# VOLUME 3

# 

# TECHNICAL SPECIFICATIONS / TEHNIČKE SPECIFIKACIJE

**1. TECHNICAL JUSTIFICATION / 1.TEHNIČKO OBRAZLOŽENJE**

To determine the energy consumption in the Sport Centre „Mejdan“ (SC Mejdan) Tuzla facility, an analysis of the thermal characteristics of the exterior surface of the facility was performed and a thermal calculation was performed according to the current Rulebook on technical requirements for thermal protection of buildings and rational use of energy in the Federation of BiH (Official Gazette of the Federation of BiH, No 2/06, 72/ 07, 32/08).

After determining energy consumption and losses that occur on the outside,

recommendations for reducing energy consumption through energy efficiency measures are given:

- installation of thermal insulation on the exterior of the building,

- installation of thermal insulation on the ceiling structure of the building, and

- replacement of external carpentry.

By implementing energy efficiency measures (construction measures) at the building of SC Mejdan Tuzla, such as the installation of thermal insulation on the external walls and the replacement of external carpentry, it is possible to achieve reduction in energy consumption depending on which part of the building the measures are implemented.

The thermal insullation is installed on the ceiling structure and parts of the external walls of the facility, therefore these parts of the facility exterior do not generate energy losses. However, the biggest energy losses in the building are created on the exterior carpentry, that is on the large glass surfaces that close certain parts of the building./

Za utvrđivanje potrošnje energije u objektu SKC Mejdan Tuzla izvršena je analiza toplotnih karakteristika vanjske ovojnice objekta te urađen termički proračun prema važećem Pravilniku o tehničkim zahtjevima za toplotnu zaštitu objekata i racionalnu upotrebu energije FBiH (Službene novine Federacije BiH, br. 2/06, 72/07, 32/08).

Nakon utvrđivanja potrošnje energije i gubitaka koji se javljaju na vanjskoj ovojnici objekta date su preporuke za smanjenje potrošnje energije kroz mjere energetske efikasnosti kao što su:

* postavljanje termoizolacije na vanjsku ovojnicu objekta,
* postavljenje termoizolacija na stropnu konstrukciju objekta, i
* zamjena vanjske stolarije.

Realizacijom mjera energetske efikasnosti (građevinske mjere) na objektu SKC ,,Mejdan" Tuzla, kao sto su postavljanje termizolacije na vanjske zidove i zamjena vanjske stolarije, moguće je ostvariti smanjenje potrošnje energije, zavisno na kojem dijelu objekta se realizuju mjere.

Objekat SKC ,,Mejdan" na stropnoj konstrukciji i dijelovima vanjskih zidova ima postavljenu termoizolaciju tako da ovim dijelovima vanjske ovojnice se ne stvaraju gubici energije. Međutim, najveći gubici energije na objektu se stvaraju na vanjskoj stolariji, odnosno na velikim staklenim površinama kojima su zatvarani dijelovi objekta (slika 1.)



Figure 1/ Slika 1.

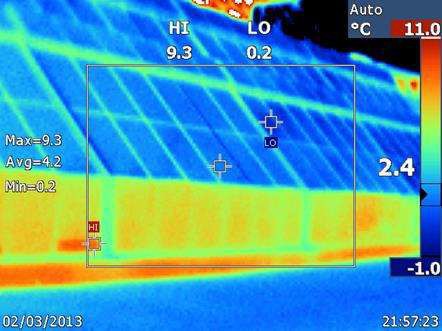


Figure 2 / Slika 2.

The thermographic image shows that there are visible energy losses on this part of the structure - detail of the glass sloping facade - north. The video shows temperature of 9.3°C on the vertical glass of the observed structure.

Thermographic recording and photography of the object was carried out on March 2, 2013. The photographing of the building was done in the morning hours from 10:00 a.m. to 2:00 p.m., when all the details of the structure that needed to be thermographically recorded were determined.

Thermographic recording of the building was carried out at night from 8:00 p.m. to 11:30 p.m. The outdoor temperature during the recording was 5°C, while the indoor temperature in the building in the heated part was 22°C.

IR thermographic imaging of all parts of the building was performed, i.e. all characteristic details of the structure were recorded, namely:

- facade surfaces of buildings,

- roof surfaces of buildings - flat roofs,

- characteristic details - glass facade, joinery, joints, etc.

It was determined that energy losses occur on a large part of the glass surfaces on the ground floor of the building and in the part of the carpentry towards the roof structure.

No significant losses were observed on the outer walls./

Termografski snimak je pokazao da na ovom dijelu konstrukcije - detalj ostakljenog kosog dijela - sjever, postoje vidljivi gubici energije. Na snimku se očitava temperatura od 9,3°C na vertikalnom staklu posmatrane konstrukcije.

Termografsko snimanje i fotografisanje objekta obavljeno je 02.03.2013. godine. Fotografisanje objekta obavljeno je u prijepodnevnim satima od 10.00h do 14.00h, kada su utvrđeni svi detalji konstrukcije koje je potrebno termografski snimiti.

Termografsko snimanje objekta obavljeno je u noćnim satima od 20.00h do 23.30h. Vanjska temperatura prilikom snimanja iznosila je 5°C, dok je unutrašnja temperatura u objektu u grijanom dijelu iznosila 22°C.

lzvršeno je IC termografsko snimanje svih dijelova objekta, odnosno snimljeni su svi karakteristični detalji konstrukcije i to:

* fasadne površine objekata,
* krovne površine objekata-ravni krovovi,
* karakteristični detalji - staklena fasada, stolarija, spojevi i sl.

Utvrđeno je da se gubici energije javljaju na velikom dijelu staklenih površina i u prizemlju objekta i u dijelu stolarije prema krovnoj konstrukciji.

Na vanjskim zidovima nisu uočeni značajniji gubici.

**Reasons for replacing the facade**: The existing glass facade system at the SC "Mejdan" facility shows signs of ageing, damage and loss of energy efficiency. The glass panes are worn out, the sealing material has worn out and the existing structure, i.e. load-bearing profiles needs to be inspected in detail from the aspect of statics and used if possible. The existing locksmith elements with new glazier/glass positions still comply with modern safety and insulation standards. Replacing the facade is necessary in order to improve the energy efficiency, safety and aesthetics of the building.

**Selection of materials**: Insulation glass selected to replace glass facade is SGS Silver 6 mm ESG+HST + 16mm 90% argon + 6 mm float glass ESG+HST + 16mm 90% argon + Lamistal LOW-E 4.4.2. or equivalent. This glass combines a high level of thermal and sound insulation with improved energy efficiency. SGS Silver 6 mm ESG+HST + 16mm 90% argon + 6 mm float glass ESG+HST + 16mm 90% argon + Lamistal LOW-E 4.4.2.glass has a low emissivity (LOW-e) coating that prevents heat loss and improves the building's energy efficiency. Lami Loe 4.4.2. laminated glass provides additional security as it remains glued to the frame in case of breakage.

**Energy efficiency**: The glass should meet the heat transfer coefficient of k = 0.6 W/m2K. Replacing the glass facade with insulated glass will significantly improve the energy efficiency of the SC Mejdan building. The low emissivity of the coating on the glass reduces heat loss and helps maintain a stable internal temperature. This results in reduced energy consumption for heating and cooling of the facility, which achieves energy savings and reduces the impact on the environment.

**Safety**: Lami Loe laminated glass 4.4.2. ensures improved facility security. In the event of glass breakage, the laminated layers hold the fragments in place, reducing the risk of injury. This feature is especially important in public facilities like SC Mejdan.

**Aesthetics and functionality**: Regardless of the existing load-bearing structure of the facade, insulation glass will improve the aesthetic appearance of the building SC Mejdan, providing a more modern and attractive appearance. The new glass facade will be adapted to the building's architecture and will enable reliable and safe window opening and closing functionality.

**Acoustic insulation**: lnsulation glass provides improved sound insulation. This is especially important for facilities located in urban areas or near traffic routes. Replacing the glass facade with insulated glass will reduce the penetration of noise into the interior of the building, providing users with a more comfortable environment.

**Maintenance**: Insulation glass SGS Silver 6 mm ESG+HST + 16mm 90% argon + 6 mm float glass ESG+HST + 16mm 90% argon + Lamistal LOW-E 4.4.2. or its equivalent require minimal maintenance. Quality materials and coatings must allow easy glass cleaning and require minimal repairs or replacements.

**Adaptability and future upgrades**: The replacement of the glass facade will enable the adaptability of the SC Mejdan facility to future changes or upgrades. The new glazing position can be easily replaced or supplemented in case of need for additional functionality or design changes./

**Razlozi za zamjenu fasade**: Postojeći sustav staklene fasade na objektu SKC „Mejdan“ pokazuje znakove starenja, oštećenja i gubitka energetske učinkovitosti. Stakla su dotrajala, zaptivni materijal dotrajao, a postojeću konstrukciju tj. nosive profile potrebno je detaljno pregledati sa statičkog dijela i iskoristiti. Postojeća bravarija sa novim staklarskim pozicijama još je u skladu s modernim standardima sigurnosti i izolacije. Zamjena fasade postaje nužna kako bi se poboljšala energetska učinkovitost, sigurnost i estetika objekta.

**Odabir materijala**: Za zamjenu staklene fasade odabrano je izo staklo SGS Silver 6 mm ESG+HST + 16mm 90% argon + 6 mm float staklo ESG+HST + 16mm 90% argon + Lamistal LOW-E 4.4.2. ili ekvivalent. Ovo staklo kombinira visoku razinu toplinske i zvučne izolacije s poboljšanom energetskom učinkovitošću. SGS Silver 6 mm ESG+HST + 16mm 90% argon + 6 mm float staklo ESG+HST + 16mm 90% argon + Lamistal LOW-E 4.4.2. staklo ima nisku emisivnost (LOW-e) premaz koji sprječava gubitak topline i poboljšava energetsku učinkovitost objekta. Lami Loe-e 4.4.2. laminirano staklo pruža dodatnu sigurnost, jer ostaje prijanjajuće na okvir u slučaju loma.

**Energetska učinkovitost**: Staklo treba da zadovolji koeficijent prelaza toplote stakla k = 0,6 W/m2K. Zamjena staklene fasade sa izo staklom značajno će poboljšati energetsku učinkovitost objekta SKC Mejdan. Niska emisivnost premaza na staklu smanjuje gubitak topline i pomaže u održavanju stabilne unutarnje temperature. To rezultira smanjenom potrošnjom energije za grijanje i hlađenje objekta, čime se postiže ušteda energije i smanjuje utjecaj na okoliš.

**Sigurnost**: Laminirano staklo Lami Loe-e 4.4.2. osigurava poboljšanu sigurnost objekta. U slučaju loma stakla, laminirani slojevi zadržavaju fragmente na mjestu, smanjujući rizik od ozljeda. Ova karakteristika posebno je važna u javnim objektima poput SKC Mejdan.

**Estetika i funkcionalnost**: Bez obzira na postojeću nosivu konstrukciju fasade izo staklo poboljšat će estetski izgled objekta SKC Mejdan, pružajući moderniji i atraktivniji izgled. Nova staklena fasada će biti prilagođena arhitekturi objekta i omogućit će pouzdanu i sigurnu funkcionalnost otvaranja i zatvaranja prozora.

**Akustična izolacija**: lzo staklo pruža poboljšanu zvučnu izolaciju. To je posebice važno za objekte koji se nalaze u urbanim sredinama ili u blizini prometnih ruta. Zamjena staklene fasade s izo staklom smanjit ce prodor buke u unutrašnjost objekta, pružajući korisnicima ugodnije okruženje.

**Održavanje**: IZO staklo SGS Silver 6 mm ESG+HST + 16mm 90% argon + 6 mm float staklo ESG+HST + 16mm 90% argon + Lamistal LOW-E 4.4.2.ili ekvivalent zahtijevaju minimalno održavanje. Kvalitetni materijali i premazi moraju omogućiti lako čišćenje stakla i minimalne popravke ili zamjene.

**Prilagodljivost i buduće nadogradnje**: Zamjena staklene fasade omogućit će prilagodljivost objekta SKC Mejdan budućim promjenama iii nadogradnjama. Nova staklarska pozicija može se lako zamijeniti ili nadopuniti u slučaju potrebe za dodatnom funkcionalnošću ili promjenama u dizajnu.

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