

# SLRB Bahrain – 3D Property Registration System

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**Key words:** Property Registration, 'Parcel in Air', 3D, Case File Application System, Technical Affairs Directorate, SLRB Bahrain

## SUMMARY

Technical Affairs Directorate or TAD of Survey and Land Registration Bureau or SLRB in Bahrain is responsible for maintaining property transactions repository. This repository records and reports all properties transactions related to ownership rights and restrictions in the kingdom. Property transactions repository was made digital by implementing Case File Application System or CFAS in 2005 for traditional parcels delineated on ground. All historical paper records were captured or scanned and linked to parcels using the geospatial platform of CFAS. CFAS was positively adopted by directorate users of different ages and academic background because of its obvious benefits.

Due to amendments in ownership laws in 2006/7, individual owners can now own parcel in a multistory building. While in past parcels were defined on land they are defined in air hence the name 'Parcel in Air' is coined for parcels in multistory buildings. Registration of parcels in different floor of a multistory building is a tough task – search and identify the 'Parcel in Air' and then attach right ownership transactions information to that identified parcel considering all parcels are stacked on top of each other. Registration of these parcels spurred after 2010.

TAD property registration challenges for these 'Parcel in Air' were due to two obstacles – first, off the shelf commercial software or technology were not meeting requirements and second, vertical extent information of all 'Parcel in Air' is not readily available in digital format.

TAD successfully developed a system called “SLRB Bahrain – 3D Property Registration System” using Application Programming Interface or API of an existing commercial product. This system can be characterized by the following:

1. Scalable system is working and meeting requirements within given constraints.
2. It is user friendly – business users, who are untrained on GIS or 3D system, use 3D functionalities.
3. It is integrated with other business systems.

Full paper elaborates the making of digital property repository in 2D and in 3D in Bahrain. It also briefly explores the LADM compliance of its property repository model.

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## 1. INTRODUCTION

### 1.1 About Bahrain

The Kingdom of Bahrain is an archipelago in the Arabian Gulf situated between Saudi Arabia and Qatar. Bahrain in Arabic means two seas – one is the Arabian Gulf around it and the second is the natural water springs.

The earliest recorded reference to Bahrain dates back to the third millennium BC, when it was known as Dilmun. Archeological surveys have proved the existence of a very organized lifestyle, with well-laid roads, workshops and central marketplace.

### 1.2 About Survey and Land Registration Bureau

Survey and Land Registration Bureau or SLRB is a national authority in the Kingdom of Bahrain that organizes, registers, and documents

- All properties within the Kingdom of Bahrain
- All survey activities including Cadastral, Topographic and Hydrographic.

SLRB is one of few countries in the world where all types of geographic surveys and land registration activities comes under one bureau.

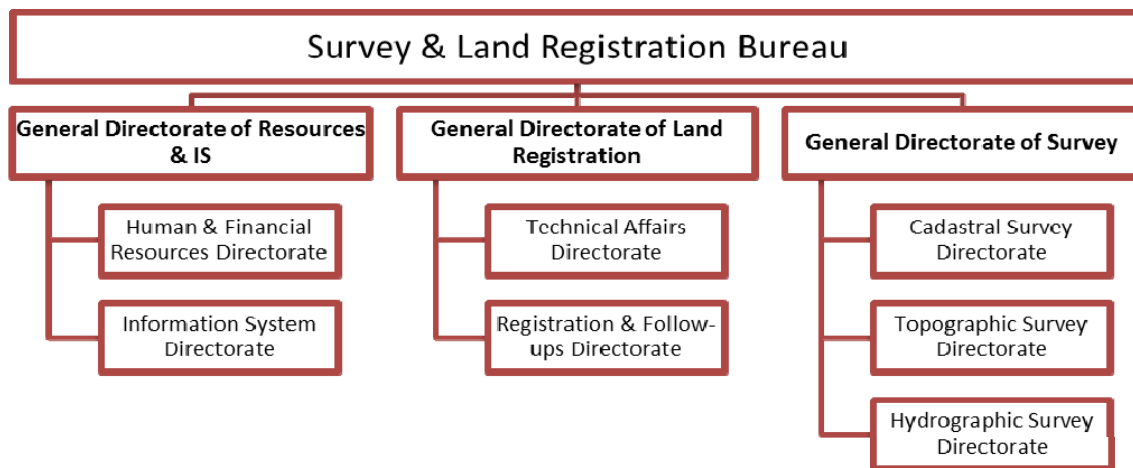


Figure 1. SLRB Organization Chart

### 1.3 About Technical Affairs Directorate

Technical Affairs Directorate [TAD], one of the directorates of Survey & Land Registration Bureau [SLRB], is responsible for providing vital property data, records, and land information to support any decision process related to property transactions. TAD is mandated to manage the historical maps having ownership information dating back to 1920s.

TAD has been mentioned in this paper because it took initiative and implemented digital repository of property transaction using geospatial technology.

## 2. WHAT A PROPERTY RECORD IN BAHRAIN MEANS?

### 2.1 Property

Traditionally property in Bahrain means a cadastral parcel marked on the ground and shown on 1:1000 scaled cadastral maps. Property ownerships are granted to these grounded parcels.

All parcels in Bahrain are divided into three categories viz. CIM (~5%), Graphics (~18%) and Numeric (~77%) depending on the method of surveying. Numeric type parcels are the most accurate parcels. CIM and Graphics parcels when resurveyed are converted into Numeric parcels. Good thing about these parcels are that their 8 digit numbers (NNNN NNNN) are unique.

However in 2006/7, Bahrain introduced or rather amended its properties law to allow ownership and residence permit to foreigners for parcels [also known as strata parcels or apartments] in multi-storey buildings. These parcels are defined in air hence the name 'Parcel in Air' is coined for parcels in multistory buildings. Bahrain skyline started getting flooded with high rise buildings. 'Parcels in Air' are marked on top of each other on traditional 1:1000 scaled cadastral maps and are assigned number starting with 15 (15NNNNNN). Information about the vertical extent of these parcels is available in survey drawings (*Annex1: Survey drawing having 'Parcel in Air' Information*).



Figure 2. Bahrain Skyline [Image Courtesy - Wikipedia]

### 2.2 Property Record

Every property owner in Bahrain receives a Title Deed which contains information such as owner name, rules governing title deed, parcel boundary & description, neighbors information, deed certificate, mortgage information (if any) to name few. A copy of original Title Deed is kept in SLRB.

All property transactions are recorded in case files which are opened at the start of the transaction in SLRB. These transaction files contain information about the owners,

restrictions (if any) from government or court, transaction fees, valuation of transaction etc. Once the fee is paid, these transactions are recorded in an archival system as well as on parcel maps for which transaction has taken place.

Good thing about the property records is that the transaction number [called case number in SLRB] of any parcel in a year is unique.

### **2.3 Property Laws and Decrees**

Following is the list of laws, decrees and orders issued which affects the property market in Bahrain:

- Amiri Order No. (4) of 1975
- Legislative Decree No. 8 of 1970 with respect to Lands Acquired for Public benefit, as amended,
- Legislative Decree No.(8) of 1987 governing the Ownership of Storeys and Flats ,
- Legislative Decree No. (11) of 1995 with respect to the Protection of Antiquities,
- Legislative Decree No. 28 for 1999 governing the Establishment and Organization of Industrial Areas
- Legislative Decree No. 40 of 1999 with respect to the Land and property Ownership by GCC nationals in the Kingdom of Bahrain
- Legislative Decree No. 2 of 2001 With Respect to Property and Land ownership by non-Bahrainis
- Prime Ministerial Edict No. 43 of 2003, with respect to the ownership of non-Bahrainis in real estate and land for investment or residential purposes in certain areas.
- Ministerial Order No. 67 of 2006. With respect to property ownership of Non-Bahrainis in built properties as long as the residential buildings area above 7 storeys.
- Ministerial Order No 74 of 2007. With respect to granting residence permits by a personal sponsorship to expatriates (non-Bahrainis) who purchase freehold property.

## **3. PROPERTY REPOSITORY**

Property repository records and reports all properties transactions related to ownership rights and restrictions in Bahrain. Both digital and manual methods are used in maintaining property repository in Bahrain. SLRB started making the digital property repository about 8 years back and ensured that all property transactions are continually updated as and when they happen.

Initially two systems, Archive System and Case File Application System, helped users to first record property transactions and then to retrieve past transactions. Recently third system, 3D Property Registration System has been added to extend the capability of Case File Application System. Third system is focused on transactions related to ‘Parcel in Air’.

### **3.1 Archive System**

In Archive System, all property transactions papers are scanned, indexed and stored. Each transaction is uniquely represented using case number of a year.

### 3.2 Case File Application System or CFAS

Case File Application System is an ever evolving geospatial project commissioned in early 2005. CFAS is now in its Phase 5.

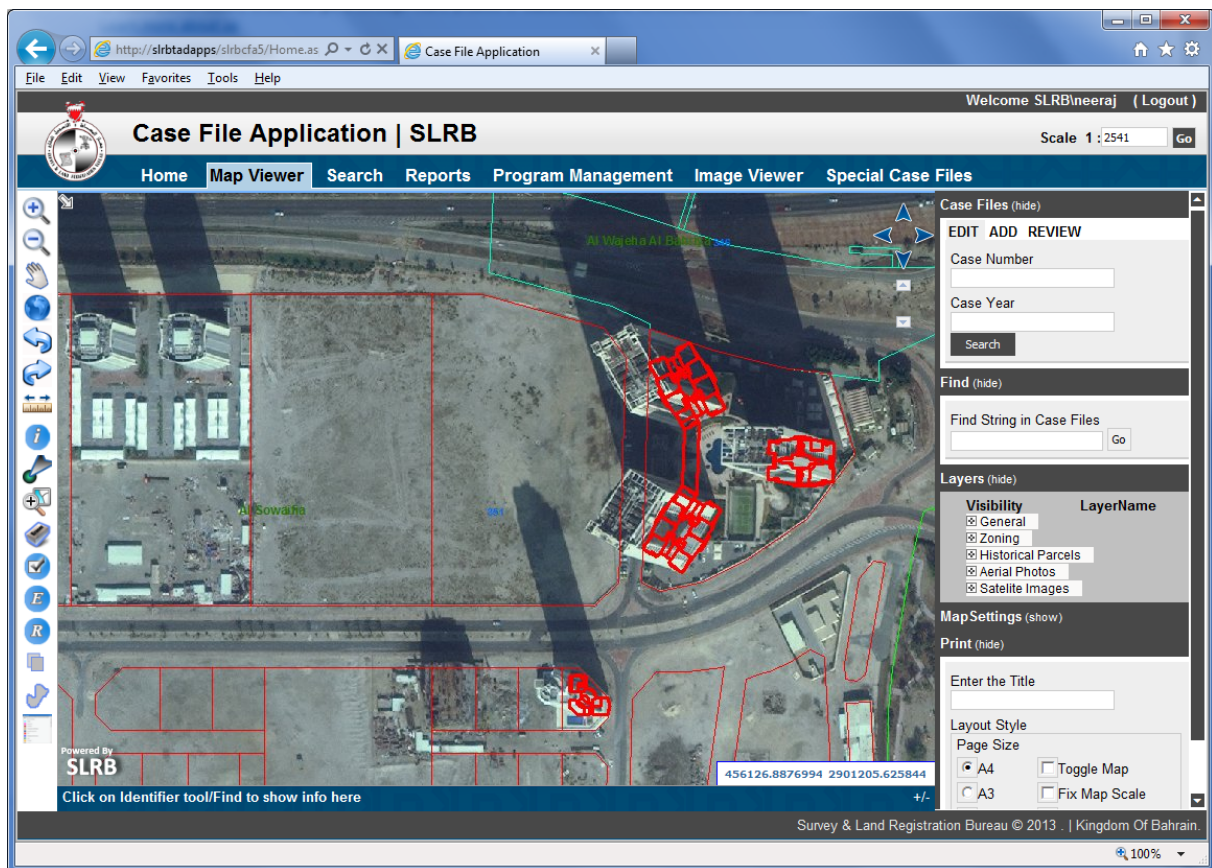


Figure 3. Screenshot of Phase 5 of the CFAS

#### 3.2.1 CFAS Salient Points

CFAS has the following few salient points:

- All possible handwritten property information from paper maps, including historical maps, was captured in database built on top of geospatial platform.
- It digitally records all properties transactions including associated attributes.
- Built-in quality module minimizes manual data entry and maximizes geospatial capabilities to fetch underlying data.
- An advance search engine quickly retrieves related info to reduce time in completing property transactions.
- Reporting tool produces statistical & graphics reports to keep track of real estate market movements.
- All historical paper maps were made digitally active by scanning and geo-referencing with CFAS.
- It streamlined the transaction history of parcels which had gone through many phases of subdivisions and consolidations over decades.

### 3.2.2 CFAS Architecture

CFAS is built on the traditional client-server technology. Clients are served via simple user interface using Internet Explorer. Server hosted different geographic layer including parcels, cases and satellite imagery and aerial photographs using GIS software from ESRI. Attribute data is kept in industry standard Relational Database Management System. Case number is represented as a point feature and parcel as polygon feature in CFAS.

CFAS is linked with Archiving System, a system where all scanned transaction documents are stored, using unique case number. CFAS is also linked with scanned paper maps using geospatial queries.

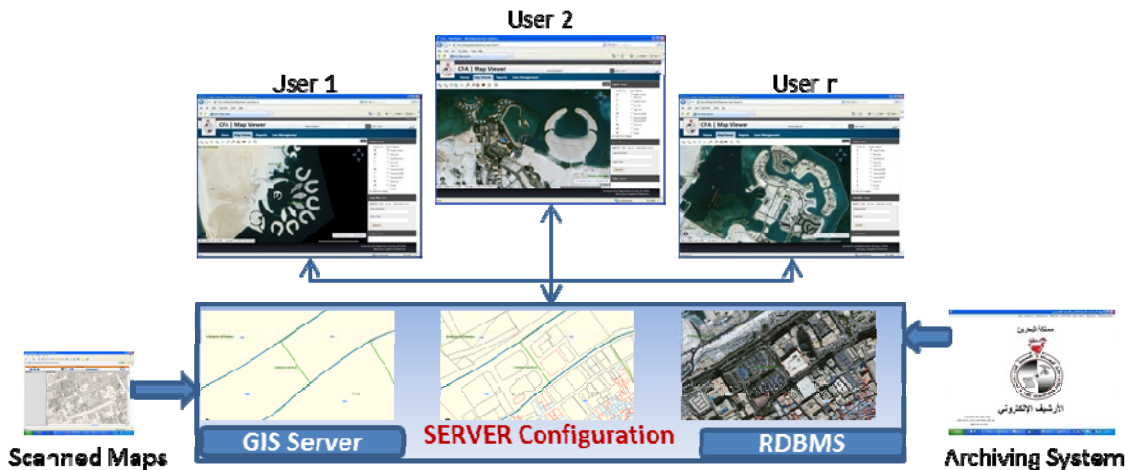


Figure 4. Case File Application Architecture

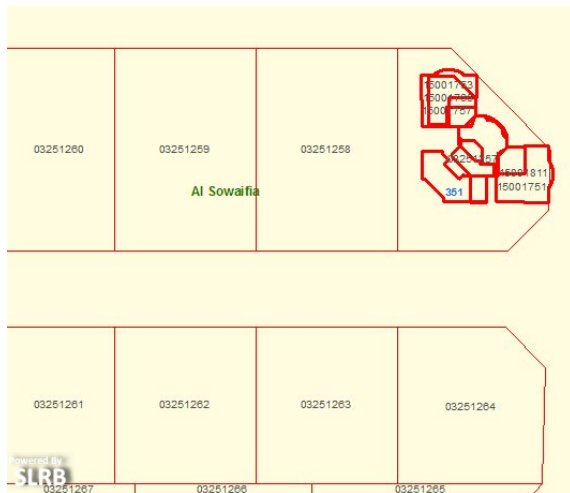
## 4. SLRB BAHRAIN – 3D PROPERTY REGISTRATION SYSTEM

Today there are more than 10000 'Parcels in Air' out of which more than 4000 are registered to their respective owners [February 2013]. 3D Property Registration System is developed to register these parcel in digital repository and is an extension to CFAS.

### 4.1 Why a new system was required?

Till recent past, when property ownerships were only granted to parcels demarcated on land, all related property transactions tasks were effectively accomplished in CFAS. Locating parcels and attaching property attributes is planar and easier in CFAS.

However it faced limitation when owners or their agents came to register their 'Parcel in Air'. Numerous such parcels are stacked on top of each other making it difficult for users to attach transaction information to correct parcel and effective querying and displaying results using CFAS.



**Figure 5. 2D Parcels and 'Parcel in Air'**



**Figure 6. Parcels overlaid Aerial Photo**



**Figure 7. Registrations clutter of 'Parcel in Air'**

Therefore there was a need to develop to develop a new system which can overcome the challenges such as search, identify and attach right ownership transactions to that identified 'Parcel in Air'.

#### **4.2 What was required from the new system?**

To overcome the challenging registration task due to 'Parcel in Air', TAD listed down its requirements and constraints from a forthcoming system as below –

##### **4.2.1 Main Requirements**

- Visualize the 'Parcel in Air' in multistory buildings across country.
- Register or record property transactions for a selected parcel.

##### **4.2.2 Constraints**

- Any new system must be an extension of existing transaction system i.e. CFAS.

- System must update property repository in real time, similar to CFAS.

#### 4.2.3 Minor Requirements

- Selected technology to be used for development must have upgrade and migration path to meet future requirements.
- System shall be scalable and can be integrated with other business systems.
- Training requirement must be minimal.

### 4.3 Obstacles

Initially TAD faced two main obstacles to manage its 'Parcel in Air' –

#### 4.3.1 Unavailability of Commercial Technology

TAD looked around for guidance, since 2010, for off-the-shelf software or tool or technology because of growing registration demand at hand. There was none available commercially (Renzhong GUO, Shen YING, Lin LI, Ping LUO, and Peter VAN OOSTEROM., 2011) and no software solution vendor came forward to offer solution.

TAD quest to find a solution was prolonged and unsuccessful after meetings with representatives of different known product companies or solution providers in market.

#### 4.3.2 Unavailability of Digital Vertical Information of 'Parcel in Air'

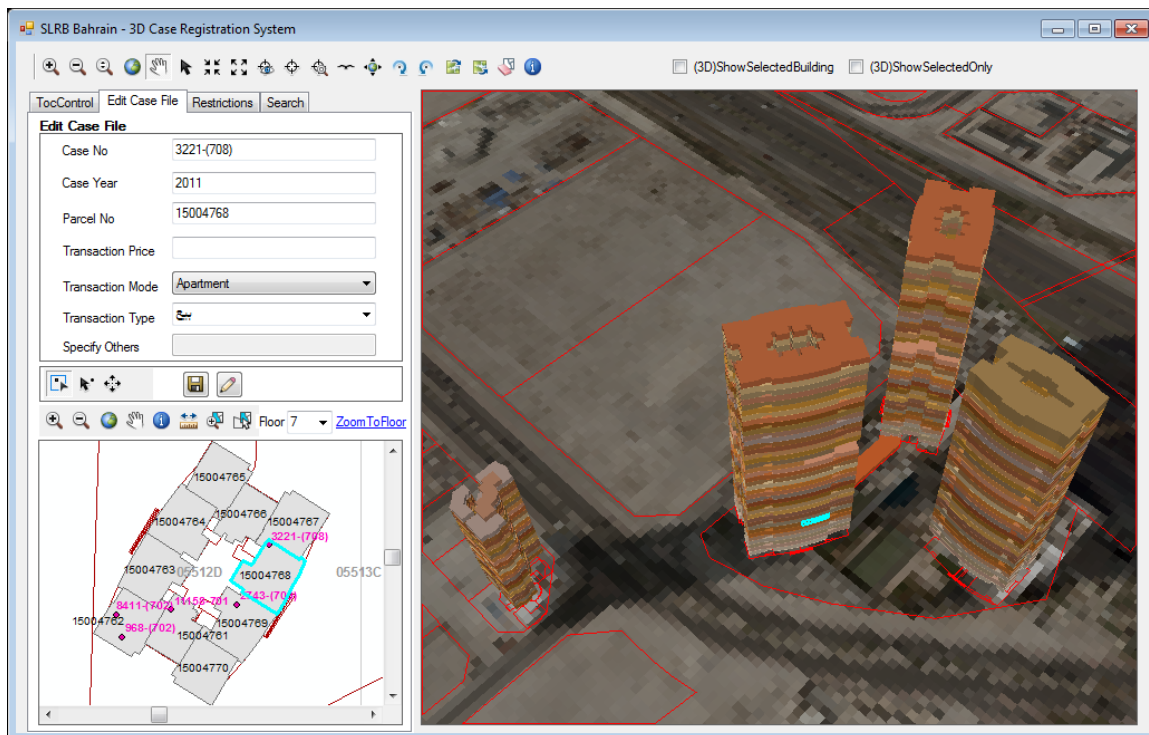
Cadastral parcels though are spatially enabled but vertical extents information of 'Parcel in Air' existed only in paper drawings. (*Annex1: Survey drawing having 'Parcel in Air' Information*).

### 4.4 Development of 3D Property Registration System

TAD overcame first obstacle by selecting API of popular ESRI ArcGIS platform to custom develop new system, namely 'SLRB Bahrain – 3D Property Registration System' to meet its requirement and associated constraints mentioned in previous subsection. This system is developed and deployed using in-house resources.

Second obstacle is managed through the collaborative work between TAD and Cadastral Survey Directorate. Both the directorates are continually working to capture the vertical extent information from the 'Cadastral Survey of Strata Titles for [Project Name]' paper drawings and linking it to 'Parcel in Air'. More than 9,500 'Parcel in Air' have been duly placed vertically [FEB 2013]. Though few assumptions related to height has been made but they are within the acceptable limit when it comes to the updating property repository.





**Figure 8. SLRB Bahrain - 3D Property Registration System**

#### **4.5 What the 3D Property Registration System does**

Though this system may not compete with fancies of forthcoming ‘future’ expensive commercial products or systems but TAD’s 3D Property Registration System can be characterized by the following:

- It is working.
- It is meeting requirements within given constraints
- It is user friendly
- It is linked with other system
- It is scalable.

3D Property Registration System is different because of two reasons.

First, system is tri-directional that means it links 2D parcel, 3D parcel and attributes from relational database in the same screen. It also allows users to add and update property attributes as and when required.

Second, simple one mouse click operation helps users to

- Rotate buildings to bring selected ‘Parcel in Air’ in front.
- Hide all buildings except the building having selected ‘Parcel in Air’.
- Hide all except the selected ‘Parcel in Air’

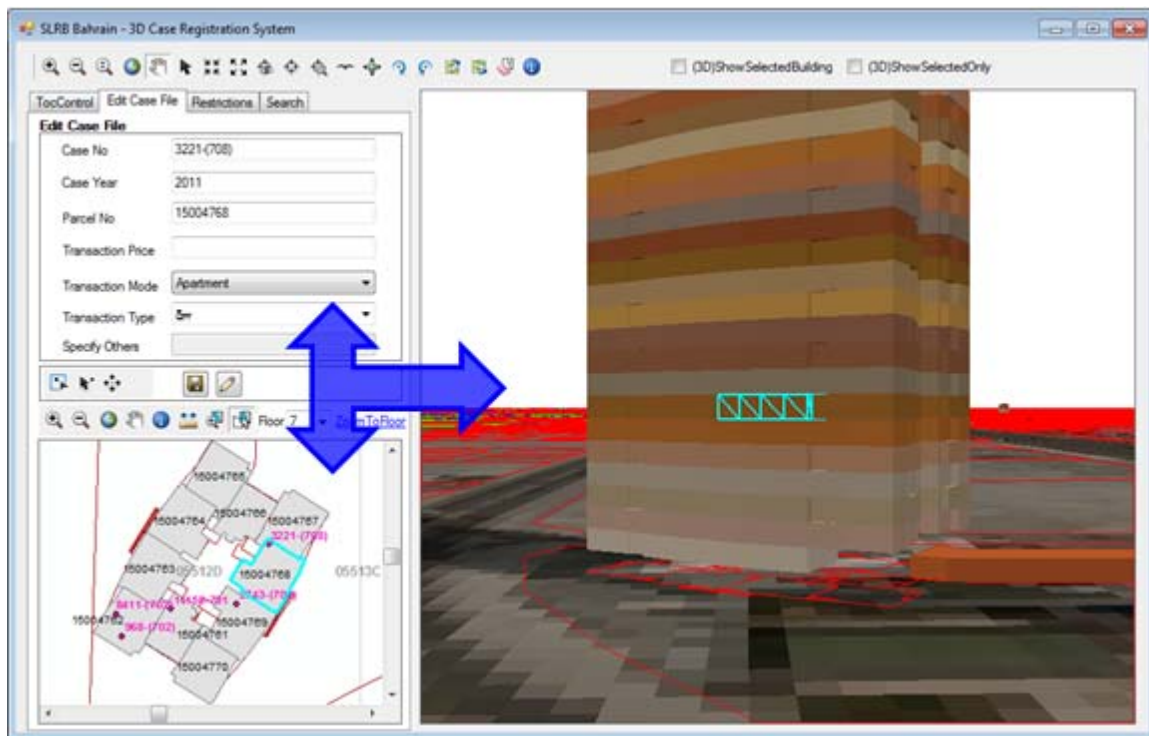


Figure 9. Tri-Directional system linking parcels in 3D and 2D and attributes from relational database

## 5. CONCLUSIONS

### 5.1 Lesson learnt while developing the 3D Registration System

#### 5.1.1 Phased Technology Adoption

First and foremost lesson learnt is the adoption of technology in phased manner. Instead of going for all out changes, TAD started working on pain points with proponents of technology to bring in changes in property registration using bottom to up approach. CFAS adoption increased when users around proponents saw the benefits of technology.

#### 5.1.2 Collaboration

TAD used all possible data, tabular as well as spatial, available in SLRB. It collaborated with other directorates especially Cadastral Survey Directorate to fulfill its need of regular supply of parcel geometry and vertical extent information of 'Parcel in Air' and with Topographic Survey Directorate for aerial photographs. Collaborative partners readily agreed to provide data and information in requested format which was a great help in building CFAS and 3D Property Registration System.

#### 5.1.3 Support

TAD was lucky to have the patronage from the top management to start the development of CFAS as early as 2004. Once the benefits of CFAS were known, users became important stakeholders of the system and they helped in optimizing various processes to manage the property repository efficiently.

## **5.2 What's next – LADM implementation**

Different systems responsible for property repository share the same attributes and geometry information, stored in relational database. Relationships between different attributes related to ownership have been modeled from scratch based on the existing available knowledge to meet the local registration requirements. Efforts were made to standardize standard inputs and use geospatial queries to have minimum data entry to avoid manual errors. All the relations, such as ownership, rights, restrictions, auditing etc. are linked to case file number of a particular year and in turn case file numbers are linked spatially to parcel.

Because table structure and relationship between tables is already in place for property repository in Bahrain and LADM has also become an ISO standard supporting 3D parcels, it is logical for TAD to transition its local property model towards LADM. There is no time table set at the moment for this transition but definitely it will be easier for TAD once it becomes more aware of LADM and LADM implementations happen in other countries.

Bahrain government is very seriously pursuing its Economic Vision 2030 which lay emphasis on coordinated reforms to improve living standards for all Bahrainis. Property sector which is contributing approximately 4% of GDP is expected to maintain sustainable growth. With push from Government of Bahrain, SLRB is working to reform its all operations – survey and land registration, and align them with international standards. TAD will use this push as catalyst in near future to implement LADM, which is now ISO Standard in land administration field.

## **ACKNOWLEDGEMENT**

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## ANNEXES

### Annex 1. Survey drawing having 'Parcel in Air' Information

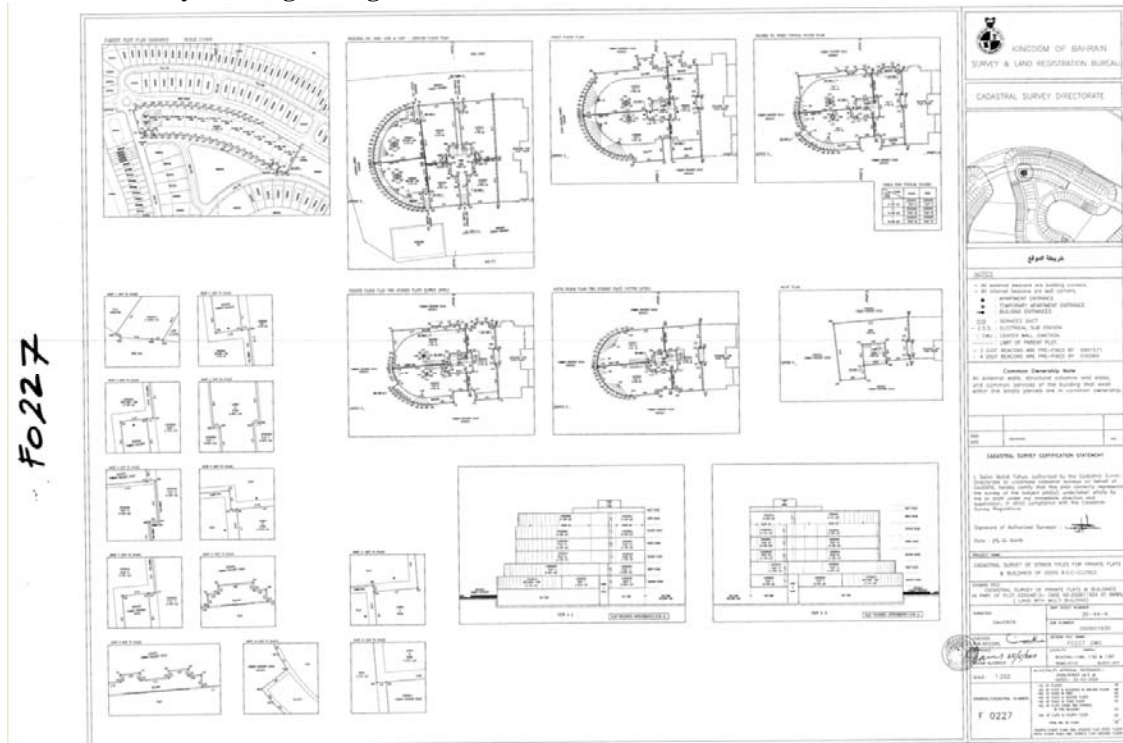


Figure 10. 'Cadastral Survey of Strata Titles for [Project Name]' scanned paper drawing

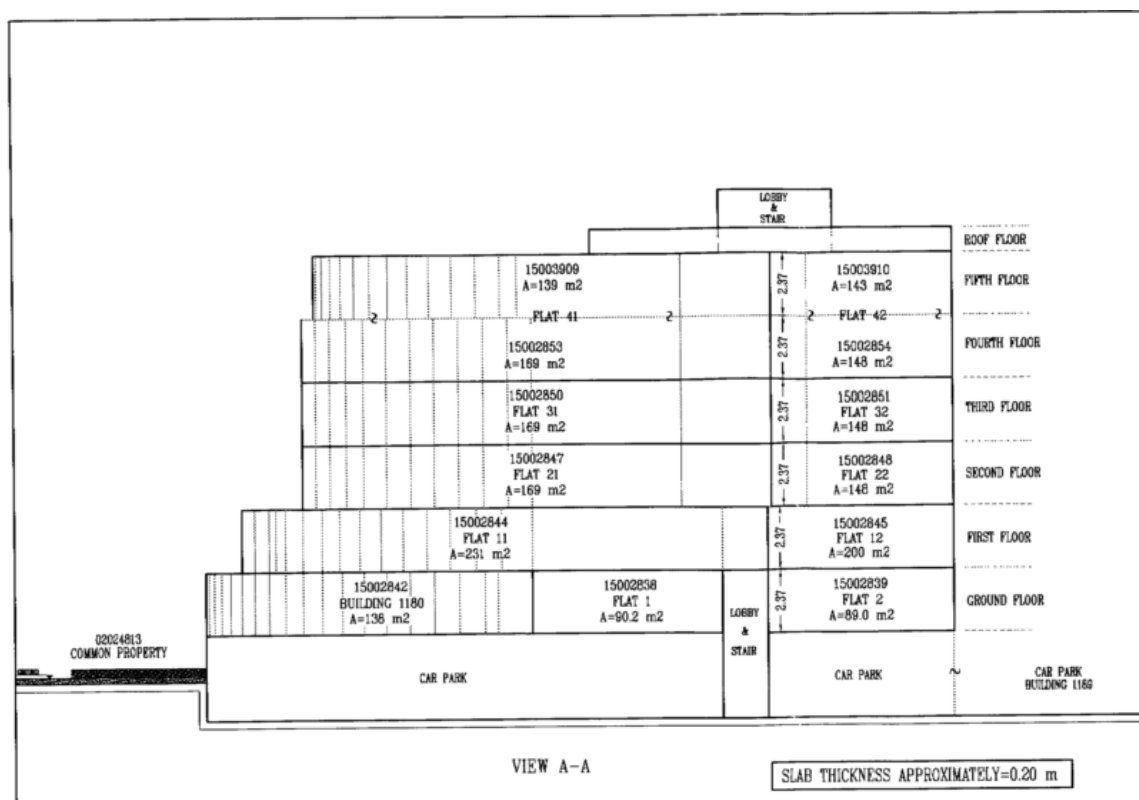


Figure 11. Vertical extent information of 'Parcel in Air'

## BIOGRAPHICAL NOTES

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**Dixit Neeraj** [neeraj@slrb.gov.bh] is Consultant at Technical Affairs Directorate in Survey and Land Registration Bureau since 2010. Neeraj has been using CAD [Microstation & AutoCAD], GIS [ESRI, Intergraph and Bentley products] and RDBMS [SQL\*Server and Oracle] technology since 1993 in various fields. Prior to joining SLRB, he worked for DHI as Manager [2009], Autodesk Inc. as Civil Product Line Manager [2006-2008] and Bahrain Center for Studies and Research as GIS Project Manager [2001-2005].

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