3D Model Specifications for Buildings

Version 1.0

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A. Introduction

Lusail Real Estate Development Company (LREDC) is building a 3D model of infrastructure and new buildings for Lusail City. This model is updated with new infrastructure and building design information as the city evolves. The model is used to assist with visualizations, urban design and architecture analysis, infrastructure and building interface coordination and master plan compliance.

Sub-developers are required to submit 3D models of their proposals as part of the Lusail building permit review process. These models are then incorporated into the larger Lusail 3D model for visualization and analyses in accordance with Lusail's Building Information Modeling (BIM) strategy.

This document describes the general 3D modeling requirements and principles and the specifications for the type of models required in each LAC building permit review stage.

The review stages and model types are as follows:

Concept Design: 3D Schematic Model
Design Control 1 (DC-1): 3D Urban Model
Design Control 2 (DC-2): Revised/Final 3D Urban Model

B. General 3D modeling requirements

B.1 Modeling principles

1. A 3D Model consists of objects representing building parts. For the purposes of Lusail's modeling requirements, all objects must be generated as 3D solids (see Figure 1). Objects represented by surfaces, lines or grid elements are not acceptable.

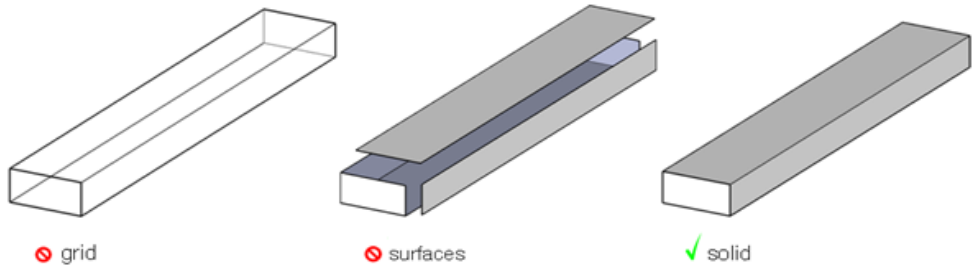


Figure 1: Difference between grid, surface and solid 3D modeling

2. The 3D Model file format shall be one of the following:

Table 1: Overview of approved file formats

Format	Version	Software
DWG	Up to 2012	Autodesk AutoCAD
RVT	Up to 2012	Autodesk Revit

Other file formats may be used, but are to be confirmed by LREDC.

3. The file units should be in "meters". The origin of the project coordination system should have a reference to the Qatar National Grid (QND95) and the Qatar National Datum (QND).

4. A 3D Model file shall consolidate all 3D information (e.g. no links to other files or inserted x-refs). No 2D elements should be visible. All unnecessary data should be switched off or eliminated.

B.2 File Naming

3D Model file name should be as follows:

PROJECT_PLOT_MODEL_REVISION_DATE

Table 2: 3D Model file naming convention – description

Field	Example	Description
PROJECT	LU	Lusail City
PLOT	COM037 RES025 MIX014	Commercial Plot no 37 Residential Plot no 25 Mix Use Plot no 14
MODEL	SCH URB	3D Schematic Model 3D Urban Model
REVISION	A B C	Initial Model submitted to LREDC First Revision submitted to LREDC Second Revision submitted to LREDC
DATE	YYYY-MM-DD	File creation date

Examples of valid file names:

“LU_COM037_SCH_A_2011-06-18.dwg”
“LU_COM037_URB_B_2011-08-22.rvt”

B.3 3D Model structure

1. All 3D Model objects are divided by type and levels. The level to level division shall be according to the Finished Floor Level (FFL) of each floor.
2. The 3D Model objects should be grouped in layers or families. The general naming convention for layers/ families is:

   TYPE_ELEMENT

   TYPE Groups 3D Model objects with similar information / structure
   ELEMENT Details objects within the group type
3. 3D Model objects representing entire levels should be grouped per level whereas other 3D Model objects can be grouped by their usage. For example:
   a. A vertical shaft is represented by 3D solids divided by levels. All of these 3D Model objects should be on one layer or belong to the same family – SHAFT_MEP.
   b. A 3D solid representing the 1st floor of a building is placed on the layer or included into the family LEVEL_01.
4. Name and color of all layers/ families shall follow the conventions outlined in Table 3.

Table 3: Layer/ family naming convention and color code

Model	TYPE	ELEMENT	Description	Color	Color RGB		
					R	G	B
3D Schematic Model	Levels						
	LEVEL	B1	3D solid for 1st basement		220	220	220
	LEVEL	GR	3D solid for ground floor		220	220	220
	LEVEL	MZ	3D solid for mezzanine floor		220	220	220
	LEVEL	01	3D solid for the 1st floor		220	220	220
	LEVEL	RF	3D solid for the roof floor		220	220	220
	LEVEL	UR	3D solid for the upper roof		220	220	220
	Shafts						
	SHAFT	MEP	Shaft for MEP utilities		127	127	127
	SHAFT	ST-ELE	Shaft for stairs & elevators		127	127	127
	Utility Rooms						
	UTILITY	ELEC	Electric utility room		127	0	127
	UTILITY	FIRE	Fire utility room		255	0	0
	UTILITY	FS	Foul sewer utility room		127	63	63
	UTILITY	GAS	Gas utility room		255	127	0
	UTILITY	HVAC	HVAC utility room		0	191	255
	UTILITY	IRR	Irrigation utility room		0	127	127
	UTILITY	PW	Potable water utility room		0	255	0
	UTILITY	SW	Storm water utility room		0	0	255
	UTILITY	QTEL	Telecom (QTEL) utility room		255	0	255
	UTILITY	PWC	Waste collect utility room		204	127	102
	Access Points						
	ACCESS	PED	Pedestrian access		127	255	127
	ACCESS	VEH	Private vehicles access		255	255	127
	ACCESS	SERV	Service vehicles access		255	191	0
	ACCESS	EMER	Emergency vehicles access		255	63	0
3D Urban Model	Façade Elements						
	SHELL	WALL-CLADD	Wall cladding	By Material			
	SHELL	WALL-CONCRETE	Concrete walls	By Material			
	SHELL	COLUMN-RC	Reinforced columns	By Material			
	SHELL	CURTAIN-MAIN	Curtain wall main type	By Material			
	SHELL	GLASS	Glass windows	By Material			
	SHELL	SHED	Shading elements	By Material			
	SHELL	ROOF-SLAB	Roof floor slab	By Material			
	Landscape Elements						
	LS	GREEN	Landscape – Green area		63	127	63
	LS	PAVE	Landscape – Pavement		191	127	127
	LS	STREET	Landscape – Streets		63	63	63

C. 3D Model Specifications

The 3D Models are differentiated according to project phases. The 3D Schematic model specifications correspond to the design development at the Concept Design phase. The 3D Urban Model specifications correspond to the more detailed requirements at the DC-1 and DC-2 stages of review. The submission of the 3D Models is defined in Attachment 2. Lusail REDC use the 3D Schematic Model and the 3D Urban Model for urban design evaluations, Master Plan compliance and for infrastructure coordination. The content and the way how the 3D Models should be created are described in the following paragraphs.

C.1 3D Schematic Model

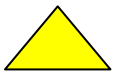
The 3D Schematic Model represents the outer dimensions of the building and gives an overview of its general layout and structure. It highlights major utility rooms and important vertical shafts, and the building's total GFA.

The initial 3D Schematic Model has to be submitted with Concept Design deliverables. The 3D Schematic Model is the base model that gets updated through project design development and as the project proceeds through the building permit process.

The 3D Schematic Model consists of the following:

1. 3D solids that define the exterior perimeter of the building drafted on the most exterior facade line in all directions.
2. 3D solids that define the interior edges of all shafts.
3. 3D solids that define the interior spaces of all utility rooms.
4. 3D solids in arrow shape (see table 4) representing the different types of accesses for the building. These objects shall have a reasonable size and shall be placed at ground floor level.

Table 4: Definition of symbols used to mark type of building access

Access Type	Pedestrian	Private Vehicles	Service Vehicles	Emergency Vehicles
Symbol				

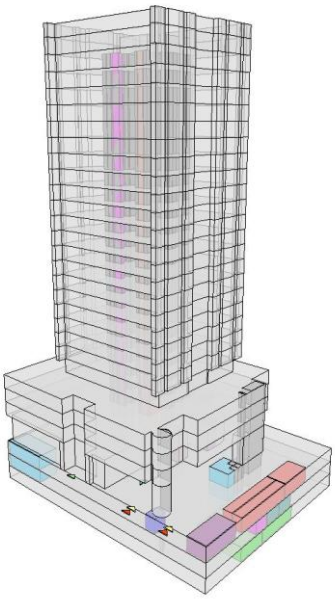


Figure 2: Sample 3D Schematic Model

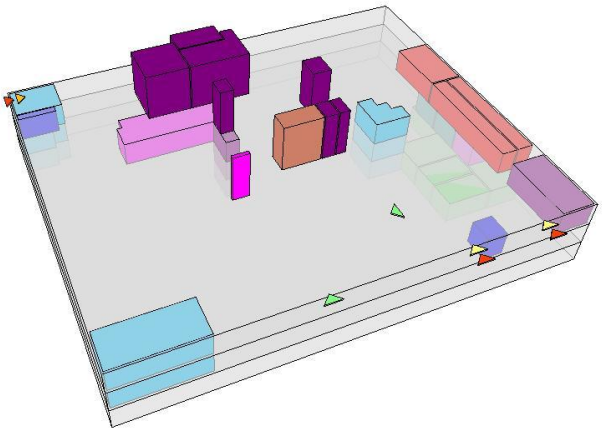


Figure 3: Detail of a 3D Schematic Model showing utility rooms and building access symbols

C.2 3D Urban Model

The 3D Urban Model represents the outer appearance of the building including the rough plot layout. It gives a first urban design impression and is placed within the overall 3D City model. It shall serve the basis for building and city visualizations in order to reduce additional efforts for creating virtual city or street views of Lusail City.

The 3D Urban Model has to be submitted with the deliveries for the DC1-Stage. A detailed update of the 3D Urban Model has to be submitted with the deliveries for the DC2-Stage. The Model has also to be updated in parallel with relevant design updates during the entire building permit process.

The 3D Urban Model consists of the following:

1. 3D solids that represents the main exterior building structure.
2. 3D solids that represents the façade elements.
3. 3D solids that represents the exterior doors, windows, and superstructure.
4. 3D solids that represents the roof, podium, and lower basement slabs
5. 3D basic landscape layout elements within the plot (e.g. covered or green area, access roads) with 20mm thickness for zoning purposes with no details. The terrain solids can be horizontally leveled or created by using a simplified sloped in main direction.

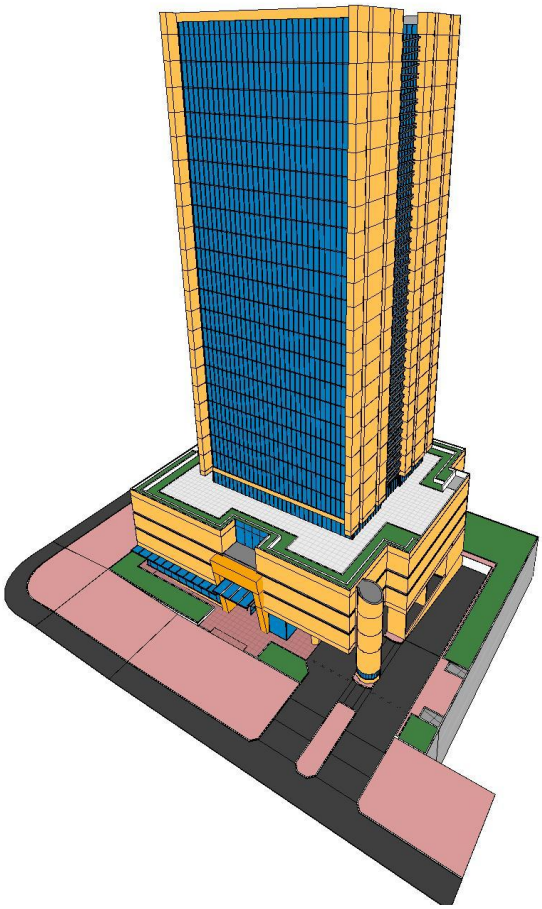


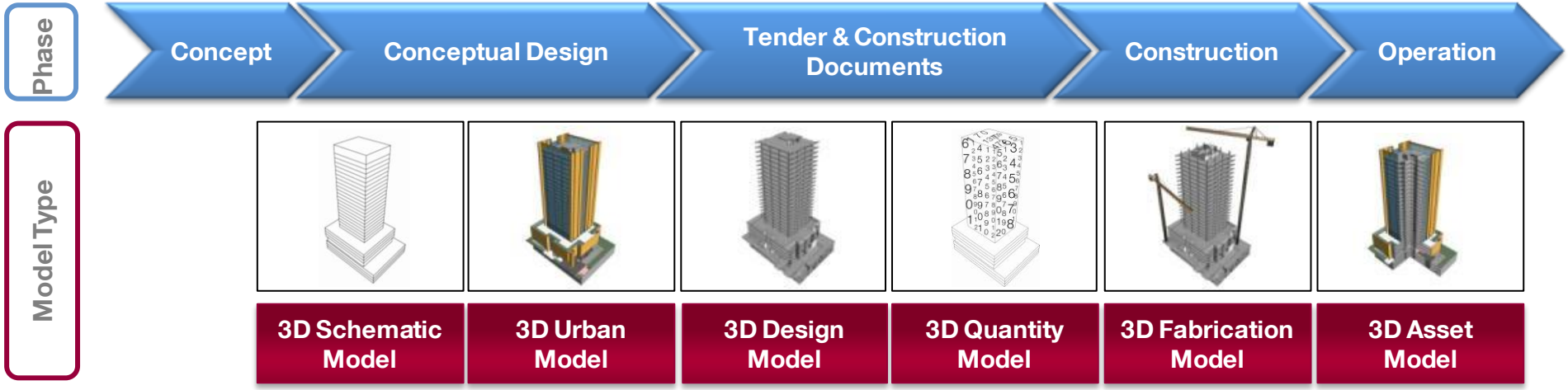
Figure 4: Sample 3D Urban Model

Attachment 1

3D Model Lifecycle

3D Model Lifecycle

3D Models are developed based on design and other data available during each phase of a project. Model types are defined to structure, store and use this information throughout the lifecycle of a building. This prevents the typical loss of knowledge as a project develops from one phase to the other. The content and the type of models are shown in the figure below.

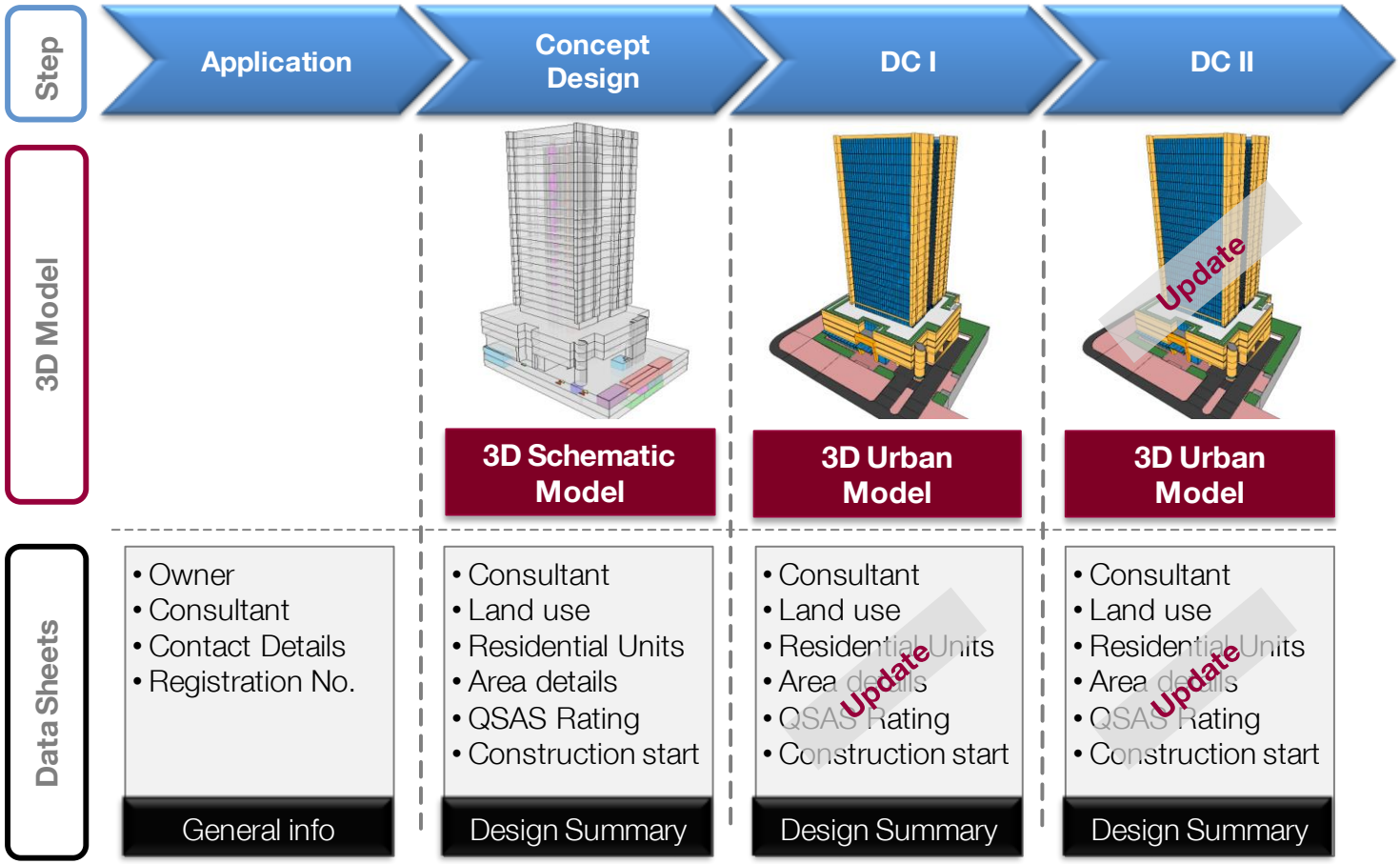


Attachment 2

Building Permit Application Process

Building Permit Application Process

Lusail City uses 3D Models and data sheets to collect and structure information required during the Building Permit Application Process. Concept Design approval requires a 3D Schematic Model and a design summary data sheet. DCI approval requires an Urban Model and an update of the design summary data, and for DCII an update of the Urban Model and the data sheet is needed.



Attachment 3

3D Model utilization at Lusail City

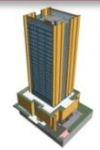
3D Model utilization at Lusail City

The table below gives an overview of typical business processes supported by 3D Models during design, construction and operation of a building. Lusail City requires the two highlighted 3D Models to process the building permit application.
Developers and their Consultants are however encouraged to pick up the idea and to enhance the initial 3D Models to reap the benefits of Building Information Modeling.

3D Schematic Model

- Optimize Building Layout
- Building Areas Analysis
- Major Utility Routings

3D Urban Model



- Design Visualisation
- Marketing and Sales
- Building Permit Acquisition

3D Design Model

- Design Coordination
- Simultaneous Engineering
- Project Phasing

3D Quantity Model

- Quantity Take Off
- Cost Estimation
- Scope Visualisation

3D Fabrication Model

- Construction Sequencing
- Progress and Cost Monitoring
- As-Built Data Collection

3D Asset Model

- O&M Handover
- Asset Data Documentation
- Facility Management