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FACILITY MANAGEMENT GUIDING DESIGN

Ensuring Safety, Efficiency, and Compliance

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Station Manager	Qatar Rail Company	Aug17– Present
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BIM Project Manager	Hochtief ViCon, Qatar	Feb16– July17
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- **Professional Qualifications:**
- - M. Eng in Product Architecture Engineering, Stevens Institute of Technology, USA
- - B.Sc. in Architectural Engineering (Honors), University of Khartoum, Sudan
- - LEED AP® Accredited Professional

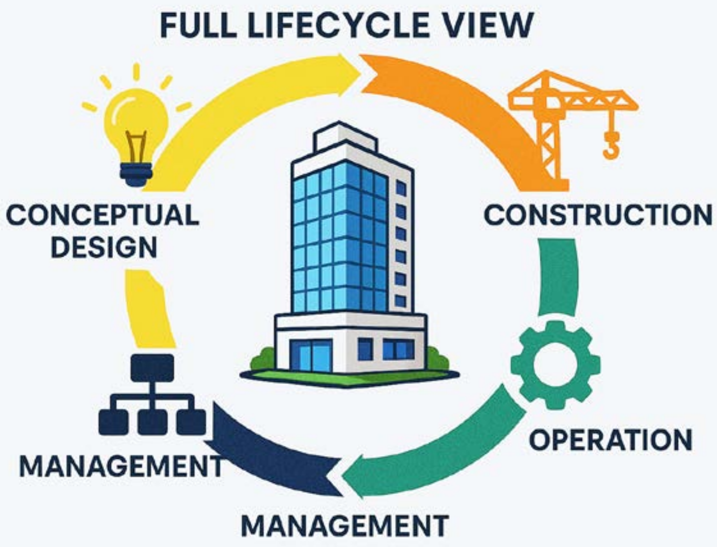
- **Areas of Expertise:**
- - Strategic Planning & Policy Development
- - Urban Planning & Transport Consultancy
- - BIM Management & Parametric Modeling
- - Sustainable Design & LEED Accreditation
- - Infrastructure Development & Risk Mitigation

INTRODUCTION

Facility Management:

The Silent Force Behind Design Success

- FM is no longer post-occupancy maintenance — it's a **design driver**.
- The **link** between design intent and operational reality defines long-term performance.
- My approach: bridging conceptual design, construction, operation, and management — **the full lifecycle view**.



THE TRADITIONAL GAP

Design vs. Operation: A Persistent Disconnect

- Designers focus on aesthetics & compliance.
- Operators focus on usability, access, and maintenance.
- Lack of early FM input leads to:
  - Inefficient maintenance access
  - Higher energy bills
  - Shortened equipment lifespan
  - Recurring failures due to unquestioned design assumptions.

THE TRADITIONAL GAP

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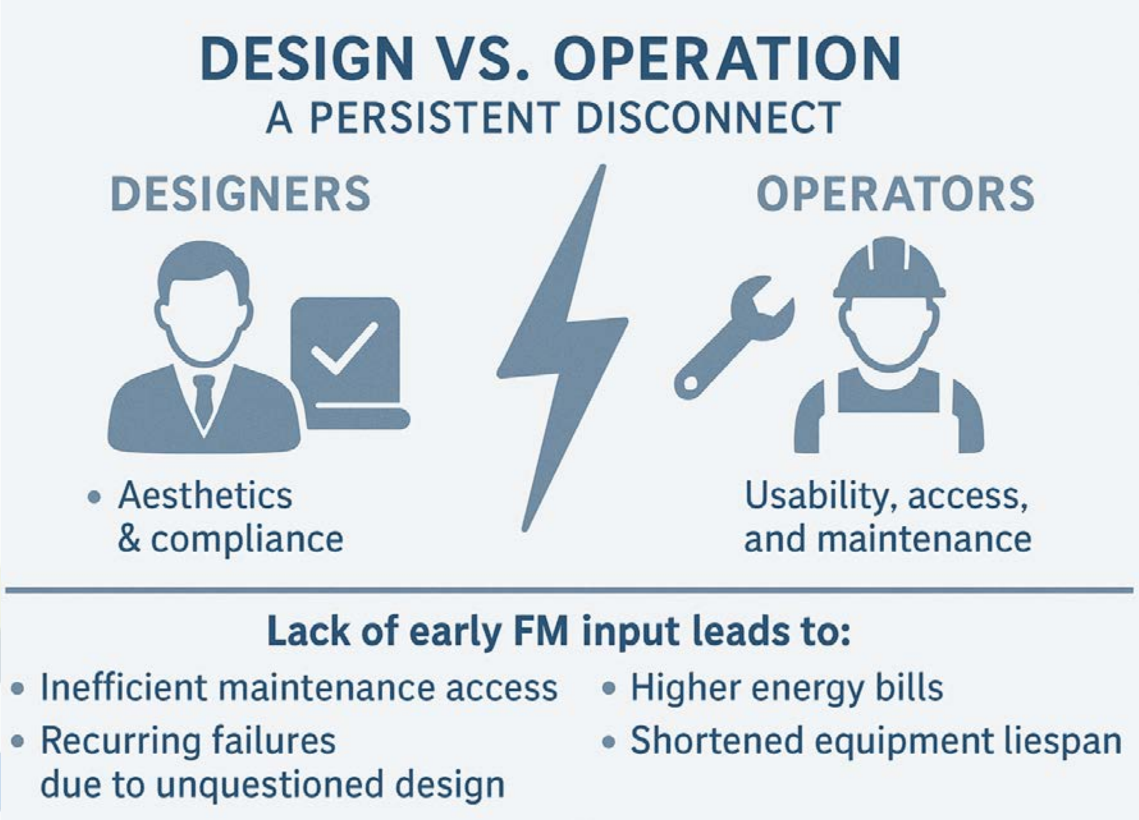


FACILITY MANAGEMENT AS A DESIGN PARTNER

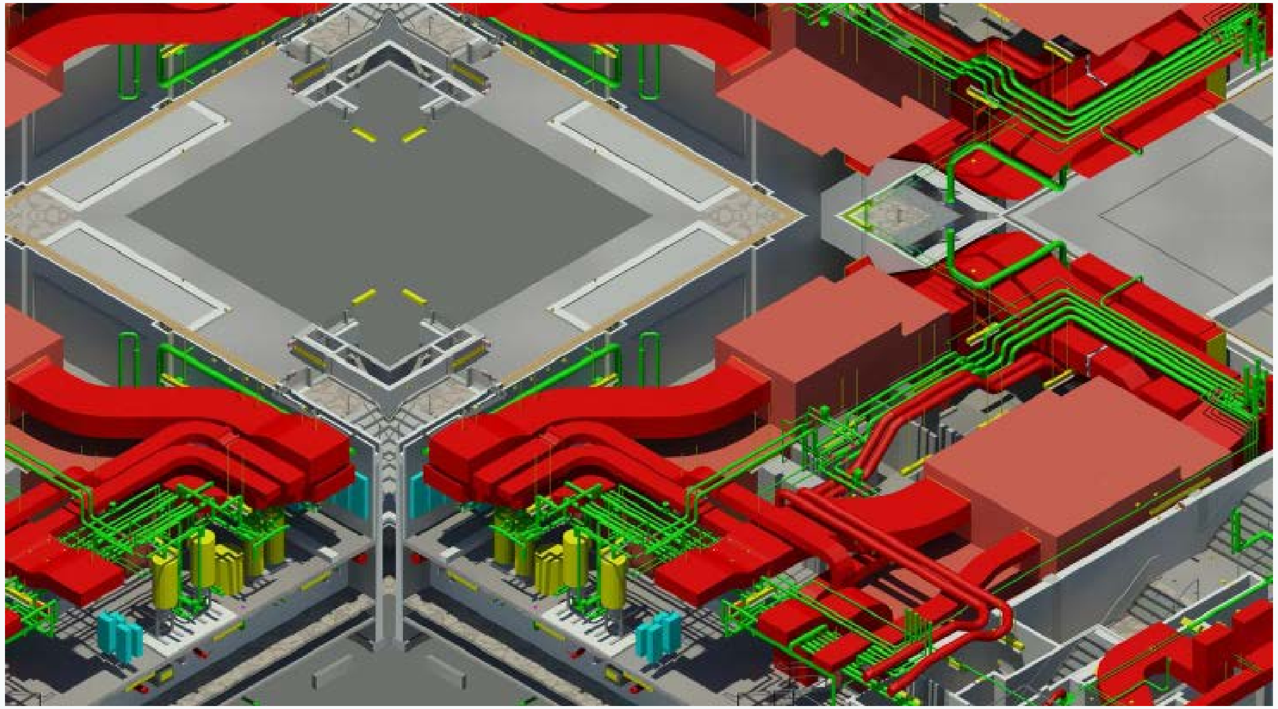
A Shift in Mindset

- Involve FM professionals from conceptual design.
- Adopt Design for Maintainability (DfM) and Life Cycle Costing (LCC) principles.
- Integrate asset management systems during design (BIM, CAFM-ready models).
- Align project documentation to operational deliverables (O&M manuals, digital twins).

FACILITY MANAGEMENT AS A DESIGN PARTNER

A Shift in Mindset

Create an information structure that can live along with and support the facility for its entire life



FACILITY MANAGEMENT AS A DESIGN PARTNER

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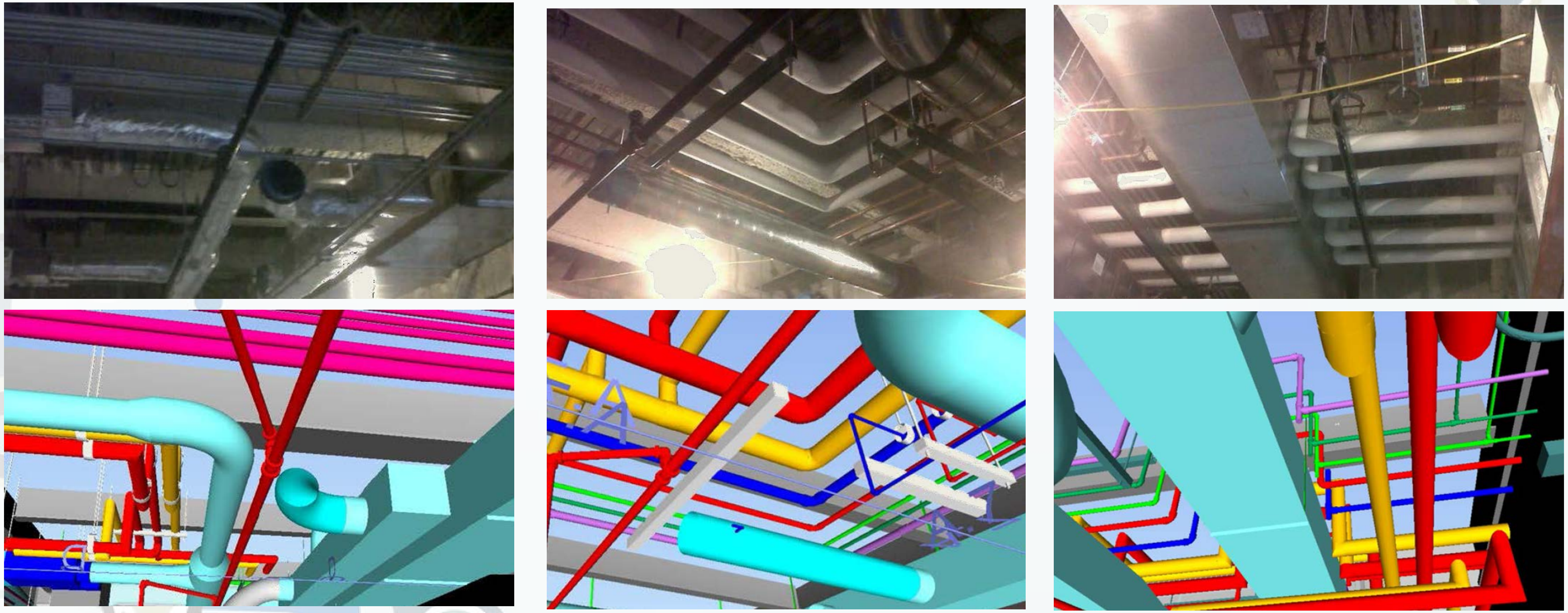

FACILITY MANAGEMENT AS A DESIGN PARTNER

A Shift in Mindset

Teesside University

ARCHITECTURE, CONSTRUCTION MANAGEMENT AND ECONOMICS

Cost-benefit analysis of BIM-enabled design clash detection and resolution

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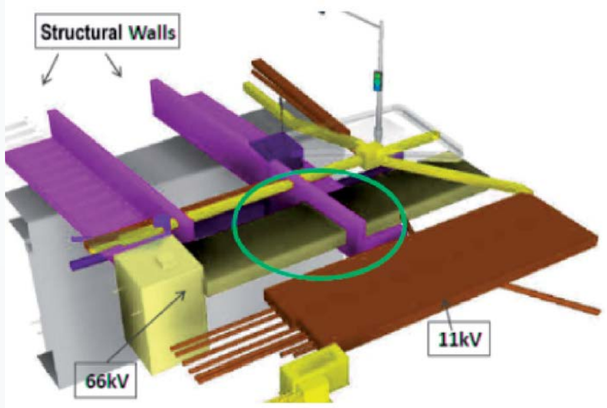
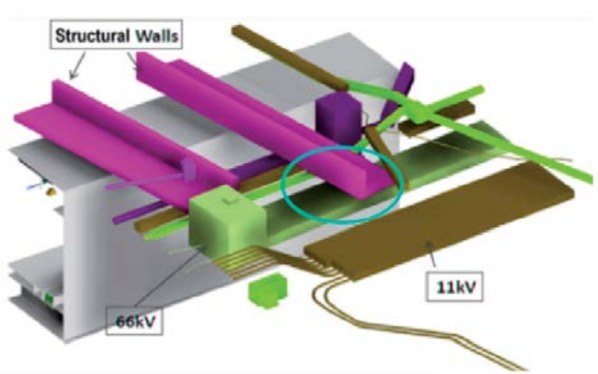
ABSTRACT
Building Information Modelling (BIM) is increasingly deployed as part of the processes in Architecture, Engineering and Construction (AEC) industry projects. While the benefits of BIM have been extensively proclaimed, explicit justification in terms of direct cost savings for BIM implementation on real-life projects, particularly for clash detection BIM workstream, are not well documented. This paper proposes and demonstrates a methodology to prove how BIM-based clash detection leads to cost savings. A schema is developed based on literature review and industrial expertise to quantify cost savings achieved by the utilisation of BIM-based clash detection and resolution. This paper provides validation of the proposed schema on a major infrastructure project. The developed schema includes the categorisation of identified clashes

REPORT DATE
15 July 2020

KEYWORDS
Building Information Modelling (BIM); cost estimation; clash detection; BIM savings; BIM case study; cost benefit analysis



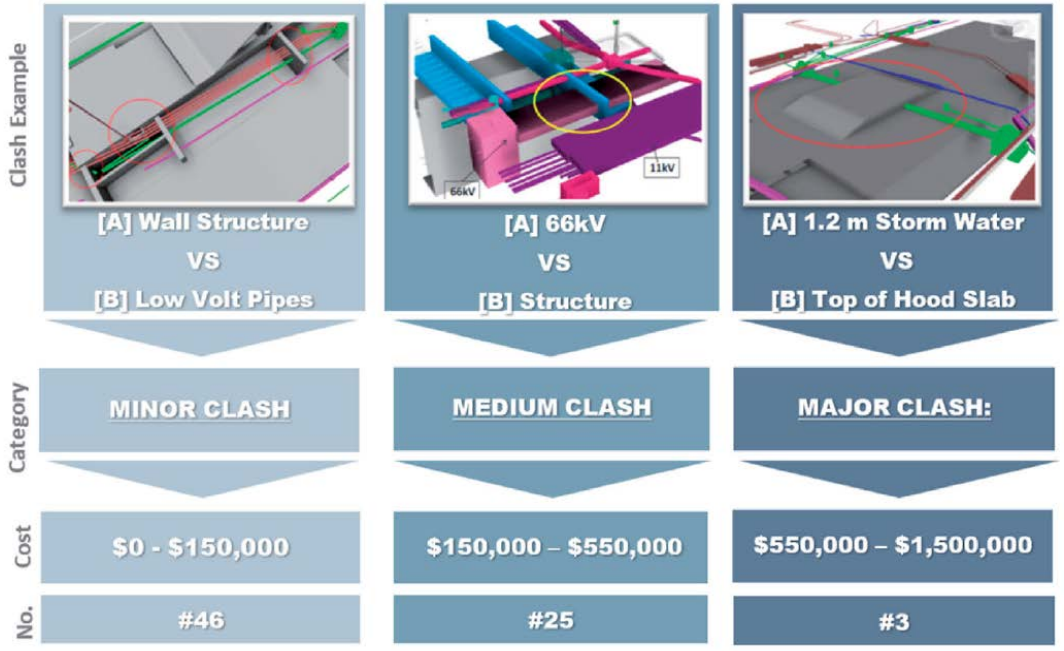


FACILITY MANAGEMENT AS A DESIGN PARTNER

A Shift in Mindset

Table 7. Listing and categorisation summary of all clash instances.

Involved disciplines	Major	Medium	Minor
IRRIGATION VS. STRUCTURE	0	1	12
SEWAGE VS. STRUCTURE	1	5	6
ELECTRICAL VS. STRUCTURE	0	1	3
PORTABLEWATER VS. STRUCTURE	0	1	3
PNEUMATIC WASTE VS. STRUCTURE	0	3	0
DISTRICT COOLING VS. STRUCTURE	1	0	1
TELECOMMUNICATION VS. STRUCTURE	0	1	1
VARIOUS 66 KV HARD CLASHES	0	0	12
VARIOUS 66 KV SOFT CLASHES	0	4	7
OTHERS	1	9	1
Total	3	25	46



$15,275,000

THE DESIGN-OPERATION CONTINUUM

How the Two Worlds Interact

CONCEPT

- Space, systems, aesthetics
- Maintainability feedback
- Equipment layout & access

DESIGN DEV.

- Material & system selection
- Lifecycle cost validation
- FM review checkpoints

CONSTRUCTION

- As-built accuracy
- Asset tagging & commissioning
- Digital handover

OPERATION

- Refine and update FM strategy
- Monitor performance
- Lessons learned for next design

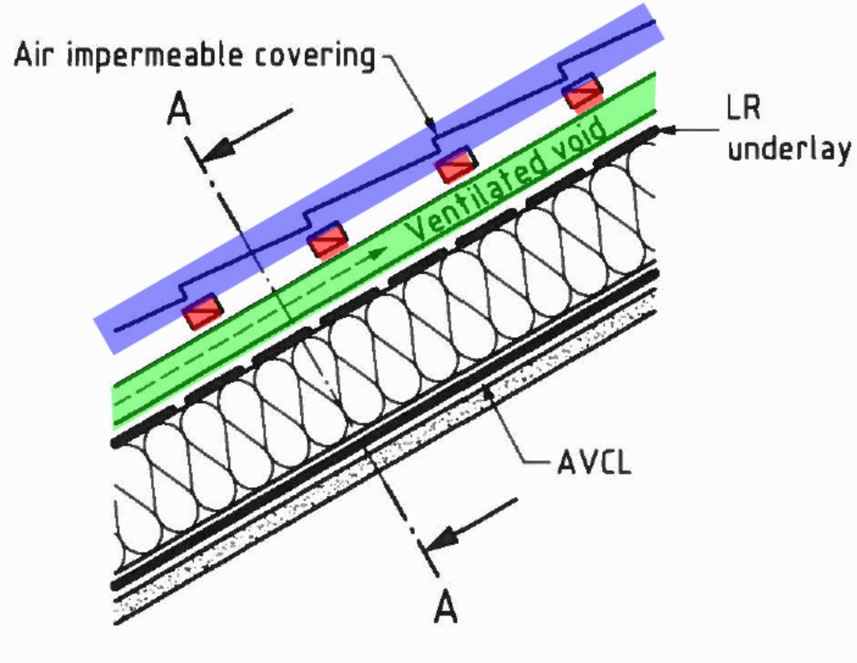
CASE STUDY 1: FULL-CYCLE EXPERIENCE

From Concept to Operation – Lessons from Real Projects

- Projects followed from idea → construction → operation.
- Key insight: seeing your own design aged over years teaches more than any manual.
- Real-world feedback loops:
  - Material degradation in unexpected microclimates
  - User behavior redefining space utilization
  - Access issues in ceiling, MEP shafts, or façade cleaning.

CASE STUDY 1: FULL-CYCLE EXPERIENCE

From Concept to Operation – Lessons from Real Projects



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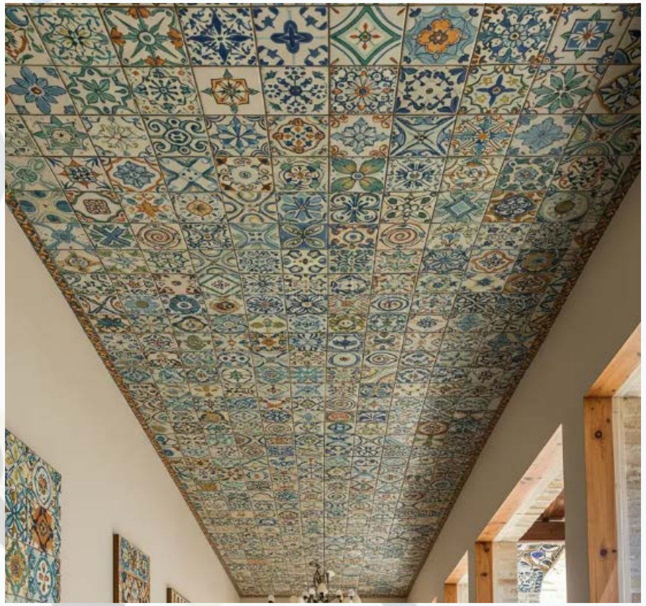
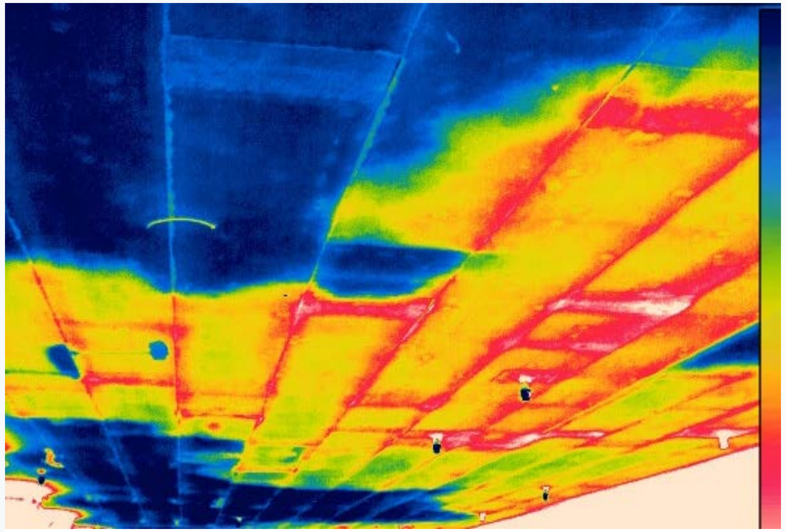


CASE STUDY 1: FULL-CYCLE EXPERIENCE

From Concept to Operation – Lessons from Real Projects

Humidity Sensor

Moisture Meters



Thermal Imaging to determine water presence

CASE STUDY 1: FULL-CYCLE EXPERIENCE

From Concept to Operation – Lessons from Real Projects

• Maximum ambient outdoor air temperature (shade):	53^0C
• Minimum ambient temperature:	7^0C
• Average summer Maximum ambient outdoor air temperature (shade):	49^0C
• Average winter Maximum ambient outdoor air temperature (shade):	12^0C
• Average annual ambient temperature:	35^0C
• Maximum external surface temperature (direct exposure to sun):	84^0C
• Average annual ambient relative humidity:	70%
• Maximum ambient relative humidity:	100%
• Minimum ambient relative humidity:	1%

CASE STUDY 2: STANDARDS MISALIGNED WITH CLIMATE

When Compliance Isn't Enough

- Example: HVAC design depend on glazing U-Value.
- U-Value is measured based on the difference of temperature between external and internal.
- Usually the U-Value, the industry follows mainly the European standard where the difference between external and internal is less than in Qatar.
- The more difference in temperature the more U-Value, more cooling load required.

CASE STUDY 2: STANDARDS MISALIGNED WITH CLIMATE

When Compliance Isn't Enough

- **Following European Standard s may results in under sizing the cooling load- which affects in HVAC performance ibn summer peak time.**
- **Consequences:**
  - **VAC Continuous overload**
  - **Energy waste and tenant dissatisfaction.**

10˚-8˚ external to internal *(for 32˚C external temperature targeting 22˚C internal).*

- **Meets international code – but fails Qatar's 46˚C+ summer reality.**

- **Lesson: Standards must be localized , not imported.**

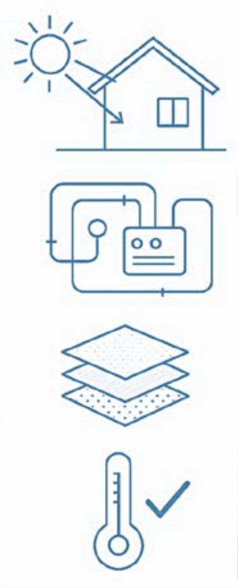
THE COST OF IGNORING FACILITY MANAGEMENT

Design Errors Become Operational Burdens

- **60–80%** of a building's cost is in operation & maintenance, not construction.
- Each inaccessible valve, under-ventilated shaft, or undersized plant room adds hidden cost.
- Reactive maintenance culture is a symptom of design-stage neglect.

GOOD DESIGN AS PREVENTIVE MAINTENANCE

Design Choices That Extend Asset Life



- **Proper shading orientation = lower cooling load**
- **Accessible MEP layouts = reduced maintenance downtime**
- **Material compatibility = fewer premature replacements**
- **Right thermal parameters = longer system life**

SUSTAINABLE FM STARTS AT THE DRAWING BOARD.

LEARNING FROM RECURRING DEFECTS

Root Cause Thinking

- Repeated defects often trace back to unchallenged design assumptions.
- WORKMANSHIP is included if design is too complicated or skilled labor scarcity .
- Every recurring defect is an opportunity to redefine design criteria.
- Establish feedback loops between FM and design teams.

TOWARD INTEGRATED LIFECYCLE THINKING

Bridging the Cycle: Design → Build → Operate → Renew

- **Adopt BIM-based asset information models.**
- **Mandate FM design reviews before IFC drawings.**
- **Use post-occupancy evaluation as part of design KPIs.**
- **Promote a Whole Life Value culture across all project stakeholders.**

CONCLUSION

Facility Management Should Guide Design, Not Follow It

- The best design is the one that lasts with the least intervention.
- Every line drawn on paper has operational implications.
- The synergy between design and FM is the foundation of sustainable cities.
- Design for operation, not just for completion.

THANK YOU

Sudanese Engineers Association
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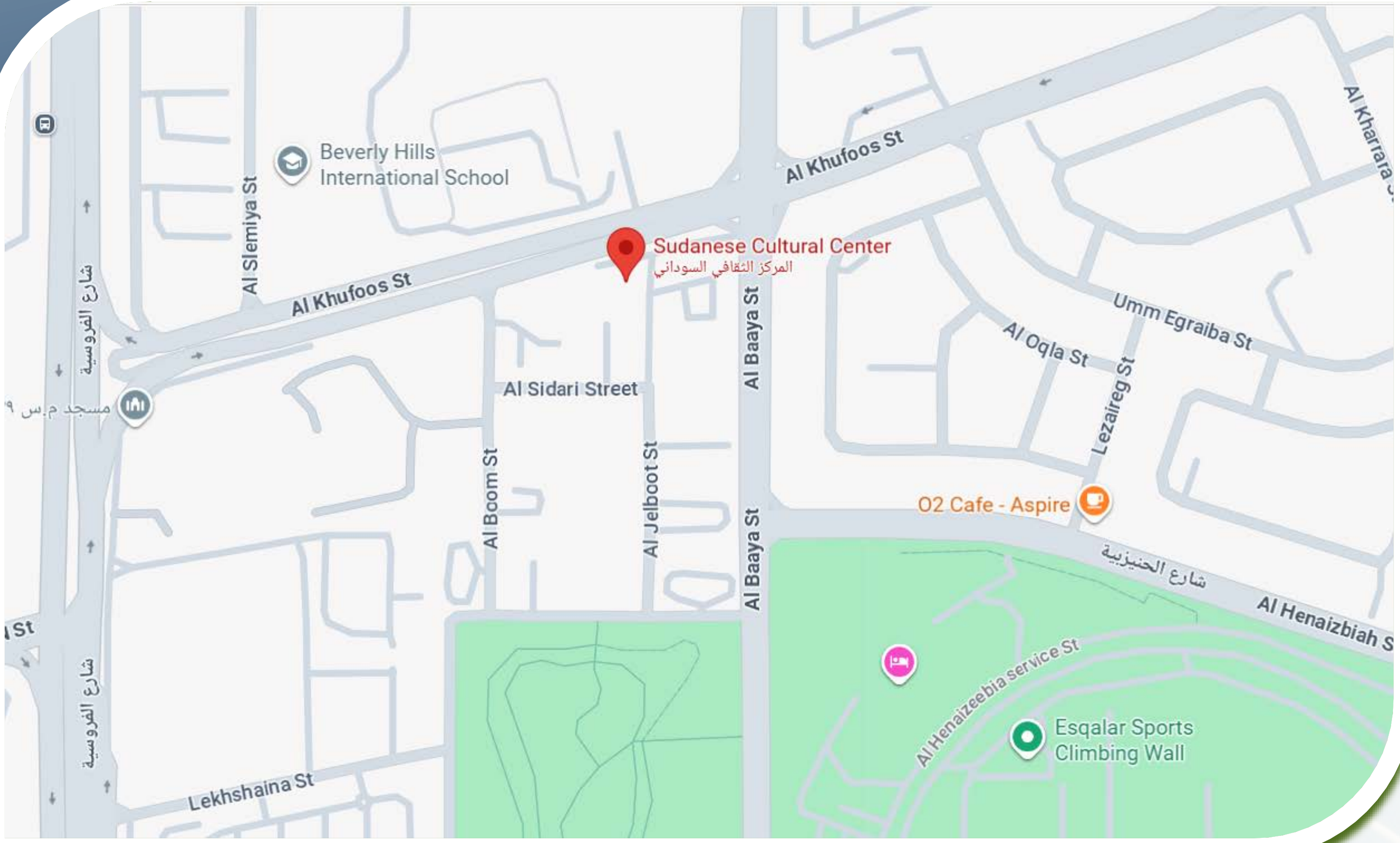

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