

27th IPMA World Congress

Comparison of Different Roof Types in Housing Projects in Turkey: Cost Analysis

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Abstract

As essential elements of buildings, roofs traditionally correspond to about 3-8% of total project cost. Despite this considerable share, in the literature there have been only a few researches that investigate roof types preferred by owners/designers and make a cost analysis to reveal cost differences between alternatives. Toward this aim, in this study, twelve types of roofs installed in construction projects in Turkey were first examined. In this context, practical answers of the following questions were investigated briefly: (i) how different are roof types from each other, (ii) by which criteria are roofs chosen, and (iii) which roof types are selected in which buildings (such as, housing and industrial). Among twelve roof types, reinforced concrete flat roofs (RCFR) and free standing wooden roofs (FSWR) were determined as the most used roofs in housing projects. Finally, a real-life building project was considered. Its roof plan and cross sections of above-mentioned two roofs were given, and their detailed measurements and cost estimations were made. As a result, in terms of initial investment cost, a RCFR which has similar insulation conditions with a FSWR was found to be 35.46% more inexpensive than a FSWR. In conclusion, designers/constructors can manage projects more efficiently by directing their clients towards a more inexpensive option. Thus, potential building owners can allocate lower project budgets by decreasing their roof costs. As a research implication, future studies can compare life cycle costs of these roofs, which will likely provide a broader perspective for better cost management practices.

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Selection and peer-review under responsibility of the IPMA.

Keywords: Cost; flat roof; wooden roof; housing projects; Turkey

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1. Introduction

Roofs are the components installed at the top of buildings to protect them against adverse weather conditions such as high and low temperatures, rain, snow, and wind. In other words, they cover the top floors of buildings. With this essential characteristic, they traditionally correspond to approximately 3-8% of total project cost (Ocal & Pancarci, 2010; Toydemir & Bulut, 2010).

Roof surfaces are constructed with slope to let water on them flow immediately. This slope can vary generally according to climate, environmental conditions, type of roof covering material, and aesthetics of building. In the literature, roofs are classified by their slopes, shapes, and construction materials (MNE, 2011). In order to describe a roof completely, it is necessary to employ all of these groups to some extent. In building projects executed in Turkey, owners and designers mostly prefer some roof types to others in these groups. Up to date, only a few research studies investigating mostly preferred roof types in building projects and cost differences between them have been carried out (Worth, Boyle, & McDowall, 2007; Coffelt & Hendrickson, 2010a; 2010b; 2012). Moreover, they mainly focus on roof costs from the life-cycle perspective.

Therefore, in this study, main roof types in practice were first examined. In this context, mostly preferred twelve roof types in Turkey and their particular characteristics were considered. These characteristics were investigated by means of the following questions: (i) how different are roof types from each other, (ii) by which criteria are roofs chosen, and (iii) which roof types are selected in which buildings (such as, housing and industrial). A detailed cost analysis that compares mostly preferred two roof types in housing projects in Turkey was then made. Toward this aim, a real-life housing project was taken into account. Its roof plan and cross sections of two possible roofs were presented, and their detailed quantity measurements and cost estimations were performed. Thus, as the objective of the present study, cost-based comparison of mostly preferred roof types in housing projects in Turkey was carried out.

2. Main roof types in Turkey

In Table 1, main roof types installed in construction projects in Turkey and their demand conditions are given by classification. In the following subsections, common roof types in this classification are explained in terms of definition, building types, and causes of widespread use.

2.1. Flat roof

A roof, which has a slope angle of maximum 5 degrees, is called as a flat roof. In general, such a roof can be constructed as the ceiling floor of top story in a large-area building such as hotel, office, apartment and shopping mall. It is not suitable for buildings located in heavy rainy or snowy geographical areas. It is widespread especially in housing buildings in many regions of Turkey. Avoiding costs of a detailed roof construction, installing solar energy system, and constructing additional stories in the future are among the causes of its widespread nature in Turkey.

2.2. Middle-sloped roof

Slope angle of this roof vary between 5 and 40 degrees. Because four seasons are seen in many regions of Turkey, it is the most frequently constructed roof type in buildings.

2.3. Lean-to roof

It is also called as single surface roof because of the fact that it has flow towards only one direction. Its construction is easy and inexpensive. In general, shingle or decorative tile is used as cover material. This type of roofs is constructed in small-width buildings and low annexes that lean to a building or a wall. In Turkey, there are many examples of this roof type in garage and farm structures.

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