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TAWNING COVERS AS MEANS OF FORMATION OF ARCHITECTURAL EXPRESSIVENESS OF AIRPORTS

Airport complexes are considered, where a part of long span premises is covered by awning covers. In Ukraine, it is proposed use awning covers for buildings and structures that are to become composition components in developing the airport building.

Airport complexes as integral parts of complex dynamic systems (airports) are samples of innovative searches for image and artistic expression of architecture of public buildings.

Modern airport complexes are primarily an effective organization of technological processes that provides comfortable stay and quality of service of multi-million passenger flows; secondly, they present a dizzying geometry of volumes filled with light, vegetation, art objects, cultural initiatives etc., which gives airports a unique architectural expression [1, 2].

A special place in global practice of airport building belongs to complexes, in which a part of long span premises is covered by awnings with complex geometric shapes (Figure 1). By virtue of originality of the created curved surfaces of negative Gaussian curvature, awning covers, in most cases, are the center of the architectural composition (Figure 1d). The most popular is the "pseudoconic" hip form of the cover with a central pillar. In this case, the central support can be arranged via a traditional compressed internal structure (Figure 2), or suspending this highest point of the cover using a rope system attached to the external supports outside the lower contour of the tent (Figure 1, a-c). The polygonal shape of the cover is achieved by bringing several different top points on levels different by height (Figure 1, e).

Folded surface or combinations of «pseudoconic» hip and folded forms (Figure 1c) are used to cover linearly extended objects.

Overlapping of open spaces is provided by a set of modules having similar designs, the number of which depends on the size of the overlapping area - waiting areas (5 blocks of 21 modules with a total area of 495 thousand m², Hajj terminal, Jeddah airport, Saudi Arabia, Figure 1, a), flyovers of the entrance and transport stops (27 modules, Denver airport, USA) etc.

Expressiveness of architectural images of airport terminals is largely attributable to a significant shape-generating potential of high-duty synthetic material, as well as technological and design-engineering solutions. The choice of the cover shape is primarily dictated by:

- **climatic conditions in the construction areas** (hot climate: the Arabian Peninsula, the Sinai Peninsula; semi-arid, continental climate: Colorado, USA; Mediterranean, Turkey);

- **natural surroundings** (high sandstone mountains towering in the midst of

rocky deserts: Arabia and the Sinai Peninsula; snowy peaks of the Rocky Mountains and Great Plains of Denver, Colorado, USA).



a)



b)



c)



d)



e)



f)

Figure 1. Airports with awning covers: a, b - Jeddah, Saudi Arabia; c, d - Denver, Colorado, USA; e - Sharm el-Sheikh, Egypt, f - Antalya, Turkey

The influence of national traditions in the construction area is also important. The realized objects show images of:

- **tents** - Bedouins' camp shelters (Figure 1, a, e);
- **Cheyennes' encampments**, which located many traditional portable dwellings - teepees (Figure 1c).

The shape of the cover can reduce the level of exposure to the sun on the building, provide natural ventilation of the covered volume, and the material (PVC fabrics, PTFE-, ETFE-films) - reflect heat rays of the sun, transmit and dissipate daylight [3].

These covers are placed above the premises hosting large numbers of people due to the maintenance technology: waiting rooms, receptions and baggage handling rooms, etc. Considerable height of the premises enables to reduce the influence of thermal radiation of the heated ceiling perceived by man, as well as to decrease the concentration of carbon dioxide and water vapor, additional heat buildup from people.

Air exchange in airport terminals in hot climates is a powerful tool to improve thermal comfort when staying in buildings.

Translucent materials are widely used by architects to illuminate interior spaces, and in the evening and night - to light up facades.

Properties of synthetic covers enable not only to realize original ideas, but also to create high performance objects, including:

- minimum unit cost of materials;
- fast assembly and disassembly technology;
- ease of transformation etc.

High degree of maintainability of the tent construction should also be noted.

This is confirmed by a surprisingly short time of reconstruction of Sharm el-Sheikh terminal destroyed by a hurricane in January 2010.

Constructive systems of awning coverings are also actively involved in space-planning and architectural design of overlapped volumes (Figure 1, a, b, d, 2). Systems may have a support frame with high external supports (Figure 1b).

Spatial framings of tent coverings implemented in Sharm el-Sheikh, Denver, Antalya terminals are located within the covered premises, are open for overview and are an integral part of interior solutions (Figure 2).

Half a century of experience in building and reconstruction of airport terminals in Ukraine suggests that traditional building materials were brick, concrete, metal, glass. This is primarily motivated by temperate continental climate with distinct seasons, except for the south coast of the Crimea where the climate is subtropical; and operational requirements to airports - objects of III-V complexity categories, where disruption or damage to structures can lead to significant consequences [4].

Modern airports which implement in their operation the concept of «city airport» provide a range of non-aviation services on a commercial basis [5]. This involves not only the existing areas and volumes, but also specially created zones in the airports or adjacent areas. As a result, multi-functional transport companies (airports) are transformed into formations with signs of urban settlements, where the technological and functional architectural design must meet modern requirements to

urbanized areas.

New buildings and facilities (logistics centers, warehouses, hotels, shopping and entertainment complexes, parking, etc.) should be compositional components of the existing building of the airport. At the same time, some of them must have multifunction free planning, be built with the use of fast-assemble structures, as well as enable transformation and rapid dismantling.



a)



b)



c)



d)

Figure 2. Fragments of constructive solutions of the awning covering in Sharm el-Sheikh airport, January 2010 (a, b, c); Antalya airport, Turkey, January 2011 (d)

The use of awning covers of various geometric shapes and colors to overlap open structures can solve the problem of unification of different purpose objects in a single ensemble. In this case, a shift of emphasis of perception may accentuate functionally important sites. Awning covers can change the shape in time depending on the proposed events (anniversaries, industry events, etc.).

Developing airports should not only become successful enterprises, but also be attractive for life activities.

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