



High-rise building glazing for strict climatic conditions



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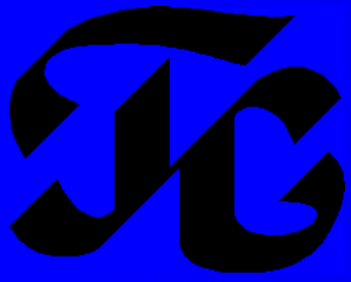
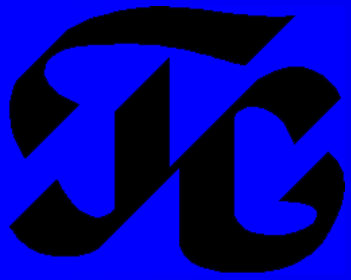


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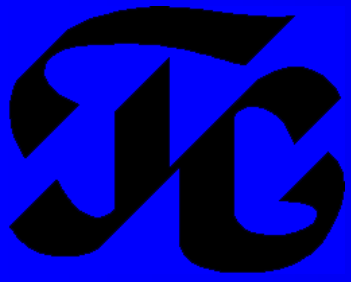


Introduction



«Riverside
Towers»
Complex,
Moscow

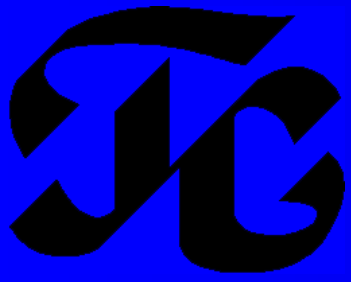
Eugeny Shelsov



Main trends in modern glass architecture



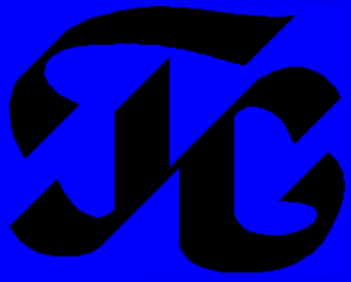
- number of floors increases;
- part of the glazing in façade area grows up to 80 % of façade area and more;
- sizes of used glass products increase.



Example of the state-of-art building



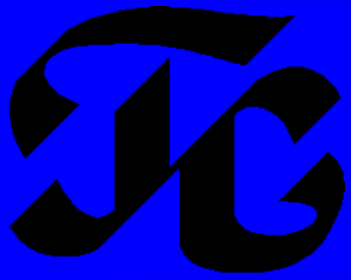
- Antaeus Hotel,
Yekaterinburg



Main glazing requirements



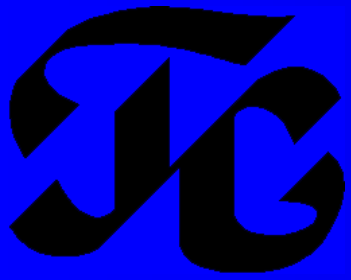
- safety;
- strength (resistance to loads and effects);
- optical properties (coefficients of light transmission, reflection and absorption; same coefficients for solar energy, ultraviolet radiation, optical distortions, colour);
- thermal properties (heat transfer resistance, glazing inner surface temperature, air and water permeability);
- noise insulation;
- durability;
- special properties (including fire resistance, impulse resistance, blast resistance, bullet resistance, thrust resistance etc).



Russian climate



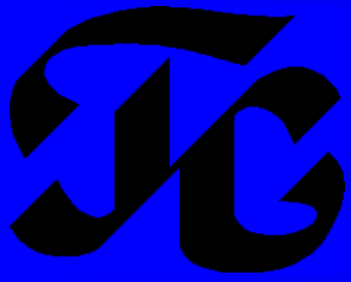
Yakutsk,
Eastern
Siberia



Russian climate (cont.)



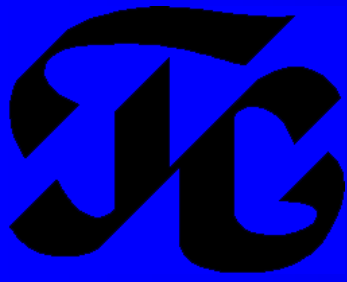
Norilsk,
The polar
night



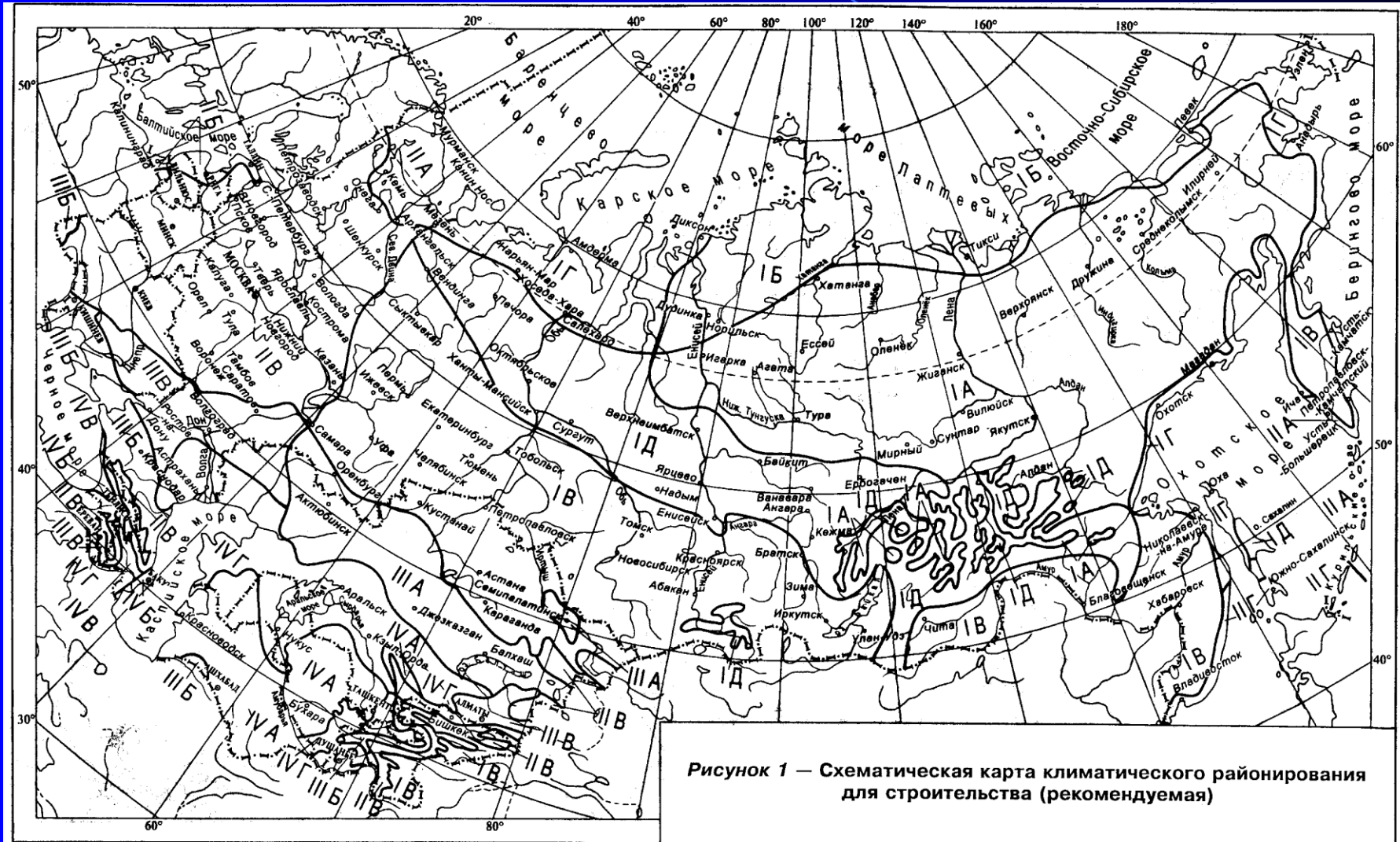
Russian climate (cont.)

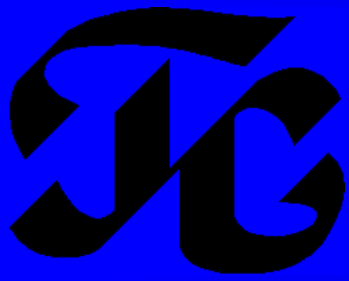


Sochi,
Subtropics



Climatic zoning

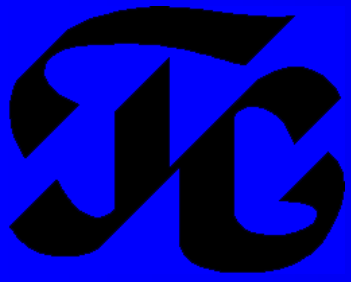




Examples of several Russian cities climatic parameters



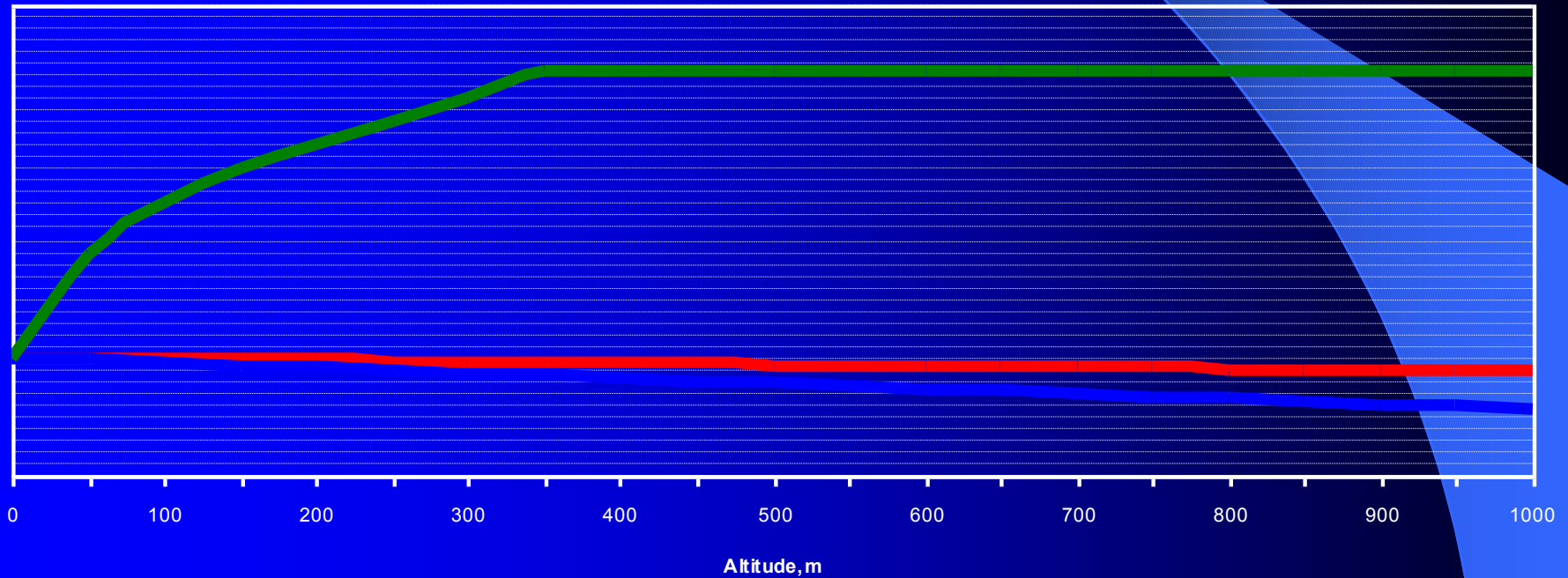
City	Absolute minimum of air temperature, °C	Mean air temperature during the coldest 5-days period, °C	Absolute maximum of air temperature, °C	Average air temperature of the hottest month, °C	barometric pressure, gPa	Maximum from wind speeds by rhumbs, m/s,	Normative wind load, kPa
Moscow	-42	-28	+37	+23,6	995	4,9	0,23
Saint Petersburg	-36	-30	+34	+22	1010	4,2	0,30
Volgograd	-35	-28	+44	+30	1000	8,1	0,38
Derbent	-19	-11	+38	+28,2	1015	5,2	0,60
Novosibirsk	-50	-42	+38	+24,6	995	5,7	0,38
Yakutsk	-64	-57	+38	+25,2	995	2,6	0,30

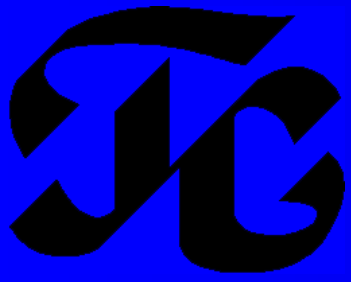


Climatic factors dependence from altitude



Temperature, atmospheric pressure and wind load dependence from altitude

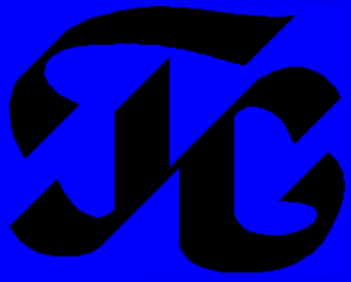




Main particularities of high-rise building glazing design



- Risk increase, appeared during assemble, exploitation and maintenance of glazing. This risk generates a need in more strict safety requirements.
- Complication of operational conditions due to loads and effects increase.
- Stricter requirement to aesthetic effect of the glazing due to glazing area growth.

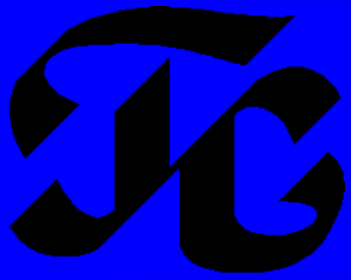


More strict safety requirements



«Alye parusa»
housing estate,
Moscow

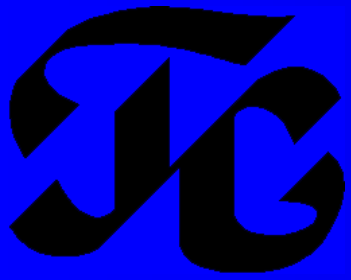
<http://fotomoskva.net.ru/>



Relevant factors for design



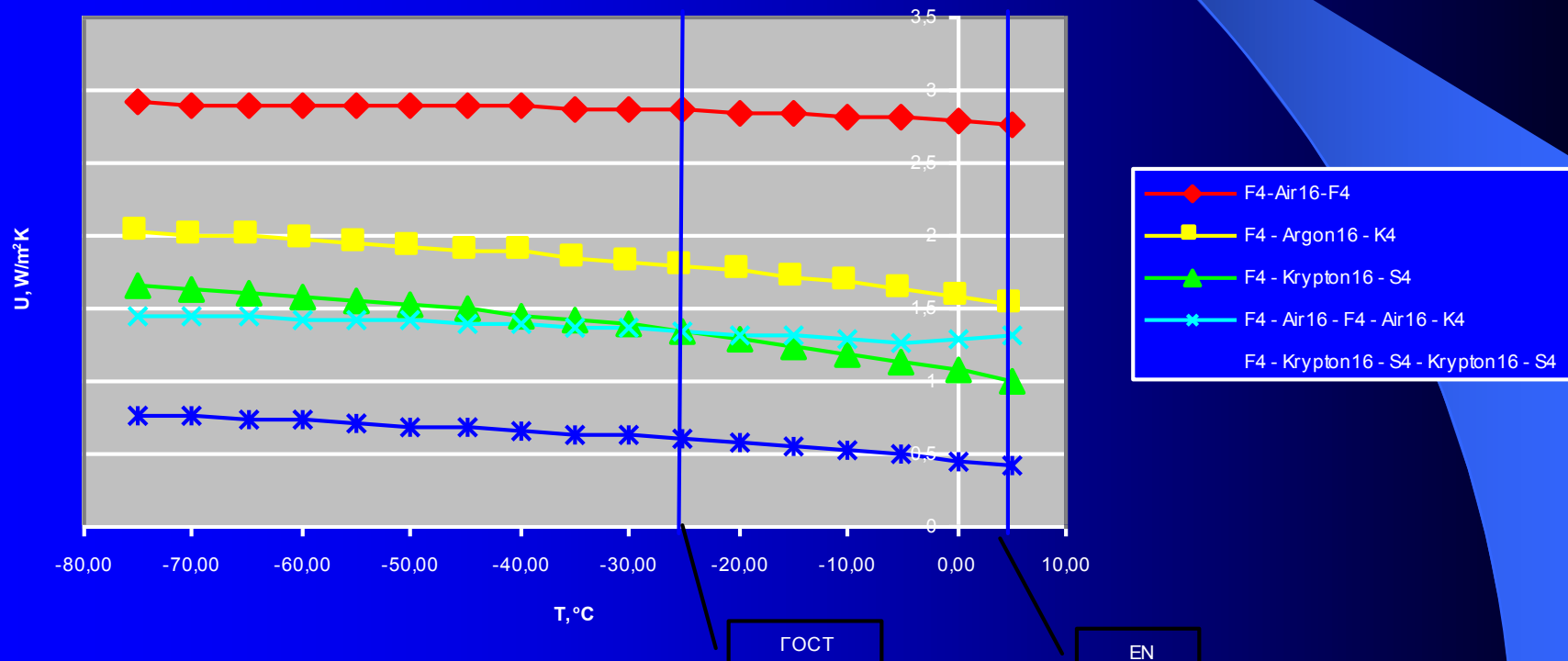
- nominal working load;
- glazing weight;
- minimal possible temperature and maximal atmospheric pressure of installation region;
- maximal wind load of glazing position;
- maximal snow load (with possibility of snow bags forming) of installation region;
- activity of solar radiation absorbed by glazing.

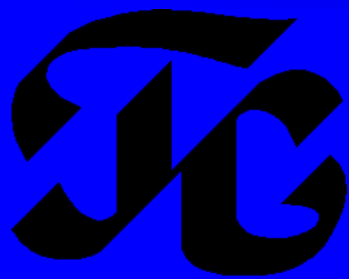


Heat transfer coefficient dependence from external temperature

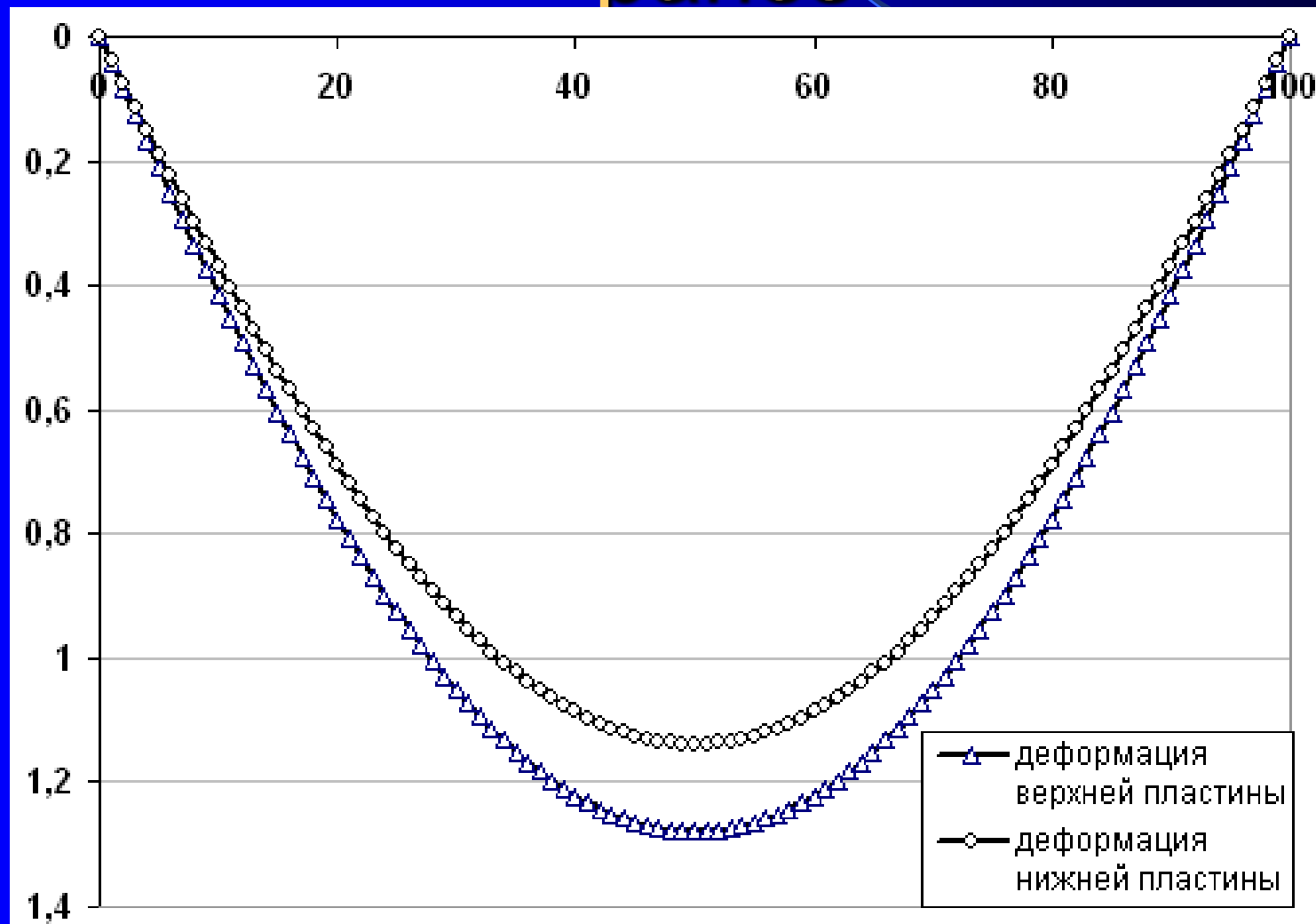


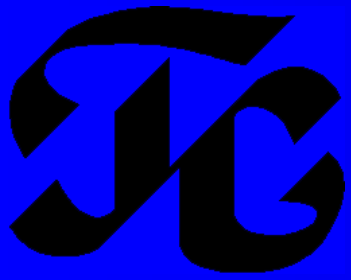
U dependence from external air temperature





Deformation in the center of the IGU's panes

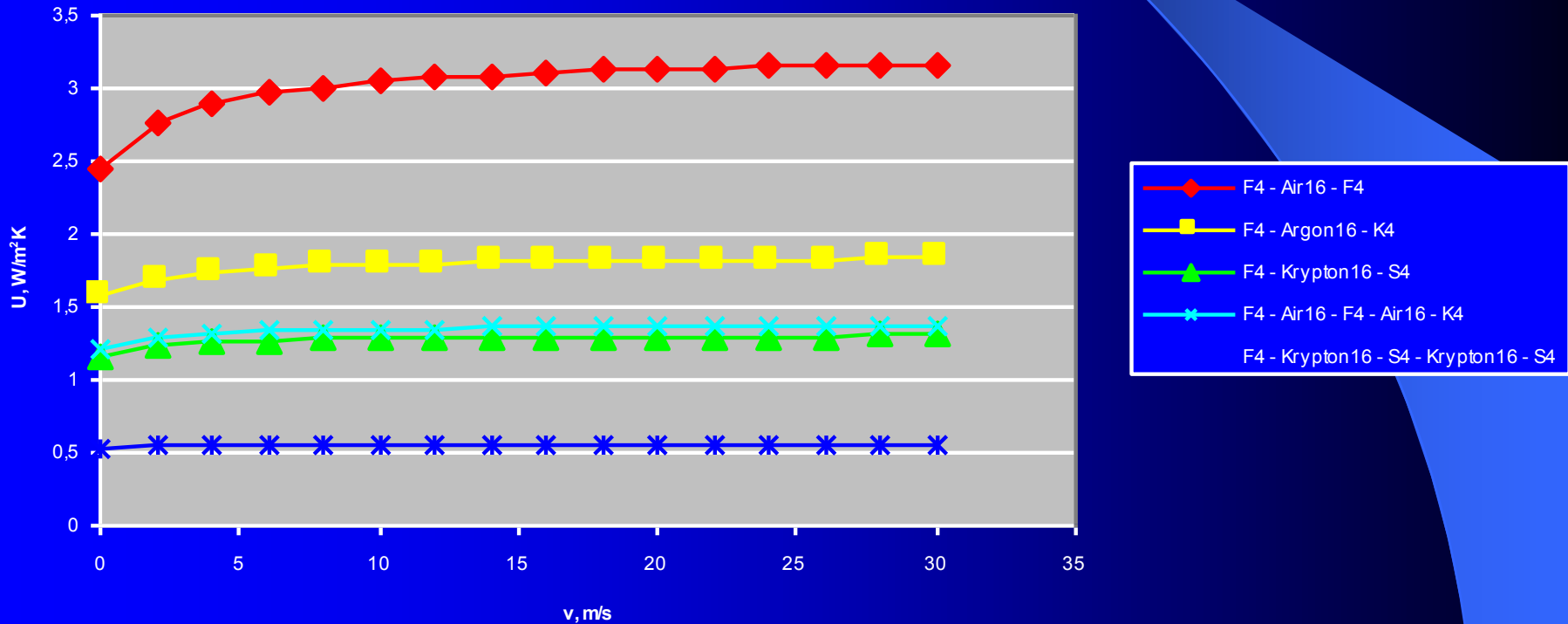


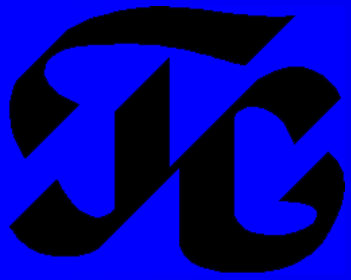


Heat transfer coefficient dependence from wind speed



U dependence from wind speed



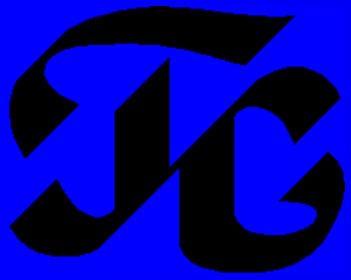


Optical properties



- optical distortions visible in reflected light
- color of used glass

Moscow-city business center

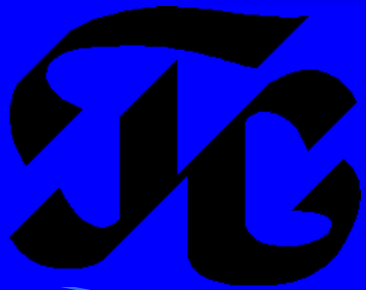


Conclusions



It is necessary to raise higher requirements to the glazing concerning:

- Wind loads resistance;
- Heat transfer resistance due to heat losses through the glazing increase, inner glass pane temperature lowering and discomfort for people indoor;
- Protection from excess solar radiation infiltration.



Contact info:

Please, don't hesitate to ask speaker or
contact with

ОАО «Glass Institute»

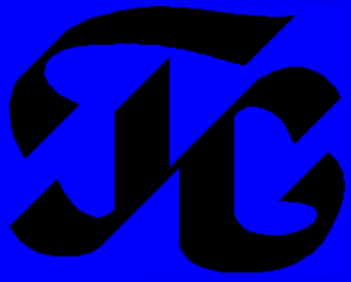
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Thank you for attention!