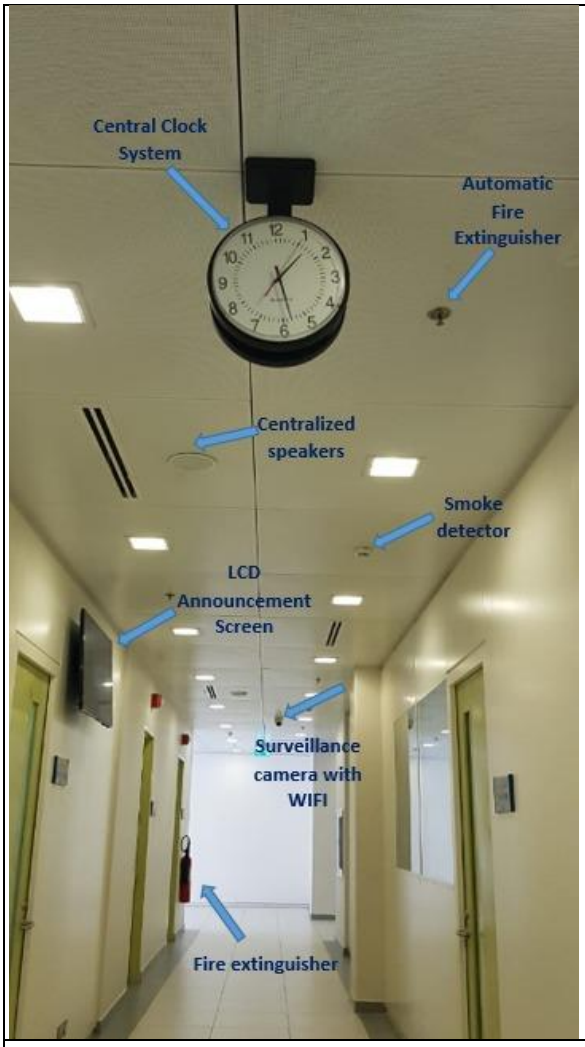
جامعة الإمام عبدالرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY

Energy-efficient renovation and building

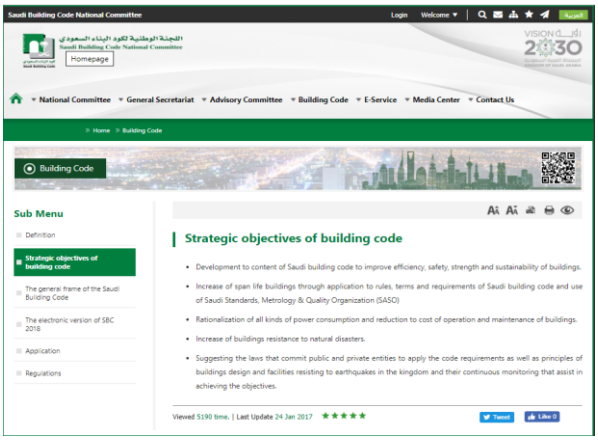
All renovations or new build construction are following energy efficiency standards as per the Saudi Building Code

Part A



Energy Efficient Appliances Usage in all the Buildings of IAU: Use of LED & fluoracent lighting and lamps with central clock system, centralized speaker & LCD Announcement screen

(Precast Concrete insulated panels and Curtain wall) Administration Building- IAU



IAU implement and abide by Saudi Building Code in its all Construction and Electricity plan

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PART B

OUTDOOR SIGNAGE IN C1-EAST CAMPUS

Example of Energy Efficient Appliances Usage: Solar energy for map direction and board and light outside

EXAMPLES OF SIGNAGE & SOLAR LIGHTS IN IAU CAMPUS

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DESCRIPTION:

Under the criteria Energy and Climate Change, the Imam Abdulrahman Bin Faisal University's Energy Efficient Appliances Usage is explained into following two parts A & B.

PART A: Optimized Eco-friendly Buildings

Imam Abdulrahman Bin Faisal University intends to realize further energy savings by paying close attention to energy management in all the colleges, deanships and administrative offices. They can assess their own energy consumption and realize their own energy-saving potential by means of, for example, insulation, LED lighting and the deployment of sustainable technology *(refer to 2 & 3)*

In order to build eco-friendly buildings which are more efficient in their energy usage different practices have been adopted:

1- Optimized Building Envelope

I) Window or Curtain wall Glass (Triple Silver Neutral enhanced high performance)
Insulating glass units opted has the best possible ratio of luminous transmission factor and total solar energy transmittance. "The coating systems used, reflect the long-wave infrared ray component of the incident solar radiation, which is primarily responsible for heating up interior spaces. The short-wave, visible radiation, on the other hand, passes through almost unhindered. In this way, solar control coatings reduce the inward transmission of energy, while still allowing natural daylight to enter the room. The special magnetron combi coatings also ensure good thermal insulation in winter "(Glastroesch).

U- Value	0.23 Summer (BTU/HR/SQ.FT/F)
	1.30 (W/SQ.M/C)
Solar Heat Gain Co-efficient	**0.15**
Shading Co-efficient	0.17
Visible Light Transmission (%)	35
Solar Energy Transmission (%)	10

II) Exterior Walls
Precast concrete insulated sandwiched panels external cladding and internal autoclaved aerated concrete (AAC) blocks may achieve:

U-value **0.23 (W/m2K)**

The above values "exceeds" Saudi building code (2018) and Saudi energy code (2018) requirements.

2- **LED**

In latest projects, LED exterior lights would save approximately 70% and LED interior lights would save approximately 40% to 45% as compared to previous lights used.

3- **HVAC**

Calculation based on energy standard ASHRAE 90.1 (2010) and LEED 2009.

As it is also apparent from the pictures, IAU's all buildings are equipped with LED lights and remaining few buildings with fluorescent light. Beside lighting, IAU has centralized air-condition system using recycled water for its cooling, which is serving vast IAU campuses.

Since, IAU abide by Saudi Building Code in its all Construction, Energy and Electricity plan, one of the sole objectives of Saudi Building Code National Committee is the rationalization of all kinds of power consumption and reduction to cost of operation and maintenance of buildings. That's the reason LED lighting system has been adopted and all fluorescent lights will be replaced with LED in coming days.

Implementation of solar energy is also in pipeline, although, as displayed in the picture above the example of Energy Efficient Appliances Usage, where Solar energy in IAU is used energy (light) to the map direction board and lights outside the IAU's buildings.

Deployment of sustainable technology is an important element of IAU's strategic plan which is aligned with 2030 vision of the country.

PART B: Sustainable system for Outdoor Signage

The Imam Abdulrahman Bin Faisal University provides an inclusive and sustainable wayfinding system. The system is designed and provided by the Inclusive Design Unit. Its signage design, location, and numbering strategies are utilized to ensure continuity within the Campus building and facilities, help maintain their integrity, and make them highly legible comprehensible by all potential on-campus and off-campus users. The system comprises the Exterior and Interior Graphic Wayfinding system.

The established geo-functional Information delivery approach handles a large amount of complex data that- when mainly referred to its spatial derivation- can be identified, intertwined, be combined, and crossed to different levels of communication complexity depending on the functional purpose of the environmental conversation.

The outdoor signage is designed to be integrative and eco-friendly. Sustainability features are demonstrated as follows:

1. **Sustainable system in terms of its material, energy-saving, and costs**
2. Mainly, adopting a clean – green energy system that produces electricity in a direct electricity generation way that is independent of the main university electric supply (i.e., Photovoltaic power system with LED lighting for all outdoor signage with embedded lighting);
3. Durable and Eco-Friendly materials (structure and finishing materials) as well as PV system components that weatherproof and suitable materials for the region;
4. An adaptable system that will work with all existing and future settings and buildings;
5. Easy to maintain and flexible for future expansion;
6. Available kit of parts for maximum changeability to accommodate phased implementation and future growth of institution;
7. Intentional flexibility considering the non-static and changeable nature of the numbers of buildings, facilities, and their indoor and outdoor components, a character that requires reconfiguration of spaces and their associated numbers.

The university has seven main campuses. The following table presents the amount of electricity consumed per each type of signage in only the main campus (C1 Campus) in Rakkah and their respective monthly and yearly Tariff. As shown, reliance on the PV system will spare the university a total amount of **96130.2 SAR** yearly.

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COMSUMPTION OF PV OUTDOOR SIGNAGE SYSTEM IN C1 CAMPUS

Sign Type	Number of signs in C1 Campus	Number of LED Bar/unit (1 LED bar = 14 W Each)	Lighting Power/Unit Watts/Panel	Solar Panel Size/ number/Unit	Electricity Consumption /Day (9 hours on)/ unit (KWH)	Electricity Consumption/ month/unit (KWH)	Tariff saved per month/unit (SAR)	Total Tariff saved per month (SAR)	Total Tariff saved per year (SAR)
Street Sign Pole	186	6 LED bar-each	90 W	80 x 80 x 1	0.81 kwh	24.3 KWH	7.78 SAR	1447.08 SAR	17364.96
Parking Sign Pole	168	4 LED bar-each	60 W	60 x 60 x 1	0.54 kwh	16.2 KWH	5.18 SAR	870.24 SAR	10442.88
Directional Sign	66	16 LED bar-each	120 W + 120 W	60 x 75 x 2	2.16 kwh	64.8 KWH	20.77 SAR	1370.82 SAR	16449.84
Identification BI-8	5	16 LED bar-each	120 W + 120 W	60 x 75 x 2	2.16 kwh	64.8 KWH	20.77 SAR	103.85 SAR	1246.2
Gateway Sign	6	16 LED bar-each	150 W + 150 W	67 x 140 x 2	2.70 kwh	81.0 KWH	25.92 SAR	155.52 SAR	1866.24
Two Post Sign	104	10 LED bar-each	140 W	60 x 80 x 1	1.26 kwh	37.8 KWH	12.10 SAR	1258.4 SAR	15100.8
Flag Sign	92	10 LED bar-each	120 W	40 x 100 x 2	1.08 kwh	32.4 KWH	10.37 SAR	954.04 SAR	11448.48
Map Wall Mounted	8	6 LED bar-each	90 W	60 x 60 x 1	0.81 kwh	24.3 KWH	7.78 SAR	62.24 SAR	746.88
Road Map Free-Standing	72	14 LED bar-each	100 W + 100 W	60 x 90 x 2	1.80 kwh	54.0 KWH	17.28 SAR	1244.16 SAR	14929.92
Walkway Map	45	8 LED bar-each	120 W	60 x 90 x 1	1.08 kwh	37.8 KWH	12.10 SAR	544.50 SAR	6534

Total Savings per year for the overall project: **96130.2** **SAR**

To date, 15 percent of the outdoor signage has been installed with a yearly savings of 4614.24 SAR.

Additional evidence link:

https://www.sbc.gov.sa/En/BuildingCode/Pages/Target.aspx

https://www.iau.edu.sa/en/administration/offices-of-the-vice-presidents/office-of-the-vice-president/deanships-and-departments/inclusive-design-unit/projects