The design of the Ibn al Haytham Pavilion pays tribute to the Arab scientist Ibn al Haytham who, over one thousand years ago through his experiments with optics, built the first camera obscura and successfully projected an entire image from outdoors onto a screen indoors. He was the first to recognize that light travels always in a straight line and yet can be refracted with materials such as glass and water. Thus we are designing a pavilion that captures the energy of the sun and transforms it into 196 vertical columns of light through a series of lenses. These columns of light can be seen in the adjacent camera obscura room as they shift their position throughout the day, following the movement of the sun. Markers in the room will also allow these columns of light to function as a sundial so that viewers can track the time of day. Concentrated photovoltaic (CPV) collectors receive the condensed power of each beam at the floor level, generating a peak capacity of approximately 160KW. The pavilion will therefore serve as a source of beauty and inspiration for park-goers as well as a source of clean energy for the park. The power from the pavilion would reduce the external electrical demand load of the park by about 10%-20%.
The Ibn al-Haytham Pavilion would generate 10%–20% of Mushrif Park’s energy needs through concentrated photovoltaic technology.

**Building Orientation and Solar Path Diagram**

**Concrete: A Sustainable Building Material**

**Resource Efficiency**
- The predominant raw material for the cement in concrete is lime, the most abundant mineral on earth. Concrete can also be made with fly ash, slag cement, and silica fume, all waste by-products from power plants, steel mills, and other manufacturing facilities.

**Durability**
- Concrete is durable, long-lasting structures that will not rust, rot, or burn. Life spans for concrete building products can be double or triple those of other common building materials.

**Photovoltaic Technology.**
- Mushrif Park’s energy needs through concentrated solar photovoltaic (CSP) technology concentrates sunlight through a lens onto a high performance solar cell, thus increasing the electricity generated over conventional PV panels. Typical photovoltaic panels only convert about 10 to 15 percent of incoming light into energy. CSP cells can reach efficiencies of 45 percent.
- The CSP solar cell has directly beneath the Fresnel lens concentrated solar concentrator. In the Ibn Al-Haytham Pavilion, the systems redesigned to create beams of vertical light with the power of 800 suns by concentrating sunlight through Fresnel lenses at the roof. These beams are then re-concentrated on the raised floor level by a second fresnel lens field and onto the CSP cells which are arranged in a naturally cooled plenum space at ground level.

**Benefits of Green Roofs**
- Grow herbs, vegetables, and flowers.
- Reduce heating by adding mass and thermal resistance value (by evaporative cooling) loads on a building—a building is glassed in so as to act as a terrarium and passive solar heat reservoir—a concentration of green roofs in an urban area can even reduce the city’s average temperatures during the summer.
- Increases roof life span.
- Reduce stormwater run off.
- Filter pollen and carbon dioxide out of the air.
- The soil and plants on green roofs help to insulate a building for sound. The soil helps to block lower frequencies and the plants block higher frequencies.
- Filter pollen and heavy metals out of rainwater.
- Increase wildlife habitat in built-up areas.