

Unofficial Translation

In the event of any doubt or misunderstanding arising from this translation, the standard in Thai will be held to be authoritative

TIS 880-2547 (2004) Thai Industrial Standard for Clear float Glass

1. Scope

1.1 This standard covers colorless clear float glass , general grade and special grade.

2. Definitions

For the purpose of this standard, the following definitions apply.

2.1 CLEAR FLOAT GLASS : Glass made from a fusion of a mixture of silica sand and other substances, at a temperature not below 1,400°C, formed into plate by a process in which a ribbon of glass is floated upon a molten tin at a temperature of about 800°C.
The glass are, as usual, transparent and colorless.

3. Grades

3.1 Clear float glass shall be classified into 2 types i.e.

3.1.1 General grade

3.1.2 Special grade

4. Sizes and tolerances

4.1 Sizes of transparent clear float glass

4.1.1 Thickness and tolerances shall conform to Table 1 and Table 2.
Compliance is checked by the test as described in clause 9.1.1.

4.1.2 Width and length shall be as specified on the label with a tolerance as given in Table 1 and Table 2.
Compliance is checked by the test as described in clause 9.1.2.

Table 1 Sizes and tolerances for general grade of clear float glass
(clauses 4.1.1 and 4.1.2)

Units in millimetres

Thickness		Width and length	
		Up to 3000	Over 3000 up to 5000
Requirement	Tolerance	Tolerance	Tolerance
2.0	± 0.2	+ 1 - 2	-
3.0			
4.0			
5.0		± 2	
6.0			
8.0	± 0.6	+ 2	+ 3
10.0		- 3	- 4
12.0	± 0.8	± 3	± 4
15.0			
19.0			
22.0	± 1.2	± 5	± 6
25.0			

Table 2 Sizes and tolerances for special grade of clear float glass
(clauses 4.1.1 and 4.1.2)

Units in millimetres

Thickness		Width and length	
		Up to 3000	Over 3000 up to 5000
Requirement	Tolerance	Tolerance	Tolerance
Not exceed 1.5	± 0.2	+ 1 - 2	-
Over 1.5 up to 2.5			
Over 2.5 up to 3.5			
Over 3.5 up to 4.5		± 2	
Over 4.5 up to 5.5			
Over 5.5 up to 6.0			

5. Requirements

5.1 Clear float glass

5.1.1 General grade clear float glass shall conform to the requirements as specified in Table 3.

5.1.2 Special grade clear float glass shall conform to the requirements as specified in Table 4.

6. Packing

6.1 Clear float glass shall be securely packed in suitable shock absorbing container.

Table 3 Requirements of clear float glass for general grade

(clause 5.1.1)

Type of defects	Requirements					Test methods in accordance with
Bubble ¹⁾	Upper limit of permissible number of bubbles					Clause 9.2
	Diameter of bubble (mm)					
	0.5 to less than 1.5	1.5 to less than 3.0	3.0 to less than 5	5.0 to less than 10.0	10.0 mm or over	
	5.5 x S ²⁾	1.1 x S ²⁾	0.44 x S ²⁾	0.22 x S ²⁾	0	
Foreign material ¹⁾	Upper limit of permissible number of foreign materials					
	Diameter of foreign material (mm)					
	0.5 to less than 1.5	1.0 to less than 2.0	2.0 to less than 3.0	3.0 mm or over		
	2.2 x S ²⁾	0.44 x S ²⁾	0.22 x S ²⁾	0		
Concentration of point-shape defects	As for bubbles of 1.5 mm or more in diameter and foreign materials of 1.0 mm or more in diameter, the distance between them shall be not less than 150 mm.					
Linear and zonal defects	There shall be no defect distinguished visually					
Flaw ¹⁾	Upper limit of permissible length of flaw (mm)					
	Area of one plate Less than 1 m ²	Area of one plate 1 m ² to less than 4 m ²		Area of one plate 4 m ² or over		
	60	60 x S ²⁾		240		
	Permissible upper limit of total sum of flaw lengths in one plate (mm)					
	Less than 1 m ² in area of one plate			Area of one plate 4 m ² or over		
	240			240 x S		

Table 3 Requirements of clear float glass for general grade (continued)

(clause 5.1.1)

Type of defects	Requirements	Test methods in accordance with
Crazing	There shall be no defect distinguished visually	Clause 9.2
Perspective distortion	Not to give distorted vision of straight stripe pattern	Clause 9.3
Defect on cut side	Defects in shape such as chipping of cut side, shelling, protrusion, slicing off, corners on/ off, etc. shall be that the deviation from the cutting line when seeing perpendicularly to the surface of plate glass is not more than the nominal value of thickness of plate glass and not more than 10 mm.	Clause 9.4

Remarks

- 1) Of the point-shape defects, those with gas are bubbles and those without it are foreign materials. The values of diameter of bubble and foreign material shall be the largest external diameter. However, in the value of diameter, halo part is not included.
- 2) In the calculation formula in Table, S is the area of the plate glass expressed with the unit of m² and around off down to the second decimal place in accordance with the specification in Table 3. The permissible upper limit of the number of bubbles and foreign materials and the permissible upper limit of the length of flaw and its total sum shall be the integer value obtained by discarding the decimal fraction of the value obtained by multiplying S by the coefficient.
- 3) Linear and zonal defects are those which exist in the inside or on the surface of the glass, such as line, non-uniformity of base, scratch, etc.

Table 4 Requirements of clear float glass for special grade
(Clause 5.1.2)

Type of defects	Part of plate glass ¹⁾	Requirements								Test method in accordance with
Bubble ²⁾		Upper limit of permissible number of bubbles in plate less than 2.6 mm in thickness				Upper limit of permissible number of bubbles in plate 2.6 mm to 6.0 mm in thickness				Clause 9.2
		Diameter of bubble (mm)				Diameter of bubble (mm)				
		0.5 to less than 1.0	1.0 to less than 1.5	1.5 to less than 2.0	2.0 or over	0.5 to less than 1.0	1.0 to less than 1.5	1.5 to less than 2.0	2.0 or over	
	Middle	2.6 x S ²⁾	2.6 x S ²⁾	0.44 x S ²⁾	0	1.3 x S ²⁾	1.3 x S ²⁾	0.44 x S ²⁾	0	
	Outer					2.6 x S ²⁾	2.6 x S ²⁾	0.44 x S ²⁾	0	
	Peripheral	-	-	-	0	-	-	-	0	
Foreign material ²⁾		Upper limit of permissible number of foreign materials in plate less than 2.6 mm in thickness				Upper limit of permissible number of foreign materials in plate 2.6 mm to 6.0 mm in thickness				
		Diameter of foreign materials (mm)				Diameter of foreign materials (mm)				
		0.3 to less than 1.0		1.0 or over		0.3 to less than 1.0		1.0 or over		
	Middle	2.2 x S ²⁾		0		0.44 x S ²⁾		0		
	Outer					1.3 x S ²⁾		0		
	Peripheral	-		0		-		0		
Concentration of defects	Whole	As for bubbles of 0.50 or more in diameter and foreign materials of 0.3 mm or more in diameter, within middle and outer part, the distance between two bubbles, two foreign materials, or bubble and foreign material shall be 150 mm or more.								

Table 4 Requirements of clear float glass for special grade (continued)

Type of defect	Parts of plate glass ¹⁾	Requirements			Test method in accordance with
Linear and zonal defects	Whole	There shall be no visually distinguishable defect in the middle part and outer part of the plate.			Clause 9.2
Flaw	Middle	There shall be no defect distinguished visually.			
	Outer	Upper limit of permissible length of flaw (mm)			
		Length of flaw			
		Less than 1 m ² in area of one plate	1 m ² or more to 4 m ² excl. in area of one plate	4 m ² or more in area of one plate	
		30	30 x S ³⁾	120	
	Peripheral	-			
Slight flaw	Middle	There shall be no flaw exceeding 15 mm in length			
	Outer	-			
	Peripheral	-			
Crazing	Whole	There shall be no defect distinguished visually.			
Perspective distortion	Whole	The linear stripe pattern shall not be seen to be distorted			Clause 9.3
Defect on cut side	Whole	Such defects as chipping on cut side, shelling, protrusion, slicing off , corners off etc., shall be that the deviation from the cutting line when seeing perpendicularly to the surface of plate glass is not more than the nominal value of thickness of plate glass.			Clause 9.4

- Remark :
- 1) Middle part, outer part, peripheral part of clear float glass for special grade as shown in Figure 1.
 - 2) Of the point-shape defects, those with gas are bubbles and those without it are foreign materials. The values of diameter of bubble and foreign material shall be the largest external diameter. However, in the value of diameter, halo part is not included.
 - 3) In the calculation formula in Table, S is the area of the plate glass expressed with the unit of m² and around off down to the second decimal place in accordance with the specification in Table 4. The permissible upper limit of the number of bubbles and foreign materials and the permissible upper limit of the length of flaw and its total sum shall be the integer value obtained by discarding the decimal fraction of the value obtained by multiplying S by the coefficient.
 - 4) Linear and zonal defects are those which exist in the inside or on the surface of the glass, such as line, non-uniformity of base, scratch, etc.

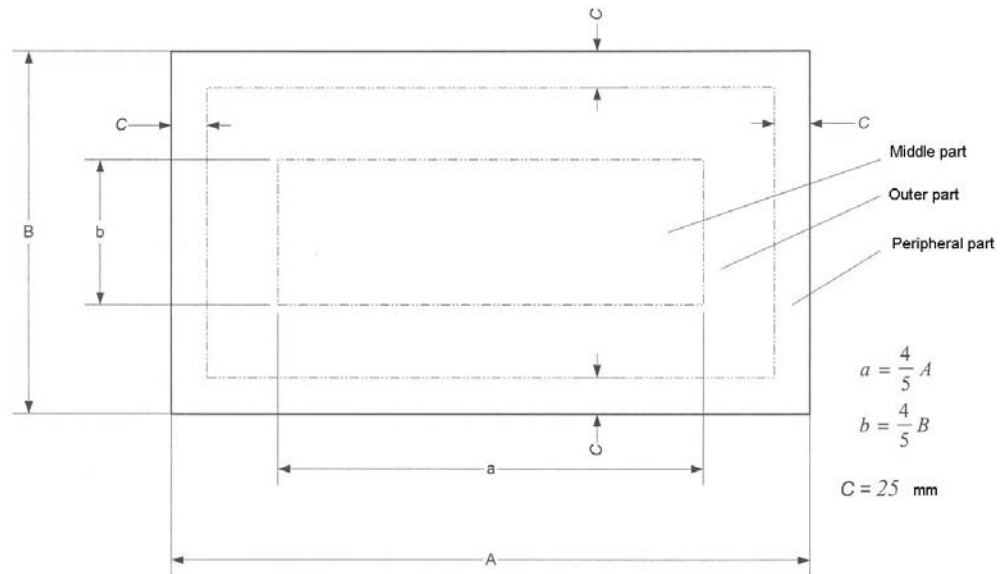


Figure 1 Middle part, outer part and peripheral part of plate glass for special grade
(Table 4)

7. Marking and labelling

7.1 Every unit of clear float glass containers shall bear at least number, letter or mark clearly and legibly indicating the following information:

- (1) The term "Clear float glass"
- (2) Grade
- (3) Size (width × length × thickness) expressed in mm
- (4) Number
- (5) Month and year of manufacture
- (6) Name of manufacturer or factory, or registered trade mark
- (7) Country of manufacture

In case foreign language is used, the meaning shall correspond to that in Thai specified above.

8. Sampling and Criteria for conformity

8.1 Sampling and criteria for conformity shall be in accordance with Annex A.

9. Tests

9.1 Size

9.1.1 Thickness

By means of a measuring device accurate to 0.01 mm, measure the thickness of the sample at four points of intersection between the diagonal and the parallel line spaced at not less than 15 mm from edge. The average thickness value of each sample shall be reported.

9.1.2 Width and length

By means of a measuring device accurate to 1 mm, measure the width and length of the sample at points parallel to and spaced at 50 mm from edge. The average thickness value of each sample shall be reported.

9.2 Bubbles, foreign material, linear and zonal defects, and flaw

9.2.1 Apparatus

9.2.1.1 By means of measuring device accurate to 0.1 mm or a metal rule accurate to 0.5 mm.

9.2.1.2 The fluorescent lamp to be used shall be 40 W cool white fluorescent lamp of 120 cm in length and, if the length exceeding 120 cm is required, plural lamps shall be installed touching end by end in tandem.

9.2.2 Test method

Illuminating the specimen glass put on the position 1000 mm apart from and parallel to the wall from the black side, and observing visually the specimen from the front side. The distance between the specimen glass and the observer shall be approximately 50 cm in the case of bubble, foreign material and crazing, and some 4000 mm for general grade and 2000 mm for special grade in case detection of linear and zonal defects and crazing. (see figure 2)

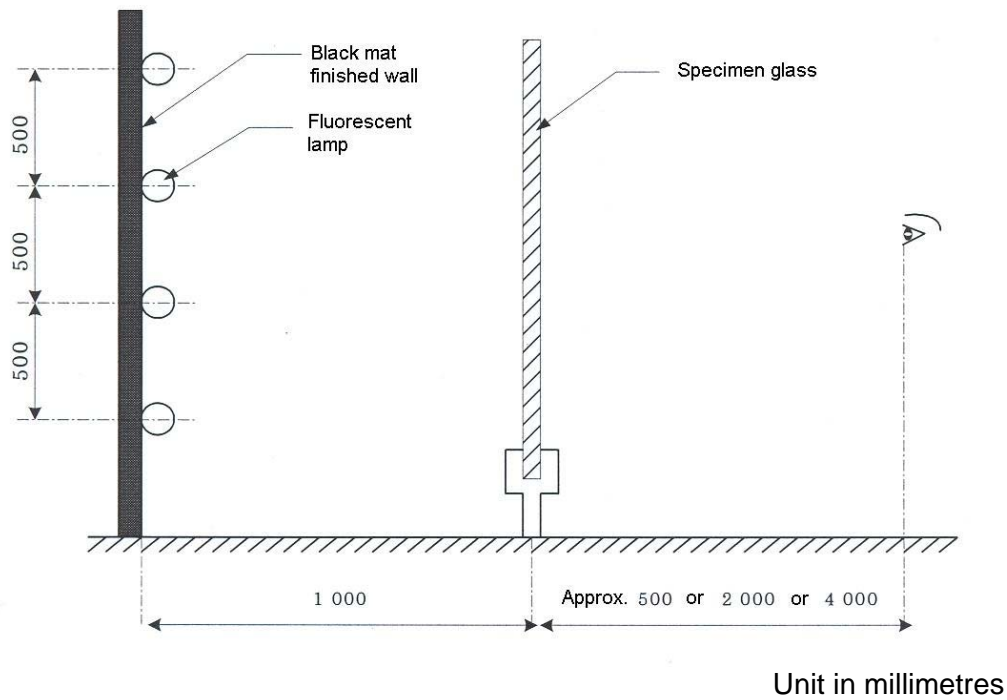


Figure 2 Arrangement for detecting defects
(clause 9.2.2)

9.3 Perspective distortion

9.3.1 Apparatus

A square screen of about 2 500 mm with parallel black and white stripes, each 25 mm wide, is forming 45° to the vertical (see figure 3).

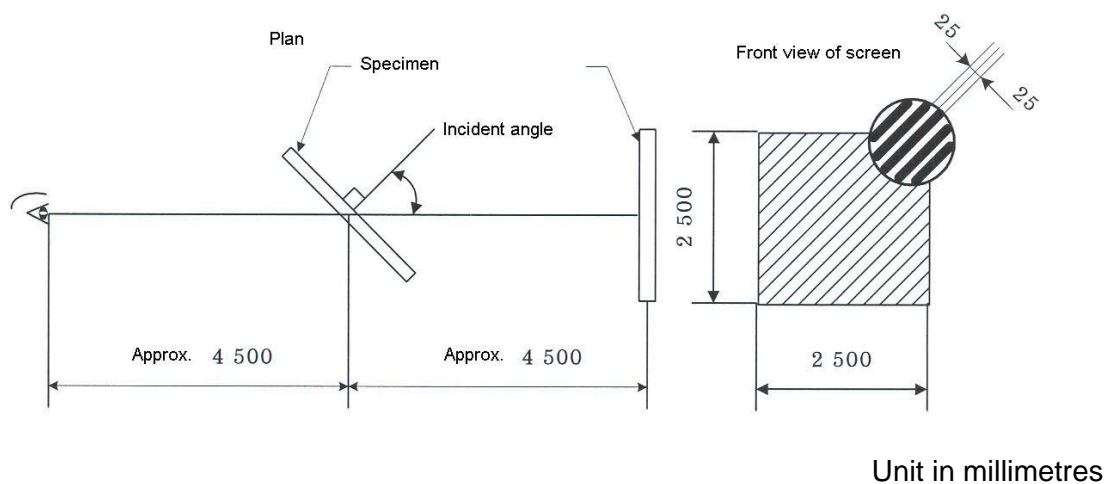


Figure 3 Arrangement for test on perspective distortion
(clause 9.3.1 and 9.3.2)

9.3.2 Procedure

Erect the sample of adequate size to cover the screen when rotated to the angle given in Table 5, at mid point between the screen and the inspector, i.e. at about 4500 mm from each. The inspector shall look through the middle line along the entire width of the sample such that the direction of viewing is at right angle to the screen and forms an incident angle to the sample as given in Table 5 (see Figure 3)

Appearance shall be reported.

Note Erection of the sample for this test shall be such that the drawing direction as in the plate manufacturing process is set in vertical plane. When the drawing direction in the plate manufacturing process is not clear, observation shall be made for two directions to assume the direction in which stranger waves are shown as the direction of drawing.

Table 5
Degrees of incident angle for waving test
(clause 9.3.2)

Thickness of clear float glass, mm	Incident angle (degree)	
	General grade	Special grade
Less than 2.5	40	45
2.5 to less than 3.5	45	55
3.5 and over	50	60

9.4 Defects on cut side

Defects in shape such as chipping of cut side, shelling, protrusion, slicing off, corners on/off shall be that the deviation from the cutting line when seeing perpendicularly to the surface of plate glass. (see Figure 4)

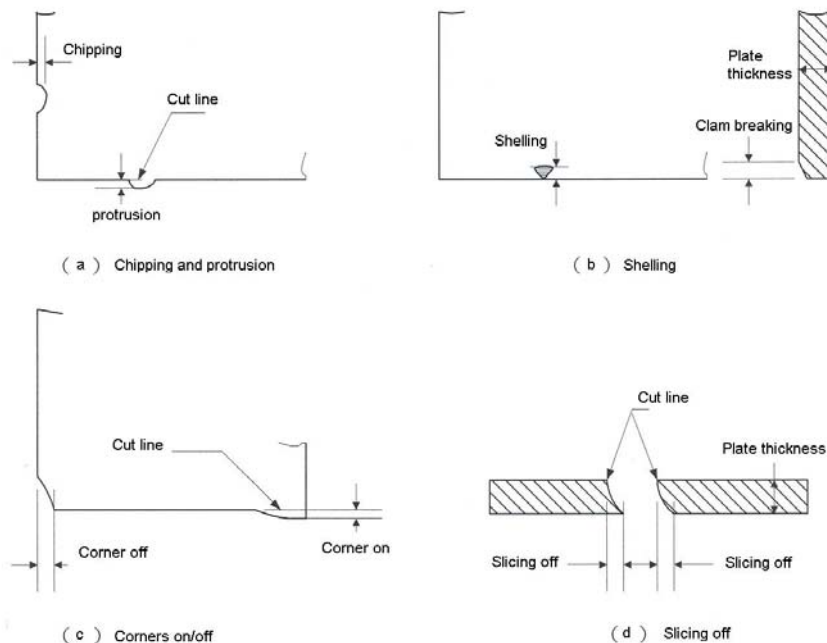


Figure 4 Defects on cut side
(clause 9.4)

Annex A.
Sampling and criteria for conformity
(clause 8.1)

A.1 Lot: Clear float glasses of the same type and thickness made by the same process which are manufactured, delivered or purchased at the same time.

A.2 Sampling and criteria for conformity shall comply with the following sampling plan or other technically equivalent plan.

A.2.1 Sampling

Samples shall be taken at random from the same lot as given in Table A.1.

Table A.1 Sampling plan
(clauses A.2.1 and A.2.2)

Lot size sheets	Sample size sheets	Acceptance number
Up to 500	8	1
Over 500	13	2

A.2.2 Criteria for conformity

Provided the number of samples failing to comply with each of the requirements of clauses 4 and 5 does not exceed the acceptance number given in Table A.1, that lot shall be deemed to comply with this standard.