جهاز المساحة والتسجيل العقاري
Survey & Land Registration Bureau

CADASTRAL SURVEY DIRECTORATE

CADASTRAL SURVEY STANDARDS GUIDELINES MANUAL

2nd Edition

March 2024

Acknowledgements

Eng. Naji Sebt / Director General Survey

Eng. Mai Al Muraikhi / Act. Director Cadastral Survey Directorate

Eng. Yousef Al Wazan, Eng. Mohammed Al Khudri, Eng. Abdul Rahman Showaiter, Eng. Mohammed Al Mahmeed, Eng. Majeed Hasan, Eng. Fawaz Al Doseri, Eng. Khaled Al Sheikh, Eng. Abdulla bin Sanad, Eng. Abdulla Abdulrazaq

Eng. Jon Davies / Advisor TSD

Eng. Eleni Tziortzioti / Advisor CSD

Table of Contents

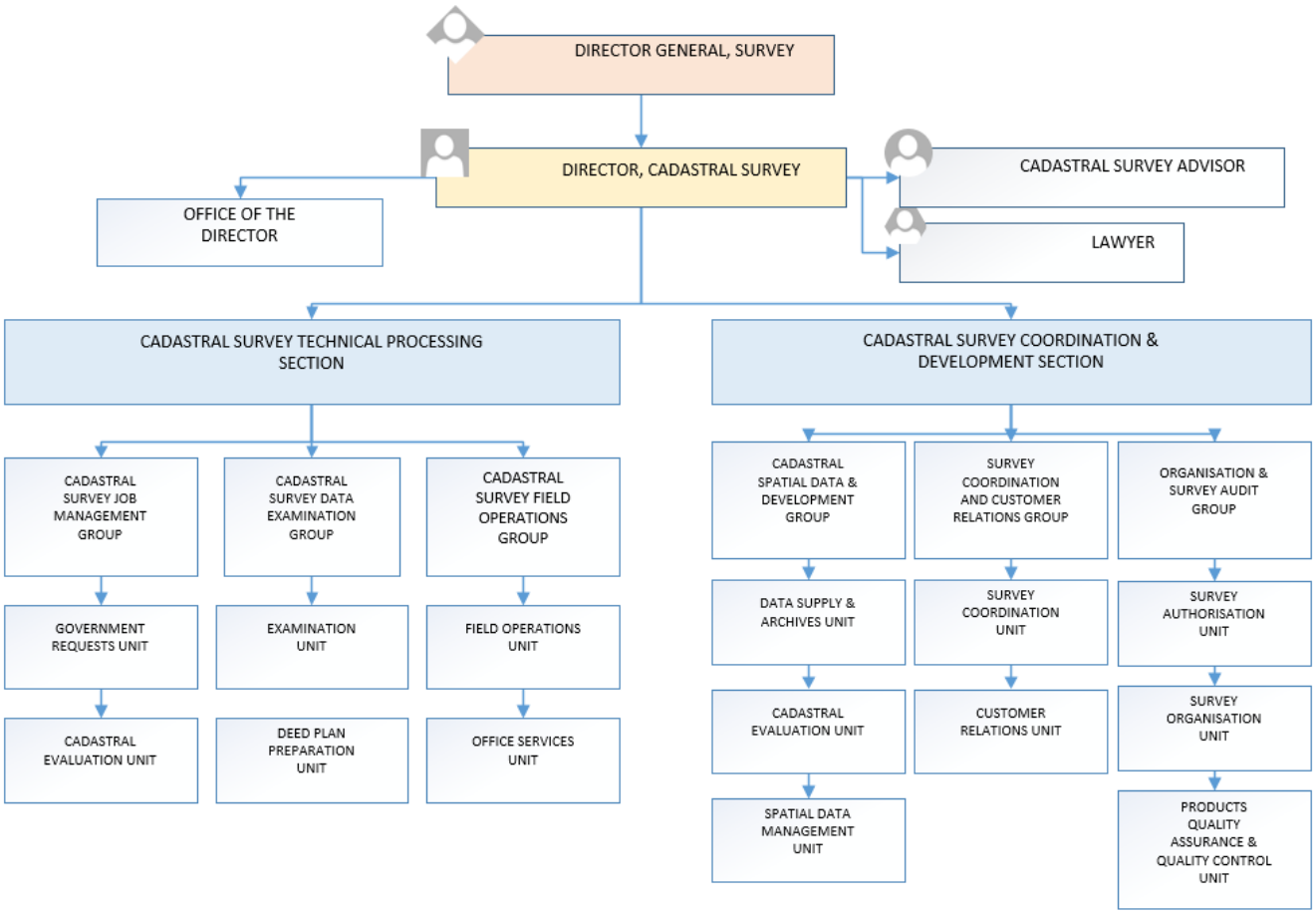
A. INTRODUCTION

Overview of the Cadastral Directorate

Cadastral Surveying is the process of defining real estate and property legal boundaries, property areas and dimensions detailed measurements. The phrase "Real Estate Property" refers to any ground-based area or structure that is immovable and is categorized as either natural (land) or a designated form of building: house, office building, etc.
The Cadastral Survey Directorate (CSD) administers the survey system primarily to provide accurate identification of boundaries for land tenure purposes and prepare detailed records and publish maps, title deed plans and survey certificates for the benefit of the public, private entities, and government agencies.
Mainly, the CSD is responsible for:

- Performing all necessary surveying activities to count, analyse, and classify different types of real estate units and their specifications for private and public benefit all over the Kingdom; Part of the activities are performed by Private Sector Offices, authorised by CSD.
- Conducting cadastral surveys, and preparing deed plans, for private and public real estate sectors.
- Developing and updating databases and digital maps of all cadastral related data records.
- Carrying out all Royal orders regarding land allocation and grants.
- Preparing reports and offering technical advice on property issues upon request from public and private sector entities.
- Preparing survey reports and certificates, maps, ownership documents, and laying physical markers to determine limitations and borders for public and private real estate units.
- Enhancing and updating surveying methodologies to comply with the latest technical advancements in this field.
- Reviewing surveying regulations and suggesting newer ones; and
- Contributing necessary surveying data for GIS applications in public and private entities.
- Sharing cadastral data in real time with public stakeholders, underpinning their activities.
- Authorising, monitoring, and auditing the Private Sector activities and efficiency and proposing all the necessary correction actions.
- Focusing on design, development and providing internal and external audit reports and other related activities, within the standards and KPI’s, ensuring the QA/QC of the CSD products.

Organisational Structure



Abbreviations

Term	Definition
GDS	Director General Survey
CSD	Cadastral Survey Directorate
TSD	Topographic Survey Directorate
HSD	Hydrographic Survey Directorate
CSD Director	Director, Cadastral Survey
ACSD	Consultant/ Advisor (Cadastral Survey)
CCTP	Chief, Cadastral Survey Technical Processing
CCCD	Chief, Cadastral Survey Coordination & Development
CTP Section	Cadastral Survey Technical Process Section
CFO	Cadastral Survey Field Operations Group
CJM	Cadastral Survey Job Management Group
CDE	Cadastral Data Examination Group
CCD Section	Cadastral Survey Coordination & Development
CCR	Cadastral Survey Coordination & Customer Relations Group
CDE	Cadastral Data Examination Group
OSA	Organisation & Audit Group
CoS / LC	Certificate of survey / Land Certificate
CP	Cadastral Plan
DP	Deed Plan
PS	Private Sector Office
PI	Primary Investigation
TCC	Technical Coordination Committee
SC	Survey Committee
CTC	Court Technical Committee
MoF	Ministry of Finance
MUN	Ministry of Municipalities
UPDA	Urban Planning & Development Authority
LRD	Land Registration Directorate
TAD	Technical Affairs Directorate

Purpose of the Survey Standards Guidelines Manual

The Standards and the Guidelines in this CSD Survey Standards Guidelines Manual will enable users (internally in CSD and externally to the stakeholders):

- ✓ To have access to Up-to date Standards they must comply with.
- ✓ To understand the Coordinated Cadastre of Bahrain and adopt modern survey instrumentation and techniques to use the appropriate survey control of International Standards.
- ✓ To understand the governance, administrative authority, and procedures of conducting cadastral survey within the Kingdom of Bahrain.

Scope

The Cadastral Survey Standards Guidelines Manual is divided in Chapters that:

1. Introduce the Cadastral Survey Directorate
2. Describe the Cadastral Survey Identifications
3. Present the Cadastral Survey Directorate Products and their guidelines
4. Present the Regulations between the Directorate and the Private Sector firms.
5. Present the Bahrain Coordinated Cadastre and the Field Operations Guidelines
6. Summarise the Standards.

The Cadastral Survey Directorate is currently upgrading their systems; thus, this is the First Draft of the Survey Standards Guidelines Manual, and it is subject to enrichment and updated versions in the near future.

DEFINITIONS

Standards' Guidelines Manual:
Guideline rules issued by the Director General Survey, that determine the technical and administrative standards and procedures that shall be followed in the completion of a survey transaction.

Land survey:
Defining the property's location, indicating its area, dimensions, and boundaries of ownership.

Cadastral Survey: {Amendments of L13}
Collection and processing of measurements and preparation of plans defining the physical extent and boundaries of land and property, encumbrances, abuttals, and neighbours, to represent ownership as recorded in Title Deeds and Property Register including all types of tenure under this Law in 2 or 3 dimensions.

Non-Cadastral Survey:
Survey of features of the natural and built environment other than cadastral survey such as topographic, geodetic, hydrographic survey and other disciplines as defined by the concerned directorate. May include the collection and processing of measurements and preparation of plans defining the physical extent of the natural and built environment.

Survey:
Measurement and observation by direct or non-contact methods, the collection and processing of measurements, capture and creation of spatial data, the preparation of plans and maps (in 2D and 3D), for the purpose of cadastral, topographic, geodetic, and hydrographic surveying and mapping under this Law.

Topographic Survey:
Collection and processing of measurements made to determine the location and attributes of features of the natural and built environments by direct and/or non-contact methods and observation.

Geodetic Survey:
Measurement and representation of the Earth including its gravitational field in three dimensions and according to time to enable definition of the National (foundation) reference framework with respect to the Bahrain National Datum and Grid to which all survey measurements and features can be referenced

Hydrographic Survey:
Collection and processing of measurements of the sea, waterways and along the coast relating to depth of the sea, coastal features, navigation aids, nature of the seafloor including sub bottom, tides, currents, and physical properties of the water column.

Cadastral Parcel
Cadastral parcel should be considered as a single area of Earth surface, under homogeneous real property rights and unique ownership (adapted from UN ECE 2004 and WG-CPI, 2006).
Remark: By unique ownership is meant that the ownership is held by one or several owners for the whole parcel.

Cadastral Parcel Types
- **Numeric:** Surveyed and coordinated parcels. where their data uploaded and archive in a database table and exported to cad tile in DGN format.

- **Graphic:** Surveyed parcels. where their data uploaded and archive in a database table and exported to cad tile in DGN format.

- **CIM (Cadastral Index Map):** Not surveyed parcels, charted from land registration charting map.

Certificate of Survey (CoS) known and as Land Survey Certificate (LC):
A technical plan outlining the property's nature, location, indicating its area, dimensions, and boundaries.

Strata:
Each independent horizontal unit of a property, that has the descriptions and characteristics of the property, and it's divided into one apartment or several apartments.

Apartment / flat:
Any part of a strata building which constitutes an independent horizontal unit.

Cadastral Plan:
A map prepared by a Private Survey Firm and approved by Cadastral Survey Directorate that shall have the same characteristics as that of a survey certificate and relates to a group of properties for any subdivision or in implementation of detailed plan.

Deed Plan:
An engineering drawing by the Cadastral Survey Directorate for the unit subject of a transaction and the property in which it is located therein. Such drawing shall be based on survey drawings and physical field survey. There shall be shown in it the area of the unit, its boundaries, its number amongst the property units, stratum in which it is located, and the parts associated therewith, all in accordance with the technical requirements and instructions mentioned in the Standard's Guideline Manual

Title Deed:
A deed issued by the Bureau (SLRB) and proving title to the property.

Survey Drawings:
Drawings prepared by a Private Engineering Firm at the request of an owner and approved by the Cadastral Survey Directorate in respect of units subject to a transaction. Drawings shall be based on field survey and detailed engineering drawings of the said units and in accordance with the technical requirements and instructions mentioned in the Standards' Guidelines Manual.

Detailed Engineering Drawings:
Drawings prepared by a Private Engineering Firm at the request of an owner and approved by the concerned municipality and based on which a permit is issued to build the property in which the units' subject of a transaction are situated.

BPMS:
Bahrain Property Measurement Standards. Standards adopted in 2019, define what should be measured and consequently what is measurable in Cadastral Plans, Deed Plans etc.
The BPMS comply with IPMS/International Property Measurement Standards.

Property Plan:
A plan showing the property's area, location, boundaries, dimensions, and numbers.

Common Property:
An entire building, or any part thereof, or the land, or both, which is divided into Units allocated for ownership or usufruct. Part of such building or land shall be designated as Common Parts.

Property Unit / Unit:
An apportioned part of a Common Property, which includes any allocated off-plan part, or any apartment, or storey or part of a land or house (villa) whether attached to another house or detached, which is located within a Common Property.

Common Parts:
The parts of a Common Property that are held in common and are allocated for common use by all the owners and Occupants of the Property Units on the Property Location Plan.

Survey Job (Job Transaction)
A file that includes a paper or electronic application filed by and owner or his representative who is duly authorised by an official power of attorney to survey a property. The application shall be recorded in the concerned Register under a serial number and shall mention the necessary information, date of the application and what procedures have been done until the completion of the job.

Surveyor:
The person who does the survey works in accordance with the provisions of these Implementation regulations.

Private Survey offices:
A private office authorised to perform various types of surveying under the Law 13/2013 and its amendments, or an office that is registered and licensed with the Council for Regulating the Practice of Engineering Professions according to Law No. (51) of 2014, with respect to Regulating the Practices of Engineering Professions, and which are approved by the Director General Survey.

Examination of Cadastral works:
The Quality Check of all the Cadastre Products so that secure their accuracy and their compliance with CSD Standards.

Land and Property Consolidation:
The survey act by consolidating two or more parcels of land and defining them as one parcel, according to the UPDA approved plans.

Demarcation
The survey act to define the land boundary of registered or unregistered land.

Re-demarcation
The survey acts to reset out previously defined boundaries.

Subdivision
The process that the owner/developer of a land or building must go through to subdivide it into two or more parcels/plots.

Replanning
A request from UPDA to re-plan an area & prepare a Cadastral Plan.

Case number:
Is a number allocated to the property after the payment by a buyer of the real estate fees, whereby the buyer becomes the owner of the property subject of the transaction.

Public bodies:
Government ministries, agencies, and other government entities

CRPEP:
The Council for Regulating the Practice of Engineering Professions in the Kingdom of Bahrain according to Law No. (51) Of 2014.

Data:
All type of information text, graphic, image, audio and/or visual material, software, data, spatial data, database and/or system content, information and material, and data about data (metadata).

Spatial Data:
Data derived from survey measurement or processing that has attribute of location in two or three dimensions and according to time including features, feature attribution, and data about data (metadata).

Data License:
License issued by the Concerned Directorate for the permissions to access, use, publish, reproduce, or re-sell data including spatial data and all associated restrictions. The Data license is valid for a year.

Fundamental (or Foundation) Spatial Data:
A set of spatial data required to produce national base maps, which is determined by SLRB. It is referred to a primary collection of processed measurements of the natural and built environment on, above or below the surface of the Earth or the sea that are surveyed and stored according to defined standards and position related to the National (foundation) reference framework, including the attributes of features and associated metadata.

CIS (cadastral Information system):
CSD current Job management system.

B. CADASTRAL IDENTIFICATIONS

Parcel, Beacon Identification and Numbering

Land parcels in Bahrain are identified in several ways by the various authorities who have a legitimate interest in the management, identification, and ownership of land.

Cadastral Directorate Identification

Cadastral Directorate gives a unique number to each land parcel by identifying successive plots in geographically defined districts and sub-districts.
The number has the format:

DD-SS-nnnn

DD: the Registration District Number (01-17)

SS: the sub-District

nnnn: the serial parcel number

Gaps will appear in the sequence as plots are cancelled or superseded by later sub-division, consolidation, or re-planning. A plot number, once used, must NOT be used again.

The general relationship between Registration District and locality is set out below.

DISTRICT	SUB-DISTRICT	AREA
01	00 - 01	ARAD, HALAT AL NEAIM, HALAT AL SLETAH, HIDD SALMAN INDUSTRIAL CITY, SHARQ AL HIDD
02	00 - 04	AL DAIR, AMWAJ, BUSAITEEN, DIYAR AL MUHARRAQ, MUHARRAQ, QALALI, RAYA DISTRICT, SAMAHEEJ, SHARQ AL HIDD (101)
03	01	DIPLOMATIC AREA MANAMA / SEA FRONT
03	02	MANAMA / ALCORNICHE, MANAMA / ALHOORA, MANAMA / ALQUDAYBIYAH (321)
03	03	MANAMA / ALQUDAYBIYAH
03	04	MANAMA / ALFATEH, MANAMA / ALGHURAYFAH, MANAMA / ALJUFFAIR
03	05	MANAMA / MINA SALMAN INDUSTRIAL AREA
03	06	MANAMA / UMM ALHASSAM
03	07	MANAMA / ALADLIYAH
03	08	MANAMA / ALSALMANIYA (329), MANAMA / ALSUQAYYAH, MANAMA / BUASHIRAH MANAMA / BUGHAZAL, MANAMA / UMM ALHASSAM (333)
03	09	MANAMA / ALQUDAYBIYAH (308), MANAMA / ALSALMANIYA, MANAMA CENTER (307)
03	10	MANAMA / ALGUFUL
03	11,12,13,14,15,16,17,18,19,20,21,22,23, 24	MANAMA / ALNAIM, MANAMA / ALSUWAYFIYAH (313), MANAMA CENTER
03	25	AL BURHAMA, MANAMA / ALSUWAYFIYAH (351), SALIHIYA
03	26	BILAD AL QADEEM, ZINJ
03	27	ABU BHAM, ADHARI, KHAMIS, SOUTH SEHLA
04	01	JANNUSAN, JID AL HAJ, KARRANAH
04	02-06	AL DAIH, AL MAQSHA, AL QAL AH, AL SEEF, HILLAT ABDULSALEH, JIDHAFS (422, 424, 426) KARBABAD, KARRANAH (458), NURANA, SANABIS
04	03 - 07	ABU SAYBA, AL HAJAR, AL QADAM, BU QUWAH, JEBLAT HIBSHI, MAQABAH, NORTH SEHLA, SHAKHURAH
04	04	AL MUSALLA, JIDHAFS, TASHAN
05	01 & 03	AL DIRAZ, AL MARKH (533), BAR BAR, BUDAIYA (550, 552), JANNUSAN (508), MADINAT SALMAN
05	02 & 04	AL JANABIYAH, AL JASRAH, AL MARKH, AL QURAYYAH, BANI JAMRAH, BUDAIYA, JIDDAH MAQABAH, MOHAMMADIYAH, SAR, UMM AL NA SAN
06	00 - 02	AL AKR AL GHARBI, AL HAMRIYA, AL MA AMEER, AL NUWAIDRAT, HAWRAT SANAD, INDUSTRIAL AREA, JUZUR AL DAR, SANAD, SHARQ SITRA CITY, SITRA (7 areas), UM AL BAIDH
07	01 & 03	A ALI (740, 742), AL JANABIYAH, AL RAMLI, BURI, HAWRAT A ALI, SALMABAD, ZAYED TOWN
07	02	A ALI, BURI (752, 754), RIFFA / JARYALSHAIKH
08	00 - 02	AL NASFA, ISA TOWN, JERDAB, JIDD ALI, MANAMA / SEEF UMM ALHASSAM (373), NABIH SALEH, TUBLI
09	01	AL RIFFAH, RIFFA / ALGHARBI (932), RIFFA / ALROWDHA, RIFFA / WADI ALSAIL, SAFREH
09	02 & 04	RIFFA / ALGHARBI, RIFFA / ALHUNAYNIYAH, RIFFA / ALSHARGI, RIFFA / MO ASKAR, RIFFA / SWAYFRA
09	03 & 06	RIFFA / ALBUHAIR, RIFFA / ALBUKOWARAH, RIFFA / ALHAJIYAT, RIFFA / ALSHAMALI
10	00 - 04	AL HAMALAH, AL JASRAH, AL LAWZI, AL SAFRIYAH, DAMISTAN, DAR KULAIB, KARZAKKAN, MADINAT HAMAD, MALKIYA, SADAD, SHAHRAKKAN, ZALLAQ
11	00	HAWRAT INGAH, JAZAER BEACH, WADI ALI, ZALLAQ
12	00 - 01	AL AMUR, AL GHAYNAH, AL MAMTALAH, AL MAZROWIAH, AL QARAH, AL QURAYN, AL RUMAMIN, AL RUMAYTHAH, AL SAKHIR, AL SHABAK, AWALI, DURRAT AL BAHRAIN, HAFIRAH, HIDD ALJAMAL, MADINAT KHALIFA (8 areas), MAMLAHAT AL MAMTALAH, MUZARRA, RAS ABU JARJUR, RAS HAYYAN, RAS ZUWAYED, TARRAFI, UMM JIDR, UMM JIDR AL SUMMAN, WADI ALI (part of 1068)

Locality Codes

Locality codes are two to three letter codes used to identify areas around the Kingdom of Bahrain, these codes simplify linking the parcel to the area it is located in without having to write the full locality name.

The locality Codes used are presented in the following table:

	LOCALITY CODE	LOCALITY NAME		LOCALITY CODE	LOCALITY NAME
1	HWS	HAWRAT SANAD	61	MZR	ALMAZROWIAH
2	NUR	NURANA	62	MSK	ALMUASKAR
3	SHA	SHARQ AL HIDD	63	UMJ	UMM JIDR
4	MDS	MADINAT SALMAN	64	UJS	UMM JIDR ALSUMMAN
5	MKA	MADINAT KHALIFA/ ASKAR	65	JZB	JAZAER BEACH
6	MKN	MADINAT KHALIFA/ NAAMIYAT	66	RSJ	RAS ABU JARJUR
7	MKM	MADINAT KHALIFA/MISHREF	67	RBS	RUBUD AL SHARQIYAH
8	MKU	MADINAT KHALIFA/ UM ALOWSAJ	68	SUJ	SUWAD AL JANUBIYAH
9	MKJ	MADINAT KHALIFA/ JAU	69	SUS	SUWAD AL SHAMALIYAH
10	MKL	MADINAT KHALIFA/ ALULAIM	70	SWF	SWAYFRA
11	MKR	MADINAT KHALIFA/ ALMAHADIR	71	TRF	TARRAFI
12	MKD	MADINAT KHALIFA/ AL DUR	72	MUZ	MUZARRA
13	SIC	SLAMAN INDUSTRIAL CITY	73	MLM	MAMLAHAT AL MAMTALAH
14	DLM	DILMUNIA	74	WDS	WADI AL SAIL
15	DRM	DIYAR AL MUHARRAQ	75	WDA	WADI ALI
16	SRH	SHARQ AL HIDD	76	RBG	RUBUD AL GHARBIYAH
17	MHD	MADINAT HAMAD	77	DAB	DURAT AL BAHRAIN
18	ALZ	AL-LAWZI	78	RFA	AL RIFFAH
19	RFG	AL RIFFA AL GHARBI	79	BAS	BANDAR AL SEEF
20	RFS	AL RIFFA AL SHARQI	80	AA	ALBA
21	RFN	AL RIFFA AL SHAMALI	81	AB	ABU SAYBA
22	SAF	AL SAFRIYAH	82	ABD	AL-BIDAH
23	SEF	SEA FRONT	83	AD	AL ADLIYAH
24	CNM	CENTRAL MANAMA	84	AJ	AL-JILAH
25	LAS	LHASSAY	85	AK	AKR
26	NRC	NORTH CITY	86	AL	AALI
27	AMW	AMWAJ	87	AR	ARAD
28	SUW	AL-SUWAFIYAH	88	AS	ASKAR
29	GUF	AL-GUFUL	89	AW	AWADIYA
30	CRN	AL-CORNICHE	90	AWL	AWALI
31	BUS	BU ASHIRA	91	AZ	ALZARARIH
32	MSI	MINA SALMAN INDUSTRIAL AREA	92	BD	BUDDAIYA
33	ZIN	ZINJ	93	BH	AL BURHAMAH
34	ABA	ABU AL AYASH	94	BK	BU QUWAH
35	HAJ	AL-HAJIYAT	95	BL	BILAD AL-QADEEM
36	HAM	AL-HAMRIYA	96	BM	BUMAHER
37	KHR	AL-KHARIJIAH	97	BN	BANI JAMRAH
38	AKS	AL-AKR AL SHARQI	98	BR	BARBAR
39	AKG	AL-AKR AL GHARBI	99	BS	BUSURAH
40	INA	INDUSTRIAL AREA	100	BU	BURI
41	NAS	AL-NASFA	101	BY	BUSAITEEN
42	UMB	UM AL-BAIDH	102	DH	AL DAIH
43	BUH	BUHAIR	103	DK	DARKULAYB
44	BUK	BU KUWARAH	104	DM	DAMISTAN
45	SUF	SUFALA	105	DP	DIPLOMATIC AREA
46	MRQ	MURQOBAN	106	DR	AL DIRAZ
47	MHZ	MAHAZZAH	107	DU	AL DUR
48	WDN	WADIYAN	108	DW	DHAWAWDA
49	JNB	AL-JANABIYAH	109	DY	AL DAIR
50	MHM	MOHAMMADIYA	110	FD	FADEL
51	ADR	ADHARI	111	FR	FARSIA
52	UMZ	UMMHAZWARAH	112	HA	HAMAM
53	JAS	ALJASIRAH	113	HD	HIDD
54	HUN	ALHUNAYNIYA	114	HF	HAFIRAH
55	RMN	ALRUMAMIN	115	HJ	HAJAR
56	RWD	ALROWDHA	116	HL	HELAT ABDUL SALEH
57	SBK	AL-SHABAK	117	HM	AL HAMALA
58	GHN	ALGHAYNAH	118	HR	AL HOORA
59	QRH	ALQARYAH	119	HT	HAMAD TOWN
60	QUR	ALQURAYN	120	HW	JAZIRAT HAWAR

	LOCALITY CODE	LOCALITY NAME		LOCALITY CODE	LOCALITY NAME
121	IT	ISA TOWN	181	SL	SALMABAD
122	JA	JID AL-HAJ	182	SLM	AL SALMANIYA
123	JB	JUBAYLAT	183	SM	SAMAHEEJ
124	JD	JIDHAFS	184	SN	SANAD
125	JDD	JIDDAH	185	SNB	SANABIS
126	JF	JAFOOR	186	SR	SAAR
127	JH	JABALAT HABSHI	187	ST	SITRA
128	JL	JIDD ALI	188	SU	AL SAQIYYAH
129	JM	JAMALAH	189	SY	SALIHIYAH
130	JNN	JANABIAH North	190	TB	TUBLI
131	JNS	JANABIAH SOUTH	191	TN	TASHAN
132	JQ	JIBLA QUILLA	192	TT	TASH TASH
133	JR	JERDAB	193	UH	UMM AL-HASSAM
134	JS	JANNUSAN	194	UN	UMM AN NA'SAN
135	JU	AL JUFAYR	195	WS	WASMIYAH
136	JW	JAU	196	ZL	ZALLAQ
137	JZ	AL JASRAH	197	ZNE	ZINJ EAST
138	KB	KARBABAD	198	ZNW	ZINJ WEST
139	KH	KHAMIS	199	JZM	JAZIRAT MUSHTAN
140	KN	KANOO	200	FA	FASHT AL-ADHAM
141	KR	KARRANAH	201	JZN	JAZIRAT NUN
142	KW	KAWARAH	202	FJ	FASHT AL-JARIM
143	KZ	KARZAKKAN	203	ASH	AS SAHAYLAH
144	MA	AL MAAMEER	204	KWF	KHAWR FASHT
145	MG	MAQABAH	205	SFR	SAFREH
146	MH	MUHARRAQ	206	HJM	HIDD AL JAMAL
147	ML	MALKIYA	207	GU	AL GHURAYFAH
148	MN	MANAMA	208	RZW	RAS ZUWAYED
149	MQ	AL MAQSHA	209	HN	HALAT AL NEAIM
150	MR	AL MARKH	210	HE	HALAT AL SLETAH
151	MS	AL MUSALLA	211	HAL	HAWRAT A'ALI
152	MUM	AL MAMTALAH	212	ABB	ABU BHAM
153	MW	MUWAYLIGHAH	213	ZT	ZAYID TOWN
154	MZ	AL MAHUZ	214	RAB	RAS AL BARR
155	NA	AL NAIM	215	ALQ	AL-QALAH
156	NL	NAKHL EL-LAWZI	216	ALF	AL FATEH
157	NS	NABIH SALEH	217	JSH	JARY AL SHAIKH
158	NW	AL NUWAIDRAT	218	BGZ	BU GHAZAL
159	QD	AL QADAM	219	HIG	HAWRAT INGAH
160	QFE	QUFOOL EAST	220	AMR	AL AMUR
161	ALS	AL SAYH	221	SMH	SHAMAL AL MUHARRAQ
162	MC	MANAMA CENTRE	222	SUH	SEEF UMM AL HASSAM
163	QFW	QUFOOL WEST	223	MSF	MARSA AL-SEEF
164	QL	QALALI	224	SEB	SOUTH EAST BAHRAIN
165	QR	AL QURAYYAH	225	RAM	AL RAMLI
166	QU	AL QUDAYBIYAH	226	SHS	SHARAQ ALHIDD/BU SAHEEN
167	RF	RIFFA	227	SHE	SHARQ AL HIDD/ALEZEL
168	RH	RAS HAYYAN	228	SHQ	SHARQ AL HIDD/ALQULYAH
169	RJ	RAS JAZAIR	229	SHJ	SHARQ AL HIDD/UM ALSHAJAR
170	RQ	RAS AL-QURAIN	230	SHW	SHARQ AL HIDD/UM ALSAWALI
171	RS	RAS RUMAN	231	MSR	MADINAT SALMAN/BU RABEA
172	RUM	AL RUMAYTHIYAH	232	MSB	MADINAT SALMAN/AL-BEDA
173	SA	SHAHRAKKAN	233	MSD	MADINAT SALMAN/AL-SHATA DISTRICT
174	SAK	AL SAKHIR	234	MSN	MADINAT SALMAN/AL-NAKHEEL DISTRI
175	SB	SHABATHA	235	MST	MADINAT SALMAN/TEENAR
176	SD	SADAD	236	SSC	SHARQ SITRA CITY
177	SF	ALSEEF	237	DN	DHAHYAT AL NAKHEEL
178	SHF	NORTH SEHLA	238	RD	RAYA DISTRICT
179	SHH	SOUTH SEHLA			
180	SK	SHAKHURAH			

PARCEL NUMBER GENERATION

OVERFLOWS

In general, to cover parcel serial numbers exceeding 9999 within any Registration District:

If the center element is 00 use 01 (e.g., in Sitra, parcels with serial numbers > 9999, appears as 06-01-nnnn).

REGION 13 PARCELS

Registration District 13 was introduced to enable parcel stringing of Roads and other Services.

This Registration Division District 13 is governed by the following rules:

Region	Description
13 00	Road Reserve
13 01	Access Way
13 02	Car Park
13 03	Common Access
13 04	Master Plan Block & Planning Study Areas
13 05	Corner Plots Restricting Access
13 06	Mosques, Cemeteries & Religious Sites on Gov. Land
13 07	Miscellaneous Sites on Gov. Land
13 08	MOH Housing Sites Planned Extension Plots
13 09	Closed Road (A corner needs neighbor approval)
13 10	Multiple Service Corridor
13 11	Electric Service Corridor
13 12	WSD Service Corridor
13 13	BATELCO Service Corridor - TRA
13 14	BAPCO Service Corridor
13 15	SEPPD/ Drainage Corridor
13 16	PROTECTION ZONES
13 20	Multi le Service Site
13 21	Electricity Service Site
13 22	WSD Service Site

13 23	BATELCO Service Site - TRA
13 24	BAPCO Reserve
13 25	SEPPD/ Service Site
13 26	ACCESS MULTIPLE SERVICES (Registered)
13 27	Green Land Zones
13 28	Train Railway, Light Metro, Transportation Lane, Sky Walk
13 30	Common Wall

- In most cases, services sites in Region 13, will be registered in the name of the Kingdom of Bahrain with a normal parcel number.

REGION 14 (OFFSHORE) PARCELS

Region 14 has been introduced to cover all offshore parcels.
No sub-districts are envisaged, and all parcels too far are labelled serially in District 14.

REGION 15 UNITS /FLATS & ATTACHED VILLAS (STRATA) PARCELS

Region 15 has been introduced to cover all flat parcels and the horizontal Villas. Villas are considered as strata parcels.
Flat parcels will be totally contained within a valid parent parcel which shall have a normal parcel number and Title Deed.

REGION 16 MINISTRY OF INDUSTRY PARCELS

Region 16 has been introduced to cover all the Ministry of Industry parcels.

REGION 17 (REGISTERED ROADS OR SERVICES) PARCELS

Region 17 has been introduced to cover the registration of Roads and Multiple Services Corridors.

This Registration Division District 17 is governed by the following rules:

Region	Description
17 00	Road Reserve
17 10	Multiple Service Corridor

OFFSHORE SECOND CROSSING

To cope with extensive offshore work related to the second Manama/Muharraq Causeway Manama offshore along the whole northern length of District 3 will be sub-district 03-21, currently only sea front.

REGION 88 (LEASEHOLDS) PARCELS

Leasehold parcels are identified under Registration District 88 in the format 88SSNNNN. No sub-districts are envisaged.

REGION 99 (COURT CASES) PARCELS

Registration District 99 is used for court case parcels, which in many cases conflict with other parcels. Court case parcel are allocated temporary numbers in the format 99SSNNNN until a decision is made to issue a title deed, or the claim for the parcel is rejected by the courts. No sub-districts are envisaged.

Job Categories

CSD classify the jobs as follows:

CATEGORY CODE	DESCRIPTION	DEMARCATION	Comments
1	SD LC	E	
1	Mun. LC	E	
1	Owner Request/LC	E	
1A	Normal LC	E	
1F	Fast LC	E	
3A	SD Dimensions	N	
3A	LA or O and L Request/Dim	N	
3A	Mun. Dimensions	N	
3B	Owner Request/Dem	Y	
3B	SD Demarcation	Y	
3B	LA or O and L Request/Dim	Y	
4A	LRD Inheritance Subdivision	E	
4A	LRD Court Implementation	E	
4A	LRD Metrication	E	
4A	LRD Exchange	E	
4B	LRD Sale	E	
4C	LRD Deed Renewal	E	

4D	LRD: Shares	E	
4E	LRD Minor Subdivision	E	
4E	SD Minor Subdivision	E	
4F	LRD Family Gift	E	
4G	SD OGD Acquisition	E	
4P	LRD: ByPass DeedPlan	E	
4S	LRD: Strata DeedPlan	E	
4Z	SD Major Subdivision	Y	Need to be modified to LRD: UPDA Subdivision
5A	LRD RePlan	E	
5A	SD RePlan	E	
5B	LRD Compensation	E	
5B	SD Compensation	E	
5C	LRD/LA Amiri Gift	E	
5D	Amiri gift form Owner.loa	E	
5E	SD Defective DP	E	
6	Court Report	E	
6A	Court Deed Replacement	E	
6B	Resolve Complict/Dispute	E	
6C	Court Claim Open Land	E	
6D	Court Claim Occupied Land	E	
6E	Court Claim Exist House	E	
6F	WAQF Report for HCIA	E	
7	SD Others	E	
7	LA or O and L Layout	E	
7H	Housing Projects	E	
7S	Strata Survey	E	

Primary Investigation

Primary Investigation is a CSD process for identifying the requirements of the jobs by doing necessary investigations. The parcel/s are updated, or it is allocated a new parcel number/s and maintain a record of parcel numbers of changes by using the Cadastral Investigation System.
All the relevant information is attached to the job file, and it is provided to enable surveyors to carry out their work.

Categories of Cadastral Survey

Cadastral Survey

Collection and processing of measurements and preparation of plans defining the physical extent and boundaries of land and property, encumbrances, abuttals, and neighbors, to represent ownership as recorded in Title Deeds and Property Register including all types of tenure under the Law 13/2013 in 2 or 3 dimensions.

Non-Cadastral Survey

Survey of features of the natural and built environment other than cadastral survey such as topographic, geodetic, hydrographic survey and other disciplines as defined by the concerned directorate. May include the collection and processing of measurements and preparation of plans defining the physical extent of the natural and built environment.

Survey Requirements for Cadastral Land survey

A Cadastral Survey is subject to a direct e- request or by person to the Customer Relations Unit, or through the Land Registration Directorate.

a) A completed Cadastral Survey fulfill the following:
b) Land boundaries have been determined in digital coordination system.
c) The physical land boundaries have been defined by digital coordinated in digital system or demarcated by physical marks. (Flats boundaries are defined by walls)
d) The land area has been determined.
e) A cadastral number has been assigned by CSD.
f) The land survey output (LC, Deed Plan etc.) has been recorded onto CSD Database.

C. CADASTRAL SURVEY PRODUCTS

1. Cadastral Plan (C.P.)

A Cadastral Survey map prepared by a Private Survey Firm or by CSD and approved by Cadastral Survey Directorate that shall have the same characteristics as that of a Certificate of Survey (C.o.S.) and relates to a group of properties for any subdivision or in implementation of detailed plan, with a unique number assigned to each map/plan.
(By Laws L.13/2013)

2. Types of cadastral Plans:

Survey Drawings (Flats and Villas)

A Survey Drawing is a cadastral plan for flats and/or villas only, it has a unique number starting with F****. All the drawings following the BPMS (Bahrain Property Measurement Standards)

The approved Survey Drawing is required for LRD to register surveyed flats or villas.

MOH (As Built)

A cadastral/Strata plan for As Built houses/flats which is requested to be surveyed by MOH. This type of request is only applicable to MOH, because it doesn't require approval from UPDA.

The approved Cadastral Plan /Surveying Drawing is sent to MOH.

Land and Property Subdivision

The survey act by dividing a parcel of land and building into two or more parcels.

a. **Normal subdivision**

The process that the owner/developer of a land or building must go through to subdivide it into two or more parcels/plots.

This type of subdivision requires UPDA or in some cases Court approval.

b. **Affordable houses**

A cadastral plan survey, but with more procedures required by UPDA to the final plan to be approved for LRD to register the parcels/plots.

- Phase 1:

A request from UPDA to prepare a cadastral plan by subdividing a plot into an (X) number of parcels/plots.

The cadastral plan is annotated that DP will not be prepared in this phase; this allows LRD to know that this plan is not final.

The parent parcel/plot will not be deleted in this phase.

The approved phase 1 cadastral plan is sent to UPDA.

- Phase 2:

A request from UPDA to prepare a cadastral plan for the As Built houses showing if all As Built houses are built within designated plots and if there are any encroachments to be shown for UPDA approval.

The approved phase 2 cadastral plan is sent to UPDA.

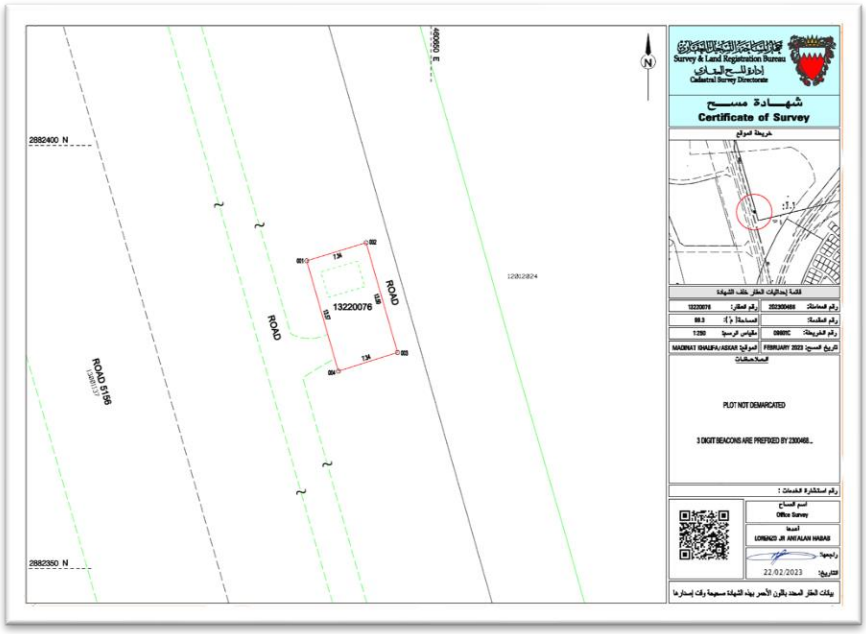
- Phase 3:

UPDA reviews the cadastral plan, if no amendments are required, UPDA approves the Cadastral plan and send it to LRD for registration.

Otherwise, UPDA sends a letter to CSD if there are minor within tolerance amendments to be done in the cadastral plan, or UPDA sends a letter to the owner to demolish or amend the encroachments.

3. Certificate of Survey (CoS), known and as Land Certificate (LC)

Certificate of Survey (CoS) is also known as Land Certificate (L.C.); is a technical plan outlining the property's nature, location, indicating its area, dimensions, and boundaries.
The CoS can be prepared by CSD or a Private Survey firm.
The Certificate of Survey is endorsed by authorised staff of CSD. (Appendix 16)



4. C.o.S /L.C. from Closed File

When an owner has lost, or never received, a CoS, he may apply for a "CoS / LC from a closed file".

A closed file is an archive/ record of a completed cadastral survey.

The product is valid with the assumption that the parcel has not been affected by any boundary changes.

5. Deed Plan

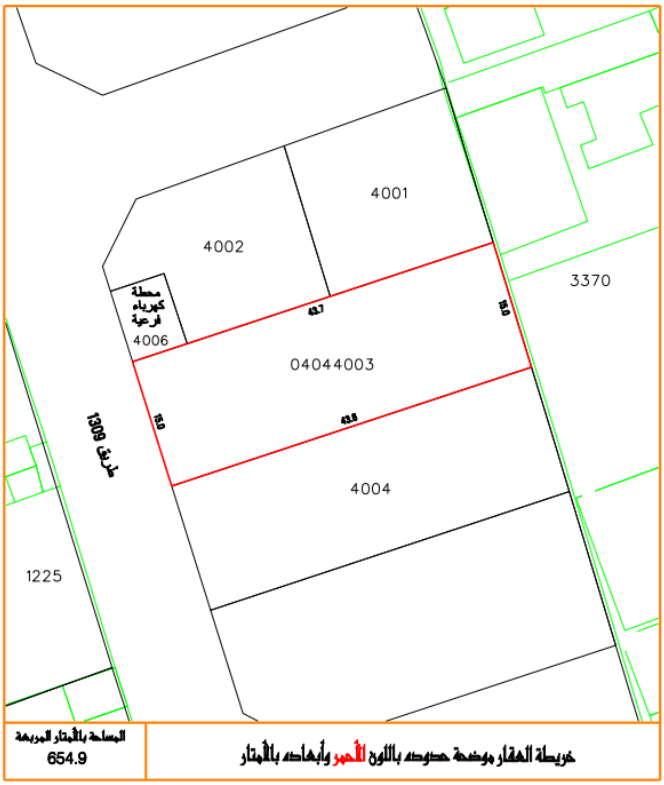
An engineering drawing by the Cadastral Survey Directorate for the unit subject of a transaction and the property in which it is located therein. Such drawing shall be based on survey drawings and physical field survey. There shall be shown in it the area of the unit, its boundaries, its number amongst the property units, stratum in which it is located, and the parts associated therewith, all in accordance with the technical requirements and instructions mentioned in this document.
(By Laws L.13/2013)

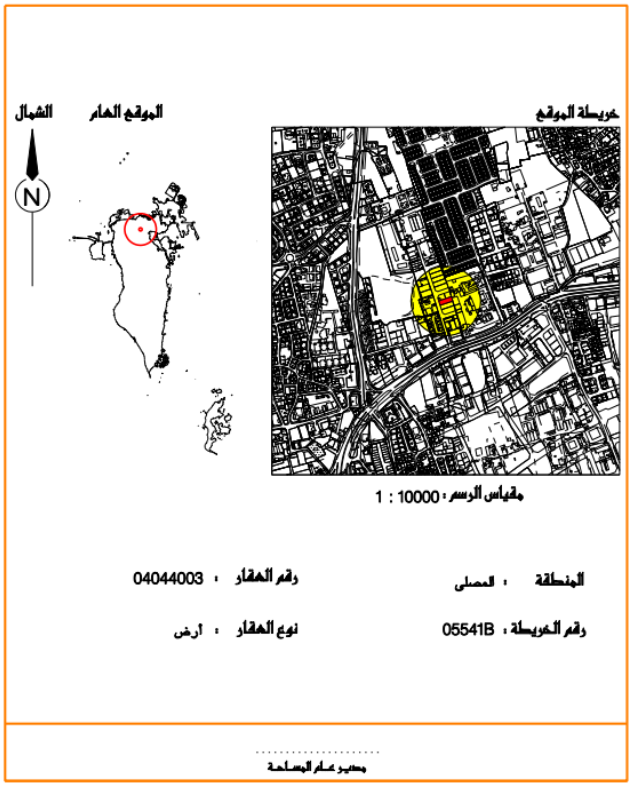
Deed Plan types and drawing specifications.

A. Types of Deed Plan and definition of their components

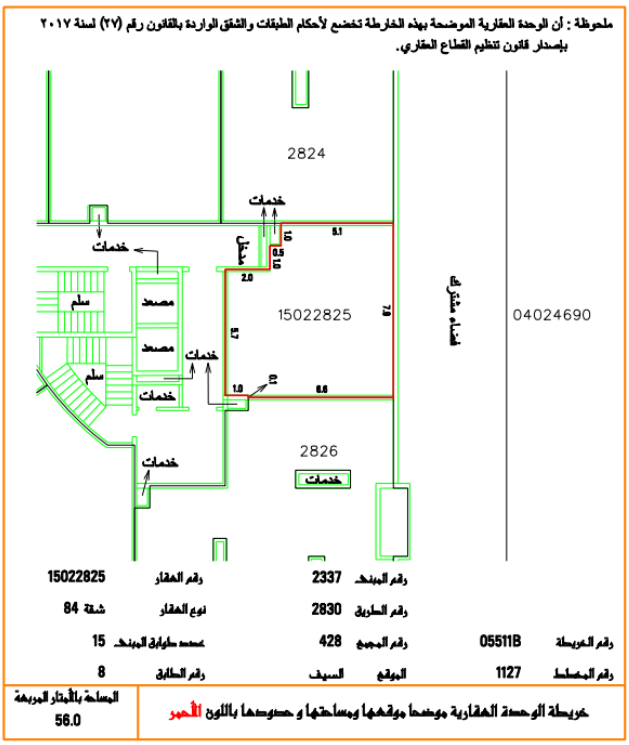
There are two types of Deed Plan

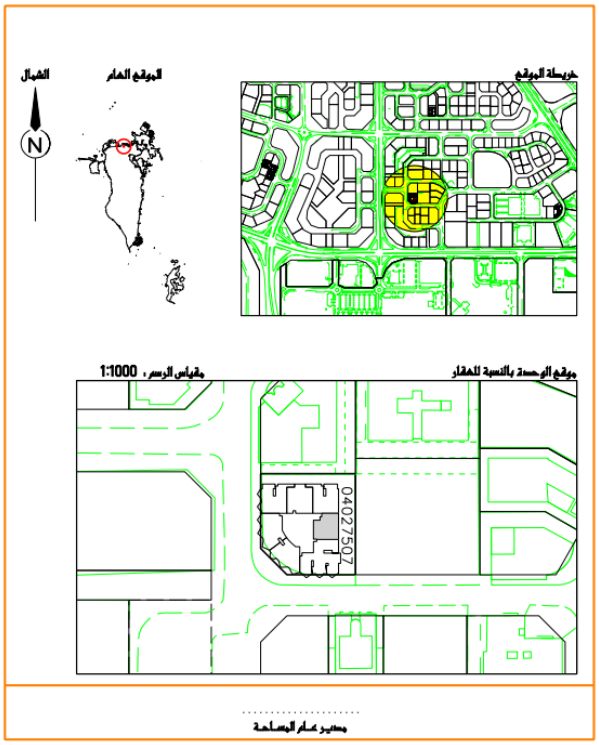
A1. Normal Deed Plan (Land, houses, and buildings)





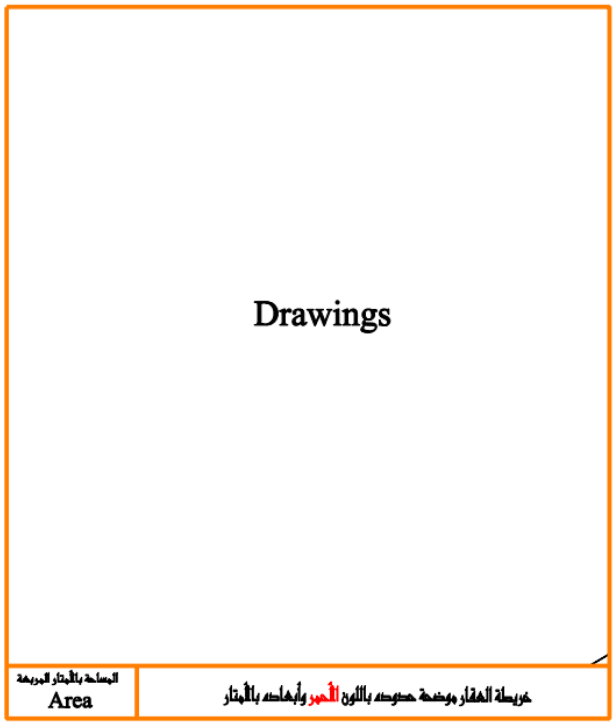
A2. Strata Deed Plan a) Flats, b) Villas

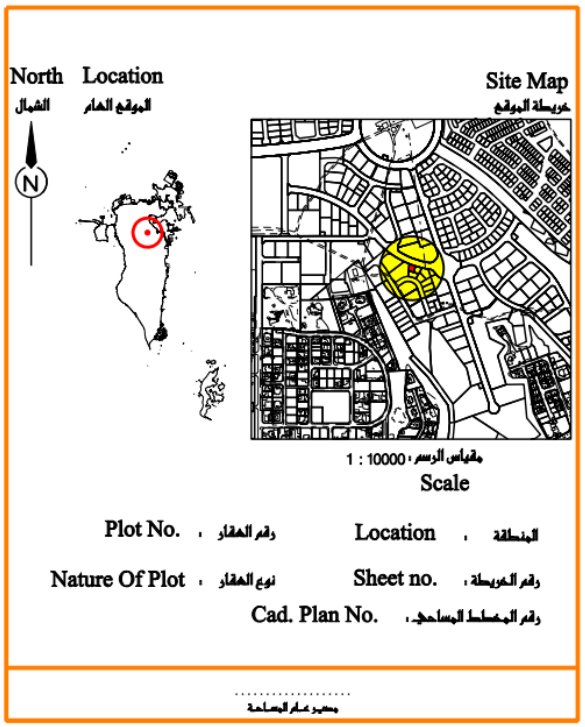




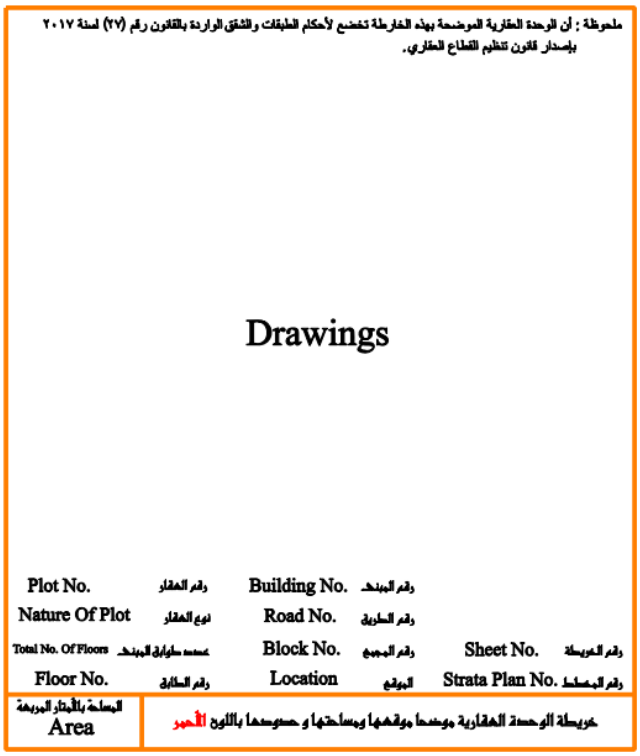
B. Components of Deed Plans

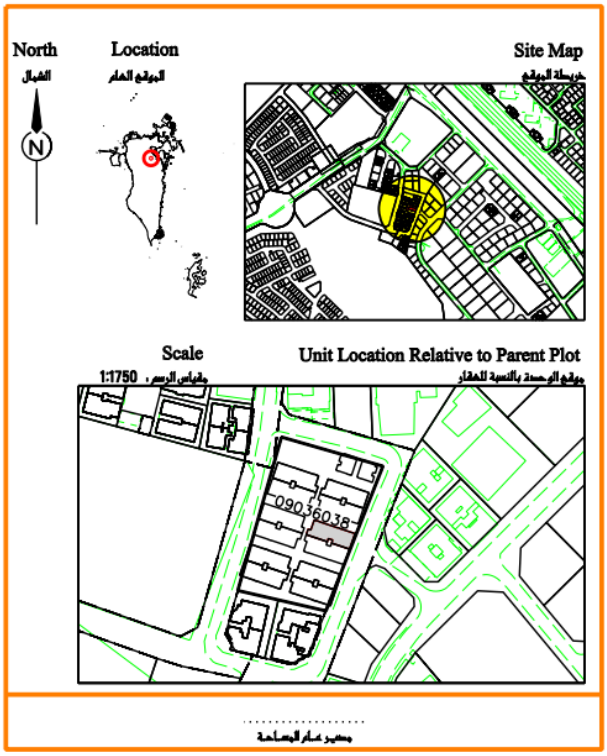
B1. Normal Deed Plan Frame





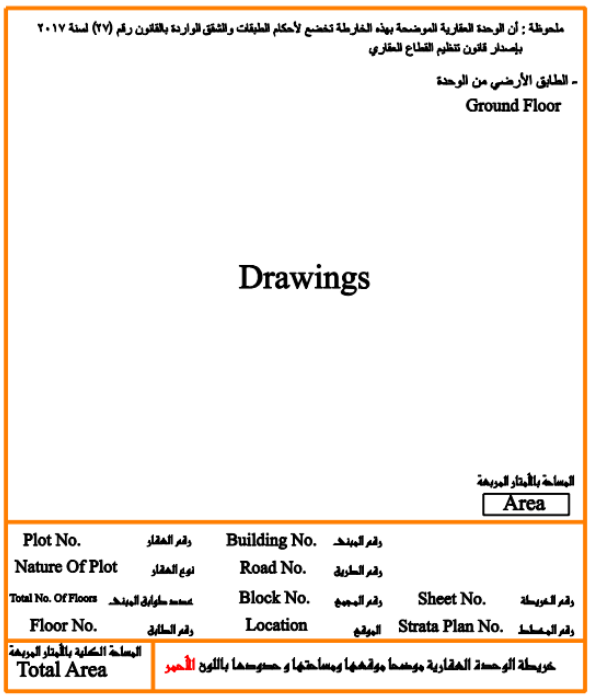
B2. Strata Deed Plan Frame (FLAT)

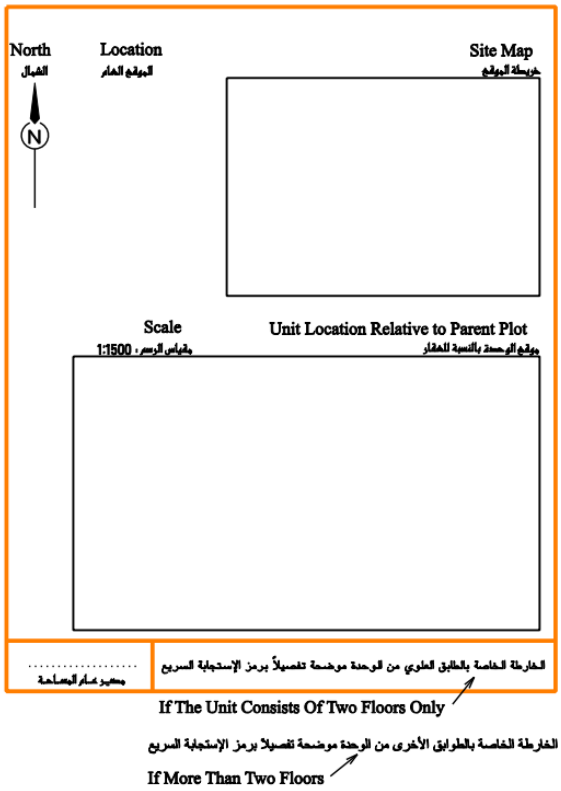


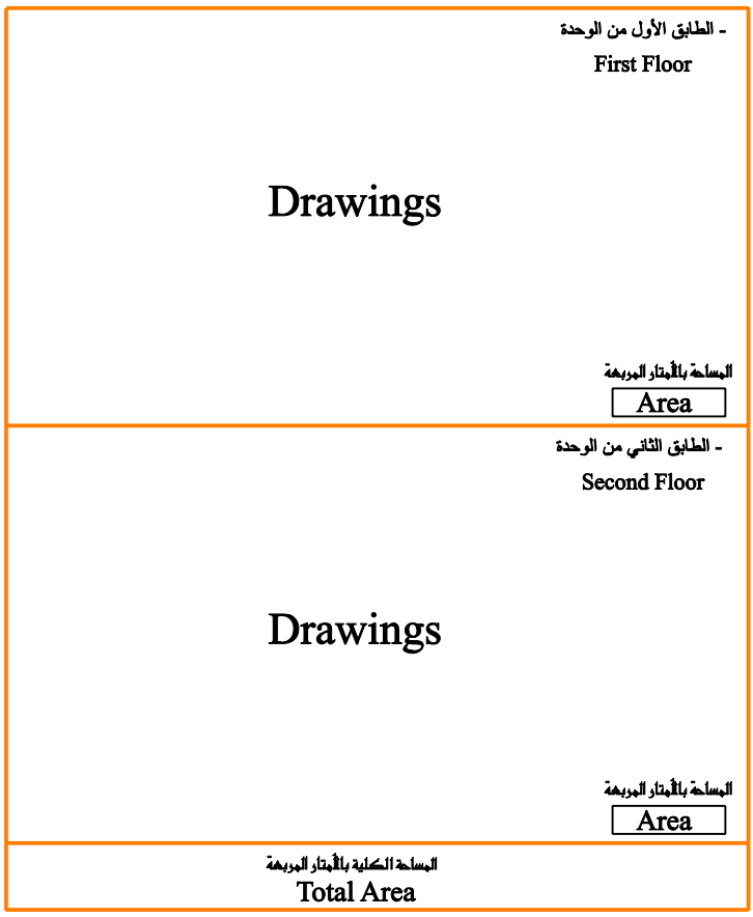


B3. Strata Deed Plan Frame (VILLA)

If the unit consists of more than one floor, the deed plan shall be prepared from two pages.







The area of each floor of the unit is written on the plan below the drawings, and the total area of the unit is written at the bottom of the deed plan.

SCALE	DIM	ROAD	PARCEL	WALL
50	0.110	0.175	0.150	0.050
100	0.220	0.350	0.300	0.100
150	0.330	0.525	0.450	0.150
200	0.440	0.700	0.600	0.200
250	0.550	0.875	0.750	0.250
350	0.770	1.225	1.050	0.350
400	0.880	1.400	1.200	0.400
500	1.100	1.750	1.500	0.500
750	1.650	2.625	2.250	0.750
1000	2.200	3.500	3.000	1.000
1250	2.750	4.375	3.750	1.250
1350	2.970	4.725	4.050	1.350
1750	3.850	6.125	5.250	1.750
2000	4.400	7.000	6.000	2.000
2500	5.500	8.750	7.500	2.500
3000	6.600	10.500	9.000	3.000
3500	7.700	12.250	10.500	3.500
4000	8.800	14.000	12.000	4.000
5000	11.000	17.500	15.000	5.000
7500	16.500	26.250	22.500	7.500
10000	22.000	35.000	30.000	10.000
12500	27.500	43.750	37.500	12.500
15000	33.000	52.500	45.000	15.000
17500	38.500	61.250	52.500	17.500
20000	44.000	70.000	60.000	20.000
25000	55.000	87.500	75.000	25.000
30000	66.000	105.000	90.000	30.000
40000	88.000	140.000	120.000	40.000
50000	110.000	175.000	150.000	50.000
FONT	160 ATISN	160 ATISN	1 WORKING	-

C. Standards for preparing Deed Plans

These standards are used to determine the size and type of fonts used in writing dimensions, roads, parcel numbers, and the distance of double walls from the parcel boundaries.

FOR ARABIC TEXT: MUST USE (**ARABIC TRANSPARENT)** FONT

C1. Types and names of parcels that are written on the Deed Plans

In this table the names of plots are based on their nature.

أنواع العقارات التي يتم كتابتها في الخرائط

English	Arabic	
Land	أرض	1
Corner	زاوية	2
Trees, Palm trees, most of agricultural areas	نخل	3
Building, building with shops, showrooms	مبنى	4
Compound	مجمع سكني	5
House, villa	بيت	6
Shop	محل تجاري / محلات تجارية	7
Mosque	مسجد	8
Ma'atam	مأتم	9
Jame'	جامع	10
Cemetery	مقبرة	11
Garden	حديقة	12
Walkway	ممشى	13
Beach & Walkway	ساحل وممشى	14
School	مدرسة	15
	نادي صحي	16
Carpark	موقف سيارات	17
Avenue, Highway, 40m+ Road Reserve	شارع	18
Road, less than 40m Road Reserve	طريق	19
Lane, Access	ممر	20
	حرم شارع	21
	حرم طريق	22
Service Corridor	ممر خدمات	23
Main Electricity Sub-Station	محطة كهرباء رئيسية	24
Electricity Sub-Station (ESS)	محطة كهرباء فرعية	25
Main Pumping Station (MPS)	محطة ضخ رئيسية	26
Sewerage Pumping Station (SPS)	محطة ضخ	27
SEA	خدمات الصرف الصحي	28
Services (Land reserved for services)	خدمات	29
Telecommunications (TRA)	خدمات (ابراج اتصالات)	30
Garbage	خدمات (حاويات النفايات)	31
Greenary	مساحة خضراء	32
Office	مكتب	33

نظام الطبقات و الشقق

نوع العقار	الملاحظات	
شقة	لجميع أنواع الشقق سواء كانت من دور أو دورين	1
فيلا	لجميع أنواع الفلل وإن كانت من عدة طوابق	2

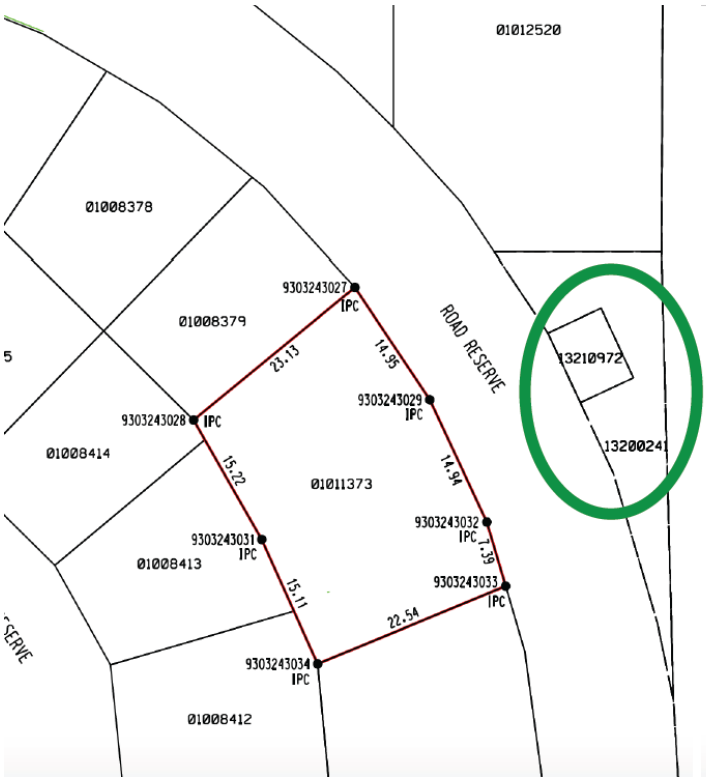
REGION NO.	DESCRIPTION	الوصف
13 00	ROAD RESERVE	طريق
13 01	ACCESSWAY AND FOOTPATH	رصيف وممر
13 02	CAR PARK	موقف سيارات
13 03	COMMON ACCESS	ممر مشترك
13 04	MASTER PLAN BLOCKS	مجمعات من المخطط العام
13 05	CORNER PARCEL	زاوية
13 06	MOSQUES	مسجد
13 10	MULTIPLE SERVICES CORRIDOR	ممر خدمات
13 11	ELECTRICITY SERVICE CORRIDOR	ممر خدمات الكهرباء
13 12	W.S.D. SERVICE CORRIDOR	ممر خدمات المياة
13 13	BATELCO SERVICE CORRIDOR	ممر خدمات بتلكو
13 14	BAPCO SERVICE CORRIDOR	ممر خدمات بابكو
13 15	SDES DRAINAGE CORRIDOR	ممر خدمات المجاري
13 20	MULTIPLE SERVICE SITE	أرض مخصصة للخدمات
13 21	ELECTRICITY SERVICE SITE	أرض مخصصة للكهرباء
13 22	W.S.D. SERVICE SITE	أرض مخصصة للمياة
13 23	BATELCO SERVICE0 SITE	أرض مخصصة لبتلكو
13 24	BAPCO	بابكو
13 25	SDES DRAINAGE SITE	أرض مخصصة للمجاري
13 26	ROAD RESERVE & MULTIPLE SERVICE CORRIDOR	طريق وممر متعدد خدمات
13 27	GREEN AREA	مساحة خضراء
13 28	BAHRAIN METRO LANE	مسار مترو البحرين
-	UNDEVELOPED LAND OR EXISTING BUILDING	ملك
-	GOVERNMENT PROPERTY	ملك حكومة مملكة البحرين

REGION 22 PARCELS CATEGORY TABLE

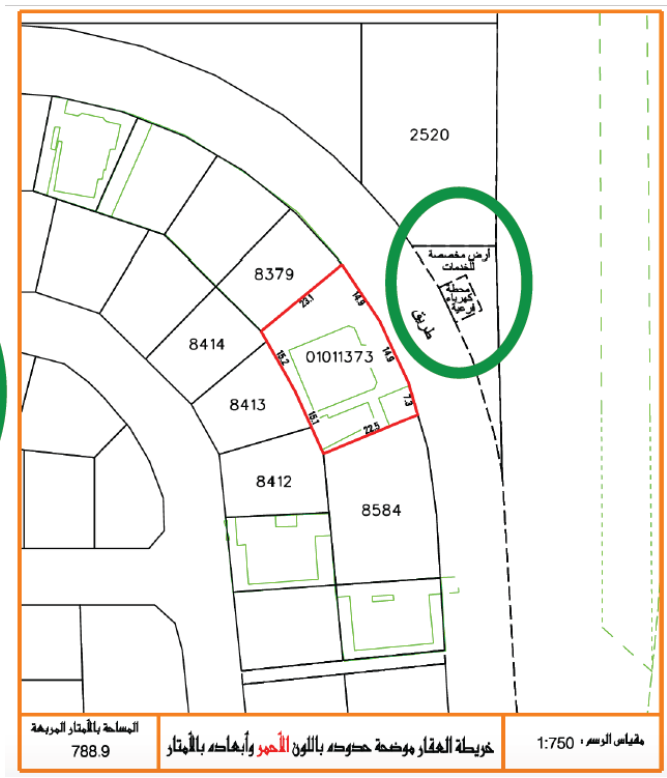
This table has the names of service parcels, which usually start with the number 13…….

Example of service plots in Deed Plan

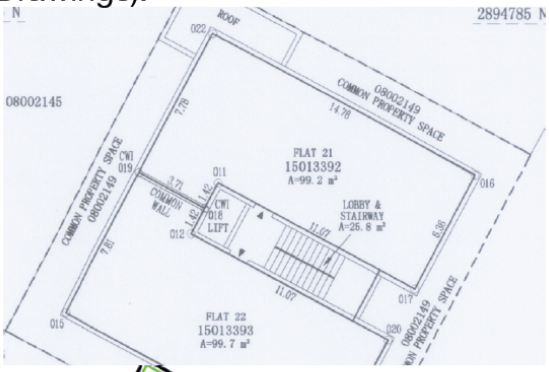
Certificate of Survey



Deed Plan



In this table the names of services in Strata Plan (Survey Drawings).



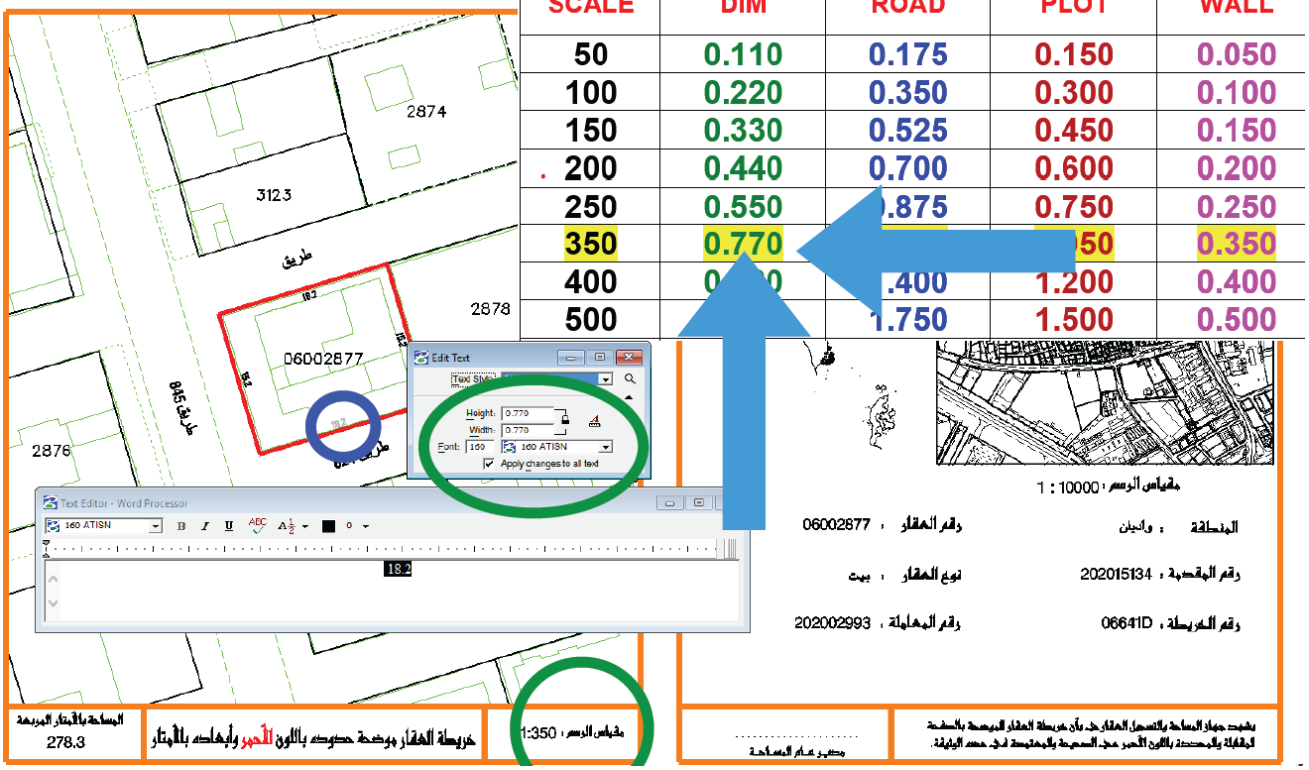
Strata Plan	Deed Plan (Arabic)
Common Property	منطقة مشتركة
Car Park	موقف سيارات
Entrance (Most of the time represented by an arrow pointing toward the subject plot)	مدخل
Stairway	سلم
Lift/Elevator	مصعد
Void	خدمات
Terrace	سطح
Balcony (If outside the plot boundary)	شرفة
Common Property Space	فضاء مشترك
Roof	سطح
Swimming Pool, Gym...etc. (Entertainment Facilities)	خدمات
Watchman Room, Engine Room, A/C Room...etc. (Maintenance Facilities)	خدمات

C2. Use of Standards to prepare the Deed Plans

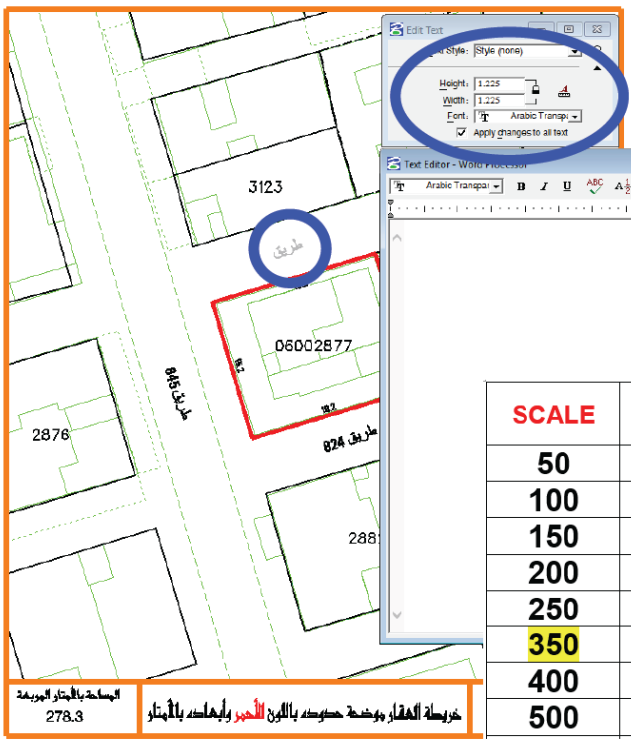
The Standards table is used as follows

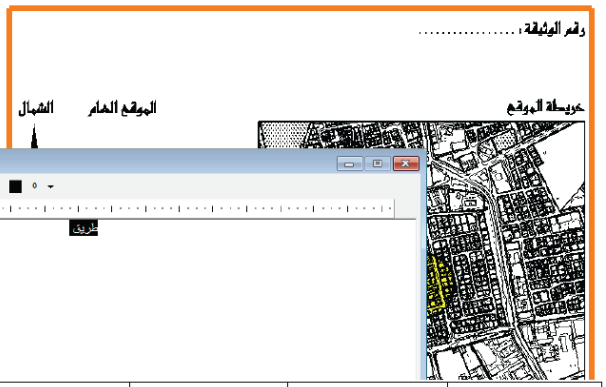
1- Dimensions

SCALE	DIM	ROAD	PLOT	WALL
50	0.110	0.175	0.150	0.050
100	0.220	0.350	0.300	0.100
150	0.330	0.525	0.450	0.150
200	0.440	0.700	0.600	0.200
250	0.550	.875	0.750	0.250
350	0.770		50	0.350
400	0	.400	1.200	0.400
500		1.750	1.500	0.500



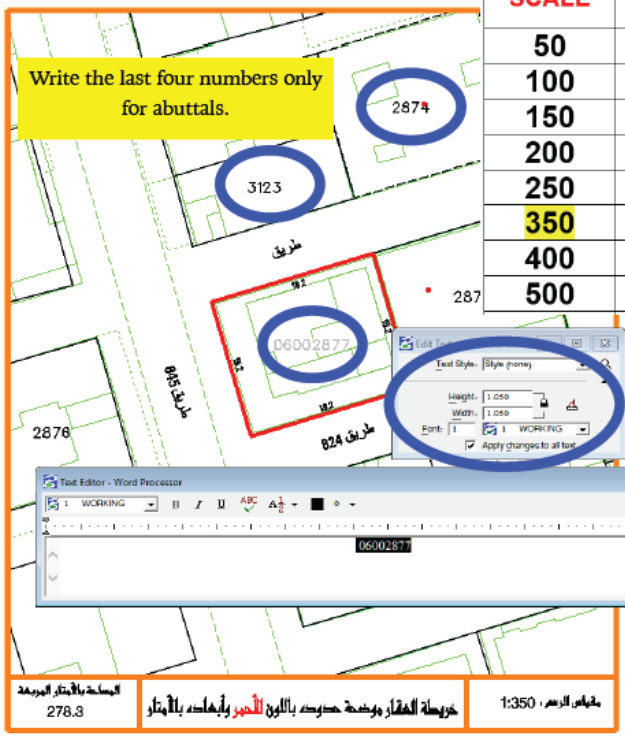
2- Road





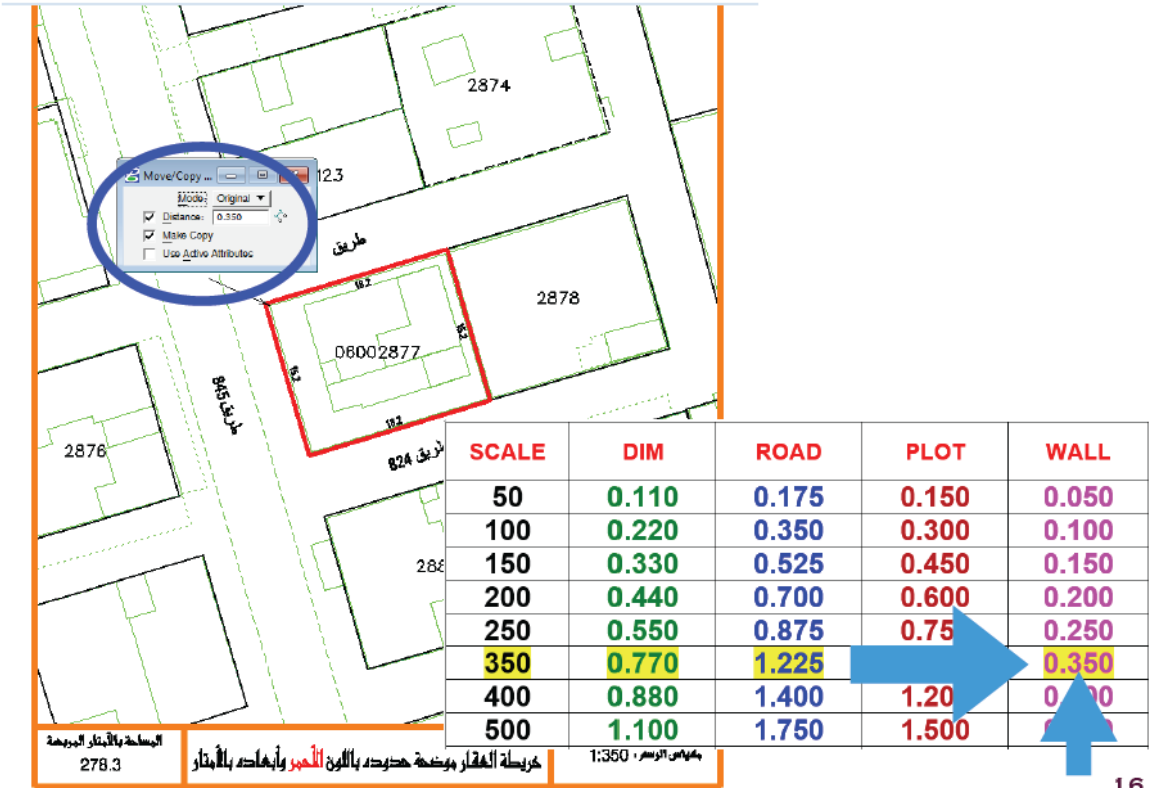
SCALE	DIM	ROAD	PLOT	WALL
50	0.110	0.175	0.150	0.050
100	0.220	0.350	0.300	0.100
150	0.330	0.525	0.450	0.150
200	0.440	0.700	0.600	0.200
250	0.550	0.875	0.750	0.250
350	0.770	1.225		0.350
400	0.880	1.400	1.200	0.400
500	1.100	1.750	1.500	0.500

3- Plot Number



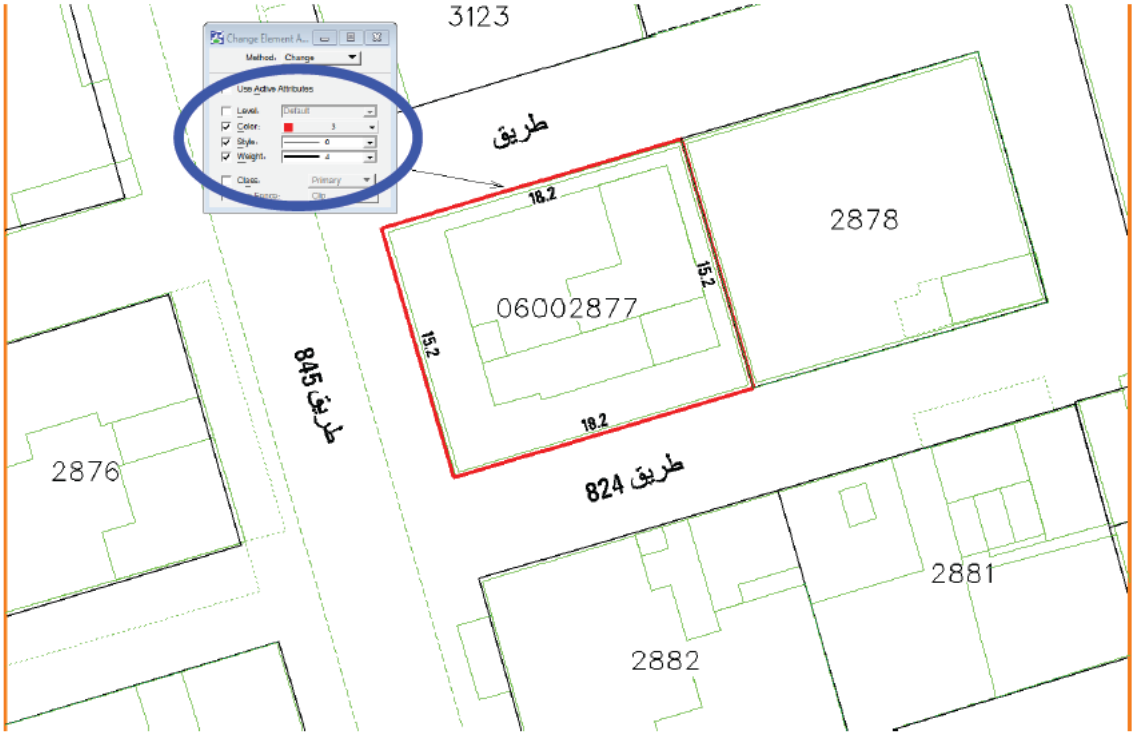
SCALE	DIM	ROAD	PLOT	WALL
50	0.110	0.175	0.150	0.050
100	0.220	0.350	0.300	0.100
150	0.330	0.525	0.450	0.150
200	0.440	0.700	0.600	0.200
250	0.550	0.875	0.750	0.250
350	0.770	1.225	1.050	0.350
400	0.880	1.400	1.200	0.400
500	1.100	1.750	1.500	0.500

4- Double Wall



SCALE	DIM	ROAD	PLOT	WALL
50	0.110	0.175	0.150	0.050
100	0.220	0.350	0.300	0.100
150	0.330	0.525	0.450	0.150
200	0.440	0.700	0.600	0.200
250	0.550	0.875	0.75	0.250
350	0.770	1.225		0.350
400	0.880	1.400	1.20	0
500	1.100	1.750	1.500	

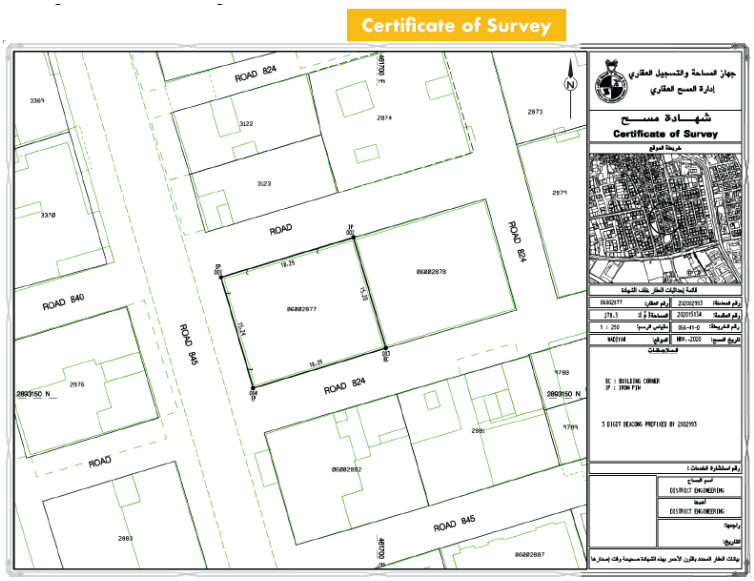
5- Weight of subject plot boundary line

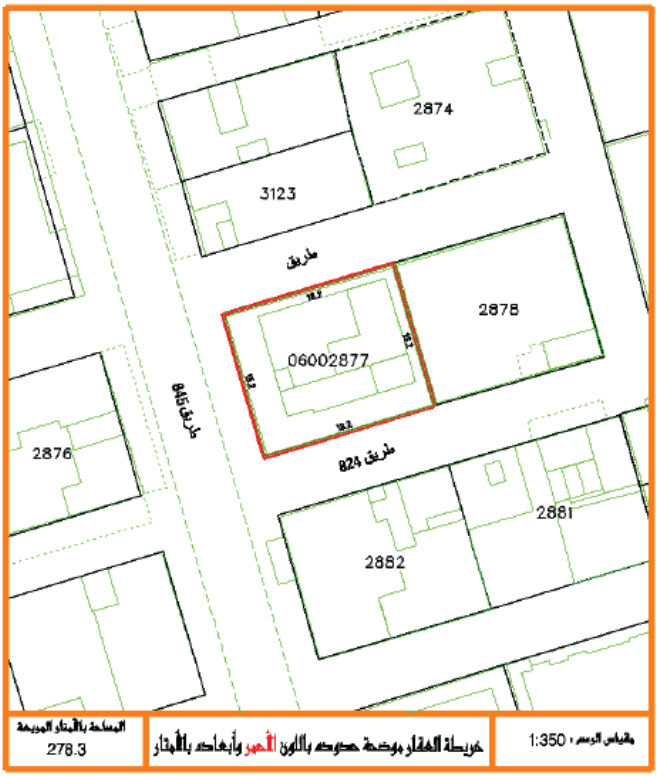


The plot boundary line is always red, and the weight is 4.

C3. Examples

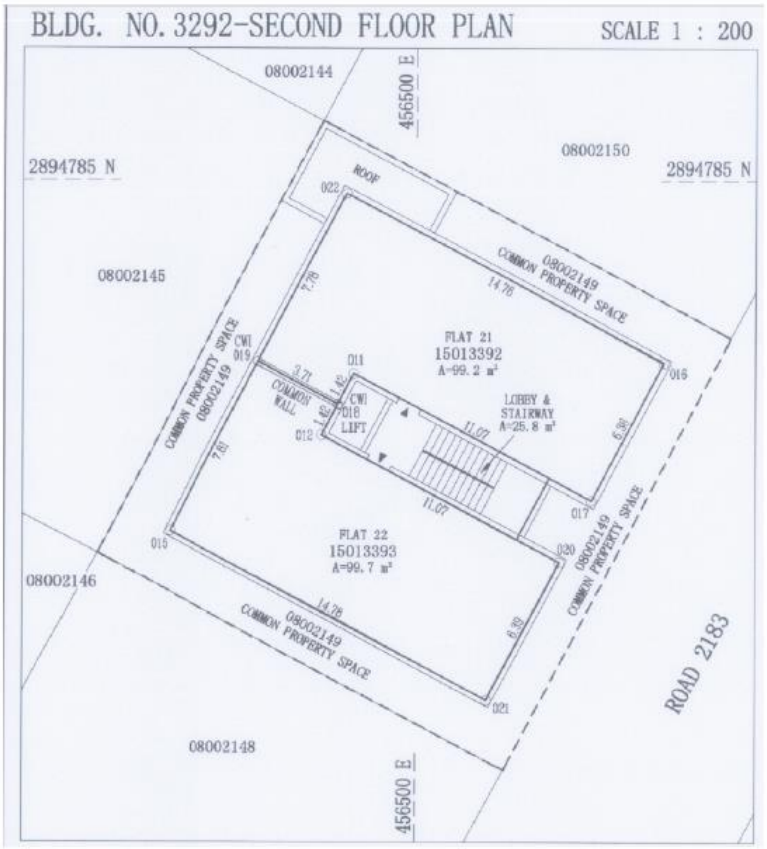
A Normal Deed Plan (House)





A Strata Deed Plan (flat)

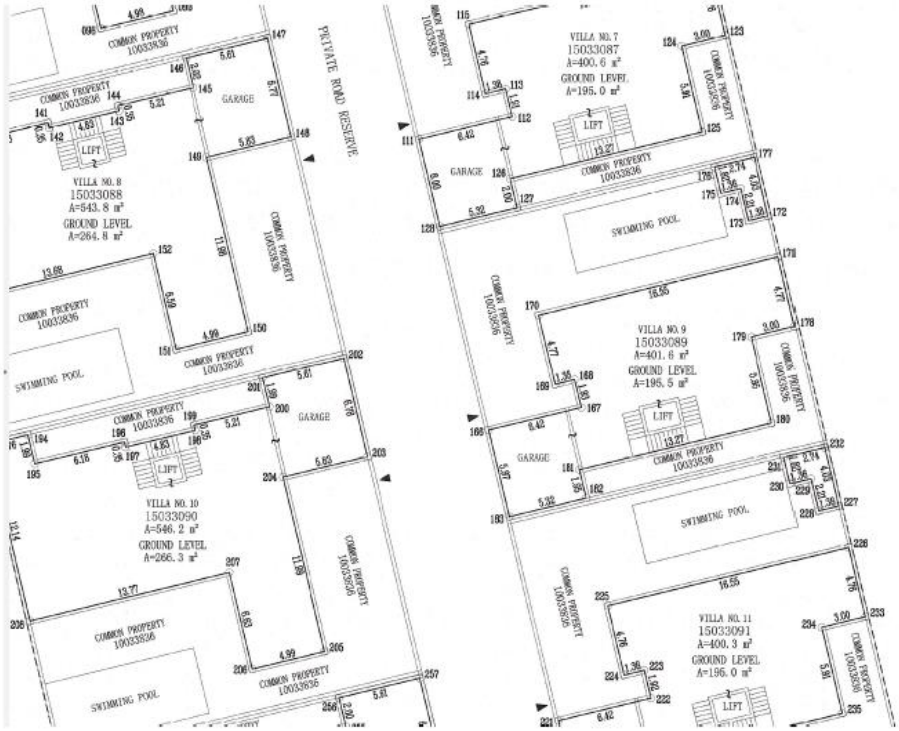
Survey Drawings



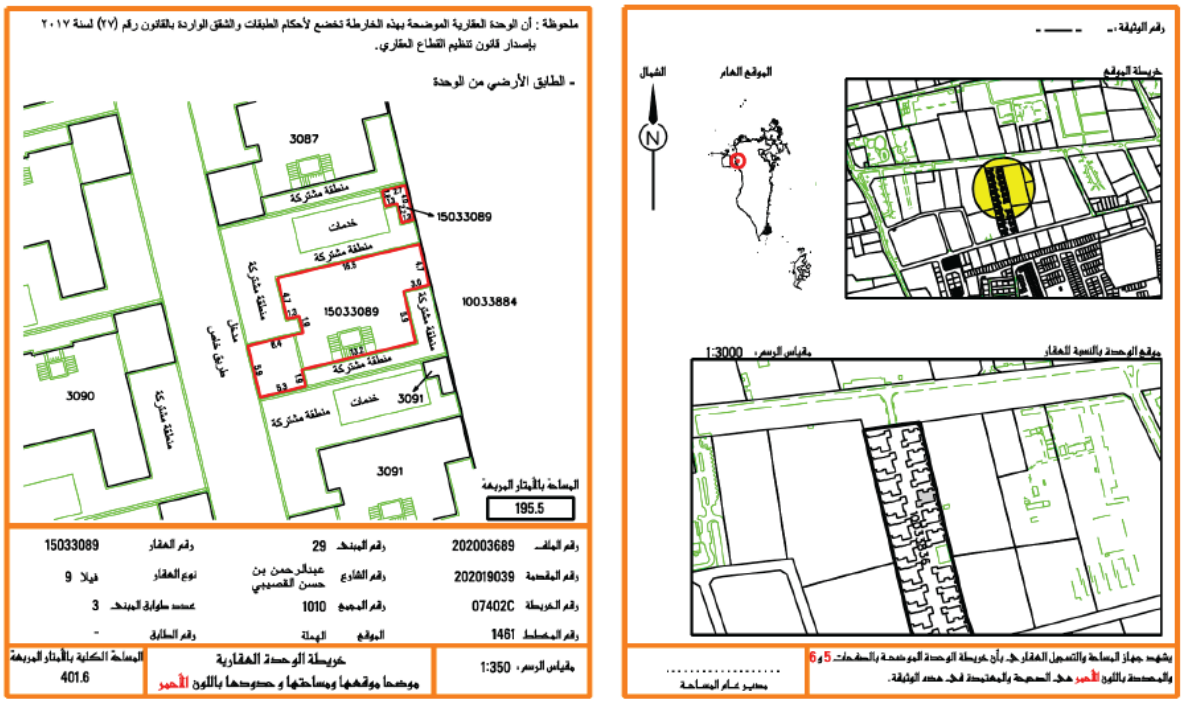
Deed Plan

A Strata Deed Plan (Villa)

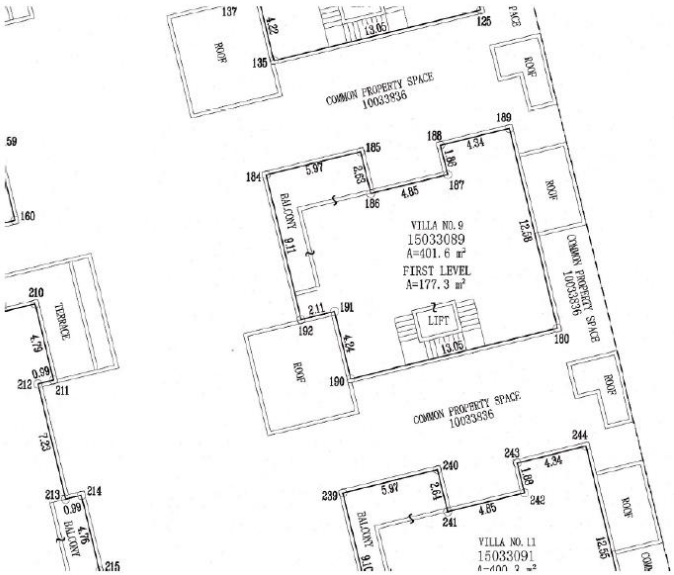
Survey Drawings of Ground floor



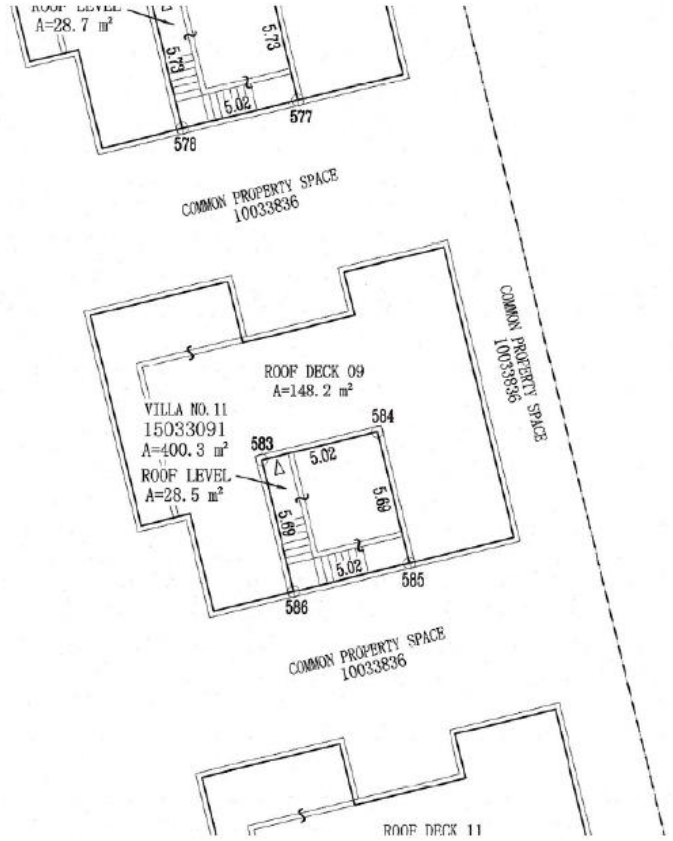
Deed Plan of Ground floor



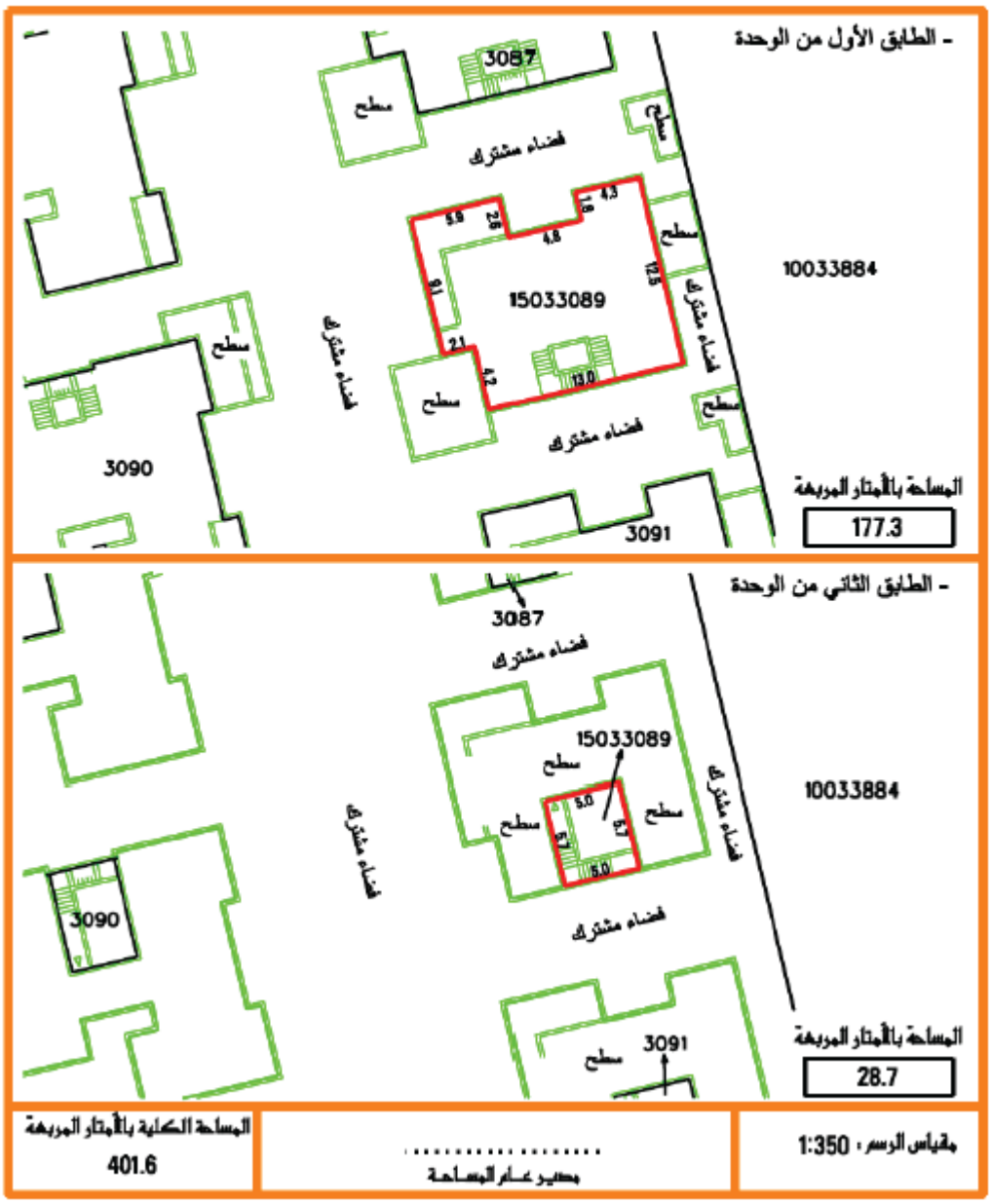
Survey Drawings of First floor



Survey Drawings of Second floor

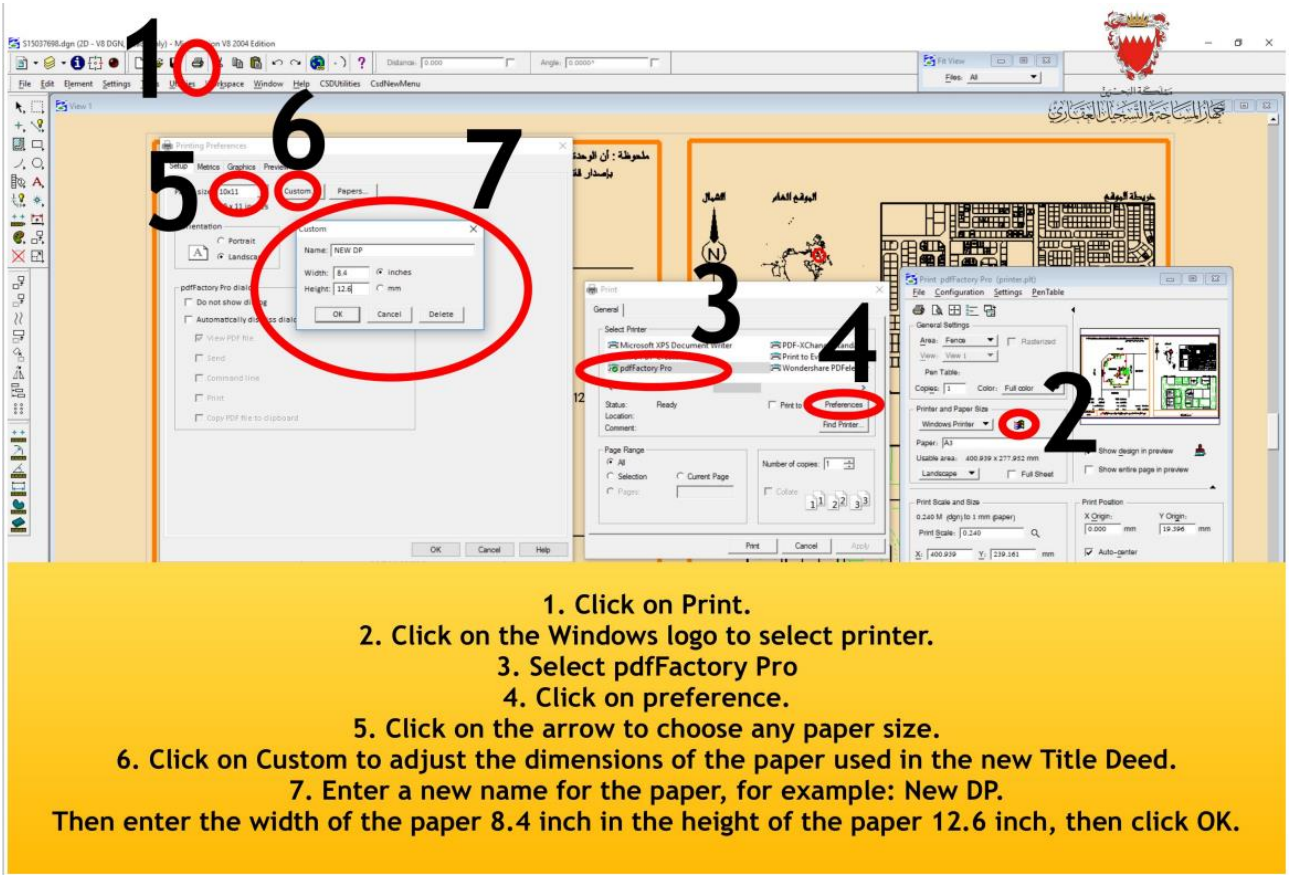


Deed Plan of First & Second floors



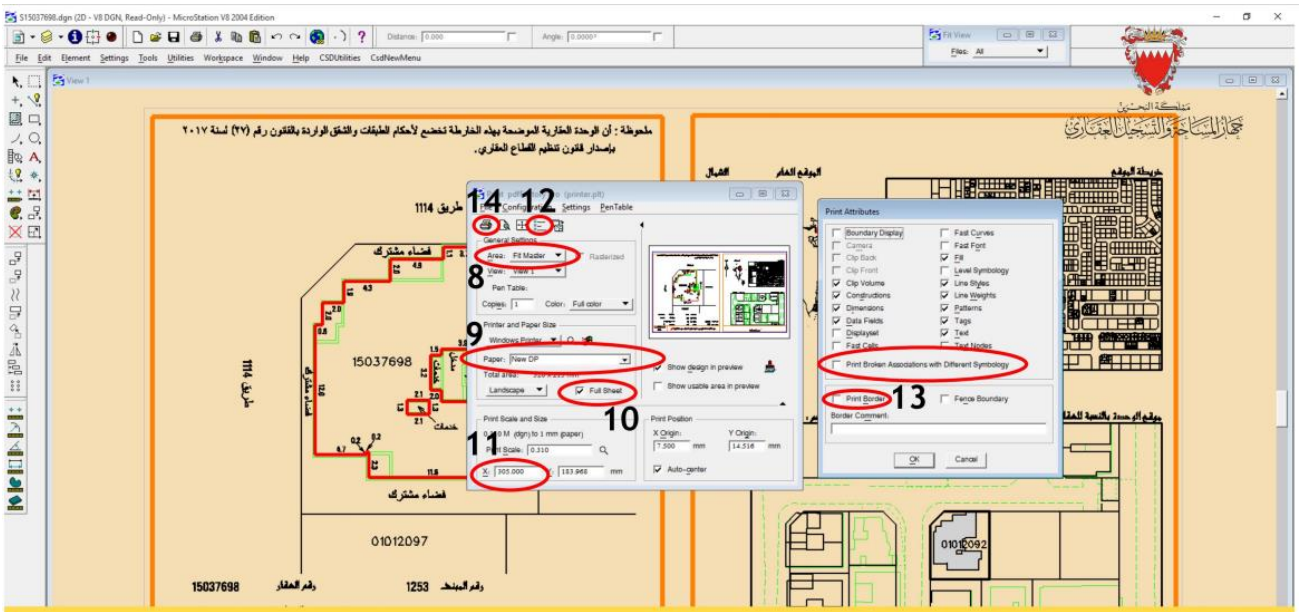
Deed Plan printing info and specifications.

The program used to save the “Deed Plan” in PDF format is pdfFactory Pro

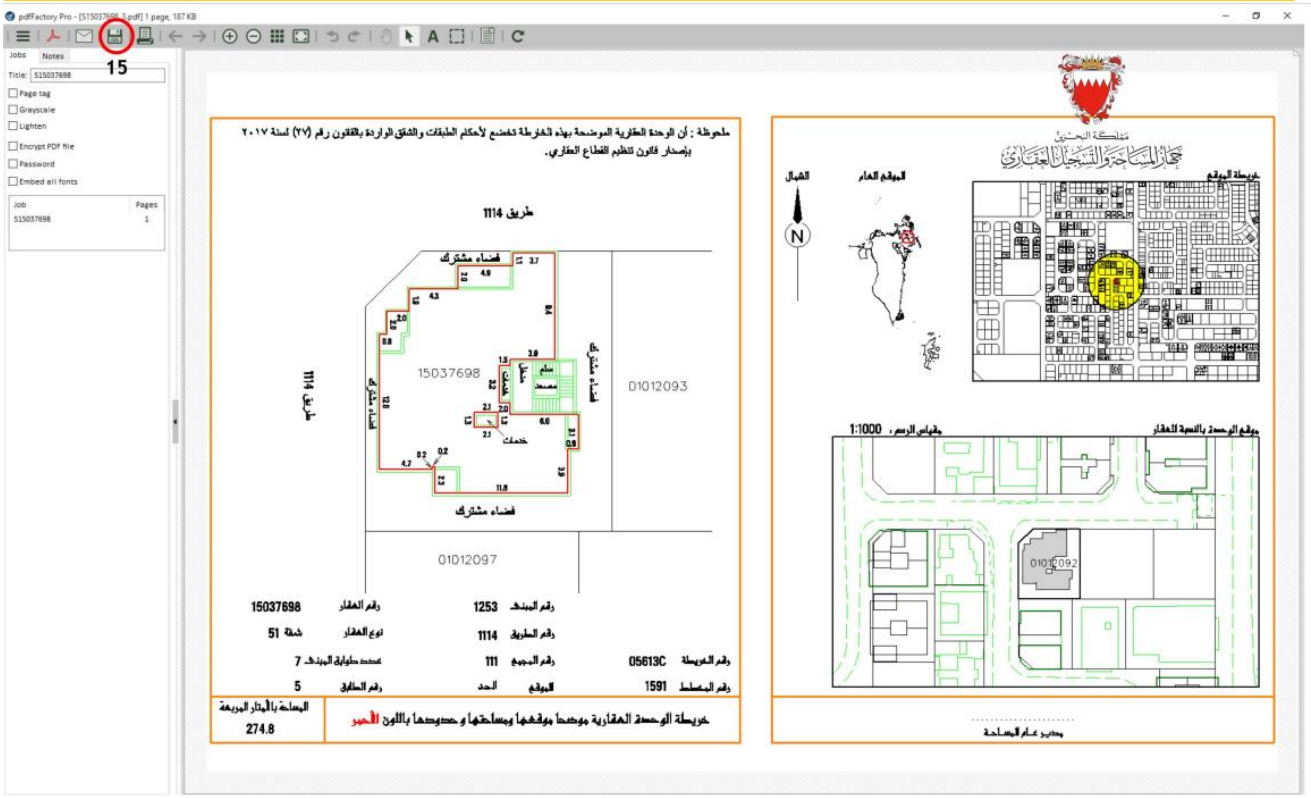


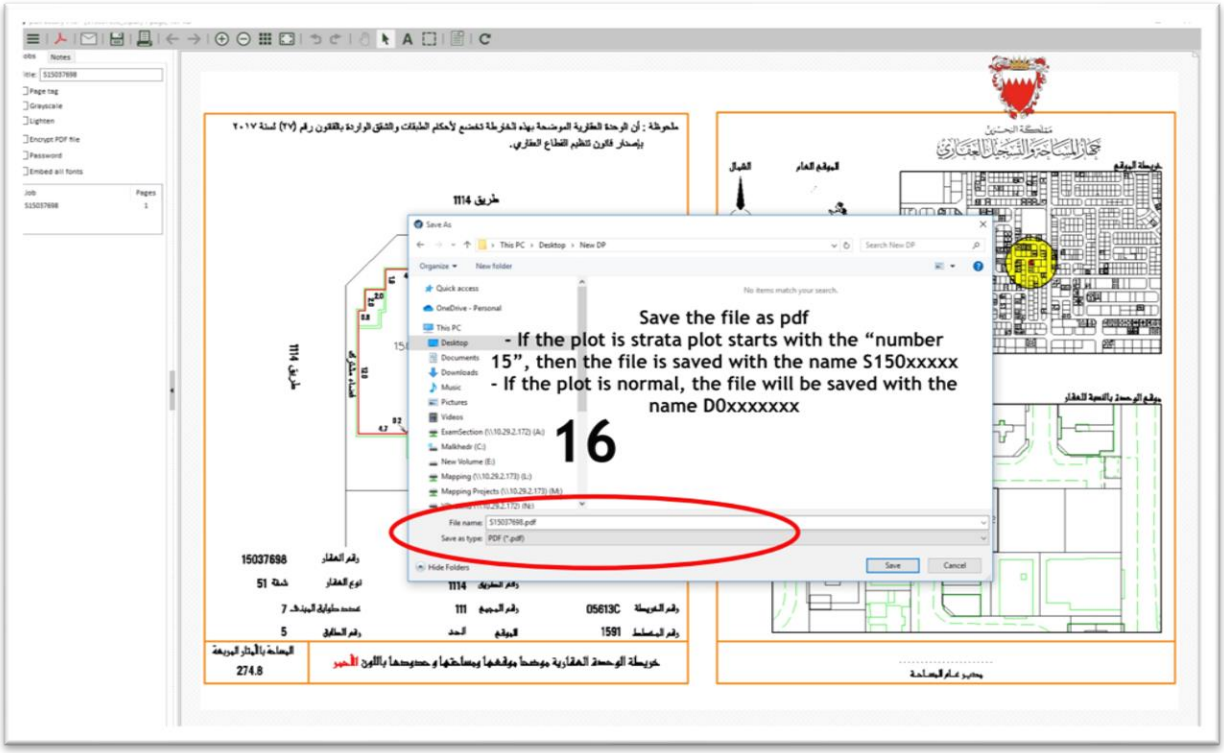
1. Click on Print.
2. Click on the Windows logo to select printer.
3. Select pdfFactory Pro
4. Click on preference.
5. Click on the arrow to choose any paper size.
6. Click on Custom to adjust the dimensions of the paper used in the new Title Deed.
7. Enter a new name for the paper, for example: New DP.

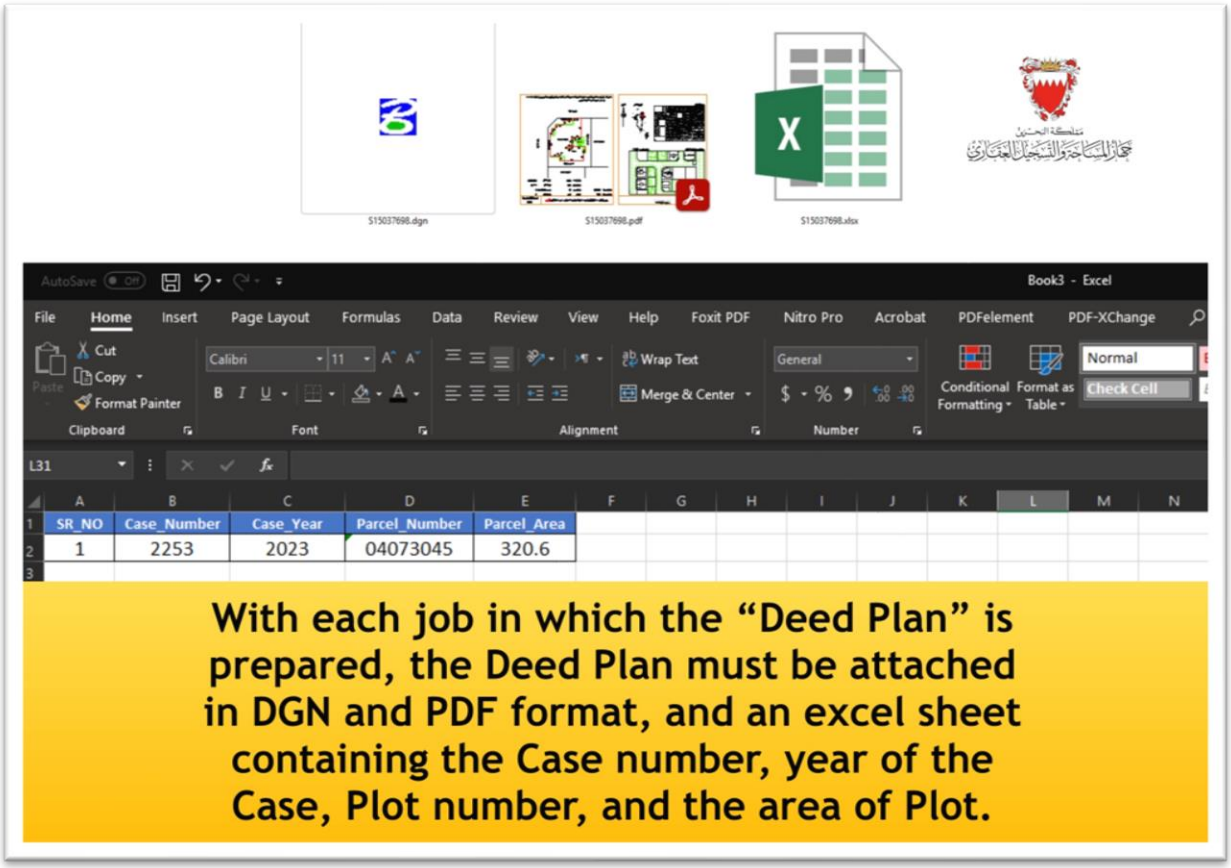
Then enter the width of the paper 8.4 inch in the height of the paper 12.6 inch, then click OK.

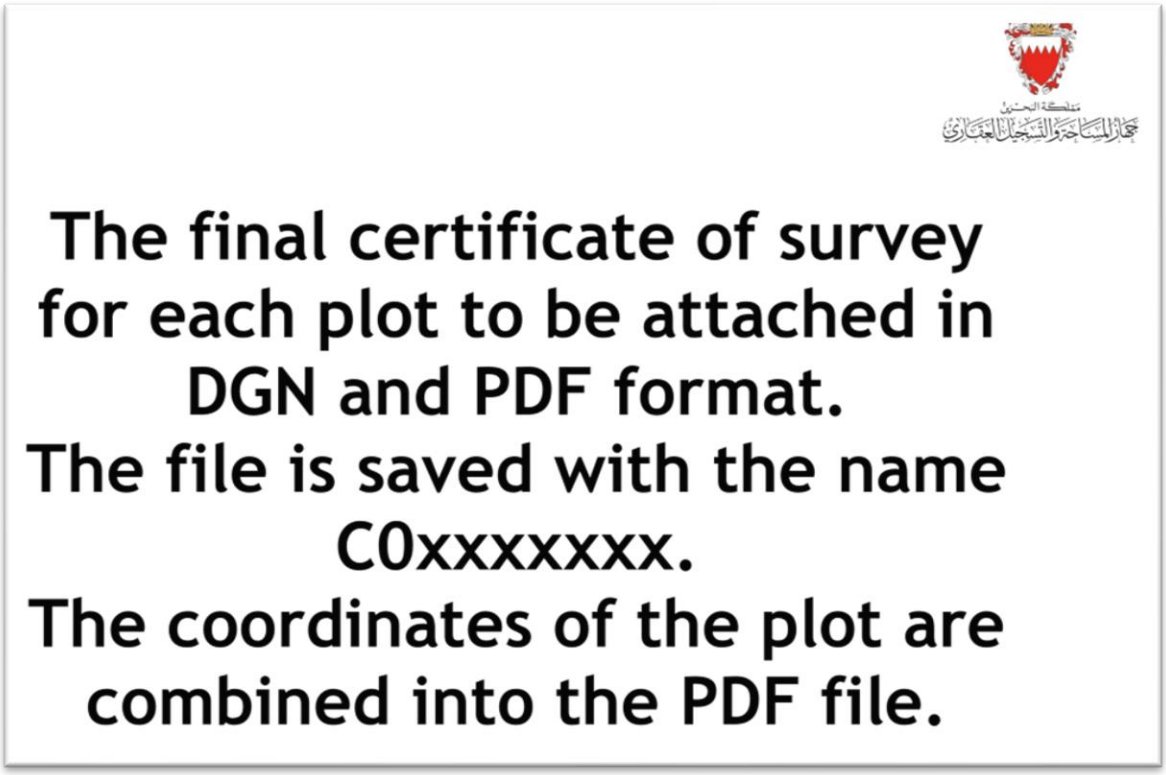


8. Choose Fit Master
9. Choose the name of the new sheet that you entered
10. Put a check in the Full Sheet box
11. In the X field, write 305
12. Click on the symbol
13. Remove the checks from the two boxes
14. Click on Print.




Save the file as pdf
- If the plot is strata plot starts with the "number 15", then the file is saved with the name S150xxxxx
- If the plot is normal, the file will be saved with the name D0xxxxxxx
16


S15037698.dgn
S15037698.pdf
S15037698.xlsx
Book3 - Excel
SR_NO
Case_Number
Case_Year
Parcel_Number
Parcel_Area
1
2253
2023
04073045
320.6
With each job in which the "Deed Plan" is prepared, the Deed Plan must be attached in DGN and PDF format, and an excel sheet containing the Case number, year of the Case, Plot number, and the area of Plot.



6. Court Report

A report be prepared by CSD to provide all the information requested by Courts in relation to any of the following:

- Disputes between parties in relation to land ownership.
- Proof of land ownership; or
- Proof of land shares ownership.

7. Map Sheet

Map sheets contain all the latest known and projected cadastral information. These sheets are continuously updated and hence their contents are subject to change. Note that each sheet is 1000 * 500 km.
The standard scales of mapping issued are:

- 1: 10000 System based on UTM grid lines (Index #1) / (Appendix 2).
- 1: 2000 Is the 1:10000 sheet divided into 16 sections. (Index #3) (Appendix 3)
- 1: 1000 Is the 1: 2000 sheet broken down into 4 quadrants. The sheets of this series are numbered as: (TT – NN – X) (index #3) (Appendix 3)
  - Where TT is the number of the relevant 1: 10000 sheets.
  - NN is the number of 1: 2000 sheets.
  - X is the quadrant letter.

Additionally, the LMB-BLOCKS are shown at the Appendix 1.

8. Parcel Coordinates

The coordinates of the cadastral parcels that define their dimensions and boundaries.

9. Survey Drawings

Drawings prepared by a Private Engineering Firm at the request of an owner and approved by the Cadastral Survey Directorate in respect of units subject to a transaction. Drawings shall be based on field survey and detailed engineering drawings of the said units and in accordance with the technical requirements and instructions mentioned in the Standards' Guidelines Manual.

10. Service Consultation

An application form is prepared for these requests or inquiries based on instructions received from Field, Examiner, or the Director himself, to show the services affected with the selected area. This application is sent to CPO department to be circulated to the relevant authorities such as (Electricity and Water Authority, Ministry of Works, TRA, NOGA).
The primary key for Services Consultation Requests application is the consultation no. as 0000/0000/XXXX for example (2022/0145/SD)

- Where the first four digits are the current year.
- Next 4 digits are the request serial.
- The last letters are the directorate initials for example (SD).

UPDA requests Service Consultation for Major or/and Minor Subdivision. See samples (Appendices 12 & 13).

11. Planning Permission

Such requests come from various government authorities such as (Electricity and Water Authority, Ministry of Works, Urban Planning and Development Authority) via Tasareeh web system to inquire about any of the following (new subdivisions parcels, sanitary cables, or electricity cables) whether if they are conflicted or not with any existing plots in the cadastral data, through sending the following:

- Cadastral plan reflecting the required area in PDF format.
- Parcels attributes for the conflicted plot.

12. Ownership Information

Such requests come from Ministry of Works (CPO) via email to provide them with the available cadastral data for specific area as following:

- Cadastral plan reflecting the required area in DGN format.
- Parcels attributes list.

13. Corner Application

According to the Article 16 of the Law13/2013 definition, Corner plots (parcels) are land parcels whose area does not exceed 200m2, suitable to be adjusted to neighboring parcels.
The Municipalities may sell corner plots of land whose area does not exceed 200 square metres (two hundred square metres) upon seeking the opinion of the concerned authorities. For the sale of a corner plot of land, it shall be essential that it shall be adjacent to a property owned by the person applying for purchase of such plot of land and shall not be taken out of a government owned land whose area exceeds the area mentioned in the first paragraph of this Article and shall not be suitable to be an independent plot of land that can be exploited.
The process is taking place through an automated system, Corner Sale Application.

A new customer can get his username and password by registering the user account with Municipality using the single sign-on registration.

https://www.mun.gov.bh/corner/login

D. PRIVATE SECTOR PARTNERSHIP - AUTHORISATION of SURVEY COMPANIES - ACCREDITATION REQUIREMENTS

1. Legal Background

History

The Survey & Land Registration Bureau is mandated by Legislative Decree 62 of 2004 the responsibility for Cadastral, Topographic and Hydrographic survey. The Director, Cadastral Survey Directorate (CSD), by extension of Ministry of Housing Ministerial Order No. 93 of 1992 with respect to implementing the regulations of Legislative Decree No 15 of 1979, is responsible for (Articles 3.1, 4) ensuring that any measurement and calculation performed by a surveyor has applied the proper standards and technical instructions issued by the Director. Article 8 identifies that Private Sector Survey Offices are authorised by the Directorate. Consequently, all standards and technical instructions apply equally to Directorate staff and PSSO's.

The relationship between SLRB and PSSO's is determined by SLRB Order No 5 of 2013 (The Order), effective 22 February 2013, implementing Article 4 of SLRB Order No 36 of 2012.

In 2023, the following Circulars and Resolutions published to re-determine the relationship between Survey and Land Registration Bureau and the Private Sector Offices:

1. Circular No. (1) of 2023 - Deputy Prime Minister Sheikh Khalid bin Abdullah Al Khalifa • Concerning the transfer of government cadastral transactions and private sector transactions to accredited private cadastral offices.

2. Circular No. (8) of 2023 - President of the Survey and Land Registration Bureau, Sheikh Salman bin Abdullah Al Khalifa • Concerning Referring all cadastral transactions for individuals and companies to private surveying offices and companies registered with the agency.

3. Ministerial Resolution No. (17) of 2023 - President of the Survey and Land Registration Bureau, Sheikh Salman bin Abdullah Al Khalifa • Concerning the implementation of real estate surveying procedures and opening cadastral transactions.

4. Resolution No. (197) 4) for the year 2023 - Committee • "Approval of mechanisms, penalties and penalties for private cadastral offices and, in addition to the Guidance Guide for Cadastral Standards and Procedures and Approval according to the issuance of the proposed decision regulating work within the Department of Land Survey and Private Offices and assigning the Survey and Land Registry to take necessary measures." "The matter."

5. Resolution No. (197-5) For the year 2023 - a committee: "Assigning the Government Procedures Re-engineering Committee in the Office of the Prime Minister to review the

procedures for requesting cadastral transactions and the possibility of reducing and simplifying the number of approval procedures in the country to expedite the completion of cadastral transactions and present what has been reached to the Ministerial Committee for Developmental Projects and Infrastructure."

2. Type of work performed by Private Sector Offices

Private Sector Offices after their Authorisation by Cadastral Survey Directorate are entitled to perform the following cadastral works and services:

a. Demarcation and detailed field surveying

b. Preparation of Certificates of Survey (CoS) known and as Land Certificates (LS)

c. Preparation of Cadastral Plans

d. Preparation of Deed Plans

e. Audit of the above (a., b., c., d.) cadastral works and products.

The Private Sector Cadastral Offices, approved by CSD, will be published in SLRB Website.

3. Authorisation / Accreditation

Based on the legal background outlined above, and the above-mentioned cadastral works and services, the Director CSD will grant by means of Authorisation of a PSSO his responsibility for ensuring the Professional Standards of work performed by that PSSO to determine the limits of land to collect Spatial Data for addition to the Fundamental Datasets, prepare cadastral products and audit the work of other Private Sector Cadastral Offices. Such an Authorisation cannot be construed to create a contractual relationship of any kind between CSD and the Authorised PSSO.

3.1 Accreditation and Classification system for Private Sector Cadastral Offices

3.1.1 The Private Sector Cadastral Offices will be accredited in three levels:

- **Level 1** requirements:
  - At least two surveyors provided that one of them has accredited with class "A" and the second one with class "B" or "A" **by CRPEP.**
  - Availability of at least three (3) surveying technicians.

- The office space is not less than the minimum required for this category, which is 150 square meters **by CRPEP**.
- Availability of four units of approved field survey equipment.
- Provides computers/hardware at the rate of one for each engineer and technician, with the necessary provision of printers, scanners, desks, and the required engineering software.

- **Level 2** requirements:
  - At least two surveyors, provided that the class of both is not less than class "B" **as per CRPEP classification**.
  - Availability of at least two (2) survey technicians.
  - The office space is not less than the minimum required for this category, which is 100 square meters **as per CRPEP classification**.
  - Availability of three units of approved field survey equipment and the necessary hardware and software.
  - Provides computers/hardware at the rate of one for each engineer and technician, with the necessary provision of printers, scanners, desks, and the required engineering software.

- **Level 3** requirements:
  - At least two surveyors provided that the class of both is not less than class "C" **as per CRPEP classification**.
  - Availability of at least two (2) survey technicians.
  - The office space is not less than the minimum required for this category, which is 50 square meters **as per CRPEP classification**.
  - Availability of two units of approved field survey equipment and the necessary hardware and software.
  - Provides computers/hardware at the rate of one for each engineer and technician, with the necessary provision of printers, scanners, desks, and the required engineering software.

3.1.2 The PS Cadastral Offices will be able to perform the following limits of survey or audit work, according to their Level:

- **Job capacity** for each Level:
  Level 1:
  - The offices that have the right to carry out survey or audit works and provide cadastral survey services for all types of jobs and projects, regardless of the cost of these projects.
  - There is no limit to the number of plots in a single transaction.
  - The number of live (in progress) survey jobs does not exceed 30.

Level 2:

- The offices that are entitled to carry out survey or audit works and provide cadastral survey services for projects whose cost does not exceed twenty million Bahraini dinars.
- The number of plots contained in a single transaction/job does not exceed 200.
- The number of live (in progress) survey jobs does not exceed 20.

Level 3:

- The offices that are entitled to carry out survey work and provide cadastral survey services for projects whose cost does not exceed five million Bahraini dinars.
- The number of plots contained in a single transaction/job does not exceed 50.
- The number of live (in progress) survey jobs does not exceed 10.

Summary Table

Level	Level 1	Level 2	Level 3
Min. Land Surveyors	1A, 1B	2B	2C
Min. Survey Technicians	3	2	2
All Cadastral jobs	YES	YES	YES
Audit	YES	YES	NO
Maximum number of Jobs live	30	20	10
Maximum number of parcels/properties per job	No limit	200	50

3.2 Accreditation and Classification system for Private Sector Cadastral AUDIT Offices

The Private Sector Cadastral Audit Offices are Private Sector Cadastral Offices that they have been accredited with Licenses (by CSD) to perform Audit of the Private Sector Cadastral works. They do not need to apply separately.

The Audit Licenses' accreditation is given to the PS Cadastral Offices according to the work experience of the surveyor engineers, and according to their performance as Private Sector Cadastral Offices.

Their evaluation for accreditation or/and renewal of their licenses, is following the evaluation system and according to the following criteria:

A. The highest rated Private Sector Cadastral Offices are allowed to carry out examination work according to the PS system of evaluation and classification.
B. The Level of the PS Cadastral Audit Office should not be less than Level (1) and (2).
C. The category of Surveyor Engineer (Examiner) in the PS Cadastral Audit Office should not be less than category (A) and (B) (CRPEP classification).
D. The minimum number of required engineers is 2 and of technicians is 2.
E. The Approval of Private Sector cadastral Offices that carry out examination (Audit) work shall be for a period of one year and based on the evaluation and classification system for PS, renewal or replacement of examination offices is carried out.
F. The PS Cadastral Audit Offices approved by the CSD are published on the SLRB website.
G. For annual renewal, a minimum of 10% of the total parcels must be completed within a year.

3.3 Accreditation of Individual Practitioners

Individual practitioners can be Authorised Surveyors, following the application of a Private Sector Cadastral Office. **However, this might be a future need which will follow the path of the of the PSSO application**. At the initial application by all PSSO's for Authorisation after introduction of this chapter, full details of all staff engaged in Cadastral Survey will be submitted by the PSSO.

Where PSSO staff competencies have been previously assessed, that previous assessment will be carried forward. Where PSSO staff competencies have not been previously assessed, the standard assessment process will be applied by the Director, CSD and the PSSO will be advised of the outcome of that assessment.

4. Application for Authorisation

4.1 Private Sector Surveying Offices

An Application for Authorisation to Perform Cadastral Surveys **must be made annually** on **Form PS 1 (Appendix 4)**, with the enclosures specified on that form. A first-time application must include details of all PSSO staff to be involved in Cadastral Surveys on **Form PS 2 at (Appendix 5)**, with the enclosures specified on that form. Applications for annual renewal of authorisation need only include the enclosures for staff members not previously authorised.

The Application will be evaluated by the Director, CSD based on the material provided in support of the application. If the material provided is insufficient to complete the evaluation, the Director CSD will return the application to the PSSO to provide the missing

information. The evaluation will result in a recommendation to the Director General, Survey to either authorise the PSSO or reject the application.

For rejected applications the Director, CSD will, on written request, counsel the PSSO concerning the reasons for the rejection. The PSSO is free at any time to re-submit its application. However, should an application be rejected three times for valid reasons, the applicant PSSO will be deemed to be unsuitable for Authorisation and no further application will be considered within 12 (twelve) months.

By being assessed as Authorised to Perform Cadastral Surveys, and accepting that Authorisation, a PSSO expressly **agrees to meet all conditions for Authorisation laid out by CSD at Authorisation and from time to time modified by the Director, CSD in writing.** In addition, the PSSO expressly agrees to comply fully with all applicable provisions of CSD Practice & Procedures, Survey Standards Guidelines Manual, and any other Technical Instructions currently in force and as amended from time to time by the Director, CSD in writing.

4.2 Individual Practitioners

An application by an individual practitioner to be an Authorised Surveyor is normally made as part of the PSSO application. At the initial application by all PSSO's for Authorisation after introduction of this chapter, full details of all staff engaged in Cadastral Survey will be submitted by the PSSO.

Where PSSO staff competencies have been previously assessed, that previous assessment will be carried forward. Where PSSO staff competencies have not been previously assessed, the standard assessment process will be applied by the Director, CSD and the PSSO will be advised of the outcome of that assessment.

Where a PSSO engages a new staff member in the professional category for whom registration with CRPEP is sought, the standard competency assessment will be performed by the Director, CSD at the request of CRPEP. CRPEP will use that assessment to determine whether to register the applicant. Following CRPEP Registration, the PSSO must make an extraordinary application the Director, CSD for grant of Authorised Surveyor status.

Where a PSSO engages a new staff member and ***does not intend to seek CRPEP*** registration for that staff member, full educational and experience details must be provided to the Director CSD to assess the new staff member's competencies to be engaged in Cadastral Surveying and assign the staff member the status of Authorised Surveyor or Surveying Technician.

Where individual staff are found to lack the required competencies, the Director, CSD will, on written request, counsel the PSSO concerning the assessment. The PSSO is free at any

time to re-submit its application. However, should an application be rejected three times for valid reasons, the concerned staff member will be deemed to be unsuitable for Authorisation or for engagement in Cadastral Surveying and no further application will be considered within 12 (twelve) months.

5. Register of Authorised PSSO's and Individual Land Surveyors and Surveying Technicians

CSD will maintain a Register of PSSO's Authorised to Perform Cadastral Surveys, the Person Responsible for Cadastral Surveys and all Authorised Surveyors and Surveying Technicians employed by the PSSO. By applying for Authorisation, a PSSO expressly consents to CSD making selected items of the information contained in the Register available to the public (e.g., CSD Website).

6. Human Resources

For CSD to be confident of the competency of all individuals engaged in Cadastral Surveying it is necessary that **all** such individuals are identified in the PSSO Application for Authorisation.

Based on their qualification and experience, they will be categorised as follows:

1) Authorised Surveyors.
2) Surveying Technicians.

Cadastral Surveys shall not be carried out by persons other than Authorised Surveyors or Surveying Technicians. It is the responsibility of the Person Responsible for Cadastral Surveys to ensure compliance with this requirement. The use of non-permanent human resources of unknown competency is specifically prohibited.

It is also the responsibility of the Person Responsible for Cadastral Surveys to notify CSD in writing of any changes to the human resources engaged in Cadastral Surveys in his office immediately that they occur.
He must also inform CSD in writing 10 days before any intended period of his absence from Bahrain of more than 14 days, and in the event of such absences, nominate another Authorised Surveyor from the PSSO who will act as the Person Responsible for Cadastral Surveys during his absence.

Authorised Surveyors are those surveying professionals who have been authorised by CSD to be responsible for:

- compliance with the standards set and from time to time amended by CSD, and

- certification that the work performed by them, or by other categories of practitioners for whose work they accept responsibility, complies with those standards.

A suitable surveyor will in general be of standard acceptable for employment within CSD as a professional surveyor, having the following qualifications and experience:

1) A bachelor's degree in surveying engineering, geomatics, or equivalent (for example a first degree in Civil Engineering with a post-graduate specialist qualification in Spatial Sciences), which includes a taught Cadastral Surveying component, from a recognized University or other institute of higher education; and
2) At least four (4) years post-qualification practical cadastral surveying experience; and
3) Licensed or Registered by the competent authority in his home country to perform cadastral surveys; or
4) Registration with a recognized professional institution that proves professional capability or at least one (1) year of documented experience in the Kingdom of Bahrain in which work examined and approved by the CSD can be directly attributed to the surveyor and which demonstrates good knowledge of laws and procedures governing cadastral surveys in the Kingdom of Bahrain.
5) All surveyors identified by CSD at the commencement of this chapter as being the Senior Member of an Approved Land Survey Firm responsible for Cadastral Survey matters will be automatically qualified as Authorised Surveyors, regardless of their qualifications and experience (2013).

Surveying Technicians are expected to work under the guidance and direct personal supervision of an Authorised Surveyor, who will be held responsible for their work. A suitable technician will in general be of standard acceptable for employment within the Directorate as a survey technician, having the following qualifications and experience:

1) A bachelor's degree in surveying, geomatics, or equivalent (for example a first degree in Civil Engineering with a post-graduate specialist qualification in Spatial Sciences), which includes a taught Cadastral Surveying component, from a recognized University or other institute of higher education, **but lacking the other criteria necessary for qualification as an Authorised Surveyor**; or
2) A diploma in surveying, geomatics, or equivalent (for example diploma in Civil Engineering with emphasis on surveying, or a second diploma or conversion course in surveying) from a recognized institute of higher education.
3) In **exceptional cases**, the requirement for a diploma in surveying, geomatics or equivalent may be waived, on the condition that the surveyor can demonstrate having completed high school and having 10 years relevant experience, of which 3 have been in the Kingdom of Bahrain and known to CSD.

7. Suspension, Reinstatement and Withdrawal of Authorisation

7.1 Private Sector Surveying Offices

CSD reserves the right to suspend the Authorisation to Perform Cadastral Surveys of a PSSO in the following circumstances:

1. Violation of the confidentiality of cadastral information
2. A disciplinary action by the CRPEP against the PSSO
3. Failure to fully comply with the conditions of Authorisation set out in this chapter.
4. Submission of fraudulent credentials in support of application for Authorisation
5. Failure to meet the quality criteria set in **Section 9 (below)**
6. Failure to comply with timeliness criteria set in **Section 9 (below)**
7. Breach of Technical Instructions
8. Execution of surveys by staff whose competencies have not been evaluated and approved by CSD.
9. Submission of signed statements of supervision and checking that are proved to be fraudulent.

On first detected occurrence of each circumstance, CSD will provide the PSSO with notice of the occurrence, the remedy required and timescale for the remedy to be completed.

On second detected occurrence of each circumstance, CSD will suspend Authorisation until such time that it is satisfied that underlying cause of the circumstance has been remedied.

Once Authorisation is suspended, the Register entry for the PSSO will include a record of the suspension and the reason for it. No new jobs will be opened for a suspended PSSO, and if, in the judgement of the Director, CSD, the circumstances warrant it, CSD will cease to accept existing jobs for Examination until suspension is lifted. At the lifting of the suspension, the record of the suspension will be removed from the Register available to the public but retained on the master Register retained by CSD for internal use.

7.2 Private Sector Cadastral Audit Offices

Their suspension is following the Penalty System, see chapter 10 below.

7.3 Authorised Surveyors

CSD reserves the right to suspend the Authorisation of individual Authorised Surveyors, including the Person Responsible for Cadastral Surveys, in the following circumstances.

1. Violation of the confidentiality of cadastral information
2. A disciplinary action by the CRPEP against the individual
3. Breach of Technical Instructions
4. Submission of fraudulent credentials in support of application for Authorisation
5. Submission of signed statements of supervision and checking that are proved to be fraudulent.

On first detected occurrence of each circumstance, CSD will provide the PSSO with notice of the occurrence, the remedy required and timescale for the remedy to be completed.

On second detected occurrence of each circumstance, CSD will require the PSSO to stop allocating work to the Authorised Surveyor concerned and the Authorised Surveyor concerned will have his individual Authorisation suspended until such time that CSD is satisfied that underlying cause of the circumstance has been remedied.

Once Authorisation is suspended, the Register entry for the Authorised Surveyor will include a record of the suspension and the reason for it. If, in the judgement of the Director, CSD, the circumstances warrant it, CSD will cease to accept existing jobs performed by the Authorised Surveyor for Examination until suspension is lifted.

At the lifting of the suspension, the record of the suspension will be removed from the Register available to the public but retained on the master Register retained by CSD for internal use.

7.4 Surveying Technicians

CSD reserves the right to require a PSSO to suspend the work of Surveying Technicians for Cadastral Surveys in the following circumstances.

1. Violation of the confidentiality of cadastral information
2. Breach of Technical Instructions
3. Submission of fraudulent credentials in support of application for Authorisation
4. Submission of signed statements of execution and checking of work that are proved to be fraudulent.

On first detected occurrence of each circumstance, CSD will provide the PSSO with notice of the occurrence, the remedy required and timescale for the remedy to be completed.

On second detected occurrence of each circumstance, CSD will require the PSSO to stop allocating work to the Surveying Technician concerned and Cadastral Surveys executed by the Surveying Technician concerned will not be accepted for examination until such time that CSD is satisfied that underlying cause of the circumstance has been remedied.

Once Authorisation is suspended, the Register entry for the Surveying Technician will include a record of the suspension and the reason for it.

At the lifting of the suspension, the record of the suspension will be removed from the Register available to the public but retained on the master Register retained by CSD for internal use.

7.5 Withdrawal of Authorisation

On the third occurrence of any of the circumstances in sections 8 and 9 (below), the Authorisation of a PSSO, an Authorised Surveyor or a Surveying Technician will be withdrawn permanently. In the case of a PSSO or Authorised Surveyor, CRPEP will also be informed of the withdrawal and the reason(s) for it.

Where the Withdrawal of Authorisation of a PSSO occurs, Authorised Surveyors and/or Surveying Technicians who have not have their status suspended may, subject to LMRA regulations, be accepted as employees of another PSSO.

Where the Withdrawal of Authorisation of individual practitioners occurs, the personnel concerned may not be involved in Cadastral Surveys in Bahrain in any capacity, unless they can demonstrate a change in their personal circumstances that would support a new application for Authorisation.

A PSSO or individual subject to Withdrawal of Authorisation may lodge an appeal against the withdrawal, in writing, with the Director General, Survey, who will initiate an investigation of the circumstances of the withdrawal. At the end of the investigation, he will make his decision known to the PSSO or individual. His decision will be final.

8. Private Sector Professional Responsibility

PSSO's by accepting Authorisation explicitly agree to abide by their obligations of professional responsibility as defined below.

Fundamental concepts of surveying are:

- Independent checking of work
- Traceability of work to individuals

Measures introduced in this document establish processes where observations, calculations and product preparation can be traced to the surveyor or surveying technician who performed the work, and where required, the person responsible for supervision and checking of the work.

Professionals responsible for such checking must fully understand and be in no doubt that they will be held completely responsible for work they have certified as having checked and will not be allowed to pass responsibility back to the person executing the work. Certification of work without having fully checked it will be treated extremely seriously and is grounds for suspension of individual Authorisation.

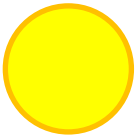
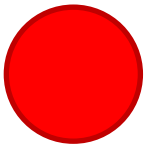
9. New: Private Sector and CSD regulations

CSD established a system for evaluating and classifying PSSO undertaking **cadastral survey or examination** in order to follow up and monitor their performance, provided that this system includes the following controls:

9.1 Penalty System:

Penalty system for Cadastral Surveying: to determine the number of cadastral mistakes committed by PSSO in cadastral jobs, during a calendar year.

- The system is to start calculating from 1st of January of each year till the end of the year.
- Classification of cadastral mistakes according to their severity.
- Cadastral mistakes have different weights (Severe mistakes receive a red warning, non- severe a yellow warning).
- Type of mistakes:

Not providing all the documents of the cadastral transaction in the cadastral file or not sending the digital copies of the documents for the cadastral transaction	
Not applying standards for drawing survey certificates, deed plans, or cadastral plans	
Printing errors in the survey certificate, deed plans, or cadastral plans	
Failure to apply the field survey and audit standards approved by the CSD	
Exceeded the specified time to complete the survey job	
Failure to comply with the plans of the Urban Planning and Development Authority, or the plans issued by the court, such as subdivision, consolidation, re-planning, or engineering drawings.	
Improper fixation of the property	
Ignoring the purpose of the required survey or the instructions of the Cadastral Survey Directorate	
Ignoring surveying profession standards	
Ignoring or violating laws, regulations, and judicial rulings	**Referred to the CRPEP**

- CSD sets a fixed limit for the number of points.
- When a private office reaches the prescribed limit, action against the office is taken as follows:

  a. Warn the office in writing for the first time.

  b. Suspension of the office from carrying out cadastral survey or examination work for a period not exceeding one year in the second and third times.

  c. Canceling the accreditation of the office for the fourth time.

  d. CSD may, if it finds weakness or lack of knowledge of any private office in completing one of the types of cadastral jobs, stop the office from requesting the opening of this type of job within the period specified by the CSD.

- The number of points calculated on private offices is an influential factor in the evaluation and classification process.
- Points are automatically erased after the office returns from suspension or at the end of the calendar year without reaching the limit set for suspension. The points are reset again after the end of the year Gregorian calendar.
- The point system applies to all PSSOs that have been approved by CSD to provide survey or examination services through SLRB, and points are calculated on the commercial name of the office.

E. COORDINATED CADASTRE

1. Survey Datum

The Bahrain National Spatial Datum is consisted by:
A. Geodetic Datum: Ain Al-Abd 1970 (International Ellipsoid of 1924)
B. Horizontal Datum Definition

- Projection: Universal Transverse Projection
- Zone: 39 North
- CM Scale Factor: 0.9996
- Projection origin
    - Latitude: 0°00'00" N
    - Longitude: 51°00'00" E
    - False Northing: 0.000 M.
    - False Easting: 500000.000 M.

C. Vertical Datum: Bahrain National Level Datum of 1976
D. Official Transformation Parameters from ITRF2005 (WGS84) to Ain Al-Abd

- D.1 Ain Al-Abd 3D V0 Revision-1
- D.2 Ain Al-Abd 3D V1 (Molodensky - Badekas Model Version)
- D.3 Ain Al-Abd 3D V1.B (Bursa-Wolf Model Version of D.2)

NOTE: The following 3 sets are for the Island of Hawar.

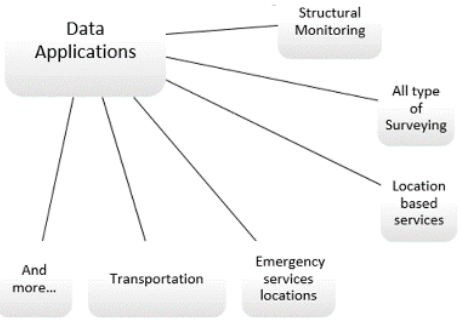
- D.4 Ain Al-Abd 3D V2007.A (Molodensky - Badekas Version)
- D.5 Ain Al-Abd 3D V2007.B (Bursa-Wolf Version)
- D.6 Hawar 2D HDT2019 (To be applied to the resulting grid coordinates after applying D.4 or D.5)

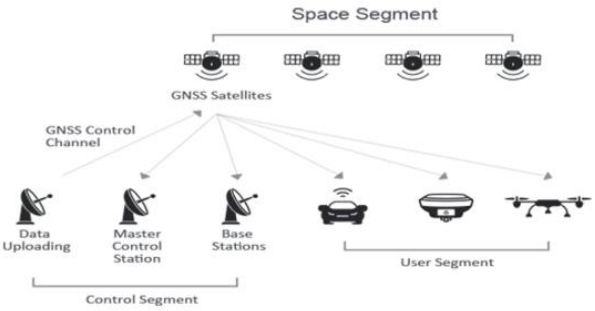
2. PRN

Permanent Reference Network (PRN) provides the geodetic basis for all surveying and engineering operations in Bahrain in that it is the Nation's official precise positioning service.

PRN comprises six (8) GNSS Reference Stations creating a network that covers all of the urban and development areas of the Kingdom. The six (6) reference stations are located at Diyar Al Muharraq, King Fahd Causeway, Scout Camp, Durrat Al Bahrain, Jauu, Budaiya, Hawar Islands and Umm Al Hassam.

The PRN is available for private sector survey and engineering firms via a subscription to access the service.





Background

SLRB therefore defined the requirements for a modern network infrastructure of permanent GNSS reference stations and established the network in late 2006 and renewed it with extra stations in 2021. The Bahrain PRN now provides the primary realisation of the Ain Al Abd datum in the Kingdom of Bahrain. The PRN therefore provides the geodetic basis for all surveying operations in Bahrain in that it is the nation's official spatial reference framework.

Reference Stations

The PRN includes six (8) GNSS Reference Stations defining a network that covers all the readily accessible land areas of the Kingdom. The six reference stations are located at Diyar Al-Muharraq, King Fahd Causeway, Scout Camp, Durrat, Jauu, Budaiya, Hawar Island and at Umm al Hassam.

These GNSS Reference Stations are equipped with the highest quality choke-ring antennae that receive both GPS and Glonass satellite signals 24 hours a day. This satellite tracking data is then transmitted continuously to the Data Control Centre (DCC) for real-time processing and archive.

Quality Assurance Stations

The PRN includes an additional station which primarily operates as a quality assurance facility. This QA station is located at Awali in the center of the island and furthest from any of the permanent reference stations.

This station is configured as a permanent rover with a standard geodetic antenna (not choke-ring) tracking both GPS and Glonass satellite signals. The station configuration is essentially the same as any rover except that network corrections are received over land-line based internet rather than mobile internet as is the case with normal rover units.

Services

The PRN is primarily developed to support high-precision real-time positioning requirements. In addition, tracking data is archived and can be accessed and downloaded through a RINEX data facility.

Applications

The Bahrain PRN provides the fundamental infrastructure for development of a huge variety of GNSS applications. SLRB is very interested to co-operate with agencies that can utilise the PRN in

Cadastral surveying

Mapping and geographical information system (GIS)

Topographical survey

Structural monitoring

Hydrographic survey

Land transportation applications

Emergency services locations

Geodetic survey

And many other applications

Benefits

The PRN offers a very effective entry for all potential users into the high-precision positioning market. The network is compatible with all major equipment manufacturers and operations can commence with minimal effort in configuration.

The cost of operating GNSS positioning equipment is kept low since users now only require a single rover unit rather than the previous requirement of individual operation with a base and a rover unit.

In addition,

the logistics of positioning with the PRN are greatly improved since the service is “always–on”.

3. Guidelines for field instrumentation Cadastral Surveying

3.1 Background

The integrity of every survey depends on:

- Selection and adoption of the most appropriate surveying techniques to achieve the required precision and accuracy.
- Design survey observations to trap or quantify gross and systematic errors, using techniques such as redundant and repeated observations.
- Accurate, error-free recording of the measurements taken at the time they are taken. This must include the recording of raw observables, not instrument-processed/” reduced” observations. See Section 3 below.
- A clear audit trail from measurement to result.

3.2 Instrumentation

It is the responsibility of the surveyor to use his professional expertise and judgement to select the appropriate combination of instrumentation to achieve the required outcome of the survey, considering any operational and site constraints. The techniques applied to that instrumentation must be such as to clearly demonstrate its suitability and its ability to trap or identify gross and systematic errors. It is the responsibility of the professional surveyor to ensure that trainee professional surveyors, surveying technicians and field assistants fully understand and apply these concepts.

Instrumentation that may be used is as follows:

Ref.	Type	Typical Examples
1.	Direct Linear Measurement	Steel or Fibre tape, with or without tension and temperature correction
2.	Angles	Theodolite or Total Station
3.	Indirect Linear Measurement	Electronic Distance Measurement (with Theodolite), Total Station (Infra-Red or Laser, with reflector or reflector less)
4.	Direct Coordinated Positioning	GNSS (GPS), standalone, post-processed, RTK (own base station or SLRB PRN corrections)

Basic techniques for trapping and identifying observation errors are as follows. See different chapters below for each type of instrumentation for SLRB's required minimum procedures required to achieve the required positional accuracy for each type of instrumentation. It is considered required practice for these techniques to be applied at the time of measurement, in the field, to identify errors at a time when check measurements can be made.

Ref.	Type	Typical Examples
1.	Direct Linear Measurement	Measure and record each measurement in opposite directions. Measure and record each measurement twice, once with the tape end on zero, once with a "random zero" e.g., 0.76 m. Calculate the measured distance and compare with the direct measurements. Record the checks. Where a feature is measured in parts, include an overall measurement, and compare with the sum of the parts. Take check measurements that create triangles and use trigonometry to confirm the measurements.
2.	Angles	For control and traversing make multiple repeated observations, on face left and face right, with different zeroes. Even though the instrument may record measurements electronically, unless it is having the capability to set the maximum difference between sets and identify errors to the instrument man, and that facility is properly used, manual booking and reduction of sets of angles must be used, in the field, at the time of observation.
3.	Indirect Linear Measurement	At start and end of job, measure between points of known coordinates and compare measured distance with computed distance corrected for projection scale factor, reduction to sea level, slope and differences in instrument and target height. Multiple repeated measurements.
4.	Direct Coordinated Positioning	Use mission planning software, with horizon obstruction entries made to ensure number of satellites (minimum 6 for RTK) and PDOP (< 6) are suitable for site at planned time of observation. Observe points of known coordinates at start and end of job Avoid multi-path situations such as close to walls that are higher than the antenna. Be aware of effects of satellite signal blocked by buildings, trees etc that would give an unbalanced position solution. Re-observe critical points and demarcated beacons at least 20 minutes after initial observation to allow sufficient change to satellite constellation in view.

3.3 RAW vs Instrumentally Processed Data

i) Direct Linear Measurement

As no instrumental processing is available for taped measurements, this section relates only to observables.
For precise taped distance measurements, a steel tape should be used, and a record be made of tape tension and temperature to allow calculations of corrections for deviations from the standardisation values. In addition, to ensure true horizontal distances, the tape should be level. If significant height difference exists between the points being measured, it must be determined by means providing the required accuracy.
However, given the specified tolerances for cadastral surveys and the short distances over which taped measurements are used, the corrections above may generally be ignored. Nevertheless, the surveyor must be aware of, and understand them, should it be required to use taped measurements in abnormal situations.

ii) Angles and Indirect Linear measurement

These are combined, because with the almost universal use of Total Stations it is unlikely that separate angle and distance measurements are being made.
With onboard data recording and software, it is tempting to utilise these capabilities to simplify the surveyors' work. For setting out or demarcation this does not present a problem as independent checks can be made.
However, for traversing to establish control, it is difficult to identify whether the on-board processing of the total station from measurements to produce coordinates has been performed without error and using appropriate parameters, as manual entries cannot be verified, and the computational algorithms are not open for inspection and evaluation. It is hence not acceptable to output only a coordinate listing from the instrument, as there is no traceability from measurement to coordinate.

The raw observables are:

Height of Instrument above Station
Height of Targets above Station
Horizontal Angle
Vertical Angle
Slope Distance
Temperature
Pressure

It is not acceptable to record horizontal distance with a vertical angle of 90° and 270°.
It is not acceptable to calculate and manually input a ppm correction into the instrument based on a combination of temperature, pressure, and height above sea level.

While it is acceptable to set an instrument to display other parameters for convenience of working, the above raw observables must be set for internal recording. If that is possible, a printout of the recorded raw observables may be submitted as field notes. If it is not possible, they must be manual recorded on an appropriate form, at the time of observation.

It is not acceptable to record the data electronically then transcribe it manually onto field sheets in the office later.

iii) Direct Coordinated Positioning

When using PRN GPS, the instrument controller must be set to record pseudoranges at 1 second intervals to all satellites in view and network corrections received.

Field Notes – include Field Notes Surveyor's Certificate

3.4 Horizontal Angle Measurement

i) Definitions

Horizontal Angle:	is the measure in degrees, minutes, and seconds of arc, between theodolite circle readings to two different objects, regardless of their relative elevation
A Zero:	is normally the mean value of the angle as measured on face right and face left, although in detail survey when constrained by an EDM attachment, a single face zero is accepted
A Round of Angles:	is defined as a succession of circle readings in a single direction which are closed by a final observation to the opening Reference Object (RO) on each face

ii) General

1. A control traverse should open and closed on different established control stations, preferably of RM standard and never of L status. Closed loop traverses are a last resort as these contain neither scaling nor orientation check.
2. The reliability of both opening and closing control stations must be confirmed by a minimum of redundant observations, either: -

    a. Horizonal angles to 3 or more known controls, or
    b. Horizontal angles to 2 known control points and distances to 1 or more such points.

The purpose, and hence the relative accuracy required of these confirmatory observations, is to ensure that that the control stations have not been disturbed.

If necessary, the ends of the traverse must be extended until undisturbed control has been reached.

3. Horizontal angles will be observed on two zeros from backsight clockwise to foresight.

iii) Standard Practices

1. Angles will be measured clockwise on face left and anti-clockwise on face right.

2. In general, each angle will be observed individually without closure. However, if four or more objects are to be included, the observations will be by a closed round on each face.

3. Traverse angles will always be measured from back-sight to foresight.

4. Zero settings for four rounds will be set as:

Round	Zero setting
1	As found.
2	1 + 90
3	2 + 45
4	3 + 90

iv) Precision

1. With a 1" theodolite (e.g., Wild T2)

    1. Rounds to detail points should close to < 30"
    2. Multiple values of an angle lie within a 10" spread

2. With a 20" theodolite (e.g., Wild T16)

    1. Rounds to detail points should close to < 1'
    2. Multiple values of an angle lie within a 40" spread.

3.5 Vertical Angle Measurement

Definitions

A Vertical Angle	is the measure in degrees, minutes, and seconds of arc of the vertical circle of a levelled theodolite.
Collimation	is half the amount by which face left and face right vertical angles of a levelled theodolite differ. In a well-adjusted theodolite it will be the same value as: -
Index Error	the amount by which the vertical circle reading of a levelled theodolite, pointing to an object in the same horizontal plane, differs from zero.

Standard Practices

One set of vertical angles will be observed.

- to reflector for EDM traverses
- To target at instrument height for taped traverses

1. At the start of work each day, face left and face right vertical circle readings to an object with a clearly defined horizontal axis should be used to check for and determine the index error.

2. When index error is known, and the theodolite is level, it is sufficient for detail purposes to measure the vertical circle reading on face right only.

3. When used to correct EDM measurement, vertical angles are taken to reflector level.

4. When used to correct tape measurements, vertical angles must be measured to a point at the same height above the ground as the instrument.

5. ALWAYS ENSURE THAT THE THEODOLITE IS LEVEL AND LEVEL THE SPLIT BUBBLE ON ALL NON-AUTOMATIC THEODOLITES BEFORE TAKING A READING

3.6 Traversing

General

1. Traverse stations are of a permanent nature.

2. Numbering is in sequence in the 1:2000 map sheet in which they fall in the form xxxyy/nnn. The issue is controlled by the computer system when the traverse is finalised.

3. Traverses on UTM will be observed and computed under a normal job number but with a 3 in third place e.g., 94 3 nnnn.

4. Local grid traverses are permitted provided that: -

    a. boundary points may be easily re-established from hard detail on site.
    b. The parcels fall within a 150m circle.
    c. There are no UTM control stations nearby.
    d. supervisor has given approval.

5. For local grid traverses ONLY: -

    a. Points will not be permanent.
    b. Station descriptions are not required.
    c. Traverses must be closed loop to similar standard.

Except that single face horizontal angles will suffice

Observations

1. A control traverse should open and closed on different established control stations, preferably of RM standard and never of L status. Closed loop traverses are a last resort as these contain neither scaling nor orientation check.

2. The reliability of both opening and closing control stations must be confirmed by a minimum of redundant observations, either: -

    a. Horizonal angles to 3 or more known controls, or
    b. Horizontal angles to 2 known control points and distances to 1 or more such points.

The purpose, and hence the relative accuracy required of these confirmatory observations, is to ensure that that the control stations have not been disturbed. If necessary, the ends of the traverse must be extended until undisturbed control has been reached.

Horizontal angles will be observed on two zeros from backsight clockwise to foresight.

3. One set of vertical angles will be observed:

    a. to reflect for EDM traverses
    b. To target at instrument height for taped traverses

4. Distance measurement will be either:

    a. EDM with a minimum of 3 readings for each length, and both forward and backward measures for each leg
    b. Steel tape with agreement between 2 independent measures:
        i. 0.01m for distances less than 100m
        ii. 0.02m for distances >100m and <200m
        iii. Distances >200m will always require EDM.

Recording

1. All readings will be booked on a "Traverse Observation" with the following content:

    1. Header with Job number

2. Observer's name - printed for legibility.
3. Booker's name - printed for legibility.
4. Date of observations
5. EDM type and colour code
6. Station at which observations are being made.
7. Approximate ambient temperature
8. The mean height of the station
9. The instrument height (particularly when taping)

2. At the time of observation:
    1. Horizontal angles will be reduced to a mean angle from the R.O. and checked for standard agreement:
        1. Less than 10" for a 1" theodolite
        2. Less than 40" for a 20" theodolite
    2. Vertical angles will be reduced to ensure that the index error has not varied significantly from that morning's initial check.
    3. A separate sheet will be used for each station at which observations are made.
    4. A traverse diagram will be prepared as an integral part of the cover page.
    5. Erasures or obliterations on field sheets will not be accepted. Mistakes must be crossed through, and the correct value written above.

3. Completed documentation.
    1. Station descriptions, on the standard form at Annex C, should be initiated for each new station, and completed as the computation and checking proceed. These are not required for local surveys on an arbitrary grid. On completion:
        a. The original of each description is filed in sheet number/serial order in the Station Description file maintained in each Region.
        b. A copy is supplied to Survey Operations.
    2. All new traverse stations will be plotted in black on the relevant intelligence sheet. The recording will be of the symbol of a vertical cross contained in a 2mm circle with the number of the station printed alongside. Thus

06423003

3. Where a control point proves to be disturbed or destroyed, the face of the relevant description in the regional file will be annotated accordingly and a copy supplied to S.O.

Computation

1. Reduction of field observations will be carried out on site with re-observation as necessary.
2. The surveyor has the option:
    1. to compute the traverse
    2. to submit the observations, with a completed cover page, for computation and database loading by the Data Team.
3. Traverses with a misclosure of better than 1:20000 or 0.0015 /L m (whichever is the smaller) may be loaded into the database.
4. Traverses with a sub-standard misclosure will be referred to the Regional Surveyor who will arrange independent check on:
    1. R.O. comparisons
    2. Reduction of Observations and input to the calculation
    3. Closure of established control

    - If all three are acceptable, the Regional Surveyor will sign to this effect in the action column of their cover sheet before loading to the database.

3.7 Establishment and Use of Line Points

Definition

Line Points are stations on-line between two existing control stations (either Minor Control Points or Reference Marks) and may be established where it is more efficient than fixing additional control by traverse.

Two categories of Line Point exist:

- Temporary Line Points. These are not finalised to the database and may be used where necessary for setting out checks, and detail survey.
- Permanent Line Points. These are finalised as Minor Control Points and may be used where necessary for setting out, setting out checks, detail survey and traversing.

Establishment

- Prior to establishment of a Line Point, the reliability of the two terminal control stations must be proven by observation to a third control station.
- The Line Point must be placed online from the nearest terminal control station.

- A Line Point should not be placed closer to a terminal control station than the minimum focusing distance of the theodolite being used.
- Each Line Point must be verified by observation and measurement to both terminal control points, and this should be recorded on the appropriate Field Sheet.
- A clear field sketch of the Line Point shall be drawn.
- No Line Point shall be placed online to a BT, or the balance distance to one of the terminal control points not measured, unless this is justified and approved by the Regional Surveyor. In these cases, the distance measured shall be checked by an independent second measurement.

Accuracy

- The total measured distance between the two control points must agree to within 0.03 of the computed total distance.
- The calculated offset from the Line Point to the join between the terminal control points shall not exceed 0.02.

Temporary Line points

Temporary Line Points that have been computed will appear in the finalised coordinate listing of a finalised Job with point status 'L'. However, the Line Point is not finalised to the Database. There is no requirement to prepare a Minor Control Point description.

Permanent Line points

- The procedure for establishment as outlined in the relevant chapter is to be followed.
- The Line Point should meet the accuracy requirements set out in Chapter F.
- The Line Point coordinates should be computed on the line between the two existing terminal control stations. For computation, the sum of the measured distances from the line point to the terminal control stations must be adjusted pro-rata to agree with the computed distance between the terminal control stations.
- The computed Line Point coordinates are to be supplied to Survey Operations for loading as Minor Control Points.
- A Minor Control Point description is to be prepared. The Location diagram is to be clearly annotated 'Online between ..... and .....'
- All new Stations will be plotted on the relevant Intelligence (MAP) Sheet.

Traversing from Permanent Line Points

Where a Permanent Line Point is utilised for traversing the normal procedures for traversing apply. (See Chapter F).

3.8 Detail Survey

Purpose

1. Detail survey is the observation of the angles and/or distances measured to clearly identifiable physical features either:
    1. to enable features to be coordinated, or
    2. to enable graphic plotting.

2. The fixed points may be used:

    1. for map revision
    2. for further fixation of Cadastral boundary marks.

3. The points used must be clearly identified in accordance with the list of standard abbreviations set out at the Point Numbering (below) which is drawn up in accord with Survey Operations to ensure compatibility.

Technique

1. Fixation may be by:
    1. Bearing and distance (a polar fix)
    2. The intersection of the arcs of two measured distances
    3. The intersection of the vectors of two measured angles

2. In every case, before calculated coordinates are used, they must include the observation and fixation of AT LEAST one redundant measurement. This check will frequently be by taping to another independently fixed point.

3. Vertical circle readings will always be booked.

Field Checks

1. The coordinates will be calculated from known starting positions, EACH of which must be verified by check observations.

2. Check observations consist of either:

    1. a horizontal circle reading to different RO's or,
    2. a horizontal reading and distance to a single RO.

3. If EDM is in use, at some stage in the survey a minimum of 3 readings will be taken between a pair of control stations.

4. At least once each day, the theodolite should be checked for vertical index error.

Recordings

1. Field recording will be on a standard form as per Cadastral Survey Field Operations Instructions.
2. A fresh page will be used for each set up.

3. A recording is made up of:
    1. Header - to be completed for EVERY page used:
        a. Station - point at which observations are made.
        b. Instrument identification code
        c. Approximate temperature in degrees Centigrade
        d. Instrument height to 0.1 m (if needed)
        e. Observer and bookers name
        f. Date of observations
        g. Job number

    2. Observation data - filled in line by line as:
        a. point observed.
        b. horizontal angle
        c. vertical angle
        d. slope distance
        e. coded description of the nature of the point

4. Every page will open and close with readings to the RO station; and these must agree within:
    1. 30" in angle for T2 theodolites
    2. 1' in angle for T16 theodolites
    3. 2 cm (.02m) in distance

5. A field sketch - an oriented sketch of the points observed on that page which shows:
    1. the point numbers.
    2. the links between them.

6. The rules against erasure and requiring mistakes to be crossed through with the correct value written above will be STRICTLY observed.

Point Numbering

1. Detail points throughout the survey will be numbered sequentially from 001.

2. Each detail point will be given a unique number to be used wherever it occurs in the survey, i.e., if it is observed from any other station, it retains the number which it was originally given.

3. Where detail points occur in the final coordinate list, they will be annotated with coded descriptions and cross-referenced to the relevant field record.

THE FOLLOWING STANDARD ABBREVIATIONS WILL BE USED

Structure		**Street furniture**	
Building corner	BC	Inspection Cover	IC
Wall corner	WC	Manhole	MH
Wall junction	WJ	Road Signs	RS
Wall intersection	WI	Lamp Post	LP
Foundation corner	UC	Traffic Signal	TS
Under construction	U	Electricity Pole	EP
Ruin corner	RC	Telephone Pole	TP
Ruin (not corner)	R	Electricity Pylon	PY
		Electricity Pylon corner	PYC
		Gate Post	GP

Fencing		**Roads**	
Barasti fence	BF	Asphalt Edge	AE
Close Boarded fence	CBF	Asphalt Centerline	ACL
Corrugated Iron fence	CIF	Track Edge	TE
Post & Rail fence	PRF	Track Centerline	TCL
Post & Wire fence	PWF	Road centerline	RCL

Chain-Link fence	CLF	Kerbline	K
Fence (Other)	F	Footpath edge	FE
Fence Corner	FC	Footpath centerline	FCL
Temporary fence	TF		
Temporary fence corner	TFC		
Hedge	H		

Miscellaneous		**Boundary Mark (with ref):**	
Channel	CH	Iron Pin	IP
Channel Edge	CHE	Iron Pin in Concrete	IPC
Channel Centerline	CCL	Pipe	PIP
		Bund	BU
		Nail	NL
		Aluminum Marker	AP

The following additional codes appear in the SURVEY OPPERATIONS manual

Street Furniture

Gully	G	Transformer	TM
Stop Valve	SV	Hydrant	H
Cable Marker	CM	Barrier	BR
Water Marker	WM	Bollard (incl mooring)	BD
Gas Marker	GM	Telephone junction box	TBX
Sewerage Marker	SM	Electricity junction box	EBX

Unidentified duct	M	Street lighting box	BX
Sign Board	SGN	Letter box	LB
Post (<2m high)	PO	Telephone call box	TCB
Pole (>2m high)	P	Bus stop	BS
Power box	PB	Overhead Electric line	OEL

Miscellaneous

Station	STN	Water tank	WT
Flagstaff	FS	Pipeline	PL
Mast	MST	Cemetery (limits)	CE
Palm Tree	PT	Vegetation (limits)	VE
Tree (other types)	TR	Wadi Edge	WE
Bush	BSH	Wadi centerline	WCL
Chimney	CHY	Top of slope	TOS
Steps	STP	Bottom of slope	BOS
Plinth	PLI	Apparent High-water mark	AHW
Jetty	JET	Apparent Low water mark	ALW
Spring (Ain)	SPR	Cliff	CL
Well (Water)	WLL	Spot Height	SH
Qanat	QA	Overhang	OVH
Borehole	BH	Spotlight	SL
Pump	PMP	Playground	PLG
Oil well	OW	Pavement	PVT
Gas well	GW	Pavement edge	PVE

Culvert	CU

Combination use of poles

Electricity/Telephone	ETP
Electricity/Lamp	ELP
Telephone/Lamp	TLP
Electricity/Telephone/Lamp	ETL

3.9 Setting out from control

General

"Setting out" is the process of establishing marks in the ground at positions defined by pre-determined coordinates or, occasionally, graphic infill dimensions. The positions will be fixed by measurement from a point or points of proven fixed position and may be by:

1. Intersection of two computed bearings
2. A polar fix of computed bearing and distance
3. The intersection of arcs of two computed distances

In every case, the mark which is emplaced must be CHECKED by a second independent measurement which may be:

1. A polar from a second station
2. Distances from two independently fixed points

In exceptional cases ONLY, a second polar from the same point may be used and in such cases:

1. the horizontal circle setting will be changed.
2. the EDM target height will be altered.
3. the surveyor will justify the need.
4. the supervisor will endorse the justification.

To obtain independent checks, it may be necessary to emplace a temporary station online between two control stations. It is particularly important that the coordinates of such a station are determined accurately *(G. ESTABLISHMENT AND USE OF LINE POINTS)*

Pre-field procedures

For each control station:

1. A list of the coordinates of all points which could be set out from that point is compiled and is converted to a tabulation of setting out data by use of option 2 of the calculation of bearings and distances suite in SURVEYOR 4 (software under replacement).

2. Setting out distances must not exceed 200m without specific authority from the supervisor.

3. Included in the list are AT LEAST two RO's, chosen such that the nearer of the two is further from the point than any of the points to be set out.

4. A new page of printout will be used for each setting out station.

5. Each point to be set out should appear on the list of AT LEAST two stations; **if this is not practicable the need for supplementary taping to enable an independent check must be noted.**

Booking (Field Note)

The following data is entered at the top of the computer tabulation of points to be set out:

1. Observer's and Booker's name (printed for clarity)
2. EDM type and colour code
3. Date (not to be confused with date of the printout)
4. Approximate temperature in degrees Centigrade
5. Job number (if this differs from that on the printout)

Field observations are recorded directly onto the computer printout (or photocopy) and consist of confirmatory readings for all the points actually set out at the relevant station.

Initial Field Checks

1. The setting out will be conducted from known starting positions, EACH of which must be verified by check observations.

2. Check observations consist of either:

   (a) a horizontal circle reading to different RO's, or,
   (b) a horizontal reading and distance to a single RO.

3. If EDM is in use, at some stage in the survey a minimum of 3 readings will be taken between a pair of control stations.

4. At least once each day, the theodolite should be checked for vertical index error. *(Vertical Angle Measurement).*

Field Work

At each control station

Verify control by:

1. Set horizontal plate to bearing of the more distant RO
2. At the right-hand side opposite the data:
    a. Book horizontal and vertical angles to that RO
    b. Book slope distance measure to that RO
    c. Book horizontal reading of second RO
3. Confirm that distance and angle agree within tolerance.

From the tabulated data, set out all accessible marks which have not so far been emplaced using one of the techniques described above.

For each new point:

1. Complete the following observations and record the results on the right-hand side of the tabulation sheet:
    - Horizontal plate reading (angle from first RO)
    - Vertical angle
    - Slope distance
2. Before closing the observations:
    - Check and record horizontal angles to RO1 and RO2
    - Check and record vertical angle to RO1
    - Check and record distance to RO1
3. When setting out large numbers of points, it is recommended that this check back to RO's is carried out periodically throughout the survey.
4. The setting out readings must agree within reasonable tolerance with the pre-computed tabulation (i.e., bearing in mind distance from the setting out station etc.) before the surveyor leaves the site.

SPURIOUS FIELD READINGS INVITE SEVERE DISCIPLINARY ACTION

Following the measurements to newly emplaced points, check observations are made as follows:

1. Complete/book any additional taping.
2. On a separate "Detail/Setting out" sheet (see detail survey), record the H/A, V/A and slope distance to any accessible points which have already been emplaced from another station.
3. Field sheets must NOT contain over-writing or erasure. Incorrect entries should be struck through, and the correct value written above.

Post Field Work

On return to the office:

1. For each station, the observation data for the check observations only are entered into the PC using the "EDM Field Obs Entry" option and the checks are computed using the "Field Obs (EDM) Compute"
2. The software will give a printout of residuals between observed/computed and theoretical coordinates. The residuals are examined and assessed:
   - Coordinate residuals less than 5 cm are acceptable
   - Residuals in excess of 5cm must be reviewed and endorsed by the supervisor.
   - Residual values in excess of 10cm require re-observation and further examination.
3. Taped observations and re-observations
   - Where observation includes supplementary taped distances, the checks can be entered and confirmed using the "Verify Beacon by 3 distances" option.
   - If a mark is moved to "accommodate" the check observations, it is necessary to make a further check observation from an independent proven station.
4. As a manual alternative, the Working Data Disc containing the job may be passed to the Data Centre so that the beacon status can be upgraded to "verified (V)" status before the job is finalised.
5. A "Summary of Beacons" form (Appendix 7) is prepared to give a comprehensive record of:
   a) All points fixed in the survey

b) The control point from which each was emplaced
c) The control point(s) from which each was independently checked.
d) A full X-reference to the relevant field and computation sheets
e) The nature of the mark emplaced which is recorded, inter alia, in the remarks' column
f) The form demonstrates that each point has been fixed at least twice.

Presentation of Data

The data presented for examination at the end of a setting out job must include, for each station:

1. A setting out data sheet complete with confirmatory
2. A detail/setting out sheet of check observations to previously emplaced marks
3. Supplementary taping sketch etc. if appropriate (Appendix 9)
4. Computer printout of check observation residuals
5. A "Summary of Beacons" list for the whole job (appendix 7)
6. A survey plan which contains all the information for each parcel which is as specified for a Certificate of Survey.

3.10 Surveys By Linear Measurement Only

DEFINITION OF A GRAPHIC SURVEY

A field survey, when the work is carried out with a tape and optical square only, is normally defined as "graphic". Most frequently such surveys will be parcels which have a simple geometric shape and side lengths of less than 50m, and which can be fixed on, or related to, detail readily identifiable on the existing mapping.

SIZE, SHAPE AND POSITION OF THE PARCEL

In such surveys: -

- The SIZE of the parcel will be determined by linear measurement, usually by a steel or cloth tape.
- The SHAPE of the parcel will be determined by diagonals, optical square (rarely used nowadays) or such similar measurements as are necessary to fix an unambiguous geometric figure.
- The POSITION of the parcel will be determined by measurements to sufficient points of "hard detail" to allow the parcel to be accurately charted at standard map scale. This charting will then be used to fix the position on the national grid to plottable accuracy.

THE FIELD SKETCH

The surveyor will draw the Field Sketch (Appendix 9), either on the pre-printed form or on a photocopy of an extract of the latest update of the standard map sheet, whichever is more convenient. The Field Sketch will record:

- All measurements made by the surveyor in the field, and ONLY such dimensions/measurements as he has physically measured i.e., any scaled or calculated distances which are needed will only appear, suitable annotated, on the Certificate of Survey.
- Annotation of any descriptive detail which will appear on the final certificate such as:
  - Road and parcel numbers
  - Such abuttal information as is available.
  - Description of the property or land use

- The following topographical detail and services (visible & underground), where is it relevant or necessary to the parcel boundary, will be recorded if it falls within the parcel or within 10m of the parcel boundary:
  - Walls
  - Buildings
  - Telegraph poles
  - Electricity poles
  - Manhole covers.
  - Any other permanent development feature
  - Any other feature which might directly affect the development of the parcel e.g., any evidence of underground cable, or entrances, windows or A/C units in walls abutting the parcel.
- All necessary measurements to identify and quantify an apparent encroachment by public or other private property.

TECHNICAL REQUIREMENTS

The following technical conditions will be observed in all cases:

- Sufficient redundant measurements must be made to enable two independent area calculations and independent confirmation of the shape and positioning of the parcel. In particular, when setting out "online", measurements are required to fixed marks in BOTH directions.
- Sufficient check measurements will be made, and recorded, to ensure that the hard detail which is used is correct.
- Taped off-sets are limited to 15m, offsets with an optical square are limited to 25m.
- Prolongations will not normally exceed twice the base length and should NEVER exceed 50m.
- Measurements will be made and recorded to the nearest 0.01m (i.e., 1 centimetre).

- Curvilinear boundaries will be approximated by internal chords. In the normal case the chord to curve distance will be less than 0.1m. If this criterion results in marks at less than 3m spacing the case should be referred to a supervisor for instructions.
- Incorrect information on the field sheet must be crossed out and initialled, it must NOT be erased or over-written. Failure to comply will result in disciplinary action.

FIELD COMPLETION

Before leaving the site:

- The surveyor will mark and number the parcel corners.
- Where appropriate, ensure the marks have been pointed out to the client, and "Handover of Marks" certificate has been signed.

NOTE

All the field graphic surveys have been transferred to numeric environment.

3.11 Beacon Verification by 3 Distances

The “Verify Beacons by 3 Distances” option of Surveyor4, related to the use of “supplementary taped distances”.

Particularly, relates to the process of establishing marks in the ground at positions defined by pre-determined coordinates, or **occasionally** graphic infill dimensions.

Pre-Field states:

For each control station:

1. A list of the coordinates of all points which could be set out from that point is compiled and is converted to a tabulation of setting out data by use of option 2 of the calculation of bearings and distances suite in SURVEYOR.
2. Setting out distances must not exceed 200m without specific authority from the supervisor.
3. Included in the list are AT LEAST two RO's, chosen such that the nearer of the two is further from the point than any of the points to be set out.
4. A new page of printout will be used for each setting out station.
5. Each point to be set out should appear on the list of AT LEAST two stations; **if this is not practicable the need for supplementary taping to enable an independent check must be noted**.

From this it is clear that the intent of the use of “supplementary taping” is for **extraordinary** situations only and only to provide an **independent check** of point set out by **instrumental survey.**

Consequently, the use of the PRN/RTK GPS to establish 3 coordinated points close all corners of a parcel, with all corners then fixed by 3 taped distances from those temporary points is not in keeping with the requirements of the Technical Instructions.

A further concern lies with the quality of recording of tape measured distances on Field Sketches, and the absence in this process of any redundancy, gross error check or method of confirmation that the measured distances have been accurately recorded and no observation error exists. This is a fundamental principle of surveying, which is not being satisfied by this field procedure.

The final concern is that this process provides no reliable accuracy assessment of the GPS coordinates derived for the temporary points.

CONCLUSION

The Field Procedure described above does not meet the Technical Standards required for Cadastral Surveys and hence must not be used on any jobs carried out in the field, effective from the date of this Notice **except in exceptional circumstances.**

With effect from 1 February 2011, Private Sector Survey Offices (PSSO's) must cease using this procedure **except in exceptional circumstances**. Any jobs submitted for examination where this field procedure was used after 1 February 2011 will be Returned to Surveyor for survey by an accepted procedure.

Any surveyor, CSD or PSSO who can demonstrate that enhancements to the procedure can satisfy CSD concerns about ensuring no observation error in taping or GPS observations, may apply to CSD for consideration of that process.

4. Survey by GPS – Procedure for use of GPS with the Bahrain Permanent Reference Network (PRN)

1. Usage

These instructions are valid for every survey that:

1. utilizes GPS with the Bahrain PRN, and
2. is to have effect on the Bahrain cadastre or any cadastral parcel.

These instructions have been derived to overcome the fact that the Bahrain PRN provides coordinates that are a best fit over the Bahrain main islands, and do not allow for errors and adjustments that have occurred during the historic break-down of the Bahrain primary control network to the tertiary level (RM's) upon which the local area cadastre depends. Now local area corrections (where required) are provided by the system in order to agree with the existing grid coordinates. Functioning of PRN with local area corrections to be monitored for some time to check the agreement of PRN coordinates of the CSCS model with the existing coordinates.

2. General

Coordinate Validation and Proof of Origin.

2.1 To ensure that each survey is in terms of its local area coordinates, upon commencement the survey must be connected to three (3) existing major control marks that are chosen geographically to surround the survey site.

2.2 Coordinate validation and proof of origin observations shall be made with the GPS antenna held steady and vertical above each major control mark.

2.3 Observation of each major control mark will produce PRN coordinates that agree with the published value of that mark to within 0.030m.

2.4 If agreement at a major control mark cannot be obtained to the accuracy prescribed at 2.3 above, alternative marks can be chosen providing the geographical requirement at 2.1 is satisfied.

2.5 When requirements at 2.1 and 2.3 are satisfied, survey at the site may commence.

2.6 If agreement cannot be obtained, the survey should be carried out by some other method (i.e., GPS using a local base station, conventional cadastral TPS techniques, etc.).

3. Monitoring the functioning of PRN

3.1 Surveyor must occupy at least 3 RM control points that surround the area of the subject parcel in Stakeout mode on commencement of each survey. (Use a Tripod when recording observation at RM Control Points)

3.2 Record the coordinates of RM Control points in Stakeout mode so that the Surveyor can ensure the agreement between measured coordinate and original coordinate at the time of survey.

3.3 Before completion of each job, Surveyor must update the records of MS spread sheet

4. Detail Surveys

Following procedure is indicative on detail survey work with Bahrain PRN (indicative) for Leica GPS 1200 system.
Procedures are similar to other GPS receivers.

4.1 Follow the field survey procedure given in the Leica GPS 1200 training to carry out surveys.

4.2 Select the Coordinate System **Bahrain CSCS v1** to view the National Grid Coordinates

4.3 The Max 3D Quality should be set as **0.05m** for CSD work

4.4 Pick all details and record them as 001, 002, 003, etc.

4.5 Open project in LGO and import data

4.6 Export to ASCII file after filtering data.

4.7 Import ASCII file to SURVEYOR4 for the rest of the computation.

5. Setting out Surveys

5.1 Import required parcel coordinates from the **SURVEYOR4** (or from any other Survey COGO Software) to Project in **LGO**

5.2 Transfer Project coordinates to Controller

5.3 Follow the field survey procedure given in the Leica GPS 1200 training to carry out Staking out Surveys and Stakeout required points from the job within the limit and record each point.

5.4 Open project in LGO and import data.

5.5 Get the **Coordinate Comparison Report** from LGO (Appendix 15)

5.6 No need to import stakeout coordinates to SURVEYOR4 to get 'V' Status. The Coordinate Comparison Report shows the accuracy of the staked-out points. The examination must check the Coordinate Comparison Report for the deviation of staked out points.

6. Control Surveys

The following procedure is to be adopted to establish Minor Control Points (MCP) (Appendix 10).

6.1 Occupy GPS system over the point using Tripod for 10-15 minutes.

6.2 Use Point Nos as STN1, STN2…, and record data.

6.3 Open project in LGO and import data.

6.4 Export to ASCII file after filtering data.

6.5 Import ASCII file to SURVEYOR4 and finalize the job.

7. PRN Data Management

7.1 **Transfer Data to Controller**

Data from the Controller to Computer and LGO to Controller can be transferred using the Data Exchange Manager in LGO

Steps:

7.1.1 Connect Controller to Computer

7.1.2 Open LGO

7.1.3 Go to TOOLS and then Data Exchange Manager

7.1.4 Double click the ActiveSync at Left Side then all jobs in Controller can be viewed.

7.1.5 Double click the Projects at Right Side then all projects in LGO can be viewed.

7.1.6 Transfer DBX folder from Controller to Computer or Transfer Project in LGO to Controller

7.2 **Data downloading and Viewing**

7.2.1 Open a new project in LGO

7.2.2 Give Job number as Project Name and Path of your working directory

7.2.3 Select Coordinate System as Bahrain CSCS v1

7.2.4 Import data from your data drive (IMPORT RAW DATA & Select raw data from the DBX folder)

7.2.5 Select the Job File Name: JOB & File Type: System 1200 raw data & IMPORT

7.2.6 ASSIGN data to the Project.

7.2.7 Select LOCAL & GRID to view the local grid coordinates

7.3 **Filtering & Quality Check**

7.3.1 Go to the **TOOLS** menu and select **FILTER**S from the pull-down menu.

7.3.2 Select **GENERAL** tab & then **CSD-D- Status** and Click **OK** for Detail Survey jobs and **CSD-MCP** and Click **OK** for Control (MCP) Surveys.

7.3.3 All points with good quality accepted for "D" status will be selected to export. **(Surveyor has recorded Point 0003 before it reached the accepted quality. This point is now de-selected with this filtering**

7.4 <u>Export Data from LGO (Detail Surveys)</u>

7.4.1 Go to **EXPORT** menu and select **ASCII DATA**

7.4.2 Select Path & Type file name with extension .asc (0721234.asc)

7.4.3 Select save as type: **Custom ASCII fil**e

7.4.4 Select Format Template file ***LGO_DD.FRT*** for Detail Surveys and ***LGO_MCP.FRT*** for Control Surveys from *W:\CSD Tech. Procedures for Survey Instruments\GPS – PRN\LGO_FORMAT*

7.4.5 Select Coordinate System **Bahrain CSCS v1**

7.4.6 You can import this ASCII file to **SURVEYOR4**

7.5 <u>Import Data from SURVEYOR4 to LGO</u>

7.5.1 Open a Job (0701234) in SURVEYOR4 Version 4.0818 & Extract data you need to export to GPS instrument.

7.5.2 Export **tab separated text file** from the SURVEYOR4 Version 4.0818 (0701234.txt)

7.5.3 Go to the LGO and Create a project
7.5.4 Select **Import** and then select **ASCII data** from the pull-down menu
7.5.5 Select **File Name** & Select **Template: From-Surv4**, **Coordinate System: Local** and import data to the project
7.5.6 This project can be transferred to the Controller for setting out surveys.
7.5.6 This project can be transferred to the Controller for setting out surveys.
7.6 Stakeout Survey output from LGO
7.6.1 Open a Project in LGO
7.6.2 Import Stakeout data to the Project.
7.6.3 Go to TOOLS from the main menu and then click Coordinate Comparison to get the Coordinate Comparison report (Appendix 15).
7.6.4 Point No, Original Coordinates, Stakeout Coordinates, Differences in Coordinates and Difference Vector are shown in the Coordinate Comparison Report.

5. Authorised Survey Markers

5.1 Purpose

The purpose of a survey mark is to provide physical representation of a point which is either: -

- fixed on the national grid or,
- known in relation to a coordinated point
- mered to identifiable features of hard detail.

In the Cadastral Directorate, marks are used: -

- As a basis for further survey
- Demonstrate the boundaries of a land parcel to:
  - an owner or potential purchaser
  - the Municipality for purposes of building control
  - service authorities, to control service corridors

The mark must be: -

- ✓ durable

- ✓ a permanent mark should be designed to last at least 5 years
- ✓ potential vehicle damage should be minimised by keeping the mark as close as possible to the ground
- ✓ identifiable; the point's unique number to be clearly inscribed in the metal or the surrounding concrete.

5.2 Standard Parcel Boundary Marks

Depending upon the terrain, parcel boundaries should be marked by one of the following: -

- ❖ Wherever practicable every boundary turning point will be marked by a departmental design aluminum peg driven flush to the surface. The peg will be: -
  - the most suitable of the three standard lengths of 25cm, 50cm or 75cm
  - Pre-numbered to minimise damage and early obliteration.
- ❖ In urban areas it may be necessary to use:
  - A small metal pin driven flush into an existing wall.
  - A round headed, washered, pin driven into a tarred road
  - A discreet paint mark.
  - Numbering will be on the washer or, for temporary marks only, a metal dymo number pinned alongside.
- ❖ In areas where bedrock occurs at or near the surface:
  - A hole drilled into bedrock with a metal pin or aluminum mark concreted collared to the surface.
  - An iron pin/pipe driven to refusal with a further construction as shown in Appendix 11
- ❖ In reclamation areas, unconcreted marks are unlikely to survive and suitable lengths of 2" pipe, long enough to reach firm ground or adequately compacted fill, preferably with a concrete filled concrete plastic collar will be required.
- ❖ In the interests of permanence, the owner should be encouraged to construct a well-founded wall corner:
  - this should be not less than three blocks in each boundary direction and at least two blocks high.

- it may be constructed over either an aluminum peg or a temporary pin
- the wall must lie INSIDE the boundary as defined and not straddle or lie outside the boundary.

5.3 Control

- Bahrain is covered by a network of substantial marks fixed and maintained on the National Grid by Cadastral Directorate staff will not be called upon to place or build such marks. They are used as origin and closure for local control traverses using coordinate values provided to the database by Svy Ops.
- Coordination is disseminated from the control framework by a series of closed control traverses. The stations used for this purpose are usually intended to be permanent, unless in particularly vulnerable locations, and should be marked as such.

5.4 Utility Hazards

- The attention of all surveyors is drawn to the dangers and risks of striking buried utilities, in particular:
  - Electricity cables of various voltage
  - Water mains of various diameters and materials
  - Telephone cable, in particular fiber-optics
  - Gas lines which are usually under high pressure.
- All such cabling etc. is required to be at a depth greater than 1m, but the relevant authorities are unable to guarantee that this is the case.
- If any doubt exists, the location of such services should be determined by a service enquiry and trial holes if necessary. In extreme cases, it may be necessary to hand clear the marker site rather than just drive in a metal peg.
- In the event of damage to a utility, the relevant emergency service must be alerted immediately. A report detailing the circumstances and position (incl depth) of the utility will be made immediately upon return to the office.

5.5 Historical marks

In the past a variety of marks have been used which may still be found and should be recorded. These include:

- Iron pins, frequently physically unnumbered, in varying amounts of concrete.
- Iron pipes driven deep into soft or reclaimed ground usually with a concrete collar and inscribed number.
- Survivors of the first experiment in a standard pattern marker consisting of a 4" plastic pipe, concrete filled round an iron pin in a concrete foundation, with a standard plastic label.

Cadastral Survey Marker numbering

There are two levels of ground mark in the Cadastral system.

- Control points, &
- Property boundary marks

Control Points

a. Control points are numbered in sequence in the 1:2000 map sheet in which they fall.

b. The correct map sheet is indicated by the grid coordinates of the point.

c. Numbers have the form

1:2000 Map sheet / Serial i.e., the format XXXYY/nnn

Parcel Boundary Turning Point Markers

a. Parcel boundary markers are numbered in accordance with the SD job number in which they are emplaced.

Job Number / Serial i.e., the format YYXXXXX/nnn

b. Where old beacon numbers incorporate the job number but are incorrectly formatted, they will be re-numbered in the new system e.g.

either 12348301 or 831234001 will become 8301234001

c. Parcels will be numbered clockwise from the point in the northwest corner and will incorporate the existing beacon values and numbers of the parcels they abut. This includes parcels fixed by graphic survey.

d. Where a corner point is also a point of hard detail (e.g., a house or wall corner) this will be indicated in the beacon description and noted on the Certificate of Survey.

e. Any permanent witness marks emplaced to assist recovery after demolition will be numbered serially as YYXXXXX/nn/r

5.6 Historical Marker Numbering Systems

a. Prior to job number 83020001, marker numbering followed a different system

b. Control points were numbered, in a series similar to the present boundary point system, as:

Job No./ Year / Serial i.e., the format JJJ/YY/nn

c. Boundary marks were either labelled as "numeric" (i.e., Fixed instrumentally) or "graphic".

- Numeric points were numbered sequentially from a centrally maintained register as:

Year / serial i.e., the format YY/nnnn

- Graphic survey marks were an unnumbered iron pin.

d. Such marks will still frequently emerge in surveys, and wherever convenient, they should be re-numbered in the new system

5.7 Handover of Boundary Marks Responsibility

INTRODUCTION

With the introduction of the comprehensive "permanent" marking of parcels, the owners should be made responsible, and be made aware that they are responsible, for the markers emplaced to delineate their parcels.

PROCEDURE

- As soon as possible after demarcation, preferably on the same day for simple jobs, an appointment will be made with the owner or client for him to take responsibility for the marks.
- In all cases this will be done before any documents are released from SLRB.
- A form will be filled with:
  i. The locality and locality code of the survey
  ii. The name of the owner or agent receiving the parcel

iii. The name of the owner if he is represented by an agent.
iv. The LRD registration number of the parcel
v. The LRD case number if one exists.
vi. The job number of the survey
vii. The SD parcel number of the parcel
viii. The owner and/or agent's CPR number, signature, and date, by which he accepts responsibility for the marks which he has been shown.

- Two copies are to be completed.
  i. First copy for retention by the signatory
  ii. Second copy to be secured in the relevant job file.

5.8 Field Data Records (Private Sector Subdivision)

Submission

On completion of the design, calculation and demarcation of a development sub-division, the Private Sector firm will provide:

1. A plan on a stable base material of all parcel corners and block corners. The plan will conform to the following:

   (a) Scale 1:500 (1:1000 or 1:2000 if 1:500 exceeds A1)

   (b) Plan must be clear and legible, suitable for copying

   (c) Standard panel must be completed and signed off by the professional Principal of the firm

   (d) To include:

      1. All parcel numbers and areas
      2. All beacon numbers
      3. All beacons join dimensions
      4. All service parcels clearly labelled
      5. All roads numbered (with widths if available)
      6. All abuttal parcel numbers or descriptions of abuttal if no parcel number has been allocated
      7. Grid values

2. All beacon coordinates suitably labelled and all subordinate parcel strings (i.e., not to contain the parent parcel string); are recorded to the database. Exchange is happening by e-mail.

3. A Report to include:

(a) Any further correspondence.
(b) The method of construction of the computations
(c) Printout of joins proving road widths, splays etc.
(d) Printout of the final coordinate list
(e) Print of parcel strings (bearing and distance with area)
(f) Listing of the parcels differentiating between owner's parcels and O.G.D. parcels (e.g., sub-station sites).

Field Practice

1. Every field survey must contain a minimum of at least one redundant measurement; more are preferable.
2. Wherever possible, redundancies based upon "strong" geometric solutions will be adopted.
3. Multiple observations to obtain reliable mean values should always be reinforced by independent geometric redundancies.

Surveyor's Report

Initiation

Every survey requires a surveyor's report which will: (Appendix 6)

1. be written on a separate sheet
2. be headed by:
   1) Job No .....
   2) Surveyor's name printed in BLOCK CAPITALS
   3) Date

Contents

The report will include, as appropriate, details of the following items:

i) the nature of the parcel (rural/urban, open/built up etc.)
ii) a verbal description of the boundary
iii) the fixed points or hard detail points used for fixation
iv) the method of location
v) the method of survey
vi) accuracies/residuals of any computation involved

vii) all field checks applied (including a statement of results)

viii) the area of parcel, and details of method of area calculation

ix) any difficulties encountered in the survey

x) any discrepancies discovered e.g.

(a) encroachments

(b) shortfalls

(c) clashes with services/utilities

(d) conflicts with planning intentions

xi) suggestions on possible solutions to any discrepancies

xii) a certificate of compliance with Technical Instructions

Style

The report should be concise, i.e., as brief as possible consistent with including all relevant items of the above information.

Validation

Before release for examination the report will be:

i) signed by the surveyor
ii) counter-signed and dated by his supervisor

ADDITIONAL REPORTS

In the event of further surveys being required, a similar report will be added to explain and describe the additional work.

F. Cadastral Survey Standards / Accuracy

Accuracy Standards

This summary indicates the accuracy expected and represented for survey work carried out by, or utilised by, Cadastral Directorate		
1	**Geodetic Control Closure** **(Closure: defined to be vector misclosure/total traverse length)** **Marks (absolute position)** **Relative to the distance between**	**1:50 000** **0.01m** **1:50 000**
2	**Cadastral Control Surveys** **Traverse closure* the smaller of** **Points (position)**	 **0.0015/Lm or** **1:20 000** **0.02 m**
3	**Cadastral Parcels** **Parcel boundary marks** **Parcel dimensions (as quoted on Title Deeds)** **(As quoted on LC / CoS)** **Curvilinear boundaries - arc to chord (dev)** **(undeveloped)** **Detail points**	 **0.05m** **0.1m** **0.01m** **< 0.2m** **< 0.3m** **0.1m**
4	**Cadastral Index Maps (CIM)** **95% parcel corners – urban are** **- rural are**	 **within 1m** **within 5m**
5	**Topographic Mapping** **hard detail - relative accuracy between** **- absolute (rmse)**	 **0.15%** **0.3m**

Field Survey Precision

The following indicates the consistency requirements for repeated field observations			
1	ANGLES	Detail rounds Multiple values closures	Multiple values of traverse angles
	1" Theodolite	< 30"	< 10" spread
	20" Theodolite	< 1'	< 40" spread
2	Distances		
	Tape repeatability < 100m		< 0.01m
	100m < d < 200m		< 0.02m
	EDM to hard detail or survey mark		< 0.02m

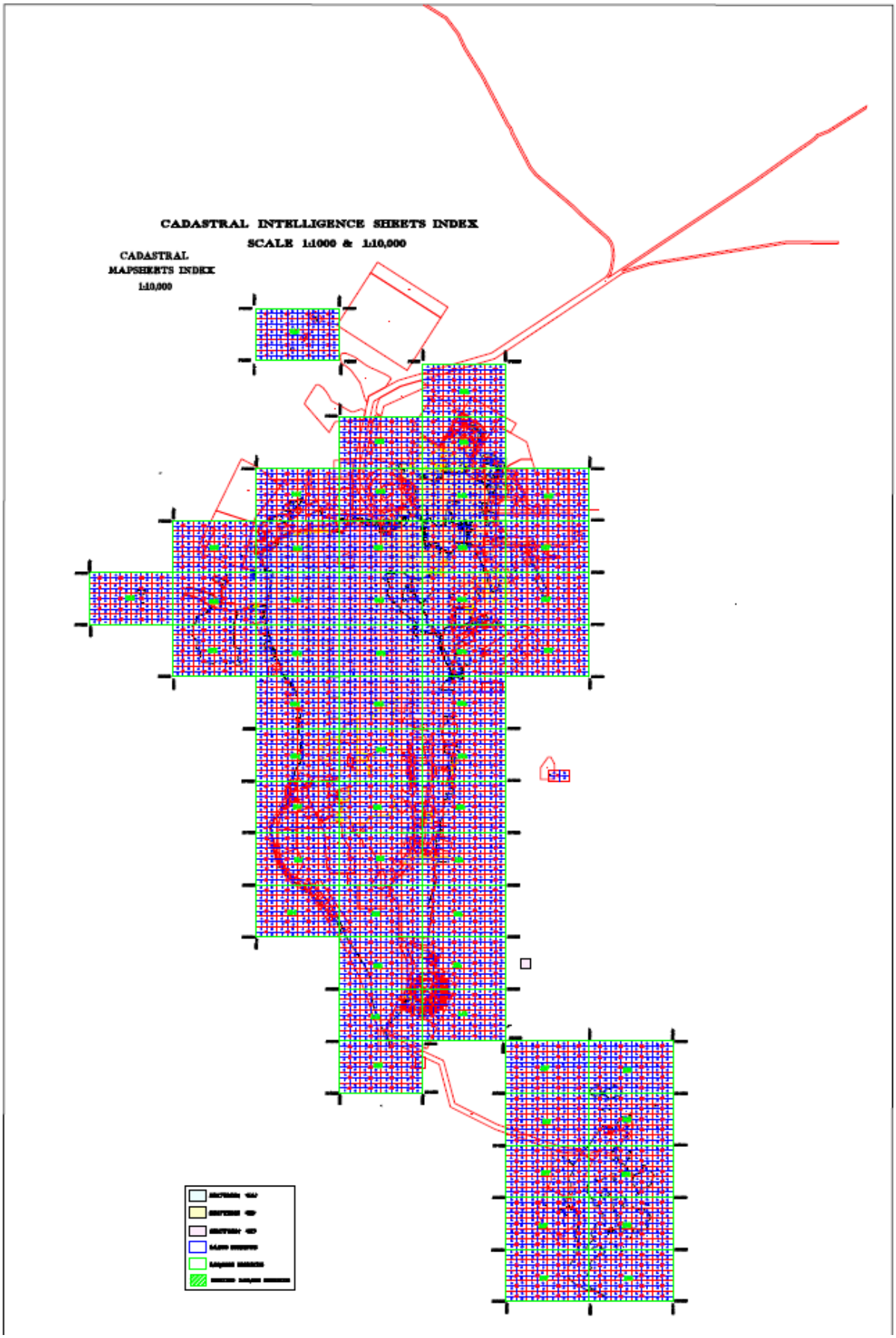
Appendices

Appendix 1. LMB-BLOCKS

LMB-BLOCKS.xlsx

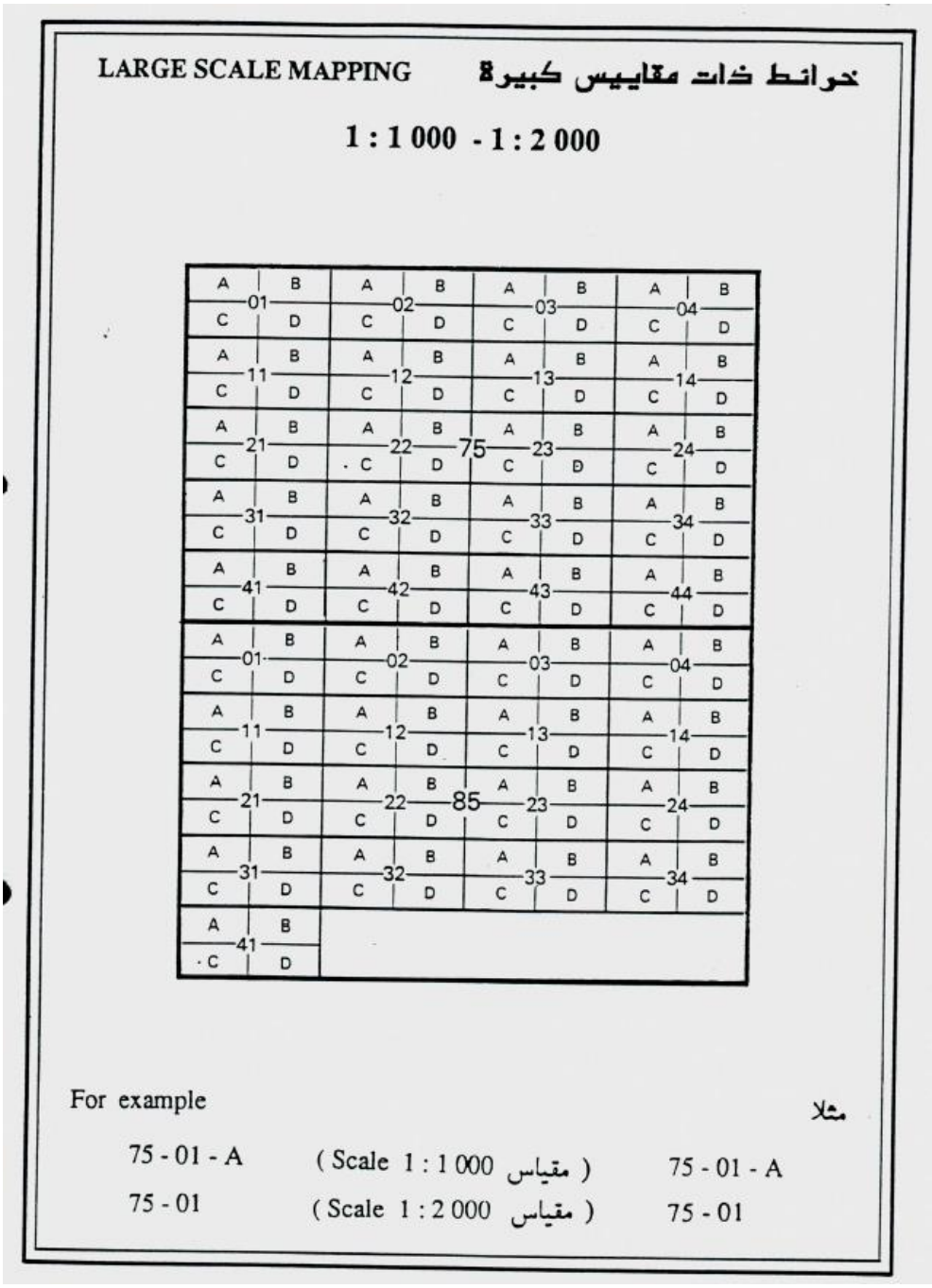
Appendix 2. Map Index 1:1000 & 1:10000 entire Bahrain areas

index-2014-1000-cad.pdf


CADASTRAL INTELLIGENCE SHEETS INDEX
SCALE 1:1000 & 1:10,000
CADASTRAL
MAPSHEETS INDEX
1:10,000

Appendix 3. Large Scale Mapping Index

index#3.pdf



Appendix 4. Private Sector Application.

	PRIVATE SECTOR SURVEYING OFFICE APPLICATION FOR AUTHORISATION	FORM No: PS 1 Date: March 2023

CSD Ref: _____

The firm of _____ hereby applies for inclusion on the Register of firms authorised by the Cadastral Survey Directorate (CSD) of the Survey & Land Registration Bureau (S&LRB) to carry out such cadastral land survey work as may be requested by private clients, including other Government departments, which has been approved by CSD as work suitable for this purpose.
The following information is given in support of the application (use additional pages as required):

1. Full Name of Firm:

   Address:

   Tel No: Fax:

   Email:

2. Copy of Commercial Registration.

3. Committee for Organising Engineering Professional Practice
   a. Licence No:
   b. Category:
   c. Discipline:
   A copy of the valid Permit to Practice Engineering in the Land Surveying Discipline is required.

4. Main Activities of the Firm:

5. Senior Member Responsible for Land Survey Matters:

   Tel No: Mobile:

6. Does the firm carry professional indemnity insurance? Yes/No
   If the answer is Yes, to what limit? BD

7. Equipment: (Please state make and quantity. Provide current calibration certificate for opto-electronic instruments)

   EDM
   Theodolite
   RTK GPS
   Computer
   Other relevant major items

8. Staff:
   (Please list the personnel who will carry out the work and provide a copy of qualification certificate, course transcripts (where available), CV and copy of current CPR for each)

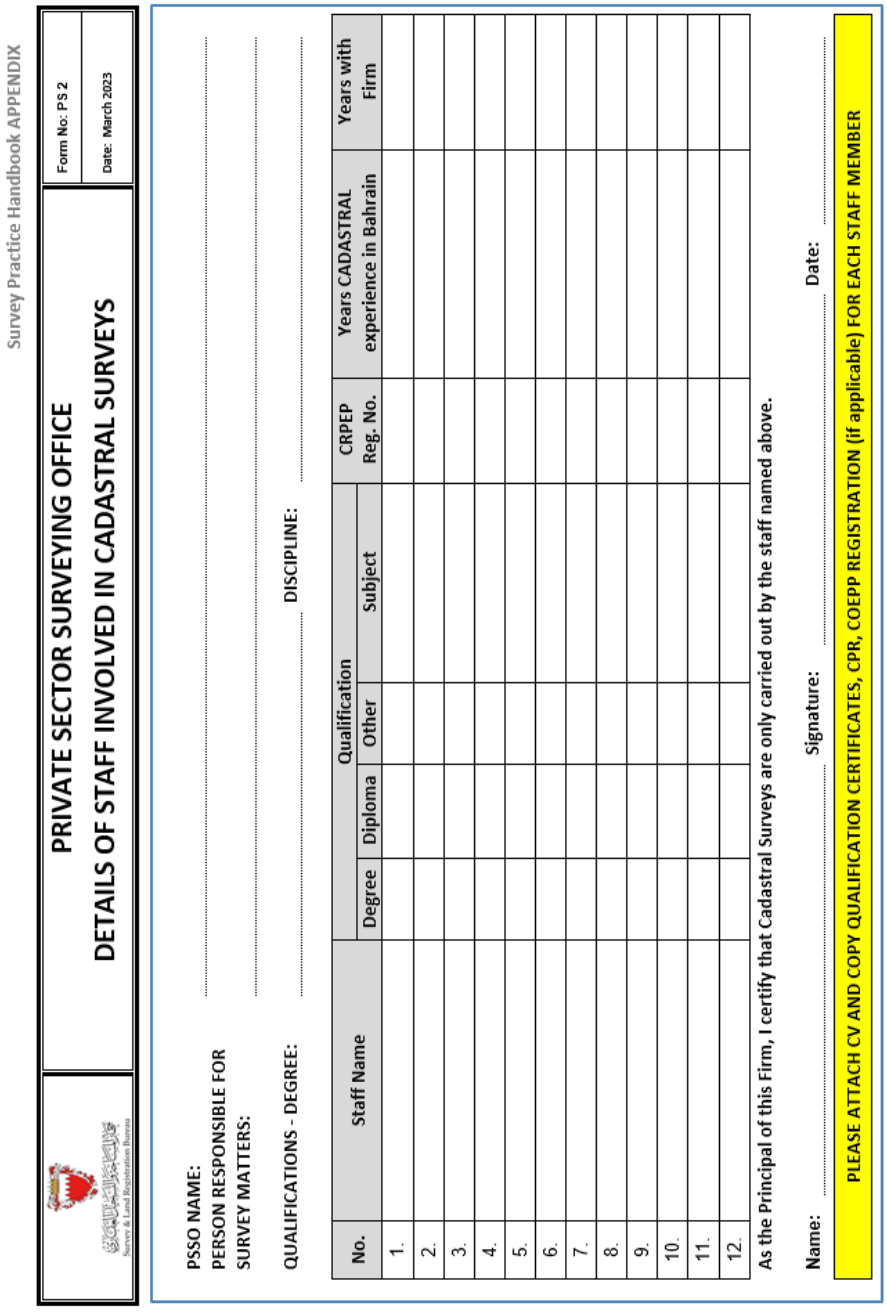
9. Which, if any, of the above are registered with the Committee for Organising Engineering Professional Practice.

Applicants Signature: _____ Approved By: _____
Director General of Survey

Date: _____ Date: _____

NOTE: CADASTRAL SURVEY DIRECTORATE MUST BE INFORMED AS SOON AS POSSIBLE OF ANY CHANGES/ADDITIONS TO THE INFORMATION GIVEN ABOVE

Appendix 5. Private Sector Staff Application Table



Survey Practice Handbook APPENDIX

PRIVATE SECTOR SURVEYING OFFICE

DETAILS OF STAFF INVOLVED IN CADASTRAL SURVEYS

Form No: PS 2

Date: March 2023

PSSO NAME: .....

PERSON RESPONSIBLE FOR SURVEY MATTERS: .....

QUALIFICATIONS - DEGREE: ..... DISCIPLINE: .....

No.	Staff Name	Qualification				CRPEP Reg. No.	Years CADASTRAL experience in Bahrain	Years with Firm
		Degree	Diploma	Other	Subject			
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								

As the Principal of this Firm, I certify that Cadastral Surveys are only carried out by the staff named above.

Name: ..... Signature: ..... Date: .....

PLEASE ATTACH CV AND COPY QUALIFICATION CERTIFICATES, CPR, COEPP REGISTRATION (if applicable) FOR EACH STAFF MEMBER

PS Authorisation Application Forms 2

Survey Report.pdf Surveyors Report Template v1.0 20042

Appendix 6. Surveyor Report

CSD-CAD-10
Page: 15.1

SURVEY REPORT

Job No: **Surveyor:** **Survey Date:**

Nature of Plot:

UTM Coordinates Given: **YES** / NO

(1) Description of Boundary:

(2) Method of Survey & Remarks:

(3) Details of Encroachment / Short falls / Planning / Services affecting plot

(4) Beacons Found:

(5) Beacons Placed:

Time taken Office: H **Field:** H **Travel:** H

I certify that the above survey was carried out in accordance with current procedures.

Sig. of Surveyor: ..... **Date:** 08/02/2021

Sig. of Reg. Surveyor: ..... **Date:** .....

Appendix 7. Summary of beacons

Summary of Beacons.pdf

15.2

SUMMARY OF BEACONS

BEACON NO.	PLACED FROM		COMPUTATION REFERENCE PAGE	CHECKED FROM		ACCURACY	DESCRIPTION REMARKS
	STATION NO	F.B. PAGE		STATION NO	F.B.PAGE		

EXAM REPORT SHEET.pdf

Appendix 8. Examination Report

JOB NO: _____ 20.1

PROCEDURE	SIGNATURE AND DATE
CORRECT JOB REQUIREMENTS	DP / L.C. / C.O.S
INDENTS AND PAPERS	LRD/OWNER REQ./
IMPERIAL TO METRIC CONVERSIONS	INTERNAL MEMO
DIMENSION ON TD BLOCK PLAN PPD ABUTTAL'S	
LOCATION ON SD SHEET, RDG'N ON CHECKED	
FIELD SKETCH-OFFICE SKETCH, LAND CERTIFICATE	PLOT NO.
ABUTTAL'S SHOWN CORRECTLY, ENCROACHMENT NOTED	_____
CHARTED	
CHECK SCALED DIMENSION ON CHARTED PLOT	
CALCULATED AREAS	
MARK OFF JOB CHECK LIST	

ATTACH A PHOTO COPY OF OFFICE SKETCH FOR CHEKING COMPARISON

COMMENT/ Remarks:

EXAM REPORT
- OFFICE/FIELD SURVEY PREPARED
TO ISSUE : DP / L.C. / C.O.S.
- FIELD SKETCH / DATA EXTRACTED FROM DATABASE.
- HANDOVER
- MODIFICATION REQ.
- COMPARISON/FIXATION
- SURVEY REPORT
- FINILIZED
- L.C. / C.O.S. PREPARED

FIELD SKETCH.pdf

Appendix 9: Field Sketch

Jop N° .....
Map Sheet .....

FIELD SKETCH مسودة الحقل

رقم العمل .....
رقم الخريطة .....

I certify that the measurements shown on this plan were recorded by me in the field.

Signed ..... Date .....

أشهد أن جميع القياسات الموضحة في هذه الخريطة مسجلة من قبلي في الحقل.

التوقيع ..... التاريخ .....

Cad. Frm. 12 — 5000/11/81

Appendix 10: Minor Control Point Description

SD-FLD-16.

MINOR CONTROL POINT DESCRIPTION

Established by:	Date:	Point No:
Job No:	Closure: 1:	
Checked by:	Date:	
EASTING:	NORTHING:	HEIGHT:

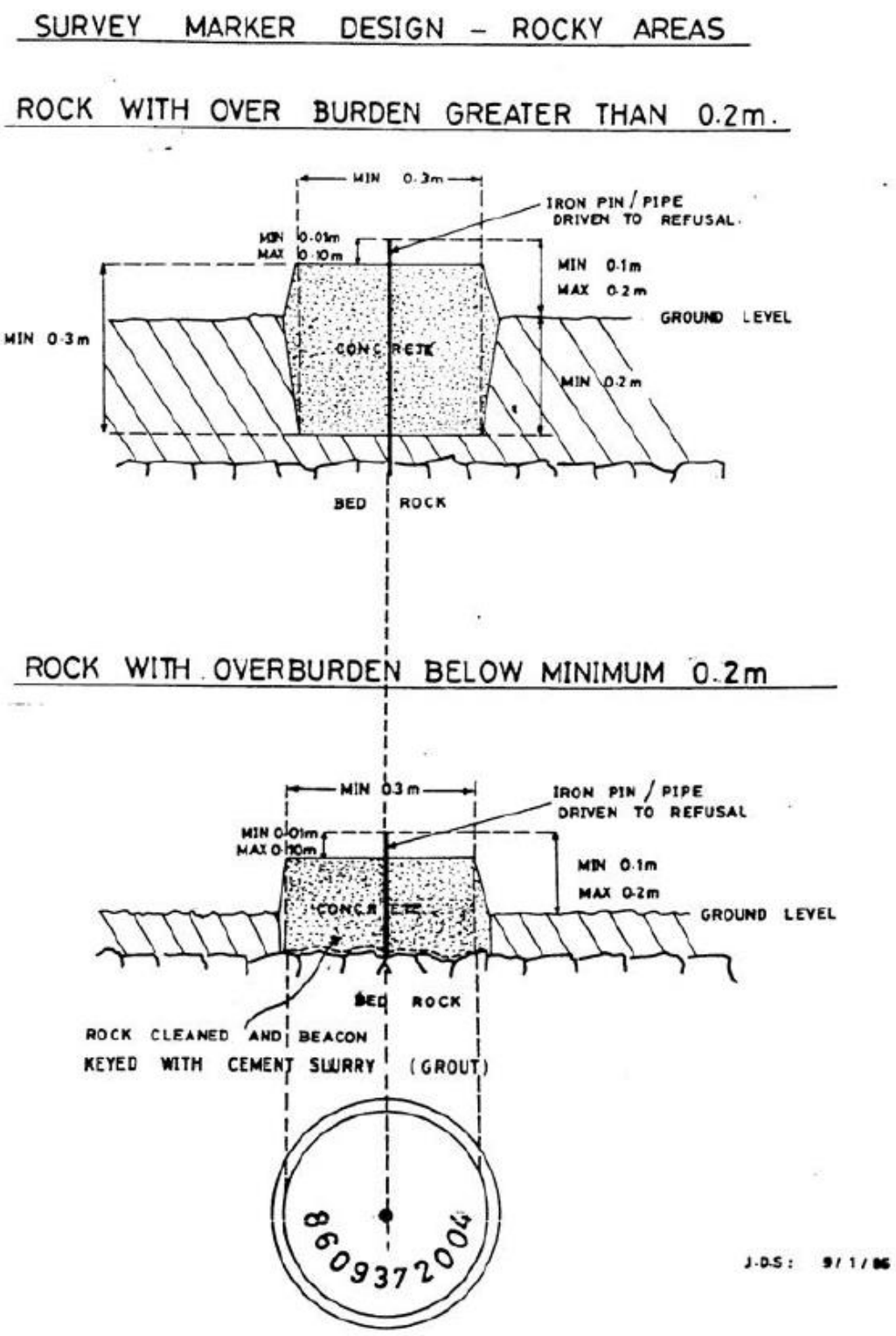
Construction of mark

Location Diagram

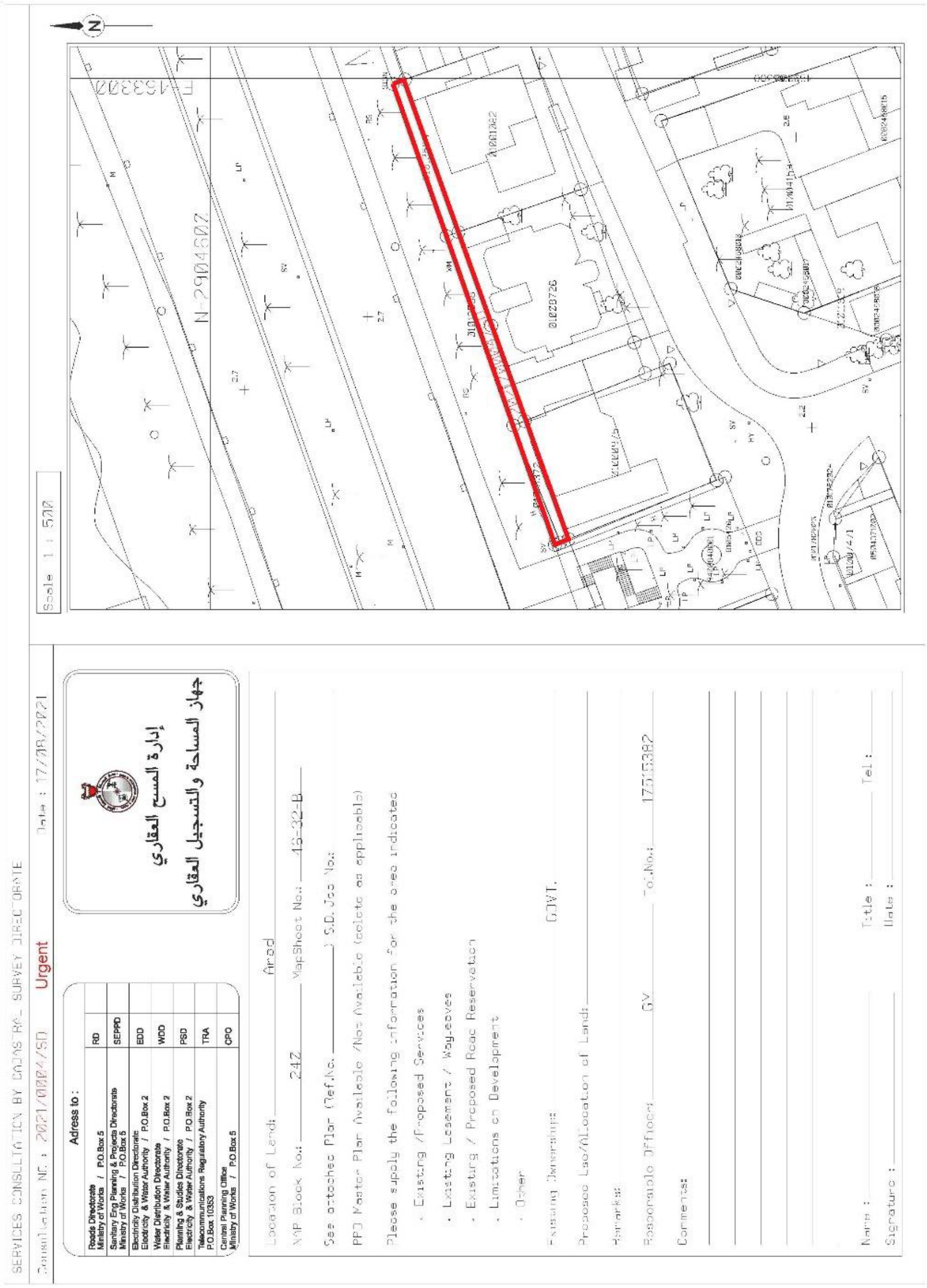
N

Appendix 11: Survey Marker Designs

ANNEX A.pdf



Appendix 12: Service Consultation



Appendix 13: Service Consultation / New Major Subdivision

New Major Subdivision.pdf

استمارة استشارة الجهات الخدمية / تقسيم رئيسي جديد

SERVICES CONSULTATION FORM / NEW MAJOR SUBDIVISION

To	Survey Directorate SURVEY AND LAND REGISTRATION BUREAU

Owner Name: MOHAMED EBRAHIM KANOO B.S.C CLOSED	
Subdivision No: UPDA/SDN/426874/22	Plot No: 08009952
Area: TUBLI	Map Sheet No: 65-13-A
Block No: 711	Date: 22/05/2022

ATTACHMENTS:
1- Location Plan.
2- Subdivision Plan.
3- Zoning Plan.

Please supply following information:

1. Cadastral / Topo map of the area showing the land of subdivision (Scale 1:1000 or 1:2000).

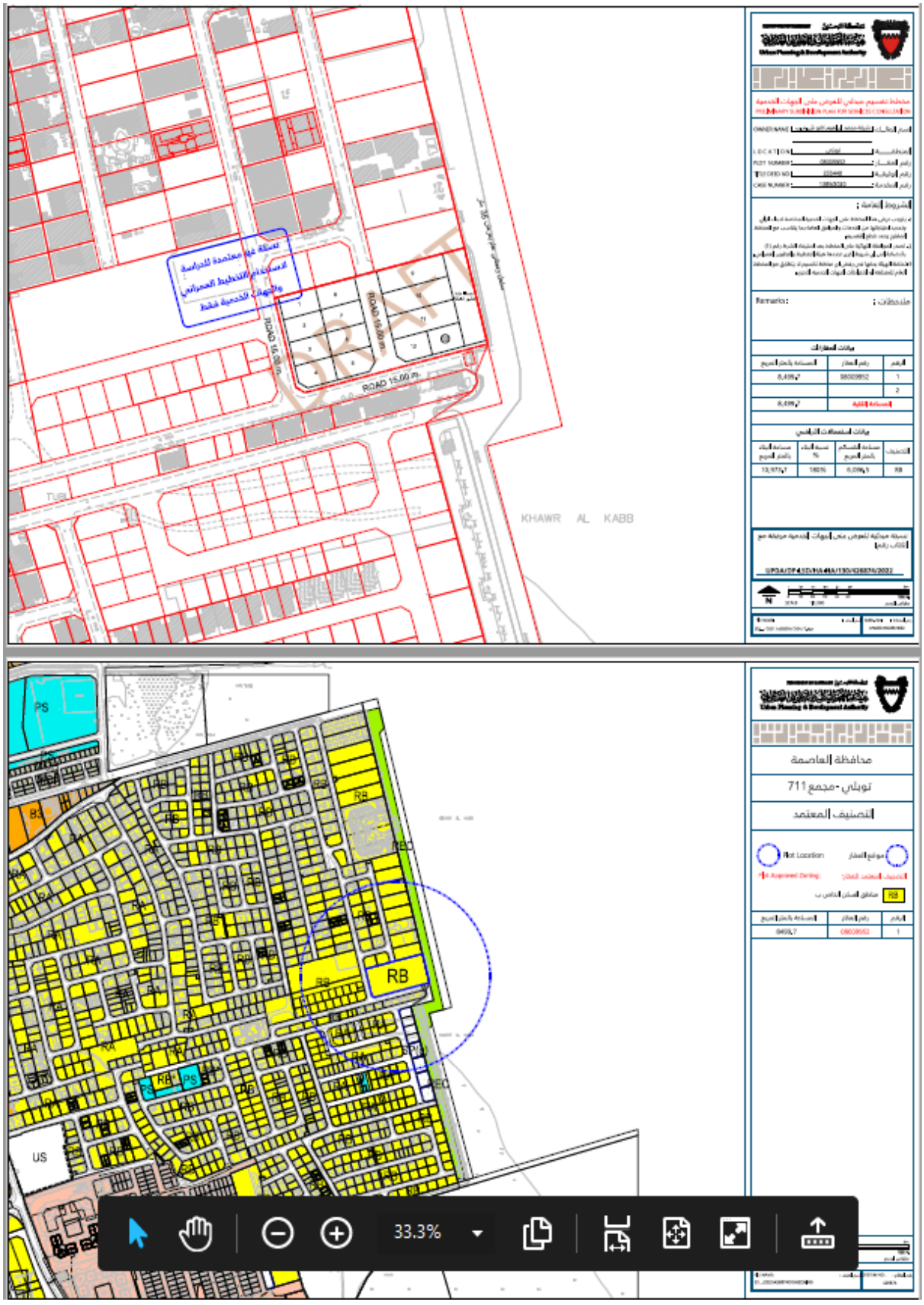
2. Comments / Conditions:

NOTE: Comments must be either typed or clear handwriting.

Authorized Signature: _____ Position: _____

Name: _____ Stamp:

KINGDOM OF BAHRAIN, URBAN PLANNING & DEVELOPMENT AUTHORITY


DRAFT
ROAD 15.00 m.
KHAWR AL KABB
RB
PS
US
33.3%

Appendix 14: Service Consultation / New Minor Subdivision

New Minor Subdivision.pdf

استمارة استشارة الجهات الخدمية / تقسيم رئيسي جديد

SERVICES CONSULTATION FORM / NEW MINOR SUBDIVISION

To	Survey Directorate SURVEY AND LAND REGISTRATION BUREAU

Owner Name: H/O of SALMAN ABDULLA ALSHAKHOORI	
Subdivision No: UPDA/SDN/434870/21	Plot No: 10024509
Area: AL MALKİYAH	Map Sheet No: 084-03-D
Block No: 1032	Date: 03/08/2021

ATTACHMENTS:

1- Location Plan.
2- Subdivision Plan.
3- Zoning Plan.

Please supply following information:

1. Cadastral / Topo map of the area showing the land of subdivision (Scale 1:1000 or 1:2000).

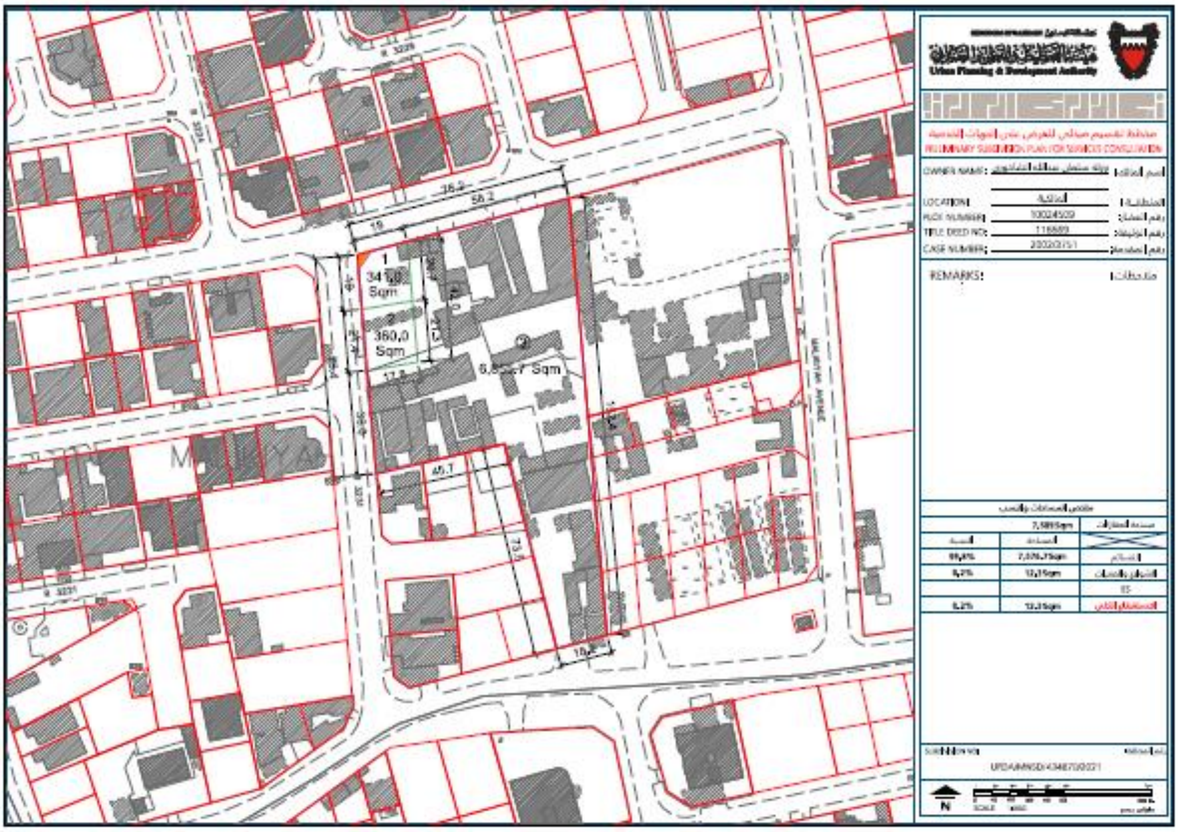
2. Comments / Conditions:

NOTE: Comments must be either typed or clear handwriting.

Authorized Signature: _____ Position: _____

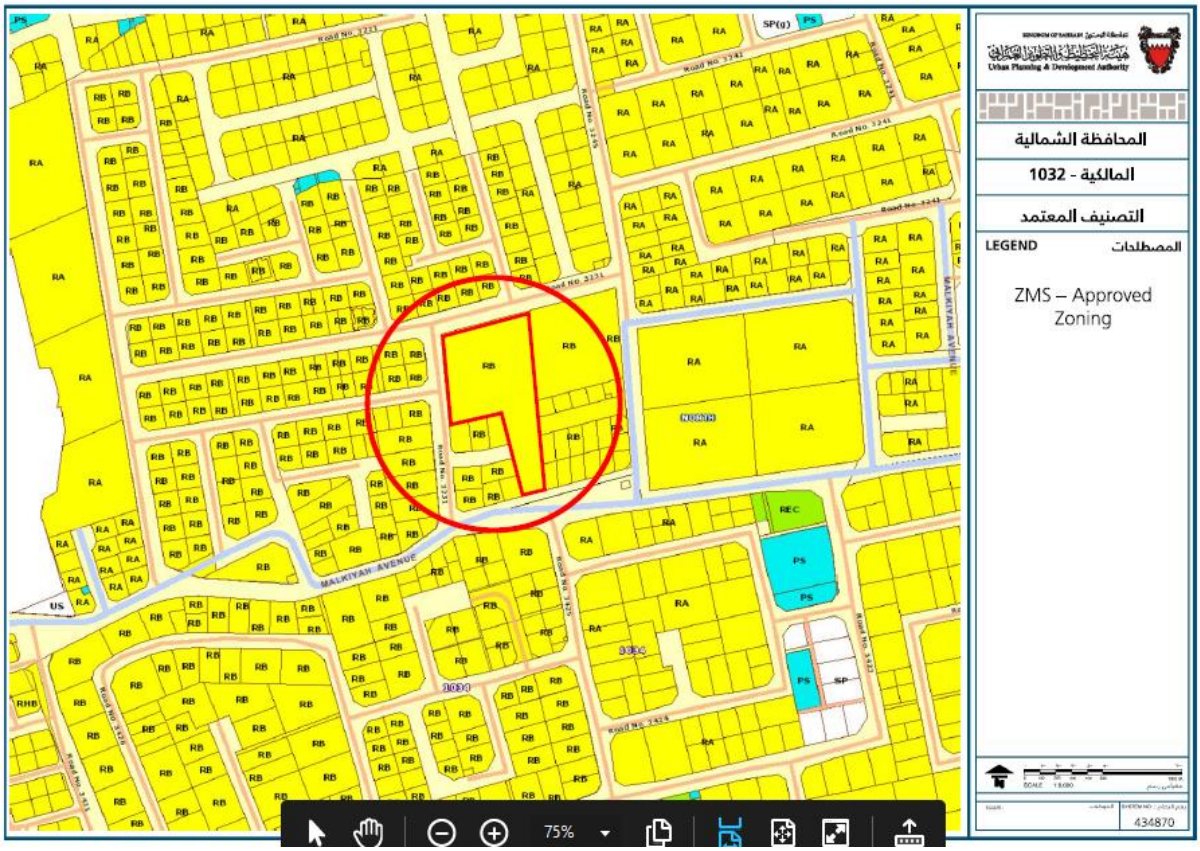
Name: _____ Stamp:

KINGDOM OF BAHRAIN, URBAN PLANNING & DEVELOPMENT AUTHORITY

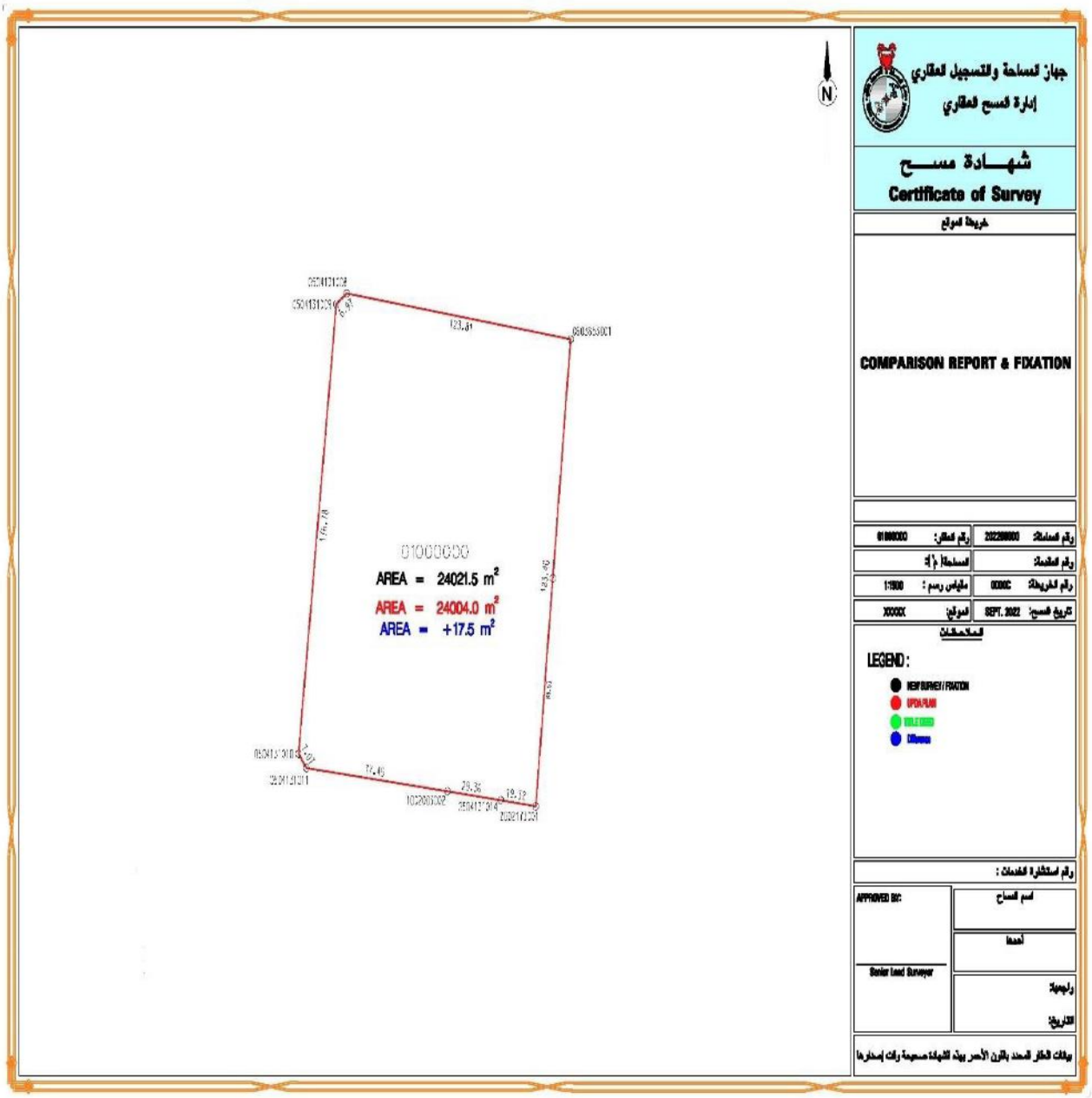


Urban Planning & Development Authority
PRELIMINARY SUBDIVISION PLAN FOR SERVICES CONSULTATION
OWNER NAME:
LOCATION:
PLOT NUMBER:
TITLE DEED NO:
CASE NUMBER:
REMARKS:
341,0 Sqm
360,0 Sqm
N

Urban Planning & Development Authority
المحافظة الشمالية
1032 - المالكية
الموقع العام
LEGEND
المصطلحات
Geo – Satellite Image 2020
434870

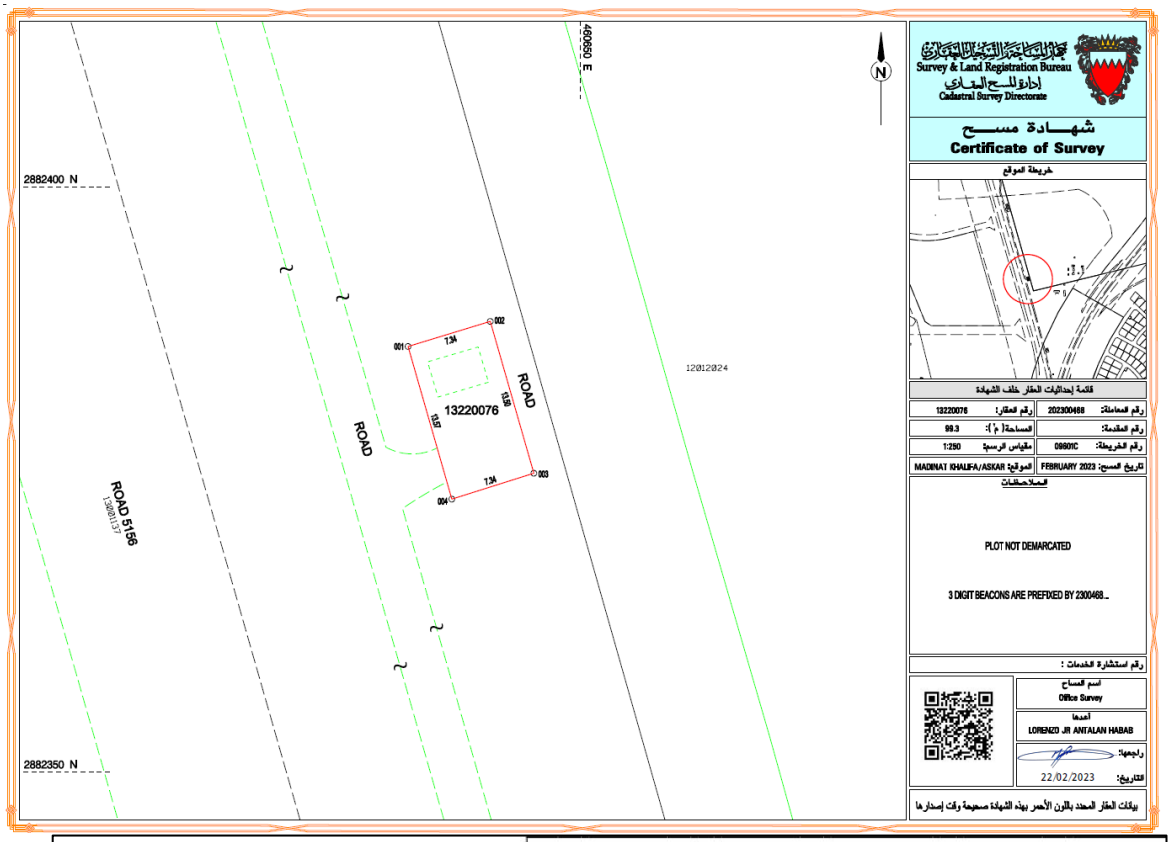

Urban Planning & Development Authority
المحافظة الشمالية
المالكية - 1032
التصنيف المعتمد
LEGEND
المصطلحات
ZMS – Approved Zoning
MALKIYAH AVENUE
434870

Appendix 15: Report and Comparison of Dimensions - Areas



Appendix 16: Certificate of Survey (CoS)

c13220076_v1.pdf



The Parcel Coordinates
PARCEL NO : 13220076

KINGDOM OF BAHRAIN
Survey & Land Registration Bureau

POINT NO	EASTING	NORTHING
2300468001	460635.320	2882386.350
2300468002	460642.340	2882388.490
2300468003	460646.060	2882375.520
2300468004	460639.060	2882373.310