SMART BY DESIGN:
Implementing Intelligence During Design & Construction
DESIGN STAGES

1. Ability to impact cost & functional capabilities
2. Cost of design changes
3. Traditional design process
4. IPD design process

Design effort/impact

1. Brief
2. Concept design
3. Schematic design
4. Detail design
5. Tender & issue for construction
6. Supervision & handover
BRIEF

LAMAR INVESTMENT, KSA

• Typical floor plate study
BRIEF

LAMAR INVESTMENT, KSA

- Typical floor plate development

and area summary

<table>
<thead>
<tr>
<th>CATEGORIES</th>
<th>EXISTING</th>
<th>PROPOSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>APARTMENTS</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>CIRCULATION</td>
<td>25%</td>
<td>13%</td>
</tr>
<tr>
<td>SERVICES</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>BALCONIES</td>
<td>11%</td>
<td>19%</td>
</tr>
<tr>
<td>PUBLIC FACILITIES</td>
<td>13%</td>
<td>17%</td>
</tr>
<tr>
<td>GROSS AREA PER APARTMENT + MULLIONS</td>
<td>101%</td>
<td>121%</td>
</tr>
<tr>
<td>CORE AREA</td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td>GROSS BUILDING AREA + FACILITIES</td>
<td>120%</td>
<td>141%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NUMBER OF APARTMENTS PER FLOOR</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 BED UNIT</td>
<td>156</td>
<td>156</td>
</tr>
<tr>
<td>2 BED UNIT</td>
<td>194</td>
<td>194</td>
</tr>
<tr>
<td>3 BED UNIT</td>
<td>209</td>
<td>209</td>
</tr>
<tr>
<td>4 BED UNIT</td>
<td>421</td>
<td>421</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NUMBER OF APARTMENTS IN BUILDING</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 BED UNIT</td>
<td>71:129:2</td>
<td>71:109</td>
</tr>
<tr>
<td>2 BED UNIT</td>
<td>69:130:4</td>
<td>71:155</td>
</tr>
<tr>
<td>3 BED UNIT</td>
<td>150:125:6</td>
<td>151:35</td>
</tr>
<tr>
<td>4 BED UNIT</td>
<td>151:140:4</td>
<td>151:6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OVERALL SUMMARY</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 BED UNIT</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>2 BED UNIT</td>
<td>154</td>
<td>154</td>
</tr>
<tr>
<td>3 BED UNIT</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>4 BED UNIT</td>
<td>210</td>
<td>210</td>
</tr>
</tbody>
</table>
PRE-CONCEPT DESIGN
PRE CONCEPT DESIGN
ELITE RETAIL & RESIDENCES, KSA

- Typical floor plate study.
- Unit mix and their arrangement.
CONCEPT DESIGN
**CONCEPT DESIGN**

TOIC: ABU DHABI

- Typical units plans study
- Unit mix and their arrangement.
CONCEPT DESIGN
TDIC, ABU DHABI
- Typical floor plate development
- Facade study & development
- Analysis

FACADE DEVELOPMENT RENDERS

TYPICAL FLOOR PLANS

RENDERED ELEVATIONS
CONCEPT DESIGN
TECOM INNOVATION HUB, DUBAI

- Masterplan development,
- Typical building designs, development and treatment.

MASTERPLAN DEVELOPMENT

Bicsi
EMEA REGION
bicsi.org/emea2020
CONCEPT DESIGN
TECOM INNOVATION HUB, DUBAI

- Facade development
- Facade developed as modulated elements which are further used as repetitive pattern.
- Time saved with effective modeled elements.
CONCEPT DESIGN
AL MULLA 5 STAR HOTEL & RESIDENCES, DUBAI

- Facade study & development
- Utilized system modulation
- Modulation patterns created based on the percentage of clear glass requirement.

MODULATION PATTERNS
SCHEMATIC DESIGN
SCHEMATIC DESIGN
AL MULLA 5 STAR HOTEL & RESIDENCES, DUBAI

- Schematic design development
- Authority code compliant design.
- Efficient, typical design elements

Efficiency = (B/A) * 100
Floor Efficiency achieved = 88%

TYPICAL FLOOR PLAN - RESIDENTIAL
**SCHEMATIC DESIGN**

AL MULLA 5 STAR HOTEL & RESIDENCES, DUBAI

- Schematic design development
- Authority code compliant design.
- Efficient, typical design elements

**LEGEND**

- STANDARD ROOM TYPE D
- STANDARD ROOM TYPE E
- TWIN ROOM TYPE B
- TWIN ROOM TYPE C
- TWIN ROOM TYPE D
- SUITE ROOM TYPE A
- SUITE ROOM TYPE B

**Efficiency = (B/A) * 100**

Floor Efficiency achieved = 84%
SCHEMATIC DESIGN
ELITE RETAIL & RESIDENTIAL, KSA

- Parametric modelling
- Modulation
- Marketing materials

REVIT MODEL VIEW

RENDER

bicsi.org/emea2020
SCHEMATIC DESIGN

- Parametric modelling
- Curved walls modelling
- Precast panel modelling
- Slanted columns modelling
- Curtain system
- Trusses modelling
- Drafting techniques and wall sections
SCHEMATIC DESIGN

- Clash detection & coordination.
- Detecting collisions during design, in real time.
- Filters and searches saved and used throughout the project.
SCHEMATIC DESIGN
DUBAI CREEK HARBOUR - THE TOWER, DUBAI

- Parametric modelling
- Authority complaint design development

STAIR SELECTION
GENERAL 3D VIEW

FIG - 1
FIG - 2
FIG - 3

bicsi.org/emea2020
SCHEMATIC DESIGN
TECOM INNOVATION HUB, DUBAI

- Parametric modelling
- Quicker production of rough layouts.
- 3D views to assist with different design ideas at early stages.
SCHEMATIC DESIGN
TOIC. ABU DHABI
- Parametric modelling
- Façade development
5
DETAIL DESIGN
DETAIL DESIGN
AL MULLA 5 STAR HOTEL & RESIDENCES, DUBAI

- Typical standard details developed for the wet areas.
- Overall time reduced with effective modelling and typical details.
DETAIL DESIGN
AL MULLA 5 STAR HOTEL & RESIDENCES, DUBAI

- Clean modulated design development.
- Overall time reduced with effective modeling and typical details.

DESIGN DEVELOPED FOR RESIDENTIAL LOBBY AND CORRIDOR SPACES.
DETAIL DESIGN
AL MULLA 5 STAR HOTEL & RESIDENCES, DUBAI

- Overall coordination between various disciplines namely - Architecture, Structure and MEP.
DETAIL DESIGN

- Curved walls modelling
- Pre-cast panel modelling
- Slanted columns modelling
- Curtain system
- Trusses modelling
- Drafting techniques and wall sections
- Parametric modelling and documentation done using dynamo scripts.

Dynamo scripts created for modelling and documentation.

Bicsi.org/emea2020
DETAIL DESIGN
DUBAI CREEK HARBOUR - THE TOWER, DUBAI

- Multi-disciplinary coordination achieved using navisworks for clash detection.
DETAIL DESIGN
DUBAI CREEK HARBOUR - THE TOWER, DUBAI

- Design developed further from concept stage to the level of FF.
TENDER & ISSUE
FOR CONSTRUCTION
DUBAI CREEK HARBOUR - THE TOWER, DUBAI

- Coordinated, error-free and high quality construction documentation.
TENDER & ISSUE FOR CONSTRUCTION
(SAE PAVILION - EXPO 2020, DUBAI)

- Coordinated, error-free and high-quality construction documentation.

SAMPLES OF PROJECT SHEETS
TENDER & ISSUE FOR CONSTRUCTION
AL MULLA 5 STAR HOTEL & RESIDENCES, DUBAI

- Coordinated, error-free and high quality construction documentation.
TENDER & ISSUE FOR CONSTRUCTION
TECOM INNOVATION HUB, DUBAI

- Coordinated, error-free and high-quality construction documentation.
SUPERVISION & HANDOVER
TECOM INNOVATION HUB, DUBAI

- Contract administration: manage the negotiation, execution, performance, modification, and termination of contracts with various parties including the developer, suppliers, designers, contractors, and sub-contractors. It also involves online tracking and recognizing performance by managing a common data exchange environment for validation and approvals.

- Render
- IFC, Revit Model
- As Built on Site
SUPERVISION & HANOVER
DFC GATE AVENUE, DUBAI

PROGRAMME MANAGEMENT: THE OVERALL MANAGEMENT OF CONSULTANTS AND CONTRACTORS’ PROGRAMMES AND SIMULATION IN 4D VISUAL PROGRAMME. IT ALSO INVOLVES THE LINKAGE OF THE OVERALL PROGRESS WITH THE 4D PLANNED PROGRAMME TO TRACK CHANGES, RESOLVE CONFLICTS AND PRIORITIZE WORKFUL PROCESSES TO ACHIEVE BEST PERFORMANCE WITHIN PLANNED TIMEFRAME.
SUPERVISION & HANDOVER
HOLIDAY INN & STAYBRIDGE, DUBAI

- Shop Drawing Review: As Shop Drawings Forms an Essential Part of the Contract, We Manage and Control the Validation Process with Specs and Plans Online with Designers and Engineers. Detect Clashes and Resolve Them Using BIM Construction Simulation to Avoid Any Unplanned Changes in Time, Quality or Cost. Shop Drawing Model is Later Verified with the As-Built State of Construction to Issue a Final As-Built Model Including All Required Information Needed by the Operator and Facility Manager With a Valid Extractable, Share Information and Compliant with Facility Management CATIA.
SUPERVISION & HANDOVER
SOUQ EXTRAMALL DSOA, DUBAI

VALUE MANAGEMENT: DEFINING AND ADDING MEASURABLE VALUE, FOCUSING ON OBJECTIVES AND VISION, AND CONCENTRATING ON FUNCTION AND EFFICIENCY WITH NO COMPROMISE WITH THE BEAUTY FACTOR. IT IS AN ESSENTIAL PART OF THE VALIDATION PROCESS OF SHOPDRAWINGS WITHIN THE INTEGRATED FRAMEWORK INCLUDING DESIGNERS AND CONTRACTORS AS A VALUE FOCUSED MANAGEMENT STYLE; A POSITIVE APPROACH TO INDIVIDUAL AND TEAM MOTIVATION AND COMMUNICATES THE NEEDED AWARENESS TO PROJECT OWNER TO ACHIEVE BEST OPTIMAL RESULTS.
Are we on track?
22% SAVING IN CONSTRUCTION COSTS

Following British standard BS 1192 and publicly available specification PAS 1192-2 which have already been shown to help users save up to 22% in construction costs.
COLLABORATIVE WORKING

Integrated design and construction team using BIM edge technology to stimulate time, cost, sustainability and deliver CO2ise quality graphical and non-graphical information.
DIGITAL WORKING

Digitally engage with all teams using a unified cloud database to communicate, submit, and validate graphical and non-graphical information online with client's team.
SUSTAINABILITY

Achieve green construction goals, carbon footprint, LEED, BREEAM, energy consumption conclusion and deploy renewable energy solution
DESIGN INTELLIGENCE

Programmatic architectural smart design based on modular approach and contructed by digital framework of integrated technology to afford cost and time optimising during design life cycle.
CONSTRUCTION INTELLIGENCE

Digitally engage with the contractor for validation & approval, supervise & ensure delivery, and deliver COBBie standard asset models. The operator.
E-CONSTRUCTION

Building design is constructed & tested electronically to avoid hidden surprises, solve issues and simulate cost & time to build before starting on construction site.

- Development of challenging design solutions which account for time & cost simulation through effective BIM integration.
- Modulation to aid construction and installation
- Prefabrication of modelled components by unfolding built form through the use of programmed Dynamo scripts

fig - 1: Isometric view of retail mall
fig - 2: BIM-generated schematic drawings of retail mall
fig - 3: Shop revision of retail mall
used for pre-fabricated construction
MITIGATION

Avoid any unplanned variations on the construction site by coordinating and testing graphical and non-graphical inputs before starting work on site.

- **Planning to Optimize Design Development Through Feasibility Studies Prior to Construction**
- **Centralized Modeling Practices for Ease of Coordination**

---

**Fig - 1: Conceptual Development of Master Plan on Rhino**

**Fig - 2: Construction Drawings Developed on BIM Utilizing Conceptual Model as a Base**
CONSERVATION

Effective programming and prevention of time wastage to achieve targets within the prescribed time and budget through electronic simulation.
ENGAGEMENT

Engagement with client beyond design and construction providing accurate visuals for sales & marketing, value engineering by providing options and commit passing as-built information to the building operator CAFM

- EFFECTIVE COMMUNICATION OF DESIGN AND ASSOCIATED COMPONENTS IN THE FORM OF GRAPHICAL & VISUALLY AESTHETIC REPORTS, PRESENTATIONS & RENDERS/ANIMATIONS.

- ENHANCE VALUE ENGINEERING THROUGH THE DEVELOPMENT OF DESIGN OPTIONS, ADHERING TO CLIENT REQUIREMENTS & STANDARDS
THANK YOU

Mohamed Essam – RMJM
Chief Technology Officer
Email: m.essam@rmjmd3.com