

# New Commercial Building in Al-Ain, UAE, Improves Local Urban Economy

British Applied College Promotes a Sustainable Design and Reduces Carbon Footprint Using STAAD

## SUPPORTING URBAN DEVELOPMENT

Located in the United Arab Emirates (UAE), approximately 160 kilometers east of the capital of Abu Dhabi, and 120 kilometers south of Dubai, Al-Ain is an important service center and developing tourist destination. A UNESCO World Heritage Site, it is known for its combination of modern buildings and historical structures that offer insight into the city's cultural heritage as one of the world's oldest permanently inhabited settlements. It was also where Sheikh Zayed bin Sultan Al Nahyan, the founder of the United Arab Emirates, spent much of his life.

To support economic growth and urban development, a new commercial building is being constructed in Hilli, one of the UAE's oldest civilizations, just north of Al-Ain. However, the building needed to meet strict height controls mandated by the city, as buildings can be no more than seven floors. Therefore, the building is a three-story structure, featuring a basement car park with a six-meter ramp connecting the parking area to the ground level for optimal mobilization. The municipality demands that car parking be provided for any commercial building.

To comply, the project team at British Applied College was tasked with creating the plan. Located in Umm Al Quwain, the university uses its latest, state-of-the-art facilities to prepare students for their future professional practice. Their mission is to nurture a community committed to attracting and retaining diverse, world-class talent, creating an innovative space, and ensuring individuals can achieve their full potential.

After reviewing the surrounding landscape, the team chose to plan a basement garage park rather than a ground-level car park. "The constructing of a commercial building will improve the urban

area and increase the economy and business in the city," said Mustafa Salsal, civil engineering undergraduate at British Applied College.

## SLAB LOADS AND SOIL BEARING CAPACITY

The Al-Ain desert climate brings wind speeds of up to 50 kilometers per hour and soft soil with low bearing capacity. Engineers thought that they might need to replace the soil or use a pile foundation to reach deeper, more supportive soil. Additionally, Al-Ain is known for its sprawling oasis, which is watered via an ancient irrigation system called falaj that still runs to this day. Therefore, the project team needed to ensure that their construction did not interfere with this ancient structure.

These environmental and topography conditions were compounded by the high tension of some of the building slabs, presenting structural challenges that required not only foundation support but also added reinforcements. The building is designed with 15-centimeter-thick slabs and the relatively high design loads required additional reinforcement in some floor areas.

The project team wanted to implement cost-effective and time-efficient structural design solutions, requiring comprehensive evaluation. However, to accurately assess the slab loads and soil-bearing capacity and ensure structural integrity of the building, the engineers needed advanced structural analysis technology.

## STAAD PROVIDES STRUCTURAL DESIGN SOLUTIONS

After considering their options, the project team selected STAAD to evaluate design options for optimizing structural reliability of the substructure and the superstructure. "Using STAAD allowed for

## PROJECT SUMMARY

### ORGANIZATION

British Applied College

### SOLUTION

Structural Engineering

### LOCATION

Hilli, Al-Ain, United Arab Emirates

### PROJECT OBJECTIVES

- ◆ To deliver a three-story commercial building to enhance an urban economy.
- ◆ Evaluate multiple design alternatives to optimize structural integrity.

### PROJECT PLAYBOOK

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### FAST FACTS

- ◆ An AED 988,000 commercial building will improve Al-Ain's local urban economy.
- ◆ The structure features a basement garage park and a ground level, plus two additional levels.
- ◆ British Applied College chose STAAD to help face weak soil conditions and high slab tension requiring foundation support and added reinforcements.

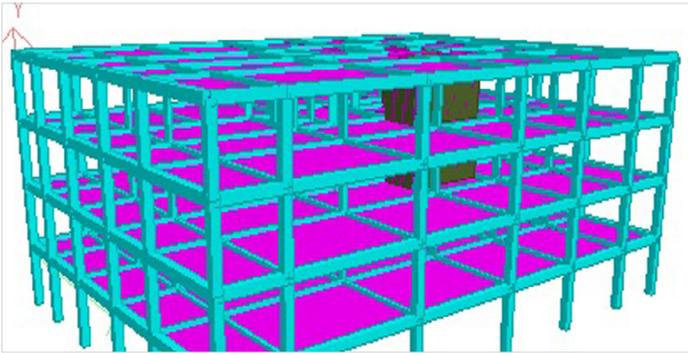
### ROI

- ◆ Using STAAD, British Applied College saved approximately 14% of the cost compared to using other applications.
- ◆ Working in a 3D analytical modeling environment enabled more detailed accurate analysis and accelerated design time to save about 24 days.
- ◆ The flexibility of STAAD provided accurate results, which eliminated the need to redesign or recheck the model, saving additional time.

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“[STAAD] saved a lot of time while analyzing the impact loads and helped to reduce the excess use of materials.”

– Mustafa Salsal, Civil Engineering Undergraduate, British Applied College



An AED 988,000 commercial building in Al-Ain features a basement garage park with a ground level and two additional levels.



British Applied College chose STAAD to help address weak soil conditions and high slab tension, which required foundation support and added reinforcements.

the use of alternative methods to solve our problems in both the substructure and superstructure,” said Salsal.

The project team quickly modeled and analyzed numerous design options for the foundation with STAAD, ultimately determining that a raft mat foundation with a depth of 1.2 meters would be the most time efficient and least costly solution. With Bentley’s structural design and analytical modeling technology, the engineers were able to design the emergency staircase and elevator to withstand all impact loads using a 20-centimeter core wall to resist lateral loads and maintain more strength against seismic loading conditions.

## DELIVERING SAVINGS AND SUSTAINABILITY

Compared to other structural engineering software, STAAD delivered faster results with more detail and accuracy. “The software saved a lot of time while analyzing the impact loads and helped to reduce the excess use of materials,” said Salsal.

Using Bentley’s user-friendly application for advanced 3D structural analysis accelerated design time while delivering a cost-efficient, robust building structure, while helping the team to reduce the structure’s carbon footprint. The structural solutions developed using STAAD facilitated a more sustainable design, using less construction materials while supporting a greater structural span.

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