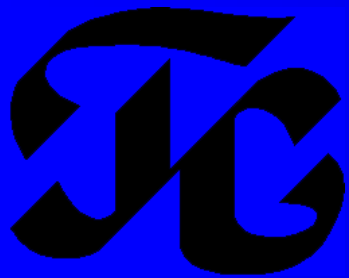




New standard on laminated glass for buildings

Olga A. Emelianova, Alexander G. Chesnokov
(Glass Research Institute, Moscow)

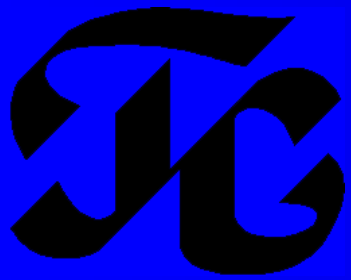


Now we present

Intergovernmental Standard
GOST 30826-2001

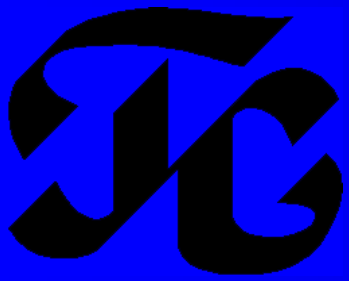
Laminated sheet building glass.
Specifications

Interstate Scientific and Technical Committee of
Standardization, Technical Regulation and
Certification in Construction field (ISTCS)



Development phases of GOST 30826-2001

- 1993 – development start;
- 1996 – first version of the standard;
- 2000 – second version of the standard;
- 2001 – approval by Interstate Scientific and Technical Committee of Standardization, Technical Regulation and Certification in Construction field ;
- January 01, 2003 – the standard was put into force in Russia



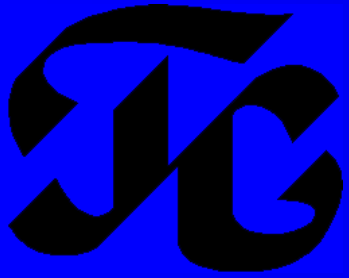
Laminated glass types in GOST 30826-2001

- resistant to mechanical loads
 - secure during use (resistant to soft body impact);
 - resistant to hard objects impact;
 - bulletproof;
 - explosion protective;
- fire proof;
- sound insulating;
- frost-resisting;
- laminated glass with special properties (for example, with radio-interference defense, biological protection, informational defense, increased endurance etc).



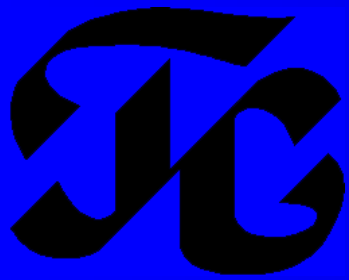
Flat glass types applied for laminated glass manufacturing

Glass type	Norm	Glass mark
Flat	GOST 111	M0, M1, M2
Figured	GOST 5533	U(Y)
Wire	GOST 7481	A
Polished wire	—	A _п
Tint	—	T
Hardened:		
Chemically strengthened	—	X
Tempered	GOST 30698	Z(3)
Solar-control	—	S(C)
Energy-efficient:		
With hard coating	GOST 30773	K
With soft coating	—	I(И)



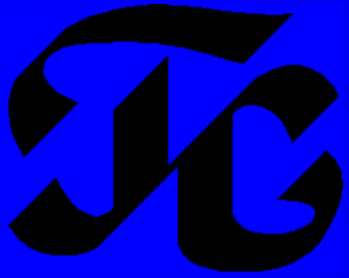
General requirements to laminated glass

- Appearance factors,
- Requirements to geometrical dimensions,
- Requirements to edge working,
- Ultraviolet radiation effect resistance,
- Moisture resistance,
- Optical distortions.



Tolerate number of local defects

Number of laminated plates	Magnitude of defect, L, mm				
	0,5 < L ≤ 1,0		1,0 < L ≤ 3,0		
	For a plate area, m ²				
	For all dimensions (areas)	≤ 1,0	1,1 – 2,0	2,1 – 7,9	≥ 8,0
2	Tolerate but in unfocused form *	1	2	1 in m ²	1,2 in m ²
3		2	3	1,5 in m ²	1,8 in m ²
4		3	4	2 in m ²	2,4 in m ²
≥ 5		4	5	2,5 in m ²	3 in m ²



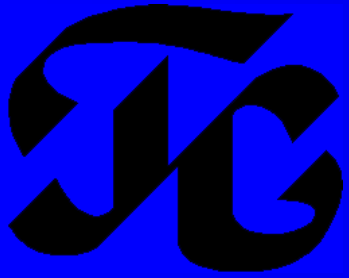
Tolerate linear defects

Area of the laminated glass, m ²	Number of defects with length, mm	
	From 3 to 10	Above 10 to 30
Below 5	1	Debarred
From 5 to 8 inclusive	2	1
Above 8	3	2



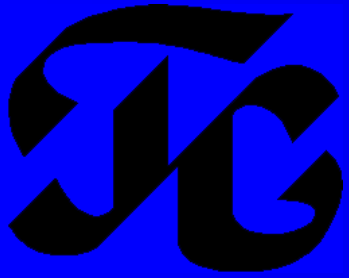
Extreme deviations in length and width dimensions

Nominal dimension to length or width, mm	Thickness of laminated glass ≤ 12	Thickness of laminated glass > 12	
		Each glass plate has nominal thickness < 6	At least on plate has thickness ≥ 6
Below 1100	+2,0/-2,0	+2,5/-2,0	+3,5/-2,5
From 1100 to 1500	+3,0/-2,0	+3,5/-2,0	+4,5/-3,0
From 1500 to 2000	+3,0/-2,0	+3,5/-2,0	+5,0/-3,5
Above 2000	+3,5/-2,5	+5,0/-3,0	+6,0/-4,0



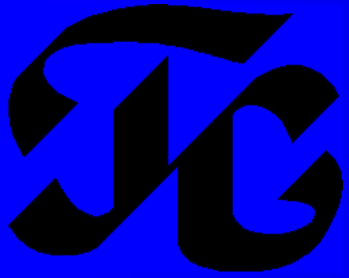
Requirements to edge working

- Similar to EN ISO 12543:5



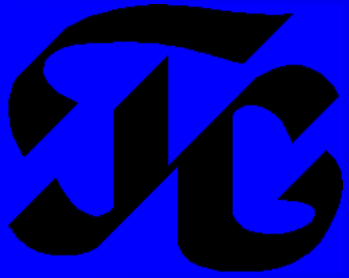
ultraviolet radiation effect resistance

- Similar to EN ISO 12543:4 – UV radiation action during 100 hours



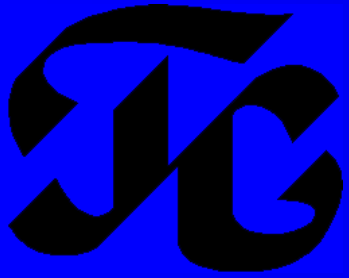
Moisture resistance

- Similar to EN ISO 12543:4 – moisture action at 50° C temperature (if glass has absorptance above 15 % - 70° C) during 14 days



Optical distortions

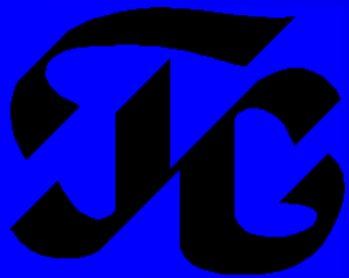
- Similar to EN 572-2 – “brick wall”, 60°



Requirements to safety glass (soft body impact)

- Similar to ANSI Z97.1-1984 and DIN 52337

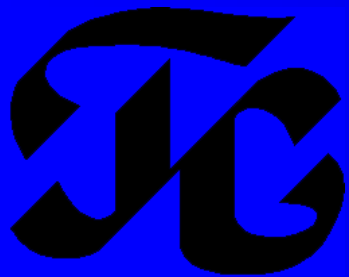
Protection class	Drop height, mm	Bag mass, kg
SM(CM) 1	300± 30	45±1
SM(CM) 2	700± 30	
SM(CM) 3	1200± 30	
SM(CM) 4	2000± 50	



Requirements to hard objects impact resistant glass

Similar to EN 356

Protection class	Drop height, mm	Total number of hits	Mass, kg
Ball test			
P1A	1500± 20	3	4,108±0,4
P2A	3000± 20	3	
P3A	6000± 20	3	
P4A	9500± 20	3	
P5A	9500± 20	3x3	
Hammer and axe test			
P6B	-	от 30 до 50	2,0±0,1
P7B	-	св. 50 до70	
P8B	-	св. 70	
Note: Hammer and axe test will be implemented from 01.01.2004			



Requirements to bulletproof glass

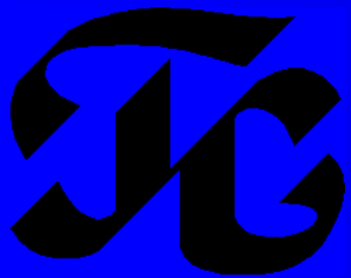
Protection class	Fire-arm type	Name and index of the cartridge	Bullet characteristics			Firing distance, m
			Core type	Mass, g	Velocity, m/s	
P(II)1	Makarov pistol PM(ИМ)	9-mm gun cartridge 57-H-181C with Pst(Пст) bullet	steel	5,9	315±10	5±0,05
	Nagan-type revolver	7,62-mm rev. cartridge 57-H-122 with R(P) bullet	lead	6,8	285±10	5±0,05
P(II)2	Special small-bore pistol PSM(ИСМ)	5,45-mm gun cartridge 7H7 with Pst(Пст) bullet	steel	2,5	320±15	5±0,05
	Tokarev pistol TT(ТТ)	7,62 gun cartridge 57-H-134C with Pst(Пст) bullet	steel	5,5	430±15	5±0,05
P(II)2a	12-gauge Shotgun	18,5-mm sporting cartridge	lead	35,0	400±10	5±0,05
P(II)3	AK-74 Kalashnikov automatic rifle	5,45-mm cartridge 7H6 with PS(ПС) bullet	thermostrengthened steel	3,4	900±10	5-10
	AKM Kalashnikov automatic rifle	7,62-mm cartridge 57-H-231 with PS(ПС) bullet	steel without thermostrengthening	7,91	725±15	5-10
P(II)4	AK-74 Kalashnikov automatic rifle	5,45-mm cartridge 7H10 with PP(ПП) bullet	thermostrengthened steel	3,6	900±10	5-10
P(II)5	Sniper rifle SVD(СВД)	7,62-mm cartridge 57-H-323C with LPS(ЛПС) bullet	steel without thermostrengthening	9,6	830±10	5-10
	AKM Kalashnikov automatic rifle	7,62-mm cartridge 57-H-231 with PS(ПС) bullet	thermostrengthened steel	7,9	725±15	5-10
P(II)5a	AKM Kalashnikov automatic rifle	7,62-mm cartridge 57-Б3-231 with BZ(БЗ) bullet	special	7,6	735±15	5-10
P(II)6	Sniper rifle SVD(СВД)	7,62-mm cartridge CT-M2	thermostrengthened steel	9,6	830±10	5-10
P(II)6a	Sniper rifle SVD(СВД)	7,62-mm cartridge 7-Б3-3 with B(Б)-32 bullet	special	10,4	820±20	5-10



Requirements to explosion protective glass

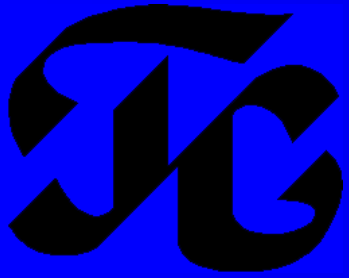
Protection class	Protection class correspondence with another documents and norms into force	TNT charge mass, kg	Distance from the possible explosion	Blast wave specific impulse, Pa/s	Pressure of blast wave, kPa
K1	DV(ДВ)5*	2	23	10	6.5
K2	DV(ДВ)4		12	20	15
K3	DV(ДВ)3		9	35	25
K4	DV(ДВ)2		5	55	65
K5	DV(ДВ)1		3	100	200
K6	A**	100	45	150	20
K7	B		30	220	35
K8	C		20	330	65
K9	D		15	500	100
K10	E		12	750	175
K11	ER1***	1000	35	900	100
K12	ER2		30	1500	150
K13	ER3		25	2200	200
K14	ER4		20	3200	250

Notes (references) – 1.* RD 77-7399-02-2001 “Protective Blastproof Glasses”, Central Directorate of Civil Defense and Emergency Situation, Moscow
 2. ** General Service Administration of USA norms;
 3. *** EN CEN norms.



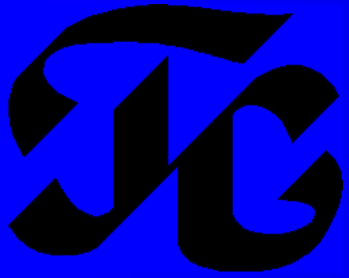
Requirements to fire proof glass

- Complete analog of EN 357



Requirements to sound insulating glass

- Analogue of prEN 12758-1



Requirements to frost-resisting glass

- Frost resisting glass must sustain influence of low temperatures from -50° C and lower depending on region of future exploitation (below minimal temperature of operation zone on 5° C)



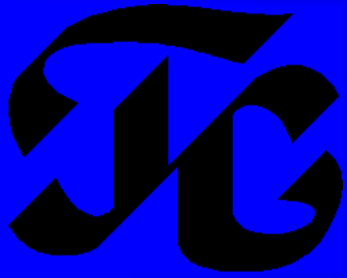
Requirements to laminated glass with special properties

- Specified in glass supply contract



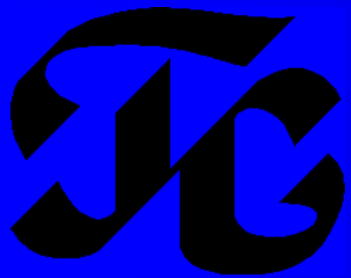
Remark

- Same laminated glass can reply several different special requirements (for example, it can be bulletproof and explosion-resistant). Such glass must be marked in accordance with all requirement classes.



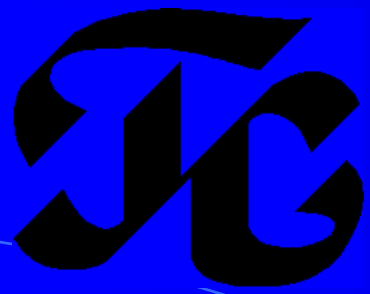
GOST 30826-2001 correspondence

- EN 356 Glass in building - Security glazing - Testing and classification of resistance against manual attack
- EN ISO 12543:1 Glass in building - Laminated glass and laminated safety glass - Part 1: Definitions and description of component parts (ISO 12543-1:1998)
- EN ISO 12543:2 Glass in building - Laminated glass and laminated safety glass - Part 2: Laminated safety glass (ISO 12543-2:1998)
- EN ISO 12543:3 Glass in building - Laminated glass and laminated safety glass - Part 3: Laminated glass (ISO 12543-3:1998)
- EN ISO 12543:4 Glass in building - Laminated glass and laminated safety glass - Part 4: Test methods for durability (ISO 12543-4:1998)
- EN ISO 12543:5 Glass in building - Laminated glass and laminated safety glass - Part 5: Dimensions and edge finishing (ISO 12543-5:1998)
- EN ISO 12543:6 Glass in building - Laminated glass and laminated safety glass - Part 6: Appearance (ISO 12543-6:1998)
- pr EN 12543:1998 Glass in building - Laminated glass and laminated safety glass - Part 7: Evaluation of conformity
- pr EN ISO 14440 Glass in building - Specification for security glazing - Explosion-pressure-resistant glazing - Classification and test method (ISO/DIS 14440:1994)
- ANSI Z97.1-1984 Safety Glazing Materials Used In Buildings Safety
- DIN 52337 Methods of testing flat glass for use in buildings; pendulum impact tests



Conclusions

- Joining in one document of all laminated glasses for building manifold is very comfortable for developers and customers
- GOST 30826-2001 is tightly bound with European standards and that fact lighten international trade
- GOST 30826-2001 takes into account specificity of laminated glass application in Russia



If you have question you
can address to presenter
or directly to developers:

Glass Research Institute

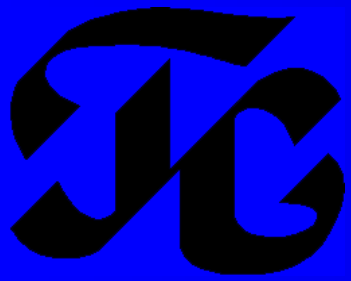
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Thank you for attention!