



THIMPHU THROMDE

CITY ADDRESSING SYSTEM GUIDELINE

2022

PREPARED BY
URBAN PLANNING DIVISION

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Thimphu Thromde



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THIMPHU THROMDE

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1. INTRODUCTION

Thimphu, the capital city of Bhutan, owing to its size and ongoing rapid pace of urban development, the need for city addressing is critical for efficient functioning. Addressing system is evidently crucial for navigational purposes but even the most basic service requires locational information for effective and efficient service delivery. The brunt of a poorly designed system is borne by the Government as well as the citizens which alarmingly felt during the Covid19 lockdowns. The challenges of linking people to the services and vice versa took immense effort and resources despite which the facilitation still could not be optimized.

Often times the addressing scheme in terms of the usability outcome is not well thought out and incoherent that leads to inefficient and ineffective governmental and commercial service delivery. An easily comprehensible system takes immense effort to design and maintain but is more effective in the real world. Thimphu Thromde has experienced similar challenges in the past either due to lack of skilled manpower or digital resources. Since the last scheme was implemented in 2012 and long overdue for revision.

The task to come up with a more effective system was initiated in November, 2021 as a part of the pledge made by newly elected Thrompon, Ugyen Dorji. The two-part system consists of 1) Preparation of an Addressing Guideline and Data Dictionary for Standards 2) Digital implementation in the GIS environment for developing a geodatabase.

To ensure systemic continuity, in addition to the above, public awareness and training were conducted for those involved in keeping the system up-to-date.

2. BACKGROUND

City Addressing System is fundamental to any Thromde to deliver effective and efficient service to the citizens. It is specifically relevant for use in today's digital environment where addresses could be readily located for a variety of purposes especially emergency service response.

This is accomplished by adopting efficient means to locate and reference properties as spatial significance plays a major part in decision-making process and service delivery. In a city addressing system, through a system of

logical and standard procedures, properties are assigned addresses that are unique, clear and unambiguous.

Addressing must be carried out in a systematic manner. Absence of proper guidelines and standards lead to confusion, duplication, inefficient and ineffective service delivery. The resulting inconsistencies can have an adverse effect on the expected outcome. This document aims to streamline the scheme and make it consistent throughout the Thromde.

Once the system is established, it will make the city more user-friendly, enhance emergency service delivery, increase municipal revenues and improve management in terms of planning, monitoring, levying taxes, and maintenance and service delivery.

Addresses are determined based on the “street-house” concept. This concept elaborates on the regulations to identify and designate street, a basis on which buildings shall be numbered consequently. The procedure defines the standard naming conventions based on the hierarchy, location and function of the street. Subsequently, buildings are numbered. There are three types of building numbering system:

- i. Sequential numbering: Odd (1, 3, 5 and so on) and even (2, 4, 6, and so forth) numbers are assigned sequentially to buildings on opposite sides of the street. Structures that are built between existing buildings after numbers have been assigned will use suffix.
- ii. Metric numbering: Structures are assigned even or odd numbers corresponding to the distance between the building entrance and the beginning of the street.
- iii. Combination of Sequential and Metric numbering: Even and odd numbers are assigned sequentially as in the first two solutions, but based on assigned distances on sections of street. This combination offers the dual advantage of simplicity and estimated-distance numbering.

Based on the topographic conditions and the irregular alignment of roads, the third option for numbering system is adopted.

3. PURPOSE

The purpose of this document, *Thimphu Thromde City Addressing System Guideline*, is to formulate procedures to facilitate the Thromde in implementing a standardized addressing system for consistency and continuity.

The document assumes that street addressing is a prerogative of the Thromde.

4. GOALS

The primary goal of this document is to formulate a set of addressing guidelines for consistency in addressing systems and preserve systemic continuity which subsequently lead to efficient management of services.

Secondary goals include:

- To make the city navigation more user-friendly;
- To ease the delivery of emergency services;
- To facilitate in maintaining inventory of Thromde assets;
- To improve Thromde management in terms of planning, monitoring, taxation, maintenance and service delivery;
- To enable tax assessment and collection;
- To adopt a standardized addressing system throughout the Thromde;
- To encourage the use of GIS for decision-making and management in Thromdes.
- To ease location-based complaint reporting for project identification and prioritization.

5. REVIEW OF EXISTING GUIDELINE

The preceding guideline “City Addressing System-Pilot for Thimphu Thromde” available under Appendix 8.C, was formulated by the Coordination Center for GIS and Department of Survey and Mapping, National Land Commission Secretariat in June 2020.

The document emphasizes on the importance of establishing a City Addressing System and its role in fulfilling the requirements of urban dwellers by pro-

viding locational information to:

- Locate residents and property.
- Emergency services response.
- Pinpoint breakdowns of water, electricity, and telephone system.
- Expedite postal service.
- Valid deliveries of urban service such as taxis, mail, goods and services.
- An efficient tax collection system.
- Franchising voters.
- Map crimes and accidents.

The primary objective as per the document was to review the previous system of 2010 formulated jointly by Thimphu Thromde and Bhutan Post and develop a set of conventions for naming the streets and numbering the buildings for future updates. The document states that due to the lack of documentation, not much was known about the previous system.

The “City Addressing System-Pilot for Thimphu Thromde” was formulated in 2020, due to the incompleteness and related inconsistency in the spatial dataset, Thimphu Thromde took the initiative to revisit the system. The details of the review is covered in the following sections.

5.1. REFERENCE POINT AND BASELINES

A study of the International best practices reveals that identification of the baseline street and the reference point is the most critical part of the addressing system without which a proper system is not possible.

Ideally, baseline streets are expected to run from boundary to boundary dividing the city four equivalent quadrants running in E-W and N-S direction. The reference point is supposed to be located relatively at the center of the city.

As per the convention under Chapter 3, under Section 3.2, it is stated that:

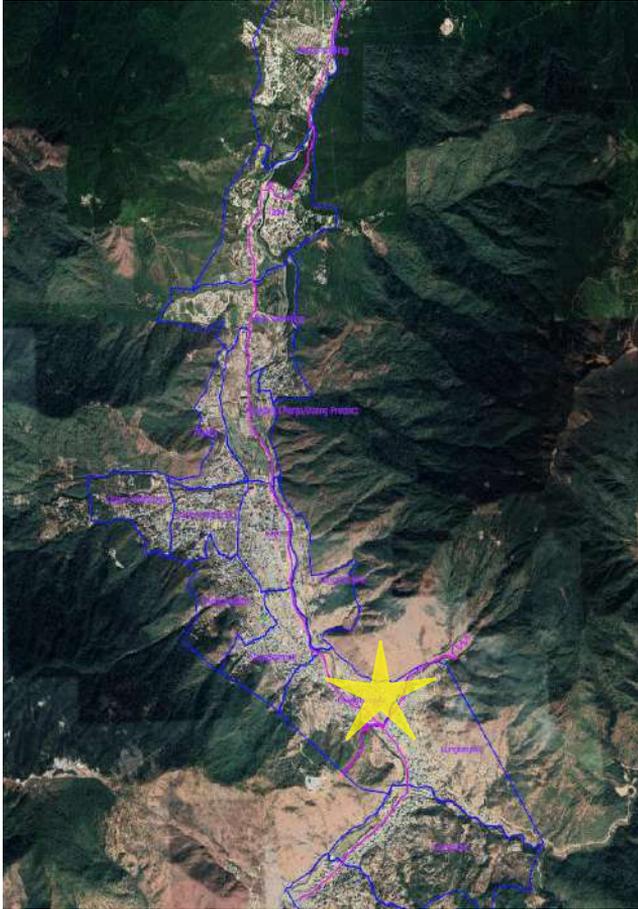
- **Baselines** cannot be arbitrary lines but intersection of two prominent streets
- **Reference point** should be the intersection of North-South and East-West prominent streets, preferably at the centre of the Thromde.

In the same section, the baselines for identified were:7 streets in the North-South direction and 4 streets combined with 2 urban villages in the East-west

Direction.

The Reference Point was located towards the South of the city and not centrally

Figure 5.1. Reference point and Baselines
(Source: City addressing System, June 2020)



Example:

- 1 K1, Hejo Lam 1
- 1 K2, Hejo Lam 1
- 1 K3, Hejo Lam 1

5.2. CLASSIFICATION OF STREET

In Section 3.3, it is stated that the street shall be classified into six categories. The section describes only 5 categories:

- 1) Primary
- 2) Secondary
- 3) Child
- 4) Grandchild
- 5) Access

In the map display, an additional category as First Order which is presumed to be the sixth category.

Figure 5.2. Classification of streets
(Source: City addressing System, June 2020)



Further, in the dataset, there categories are listed as:

- 1) Primary
- 2) Secondary
- 3) Child
- 4) Grandchild
- 5) Great Grandchild
- 6) Access
- 7) Bridge
- 8) Roundabout
- 9) Parking
- 10) Footpath

The inconsistencies seem to be due to confusion in street type, road type, street order or hierarchy which led to exception cases in the convention. This ambiguity could result in confusion for future addressing system. In Bhutan, the only street type that exists is “Lam”, which is not reflected in the classification.

The other major concern is the segmentation of continuous street and naming, ideally a single name is given for the entire stretch of the street to avoid confusion.

5.3. BUILDING NUMBERING

As per the Section 3.5, the buildings are to be given a unique building number. In the same section under the heading “Multiple buildings on single plot at an intersection of two plots” with the following example:

Figure 5.3. Building numbering

(Source: City addressing System, June 2020)



Where K1, K2 and K3 stands for building name and 1 stand for building number. In the absence of unique building IDs, the repetition of building number could cause confusion in the database as not all buildings are named. In the above figure, the plot contains 3 building with the same number.

Likewise, buildings with dual numbers could also cause confusion as GIS database generates 1 record per feature.

After careful review and issues identified from past issues the following guideline was developed.

6. GUIDELINE FOR ADDRESSING

The geodatabase model and the documentation for the addressing system is compiled under Appendix 6 of this document. The model shows the structure road data with established relationship with address data. Key fields are created for 1) instant identification of location for emergency services 2) accessibility to information on legal cadastre for taxation and regulatory purpose. Additional fields as deemed necessary in the future may be added as and when required.

6.1. REFERENCE POINT AND BASELINES

The establishment of reference point and baseline are sine qua non of an addressing system. The reference point functions as a basis with reference to which all addresses are assigned. Reference point should be a prominent intersection of two streets and located relatively at the center of the Thromde. The two streets that intersect at the reference point are called baselines. The baselines should continue all the way to the Thromde boundary even if this requires one or more changes of contiguous streets en route.

The linear development of the city in a north-south direction enabled the team to identify the baseline as Doebum Lam but due to the lack of contiguous street in the East-West direction, two streets were identified to make up for the baseline i.e., Thori Lam and Chhugo Lam.

The baseline are considered as 1st order street as per the street hierarchy and also assigned Pre directions i.e. E, W, N or S for easy reference in the future. This resulted in two reference points shown in Figure 5.4.

Figure 6.1. Reference point and baseline



6.2. STREET NAMING

Streets naming in current scenario may seem manageable and organized at the current stage. Over time, as the area grows, new streets will start emerging and old ones may be rerouted. In the absence of a street naming mechanism in place, the task can become complicated and disorganized. The problems can be manifested in a form of lack of coordination, weakened monitoring & management due to frequent name changes, non-sequential numbering and duplication. Adherence to the guideline below should alleviate such problems in future.

6.2.1. COMPOSITION OF STREET NAME

The full street name shall consist of following components based on the order or function of the streets. The matrix below shows the applicability of the different components a street name is composed of:

Table 6.1. Name composition matrix

Streets	Pre Direction	Street Name	Street Type	Zur Lam Number	Zur Lam Suffix	Quadrant	Locality
Baseline/First Order Street	Y	Y	Y	N	N	N	Y
Second Order Main Street	N	Y	Y	N	N	Y	Y
Second Order Onwards Branch Street	N	Y	Y	Y	N	Y	Y
Second Order Onwards Sub-branch Street	N	Y	Y	Y	Y	Y	Y

- Y=Yes N=No

1. Baseline Street (Lam):

Pre-directions are assigned for first order/ baseline streets to distinguish it from the rest of the streets. These should not be assigned the quadrants as those were the basis on which the quadrants were formed.

S Doebum Lam

It may be noted that the Doebum Lam as baseline connecting the two reference points shall not be assign any Pre Direction.

2. Main Streets (Lam):

The primary streets apart from the baselines and caters to bigger catchments fall in this category. The type assigned is Lam and it must reflect the quadrant that the stretch falls in.

Norzin Lam SE

3. Secondary Streets (Zur Lam):

Those streets that are relatively short and usually branch out from the main street fall in this category. The parent street (Lam) is segmented into 50m stretches for which reserved numbers were generated as provisions for future road extensions.

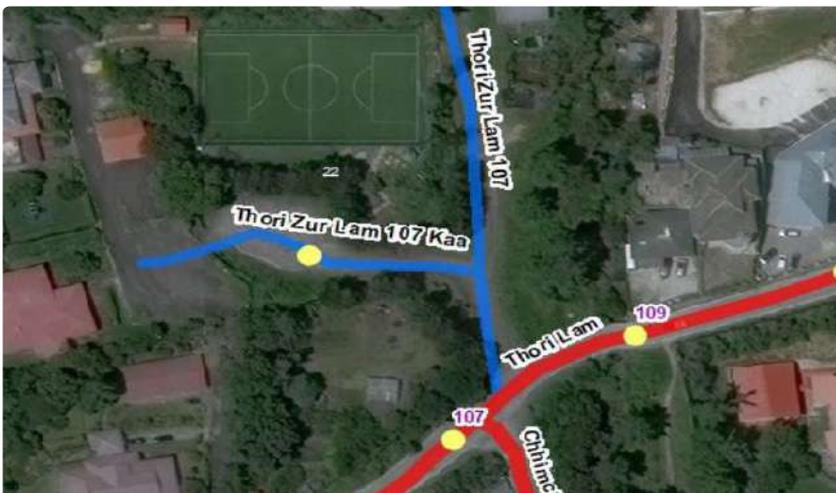
The name of the Zur Lam is subsequently inherited from the parent street (Lam) and the number is assigned based on the provision kept.

Norzin Zur Lam 100 SE

Streets that branch out further from the Zur Lam are assigned suffixes while the number is inherited from the parent Zur Lam.

Norzin Zur Lam 100 Kaa SE

Figure 6.2. Name composition of street



6.2.2. PRE DIRECTIONS

The predominant compass direction assigned to the baseline streets based on the reference points (e.g., N, S, E, W).

- 6.2.2.a. Pre directions should be used only for the first order baseline streets to indicate the primary direction that the street travels from the reference point.
- 6.2.2.b. Pre direction should consist of only one primary direction N, S, E, W (North, South, East, or West).
- 6.2.2.c. Pre direction shall not be assigned for the stretch of the baseline which runs between the reference points.

6.2.3. STREET NAMES

The principal identifying component of a full street name, which in most cases should uniquely distinguish a street from all others (e.g., Doe-bum, Norzin).

A full street name shall be unique and used only once in any locality. Except for historically significant names, a street name should be easy to read, spell, and pronounce especially during emergencies (even for children). The following must be avoided at all times:

- 6.2.3.a. Names that tend to be mispronounced or misspelled or are difficult to pronounce or spell
- 6.2.3.b. Using punctuation or special characters, as usage is reserved in some of the database programs
- 6.2.3.c. A continuous street should have only one name signed irrespective of change in direction
- 6.2.3.d. Street names should be made up of single word of 15 characters or less to minimize the data entry error.

6.2.4. STREET TYPE

Street type gives some indication of the primary use, length, or shape of the street (e.g. Lam, Zur Lam).

- 6.2.4.a. Every street should be assigned a street type. Considerations shall be given to the function, width, and length of the road for categorization
- 6.2.4.b. The distinction between street name, street shall not be confused

For example, Norzin Lam, Norzin is the name of the street and Lam is the type. In terms of street order, it is a second order street which connects to Doebum Lam i.e. a first order street which is also a baseline

6.2.5. ZUR LAM NUMBER

These are shorter streets and inherits the name from the main street but the type assigned is Zur Lam. This is a distance based number assigned to branching streets (Zur Lam) for which the name is inherited the main street (Lam).The numbers are reserved sequentially at every 50m of the main street and allocated to the Zur Lams coinciding with or closest to the intersection.

For example, Norzin Zur Lam 5 means the street inherited its name from Norzin Lam (Main Street) and intersects at 150m distance with the main street on the left. This eases navigation as people can locate the main street (Lam) and conveniently pull into the connected Zur Lam.

- 6.2.5.a. Every Zur Lam should inherit the name from the main street (Lam) it branches out from.
- 6.2.5.b. Every Zur Lam should be assigned a Zur Lam number.
- 6.2.5.c. The numbers assigned should be even on the right and odd on the left from the direction of the reference Point.
- 6.2.5.d. Zur Lams that branches out from another Zur Lam must inherit the name and the number from the main Zur Lam.

6.2.6. ZUR LAM SUFFIX

Any short street further branching out from the Zur Lams are additionally assigned suffixes of Kaa, Khaa etc. (Dzongkha Alphabets). For example, it inherits Norzin Zur Lam 5 from the main Zur Lam and a suffix is additionally assigned resulting in Norzin Zur Lam 5 Kaa.

6.2.6.a. Zur Lams that branches out from another Zur Lam should be assigned a suffix in addition to name and the number inherited from the main Zur Lam it branches out from.

6.2.7. QUADRANT

The baselines divide the Thromde area into four quadrants and each reference was assigned to their respective quadrants.

Figure 6.3. Baseline street delineating Quadrants



The Figure 6.3 shows the reference point along with the quadrants. All these components serves the following purposes:

1. Gives a sense of location relative to the reference point and the baseline.
2. Establishes a starting point for numbering buildings in each quadrant.

As a result of 2 reference points being identified, each quadrant was assigned to the reference point at the intersection of the baseline that encompasses the quadrant.

Quadrants indicates the street's location relative to the reference point and baselines (i.e., NW, NE, SW, and SE).

6.2.7.a. The quadrant shall be made up of a combination of two primary compass directions

6.2.7.b. It is assigned to streets which falls in any area defined by the Thromde boundary at the external bounds and baselines. There are only four acceptable values for this element (NW, NE, SW, and SE).

6.3. STREET ORDERING

Street ordering is a defining frame for naming and categorizing streets. It is also instrumental in assigning address ranges.

6.3.1. ASSIGN STREET ORDER

Once the reference point and baselines have been established, a tree branch scheme should be used to assign an order to each street. The baseline street act as the main trunk and are referred to as first order streets. Any street that intersects a baseline street is designated a second order street. Any street that intersects a second order street, and that is not a baseline or second order street itself, is designated as a third order street. This process should continue until all streets are assigned an order.

Figure 6.4 displays the street with orders assigned as per the conditions specified:

Figure 6.4. Assign street order



6.3.2. ASSIGN ADDRESS RANGES

There are four general principles to be followed while assigning address ranges.

Numbering should always commence at the intersection of the center-lines.

- 1) Numbering should always start at the intersection of the center-lines.
- 2) The sequence of numbering should be based on the order of the streets.
- 3) Even numbers should be assigned to the right side of the street and odd on the left from the direction of the reference point.
- 4) The numbers should be increasing radially from the reference point towards the periphery i.e., Thromde boundary.

6.3.2.a. Baselines are considered as first order streets based on which the reference point is identified. This being the closest street to the reference point, the addressing commences from there. The addresses are assigned at every

20m interval starting from a value of 100 on the right side and 101 on the left. The example as shown below in Figure 6.5.

Figure 6.5. Address range assignment from reference point



- 6.3.2.b. From the second order street onwards, the numbering shall commence from the intersection with the higher order streets. The starting value should be taken as the value assigned to the higher order street located at the intersection. The value should increase or decrease depending on the distance of the ends of the street to the reference point. An example of which is as shown in Figure 6.6.

The system would eventually lead to a numbering pattern whereby the numbers increase from the centre of the city towards the periphery. It also eases locating an address as the range of numbers within the block very close irrespective of the assignment from different streets.

Figure 6.6. Address range assignment from baseline



6.4. BUILDING NUMBERING

On completion of the street naming, the next task is assigning unique numbers to buildings along particular streets. Based on the Local Area Plan minimum plot size and layout, numbers shall be assigned sequentially at 20m interval perpendicular to the street centerline. The number generation can be automated from the street centerline using GIS but assignment could be done based on the location of the driveway of the existing buildings to the corresponding point. The system of distance-based numbering is to ensure that numbers are reserved for undeveloped plot.

Figure 6.7. Building numbering

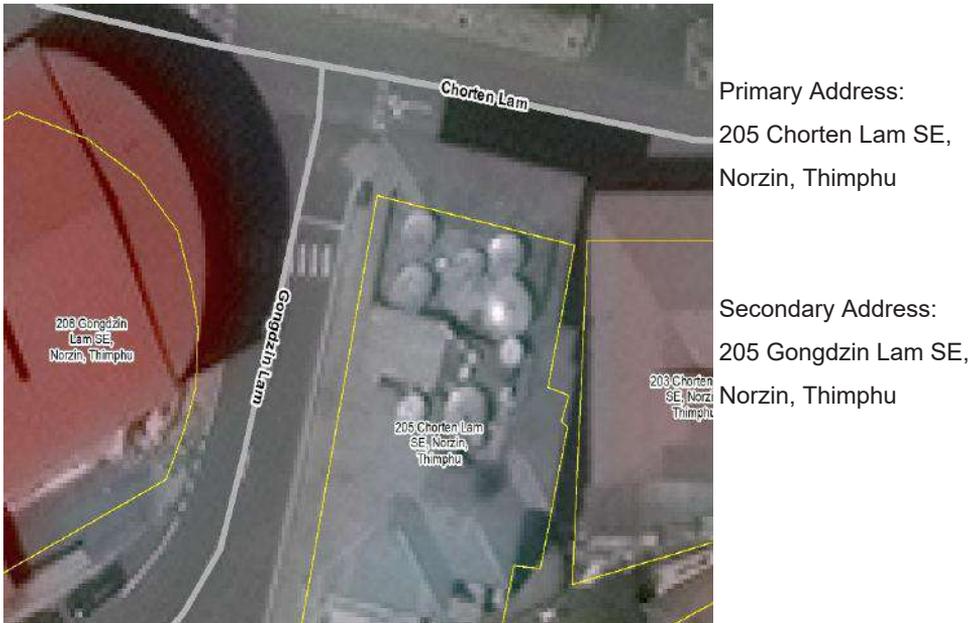


6.4.1. CORNER BUILDINGS

For corner buildings, alternative addresses maybe assigned from all road facing sides, but the primary address shall be the most accessible during emergencies.

Address assignment for corner building shall be as shown below:

Figure 6.8. Assigning address to corner building



6.4.2. MULTI DWELLING UNIT BUILDINGS

The addresses for multi dwelling units shall include the additional information of the unit in addition to the building address. For example, the residence at the address 205 Gongdzin Lam SE, Unit G01, indicates unit no. 1 on ground floor of building no. 205.

6.4.3. PLOTS WITH MULTIPLE HOUSES WITH SINGLE ADDRESS

In a scenario where a common address assignment to multiple houses on a single plot is opted for i.e., 1 plot with many duplexes a sub-number

shall be assigned. The address format shall be 218 Chorten LamSE, H08 (H=House) which can be interpreted as House No. 8 at address 218 Chorten Lam SE.

The following conditions must be met for assignment of a common address to all houses on the plot:

- 6.4.3.a. The houses must be assigned a house number in addition to the building number (the building number functions as an address number for the particular plot).
- 6.4.3.b. The direction of numbering shall be done in a clockwise direction from the entry point to the plot.

Figure 6.9. Assigning common address to multiple houses on a plot



6.4.4. PLOTS WITH MULTIPLE BUILDINGS WITH SINGLE ADDRESS

On instances where a single address is assigned for a plot with multiple buildings i.e., institutional buildings, a sub-number for each building shall be assigned, the format shall be 165 S Doebum Lam, Block C interpreted as Block No. C at address 165 S Doebum Lam or as 165 S

Doebum Lam, Unit G01 Block C if there are multiple units. The buildings must be assigned a block number in addition to the building number (the building number functions as an address number for the particular plot).

- 6.4.4.a. The direction of numbering shall be done in a clockwise direction from the entry point to the plot.

Figure 6.10. Assigning common address to multiple buildings on a plot



6.5. UNIT NUMBERING

The address element is not complete without the provision for unit numbering especially for the multi dwelling units. As more and more multi dwelling structures are constructed, provision has to be kept to locate the units within a building.

6.5.1. UNIT NUMBER COMPOSITION

The unit number shall be composed of the following elements:

1. The floor level on which the unit is located.

2. The number sequence on the same floor.

For example, G01 shall be read as G= Floor Level and 01= the sequential number of the unit on that particular floor.

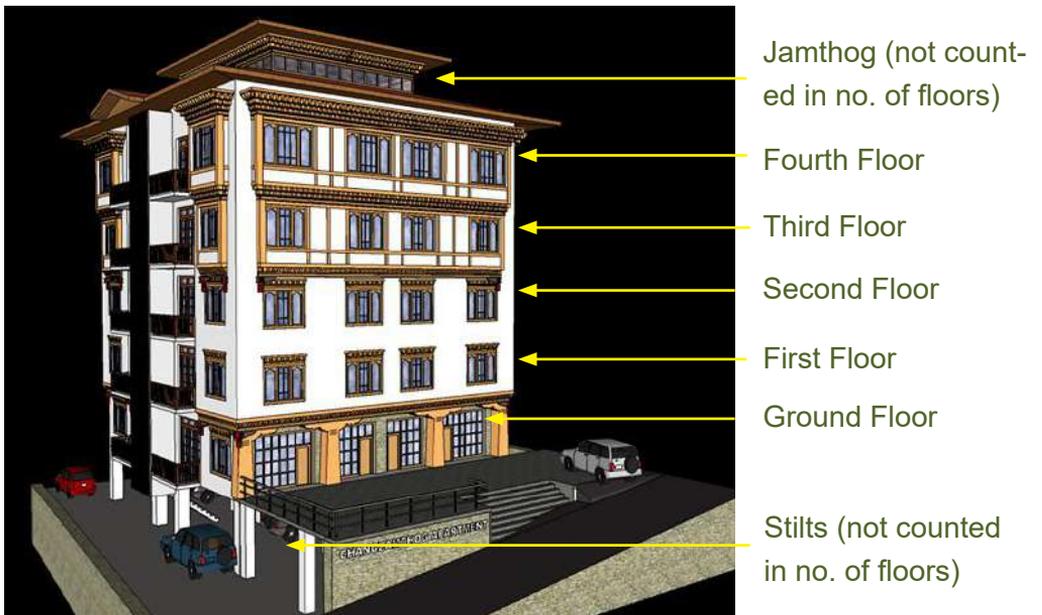
The unit numbering may not necessarily be assigned for all buildings and the following conditions must be met for assignment of unit numbers:

- 6.5.1.a. The building shall have multiple dwelling units.
- 6.5.1.b. Duplexes or houses and institutional blocks shall not be assigned unit numbers.

6.5.2. THE FLOOR LEVEL.

The floor level is instrumental in assigning the unit number. Although the number of floors in the building is counted from the ground floor till the last floor below the attic. In unit numbering basements, stilts, attic, jamtho including annexes are also included in unit numbering.

Figure 6.11. Assignment of floor levels



There are certain instances where there is more than one level of basement, these shall be assigned Basement 1 and Basement 2 wherever applicable. The figure in the following page shows the sample of the exceptional case:

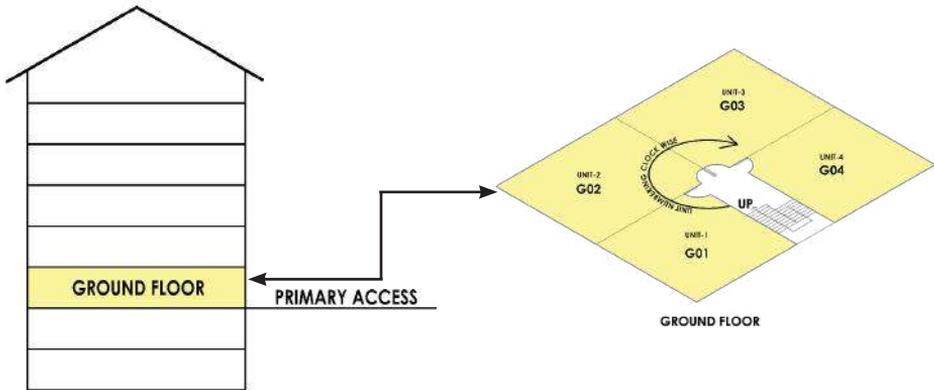
Figure 6.12. Floor levels of building with double basement



6.5.3. NUMBERING DIRECTION

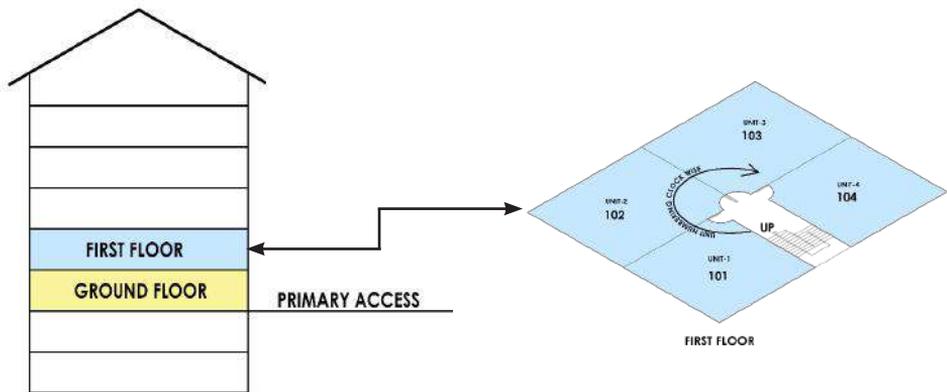
The unit number shall be a combination of the floor level and the number sequence assigned in a clockwise direction from the entrance or the staircase. For Example, G03 is a unit on level G= Ground Floor and 03= the sequential number assigned to the unit in a clockwise direction. The figure below shows the number assignment for units on the ground floor:

Figure 6.13. Numbering direction on ground floor



Likewise, this system of assignment should be replicated on the rest of the floors as shown below for the 1st floor units:

Figure 6.14. Numbering direction on first floor



6.6. LOCALITIES

A system of localities has been introduced to instill a sense of ownership from the residents. This also adds cultural value promote the civic identity, community participation in the functioning of the city therein. These boundaries are identified and defined based on consultation conducted by Thromde Thuemis with the local elders. A total of 31 localities were identified.

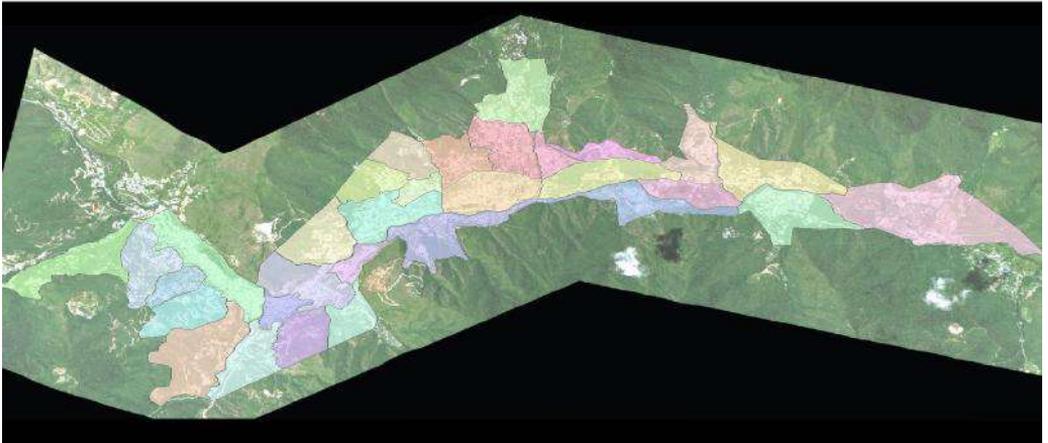
Table 6.2. List of Localities

Locality ID	Locality Names	Locality ID	Locality Names
1	Serbithang	17	Chang Gedhaphu
2	Wangchhu Taba	18	Chang Zeri
3	Dolay Gang	19	Norzin
4	Kemkha	20	Chang Genye
5	Simtokha	21	Chang Gangkha
6	Babesa	22	Motithang
7	Tshatshobaykha	23	Kawang Jangsa
8	Lubding	24	Ludrong Phakha
9	Lungtenphu	25	Lhadrong
10	Chang Olakha	26	Samteling
11	Chang Jalu	27	Jungzhina
12	Chang Jiji	28	Taba
13	Yangchenphu	29	Dechenchholing
14	Chang Bangdu	30	Zilukha
15	Chang Zamtok	31	Kawang Chhodzong
16	Chang Khorlo		

- 6.6.3.a. The locality boundaries shall be clear and unambiguous and topologically correct.
- 6.6.3.b. It should follow distinguishable community or physical boundary (e.g. roads, rivers etc.).
- 6.6.3.c. The boundary should not separate community of interest.
- 6.6.3.d. Cadastral plots should not be bisected while defining the boundary.

In an event if Thromde boundary changes, Thromde Thuemis shall be consulted for naming of additional localities. The image below shows the locality boundaries:

Figure 6.15. Localities



7. SIGNAGE

Signage is imperative to locate the address site on the ground. It enables the Thromde residents to familiarize with the system and promote the use of addresses for navigation.

7.1. STREET SIGNAGE

Street signs are informational traffic signs placed along the street to indicate the name of the road and traffic direction for ground navigation. It plays a paramount role in the city/street addressing system.

Type of Road Signs

As per Bhutan's standard of Road safety signs and symbols, there are three-types of road signs as follows:

1. Mandatory/ Regulatory Signs
2. Warning/Cautionary Signs
3. Informatory/Guide Signs

Street signage falls under the category of Informatory/Guide Signs.

7.1.1. INFORMATORY/GUIDE SIGNS

The informatory/guide sign is used to provide information and to guide road users along routes about the location of facilities in the vicinity

of the road or about the destination. The information may comprise names of locations, such as those identified by signs for emergency management, tourist, recreational, and cultural interest areas, sites, and directions to those locations, among other things. It has the following types:

- a) Advance direction signs
- b) Intersection direction signs
- c) Reassurance signs
- d) Services signs

The Street signage falls under the Advance direction sign and intersection direction sign.

7.2. PRINCIPLES OF ROAD SIGNS

The following principles are given primary consideration in the selection and application of each road sign. Five fundamental requirements must be met for a road sign to be effective:

- a) Fulfill a need;
- b) Command attention;
- c) Convey a clear and simple meaning;
- d) Command respect from road users; and
- e) Give adequate time for response.

Aspects such as Design, Placement, Operation, Maintenance, and Uniformity should be carefully considered to maximize the ability of a road sign to meet these five basic requirements.

7.2.1. PLACEMENT AND OPERATION OF ROAD SIGNS

Road signs should be placed such that they are visible to drivers. Road signs should be positioned with respect to the site or circumstance to which they apply to help with proper communication. The location and legibility of the road sign should be such that it provides the adequate response time for road users to read and take action at the operating speed. The placement and use of road signs should be uniform and consistent.

Road signs which are not necessary or no longer required should be removed. A sign's physical condition shouldn't be used as an excuse to put off removal or revision if it is necessary.

Note:

The Reading Distance = Reading Time x Speed (85 percentile speed)

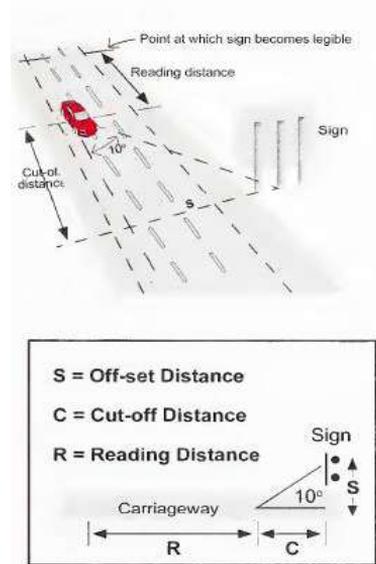
Reading Time = $2 + N/3$ seconds (N = no. of words on sign, say 3) = $2 + 3/3 = 3$ seconds

If the actual speed = 50km/h

If 85th percentile speed = 42 Km/h = 11 m/s.

Therefore: Reading Distance = 3 seconds x 11m/s = 33 m.

Figure 7.1. Location of informatory signs
(Source: IRC:67-2012)



7.2.2. MAINTENANCE OF ROAD SIGNS

Clean, legible, properly mounted signs in good working condition command respect from road users. Therefore, regular maintenance of the signs plays an important role.

7.2.3. UNIFORMITY OF ROAD SIGNS

The uniformity of signs simplifies the task of the road user because it helps in recognition and understanding, thereby reducing perception/ reaction time. Uniformity assists road users, traffic police, and related agencies by giving everyone the same interpretation message. Uniformity also promotes efficiency in manufacture, installation, and maintenance.

Uniformity means similarly treating similar situations. A standard sign,

used where it is not appropriate, is as objectionable as a nonstandard sign.

7.3.LOCATION OF ROAD SIGNS

The road signs shall be so placed that the drivers can recognize them easily and in time. Normally the signs shall be placed on the left-hand side of the road. If local conditions are such that the signs might not be noticed in time by the drivers on two-lane roads, the signs may usually be put on the left side of the carriageway and replicated on the other side of the carriageway. For multilane divided roads the signs may be placed on the left side of each carriageway. In the case of hill roads, the signs shall generally be installed on the valley side of the road, unless traffic and road conditions warrant these to be placed on the hillside.

Depending on the local conditions, the extreme edge of the ground-mounted sign adjacent to the roadway on all roads with or without a kerb and with or without a shoulder shall be at a distance of 600 mm to 3 m from the carriageway or paved shoulder edge. It must be at least 300 mm away from the kerb line on roads with kerbs, but in no case shall any part of the sign come in the way of vehicular traffic.

On kerbed roadways, the lowest sign's bottom edge must be at least 2.1 meters and no higher than 2.5 meters above the kerb. The bottom edge of the lowest sign cannot be lower than 2 m or higher than 2.5 m above the crown of the pavement on roads without kerbs. There must be a minimum of 2.1 meters of headroom if signs are placed above sidewalks or in locations that are likely to be utilized by pedestrians.

A sign may be placed on the median instead of the left-side shoulder of a road with a dual carriageway if placing it on the left side would render it ineffective. The lower border of the sign should always be at least 2.5 meters above the highest point of the highway to improve visibility on multi-lane roads.

The signs shall be so placed that these do not obstruct vehicular traffic on the carriageway, and if placed on the berm/footpath/refuge island cause the least obstruction to pedestrians. The difference in level between the lower edge of the sign and the carriageway shall be as uniform as possible for signs of the same class on the same route.

7.4. ORIENTATION OF SIGNS

The signs unless otherwise stated shall normally be placed at right angles to the line of travel of the approaching traffic. The sign should be turned slightly away from the road as shown in Figure 7.2 if light reflection from the sign face occurs to the extent that it affects legibility. Sign faces are normally vertical, but on gradients, it may be desirable to tilt a sign forward or backward from the vertical to make it normal to the line of sight and improve the viewing angle.

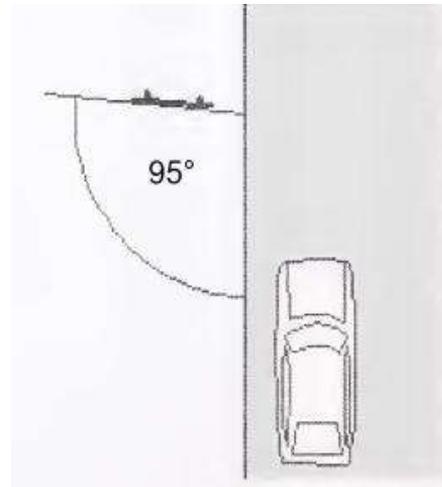


Figure 7.2. Orientation of Signs.
(Source: IRC:67-2012)

7.5. COLOUR OF SIGNS

Signs shall be provided with retro-reflective sheeting and/or overlay film as shown on the detailed drawings. The reverse side of all signs shall be painted grey. The typical colors for the informatory signs are as follows:

Table 7.1. Colour of signs

Road Type	Background	Arrows/Border/Letters
Expressway	Blue	White
National Highway (NH)	Green	White
State Highway (SH)	Green	White
Major District Road (MDR)	Green	White
Village Road (ODR & VR)	White	Black
Urban/City Road	Blue	White

7.6.SIZE OF LETTERS

The size of letters on the sign boards should be ranging from 50 to 300 mm depending on the number of words and reading distances available. In order to ensure that the sign is large enough for legibility without being excessively huge or obtrusive, letter size should be chosen with due consideration for the speed, classification, and location of the road. Table 7.2 provides the recommended letter size in terms of x-height based on design speed.

Table 7.2. Letter size requirements

1	Advance Direction Signs (Shoulder Mounted)					Flag Type Direction Signs Reassurance Signs Place Identification Signs			Gantry Mounted Signs		
	2	3	4	5	6	7	8	9	10	11	12
Design Speed	"x" height (mm) lower case	"X" height (mm) upper case	Minimum clear visibility to the sign (m)	ONE sign: distance from junction (m)	TWO signs: distance between 1 st and 2 nd sign (m)	"x" height (mm) lower case	"X" height (mm) upper case	Minimum clear visibility to the sign (m)	"x" height (mm) lower case	"X" height (mm) upper case	Minimum clear visibility to the sign (m)
Up to 30 km/h	75 (60)*	105 (84)	50 (35)	20	-	60 (50)	84 (70)	35 (30)	200 (175)	280 (245)	150
31 – 50 km/h	100 (75)	140 (105)	75 (45)	45	45	75 (60)	105 (84)	45 (35)			
51 - 65 km/h	125 (100)	175 (140)	100 (60)	90	50	100 (75)	140 (105)	60 (45)			
66 - 80 km/h	150 (125)	210 (175)	135	90 - 150	70	125 (100)	175 (140)	75 (60)			
81 - 100 km/h	200 (150)	280 (210)	165	150 – 225	100	150 (125)	210 (175)	105 (75)	250 (200)	350 (280)	200
101- 110 km/h	250 (200)	350 (280)	225	225- 300, See also Note 1	100	200 (150)	280 (210)	135 (105)	275 (250)	385 (350)	240
111- 120 km/h	300 (250)	420 (350)	260	See Note 1	See Note 1	300 (250)	420 (350)	180 (150)	300 (275)	420 (385)	260

*Note: The values in brackets are the minimum values to be adopted when there are site/space constraints.

7.7. SIZE OF SIGNS

Standardization of the size of Informatory Signs is not always practicable due to the variety of legends used. The size adopted will depend on the required letter size, the number of words in the legend, the symbols used, and the general arrangement. The likely visual impact of the sign must be considered in relation to its location, background, and surroundings.

7.8. STUDY OF EXISTING SIGNS

7.8.1. EXISTING STREET SIGN POST

Two types of street signposts are found to be in use in Thimphu Thromde. These include:

1. Signpost with yellow lettering on a red background.
2. Signpost with white lettering on blue background

Figure 7.3. Existing Signposts in Thimphu Thromde



7.8.2. LIMITATIONS OF EXISTING STREET SIGN POST

The following limitations are found in the Existing Street SignPost:

1. The signposts are not designed based on International Code.
2. The non-uniformity of the signposts confuses the users.
3. The letter sizes are small and vary from one signpost to another. The letter size is not uniform even in a signpost.

4. Most of the signposts require proper maintenance.
5. Some of the signposts are placed in the direction of the traffic. Therefore, it is not visible.
6. The existing signposts would become obsolete as the new City Addressing System embraces a new form of Street Naming System.

7.9.DESIGN OF NEW STREET SIGNS

7.9.1. SIZE AND SHAPE OF SIGNS

- 7.9.1.a. The shape of the signs shall be rectangular terminating with rounded edges.
- 7.9.1.b. Sizes of the signs shall be decided based on the letter length and spacing required. However, the length shall not be longer than 700mm in any case.
- 7.9.1.c. A white border of 15mm shall be kept after keeping a 10mm space from the extreme ends of the texts and the arrows. The white border shall be 30mm on the mounting side.

7.9.2. COLOUR OF SIGNS

- 7.9.2.a. The color of the signs shall be white lettering, border, and arrows on blue background.

7.9.3. FONT AND SIZE OF LETTERS

- 7.9.3.a. English font shall be 'Highway Gothic' with Tracking of 0.9 and a Width Factor of 1.
- 7.9.3.b. The cap height of the text in English shall be 50mm. It shall reduce to 40mm in case the length of the signs exceeds 700mm.

- 7.9.3.c. Dzongkha font shall be 'DDC Uchen' with Tracking of 1 and a Width Factor of 0.82.
- 7.9.3.d. The height of the text in Dzongkha shall be 45mm including 'Gochen' and 'Dokchen'. An additional 15mm height shall be provided for writing 'Yang Zhi' on top of the text.
- 7.9.3.e. A 10 mm gap shall be kept between the edge of the text (either English or Dzongkha text, whichever is longer) and the white border.
- 7.9.3.f. The gap between the English and Dzongkha texts shall be 10mm.
- 7.9.3.g. In the case of the signs with two street names, a 15mm gap shall be kept between the two street signs. This shall be incorporated even in the signs with three street names.
- 7.9.3.h. The length of street signs mounted together shall be uniform which is determined by the sign with the longest length.
- 7.9.3.i. The signs with more than one street name shall be mounted in order from top to bottom based on road hierarchy.

Figure 7.4. Standard street signage with single street name



7.9.4. DESIGN OF ARROW

- 7.9.4.a. The length of the single arrow shall be 75mm while the width shall be 50mm.
- 7.9.4.b. The thickness of the arrow shall be 10mm while the angle shall be 45°.
- 7.9.4.c. A gap of 10mm shall be kept between the text and the arrow as well as the white border and the arrow.
- 7.9.4.d. The horizontal arrow shall align with the 10mm gap shall align its arrowhead with the Dzongkha text as shown in Figure 7.5.

Figure 7.5. Standard street signage with multiple street names

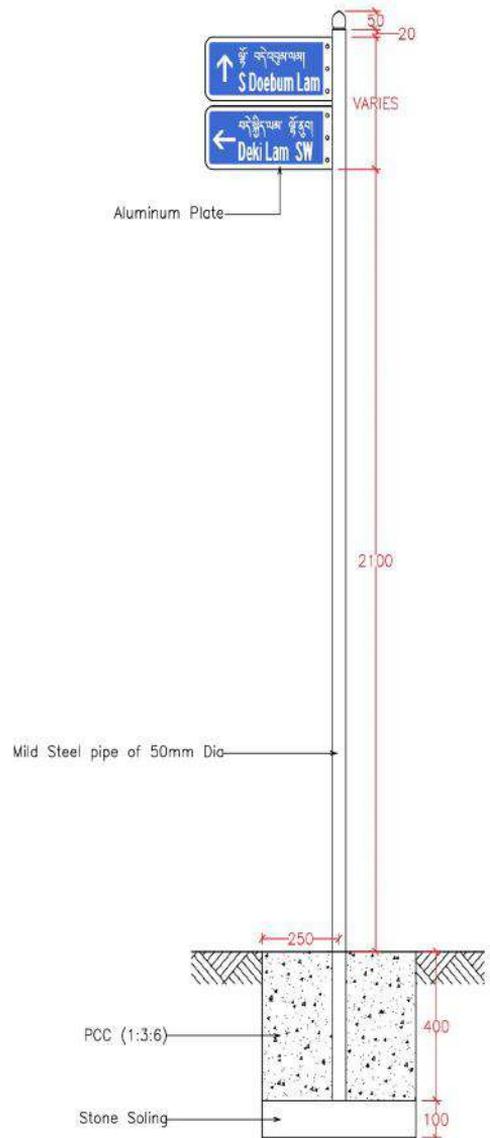


7.9.5. SPECIFICATION OF BOARD AND SUPPORT POST.

- 7.9.5.a. Material for the signboard shall be Aluminum or Aluminum Composite Materials (ACM).

- 7.9.5.b. The thickness of the Signboard plate of signs with a maximum dimension not exceeding 600 mm shall not be less than 1.5 mm thick with aluminum and 3 mm thick with aluminum composite material.
- 7.9.5.c. The support post shall be a Mild Steel pipe of 50mm in diameter.
- 7.9.5.d. The footing of the support post shall be 400mm thick and 250mm dia of 1:3:6 PCC with 100mm stone soling.

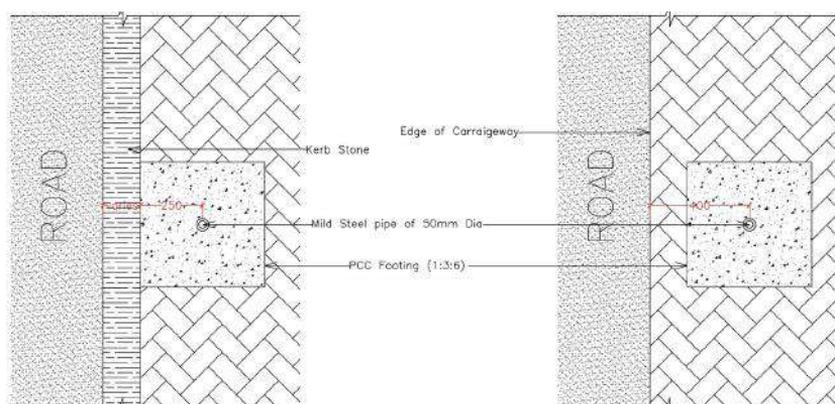
Figure 7.6. Detailed drawing of signage post



7.9.6. INSTALLATION OF SIGNS

- 7.9.6.a. The support post shall be installed at 250mm from the kerb stone in kerbed road.
- 7.9.6.b. In the roads without kerb stone, the support post shall be installed at 400mm from the edge of the carriageway.
- 7.9.6.c. There shall be a minimum of 2.1 meters of headroom for the signposts.

Figure 7.7. Standard installation of the signposts



7.9.7. PLACEMENT OF SIGNS

i. General Placement

- 7.9.7.a. The signs shall be placed on the left-hand side of the road.
- 7.9.7.b. On two-lane roads, the signs may usually be put on the left side of the carriageway and replicated on the other side of the carriageway.
- 7.9.7.c. For multilane divided roads the signs shall be placed on the left side of each carriageway.
- 7.9.7.d. The signs shall be so placed that the signboard faces away from the carriageway.

7.9.7.e. In case there is not enough space, the signs shall be so placed that the signboard faces the carriageway. However, this shall not obstruct vehicular traffic on the carriageway.

ii. Orientation of Signs

7.9.7.f. The signs unless otherwise stated shall normally be placed at right angles to the line of travel of the approaching traffic.

7.9.7.g. Sign faces shall normally be vertical, but on gradients, it may be desirable to tilt a sign forward or backward from the vertical to make it normal to the line of sight and improve the viewing angle.

iii. Placement of Signs at different road junctions

7.9.7.h. The placement of the signs at different road junctions shall be as follows:

Figure 7.8. Standard placement of the signposts

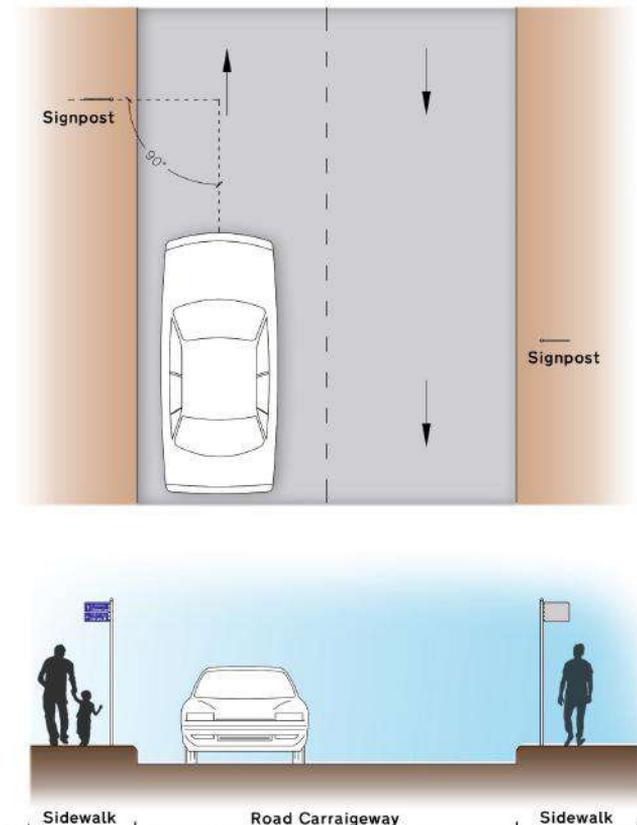


Figure 7.9. Example of placement of Signs at typical T-Junction 1

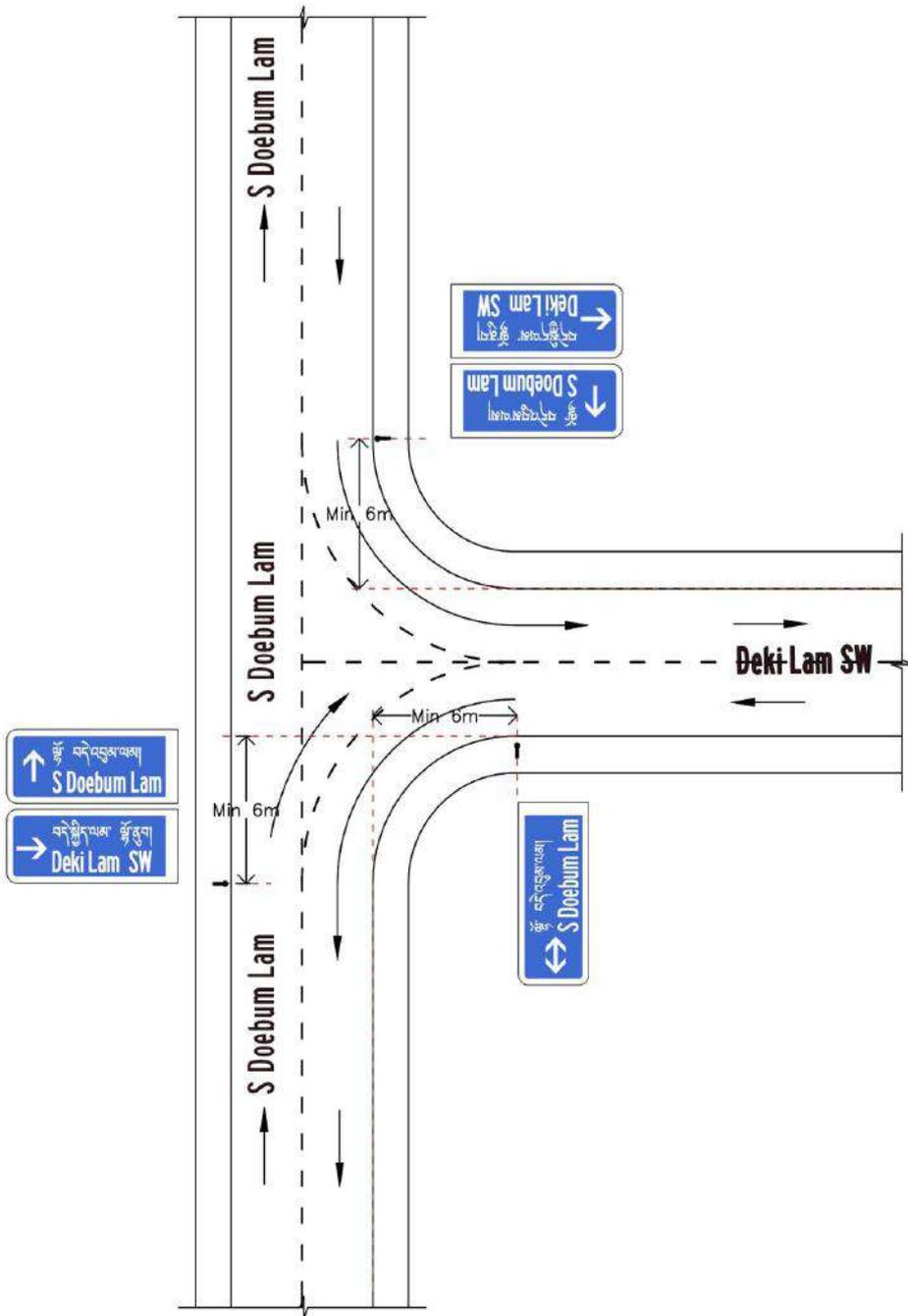


Figure 7.10. Example of placement of Signs at typical T-Junction 2

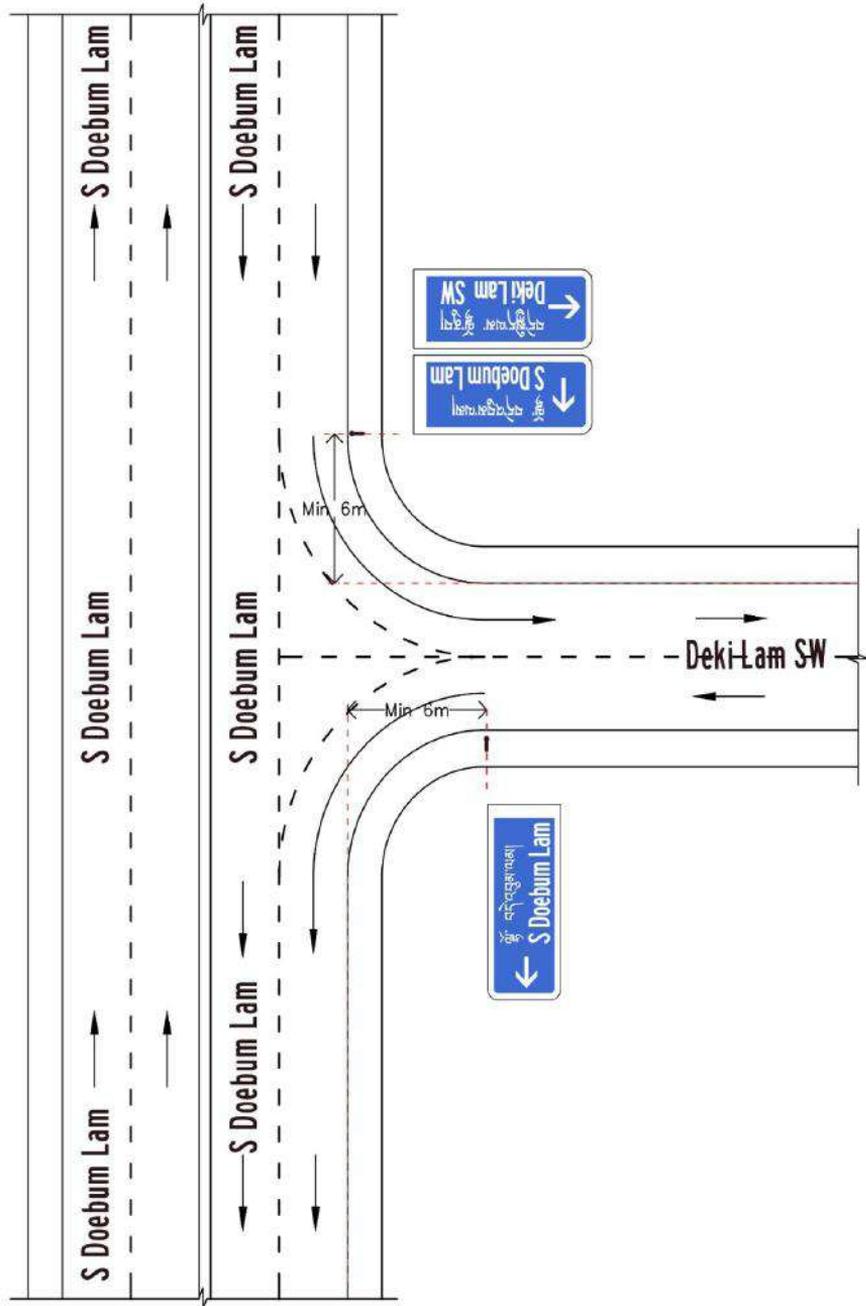


Figure 7.11. Example of placement of Signs at typical Cross-Junction

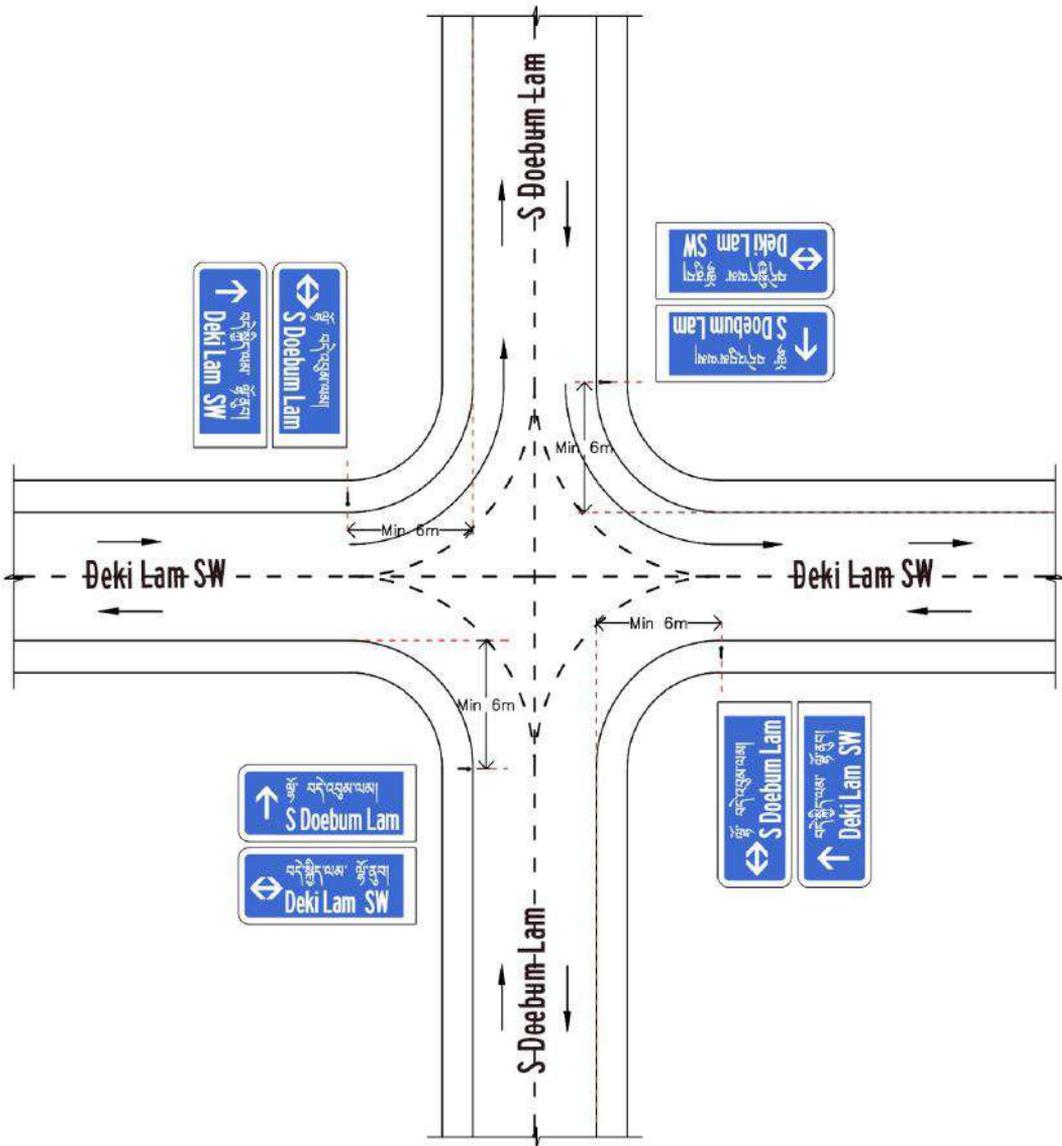


Figure 7.12. Example of placement of Signs at typical Roundabout

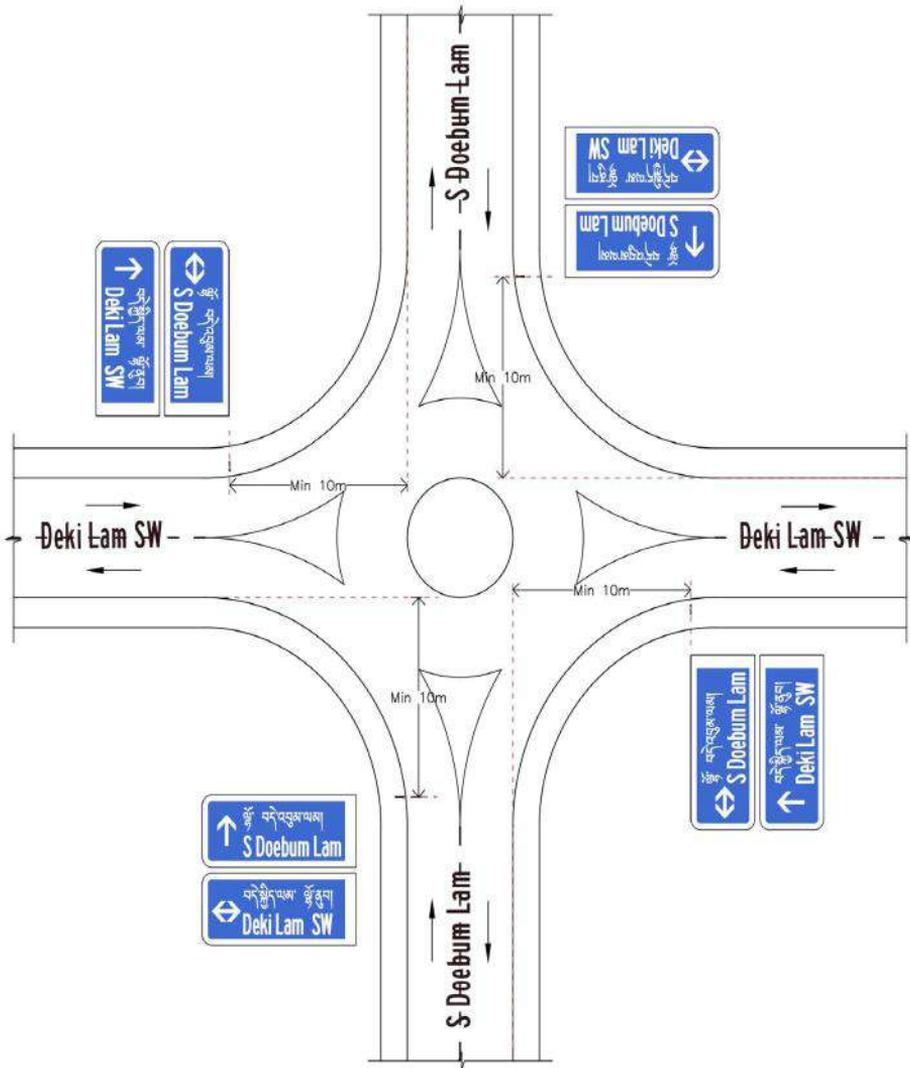


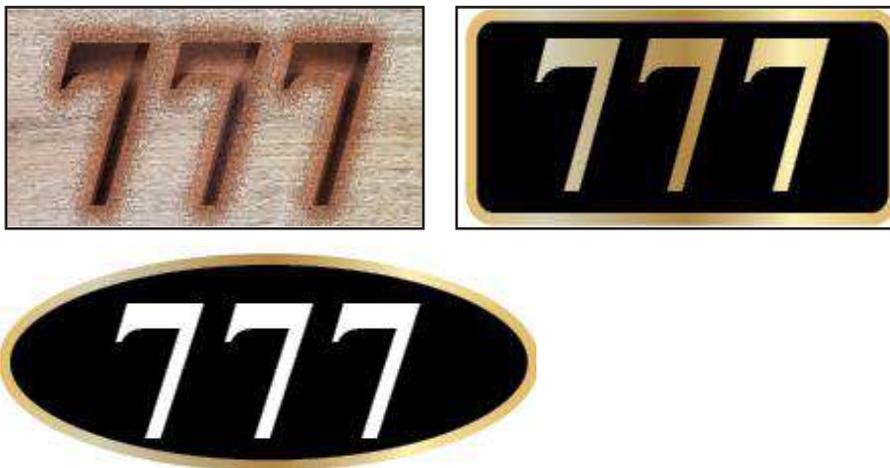
Figure 7.13. Standard street sign with a single street name & double headed arrow



7.9.8. HOUSE NUMBER SIGNAGE

- 7.9.8.a. House numbers should be placed at a maximum of 2m height from the road level.
- 7.9.8.b. It should be placed on the most visible section of the building/wall/gate.
- 7.9.8.c. The the font to be used for building numbering should be Dutch801 XBd BT and size 750 points or 182mm.

Figure 7.14. Examples of building numbers



7.9.9. UNIT NUMBER SIGNAGE

- 7.9.9.a. Wall mounted signs should be placed at a height between 1.4m and 1.6m from the finished floor level.

8. APPENDICES

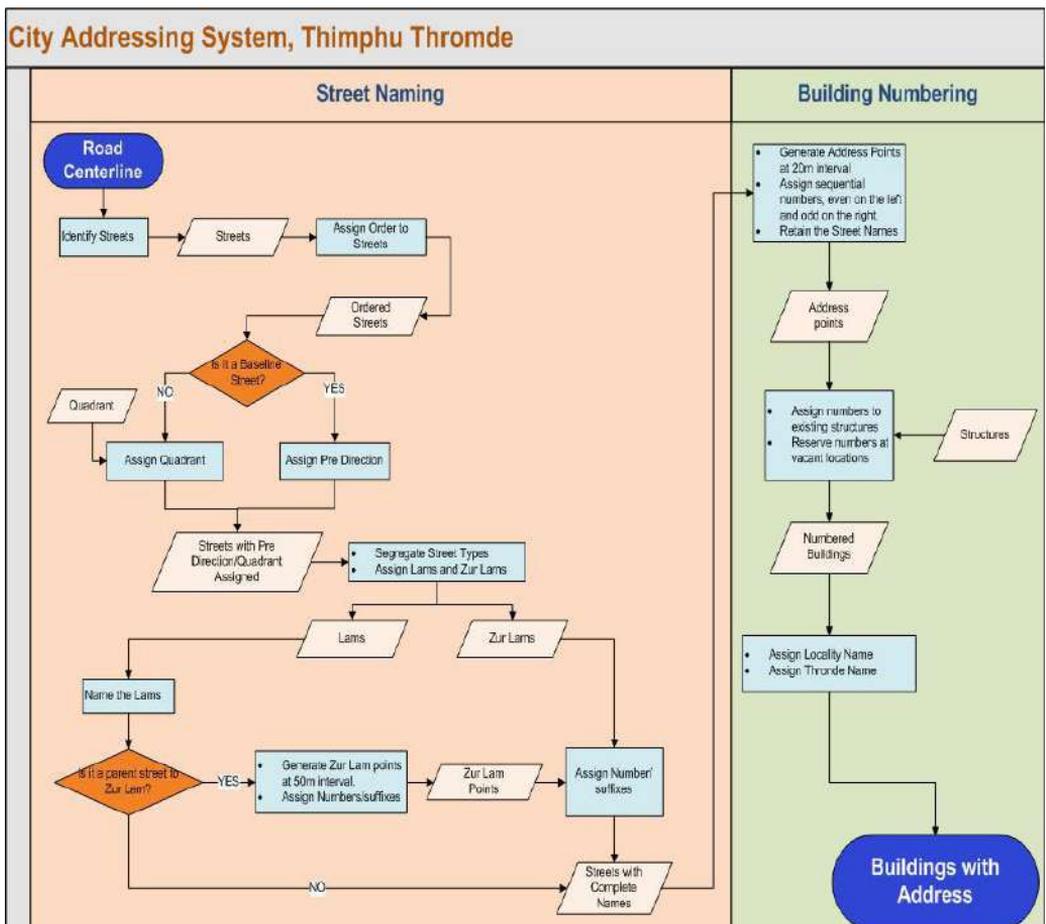
8.A. WORKFLOW

The creation of the geodatabase requires a carefully planned workflow. This gives a clear understanding of the expected outcome and the steps /resources required to achieve it.

It enables the organization to introduce and carry out activities in a systemic manner to realize a common goal

The workflow of the City Addressing System is as shown in the figure below:

Figure 8.1. Examples of building numbers



8.B. DATA DICTIONARY

This Data Dictionary would set reference as a guide and a template for future GIS database for addressing, with the expectation that the standardized approach will lead to consistency, efficiency and completeness of address database.

8.B.1.CITY ADDRESSING GEODATABASE

An Address Geodatabase is a spatial database of an addressing system.

Name of Geodatabase: CAS_TT

Description: This is a spatial database of the City Addressing System of Thimphu Thromde. The geodatabase workspace consists of 2 sets of features called feature datasets, related non-spatial data and domains.

Dataset List:

NAME	TYPE
Address	Feature Dataset
Signage	Feature Dataset
Structure Detail	Table
Address Unit	Table
Associative Function	Domain
Structure Use	Domain
Existence	Domain
Structure Type	Domain
Style	Domain
Structure Occupancy	Domain

NAME	TYPE
Floor Level	Domain
Unit Occupant	Domain
Unit Allotment Status	Domain
Unit Use	Domain
Pre Direction	Domain
Street Order	Domain
Street Type	Domain
Quadrant	Domain
Status	Domain
Locality	Domain
Thromde	Domain

8.B.2. FEATURE DATASET

Name of Feature Dataset: Address

Description: A set of features compiled based on addressing theme.

Feature List:

Points

CODE	NAME
PTADDR	Address Point
PTZURL	Zur Lam Point

Lines

CODE	NAME
PTADDR	Address Point
PTZURL	Zur Lam Point

Area

CODE	NAME
ARADDR	Address Area
ARLOCT	Locality
ARQUAD	Quadrant
ARTHRM	Thromde

8.B.3. FEATURES

This will describe what the feature is in its true existence (not how it will be geometrically represented).

8.B.3.a. Street

Name of Feature: Street

Code : LNSTRT

Feature Dataset: Address

Definition: A public road in a city, town, or village, typically with houses and buildings on one or both sides.

Aliases:

- Road

Compilation Description

- Centre line to be generated from roads.

Example:



8.B.3.b. Zur Lam Point

Name of Feature: ZurLamPoint

Code : PTZURL

Feature Dataset: Address

Definition: Location of take-off points of Zur Lam from Lam.

Aliases:

- Zur Lam Point
- Take-off Point

Compilation Description

- Point assigned at the junction of Zur Lam with the Parent Lam.
- Reserved point at every 50m on the main street for future streets.

Example:



8.B.3.c. Address Point

Name of Feature: AddressPoint

Code : PTADDR

Feature Dataset: Address

Definition: Location of addresses in coordinate pairs.

Aliases:

- Address Point
- Geocode

Compilation Description

- Points generated along the street based on the access to existing buildings.
- Reserved point at every 20m in non-buildup area.

Example:



8.B.3.a. Address Area

Name of Feature: AddressArea

Code : ARADDR

Feature Dataset: Address

Definition: Building footprint or roofline coverage for which an address is assigned..

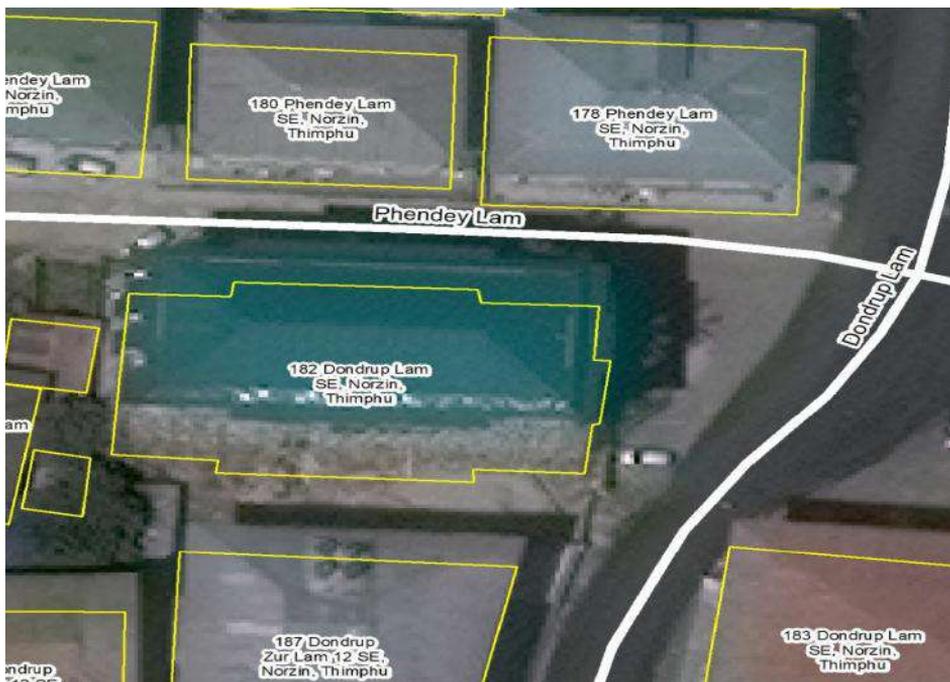
Aliases:

- Building
- Building Footprint
- Building Roof Line

Compilation Description

- Area generated from either building footprint or roof line.

Example:



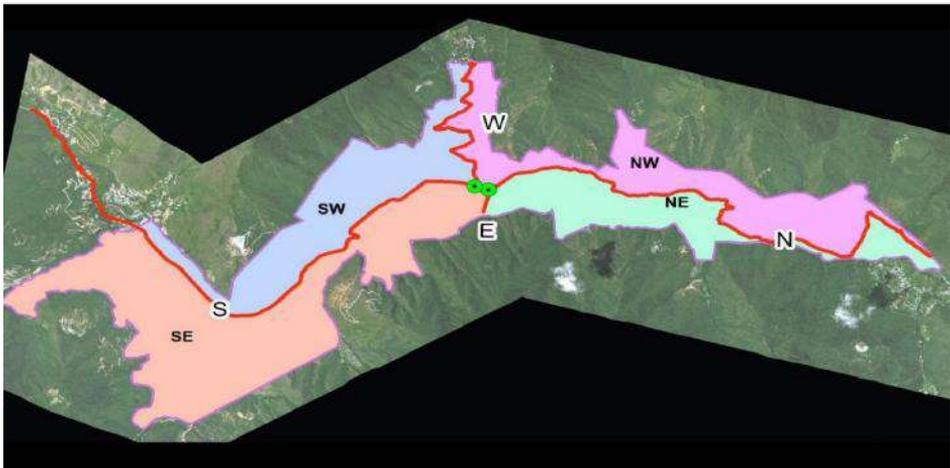
8.B.3.a. Quadrant

Name of Feature:	Quadrant
Code :	ARQUAD
Feature Dataset:	Address
Definition:	Thromde area divided into four infinite parts bounded by two half-axes formed by the baseline streets.
Aliases:	

Compilation Description

- Area defined based on the base line street running in a North-South and East-West Direction.

Example:



8.B.3.a. Locality

Name of Feature: Locality

Code : ARLOCT

Feature Dataset: Address

Definition: An area or neighbourhood bound where residents of mutual community interest reside.

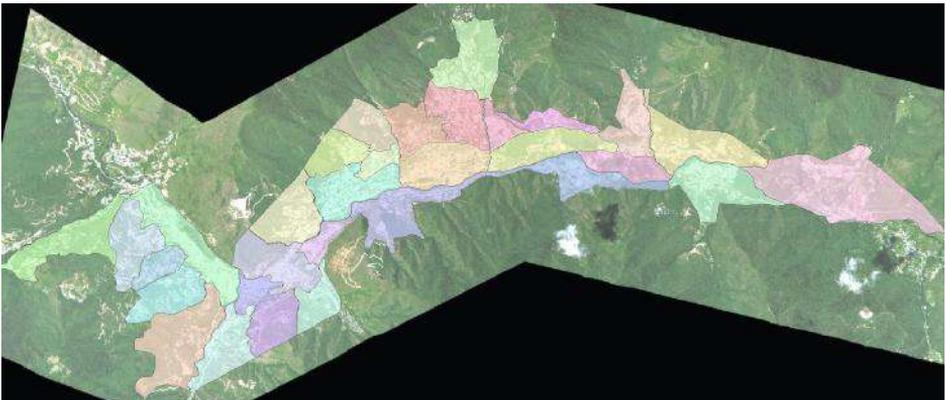
Aliases:

- Place Name

Compilation Description

- Area defined based on the natural boundaries, common community of interest or cadastral boundary.

Example:



8.B.3.a. **Thromde**

Name of Feature: Thromde

Code : ARTHRM

Feature Dataset: Address

Definition: A town or district that has local government.

Aliases:

- Thromde

Compilation Description

- Area defined based on the natural boundaries, common community of interest or cadastral boundary.

Example:



8.B.4. TABLES

The geodatabase is made up of multiple tables containing spatial as well as non-spatial data. The tables consists of attributes that describes characteristics of features. The difference between the two types of table is that the spatial tables additionally contains the geographic field which describes the location, size and shapes of features on the Earth's surface.

Each attribute is described by using codes that represents the category of information. The description enables us to draw information of the feature, the attribute value data is stored in a format that could be interpreted by a computer (i.e. string, date, integer etc.).

While the succeeding sections describes the schema of each feature, it is necessary to identify certain generic attribute concepts which could be applied consistently to all types of attributes to avoid confusion due to missing/unrequired attribution. These concepts are specified below:

VALUES	STRING	NUMBERS
UNKNOWN	UNKN	0
NOT APPLICABLE	NTAP	7777
OTHERS	OTH	7778

These values shall be special reserved values and shall be used specifically to represent the prescribed values.

8.B.5. SPATIAL TABLE

8.B.5.a. Street

Table Name: Street

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
StreetID	8	C	
StreetOrder	10	C	
PreDir	3	C	
StreetName	25	C	
StreetType	6	C	
ZurLamNo	6	I	
ZurLamSuffix	6	C	
Quadrant	3	C	
StreetAddr	70	C	
LeftFrom	6	I	
LeftTo	6	I	
RightFrom	6	I	
RightTo	6	I	

Column Definitions:

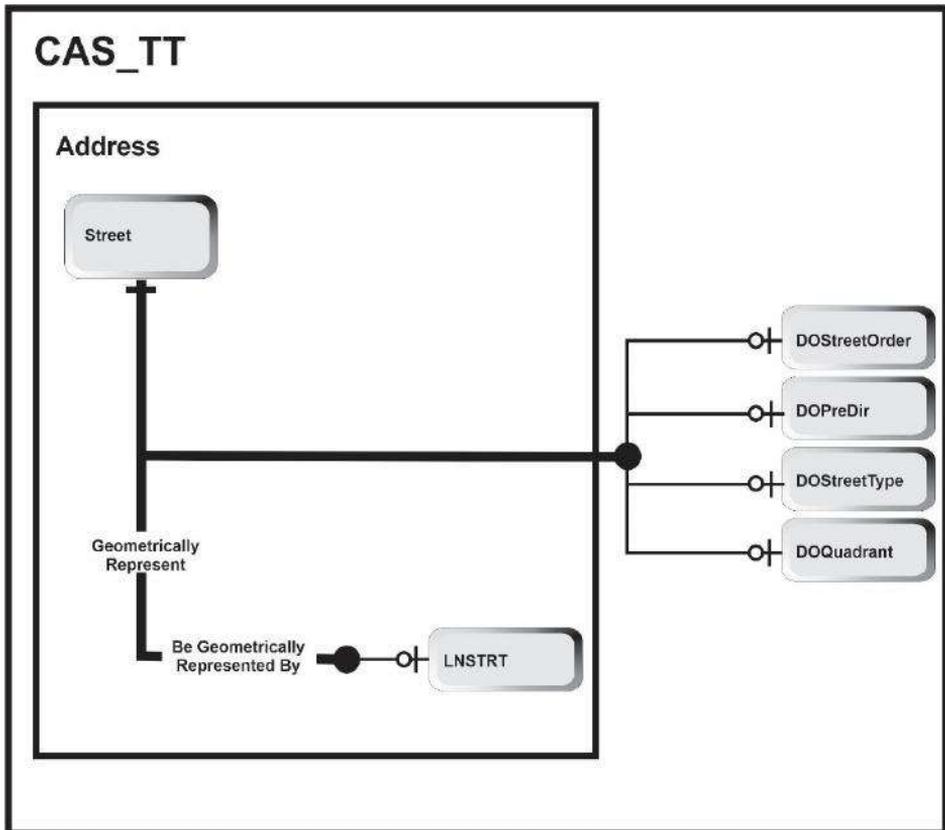
Code	is the Feature Code.
StreetOrder	is order/hierarchy of the street. Refer Domain Street Order, Appendices 8.A.6.o, for valid entries.

PreDir	is the pre direction assigned to the baseline streets. Refer Domain Pre Direction, Appendices 8.A.6.n, for valid entries.
StreetName	is the name assigned to the street.
StreetType	is the type of street. Refer Domain Street Type, Appendices 8.A.6.p, for valid entries.
ZurLamNo	is the number assigned to Zur Lams based on 50m interval takeoff points identified on the main street with odd number on the left and even on the right.
ZurLamSuffix	is the Dzongkha alphabet assigned to Zur Lams in addition to the number for Zur Lams that branches away from a parent ZurLam
Quadrant	refers to quadrant defined by the baseline streets. Refer Domain Quadrant, Appendices 8.A.6.q, for valid entries
StreetAddr	is the full address of the street, a combination of Name, Type, Zur Lam number/Zur Lam suffix (if applicable) and Pre direction/Quadrant
LeftFrom	is the starting number in the range of buildings number to the left of the street segment.
LeftTo	is the ending number in the range of buildings number to the left of the street segment.
RightFrom	is the starting number in the range of buildings number to the right of the street segment.
RightTo	is the ending number in the range of buildings number to the right of the street segment.

Relate Table:

FILE1	KEY1	FILE2	KEY2
Street	StreetOrder	DOSTreetOrder	CODE
Street	PreDir	DOPreDir	CODE
Street	StreetType	DOSTreetType	CODE
Street	Quadrant	DOQuadrant	CODE

Relate Diagram:



8.B.5.b. Zur Lam Point

Spatial Table Name: ZurLamPoint

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
StreetName	25	C	
ZurLamNo	6	C	
AllotStatus	6	C	

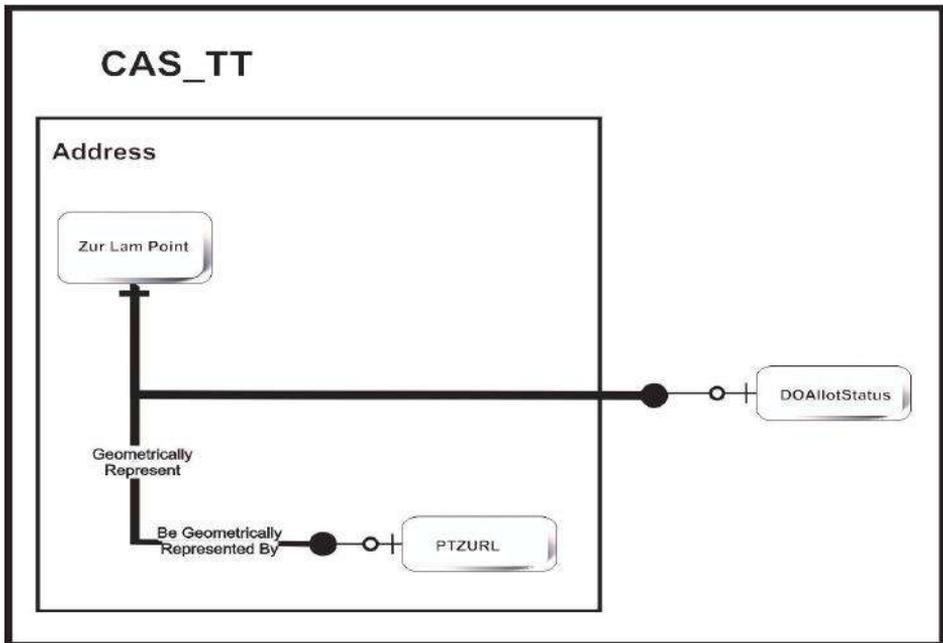
Column Definitions:

Code	is the Feature Code.
StreetName	is the name assigned to the street.
ZurLamNo	is the number assigned to Zur Lams based on 50m interval takeoff points identified on the main street with odd number on the left and even on the right.
ZurLamSuffix	is the Dzongkha alphabet assigned to Zur Lams in addition to the number for Zur Lams that branches away from a parent ZurLam
AllotStatus	

Relate Table:

FILE1	KEY1	FILE2	KEY2
ZurLamPoint	AllotStatus	DOAllotStatus	CODE

Relate Diagram:



8.B.5.c. Address Point

Spatial Table Name: AddressPoint

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
BuildingNo	6	I	
StreetAddr	70	C	
AllotStatus	6	C	

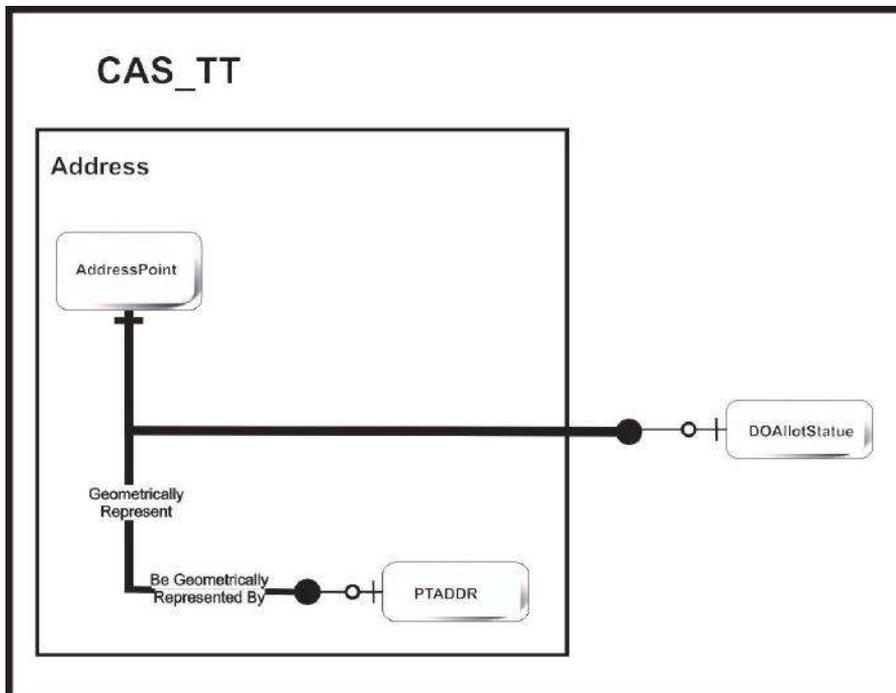
Column Definitions:

Code	is the Feature Code.
BuildingNo	is the sequential number generated for the address points along a street for numbering the buildings. Based on the direction of the street from the reference point odd numbers are assigned on the left side of the street and even on the right
StreetAddr	is the full address of the street, a combination of Name, Type, Zur Lam number/Zur Lam suffix (if applicable) and Pre Direction/Quadrant.
AllotStatus	refers to allotment status of the numbers to the buildings.. Refer Domain Allotment Status, Appendices 8.A.6.m, for valid entries.

Relate Table:

FILE1	KEY1	FILE2	KEY2
AddressPoint	AllotStatus	DOAllotStatus	CODE

Relate Diagram:



8.B.5.d. Address Area

Spatial Table Name: AddressArea

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
StrucID	8	C	
SubNumber	8	C	
StreetAddr	70	C	
LocName	20	C	
Thromde	20	C	
CityAddr	70	C	

Column Definitions:

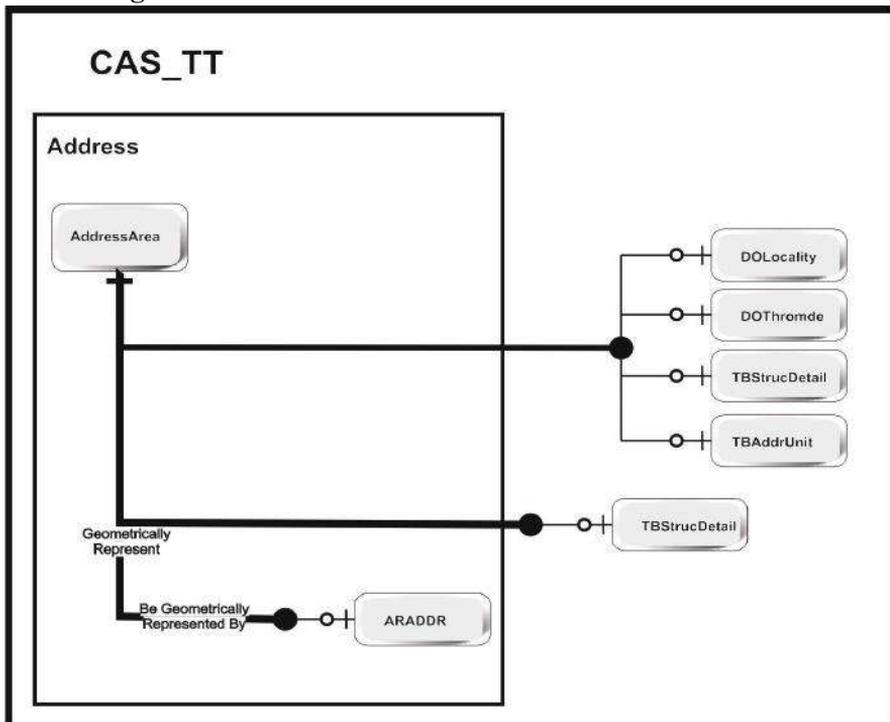
Code	is the Feature Code.
StrucID	is the unique ID assigned for the structure and is a combination of the locality ID and the number sequence assigned within the locality.
SubNumber	is additional number assigned to a building to identify individual building with common address on the plot.
StreetAddr	is the complete address of the street, a combination of Name, Type, Zur Lam number/Zur Lam suffix (if applicable) including Pre direction/Quadrant (if applicable)
LocName	is the name of the locality where the address area is located. Refer Domain Locality, Appendices 8.A.6.r, for valid entries.

Thromde	is the name of the Thromde where the address area is located. Refer Domain Thromde, Appendices 8.A.6.s, for valid entries.
CityAddr	is the complete address that has been assigned to the feature from a combination of SubNumber (if applicable), StreetAddr, Locality and the Thromde.

Relate Table:

FILE1	KEY1	FILE2	KEY2
AddressArea	LocName	DOLocality	CODE
AddressArea	StrucID	TBStrucDetail	StrucID
AddressArea	StrucID	TBStrucUnit	StrucID
AddressArea	Thromde	DOThromde	Thromde

Relate Diagram:



8.B.5.e. Quadrant

Spatial Table Name: Quadrant

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Quadrant	3	C	

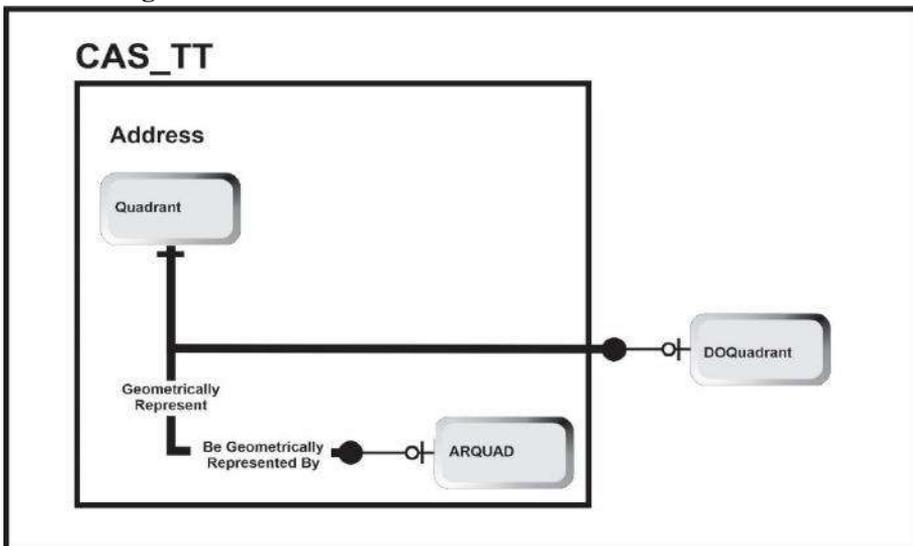
Column Definitions:

Code	is the Feature Code.
Quadrant	is the quadrant location. Refer Domain Quadrant, Appendices 8.A.6.q, for valid entries

Relate Table:

FILE1	KEY1	FILE2	KEY2
Quadrant	Quadrant	DOQuadrant	CODE

Relate Diagram:



8.B.5.f. Locality

Spatial Table Name: Locality

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
LocID	3	I	
LocName	20	C	

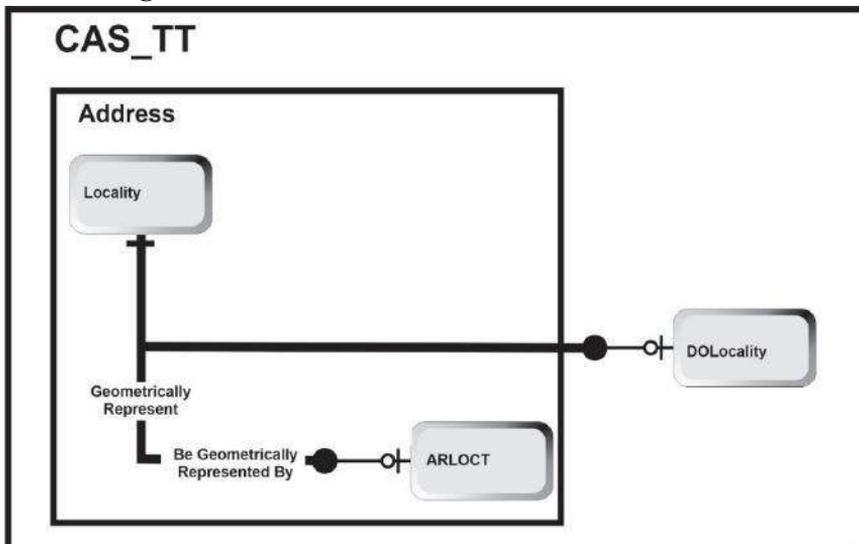
Column Definitions:

Code	is the Feature Code.
LocID	is the unique ID assigned to Locality.
LocName	is the name of the Locality. Refer Domain Locality, Appendices 8.A.6.r, for valid entries.

Relate Table:

FILE1	KEY1	FILE2	KEY2
Locality	LocalityID	DOLocality	CODE

Relate Diagram:



8.B.5.g. Thromde

Spatial Table Name: Thromde

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
PostCode	6	I	
Thromde	20	C	

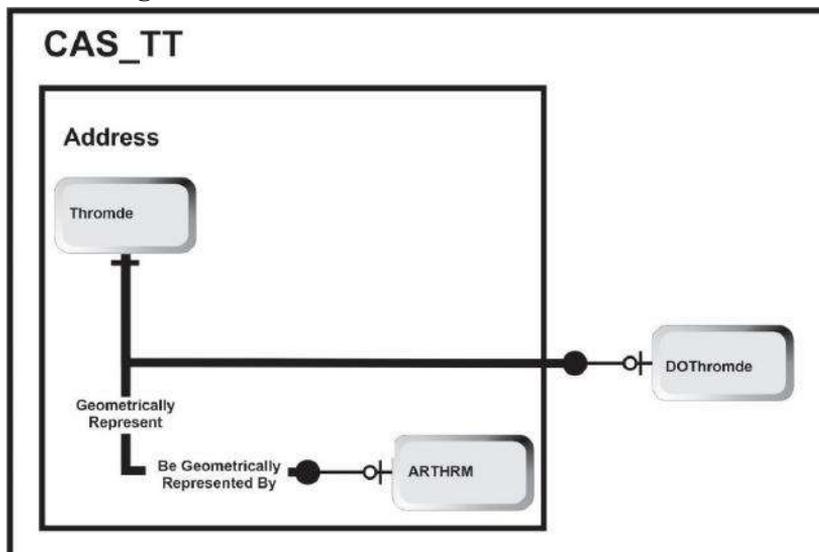
Column Definitions:

Code	is the Feature Code.
PostCode	is the postal code assigned to Thromde.
Thromde	is the name of the Thromde. Refer Domain Thromde, Appendices 8.A.6.s, for valid entries.

Relate Table:

FILE1	KEY1	FILE2	KEY2
Thromde	PostCode	DOThromde	CODE

Relate Diagram:



8.B.6. NON-SPATIAL TABLE

8.B.6.a. Structure Detail

Domain Name: TBStrucDetail

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
StrucID	8	I	
NumFloor	4	I	
AssoFunc	6	C	
StrucUse	6	C	
Existence	6	C	
StrucType	6	C	
Style	6	C	
StrucOccu	6	C	

Column Definitions:

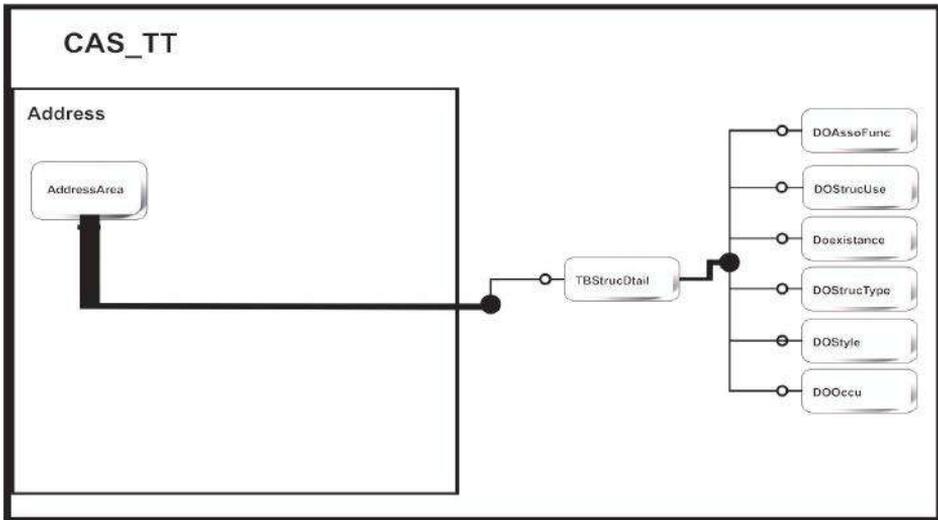
Code	is the Value Code.
StrucID	is the unique ID assigned for the structure and is a combination of the locality ID and the number sequence assigned within the locality.
NumFloor	The number of floors in the structure.
AssoFunc	The associative function of the structure in terms of the functional dependency to each other within the plot. Refer Domain Associative Function 8.A.6.c, for valid entries

StrucUse	The predominant use of the structure. Refer Domain Structure Use, Appendices 8.A.6.d, for valid entries.
Existence	The physical existence status of the structure in the real world. Refer Domain Existence, Appendices 8.A.6.e for valid entries
StrucType	The type of structure in terms of its design. Refer Domain Structure Type, Appendices 8.A.6.f.
Style	The style of architectural façade of the building. Refer Domain Style, Appendices 8.A.6.g.
StrucOccu	The occupancy status of the structure. Refer Domain Structure Occupancy, Appendices 8.A.6.h.

Relate Table:

FILE1	KEY1	FILE2	KEY2
TBStrucDetail	StrucID	AddressArea	StrucID
TBStrucDetail	AssoFunc	DOAssoFunc	Code
TBStrucDetail	StrucUse	DOStrucUse	Code
TBStrucDetail	Existence	DOExistence	Code
TBStrucDetail	StrucType	DOStrucType	Code
TBStrucDetail	StrucStyle	DOStyle	Code
TBStrucDetail	StrucOccu	DOStrucOccu	Code

Relate Diagram:



8.B.6.b. Address Unit

Domain Name: TBAddrUnit

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
UnitID	10	I	
StrucID	8	I	
UnitNo	4	C	
UnitName	60	C	
FloorLvl	6	C	
UnitStatus	6	C	
UnitOccupnt	6	C	
UnitUse1	6	C	
UnitUse2	6	C	
UnitUse3	6	C	

Column Definitions:

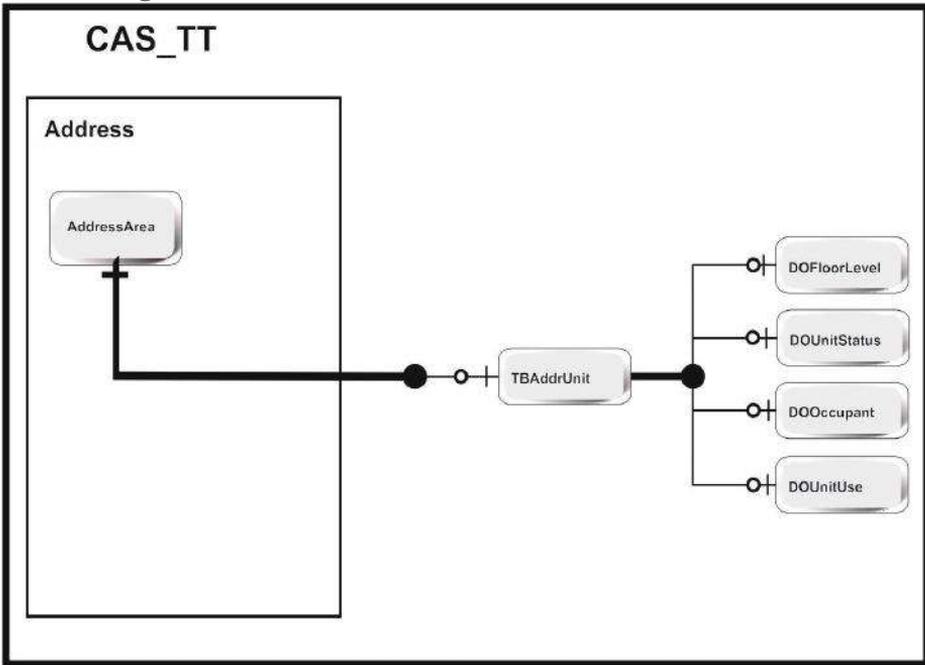
Code	is the Value Code.		
UnitID	The Unique ID assigned for the unit		
StrucID	The number of floors in the structure.		
UnitName	The Unique ID of the structure in which the unit is located.		
FloorLvl	The floor level on which the unit is located. Refer Domain Floor Level, Appendices 8.A.6.i, for valid entries.		
UnitStatus	The occupancy statue of the unit. Refer Domain Unit Status, Appendices 8.A.6.k for valid entries.		
UnitNo	The occupancy statue of the unit. Refer Domain Unit Status, Appendices 8.A.6.k for valid entries.		
	Floor	Unit ID (eg.)	Unit ID for annex Structures
	Basement 2	2B01, 2B02...	An2B01,An2B02...
	Basement 1	1B01, 1B02....	An1B01, An1B02
	Stilt Floor	S01, S02	AnS01, AnS02...
	Ground Floor	G01,G02....	AnG01,AnG02...
	First Floor	101,102...	
	Second Floor	201,202...	
	Third Floor	301,302....	
	Attic Floor 1	1A01,1A02....	
	Attic Floor 2	2A01,2A02...	
	Jamthog	J01,J02.....	

UnitOccpnt	The type of occupancy in terms of ownership of the unit. Refer Domain Unit Occupant, Appendices 8.A.6.j for valid entries
UnitUse1	The primary use assigned for the unit as per the categorization. Refer Domain Unit Use, Appendices 8.A.6.1.
UnitUse1	The secondary use, if any, assigned for the unit as per the categorization. Refer Domain Unit Use, Appendices 8.A.6.1
UnitUse1	Any other use, if any, assigned for the unit as per the categorization. Refer Domain Unit Use, Appendices 8.A.6.1.

Relate Table:

FILE1	KEY1	FILE2	KEY2
TBAddrUnit	StrucID	TBAddrUnit	StrucID
TBAddrUnit	FloorLvl	DOFloorLevel	Code
TBAddrUnit	UnitStatus	DOUnitStatus	Code
TBAddrUnit	UnitOccpnt	DOOccupant	Code
TBAddrUnit	UnitUse1	DOUnitUse	Code
TBAddrUnit	UnitUse2	DOUnitUse	Code
TBAddrUnit	UnitUse3	DOUnitUse	Code

Relate Diagram:



8.B.6.c. Domain Associative Function

Domain Name: DOAssoFunc

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

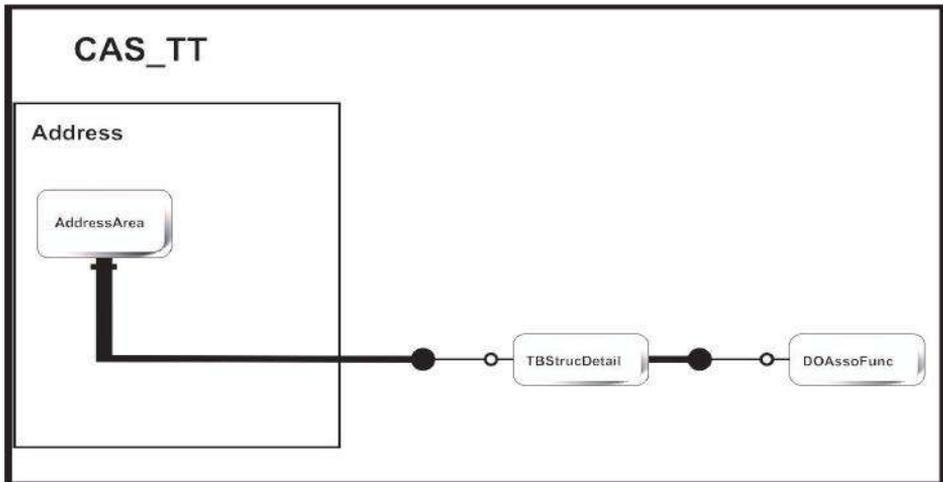
Column Definitions:

Code	The Value Code.	
Description	The associative function of the building based on the relative position to one another.	
	Valid entries are:	
	MAIN	Main
	ANCI	Ancillary

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOAssoFunc	Code	TBStrucDetail	AssoFunc

Relate Diagram:



8.B.6.d. Domain Structure Use

Domain Name: DOStrucUse

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

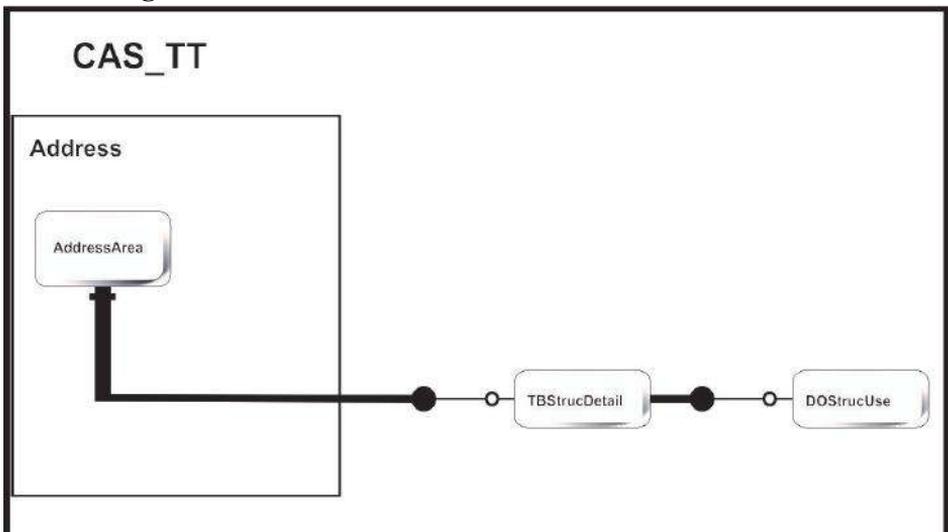
Column Definitions:

Code	The Value Code.																										
Description	<p>The primary use of the structure. This shall be generalized from the Unit Use.</p> <p>Valid entries are:</p> <table> <tr><td>COM</td><td>Commercial</td></tr> <tr><td>EDU</td><td>Educational</td></tr> <tr><td>ENT</td><td>Entertainment</td></tr> <tr><td>IND</td><td>Industrial</td></tr> <tr><td>INS</td><td>Institutional</td></tr> <tr><td>MXD</td><td>Mixed</td></tr> <tr><td>REC</td><td>Recreational</td></tr> <tr><td>REL</td><td>Religious</td></tr> <tr><td>RES</td><td>Residential</td></tr> <tr><td>SER</td><td>Service</td></tr> <tr><td>SSR</td><td>Social Service</td></tr> <tr><td>UTL</td><td>Utility and Miscellaneous</td></tr> <tr><td>WRH</td><td>Warehouse and Sto</td></tr> </table>	COM	Commercial	EDU	Educational	ENT	Entertainment	IND	Industrial	INS	Institutional	MXD	Mixed	REC	Recreational	REL	Religious	RES	Residential	SER	Service	SSR	Social Service	UTL	Utility and Miscellaneous	WRH	Warehouse and Sto
COM	Commercial																										
EDU	Educational																										
ENT	Entertainment																										
IND	Industrial																										
INS	Institutional																										
MXD	Mixed																										
REC	Recreational																										
REL	Religious																										
RES	Residential																										
SER	Service																										
SSR	Social Service																										
UTL	Utility and Miscellaneous																										
WRH	Warehouse and Sto																										

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOStrucUse	Code	TBStrucDetail	StrucUse

Relate Diagram:



8.B.6.e. Domain Existence

Domain Name: DOExistence

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

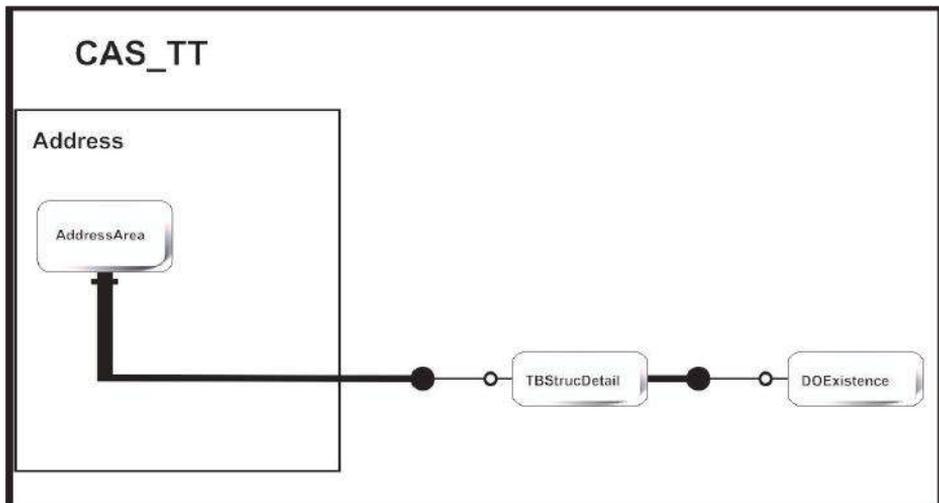
Column Definitions:

Code	The Value Code.
Description	The existence status of the building. Valid entries are: STAN Standing UNCO Under Construction DAMG Damaged ABAN Abandoned

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOExistence	Code	TBStrucDetail	Existence

Relate Diagram:



8.B.6.f. Domain Structure Type

Domain Name: DOStrucType

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

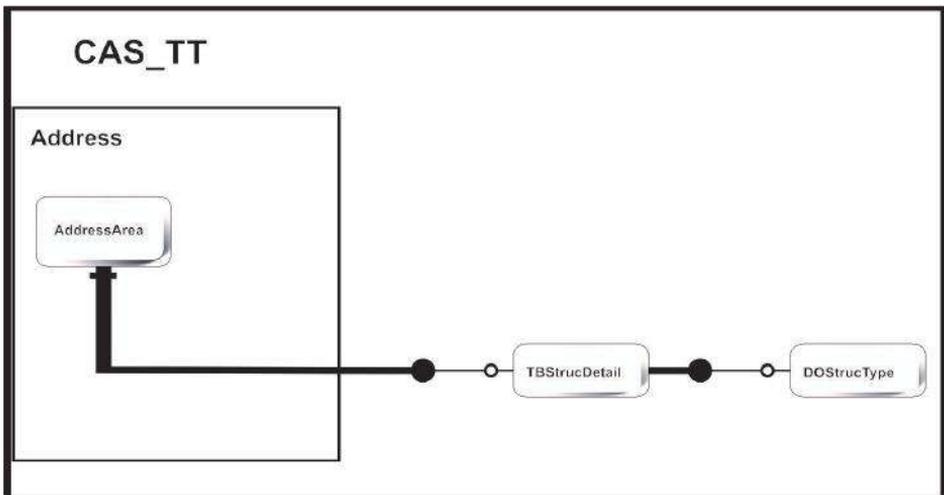
Column Definitions:

Code	The Value Code.
Description	The structural type of the building. Valid entries are: FRMD Framed LDBR Load Bearing

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOStrucType	Code	TBStrucDetail	StrucType

Relate Diagram:



8.B.6.g. Domain Style

Domain Name: DOStyle

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

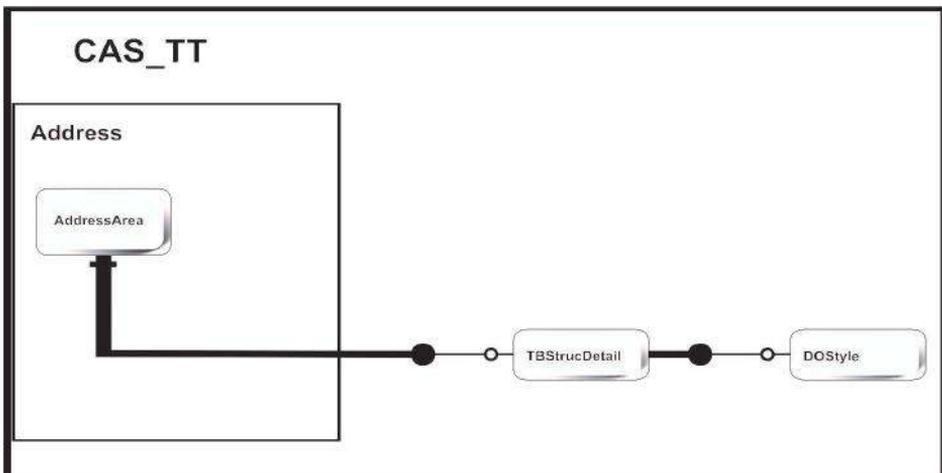
Column Definitions:

Code	The Value Code.
Description	The architectural style of the building. Valid entries are: TRAD Traditional MORD Modern

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOStyle	Code	TBStrucDetail	Style

Relate Diagram:



8.B.6.h. Domain Structure Occupancy

Domain Name: DOStrucOccu

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

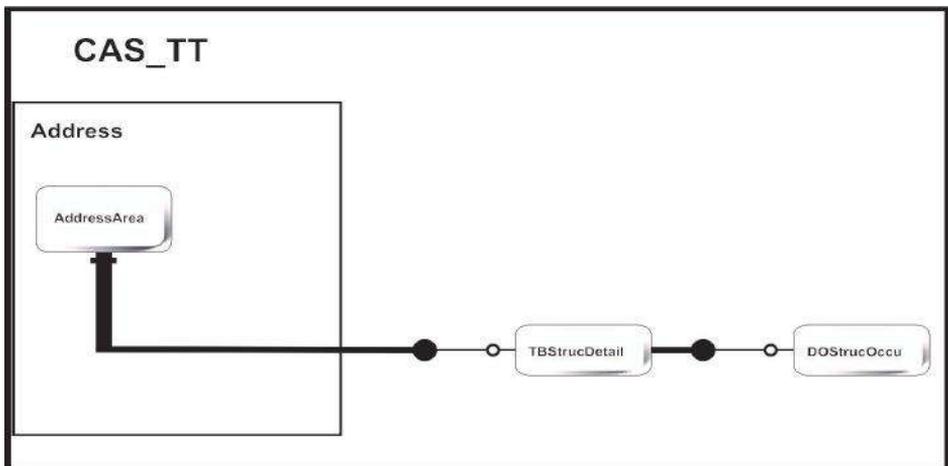
Column Definitions:

Code	The Value Code.
Description	The occupancy status of the structure. Valid entries are: VCNT Vacant OCCP Occupied ABDN Abandoned

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOStrucOccu	Code	TBStrucDetail	StrucOccu

Relate Diagram:



8.B.6.i. Domain Floor Level

Domain Name: DOFloorLevel

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

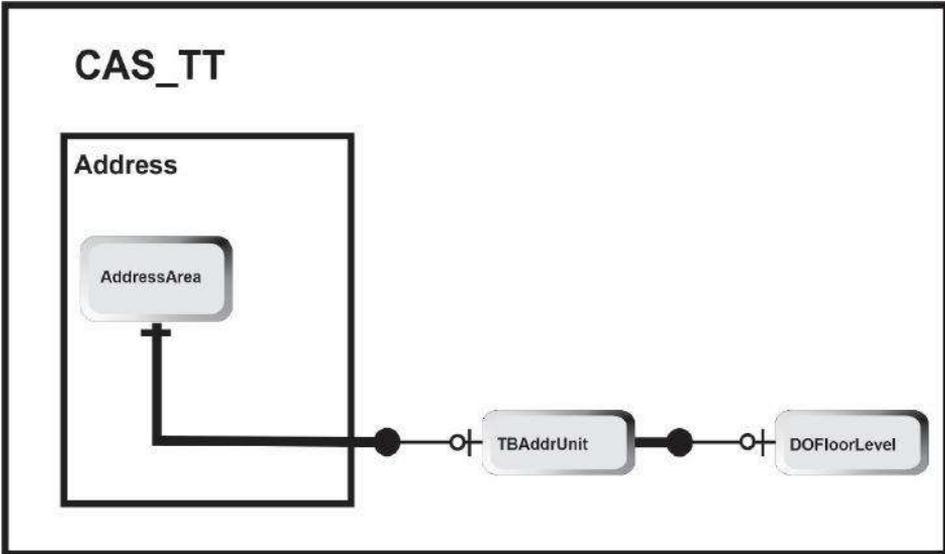
Column Definitions:

Code	The Value Code.																												
Description	<p>The floor level on which the unit is located.</p> <p>Valid entries are:</p> <table> <tbody> <tr> <td>GRND</td> <td>Ground Floor</td> </tr> <tr> <td>FRST</td> <td>First Floor</td> </tr> <tr> <td>SCND</td> <td>Second Floor</td> </tr> <tr> <td>THRD</td> <td>Third Floor</td> </tr> <tr> <td>FRTH</td> <td>Fourth Floor</td> </tr> <tr> <td>FFTH</td> <td>Fifth Floor</td> </tr> <tr> <td>SXTH</td> <td>Sixth Floor</td> </tr> <tr> <td>SVTH</td> <td>Seventh Floor</td> </tr> <tr> <td>EGTH</td> <td>Eighth Floor</td> </tr> <tr> <td>NNTH</td> <td>Ninth Floor</td> </tr> <tr> <td>TNTH</td> <td>Tenth Floor</td> </tr> <tr> <td>BSMT</td> <td>Basement Floor</td> </tr> <tr> <td>ATTC</td> <td>Attic Floor</td> </tr> <tr> <td>STLT</td> <td>Stilt Floor</td> </tr> </tbody> </table>	GRND	Ground Floor	FRST	First Floor	SCND	Second Floor	THRD	Third Floor	FRTH	Fourth Floor	FFTH	Fifth Floor	SXTH	Sixth Floor	SVTH	Seventh Floor	EGTH	Eighth Floor	NNTH	Ninth Floor	TNTH	Tenth Floor	BSMT	Basement Floor	ATTC	Attic Floor	STLT	Stilt Floor
GRND	Ground Floor																												
FRST	First Floor																												
SCND	Second Floor																												
THRD	Third Floor																												
FRTH	Fourth Floor																												
FFTH	Fifth Floor																												
SXTH	Sixth Floor																												
SVTH	Seventh Floor																												
EGTH	Eighth Floor																												
NNTH	Ninth Floor																												
TNTH	Tenth Floor																												
BSMT	Basement Floor																												
ATTC	Attic Floor																												
STLT	Stilt Floor																												

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOFloorLevel	Code	TBAddrUnit	FloorLevel

Relate Diagram:



8.B.6.j. Domain Unit Occupant

Domain Name: DOUnitOccupant

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

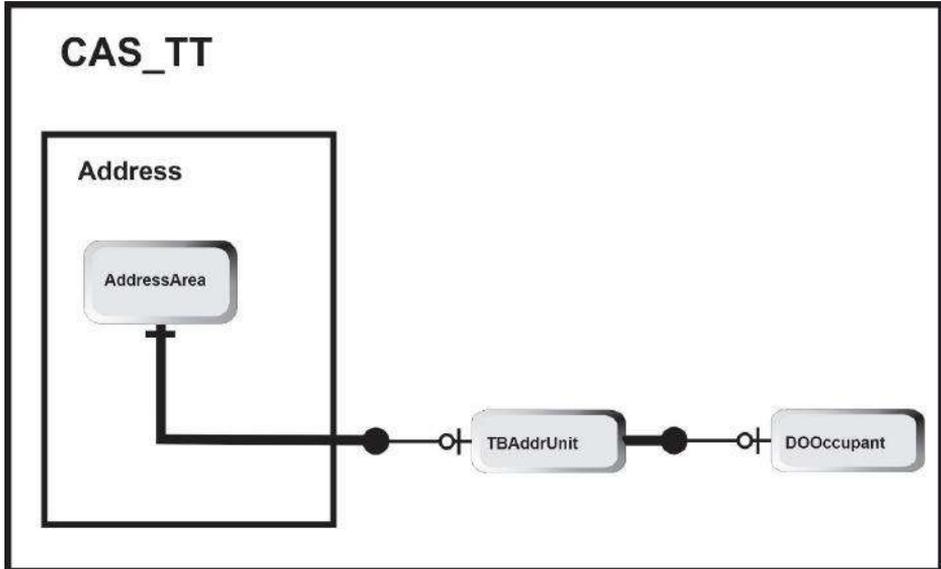
Column Definitions:

Code	The Value Code.				
Description	<p>The type of occupancy in terms of ownership of the unit.</p> <p>Valid entries are:</p> <table> <tr> <td>TNNT</td> <td>Tenant</td> </tr> <tr> <td>OWNR</td> <td>Owner</td> </tr> </table>	TNNT	Tenant	OWNR	Owner
TNNT	Tenant				
OWNR	Owner				

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOUnitOccupant	Code	TBAddrUnit	Occupant

Relate Diagram:



8.B.6.k. Domain Unit Status

Domain Name: DOUnitStatus

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

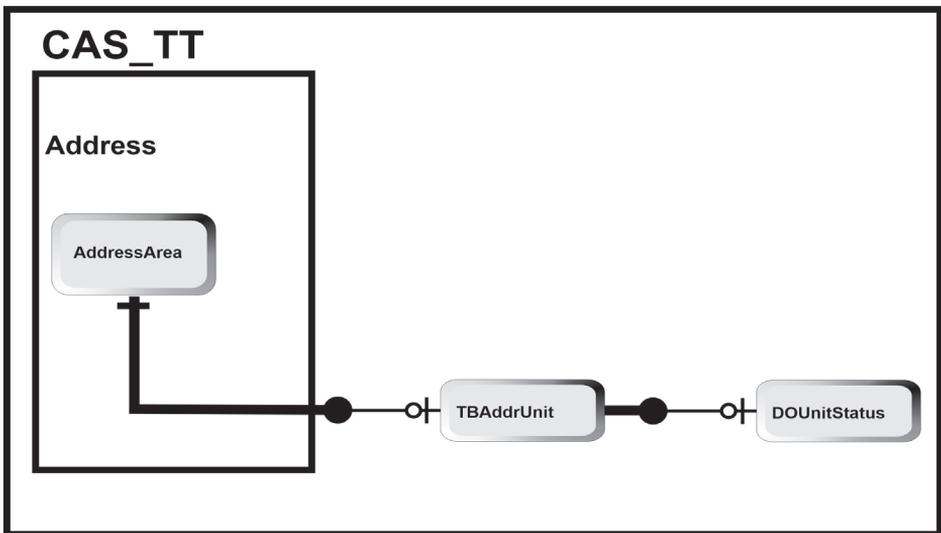
Column Definitions:

Code	The Value Code.
Description	The status of unit occupancy. Valid entries are: VCNT Vacant OCCP Occupied

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOOccupant	Code	TBAddrUnit	Occupant

Relate Diagram:



8.B.6.I. Domain Unit Use

Domain Name: DOUnitUse

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

Column Definitions:

Code	The Value Code.		
Description	The associative function of the building based on the relative position to one another.		
	Valid entries are:		
	RESIDENTIAL:		
	RES1	Residential Group 1	
	Apartment houses Boarding houses (non-transient) Congregate living facilities (non-transient)		
	RES2	Residential Group 2	
	Buildings that do not contain more than two dwelling unit Lodging houses with five or fewer guest rooms		
	RES2	Residential Group 2	
	Boarding houses (transient) Congregate living facilities (transient)		
	INSTITUTIONAL GROUP:		
	INS	INSTITUTIONAL	
	Government Institutions Private Institutions		
	RELIGIOUS:		

	REL	Religious Group
	Monasteries Lhakhangs Mandirs Prayer Halls	
	EDUCATIONAL:	
	EDU	Educational Group
	use of a building or structure, or a portion thereof, for educational purposes through the 12th grade.	
	SOCIAL SERVICE:	
	SSR1	Social Service Group 1
	Child Day Care Adult Day Care ECCD	
	SSR2	Social Service Group 2
	Foster care facilities Detoxification facilities Hospitals Nursing Homes Psychiatric Hospitals Veterinary Hospitals Clinic, BHU.	
	SSR3	Social Service Group 3
	Alcohol and drug centers Assisted living facilities. Care facilities Group homes Residential board and care facilities Social rehabilitation facilities.	

	SSR4	Social Service Group 4
	Correctional Facilities Detention Centres Prisons Reformatories	
	SSR5	Social Service Group 5
	Religious Activity Halls Cremation Structures	
	COMMERCIAL:	
	COM	Commercial Group
	Retail and Wholesale Shops Departmental Stores Markets Sales Room Showrooms Hotels (transient)	
	ENTERTAINMENT	
	ENT	Entertainment Group 1
	Amusement Park Structures Nightclubs Restaurants, cafeterias and similar dining facilities with live music. Bars Amusement arcades Bowling alleys Pool and Snooker parlors Karaoke	
	RECREATION	
	REC1	Recreational Group 1
	Concert Halls Television and radio studios admitting an audience Theaters	

	REC2	Recreational Group 2
		Art Galleries Banquet Halls Community Halls Dance halls (not including food or drink) Exhibition halls Gymnasiums (without spectator seating) Indoor Tennis Courts (without spectator seating) Indoor Swimming pools without spectator seating Libraries Museums
	REC3	Recreational Group 3
		Swimming Pools Tennis Courts
	REC4	Recreational Group 4
		Amusement Park Structures Bleachers Grandstands Stadiums Archery Skating rink Futsal
	INDUSTRIAL	
	IND1	Industrial Group 1 (Low Hazard)
		Beverages: up to and including 16-percent alcohol Brick and Masonry Blocks Pottery Foundries Metal products (fabrication and assembly) Food processing

	IND2	Industrial Group 2 (Medium Hazard)
		<p>Beverages: over 16-percent alcohol content</p> <p>Machinery</p> <p>Disinfectants</p> <p>Dry cleaning and dyeing</p> <p>Electric Generation Plants</p> <p>Leather Products</p> <p>Printing and Publishing</p> <p>Car Wash</p> <p>Soaps and Detergents</p> <p>Textiles</p> <p>Upholstering</p> <p>Woodworking</p>
	IND3	Industrial Group 3
		<p>The use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard</p> <p>Automobile Workshop, Refuse incineration</p>
		SERVICE:
	SER	SERVICE Group
		<p>Community Service Centre</p> <p>Banks</p> <p>Professional services</p> <p>Laboratories: testing and research</p> <p>Training and skill development not in a school or academic program</p> <p>Radio and television stations</p> <p>Post offices</p> <p>Barber and beauty shops</p> <p>Dry cleaning and laundries</p> <p>Outlets</p> <p>Print shops</p> <p>Bakeries</p> <p>Waiting areas in transportation terminals</p>

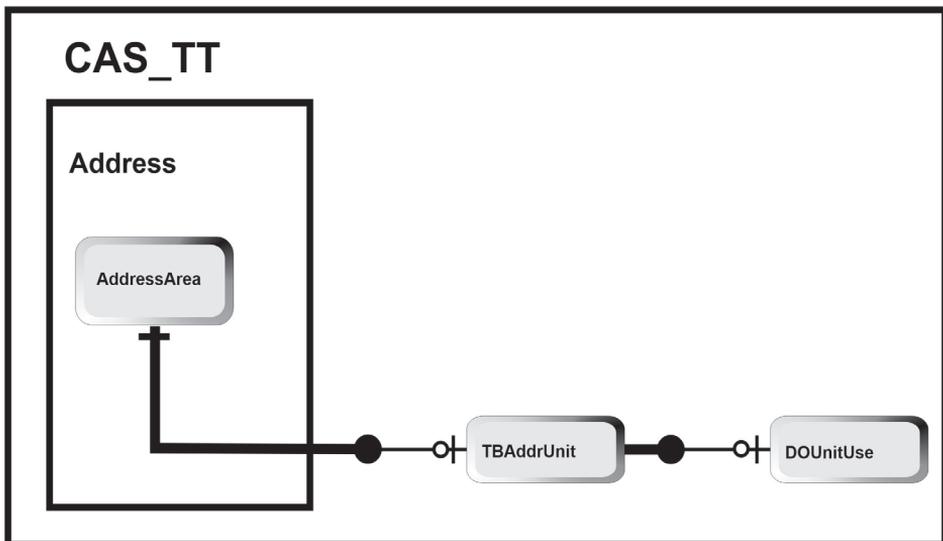
	WAREHOUSE (Bulk Storage)	
	WRH1	WAREHOUSE Group 1(Low Hazard)
	Asbestos Beverages up to and including 16-percent alcohol in metal, glass or ceramic containers Cement in bags Chalk and crayons cell batteries Scrap Food products Frozen foods Glass bottles, empty or filled with noncombustible liquids Meat.	
	WRH2	WAREHOUSE Group 2(Medium Hazard)
	Aerosols, Levels 2 and 3 Cloth and clothing Paper Bamboos and rattan Furniture Furs Lumber Tyres Tobacco Upholstry Wax	
	WRH3	WAREHOUSE Group 3(HighHazard)
	Fuel Storage LPG	
	UTILITY AND MISCELLANEOUS:	
	UTI	Utility and Miscellaneous Group

	Agricultural Buildings Greenhouses Livestock Shelter Garages Sheds Tanks Towers Generator Houses Substations Transformers
--	--

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOUnitUse	Code	TBAddrUnit	UnitUse1
DOUnitUse	Code	TBAddrUnit	UnitUse2
DOUnitUse	Code	TBAddrUnit	UnitUse3

Relate Diagram:



8.B.6.m. Domain Allotment Status

Domain Name: DOStatus

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

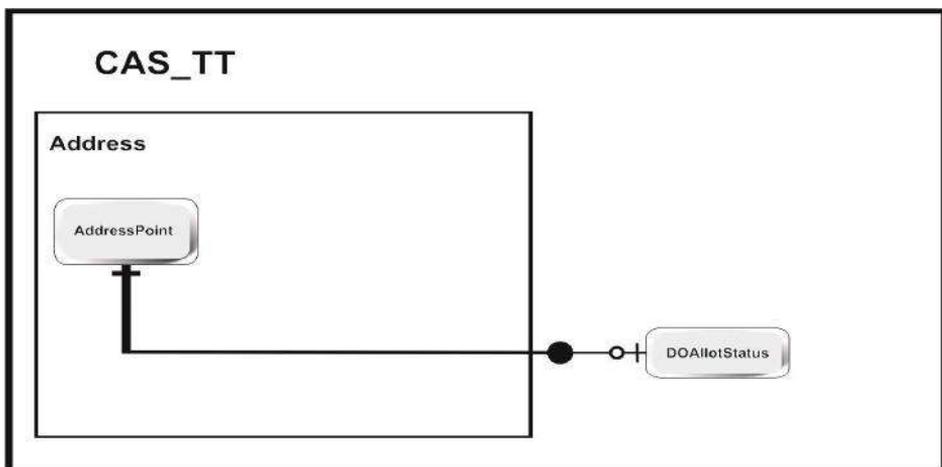
Column Definitions:

Code	The Value Code.
Description	The assignment status of the address. Valid entries are: ALLOT Alloted RSVD Reserved

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOAllotStatus	Code	AddrPoint	AllotStatus

Relate Diagram:



8.B.6.n. Domain Pre Direction

Domain Name: DOStatus

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

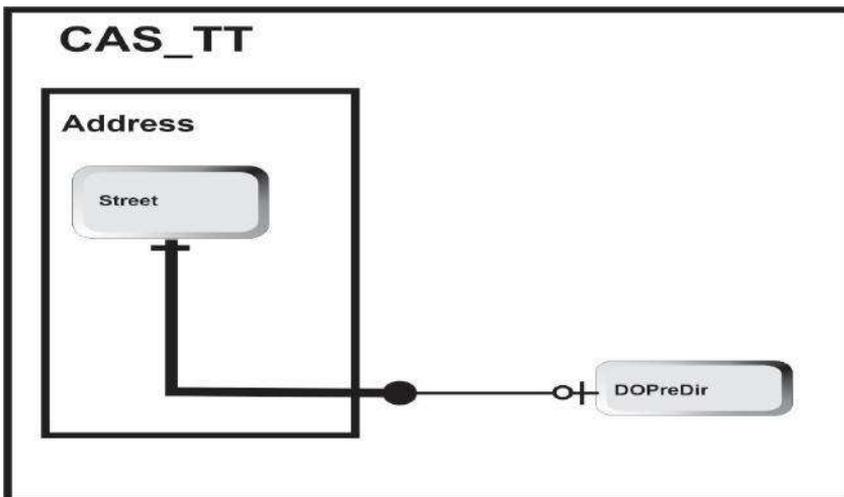
Column Definitions:

Code	The Value Code.								
Description	The pre direction assigned to the baseline street. Valid entries are: <table style="margin-left: auto; margin-right: auto;"> <tr> <td>E</td> <td>E</td> </tr> <tr> <td>W</td> <td>W</td> </tr> <tr> <td>N</td> <td>N</td> </tr> <tr> <td>S</td> <td>S</td> </tr> </table>	E	E	W	W	N	N	S	S
E	E								
W	W								
N	N								
S	S								

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOPreDir	Code	Street	PreDir

Relate Diagram:



8.B.6.o. Domain Street Order

Domain Name: DOStreetOrder

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

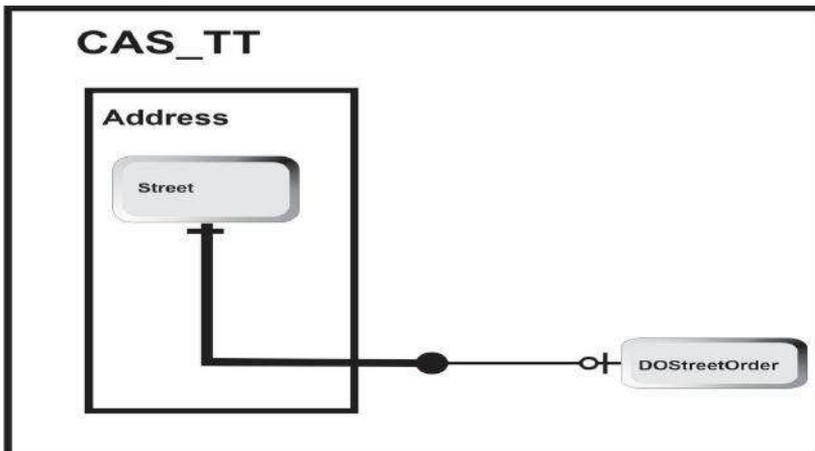
Column Definitions:

Code	The Value Code.										
Description	<p>The order assigned to the street allotment based on the baseline street i.e. first order.</p> <p>Valid entries are:</p> <table> <tbody> <tr> <td>ORD1</td> <td>First Order</td> </tr> <tr> <td>ORD2</td> <td>Second Order</td> </tr> <tr> <td>ORD3</td> <td>Third Order</td> </tr> <tr> <td>ORD4</td> <td>Fourth Order</td> </tr> <tr> <td>ORD5</td> <td>Fifth Order</td> </tr> </tbody> </table>	ORD1	First Order	ORD2	Second Order	ORD3	Third Order	ORD4	Fourth Order	ORD5	Fifth Order
ORD1	First Order										
ORD2	Second Order										
ORD3	Third Order										
ORD4	Fourth Order										
ORD5	Fifth Order										

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOStreetOrder	Code	Street	StreetOrder

Relate Diagram:



8.B.6.p. Domain Street Type

Domain Name: DOStreetOrder

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

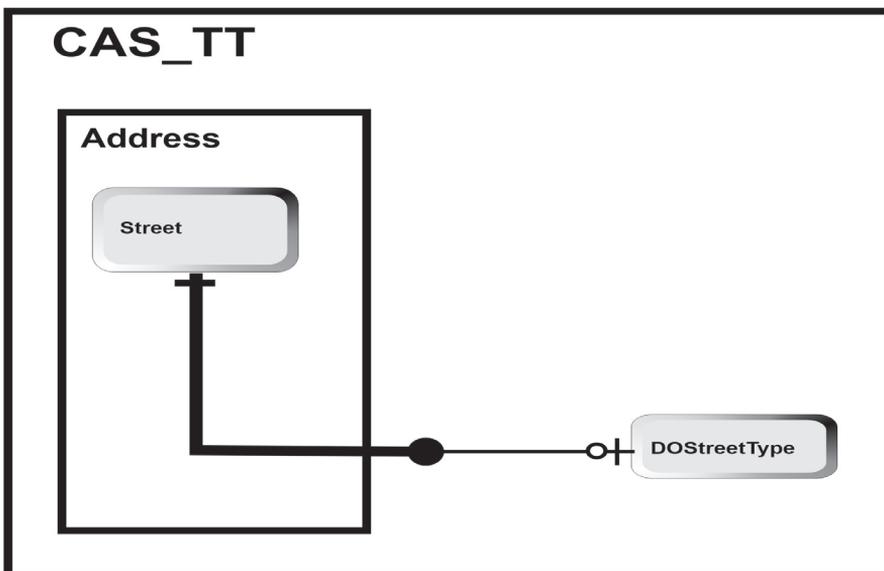
Column Definitions:

Code	The Value Code.
Description	The type of street. Valid entries are: <div style="display: flex; justify-content: space-around;"> STYP1 Lam </div> <div style="display: flex; justify-content: space-around;"> STYP2 Zur Lam </div>

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOStreetOrder	Code	Street	StreetOrder

Relate Diagram:



8.B.6.q. Domain Quadrant

Domain Name: DOQuad

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

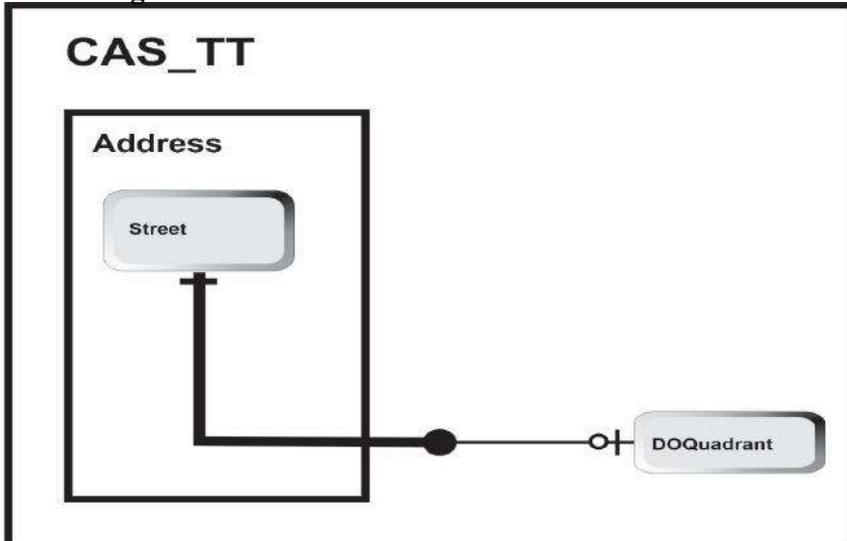
Column Definitions:

Code	The Value Code.								
Description	The quadrant assigned to the area. Valid entries are: <table style="margin-left: 40px;"> <tbody> <tr> <td>NE</td> <td>NE</td> </tr> <tr> <td>NW</td> <td>NW</td> </tr> <tr> <td>SE</td> <td>SE</td> </tr> <tr> <td>SW</td> <td>SW</td> </tr> </tbody> </table>	NE	NE	NW	NW	SE	SE	SW	SW
NE	NE								
NW	NW								
SE	SE								
SW	SW								

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOQuad	Code	Street	Quadrant

Relate Diagram:



8.B.6.r. Domain Locality

Domain Name: DOLocality

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

Column Definitions:

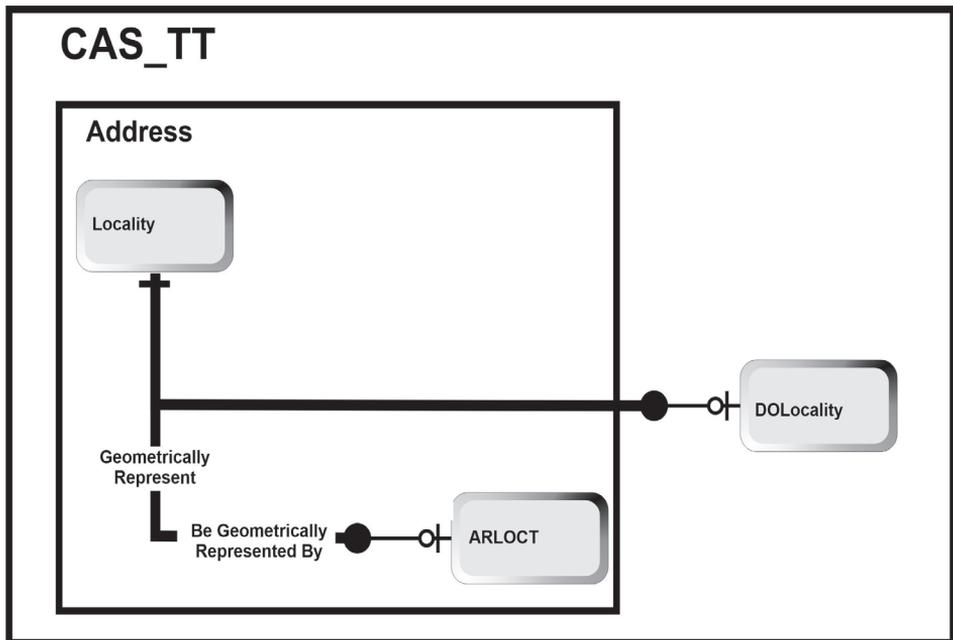
Code	The Value Code.	
Description	The name of locality. Valid entries are:	
	1	Serbithang
	2	Wangchhu Taba
	3	Dolay Gang
	4	Kemkha
	5	Simtokha
	6	Babesa
	7	Tshatshobaykha
	8	Lubding
	9	Lungtenphu
	10	Chang Olakha
	11	Chang Jalu
	12	Chang Jiji
	13	Yangchenphu
	14	Chang Bangdu

	15	Chang Zamtok
	16	Chang Zamtok
	17	Chang Gedhaphu
	18	Chang Zeri
	19	Norzin
	20	Chang Genye
	21	Chang Gangkha
	22	Motithang
	23	Kawang Jangsa
	24	Zilukha
	25	Kawang Chhodzong
	26	Ludrong Phakha
	27	Lhadrong
	28	Samteling
	29	Jungzhina
	30	Taba
	31	Dechencholing

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOLocality	Code	AddressArea	LocName
DOLocality	Code	locality	LocName

Relate Diagram:



8.B.6.s. Domain Thromde

Domain Name: DOThrm

Column Data Types:

COLUMN	WIDTH	TYPE	DECIMALS
Code	6	C	
Description	6	C	

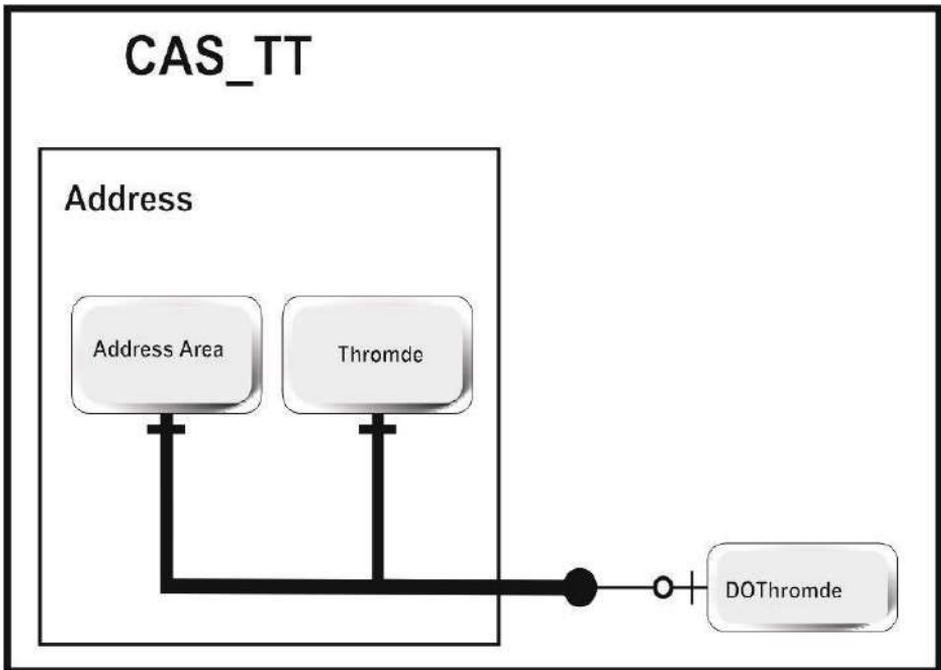
Column Definitions:

Code	The Value Code.
Description	The name of the Thromde. Valid entries are: 1101 Thimphu

Relate Table:

FILE1	KEY1	FILE2	KEY2
DOThromde	Code	AddressArea	Thromde
DOthromde	Code	Thromde	Thromde

Relate Diagram:



8.C. CITY ADDRESSING SYSTEM-PILOT FOR THIMPHU THROMDE

The Street Addressing System issued by NLCS to Thimphu Thromde for implementation is given below:

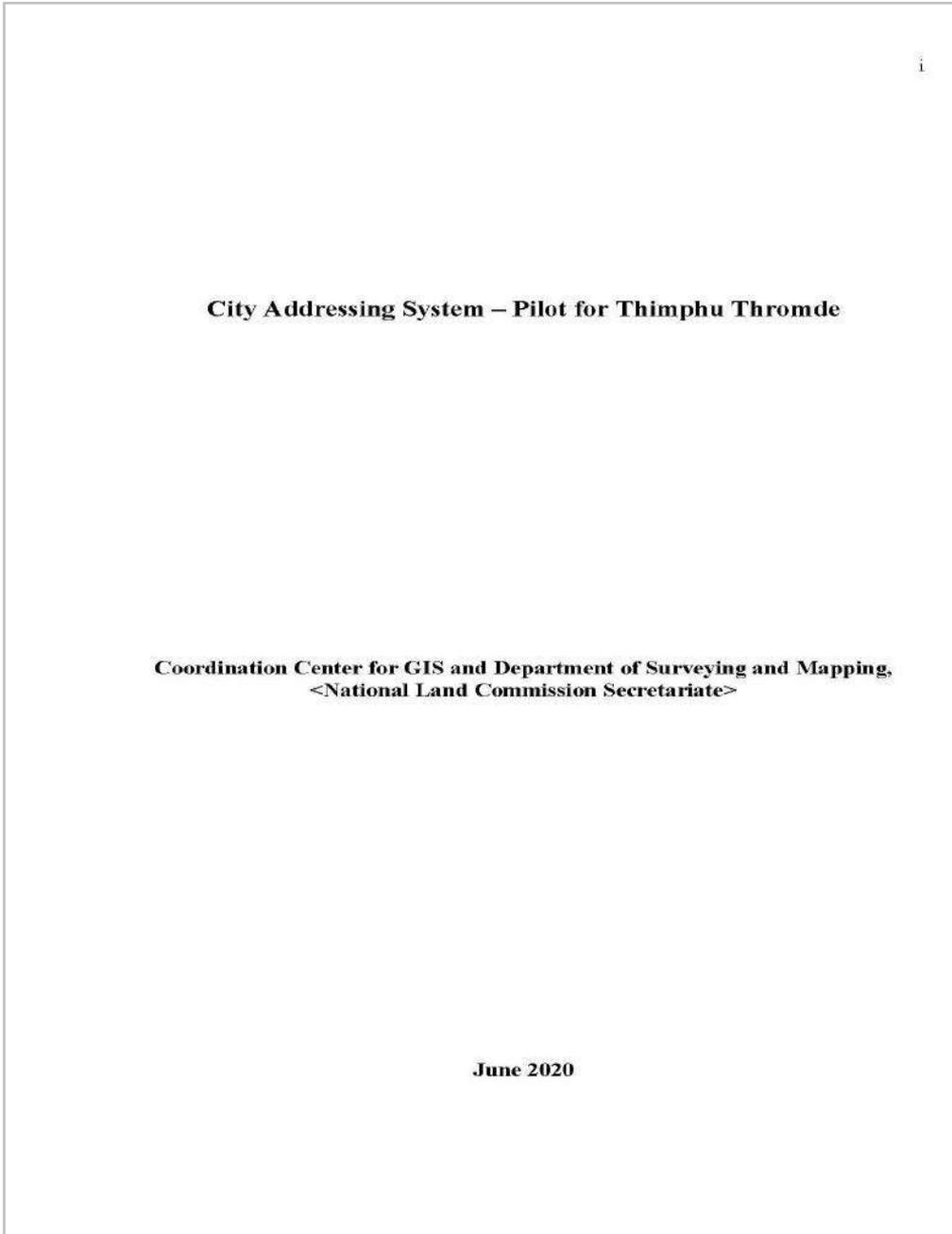


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CHAPTER 1: INTRODUCTION

1.1 Introduction

Over the last few decades, Bhutan has seen considerable urban development, and this has necessitated the use of a functional Street Addressing System to manage the ever-expanding towns. Without Street addresses, it is difficult to figure out how and where to direct services such as ambulance and firefighter, how to track water or electricity networks breakdown or as simple as how to send a courier to a person. Street Addressing is a foundation to proper urban management; therefore, adopting the logical and consistent convention of Street Addressing is necessary.

1.2 Importance of City Addressing

The significance of having a correct and complete City Addressing is evident, especially with so many service deliveries availed by dwellers in urban and some of the explicit essence of having consistent location information are:

Locate residents and property.

Emergency services response.

Pinpoint breakdowns of water, electricity, and telephone system.

Expedite postal service.

Valid deliveries of urban service such as taxis, mail, goods and services.

An efficient tax collection system.

Franchising voters.

Map crimes and accidents.

The updated addressing information is an asset to a nation's economic and social infrastructure (Anselm & Brian, 2010).

Objectives

The primary objective of the project is a comprehensive review of the existing City Addressing System. Thus to determine standards and convention to name and number the Streets and

Buildings. The project also discusses the approaches to implement the City Addressing, firstly to the pilot area of Thimphu Thromde followed by three other Thromde.

This project also aims to document the convention developed to name the streets and number buildings for future updates. In the process, the fundamental GIS layers required for the City Addressing System are collected, updated and stored.

1.3 Responsibilities for Addressing

According to the executive order by Cabinet dated....., the statutory responsibility of assigning addressing and naming Streets lies in Local Government and National Land Commission.

1.4 Structure of report

The structure of the report is as follows: Chapter 1 has the introduction of the report and introduces its objectives. Chapter 2 gives a review of the initiative taken by Thimphu Thromde to develop the City Addressing. Chapter 3 discusses the typical methodology adopted in naming and numbering the Street and buildings with a pilot area of Thimphu Thromde. In chapter 4, we formulate the design of the database for storage of street and building information. Chapter 5 presents the implementation plan. The limitations and challenges for its best performances are discussed in Chapter 7. The conclusion and discussion with future recommendation are in Chapter 8.

CHAPTER 2: BACKGROUND

Thimphu Thromde (TT) initiated the first City Addressing in Bhutan in collaboration with Bhutan Post in 2008. Later in 2011, Samdrup Jongkhar Thromde (SJT) also carried out the City Addressing using the same convention used by TT. The infrastructure such as signposts and building numbers were installed in part of the Southern and Northern part of the TT. As part of the implementation, the new street names were broadcasted through a national news channel, and the building owners were made to install building number while issuing the occupancy certificate by Thromde management. However, the maintenance and updation of the City Addressing System were not done so far.

2.1 Street Naming and Numbering convention used by Thimphu Thromde

2.1.1 Baseline/Reference point

There is no documented proof noting the establishment of any reference point for the addressing system developed by TT. However, while doing the comprehensive study of the practice of numbering the Street and buildings, it is found that the Bangdu Zam on Wangchu road (in Changbandu Urban Village) is used as the baseline. The number increases from that point onwards.

2.1.2 Street and Building numbering

For numbering the Street and buildings, even on the right-hand side and odd on the left-hand side is applied. The consistent is missing in certain places, as shown in figure 1. The numbering is done on the cadastral plot, not on the building raised, and the future reservation is resolved by giving suffix letter to the number.

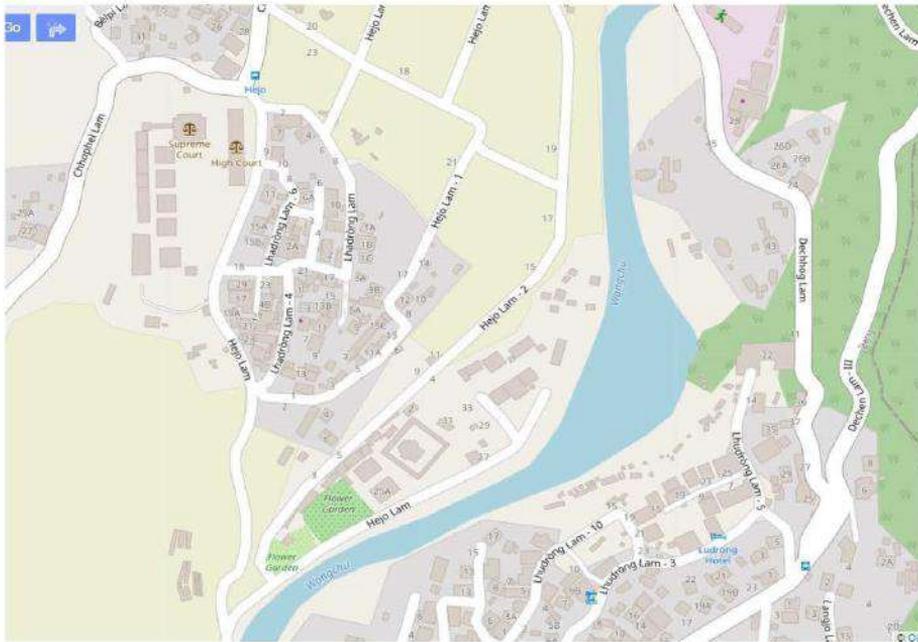


Figure 1: Inconsistent in the numbering of the Street.

Hejo Lam-1 and Hejo Lam-2 branching from Hejo Lam and it is on the same side. The Even number on the right-hand side and odd on left-hand side convention are not followed above.

Gap/Limitation analysis

Based on the existing street and building numbers, it was observed that Changjiji bridge was considered as a reference point but no such documentation was maintained by Thimphu Thromde. However, many inconsistencies were observed in the numbering system as some building and street numbers were found decreasing as the euclidean distance increased from the reference point. There is also no evidence for the adoption of such a reference base line for the numbering system done. Thus, the need to adopt a new reference system was seen necessary. This was not inline with the international convention.

Street names are not consistent, for instance, as shown in figure 2, some street names have a hyphen (-), and some do not have. Doendurp Lam 2 has no hyphen, but most other Street names like in Norzin Lam -2, has a hyphen.

Diacritic mark use in the Street names, such as Bèlpi Lam -19.

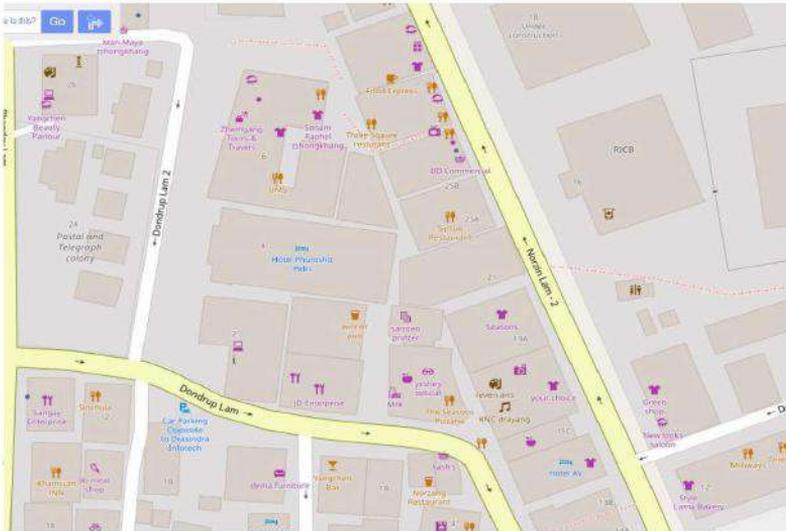


Figure 2: Inconsistent in the use of a hyphen (-) in Street naming.

Lack of documentation. No convention for future plot fragmentation, as the numberings are done to the plot.

There is no recommendation for future updations of City Addressing.

CHAPTER 3: CITY ADDRESSING METHODOLOGY STANDARDS

After the study of the existing City Addressing System, following methodology were adopted to revamp the City Addressing.

Establishment of Reference Point and Baseline

Classification of Streets

Naming and Numbering of Streets

Field verification

Updation if missing Streets

Street name review

Building numbering

Field verification

Database design

2.1 Workflow

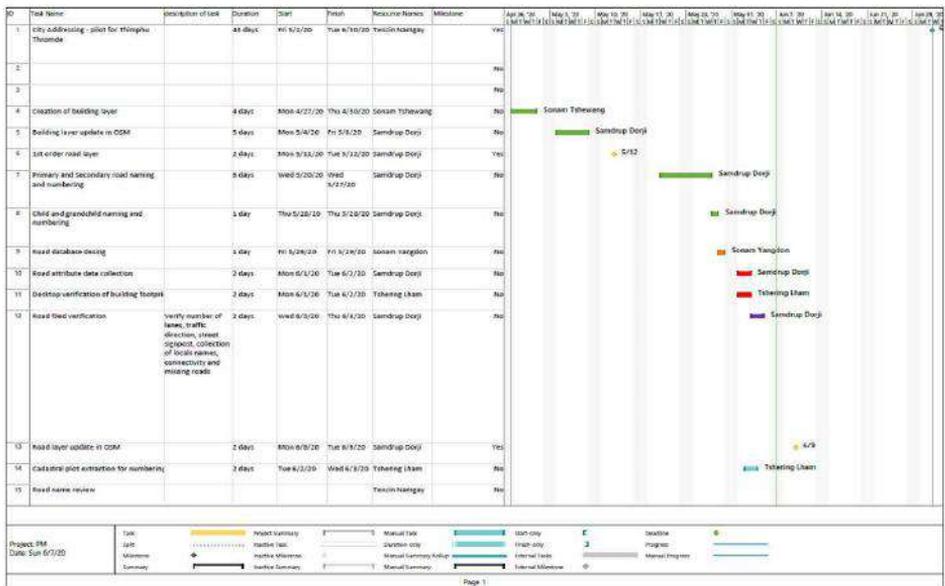


Figure 3: Planning of a task.

3.2 Establishment of Baseline and Reference point

While establishing the reference point and baseline, following consideration were taken into account:

Baselines cannot be arbitrary lines but intersection of two prominent streets

Reference point should be the intersection of North-South and East-West prominent streets, preferably at the centre of the Thromde.

This reference point is established to address the inconsistencies observed in the previous addressing system and to align to the best international addressing system.

The reference point of the existing addressing system was considered along the Bangdu Zam, thus a new reference point established nearby.

A **North-South baseline** is derived from the centerline starting from Wangchhu Lam in South Thimphu connecting Chogyal Lam, Chagchen Lam, Hejo Lam, Jungzhina Lam, Taba Gyen, Taba Lam and Dechen Lam in North Thimphu.

An **East-West baseline** is derived from Lungten Lam 7, Jalu Gom, Jalu Lam, a small part of Olakha Lam, Pelkhil Lam and continues to Urban Village boundary of Changbandu and Lungtenphu. Refer to figure 4.

The **reference point** established for the street naming of Thimphu Thromde is the intersection of the above two baselines.

3.3 Classification of Street

For the convenience of naming and numbering the Streets, the Streets of Thimphu Thromde are classified into six categories.

Primary – the prominent road in the locality. It connects the Urban Village and a standalone local name is given to this street category.

Secondary – identified and categories from the name given to it. It adopts the branched name of the primary streets. It is less prominent than primary Streets.

Child – the road branching out from primary and secondary Streets.

Grandchild - the road branching out from the child category.

Access - a road within the private compound and it serves one plot. Access street has no name.



Figure 5: Classification of Streets

3.4 Street Naming and Numbering convention

3.4.1 General principle

The combination of Street name and building number should unambiguously identify and locate properties. The unique anatomy of the address comprises the following component:



The following principles are adopted throughout the naming and numbering process to obtain consistent standards in addressing the properties and roads.

Street addressing cannot begin without a reference point and baseline.

The street number shall increase as we go away from the reference point

Street names should be uniform with no hyphen or dash in between. No romanisation of letters and it should be simple.

Street names should not be more than 16 characters.

Roads on the right-hand side are numbered even while on the left-hand side are odd.

A great-grandchild street category is generated in an anomaly scenario.

Avoid unnecessary branching from

While naming the Street, contemplate following points:

Priority to local names.

Avoid giving business names to Street.

Avoid giving individuals names unless it has historical significance.

Consider toponym names.

Keep it simple.

Avoid similar street names to avoid confusion.

Avoid long names.

Avoid duplication.

3.4.2 Street Naming

Primary	Secondary	Child	Grandchild
All text (e.g. Jalu Lam)	All text (e.g. Jalu Wom and Jalu Gom)	Text-number (e.g. Jalu Lam 4)	Text-number-letter (e.g. Jalu Lam 4A)

3.4.3 Child Street branching from two primary/secondary Street

If the child road intersects two primary/secondary parents, then the Euclidean distance from the reference point to the two-point of intersections is determined to inherit the name.

3.4.4 Child Street intersecting primary and secondary street

If a child Street is intersecting primary and secondary street, then child road will inherit name from a primary such as in the figure below. For instance, Jalu Lam 4 intersect Jalu Lam and Jalu Wom. Since Jalu Lam is the primary parent and Jalu Wom is a secondary parent; thus Jalu Lam 4 inherits the name from the primary street.

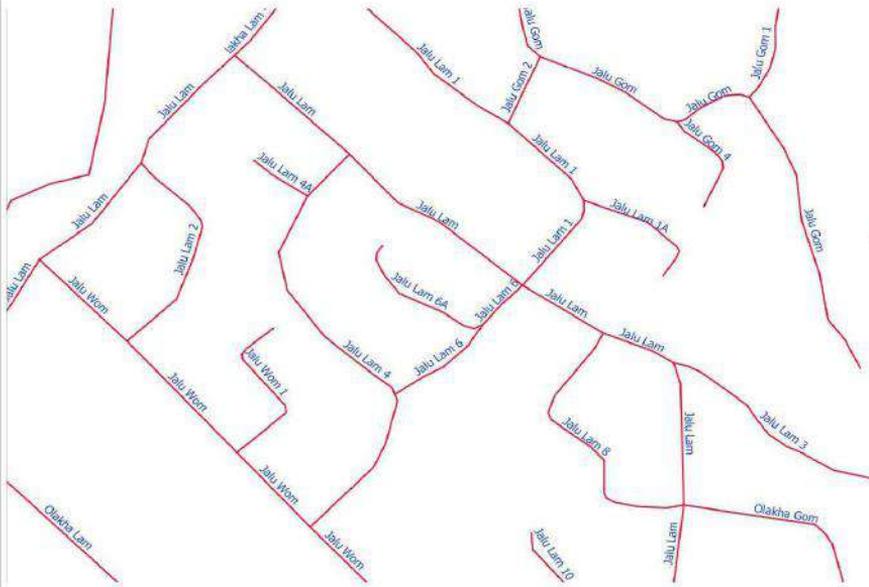


Figure 6: Child street naming convention.

3.4.5 Exceptional convention cases

To exceptional cases, naming and numbering conventions are adjusted.

The street branching from the streets with aesthetic names (such as Taba Drive) shall not inherit the parent name but from the adjacent street.



Figure 7: Exception case 1

Taba Wom 1B is the one of exception case. It branches from Taba Drive, but inherit the name from Taba Wom 1, so to preserve the aesthetic essence of the name DRIVE.

Further branching of the street from grandchild Street will create great-grandchild Street. Great-grandchild street will have text-number –letter-number (e.g. Samtenling Lam 1C1)



Figure 8: Exceptional case 2

Samtenling Lam 1C1 and Bebona Lam 12C1 are examples of great-grandchild Street.

3.5 Building numbering

After the roads are named, the buildings will be given a unique Building Number. Building number is the address of that Building with respect to the Street and cadastral plot. Every registered cadastral plot shall be numbered. The principal of numbering building will be similar to Street numbering; even number to right-hand side and odd number to left-hand side.

3.5.1 Multiple buildings on a single plot at an intersection of two streets.



A plot has three buildings, named K1, K2 and K3. Building K1 has access to both Hejo Lam and Hejo Lam 1. However, while providing the address, the building number is assigned with respect to Hejo Lam 1 for having primary access from Hejo Lam 1. Thus the buildings will have numbers as:

Example:

1 K1, Hejo Lam 1

1 K2, Hejo Lam 1

1 K3, Hejo Lam 1

3.5.2 Multiple buildings in a single plot and access through the single street

Assign Plot Number followed by building number with prefix (K) with a running number

Example: ***Plot Number K*1 2 3** Like **2 K1, 2 K2, 2 K3.....**etc. for each plot

3.5.3 Multiple buildings in a single plot with access from two streets

Assign building number with respect to the street used for access, thus the plot will have two different numbers.

For instance, in plot A, there are two buildings accessed through different street. Building frontage to Gida Lam 3 is assigned number 8 with respect to Gida Lam 3, the other building is assigned 15 with respect to Gida Lam 5.



3.5.4 Multiple plots with a single building



Such cases are common in the Core Urban Village of Thimphu Thromde where the two or more plots have one building. The convention adopted is to assign a unique number to each plot as per the odd and even convention. Thus the building will have two addresses such as 41 Norzin lam and 43 Norzin Lam.

3.5.5 Inaccessible plots (In Traditional Village)

Assign the number with respect to the nearest accessible street.

3.5.6 For vacant state land/empty space

Assign numbers based on the convention used for a single access. However, for vacant state land with multiple access, assign a number based on convention number 4.

3.5.7 Multiple structures in an institutional plot with access from multiple streets

map

For multiple structures on an institutional plot with multiple access roads, the convention of numbering buildings as K1 K2... will not be followed. Instead, a number is assigned with respect to the main entrance street.

3.5.8 Numbering of Housing Complex

Every building is treated as an individual plot and numbered accordingly. The streets within the housing complexes are named and numbered.

Example chang jiji housing (add map)



181

163

155

175

160

161

161

157

171

169

167

165

162

163

172

170

168

166

164

165

Phendey Lam

171

152

150

173

167

169

152

154

1

156

Jangchub Zang

