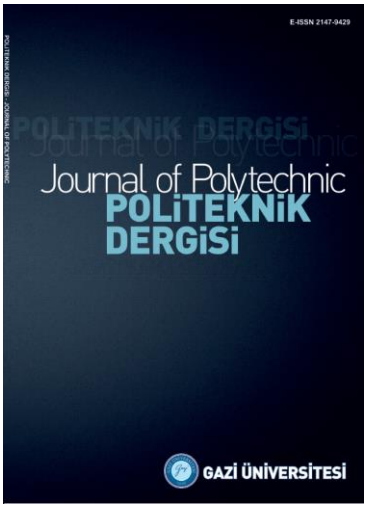

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Assessment of energy performance of buildings constructed in different regions of turkey according to european specification

Farklı bölgelerinde avrupa şartnamelerine göre inşa edilen yapıların enerji performans değerlendirilmesi

***Yazar(lar) (Author(s))**: Gökhan DURMUŞ[1], Sadık ÖNAL[2],*

ORCID[1]: 0000-0002-8827-7041

ORCID[2]: 0000-0002-7624-0145

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Assessment of Energy Performance of Buildings Constructed in Different Regions of Turkey According to European Specification

(*II. Uluslararası Sürdürülebilir Yapılar Sempozyumu'nda sunulmuştur / Presented at II. International Sustainable Constructions Symposium)*

Araştırma Makalesi / Research Article

Gökhan DURMUŞ*, Sadık ÖNAL[2]

[1]Teknoloji Fakültesi, İnşaat mühendisliği Bölümü, Gazi Üniversitesi, Türkiye
[2]Fen bilimleri Ensititüsü, İnşaat mühendisliği Bölümü, Gazi Üniversitesi, Türkiye

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ABSTRACT

In this study, the complex of buildings built in Turkey's eastern and western regions (Kırklareli- Pehlivanköy, and Gaziantep-Oğuzeli) energy performance levels was investigated according to European specification. To determine these levels were used Building Energy Performance (BEP) program. It is a software that has been in force the protection of the environment and limitation of greenhouse gas emissions regarding primary energy and carbon dioxide (CO_2) emissions of buildings, according to "Energy Performance Regulations at Buildings" of the Ministry of Environment and Urban Plannings since 2010. Building geometry, heating, lighting, ventilation, mechanical and technical values project data is entered into the program. It has been identified what the amount of energy required by the building through the program, daylighting needs for areas where the effectiveness of energy utilization daylight time from light and carbon emissions is. After all, under EU norms, evaluation of energy certification of buildings built in different regions of all energy, fuel costs, climate and regional differences revealed that changes were explained. A result, energy data of Gaziantep reception center which was built in Turkey's southeastern is lower than 8% energy data of Kırklareli reception center which was made in Turkey's region of Thrace. However, when looking at the results obtained carbon emissions, lighting, ventilation and hot water systems has been shown to occur in the near value for the two centers. It has been observed that there are differences in heating and cooling systems.

Keywords: Energy performance of buildings, building energy performance program (bep- tr), quantity of net energy building, energy identity certificate.

1. INTRODUCTION

The unusually rapid growth of the world population will occur inevitably show that the energy expenditure of energy shortages. How to be a more effective use of energy and how to save energy to find answers to the questions scientists have done studies [1]. It is necessary to know essential features such as carbon emission [2, 3], building typology [4, 5], cooling [6, 7], ventilation [8, 9] lighting [10] and heating system [11] in determining the energy performance of buildings. Also the studies in this area; the method of calculating the energy performance of buildings, the levels of intricate and detailed dynamic calculation method of calculating the simple activities of hours studied. When it comes to complex structures, the thermal behavior of the building zones in the zones with the highest values regarding useful internal gains, there could be a problem that the energy performance of buildings on health are examined [12].

Santamouris M., Argiriou A., their studies the characteristics of the building's energy consumption in Southern Europe are analyzed. The energy potential of solar energy for heating and lighting purposes as well as the potential of passive cooling techniques are investigated. The ecological impact of the energy-saving technologies, as well as the market opportunities of the alternative technologies, are discussed [13].

Ramesha T., Prakasha R., Shuklab K.K.; their studies on the total energy use during the life cycle are desirable to identify phases of most significant energy use and to develop strategies for its reduction. In the present paper, a critical review of the life cycle energy analyses of buildings resulting from 73 cases across 13 countries is presented. Results show that operating (80–90%) and embodied (10–20%) phases of energy use are significant contributors to building's life cycle energy demand. Life cycle energy (primary) requirement of conventional residential buildings falls in the range of 150–400 kWh/m2 per year and that of office buildings in the field of 250–550 kWh/m2 per year. Building's life cycle energy demand can be reduced by reducing its operating energy significantly through the use of passive and active technologies even if it leads to a slight increase in embodied energy. However, excessive use of passive and active features in a building may be counterproductive. It is observed that low energy buildings perform better than self-sufficient (zero operating energy) buildings in the life cycle context [14].

Eskin N, in the study of electricity use in the commercial buildings, accounts for about one-third of the total energy consumption in Turkey and fully air-conditioned office buildings are crucial commercial electricity end-users

*Sorumlu yazar (Corresponding Author)
e-posta : gdurmus@gazi.edu.tr

since the mid-1990s. In the presented paper, the interactions between different conditions, control strategies and heating/cooling loads in office buildings in the four major climatic zones in Turkey-hot summer and cold winter, mild, hot summer and warm winter, hot and humid summer and warm winter - through building energy simulation program has been evaluated. This verified model was used as a means to examine some energy conservation opportunities on annual cooling, heating and total building load at four major cities which were selected as a representative of the four climatic regions in Turkey. The effect of the parameters like the climatic conditions (location), insulation and thermal mass, a color of external surfaces, shading and window systems including glazing system on annual building energy requirements are examined and the results are presented for each city [15]. Aykal D. etc.; their studies evaluation of renewable energy sources, energy, architecture, building design principles to the use of energy efficiency, as well as the importance of creating sustainable environments are expressed. Therefore, under the leadership of the Metropolitan Municipality of Diyarbakır Dicle University, and a variety of EU Project, in collaboration with non-governmental organizations "Solar House Education and Practice in Diyarbakir Park" was built [16].

Ding G. and Forsythe P. J., their studies in 2010, the Australian residential construction sector contributed about 28% of the value of all construction and was responsible for 8% of the total energy consumption. Residential development will continue to increase to cope with the demand due to population growth. The research findings reveal that the slope for each type of soil has a positive correlation with life cycle energy consumption. As part of the onsite construction process, the results also show that the energy consumption of construction on sloping sites plays a significant factor in the life cycle energy analysis of a building [17].

The European Union (EU) prepared for energy efficiency, the external climate/local conditions, taking into consideration the cost efficiency of indoor climate requirements, the development of energy performance of buildings, the Energy Performance of Buildings Directive 2002/91/EC in 2002 [18, 19] and it published specifying the obstacles encountered in the direction of improvement of energy efficiency a Green Paper on Energy Efficiency in accordance with the solution of problems in 2005 [20] . In 2006, it prepared indicates the energy efficiency of buildings is vital for the Action Plan for Energy Efficiency [21].

Our country is a country signatory to Kyoto Protocol, make up a significant portion of energy consumption and reduce energy use in buildings, energy performance certification of buildings Energy Performance of Buildings Regulation mandating the Ministry of Environment and Urban Planning (Ministry of Public Works and Settlement) published in 2008. Identification required by this regulation to building energy analysis method to be used in the Building Energy Performance Program (BEP-TR) was completed in 2009. This program is published on 5 December 2008 Energy Performance of Buildings Regulations 1000 m2 of new and existing buildings, Energy Performance Certificates to get a great legal mandate. In this context, reception and accommodation centers built by the directives as mentioned earlier and laws were necessary planning [22]. In additional, the Ministry within the framework of the EU harmonization Ankara, Erzurum, Kırklareli, İzmir, Kayseri, Van and Gaziantep will be established in the provinces a total of 7 people capacity 750 to be built in the regions of "For Refugees and Asylum Seekers Reception, Screening and Accommodation System / Centers Facility" was prepared Pairing and Investment Project [23].

EU standards and assisted in Gaziantep and Kırklareli entire 18.000m² buildings were built with an accept field, Reception, Screening and Accommodation Centre A-Block, dormitories, laundry and dining sections of making energy performance reviews are part of a total of 942 m² of construction area evaluated in this study.

At this article, Gaziantep and Kırklareli reception and accommodation centers, have been recognized as an

Table 1. Gaziantep and Kırklareli Reception and Accommodation Centers Basement floors plans and areas

Gaziantep and Kırklareli Reception and Accommodation Centers Independent Sections					
(-2) Basement floor, m²			(-1) Basement floor, m²		
1	Power room	50,715	1	Lift 1	5,94
2	Laundry	135,24	2	High security room 1	143,04
3	Food Warehouse	168,245	3	High security room 2	120,33
4	Fire Escape	24,95	4	High security room 3	120,33
5	Lift 1	5,94	5	Stairs	30,555
6	Boiler room	213,65	6	Lift 2	29,61
7	Ware house	153,72	7	Electric room	53,235
8	Stairs	31,03	8	High security room 4	106,47
9	Lift 2	26,62	9	High security room 5	106,47
			10	WC	105,625
			11	Fire Escape	26,195
Total		942,00 m²	Total		942,00 m²

example. These centers housing space names and characteristics of the fields, -2 and -1 for basement floor: Table 1, for the ground, first second and third floors: Table 2, A-block floor plans of Gaziantep and Kırklareli constructions are shown in Figure 1.

2. MATERIAL and METHOD

Gaziantep and Kırklareli Reception and Accommodation Centers floors and walls materials are shown in Table 3.

2.2. Calculation Method For Energy Performance Of Buildings (BEP-TR)

Figure 1. A-block floor plans of Gaziantep and Kırklareli constructions

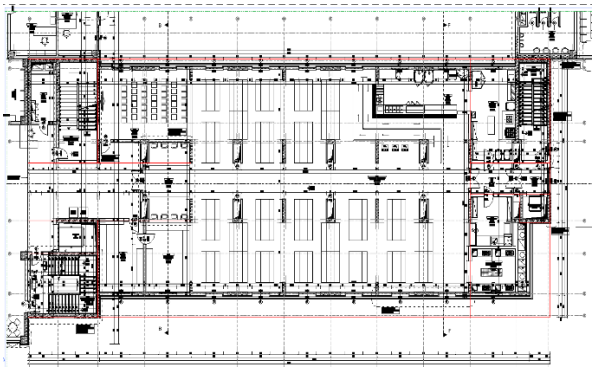
Prepared by the Ministry of Public Works and Settlement (BEP-TR) is a web-based program. This program includes 1000 m^2 large structures Energy Performance of Buildings Directive. The building enables that annual energy consumption per square meter, CO_2 emissions, the datum of the reference values and comparison with a reference building A-G placed an inter-energy class operations. This program is also using the method of calculation of the energy performance of buildings (BEP-HY), all the parameters that affect energy consumption,

Table 2. Gaziantep and Kırklareli Reception and Accommodation Centers ground, First, Second and Third floor plans and areas

Gaziantep and Kırklareli Reception and Accommodation Centers Independent Sections					
Ground floor, m²			First, Second and Third, m²		
1	Lift 1	5,94	1	Lift1	5,94
2	Dish washing area	62,82	2	Single woman room 1	143,04
3	Dining hall	504,00	3	Single woman room 2	120,33
4	Canteen	62,90	4	Single woman room 3	120,33
5	Lift 2	16,065	5	Stairs 1	31,0275
6	Stairs 1	31,0275	6	Lift 2	29,1375
7	Hall1	65,78	7	Hall	94,20
8	Lavatory	67,62	8	Stairs 2	53,235
9	Stairs 2	50,71	9	Single woman room 4	106,47
10	Food Prepared room	33,00	10	Single woman room 5	106,47
11	Fire Escape	24,95	11	Single woman room 6	105,625
12	Hall 2	17,28		Fire Escape	26,195
	Total	942,00 m²		Total	942,00 m²

Table 3. Gaziantep and Kırklareli reception and accommodation centers a-block floor and wall construction elements

Gaziantep and Kırklareli Reception and Accommodation Centers Floors and Walls Materials					
	Wall Materials	Thickness		Floor Materials	Thickness
1	Interior plaster and plastic paint	0,01 cm	1	PVC Floor covering	0,02 cm
2	Agregate concrete brick wall	19 cm	2	Mortar	0,02 cm
3	Plane plaster	0,02 cm	3	Levelling concrete	0,02 cm
4	XPS Adhesive plaster	0,01 cm	4	Reinforced concrete	10 cm
5	XPS Heat Insulation Sheet	0,02 cm	5	Gypsum panel and Metal suspended ceiling	0,03 cm
6	Press Brick adhesive	0,01 cm			
7	Brick elevation claddind	0,03 cm			



the impact of energy efficiency and energy performance

operations. This program is also using the method of calculation of the energy performance of buildings (BEP-HY), all the parameters that affect energy consumption, the impact of energy efficiency and energy performance of buildings is used to determine the class. BEP-TR and BEP-HY programs enable that residences, office buildings, educational buildings, health buildings, hotels,

Table 4. Gaziantep reception center a block data for the identification of energy.

Data / Results	Final Consumption (kWh/year)	Consumption per m^2	Class
Heating Systems	7.160.304,80	1.727,44	***C***
Hot water Systems	14.789.471,60	3.567,99	***C***
Cooling Systems	1.147.638,89	276,87	***C***
Ventilation Systems	18.019,99	4,35	***D***
Lighting Systems	163.072,91	39,34	***B***
Greenhouse Gas Emis. (CO_2)	---	493,91	***C***
Total	*23.278.508,19*	*5.615,99*	***C***

Table 5. Kırklareli reception center a block data for the identification of energy.(Kırklareli kabul merkezi enerji belirlenmesi için veriler)

Data / Results	Final Consumption (kWh/yıl)	Consumption per m^2	Class
Heating Systems	9.448.804,00	2.279,54	***C***
Hot water Systems	14.789.471,60	3.567,99	***C***
Cooling Systems	847.566,37	204,48	***A***
Vantilation Systems	17.963,43	4,33	***D***
Lighting Systems	163.153,34	39,36	***B***
Greenhouse Gas Emis. (CO_2)		1.198,66	***C***
Total	25.266.964,74	6.095,71	***C***

Figure 2. Gaziantep and Kırklareli reception and accommodation centers A-block

of buildings is used to determine the class. BEP-TR and BEP-HY programs enable that residences, office buildings, educational buildings, health buildings, hotels, shopping and commercial centers as well as an assessment of the energy performance of new buildings and existing building typologies [22].

Prepared by the Ministry of Public Works and Settlement (BEP-TR) is a web-based program. This program includes 1000 m^2 large structures Energy Performance of Buildings Directive. The building enables that annual energy consumption per square meter, CO_2 emissions, the datum of the reference values and comparison with a reference building A-G placed an inter-energy class

shopping and commercial centers as well as an assessment of the energy performance of new buildings and existing building typologies [22].

3. EXPERIMENTAL RESULTS AND DISCUSSION

3.1.Building Energy Performance Program (BEP-TR) Results

At this article, entering the data of the Project to BEP-TR (Building Energy Performance) Program was explained that the building needs for heating and cooling of buildings in the net amount of energy, not benefit from daylight saving time, daylight lighting energy demand and consumption is not effective for the calculation of areas and carbon emissions of the building. These results have been interpreted in terms of sustainability.

Firstly, for Gaziantep and Kırklareli reception centers, all of the geometric and mechanical data has been entered to BEP-TR program which information belonging to the building (architectural, structural, mechanical, heating, ventilation, and lighting data) as defined in the program. Resulting in heating, cooling, ventilation and lighting systems in addition to greenhouse gas emissions were calculated. All results have been compared in terms of regional for Gaziantep and Kırklareli reception centers. These values have been shown in Table 4.

According to Table 4, Heating Systems: C, Hot Water: C, Cooling: C, Ventilation Systems: D, Lighting: B and

greenhouse gas emissions: C were found. These values can be considered as the average value of building energy class, which is C-Class was found. However, the ventilation system for the evaluation of building energy basis, the D-Class is not an available result.

Kırklareli reception center a block data for the identification of energy three zones values have been shown in Table 5.

According to Table 5, heating systems: C, Hot Water: C, Cooling: A, Ventilation Systems: D, Lighting: B and greenhouse gas emissions: C were found. These values can be considered as the average value of building energy class, which C-Class was found.

However, the ventilation system for the evaluation of building energy basis, the D-Class is not an available result. For Ankara reception center a block three zones energy performance was calculated and this building energy identification class C.

4. CONCLUSION

For Gaziantep and Kırklareli Reception, Screening and Accommodation Centers are listed by building energy performance (BEP) the energy obtained from the analysis and classification of data and study results below.

- When Gaziantep and Kırklareli reception centers investigated energy performances in terms of regional, especially we could see that cooling and ventilation systems were different results.
- Both Gaziantep and Kırklareli reception centers of A-blocks of the energy performance assessment had been identified that is energy for the class "Class C". This result which is C Class, that is understood that the building classification of energy is acceptable for in the evaluation of the EU Energy Performance Certificate standard.
- Determining the identification of energy had been observed that to be important to the region and the location of the building. But for the program of BEP-TR, the location of building data could not be entered into the program exactly as and the project is simulated geometric shapes in the system whereby gets results. These results have been hesitations what can be a positive or negative contribution.
- Also, entered in the system as separate blocks of the center was prevented that the come out of a common energy for the center. Therefore specific areas of the center (Refuge Dormitory, Block Management, Health Unit, etc.) energy analysis was carried out. It is considered to be more convenient to have.
- It was observed that some of the building materials used in the construction of the building were not the same at BEP-TR program, so the similar products were used at BEP-TR. This may have influenced the results evaluated.

Also, this informations could be used for determining the energy certification for the program taking into account the lack of observed in the simulation program.

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