

## Unofficial Translation

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

### **Thai Industrial Standard For Automobile Safety Glasses : Tempered Glass TIS 197-2536(1993)**

#### **1. Scope**

- 1.1 This standard specifies thickness and tolerances, material, requirements, mark and label, sampling and criteria for conformity and testing for automobile safety glasses: tempered glass.
- 1.2 This standard covers tempered safety glass which is transparent, both coloured and colourless, intended to be used as any glass part of a motor vehicle except windscreen; it does not cover safety glass made for the purpose of bullet resistance.

#### **2. Definitions**

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

- 2.1 SAFETY GLASS: A glass which has been subjected to a specific process such that if fractured, it is less likely to cause severe cuts or serious physical injuries.
- 2.2 AUTOMOTIVE SAFETY GLASS: TEMPERED SAFETY GLASS hereinafter referred to as TEMPERED GLASS: A safety glass intended for automobile part which is made by subjecting to a heat treatment to effect a compression stressed layer on the glass surface which will increase resistance to external forces and temperature changes, and cause the glass to disintegrate into small pieces if fractured.
- 2.3 SCRATCH: Scar produced on the glass surface either during manufacturing or handling process of the product. The scar can be classified as heavy and light. A heavy scar can be easily felt but a light scar may not.
- 2.4 INCLUSION MATERIALS: Coloured bubbles, unmelted substance and devitrification contained in the glass.

#### **3. Thickness and tolerances**

- 3.1 Thickness and tolerances of tempered glass shall conform to Table 1.  
Test shall conform to TIS 195, "Test methods for automobile safety glasses".

#### **4. Material**

- 4.1 It is recommended that tempered glass be made of float glass.

Table 1  
Thickness and tolerances  
(clause 3.1)

| Units in millimetres |           |           |
|----------------------|-----------|-----------|
| Nominal thickness    | Thickness | Tolerance |
| 3.1                  | 3.1       | ± 0.2     |
| 3.5                  | 3.5       |           |
| 4                    | 4.0       | ± 0.3     |
| 5                    | 5.0       |           |
| 6                    | 6.0       |           |

## 5. Requirements

### 5.1 Appearance

Appearance shall conform to Table 2.

Test shall be in accordance with TIS 195.

### 5.2 Visible light transmission

When tested as in TIS 195, the visible light transmission for light shall not be less than 70%.

### 5.3 Impact resistance

When tested as in TIS 195, the test piece shall not crack nor fracture.

### 5.4 Fragmentation

When tested as in TIS 195, the following shall be complied with:

5.4.1 There shall be not less than 40 fragments nor more than 400 fragments in the square of size 50 x 50 mm. In case of glasses having a nominal thickness not exceeding 3.5 mm, if there are less than 40 fragments in the coarsest area, further count in a square of 100 mm side including the former area shall not be less than 160.

5.4.2 There shall be not more than 2 fragments exceeding 3 mm<sup>2</sup> but not over 5 mm<sup>2</sup> in area.

5.4.3 There shall be not more than 5 fragments of length exceeding 75 mm to a maximum of 150 mm.

5.4.4 If elongated fragment extending to the edge of the specimen forms an angle not less than 45° with it, the length of that fragment shall be less than 60 mm.

Table 2  
Appearance of tempered glass  
(clause 5.1)

| Defect              | Limitation   |
|---------------------|--|
| Bubbles             | Length : 3.0 mm - 15.0 mm<br>Width : 1.0 , max.                |
| Scratches           | Heavy : 3.0 mm - 15.0 mm long<br>Light : 5.0 mm - 30.0 mm long |
| Inclusion materials | 0.5 mm - 1.5 mm long   |

Table 2  
Appearance of tempered glass (continued)

|                            |  |
|----------------------------|--|
| Aggregate of above defects | <p>(1) Aggregate of defects of dimension below the corresponding minimum given above may be allowed provided that the visible light transmission is not impaired when tested according to TIS 195.</p> <p>(2) Aggregate of up to 5 defects within allowable limits of size and length given above may be allowed within an arbitrary circle of 300 mm provided that among these there is not more than 1 large defect.</p> <p>Large defects involve the following:<br/>Bubbles 10.0 mm - 15.0 mm long<br/>Heavy scratches 10.0 mm - 15.0 mm long</p> |
| Tong mark                  | <p>Permissible in the area not exceeding 8 mm from the periphery for flat glass.</p> <p>Permissible in the area not exceeding 12 mm from the periphery for curved glass.</p>   |
| Mold mark                  | Permissible in the area not exceeding 12 mm from the periphery for curved glass.   |
| Crack                      | Not permissible  |
| Edge chipping              | Permissible in the area not exceeding 1.0 mm from the periphery. Unexposed chipping allowed up to the concealing range, none which might be obstacle in use.   |

## 6. Mark and label

- 6.1 There shall be at least number, letter or mark indicating clearly, legibly and durably the following information at any corner on each pane of tempered safety glass.
- (1) The term "Tempered glass" or "Tempered" or the letter "T"
  - (2) Name of manufacturer or factory, or registered trade mark
- 6.2 There shall be at least number, letter or mark indicating clearly and legibly the following information on each package.
- (1) The term "Tempered glass" or "Tempered" or the letter "T"
  - (2) Thickness in millimetres
  - (3) Number of sheets in package
  - (4) Lot code
  - (5) Name of manufacturer or factory, or registered trade mark
- 6.3 In case foreign language is used, the meaning shall correspond to that in Thai specified above.
- 6.4 Any person who manufactures products complying with this standard may use the Standards Mark in connection with his products only after having received a license from the Industrial Product Standards Council.

## 7. Sampling and criteria for conformity

- 7.1 Lot: Tempered glasses of the same thickness made from the same material under the same conditions and in the same continuous run which are manufactured or delivered or purchased at one time.

- 7.2 Sampling and acceptance shall comply with the following plan or other technically equivalent plan.
- 7.2.1 Sampling and acceptance for test on thickness, appearance and visible light transmission
- 7.2.1.1 Three samples shall be drawn at random from a lot as test pieces.
- 7.2.1.2 Provided all the test pieces comply with the requirements of clauses 3.1, 5.1 and 5.2, that lot shall be deemed to comply with the requirements.
- 7.2.2 Sampling and acceptance for test on impact resistance
- 7.2.2.1 Six samples shall be drawn at random from a lot as test pieces.
- 7.2.2.2 Provided that at least 5 test pieces comply with clause 5.3, that lot shall be deemed to comply with the requirement.  
Failure of more than 2 test pieces shall constitute failure of the lot to meet the requirement.  
If 2 test pieces fail to comply with any of clause 5.3, 6 more test pieces shall be drawn for retest all of which shall comply with clause 5.3 for the lot to be deemed in compliance with the requirement.
- 7.2.3 Sampling and acceptance for fragmentation test
- 7.2.3.1 Sampling
- (1) Flat or cylindrical-curved glass  
Three samples shall be drawn at random from a lot as test pieces.
- (2) Complex-curved glass  
Four samples shall be drawn at random from a lot as test pieces.
- 7.2.3.2 Acceptance
- (1) Flat or cylindrical-curved glass  
Provided that all test pieces comply with clause 5.4, that lot shall be deemed to comply with the requirement.  
If 1 test piece fails to comply with clause 5.4, 1 more test piece shall be drawn for retest at the same position as the failing one and shall meet the requirement of clause 5.4 for the lot to be deemed in compliance with the requirement.  
If more than 1 test piece fails to comply with clause 5.4, 3 more test pieces shall be drawn for retest all of which shall meet the requirement of clause 5.4 for the lot to be deemed in compliance with the requirement.
- (2) Complex-curved glass  
Provided that all test pieces comply with clause 5.4, that lot shall be deemed to comply with the requirement.  
If 1 test piece fails to comply with clause 5.4, 1 more test piece shall be drawn for retest at the same point of impact as the failing one and shall meet the requirement of clause 5.4 for the lot to be deemed in compliance with the requirement.  
If 2 or 3 test pieces fail to comply with clause 5.4, 4 more test pieces shall be drawn for retest all of which shall meet the requirement of clause 5.4 for the lot to be deemed in compliance with the requirement.
- 7.3 Criteria for conformity  
Provided the samples meet all the requirements of clauses 7.2.1.2, 7.2.2.2 and 7.2.3.2, that lot of tempered glasses shall be deemed to comply with this standard.