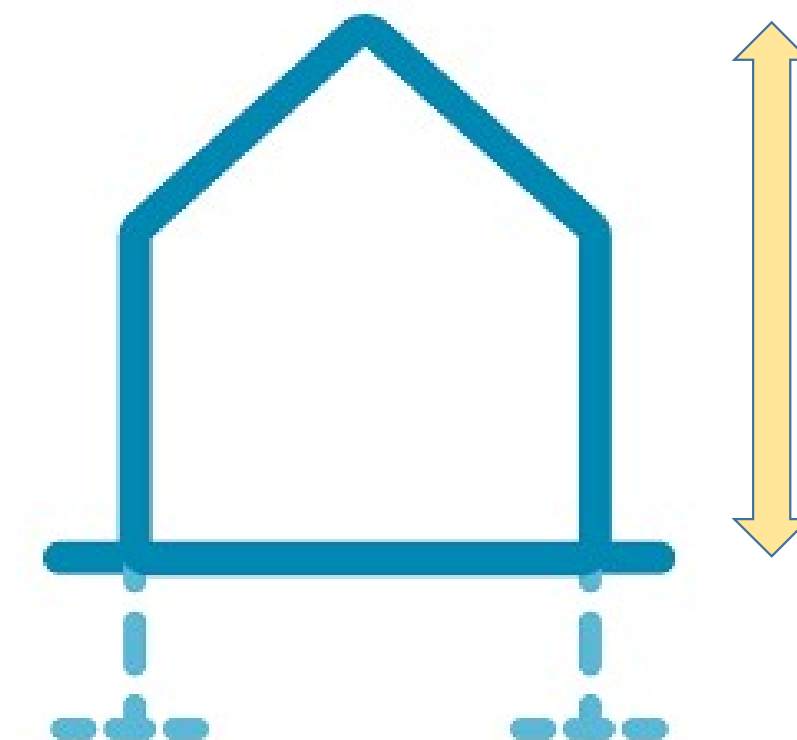


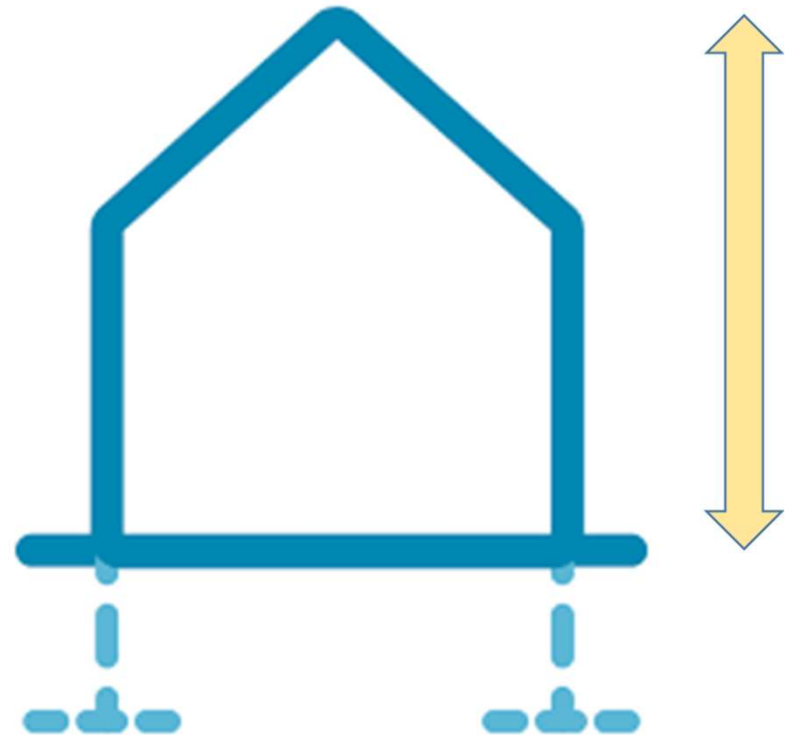
Superstructure : Fundamentals of Construction Technology



Week 4:

Arches & Openings

Building Regulations





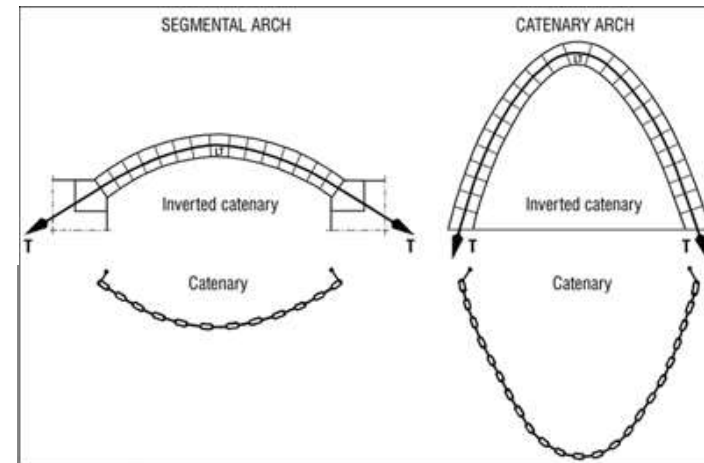
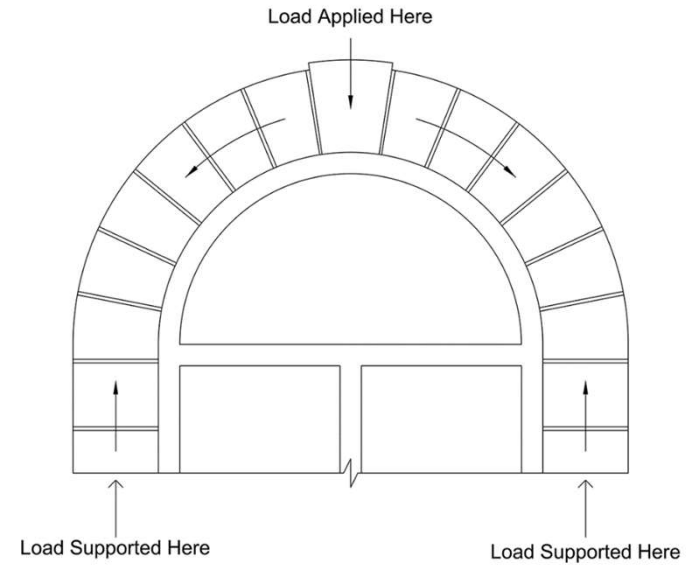
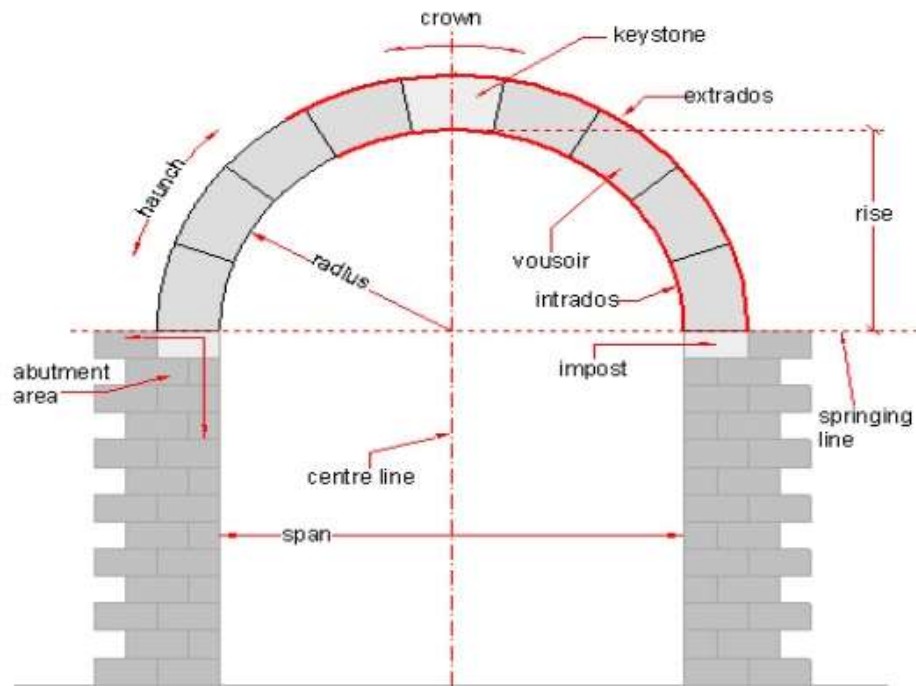
ARCHES & OPENINGS



Green Bridge of Wales, Pembrokeshire

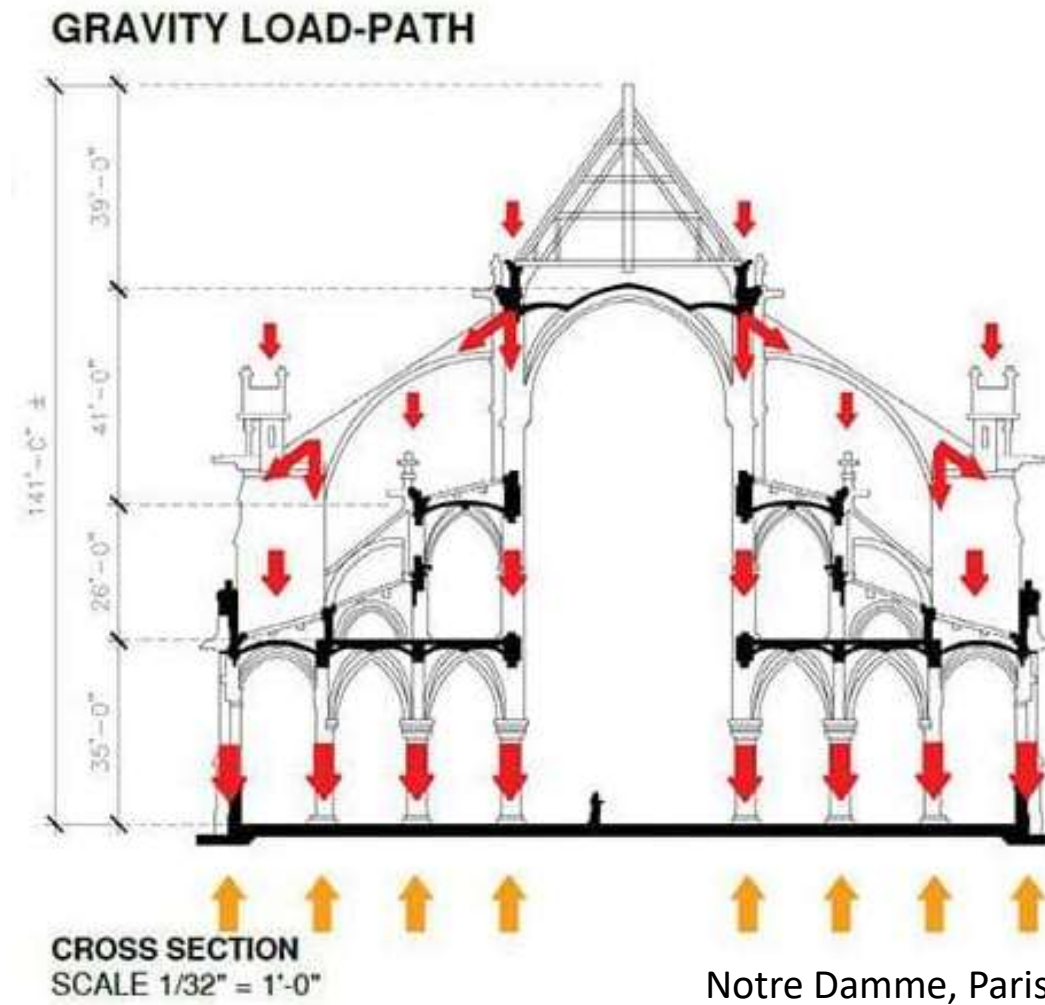


ARCH LOAD TRANSFER

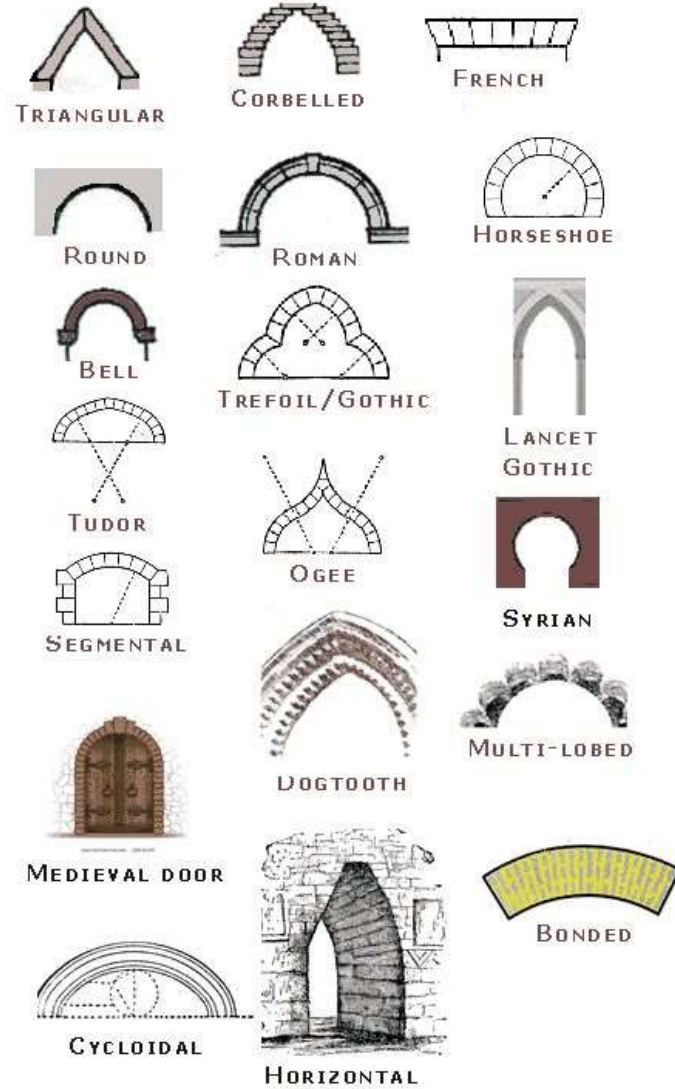


<https://www.youtube.com/watch?v=JIL6ZHChhQE>

ARCH LOAD TRANSFER



ARCH TYPES



FACE BRICK ARCH TYPES



QUEEN ANNE



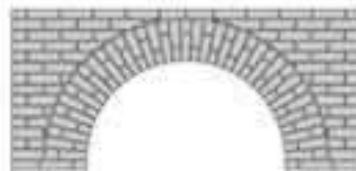
NEW CONCEPT



ELLIPTICAL



JACK ARCH



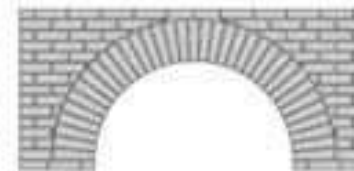
BONDED ROMAN



BONDED RADIAL



BONDED JACK ARCH



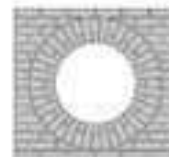
ROMAN



CIRCULAR



JACK PACK



BONDED CIRCULAR

FACE BRICK ARCHES

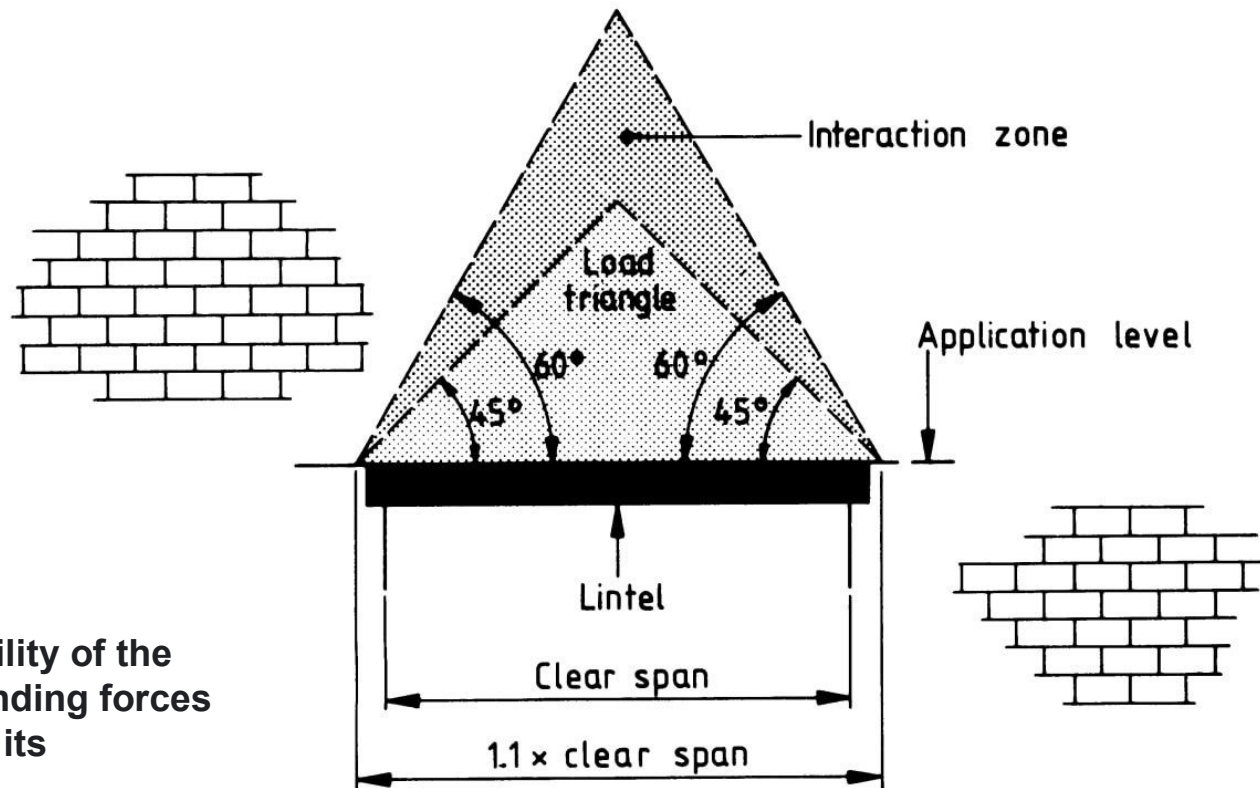




WHAT? NO ARCHES!

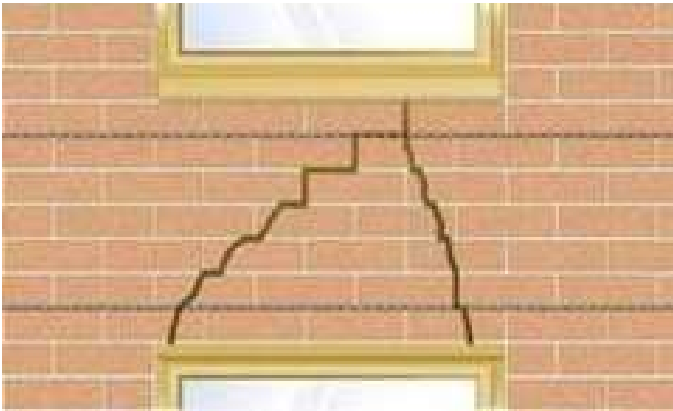
LINTELS

Construction of element that can support flexural efforts



Flexural strength is the ability of the material to withstand bending forces applied perpendicular to its longitudinal axis.

LINTEL FAILURE



LINTELS

Timber elements

- They will cover the whole span and will be supported at the jambs
- Maintenance is essential
- It is more flexible than masonry and can bend without breaking
- Bending is an indicative of wrong performance but does not mean immediate failure



LINTELS

Stone elements

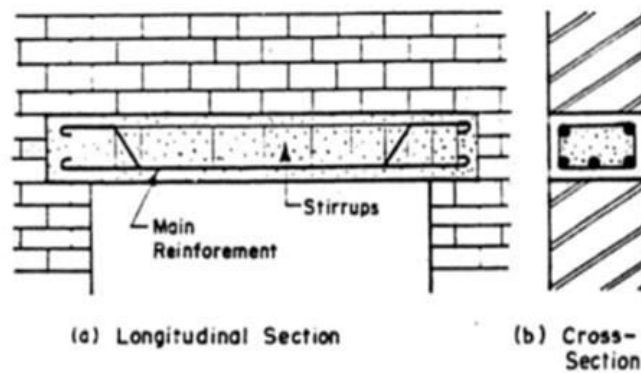
- Similar construction
- Much heavier
- No special maintenance
- Stone has little flexural strength, improved with thickness
- Fragile. Easy to break
- Ruined when broken



LINTELS

Cast in-situ elements

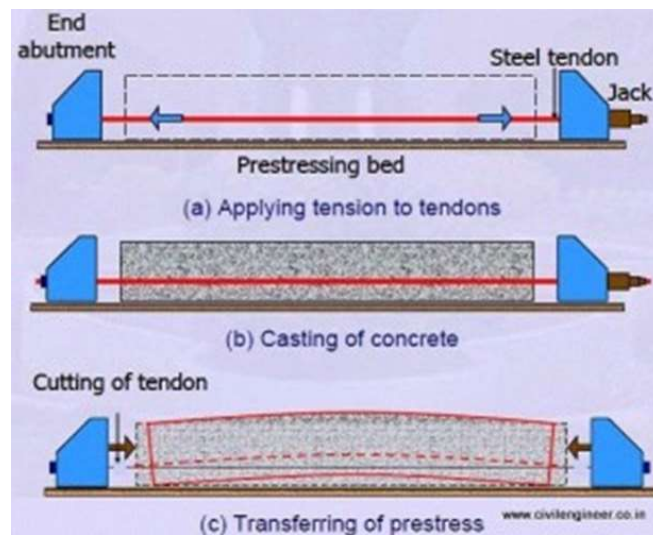
- They are made at the same time of the wall construction and form part of it
- Usually made of reinforced concrete to absorb flexural efforts properly
- More difficulty in construction
 - Framework/mould
 - Reinforcement
 - Pouring concrete
- Replacement and repair are more difficult



LINTELS

Precast/pre-stressed elements

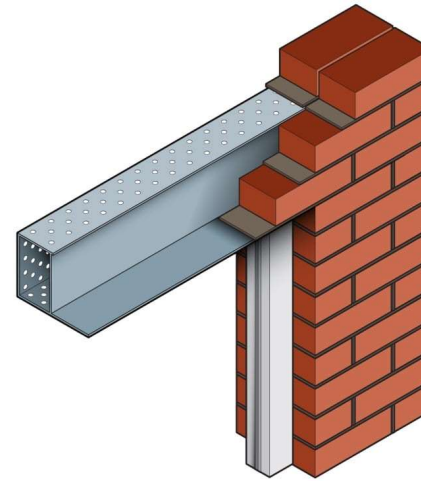
- Made off-site
- Reinforcement can be pre-stressed to absorb flexural stress better
- Health and Safety?



LINTELS

Metal elements

- Fast and cheap solution
- Light weight
- Problems with thermal bridging. It should be correctly installed and insulated



LINTELS

Metal elements

Box lintel with
perforated base
plate



**Be careful!!!
Thermal bridge**

LINTELS

Metal elements

- Cavity walls
- Concrete lintel to inner leaf
- Steel stepped lintel to outer leaf
- Cavity tray
- Insulation



LINTELS

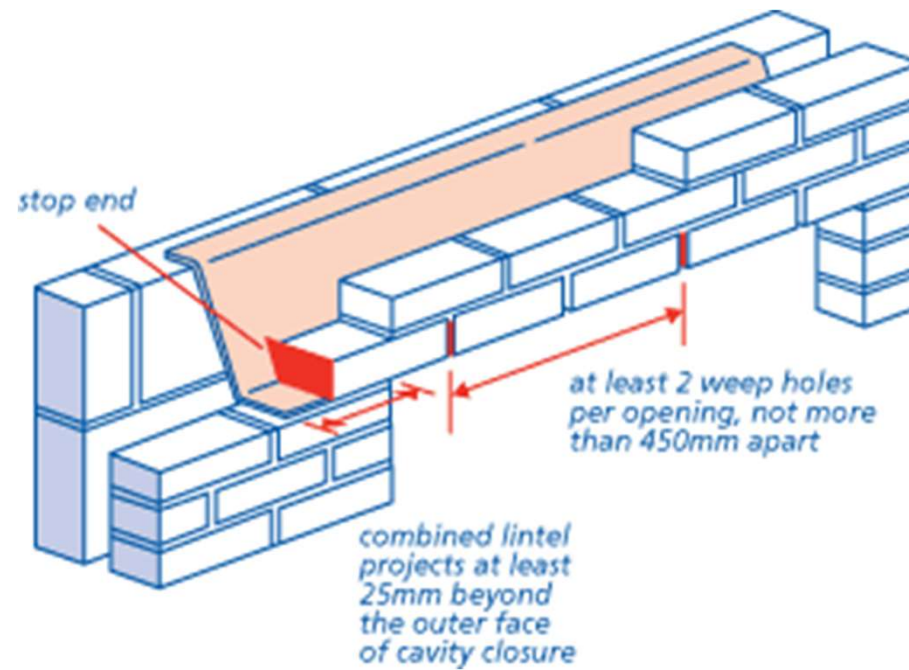
Metal elements



- Standard steel cavity lintel
- Cavity tray
- Insulation
- Size dependant upon masonry and cavity dimensions

LINTELS

Metal elements



LINTELS

Specifications

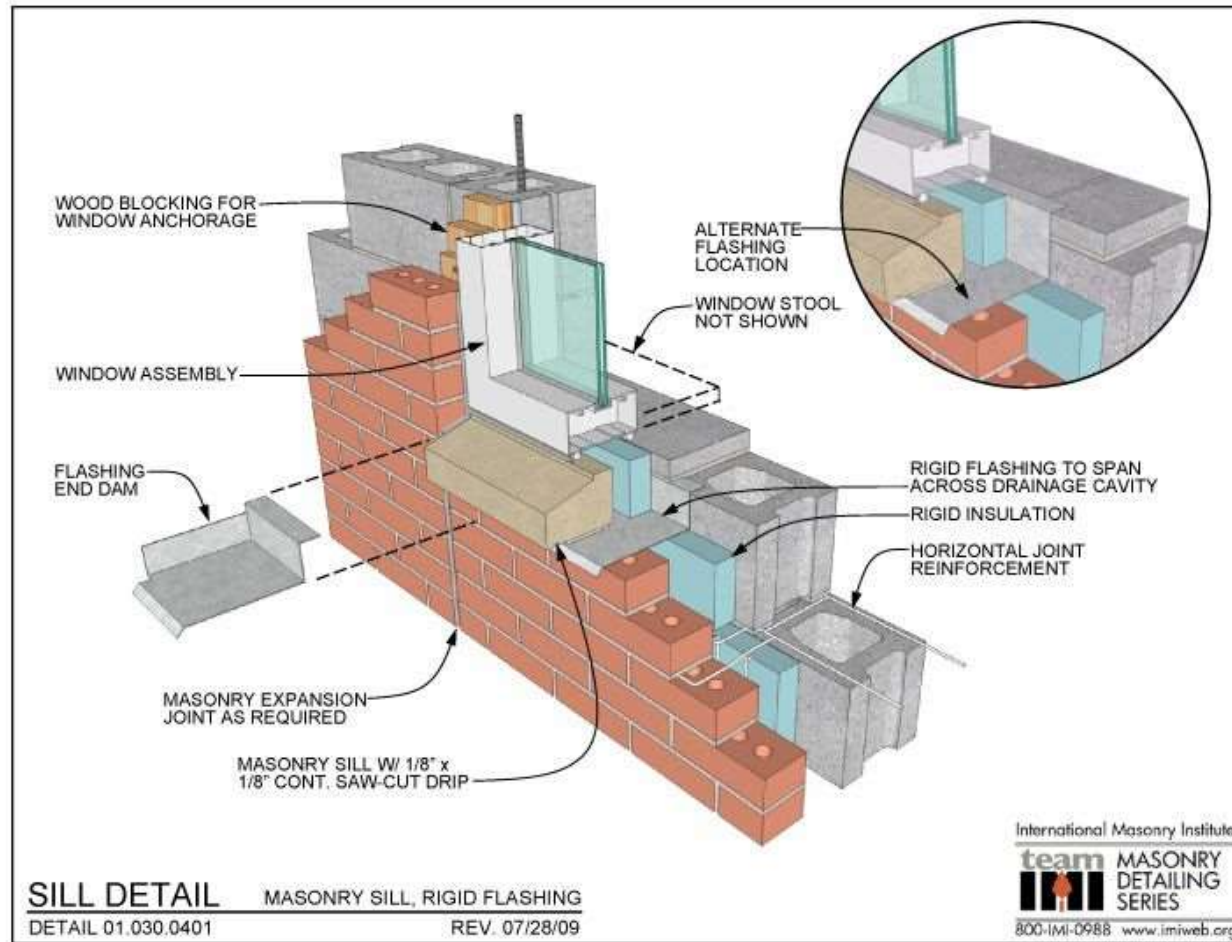
- Lintels should be installed with a minimum end bearing of 150mm, bedded on mortar and levelled along its length and across its width.
- The masonry above the lintel should be built in accordance with BS EN 1996-2:2006.
- Raise the inner and outer leaves simultaneously to avoid excessive eccentricity of loading, with a maximum height difference of 225mm (Masonry should be laid on a mortar bed and all perpendicular joints should be filled.)
- Allow the mortar to cure before applying floor or roof loads (Temporary propping beneath a steel lintel is practised to facilitate speed of construction).
- A damp proof course (DPC) or cavity tray should be installed over all openings in external cavity walls.
- When installing concrete floor units or other heavy components above a lintel care should be taken to avoid shock loading and floor units should not be dragged into position. Masonry immediately above the lintel should be allowed to cure.
- Point loads should not be applied directly onto lintel flanges. Lintels should have a minimum of masonry 150mm high between the flange and the application level of any form of loading.

LINTELS

How would to solve a window sill?

What about the jambs?

Sills



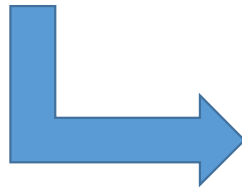
The Building Regulations

Access your individual products

► The Construction Information Service - CIS

The most comprehensive source of technical standards legislation and technical guidance for construction industry professionals.

[view product](#)



CIS (Construction Information Service) - University of Wales
Trinity Saint David

Complying with the Building Regulations on Domestic developments

Part A: Structure

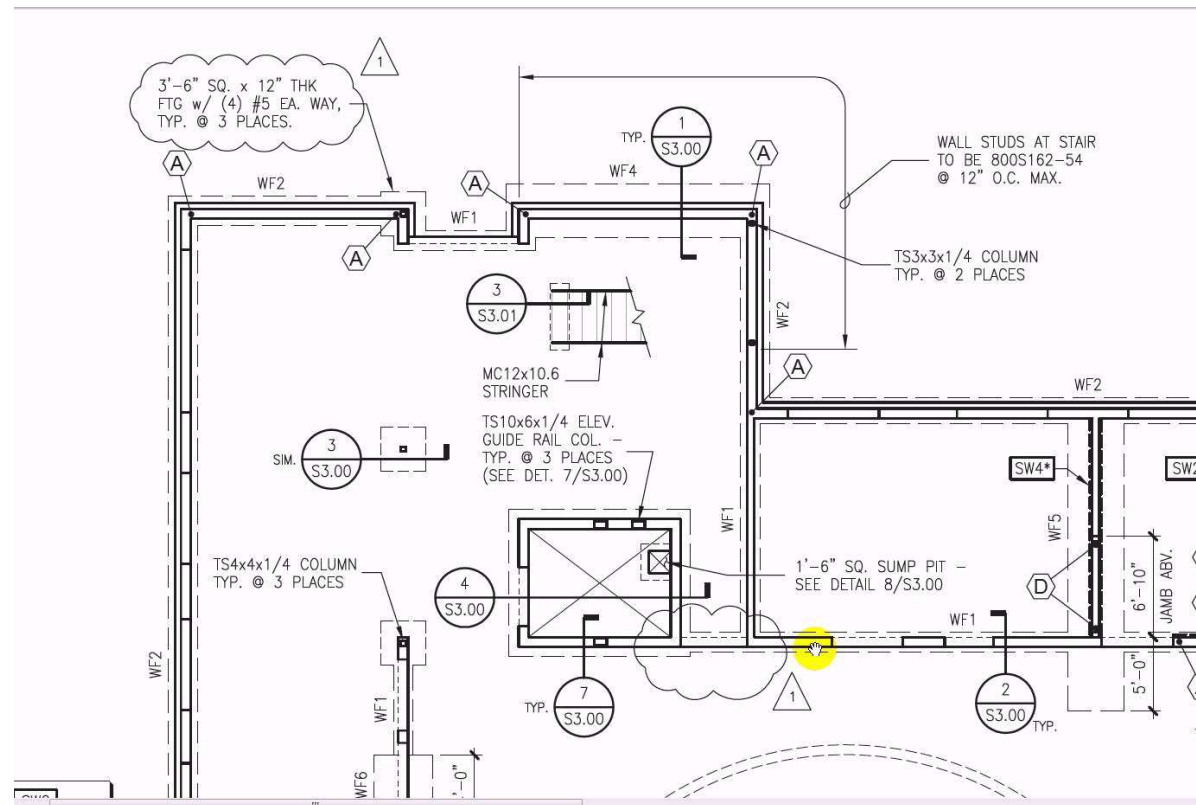


Part A: Structure

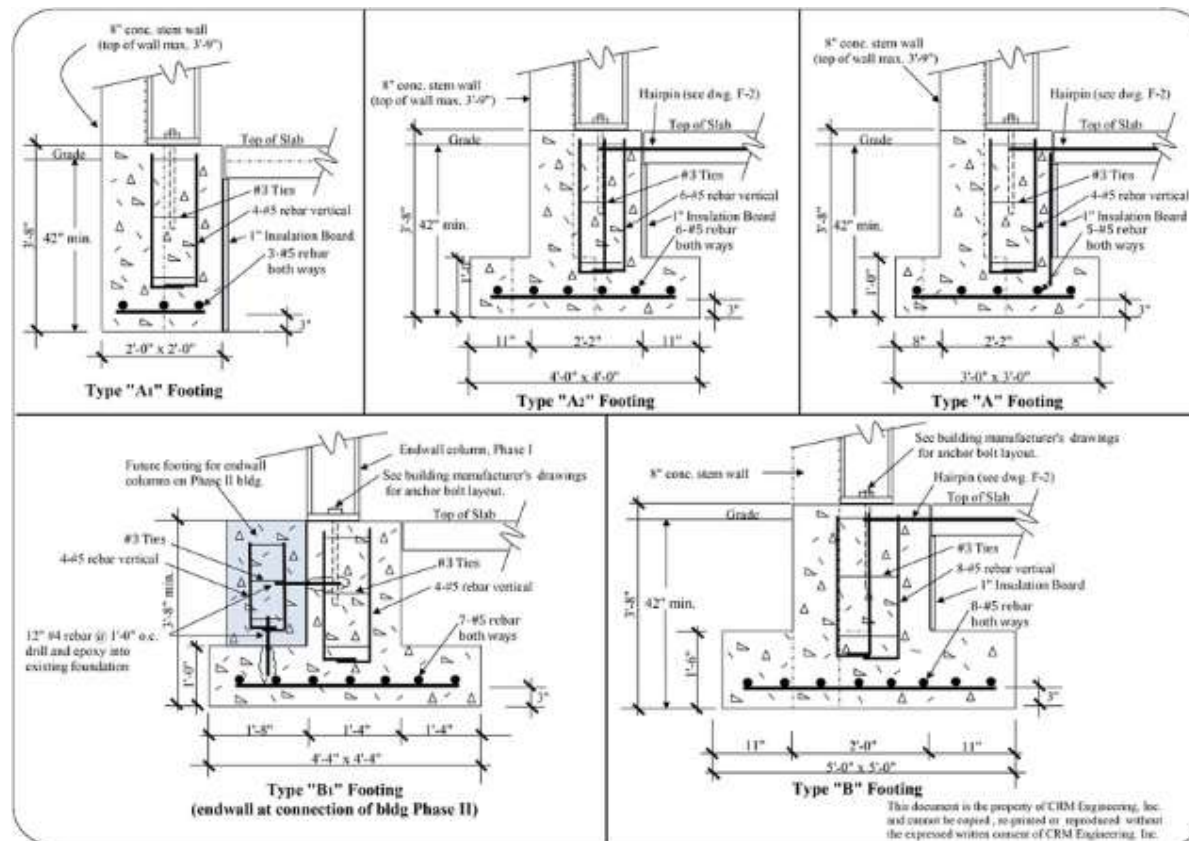
Requirements:

- Foundation design – Ground stability report. Mining Report.
- Frame design – Steel/Timber etc
- Joist layout – Joist type, Joist size, spans, Direction of span.
- Wall construction.
- Lintel schedule – Doors, Windows, Openings.

Part A: Structure. General Arrangement



Part A: Structure. Foundations.



CRM Engineering, Inc.

509 E. Mitchell Street
Adel, Georgia 31620
Tel: 229-546-5053

Engineer's Seal

Customer

Project

Rev	Date	Description

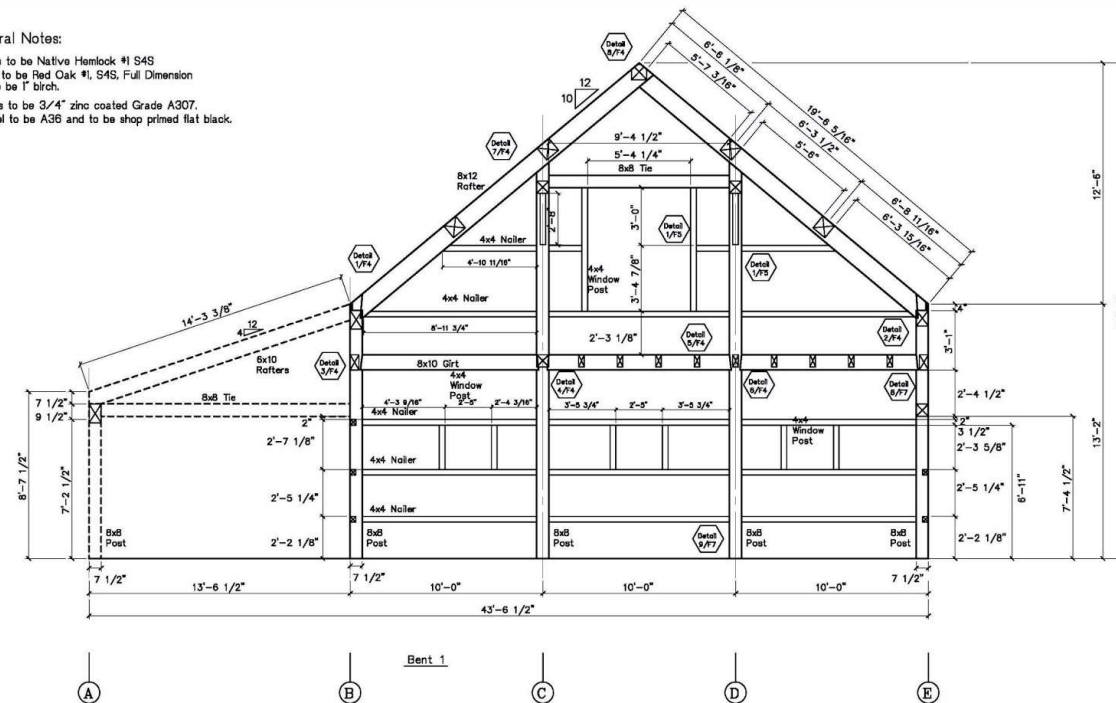
Date: 08/15
Scale: N/A
Project No. C-15-170

Sheet No.
F-3

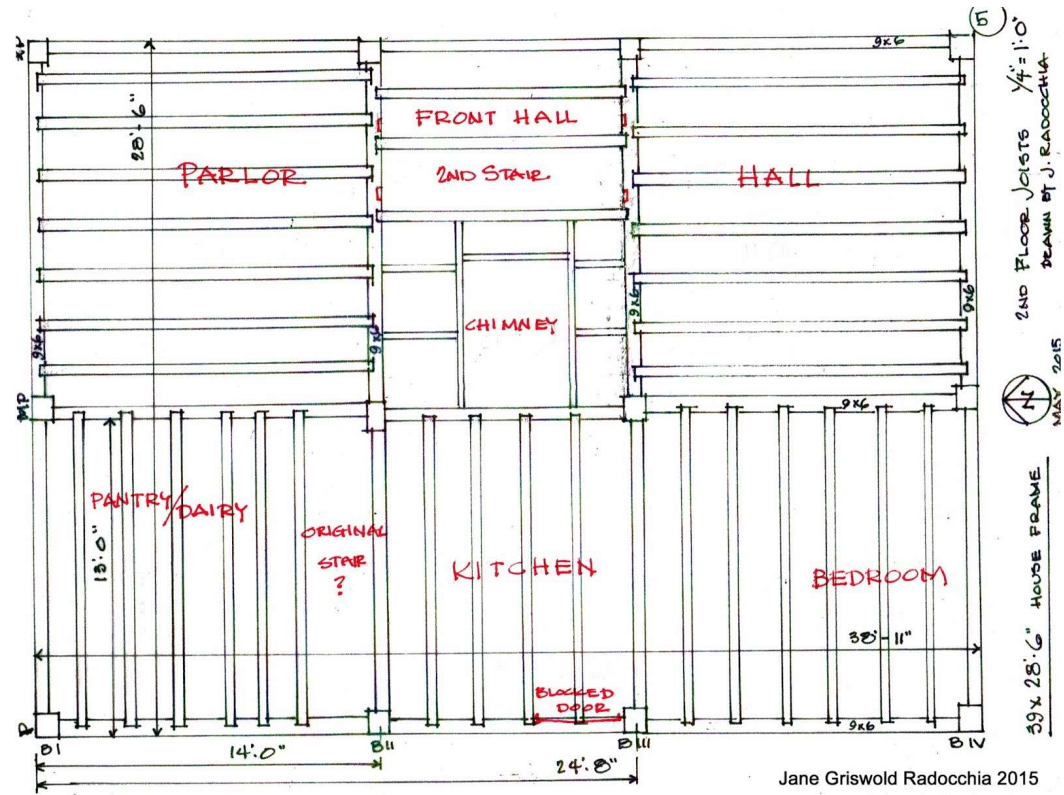
Part A: Structure. Frame Design

General Notes:

Timbers to be Native Hemlock #1 S4S.
 Braces to be Red Oak #1, S4S, Full Dimension
 Pegs to be 1" birch.
 All Bolts to be 3/4" zinc coated Grade A307.
 All Steel to be A36 and to be shop primed flat black.



Part A: Structure. Joist Layout



Part A: Structure. Schedules

BETTER BY
DESIGN

Lintel Comparison Chart

IG
 STEEL LINTELS

		CAVITY WALL 100mm Inner Leaf				Wide Inner Leaf				Wide Outer Leaf		EAVES & TIMBER FRAME				SINGLE LEAF		SOLID WALL		Box Lintels		
		STANDARD DUTY	HEAVY DUTY	HEAVY DUTY	EXTRA HEAVY DUTY	STANDARD DUTY	HEAVY DUTY	HEAVY DUTY	STANDARD DUTY	STANDARD DUTY	STANDARD DUTY	STANDARD EAVES	WIDE INNER EAVES	TIMBER FRAME	CONCRETE FINISH	SINGLE LEAF STANDARD	SINGLE LEAF HEAVY DUTY	INTERNAL WALL	SOLID WALL	STANDARD DUTY	HEAVY DUTY	HEAVY DUTY
IG STEEL LINTELS		U/S 30	U/S 40	U/S 50	U/S 60	U/S 30 W/L	U/S 40 W/L	U/S 50 W/L	U/S 60 W/L	U/S 30 W/L	U/S 40 W/L	U/S 30	U/S 30 W/L	U/S 50	U/S 75	U/S 100	U/S 120	INT 44	LP	BOX 75	BOX 100	HD BOX 100
		U/S 75	U/S 85	U/S 95	U/S 105	U/S 30 W/L	U/S 40 W/L	U/S 50 W/L	U/S 60 W/L	U/S 30 W/L	U/S 40 W/L	U/S 75	U/S 75 W/L	U/S 95	U/S 105	-	-	INT 100	1 BEAM	BOX 130	-	HD BOX 140
		U/S 100	U/S 110	U/S 120	U/S 130	U/S 30 W/L	U/S 40 W/L	U/S 50 W/L	U/S 60 W/L	U/S 30 W/L	U/S 40 W/L	-	-	U/S 100	U/S 110	-	-	-	-	BOX 140	-	HD BOX 150
Keystone		S/N 30	H/N 30	C/S 40	S/N 50	S/N 30 W/L	H/N 30 W/L	C/S 40 W/L	S/N 50 210W/L	S/N 30 W/L	S/N 40 W/L	S/N 30	S/N 30 W/L	S/N 50	S/N 75	S/N 100	S/N 120	INT 75	S/N	BOX 75	BOX 100	HD BOX 100
		S/N 75	H/N 75	C/S 85	S/N 95	S/N 30 W/L	H/N 75 W/L	C/S 85 W/L	S/N 95 210W/L	S/N 30 W/L	S/N 40 W/L	S/N 75	S/N 75 W/L	S/N 95	S/N 105	-	-	INT 100	S/N 100	BOX 130	-	HD BOX 140
		S/N 100	H/N 100	C/S 110	S/N 120	S/N 30 W/L	H/N 100 W/L	C/S 110 W/L	S/N 120 210W/L	S/N 30 W/L	S/N 40 W/L	-	-	S/N 100	S/N 110	-	-	-	S/N 120	BOX 140	-	HD BOX 150
Birtley									-													
		CR0	CR04D	CR08	CR12D	CR03/10	CR04/104D	CR08/10	-	CR03/10/100	CR04/10	CR03/10	CR04/10	T/N	U/S	LA	EY100	INT 100	CR10	INT 1004D	SR100	SR1004D
		CR0	CR04D	CR08	CR12D	CR03/10	CR04/104D	CR08/10	-	-	-	-	-	-	-	-	-	-	-	SR100	-	SR1004D
Catnic									-						-							
		CR0	CR04/100	CR08/100	CR12/100	CR03/10	CR04/100	CR08/100	-	CR04/10	CR03/100	CR03/100	CR04/100	CR05	-	CR04/100/100	CR04/10	CR04/100	CR04/10	CR04/100	CR04/10	CR04/100
		CR0	CR04/100	CR08/100	CR12/100	CR03/100	CR04/100	CR08/100	-	-	CR03/100	-	-	-	-	-	-	-	-	CR04/100	-	CR04/100

Part B: Fire safety



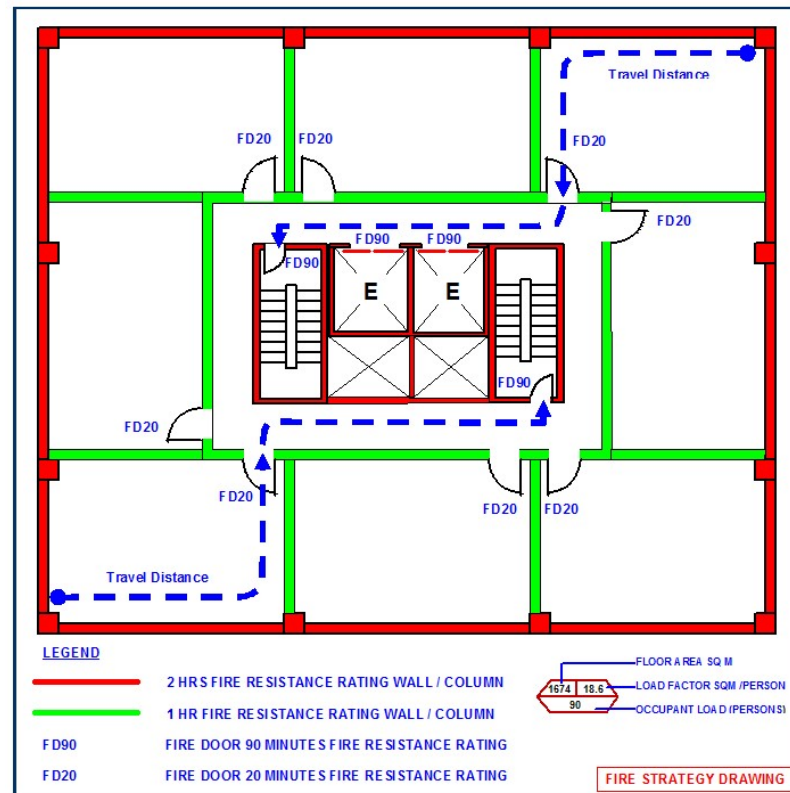
Part B: Fire safety

Requirements

- Escape Strategy
- Specification and location for Detection and early Warning
- Site layout for access of emergency vehicles

3 storey and above requires different considerations.

Part B: Fire safety

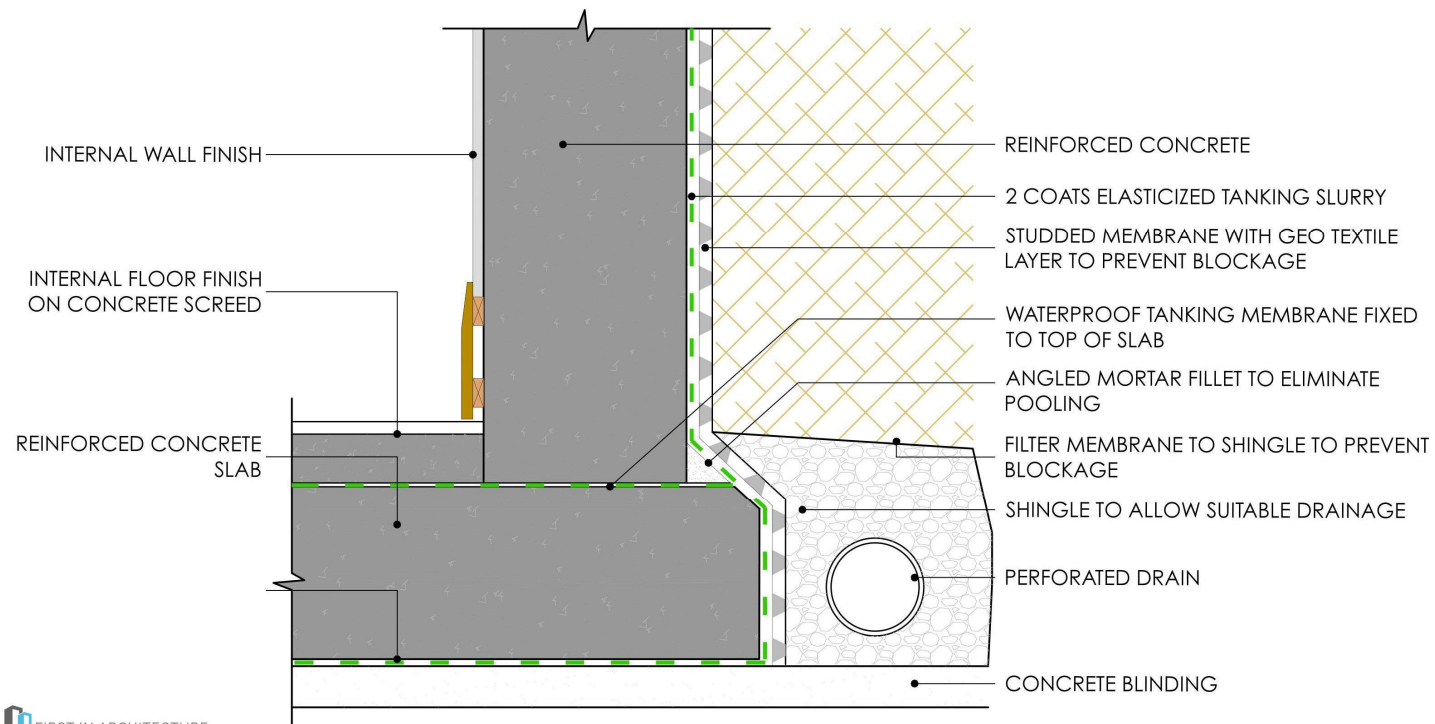


Part C. Site preparation and resistance to contaminants and moisture

Requirements

- Site investigation report – Ground saturation/contamination etc
- Details
- Specifications
- Consultant information

Part C. Site preparation and resistance to contaminants and moisture



Part C. Site preparation and resistance to contaminants and moisture



Part E. Resistance to the passage of sound



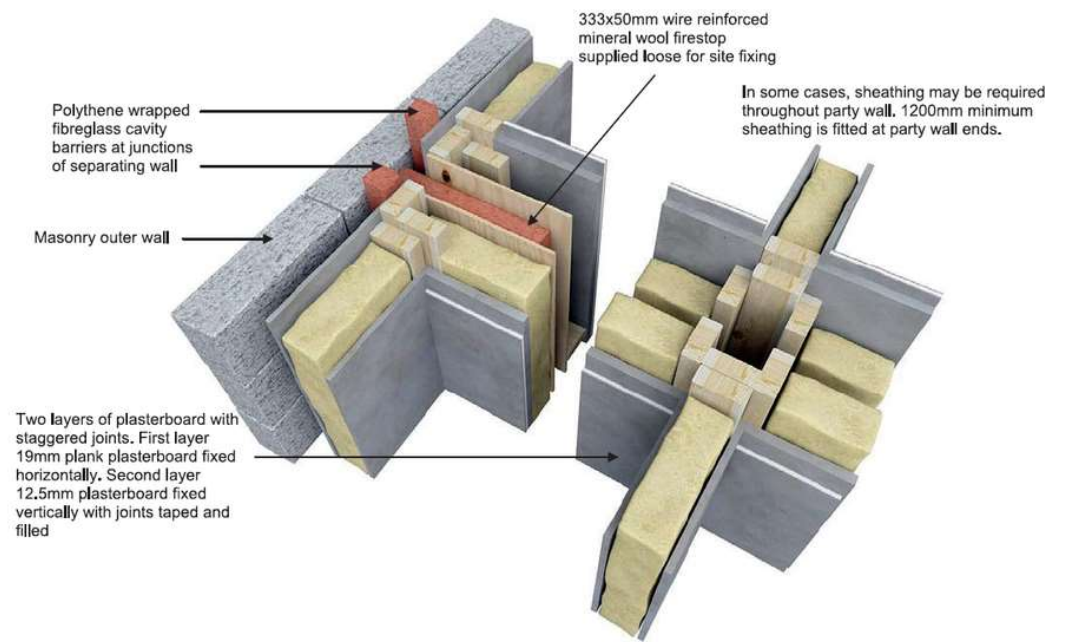
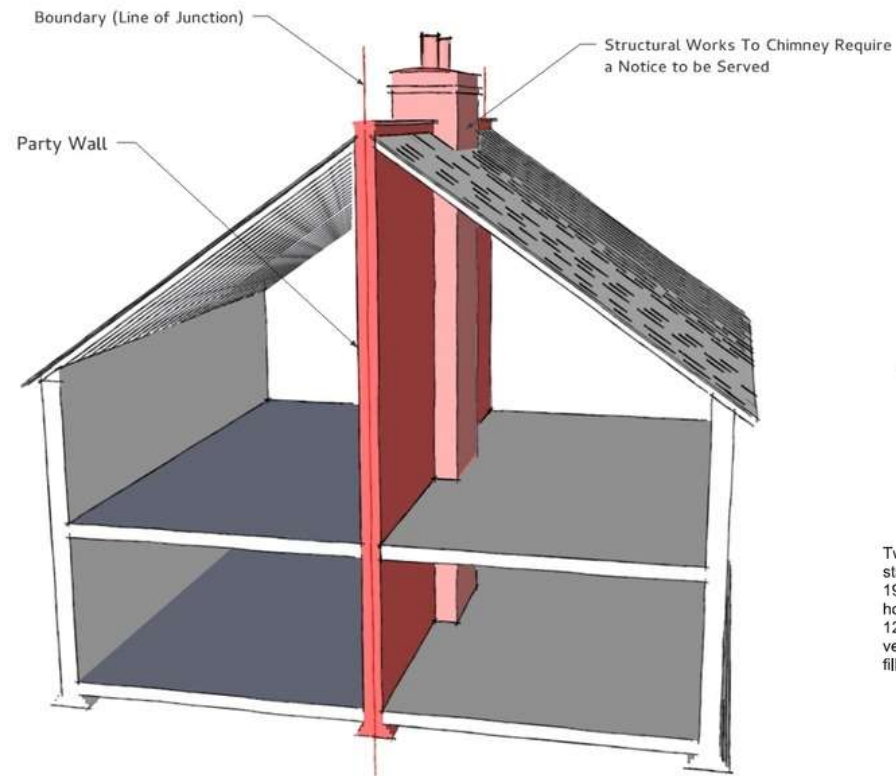
Part E. Resistance to the passage of sound

Requirements

Only applicable on domestic projects with a party wall or floor.

- Specification's
- Details
- Specialist information
- Party Walls Agreement (on conversion projects)

Part E. Resistance to the passage of sound



Part F. Ventilation

Requirements

- Specification
- Room volume calculations
- Manufacturers details

Part F. Ventilation



Part H. Drainage and waste disposal

Surface Water

- To mains drainage
- Soak Away
- To open Watercourse
- Recycle
- Other

Foul Drainage

- To Mains Drainage
- To Septic Tank
- Other

Part H. Drainage and waste disposal

Requirements

- Site porosity tests
- Approval for connection to mains drainage
- Volume calculations for tank capacity
- Drainage drawings – Internal/External
- Specifications – consider the falls. Is a pump required

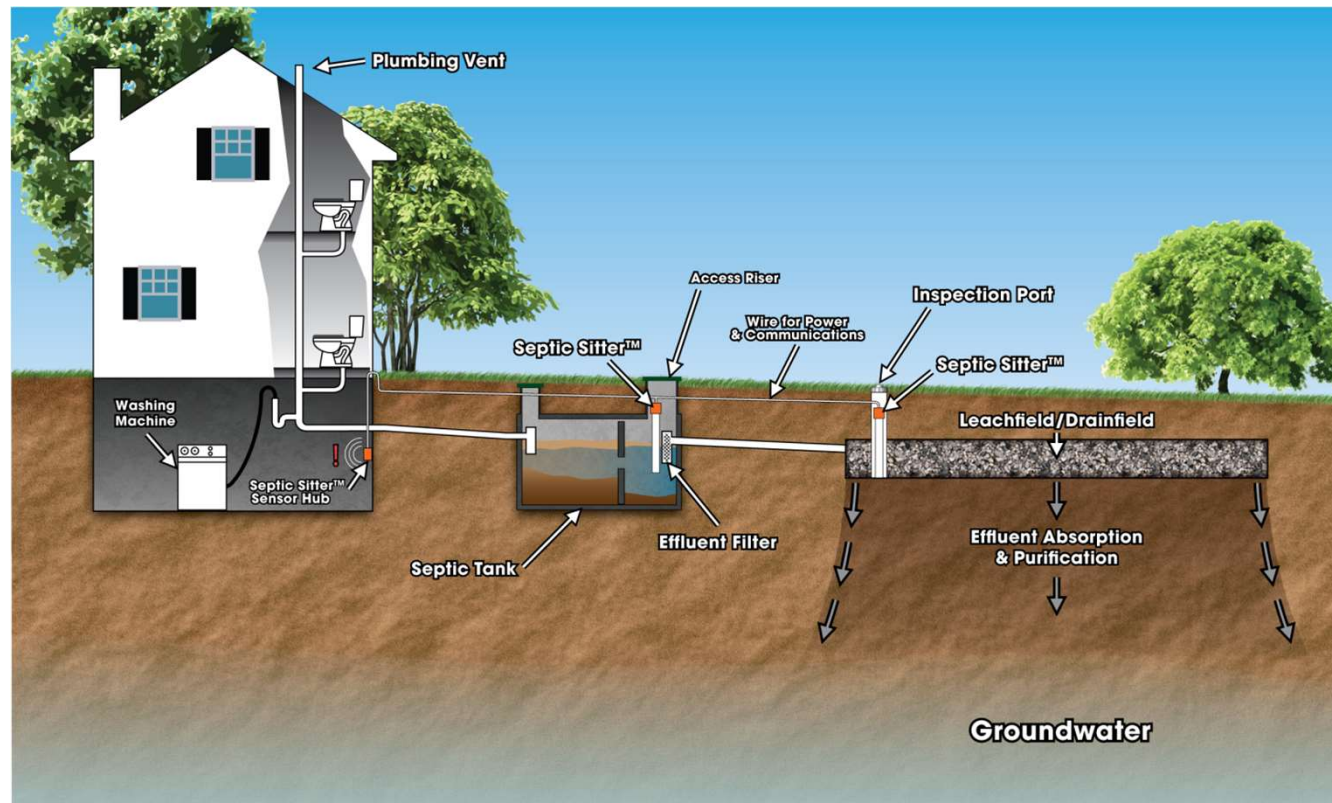
Part H. Drainage and waste disposal – Surface Water



Part H. Drainage and waste disposal – Porosity Testing



Part H. Drainage and waste disposal - Foul

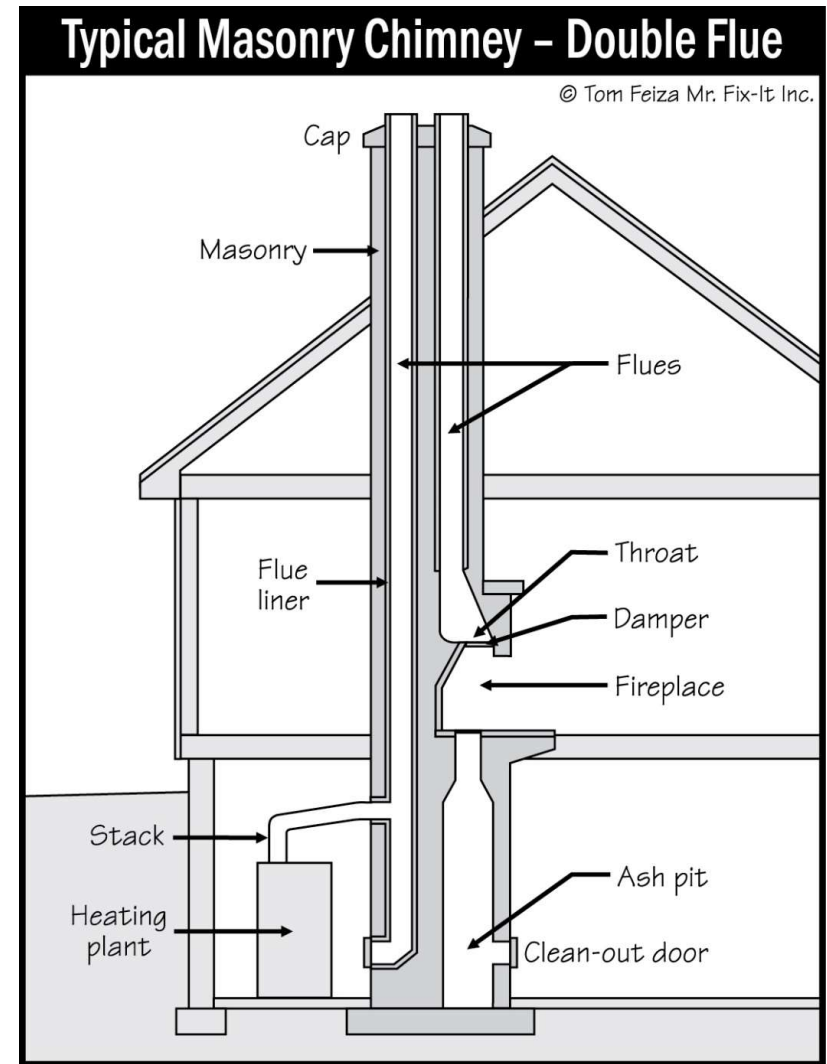


Part J. Combustion appliances and fuel storage systems

Requirements

- Room Volume Calculations
- Flue Designs
- Ventilation considerations
- Specifications

Part J. Combustion appliances and fuel storage systems



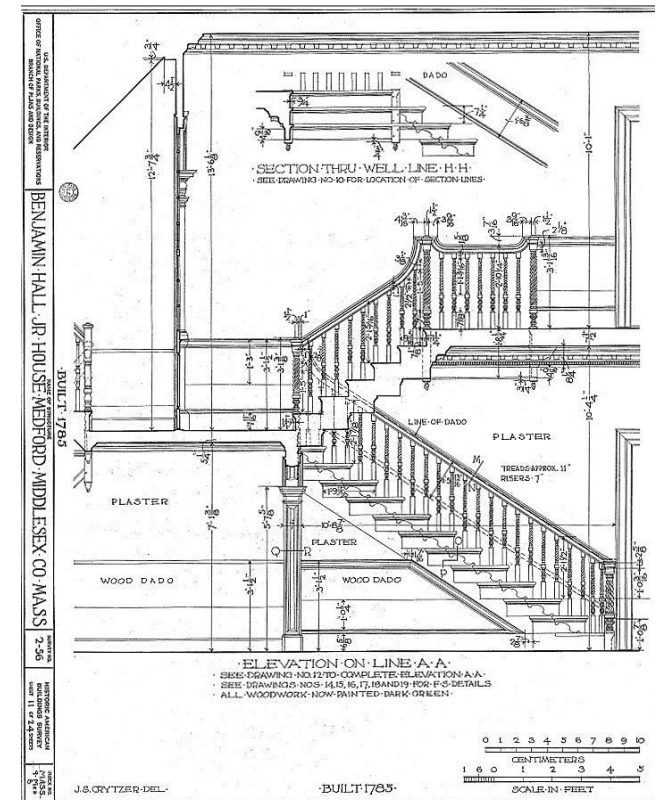
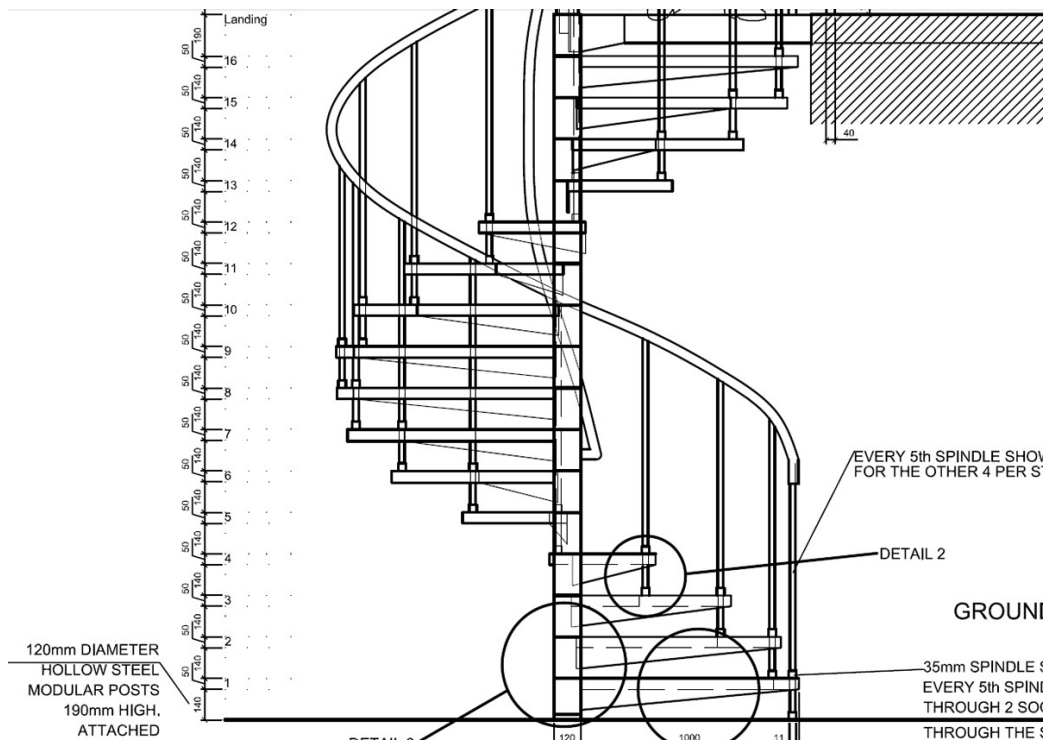
F002

Part K. Protection from falling, collision and impact

Requirements

- Staircase design with dimensions
- Balcony details
- Handrail details
- Balustrade details

Part K. Protection from falling, collision and impact



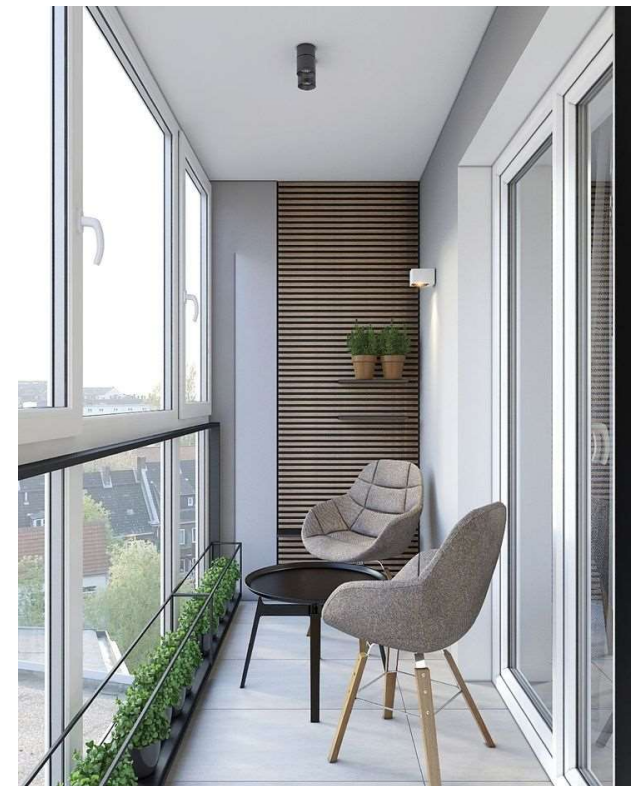
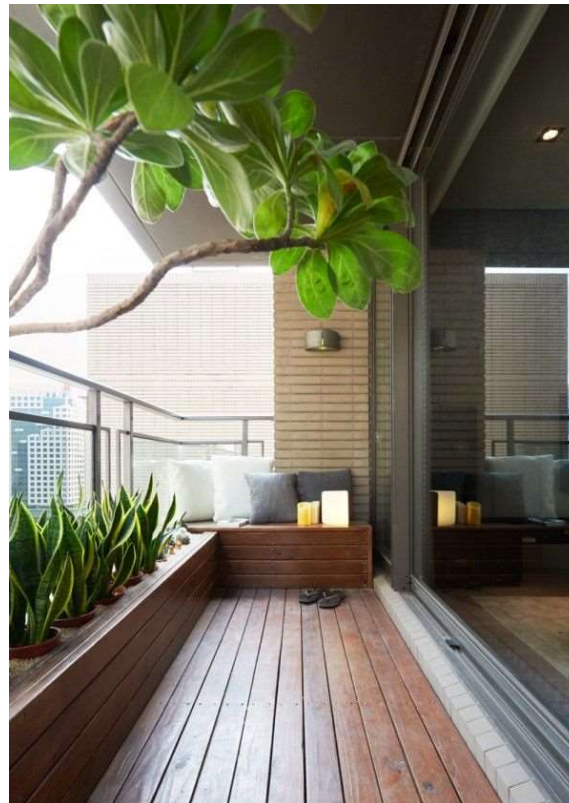
Part K. Protection from falling, collision and impact

☐ Quotation Purposes Only ☐ Initial Confirmation of Overall Layout & Sizes
 Please Sign & Return the attached Stair Order Form

The drawing shows a staircase with the following dimensions and labels:

- Overall Width:** 1780 (top and bottom)
- Overall Height:** 1631 (left) and 1625 (right)
- Staircase Width:** 860 (bottom)
- Staircase Depth:** 920 (bottom)
- Labels:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Part K. Protection from falling, collision and impact

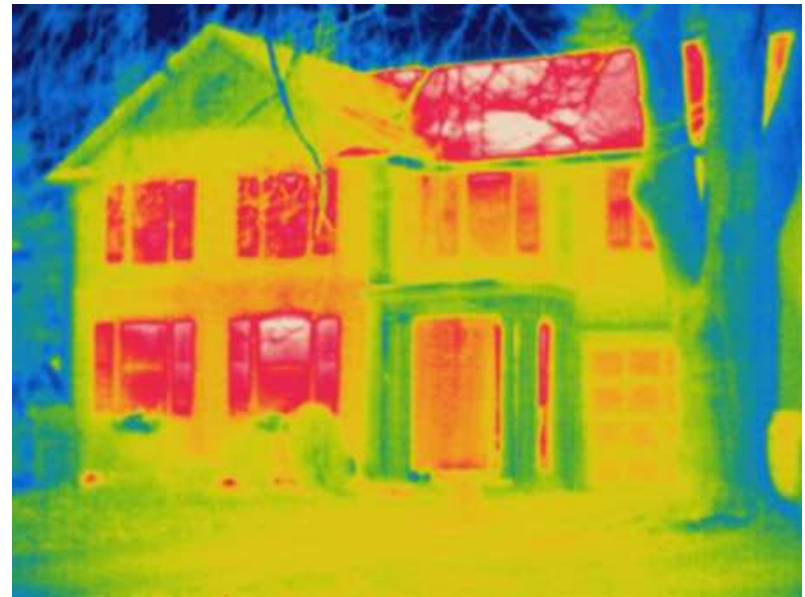
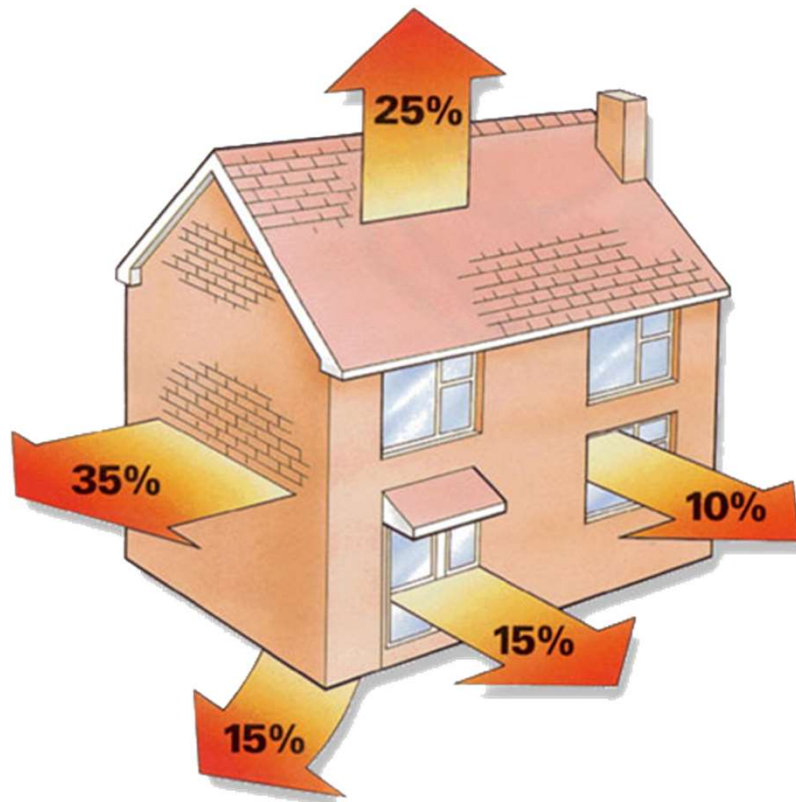


Part L. Conservation of fuel and power

Requirements

- Insulation specification. Floors/Walls/Roof etc
- U-Values – Heat Loss Calculations
- Air Tightness.

Part L. Conservation of fuel and power



Part M. Access to and use of buildings

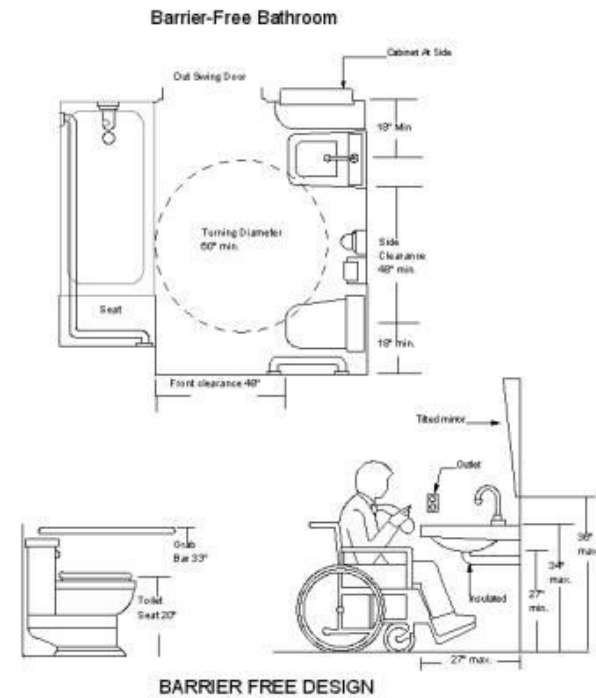
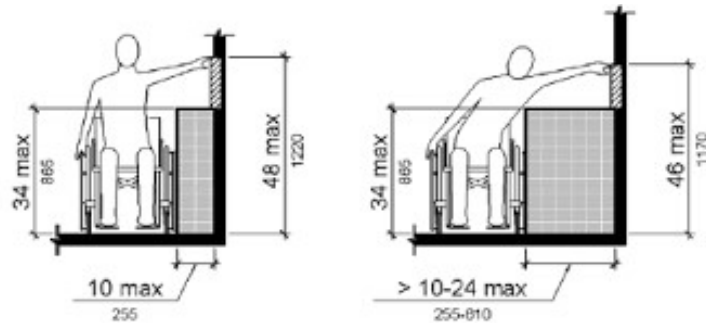
Requirements – Access for All

- Door Widths
- Ground Floor Facilities
- Point and switch access
- Staircase considerations
- External Landscaping
- Thresholds
- Colour Scheme
- Obstructions

Part M. Access to and use of buildings



Part M. Access to and use of buildings



Part M. Access to and use of buildings



Summary:

Arches & Openings
Building Regulations

