Evaluating the influence of Development Control Regulation in generating Urban Built Character at neighbourhood scale in Surat City - Case of Ghod Dod Road

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Approval

The following study is hereby approved as a creditable work on the subject carried out and presented in the manner, sufficiently satisfactory to warrant its acceptance as a pre-requisite towards the degree of Bachelor of Architecture for which it has been submitted.

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Thesis Title : Evaluating the influence of Development Control Regulation in generating Urban Built Character at neighbourhood scale in Surat City - Case of Ghod Dod Road

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Declaration

I, Harshil Jivani, 19BAR057, give an undertaking that this research thesis entitled "**Evaluating the influence of Development Control Regulation in generating Urban Built Character at neighbourhood scale in Surat City - Case of Ghod Dod Road**" submitted by me, towards partial fulfilment for the Degree of Bachelor of Architecture at Institute of Architecture and Planning, Nirma University, Ahmedabad, contains no material that has been submitted or awarded for any degree or diploma in any university/school/institution to the best of my knowledge.

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This research thesis includes findings based on literature review, study of existing scientific papers, other research works, expert interviews, documentation, surveys, discussions and my own interpretations.

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Most importantly and endlessly grateful to my family for giving me this opportunity, for supporting me in all my endeavors, for encouraging me to be my best, and for invariably being there beyond the boundaries of time, place, and situation.

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Introduction

1. INTRODUCTION

1.1 Background:

India has seen population increase over the past few decades. This has resulted in growth of urban area and led to rapid urbanization. It has created pressure on the city's existing infrastructure. This resulted in hapazard growth and unplanned development in periurban areas of the city. The physical infrastructure were laid in outskirts to ensure the pressure of development is balanced evenly. In order to control that growth master plan and rules & regulations are being prepared by the urban development authority of the city. Development Control Regulation is one such set of rules which has details on all guidelines of different zones. These guidelines are created in order to attain an efficient or livable neighbourhood/city with visually appealing built character. This research intends to explore the linkage between Urban Form and Development Control Regulation by assessing the impact of DCR on Urban Built Character.

This research investigates how Development Control Regulations (DCRs) shape Surat's urban form by analysing building heights, margins, densities, and land-use zoning, influence architectural design, building scale, and the overall visual character of the city. While recognizing DCRs as a key element, the study goes beyond just rules, considering how factors like plot size, location, landform, and building use interact with these regulations to create Surat's unique architectural and spatial identity. This research attempts to interpret and check violation of a specific rule and its impact on the urban built character of a neighbourhood in context of Surat City.

Key words : Urban Form, Urban Built Character, Neighbourhood Character & Development Control Regulations.

1.2 Research Questions:

- What is the relationship between Development Control Regulation and Urban Form?
- How different interpretation of DCR alter the desired character of that neighbourhood?

1.3 Aim:

The study aims to Evaluate the influence of DCR on generating urban built character at neighbourhood scale of Surat's Ghod Dod Road.

1.4 Objective

- To understand and identify the relation between Development Control Regulation and Urban Form.
- To analyse the regulation that affects the urban built character of a space.
- To infer the relationship of the DCR and Built Character through selected case study in a tabular matrix.

1.5 Methodology

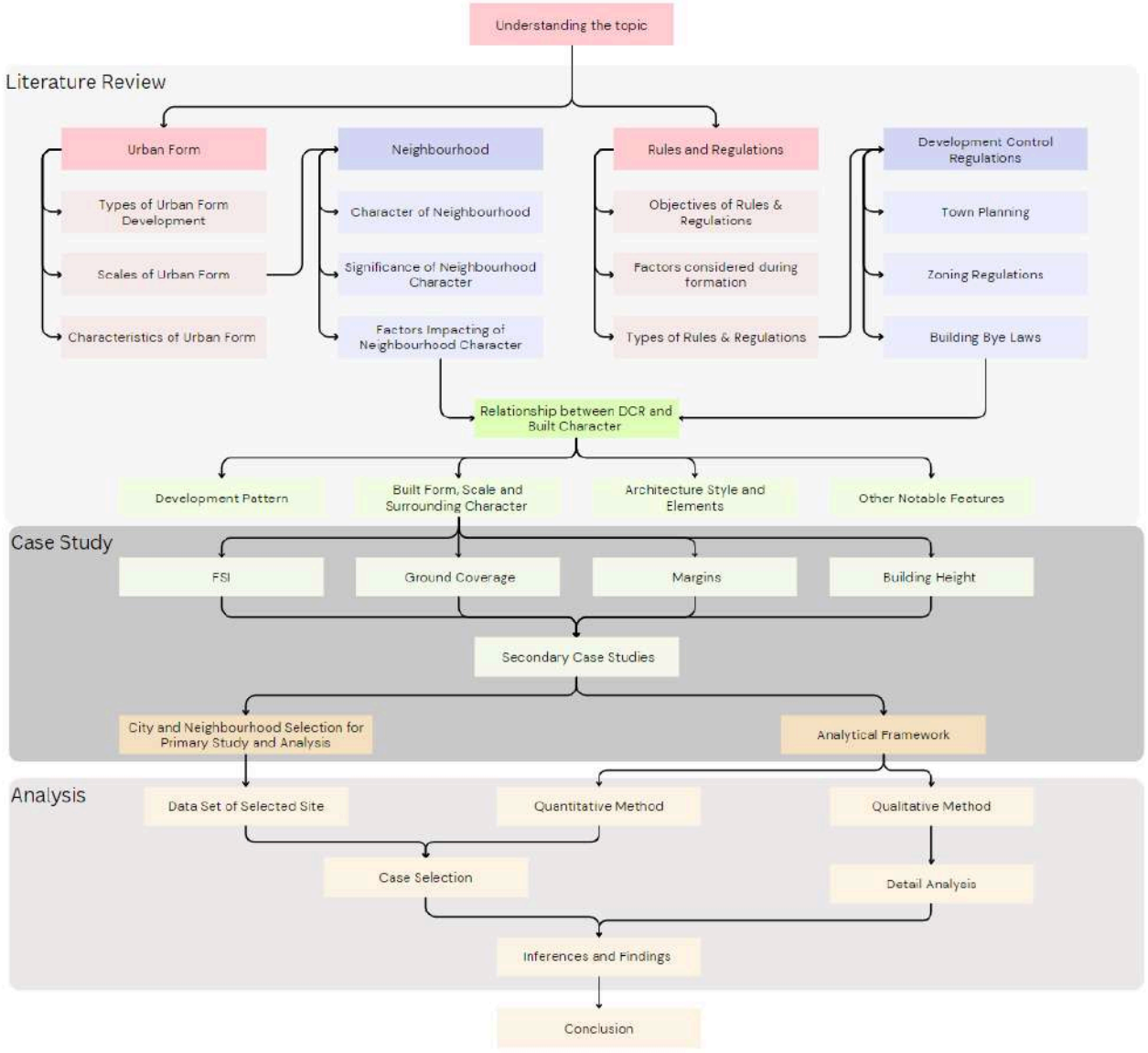


Fig.1 – Research Methodology Flow Chart (Source - Author)

1.6 Research Framework

WHAT			WHY	HOW
Typology	Commercial		This typoloogy contributes significantly in building an urban form	Literature Review
	Residential			
	Industrial			
	Mixed Use			
Factors	Political	Policy and Governance	This is relevant to architecture that is in the form of construction rules and regulation..	Literature Review
		Political Stability		
		Government Decision-Making		
		Political Ideology		
	Social			
	Economical			
	Cultural			
	Environmental			
	Technological			
	Historical			
Rules and Regulation	National Level		Certain parameters (constants & variables) is finalised from DCR for the study of selected cases as it is easy to connect with architecture.	Literature Review and analysing the rules and regulations
	State Level			
	City Level	DCR		
		Master Plan		
		Area Development Plans		
	Additional Regulations			
Scale	Macro		This scale is selected as a result of analysing capacity as an architecture UG student.	Case Study and analysis
	Medium			
	Micro	Elevations		
		Spaces		
		Building Units		

Table 1 – Framework of Research (Source - Author)

1.7 Scope

The influence of DCR on urban character can be assessed through various perspectives but for this research, a theoretical and analytical approach has been selected. It will be done by assessing the urban form of neighbourhood scale for selected parameters such as Margin, Building Height, FSI, ground coverage and other factors. Thse study is limited to understanding the urban form of a city in the case of Ghod Dod Road of Surat City.

1.8 Limitations

- The research is limited to a single neighbourhood looking at the semester timeline.
- The research is limited to selected rule of DCR which can be analysed at undergraduate level and impact of policy level decision affecting urban form are not studied in detail.

Chapter : 2
Literature Review

2 LITERATURE REVIEW

2.1 Overview of Urban Form

2.1.1 Introduction of Urban Form

Urban form is the term which is used to describe the physical characteristics and the built environment of a city. Urban form of a space consists of the size, shape, and distribution of buildings in the city, roads and walkways across a city, and sometimes the wall or gates around a city which indeed is dependent on the architecture and planning of the city (Jelena, 2019).

The urban form can also be seen as the arrangement of components of a city along with the and discipline among variety and it is something that one directly perceived by different senses, it is a concept of arrangement of component which indicates the presence of an element that distinguishes it from the other subjects, also the Form is a conceptual extract of fact that something which is placed opposed the casual features disrupts the urban form (Sharma, 2014).

2.1.2 Types of Urban Form Development

Urban Form are generally of two types: organic and planned. Organic type of urban form follows a timely development that is the form of the city develops over time, many cities after industrial revolution has developed in such manner, on the other hand planned urban follows a specific development plan (Urban Form Definition & History - Lesson | Study.com, n.d.).

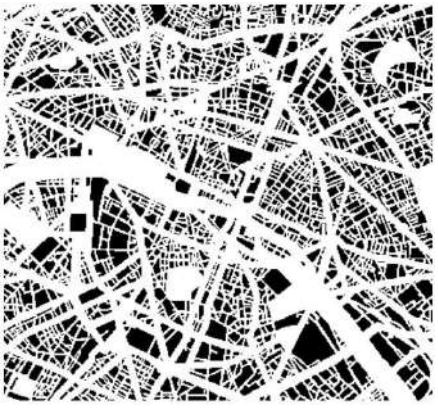


Fig. 2 – Organic Urban Form

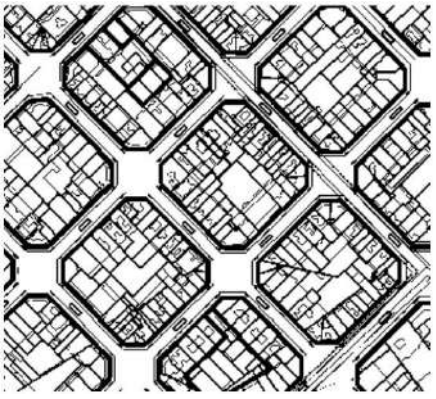


Fig. 3 – Planned Urban Form

Source - (The 15-minute City: Organic and Planned Process of Development, n.d.)

Examples of cities with organic urban form are Paris, Tokyo, Amsterdam, Marrakech while cities such as Melbourne, Nantes, Vancouver, Vauban are example of cities with planned urban development.

2.1.3 Scales of Urban Form

There are different scales of urban form which can be considered or measured this scale varies from major to minor that include the individual building, street, urban block, neighbourhood and city, these levels of spatial arrangement determines how urban form can be measured, analysed and understood. (Dempsey et al., 2010).

The difference in the scale which is determined by height, width and depth of a building and the compassion of the building with its context using the element such as open space, margin , road width and other factors can change perception of a buildings and spaces. For example, a building with a larger scale set amongst the neighbourhood of smaller scale buildings may seem 'out of scale' (What Is Urban Design? | Urban Design, n.d.).

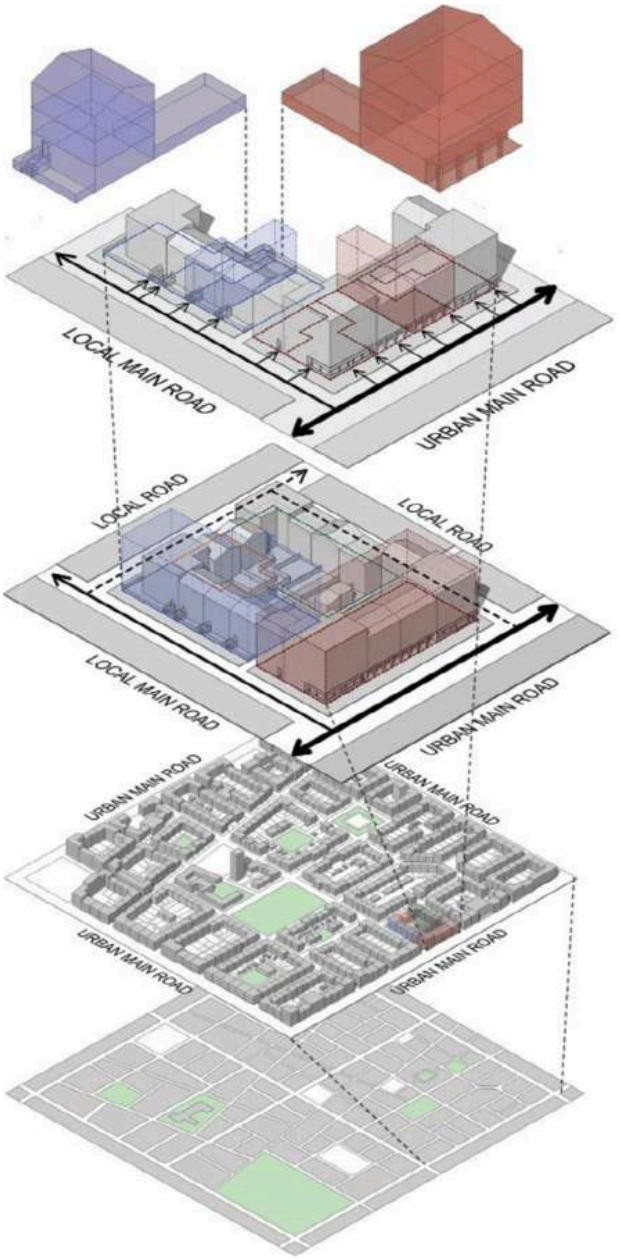


Fig. 4 – Different Scale of Urban form (Source - Researchgate.net)

When talking about the hierarchy of Urban form, specific nomenclature has been used, that is the city scale which is termed as urban fabric at a macro level, at neighbourhood scale which is termed as urban tissue and then there is building scale which is referred as urban grain. This diagram represents the approximate relationship of hierarchy between the elements of urban design, followed by a brief definition of each of the elements.

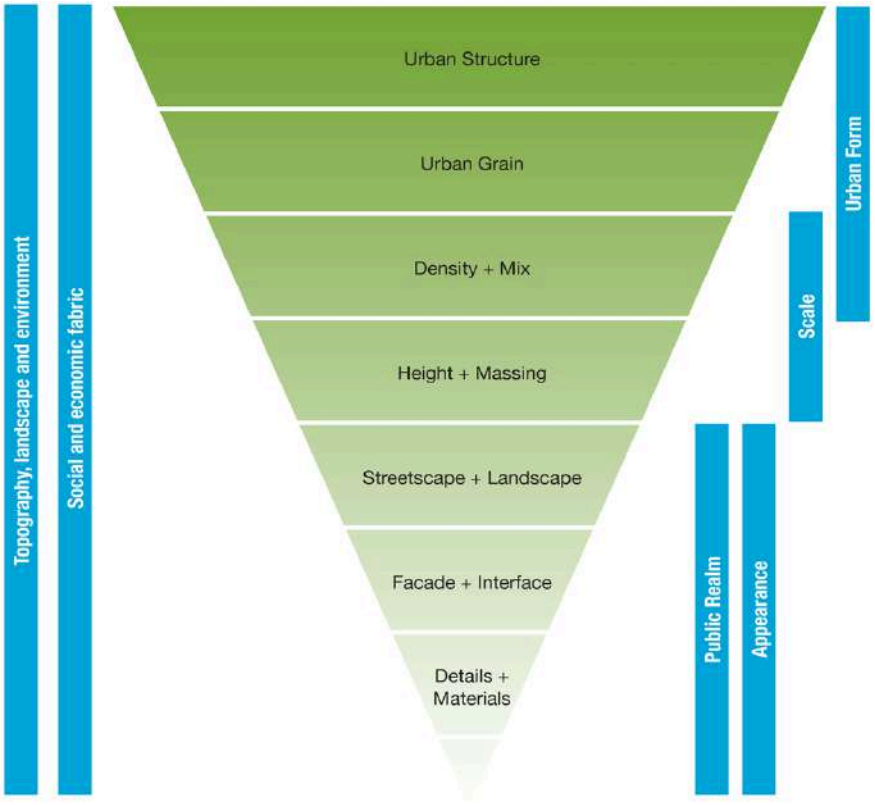


Fig. 5 – Hierarchy in urban design.(Source - What is Urban Design? | Urban Design. (n.d.). https://www.urbandesign.org.au/what-is-urban-design/)

Urban Structure: It is referred to an entire layout of a city which includes all the aspects such as build & nature - environment, land use, transportation and public and private space. It can be called the blueprint of an entire city (Zukin, 2010).

Urban Grain: Urban grain can be termed an arrangement pattern of different plots and streets in an urban tissue and when this pattern is dominated by larger plot smaller plots it is called fine urban grain(Andrew, 2017).

Density & Mix: It is the measure of all scales of urban form that how an urban tissue or grain is occupied in terms of both size and use of the buildings. The higher the density, more will be the building in that vicinity and vice versa.

Height & Massing: This is concerned with the skyline of a particular neighbourhood or city as it is controlled by height which is how tall structures are. Massing is referred to how much is the scale of the structure is it in scale that matches with the surrounding context or not(Jelena, 2019).

Streetscape & Landscape: This focuses more on the pedestrian experience elements like street, trees, sidewalks other street furniture, this impacts the streetscape and landscape. It is considered how these different elements interact to create a visually appealing, comfortable, and functional environment for people to walk and cycle.

Facade & Interface: It is a term to describe how a building appears from the street, that is its outer appearance of the building. There are many small factors which contribute to the variation of facade and these are window size, placement, material, texture and colour etc.

Details & Materials: This is the close-up look of things like what is the built structure made of, what are the specific amenities provided on the street such as benches, streetlight and other such aspects(Jelena, 2019).

Public Realm: This scale looks at interconnected public spaces such as parks, plaza, squares, pedestrian, walkways and how they connect with each other to create spaces for people to gather and socialize(Deicke, 2017).

Topography, Landscape & Environment: This is the broader scale or natural features that influence the urban form, this includes aspects such as hills rivers, vegetation, and existing ecological systems.

2.1.4 Elements influencing Urban Form

However, urban form is closely related to scale and has been described as the 'morphological attributes of an urban area at all scales' (Williams et al., 2000). Characteristics of urban form range from localized scale which are controlled by features such as façades, building materials, and fenestration, to broader scale such as typology of the housing, street and spatial arrangement of all of them combined together. Key consideration is that urban form is not only the relation of physical aspects that is housing, schools, parks and other services and facilities but it also comprises of non physical aspects which includes economic, social and political processes.

Elements such as land use, building density and typology, planning and layout, and transport infrastructure are responsible for determining urban form of a space. It Includes a number of physical and non-physical features including density, land use, building types and scale, layout or pattern of development and distribution of built and open spaces which are interrelated elements that governs the urban form of a space (Dempsey et al., 2010).

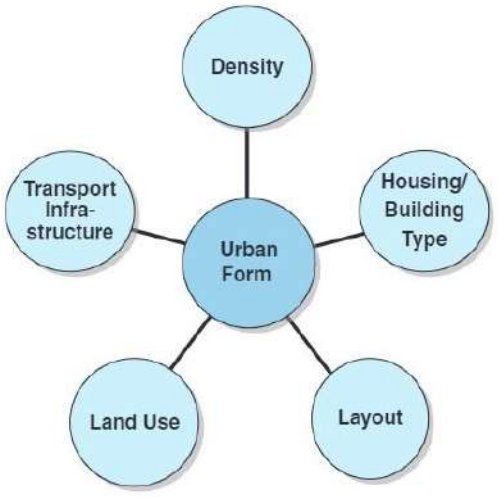


Fig. 6 – Characteristics of Urban Form Source - (PDF) Elements of urban form. (2010, March 1). ResearchGate. https://www.researchgate.net/publication/226686462_Elements_of_Urban_Form

2.2 Concept of Neighbourhood

2.2.1 Introduction of neighbourhood

The term neighbourhood is often used to describe the subdivisions of urban and rural settlements. Neighbourhoods form the urban tissue of the city both physically and socially. Definition of a neighbourhood in its most filtered form is a space or vicinity in which people live. As Lewis Mumford mentioned, that a 'neighbourhood' is a 'fact of nature' in which when a group of people shares that space it comes into exixtence. Since the early ages of humanity, for political, economical, sociological and envirnmental reasons, people have formed communities and are more inclined to live close together in sections of an area. Each of these neighbourhood or so called sections have some particular characteristics which can be physical or social that distinguish them from the rest of the settlement and the clustering of these sections or neighbourhood has formed towns, villages, and cities (Williams, 2000).

The neighbourhood can be seen as a unit which is a universal phenomenon and mostly found in every urban and non-urban area. "(Arnold ,1974) describes neighbourhood units as an integrated, and planned urban area related to the larger community of which it is a part, and consisting of residential districts, a school or schools, shopping facilities, religious buildings, open spaces, and perhaps a degree of service industry."

2.2.2 Character of neighbourhood

The combination of both, the state and private spheres can be regarded as neighbourhood character. Every piece of property, public space or infrastructure contributes to the character of the neighbourhood regardless of its size. The neighbourhood character is determined by the cumulative effect of all these contributions (Mumford, 2009).

In order to understand the character, one must be able to describe how a particular area's characteristics come together so that it is its own distinctive character. Breaking up character into discrete features and characteristics misses out on the relationships between these features and characteristics. The most fundamental aspect in determining the character of an area is to understand how these relationships are actually formed on the ground.

In some areas, there is usually a tendency to describe them as having little or no character and in other cases the areahas many characters. The neighbourhood's character is confused with attractiveness by such descriptions. There's a character to every area, just like every person has a personality. The character may be more obvious, more unusual, or more attractive in certain areas, but there is no such thing as an area without character.

2.2.3 Factors influencing neighbourhood character

Factors impacting character	Questions that might help in the preparation of the neighbourhood and site description	Terms/features that might help to describe this aspect of neighbourhood character
The pattern of development of the neighbourhood (only required where more than one dwelling on a lot is proposed)	- Is the neighbourhood typical of a particular form or pattern of development? - Are there any patterns in building form, height, margins or rhythm? -How do these relate to topography, natural features and street network? - Is there any pattern in relation to any particular feature or characteristic? -What is the pattern of landscape and street tree planting? - How do buildings and private open spaces relate to each other or to the public realm?	• Topography • Street block length • Street alignment, type and proportions • Extent of rear gardens and private open space • Landscaping and vegetation in the neighbourhood • Patterns of use and occupation • Diversity of housing
The built form, scale and character of surrounding development.	-What is the predominant form of development? -Is the neighbourhood homogenous or diverse in terms of the built form, scale and character? -What sort of front fences are there? -How is parking and access arranged?	• Building mass and height • margins • Space around properties and site coverage • Car parking • Fences (style and height)
Architectural and roof styles.	-What architectural styles are typical in the neighbourhood? - What levels of articulation and detail are typical in the neighbourhood? -How do roof patterns relate to built form?	• Architectural rhythm of street • Porches and verandahs • Architectural consistency • Roof form
Any other notable features or characteristics of the neighbourhood.	-Are there any other notable features that have not been picked up through the consideration of the above matters? -Are there any significant street trees or vegetation that would affect the design response?	• Waterways • Street trees • Details of the footpath and street • Landscaping and vegetation on private lots • Nearby historic buildings or features

Table 2 – Features describing the character of a neighbour.

2.2.4 Significance of neighbourhood character

A sense of place and identity form the setting of people's lives and communities, based on experience, association, use or activity with each other. Places which develop in a manner that responds to the local character and context have more chances that the place will be more sustainable, contributing to a good quality of lifestyle and healthy living condition. It also has an increased chance of attracting investments and being economically, culturally

and intellectually better as compared to other communities. Some of the important considerations that must be taken into account are :

1. Sense of Place and Identity: One's experiences, interactions, and activities with a place shapes the feelingsof character and how we identify the chracter. This creates a "sense of place" that's unique to a community character.

2. Importance of Local Character: When places are developed considering their local history, culture, and environment, they become more sustainable that is they can be maintained and enjoyed by future generations

3. Benefits of a Strong Sense of Place: Communities with a strong sense of place have a better quality of life. This is because people feel more connected, invested, and happy in their surroundings. It can also attract economic and cultural opportunities that is tourism.

4. Respecting Identity in Development: When a space changes or something is added to a place, it is important to consider the existing community and its sense of identity. This ensures that the new development respects what makes the place special.

5. Understanding Place Benefits Everyone: By understanding the character and context of a place, people in various professions can make better decisions. This can be in areas like policy making, urban planning, oreven designing buildings.

In order to facilitatethe appropriate level of growth and change that respects a community's sense of identity and distinctiveness, consideration should be given to that and understand how places have developed.

The table shows that having abetter understanding of what's going on, character and context of a place can helps a lot of people in their job, whether it's through policy development, decisions making or site design.

AUDIENCE	HOW CHARACTER AND CONTEXT INFORMATION CAN BE USED
Local community and neighbourhood groups	Defining and shaping neighbourhoods; central strand in planning for and delivering responsive environments
Spatial planners	Developing sound and complete evidence bases and informing plan development, policies and proposals. Helping to ensure visions, plans and policies are relevant and respect localities
Development managers, urban designers and heritage advisors	Ensuring schemes respond to policy objectives Enabling approval of higher quality and more place responsive design Relating individual sites and proposals to the wider context (place, green infrastructure networks, etc.)
Developers and their consultants	Informing and improving scheme design and development to respond to context/to be 'right for its place' Contributing to place specific design and access statements Speeding the planning process and achieving planning permissions

Table 3 – Importance of character of neighbourhood for different stakeholders.

Source - Shaping Neighbourhoods: character and context, draft supplementary planning guidance.

2.3 Overview of Development Control Regulations (DCR)

2.3.1 Introduction of DCR

The rules and regulations are enforced with an intent to ensure effecient development of a city and also considering thepublic and society's general welfare shall be set out in the Development Control Regulations.In order to guarantee a good planned development, a regulation is a must needed constant. It is depended on a ""plan-led system" whereas development plans are made with consideration of the public. In order to ensure efficient growth and the general welfare of the population, DCR is responsible for planned urban development. The purpose of these rules and regulations is to ensure that the public has basic needs, such as health, safety,convenience, economy and amenity.

Development Control Regulationscan be referred to as the tools which controls the use and development of land. This involves the construction of new buildings, the extension of the existing ones, reducing the misuse of land and the changeof use of the building or land to another use. Developing new houses/industrial buildings/shops are important for supporting economic progress. At the same time, it is also necessary to protect or improve the quality of towns, villages, countryside, etc (S, n.d.).(Source - Town and country planning - info)

2.3.2 Types of Regulations

There are many different types of development control regulations and rules which are formulated in order to focus on a particular area of urban development. These are some of the different types of Development Control Regulations in India that govern the generation of urban form and development.

- Town and Country Planning Act: This act guides the development and form of the cities and rural areas. It involves creating long-term development plans (like master plans) to improve infrastructure, such as building new roads, parks, and public transportation systems while considering the growth of population and town.
- Zoning Regulations Act: This act regulates how land will be used in different parts of the city. It divides land into zones (residential, commercial, industrial) and than sets rules for what kind of buildings can be built in each zone. For example, a zoning regulation might limit the height of buildings in a residential area to protect sunlight and privacy while gives higher building FSI in TOD zones.
- Slum Clearance Act: This act aims to improve living conditions for people living in slums. It allows the government to acquire the land of slums in the city, demolish unsafe housing, and than relocate residents to better housing options in different parts of the city.
- Building Bye-Laws: These are the detailed construction rules and regulations that ensure that are the buildings safe and up to code for public use. They might cover

things like the strength of building materials, fire safety measures, and accessibility features for people with disabilities.

- Periphery Control Act: This act protects the land on the outskirts of the cities (the periphery) from uncontrolled development in the peripheral region of a city. It might restrict activities like building factories or dumping waste to preserve the natural environment and prevent urban sprawl.
- Land Acquisition Act: This act allows the government to acquire private land for public projects like building roads, schools, or hospitals. It ensures a fair compensation is paid to landowners for their property.

2.3.3 Objectives of DCR

The Development Control Regulations (DCR) are intended to govern the urbanisation process of a city. It ensures efficient growth and the general welfare of the public. These guidelines helps in implementing a plan-led system by taking public opinion into account, these development regulations are a must have as it also impacts on the city's character. As a result, DCR guidelines have also helped to increase the rate of growth of cities in terms of their objective of Public interest and Community benefit. These Regulations are designed to provide the public with essential needs such as health, safety, convenience, economic and quality of life (Mathur, 2023)."

Some of the objectives of DCR are as follows - "

- To stop the unfavorable demand and misuse of land.
- To assist private interest along with public interest in all the phases of development.
- Development control is legal in nature and the planning authority has the power to punish the defaulters.
- To control and limit overcrowding on land.
- To create a city or neighbourhood with good livable conditions.
- To control the private development as per the required rules in connection to public safety, health, and convenience. (S, n.d.)"

2.3.4 Considerations during DCR formation

It is important to understand the factors that are taken into consideration during the formulation of DCR as it helps in understanding the baseline of the thesis as DCRs are established to ensure proper development of the built environment of a neighbourhood level too, it also helps in understanding key influencing factors. Considerations during DCR formulation are:

- To maintain a balance in needs
    - Growth and sustainability
    - Public Interest and Private Rights
- Urban Design and Planning
    - Land Use and Zoning
    - Building Form and Design
    - Infrastructure and Amenities
- Technical Considerations
    - Building Code and Safety
    - Environmental Impact
    - Accessibilty
- Process and Implementation
    - Public Consultation
    - Enforcement Mechanism

2.4 Development Control Regulations (DCR) and Urban Form

2.4.1 Overview of role of DCR in shaping Urban Form.

The Development Control Regulation is the governing body in the formulation of urban form. "It's trying to control and regulate various aspects of urban development. At the city level itself, the quantum of different land uses and overall density is regulated. In the case of each land use zone, activities, densities and highrise versus lowrise development are controlled by means of zoning other regulations such as ground coverage, height, margins, minimum road width, number of housing units, etc. In order to protect public welfare, open spaces within and outside buildings are regulated by margins, percentage of open space, minimum distance between buildings, etc. Approach roads and parking requirements shall govern the movement of vehicles to specific areas. Development controls or other agencies such as the Fire Department, Airport Authority of India, Archaeological Survey of India etc. regulate the height of buildings in different land use areas. A number of additional controls relating to detailed design and construction of buildings, such as stairs, windows, shafts etc. are provided for in the various regulations. In somecases, facades and even the colour of the building is regulated for urban design concerns.(Anand & Rao, 2016)".

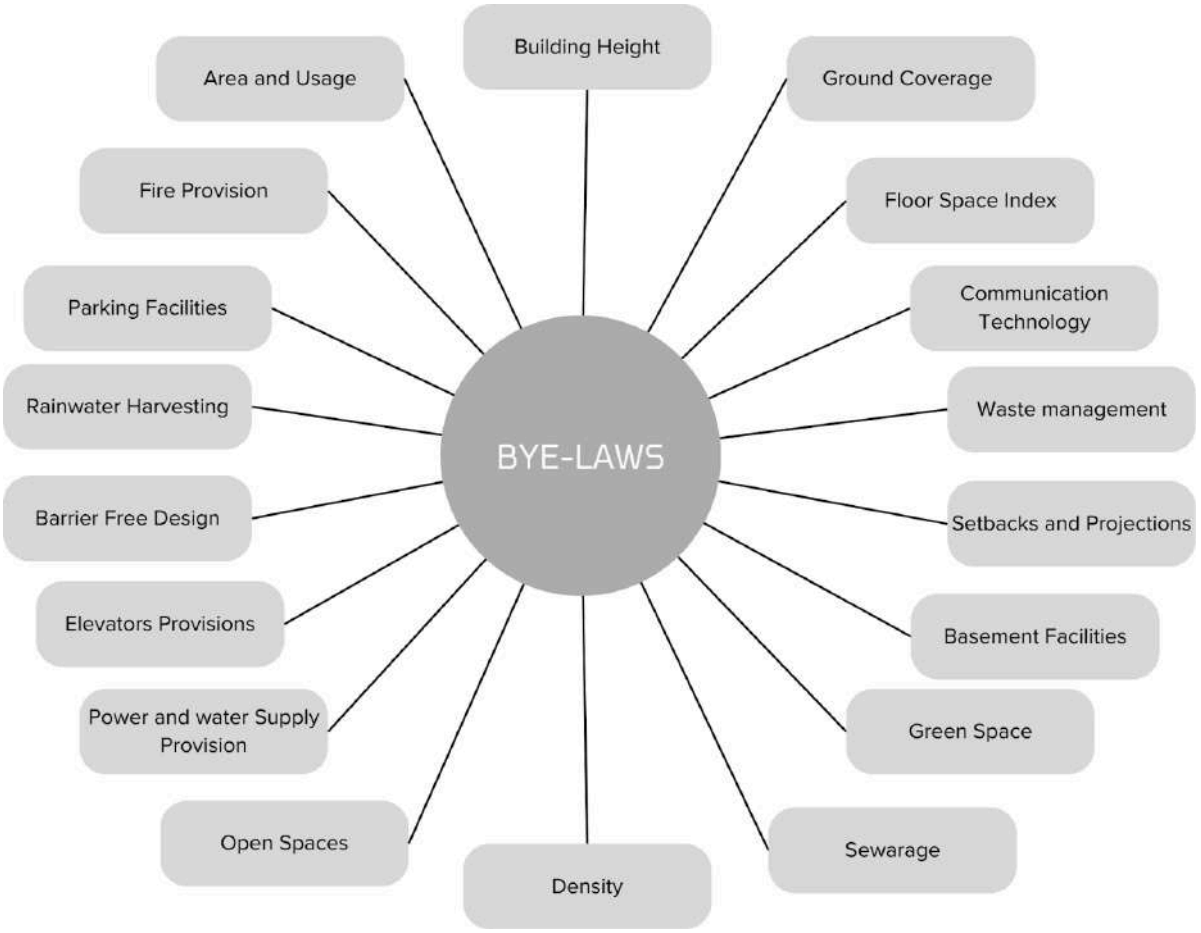


Fig. 7 – Some of the aspects covered under DCR
Source - DCR and Model 2016 Building Bye-laws.

2.4.2 Factors of DCR regulating Urban Character at neighbourhood scale.

To understand the factors of DCR regulating Urban Character one needs to understand the factors that shapes the built character of a city, neighbourhood or a space. When we talk about neighbourhood character there are four main aspects to consider.

- The pattern of development of neighbourhood
- The built form, scale and character of surrounding development
- Architectural and roof styles
- Notable features or characteristics of the neighbourhood.

All these factors are governed by the DCR from some or the other aspects here is the table for factors of DCR which regulates the above four factors.

Some of the factors in the DCR which governs the pattern of development of neighbourhood are landuse regulations, zoning regulations, permissible uses, building typology restrictions and road approach regulations. This governs that what kind of pattern will be followed for the overall layout of the neighbourhood.

Fig. 8 – Factors of DCR governing neighbourhood development pattern. (Source - Author)

Considering the built form, scale and surrounding character of the neighbourhood, the major factors of DCR that regulates it are building height which gives a specific skyline, FSI and ground coverage which deals with the density of build in the surrounding, margins responsible for regulating the pedestrian experience of a street in a vicinity and parking regulations which governs the car parking space leaving with unhindered long street views.

Fig. 9 – Factors of DCR governing built form, scale and surrounding character. (Source - Author)

While the architecture elements and style DCR has a specific set of rules under building and infrastructure that is architecture elements which governs these smaller scale factors impacting character of neighbourhood. these rules includes specifications such as, Boundary walls and gates, railing, plinths and access, terrace and roofs, levels and pavings and many such other rules that regulates architectural elements.

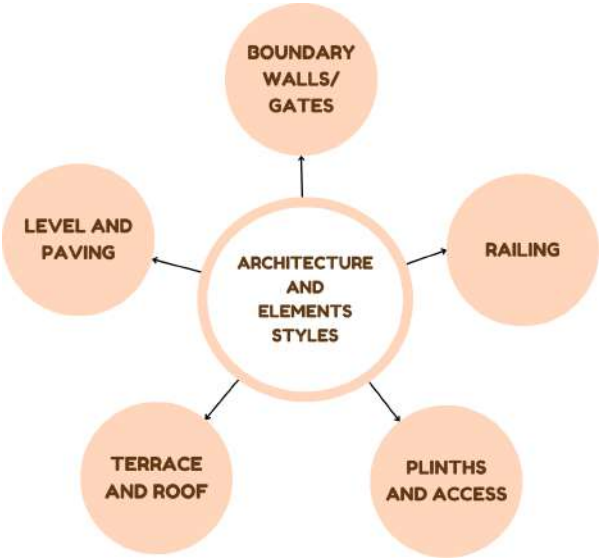
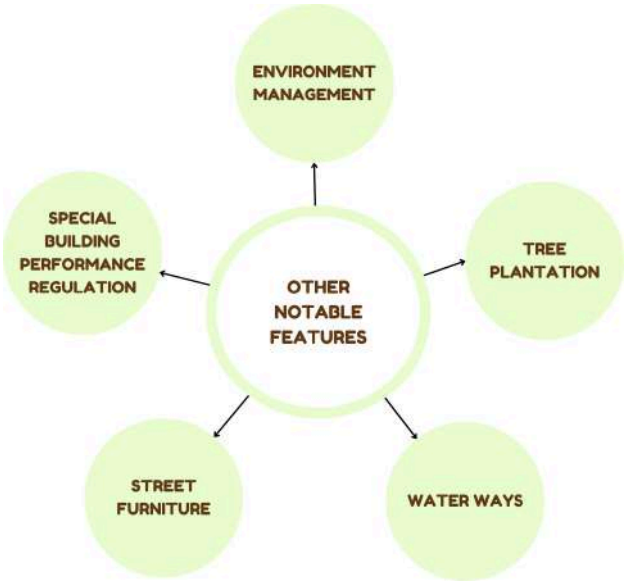


Fig. 10 – Factors of DCR governing architectural elements. (Source - Author)



Some of the other notable features of neighbourhood character are governed by the regulations such as environment management, tree plantation specifications waterways in the surrounding, street furniture and also regulation falling under special building performance regulation that is visibility these governs the character by creating visually aesthetic neighbourhood.

Fig. 11 – Factors of DCR governing other notable features. (Source - Author)

Chapter : 3
Case Studies

3 CASE STUDIES

3.1 Selection of Parameters

Study of neighbourhood character of Melbourne, Victoria, Australia. It was the year of 1990 the 'Urban consolidation policy' of Liberal Kennett government was promoting medium density infill development. The first objective of that was 'Good Design Guide' which can support urban consolidation and the use of available infrastructure with well designed medium density development and to save the suburbs from inappropriate development.

But in 1990 a term 'A sensible balance' came in front which wanted to create a certainty and consistency in planning and for that neighbourhood character was made mandatory starting point for all development assessment (Save Our Suburbs Vic. Assoc. No: A00360675 | Promoting Residential Amenity, and Sustainable Development., n.d.).
Neighbourhood character as the starting point was considered with two standard that must always be met :

- The design response must be appropriate to the neighbourhood and the site'
- The proposed design must respect the existing or preferred neighbourhood character and respond to the features of the site.

Policies were developed which specifically targets the development of neighbourhood character. The map shows the area with different policy strategy.

- Municipalities with Character Study / Strategy
- Municipalities with Neighbourhood Character Local Policy in Planning Scheme
- Municipalities with no Policy/ Study/ Strategy

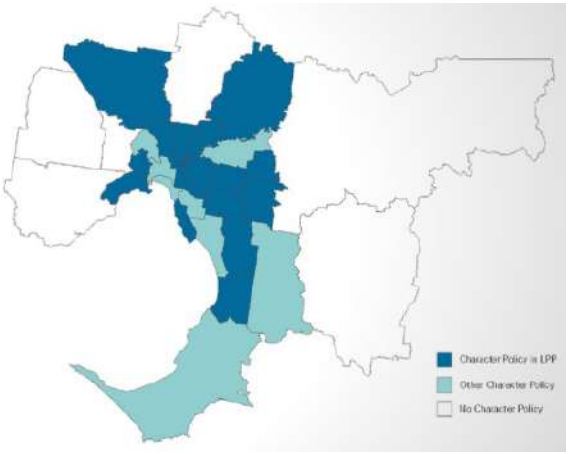


Fig. 12 – Map showing areas with different policy strategy. (Source - planning.org.au)

Providing better guidance for managing neighbourhood character through policy. To achieve this parameters were selected through careful investigation and surveys which impacts the character of the neighbourhood the most. Six major factors which were chosen were:

- Public Realm
- Rhythm
- Front margins
- Building Envelope and massing
- Side and rear interface

1. Public Realm

The public realm is one of the most important element of a neighborhood, shaping its character and vitality. Roads acts as the arteries, facilitating movement and connectivity which defines the area's layout. Verges and footpaths,can be seen as the veins,which invite pedestrian activity, fostering community interaction and leisurely strolls.

Fig. 13 – Image of node Melbourne (Source - https://www.planning.org.au/)

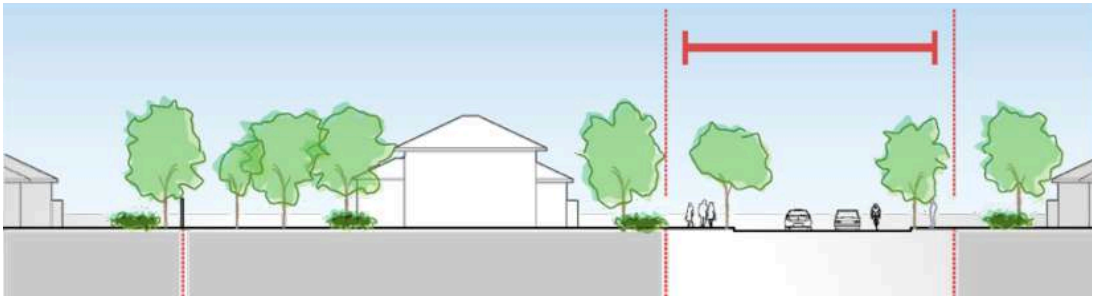


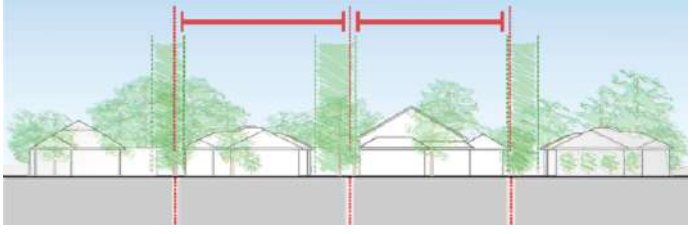
Fig. 14 – Section of street to understand public realm.

Landscaping and street trees adds a vibrant aesthetic, making the surroundings with natural beauty. Parking and transport infrastructure provide essential functionality, ensuring accessibility and convenience for residents and visitors alike. Kerbs and crossovers act as the foundation, delineating boundaries and enhancing safety. Together, these elements form the public realm, together creating the fabric of a neighbourhood's identity.

2. Rhythm

The rhythm of a neighbourhood is shaped by its subdivision pattern and site consolidation and that defines its character. Lot widths and layouts forms a modulation of diversity while side margins and building positioning creates

Fig. 15 – Image of neighbourhood of Melbourne, Victoria (Source - https://www.planning.org.au/)



harmonies of coherence. Together, they form the pattern so called rhythm of a community creating an aesthetic repetitive visual character.

Fig. 16 – Section of neighbourhood showing similar rhythm.

3. Front margins

Front margins play a pivotal role in shaping a neighborhood's character. The depth of these margins defines the spatial relationship between residences and streets, influencing the sense of openness.

Fig. 17 – Image of front facade of neighbourhood in Melbourne (Source - www.planning.org.au)

Thoughtful landscaping within margins adds greenery, fostering a welcoming ambiance. Minimizing driveway dominance preserves pedestrian-friendly environments, enhancing the public realm's allure and livability.

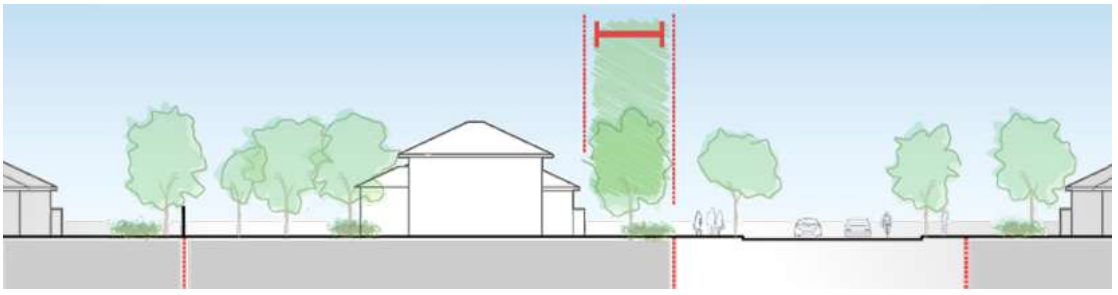


Fig. 18 – Section of neighbourhood showing front margin.

4. Building envelope and massing

The building envelope and massing contributes significantly to the distinctive character of a neighborhood. Factors such as height, roof transitions, and upper-level margins shape the visual identity and sense of scale within the neighbourhood. The height of structures develops the skyline's of the neighbourhood, while smooth roof transitions maintain architectural coherence.

Fig. 19 – Image of neighbourhood showing building envelop. (Source - www.planning.org.au)

Fig. 20 – Section of neighbourhood showing height and roof.

Additionally, upper-level margins offer visual relief and enhance pedestrian experiences by allowing ample light and air circulation, fostering a harmonious blend between built and natural environments.

5. Side and Rear Interface

The side and rear margin of a neighborhood profoundly shape its character. Backyards and courtyards helps in allowing space for gatherings and private retreats, while thoughtful tree planting and landscaping add natural serenity. Walls on boundaries provide security and distinguish personal space, enhancing both privacy and the aesthetic cohesion of the community.

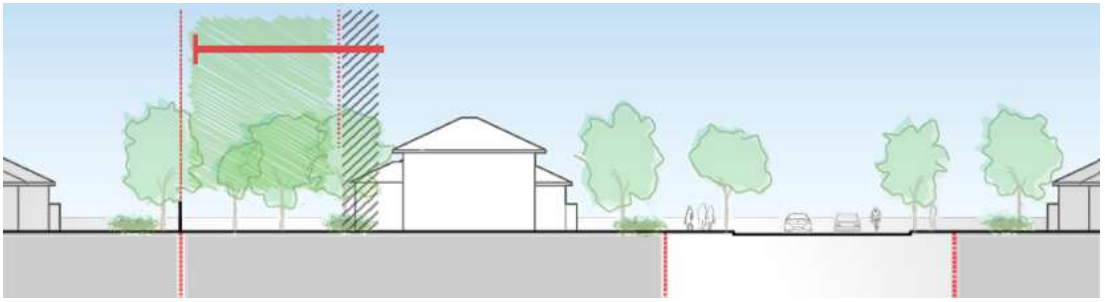


Fig. 21 – Section of neighbourhood showing rear margin.

Therefore,

- Clear policy is rquired to guide neighbourhood character which is separate from urban development .
- Character is a design issue that needs to be taken into consideration
    - Site and streetscape based
    - Clear, simple design assessment tools, not complex lengthy policies
    - Respond to 'existing character' (what's there and evolving)
    - Preferred character (vision statement of what can be as defined by policy)
- Factors such as public realm, rhythm, front margin, rear and side margin, height, scale and mass are crucial in determining neighbourhood character.

3.2 Selection of City - Surat

In order to identify a city one needs to understand the following two aspects to see that, is that city suitable for the study

- Historical Development
- Urbanization trend

Fig. 22 – Location of Surat City. (Source - Wikidata.)

1. Historical Development

Surat was established with a castle built on the eastern bank and the settelement developed on the west bank of the river with a custom house built on the south side of the Surat castle. In the year 1664 construction of the inner wall of city enclosing an area of 178 hectares started where all the major activities took place. The area of the city at this time within the wall was 178 hectares. Twelve gates were provided for the purpose of movement in the walled city which were Navsari and Majura gates on the south side, Mecca and Badshahi gates on the western part of the wall. Dacca Dwara or Custom House Water gate were also provided which were alongside the riverfront of Tapi and many more. In the year 1707 the construction of the entire wall completed which enclosed area of 736 hectares. (Chauhan, Dalal & Agrawal, 2013)

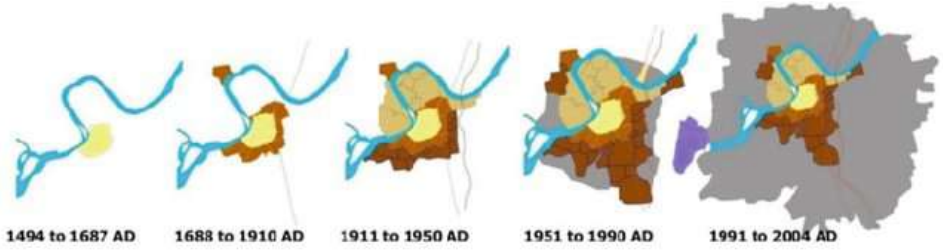


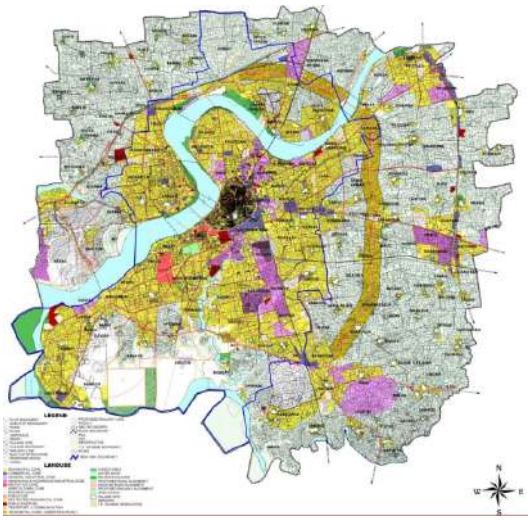
Fig. 23 – Section of neighbourhood showing rear margin. (Source - researchgate.net)

Till the end of 1980 the expansion of Surat city was in radial pattern and was much rapid along five major corridors on theeast, west, north, south, and south-west and it has been growing rapidly on the east, south and south-west sides since 1990 with large parts of new residential localities, which were being developed under the SUDA authority. At the beginning of the 20th century Surat has witnessed the development of its suburbs such as Udhna, Athwa and Fulpada during the beginning of the 20 th century (Development Plan 2006-2012) .

2. Urbanization trend

Surat City is the tenth largest city in the country with rapid urbanization. This urban development is regulated by the Gujarat Town Planning and Urban Development Act, 1976 under the provisions of which the Surat Urban Development Authority prepares the development plan for the entire area of SUDA including the area under the Surat Municipal Corporation.

Fig. 24 – Development Plan of Surat - 1986 (Source - SUDA Website)



After which Surat Municipal Corporation had a task of preparing a Town Planning Schemes for all the area under the jurisdiction of SMC which was needed to be in accordance with DP prepared by the SUDA .Urban planning in Surat had started in 1960 with the preparation of its first Development Plan. The Development Plan of the city was then revised for the additional area included in the city limits at a later stage.

Fig. 25 – Development Plan of Surat - 2004
(Source - SUDA Website)

On February 2, 1970, two new areas were included in the limit of SMC which were Rander and Adajan, and DPs for both of them were sanctioned in the yaer 1961 and 1969 respectively by the government. Subsequently followed by the development plan of 1986, 2004 and 2035, clearly shows the rapid development of surat's urban form. (Development Plan 2035)

Moreover, the city's infrastructure challenges and cultural context provide additional layers of complexity to the analysis, which helps in offering lessons and best practices applicable to urban planning endeavors worldwide. The study of Surat shows the intricate relationship between regulations and urban form, guiding future sustainable and equitable urban development strategies.(Nair,Singh & Tiwari, 2000)

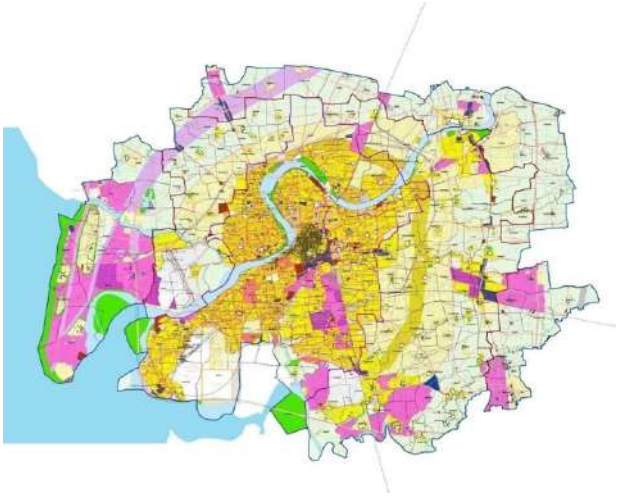


Fig. 26 – Development Plan of Surat - 2035
(Source - SUDA Website)

Hence, Surat has a dynamic urban landscape, rapid growth, diverse economic activities, and varied development policies which makes it an ideal case study for analyzing the impact of development control regulations on urban form. By studying Surat, it is easier to gain valuable insights into how regulations factors impacts to shape the built environment.

3.3 Selection of Neighbourhood - Ghod Dod Road

The historical development of Ghod - Dod Road, as the name suggests Ghod Dod meaning horse racing in gujarati, this name originated in 1900s when horse racing event took place on this road. The road was consider for redevelopment in 1980 with idea of creating a road which effeciently caters both commercial and residential as it connects to important location of Surat that is from Parle Point to Majura Gate.

Fig. 27 – Location of Ghod Dod Road (Source - Google Maps)

It has many shopping complexes and residential towers and other amenities, which turned the road into a major shopping hub of Surat. The road is most well known for its high quality lifestyle.

Fig. 28 – Satellite Map View of Ghod Dod Road - 2012. (Source - Google Earth Pro.)

Fig. 29 – Satellite Map View of Ghod Dod Road - 2023. (Source - Google Earth Pro.)

The road was selected as it had a good history of planned urban development as it was included in development plan of 1986, 2004 and 2035. These led to a planned development of the neighbourhood, but there were many violation and variations done which resulted in alteration of the character of that neighbourhood. And as the number of violation and variation are it will be more useful for the study of impact of DCR on urban built character.

Therefore, Ghod Dod Road is appropriate area for the study because of its decadal variation that it has seen in terms of both development and redevelopment , also further chances of change becomes an major opportunity for the study. The selected case study is constantly evolving and urban form dynamics are updating every year giving opportunity to study DCR application in details

Chapter : 4
Framewrok OF Analysis

4 FRAMEWORK OF ANALYSIS

4.1 Studying the parameters for Analysis

According to Planning and Practice Department character of a neighbourhood depends on the many factors such as Landform, Land use, Demographics, Activity and image, Architectural style and vernacular, Scale, mass and density, Public realm, Access and permeability, Connections and circulation, Views and visual interest (Shaping_neighbouthoods_SPG, 2013), out which some of the factors that are directly associated with the DCR are considered.

Variable	Association with Character	Method
Margins	Defines building setbacks,street width, pedestrian experience.	Analyze margin regulations and variations across zones. Measure impact on street canyon geometry and public space availability.
Floor Space Index (FSI)	Determines building density, impacting land use mix, building heights, and open space provision	Analyze FSI variations across and their impact on FAR, built density.
Ground Coverage	Defines the built footprint, influencing open space availability.	Analyze ground coverage regulations and their impact on open space ratios.
Building Height	Impacts skyline profile, viewsheds, access to sunlight, and wind patterns	Analyze height regulations and their impact on building typologies, street and visual charcter.

Table 4 – Aassociation of factors impacting character with DCR rules . (Source - Author.)

4.1.1 Margins

"Building margins, the distance between a building and the property line, play a big role in shaping a neighbourhood's character. Wide margins with ample space between buildings create a sense of openness and privacy, often found in suburban areas. Conversely, narrow margins with buildings close to the sidewalk foster a denser, urban feel. This can also influence walkability - wider margins allow for more space for pedestrians and greenery, while narrower ones can encourage neighborly interaction. margins even play a role in architectural style, with zoning regulations sometimes dictating minimum margins to maintain a neighbourhood's historic character (Ramos, 2023)."

For Example - London Boroug of Barnet has developed a unique character after the regulation of following a specific margin.

Fig. 30 & 31 - Location of London Borough of Barnet. (Source - Google Map)

Fig. 32 & 33 - Google Earth Image of Neighbourhood of London Borough of Barnet. (Source - Google Earth)

As seen clearly in the image the neighbourhood has developed certain character and that is due to building rules and regulations of London Borough of Barnet.

In Supplementary Planning Document – Residential Design Guidance, October 2016. Under the Part 2 Section 6 of Enhancing Local Character. In sub section - building line and setback it is stated that as shown in Table 2, residential areas have a predominant suburban identity, characterised by the houses set back from the road with frontage gardens, with generous gaps between the buildings must be followed which is divided according to the street width in the vicinity.

Enclosure	Street Widths	Setbacks (building front from plot edge)*	Landscape character / Streetscape	Architectural Style / Period	Photograph
Street space is enclosed by trees, hedges and other vegetation	Narrow Street space / lane, with little or no pavement (15 - 20 metres)	Buildings are well set back (8 - 40 metres)	Typically leafy and rural, prominent vegetation with mature native trees and hedgerows.	Varied	
Street space is enclosed primarily by vegetation, as buildings provide secondary enclosure	Wide street space with pavement (11 - 13 metres)	Buildings are well set back (8 - 14 metres)	Leafy and exclusive character, as parking is well integrated into large front gardens. Front gardens contain an array of vegetation.	Varied	
Buildings provide primary enclosure to street.	Medium to wide street space, often with generous pavement (12 - 18 metres)	Buildings are well set back (4 - 9 metres)	Broad, open street profile with medium-sized front gardens primarily used for parking. Small trees evident on many streets.	Typically buildings from the interwar period	
Buildings provide primary enclosure to street.	Medium to wide street space with pavement (9 - 12 metres)	Buildings medium to well set back (4.5 - 7 metres)	Medium-sized front gardens primarily used for parking. Small trees evident on many streets.	Typically buildings from the interwar period, and occasionally late Edwardian. Houses influenced by Garden City movement also present.	
Buildings provide primary enclosure to street.	Narrow street space with pavement (10 - 11.5 metres)	Limited set back (1.5 - 3 metres)	Narrow street profile with shallow front gardens. Streets are dominated by cars with little room for vegetation.	Victorian and Edwardian buildings	
Buildings provide primary enclosure to street.	Wide street with pavement (4 - 13 metres)	Buildings well set back (5 - 17 metres)	Vegetation along the routes varies considerably in species and maturity. Front gardens have often been converted to hard standing	Typically post war blocks or Victorian and Edwardian mansions converted into flats	

Table 5 - The rules and regulations of London Borough of Barnet (Source - Supplementary Planning Document - Residential Design Guidance, October 2016)

Fig. 34 - Plan of Neighbourhood of London Borough of Barnet showing the rule.
(Source - Shaping Neighbourhood : Character and Context , 2016)

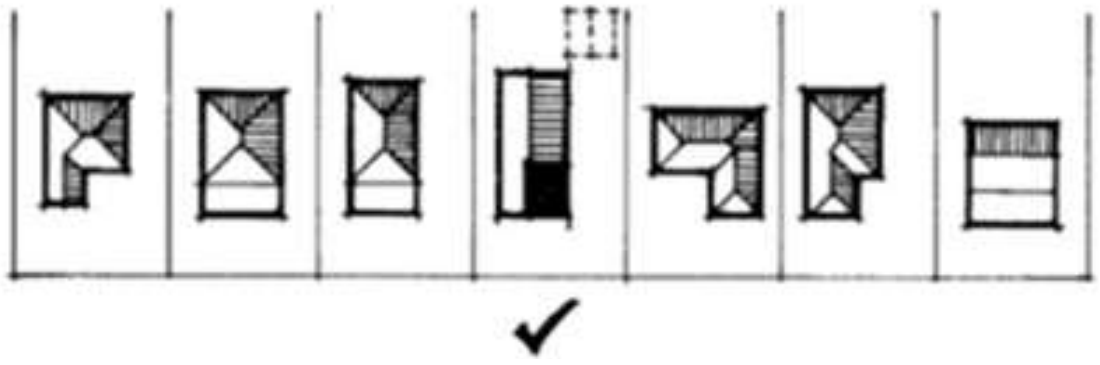


Fig. 35 - Image of Consistent design solution of building in a neighbourhood .
(Source - Planning Scheme Policy – Neighbourhood Character)

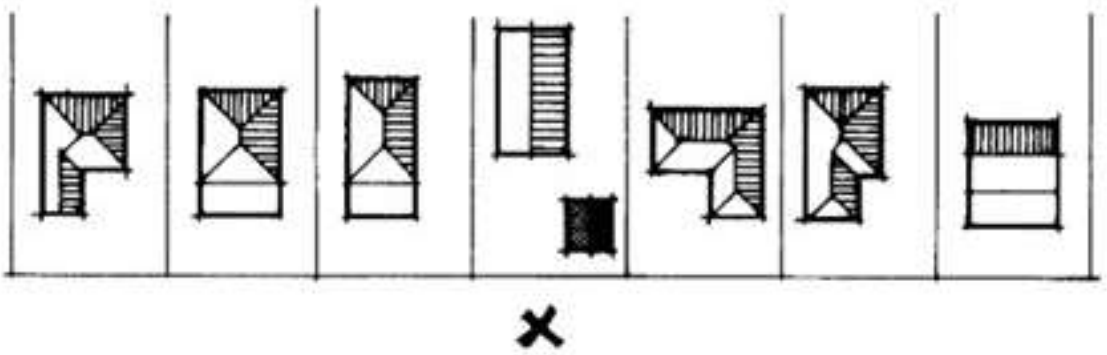


Fig. 36 - Image of Inconsistent design solution of building in a neighbourhood .
Source - Planning Scheme Policy – Neighbourhood Character

It is evident that margin can impact the character of the neighbourhood and also different interpretation of a rule can alter the character of that neighbourhood. Hence, margin will be considered in the analysis of Actual Site selected for the case study to understand the impact of DCR on built character of a neighbourhood.

4.1.2 Building Height

The height of a building plays a vital role in defining a character of a space, it transform an area into a lively, dense city center while cozy bungalows make it feel more relaxed and comfortable in small towns. The height of the building also has an impact on how much sunlight gets to the street and what kind of view you get. This is not only about density, but also about the fact that some neighbourhoods have restrictions on the height of buildings to preserve their historic character, which has a surprising influence on the overall style of architecture.

For Example - London Borough of Waltham Forest has specified height and typology restriction in order to maintain a specific character of that place.

Fig. 37 - Location of London Borough of Waltham Forest.
(Source - Google Map)

In Supplementary Planning Document – Residential Design Guidance, October 2016. Under the Part 2 Section 6 of Enhancing Local Character. In sub section - Scale, massing and height it is mentioned that height must be followed for new building as stated in table below that each type of neighbourhood and housing must follow specified height as it determines the local character, views, vistas and skyline of that neighbourhood.

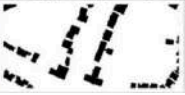
	Density (Dwellings per hectare)	Density (Dwellings per hectare)	Density (Dwellings per hectare)	Building Types	Heights (Storeys)
Linear Rural			2 - 10	Detached houses	1 - 3
Suburban Periphery			10 - 15	Detached houses	2 - 3
Suburban			20 - 30	Semi-detached houses	2 - 3
Suburban Terrace			20 - 30	Terraced houses	2 - 3
Urban Terrace			37 - 50	Terraced houses	2 - 3
Flats			80 - 150	Street facing flats	3 - 6

Table 6 - Image of Table showing the rules and regulations of London Borough of Waltham
(Source - Supplementary Planning Document - Residential Design Guidance, October 2016)

Also the rules states that the new building development must recognise and consider the scale, massing, roof form, height of the surrounding neighbourhood and should reflect these where they are seen as positive attribute of character of that area.

Fig. 38 - London Borough of Waltham Forest.
(Source - Urban Practitioners/London Borough of Waltham Forest)

Also new building development should be similar to the existing building lines and rhythm of street, where as uniform building height in the area should form a distinctive character, variations of the same will not normally be appropriate and allowed. As one can see the result of the rule being followed by the neighbourhood.

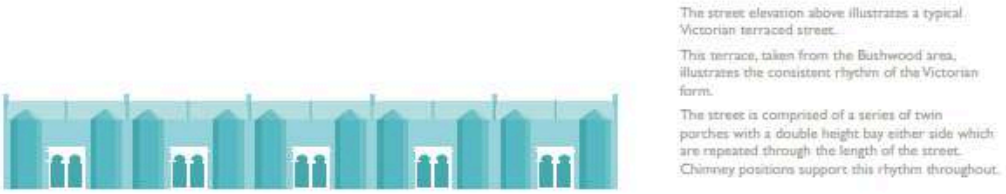


Fig. 39 - Character Development due to height and pattern restrisction in London Borough of Waltham Forest. (Source - Urban Practitioners/London Borough of Waltham Forest)

Different interpretations of the above rule may vary the character of that neighbourhood below is example of two design solution one consistent and other inconsistent.

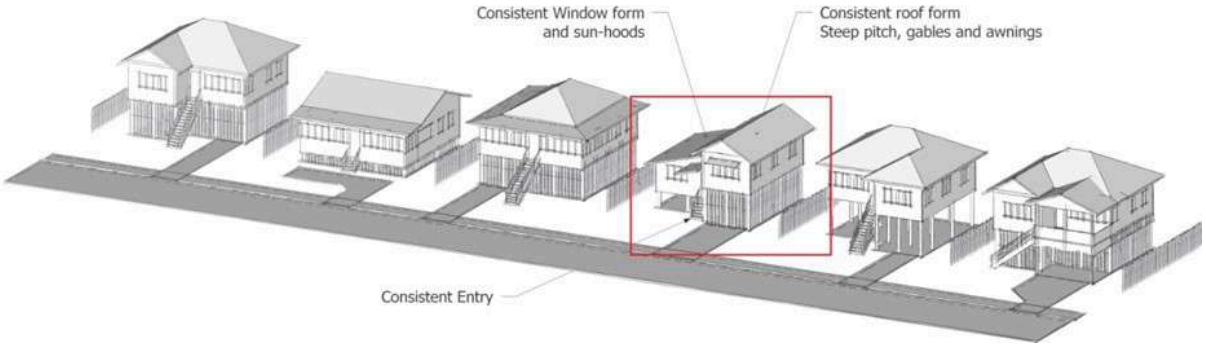


Fig. 40 - Image of Consistent design solution of building in a neighbourhood . (Source - Planning Scheme Policy – Neighbourhood Character)

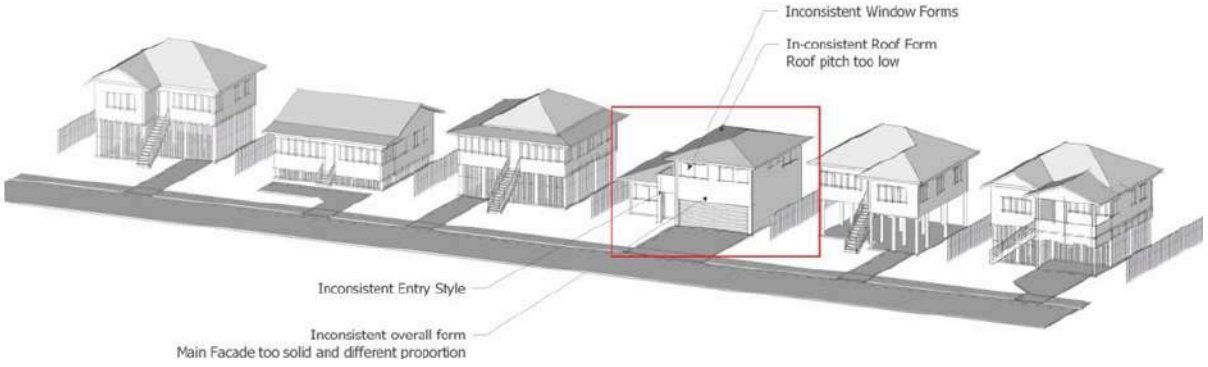


Fig. 41 - Image of Consistent design solution of building in a neighbourhood . (Source - Planning Scheme Policy – Neighbourhood Character)

It can be seen that building height and other factor such as architectural element can impact the character of the neighbourhood and also different interpretation of a rule can alter the character of that neighbourhood. Hence, building height and other important factors will also be considered in the analysis of Actual Site selected for the case study to understand the impact of DCR on built character of a neighbourhood.

4.1.3 Ground Coverage and FSI

Ground coverage and FSI (Floor Space Index) work together to influence a city's character in a big way. Here's how:

Density and Open Space: High ground coverage (buildings taking up most of the land) and a high FSI (allowing for a lot of building floor area) create a dense city feel. Imagine a bustling downtown with towering buildings close together, leaving little room for parks and plazas. Conversely, lower ground coverage and FSI allow for more open space, parks, and greenery, leading to a more spread-out and potentially calmer atmosphere.

Building Form and Character: Ground coverage and FSI can influence the types of buildings constructed. High values might favor tall apartment buildings or office towers, while lower values might encourage development of single-family homes or smaller commercial buildings. This shapes the overall architectural style of the city.

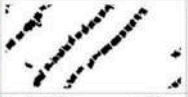
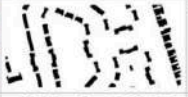
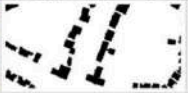
	Density (Dwellings per hectare)	Density (Dwellings per hectare)	Density (Dwellings per hectare)	Building Types	Heights (Storeys)
Linear Rural			2 - 10	Detached houses	1 - 3
Suburban Periphery			10 - 15	Detached houses	2 - 3
Suburban			20 - 30	Semi-detached houses	2 - 3
Suburban Terrace			20 - 30	Terraced houses	2 - 3
Urban Terrace			37 - 50	Terraced houses	2 - 3
Flats			80 - 150	Street facing flats	3 - 6

Table 7 - Image of Table showing the rules and regulations of London Borough of Waltham (Source - Supplementary Planning Document - Residential Design Guidance, October 2016)

As we saw in the case of London Bourough of Wlatham Forest Different densities can have a different effect on the character of that neighbourhood. Looking at example of two different cities with 1km*1km area we can see how different densities and FSI can create different character of that neighbourhood.

Fig. 42 - Dhaka, Bangladesh
(Source - sciencephoto.com)

Fig. 43 - Dallas, Texas
(Source - pngtree.com)

In a nutshell, ground coverage and FSI determine how much space buildings occupy and how densely packed they are. This directly affects the city's density, walkability, and architectural character.

4.2 Analysing the variation

The variation will be analysed in two different scale macro and micro by quantitative method which is based on the applicable rules and collected on site data of all the building in area of study which will help in understanding the amount of variation and violation of the rule and its impact on urban built character.

- Macro Level analysis will be done by comparing the development plan and the actual development on the site which will be focusing on the factor such as zoning, land use, building typologies and variation in the same in order to understand the impact on urban built character due to variation of these factors.

- Micro level analysis will be done by using following steps :

  CASE SELECTION
  STEP 1 - Entire data set will be divided into groups according to the time period. The time period selected will be based on the years surat witnessed the start of DCR application and also its further amendments.
  - ➢ Group 1 - 1990 to 2005
  - ➢ Group 2 - 2005 to 2012
  - ➢ Group 3 - 2012 to 2023

  STEP 2 - Then each group will be divided into subgroups according to plot size as mentioned in the DCR which is governing the FSI and Ground Coverage and Margins othe than road side.
  - ➢ For Ground Coverage and FSI Analysis
    - ○ Group (X)A - 0 to 90 sqm

- Group (X)B - 90 to 150 sqm
- Group (X)C - 150 to 1500 sqm
- Group (X)D - 1500 & above sqm

➢ For Margin other than road side
- Group (X)A - 0 to 150 sqm
- Group (X)B - 150 to 250 sqm
- Group (X)C - 250 & above sqm
- Group (X)D - High Rise Building

STEP 3 - Each group will be compared to applicable guideline in selected time period.
STEP 4 - Further filtering to select cases for detailed analysis will be based on the amount of variation and violation.

DETAILED ANALYSIS
STEP 1 - Above selected cases will be studied using plan, section, 3D and images in order to understand how that case is impacting the character of the neighbourhood.
STEP 2 - All the cases after study will be used to find factors impacting the character of the neighbourhood and will be used in creating a inference table with three subheads

➢ Violation of the rule
➢ Variation in following the rule
➢ Following the rule as it is in DCR

Chapter : 5
Data Collection

5 DATA COLLECTION

5.1 Rules and Regulations of Surat

After the establishment of Gujarat Town Planning and Urban Development Act 1976, Surat Urban Development Authority (SUDA) had the responsibility for creating and enforcing the General Development Control Regualtion (GDCR) also know as DCR. Development Control Regulation is a set of rules and regulations that governs the development of Surat and was established in 1986 in Surat. Other amendments came in surat in 2002 but the development according to GDCR 2002 was seen much later in around 2005. Further in 2017 another amendment came into surat which was under formulation since 2011 when the establishment of the Gujarat Regularization of Unauthorized Development Act 2011 took place is current GDCR being followed in Surat.

Margin

The table below is the data of road side margin which is with respect to the width of the proposed road in meter. Earlier the margin were only based on road width but now it also considers the building area and building height and also the road width bifurcation has changed from above 18m and upto 30m in 2002 to above 18m and upto 40m in 2017 has also impacted the built character of the neighbourhood.

Width of the Proposed Road (mts.)	Minimum Road Side Margin (mts.) (till 2002)	Minimum Road Side Margin (mts.) (2002)	Minimum Road Side Margin (mts.) (2017)
Road up to 9mts. and less.	1.5	3	3
More than 9 mts and upto 12 mts.	3	4.5	4.5
More than 12 mts and upto 18 mts.	4.5	6	6
More than 18 mts and upto 40 mts.	6	7.5	7.5
More than 40 mts.	6	9	9

Table 8 - Road Side Margin rule in DCR
(Source -Development Control Regulation, 2002 & 2017)

Height

The height restriction before 2002 were that the height of the building should not exceed 30m, but in 2002 the maximum height of the building was permitted till 40 mt and in 2017 it

has been increased to maximum of 70m. But looking at the building height restriction according to the the abutting road width in 2017 DCR it is mentioned below it only permits maximum height of 45m on road width of 18m to 45m.

Sr. No.	ROAD WIDTH (m)	MAXIMUM PERMISSIBLE BUILDING HEIGHT (m)
1	less than 9 m	10.00
2	9 m and less than 12 m	15.00
3	12 m and less than 18 m	25.00
4	18 m and less than 45 m	45.00
5	45 m and above	70.00

Table 9 - Maximum Permissible Building Height (m)in relation with road width (m) in DCR 2017
(Source -Development Control Regulation, 2002 & 2017)

FSI

There has been a drastic change in the FSI regulation among these years as there is a difference in the vision and creation of development plans of 2004 and 2035. Earlier the focus was on low density development which led to urbanization and city expanded and problem was seen in terms of maximum utilization of the land and available infrastructure, but in the new DP more focus on high rise development has been seen in Transit Oriented Development Zone and Central Business District Zone. Another factor contributing in change in FSI regulation is the concept of chargeable FSI which was not seen few years back and that has also resulted in change in development pattern of certain neighbourhood.

DCR Year	Land Use Zone	Permissible FSI (Base)	Chargeable FSI	Maximum FSI	Road Width
2002	Residential Zone	1.8	-	1.8	
2017	Residential Zone	1.8	0.45	2.25	Above 18m
			0.9	2.7	Above 30m
2017	Proposed Residential Zone	0.6	1.2	1.8	
2017	Residential Zone ORR (90 m)	0.6	3.4	4	
2002	Commercial Zone	1.8	-	1.8	
2017	Commercial Zone	1.8	0.45	2.25	Above 18m
			0.9	2.7	Above 30m
2017					

Table 10 - Maximum Permissible FSI
(Source - Development Control Regulation, 2002 & 2017)

Ground Coverage and Side Margin

No major changes have been seen in regulation of maximum ground coverage and side margin from the last amendments earlier and below is the table of margin other than road side and maximum built up area on any floor with respect to Plot Size.

Plot size	Margins other than road side.	Maximum built-up area on any floor
up to 150 sq.mts.	2.25 mts.(any one side)	60%
Above 150 sq.mts. and up to 250 sq.mts.	2.5 mts.(rear side) and 1.5 mts.(any one side)	50% or 90 sq.mts. whichever is more.
Above 250 sq.mts.	3.0 mts. in all sides except road side subject to these regulations as the case may be.	45 % or 150 sq.mts. whichever is more.
For high- rise building.	as per regulation no 12.4.1. A(iv)	30%

Table 10 - Regulation of Maximum built-up area on any floor and margins other than road side for low rise building except commercial and mixed use.
(Source - Development Control Regulation, 2002 & 2017)

In case of Low rise building for commercial and mixed development the margins and ground coverage shall be as under. (a) Maximum 50% built up area of proposed ground floor shall be permitted in mixed development subject to these regulations. (b) In case of sub division / Sub plotting of Survey no / Final Plot / Block No, the area of sub divided building unit is up to 250 sq.mts., minimum 3.00 mt. margin shall be required along the boundary of Survey No / Final Plot / Block No and Boundary of sub divided building unit as the case may be.

Table 11 - Regulation of Maximum built-up area on any floor for low rise commercial and mixed use.
(Source - Development Control Regulation, 2002 & 2017)

Use	Width of road	Minimum Road side Margins
1	2	3
For all uses	Irrespective of road width of Development Plan Roads or Town Planning Scheme Roads, as may be applicable.	0.3 H. or 6 mts. whichever is more on road sides. 0.2 H. or 6.0 mts. whichever is more on remaining sides. Margin between two building shall be two times the margins required on remaining side as mentioned above.

Table 12 - Regulation of Maximum built-up area on any floor for high rise all typologies.
(Source - Development Control Regulation, 2002 & 2017)

Therefore these rules and regulation also control the character and development of the neighbourhood and can highly alter the character even if certain small changes are made in the regulation of the same.

5.2 Data set of selected Study Area

The area selected for the analysis is Ghod Dod Road, Surat. The region is specifically selected due to its rich character. The total stretch of the road in 2.7 km, and the width of the road is 24m which for study was divided into 2 parts and internally both parts were divided into 4 parts. The following data set collected is obtained from site visit, photographs, measurements on site, surveys and interviews.

Fig. 44 – Satellite Map View of Ghod Dod Road - 2023. (Source - Google Pro.)

This is the data set of 80 buildings of ghod dod which includes data of all the selected parameters that are margins, ground coverage, height of the building and FSI. The study framework will be conducted after grouping the data according to the divided area and this data will be used for inference and analysis of how dcr affect the character of a neighbourhood. Different interpretations of DCR rules has also been found which alter the character of that space.

Below is the table of data containing data of time period of construction plot area, road and other side margin, FSI, ground coverage and building height. This is data set contains data of total 80 buildings of ghod dod road.

Sr. No.	Building Name	Year of construction	Plot Area (Sqm)			Margins (in m)			Floor Space Index			Ground Coverage		Building Height
			Length (m)	Breadth (m)	Area (sqm)	Front	Side	Back	Total Built Up	Plot Area	FSI	Area	%	
1	Turning Point Complex	2000	62.5	48.3	3021	9	6.5	3	10100	3021	3.34	1572	52	29
2	Shiv Smruti Complex	2001	57.6	47.9	2758	6	3.5	8	10350	2758	3.75	1480	53.7	23
3	BOB Complex	2005	39.2	71.2	2791	15	5.5	6	7400	2791	2.65	1560	55.9	27
4	BOI Complex	2008	42.3	53.6	2268	9	6	16	4260	2268	1.88	960	42.3	23
5	CSC BSNL	1992	76.1	84	6391	18	12	5	8100	6391	1.27	1200	18.8	27
6	Panchratna Jwellers	2012	22.4	25	560	4	3	3	1080	560	1.93	252	45	15
7	Neelam Complex	2017	39.2	23.5	923	6	3	3	2450	923	2.65	490	53.1	15
8	Electro Academy	2011	18.3	22.7	415	6	3	3	800	415	1.93	160	38.6	14
9	Ruhi Studio	2006	14.8	25.7	380	4	3	2	420	380	1.11	140	36.8	10
10	Luxury Time Complex	2013	18.4	22.3	410	4	3	2	1020	410	2.49	300	73.2	16
11	Jolly Square	2008	46.2	41.4	1870	10	6	8	3500	1870	1.87	700	37.4	16
12	Surya Kiran Complex	1996	57.8	103.8	6000	12	8	18	11900	6000	1.98	2350	39.2	26
13	Gerela Shopping Centre	2006	55.9	59	3300	12	10	16	8900	3300	2.7	1650	50	30
14	Shakuntal Complex	1999	36.2	24.5	886	5	6	3	1750	886	1.97	350	39.4	15
15	Prakash Complex	2003	26.3	27	711	5	3	5	1510	711	2.12	310	43.6	12
16	Galaxy Complex	2007	16.4	24.8	406	5	3	0	670	406	1.65	190	46.8	12
17	Krishna Regal	2015	16.8	19	320	8	3	3	575	320	1.8	115	35.9	19
18	Rajgharana	2016	32.3	18.3	591	5	3	3	1176	591	1.99	294	49.7	13
19	Dharmesh Apt	2005	29.2	22	642	4	3	3	996	642	1.55	332	51.7	10
20	Jade Blue	2004	57.2	23.6	1350	4	6	3	3220	1350	2.39	805	59.6	14
21	Ponk Complex	2022	22.8	48.5	1105	12	3	0	647	1105	0.59	647	58.6	4
22	Raja Bazaar	2010	22	53.2	1170	0	0	3	1405	1170	1.2	1100	94	7
23	Chocolate House	2006	20.4	55.8	1139	6	0	3	896	1139	0.79	679	59.6	6
24	Osia Mart	2018	19.8	45.8	907	3	3	12	1569	907	1.73	523	57.7	11
25	Westfield Complex	2014	50.9	109.2	5558	15	6	6	10156	5558	1.83	2539	45.7	14
26	Tanishq	2008	22.6	23.7	535	6	4	3	1192	535	2.23	298	55.7	14
27	Amrutdhara Complex	2004	66.2	29.7	1965	6	4	3	7986	1965	4.06	1041	53	28
28	Axis Bank	1993	49.9	30.5	1522	4	3	3	3018	1522	1.98	854	56.1	27
29	Shiv Shakti Complex	2006	41.6	34.5	1435	9	3/6	3	4250	1435	2.96	850	59.2	15
30	Laxminarayan Complex	2002	30.5	50.5	1541	4	12	3	2612	1541	1.7	653	42.4	10
31	Prince Palace	2012	7.8	24.9	194	6	1.5	1.5	642	194	3.31	107	55.2	18
32	Ravi Dham Complex	2015	17.6	26.1	459	6	3	1.5	1302	459	2.84	217	47.3	18
33	Gods Gift	2014	18.8	26.8	503	6	1.5	1.5	1788	503	3.55	298	59.2	18
34	Jasani Apt	2011	17.4	22.7	395	6	3	1.5	1050	395	2.66	175	44.3	18
35	Bhavik Apt	2006	82.3	23.1	1902	6	5/6	3	5671	1902	2.98	839	44.1	30
36	Poddar Plaza	2001	41.21	45.7	1883	10	6	8	2815	1883	1.49	563	29.9	15
37	Jolly Arcade	2005	43.6	62.3	2710	12	5	6	5350	2710	1.97	1070	39.5	15
38	Jolly Complex	2003	51.6	28.7	1477	6	6	6	2350	1477	1.59	470	31.8	12
39	Royal Place	2005	45.8	113.6	5202	8	6	6	19737	5202	3.79	2193	42.2	27
40	Jolly Shopping Point	2002	62.2	19.1	1567	15	1.5	4	3850	1567	2.46	770	49.1	15
41	G3	2006	16.9	47.3	800	8	0	0	2060	800	2.58	515	64.4	14
42	Kalamandir Jwellers	2008	32.6	63.9	2097	8	6/8	15	3225	2097	1.54	645	30.8	15
43	Shiv Shakti	2004	22.1	24.2	535	7	5.5/2.5	0	1338	535	2.5	223	41.7	18
44	Rajhans Plaza	2006	31.9	25.1	800	8	3	2	2170	800	2.71	434	54.3	15
45	Trimidhi	2001	21.5	90.8	1953	15	6/8	17	4480	1953	2.28	446	22.8	30
46	Regent Arcade	2008	42.6	92.1	3924	13	3/6	6	10668	3924	2.72	2667	68	13
47	Priyadarshini Complex	2006	35.2	130.2	4584	9	6/5	4	12700	4584	2.77	1270	27.7	30
48	Kotak House	2003	20.6	49.4	1017	10	5/3	1	1820	1017	1.79	364	35.8	18
49	Laxmi Vilas Apartment	2007	34.8	64	2227	9	6/9	5	8910	2227	4	810	36.4	33
50	Niraj	2004	35.3	63	2223	9	4.5	1	8118	2223	3.65	902	40.6	27
51	Union Point	2009	35.2	48.8	1717	8	3	9	3745	1717	2.18	749	43.6	17.5
52	Kakadiya Complex	2006	93.8	42.3	3972	8	6	4	17630	3972	4.44	1783	44.4	30
53	KG House	2010	23.7	28.2	668	8	4.5/0	0	1230	668	1.84	246	36.8	14
54	Moghul Mahal Apartment	2005	35.5	27.8	987	8	1.5/4.5	6	1355	987	1.37	271	27.5	14
55	Classic Complex	2007	33.7	76	2560	20	1.5	6	7515	2560	2.94	1503	58.7	17
56	City Cente	1995	19	36.4	692	6	1.5	2	951	692	1.37	317	45.8	10
57	B More	2010	22.1	38.4	849	6	2	0	1945	849	2.29	389	45.8	15
58	G3 Next	2018	22.9	39.8	912	6	3	0	2280	912	2.5	456	50	15
59	Mark House	2013	15.5	41.3	640	6	3	0	1746	640	2.73	291	45.5	18
60	Parle Point Place	2001	63.6	59.2	3760	8	10	6	8187	3760	2.18	1467	39	26
61	AV Sons	2007	19	38.3	727	6	3	6	1660	727	2.28	332	45.7	15
62	BOB Parle Point	2010	15.6	26.1	407	6	3	0	936	407	2.3	234	57.5	12
63	Amar Siddhi Apartment	2006	21.9	48.2	1027	10	6	12	2940	1027	2.86	294	28.6	30
64	Abhishan Complex	2002	49.6	53.2	2637	6	3	1.5	14465	2637	5.49	1315	49.9	30
65	Canopus Mall	2016	53.2	75.8	4037	15	6/3	1.5	8186	4037	2.03	1639	40.6	16
66	Forum Building	2013	28.4	54.1	1537	7.5	3/4	18	3420	1537	2.23	570	37.1	18
67	CitiBank Complex	2005	26.9	22.2	664	6	6/3	1.5	1420	664	2.14	284	42.8	12
68	Sahil Enclave	2010	24.2	20.1	487	5	2/4.5	1.5	1575	487	3.23	225	46.2	21
69	Shiv Apartments	2004	36.3	66.2	2536	12	4.5	1.5	9660	2536	3.81	966	38.1	30
70	Farming Department	2021	31.7	22.3	706	5	3	0	924	706	1.31	308	43.6	9
71	Dream Business House	2012	48.7	19.9	970	5	2/6	0	1680	970	1.73	420	43.3	12
72	Essen House	2008	20.9	19	396	5	2	2	824	396	2.07	206	51.8	10
73	Zaveri & Co	2010	21.7	22.8	495	5	2	1.5	944	495	1.91	236	47.7	12
74	KM Choksi	2020	22.3	16.7	372	5	2	0	575	372	1.55	115	30.9	15
75	Tribhuvan Complex	2010	67.5	54.5	3680	12	3	1.5	12172	3680	3.31	1802	49	28
76	Sargam House	2008	24.1	26.2	632	6	2/0	6	1330	632	2.1	266	42.1	15
77	Ajanta Apartments	2008	21.9	42.3	927	8.5	6/4.5	6	3234	927	3.49	294	31.7	31
78	Abhinandan Apt	2004	40.6	56.5	2294	8	6	3	9453	2294	4.12	1160	50.6	30
79	Rangila Park Shopping Center	2006	86.3	68.1	5878	8	6	12	18468	5878	3.14	2856	48.6	35
80	Rangeela Bazaar	2017	22.2	56.3	1250	1.5	0/3	0	1197	1250	0.96	1197	95.8	3

Table 13 – Data Set of Ghod Dod Road with all parameters information. (Source - Author.)

Chapter : 6
Analysis

6 ANALYSIS

6.1 Macro Level Analysis

According to the development plan of 1986 and 2004 the entire Ghod Dod Road was planned for residential development but due its connection to two important location of Surat on both ends there has been a lot of violation in terms of landuse as seen below in the proposed and actual land use plan.

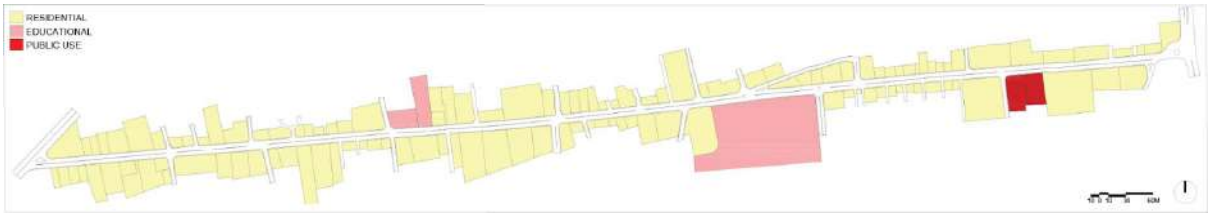


Fig. 45 – Land Use Plan - 2004 (Source - Author)

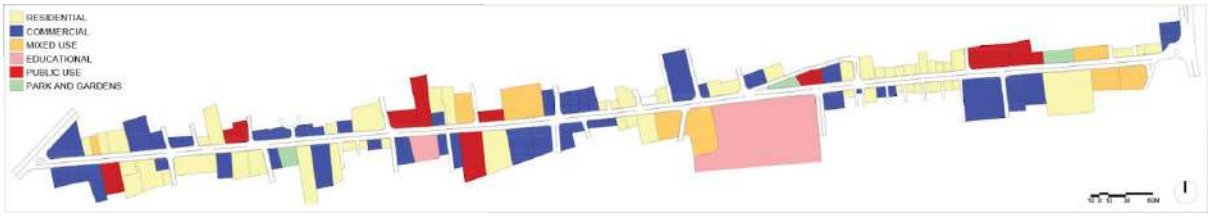
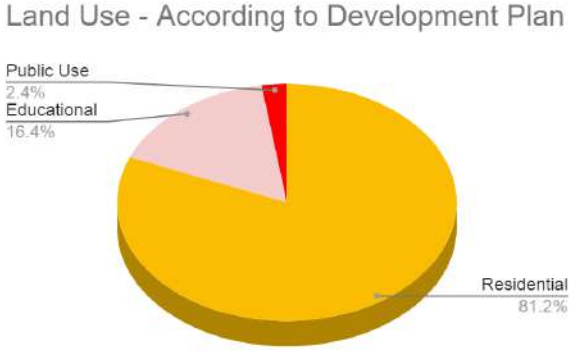


Fig. 46 – Actual Landuse (Source - Author)

Land Use (Acc. to Development Plan)		
	Land Area in Sq.mts	%
Residential	213715	81.3
Educational	42992	16.4
Public Use	6233	2.4

Land Use (Actual on Site)		
	Land Area in Sq.mts	%
Residential	83234	31.7
Commercial	78938	30
Mixed Use	28242	10.7
Public Use	27870	10.6
Educational	39987	15.2
Park & Garden	4669	1.8

Table 14 & 15 – Area table of Land Use according to DP and actual respectively. (Source - Author)



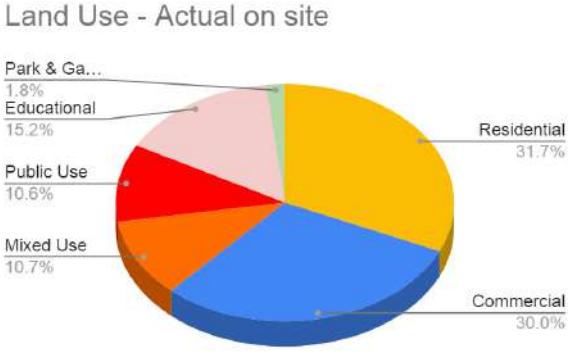


Fig. 47 & 48 – Chart showing the percentage of Land Use of different Categories according to DP and actual respectively. (Source - Author)

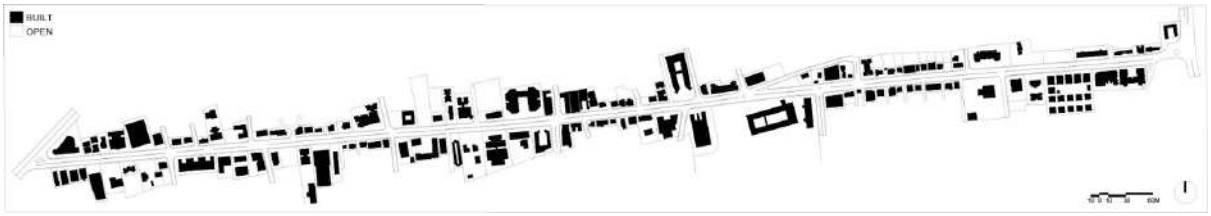


Fig. 49 – Built vs Open Map of Ghod Dod Road (Source - Author)

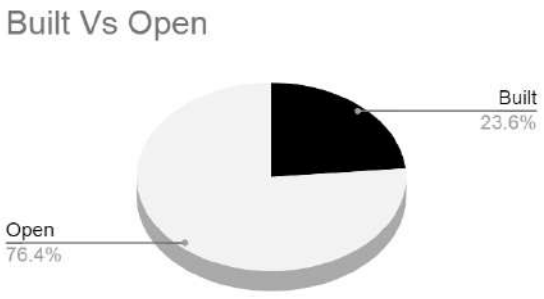
Fig. 50 – Building Typologies Map of Ghod Dod Road (Source - Author)

	Area in Sq.mts	%
Total	358761	100
Built	84645	23.6
Open	274116	76.4

Table 16 – Area table of built vs open and building typologies respectively. (Source - Author)

Building Typology		
	Area in Sq.mts	%
Residential	28263	33.4
Commercial	33212	39.2
Mixed Use	12310	14.5
Public Use	4628	5.5
Educational	6232	7.4

Table 17 – Area table of built vs open and building typologies respectively. (Source - Author)



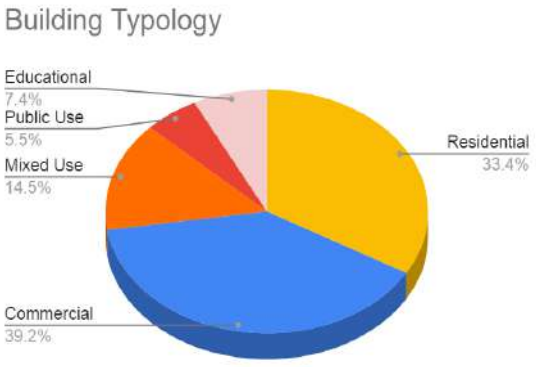


Fig. 51 & 52 – Chart showing the percentage of built vs open and building typologies. (Source - Author)

This has caused variation among the neighbourhood in many forms such as built form which earlier were low rise but as commercial development started building came in with different scale and shapes that is from towering office building and shopping malls to smaller restaurants and shops. Considering the density and FSI which initially were very low when the neighbourhood was planned for residential use, but with increase in the commercial buildings throughout the entire road density and FSI kept rising and impacted the overall congestion of the neighbourhood. Also, the width of the road had to be increased due to increase in traffic on the road after commercial development started this resulted in the alteration of urban built character of that neighbourhood.

6.2 Micro Level Analysis

This analysis is done in order to understand that how much variation has occured in the urban built character throughout the entire ghod dod road because of violation and different interpretation of specific rule, also considering the time factor the is on what time did the road has seen the most development and in what time period variation and its intensity were more. This method also helps in identifying the building with the extreme variation, similarity and violation.

FRONT MARGIN

The entire data set is divided into three groups according to the time period. There are no further divisions because of the margin rule being regulated mostly on the basis of road width. The analysis is done considering the margin rule applicable according to the year of construction. The three group are :

GROUP 1 - 1986 to 2004
GROUP 2 - 2005 to 2011
GROUP 3 - 2012 to 2023

Sr. No.	Building Name	Year of construction	Margins (in m)
1	CSC BSNL	1992	18
2	Axis Bank	1993	4
3	City Cente	1995	6
4	Surya Kiran Complex	1996	12
5	Shakuntal Complex	1999	5
6	Turning Point Complex	2000	9
7	Shiv Smruti Complex	2001	6
8	Poddar Plaza	2001	10
9	Trinidhi	2001	15
10	Parle Point Place	2001	8
11	Laxminarayan Complex	2002	4
12	Jolly Shopping Point	2002	15
13	Abhushan Complex	2002	6
14	Prakash Complex	2003	5
15	Jolly Complex	2003	6
16	Kotak House	2003	10
17	Jade Blue	2004	4
18	Amrutdhara Complex	2004	6
19	Shiv Shakti	2004	7
20	Niraj	2004	9
21	Shiv Apartments	2004	12
22	Abhinandan Apt	2004	8

Table 18 - GROUP 1 - Building Front Margin Data (Source - Author)

Sr. No.	Building Name	Year of construction	Margins (in m)
1	Panchratna Jwellers	2012	4
2	Prince Palace	2012	6
3	Dream Business House	2012	5
4	Luxury Time Complex	2013	4
5	Mark House	2013	6
6	Forum Building	2013	7.5
7	Westfield Complex	2014	15
8	God's Gift	2014	6
9	Krishna Regal	2015	8
10	Ravi Dham Complex	2015	6
11	Rajgharana	2016	5
12	Canopus Mall	2016	15
13	Neelam Complex	2017	6
14	Rangeela Bazaar	2017	1.5
15	Malabar Gold House	2018	3
16	G3 Next	2018	6
17	KM Choksi	2020	5
18	Farming Department	2021	5
19	Ponk Complex	2022	12

Table 19 - GROUP 3 - Building Front Margin Data (Source - Author)

Sr. No.	Building Name	Year of construction	Margins (in m)
1	BOB Complex	2005	15
2	Dharmesh Apt	2005	4
3	Jolly Arcade	2005	12
4	Royal Place	2005	8
5	Moghul Mahal Apartment	2005	8
6	CitiBank Complex	2005	6
7	Ruhi Studio	2006	4
8	Sarela Shopping Centre	2006	12
9	IndusInd Complex	2006	6
10	Shiv Shakti Complex	2006	9
11	Bhavik Apt	2006	6
12	G3	2006	8
13	Rajhans Plaza	2006	8
14	Priyadarshini Complex	2006	9
15	Kakadiya Complex	2006	8
16	Amar Siddhi Apartment	2006	10
17	Rangila Park Shopping Ce	2006	8
18	Galaxy Complex	2007	5
19	Laxmi Vilas Apartment	2007	9
20	Classic Complex	2007	20
21	AV Sons	2007	6
22	BOI Complex	2008	9
23	Jolly Square	2008	10
24	Tanishq	2008	6
25	Kalamandir Jwellers	2008	8
26	Regent Arcade	2008	13
27	Essen House	2008	5
28	Sargam House	2008	6
29	Ajanta Apartments	2008	8.5
30	Union Point	2009	8
31	Raja Bazaar	2010	0
32	KG House	2010	8
33	B More	2010	6
34	BOB Parle Point	2010	6
35	Sahil Enclave	2010	5
36	Zaveri & Co	2010	5
37	Tribhuvan Complex	2010	12
38	Electro Academy	2011	6
39	Jasani Apt.	2011	6

Table 20 - GROUP 2 - Margin Data (Source - Author)

From this analysis it is clear that there has been a lot of different interpretation in the margin rule during 2005 - 2010 and also many cases of violation of the rule is seen during this period. Cases has been selected with extreme variation, violation, similarities in order to understand how margin impact the urban built character of a neighbourhood.

These three group were studied for the amount of variation from the rule with respect to the time period of construction of each building.

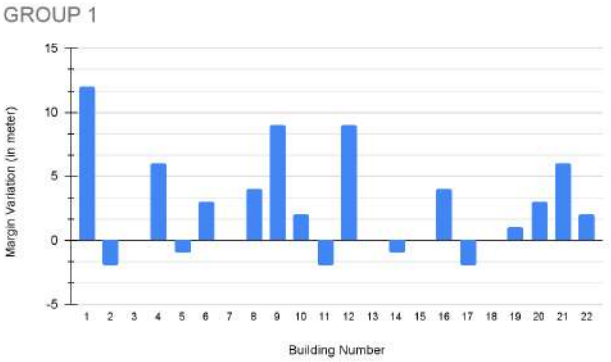


Fig. 53 - Chart showing margin variation from the rule of group 1 (Source - Author)

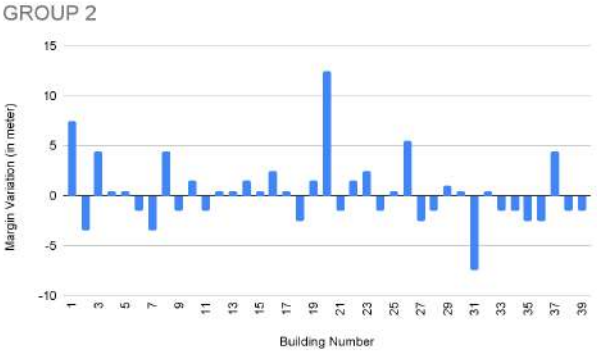


Fig. 54 - Chart showing margin variation from the rule of group 2 (Source - Author)

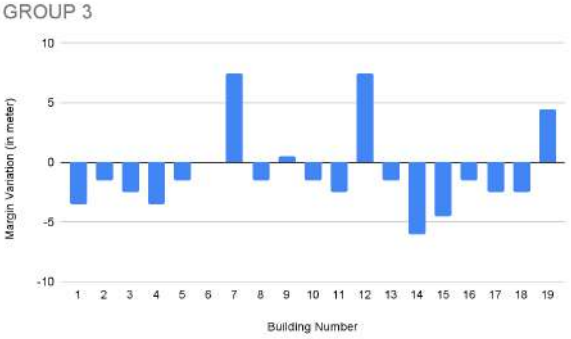


Fig. 55 - Chart showing margin variation from the rule of

group 3 (Source - Author)

HEIGHT

The data is divided into three groups according to the period of construction and also considering the height rule amendments. All the building have followed similar building height rule due to the abutting road width of 24m and also all the land use of these buildings were under the residential zone in development plan of 1986, 2004 and 2035.

GROUP 1 - 1986 to 2004

GROUP 2 - 2005 to 2011

GROUP 3 - 2012 to 2023

Sr. No.	Building Name	Year of Construction	Building Height (m)
1	CSC BSNL	1992	27
2	Axis Bank	1993	27
3	City Cente	1995	10
4	Surya Kiran Complex	1996	26
5	Shakuntal Complex	1999	15
6	Turning Point Complex	2000	29
7	Shiv Smruti Complex	2001	23
8	Poddar Plaza	2001	15
9	Trinidhi	2001	30
10	Parle Point Place	2001	26
11	Laxminarayan Complex	2002	10
12	Jolly Shopping Point	2002	15
13	Abhushan Complex	2002	30
14	Prakash Complex	2003	12
15	Jolly Complex	2003	12
16	Kotak House	2003	18
17	Jade Blue	2004	14
18	Shiv Shakti	2004	18
19	Amrutdhara Complex	2004	28
20	Niraj	2004	27
21	Shiv Apartments	2004	30
22	Abhinandan Apt	2004	30

Sr. No.	Building Name	Year of Construction	Building Height (m)
1	Dharmesh Apt	2005	10
2	Moghul Mahal Apartment	2005	14
3	CitiBank Complex	2005	12
4	BOB Complex	2005	27
5	Jolly Arcade	2005	15
6	Royal Place	2005	27
7	Ruhi Studio	2006	10
8	IndusInd Complex	2006	6
9	Shiv Shakti Complex	2006	15
10	G3	2006	14
11	Rajhans Plaza	2006	15
12	Amar Siddhi Apartment	2006	30
13	Sarela Shopping Centre	2006	30
14	Bhavik Apt	2006	30
15	Priyadarshini Complex	2006	30
16	Kakadiya Complex	2006	30
17	Rangila Park Shopping Cer	2006	35
18	Galaxy Complex	2007	12
19	AV Sons	2007	15
20	Laxmi Vilas Apartment	2007	33
21	Classic Complex	2007	17
22	Tanishq	2008	14
23	Essen House	2008	10
24	Sargam House	2008	15
25	Ajanta Apartments	2008	31
26	BOI Complex	2008	23
27	Jolly Square	2008	16
28	Kalamandir Jwellers	2008	15
29	Regent Arcade	2008	13
30	Union Point	2009	17.5
31	Raja Bazaar	2010	7
32	KG House	2010	14
33	B More	2010	15
34	BOB Parle Point	2010	12
35	Sahil Enclave	2010	21
36	Zaveri & Co	2010	12
37	Tribhuvan Complex	2010	28
38	Electro Academy	2011	14
39	Jasani Apt.	2011	18

Table 21 & 22 - GROUP 1 (Above) & GROUP 2 (Right Side) Building Height Data (Source - Author)

It is clear that the maximum number of high rise buildings were made after 2004 and that was due to change in maximum height rule. Also cases of extreme violation were found.

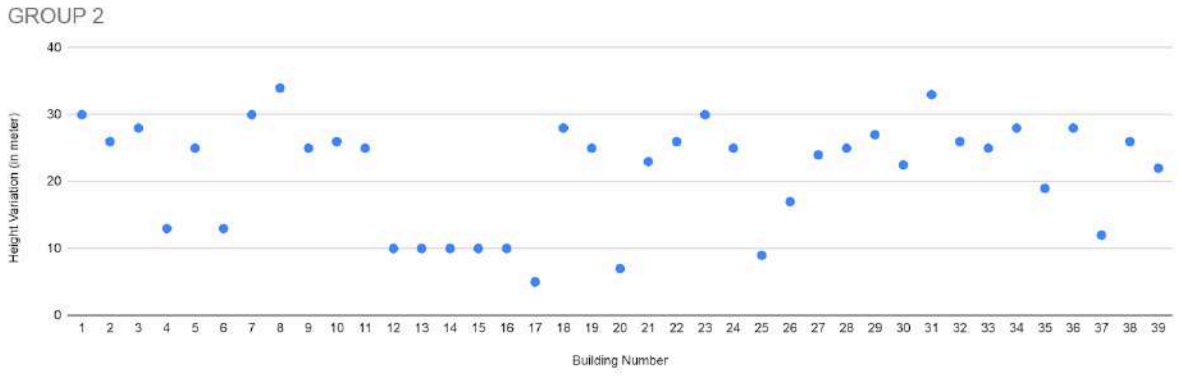


Fig. 56 - Chart showing variation of height from the rule of group 2 (Source - Author)

Sr. No.	Building Name	Year of Construction	Building Height (m)
1	Panchratna Jwellers	2012	15
2	Prince Palace	2012	18
3	Dream Business House	2012	12
4	Luxury Time Complex	2013	16
5	Mark House	2013	18
6	Forum Building	2013	18
7	God's Gift	2014	18
8	Westfield Complex	2014	14
9	Krishna Regal	2015	15
10	Ravi Dham Complex	2015	18
11	Rajgharana	2016	13
12	Canopus Mall	2016	16
13	Neelam Complex	2017	15
14	Rangeela Bazaar	2017	3
15	Malabar Gold House	2018	11
16	G3 Next	2018	15
17	KM Choksi	2020	15
18	Farming Department	2021	9
19	Ponk Complex	2022	4

Table 23 - GROUP 3 - Building Height Data (Source - Author)

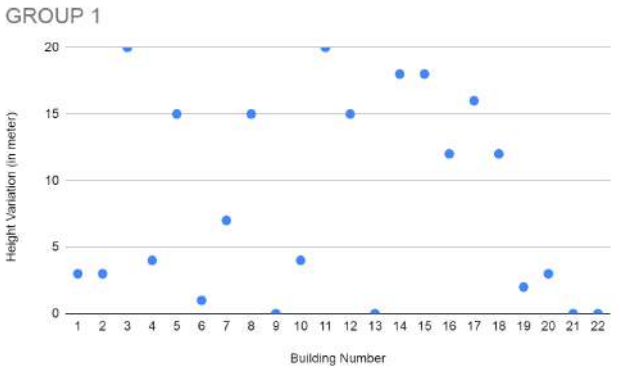
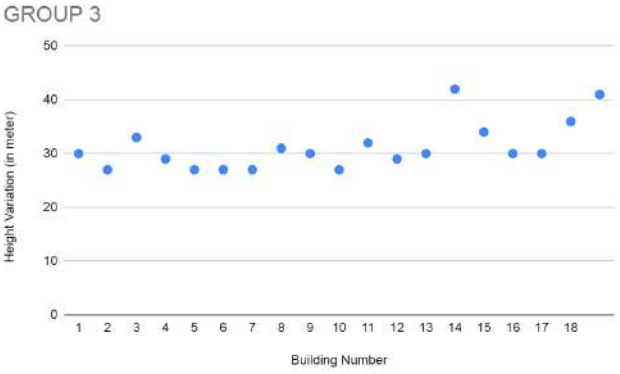


Fig. 57 & 58 - Chart showing variation of height from the rule of Group 1 & Group 3 (Source - Author)



It can be seen that building that were constructed after 2012 had followed a similar pattern of height which helped in identifying cases for detailed analysis to understand how similar height building can exhibit different character.

GROUND COVERAGE

The data is divided into three groups according to the period of construction and further each group is subdivided into two category in low rise and high rise building types. The group were also divided according to the plot size but as all the plot are above 250 sq.mts they all lie in same category of PS ≥ 250 Sq. Mt and High Rise in DCR.

GROUP 1 - 1986 to 2004
GROUP 2 - 2005 to 2011
GROUP 3 - 2012 to 2023

X(A) Low Rise (Upto 18m) - Marked in Grey
X(B) High Rise (Above 18m)- Marked in White

Sr. No.	Building Name	Year of Construction	Plot Size (in sq.mts)	Percentage of Ground Coverage	Building Height (in mts)
1	Shiv Shakti	2004	535	41.7	18
2	City Cente	1995	692	45.8	10
3	Prakash Complex	2003	711	43.6	12
4	Shakuntal Complex	1999	888	39.4	15
5	Kotak House	2003	1017	35.8	18
6	Jade Blue	2004	1350	59.6	14
7	Jolly Complex	2003	1477	31.8	12
8	Axis Bank	1993	1522	56.1	27
9	Laxminarayan Complex	2002	1541	42.4	10
10	Jolly Shopping Point	2002	1567	49.1	15
11	Poddar Plaza	2001	1883	29.9	15
12	Trinidhi	2001	1953	32.8	30
13	Amrutdhara Complex	2004	1965	32	28
14	Niraj	2004	2223	40.6	27
15	Abhinandan Apt	2004	2294	50.6	30
16	Shiv Apartments	2004	2536	38.1	30
17	Abhushan Complex	2002	2637	49.9	30
18	Shiv Smruti Complex	2001	2758	53.7	23
19	Turning Point Complex	2000	3021	52	29
20	Parle Point Place	2001	3760	39	26
21	Surya Kiran Complex	1996	6000	39.2	26
22	CSC BSNL	1992	6391	18.8	27

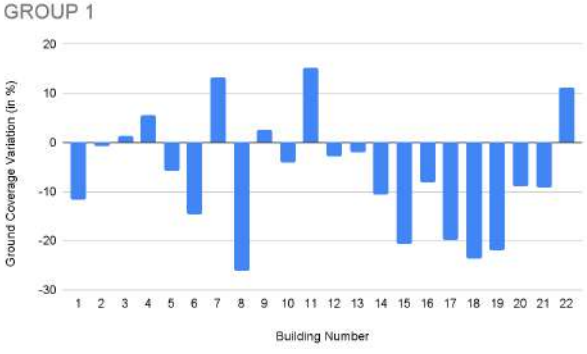


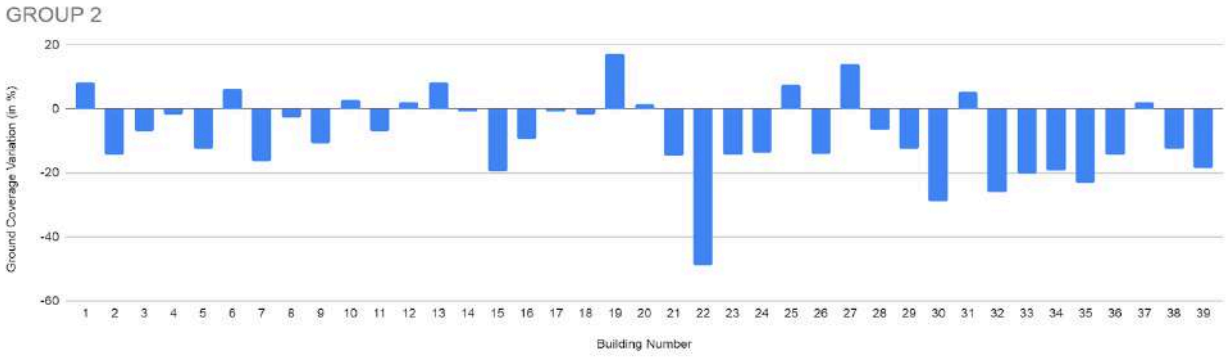
Fig. 59 - Chart showing variation of ground coverage rule of Group 1 (Source - Author)
Table 24 - GROUP 1 - Ground Coverage Data

Sr. No.	Building Name	Year of Construction	Plot Size (in sq.mts)	Percentage of Ground Coverage	Building Height (in mts)
1	Prince Palace	2012	194	55.2	18
2	Krishna Regal	2015	320	35.9	15
3	KM Choksi	2020	372	30.9	15
4	Luxury Time Complex	2013	410	73.2	16
5	Ravi Dham Complex	2015	459	47.3	18
6	God's Gift	2014	503	59.2	18
7	Panchratna Jwellers	2012	560	45	15
8	Rajgharana	2016	591	49.7	13
9	Mark House	2013	640	45.5	18
10	Farming Department	2021	708	43.5	9
11	Malabar Gold House	2018	907	57.7	11
12	G3 Next	2018	912	50	15
13	Neelam Complex	2017	923	53.1	15
14	Dream Business House	2012	970	43.3	12
15	Ponk Complex	2022	1105	58.6	4
16	Rangeela Bazaar	2017	1250	95.8	3
17	Forum Building	2013	1537	37.1	18
18	Canopus Mall	2016	4037	40.6	16
19	Westfield Complex	2014	5556	45.7	14

Sr. No.	Building Name	Year of Construction	Plot Size (in sq.mts)	Percentage of Ground Coverage	Building Height (in mts)
1	Ruhi Studio	2006	380	36.8	10
2	Jasani Apt.	2011	395	44.3	18
3	Essen House	2008	398	51.8	10
4	Galaxy Complex	2007	406	46.8	12
5	BOB Parle Point	2010	407	57.5	12
6	Electro Academy	2011	415	38.6	14
7	Sahil Enclave	2010	487	46.2	21
8	Zaveri & Co	2010	495	47.7	12
9	Tanishq	2008	535	55.7	14
10	Sargam House	2008	632	42.1	15
11	Dharmesh Apt	2005	642	51.7	10
12	CitiBank Complex	2005	664	42.8	12
13	KG House	2010	668	36.8	14
14	AV Sons	2007	727	45.7	15
15	G3	2006	800	64.4	14
16	Rajhans Plaza	2006	800	54.3	15
17	B More	2010	849	45.8	15
18	Ajanta Apartments	2008	927	31.7	31
19	Moghul Mahal Apartment	2005	987	27.5	14
20	Amar Siddhi Apartment	2006	1027	28.6	30
21	IndusInd Complex	2006	1139	59.6	6
22	Raja Bazaar	2010	1170	94	7
23	Shiv Shakti Complex	2006	1435	59.2	15
24	Union Point	2009	1717	43.6	17.5
25	Jolly Square	2008	1870	37.4	16
26	Bhavik Apt	2006	1902	44.1	30
27	Kalamandir Jwellers	2008	2097	30.8	15
28	Laxmi Vilas Apartment	2007	2227	36.4	33
29	BOI Complex	2008	2268	42.3	23
30	Classic Complex	2007	2560	58.7	17
31	Jolly Arcade	2005	2710	39.5	15
32	BOB Complex	2005	2791	55.9	27
33	Sareia Shopping Centre	2006	3300	50	30
34	Tribhuvan Complex	2010	3680	49	28
35	Regent Arcade	2008	3924	68	13
36	Kakadiya Complex	2006	3972	44.4	30
37	Priyadarshini Complex	2006	4584	27.7	30
38	Royal Place	2005	5202	42.2	27
39	Rangila Park Shopping Cente	2006	5878	48.6	35

Table 25 & 26 - GROUP 3 (Above) & GROUP 2 (Right Side) Ground Coverage Data (Source - Author)

These three group were studied for the amount of variation from the maximum ground coverage permitted with respect to the time period of construction and low rise and high rise category and also building typology of each building.



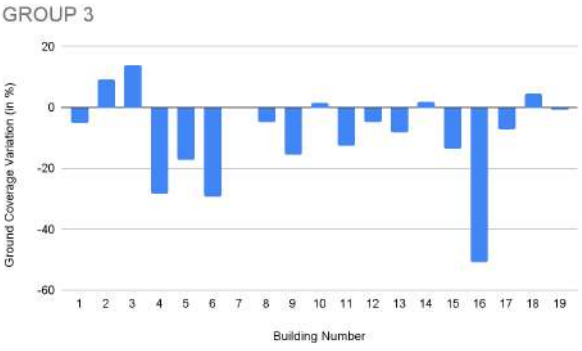


Fig. 60 & 61 - Chart showing variation of ground coverage from the rule of Group 2 (Above) & Group 3 (Right Side) (Source - Author)

Because of the majority of plot size being greater than 250 Sq. Mts. falling in same rule category, the range of variation is very high that is from highest ground coverage of 94% to lowest ground coverage of 18.8%.

Cases were identified with similar PS and different variation & vice versa and also similar PS and similar variation which will be used to understand how ground coverage can alter the urban built character of a neighborhood.

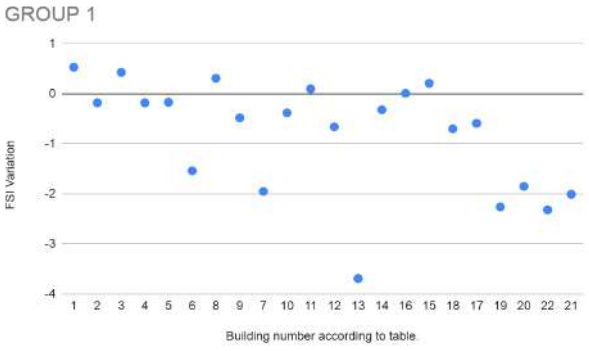
FSI

For the study of FSI the groups are form according the year of construction then it is subdivided according to the building typologies where C = Commercial, R= Residential and M = Mixed Use. Also plot size are considered but as all the plot are more than 250 sq. mt. they lie in same category of PS ≥ 250 sq.mt. and cases are selected accordingly.

Sr. No.	Building Name	Year of Construction	Plot Size (in Sq.mts)	Building Typology	FSI Used
1	CSC BSNL	1992	6391	C	1.27
2	Axis Bank	1993	1522	C	1.98
3	City Cente	1995	692	P	1.37
4	Surya Kiran Complex	1996	6000	M	1.98
5	Shakuntal Complex	1999	888	R	1.97
6	Turning Point Complex	2000	3021	M	3.34
8	Poddar Plaza	2001	1883	C	1.49
9	Trinidhi	2001	1953	R	2.28
7	Shiv Smruti Complex	2001	2758	M	3.75
10	Parle Point Place	2001	3760	C	2.18
11	Laxminarayan Complex	2002	1541	R	1.7
12	Jolly Shopping Point	2002	1567	C	2.46
13	Abhushan Complex	2002	2637	R	5.49
14	Prakash Complex	2003	711	R	2.12
16	Kotak House	2003	1017	C	1.79
15	Jolly Complex	2003	1477	C	1.59
18	Shiv Shakti	2004	535	R	2.5
17	Jade Blue	2004	1350	C	2.39
19	Amrutdhara Complex	2004	1965	R	4.06
20	Niraj	2004	2223	R	3.65
22	Abhinandan Apt	2004	2294	M	4.12
21	Shiv Apartments	2004	2536	C	3.81

Sr. No.	Building Name	Year of Construction	Plot Size (in Sq.mts)	Building Typology	FSI Used
1	Dharmesh Apt	2005	642	C	1.55
3	CitiBank Complex	2005	664	C	2.14
2	Moghul Mahal Apartment	2005	987	R	1.37
5	Jolly Arcade	2005	2710	C	1.97
4	BOB Complex	2005	2791	C	2.65
6	Royal Place	2005	5202	R	3.79
7	Ruhi Studio	2006	380	R	1.11
10	G3	2006	800	C	2.58
11	Rajhans Plaza	2006	800	C	2.71
12	Amar Siddhi Apartment	2006	1027	R	2.86
8	IndusInd Complex	2006	1139	C	0.79
9	Shiv Shakti Complex	2006	1435	C	2.96
14	Bhavik Apt	2006	1902	R	2.98
13	Sarela Shopping Centre	2006	3300	M	2.7
16	Kakadiya Complex	2006	3972	R	4.44
15	Priyadarshini Complex	2006	4584	R	2.77
17	Rangila Park Shopping C	2006	5878	M	3.14
18	Galaxy Complex	2007	406	R	1.65
19	AV Sons	2007	727	R	2.28
20	Laxmi Vilas Apartment	2007	2227	R	4
21	Classic Complex	2007	2560	C	2.94
23	Essen House	2008	398	C	2.07
22	Tanishq	2008	535	C	2.23
24	Sargam House	2008	632	C	2.1
25	Ajanta Apartments	2008	927	R	3.49
27	Jolly Square	2008	1870	C	1.87
28	Kalamandir Jwellers	2008	2097	C	1.54
26	BOI Complex	2008	2268	C	1.88
29	Regent Arcade	2008	3924	C	2.72
30	Union Point	2009	1717	C	2.18
34	BOB Parle Point	2010	407	R	2.3
35	Sahil Enclave	2010	487	C	3.23
36	Zaveri & Co	2010	495	C	1.91
32	KG House	2010	668	C	1.84
33	B More	2010	849	C	2.29
31	Raja Bazaar	2010	1170	C	1.2
37	Tribhuvan Complex	2010	3680	R	3.31
39	Jasani Apt.	2011	395	R	2.66
38	Electro Academy	2011	415	R	1.93

Table 27 & 28 - GROUP 3 (Above) & GROUP 2 (Right Side) Ground Coverage Data (Source - Author)



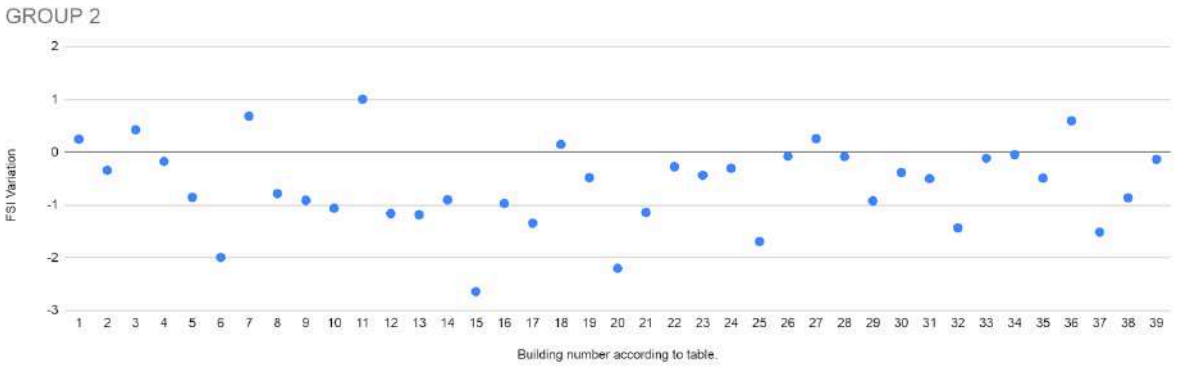


Fig. 62 & 63 - Chart showing variation of FSI from the rule of Group 1 & Group 2 (Source - Author)

Sr. No.	Building Name	Year of Construction	Plot Size (in Sq.mts)	Building Typology	FSI Used
2	Prince Palace	2012	194	R	3.31
1	Panchratna Jwellers	2012	560	R	1.93
3	Dream Business House	2012	970	C	1.73
4	Luxury Time Complex	2013	410	C	2.49
5	Mark House	2013	640	C	2.73
6	Forum Building	2013	1537	C	2.23
7	God's Gift	2014	503	R	3.55
8	Westfield Complex	2014	5556	C	1.83
9	Krishna Regal	2015	320	C	1.8
10	Ravi Dham Complex	2015	459	R	2.84
11	Rajgharana	2016	591	C	1.99
12	Canopus Mall	2016	4037	C	2.03
13	Neelam Complex	2017	923	R	2.65
14	Rangeela Bazaar	2017	1250	C	0.96
15	Malabar Gold House	2018	907	C	1.73
16	G3 Next	2018	912	C	2.5
17	KM Choksi	2020	372	C	1.55
18	Farming Department	2021	708	R	1.31
19	Ponk Complex	2022	1105	C	0.59

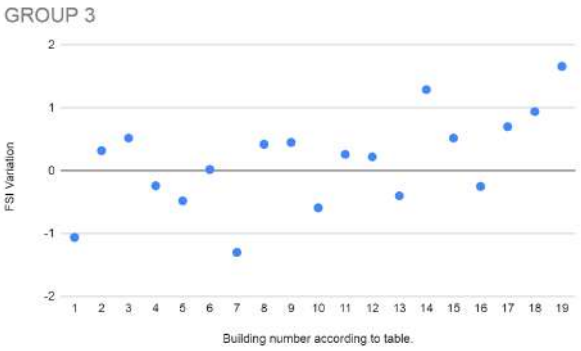


Fig. 64 - Chart showing variation of FSI rule of Group 3 (Source - Author)

Table 29 - GROUP 3 - FSI Data (Source - Author)

FSI variation ranging from minimum FSI used - 0.59 to maximum FSI used - 5.49 can be seen in the neighbourhood. Different cases has been selected for the detailed study such as cases with similar PS and different FSI used, different PS and similar FSI used, also cases with similar PS and similar FSI used but different building typology which will help in understanding how factors such as FSI, PS and building typology impacts the urban built character of a neighborhood.

6.3 Detailed Analysis

FRONT MARGIN

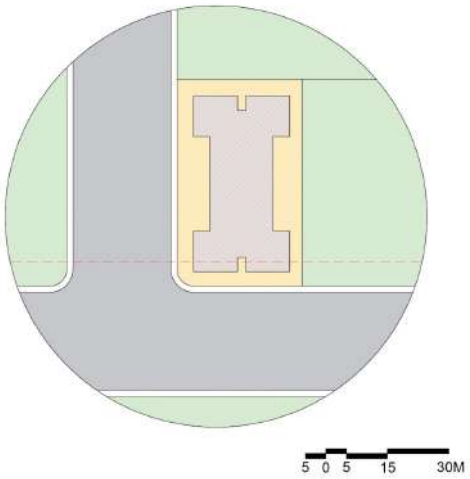
Front margin is a crucial element controlling urban built character. Some of the cases that have been selected for further study for margin study are :

CASE 1 - Axis Bank Complex and Laxminarayan Complex

These two buildings are selected as both the case has a violation of rule, which were found from quantitative analysis. Both of the building have similar area which is 1522 sqm. and 1541 sqm. respectively for Axis Bank Complex and Laxminarayan Complex.

Fig. 65 & 66 - Satellite image of Axis bank Complex (Right Side) and Laxminarayan Complex (Left). (Source - Google Earth Pro)

Both the building were constructed in time period of 1986-2004 and had to follow minimum front margin rule of 6m, but both of them violated the rule and has margin of 4m.



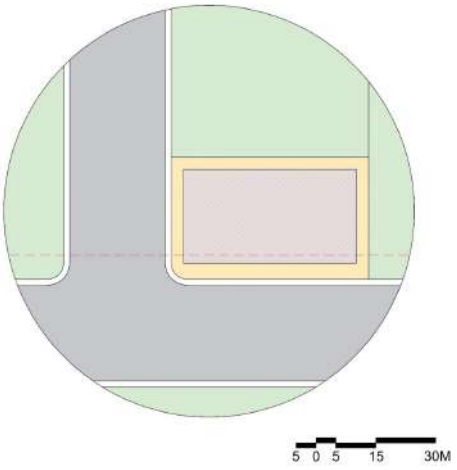
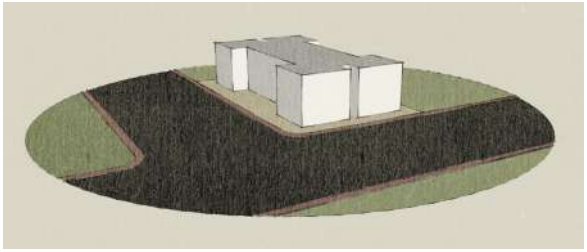


Fig. 67 & 68 - Plan of Axis bank Complex (Right Side) and Laxminarayan Complex (Left Side). (Source - Author)

Plan of both the building shows the Margin Line according to the rule and actual margin that were provided. It is clear that both of them have negative variation and have similar margin provided.

Fig. 69 & 70 - Image showing the front facade and road of Axis bank Complex (Right Side) and Laxminarayan Complex (Left Side). (Source - Author)



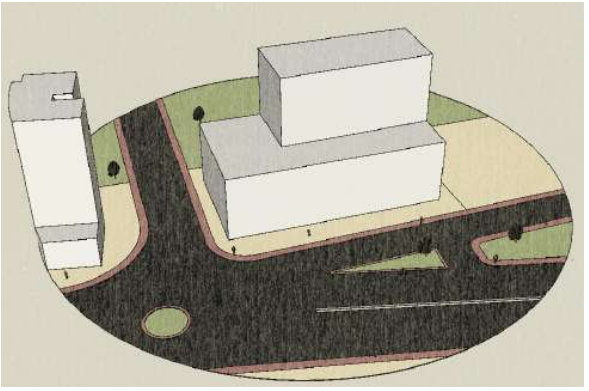


Fig. 71 & 72 - Image showing 3D visual of the front facade and road of Axis bank Complex (Right Side) and Laxminarayan Complex (Left Side). (Source - Author)

Both of the building has left 1.8m pedestrian path and margin of 4 meter but due to plot orientation the scale of facade impacting the character are different in case of Laxminarayan Complex it is more narrower and wider in case of Axis Bank Complex.

Hence it is evident that even thought two building with similar plot size and follow DCR rule similarly there may be difference in built character. The plot orientation is an important factor that needs to be taken into consideration during DCR formulation in order to maintain the character of a neighbourhood.

CASE 2 - Raza Bazaar and IndusInd Bank

Two adjacent buildings are selected as both the Raza Bazaar and the IndusInd Bank Complex has a violation of the rule. Both of the building have similar area which is 1170 sqm. and 1139 sqm. for Raza Bazaar and IndusInd Bank Complex respectively. Both of the building were constructed in time period between 2005 to 2011.

Fig. 73 & 74 - Satellite image of IndusInd Bank (Right Side) and Raza Bazaar (Left Side). (Source - Google Earth Pro)

Both adjacent building had to follow front margin rule of 7.5m but it is clear from the image and plan that Raza Bazaar (Left Side Plot) has negative variation with no margin on front side and the IndusInd Bank Complex (Right Side Plot) has negative variation with 6m wide margin on front side resulting in both building with different interpretation of margin rule.

Fig. 75 - Plan of both Raza Bazaar (Left Side Plot) and IndusInd Bank Complex (Right Side Plot). (Source - Author)

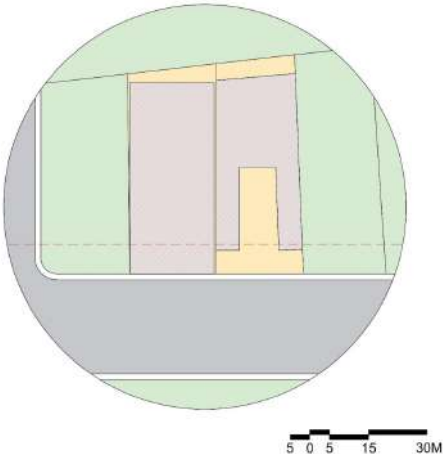


Fig. 76 & 77 - Image showing impact on character due to variation in margin rule interpretation of both Raza Bazaar (Left Side Plot) and IndusInd Bank Complex (Right Side Plot). (Source - Author)

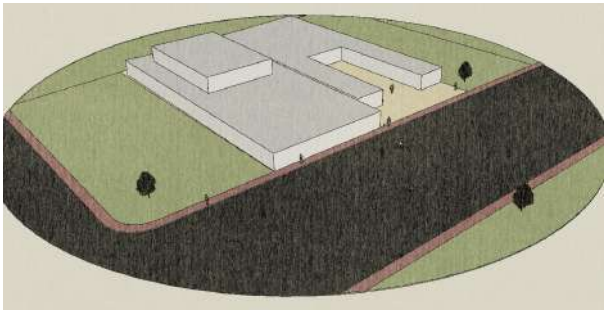
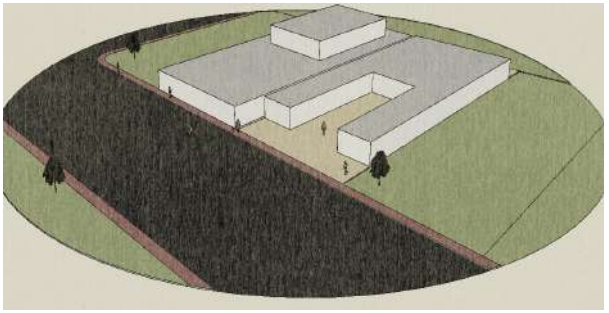



Fig. 78 & 79 - Image showing 3D view of existing margin rule interpretation (Left Side) and what could have been if both followed margin rule perfectly. (Right Side) (Source - Author)

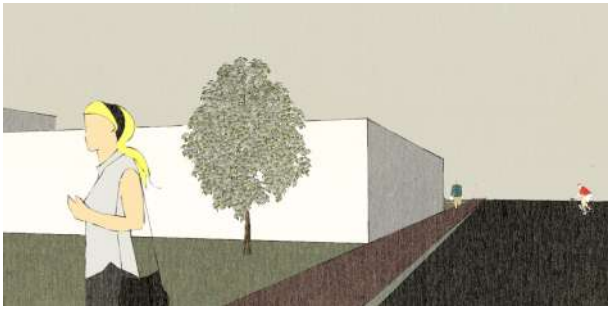
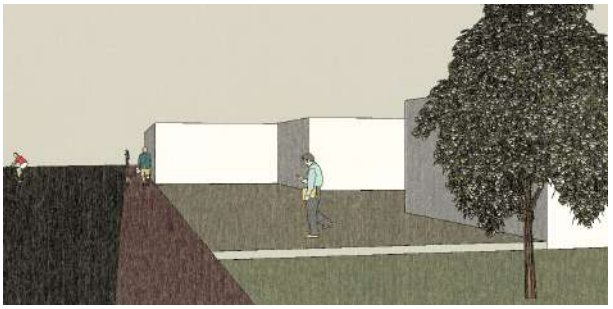



Fig. 80 & 81 - Image showing 3D street view of existing margin rule interpretation (Left Side) and what could have been if both followed margin rule perfectly. (Right Side) (Source - Author)

Looking at the images of existing scenario it is clear that Raza Bazaar is obstructing the pedestrian view and with no margin left in the front it develops a sense of congestion making it difficult for the user to find the pause point at the entry this resulting in character development of a congested space. But when we see at the images of possible scenario if margin rule was followers as it is, it is evident that there is a sense of openness on the street and no obstruction of the view is there creating a sense of spacious neighbourhood. In conclusion interpreting the margin rule differently can alter the character of that vicinity.

CASE 3 - Prince Palace, Ravi Dham Complex, God's Gift Apt. and Jasani Apt.

In this case four consecutive buildings are selected which were built in the time period of 2011 to 2023. All of the building appropriately follows the margin rules which was 7.5m front margin without any variation. Buildings are of similar plot area group that is 150 sqm. to 1500sqm. All four building have same height creating a visually appealing character.

Fig. 82 - Satellite image of all the four buildings. (Source - Google Earth Pro)

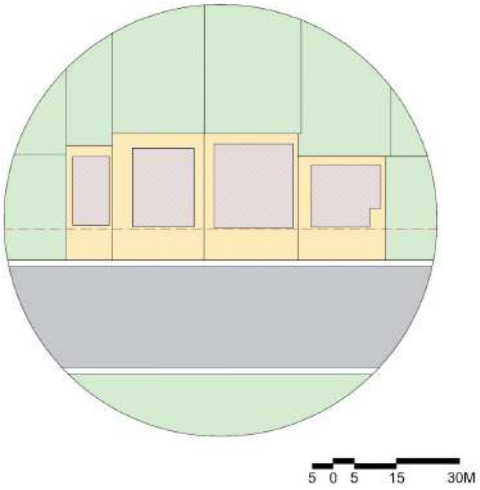
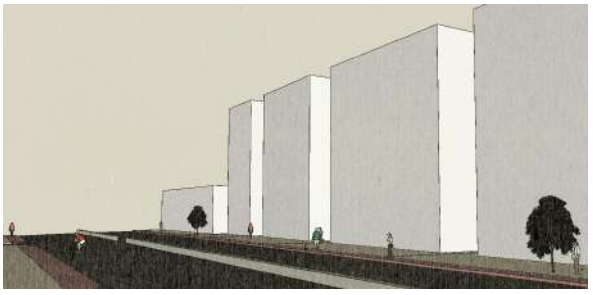


Fig. 83 & 84 - Plan of the buildings showing margin line according to the rule (Left Side) and Image of facades of the buildings. (Source -Author)



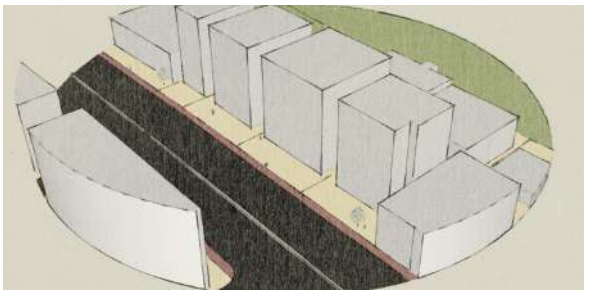
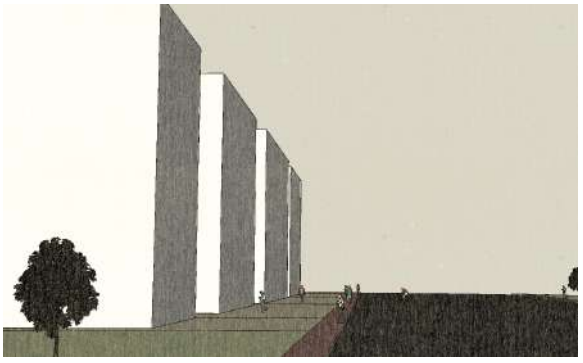


Fig. 85 & 86 - 3D of the buildings with existing condition (Left Side) and variable condition (Right Side). (Source -Author)



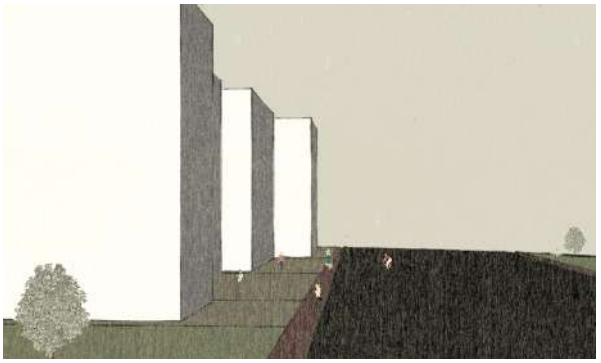


Fig. 87 & 88 - Image of 3D street view of the buildings with existing condition (Left Side) and variable condition (Right Side). (Source -Author)

It is evident from the above images that when margin rules are followed it creates a harmonic character of the neighbourhood but whenever the rules are interpreted differently or violated it breaks the visual continuity and alter the character of the neighbourhood. Therefore it can be said that margins are very important in shaping neighbourhood built character.

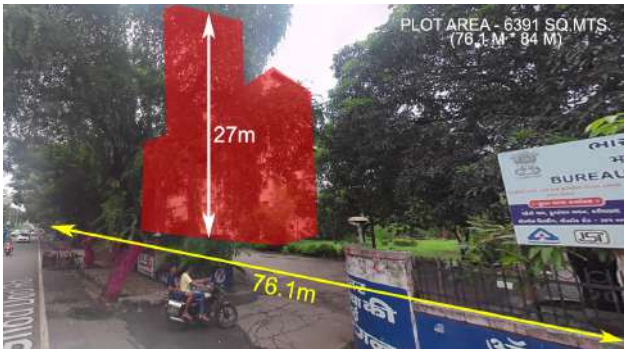
HEIGHT

Building Height is the factor that governs the scale of the building in the neighbourhood. Some of the cases of variation selected for the study are below :

CASE 1 : CSC BSNL Complex and Axis Bank Complex

These two buildings, CSC BSNL Complex and Axis Bank Complex are selected in order to understand the factors that influence the character even if the height is similar. The building are constructed in the year 1992 and 1993 respectively, and the maximum height rule during that period was 30m and the height of both building are 27m meaning they are following the rule and have similar variation of 3m. The only difference is the plot size that is CSC BSNL Complex has a plot size of 6391 sq.mts. and Axis Bank Complex has plot size of 1522 sq.mts.

Fig. 89 & 90 - Satellite image of CSC BSNL Complex (Right) and Axis Bank Complex (Left). (Source - Google Earth Pro)



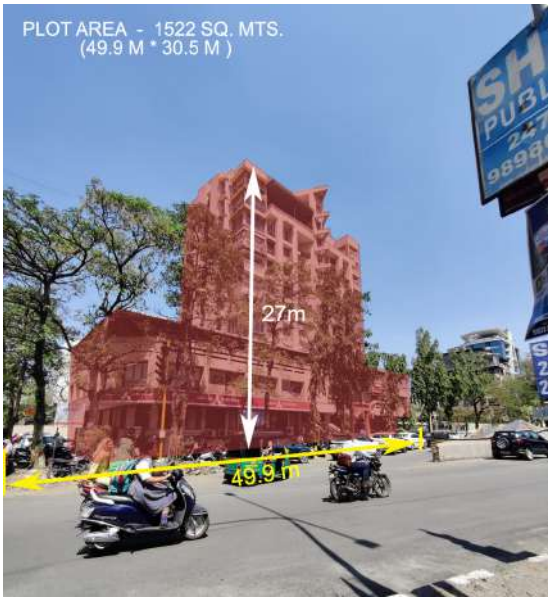
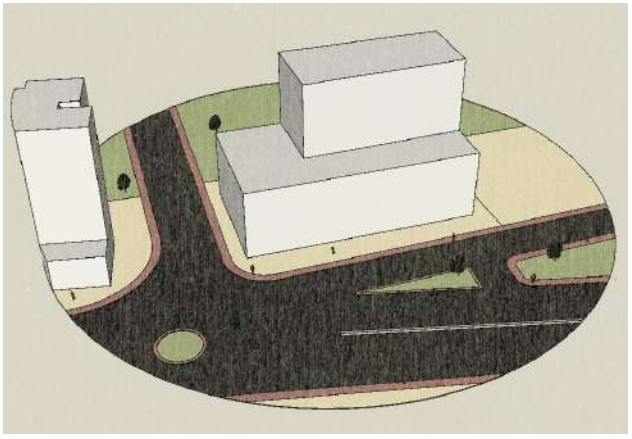


Fig. 91 & 92 - Image showing height to plot length abutting road ratio of CSC BSNL Complex (Right) and Axis Bank Complex (Left). (Source - Author)

There is a stark difference between character of the building because of the larger plot i.e. 6391 sq.mts. of CSC BSNL Complex the building appears to be in scale with respect to the the plot size.



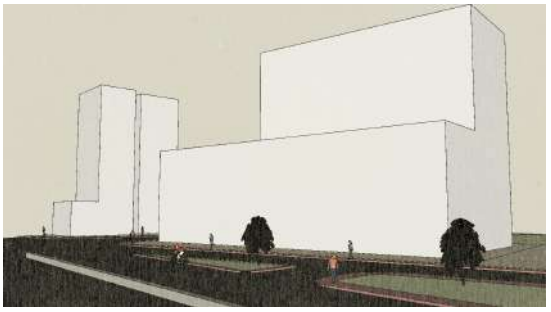
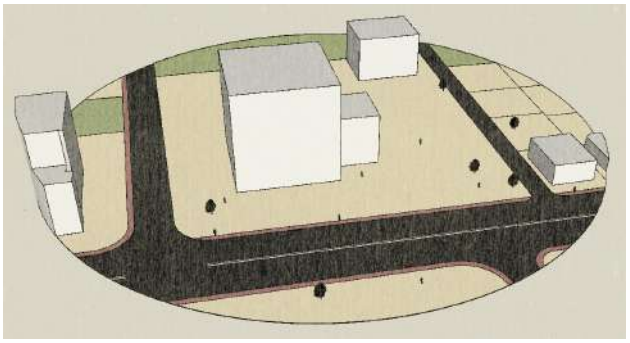


Fig. 93 & 94 - 3D Bird's Eye View and street view of CSC BSNL complex. (Source - Author)



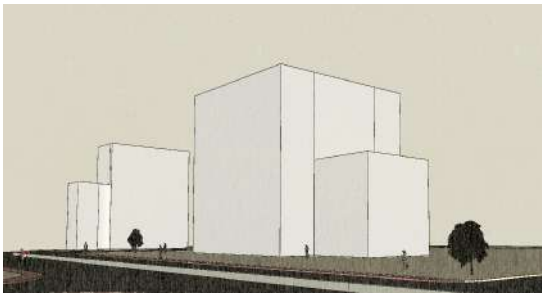


Fig. 95 & 96 - 3D Bird's Eye View and street view of Axis Bank complex. (Source - Author)

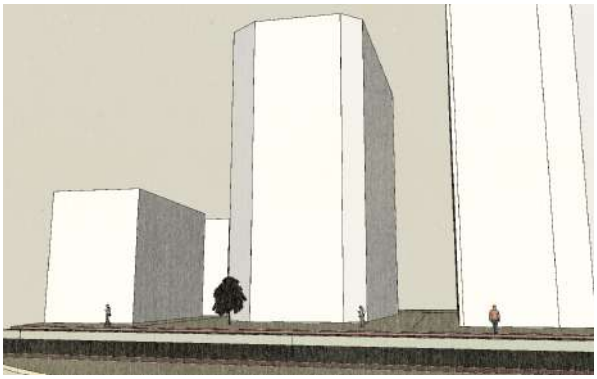
While on the other hand even though the height of the Axis Bank Complex but the plot size being comparatively very small that is 1522 sq.mt. is same it appears to be huge as compared to the CSC BSNL Complex. Therefore it is clear that though the building height may be similar, but when it is seen with the context of plot and surrounding, there may be huge difference in the built character.

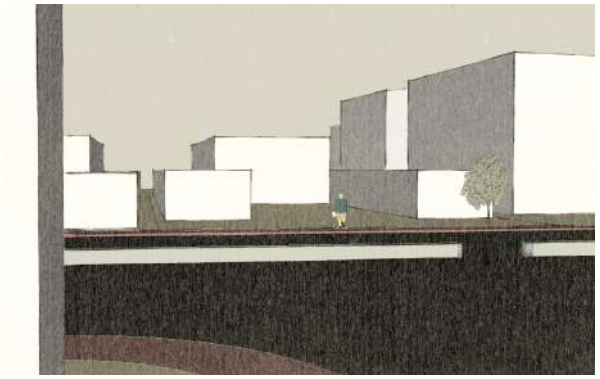
CASE 2 : IndusInd Complex and Amar Siddhi Apartment

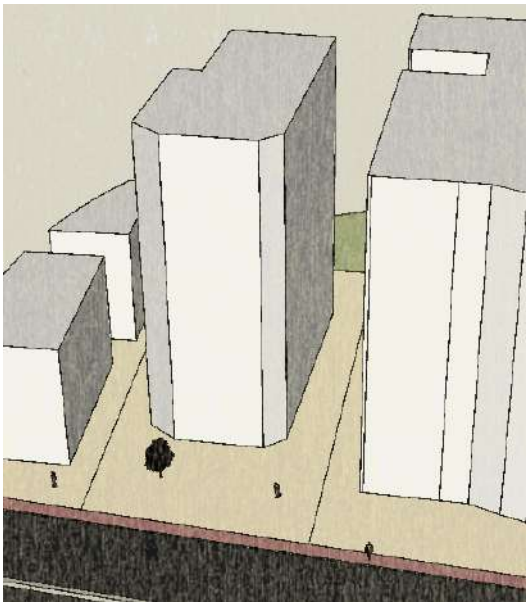
The IndusInd Complex and Amar Siddhi Apartment are selected for the study because of contrary to the above case both the building have similar plot size and the variation is in the height of the building. Both the building are constructed in the year 2006 with plot size of 1139 sq.mts. and 1029 sq.mts. and also adhering to maximum 40m height guideline during that period. The only difference between both is the building height that is 6m and 30m respectively.

Fig. 97 & 98 - Satellite image of Amar Siddhi Complex (Right) and IndusInd Complex (Left). (Source - Google Earth Pro)

Fig. 99 & 100 - Image of IndusInd Complex (Right) and Amar Siddhi Complex (Left). (Source - Author)
Fig. 101 & 102 - 3D Bird's Eye View of IndusInd Complex (Right) and Amar Siddhi Complex (Left). (Source - Author)







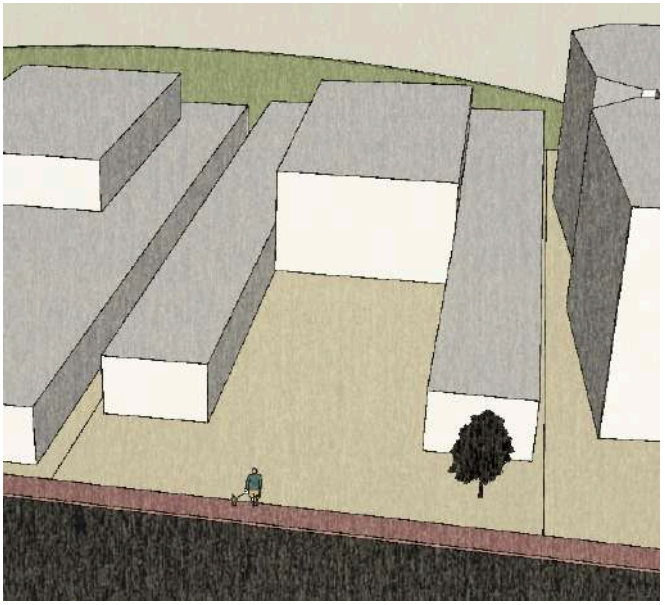


Fig. 103 & 104 - Above is 3D Bird's Eye View of IndusInd Complex (Right) and Amar Siddhi Complex (Left). (Source - Author)

As it seen that even though the the plot size being similar and also the orientation that is the length of plot abutting the road is nearly equal, there is difference in the built character and that is due to the variation in height. Hence it can be said that the building height is very crucial factor in determining the built character of a neighborhood.

GROUND COVERAGE & FSI

When urban built character is considered one of the key factor is the sense of visual perception meaning how dense or sparse a space. This is controlled by two rules of DCR one of them being ground coverage and other the other one is FSI. Both these rules go hand in hand meaning changing one can impact the other. Some of the cases selected for the study of the same are below:

CASE 1 - Moghul Mahal Apartment and Raza Bazaar Complex

To understand how ground coverage determine the built character of a neighbourhood two cases are selected that have similar plot size that is 987 sq.mts. and 1170 sq.mts respectively of moghul mahal apartment and raza bazaar complex. lying in the same category of PS > 250 sq.mts. and both of them are in similar construction period of 2005-2010.

Fig. 105 & 106 - Satellite Image of Moghul Mahal Apartment (Right) and Raza Bazaar Complex (Left). (Source - Google Earth Pro)

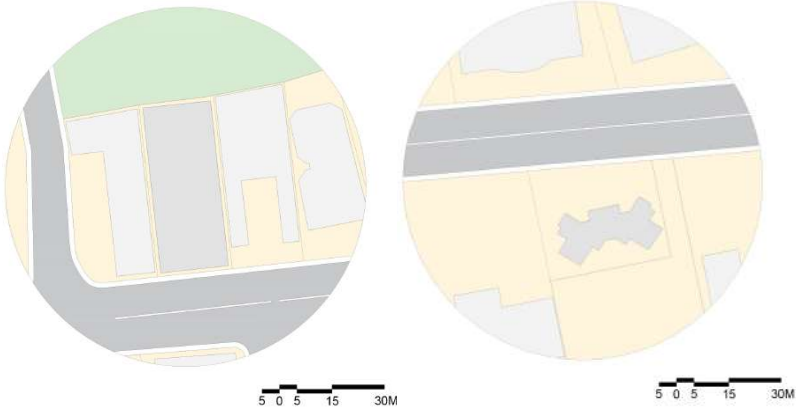
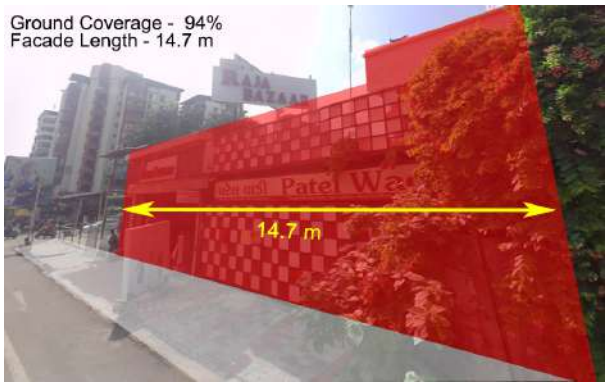


Fig. 107 & 108 - Plan shwing ground coverage of Moghul Mahal Apartment (Right) and Raza Bazaar Complex (Left). (Source - Author).

The maximum ground coverage rule during that time for the PS > 250 sq.mts. category was 45%.



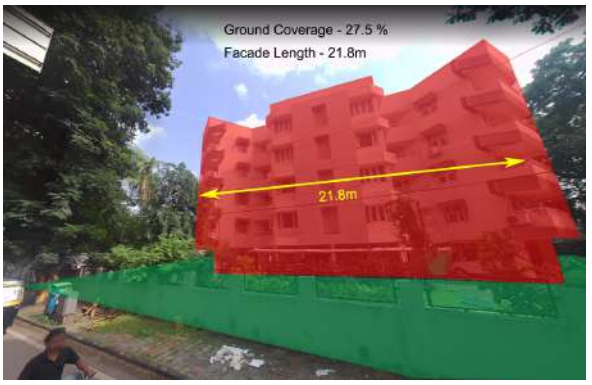
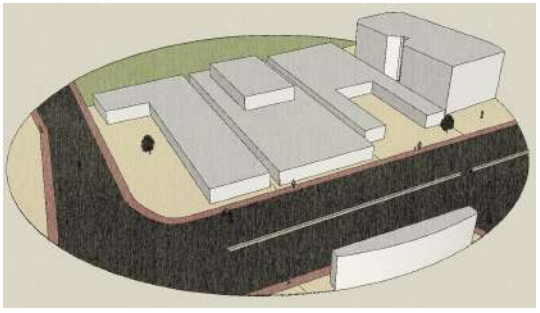


Fig. 109 & 110 - Image of Moghul Mahal Apartment (Right) and Raza Bazaar Complex (Left). (Source - Author)



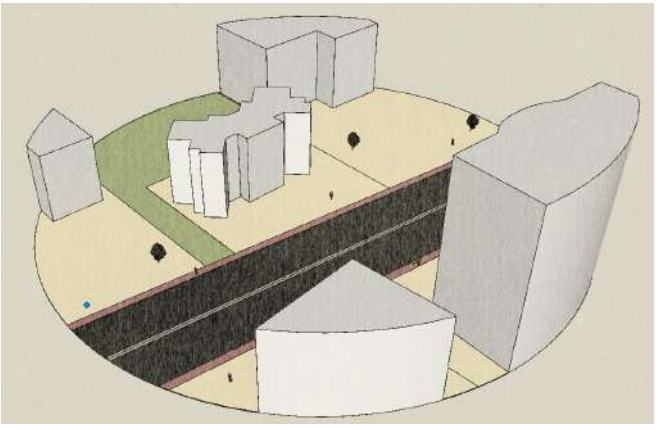
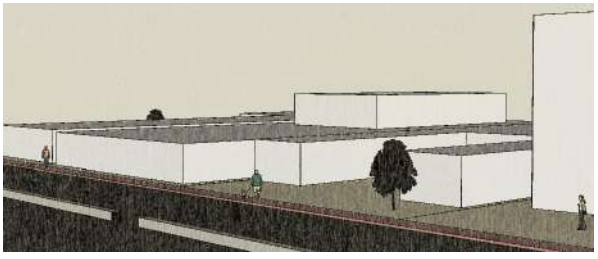


Fig. 111 & 112 - 3D Bird's Eye View of Moghul Mahal Apartment (Right) and Raza Bazaar Complex (Left). (Source - Author).



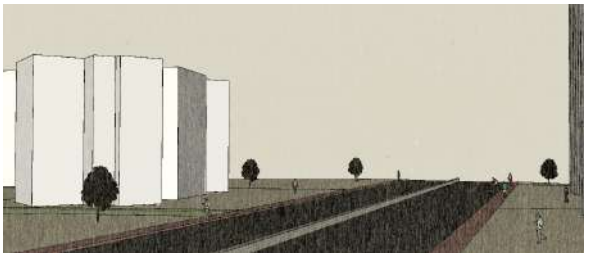


Fig. 113 & 114 - Street View of Moghul Mahal Apartment (Right) and Raza Bazaar Complex (Left). (Source - Author).

But the difference can be seen in the variation of ground coverage of each building that is Moghul Mahal Aprtments has ground coverage of 27.5% while on the other hand Raza Bazaar Complex has ground coverage of 94% meaning violation of the rule. As it is evident from the above images even though the plot size is similar, variation in ground coverage can alter the urban built character.

In the images it is clear that the more the ground coverage the more congested the space becomes and vice versa which is one of the important element of visual perception of a space character. Therefore it can be said that ground coverage is also a factor that governs the urban built character of a neighborhood.

CASE 2 - Forum Building and Prince Palace

In order to understand how ground coverage impacts the built character of a neigbourhood two cases with difference in plot and size and also different ground coverage were chosen. Both of the building were constructed in 2012 & 2013 with different margin rule as the forum building is under the category of PS above 150 sq.mts. but less than 250 sq.mts. that is 50% while prince palace is under category of PS above 250 sq.mts. that is 30%.

Fig. 115 & 116 - Satellite Image of Prince Palace (Right) and Forum Building (Left). (Source - Google Earth Pro)

Forum Building has a plot size of 1537 sq.mts. and ground coverage of 37.1% while the prince palace has plot size of 194 sq.mts. and ground coverage of 55.2 % but when we look at the images and 3D it exhibits a similar character.

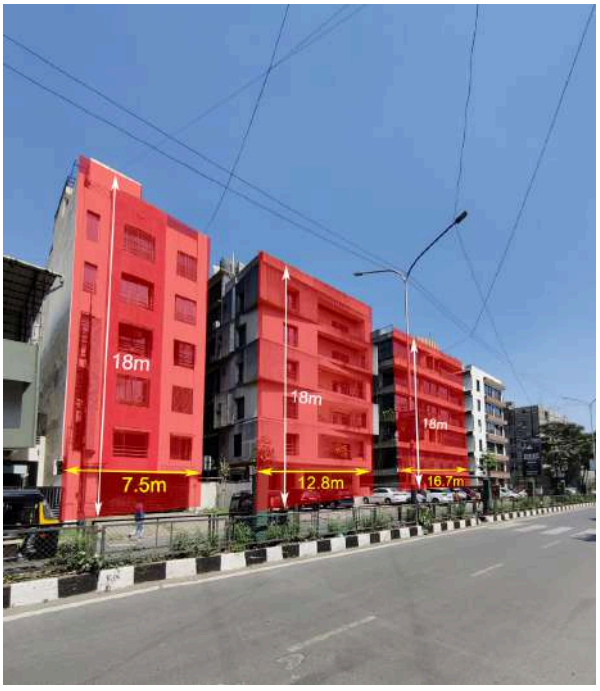


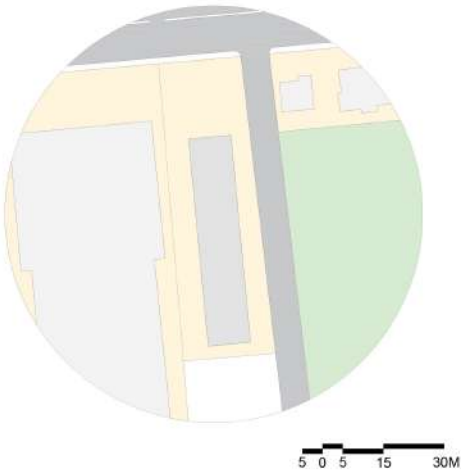
Fig. 117 & 118 - 3D Street View of Prince Palace (Left) and Forum Building (Right). (Source - Author).

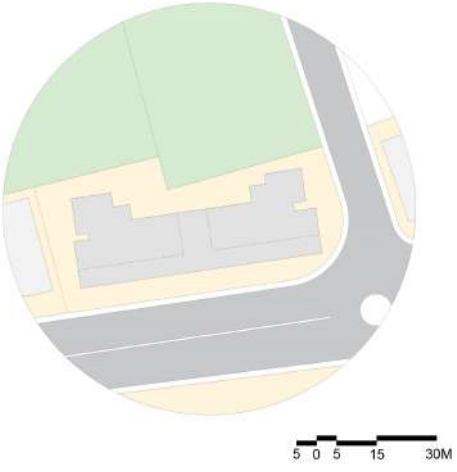
From the above images it is observed that both the building exhibits a simijlar character on the abutting road and this is due to ground coverage is set according to the plot and two other factors that also contribute to this are building height and facade length that is though the length of the facade are different but when seen from the road or at perspective angle they all appears to be similar. Therefore it can be inferred that ground coverage must also be looked with the context of building height and facade length in order to understand its impact on urban built character.

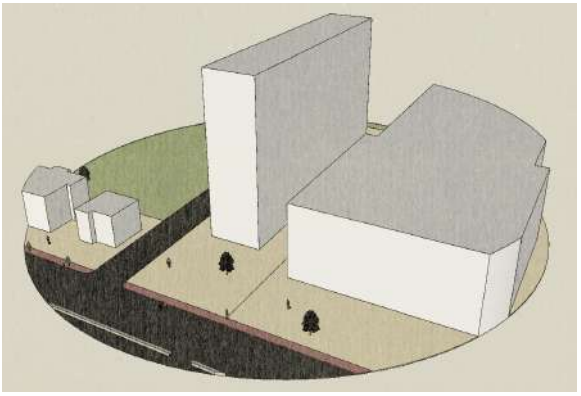
CASE 3 - Trinidhi Complex and Amrutdhara Complex

In order to understand the factors impacting the built character even when parameters such as plot size, ground coverage and building height are similar two buildings were selected which were trinidhi complex and amrutdhara complex with plot size of 1953 sq.mts. and 1965 sq.mts. respectively, building height of 30 m and 28 m respectively and ground coverage of 32 % and 32.8 % respectively.

Fig. 119 & 120 - Satellite Image of Amrutdhara Complex (Right) and Trinidhi Complex (Left).
(Source - Google Earth Pro)
Fig. 121 & 122 - Plan showing ground coverage of Amrutdhara Complex (Right) and Trinidhi Complex (Left). (Source - Author)







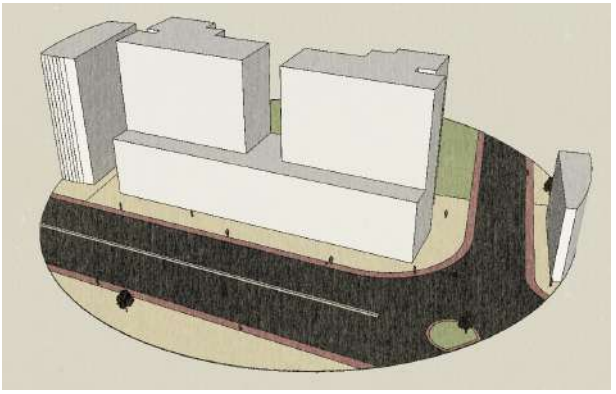


Fig. 123 & 124 - Bird's Eye of Amrutdhara Complex (Right) and Trinidhi Complex (Left). (Source - Author)

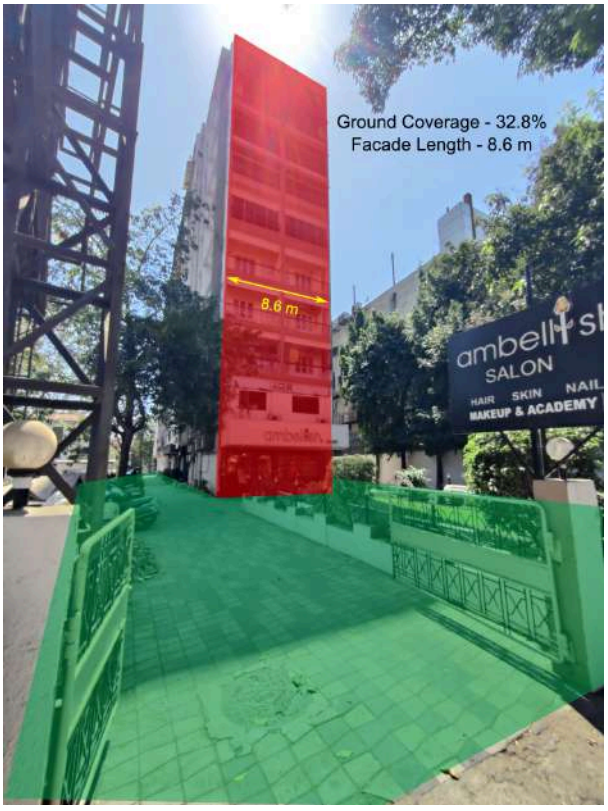


Fig. 125 & 126 - Image of Amrutdhara Complex (Right) and Trinidhi Complex (Left). (Source - Author)

As it is evident from the above images that there is a difference in the expression of built character even though parameters such as building height, ground coverage and plot size are similar. The difference is due to the varying facade length of both building that is seen from the street which is controlled by two factors and they are plot orientation and building orientation. Hence it can be considered that even though the rules of DCR are being followed there are factors that can alter the built character of a neighbourhood.

CASE 4 - Jade Blue Complex and Jolly Complex

These two cases are selected for the study to understand how variation in FSI can alter the character of a neighbourhood. Both these buildings are commercial complex with plot size of 1350 sq.mts. and 1477 sq.mts. and also both are low rise shopping complexes. Hence they fall under same rule category of maximum FSI use of 1.8.

Fig. 127 & 128 - Satellite Image of Jolly Complex (Right) and Jade Blue Complex (Left). (Source - Google Earth)

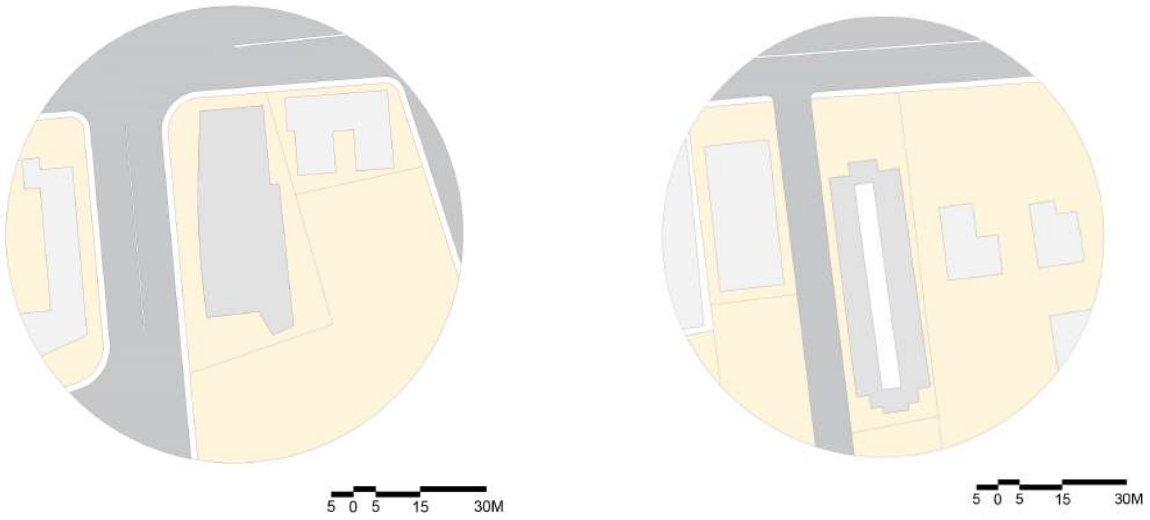


Fig. 129 & 130 - Plan showing Ground Coverage of Jolly Complex (Right) and Jade Blue Complex (Left). (Source - Author)

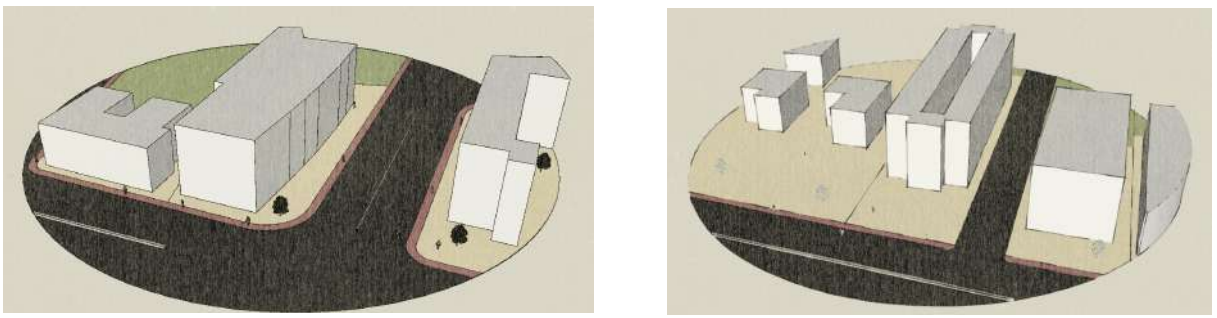


Fig. 131 & 132 - Bird's Eye view of Jolly Complex (Right) and Jade Blue Complex (Left). (Source - Author)

The only difference is in FSI used, that is 2.39 and 1.59 meaning jade blue complex has a violation of FSI while the jolly complex is following the rule but has not fully used the FSI permitted. This variation has resulted in change in the built character of that space.

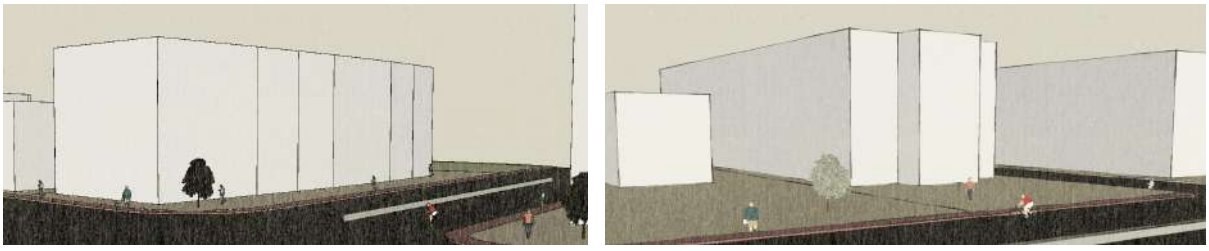


Fig. 133 & 134 - Street view of Jolly Complex (Right) and Jade Blue Complex (Left). (Source - Author)

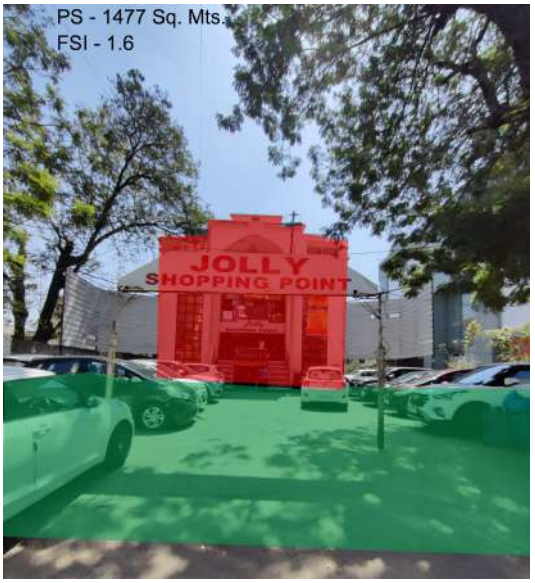


Fig. 135 & 136 - Image showing the visual perception of Jolly Complex (Right) and Jade Blue Complex (Left). (Source - Author)

As it is seen that in case of jolly complex there is a huge frontage and has a sense of openness as it has used 1.59 FSI, on the other hand jade blue complex has used FSI 2.39 which has created a building with very less frontage and creates visual clutter on the street. It is evident from the above images that variation in FSI can alter the character as FSI controls the scale of the building.

CASE 5 - BOB Complex and Sarela Shopping Centre

A case with similar variations has also been selected in order to understand the factors that impacts the character even though the FSI used in both buildings are similar. These are BOB Complex with plot size of 3300 sq.mts. and Sarela Shopping Center with plot size of 2791 sq.mts. both constructed in the year 2005-2006.

Fig. 137 & 138 - Satellite Image of Sarela Shopping Centeromplex (Right) and BOB Complex (Left). (Source - Author)

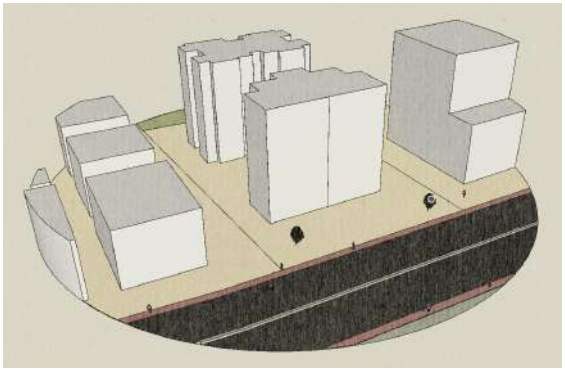
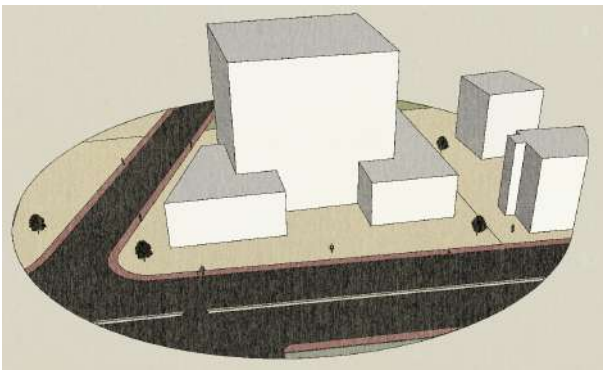



Fig. 139 & 140 - Bird's Eye view of Sarela Shopping Center (Right) and BOB Complex (Left). (Source - Author)

Even though BOB Complex being a commercial building and Sarela Shoping Center is a mixed use building both of them had a maximum permissible FSI of 1.8 and both used nearly equal FSI that is 2.65 and 2.7 respectively, still there is a difference in the character of both.

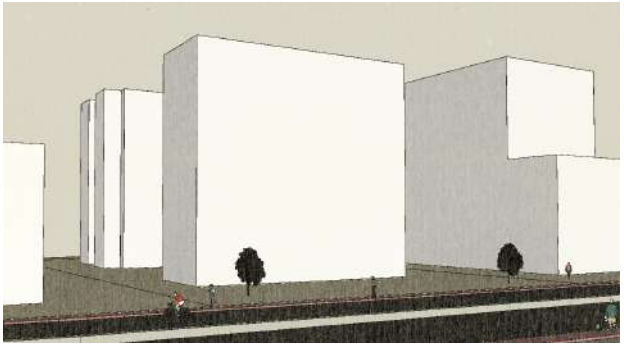
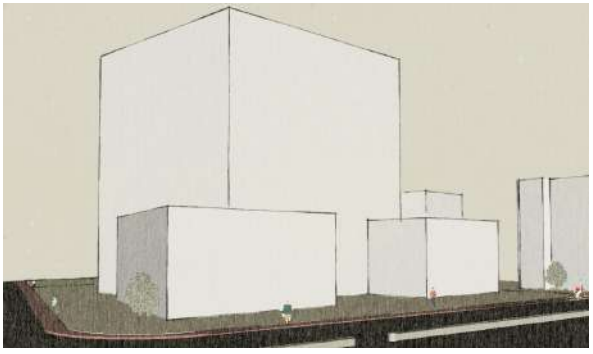



Fig. 141 & 142 - Street view of Sarela Shopping Center (Right) and BOB Complex (Left). (Source - Author)

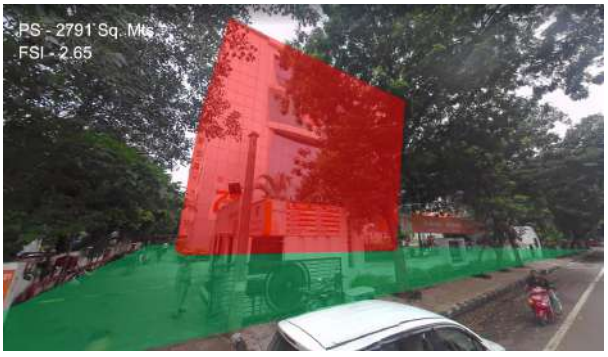


Fig. 143 & 144 - Image of Sarela Shopping Center (Right) and BOB Complex (Left). (Source - Author)

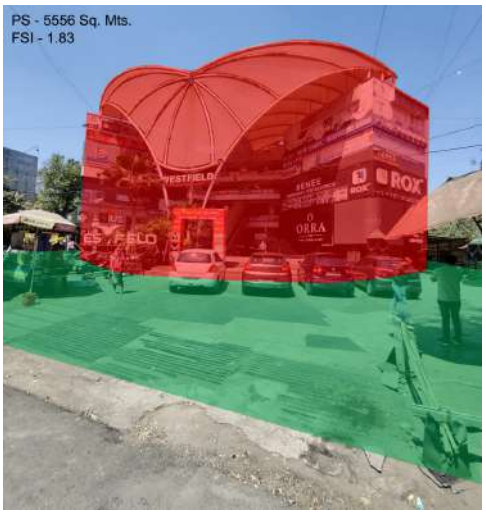
Because of Sarela Shopping Center being a mixed used building more development can be seen in the frontage for the easy user access while on the other hand BOB Complex being commercial property has a considered a security factor the building is enclosed in the boundary wall. Also the Sarela Shopping Center has a single building unit while the BOB Complex has two building units. Hence there is a stark contrast between the character of each building and the factors responsible for that variation are building typology, sense of ownership and number of building units.

CASE 6 - Westfield Complex and Krishna Regal Complex

In order to understand the importance of plot size in shaping the built character of a neighbourhood Westfield Complex with plot size of 5556 sq.mts. and Krishna Regal Complex with plot size of 320 sq.mts. has been for the study. Constructed in year 2014-2015, both of the building are commercial properties falling under same rule category of maximum permissible FSI of 2.25.

Fig. 145 & 146 - Satellite Image of Westfield Complex (Right) and Krishna Regal Complex (Left). (Source - Google Earth Pro)

Fig. 147 & 148 - Image of Westfield Complex (Right) and Krishna Regal Complex (Left). (Source - Author)



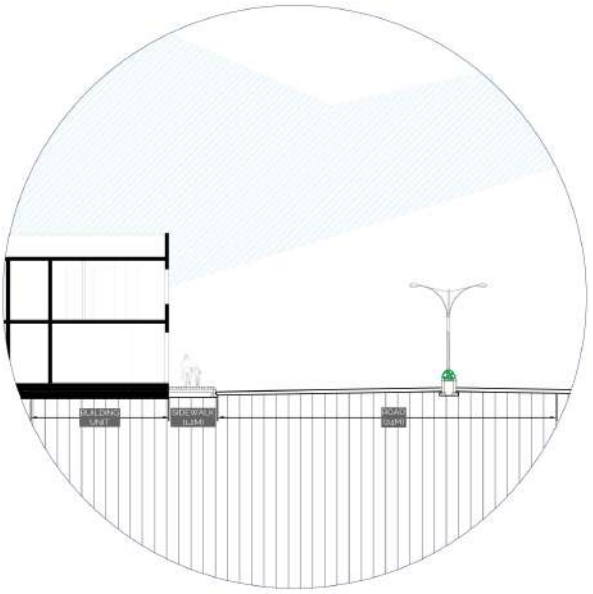
Both the buildings have used similar FSI which is 1.83 and 1.8 for westfield complex and krishna regal complex respectively. As it is clear that even though the FSI used for both the building are same but due to difference in the plot size the built character that the building exhibit are very different. Hence it can be said that plot size is also very crucial factor in controlling the character of a neighbourhood.

Chapter : 7
Infererences and findings

7. INFERENCES AND FINDINGS

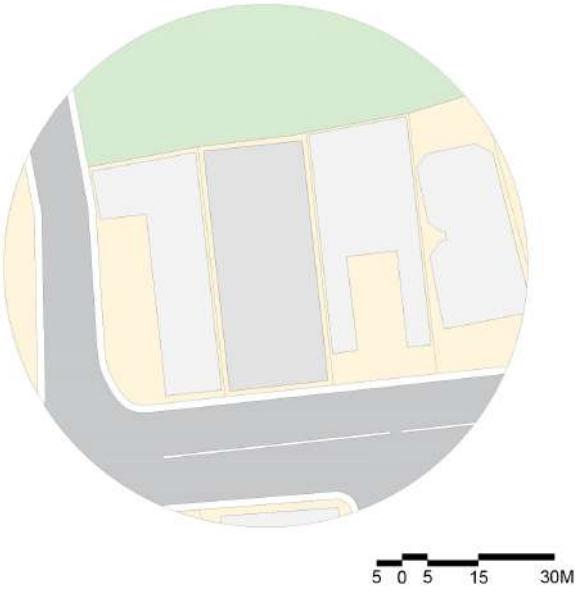
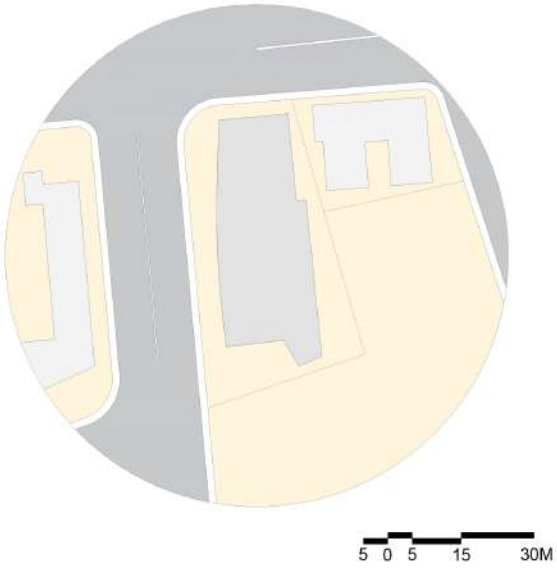
Through the analysis it can be said that Development Control Regulation has a impact on governing the built character of a neighbourhood. Both, difference in interpretation of a rule and violation of a rule may alter the desired character of the neighbourhood. Also there are many factors that influence the character of neighbourhood even though the rule is being followed. So the inference can be divided into three cases:

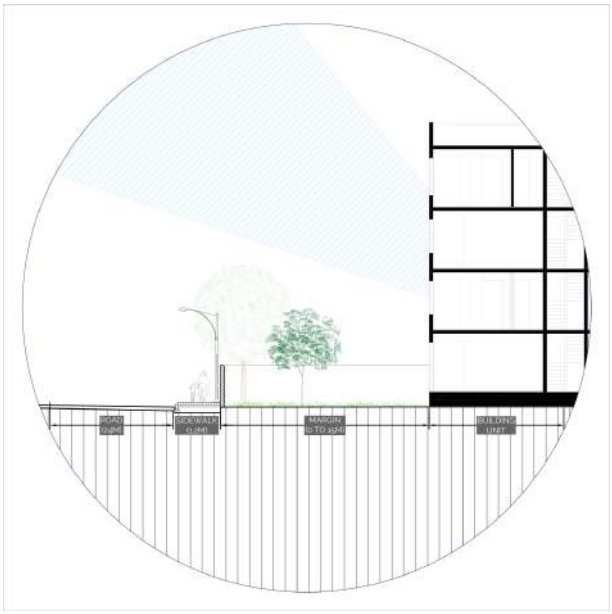
- CASE 1 - Violation of a rule.
- CASE 2 - Variations in following the rule.
- CASE 3 - Following the rule as it is in DCR.

<table>
<tr><td colspan="4">VIOLATION OF A RULE</td></tr>
<tr><td>Sr. No.</td><td>DCR Rule</td><td>Image</td><td>Inference</td></tr>
<tr><td>1</td><td>Margin</td><td> 
Fig. 149 - Section of building with no margin.
(Source - Author)</td><td>No Margin & Margin less than required minimum.

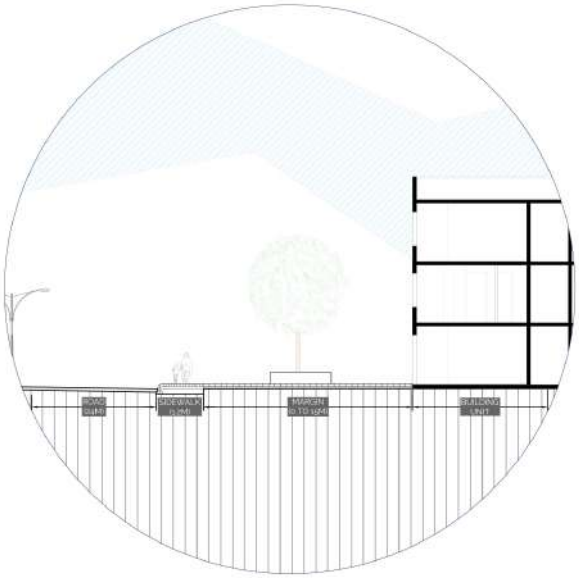
When margin rule is violated it has an impact on character by altering the visual perception of public passing on the pedestrian and abutting road. This led to development of a sense of crowding in a neighbourhood if there are more such violations.

CASE - Raza Bazaar, Malabar Gold House</td></tr>
</table>

2	Ground Coverage	 *Fig. 150 - Plan of building showing 94% Ground Coverage. (Source - Author)*	**Ground Coverage more than the maximum permissible limit.** With most of all land covered violating ground coverage rule led to negative impact that is there will be no space for green spaces. This creates a feeling of a claustrophobic and a dense surrounding. CASE - Ponk Complex, Shiv Smruti Complex, Raza Bazaar, Rangeela Bazaar
3	FSI	 *Fig. 151 - Plan of building with violated FSI. (Source - Author)*	**FSI more than maximum permissible limit.** FSI violation often leads to construction of building which is out of scale in the surrounding context which result in lack of open space which creates breaks the rhythm of built vs open creating a cramped and congested neighborhood CASE - Abhushan Complex, Jade Blue, Kakadiya Complex

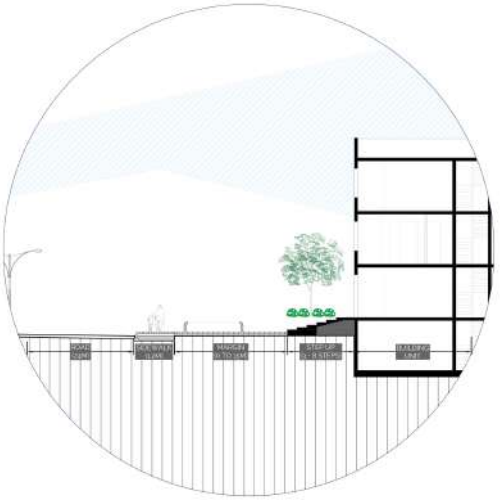
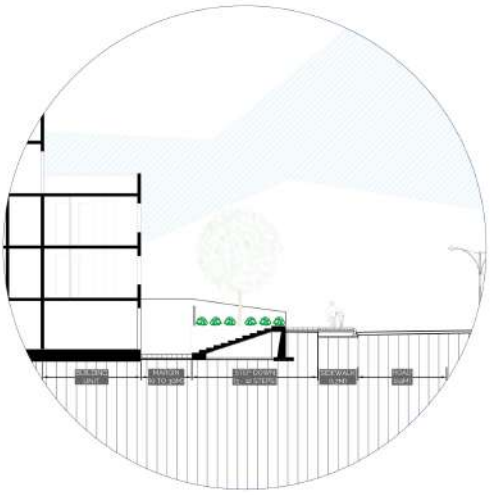
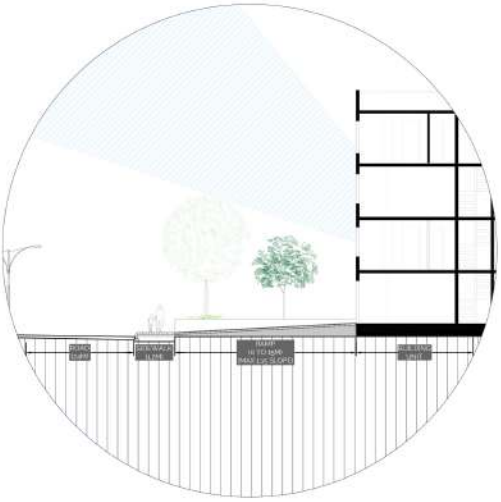
<table>
<tr><td colspan="4">VARIATION IN FOILLOWING THE RULE</td></tr>
<tr><td>Sr. No.</td><td>DCR Rule</td><td>Image</td><td>Inference</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Margin</td><td> 
Fig. 152 - Section of building with margin + boundary wall. (Source - Author)</td><td>Boundary Wall + Margin

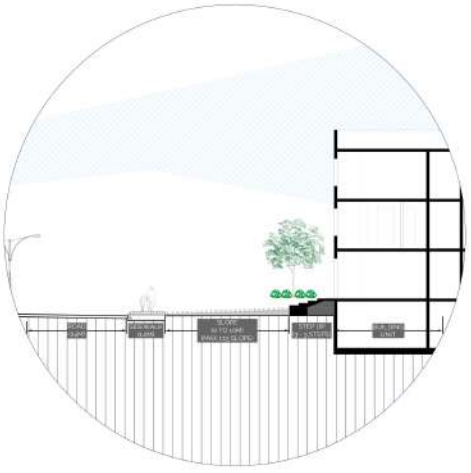
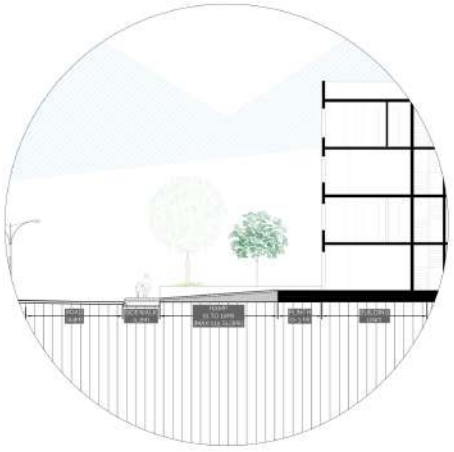
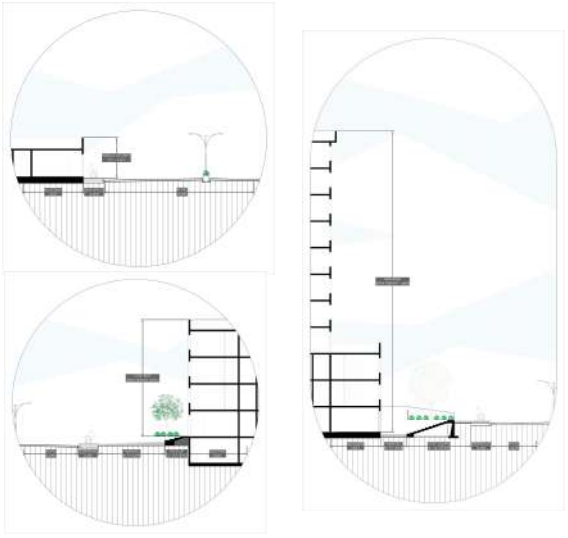
Margin are must but when a margin is inside the boundary wall it portray a very different character that is it creates a sense of privacy, now when such type of variation are seen in a commercial street it breaks the character of a public space.

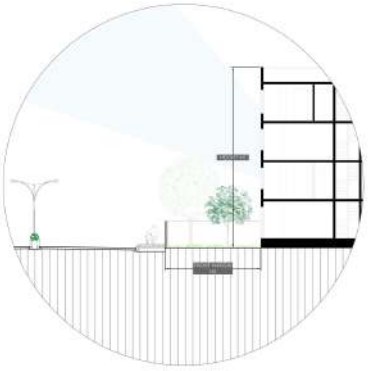
CASE - BSNL Complex, Trinidhi Apartments, BOB and BOI Complex.</td></tr>
<tr><td> 
Fig. 153 - Section of building with margin without boundary wall. (Source - Author)</td><td>Margins without boundary walls.

Such type of margins creates a sense of public space based on the length of the margin. It can alter the character if the adjacent buildings varies the length of the margin according to their interpretation.

CASE - Canopus Mall, Regent Arcade, Galaxy Complex, Essen house</td></tr>
</table>

		 *Fig. 154 - Section of building with step up margin. (Source - Author)*	**Step Up - Margin** A margin with steps up leading to building can impact the built character by impacting the pedestrian interaction by creating a pause point which leads to fostering a sense of community and vibrancy in the nieghbourhood. CASE - Malabar Gold House, G3 Complex
		 *Fig. 155 - Section of building with step down margin. (Source - Author)*	**Step Down - Margin** A margin with steps going down can create a sense of private space but it can lead to a negative character development if it lost usable spaces in the frontage. CASE - Jolly Complex, Turning Point Complex, Shiv Smruti Complex
		 *Fig. 156 - Section of building with ramp as margin. (Source - Author)*	**Ramp as margin** When margins are created with ramp they are often seen as parking spaces which develops a risk of loss of character if not taken care. The impact depends upon the specific design and how it integrates with the existing built environment. CASE - Shiv Shakti Complex, Sargam House

		 *Fig. 157 - Section of building with ramp + step as margin. (Source - Author)*  *Fig. 158 - Section of building with ramp + plinth as margin. (Source - Author)*	**Ramp + Step Margin and Ramp + Plinth Margin** Margins with a combination of ramp and steps can have both positive and negative impact on urban built character. Positive in a way it creates an inviting appeal to the building but when it is not designed properly it can add layer of complexity. Making the building feel detached and disrupt the overall rhythm of the street. The character can also clash with the architectural style of the surrounding building. CASE - Rajgharan, Kotak House, Union Point
2	Height	 *Fig. 159, 160 & 161 - Section of building with different heights. (Source - Author)*	**Building Height range from 3m to 35m.** Buildings of different heights are found in Ghod Dod Road from minimum height of 3m to maximum height 35m, this has resulted in change in character as time passed building with different height were built. CASE - Raja Bazaar, Rangila Park Shopping Complex, B More



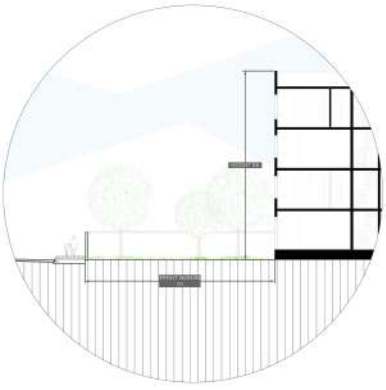


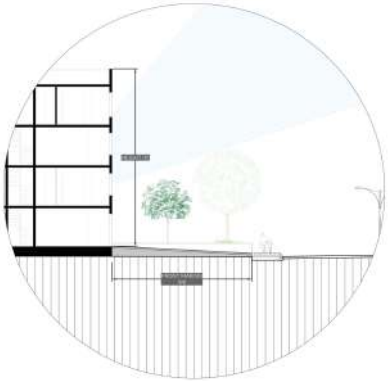
Fig. 162 & 163 - Section of building with same height but different frontage. (Source - Author)

Height to Frontage Ratio

CASE 1 - Similar Height and Varying Frontage

Even if the height of the buildings are similar there may be a huge difference in the urban built character portrayed and that is because of the frontage that is when building with less frontage will create a sense of massive scale building, while oh the other hand building with more frontage will appear to be in scale.

CASE- Axis Bank complex and CSC BSNL complex



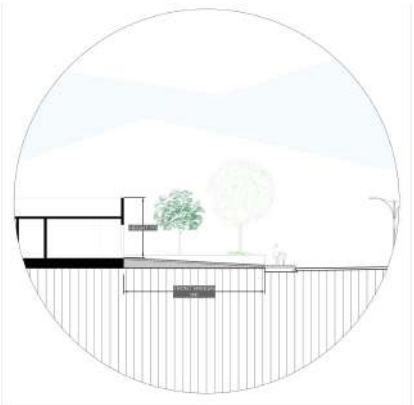


Fig. 164 & 165 - Section of building with same frontage but different frontage. (Source - Author)

Height to Frontage Ratio

CASE 2 - Similar Height and Varying Frontage

This is a vice versa form of the above case in which even thought the frontage is same there is huge difference in the character of the building and that is due to the height of the building. These buildings are divided in two categories high rise and low rise.

CASE - B More and Bhavik Apartments , Amar Sidhhi Apartment and Jolly Square

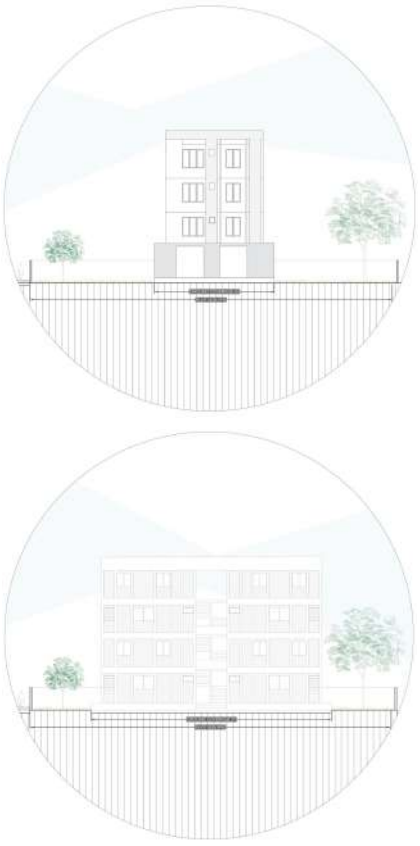
<table>
<tr>
<td rowspan="2">3</td>
<td rowspan="2">Ground Coverage</td>
<td> 

Fig. 166 & 167 - Elevation of building with same plot size but different ground coverage. (Source - Author)</td>
<td>Ground Coverage to Plot Size Ratio

CASE 1 - Varying Ground Coverage
Ground coverage control that how dense or sparse a neighbourhood will be. When two plot with similar plot size are developed with different ground coverage, both of them exhibit a different character. One with more ground cover will develop a sense of dense neighbourhood while the other will develop a sense of sparse neighbourhood.

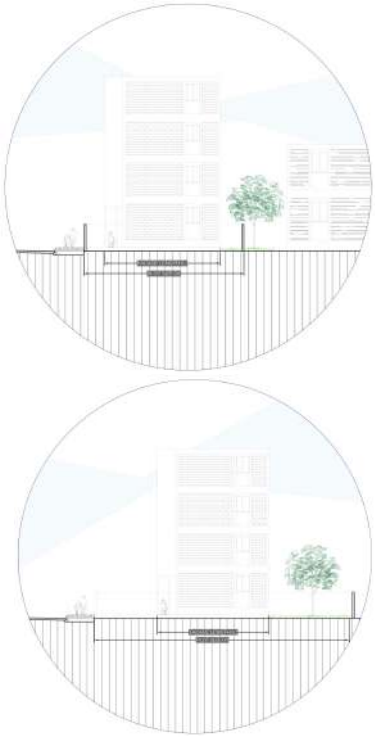
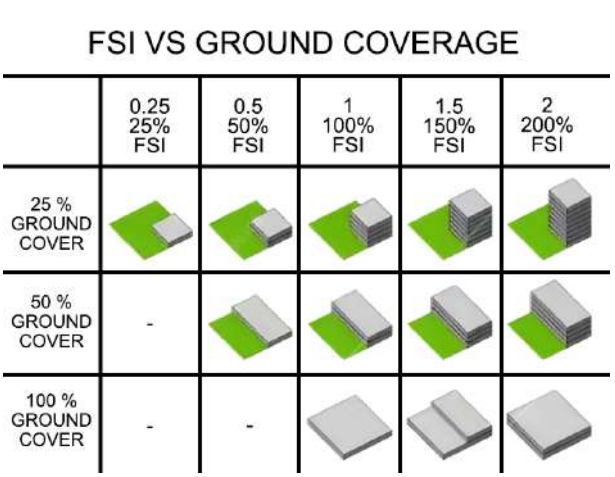
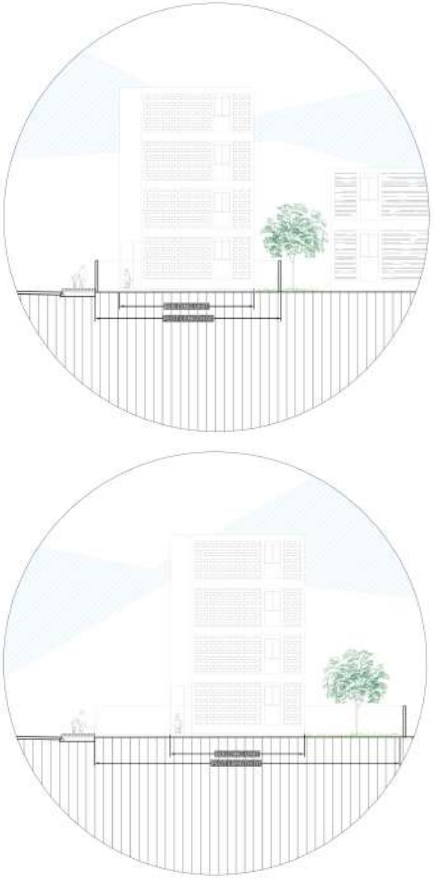
CASE - K M Choksi and Luxury Time Complex</td>
</tr>
<tr>
<td> 

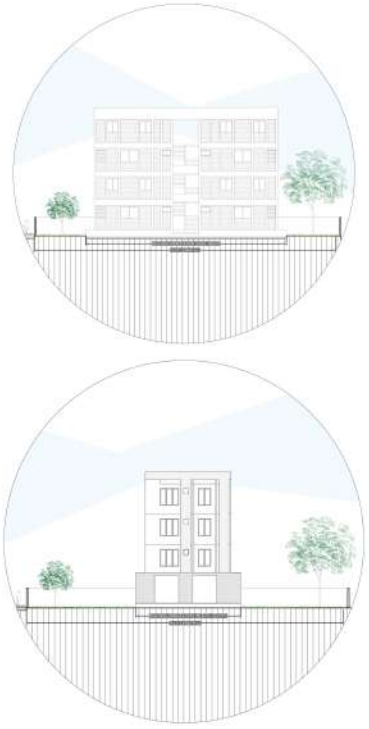
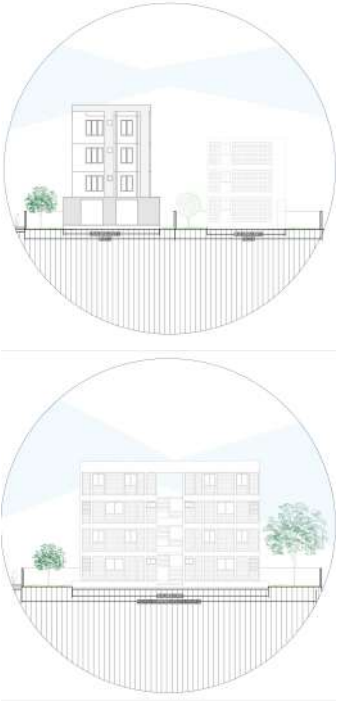
Fig. 168 & 169 - Elevation of building with same ground coverage but different plot size. (Source - Author)</td>
<td>Ground Coverage to Plot Size Ratio

CASE 2 - Varying Plot Size
Plot Size also contributes in developing the character that is when two different sizes of plot are developed with same ground coverage area the plot which is larger will create a spacious character as compared to that of smaller plot size.

CASE - Prince Palace and Forum Building</td>
</tr>
</table>

4	FSI	 *Fig. 170 - Chart showing how FSI and Ground Coverage impacts built form (Source - wikimedia.org)*	**FSI & Ground Coverage** Both of the factor are very crucial in controlling the density of the neighbourhood and as evident from the chart how different FSI w.r.t. different ground coverage can alter building scale thus influencing the urban built character.

FOLLOWING THE RULE AS IT IS IN DCR			
Sr. No.	Factor	Image	Inference
1	Plot Orientation	 *Fig. 171 & 172 -Elevation of building with different plot orientation. (Source - Author)*	Plot Orientation can determine the character of a neighbourhood by changing the plot length abutting to road. For example a linear plot perpendicular to road and other one parallel to road. Development that will take place on both of them will have a different facade length creating differences in building character when seen from the road, even thought the factor such building height, plot size, ground coverage and FSI are similar in both the cases. CASE - Amrutdhara and Trinidhi Complex

2	Building Orientation	 *Fig. 173 & 174 - Elevation of building with different building orientation. (Source - Author)*	Building orientation is also crucial factor that governs the character of a neighbourhood. There is a difference in character when facade of longer length and shorter length abuts a road even of the plot orientation, plot size, building height, ground coverage, front margin and other factors are same in both. CASES - Sarela Shopping Center and Tribhuvan Complex
3	Plot Amal-gamation	 *Fig. 175 & 176 - Elevation of building showing the impact of plot amalgamation on character. (Source - Author)*	Amalgamation of plot is also a factor that has impact on the urban built that when two smaller plot with smaller building is converted into a lrager plot the scale of the new building will be greater as compared to the original building resulting in change on the rhythm of similar scale building. Hence amalgamation of plot can also alter the urban built character. CASE - Prime Complex

Chapter : 8
Conclusion

8. CONCLUSION

Shaping the City: How Surat's Development Control Regulations Guide Urban Form

Cities are living organisms, constantly evolving. Surat, India, exemplifies this with its changing development plans and the impact they have on the city's built character. Development Control Regulations (DCRs), based on designated zones within the plan, act as the blueprint for this transformation.

Aligning Vision with Growth: The Surat Story

Surat's story unfolds through its development plans of 1986, 2004, and the recently released 2035 plan. Each plan reflects a shift in vision, with the latest one prioritizing the intensification of existing infrastructure over sprawling new development. This focus on efficiency translates into changes to key DCR parameters, like Floor Space Index (FSI) – the ratio of built-up area to plot size.

From Open Fields to Dense Hubs: The Power of FSI and Height

In 2004, Surat's DCRs limited FSI to 1.8 in Transit-Oriented Development (TOD) zones. These zones, centered around public transport hubs, were intended to be moderately dense with a mix of residential and commercial buildings. However, the 2023 DCR revision for TOD zones has dramatically increased the FSI to 4.0. This allows for taller buildings, with a maximum permissible height potentially increasing as well.

The Visible Impact: Reshaping Neighborhoods

These DCR revisions have a profound impact on Surat's neighborhoods. Higher FSI allows for more built-up area on the same plot, leading to potentially denser residential complexes, offices, and commercial spaces. This translates to a more compact urban form, with a shift from open spaces and low-rise buildings to a denser cityscape.

The Duality of Control: Regulation and Character

The influence of DCRs on a neighborhood's built character is undeniable. While some may

view increased density as a negative, it can also foster vibrant, walkable communities with easier access to amenities. This highlights the delicate balance between regulation and fostering a distinct neighborhood character. DCRs, when crafted thoughtfully, can be powerful tools to guide a city's growth while preserving its unique identity.

Looking Ahead: Surat's Urban Future

The evolving DCRs in Surat offer a glimpse into the city's future. As Surat embraces densification, it will be crucial to ensure these changes are accompanied by investments in green spaces, efficient public transport, and infrastructure upgrades. This will allow the city to retain its character while accommodating its growing population and economic aspirations.

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