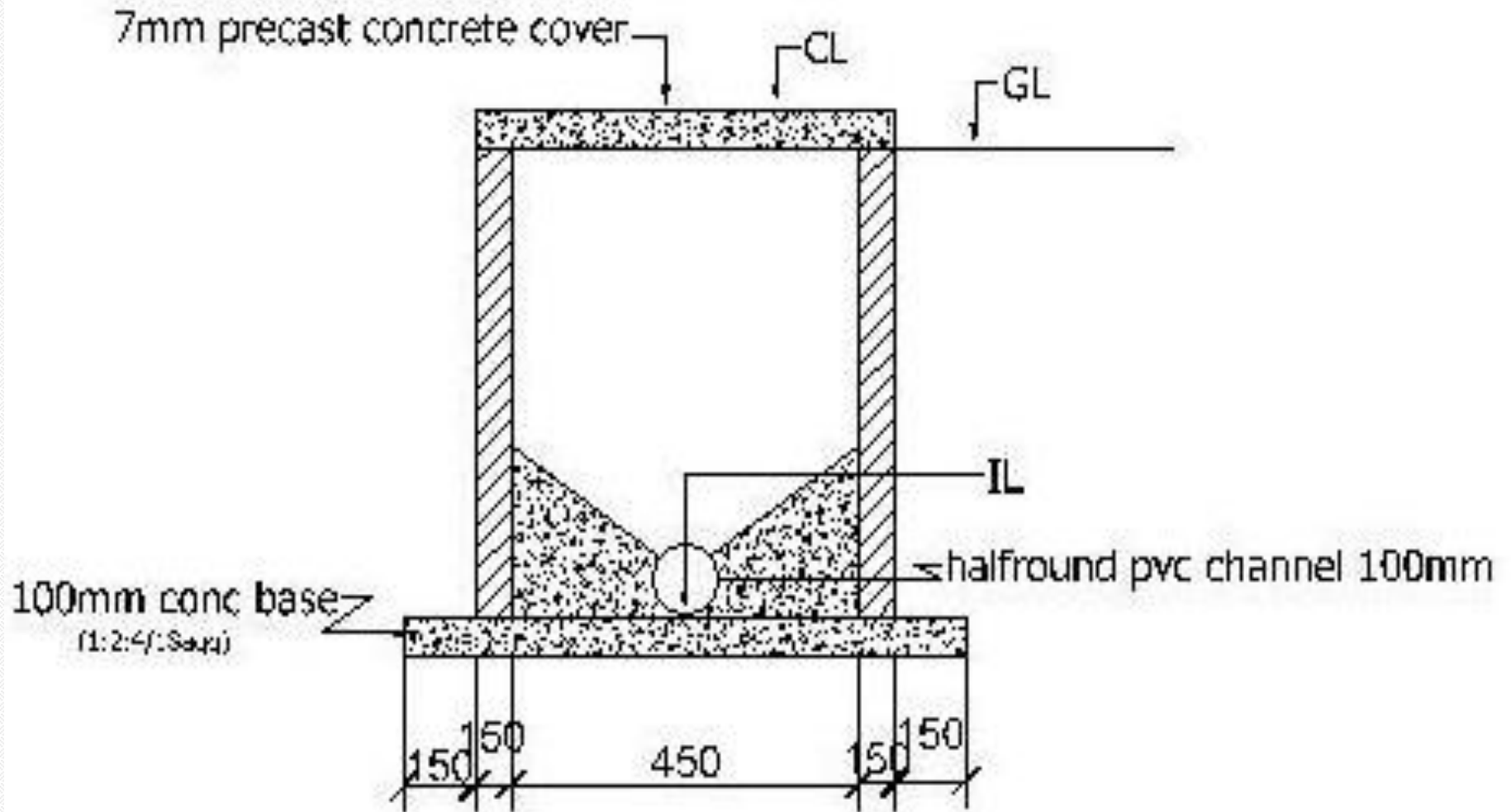


Figure 32: Manhole

SECTION II:

Relevant SMM7 Clauses



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The main work section is R: Disposal Systems

R12: Drainage below ground

Drainage below ground deals with all buried surface and foul (soil) drainage work from the gully or the above drainage stack connection to the sewer connection or other outfall and other sewage treatment and collection point such as septic tank and cesspool.



Measurement Rules

- **M1-M3** Where specific and special materials are needed for backfilling, surface treatment and excavating below ground level, D20 clauses are applicable (e.g. D20.9 and D20.13).
- **M4** In measurement of *extra over* items, the minimum width is 500mm. Where there are no beds the width (w) to be taken is the nominal size (d) of the service plus 300mm.
(i.e. $w = d + 300 \geq 500$).
- **M7** Pipes are measured over all fittings and branches. Pipes are measured as per the dotted line in figure 49.



R10.2.4.5 Tee junction

Running length joint

Figure 33: Measurement of Pipes



M8 When measuring work associated with manholes inspection chamber, soakaways, cesspits and septic tanks (R12.11-15.1-6), the rules associated with these items are covered in the relevant sections:

- ✚ Excavations (D),
- ✚ Concrete (E),
- ✚ Formwork (F), Reinforcement (E),
- ✚ Brick work / block work (F) and
- ✚ Rendering Coatings (M).

M9 Items R12.11-15.7-3.1 are accessories which are measured out where the manholes are built in situ rather than prefabricated. Preformed systems are specified and measured under R12.11-15.13; in this case the accessories required should be stated in description.



Definition Rules

D6 Pipe accessories include:

- Gullies
- Traps
- Inspection shoes
- Fresh air inlet
- Non-return flaps, etc

D7 Where describing pipe accessories, the dimensioned description needs to include the nominal size of each inlet and outlet, such as 'junction with 2nr 100mm diameter inlet and 1nr 150mm diameter outlet'.



Coverage Rules

- C1** Excavating trenches is deemed to include:
- ◆ Earthwork support,
 - ◆ Consolidation of trench bottoms,
 - ◆ Trimming excavations,
 - ◆ Filling with, and compaction of general filling materials,
 - ◆ Disposal of surplus excavated materials
- C3** Pipes are deemed to include pipe supports. No separate measurement for pipework support is therefore required. This is generally because supports for below ground drainage pipes are at discretion of the contractor to facilitate his or her method of working.

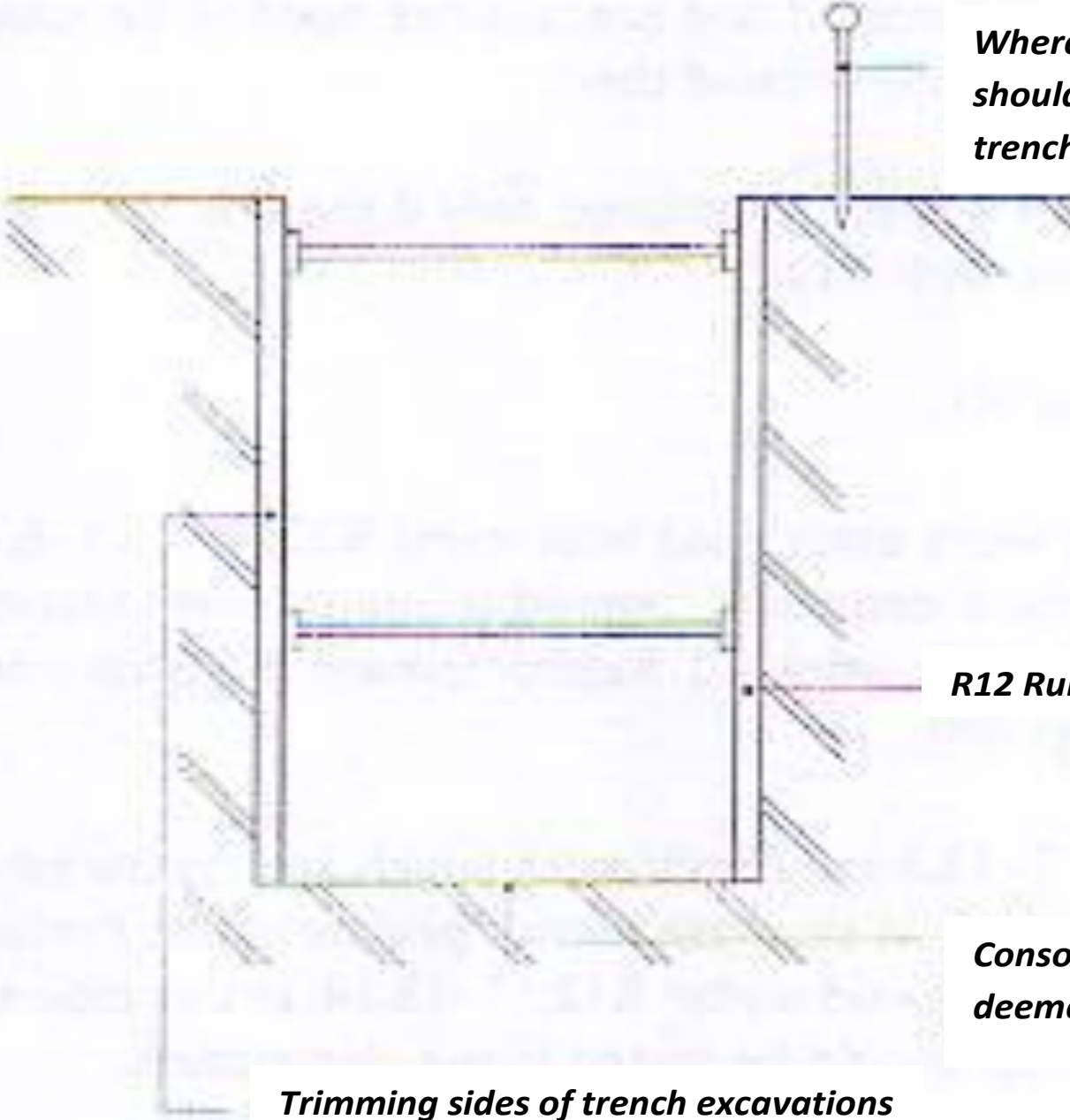
Classification Table

R12.9 Pipe fittings include:

- Bends
- Elbows
- T-junctions
- Reducers, etc.



Where protection is required this should be specified in the excavating trench description as R12 Rule S2



R12 Rule C1 (a) Earthwork

Consolidating of trench bottom is deemed to be included as per Rule C 1(b)

Trimming sides of trench excavations are covered by R12 Rule C 1(c)

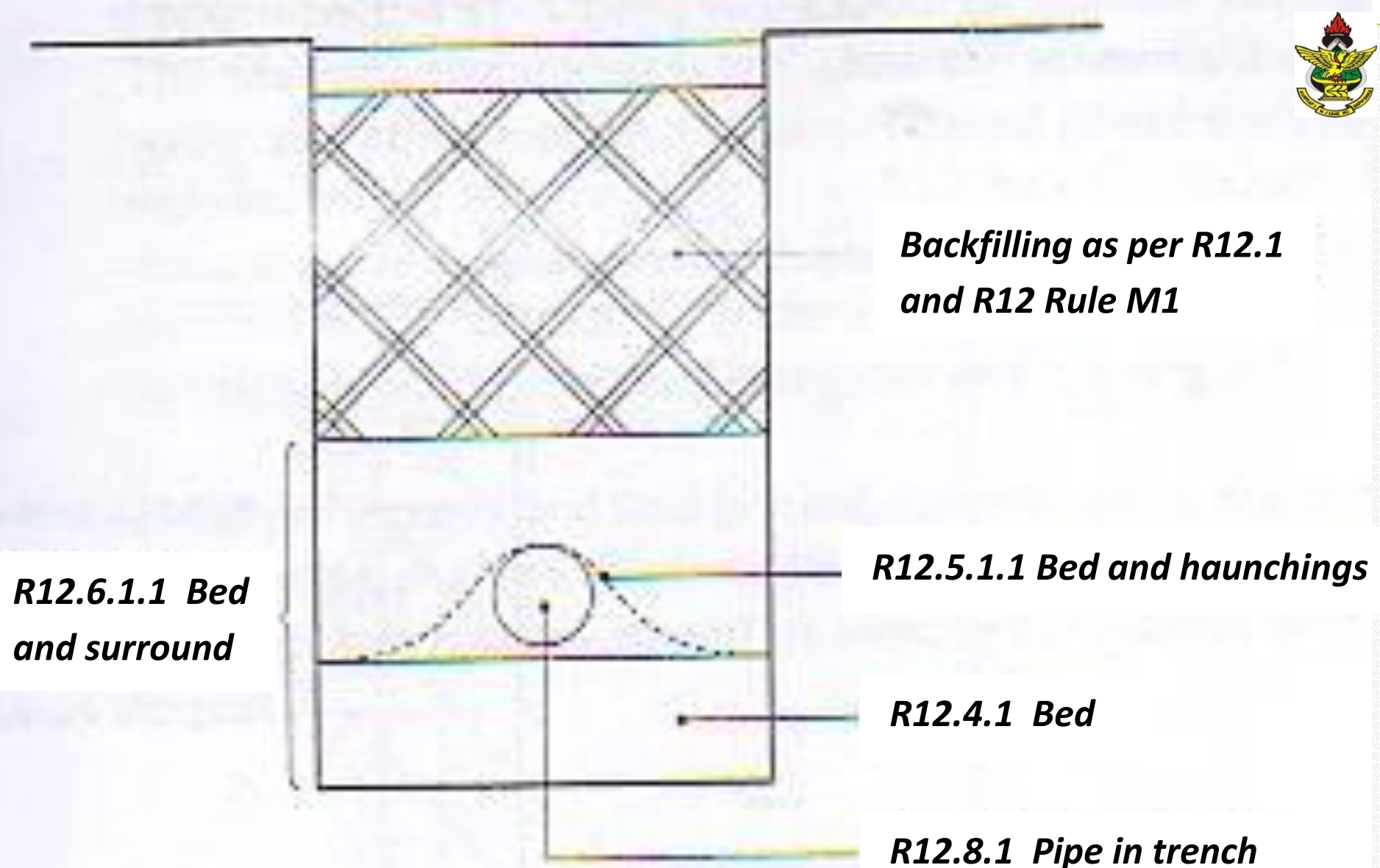


Figure 35: Bed and Haunching



R12.11 Manholes

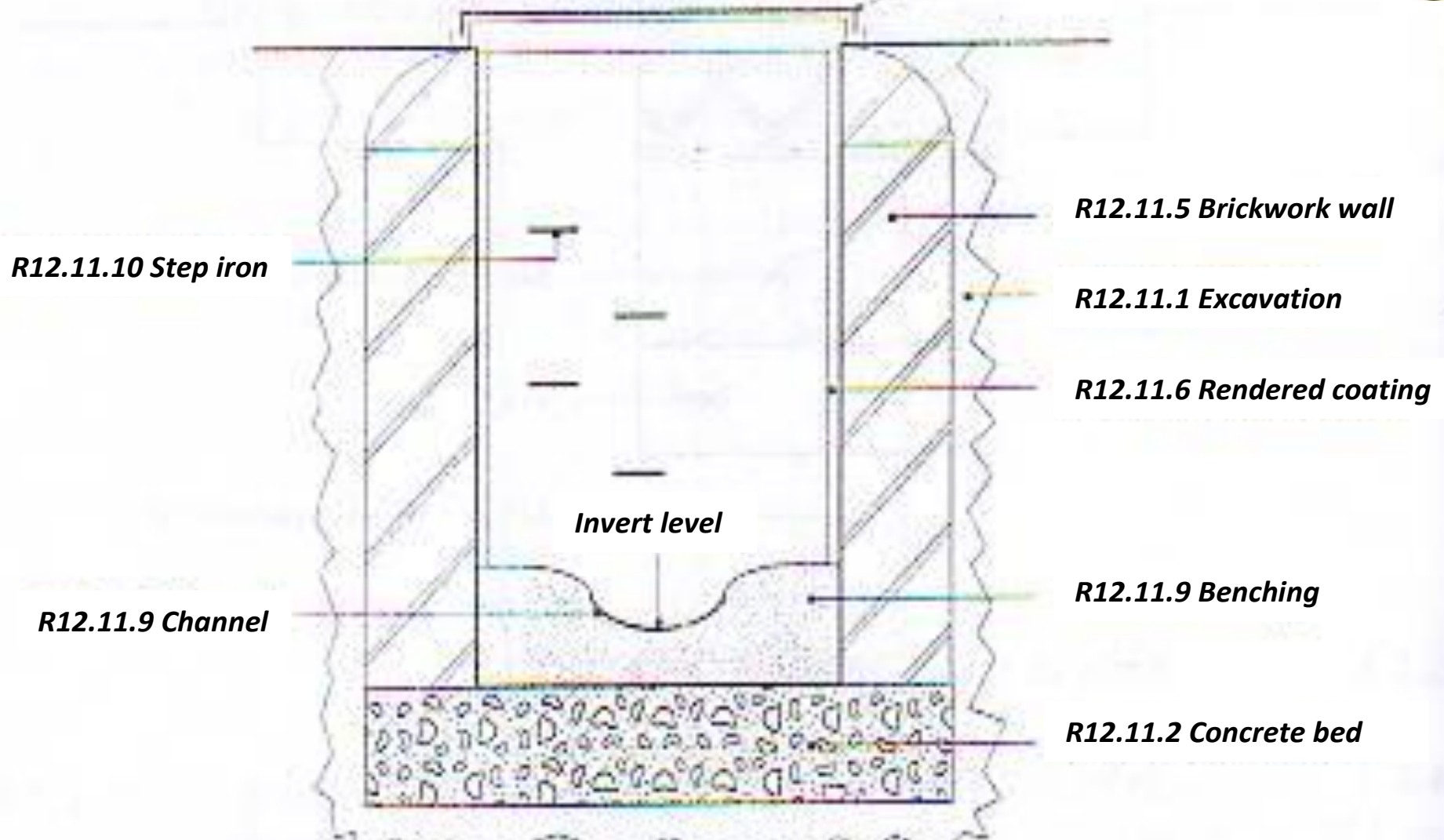


Figure 36: Manhole



R12.11-15 They deal with:

- **Manholes**
- **Inspection Chambers**
- **Soakaways**
- **Cesspits**
- **Septic tanks**

R12.16 Connecting to the local authority's sewer relates to the final connection of pipework into the local authority's manhole.

R12.17 Testing and Commissioning need to be specified and described.

R12.18 Operating and maintenance manuals. Details of interim and final printed materials which the contractor is required to produced needs to be specified and described.



R12.11-15 They deal with:

- + Manholes**
- + Inspection Chambers**
- + Soakaways**
- + Cesspits**
- + Septic tanks**

R12.16 Connecting to the local authority's sewer relates to the final connection of pipework into the local authority's manhole.

R12.17 Testing and Commissioning need to be specified and described.

R12.18 Operating and maintenance manuals. Details of interim and final printed materials which the contractor is required to produced needs to be specified and described.



Measurement Order

The measurement of drains involve the following:

- **Excavation:** Excavation of pipe trenches is measured in metres. The average depth range is given in stages of 250mm.
- **Drain Pipes:** Drain pipes are described by:
 - Kind of pipes (e.g. PVC, Cast iron, Pitch Fibre, Clay);
 - Quality of pipe, which could specify the relevant code e.g. British Standard (BS);
 - Nominal size;
 - Method of jointing (e.g. flexible mechanical joint or polypropylene couplings & rubber).
- **Concrete Protection:** May come in the form of:
 - bed,
 - bed and haunching and
 - bed and surround



Manholes, Septic tanks etc.

- **Manholes, inspection chambers, septic tanks, cesspools, cesspits and soakaways are measured in details under appropriate work sections and headings.**
- **A typical heading for manholes might read:
“*the following in 10 number block manholes*”**
- **After measuring the items under manholes, the section should be closed with
“*end of manholes*”**



Manhole Schedule

- Where a considerable number of manholes are encountered, a schedule of manholes should be prepared.
- Table 6 shows headings for such a schedule.
- Note that the schedule should indicate:
 - Plan sizes
 - Depths
 - Wall thicknesses
 - Connections
 - Channels
 - Step irons
 - Cover slab & Cover
 - Backdrop
 - Other special features.



Table 6: Manhole Schedule

MH	Size internally	Wall thickness	cover	Invert level	Ground level	Cover level	Depth of Excv`n	Depth of MH to invert	Main channel



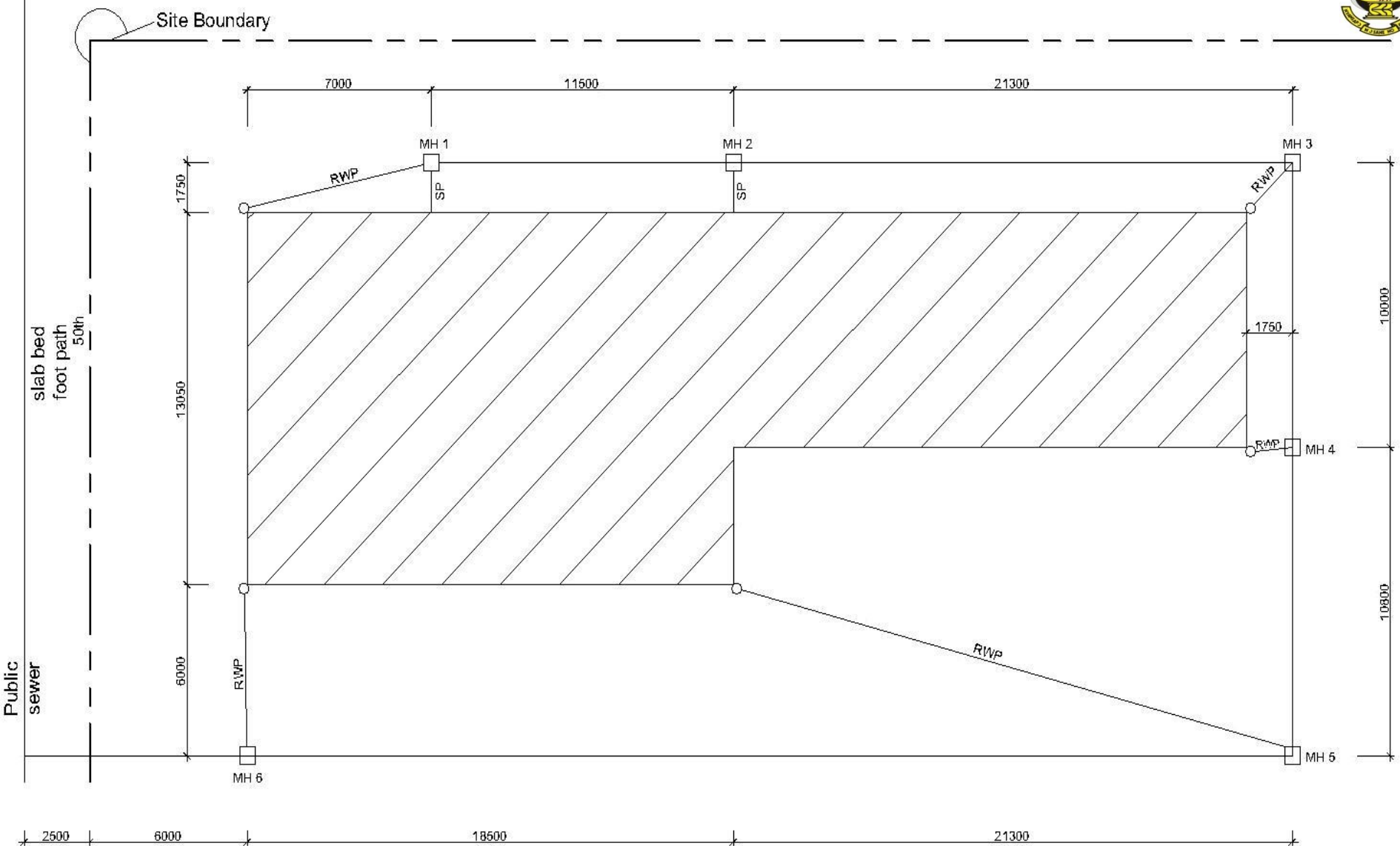
Worked Exercise

Figures 37 and 38 show the Drainage Work for the proposed house of Mr. A. K. Osei.

□ Take off for the Drainage works.
(Use the table below)

Manholes	Ground Level	Invert Level	Cover Level
MH1	13,595	12,980	13,690
MH2	13,400	12,600	13,475
MH3	13,450	12,188	13,600
MH4	12,560	11,810	12,650
MH5	12,105	11,415	12,300
MH6	11,800	11,000	12,000
SEWER	11,600	10,620	11,900

Assumes 450mm depth at head of building



Note

All pipes PVC 100mm Ø

Figure 37: Drainage Work -Worked Example

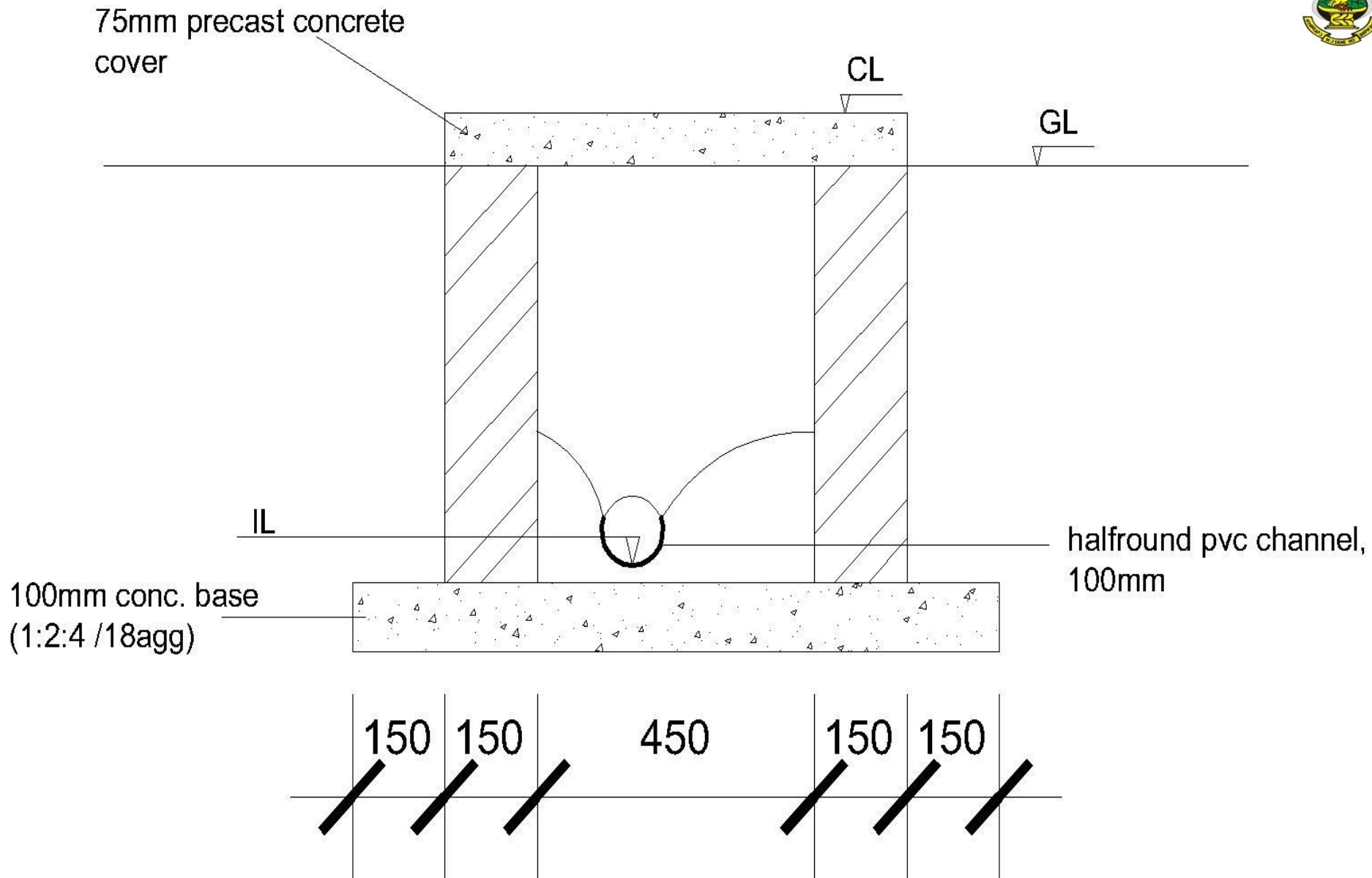


Figure38: Manhole-Worked Example



DRAINAGE WORK

Main Drain (MH1-SEWER)

MN1-MN2 MH2-MH3

11,500 21,300

Less

2 1/2 / 450

Wall 2 / 150 750 750

10,750 20,550

MH3-MH4 MH4-MH5

10,000 10,800

Less 750 750

9,250 10,050

MH5-MH6 MH6-SEWER

MH3

MH4

ogl 13,450 12,560

less il 12,188 11,810

1,262 750

Add 103 103

1,365 853

add MH2 903 MH3 1,365

2) 2268 2) 2,218

MH2-3 1,134 MH3-4 1,109

MH5

MH6

ogl 12,105 11,800

less il 11,415 11,000

690 800

add 103 103

793 903

Add MH4 853 MH5 793

2) 1646 2) 1646

MH4-5 823 5-6 848

MH5-MH6 MH6-SEWER

21,300 6,000
18,500 2,500
 39,800 8,500
 less 750 $\frac{1}{2}/750$ 375
39,050 8,125

Depths

MH1 MH2
 ogl 13,595 13,400
 Less il 12,980 12,600
 615 800

Add

chan 3

bed 100 103 103

718 903
718
 2) 1,621
 MH1-2 811

10.75

10.05

39.05

8.13

MH4-5 823 5-6 848

Sewer

ogl 11,600
 less il 10,620
 980
 add 103
 1,083
 add MH6 903
 2) 1,986
 MH6-Sewer 993

Exc. Tr. for pipes ≤ 200 , nom
 size, av. Depth of tr. ≤ 1.00 m

(MH1-2

(MH4-5

(MH5-6

(MH6-Sewer



2.50

Ddt exc. Tr. for pipes a. b.
(MH6-Sewer
§

MH5-MH6 MH6-Sew

39,050 8,125

add 300 300

39,350 8,425

Add

Exc. tr. for pipes ≤ 200
nom size, av. Depth of
tr. ≤ 1.00m, in foot path

11.05

20.85

9.55

Ditto, av. Depth of
tr. ≤ 1.25m

10.35

(MH2-3

39.35

(MH3-4

8.43

Pipes in trs., 100 (MH1-2
pvc, to BS..., wi.,
solvent jts. (MH2-3

(MH3-4

(MH4-5

(MH5-6

(MH6-Sew

1.13

1.11

2.50

0.70

E.o. excvting trs. For breakg
out xtg. Hd. pavgs., 50th.,
conc slab § stackg.
for re-use

Branh Drain

RWD - mh1



Branh Drain

Rwp - mh1

len

$$(3^2 + 1.75)^{\frac{1}{2}} = 3.473$$

less 300

3,173

Dp

Rwp 450

Add mh1 718

2) 1,168

584

sp-mh1

len

1,750

less 300

1,450

dp

584

2.50

0.70

E.o. excvting. trs. For breakg
out xtg. Hd. pavgs., 50th.,
conc slab & stackg.
for re-use

Pipes

MH1-MH2 MH2-MH3

10,750 20,550

Add

MH walls

2/125 300 300

11,050 20,850

MH3-MH4 MH4-MH5

9,250 10,050

Add 300 300

9,550 10,350

Sp-mh2

Len

1,450

Dp

head 450

add mh2 903

2) 1,353

677

Rwp-mh3

len

3,173

Dp

head 450

add mh3 1,365

2) 1,815

908

Head - mh4

Len

3.17

1.45

dp

head 450

add mh5 793

2) 1,243

622

Rwp-mh6

len

6,000

Less 300

5,700

dp

head 450

mh6 903

2) 1,353

677

Exc. Tr. for pipes

≤200 nom. size, (Rwp-mh1

av. Dp of 750mm



<u>908</u>		
<u>Head - mh4</u>	<u>3.17</u>	Exc. Tr. for pipes
<u>Len</u>	<u>1.45</u>	≤200 nom. size, (Rwp-mh1
<u>1,450</u>		av. Dp of 750mm
	<u>1.45</u>	(Sp-mh1
<u>Dp</u>		(Sp-mh2
head 450	<u>1.45</u>	
add mh4 853		(Rwp-mh4
2) <u>1,303</u>	<u>21.83</u>	
<u>652</u>		(Rwp-mh5
	<u>5.70</u>	
<u>Rwp-mh5</u>		(Rwp-mh6
<u>len</u>		
$(21,300^2 + 6000^2)^{\frac{1}{2}}$	<u>3.17</u>	Ditto, av. Dp. Of 1.00m
=22,129		<u>pipes</u>
<u>Less</u> <u>300</u>		walls 7/150
<u>21,829</u>		<u>1,050</u>



3.17

Pipes in trs, (rwp-mh1
100 pvc to BS.,

1.05

Exc. pit, max. dp

≤1.00.

(mh1

1.45

wi. solvent jts. (sp-mh1

1.05

0.72

§

1.45

(sp-mh2

1.05

1.05

Disposal of

(mh2

3.17

(rwp-mh3

0.90

excvt mat off
site

1.45

(rwp-mh4

1.05

1.05

(mh4

21.83

(rwp-mh5

0.85

5.70

(rwp-mh6

1.05

1.05

(mh5

0.79

Gullies & Connectns

1.05

1.05

(mh6

0.90

Pipe accessories: gully,
pvc trapped to BS..., 100
bw. wk. inlet & 150 x 150

5/1

5/ 1

Pipe accessories: gully,
pvc trapped to BS..., 100
bw. wk inlet § 150 x 150
sq. grtg

1.05

0.90

(mh6



1.05

1.05

1.37

Exc. pit, max depth
≤ 2.00m

(mh3

2/ 5

E. o. 100 pvc pipe for bend
(gullies

§

2

(sp § disch. pipe

Disposal of excvtd mat
Off site

ManholesEarthwk supptExtl gthThe ff in Gnr bk. manholes4/ 1,050Pit excn4,200len

450

AddWall 2/ 150 300Sprd 2/ 150 300 6001050

-4-



4.20

0.72

Earthwk. suppt.

max. depth $\leq 1.00\text{m}$, (mh1
dist bet opposg.

4.20

0.90

Faces $\leq 2.00\text{m}$ (mh2

4.20

0.85

(mh4

4.20

0.79

(mh5

4.20

0.90

(mh6

4.20

1.37

Ditto, max. depth
 $\leq 2.00\text{m}$, do

(mh3

Mh3

cl 13600

mh4

12650

less

cov. 75

75

il

12188 12263 11 810 11885

1337

765

mh5

cl 12300

mh6

12000

less

cov 75

75

il

11,515 11490 11000 11075

810

925

mg

extl gth 4200

less sprd 150

wall $\frac{1}{2}$ / 150 75

2/4 / 225

1800

2400



	4.20	Ditto, max. depth			wall $\frac{1}{2}$ / 150 75	
	<u>1.37</u>	≤ 2.00m, do (mh3			2/4/ 225	1800
						<u>2400</u>
		<u>Compq bottn of excvn</u>				
6/	1.05	Compq. bottn. of excvn.	2.40		Bk. wall, 150th.,	(mh1
	<u>1.05</u>		<u>0.64</u>		vert., laid in st. & sd	
		<u>Conc bed</u>			m (1:4) in strtech	
			2.40		Bond.	(mh2
6/	1.05	In situ conc bed	<u>0.80</u>			
	1.05	(1:2:4/18 agg), th. ≤ 150,				
	<u>0.10</u>	poured on or agaist earth.	2.40			(mh3
			<u>1.34</u>			
		<u>Bk. wall</u>				
		Mh1 mh2	2.40			(mh4
		Cl 13,690 13,475	<u>0.77</u>			
		<u>Less</u>				
		Cov 75 75	2.40			(mh5
		Il <u>12,980</u> <u>12,675</u>	<u>0.81</u>			
		<u>13,055</u> <u>12,675</u>				
		<u>635</u> <u>800</u>	2.40			(mh
		-5-	<u>0.93</u>			



0.93

Benchg

6/ 1

In situ conc. Benchg.
(1;2;4/10agg) to bottm of
MH, 140x450 av. 150hi.,
floated w.c.m. (1:2) sceeded
fin to falls to chans.

Item

Connectn to sewer

Prov. the P.C. sum of GH¢
30.00 for saddle conn. to
drain sewer to be carried out
L.A.

Chan.

3/ 1

Chan., 100 dia h. r. pvc st.
450lg. & beddg. on conc.
Benchg. (m/s) & jtg. in
c.m. (1:2)

Item

Testg & commsg

Allow for testg & commsg
drainage installn after
Backfillg, wi. water test
of not lesss than 1.50m
head

(mhs 2, 4 & 6)

7/ 1

Ditto, curved, do
(branches

Item

Water Disposal

Allow for disposal of surf
water

3/ 1

Ditto, 3/4 bend, 200 gth
& beddg & jtg a.b.
(mhs 1,3&5



3/ 1

Ditto, 3/4 bend, 200 gth
§ beddg § jtg a.b.
(mhs 1,3§5

6/ 3

Built in ends
B.i. end of 100 pvc pipe
into bk. wall, th. 150 §
m/gd

Cover

450

Add 2/150 300

750

6/ 1

Precast conc cover
(1:2:4/20agg), 750x750
x75ht., reinf'd w. st fabric
to BS 4483 ref A 193,
weighg. 3.02 kg/m², w.
smth. upper surf § settg
cover w. c.m. (1:3) § grease

End of 6 nr Manholes

-6-

end of

QSEE 352