



Glass and Glazing Federation – MENA Region

Impact Safety Glass Selection for Use in Critical Locations

Presented By

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Learning Objectives

Break characteristics and classification of safety glass EN 12600:2002

Determining critical locations BS 6262-4:2005



Break Characteristics & Classification of Safety Glass EN 12600:2002

Break Characteristics

Type A: Numerous cracks appear forming separate fragments with sharp edges, some of which are large – this is the mode of breakage typical of annealed & heat strengthened glass.

Type B: Numerous cracks appear, but the fragments hold together and do not separate – this is the mode of breakage typical of laminated glass.

Type C: Disintegration occurs, leading to a large number of small particles that are relatively harmless – this is the mode of breakage typical of tempered glass.



Classification of Safety Glass

In accordance with BS EN 12600:2002, impact testing is carried out on glass samples measuring 876mm x 1938mm where an impactor weighing 50Kg is released from a pendulum mechanism at 3 different drop heights

Classification **3** has a drop height of **190mm**

Classification **2** has a drop height of **450mm**

Classification **1** has a drop height of **1200mm**

The performance classification is given as $\alpha (\beta) \phi$

Where α is the highest drop height classification at which the product either did not break or broke in accordance with the breakage characteristics.

β is the mode of breakage.

ϕ is the highest drop height classification at which the product either did not break or broke in accordance with the breakage characteristics.



Recommended Class of Safety Glass in Critical Locations BS 6262-4:2005

| Critical location | | Minimum recommended classification |
|-----------------------------------------------------|---------------------------------|------------------------------------|
| Doors | Minor dimension of pane > 900mm | 2 (β) φ |
| | Minor dimension of pane ≤ 900mm | 3 (β) φ |
| Door side panels | Minor dimension of pane > 900mm | 2 (β) φ |
| | Minor dimension of pane ≤ 900mm | 3 (β) φ |
| Low level glazed areas | irrespective of pane dimensions | 3 (β) φ |
| Fully backed mirror glazing | Minor dimension of pane > 900mm | 2 (β) φ |
| | Minor dimension of pane ≤ 900mm | 3 (β) φ |
| Unbacked mirror glazing accessible from 1 side only | Minor dimension of pane > 900mm | 2 (β) φ |
| | Minor dimension of pane ≤ 900mm | 3 (β) φ |
| Bathing areas | irrespective of pane dimensions | 3 (β) φ |
| Areas of special risk | irrespective of pane dimensions | 3 (β) φ |



Determining Critical Locations

BS 6262-4:2005

Accident statistics show that glazing in some locations in buildings is more vulnerable to human impact than in others. These critical locations are:

- a) in and around doors
- b) at low levels in walls and partitions.



Speaker Bio

David Rogers – Chairman of Technical Committee GGF MENA Region

David has over 30 years experience in the glass processing industry in production and processing techniques, implementation of in process testing and quality procedures, live barcode tracking systems and on site investigations for the glass industry.

David was the Managing Director of his own successful glass processing company for 17 years in the UK and has worked for several major independent glass processors before moving to the Middle East 5 years ago. Since then he has been Operations Manager at Thomas Bennett Gulf and is now the Process Planning and Control Manager at Gulf Glass Industries Co. Ltd.



Types of Glass

- Annealed
- Heat Strengthened or HS
- Tempered, Toughened or FT
- Laminated



Spontaneous Breakage

- Glass to glass contact
- Glass to metal contact
- Edge defect
- Surface damage
- Inclusions in the glass



Destructive Testing of Annealed Glass



Annealed Glass Break Pattern



Advantages of Annealed Glass

- Inexpensive
- Easy to process
- No risk of spontaneous breakage
- Free from visible distortions



Disadvantages of Annealed Glass

- **Not** a safety glass – but can be used in certain critical locations in thicker forms
- Susceptible to thermal fracture
- Impact resistance is low, except in thick glasses



Destructive Testing of Heat Strengthened Glass



Heat Strengthened Glass Break Pattern



Advantages of Heat Strengthened Glass

- Good resistance to thermal fracture
- Low risk of spontaneous breakage
- Approximately twice as strong as annealed glass
- Low level of visible distortion
- Relatively inexpensive



Disadvantage of Heat Strengthened Glass

- Not a safety glass



Destructive Testing of Tempered Glass



Tempered Glass Break Pattern



Advantages of Tempered Glass

- Safety Glass
- Relatively inexpensive
- 4 to 5 times stronger than annealed glass
- Resistant to thermal fracture



Disadvantages of Tempered Glass

- Risk of spontaneous breakage
- If the glass breaks total collapse can occur
- Can have high levels of distortion



Destructive Testing of Laminated Glass



Laminated Glass Break Pattern



Advantages of Laminated Glass

- Safety glass
- If a breakage occurs the glass will not collapse
- Any combination of glass type becomes a safety glass



Disadvantages of Laminated Glass

- Any distortions in the glass type will be magnified
- Polyvinyl Butyral (PVB) is hygroscopic
- Care must be taken for compatibility issues
- Expensive



Comparison of Laminated and Tempered Glass



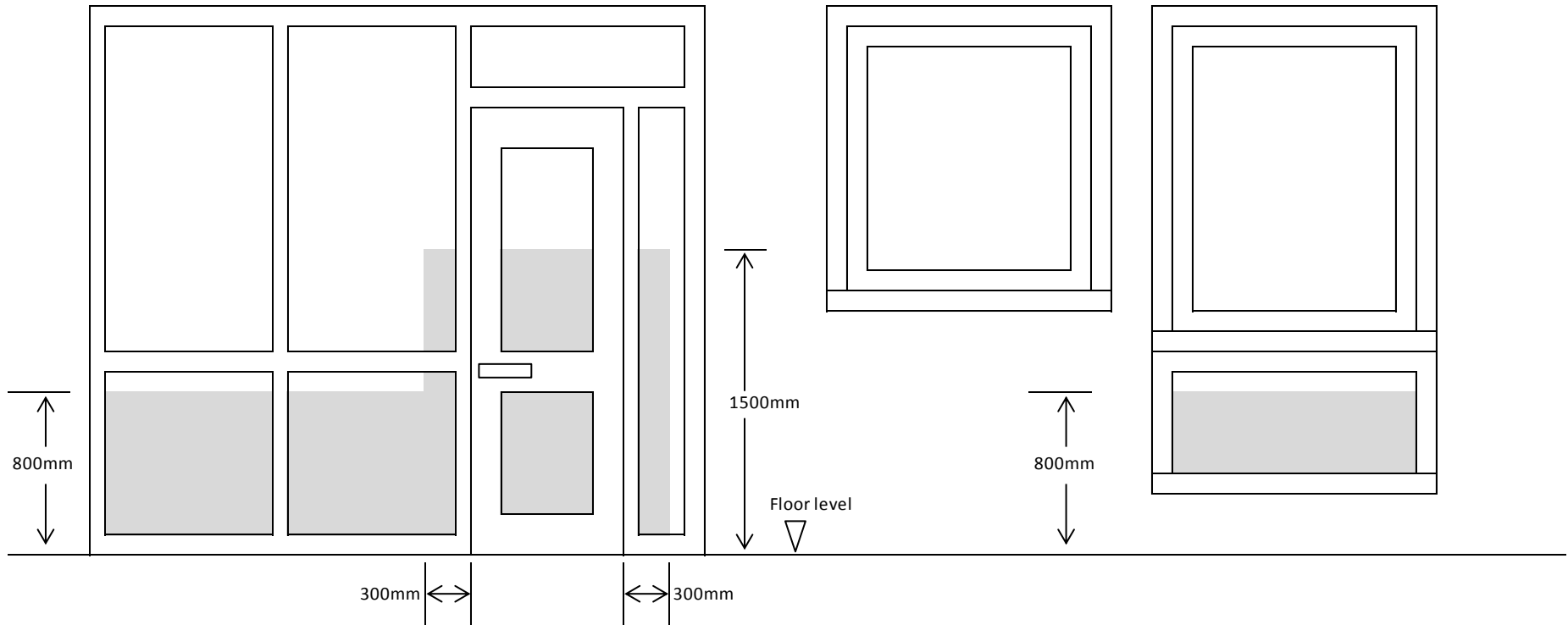
What Are Critical Locations ?

- Doors
- Side panels
- Low level glazing
- Overhead glazing
- Bathing areas
- Mirror glazed doors, side panels and low level glazing
- Areas of special risk



Door and side panels

Windows



All Shaded Areas **MUST** Be A Safety Glass



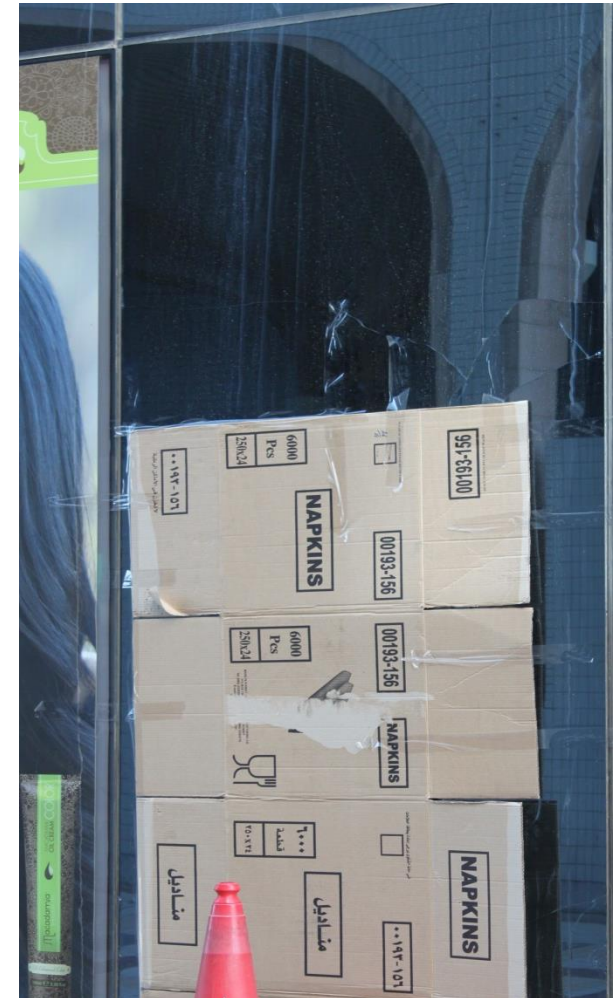
Typical Façade Specification

Outer pane Heat strengthened

Inner pane Fully tempered

Areas of concern

Ground floor Make sure inner and
Balcony outer panes are **Safety
Glass**



Balustrades

Typical Specification

- Fully Tempered
- Spontaneous breakage
- Possible total collapse
- Will have visible distortion

Alternative Specification

- Laminated
- No total collapse
- No penetration through the opening
- Ensure the correct interlayer/glass combination is selected



Ensure The Glass / Interlayer Combination Are Safe For The Application



Thank you

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