English

Technical data

# Smart sheets

## for floorings and walkways

Photo: © King Power Mahanakhon

kuraray Trosifol® SentryGlas®

## Introduction

# Interlayer strength, depth and capabilities

Delivering your window into the world of advanced interlayers for laminated safety glass, Kuraray's Advanced Interlayer Solutions Division (AIS) is underpinned by decades of innovation, application knowledge, domain experience and market success.

**OUR ADVANCED INTERLAYER PORTFOLIO –** comprising Trosifol® PVB and SentryGlas® ionoplast interlayers – has continually revolutionized aesthetic, structural and functional glass design, fabrication and installation in the architectural and automotive/transportation segments.

Designed to benefit consumers, society and industry, our products are advancing the functionality of glass, while our engineers and consultants are setting new application benchmarks by collaborating on solutions that both sustain and inspire.

We are committed to helping you transform your mindset and take your applications to the next level – aesthetically, functionally and structurally. Enjoy greater design freedom and give your glazing strength, clarity, character and purpose with solutions that cover safety, security, sound insulation, UV/solar/energy management, color and print.





➔ Bangkok city downtown, Thailand

**OUR DIVERSE PRODUCT RANGE,** the broadest on the global market and our domain expertise create strength; and we channel this strength into helping you succeed. We strive to be your strongest ally and supporter and will help you navigate and conquer the ever-changing demands of the global glass industry. Worldwide production, R&D and support, means we are always by your side … no matter where you are.

THE ORIGINAL SentryGlas®


➔ Mahanakhon, Bangkok, Thailand

# Smart sheets for selecting the right glass combination for glass floorings and walkways

## BASIC DESIGN REQUIREMENTS

- The glass flooring should be robust enough to safely bear the imposed live loads (weight of people) in addition to its own weight (dead load) with a reasonable safety factor.
- Glass being a brittle material, a high design redundancy must be ensured to sustain the design loads even if any one of the glass layers break accidentally due to spontaneous breakages, or accidental impact.
- Due to viscoelastic behavior of the interlayer, load duration and temperatures must be considered. A load duration of 1 hour for the imposed live load and 40 °C are recommended.
- From serviceability point of view, people should not fear moving on the flooring due to excessive “sagging” (deflection).


Photo: © Kuraray

Mahanakhon Skywalk, Bangkok, Thailand

## DESIGN CONSIDERATIONS

- The glass floorings have been considered to be supported on all the four edges. The edges have been considered to be “simply supported” in the structural analysis.
- “Sandwich” model used for non linear analysis in FEA tool SJ Mepla 5.0.6 Software
- Imposed loads on the flooring and the load combinations have been considered as per Australian standard AS 1170.1 – 2002. Load safety factor of 1.2 for self weight and 1.5 for imposed live load has been considered.
- Load combination for the scenario “All Layers are Intact” – 1.2 x Self weight + 1.5 x Imposed live load
- Load combination for the scenario “One Layer is Broken” – 1.0 x Self weight + 1.0 x Imposed live load
- Imposed concentrated live loads have been considered to be acting at the center of the panel in area of 150 x 150 mm.
- Permissible stresses for heat strengthened glass = 29.2 MPa (edge locations) and 62.9 MPa for fully tempered glass have been considered as ASTM E 1300 – 2019.
- For Post breakage strength check, the upper glass layer is considered to be broken.
- The maximum values of deflection and stress have been mentioned. For the majority of cases, it occurred for point loads.
- The smart sheet is applicable only to SentryGlas® 5000.



# Other important design considerations

Making the glass flooring with the combination of HS and FT glass is certainly the most ideal glass combination that not only ensures good resistance to accidental impacts but, also a high post breakage strength. However, below factors give an all FT glass combination an edge over HS–FT glass combination.

## WHAT GLASS TYPE SHOULD BE CHOSEN, FULLY TEMPERED OR HEAT STRENGTHENED?

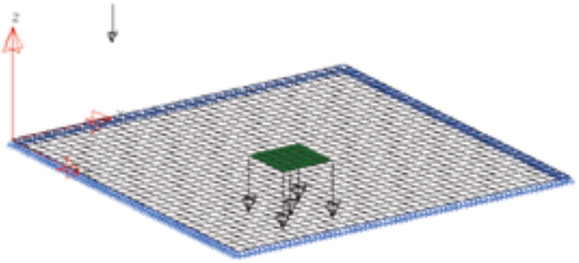
- FT glass has the highest stress endurance limit but doesn’t have a high post breakage strength. Whereas, HS glass has a lower stress endurance limit but, a remarkably higher post breakage strength. Thus, a combination of FT and HS glass would be the ideal combination to get the best of the two worlds. However, assymetric surface waviness of FT and HS glass, laminators, genrally have low confidence for a successful lamination.
- Use of HS glass no doubt ensures high post breakage strength but, it limits the pre-breakage strength as permissible stress for HS glass at the edge locations, for 1 hour load is 29.2 MPa compared to 73.1 MPa for FT glass.
- FT glass is not promoted for flooring applications due to the fear of “wet blanket” effect getting triggered off post the accidental breakage of glass e.g. spontaneous breakages due to NiS or an hard body impact at the edges. FT glass can be very hard to break with impacts at locations other than edges. The probability of breakages of more than 1 glass layer due to impact at edges is extremely low as only the top layer is vulnerable. Similarly, the probability of spontaneous breakages due to NiS in more than 1 glass layer at the same time is extremely rare. A heat soak test is recommended to rule out any NiS related spontaneous breakages.
- High stiffness of SentryGlas® 5000 should resist “wet blanket” effect to get triggered off to a large extent in four side framed laminates even when tempered glass is used.

Photo: © Hamilton Litchfield Architects & Urban Designers

People on Zhangjiajie Glass Bridge, China

Note: The user should make his / her own decision for the type of glass to be used. Above considerations are for informational purposes only.

# Floorings in private residential areas and office areas for general use



Glass panel (1.0 x 1.0 Mts) mesh with the point load acting at the center as used for finite element modeling & calculations in Mepla

**LOAD REQUIREMENTS AS PER TABLE 3.1 OF AS 1170.1 2002**

IMPOSED LOADS

1. Uniform Load = 300 kg/m²
2. Point Load = 270 kg

LOAD ACTING FOR 1 HOUR @ 40 °C TEMP.

## 3.1 Reference values of imposed floor actions

| Type of activity / occupancy for part of the building or structure | | Specific uses | Uniformly distributed actions [kPa] | Concentrated actions [kN] |
|---|---|---|---|---|
| **A** | **Domestic and residential activities (also see category C)** | | | |
| A1 | Self-contained dwellings | General areas, private kitchens and laundries in self-contained dwellings | 1.5 | 1.8[1] |
| | | Balconies and roofs used for floor type activities, in self-contained dwellings | | |
| | | a. less than 1 m above ground level | 1.5 | 1.5 kN/m run along edge |
| | | b. other | 2.0 | 1.8[1] |
| | | Stairs[1] and landings in self-contained dwellings | 2.0 | 2.7 |
| A2 | | Non-habitable roof spaces in selfcontained dwellings | 0.5 | 1.4[1] |
| A2 | Other | General areas, bedrooms, hospital wards, hotel rooms, toilet areas | 2.0 | 1.8[1] |
| | | Communal kitchens | 3.0 | 2.7 |
| | | Balconies and roofs used for floor type activities with community access | same as areas providing access but not less than 4.0 | 1.8 |
| **B** | **Offices and work areas not covered elsewhere** | Operating theatres, X-ray rooms, utility rooms | 3.0 | 4.5 |
| | | Work rooms (light industrial) without storage | 3.0 | 3.5 |
| | | Offices for general use | 3.0 | 2.7[1] |

**TAB 1** [1] Refer to Table 3.1 of AS 1288 – 2006



## Floorings in private & residential areas / office areas for general use – with 3 x 6 mm / 0.24 inch glass + 2 x 1.52 mm / 60 mil SentryGlas®

| Widths [mm] | [in] | Deflection / Stress | Lengths [mm] 1000 Intact [MPa] | 1000 Broken | 1100 Intact [MPa] | 1100 Broken | 1200 Intact [MPa] | 1200 Broken | 1300 Intact [MPa] | 1300 Broken | 1400 Intact [MPa] | 1400 Broken | 1500 Intact [MPa] | 1500 Broken |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | 39.37 | Deflection | 2.59 | 3.79 | 2.74 | 4.06 | 2.86 | 4.28 | 2.96 | 4.46 | 3.03 | 4.6 | 3.08 | 4.71 |
| | | Stress | 28.81 | 32.72 | 29.52 | 33.68 | 30.13 | 34.5 | 30.41 | 34.95 | 30.79 | 35.47 | 31.07 | 35.88 |
| 1100 | 43.31 | Deflection | 2.74 | 4.06 | 2.94 | 4.41 | 3.10 | 4.70 | 3.23 | 4.94 | 3.34 | 5.15 | 3.42 | 5.31 |
| | | Stress | 29.52 | 33.68 | 29.47 | 33.63 | 30.12 | 34.50 | 30.50 | 35.07 | 30.97 | 35.7 | 31.35 | 36.22 |
| 1200 | 47.24 | Deflection | 2.86 | 4.28 | 3.10 | 4.70 | 3.30 | 5.06 | 3.47 | 5.38 | 3.62 | 5.65 | 3.74 | 5.88 |
| | | Stress | 30.13 | 34.5 | 30.12 | 34.50 | 30.07 | 34.44 | 30.48 | 35.04 | 31.04 | 35.77 | 31.52 | 36.38 |
| 1300 | 51.18 | Deflection | 2.96 | 4.46 | 3.23 | 4.94 | 3.47 | 5.38 | | | | | | |
| | | Stress | 30.41 | 34.95 | 30.5 | 35.07 | 30.48 | 35.04 | | | | | | |
| 1400 | 55.12 | Deflection | 3.03 | 4.60 | 3.34 | 5.15 | 3.62 | 5.65 | | | | | | |
| | | Stress | 30.79 | 35.47 | 30.97 | 35.70 | 31.04 | 35.77 | | | | | | |
| 1500 | 59.06 | Deflection | 3.08 | 4.71 | 3.42 | 5.31 | 3.74 | 5.88 | | | | | | |
| | | Stress | 31.07 | 35.88 | 31.35 | 36.22 | 31.52 | 36.38 | | | | | | |
| 1600 | 62.99 | Deflection | 3.120 | 4.80 | 3.49 | 5.45 | 3.83 | 6.07 | | | | | | |
| | | Stress | 31.47 | 36.39 | 31.8 | 36.84 | 32.1 | 37.08 | | | | | | |
| 1700 | 66.93 | Deflection | 3.15 | 4.86 | 3.54 | 5.56 | 3.9 | 6.23 | | | | | | |
| | | Stress | 31.62 | 36.64 | 32.05 | 37.17 | 32.34 | 37.51 | | | | | | |
| 1800 | 70.87 | Deflection | 3.18 | 4.91 | 3.58 | 5.65 | | | | | | | | |
| | | Stress | 31.73 | 36.83 | 32.22 | 37.45 | | | | | | | | |
| 1900 | 74.80 | Deflection | 3.19 | 4.95 | | | | | | | | | | |
| | | Stress | 31.62 | 36.77 | | | | | | | | | | |

| Widths [mm] | [in] | Deflection / Stress | Lengths [mm] 1700 Intact [MPa] | 1700 Broken | 1800 Intact [MPa] | 1800 Broken | 1900 Intact [MPa] | 1900 Broken |
|---|---|---|---|---|---|---|---|---|
| 1000 | 39.37 | Deflection | 3.15 | 4.86 | 3.18 | 4.91 | 3.19 | 4.95 |
| | | Stress | 31.62 | 36.64 | 31.73 | 36.83 | 31.62 | 36.77 |
| 1100 | 43.31 | Deflection | 3.54 | 5.56 | 3.58 | 5.65 | | |
| | | Stress | 32.05 | 37.17 | 32.22 | 37.45 | | |
| 1200 | 47.24 | Deflection | 3.90 | 6.23 | | | | |
| | | Stress | 32.34 | 37.51 | | | | |
| 1300 | 51.18 | Deflection | | | | | | |
| | | Stress | | | | | | |
| 1400 | 55.12 | Deflection | | | | | | |
| | | Stress | | | | | | |
| 1500 | 59.06 | Deflection | | | | | | |
| | | Stress | | | | | | |
| 1600 | 62.99 | Deflection | | | | | | |
| | | Stress | | | | | | |
| 1700 | 66.93 | Deflection | | | | | | |
| | | Stress | | | | | | |
| 1800 | 70.87 | Deflection | | | | | | |
| | | Stress | | | | | | |
| 1900 | 74.80 | Deflection | | | | | | |
| | | Stress | | | | | | |

**TAB 2**

**Glass construction**

3 x 6 mm (0.24 in) FT glass
+ 2 x 1.52 mm (60 mil) SentryGlas®

**Loads and load combinations**

Max. uniform live load = 300 kg/m²

Point load = 270 kg

**Scenario 1: All layers intact**
1.2 x Self weight + 1.5 x Imposed live load

**Scenario 2: Any one layer is accidentally broken**
1.0 x Self weight + 1.0 x Imposed live load

**Important notes**

1. The imposed live load has been considered to be acting for 1 hour @ 40 °C.
2. Young's Modulus for SentryGlas® E = 27.8 MPa
3. Deflection values for one layer broken scenario have been calculated for information only. It may not be design requirements.

Max. allowable deflection considered = Span / 300

The maximum values of deflection and stresses have been mentioned. For the majority of cases, it occurred for the point load case.

Permissible stresses for glass types for 1 hour load
- FT glass = 62.9 MPa
- Heat strengthened glass = 29.2 MPa

# Glass walkways for public areas

Photo: © King Power Mahanakhon

➔ Mahanakhon Skywalk, Bangkok, Thailand

**LOAD REQUIREMENTS AS PER TABLE 3.1 OF AS 1170.1 2002**

IMPOSED LOADS

1. Uniform Load = 500 kg/m²
2. Point Load = 360 kg

LOAD ACTING FOR 1 HOUR @ 40 °C TEMP.

## 3.1 Reference values of imposed floor actions

| Type of activity / occupancy for part of the building or structure | | Specific uses | Uniformly distributed actions [kPa] | Concentrated actions [kN] |
|---|---|---|---|---|
| **C** | **Areas where people may congregate** | | | |
| C4 | Areas with possible physical activities | Dance halls and studios, gymnasia | 5.0 | 3.6 |
| | | Drill halls and drill rooms | 5.0 | 9.0 |
| C5 | Areas susceptible to overcrowding | Assembly areas without fixed seating (concert halls, bars, vestibules, public lounges, places of worship, shopping malls and grandstands) | 5.0 | 3.6 |
| | | Stages in public assembly areas | 7.5 | 4.5 |
| D | Shopping areas | Shop floors for the sale and display of merchandise | 4.0 | 3.6 |

TAB 3 ➔

## Floorings in public areas susceptible to overcrowding – with 3 x 8 mm / 0.31 inch glass + 2 x 1.52 mm / 60 mil SentryGlas® (Commercial & retail spaces where people may assemble in case of emergency)

| Widths | | Deflection / Stress | Lengths [mm] 1200 | | 1400 | | 1600 | | 1800 | | 2000 | | 2200 | | 2400 | | 2600 | | 2800 | | 3000 | | 3200 | | 3400 | | 3600 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [mm] | [in] | | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken |
| 1200 | 47.24 | Deflection | 2.32 | 3.49 | 2.54 | 3.9 | 2.68 | 4.19 | 2.78 | 4.39 | 2.84 | 4.55 | 2.87 | 4.88 | 2.93 | 5.13 | 3.03 | 5.34 | 3.10 | 5.50 | 3.16 | 5.62 | 3.20 | 5.71 | 3.23 | 5.78 | 3.25 | 5.84 |
| | | Stress | 25.09 | 28.41 | 25.91 | 29.70 | 26.74 | 30.81 | 27.18 | 31.47 | 27.31 | 31.8 | 27.62 | 32.18 | 27.72 | 32.36 | 27.64 | 32.37 | 27.81 | 32.54 | 27.82 | 32.59 | 27.69 | 32.52 | 27.84 | 32.65 | 27.84 | 32.66 |
| 1400 | 55.12 | Deflection | 2.54 | 3.90 | 2.86 | 4.54 | 3.12 | 5.15 | 3.43 | 6.06 | 3.84 | 6.86 | 4.18 | 7.54 | 4.46 | 8.11 | | | | | | | | | | | | |
| | | Stress | 25.91 | 29.70 | 25.38 | 29.13 | 26.33 | 30.47 | 26.99 | 31.45 | 27.31 | 32.05 | 27.77 | 32.66 | 27.98 | 33.022 | | | | | | | | | | | | |
| 1600 | 62.99 | Deflection | 2.68 | 4.19 | 3.12 | 5.15 | 3.74 | 6.67 | 4.48 | 8.13 | 5.16 | 9.47 | | | | | | | | | | | | | | | | |
| | | Stress | 26.74 | 30.81 | 26.33 | 30.47 | 26.89 | 31.01 | 27.68 | 32.20 | 28.17 | 33.06 | | | | | | | | | | | | | | | | |
| 1800 | 70.87 | Deflection | 2.78 | 4.39 | 3.43 | 6.06 | 4.48 | 8.13 | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.18 | 31.47 | 26.99 | 31.45 | 27.68 | 32.20 | | | | | | | | | | | | | | | | | | | | |
| 2000 | 78.74 | Deflection | 2.84 | 4.55 | 3.84 | 6.86 | 5.16 | 9.47 | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.31 | 31.80 | 27.31 | 32.05 | 28.17 | 33.06 | | | | | | | | | | | | | | | | | | | | |
| 2200 | 86.61 | Deflection | 2.87 | 4.88 | 4.18 | 7.54 | | | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.62 | 32.18 | 27.77 | 32.66 | | | | | | | | | | | | | | | | | | | | | | |
| 2400 | 94.49 | Deflection | 2.93 | 5.13 | 4.46 | 8.11 | | | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.72 | 32.36 | 27.98 | 33.022 | | | | | | | | | | | | | | | | | | | | | | |
| 2600 | 102.36 | Deflection | 3.03 | 5.34 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.64 | 32.37 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2800 | 110.24 | Deflection | 3.10 | 5.50 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.81 | 32.54 | | | | | | | | | | | | | | | | | | | | | | | | |
| 3000 | 118.11 | Deflection | 3.16 | 5.62 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.82 | 32.59 | | | | | | | | | | | | | | | | | | | | | | | | |
| 3200 | 125.98 | Deflection | 3.20 | 5.71 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.69 | 32.52 | | | | | | | | | | | | | | | | | | | | | | | | |
| 3400 | 133.86 | Deflection | 3.23 | 5.78 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.84 | 32.65 | | | | | | | | | | | | | | | | | | | | | | | | |
| 3600 | 141.73 | Deflection | 3.25 | 5.84 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 27.84 | 32.66 | | | | | | | | | | | | | | | | | | | | | | | | |

TAB 4

**Glass construction**

3 x 8 mm (0.31 in) FT glass
+ 2 x 1.52 mm (60 mil) SentryGlas®

**Loads and load combinations**

Max. uniform live load = 500 kg/m²

Point load = 360 kg

**Scenario 1: All layers intact**
1.2 x Self weight
+ 1.5 x Imposed live load

**Scenario 2:**
Any one layer is accidentally broken
1.0 x Self weight
+ 1.0 x Imposed live load

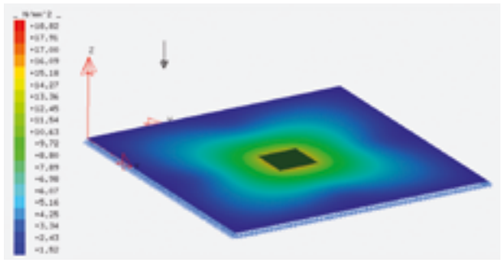
**Important notes**

1. The imposed live load has been considered to be acting for 1 hour @ 40 °C.
2. Young's Modulus for SentryGlas® E = 27.8 MPa
3. Deflection values for one layer broken scenario have been calculated for information only. It may not be design requirements.

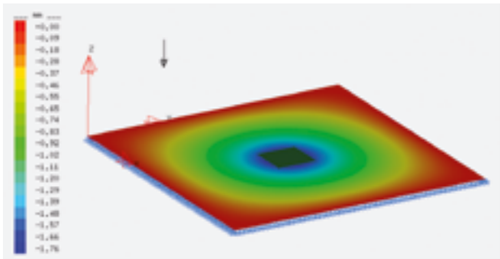
Max. allowable deflection considered = Span / 300

The maximum values of deflection and stresses have been mentioned.
For the majority of cases, it occurred for the point load case.

Permissible stresses for glass types for 1 hour load
- FT glass = 62.9 MPa
- Heat strengthened glass = 29.2 MPa



Maximum principal stress contours for the glass panel 1.0 x 1.0 mts under the imposed loads



Maximum deflection contours for glass panel 1.0 x 1.0 Mts under imposed loads

## Floorings in public areas susceptible to overcrowding – with 3 x 10 mm / 0.39 inch glass + 2 x 1.52 mm / 60 mil SentryGlas® (Commercial & retail spaces where people may assemble in case of emergency)

| Widths | | Deflection / Stress | Lengths [mm] 1600 | | 1800 | | 2000 | | 2200 | | 2400 | | 2600 | | 2800 | | 3000 | | 3200 | | 3400 | | 3600 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [mm] | [in] | | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken |
| 1600 | 62.99 | Deflection | 2.21 | 3.78 | 2.64 | 4.60 | 3.04 | 5.35 | 3.38 | 6.02 | 3.68 | 6.61 | 3.94 | 7.12 | 4.15 | 7.56 | 4.33 | 7.92 | 4.48 | 8.23 | 4.60 | 8.49 | 4.70 | 8.71 |
| | | Stress | 18.25 | 20.98 | 18.81 | 21.82 | 19.19 | 22.44 | 19.62 | 23.05 | 19.88 | 23.46 | 19.98 | 23.7 | 20.20 | 24.01 | 20.30 | 24.19 | 20.29 | 24.26 | 20.43 | 24.44 | 20.47 | 24.52 |
| 1800 | 70.87 | Deflection | 2.64 | 4.60 | 3.26 | 5.77 | 3.84 | 6.90 | 4.37 | 7.96 | 4.86 | 8.92 | 5.28 | 9.78 | 5.65 | 10.54 | | | | | | | | |
| | | Stress | 18.81 | 21.82 | 18.80 | 21.81 | 19.25 | 22.55 | 19.79 | 23.31 | 20.14 | 23.87 | 20.34 | 24.25 | 20.64 | 24.68 | | | | | | | | |
| 2000 | 78.74 | Deflection | 3.04 | 5.35 | 3.84 | 6.90 | 4.63 | 8.46 | 5.39 | 9.98 | | | | | | | | | | | | | | |
| | | Stress | 19.19 | 22.44 | 19.25 | 22.55 | 18.92 | 22.22 | 19.48 | 23.05 | | | | | | | | | | | | | | |
| 2200 | 86.61 | Deflection | 3.38 | 6.02 | 4.37 | 7.96 | 5.39 | 9.98 | | | | | | | | | | | | | | | | |
| | | Stress | 19.62 | 23.05 | 19.79 | 23.31 | 19.48 | 23.05 | | | | | | | | | | | | | | | | |
| 2400 | 94.49 | Deflection | 3.68 | 6.61 | 4.86 | 8.92 | | | | | | | | | | | | | | | | | | |
| | | Stress | 19.88 | 23.46 | 20.14 | 23.87 | | | | | | | | | | | | | | | | | | |
| 2600 | 102.36 | Deflection | 3.94 | 7.12 | 5.28 | 9.78 | | | | | | | | | | | | | | | | | | |
| | | Stress | 19.98 | 23.7 | 20.34 | 24.25 | | | | | | | | | | | | | | | | | | |
| 2800 | 110.24 | Deflection | 4.15 | 7.56 | 5.65 | 10.54 | | | | | | | | | | | | | | | | | | |
| | | Stress | 20.20 | 24.01 | 20.64 | 24.68 | | | | | | | | | | | | | | | | | | |
| 3000 | 118.11 | Deflection | 4.33 | 7.92 | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 20.30 | 24.19 | | | | | | | | | | | | | | | | | | | | |
| 3200 | 125.98 | Deflection | 4.48 | 8.23 | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 20.29 | 24.26 | | | | | | | | | | | | | | | | | | | | |
| 3400 | 133.86 | Deflection | 4.60 | 8.49 | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 20.43 | 24.44 | | | | | | | | | | | | | | | | | | | | |
| 3600 | 141.73 | Deflection | 4.70 | 8.71 | | | | | | | | | | | | | | | | | | | | |
| | | Stress | 20.47 | 24.52 | | | | | | | | | | | | | | | | | | | | |

TAB 5

Photo: © King Power Mahanakhon

Mahanakhon Skywalk, Bangkok, Thailand

**Glass construction**

3 x 10 mm (0.39 in) FT glass
+ 2 x 1.52 mm (60 mil) SentryGlas®

**Loads and load combinations**

Max. uniform live load = 500 kg/m²

Point load = 360 kg

**Scenario 1: All layers intact**
1.2 x Self weight
+ 1.5 x Imposed live load

**Scenario 2:**
**Any one layer is accidentally broken**
1.0 x Self weight
+ 1.0 x Imposed live load

**Important notes**

1. The imposed live load has been considered to be acting for 1 hour @ 40 °C.
2. Young's Modulus for SentryGlas® E = 27.8 MPa
3. Deflection values for one layer broken scenario have been calculated for information only.
   It may not be design requirements.

Max. allowable deflection considered = Span / 300

The maximum values of deflection and stresses have been mentioned. For the majority of cases, it occurred for the point load case.

Permissible stresses for glass types for 1 hour load

- FT glass = 62.9 MPa
- Heat strengthened glass = 29.2 MPa

## Floorings in public areas susceptible to overcrowding – with 3 x 12 mm / 0.47 inch glass + 2 x 1.52 mm / 60 mil SentryGlas® (Commercial & retail spaces where people may assemble in case of emergency)

| Widths | | Deflection / Stress | Lengths [mm] 2000 | | 2200 | | 2400 | | 2600 | | 2800 | | 3000 | | 3200 | | 3400 | | 3600 | | 3800 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [mm] | [in] | | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken | Intact [MPa] | Broken |
| 2000 | 78.74 | Deflection | 2.99 | 5.30 | 3.47 | 6.24 | 3.93 | 7.13 | 4.34 | 7.94 | 4.71 | 8.69 | 5.04 | 8.69 | 5.33 | 9.95 | 5.58 | 10.48 | 5.80 | 10.94 | 6.00 | 11.35 |
| | | Stress | 13.82 | 16.2 | 14.25 | 16.85 | 14.59 | 15.33 | 14.82 | 17.79 | 15.12 | 18.22 | 15.31 | 18.22 | 15.40 | 20.89 | 15.59 | 21.92 | 16.14 | 22.82 | 16.64 | 23.61 |
| 2200 | 86.61 | Deflection | 3.47 | 6.24 | 4.12 | 7.50 | 4.74 | 8.72 | 5.32 | 9.89 | 5.85 | 10.98 | 6.34 | 11.98 | 6.79 | 12.89 | | | | | | |
| | | Stress | 14.25 | 16.85 | 14.53 | 17.14 | 14.91 | 17.74 | 15.20 | 17.94 | 15.56 | 18.77 | 15.81 | 20.90 | 16.33 | 22.37 | | | | | | |
| 2400 | 94.49 | Deflection | 3.93 | 7.13 | 4.74 | 8.72 | 5.54 | 10.32 | 6.31 | 11.88 | | | | | | | | | | | | |
| | | Stress | 14.59 | 15.33 | 14.91 | 17.74 | 14.93 | 17.77 | 15.25 | 18.33 | | | | | | | | | | | | |
| 2600 | 102.36 | Deflection | 4.34 | 7.94 | 5.32 | 9.89 | 6.31 | 11.88 | | | | | | | | | | | | | | |
| | | Stress | 14.82 | 17.79 | 15.20 | 17.94 | 15.25 | 18.33 | | | | | | | | | | | | | | |
| 2800 | 110.24 | Deflection | 4.71 | 8.69 | 5.85 | 10.98 | | | | | | | | | | | | | | | | |
| | | Stress | 15.12 | 18.22 | 15.56 | 18.77 | | | | | | | | | | | | | | | | |
| 3000 | 118.11 | Deflection | 5.04 | 8.69 | 6.34 | 11.98 | | | | | | | | | | | | | | | | |
| | | Stress | 15.31 | 18.22 | 15.81 | 20.90 | | | | | | | | | | | | | | | | |
| 3200 | 125.98 | Deflection | 5.33 | 9.95 | 6.79 | 12.89 | | | | | | | | | | | | | | | | |
| | | Stress | 15.40 | 20.89 | 16.33 | 22.37 | | | | | | | | | | | | | | | | |
| 3400 | 133.86 | Deflection | 5.58 | 10.48 | | | | | | | | | | | | | | | | | | |
| | | Stress | 15.59 | 21.92 | | | | | | | | | | | | | | | | | | |
| 3600 | 141.73 | Deflection | 5.80 | 10.94 | | | | | | | | | | | | | | | | | | |
| | | Stress | 16.14 | 22.82 | | | | | | | | | | | | | | | | | | |
| 3800 | 149.61 | Deflection | 6.00 | 11.35 | | | | | | | | | | | | | | | | | | |
| | | Stress | 16.64 | 23.61 | | | | | | | | | | | | | | | | | | |

TAB 6

Photo: © rukawajung/shutterstock.com

**Glass construction**

3 x 12 mm (0.47 in) FT glass
+ 2 x 1.52 mm (60 mil) SentryGlas®

**Loads and load combinations**

Max. uniform live load = 500 kg/m²

Point load = 360 kg

**Scenario 1: All layers intact**
1.2 x Self weight
+ 1.5 x Imposed live load

**Scenario 2:**
**Any one layer is accidentally broken**
1.0 x Self weight
+ 1.0 x Imposed live load

**Important notes**
1. The imposed live load has been considered to be acting for 1 hour @ 40 °C.
2. Young's Modulus for SentryGlas® E = 27.8 MPa
3. Deflection values for one layer broken scenario have been calculated for information only. It may not be design requirements.

Max. allowable deflection considered = Span / 300

The maximum values of deflection and stresses have been mentioned. For the majority of cases, it occurred for the point load case.

Permissible stresses for glass types for 1 hour load
- FT glass = 62.9 MPa
- Heat strengthened glass = 29.2 MPa

# Contact


**FOR FURTHER INFORMATION**
on products from Kuraray, please visit www.kuraray.com.
You can find further information on our Trosifol® and SentryGlas® products at www.trosifol.com.

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