Walls & Partition
Learning Objectives

• Briefly explain the functions & functional requirements of walls
• Differentiate and compare between load bearing and non-load bearing walls
• Briefly describe the characteristics, advantages and disadvantages of different types of walls
Definition of Wall

• A **continuous, vertical** structure

• **Thin** relatively to its length and height
Functions

- **External walls** – to enclose and protect a building against weather for reasonable indoor comfort
- **Internal walls** – to divide buildings into rooms
a) **Strength & Stability**

- To resist stresses due to self-weight, superimposed and lateral pressure such as wind
- To be stable to avoid overturning due to eccentric loading or lateral pressure
- To be able to avoid buckling due to excessive slenderness
Functional Requirements

b) Resistance to Weather and Ground Moisture

- To resist passage of moisture into building
- Moisture (water vapour or liquid water) from groundwater or rain
- Methods:
  i. Thicker wall
  ii. Cavity wall
  iii. Damp proof membrane (impervious skin)
Water Exclusion

SPONGE

CAVITY

IMPERVIOUS SKIN
Functional Requirements

c) Durability and Freedom from Maintenance

- Indicated by frequency and extent of work necessary to maintain the wall
- Minimum cost of maintenance
Functional Requirements

d) Resistance to the Passage of Heat

- Barrier to heat gain/loss which increases cost of cooling and heating
- Affect energy consumption
- Heat gain – higher need for air conditioning
- Glass & metal – poor thermal insulation
Functional Requirements

d) Resistance to the Passage of Heat (Cont’d)

• Methods of thermal insulation
  i. Thicker wall
  ii. Cavity/double wall
  iii. Thermal insulation layer
  iv. Internal lining for claddings and glass
Thermal Insulation for Walls

- 1/2" (12.7 mm) gypsum board
- Vapour barrier
- R-12 (RSl 2.11) insulation batts
- 2" x 4" (38 x 89 mm) framing at 16" (400 mm) on centre
- 1 1/2" (38 mm) expanded polystyrene nailed to studs
- Sheathing membrane (air barrier)
- Horizontal metal siding with fibreboard backing nailed through polystyrene to studs
e) Resistance to the Passage of Noise

- Exclude noise from traffic, aircraft, train, building services plant & impact sound caused by neighbours
- Noise – lead to irritation & poor productivity
- Methods:
  i. Thicker walls
  ii. Cavity/double wall
  iii. Lining with absorbent material
Noise Insulation

KEY TO MATERIALS

- Resilient Bar
- Acoustic Mineral Wool
- 2 Layers of 12.5mm Plasterboard. One either Side of Soundproofing Mat
- Soundproofing Mat
- Brick Wall
Noise Insulation
Functional Requirements

f) Aesthetics

• Walls are important visually
• Affected by choice of materials
Types of Walls

• Brick Wall
• Block Wall
• RC Wall
• Stone Masonry Wall
• Cladding and Curtain Wall
• Drywall
Brick Wall

- Brick – small block of burned clay, concrete or sand-lime
- Can be used for load bearing and non-load bearing walls
Brick Wall

• Made of bricks laid in mortar
• Laid to overlap in some form of bonding
• Pointing to ensure joints are solidly filled (watertight) and for decorative reasons

http://www.youtube.com/watch?v=dojkhIrNmXU&feature=related
Brick Wall

• Finished with
  i. Plastering
  ii. Tiles
  iii. Self finished
Brick Wall

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Brick Wall

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Brick Wall

Advantages

• Cheap
• Good fire resistance
• Quite good thermal insulator
• Doesn’t deteriorate structurally and requires little maintenance
• 225 mm thick brick wall give acceptable sound insulation
Brick Wall

Disadvantages

• Expansion is quite large – expansion joints needed
• Slow construction

Application

• Walls to residential buildings
• Fire compartment
Brick Wall

Expansion joint
Brick Wall

- Common types of bond for brickwork

- English Bond
- Flemish Bond
- Stretcher Bond
Block Wall

- Blocks – wall unit larger in size than bricks
- Used for load bearing and non-load bearing walls
Block Wall

• Types:
  i. Hollow clay blocks
  ii. Hollow concrete blocks
  iii. Solid concrete blocks
  iv. Lightweight concrete blocks
Block Wall

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Block Wall

Advantages

• Economical
• Faster erection
• Less joints
• High resistance to damage by fire, less than brick wall
• Good thermal insulator
Block Wall

Disadvantages

• Suffer moisture movement causing cracking of plaster
• Settlement movement show more pronounced cracking
• Poor appearance – require finish
• Poor sound insulation

Application

• Mostly internal walls
RC Wall

- Used for load bearing walls
- Basement walls, service core, lift shafts and retaining walls
RC Wall

Advantages

- **Economical** when used to support, enclose for divide
- Dense – fairly **watertight**
- Good **fire resistance**
RC Wall

Disadvantages

- Low thermal insulation
- Require finishing to achieve better surface appearance
- May crack due to shrinkage
Stone Masonry Wall

• Natural or manufactured stone
• Bound together by mortar
• Very **durable**. However, quality of mortar and workmanship and patterns of assembly strongly affect the durability.
• Can be used as **load bearing** or **non-load bearing walls**
Stone Masonry Wall

- Rubble walling – walls made of broken stones of irregular size, shape and texture
Rubble Walling
Stone Masonry Feature Wall
Drywall

• Interior walls
• Panels made of gypsum plaster pressed between two thick sheets of paper or fibreglass
Internal Partition

Referring mainly to dry wall partition

- Dry wall partition which subdivide a room and is non load bearing
- Requires finishing only at the fasteners and joints
- Less labor and drying time
- Very popular – faster
- Mounted on timber or light-gauge steel frame
- Panels made of gypsum plaster pressed between two thick sheets of paper or fibreglass. 2 Panels usually sandwich a layer of rockwool.
Internal Partition

Performance Requirement

- Flexibility
- Sound Insulation
- Fire
- Strength & Stability
- Appearance & Durability
- Services Accommodation
- Ease of Construction
Internal Partition

Performance Requirement

Flexibility
Internal Partition

Performance Requirement

Sound Insulation
• reduction obtained when sound passes from one side of a partition to another
• Measured in frequency and intensity
• To achieve good sound insulation partitions require either a heavy construction or the use of carefully designed partition with two leaves which are as far as possible acoustically separate and the cavity filled with an absorbent quilt.
Internal Partition

Performance Requirement

Sound Insulation

• If there is a door in the partition this has the effect of diminishing (R) by about 5 dB
• Poor joints between the partition and adjacent walls, ceilings or floors can also reduce the sound reduction characteristics of the partition.
• Another source of weakness can occur when services pass through a partition.
• Not only can this be a path for direct transmission of sound through any dry joints or gaps, but sound can also be transmitted via the services themselves from one side to the other.
Internal Partition

Performance Requirement

Fire

• Partition used as part of fire compartmentalization strategy
• Requires fire rating of half to 2 hours depending on room use and locations
• To prevent spread of smoke, dry partition should be extended to the soffit of slab instead of suspended ceiling
Internal Partition

Performance Requirement

Strength & Stability
- need to resist various types of loadings.
- These can include daily impact loading such as doors closing or people leaning against it.
- In addition partitions may be required to carry permanent loads such as shelves and wash basins.

Appearance & Durability
- Ease of maintenance
- Design and finishes
Internal Partition

Performance Requirement

Services Accommodation

• As buildings have become more highly serviced and the need to alter or maintain those services becomes more frequent
• Partitions have been used as a space to place some of these services, particularly electrical and communications cables.
• If the engineer is intending to use voids within partitions for services he must ensure not only that space is adequate, but that after installation, the services can be accessed for repair and maintenance.
Internal Partition

Performance Requirement

Ease of Construction

- Leveling
- Building services above
- Services penetration
- Construction of doors
- Level of fire rating and noise reduction
The end...