

# Questionnaire 3D-Cadastral: status November 2010

## Bahrain



This questionnaire is an activity of the FIG working group 3D-Cadastral 2010-2014. The purpose of the survey is to make a world-wide inventory of the status of 3D-Cadastral at this moment (fall 2010) and the plans/expectations for the near future (2014). By sharing this information, it should be possible to improve cooperation, learn from each other and support future developments. For more information on the FIG working group on 3D-Cadastral see the website of this working group [www.gdmc.nl/3DCadastral](http://www.gdmc.nl/3DCadastral). Now a few notes and suggestions, which should be helpful when completing the questionnaire:

- In this questionnaire the concept of 3D-Cadastral with 3D parcels is intended in the broadest possible sense. However, what exactly is (or could be) a 3D parcel is dependent on the legal and organizational context in the specific country (state, province). 3D parcels include land and water spaces, both above and below surface.
- A more formal definition: A 3D parcel is defined as the spatial unit against which (one or more) unique and homogeneous<sup>1</sup> rights (e.g. ownership right or land use right), responsibilities or restrictions are associated to the whole entity, as included in a Land Administration system.
- As the definition above is quite abstract, it is tried in the questions below to be more specific and real world situations are used. Also two example sets of partial/preliminary answers are included from Australia, Queensland and The Netherlands, to support the questions and to be of help when formulating the answers for your jurisdiction.
- A 3D parcel is a 'legal object' describing a part of the space. Often there is a relationship with a real world/physical object, which can also be described in 3D. Please be aware of the difference between these two types of objects and that the focus in the context of 3D-Cadastral is on 3D parcels (spaces of legal objects).
- If a certain question is not relevant or if you have no clue what to respond, do not spend any time on this (and leave the field blank).

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<sup>1</sup> Homogenous means that the same combination of rights equally apply within the whole 3D spatial unit. Unique means that this is the largest spatial unit for which this is true. Making the unit any larger would result in the combination of rights not being homogenous. Making the unit smaller would result in at least 2 neighbour 3D parcels with the same combinations of rights.

## 1. General/applicable 3D real-world situations

This part of the questionnaire refers to the applicable 3D real-world situations to be registered by 3D parcels. It also addressed the types of 3D geometries, which are considered to be valid 3D representations for these parcels.

|                                                                                                                                      | Bahrain 2010                                                     | Bahrain 2014                     |
|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------|
| 1.1. Are all 3D parcels constrained to be within one surface (2D) parcel?                                                            | At the moment YES                                                | Hopefully YES                    |
| 1.2. Are ambulatory <sup>2</sup> boundaries permitted?                                                                               | These cases are rare in Bahrain.                                 | These cases are rare in Bahrain. |
| 1.3. Is it allowed to have 3D parcels not related to physical constructs or objects?" (e.g. airspace, subsurface volumes)            |                                                                  |                                  |
| 1.4. Are disconnected parts of a single 3D parcel allowed?                                                                           | NO<br>Floor parcel relation with allocated car park elsewhere??? | NO                               |
| 1.5. Limitation – e.g. must the 3D parcel be described by a boundary definition?                                                     | At present only the floor plans are registered in Title Deed.    |                                  |
| 1.6. Are curved surfaces to bound the 3D parcels allowed?                                                                            | NO. Curved surface are represented by line segments.             | Hope the status quo remains      |
| 1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?                                         | Not applicable                                                   | Not applicable                   |
| 1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?                                                       | At present flat footprint are registered.                        | Status quo expected.             |
| 1.9. Is there generic legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s). | Law exists in local Arabic language.                             |                                  |
| 1.10. Is the legal text available in original language?                                                                              | YES                                                              |                                  |
| 1.11. Is the legal text (relevant part) available in English translation?                                                            | NO                                                               |                                  |
| 1.12. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?                                   | NO                                                               |                                  |
| 1.13. Is there a formal model for the 3D parcels (UML style); e.g. based on ISO TC211 series?                                        | NO                                                               |                                  |

<sup>2</sup> An ambulatory boundary is a boundary of a land parcel which follows the movements of a natural feature such as a river. Its position determined at points of time (when a survey is carried out), but between such "fixes", the definition of the property is the position of the real world natural feature.

|                                                                                                                                                                                                                                  |                                                                                                                                                                                                            |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1.14. Are natural resources (groundwater, mining rights) considered as 3D parcels?                                                                                                                                               | NO                                                                                                                                                                                                         |  |
| 1.15. Are polluted areas considered as 3D parcels (as legal restrictions are associated to these spaces: above and below surface)?                                                                                               | NO                                                                                                                                                                                                         |  |
| 1.16. Are spatial plans considered as 3D parcels (as rights or restrictions are related to them)? Sometimes also called spatial development plans, zoning plans or physical plans (land use, urban, regional, environmental,...) | Responsibility lies with other government agency.                                                                                                                                                          |  |
| 1.17. Any other geometric issues?                                                                                                                                                                                                | Representation of 3D parcel in existing system.<br>At present points are placed for registered apartments with in the 'mother' land parcel.<br>Its cumbersome process to spatially identify flat location. |  |

## 2. Infrastructure/utility networks

This refers to the situation where an infrastructure network is considered to be defined within the cadastre. For example in some jurisdictions, an underground network might be privately constructed for the purpose of leasing space in it for other organisations to run cabling. In this case, a network, or part of that network may be considered to be a real estate object.

|                                                                                                                                              | Bahrain 2010                                                                                | Bahrain 2014 |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------|
| 2.1. Do you register network parcels? (e.g. subterranean conduit networks)                                                                   | Yes utility networks existing in bounding parcels are registered by the owner organization. |              |
| 2.2. If so, can the network structure be traced in the database(s)?                                                                          | Utility owners are able to trace the utilities in their enterprise GIS environment.         |              |
| 2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).                                                  | At present utilities are owned by government.                                               |              |
| 2.4. If so, are they registered as 3D property parcels?                                                                                      | No, land parcels in 2D are registered.                                                      |              |
| 2.5. Is the legal text available in original language? If so, give references to relevant document(s).                                       |                                                                                             |              |
| 2.6. Is the legal text (relevant part) available in English translation?                                                                     |                                                                                             |              |
| 2.7. Do you have example descriptions of typical 3D parcels for networks; either 'prototype' or 'operational'?                               |                                                                                             |              |
| 2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks? |                                                                                             |              |
| 2.9. Any other geometric issues?                                                                                                             |                                                                                             |              |

### 3. Construction/building units

This refers to 3D properties that are related to constructions and apartment (condominium) buildings. The individual units are often defined by the actual walls and structure of a building, rather than by metes and bounds. E.g. “unit 5 on level 6 of ... building”.

|                                                                                                                                                                                                              | Bahrain 2010 | Bahrain 2014 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
| 3.1. Do you register 3D construction/building units?                                                                                                                                                         | NO           |              |
| 3.2. If so, what are the most important types? E.g. apartment units, or also other buildings or even more general constructions (infra related; such as bridge, tunnel or even other, such as windmills,...) |              |              |
| 3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).                                                                                                       |              |              |
| 3.4. Is the legal text available in original language?                                                                                                                                                       |              |              |
| 3.5. Is the legal text (relevant part) available in English translation?                                                                                                                                     |              |              |
| 3.6. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?                                                                                                            |              |              |
| 3.7. What would be typical 3D boundaries in an apartment complex: middle of the wall and floor/ceiling, or walls, floors/ceiling as neutral/shared 3D space?                                                 |              |              |
| 3.8. Is common property inside the building registered? If so, how?                                                                                                                                          |              |              |
| 3.9. Who owns the common property inside the building?                                                                                                                                                       |              |              |
| 3.10. Who owns the land on which the apartment is built?                                                                                                                                                     |              |              |
| 3.11. Any other geometric issues?                                                                                                                                                                            |              |              |

#### **4. X/Y Coordinates**

|                                                                                                                            | Bahrain 2010                           | Bahrain 2014 |
|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------|
| 4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?) | YES, spatial reference system is used. |              |
| 4.2. Are the cadastral database coordinates authoritative?                                                                 | YES                                    |              |
| 4.3. If not, what is the authoritative source of X/Y coordinates?                                                          | Not applicable.                        |              |
| 4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?                                   |                                        |              |
| 4.5. What is the spatial reference system for X/Y Coordinates?                                                             | Ain Al Abd                             |              |
| 4.6. Any other X/Y coordinate issues?                                                                                      | No                                     |              |

### **5. Z Coordinates/height representation**

|                                                                                                                                  | Bahrain 2010                                                                                                                                                                     | Bahrain 2014 |
|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 5.1. Are the Z coordinates of 3D parcels relative to local ground?                                                               | Apartment ownership registration has started only in 2009. Right now only certificate of survey and different sections of as-built drawings are used in Title Deed registration. |              |
| 5.2. Are Z coordinates reduced to a standard datum (absolute)? If so, what is the spatial reference system for the Z coordinate? | Bahrain is relatively geographically flat country.<br>Ain-al-abd holds good.                                                                                                     |              |
| 5.3. In principle possible to store both relative and absolute Z coordinate?                                                     | YES                                                                                                                                                                              |              |
| 5.4. Is the earth surface (height) explicitly stored (in the DCDB or other accessible register)?                                 | Yes                                                                                                                                                                              |              |
| 5.5. What is the source of elevation for the 2D surface parcel?                                                                  | Cadastral field survey.                                                                                                                                                          |              |
| 5.6. Any other Z coordinate issues?                                                                                              |                                                                                                                                                                                  |              |

## **6. Temporal Issues**

|                                                                                                                                                             | Bahrain 2010                                   | Bahrain 2014 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------|
| 6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?                                                                                     | No                                             |              |
| 6.2. Are moving parcels allowed?                                                                                                                            | No                                             |              |
| 6.3. Are there any limitations on the range of temporal limits? (e.g. only on 3D apartments).                                                               | As mentioned in Title Deed.                    |              |
| 6.4. Are there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?                                  | No.<br>First 3D need to be implemented.        | Status quo   |
| 6.5. In the case of tidal boundaries, what happens to the 3D ambulatory parcel if the 2D land parcel changes extent due to the movement of High Water Mark? | These parcels are usually owned by government. |              |
| 6.6. Any other temporal issues?                                                                                                                             | no                                             |              |



## **7. Rights, Restrictions and Responsibilities**

|                                                                                                                                              | Bahrain 2010 | Bahrain 2014 |
|----------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
| 7.1. Range of RRR on 3D parcels.                                                                                                             | no           |              |
| 7.2. Are there any limitations on the range of rights?<br>(e.g. subterranean parcels must be owned by Govt).                                 |              |              |
| 7.3. Any other RRR issues?                                                                                                                   |              |              |
| 7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)                                                                       |              |              |
| 7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/articles. |              |              |
| 7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?                               |              |              |
| 7.7. What applications do you foresee for 3D cadastre?                                                                                       |              |              |

## 8. DCDB (The Cadastral Database)

|                                                                                                                                                                                 | Bahrain 2010                                                                                                                      | Bahrain 2014                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 8.1. Does the DCDB contain representation of 3D parcels (in any form)?                                                                                                          | No<br>Not at the moment;<br>process is already on.                                                                                | Yes                                                                                                                     |
| 8.2. If so, how are they represented (in the DCDB)?                                                                                                                             | 2D land parcels                                                                                                                   | Expected to be the volume of strata parcel.                                                                             |
| 8.3. If so, how are they presented on cadastral “maps” (including screen presentations)?                                                                                        | Overlapping 3D parcels in plan.                                                                                                   | In true 3D.                                                                                                             |
| 8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?                                                                                                       | Attempt is ON.                                                                                                                    | YES                                                                                                                     |
| 8.5. Is it possible to manage a 3D topological structure in the DCDB?                                                                                                           | Right now all parcels are individual entities.                                                                                    | Expected to do so.                                                                                                      |
| 8.6. Are constraints/rules defined for valid 3D objects (closed volume, no overlap, no gap in 3D)? What about rules for a mix of 2D and 3D representations?                     | All parcels are closed parcels FOR SURE. There are no overlapping. Exception occurs if there is an ownership litigation in court. | 3D parcels are expected to follow topological rules.                                                                    |
| 8.7. How can internal and external user query and visualize the 3D content supporting rotating, slicing, transparency, perspective (3D web/view service, 3D pdf documents,...)? | Existing 2D application available on Intranet doesn't allow this.                                                                 | Upgraded new system will include all archival & retrieval facilities for authorised internal as well as external users. |
| 8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?                                                                                              | SQL*server<br>Evaluating Oracle Spatial 11g 3D capabilities.                                                                      | Unsure of technology at the moment.                                                                                     |
| 8.9. Do you have any validation rules for 3D representation in the database?                                                                                                    | NO                                                                                                                                |                                                                                                                         |
| 8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?                          | Microstation, In-house product called Surveyor 4.<br><br>Title deed registration system is built on ESRI platform.                |                                                                                                                         |
| 8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?                                                   | ArcIMS.<br>It is 3D incapable.                                                                                                    |                                                                                                                         |
| 8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?                                                                                       | Multilayer custom data model evolved over a period of time [2 decades].                                                           |                                                                                                                         |

|                                                                                                         |                                                                             |     |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----|
| 8.13. How do you query 3D objects in your DCDB?                                                         | Parcel number or registration number, but returned results are in plan [2D] |     |
| 8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally? | No.<br>3D capability.                                                       | YES |
| 8.15. Any other DCDB issues?                                                                            | Migrating to new system.                                                    |     |

## 9. Plans of Survey (including field sketches)

|                                                                                                                                                                                                        | Bahrain 2010                                                                                                                                        | Bahrain 2014 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 9.1. Do the survey plans carry 3D parcel representations?                                                                                                                                              | Yes, as-built drawings from survey companies are included while issuing Certificate of Survey and Title Deeds.                                      |              |
| 9.2. If so, how are they represented?                                                                                                                                                                  | Surveyed parcel represented as closed 2D polygon is stored in cadastral database. Plan, elevation and section drawings used as supporting document. |              |
| 9.3. Is there specific legislation (regulations) describing the requirements for Plans of Survey in 3D? If so, please give link to the relevant documents.                                             |                                                                                                                                                     |              |
| 9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?                                                                                               | No                                                                                                                                                  |              |
| 9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?                                                                    | No                                                                                                                                                  |              |
| 9.6. In what format are the 3D parcels submitted for registration; attached to legal document in a single pdf (which has good 3D capabilities) or in an extension of (city)GML for 3D parcels, or....? | Plan, elevation and section drawing to represent 3D extent + 2D parcel boundary.                                                                    |              |
| 9.7. Are the 3D parcels somehow checked for spatial validity; e.g. volume is closed, does not overlap with neighbour volume (and also no unwanted 3D gaps)?                                            | NO                                                                                                                                                  |              |
| 9.8. Do you have examples of (prototype or production) 3D survey plans available?                                                                                                                      | Yes                                                                                                                                                 |              |
| 9.9. Are any reference objects visible on the survey plan (e.g. real buildings, roads, that is 3D topography)?                                                                                         | Yes                                                                                                                                                 |              |
| 9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning,...)?                                                                      | CAD & field survey                                                                                                                                  |              |

|                                                                                                                     |                                                                                                      |  |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|--|
| 9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?     | Microstation, in-house application Surveyor 4 and oracle.<br><br>3D capabilities are being explored. |  |
| 9.12. Can 3D parcels be subdivided, consolidated or nullified?                                                      | Theoretically yes.                                                                                   |  |
| 9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field? | Left to the wisdom of surveyor 4.                                                                    |  |
| 9.14. Any other survey plan issues?                                                                                 |                                                                                                      |  |

## **10. Other Issues**

Please include any other issues that may be of interest in an international context. For example, in some foreign jurisdictions 3D parcels can only be separated by horizontal planes.

|                                                                   |                                                                 |                                                          |
|-------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------|
| 10.1. Country<br>(State, Province)                                | Kingdom of Bahrain                                              |                                                          |
| 10.2. Your name,<br>function/position<br>and<br>your organization | Neeraj Dixit,<br>Consultant to Technical<br>Affairs Directorate | Ammar Rashid Kashram<br>Director, Technical Affairs      |
| 10.3. Contact<br>details:<br>address<br>email,<br>telephone       | <a href="mailto:neeraj@slrb.gov.bh">neeraj@slrb.gov.bh</a>      | <a href="mailto:ammar@slrb.gov.bh">ammar@slrb.gov.bh</a> |
| 10.4. Other issues                                                |                                                                 |                                                          |

## I. Preliminary Selling Permit from Municipality

### Documents needed:

- Copy of building permit (if exist).
- Fill the preliminary multi story selling agreement form.

Remarks: ● You can get the preliminary agreement when you request for a building permit.

- The same building regulations are applied for the flats and multistory owning system.

## II. Final Approval & Map Stamp from Municipality

### Documents needed:

- Copy of the Preliminary selling agreement.
- 3 copies of the architectures drawing shows the flats boundaries and dimension & common units.
- 3 copies of the details architectures drawing shown the plot boundaries with the building outlet & the car park.

## III. Survey Certificate from Survey Directorate

### Documents needed:

- Original copy of the architectures drawing approved by municipality.
- Final agreement from the municipality.
- CPR or Passport Copy of the owners.
- Survey request form by engineering office.
- Copy of title deed.
- Land survey certificate.

## IV. Document of the Selling Contract

### Documents needed:

- Final agreement from the municipality.
- Passport Copy for the owner and buyer.
- Original delegation (if exist).
- Unit survey certificate.
- Original title deed of the land.

## V. Issue Title Deed from Land Registration Directorate

### Documents needed:

- Documented selling contract.
- Copy of Buyer passport.
- Final agreement from the municipality.
- 3 copies of the architectural drawing approved by municipality.
- Unit survey certificate.

## ١. الموافقة المبدئية من قبل البلدية

### المستندات المطلوبة:

- نسخة من إجازة البناء (إن وجدت).
- ملئ الاستمارة الخاصة بطلب الحصول على موافقة لبيع الطقات.

ملاحظة: ● يمكن الحصول على الموافقة المبدئية من خلال طلب الحصول على ترخيص البناء.

- تطبق نفس الشروط البناء العمودية على نظام تلك الشقق والطاقات.

## ٢. الموافقة النهائية مع تلميز البئرابط من قبل البلدية

### المستندات المطلوبة:

- نسخة من الموافقة المبدئية.
- ٣ نسخ من رسومات هندسية توضح فيها حدود و أبعاد الشقق بالإضافة إلى الأجزاء المشتركة.
- ٣ نسخ من رسومات هندسية تفصيلية للعقار تبين حدود العقار فيما يتعلق بالناظر المؤدية للعقار + مواقف السيارات .

## ٣. شهادة المسجل للبلدية من قبل إدارة المسجل العقاري

### المستندات المطلوبة:

- نسخة أصلية من الرسومات الهندسية المعتمدة من البلدية.
- الموافقة النهائية من البلدية.
- نسخة من البطاقة السكانية للمالك أو نسخة من جواز السفر.
- استمارة طلب مسح مع تحديد أحد المكاتب الهندسية الاستشارية المعتمدة للقيام بعملية المسح .
- نسخة من وثيقة الملكية.
- شهادة مسح للأرض .

## ٤. توثيق عقد البيع من قبل مكتب التوثيق

### المستندات المطلوبة:

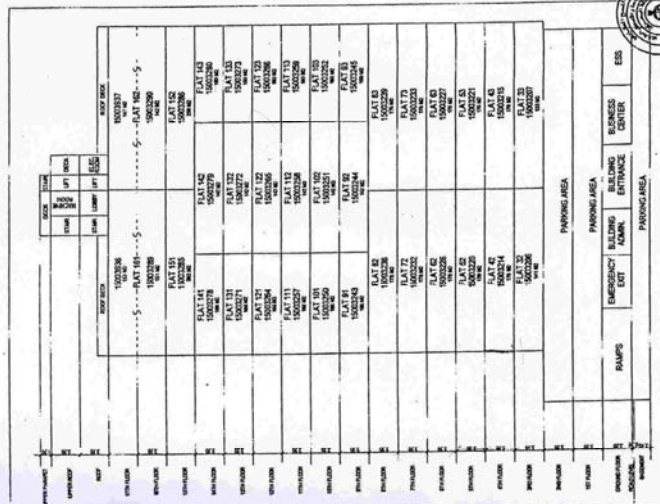
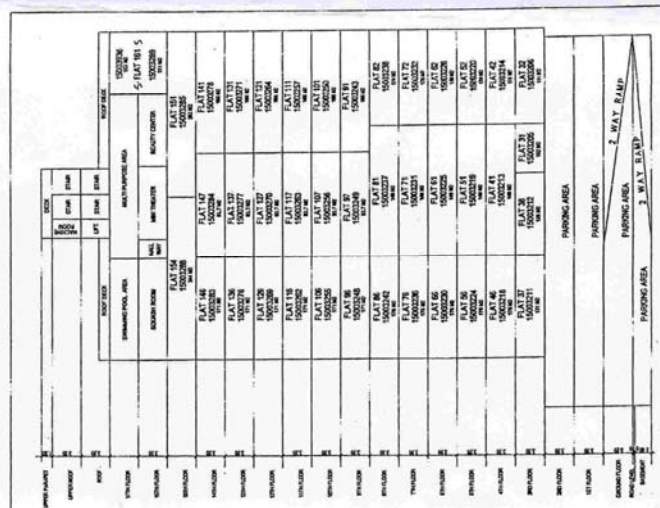
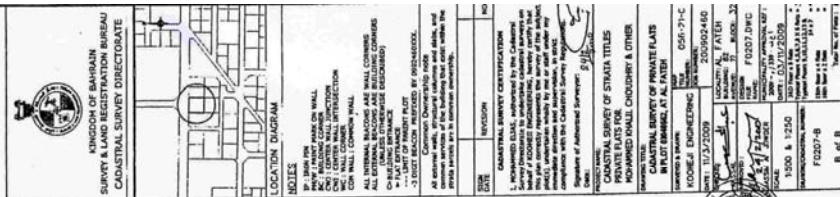
- الموافقة النهائية من البلدية.
- نسخة من جواز سفر البائع والمشتري.
- الوكالة الأصلية (إن وجدت).
- شهادة المسح للوحدة.
- الوثيقة الأصلية للملكية الأرض .

## ٥. إصدار وثيقة الملكية من قبل التسجيل العقاري و المنازعة

### المستندات المطلوبة:

- عقد البيع الموثق .
- نسخة من جواز سفر المشتري .
- الموافقة النهائية من البلدية .
- ٣ نسخ من الرسومات المعتمدة من البلدية للمبنى .
- شهادة المسح للوحدة .





VIEW C-C