

WALL SYSTEMS

(Ref: The Building Illustrated,
Ching, Francis DK)

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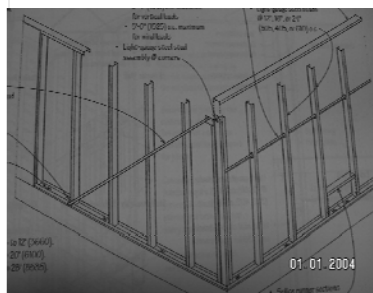
1.0 Comparative wall systems

Wood stud walls

- * walls are normally 2x4, but may be 2x6.
- * studs are spaced 16".
- * studs carry vertical loads.
- * the fire-resistance rating of the wall assembly depends on finish materials.

Metal stud walls

- * metal studs are similar in structure to wood stud walls.
- * connections may be screwed or welded.



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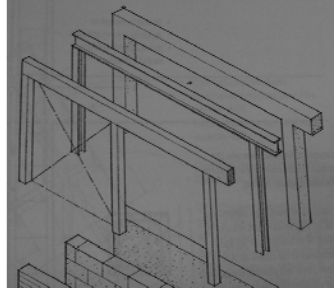
1.0 Comparative wall systems

Wood post and beam framing

- * frame requires diagonal bracing.
- * it may be difficult to accommodate mechanical and electrical services within the structural framework.

Steel and reinforced concrete frames

- * steel and concrete frame are similar in form to wood post beam structure.
- * stronger materials can span greater distances and carry heavier loads
- * structural frame can support a variety of curtain wall



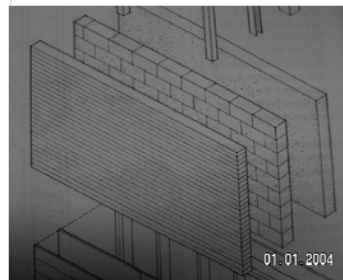
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1.0 Comparative wall systems

Masonry and concrete bearing walls

- * masonry and concrete bearing walls rely on their mass for the load carrying capability.
- * wall surfaces may be left exposed.
- * electrical and mechanical services may be integrated into wall



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2.0 Factors in wall design

- a) Strength in:
 - supporting vertical loads from wall, and roof structures above.
 - resisting lateral wind and seismic forces.

- b) Connection to foundation, floor and roof systems:
 - floor and roof systems may bear on the wall system
 - floor and roof system may frame into the wall systems.

- c) wall finish desired:
 - compatibility between base material of wall and desired wall finish.
 - visual characteristics.

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2.0 Factors in wall design (continuation)

- d) Door and window openings:
 - structural and/modular limitations on size, proportion and location.
 - effect on day lighting and potential heat loss or gain.

- e) weather tightness and the control of:
 - heat flow
 - air infiltration
 - moisture and water vapor
 - sound transmission

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2.0 Factors in wall design (continuation)

- e) Expansion and contraction
 - type and location of expansion joints if required.
- f) Accommodation of mechanical and electrical services and outlets.
- g) Fire-resistance rating desired or required by the building code.

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3.0 Masonry wall systems

Masonry walls consist of modular building blocks bonded together with mortar to form walls which are structurally most efficient in compression.

The most common types of masonry units are :

- a) brick, a heat-hardened clay unit
- b) concrete block, a chemically-hardened unit

Other masonry units include structural clay tile, structural clay tile, structural glass block, and natural or cast stone.

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4.0 Masonry wall types

a) Hollow unit masonry

Hollow unit masonry walls consist of hollow clay or concrete masonry units laid and set in mortar. When the wall thickness is made up of two or more units, the stretcher courses must be bonded with masonry headers or metal ties. When bonded with metal ties, the wall must conform to the thickness and height requirements of cavity walls.

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4.0 Masonry wall types

b) Cavity wall masonry

Cavity wall masonry is made up of a facing and backing of the wythes brick, structural clay or concrete masonry units. The wythes are completely separated by an air-space except for the metal ties which are required for bonding.

Cavity walls have two advantages:

1. Cavity wall enhances the insulation value.
2. The air space acts as a barrier against water penetration.

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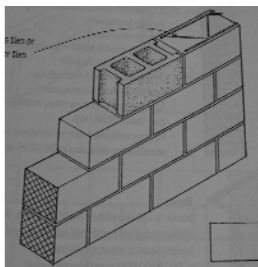
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c) Solid masonry

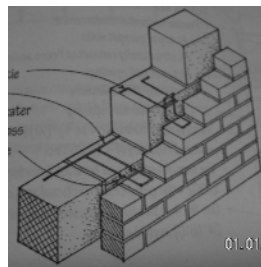
Solid masonry walls may be of brick, concrete brick, or solid load-bearing concrete masonry units. Adjacent wythes in both bearing and nonbearing walls may be bonded with either masonry headers or metal ties. Metal ties are preferred over masonry headers for better resistance to rain penetration and allowance for slight differential movement between the wythes.

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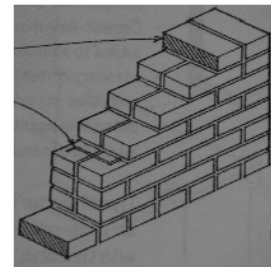
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Hollow unit masonry



Cavity wall



Solid masonry

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d) Grouted masonry

Grouted masonry walls consist of brick or solid concrete unit brick units in which the interior joints are filled with grout as the work progresses.

e) Masonry veneer

In masonry veneer construction, a single wythe of masonry serves as a single wythe barrier and is anchored (but not) bonded to a structural frame.

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f) Reinforced concrete grouted masonry

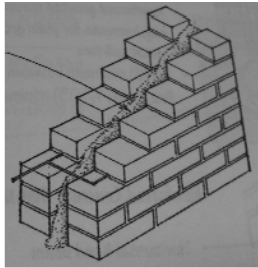
Reinforced grouted masonry should conform to the requirements for plain grouted masonry. Reinforced masonry walls are similar to reinforced concrete walls. They use standard deformed reinforcing steel bars, fully embedded in grout, for increased resistance in bucking and lateral wind and seismic loads.

g) Reinforced hollow unit masonry

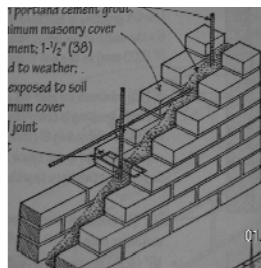
Reinforced hollow unit masonry consist of hollow masonry in which certain cells containing steel fully in concrete and cement grout.

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Grouted masonry



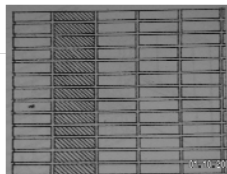
Reinforced grouted masonry

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5.0 Types of Brickwork

- a) Running Bond – the simplest pattern in which is used in cavity and veneer walls
- b) Common Bond – this is similar to running bond except for a header course at every 5th, 6th or 7th course.
- c) Stack Bond – Since unit do not overlap, longitudinal reinforcement is required in un-reinforced walls @ 16" o.c. vertically.



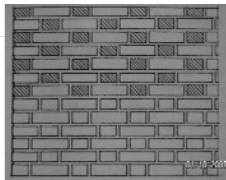
Running Bond

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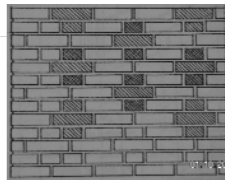
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5.0 Types of Brickwork

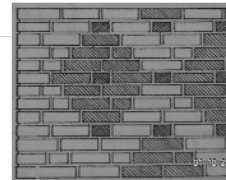
- d) Flemish Bond – Each course consist of alternating headers and stretchers.
- e) Flemish Cross Bond – Alternate headers and stretchers with stretching courses.
- f) English Bond – Pattern consists of alternating stretcher and header courses.



Flemish Bond



Flemish Cross Bond



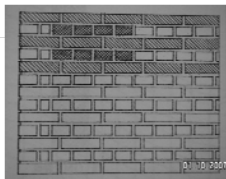
Flemish Diagonal Bond

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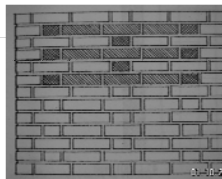
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5.0 Types of Brickwork

- f) English Bond – Pattern consists of alternating stretcher and header courses.
- g) Garden-Wall Bond- Has sequence of header and three stretchers in each course.



English Bond



Garden-wall Bond

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5.0 Brickwork

Types of Mortar Joints

- a) Raked
- b) Flush
- c) Struck
- d) Weathered
- e) Voc
- f) Tooled

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6.0 Structural Facing Tile

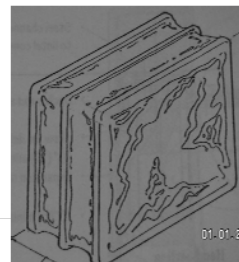
Structural facing tile is a clay masonry product glazed on one or both faces. These tiles are generally used for interior partitions or the inner wythe of exterior partitions or the inner wythe of exterior cavity walls, especially when the durable and easily clean surfaces of their glazed faces are desired.

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7.0 Glass Block

Glass block may be used in non-load bearing exterior and interior walls, and interior walls, and in conventionally framed window openings. The glass block units are laid in Type S mortar with joints at least $\frac{1}{4}$ " but not more than $\frac{3}{8}$ " thick. Typically, a wall panel is mortared at the sill support and provided with expansion joints at the head and jamb to allow for movement and settling.

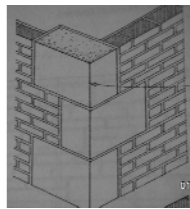


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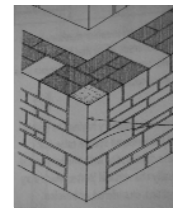
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8.0 Stone Masonry

Natural stone may be bonded with mortar and laid up as a double-faced load bearing wall or used as veneer tied to a concrete or masonry backup wall. The stone should be protected from staining by using non-staining cement mortar, especially with porous and light coloured stone. Only non-corrosive ties, anchors, and flashings should be used. Copper, brass, and bronze may stain under certain conditions.



Quoin arrangements



Long and Short arrangements

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8.0 Stone Masonry

Stone masonry may be laid up in various patterns as illustrated below:

- a) **Random rubble** – there is no apparent coursing. Bed joints are approximately horizontal for stability and appearance; pointing is kept back of face to emphasize natural shapes of stone.
- b) **Coursed Rubble** – Bed joints are approximately continuous and horizontal.
- c) **Coursed Ashlars** – Stone is cut and dressed to desired dimension in the mills. Cut stone is laid in a running bond pattern with varying course height.

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