

L30 Stairwells as Life Savers

Means of escape stairs give
occupants a way out in emergencies
firefighters a way in to save them

They need to be:

- smoke free,
- isolated by smoke free lobbies, from flats or offices
- Except top floor
with glazed door or screen to see and to trap smoke
- Within their own fire compartment isolated from the floors
- Fire and smoke doors with frames, seals and their ironmongery must be competent and maintained
- They can be air pressurised to keep smoke out
- They should never have gas pipes running up them

Post-Grenfell discoveries in other tower blocks

Width as a life saver

Building Regulations Approved Document M/K
Requires stair flights of a width to offer capacity for numbers of people on floor plates

Top flight only serves top floor
Bottom flight should serve all floors above

But BR AD M/K only requires one floor of people on any flight at any one time
Slugs of people from each floor travelling down passing each floor
But people travel at different speeds, especially in an emergency
Building Regulations requires no more than 16 steps in a flight
But landings in a straight flight (invisible in a crowd) cause legs to collapse and pile ups to occur

People climbing over each other raises them up the balustrade at higher risk
'Stay-put policy' then 'Phased evacuation' becomes important in competent high rise
Canary Wharf towers have 10,000 occupants
WTC Towers had 25,000 occupants and 5,000 visitors each

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35

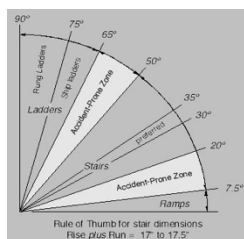
L30 Angle is everything Countries have different rules

Rung ladders
On-site were seen as essential, but unsecured are H&S risk
Step Ladders: used by the navy
Frowned on in buildings, need to be hands-free
Carrying tools/materials very nearly impossible
Needs safety line attached, full body harness and connector to line
On-site stairs in scaffolding has become common practice now

Avoid: 50-65 degrees, accident Prone
Alternative tread stairs:
to only one room, not for general public use
Stairs: 30-35 degrees
Avoid: 8-20 degrees, accident prone
Stepped Ramp (invented by UK B Regs?)
Ramps: 1:12 max (UK B Regs AD M or K)
Level floor or pavement

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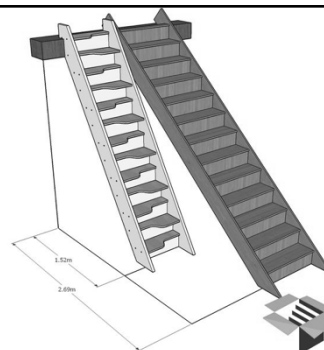
36



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37



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42



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43

Tall Buildings

What changes when you go tall?

A Structure: High level Wind loading, Many floor loading, sway, exposed above urban mass, Foundation, Lightning protection
B Fire: Fighting, Servicing, Access, Means of Escape, Evacuation, passive fire protection competency, Fire doors, services, compartmentation
E Acoustics: External Weather noise, External envelope performance, Services passing through floors, Continuity of structure: structure borne sound
F Ventilation: Passive more difficult, Positive pressure Escape wells, air conditioning energy to waste
G Water: High level storage, gravity feed (Germany urinating rules after 21:00)
K Stairs and Escape
L Heating, U values, Thermal Envelope, Airtightness Thermal Bridges, weather performance of envelop
M Disability Access, Refuge, Escape
Net to Gross Ratios, Servicing, Lifts, Risers, stairs
Core size, Core costs, Core positioning
Thinness of external envelope, compartmentation, cores, stairs

High rise Definition

Over 18 m is beyond the reach of extending ladders on fire trucks
Beyond 19 floors is beyond standard breathing apparatus capacity
Climbing 19 floors with a weight on your back gets fire fighters breathing harder
Multiple cylinder breathing apparatus gives more time at the top and the top can be higher than 19 floors
Grenfell had significantly less occupants and less floors than CWT or WTC
But that fire was fuelled by combustible insulation
Non-fire resistant external envelope allowed fire to pass outwards and inwards
Fire was inside then outside then inside at upper floors

46

Tall Building Parts

- External 'protective' skin/cladding
- Mechanical, Electrical and Plumbing (MEP)
- Building Frame (Super Structure)
- Internal Linings/Finishes
- Furnishings Fittings Equipment (FFE)
- Foundations (Sub-Structure)

Ground Bearing Concrete Floor & Foundation Types: High Rise

Excerpts from Building Construction Handbook

**Tall Buildings:
(23) Floors**

(23) Floors
(27) Roofs
(43) Ceilings
 Low or High Rise

Suspended Concrete Upper Floor: Non-Domestic & High rise

Excerpt from Building Construction Handbook

Concrete 'Waffle' Slab: Non Domestic & Low and High Rise

Interior Royal National Theatre, London, Denys Lasdun

Hybrid Steel Frame & Concrete Floor

Fire protection not fitted to steel frame yet

Example Steel Frame carrying Concrete Floor Deck

Raised Access Floor: Non-Domestic Uses

Raised Access Floor Site Photo

Floor as Service Zone: Raised Access Floor

Excerpt from Building Construction Handbook

Design Considerations - MEP

What do we mean by MEP?
1. Mechanical
2. Electrical
3. Public Health

1. Mechanical systems include:
- heating
- cooling
- ventilation
2. Electrical systems include:
- power to all outlets services and appliances
- lighting
3. Public Health systems include:
- delivery of drinking and flushing water
- draining of waste water

Note:
As architects and interior architects, we are not normally qualified to design building services. Therefore, a Services Engineer is required and we co-ordinate their design into our work

Banham Group Headquarters, Thomsett Road, London - Allies and Morrison

**MEP v Architecture v Structure
(External Services & Structure provide clear floor plates)**

Le Centre Pompidou,
Paris, France
Richard Rogers,
Renzo Piano &
Gianfranco Franchini

MEP Strategy v Interior Architecture

Banham
Headquarters, London
Allies and Morrison

Performance Requirements of Ceilings

As the underside of a floor or a roof, ceilings can contribute to:

- The look and feel of a space
- Fire performance of the space
- Acoustics performance, depending on materials, format and finishes
- Thermal Comfort of the space
- Provision of service zones or plenums depending on MEP strategy
- Provision of a surface from which to hang or fix architectural, engineering and MEP components

Key Building Regulations

Suspended Ceiling: Components

Suspended Ceiling: Suspensions grid

Source: BSI
See Page

**Suspended Ceiling & Wall or partition Junctions:
Structural Acoustic & Fire Arrangements and Details**

Source: BSI
See Page

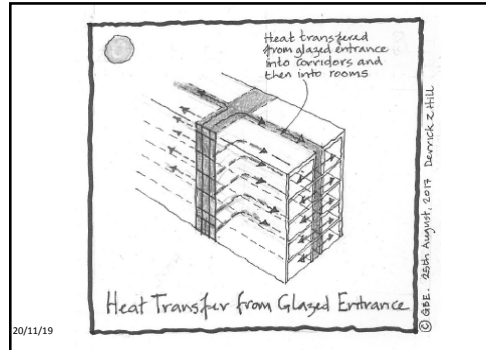
**Environmental
Design**

Glazed Stairwells Overheat

Overheating affects 20% of housing
Walk up flats with glazed stair enclosures
Without opening vents at top and
replacement air vents at bottom
Warm up in summer
Heat corridors
Overheat apartments or rooms

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79



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80

Stairwells As Acoustic Barriers

External stairs
External conditions
Enclosed without roof:
light and stair well
Windows/vents/doors open into well
Walls forms long pathway for urban
street noise barrier

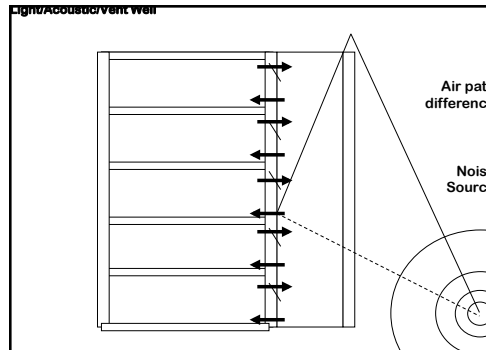
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Natural Vent/Acoustic Wells

Urban areas with high traffic noise
create problems for natural ventilation
of buildings
Wells within the building offer long air
path difference acoustic performance
and an opportunity for natural
ventilation from rooms to the well
The well may well include staircases
Discourage them as smoking places



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84



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91

External Envelope Performance Checklist:

1. Structure - frame, stability, movement
2. Water - envelope
3. Thermal - envelope
4. Airtightness - envelope
5. Acoustic - sound control, penetration, transmission
6. Fire - insulation and integrity
7. Security - robustness, privacy, locking
8. Maintenance - access, de-constructing, re-assembling
9. Comfort - temperature, ventilation, daylight

Definitions: Sub-Structure & Super Structure

Sub-structure: foundations or basement.
Superstructure main frame of a building.
That which if removed would lead to a collapse
of the whole composition.

Types:

- Concrete frame: Precast or Insitu
- Heavy Steel frame:
- Heavy Timber frame: Post and beam
- Loadbearing Masonry Walls:
- Timber Panels: CLT Glued or loose
- And combinations of any of the above.

Note:

As architects and interior architects, we are not
normally qualified to design structural frames.
Therefore, a Structural Engineer is required and
we coordinate their design into our work

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Road, London - Allies and Morrison

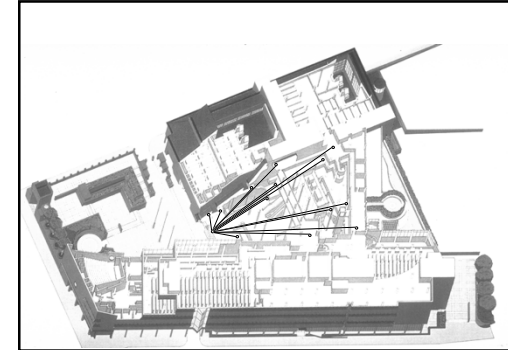
High Rise Economic Design

Building Navigation

Entrance Area: hub of the building
 Routes to building functions/rooms
 Route to rooms: readability legibility
 Room and stairs visibility
 Plan your route with your eyes
 Stairs Ramps Routes Passarells v Signage
 British Library Entrance Hall
 Stairs as Signage
 Stair Soffits signs indicate Library departments

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130



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132

L30 Communication Accommodation Stairs

Not as regulated as Means of Escape stairs
 They can be front of house,
 Encourage stair use over lifts,
 Can be at the heart of business activity
 Enable some of the most important impromptu interactions
 that happen by chance
 Link different departments of the business
 Linking social/kitchenette/café/meet spaces
 Inter-visibility between floors advantageous
 if not essential to the wellbeing of the business
 MCM's Havas HQ LKX
 same stair arranged differently at each floor of the well

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133



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134

Cores at perimeter not at core

Escape stairs inside building volume have to be in a fire compartment (FR, thickness, NIA/GIA)
 Push the cores to the perimeter of floor plates and isolate them from office compartments, services risers and lifts
 Reduces compartment enclosure performance requirements:
 Fire, acoustic
 Unoccupied spaces: lower thermal requirement?
 potentially reduces their costs
 Richard Rodgers and Rab Bennetts

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Servicing of buildings requires space

Stairs, Lifts/Elevators, Services Risers, smoke vent shafts, Plant rooms, stores, WCs

MEP Engineers:

“Architects never provide enough room”

Rationalise the floor plans into zones

Serving and Served spaces

Service Cores and Rooms

Stack similar functions on top of each other

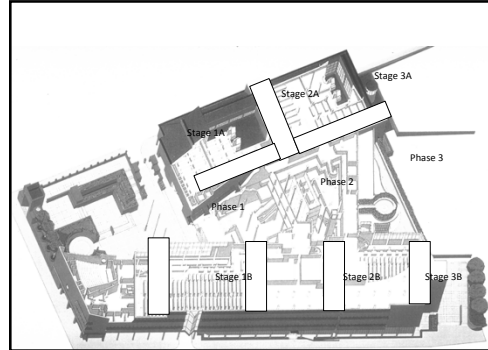
British Library cores to Phases/Zones

1 bay of core to 3-6 bays of space

Acknowledges phased development

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138



(66) Transport Systems

Mechanical vertical and diagonal movement

Tall buildings and Lift Cores Time and Space saving

The taller the building the more lifts are needed to handle people at peak times

Canary Wharf Towers (CWT) 10,000 staff and many visitors

World Trade Centre (WTC) 25,000 staff and 5,000 visitors each

If all lifts can stop at many floors

many lifts are needed

more time is needed to make a lift journey

If lifts have dedicated destinations (CWT)

ranges for floors

not stopping at others on route

Less lifts are needed

If sky concourses are created (WTC)

where transfers to other lifts can occur

Then many more lifts can ride in the same lift shaft

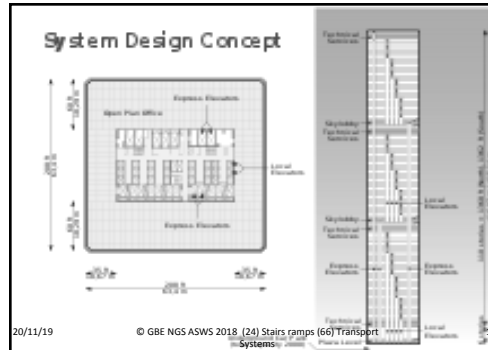
in low, mid or upper zones

At each concourse lifts have dedicated destinations (CWT style)

Concourses can include coffee lounges and meeting rooms

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X10 X11 Energy Cost Saving

Unless put to sleep manually: on 24/7 Hrs/days/week

London Kings Cross station platform escalators

Lifts/Elevators/Escalators/Moving pavement

can be set to auto shut-down when not in use/low traffic

Lifts stop closest to highest potential demand

Lifts lights off, lift car controls off

Landing lift call buttons remain on to reactivate

Escalators slow/stop, lights-down/off

Still asks 'has he turned me on yet'

'ready for action when he does'

Stand-by red light function

Never completely inactive, never zero demand

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144

Classification

CI/SfB: Information Library, Manufacturer's Literature, CAD layering, Drawing numbering

(66.1) Lifts,

(66.4) Escalators,

(66.5) Moving pavements

CAWS: Specification Work Sections

X10 Lifts,

X11 Escalators,

X12 Vertical Platform Lifts,

X13 Powered Stair lifts,

X14 Fire Escape Chutes/slides,

X15 Moving Pavements

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145

X10 Lifts are disablers

Just like flying, lifts are no-go areas for some susceptible people

They only need to stuck in a faulty lift for a short while for panic to set in

Some choose to walk up but there is a limit to the number of floors

Glass lifts in tall atrium or facing the outside world are just as disabling if not more so

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146

First Principles

Function of a lift:

- Provision of vertical transportation between building floors, levels or decks for both people, people and goods or goods alone
- Provision of vertical circulation for wheelchair and other non-ambulant building users
- Provision of ingress/egress for fire fighting and evacuation purposes



Key Building Regulations

The Building Regulations 2010

The Building Regulations 2010

Access to and use of buildings

APPROVED DOCUMENT

M

**Protection from falling
collision and impact**

APPROVED DOCUMENT

K

The Building Regulations 2010

Fire safety

APPROVED DOCUMENT

B

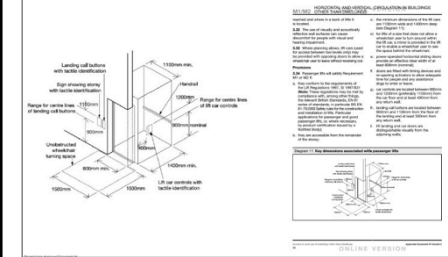
VOLUME 1 - DWELLINGHOUSES	
B1	Means of warning and escape
B2	Internal fire spread (linings)
B3	Internal fire spread (structure)

B1	Means of warning and escape
B2	Internal fire spread (linings)
B3	Internal fire spread (structure)

B1	Means of warning and escape
B2	Internal fire spread (linings)

B3	Internal fire spread (structure)
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Approved Document M

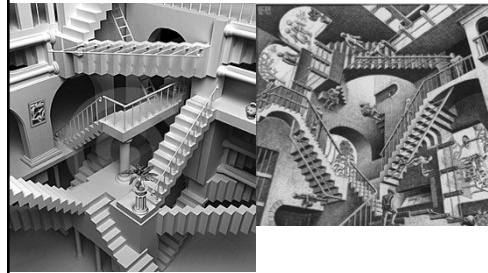


Stairs/Escalators as Fantasy

MC Escher invented the multi-dimensional gravity defying stairs
JKR imagined the articulated stairs
HP and colleagues had the advantage of many optional routes across the stair well
Stairs can be replaced by fantasy escalators (on all the time?)
RR Lloyd Building London
NF Willis Faber Dumas Ipswich

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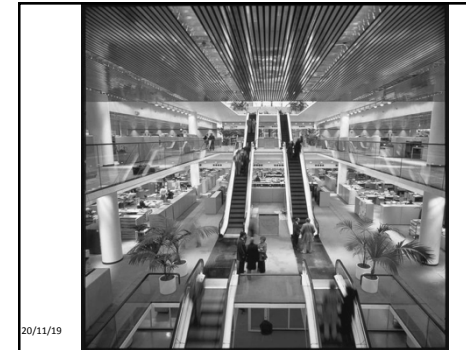
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152



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153



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154

L30 Stairs as Playground

Stairs and Slides integrated
For kids and adult 'inner kids'
Progressive companies
Stairs with concentric slides
Snakes and Ladders
Climb stairs
Slide down

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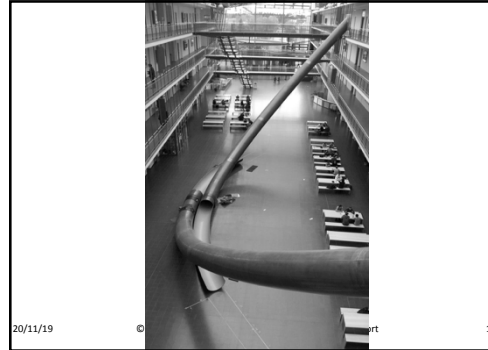
155

X10 Lifts out of bounds in a fire

If lifts are turned off or fail-safe in a fire
 you could be trapped in the line of fire or smoke
 'fail-safe' does not seem to apply
 Never use lifts in a fire
 Fire fighting lifts are dedicated lifts
 isolated from normal 'fire-off' functions
 They need to be more robust internal finishes
 Most people die of smoke rather than fire,
 with a few exceptions:
 Summerland burning plastics droplets
 Grenfell combustible plastic insulation then combustible
 interiors and home contents

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156



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157

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161