

RESILIENT URBAN DESIGN FRAMEWORK

VOLUME I

TAMIL NADU SLUM CLEARANCE BOARD
MARCH 2020



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ABBREVIATIONS

AAC - Autoclaved Aerated Concrete	MoHUA - Ministry of Housing and Urban Affairs
BIM - Building Information Modeling	MoHUPA - Ministry of Housing and Urban Poverty Alleviation
BIS - Bureau of Indian Standards	MoUD - Ministry of Urban Development
BSUP - Basic Services to Urban Poor	MRAI - Materials Recycling Association of India
C&D - Construction and Demolition	MSL - Mean Sea Level
CBO - Community Based Organization	MUDP I - Madras Urban Development Project I
CCTV - Closed-Circuit Television	MUDP II - Madras Urban Development Project II
CDW - Community Development Wing	NBC - National Building Code
CMA - Chennai Metropolitan Area	NGO - Non-Governmental Organization
CPCB - Central Pollution Control Board	OSR - Open Space Reservation
CPTED - Crime Prevention Through Environmental Design	OTS - Open-to-Sky
CPWD - Central Public Works Department	OWC - Organic Waste Converter
CRZ - Coastal Regulation Zone	PHC - Public Health Care
CSR - Corporate Social Responsibility	PMAY - Pradhan Mantri Awas Yojana
ECBC - Energy Conservation Building Code	RAY - Rajiv Awas Yojana
EDGE - Excellence in Design for Greater Efficiencies	RERA - Real Estate Regulatory Authority
EIA - Environmental Impact Assessment	RUDF - Resilient Urban Design Framework
ETRP - Emergency Tsunami Reconstruction Project	RWA - Resident Welfare Association
EWS - Economically Weaker Section	SDGs - Sustainable Development Goals
FSI - Floor Space Index	SEIAA - State Environmental Impact Assessment Authority
GIS - Geographic Information System	TNCDBR - Tamil Nadu Combined Development and Building Rules
GIZ - The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH	TNHB - Tamil Nadu Housing Board
HDI - Human Development Index	TNSCB - Tamil Nadu Slum Clearance Board
HFL - High Flood Level	TV - Television
HTL - High Tide Line	UIG - Urban Infrastructure and Governance
IFC - International Finance Corporation	UN - United Nations
IoT - Internet of Things	URDPFI - Urban and Regional Development Plans Formulation and Implementation
IRC - Indian Roads Congress	WSUD - Water Sensitive Urban Design
ITC - Infants, Toddlers, Caregivers	
JNNURM - Jawaharlal Nehru National Urban Renewal Mission	

INTRODUCTION

Purpose

Document Structure

Intended Audience

Relationship to Other Documents

Note to Users of this Document



We are in a new era of housing design that prioritizes affordability, flexibility and community-focused interventions that are resilient and sustainable. For planners, designers and the public, this is an exciting and promising prospect.

I.1 PURPOSE

Housing solutions need to be safe, environmentally responsible, economically viable, and promote social cohesion. Sensitive designed, demand-driven housing solutions can improve health, education and socio-economic outcomes of inhabitants.

To this end, the Resilient Urban Design Framework (RUDF) is a critical planning and design manual that the Tamil Nadu Slum Clearance Board (TNSCB) can use as a ready guide to design high-quality, sustainable and climate-resilient developments. As an exhaustive and customized framework, this document demonstrates sound urban design and architectural design methods that can be adopted,

The RUDF:

- Focuses on the pre-concept and concept stages of the design lifecycle and expects the rigor set in this document to be followed through in further stages of detailed design and project completion.
- Should be reviewed every year by TNSCB with a focus on updating the framework and guidelines to address new requirements and learnings, as necessary.

enabling TNSCB to provide site specific, culturally rooted, visually rich, yet cost-effective solutions. When adopted, the RUDF will (i) incorporate environmental considerations in terms of site location and planning, design and construction, (ii) promote integrated masterplans where urban design and landscape are intertwined cohesively, (iii) create diversified housing products in terms of unit layouts and promote mixing of uses, (iv) improve community participation in the design, (v) provide inclusive spaces across user groups including youth, women and the differently abled, to name a few.

This document, together with the *Social Sustainability and Grievance Management Framework* document and the *Environment Management Framework* will help create the next generation of TNSCB housing. It will do so by enabling resilient developments that go beyond a mere compliance orientation and address the needs and challenges of housing through a holistic and integrated approach.

I.2 DOCUMENT STRUCTURE

The RUDF document is structured as follows:

INTRODUCTION (THIS SECTION)

- Describes the purpose and intended audience of this document.
- Highlights the relationship to other documents that need to be read in conjunction with RUDF.
- Outlines the notes to users of this document.

VISION, GOALS AND STRATEGIES

- Describes the background of TNSCB's current approach and outlines the vision for future housing projects with a focus on enhancing the lived experience and building resilient communities.
- Provides actionable strategies across ten identified goals, which are then reflected in detail, in ensuing chapters.

DESIGN PROCESS

- Explains in detail the various steps involved in conceiving and developing a concept masterplan, undertaking community consultation, and the expected outcomes at every stage of the design process.
- Provides the foundation for developing masterplans that are consistent with the vision, goals and strategies identified; users of the document are expected to cross-refer details under the sub-sections in ensuing chapters (e.g., site planning, building design, open space design, livelihood and amenities, etc.) when undertaking the design of public housing.

SITE PLANNING

- Describes the overview, intent and applicability for site planning related aspects, including guiding principles, such as entrance gateways, pedestrian and vehicular circulation, nodes, street frontage, skyline, safety and security, universal accessibility, to name a few. It also highlights planning parameters such as setbacks,

building to building distances, parking, etc., that are critical design considerations.

BUILDING DESIGN

- Explains the built-form related guidelines, from building typology and profile to building form, configuration and visual quality.
- Describes all the factors and interrelated considerations involved in unit layouts and designs.
- Outlines the design parameters for services, indoor environmental quality as well as visual quality considerations.

OPEN SPACE DESIGN

- Describes the overview, intent and applicability for open space-related aspects, including hierarchy and networks, as well as elements such as lighting, structures, etc. It includes guidelines at the site and block levels.

LIVELIHOOD AND AMENITIES

- Describes the initiatives to be taken to address the current occupational needs of the beneficiaries and propose livelihood opportunities to build a secure future. It includes an overview of the challenges faced in greenfield, as well as reconstruction projects and possible design solutions to address the same.

CONCLUSION

- Describes the key considerations and way forward for TNSCB to create projects that are people-centric, resilient and future-ready.

APPENDIX

- Outlines important terms used in RUDF, along with references that can serve as additional reading material.

It is important to note that guidelines within chapters are not to be read in isolation, as they are cross-referenced with related points across the entire document. Key interrelationships are highlighted within the document text, as relevant.

I.3 INTENDED AUDIENCE

The users of this document are to note the following:

TAMIL NADU SLUM CLEARANCE BOARD

Adopting the framework and guidelines set forth in this document will enhance the general capacity of the TNSCB to plan and execute well-designed housing projects. It can inform:

- the in-house processes of TNSCB, with respect to urban design and architectural considerations; and
- provide the basis for selecting design consultants and steering their designs towards the agreed overall vision, goals and objectives outlined in this document.

DESIGN CONSULTANT

This document provides both a framework and specific guidelines for the masterplanning, urban design, landscape and architectural components of TNSCB's projects. In doing so, it outlines the necessary conditions a designer (e.g., urban designer, landscape architect and architect) must adhere to for ensuring a high quality output that is context specific, resilient and sustainable.

It can also serve as a useful guide for:

- **Tamil Nadu Housing Board (TNHB)** and relevant actors in the private sector involved in undertaking housing projects.
- **Academics, policymakers, Community Based Organizations (CBOs) and civil society** who are a part of the housing sector dialogue from design to delivery.

I.4 RELATIONSHIP TO OTHER DOCUMENTS

The RUDF assumes that all mandatory compliance requirements will be met by the proposed design and therefore does not include the same. Users are required to study and adhere to all applicable national and state bye-laws and guidelines. To this end, the following key documents will need to be cross-referenced during the design process. It is important to note that this list is suggestive and not exhaustive.

Document Category One: the following documents have been used as the overarching basis for the creation of the RUDF. Thus, they are not explicitly stated and mandatory rules have not been repeated in the RUDF. These documents should be referred to by the users, as relevant:

- **Tamil Nadu Combined Development and Building Rules (TNCDBR), 2019¹:** statutory document issued by the Government of Tamil Nadu that outlines all the development control regulations. TNSCB must adhere to the rules in this document in the development of its projects.
- **Model Building Bye-Laws, 2016²:** prepared by the Ministry of Urban Development, Government of India for the guidance of state governments, urban local bodies, urban development authorities, etc.,³ and should be read in conjunction with the masterplan / development plan / regional plan and any other statutory plan in force.
- **National Building Code (NBC), 2016⁴:** is a comprehensive building code and a national instrument providing guidelines for regulating building construction activities across the country. It serves as a Model Code for adoption by all agencies involved in building construction works, be they Public Works Departments, other

government construction departments, local bodies or private construction agencies.

- **Urban and Regional Development Plans Formulation and Implementation Guidelines (URDPFI), 2015⁵:** developed by the Ministry of Urban Development (MoUD), it provides norms and standards for urbanization in the form of suggested models that may be adopted by the respective state governments in accordance with local conditions.
- **Environmental Impact Assessment (EIA) Notification, 2006⁶:** is a tool for minimizing the adverse impact of rapid industrialization on the environment and for reversing those trends, which may lead to climate change in the long run. EIA relates to the systematic identification, evaluation and monitoring of potential impacts (effects) of proposed project plans, programs or legislative actions relative to the physical, chemical, biological, cultural and socio-economic components of the environment. Other relevant documents to refer to include guidelines provided by the State Environment Impact Assessment Authority (SEIAA).
- **Tamil Nadu Real Estate (Regulation and Development) Rules 2017⁷:** The Real Estate (Regulation and Development) Act, 2016 aims to regulate and promote the real estate sector by regulating the transactions between buyers and promoters of residential as well as commercial projects. It also has provisions for establishing a regulatory authority at the state level called "Real Estate Regulatory Authority" (RERA) for monitoring the real estate sector and adjudicating disputes relating to real estate projects. The main aim of the Act is to protect buyers and help investment in the real estate sector. The 2017 rules enable the

I.5 NOTE TO USERS OF THIS DOCUMENT

The users of this document are to note the following:

NATIONAL AND STATE STATUTORY DOCUMENTS

Compliance with this document does not substitute or override the obligation of developments to be in compliance with mandated building bye-laws and development control regulations. It is the responsibility of users to ensure all applicable regulations, standards and policies are identified and addressed.

It is the responsibility of the users to verify any information contained within this document, against mandatory building bye-laws and other development control regulations. In case of any divergence with respect to prescribed standards, prevalent mandatory rules will need to be followed.

PERIODIC DOCUMENT REVISIONS

The details in this document are current as of March 2020. Minor revisions were made in June 2021. It is envisaged that the content may require review and refinement from time to time. TNSCB may make such variations, as required.

TECHNICAL TERMINOLOGY

Certain technical terms are used within this document. Users are expected to reference the definitions in the glossary included in this document, for these terms.

provisions of the 2016 Act within the state of Tamil Nadu.

Document Category Two: the following documents have been referenced under the guidelines in specific chapters, as applicable. Some additional sources used have also been highlighted in the Endnotes section of this document.

- **Harmonised Guidelines and Space Standards for Barrier-Free Built Environment for disabled and elderly persons by Central Public Works Department (CPWD), 2016⁷:** these guidelines apply to all public buildings in India, and deals with access to, movement within and around buildings by persons with disabilities or elderly persons. This document is an effective tool for executing agencies, planners, designers, contractors, civic agencies, development authorities, urban local bodies, etc. to pave the way for an inclusive and accessible built environment.
- **Urban Greening Guidelines, 2014⁸:** is a model for states and cities, particularly state town planning departments, urban development authorities and urban local bodies who are in charge of maintaining and preserving urban greens. It identifies key stages in planning and development where urban greenery may be integrated with the built environment, and recommends suitable guidelines for enhancing urban greens.
- **Handbook of Landscape by CPWD, 2013⁹:** outlines the approach to integrating landscape in architectural planning, taking into account the ecological environment. It is focused on sustainable development and outlines implementable methodologies that architects,

engineers and landscape architects can readily adopt.

- **Urban Planning, Design, Policy and Evaluation for Infants, Toddlers and Their Caregivers in India, 2018¹⁰:** defines physical components and approaches that specifically improve the quality of the public realm for Infant, Toddlers and their Caregivers (ITCs). It illuminates the interrelationships of the public realm elements placed in the neighborhood, outlines how objectives can be achieved and makes a clear connection to the evaluation and monitoring methodology.
- **Guidelines for Pedestrian Facilities, 2012¹¹:** published by the Indian Roads Congress (IRC), these guidelines cover the engineering design and planning aspects of pedestrian facilities on roadsides and at road crossings in urban and semi-urban areas. Pedestrian facilities at special locations like schools, parking and transit areas are also covered. These guidelines are framed to serve the objectives of universal accessibility and social equity for sustainable transportation.

VISION AND GOALS

Context
Vision
Goals and Strategies



Sustainable planning and design solutions emerge when we anticipate what is to come in the future, and plan for these outcomes intelligently.

EXECUTIVE SUMMARY

Housing is a fundamental need and governments across the globe are constantly striving to provide, as well as enable the provision of affordable housing. Land is a precious commodity and public housing projects often have the challenge of providing safe, liveable communities while addressing the livelihood and other needs of its residents. This is particularly relevant in today's context, given the rapid urbanization and multifaceted demands on limited resources.

Resilient communities are, thus the need of the hour and the primary objective of design should be to seamlessly integrate the various aspects it encompasses, including physical, cultural, economic and social dimensions. At the core of this endeavour is designing places for people. John F.C Turner says, in the context of analyzing the success of a housing project, the worth of the physical product cannot be assumed to lie in its physical qualities, but rather in the relationships between the object and the user.

Public housing serves as an ideal platform to rekindle and explore opportunities to develop a people-centric design approach that enriches the lived experience and creates meaningful places for people to inhabit, enjoy and own.

The RUDF, therefore, establishes an overarching vision reinforcing these aspects and outlines thematic goals with

corresponding strategies that would help realize the same. It aims to not only set the standard for TNSCB projects, but also serve as a tool to enable the creation of better neighborhoods and consequently, better cities.

Spaces that have a strong sense of place, character, and culture have the ability to be emotionally uplifting.

2.1 CONTEXT

TNSCB: GENESIS AND JOURNEY TILL DATE

TNSCB was established in 1970 and has since been implementing various housing, slum development, rehabilitation and resettlement programmes to ameliorate the living conditions of slum families in Tamil Nadu. TNSCB initially started its activities in Chennai; from 1984, it extended to other urban areas of the state in a phased manner.

Since its inception, TNSCB has built 2.65 lakh tenements/individual houses. From 2011 to March 2019, TNSCB has built around 1,55,328¹² tenements/individual houses through various programs including the Jawaharlal Nehru National Urban Renewal Mission (JNNURM)¹³, Rajiv Awas Yojana (RAY)¹⁴, Emergency Tsunami Reconstruction Project (ETRP), Reconstruction of dilapidated slum tenements, XIII Finance Commission- State Specific Grants, construction of new tenements (under State Grants)¹⁵, and has adopted innovative construction technology, enhancing its capacity to deliver housing units to the Economically Weaker Section (EWS)¹⁶.

The state of Tamil Nadu has also initiated the Slum Free City programme as part of Vision 2023.¹⁷ TNSCB has been providing tenements under this program with the help of State Grants and Central Grants under the Pradhan Mantri Awas Yojana (Urban) - Housing for All, and beneficiary contributions. Housing projects are also being undertaken under several avenues that are supported by International Financial Institutions.

CURRENT APPROACH TO URBAN DESIGN AND ARCHITECTURE

Driven by the motivation to provide adequate housing to citizens living in objectionable areas, TNSCB has

thus far prioritized efficiency and speed of delivery. Therefore, the process of masterplan development has rested on creating efficient unit types, evolving repetitive block designs from the unit types and placing them on the site, adhering to prevailing development control regulations. The outcome of this approach, in most cases, has been monotonous blocks placed along orthogonal street networks, with unintended residual spaces being designated to social amenities and common areas. The layouts that emerge are thus, largely not site-sensitive and do not engender a high quality of life.

Recognizing the shortcomings of its current approach, TNSCB has made a commitment to enhance the design quality of its projects and lay greater emphasis on providing a better lived experience to its beneficiaries. This RUDF document provides the basis for introducing such improvements and is expected to usher in meaningful improvements in TNSCB's current model of design and delivery.

2.2 VISION

Global phenomena such as population growth, urban sprawl, poverty, inequality, pollution, congestion, excessive energy consumption, unsustainable urban mobility, as well as shrinking urban biodiversity, urgently necessitate a holistic approach to city development. Thus, the primary focus when creating sustainable cities should be on developing a resilient habitat for existing populations without compromising the ability of future generations to experience the same.¹⁸ To make this a reality, concerted efforts are essential from all stakeholders contributing to city building.

Public housing, provided by the government, offers an excellent opportunity to set the standard for sustainable design, and in turn can motivate private sector actors to create developments that are sensitive to climate, natural resources, people and culture. **In that, public housing plays a pivotal role in city-making and its successful integration into the larger fabric is paramount.**

Given this, it is imperative for public housing to move beyond the narrow focus of providing cost-effective solutions for people. It must transform its prevalent built form expression of characterless blocks of concrete within the city fabric and strive to provide dignified and distinctive experiences to its inhabitants. In doing so, public housing projects can empower their residents and improve their quality of life.

To contextualize this approach to Tamil Nadu, a rapid qualitative assessment of projects delivered by TNSCB in Chennai thus far was undertaken. Based on this, two core vision tenets were established for the RUDF namely (i) enriching the lived experience and (ii) building resilient communities.

Goals and strategies, as well as guidelines developed as part of this document, reinforce these imperatives and are outlined in detail in this and ensuing chapters.



ENRICHING
THE LIVED
EXPERIENCE

BUILDING
RESILIENT
COMMUNITIES

01 ENRICHING THE LIVED EXPERIENCE

The preoccupation with delivering low-cost public housing units may result in a compromise on the lived experience. Good public housing design must cater to life's needs beyond the unit one occupies and create vibrant spaces to live which will, in turn, engender thriving communities.

Urban design provides a comprehensive approach for enhancing the lived experience of residents. It is the act of providing an overarching framework for doing so, while also improving the visual structure, through a series of moves, both major and minor. It deals with designing the physical entities and structuring their relationships with one another to achieve qualitative improvements in the scheme. In doing so, urban design helps humanize the environment within the project with a particular focus on the delineation of activities through physical design. Thus, urban design focuses on the human being and addresses the design of shared public spaces to nurture harmony of collective action and spatial design.

The demographic profile of the community is a critical factor that guides both macro and micro-level design of public areas, movement networks and the interceding spaces between buildings. Normally, children, the aged, differently abled, youth and in many cases, women, are ignored in housing design. Urban design approaches all these user-groups and their specific needs through a differentiated strategy to provide a socially and physically sustainable housing environment.

The **aesthetics of place** is of crucial importance in people's multi-dimensional and dynamic relationship to their environment. It is through the "aesthetic means" that people experience their home as their personal space for living, the nearby park as a shared extension of their personal space, and the larger

development as a multiplicity of places manifesting the diverse values of its heterogeneous inhabitants.¹⁹ Therefore, visual aspects also find special attention in urban design. This can be developed through the use of innovative design of building forms, different materials, textures, colors as well as building form elements such as balconies, sunshades, windows, etc. For example, accentuating blocks in different neighborhoods with different color themes will enhance legibility and create an identity. Similarly, creating a variety of visual experiences along the streets will help promote interaction and create cues in terms of wayfinding.

As outlined above, an urban design approach is holistic, multi-faceted and user-centric. Thus, commitment to adopting its methods in their entirety is imperative to build residential developments that are comfortable, safe, sustainable and enjoyable.

02 BUILDING RESILIENT COMMUNITIES

In terms of resilience from hazards, urban areas of Tamil Nadu are vulnerable to multiple shocks such as storm surges, tsunamis, sub-regional flooding, local flooding, heat waves, earthquakes, fire hazards in high-rise housing, etc. Housing, especially public housing with high-density living, needs to be safe from these hazards and protect the residents as well as the public assets created to support them.

Given the multiplicity and complexity of resilience-related challenges faced in Tamil Nadu, it is important to develop strategies that address short, medium and long-term horizons. This section broadly outlines the impacts and some relevant strategies to be adopted to address issues that relate to flooding, earthquakes, fire and heat. Future volumes of the RUDF may contain more elaborate planning and design strategies, as well as specific guidelines across the spectrum of all anticipated shocks and stresses.

FLOODING

Site selection needs to avoid low-lying areas, wetlands, ponds, riverbeds and other areas within the Coastal Regulation Zone (CRZ)-I. These areas, though may appear at first glance as undevelopable or degraded lands, are important components of the overall health of the environment. They should not be built upon and must be preserved to a healthy condition. Besides, the foundation costs of the buildings will disproportionately rise since the load-bearing capacity of land will be low. Post development, the land will tend to flood locally and the higher moisture content in the soil will impact the longevity of construction. Low-lying areas also help recharge the soil. Concretization and construction of

such locations increase the water run-off to cause flooding in adjoining areas. A series of environmental problems are unleashed by building in low-lying areas, which will further deplete the already diminishing water table levels in Tamil Nadu.

A Geographic Information System (GIS) analysis and larger level water flow data can clearly identify the river courses and catchment areas of water bodies.

CRZ Notification is a regulation of the Government of India that is subsequently adopted by each state as a Coastal Zone Management Plan to regulate the usage of lands adjacent to water bodies, rivers and the coast, with specified distances to be maintained for construction from the High Tide Line (HTL). The HTL is fixed by the state government and made public for application to various developments. These regulative measures are meant to protect life and property. In particular, housing for vulnerable groups must strictly adhere to these laws for all projects. The laws vary based on location and the details are available in the Coastal Zone Management Plan published by the Government of Tamil Nadu.

Stilt construction is commonly adopted in floodable zones to reduce damage to housing units. From the available minimum height allowed for stilts, an excellent semi-public area is made available to the residents under protected conditions in their immediate proximity. This also helps avoid excessive need for hard paved areas within the site, for parking provisions, etc. However, completely unregulated use of stilted areas leads to chaotic entry points for houses. Children are excluded from these spaces as adults randomly use the space for parking, vending and storage. Regulated use can be achieved through designated use of stilt areas and this is discussed in other relevant sections of the report.

EARTHQUAKE VULNERABILITY (WITH RESPECT TO STILT FLOOR CONSTRUCTION)

From the point of earthquake vulnerability, the stilted floor needs some precautions. Though Chennai falls under Earthquake Zone III (low damage risk zone), it would be prudent to take adequate precautions. While the NBC describes the concrete design specifications for stilts, it is necessary to also ensure that rigid vertical elements reach a minimum of 80% of the total height of the building. 'L' shaped columns in the corners further strengthen the stilted structure along with shear walls for lift-wells. The stilt floor is normally referred to as the 'soft story' in earthquake design parlance, as vertical cracks develop on columns during earthquakes, and in some cases the entire floor can collapse, causing the first floor to flatten to the ground. The risk is even higher if the construction is on top of erstwhile ponds, wetlands or riverbeds. Conducting a pre-construction stage soil analysis will identify silty sand or excessive clay content in the soil, which will necessitate (apart from stronger foundation at a higher per sq.m. cost) a need for full caution to be expressed in providing stilted floors. Furthermore, a microzonation approach, wherein earthquake-prone zones are divided across specific factors such as geological and geophysical characteristics of the site (including shaking, landslide, liquefaction susceptibility, rock fall hazard and flooding caused due to earthquakes), can help create better mitigatory measures as it helps to understand the impact of seismic activities more precisely.²⁰ For other cities, the structural safety precautions should be taken based on the Earthquake Zone, in which the site is located.

FIRE

In high-rise buildings, fire safety is mandated in the bye-laws. The TNCDDBR stipulates the mandatory

regulations for the state. The regulations have some implications on the planning of buildings, which are consequential in working out the super built-up area, and the cost of construction. Nevertheless, they have to be followed to ensure the safety of the inhabitants. Fire safety norms must be adhered to while planning building layouts, rather than being looked at as an imposed regulation. The regulator specifies various components of the fire-fighting system which includes, but is not limited to:

- **Space standards** including fire access standards around buildings, intervals for the location of vertical circulation, staircase and access corridor widths, firefighting equipment, ducts, provisions for water storage, refuge spaces as per standards, etc.
- **Firefighting equipment** in accessible locations, fire and smoke detectors, communication booths and public address systems, alarms and provisions for fire doors with lift facilities, wet risers and related equipment, fire safety graphics, fire extinguishers and their locations, etc. Many of these equipment require periodic checks, refilling, etc. to ensure that the building firefighting provisions are ready on a permanent basis. Many of them involve plumbing, electrification, specialized specifications and planning.
- **Manpower:** one or more Facility Managers need to be trained in the upkeep of these equipment apart from training residents in emergency response systems. The youth among the residents also need to be co-opted into securing and up keeping the systems.
- **Periodic checking** of the efficacy of the equipment is necessary and these need to be proactively managed by dedicated Facility Managers.

- **Awareness building** is key to fire prevention and preparedness. Specifically, periodic engagement with communities on the importance of fire safety and steps to take in case of emergencies is imperative. This can be done through aural or visual means (audio announcements, video clips, banners, etc.)

- **Sanctions and Certifications:** A registered fire consultant needs to be involved right from the planning stage to make the spatial and other provisions compliant, write the specifications, tendering, supervision of works, testing and obtaining sanctions and training.

These measures involve certain overhead costs which are necessary in the case of high-rise buildings and has an implication on the unit cost of the housing. Some of these will go into the capital costs and the continuous need for firefighting readiness would mean recurring costs. In public housing projects, the risks involved are higher due to higher density and the possibility of malfunctioning of electrical systems is manifold. In India, the majority of fires are caused by electrical malfunction and misuse. The resulting failures and loss of life and damage to property have serious financial and legal liability. These are best managed through a professional Facility Management team functioning under the TNSCB or under legally constituted Residents Welfare Associations to deal with upkeep and emergencies.

HEAT

Tamil Nadu has been subject to extreme heatwave conditions in summer, susceptible to aggravation in future as climate change is unfolding at an alarming rate. In terms of urban design, mitigation measures can be built into almost every aspect of design from site, to orientation of buildings and their shadow patterns, building materials and facade treatments, to roof treatments. In housing schemes, paved or

concretized hard surface areas need to be reduced to prevent radiation that impacts microclimate. Softer, non-reflective surfaces (e.g., terracotta in the place of concrete, or terracotta and concrete-mixed paving, etc.) can reduce radiation effectively. It will bring in variations in visual terms as well as moderate excessive radiation.

Using appropriate building techniques and materials could also reduce the heat intake effectively. Monolithic Concrete construction, for instance, while providing more useable carpet area inside and enabling faster construction timelines, is ineffective in reducing radiation in the nights as the heat trapped inside the concrete escapes slowly during the night. Radiation towards the exterior is also higher in concrete walls. Radiation inwards can be partially mitigated by a white color finish that can reflect the heat away from the walls. Measures such as cross ventilation and enabling a 'Venturi Effect' (wind created by air that is squeezed through a narrow space known as 'channeling') to remove hot air from the interiors are extremely useful in Tamil Nadu as the weather is often hot and humid.

An excellent measure to provide a cool shaded area is through a well-landscaped outdoor environment. Every existing tree needs to be considered an asset to the site and preserved while designing the housing blocks. Spaces with trees are areas towards which activity naturally gravitates, enlivening the residential environment and air quality. Trees and plants which are indigenous to the climate and soil type must be preferred as they are more sustainable and tend to be less water-intensive. Simple pragmatic planting can contribute to creating a comfort island within the site that is naturally preferred by children and adults as a refuge from the harsh climate. Providing separate areas for parks is also an excellent option, but a design that integrates buildings and landscape will act as a heat sink within the habitation.

2.3 GOALS AND STRATEGIES

Ten goals and corresponding strategies have been developed for the RUDF, resting on a strong foundation of the two vision tenets of 'enriching the lived experience' and 'building resilient communities'. In many ways, the goals and strategies are interrelated, multi-faceted and cut across masterplanning, landscape, architecture and other disciplinary realms. Thus, they require comprehensive and detailed guidelines to be adopted successfully. The following chapters describe these guidelines in greater detail. It is important to note that this is the first volume of RUDF and future volumes may have detailed guidelines that have not been covered in this document. Goals for the RUDF have been collated into nine themes. The tenth goal is intended to cut across the nine themes and integrates technical advancements and future-proofing into other goals, as relevant.



EMBRACE ENVIRONMENTALLY SENSITIVE DESIGN

Designing public housing projects with a focus on environmental awareness is imperative and all design decisions should be reviewed with this lens. In particular, housing projects must integrate seamlessly with the surrounding infrastructure network and optimally leverage available resources. The development thus envisioned should aim for a minimum carbon footprint and a healthy, comfortable environment through enhanced thermal comfort and reduced pollution.

Strategies

- Enhance existing ecological systems and design the built environment responsively; through this process, increase biodiversity and greenery.
- Adopt Water Sensitive Urban Design (WSUD) which integrates the urban water cycle including

waste-water management, stormwater, groundwater and water supply into urban design to minimize negative environmental impacts; enable greater efficiency in the use of water by adopting water conservation solutions (especially through community-driven facility management).²¹

- Consider a life-cycle approach for waste management and incorporate waste segregation, organic composting and other relevant solutions.
- Reduce overall energy usage through the adoption of passive design.
- Promote non-motorized transportation solutions, focus on walkability and incorporate their requirements in design.
- Undertake climate-responsive studies (e.g., radiation analysis, computational fluid dynamics, etc.) for better masterplan performance.



ENHANCE ECONOMIC OPPORTUNITIES

Economic opportunities should be addressed holistically and encompass resources and networks to access available options in the vicinity, while also opening up possibilities for alternative sources of employment.

Strategies

- Provide resources and networks that facilitate convenient connections to job centers (such as access to an efficient public transit system).
- Develop convenience stores and shopping complex within the housing projects to foster organized and monetizable small businesses.
- Create opportunities for livelihood generation through design (i.e., some amenities in the project can be managed by residents, etc.) and integrate them into the employment value chain.
- Introduce training and skill development centre in the design customized to the requirements of beneficiaries.



FACILITATE SOCIAL DEVELOPMENT

Residents of public housing projects should be given adequate support for community development and opportunities to be involved in decision-making. Public housing must stand testimony to the commitment to invest in building social capital, and in turn, building a nation.

Strategies

- Create a hierarchy of spaces and programming with appropriate density to support diverse forms of social interaction and foster strong community and family bonds.
- Enhance the sense of identity and belonging through design.
- Provide quality housing with comprehensive facilities and introduce a good housing mix which will promote social cohesion.
- Provide access to commercial, educational and recreational facilities. Facilitate essential social infrastructure such as parks, playgrounds, child-care centers (anganwadis), convenience stores, ration shops, health subcentre etc. within the masterplan, at appropriate locations.
- Promote community participation and engagement in housing design at various stages. This is described in further detail in the *Social Sustainability and Grievance Management Framework* document.



ENGENDER IMPROVED HEALTH AND LIFESTYLE

Housing projects should uplift residents and engender better health and lifestyle outcomes. The place of living must recognize the importance of a well-functioning body and mind, and nourish those who inhabit it.

Strategies

- Design neighborhoods such that they avoid redundant areas away from sight which are prone to poor maintenance and blight.
- Promote walkability through design and minimize vehicle dependence.
- Create programmatic interventions in open spaces that enable physical and mental recreation for different age groups.
- Consider open spaces to be extensions of a household by crafting necessary support activities and infrastructure.
- Reduce physical / manual maintenance techniques through innovative and low-cost design strategies; both solid and wet-waste disposal systems should be built into the housing scheme and can include community-managed organic waste to manure conversion systems.²²



DESIGN FOR SAFETY

Public housing projects should be safe and secure at all times of the day and night, for all residents alike. The design should pay particular attention to the needs of women, children and other vulnerable user groups. Fostering a sense of security helps enhance the state of mental health and community spirit. The design should also have the inherent flexibility to absorb new activities and transform for the needs of the future.

Strategies

- Cater to the physical and emotional needs of different groups of people in the design of spaces.
- Ensure safety from electrical and mechanical equipment within housing areas; adopt fire safety provisions.
- Ensure safety of the site from local flooding to protect mechanical/electrical equipment, including lift pits, at the ground level.
- Provide for safe gathering refuge spaces in physical emergencies like earthquake tremors, fire, etc. Following the Bureau of Indian Standards (BIS), earthquake resilience measures is a mandatory design requirement (both planning and structure).
- Spaces within a neighborhood must foster a sense of safety and security through planning strategies such as legibility of linkages, physical

affinity of entries of residential units, etc. This contributes to social cohesion ('social wall'), which can create a sense of safety in residential environments.

- Adopt Crime Prevention Through Environmental Design (CPTED) techniques to make public housing projects safe and walkable at all times. For instance, orient buildings and activities to ensure 'Eyes on the Street' at all times of the day and night.
- Provide vehicle-free spaces for play areas and recreation along with compliance to universal accessibility requirements for all public assets.
- Ensure privacy of personal spaces through design. Detail design of ramps, railing and parapets to ensure child safety.
- Adopt detailing of doors and windows to resist high winds, salinity and storm incursions.
- In case of political and social unrest in the adjoining areas in the city, the housing scheme should be defensible.



ENSURE INCLUSION AND UNIVERSAL ACCESSIBILITY

Universal accessibility fosters and ensures inclusive public spaces, consequently creating the possibility for harmonious co-existence of people with different needs and abilities.

Strategies

- Envision public housing projects to be inclusive and accessible to all people, regardless of age, gender or any other factors.
- Ensure that the design intent incorporates universal accessibility requirements at all stages (from concept design to execution).
- Introduce universal accessibility elements at various levels of the masterplan: site (e.g., streets, open spaces), building (e.g., housing blocks and social amenities) and housing units.



PROMOTE CULTURAL RELEVANCE

Public housing projects play a key role in enhancing and preserving community character. Therefore, places designed in such projects should be locally rooted, culturally appropriate and reflect the lived experience of its inhabitants.

Strategies

- Use local architectural elements in the design and development of the built form.
- Include specific elements and requirements in housing blocks and unit designs based on the cultural context, beneficiary needs and preferences (e.g., spaces for fishing nets, separate balcony or utility area, etc.)

- Anchor the programming of open space and amenities on traditional or community-focused livelihood pursuits.
- When designing public spaces, integrate native, natural landscapes that are didactic, productive as well as recreational in their functions.
- Introduce visual enhancements to the urban environment using cues from local arts and aesthetic values.



INTRODUCE INNOVATIVE HOUSING DESIGN

Innovation in design is critical for the long-term sustainability of public housing projects. Explorations with respect to maximizing efficiency, introduction of new technologies and construction methods that broaden the aspirational goals for design, all contribute to ensuring an eco-conscious approach that is also cost-effective.

Strategies

- Innovate on unit designs to create interesting yet functional spaces (e.g., space flow, daylighting, natural ventilation, etc.).
- Develop block plans such that they maximize thermal comfort and other efficiency parameters while providing a unique response to the site and

- its particular characteristics (e.g., topography, climate, etc.)
- Enhance the external appearance of buildings through innovative façade design, with a focus on optimizing operations and maintenance costs.



ADOPT INTEGRATED SITE PLANNING

Site planning must be sensitive to the natural and physical constraints of the surrounding context and site particularities. It should successfully integrate the design of public open spaces with buildings and follow sound planning principles. The design must also ensure efficiency and minimize the footprint of the built environment in order to reduce undesirable consequences such as urban heat island effect, insufficient space for future development, inadequate open spaces and left-over pockets of land.

Strategies

- Undertake necessary studies (e.g., GIS analysis, soil analysis, etc.) to enable site planning that is sensitive, responsive and sustainable.
- Ensure that the site is well connected to the external road network, utilities and transit nodes.

- Position the reserved open spaces in combination with other open spaces, forming a logical network.
- Shape the built environment based on desirable parameters such as optimal built density (housing blocks and amenities) and open spaces (sufficient, programmable and comfortable spaces).
- Plan building locations, heights and profiles in a manner that results in a cohesive whole when viewed and experienced.
- Integrate efficient planning of essential utilities such as STP, electrical yard, etc., keeping in mind optimal land utilization.

minimize energy consumption e.g., water meters, etc., to improve energy and cost savings and promote environmental sustainability.

- Incorporate digital tools to unlock new opportunities for enhanced physical design (e.g, walkability, safety, etc.)
- Future-proof the site such that it can accommodate technological advances including, but not limited to, the utilization of IoT (creates a holistic and real time understanding of the built environment), digital experiences (merging physical and digital realities), advanced analytics (handles large amount of data to power prescriptive insights), and social technology (provides tools that power ground-up innovation).



UTILIZE SMART AND LOW COST TECHNOLOGY

Cost optimization is arguably one of the most critical considerations in public housing design and is often used as a standard of good quality results. However, it is essential to implement low-cost technologies in combination with other goals that improve the quality of life for the residents in terms of cost savings at a household level and environmentally sensitive design.

Strategies

- Introduce smart technologies at all levels of the masterplan (from site plan to unit design) to

DESIGN PROCESS

Project Preparation Process
Concept Masterplan



A robust, holistic planning process that prioritizes life and the lived experience is the foundation of design excellence and happy communities.

Designing masterplans for public housing projects requires a holistic, multifaceted approach resting on a solid urban design and architecture foundation. This chapter describes the steps involved, as well as the expected outcomes at every stage of the process. TNSCB can adopt this approach when preparing in-house designs or engaging consultants to do the same. The steps consist of the following:



- Site Selection
- Community Engagement*
- Design Brief Development
- Commissioning the Designer



- Site Planning and Analysis
- Concept Development and Masterplan Finalization
- Masterplan Performance

*Community Engagement is included under the Project Preparation Process for ease of reading. However, it has to be incorporated at every key step of the masterplanning process. Users of the RUDF should refer to the *Social Sustainability and Grievance Management Framework* document for further details regarding the same.

3.1 PROJECT PREPARATION PROCESS

3.1.1 SITE SELECTION

Earmarking sites for public housing is often contingent on the availability of low-cost land. Currently, TNSCB identifies land in and around areas where in-situ redevelopment or relocation is deemed necessary and requests the concerned government departments to transfer the land to them in order to proceed with the project. Sometimes, the Department of Revenue of the State of Tamil Nadu may identify appropriate parcels and hand it over to TNSCB, and if the latter deems it suitable, the sites will be used for public housing projects. Recognizing this, **the following section outlines the necessary conditions to be fulfilled while identifying land parcels for public housing, with a focus on sites that must be avoided due to environmental, social and other key considerations.** Following a robust method for site selection can ensure better health, safety and sustainability outcomes for residents and, in turn, enhance the lived experience. In the future, having a single and central repository of all government land will enable transparency, and provide options for TNSCB to select the most appropriate parcels for development. The criteria are as below:

- Land parcel proposed for public housing development **must adhere to relevant regional plans, land use masterplans, and other statutory documents.**
- **Implications of CRZ** must be duly addressed.
- Sites that **had involved or will involve significant degradation or conversion of environmentally critical habitats and / or legally protected ecological or social and cultural areas** under the applicable regulations must not be considered.
- **Sites within a 100-year flood plain must be avoided;** if not possible, necessary precautions (e.g., elevating the site level) must be taken.
- Tamil Nadu's vulnerability context (i.e., prone to natural disasters such as cyclones, floods, storm surges, droughts, heatwaves and earthquakes) must be factored into the site selection. Parcels must be located in safe environmental zones and

care should be taken to not disrupt a sensitive ecosystem, which is already on the verge of disappearing due to rampant urbanization.

Specifically, the following should preferably not be selected:

- + Sites which are currently classified as water bodies and waterways.
- + Sites on prime agricultural zones.
- + Sites that consist of mine shafts, gravel pits and other potential causes of structural instability.
- + Sites that have land / soil properties that make them prone to subsidence.
- + Contaminated brownfield sites that contains buried or disposed hazardous (industrial or medical or e-waste) and / or municipal solid waste.
- + Sites within close proximity to manmade hazards such as high-tension lines, polluting industries, burial grounds / crematoriums, high-pressure natural gas transmission lines, operating oil wells, garbage dump sites.
- + Sites adjacent to current and future projects / proposals of high polluting industries, power plants, mining zones, protected areas, solid waste management facilities such as landfills or incinerator plants.
- + Sites that have ownership disputes that are under consideration by the Courts.
- + Sites within 500 m radius of existing live quarry or existing crusher.
- Site must ensure that the proposed development is **resilient in the face of uncontrollable externalities, shocks and stresses** (including flooding, storm surges, tsunamis, erosion, subsidence, landslides, etc. and adverse climatic conditions e.g., temperature inversions, severe winds, etc.) and, therefore, be analyzed across the following parameters:
 - + High Tide Line (HTL).
 - + High Flood Level (HFL).
 - + Elevation above Mean Sea Level (MSL)- highest and lowest points.
 - + Seasonal water bodies (river, creek, stream, lake, tank, pond, aquifer).
 - + Presence of natural drainage / aquifers on the site and soil conditions.
 - + Prior inundation, in part or whole.
- **Public housing must respond to the carrying capacity of natural and man-made systems.** Necessary efforts should be taken to augment the systems in order to minimize adverse impacts of a new development on existing resources. The location of the site must, therefore, consider and study the proximity to and / or capacity of, the following systems:
 - + Eco-sensitive / biodiversity areas such as mangroves, forests and wildlife.
 - + Protected species of flora and fauna.
 - + Migratory pathway of animals.
 - + Archaeological, historic and cultural sites.
 - + Municipally-owned water supply, power supply, storm and sanitary sewer systems.
 - + Natural water sources.
 - + Groundwater zone classification and depth (ensuring that level of groundwater would not impact the building foundations or other infrastructure) and quality of aquifers (particularly, salinity).
 - + Soil type and quality (should avoid made-up soil, as far as possible).
 - + Telecommunication facilities.
 - + Transport facilities such as rail, bus, access roads, etc. (site should preferably be within 800m-1 km of a transit stop). Specifically, sites must have direct access in the form of a motorable road to the selected site.
 - + Mixed use clusters as well as functioning commercial, institutional, social and relevant livelihood establishments (project sites must not function in isolation which will lead to ghettoization in the long term).
- + Social infrastructure such as schools, hospitals, parks and open spaces.
- **Sites preferably be of a reasonable size and configuration** to permit efficient site planning with adequate open space, circulation, parking, and fire safety equipment. If a large number of trees are on site and need to be felled, adequate measures to replace the lost green cover must be factored in.
- The size of a selected site should account for the number of beneficiaries to be accommodated **while not compromising on urban design parameters** including:
 - + Restricting road networks to below 20% of the total site area.
 - + At Net Density level, the area under housing may go up to about 60%, the rest of the 40% going into movement, parking network and neighborhood- level open spaces.

3.1.2 STAKEHOLDER ENGAGEMENT

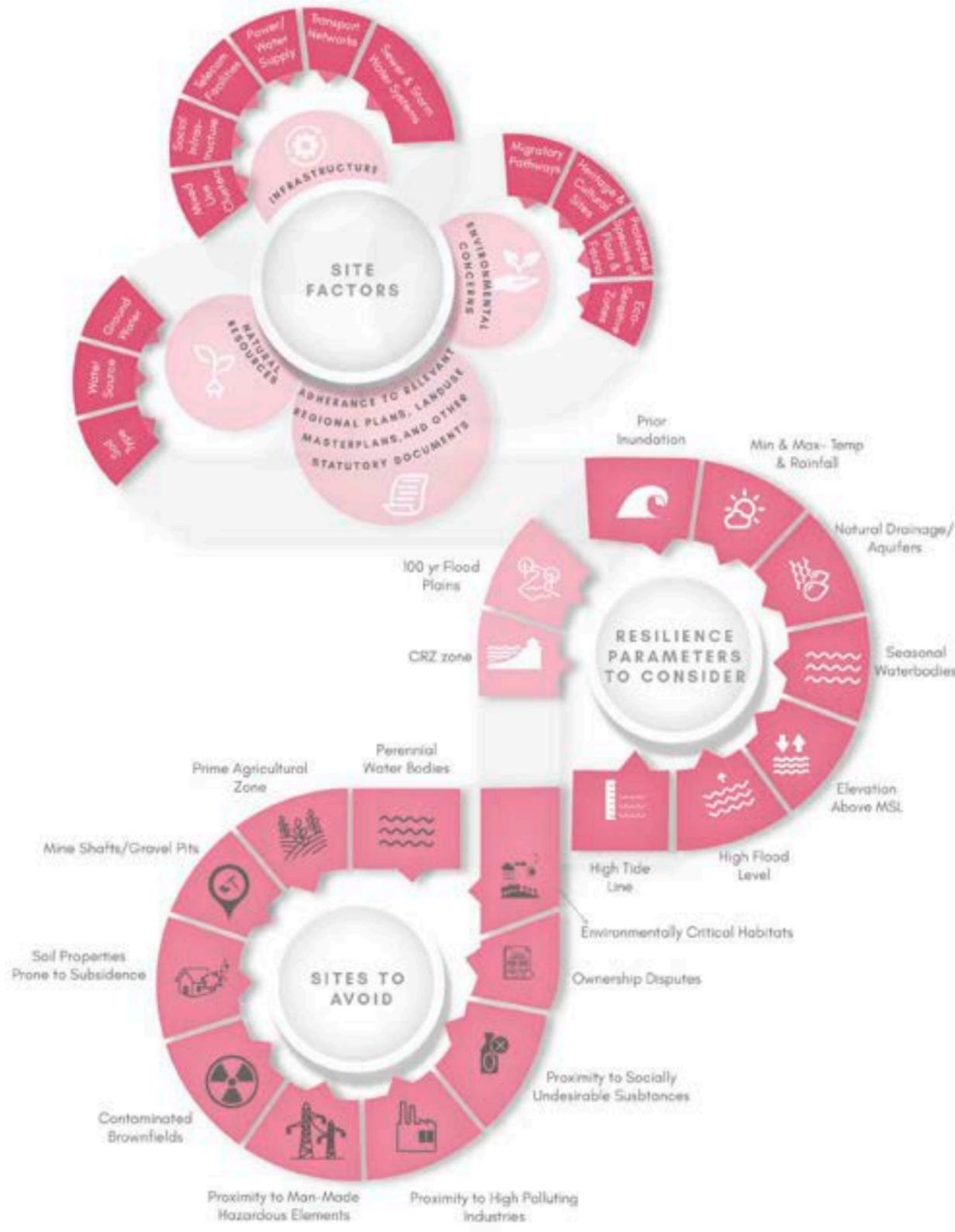


Figure 1 Site Selection Criteria (Illustrative, not Exhaustive)

Stakeholders in public housing projects are interdependent, varied and have different levels of influence on the project. They cover the gamut across intended beneficiaries (with diverse sub-user groups of women, men, children, youth, elderly, differently abled, etc.) and their Resident Welfare Associations (RWAs), institutions involved in providing the services in various capacities (e.g., TNSCB, Water supply department, etc.), Non-Governmental Organizations (NGOs), CBOs as well as private sector organizations with Corporate Social Responsibility (CSR), to name a few.

Addressing the needs of the beneficiaries and inputs of all stakeholders by actively engaging with them is a core responsibility of TNSCB and is outlined in the *Social Sustainability and Grievance Management Framework* document. Users of this RUDF document are requested to read and incorporate all relevant inputs from the above-mentioned document before commencing the design process.

Finally, TNSCB should develop a repository of community feedback and inputs received for every project. Systematic documentation of feedback received will help inform future projects right from the design brief stage through to the implementation. From a design perspective, specific attention should be paid to the following aspects:

DESIGN FOR OWNERSHIP

A collaborative approach is highly recommended, both in the development of the design brief, as well as the design scheme. This will help customize the project to the needs of the beneficiaries, while also motivating them to constructively contribute to the implementation of the project and its ongoing maintenance. Based on the inputs from early

community engagements (especially beneficiaries) during the design brief development stage, the concept design (masterplan, block plans, unit plans, etc.) must be prepared (in accordance with the framework and guidelines set forth in this (RUDF) document). This must be presented to the community in an easily comprehensible manner through simple illustrations and visualizations.

While it is not practical for community to provide inputs on all design aspects (e.g., there may be technical or other constraints that will dictate certain fundamental design decisions), **TNSCB should provide opportunities for them (especially beneficiaries) to suggest inputs on adjustments to the unit design, social support infrastructure, occupational requirements and other livelihood opportunities, within the prescribed and allowable planning parameters.**

Outcomes of this engagement must be duly reflected in the designs before proceeding to detailed design. The final design must be presented to the community so that they are fully aware of the details of the scheme that will be implemented. Community inputs on implementation may also be considered to enable a smooth process. This stage should ideally be aligned with discussions on handing over responsibilities to RWAs, etc.

DESIGN FOR CHANGE

Community consultation must include considerations such as long-term aspirations of the residents, their upward mobility and capability to embrace technological advances. These factors may be embedded in the masterplan and architectural design development process.

3.1.3 DESIGN BRIEF DEVELOPMENT

The 'design brief' is a document developed for a project typically by the developer (in this case TNSCB), in consultation with the design consultants and stakeholders. The formats and approaches in developing this document vary greatly. However, the primary intent of the brief is to evaluate the effectiveness of a design during and after its development as well as to ensure outcomes that will result in an improved quality of life for residents.

The design brief is a key tool to identify and articulate the 'problem statement', which is a concise description of strengths, opportunities and challenges of the site under consideration. It also highlights the gap between the current state and desired end state. As stated in the previous section, community inputs are a critical component in the design brief as they shape the document to be contextually rooted and address the specific needs of the beneficiaries. At minimum, these aspects (with supporting visuals such as site photographs, diagrams, maps, etc.) should be included in the design brief:

- **'Vision/theme' for the site:** this can factor in the future aspirations of TNSCB and the stakeholders, as well as site specificities. Including this will help steer desirable design outcomes.
- **Site Context:** this section should outline the macro and micro considerations that arise out of a comprehensive study. Macro considerations should include (but not be limited to) geography, disaster and climate vulnerability, key transport nodes, landmarks, prominent neighborhoods, etc. Details on the surrounding context should include information (preferably spatially mapped)

such as major and minor roads, rail connections, bus routes and stops, neighborhood-level open spaces and landmarks, surrounding urban character and access to social infrastructure and services. These may be provided at suitable scales (e.g., within a 5km, and/or 2km radius).

- **Site Details:** this should include survey drawings with clearly delineated property lines and access points. Disputes, if any, must be highlighted. In addition, existing vegetation, soil and environmental conditions, as well as contour maps with drainage options, must be included. Boundary and/or street edge conditions, as well as details of undevelopable portions or existing buildings to be retained, if any, must be specified.
- **Programmatic Requirements:** the program component of the brief must include the minimum number of housing units to be accommodated within the site, list of social amenities to be included in order to cater to the incoming population, unit sizes as well as efficiency considerations, socio-cultural preferences, occupational needs and any other relevant information. Regulatory requirements (e.g., allowable Floor Space Index (FSI), setbacks, building to building distance, etc.) should be clearly indicated and relevant documents must be made available to the designer.
- **Other Information:** if in-house designs have been prepared, those drawings may be shared with the designer so that relevant aspects of the scheme may be incorporated. Phasing plans may also be included (this is especially relevant for resettlement sites).

The design brief can be refined during the design development process as the specific requirements get crystallized (based on the site analysis and other detailed technical reviews).

3.1.4 COMMISSIONING THE DESIGNER

TNSCB may choose to develop the concept design in-house or commission a designer/design team to develop the same. For the purposes of this document, it is assumed that the detailed design and further stages of design work are handled directly by TNSCB, in collaboration with required technical experts.

Commissioning the designer or the design team (expected inputs are across masterplanning / urban design, architecture and landscape) for the concept stage is dependent upon various factors including credentials, fee, availability, etc. It can be through a direct appointment or a competitive process.

In addition to the traditional procurement methods, introducing architecture competitions can provide innovative solutions to pressing challenges.

ARCHITECTURE COMPETITIONS

Architectural competitions help identify a design scheme that is most viable and is of a high standard, across a number of entries. The process, as well as the access to multiple design solutions for a given site, brings out a wide range of ideas and concepts, and expands the design horizon to explore hitherto unexplored ideas.

Competitions can be open or invited. In the latter case (also referred to as limited competitions), specific pre-qualifications will ensure that the most relevant firms and / or individuals participate. Competitions may be held in multiple stages (typically one or two), and the requirements for each stage will have to be explicitly outlined.

Competitors have the same conditions and limitations and are required to holistically address the design brief. For abundant clarity and transparency, evaluation criteria with the corresponding weightage should be clearly mentioned and the jury (panel reviewing the entries) composition should be disclosed. In the case of paid competitions, the prize money may also be explicitly stated.

In the Indian context, the Council of Architecture (Statutory Body of Government of India, under the Architects Act 1972) clearly describes the process for conducting architecture competitions and these guidelines must be adhered to.

3.2 CONCEPT MASTERPLAN PROCESS

3.2.1 SITE PLANNING AND ANALYSIS

To commence work on the design, it is imperative to understand the character of a place / region. Several aspects such as the presence of natural ecosystems, local socio-cultural practices and preferences, as well as the nature of development in the surrounding areas (e.g., industrial, residential, commercial, etc.) exert a strong influence on the design and must be studied at the outset.

LAND AND SITE PLANNING

Every parcel of land displays its own individual traits by way of location, linkages, topographic profile and subsoil characteristics. **The site is a contiguous entity, integrally tied to its surrounding land, context, contour profile and local and global vulnerabilities.** Riverine ecology, ponding systems and vegetation are closely linked to subsoil conditions which impact buildability. A complete understanding of these traits will help determine the entry points to the project, internal disposition of spaces and buildings, potential for different kinds of public uses and most importantly provide clues to local flooding and external disaster potential. A proper site analysis is a pre-requisite to maximise the potential of the land and to build resilience.

A study of contours and levels of the site will show where best the buildings can be located, how the surface water flow will take place within the site and how the site needs to provide for the drainage of surface water from adjoining sites. Blocking these flows by buildings or even impervious compound walls will hinder the surface water flows which, often, is the underlying cause for local flooding. Surface water flow directions need

to be identified and allowed to flow across the site unhindered. Analysis of the adjoining road levels and the location and invert levels of drainage systems help determine site levels and consequently, surface water management.

The linkages and location of public transport in the adjoining areas will help determine the entry and exit points to the site. The intersection of these considerations along with the contours of the site will provide clues for structuring the internal road network, which may also carry the surface water drainage and internal wastewater pipes. These points of analysis also help determine the locations of STPs based on gravitational flows, thereby avoiding the need for expensive pumping of sewage and surface water.

The surface water flow networks on the ground usually correspond to higher subsoil moisture content which in turn determines the type and quality of vegetation. The least interventionist strategy on the site avoids expensive land cutting and filling and is least disruptive to the existing ecology. This is more sustainable as a development strategy than a highly interventionist, ecologically disruptive development.

The analysis of land and vegetation also provides us with the best suitable locations for an open space structure within the site. In locations of extreme climate like we find in many parts of Tamil Nadu, good site planning will include placing building blocks in a climatically better orientation and following the dictates of the site characteristics. Apart from a properly designed landscape plan with sufficient tree cover, the shadows cast by buildings also provide better outdoor activity spaces. In developing the site, hardpaved surfaces must be kept to a minimum so that the site is able to absorb a part of the rainwater through soft landscape areas and

open-jointed paving. This helps recharge the aquifer, which in turn helps the vegetation on the site.

In addition to the above, a detailed site analysis should be conducted to gain a spatial understanding of resources, physical and social infrastructure available (preferably within a 5km and 2km radius). These would include, but not be limited to, transit networks, commercial nodes including fair price shops, parks and public spaces, schools, public health centers, etc. Such amenity provisions must adhere to prevailing national and state access standards, while accounting for the influx of new residents through the project.

Sites have inherent opportunities and constraints from a design perspective. Opportunities may include the

presence of transit nodes and access to livelihood opportunities within close proximity, native vegetation that can provide design cues, etc. Constraints often include irregular site shape, challenging terrain, extreme climatic conditions, etc.

The site analysis exercise provides the ideal method to synthesize and study interrelationships across all considerations. When complete, it will form the basis of the masterplan concept design.

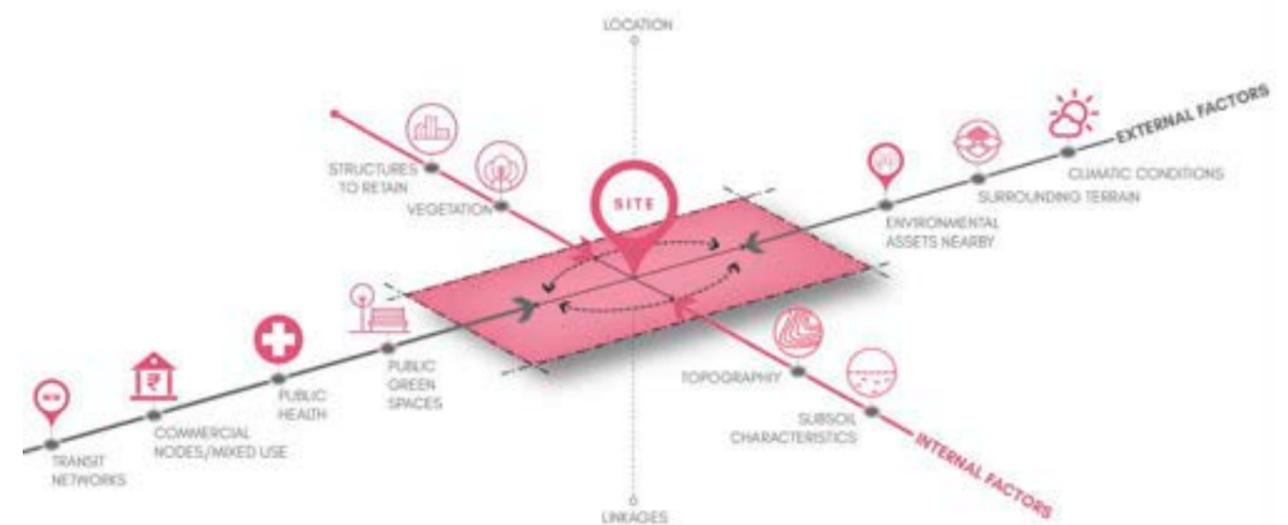


Figure 2 Site Planning Considerations

3.2.2 CONCEPT DEVELOPMENT AND MASTERPLAN FINALIZATION

The masterplanning process is complex, iterative and operates at multiple scales simultaneously. The following section describes the process sequentially for ease of understanding, however, designers must ensure that a feedback loop is built into the process. For example, while a designer may commence work on a project by pursuing a larger vision, it is critical for that vision to permeate through all scales of design including block and unit plans. Likewise, a strong unit plan can help orient the direction of the masterplan and therefore cannot be thought of in isolated terms. Thus, the whole-to-part and part-to-whole relationships must be thoroughly considered and holistically integrated to ensure a robust masterplan.

VISION, GOALS AND OBJECTIVES

The vision must be developed in a manner that is rooted in context, accommodates multi-stakeholder and community perspectives, and ensures a better quality of life for all residents. If the broad vision / theme has been provided in the design brief, the designer must respond to it and refine the same, as relevant. The vision must also consider future-proofing the plan, in anticipation of technological and other advances. Following this, goals and objectives will need to be crafted and at a minimum, identify customized approaches to achieving the broader public housing goals and objectives set forth in this document (see Chapter Two). Designers are strongly encouraged to include additional considerations which will have a positive impact on the development, on a case by case basis.

CONCEPT MASTERPLAN

The masterplan must be developed in accordance with the vision, goals and objectives outlined and must embed a logical yet creative exploration of relationships across different aspects of the plan. It must include comprehensive considerations that encompass planning, urban design, landscape, environment, engineering, social and architectural aspects, to name a few. For example, urban design will operate at the larger scale of groups of buildings, infrastructure, streets and public spaces and whole neighborhoods, with a goal of making the environment more equitable, performative and sustainable. Landscape design will comprise of crafting quality open spaces, and detailing out the specifics including the introduction of native vegetation, surface treatment, etc. The open spaces must also accommodate the livelihood and lifestyle needs of the residents. Similarly, other aspects mentioned will influence the crafting of a cohesive plan.

Given the constraints around unit sizes, the open space needs to compensate and assume the role of an extended living space / environment for the residents to have a better quality of life. In order to effectively translate the larger vision, goals and objectives into tangible physical plans, the designer is encouraged to create planning principles that will crystallize the ideas into a spatial construct. The masterplan should also demonstrate how the larger ideas can be incorporated through spatial interventions (e.g., introduction of a vehicle-free zone, pedestrian priority, etc.). These will consider various factors such as efficiency of site utilization, built density, open spaces, street character, skyline, pedestrian orientation, site gateways, possible nodes, safety and security, etc. This stage of the plan must also detail out the specifics such as proposed FSI and other parameters that will influence the development of detailed design.

BLOCK PLANS AND UNIT PLANS

Integral to the concept masterplan are block and unit plans and broad considerations for these should include (in addition to cohesiveness with the masterplan), building heights and units per floor that accommodate stakeholder preferences. Considerations of indoor environmental quality are also paramount in the development of block plans.

Furthermore, the block design is an outcome of the arrangement of housing units at every floor level of the building. The housing unit layout and dimensions are, therefore, influenced by the requirement to provide an efficient plinth area based on definitions of affordable housing. Unit plans are the core of any public housing project as they form the building block for the entire masterplan. It is also the space where residents are likely to spend maximum time and therefore must be designed with a strong focus on lived experience. Nuances in the unit plan design must consequently accommodate the needs of residents identified through the community engagement processes.

In addition, it is desirable for the living room and bedroom to have regular rectangular or square proportions for reasons of efficiency. The kitchen must be airy, bright and accommodate spaces for appliances (e.g., refrigerator). The provision of balcony or utility spaces is necessary to accommodate washing and other service needs within the unit. An ante-space in front of the toilet and bathroom is preferred; where possible, their doors should be placed away from the entry door for aesthetic and privacy reasons. Adequate storage spaces are also a critical part of the unit plan. Designs that allow for flexibility within the carpet area provided, are highly encouraged.

Clean air can be ensured by proper design of the housing units which ensures cross ventilation of air externally through proper orientation of buildings and naturally through unit designs that provide for the same. By virtue of its location near the coast, Chennai enjoys excellent wind movements and this must be factored into the design of housing. Thermal comfort in housing can be achieved through the orientation of buildings and unit design and this is a criteria used to distinguish a good housing layout from a bad one. The façade design of buildings, depends directly on the external wall elements such as sunshades, balconies, and window openings at the unit level. This should be modulated further by evaluating the visual experience of the overall built environment and key considerations such as location of the main access and open spaces, internal street fronting building façades, building entry levels and corners, etc.

MASTERPLAN PERFORMANCE

Once the concept masterplan is complete, it should be evaluated across the vision, goals and strategies set forth in this (RUDEF) document. Secondly, all frameworks and guidelines outlined in the chapters site planning, building design, open space design and livelihood and amenities, must be adhered to. If the masterplan complies with the objectives, framework and guidelines mentioned in this document (and possible future volumes), it may be considered ready for the next stage (i.e., detailed design development).

SITE PLANNING

Guiding Principles
Planning Parameters



Challenges faced by rapidly urbanizing cities and the housing crisis are interrelated and need to be addressed together. From an urban design perspective a well-planned and designed city can power housing integration and inclusivity.

EXECUTIVE SUMMARY

Holistic and sensitive site planning holds the potential for favorable masterplan performance outcomes and should be viewed as the foundational component of public housing design.

The external road networks which surround or provide access to the site, as well as the visual relationship of buildings within the site determine the position of the project in the city. The placement of buildings and their facades generate the street picture, which must harmonize, to the extent possible, with the rest of the buildings along the street.

The flow of vehicular and human circulation along the road and their experience of the housing project is a primary macro-level urban design input. Urban design defines every building as a building block with which the neighborhood and the city are constructed. Built form provides the generative basis for courtyards and gardens. This also has the advantage of increasing the open space potential within the layout. All land (open space) between buildings must be assigned a purpose and ownership to create a well-regulated image of the project from the city. Preferably, the project should not have a 'front and a back' so that the buildings present a wholesome picture from the streets and inner open spaces.

Secondly, skyline is an important aspect of urban design, although rarely implemented. A skyline is both an aesthetic and functional

aspect of design that is generated by buildings and their relationship with the sky. Instead of all the building blocks reaching the same height, the FSI and coverage permitted by the development control rules and building bye-laws can be used creatively to generate variations in the skyline, without compromising on the total built-up area (or in the case of public housing units, the maximum number of units that can be accommodated). Introducing a skyline gives identity to specific buildings, prevents a 'sameness' and also helps in wayfinding and legibility in the housing schemes. This provides a sense belonging for the residents.

This chapter has two sub-sections. The '**Guiding Principles**' section outlines a series of guidelines for qualitative elements to foster creativity and encourage best practices between the built and unbuilt environment. Specific technical considerations are addressed under the '**Planning Parameters**' sub-section.

Notes:

1. This chapter should be read in conjunction with Chapter Two, Chapter Five, Chapter Six and Chapter Seven.
2. The guidelines should be addressed in addition to the applicable national and state regulations which must be adhered to.

4.1 GUIDING PRINCIPLES

02 VEHICULAR CIRCULATION

The road network and other shared spaces that permit vehicular entry. A street is the basic unit of a road network, through which people experience a city.²⁵ Streets are dynamic spaces that adapt over time to support environmental sustainability, public health, economic activity, and cultural significance.²⁴

05 NEIGHBORHOODS

A spatial unit that has a specific geographic area and functions as a set of social networks which foster face-to-face interactions in personal settings and situations.²⁷

08 SKYLINE

A horizon that is interrupted by verticals, expressed and articulated as a variation in built form heights. It creates a collective, coherent image and a silhouette against the sky.³⁰

03 PEDESTRIAN NETWORK

Spaces that are pedestrian-friendly and include footpath along the streets, walkways connecting amenities across the site as well as pathways within the landscape.

06 STREET FRONTAGE

External street frontage refers to the property boundary that abuts the street (in some cases two or more streets).²⁸ Street frontage also includes the space between the building façade and the through zone of the pedestrian realm of the street. Internal street frontage refers to the buildings and spaces that define internal streets/access roads/drive way.

09 SAFETY AND SECURITY

Safety is the condition of being protected from harm or other non-desirable outcomes, caused by unintentional failure of design and other human or natural externalities. Security is the condition of being protected from harm or other non-desirable outcomes caused by intentional human actions or behavior.³¹

01 ENTRANCE GATEWAYS

Locations that act as transitions between the inside and outside and anchor entry or departure points, commonly manifested as a clearly defined and visually impressive space.

04 OPEN SPACE

An area forming an integral part of the site left, open to the sky.²⁵ It includes any piece of land that is undeveloped and is accessible to the public.²⁶ Open spaces may be landscaped (e.g., parks), hold programs (e.g., playgrounds, public plazas, etc.) or activate social amenities. It can also include land reserved for the Sewage Treatment Plant (STP), vacant lots, to name a few.

07 NODES

Strategic and important points in a site, that include street intersections or junctions, landmark programs of a site or community gathering spaces,²⁹ serving as either destinations, or points of transition.

10 UNIVERSAL ACCESSIBILITY

The design and composition of an environment that can be accessed, understood and used to the greatest extent possible by all people regardless of their age, gender, or ability.³²

4.1.1 ENTRANCE GATEWAYS

INTENT

Enable legibility at access points; create a welcoming entry into public housing projects.

APPLICABILITY

The guidelines will apply to the design of access points for the site and the crafting of spaces around it.

GUIDELINES

- 4.1.1.1 All access points must be clearly defined and must be kept free from any physical or visual obstructions to allow uninterrupted and convenient flow of vehicular and pedestrian traffic.
- 4.1.1.2 Vistas and signages should be introduced to orient the people coming to the site and those within.
- 4.1.1.3 The entry experience can be enhanced through the introduction of built elements (e.g., physical structures, detailing of housing blocks, placement of key amenities, etc.) or landscape components (e.g., public art installations, distinctive planting design, etc.).

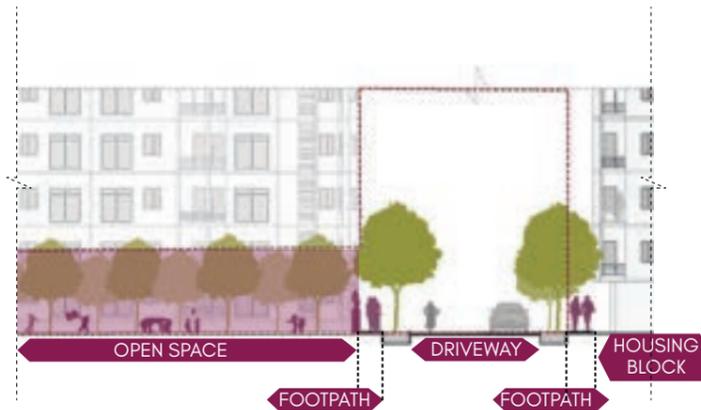


Figure 3 Gateway Defined by Public Housing and Open Space

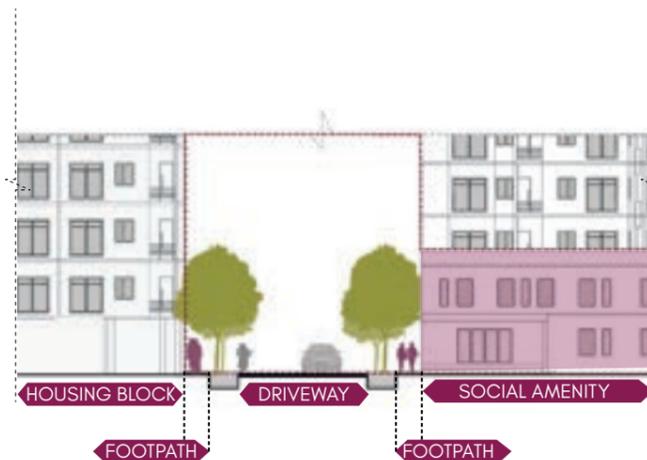


Figure 4 Gateway Defined by Public Housing and Social Amenity

4.1.2 VEHICULAR CIRCULATION

INTENT

Plan an efficient vehicular circulation network that optimizes traffic flows within site and eases the traffic outflow from the site, while ensuring pedestrian paths are uninterrupted. Create pedestrian-friendly spaces for engaging with the built environment alongside vehicular circulation.

APPLICABILITY

The guidelines will apply to the design of streets within public housing projects including the thoroughfare, footpath and landscaping.

GUIDELINES

- 4.1.2.1 Circulation must have a clear hierarchy and distinguish between primary, secondary and tertiary vehicular routes based on the masterplan and proposed traffic flows. If the masterplan has cul-de-sacs in the tertiary network, they should be planned adjacent to active uses and / or made pedestrian-friendly (e.g., through surface treatment etc.) to promote passive surveillance.
- 4.1.2.2 Safe pedestrian crossings must be provided at the intersection of vehicular-vehicular and vehicular-pedestrian networks.
- 4.1.2.3 Landscape must be integrated in the streets (along the median or planting zones) to create a shaded vehicular network; this will contribute to the improved microclimate and the reduction of heat island effects.⁵⁵ Specifically, streets can have a dedicated planting zone as per the IRC guidelines. These are typically placed adjacent to the footpath.
- 4.1.2.4 All vehicular networks should connect to parking directly or indirectly (e.g., through shared open spaces).
- 4.1.2.5 Footpaths can be provided as per the IRC guidelines and should be designed to be

- more than linear circulation zones and as engaging pedestrian-friendly spaces for urban communities. They should have adequate shading and seating (in the case of long stretches⁵⁴), and be sufficiently buffered from traffic for safety.
- 4.1.2.6 Footpaths can be conceived as covered walkways for weather protection, as relevant.
- 4.1.2.7 In addition to carrying necessary stormwater and other infrastructure provisions, streets can function as conduits for WSUD elements and sustainable infrastructure such as bioswales.
- 4.1.2.8 Street can be activated through the introduction of programs, either permanent (e.g., small congregation spaces at the building-street interface, etc.) or temporary (e.g., street theatre performances, etc.)
- 4.1.2.9 Streets can be designed in a manner that accentuates vistas and other key destinations in the masterplan.

- Main Road
- Parking
- Primary Network
- Secondary Network
- Tertiary Network
- Parking
- Secondary Road

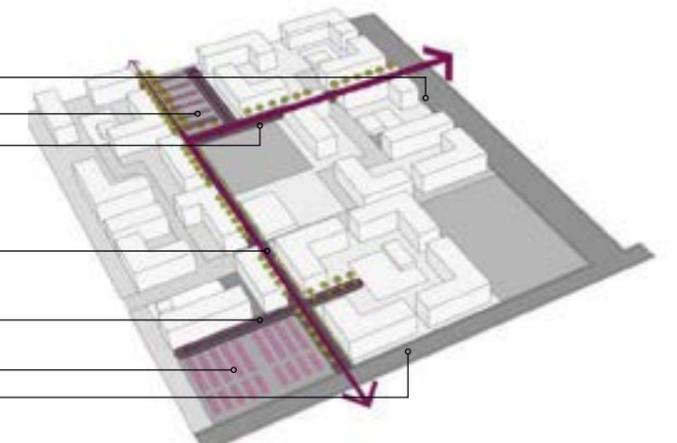


Figure 5 Vehicular Circulation Hierarchy

4.1.3 PEDESTRIAN NETWORK

INTENT

Create a contiguous, unobstructed and safe network of spaces for pedestrians which will foster a healthy lifestyle and enhance the quality of life for residents.

APPLICABILITY

The guidelines will apply to site planning and the design of vehicular networks in combination with pedestrian infrastructure provisions.

GUIDELINES

- 4.1.3.1 Continuous, unobstructed and clearly defined pedestrian connections must be created in all parts of the site.
- 4.1.3.2 Primary and secondary pedestrian networks must be created to connect to key locations within (e.g., major and minor nodes, parking, etc.) and outside (e.g., transportation hubs, commercial hubs, etc.) the site. Where possible, dedicated pedestrian networks can be provided.
- 4.1.3.3 The surface of the pedestrian network must be even; if it is along sloping terrain, the gradient must follow universal accessibility standards and include necessary additional provisions e.g. slip-resistant material, etc.
- 4.1.3.4 Pedestrian networks must have tactile ground surface indicators and adhere to other universal accessibility requirements.³⁵
- 4.1.3.5 Wherever possible, porous paving and cool pavement materials should be used.
- 4.1.3.6 Walkways (e.g., shared areas within the masterplan used for circulation) can be provided as per the National Building Code. Pathways within the landscape can be narrower as they may be less traversed.
- 4.1.3.7 The pedestrian network can be planned such that they are along shaded areas (which can be achieved through appropriate building orientation and landscape design).



Figure 6 Pedestrian Network: Footpath

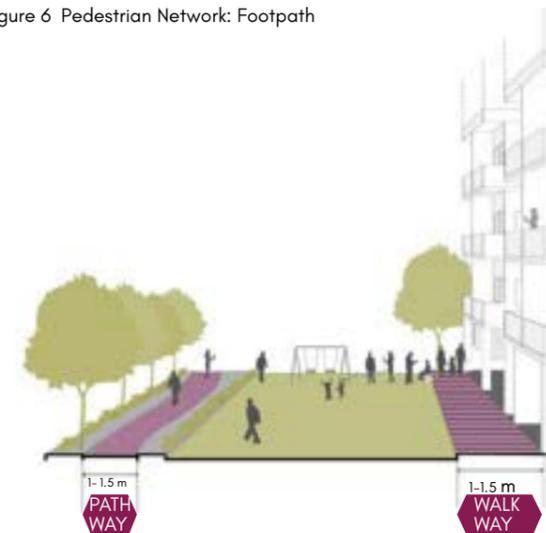


Figure 7 Pedestrian Network: Walkway and Pathway

4.1.4 OPEN SPACE

INTENT

Create public spaces with active and engaging programs that foster a sense of community and belonging and enhance the quality of life for residents.

APPLICABILITY

The guidelines will apply to the design of all undeveloped land parcels including the Open Space Reservation (OSR).

GUIDELINES

- 4.1.4.1 Open spaces must have a clear hierarchy and connect seamlessly to pedestrian networks as well as built forms within the masterplan.
- 4.1.4.2 The Open spaces must be activated through appropriate programming.
- 4.1.4.3 Open spaces can be defined through built edges in a neighborhood which will help create a sense of ownership.
- 4.1.4.4 A variety of scales and programs can be introduced in the open space network so as to create a vibrant and inclusive public realm, catering to the needs of different groups of people.
- 4.1.4.5 Large open spaces can be activated through the introduction of social amenities, within or adjacent to them.

DIVERSITY OF PROGRAMS

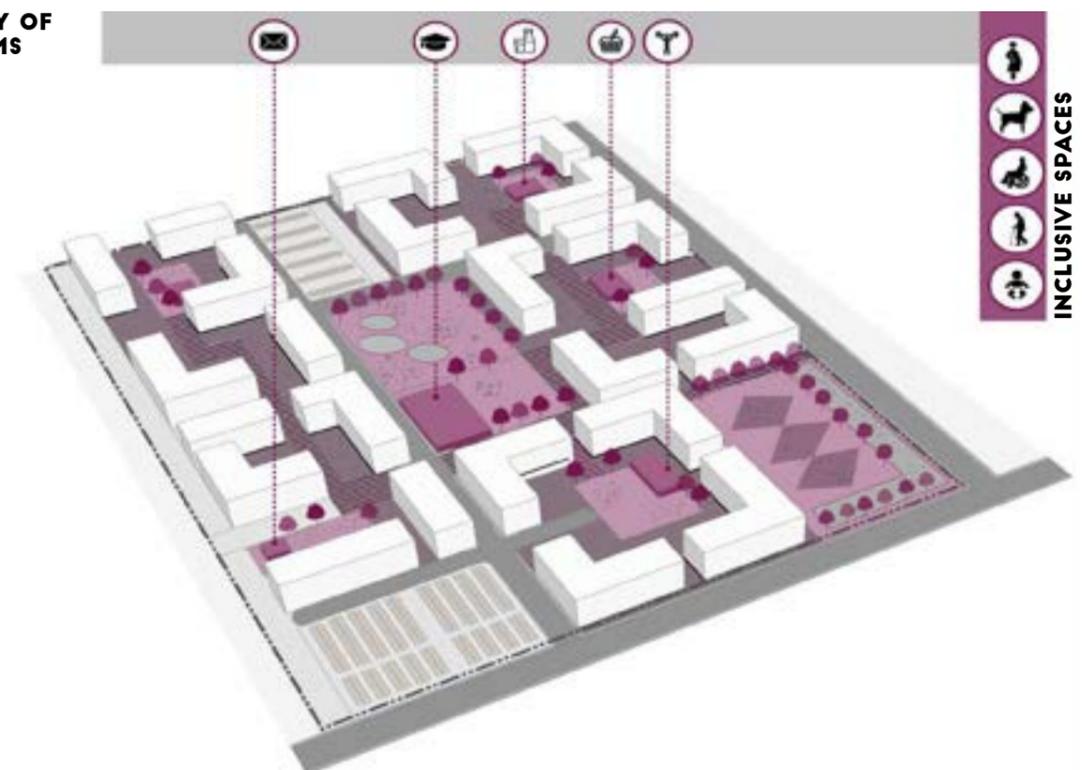


Figure 8 Open Space Hierarchy and Activities

4.1.5 NEIGHBORHOODS

INTENT

Design spatial units of an appropriate human-scale to (i) foster a sense of community (ii) realize common values (iii) create belonging and ownership and (iv) maintain effective social control.

APPLICABILITY

The guidelines will apply to multiple aspects of masterplanning including the distribution strategy of residential blocks, social amenities and open spaces.

GUIDELINES

- 4.1.5.1 In case of large projects or high-rise developments comprising of more than 5000 people³⁶, the housing scheme must be divided into self-sustaining, logical parts (i.e., neighborhoods) that are safe and provide a sense of identity for a group of residents. This can be achieved through the planning of common amenities, open spaces as well as building design within the neighborhood.
- 4.1.5.2 In case of smaller projects, it is preferable to still apply the neighborhood concept at an appropriate scale.
- 4.1.5.3 Neighborhoods across the housing scheme must be connected through a pedestrian pathway which will promote walkability and help access site-wide amenities.
- 4.1.5.4 Neighborhoods within the housing scheme must not have any barriers such as compound walls and should be defined through building form and open spaces.
- 4.1.5.5 Social amenities must be equitably distributed across neighborhoods.
- 4.1.5.6 To the extent possible, a relatively similar scale and ratio of open spaces should be planned across all neighborhoods.
- 4.1.5.7 The division of neighborhoods can be derived from various considerations including (i) spatial (ii) thematic (e.g., introducing a type of amenity such as a library will give the neighborhood an 'educational' theme) (iii) demographic profile of beneficiaries (e.g., grouping residents who have been relocated from the same area together in the new site, etc.).
- 4.1.5.8 Sites without the potential to create strong neighborhoods, such as linear/odd-shaped sites, can create legible spatial units by logically clustering buildings and open spaces.



Figure 9 Defining Neighborhoods through Built Form and Open Spaces

4.1.6 STREET FRONTAGE

INTENT

Promote public housing projects with active, safe street edges and ensure seamless integration with the surrounding context; through the crafting of internal street frontages, create an engaging pedestrian experience within the project.

APPLICABILITY

The guidelines will apply to site setbacks, building orientation and alignment with respect to adjoining streets and the design of building façades.

GUIDELINES

- 4.1.6.1 A continuous, pedestrian-scale street frontage must be created, in order to engage with the surroundings both spatially and programmatically.
- 4.1.6.2 In case large setback spaces are required along primary street frontages, they must be visually and programmatically treated such that they are active and engaging.
- 4.1.6.3 If the frontage is long, active pockets of space must be created and the building mass should be distributed such that it avoids a 'wall effect'.
- 4.1.6.4 The built facades facing the street edges should not be left blank; they can be articulated through punctures, openings, balconies, etc. to create an engaging street front.
- 4.1.6.5 Where possible, social amenities should be introduced along active street fronts to modulate the length of the building form, create a variety of experiences as well as opportunities for interaction.
- 4.1.6.6 Street edges (especially along internal streets) can also be activated through the introduction of ground floor units and their entrances as well as spillover spaces such as verandahs.
- 4.1.6.7 Activating stilt floors, wherever applicable, can be used as a strategy to create visual connections into the development; where permissible, providing specific and dedicated programs/spaces in the stilt floor (e.g., parking and spaces for informal interaction) can also promote safety through passive surveillance.

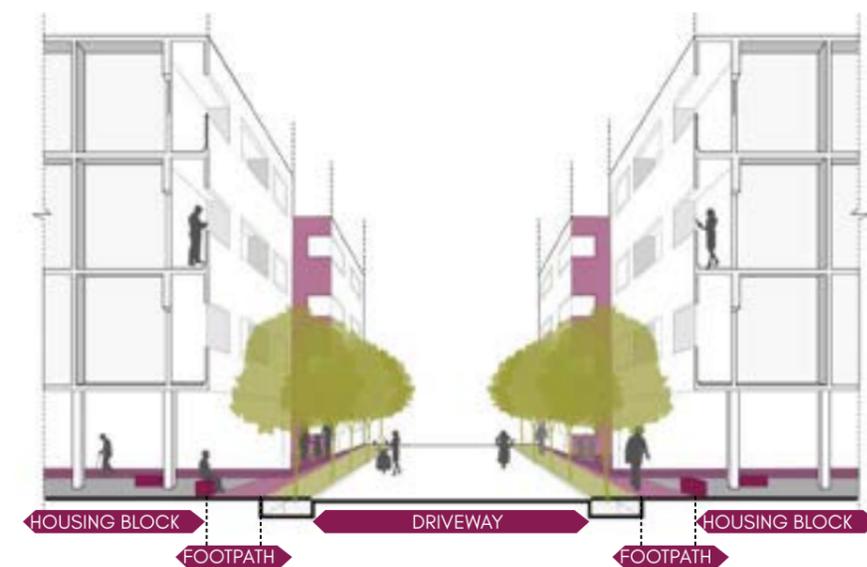


Figure 10 Active Street Frontage

4.1.7 NODES

INTENT

Establish place anchors at key locations to enable legibility and easy wayfinding; activate open spaces and buildings.

APPLICABILITY

The guidelines will apply to the planning and placement of social amenities, open spaces, landmarks, public art and other activity centers within the site.

GUIDELINES

- 4.1.7.1 Nodes created must not all be concentrated at one location and must be distributed across the housing scheme.
- 4.1.7.2 The planning and design of nodes must not obstruct vehicular and pedestrian circulation.
- 4.1.7.3 In general, intersection points have the potential to be designed as interesting nodes. They can be placed at regular intervals (e.g., based on walking distances such as 1 min. walk, 3 min. walk, 5 min. walk, etc.) to create an engaging journey within the site.

- 4.1.7.4 Nodes can include built form (e.g., social amenities) as well as landscape (e.g., public art installations in pocket parks, small gathering spaces) elements and incorporate wayfinding strategies (e.g., articulation of building form, signage, etc.) to orient people within the site.
- 4.1.7.5 The thematic focus of the nodes can vary (e.g., commercial, educational, etc.) to create variety and interest.

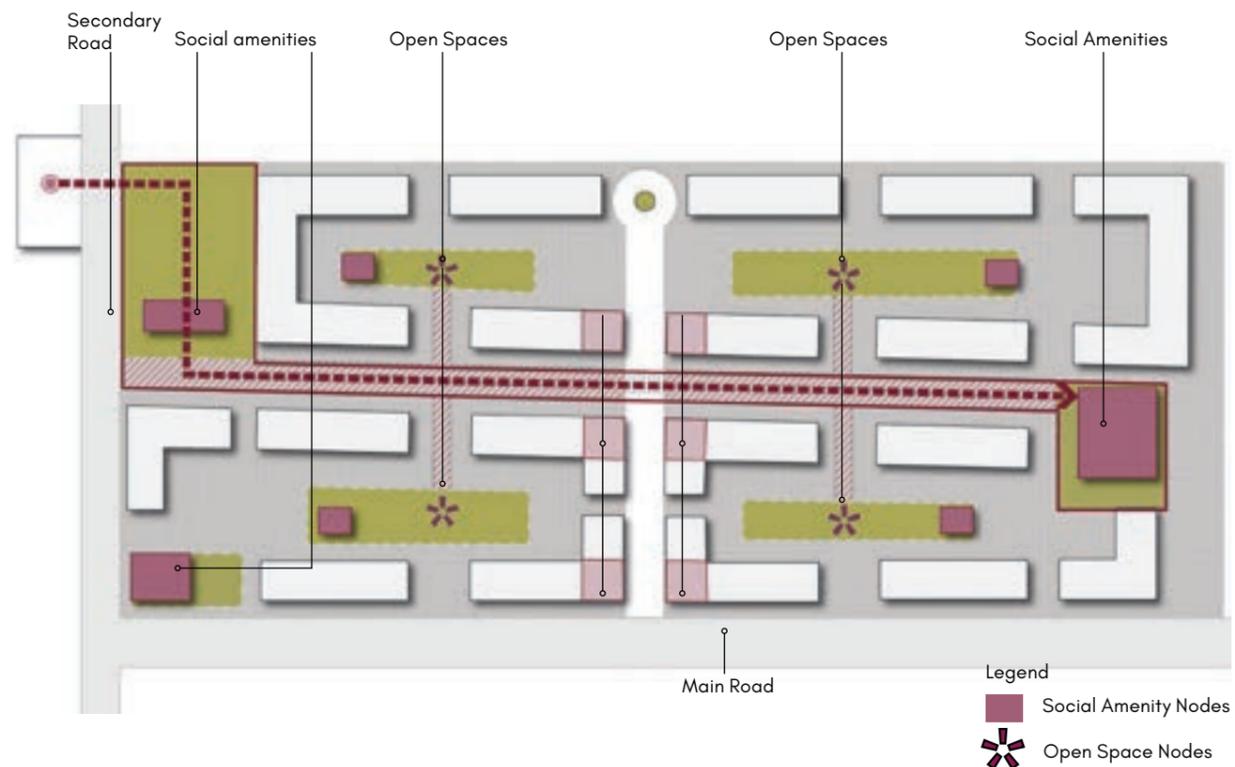


Figure 11 Placement of Nodes

4.1.8 SKYLINE

INTENT

Create legibility, visual interest and identity, while coherently connecting the site to its surroundings.

APPLICABILITY

The guidelines may apply to the heights of all buildings in the masterplan.

GUIDELINES

- 4.1.8.1 The heights of the built form can be modulated so as to avoid a “wall effect” along the street edges and within the development. This is especially important in the case of long blocks.
- 4.1.8.2 Height variations can be across building blocks on a site, or within the same block.
- 4.1.8.3 Height variations can be rationalized based on design considerations such as panoramic views to key site amenities or assets surrounding the site.
- 4.1.8.4 Where possible, terraces can be transformed into usable public spaces.

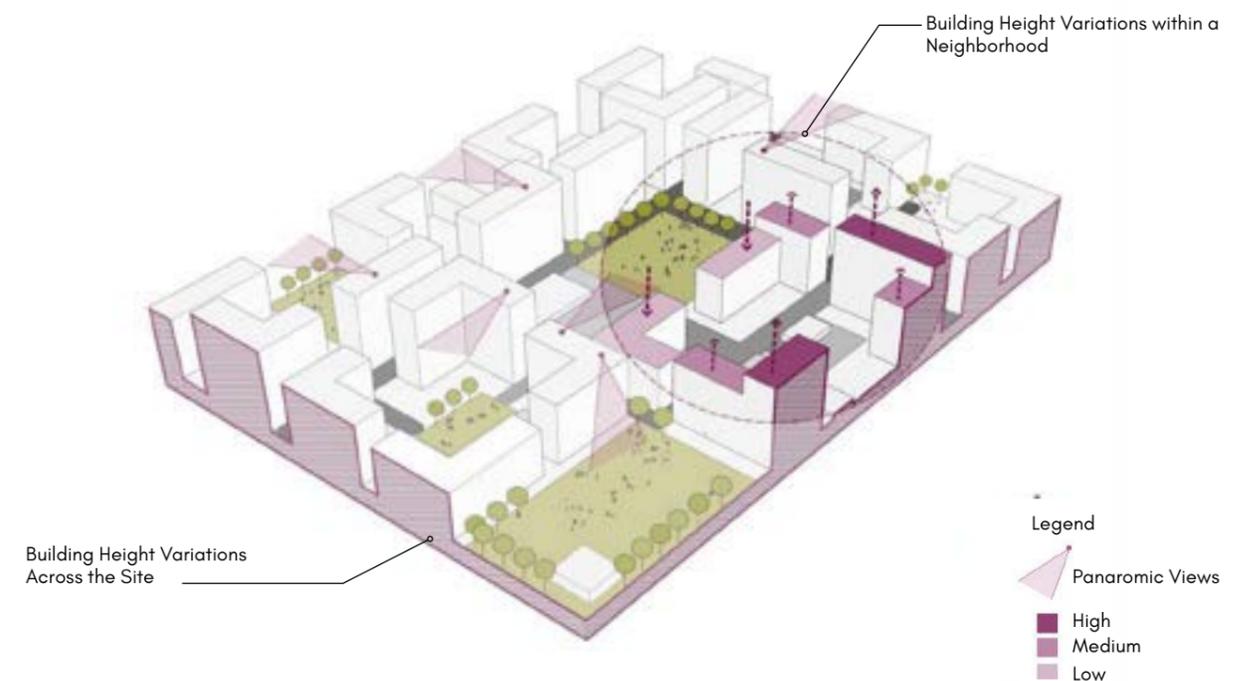


Figure 12 Skyline

4.1.9 SAFETY AND SECURITY

INTENT

Provide a safe environment for all people, especially women, children, and other vulnerable populations.

APPLICABILITY

The guidelines will apply to the design of housing and other building blocks including their common areas, public open spaces, and other social amenities.

GUIDELINES

- 4.1.9.1 Consistent and uniform levels of illumination must be provided throughout the site to prevent pockets of shadows or glare where an adult-size person could gain concealment.³⁷
- 4.1.9.2 Corridors, parking, and other spaces must have adequate natural and/or artificial lighting.
- 4.1.9.3 All building entrances, parking, and open spaces must have clear sightlines and be visible from adjacent buildings. Entrances such as stair cores and lifts should be placed such that they face active open spaces to promote passive surveillance.
- 4.1.9.4 Long blank walls on building elevations must be avoided, especially along main street frontages and open spaces; 'Eyes on the Street' can be ensured by placing habitable rooms with windows, verandas, and balconies along outdoor spaces.
- 4.1.9.5 Play areas for children must be situated such that there can be passive surveillance; placing their activities close to the main entrances and exits should be avoided.
- 4.1.9.6 All open spaces should be programmed and / or be amenable to informal activity.
- 4.1.9.7 Social amenities should be placed in active and prominent areas to make them more visible and approachable.
- 4.1.9.8 All principles of CPTED should be adopted such as providing adequate lighting, minimizing concealed and isolated routes, avoiding entrapment, and reducing isolation.³⁸
- 4.1.9.9 Streets can be designed to reduce opportunities for crime including, but not limited to, making access points to neighborhoods visible, minimizing conflict between pedestrian and vehicular traffic to encourage pedestrian activity, etc.

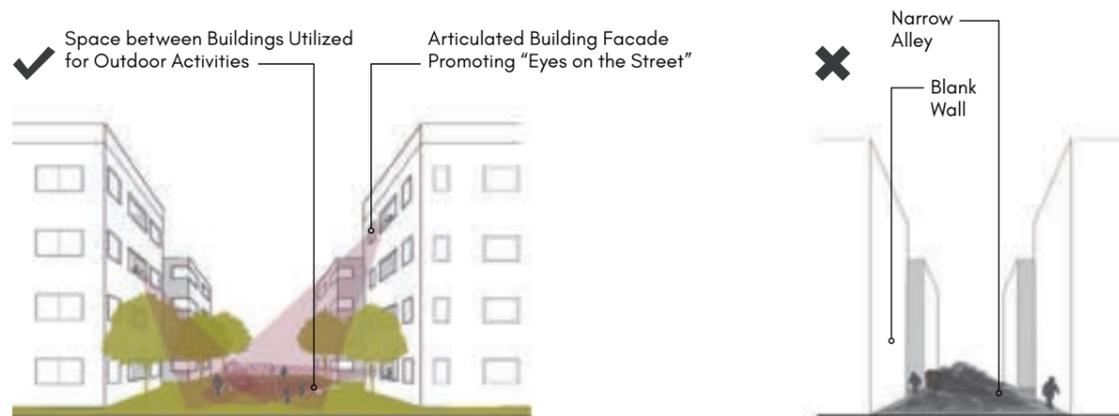


Figure 13 Crime Prevention Through Environmental Design

4.1.10 UNIVERSAL ACCESSIBILITY

INTENT

Design housing projects such that they are usable by all people without the need for adaptation or specialized design.³⁹

APPLICABILITY

The guidelines will apply to the design of all elements within the site that can assist in relation to creating a barrier-free environment such as the design of access to public and residential buildings, individual units, pedestrian pathways and public spaces.

GUIDELINES

- 4.1.10.1 In case the site has contours, the slope along universally accessible public pathways must not have a gradient greater than 5%.
- 4.1.10.2 All buildings must have ramp access at the entrance as per prevailing national standards, as well as within the building in case of variation in floor planes. If an entrance ramp is provided, separate steps may not be required.
- 4.1.10.3 Five percent of the total number of units must be provided with a barrier-free environment, preferably on the ground floor, as per the National Building Code.
- 4.1.10.4 At least one access path from the plot entry and surface parking to building entrances should be a minimum of 1.8 m wide and have an even surface without any steps. Slope, if any, should not have a gradient greater than 5%.

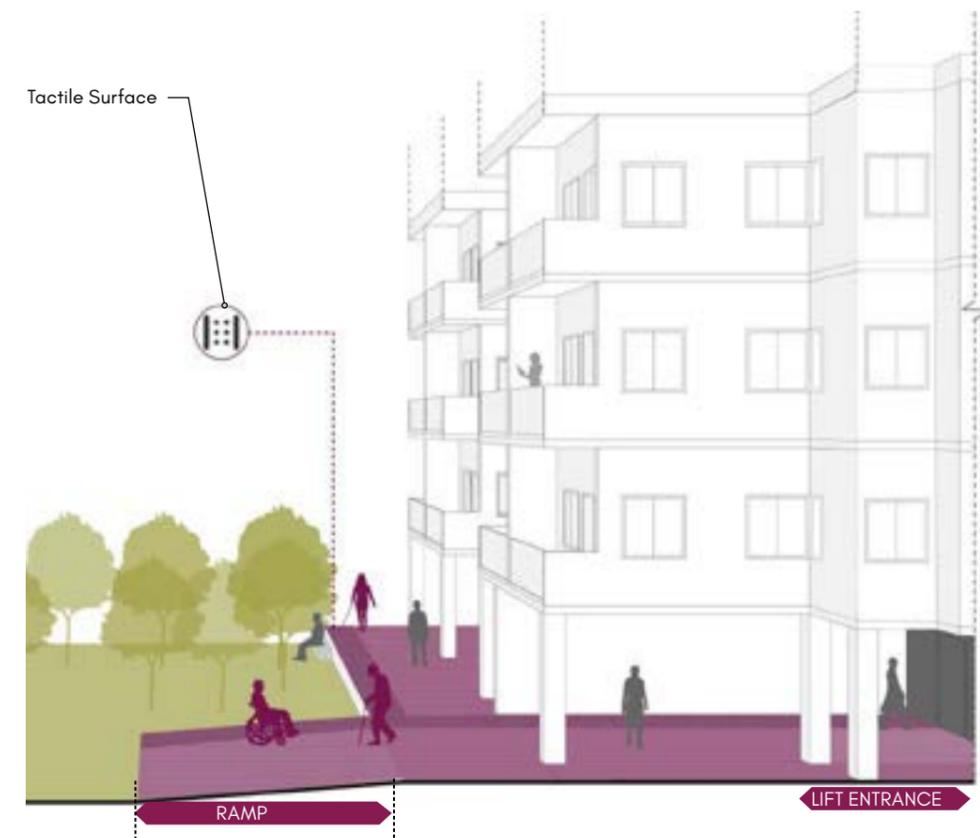


Figure 14 Universal Accessibility - Building Entrance

4.2 PLANNING PARAMETERS

03 PARKING

An area enclosed or unenclosed, covered or open, sufficient in size to park vehicles, together with a driveway connecting the parking space to a street or an alley and permitting ingress and egress of the vehicle.⁴²

01 SITE ACCESS AND SETBACK

Site access: a clear approach to a plot.⁴⁰

Site setback: open space at the front, sides, or rear of a plot between the building and street or boundary of the plot, as the case may be.⁴¹

04 TREATMENT PLANTS

The equipment required for the process of removing contaminants from wastewater, primarily from household sewage. The by-product of sewage treatment is usually a semisolid waste or slurry, called sewage sludge that has to undergo further treatment before being suitable for disposal or further application.⁴³

02 SPACE BETWEEN BUILDINGS

The minimum distance between any two building blocks within the site.

05 ELECTRICAL SUBSTATION

A Substation is a part of an electrical generation, transmission, and distribution system. It transform voltage from high voltage to low voltage and the reverse or perform any of several other important functions ⁴⁴.

4.2.1 SITE ACCESS AND SETBACK

INTENT

Define the site entry based on external factors such that it connects and integrates with its surroundings, including important transit points. Ensure environmental protection, safety, security and privacy while creating a coherent image of the project.

APPLICABILITY

The guidelines will apply to the design, location, and number of site entries, as well as the planning of setback at the front, rear, and sides of the site.

GUIDELINES

- 4.2.1.1 In addition to clearly delineated vehicular access points, dedicated pedestrian entry/exit points can be provided to create safe and convenient access to public transportation nodes and other key amenities near the site.
- 4.2.1.2 Planting can be provided such that the setbacks are treated aesthetically.



Figure 15 Setback Space- Use Cases

4.2.2 SPACE BETWEEN BUILDINGS

INTENT

Provide adequate distance between buildings and treat the space appropriately.

APPLICABILITY

The guidelines will apply to the planning and placement of all buildings within the site.

GUIDELINES

- 4.2.2.1 The space must be designed in a manner that it integrates with the rest of the masterplan, is contiguous and barrier-free.
- 4.2.2.2 Building elevations facing the spaces between buildings should be designed with openings (e.g., windows, balconies, etc.) to activate the areas and reduce isolation by maintaining sightlines.
- 4.2.2.3 Spaces between buildings can be conceived of as public spaces and can be programmed to avoid disuse.
- 4.2.2.4 Planting and seating can be provided in these spaces to encourage people use.

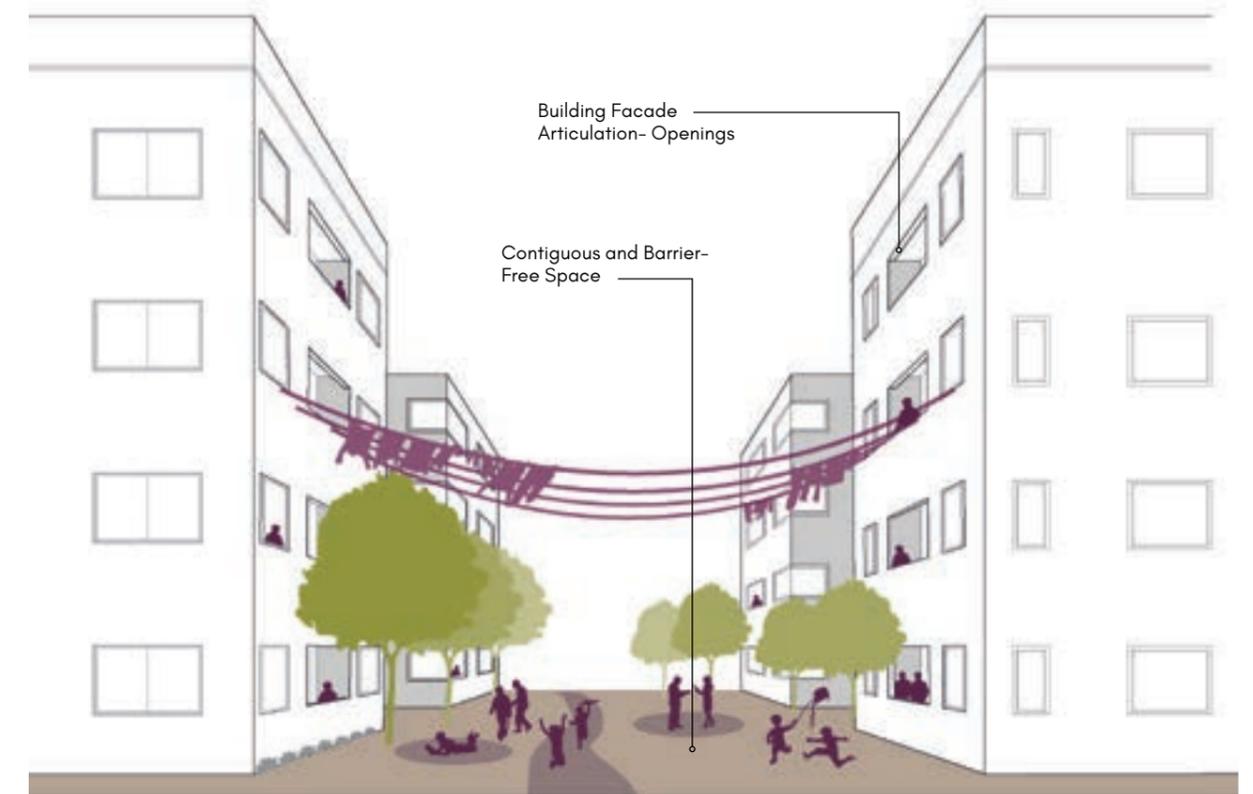


Figure 16 Space between Buildings- Pocket Open Spaces

4.2.3 PARKING

INTENT

Provide adequate and secure spaces to place vehicles of residents, visitors, and other users.

APPLICABILITY

The guideline will apply to the layout and design of parking spaces.

GUIDELINES

- 4.2.3.1 Parking entries and exits must be placed away from busy intersections to minimize traffic disruptions.
- 4.2.3.2 Parking areas for residents must be easily accessible from their respective housing blocks. Where possible, the total parking required can be distributed across the site and located within close proximity to key access roads.
- 4.2.3.3 In the case of stilt parking, entry and exits must be clearly designated and defined pedestrian entries into the blocks must be provided.
- 4.2.3.4 Pathways connecting parking areas to residential blocks and amenities should be contiguous, safe and well-lit.
- 4.2.3.5 Shade trees, native planting, porous paving and/or equivalent environmentally friendly materials should be introduced in parking lots to minimize heat gain and increase percolation.

- 4.2.3.6 Adequate seating should be provided (preferably adjacent to shade trees and structures), especially in large parking lots.
- 4.2.3.7 If the site has contours, relatively flat areas should be chosen for parking to minimize cut and fill costs.
- 4.2.3.8 A certain percentage of additional parking (especially for three and four-wheelers) can be provided to accommodate vehicles owned by residents for professional purposes (e.g., driver-owned autos, cars, etc.).
- 4.2.3.9 Parking areas can be designed as transition spaces between vehicular and pedestrian networks and integrated with the overall open space design.
- 4.2.3.10 Temporal programming can be introduced to activate parking lots and stilt parking areas to maximize their utilization.

- Parking Connected to Open Space Network
- Environmentally Friendly Design
- Parking Lot with Seating
- Surface Parking: Porous Paving

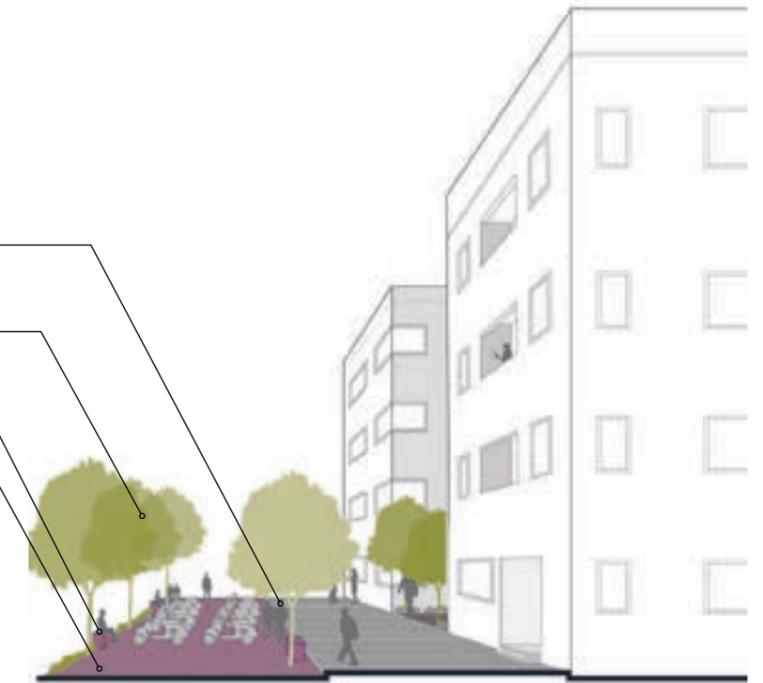


Figure 17 Surface Parking Lot Considerations

- Stilt Parking
 - Clear Vehicular Path for Entry/Exit
 - Pedestrian Connection to Stilt Floor
- Legend
- Vehicular Path
 - Pedestrian Path



Figure 18 Stilt Parking Considerations

4.2.4 TREATMENT PLANTS

INTENT

Reduce the waste or sewage outflow from the development such that it does not pollute natural resources; provide opportunities to reuse treated water.

APPLICABILITY

The guideline will apply to the planning and design of the Sewage Treatment Plant (STP) within the site.

GUIDELINES

4.2.4.1 In areas where sewerage system provided by the local body concerned is available, the services of the local body can be utilized. If the built-up area is more than 20,000 sq.m, an STP should be provided as per relevant regulatory standards.

Government of India for domestic sewage discharge) must be ensured. If discharge is on open land, BOD level should be tested at the edge of the project site. If discharge is in a natural drain or water body, BOD level should be tested at point of merging with the natural drain or water body.

4.2.4.2 For built up area less than 20,000 sq.m., in areas where sewerage system provided by the local body concerned is not available, appropriate treatment to achieve Biological Oxygen Demand (BOD) levels (prescribed by the Ministry of Environment and Forests,

4.2.4.3 The STP should ideally be located in the lowest contour of the site to take advantage of gravitational flows.

4.2.4.4 Through appropriate treatment, recycle and reuse of greywater should also be ensured.



Figure 19 Placement of Treatment Plant

4.2.5 ELECTRICAL SUBSTATION

INTENT

Provide power supply to the residents of the development.

APPLICABILITY

The guidelines will apply to the planning of electrical infrastructure in the site.

GUIDELINES

4.2.5.1 In the project site area, 0.5% of the area should be earmarked for sub station or distribution transformer as per TNCDDBR.

4.2.5.2 The floor level of the substation should not be the lowest point of the site.

4.2.5.3 For installment of transformer, a clear space of 10m x 4m or 5m x 5m open to sky and having an approach road of width not less than 3 meters, upto the public road should be provided within the site, preferably at the main entrance as per TNCDDBR.



Figure 20 Placement of Electrical Substation

BUILDING DESIGN

Building Typology and Profile
Building Form and Orientation
Unit Design
Indoor Environmental Quality
Common Areas and Services
Visual Quality



Buildings are beyond brick and mortar. They are emotive structures that influence our minds, thereby impacting our everyday lives in profound ways.

EXECUTIVE SUMMARY

Building design for public housing involves a three-dimensional conceptualization of private, semi-private and public spaces, and the thresholds of interaction among these spaces. The basic block of housing design is the housing unit, which embodies the lifestyle and aspirations of the family residing in it. Typically, housing units are arranged in a logical and standardized manner to create a cluster, which when stacked vertically, forms the building block. These blocks could be low or high-rise, as needed. Sensitively designed housing blocks have the ability to improve social well-being and a community's sense of pride in the neighborhood. This, in turn, can positively influence people's willingness to accept new development.

Several challenges may be faced by a designer in the conceptualization of housing blocks, including the necessity to fit a large number of units in a constrained land area, without compromising on fire code requirements, thermal comfort, privacy and other critical factors. Considerations such as typologies to introduce may need to be viewed in the context of cultural and social preferences, in addition to climatic constraints. Further, introducing low-cost measures and techniques are important as housing blocks form the core of the project and absorb a significant amount of the project budget. On the one hand, these practical considerations need to be addressed, while on the other, aspects such as visual quality need to be appropriately

engaged to create a cogent, well-designed and high-quality environment.

Given the breadth of aspects to address, the chapter is divided into the following sub-chapters:

- Building Typology and Profile
- Building Form and Orientation
- Unit Design
- Indoor Environmental Quality
- Common Areas and Services; and
- Visual Quality

In addition to the guidelines provided in this document, the project will benefit from adhering to green building and energy-efficiency codes such as Excellence in Design for Greater Efficiencies (EDGE)⁴⁵ (created by International Finance Corporation (IFC)) or similar, and Energy Conservation Building Code (ECBC)⁴⁶ (launched by the Ministry of Power, Government of India) respectively, to name a few.

Notes:

1. This chapter should be read in conjunction with Chapter Two, Chapter Four, Chapter Six and Chapter Seven.
2. The guidelines should be addressed in addition to the applicable national and state regulations which must be adhered to.

5.1 BUILDING TYPOLOGY AND PROFILE

01 SINGLE-LOADED

A corridor that runs along an external or atrium face of a building. The associated units are accessed from one side of the corridor only.⁴⁷

03 COURTYARD

A block profile that allows a building to enclose an exterior space. Most common courtyard block types are U-shaped blocks and perimeter blocks.⁴⁹

02 DOUBLE-LOADED

A corridor that is enclosed within the building. Units are accessed from both sides of the corridor.⁴⁸

04 REGULAR

Block profiles with varying unit arrangements i.e., units may be placed in different ways to form an 'I-block' profile, 'L-block' profile etc.

5.1.1 SINGLE-LOADED

INTENT

Provide a naturally lit, ventilated corridor; where relevant, orient the building to provide a preferred view from all the unit entrances.⁵⁰

APPLICABILITY

The guidelines will apply to the design and placement of circulation space (corridors) within a residential block.

GUIDELINES

- 5.1.1.1 When a single-loaded corridor is provided, the design of the parapet wall must ensure adequate safety for all residents, especially children.⁵¹
- 5.1.1.2 The corridor should have necessary weather protection which can additionally serve as aesthetic elements.⁵²
- 5.1.1.3 If windows of units are facing the corridors, design considerations should ensure privacy.

- 5.1.1.4 Single-loaded corridors can be limited to low floors since external corridors can feel unsafe in higher floors. If provided in taller buildings, full-height porous elements such as grills and screen walls (*jali*) can be considered to allow light and ventilation, while not compromising on safety.
- 5.1.1.5 Corridors can become social spaces by providing additional space for architectural elements like seating; enabling a 'street type' social interaction through such design interventions can encourage living on the upper floors.

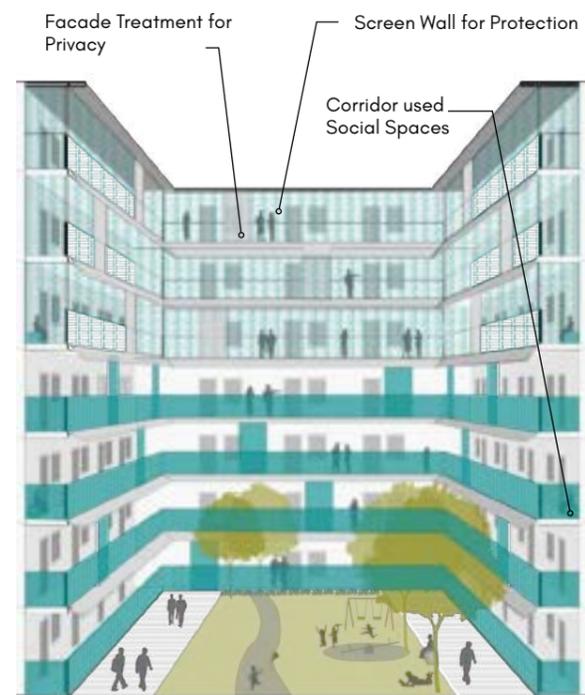


Figure 21 Single-Loaded Corridor Treatment

5.1.2 DOUBLE-LOADED

INTENT

Increase efficiency of circulation space and create the potential for double-fronted buildings on sites where this is appropriate.⁵³

APPLICABILITY

The guidelines will apply to the design and placement of circulation space (corridors) within a residential block.

GUIDELINES

- 5.1.2.1 To ensure safety and privacy, unit entrances must not face staircases or lift entrances directly; they must be staggered and a clear space in front of exit-cores at each floor must be provided.⁵⁴
- 5.1.2.2 Sufficient breaks in the form of openings must be given in the corridor to provide natural lighting and ventilation. Parapets provided in these areas must ensure safety for all residents, especially children.
- 5.1.2.3 Artificial lighting should be provided such that adequate lux levels as per prevailing

- code requirements are adhered to.
- 5.1.2.4 If windows of units are facing the corridors, design considerations should ensure privacy.
- 5.1.2.5 Gathering and viewing decks can be introduced to provide respite from long and enclosed corridor spaces.
- 5.1.2.6 The double-loaded typology can be combined with a single-loaded typology to create composite blocks, if required.

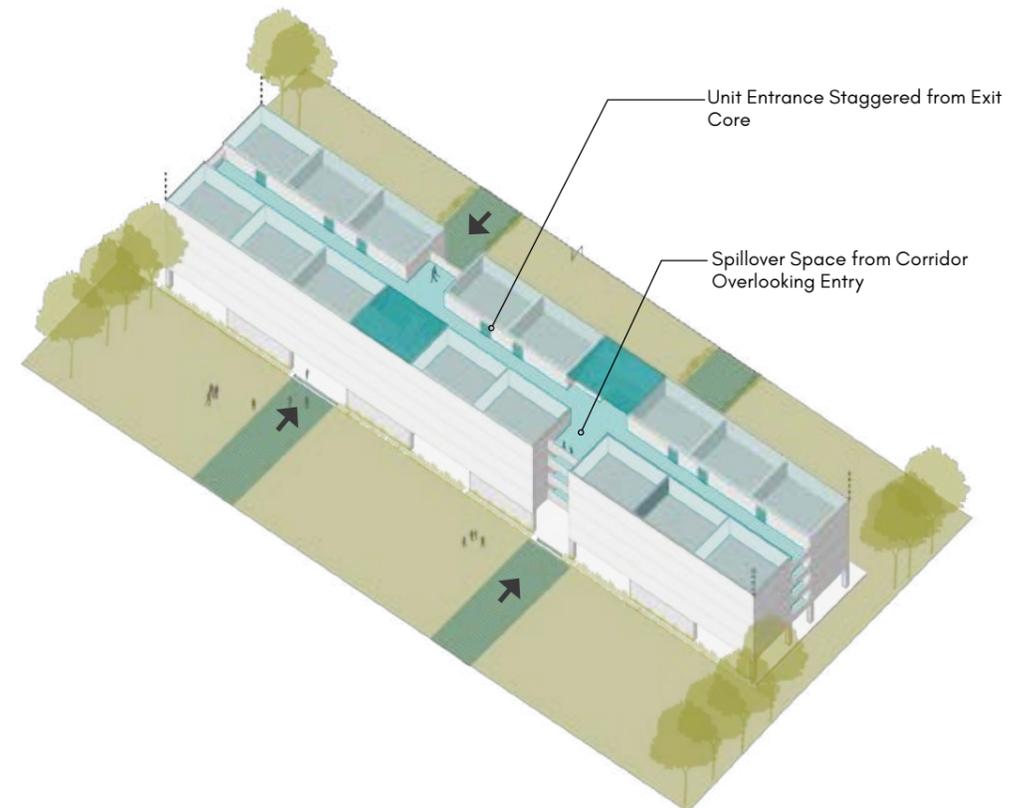


Figure 22 Double-Loaded Corridor Typology

5.1.3 COURTYARD

INTENT

Creation of a seamless relationship between buildings and open spaces. Courtyards can also serve as shaded public spaces in hot climatic conditions.⁵⁵

APPLICABILITY

The guidelines will apply to the design of the residential block profile.

GUIDELINES

- 5.1.3.1 Vehicular access within the courtyards must be avoided (controlled-access must be provided in case of emergencies such as fire, based on relevant statutory rules).
- 5.1.3.2 Blocks should be arranged such that they maximize shading within the courtyard.
- 5.1.3.3 Building openings and balconies should be provided on the courtyard side to increase passive surveillance.
- 5.1.3.4 Enclosed courtyards can be programmed for child-friendly activities.
- 5.1.3.5 Courtyards can accommodate some social amenities and the spaces around them can be designed to complement the nature of the amenities.
- 5.1.3.6 Overall building entries and entries to ground floor units can be provided on the courtyard side for visual continuity and passive surveillance.

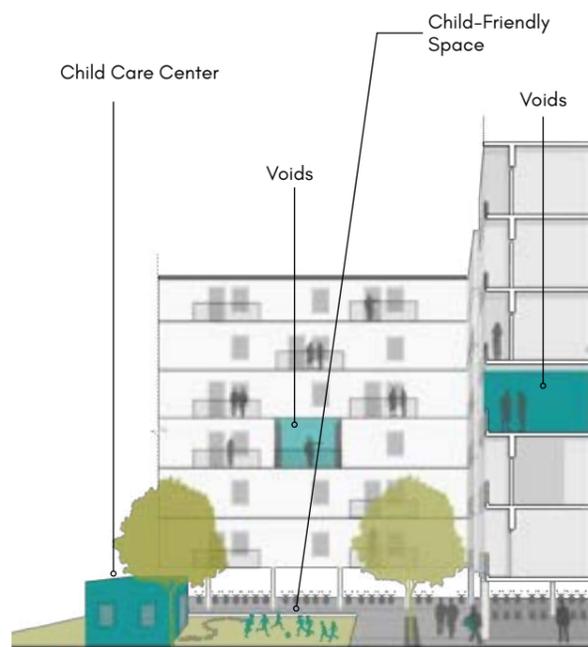


Figure 23 Courtyard Typology

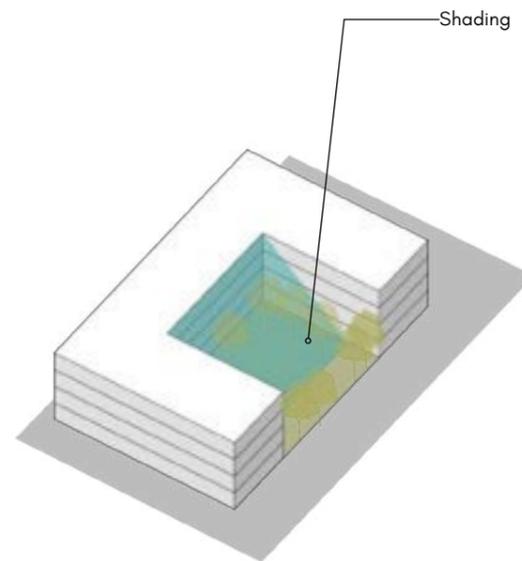


Figure 24 Courtyard Shading

5.1.4 REGULAR

INTENT

Provide block profile options that can be aligned to the spatial urban design requirements of the masterplan.

APPLICABILITY

The guidelines will apply to the design of the residential block profile.

GUIDELINES

- 5.1.4.1 In the case of long blocks, the design must reduce the perceived length of the corridor through the introduction of openings, look-out spaces / viewing decks, etc.
- 5.1.4.2 When the corridor turns / bends, care must be taken to ensure that inaccessible niches are not created; turning radii and other technical considerations must conform to universal accessibility standards.
- 5.1.4.3 The number of bends in a long corridor should be minimized for easy navigation / wayfinding.

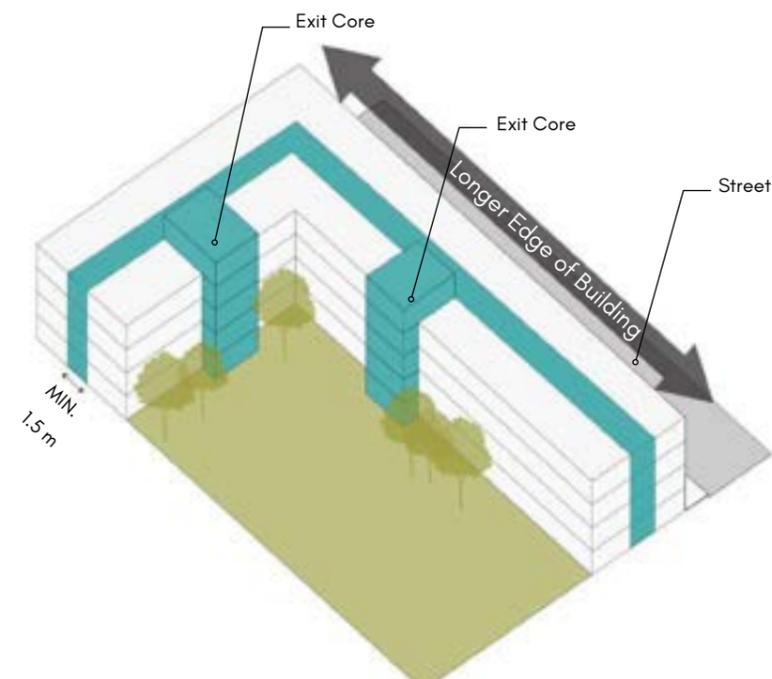
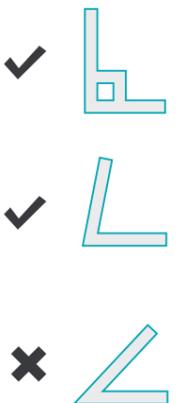


Figure 25 L-Shaped Block



5.2 BUILDING FORM AND ORIENTATION

01

BUILDING DEPTH AND LENGTH

Building depth: dimension measured from the front to the back of the building floor plate.⁵⁶
Building length: the dimension of the building, one shorter side to the other.

04

CONNECTED BLOCKS

Clusters of buildings, when joined back to back and / or on sides.⁵⁹

02

BUILDING HEIGHT

The vertical distance measured, in the case of flat roofs, from the average level of the ground around and, contiguous to the building, to the terrace of the last livable floor.⁵⁷

05

CORNERS

The juncture at which two corridors /units meet at an angle.

03

BUILDING MASS

Perception of the general shape, size, as well as form of a building.⁵⁸

06

UNIT BALANCE

Distribution of different unit types across the site.

5.2.1 BUILDING DEPTH AND LENGTH

INTENT

Choose building form to effectively address indoor environmental qualities such as lighting and ventilation for housing units and common areas; create an optimal number of units in a block.

APPLICABILITY

The guidelines will apply to the number of units in a floor, length of the corridor, design of units as well as the block typology and building profile.

GUIDELINES

- 5.2.1.1 Buildings that are very deep must be able to demonstrate how internal daylighting and natural ventilation will be achieved satisfactorily; this can be in the form of daylighting analysis or through the introduction of atriums / other open spaces.
- 5.2.1.2 The building length preferably should not exceed more than 20 units. If it exceeds, the provision of ventilation and lighting must be taken into consideration.

- 5.2.1.3 The perceived building length can be reduced through the introduction of color for building façade elements such as stair and lift cores, balconies, etc.

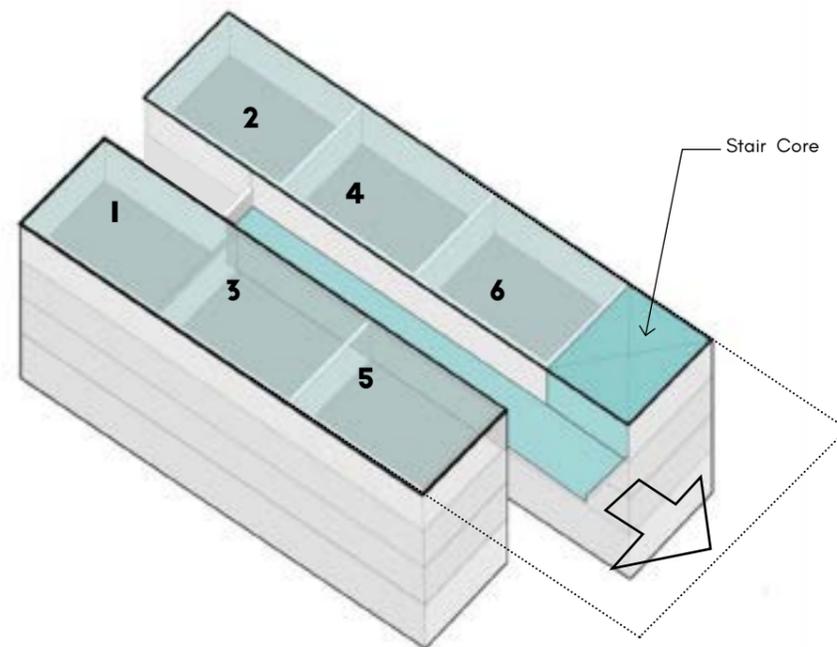


Figure 26 Key Considerations for Building Length

5.2.2 BUILDING HEIGHT

INTENT

Achieve an optimal building footprint and human-scale within the development.

APPLICABILITY

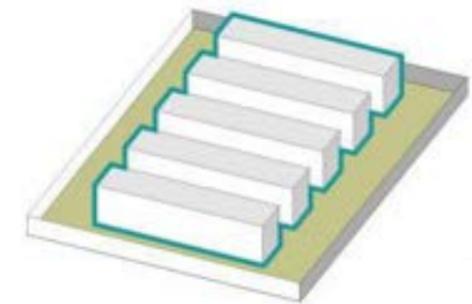
The guidelines will apply to the design of building form.

GUIDELINES

- 5.2.2.1 Building heights must be considered in relation to site planning (i.e., distribution of built density as well as the open space configuration). For example, filling the site with only low-rise buildings and not providing adequate open spaces is not desirable.
- 5.2.2.2 In high-rise buildings, care must be taken to reduce wind tunnel effects created in the space between buildings. This can be demonstrated through a wind analysis study.
- 5.2.2.3 Future (vertical) development should be considered when deciding the height of the building.

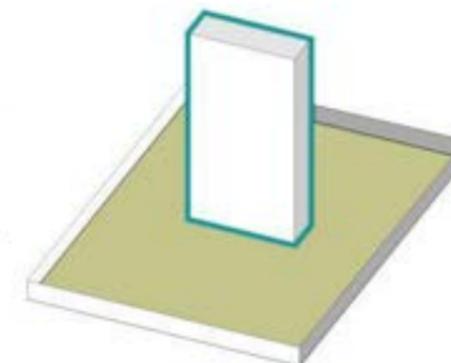
REPETITIVE BLOCKS

✘ Inadequate Open Space



SINGLE-TOWER BLOCK

✘ Lack of Distribution of Built Density



HYBRID BLOCK

✔ Modulated Form with Varying Block Heights

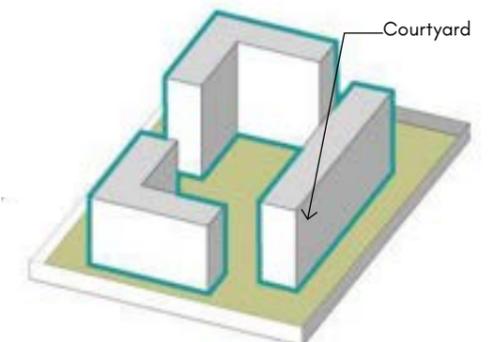


Figure 27 Height of Building Determining Built Footprint

5.2.3 BUILDING MASS

INTENT

Craft the exterior profile of the building and the space it encloses. Create optimal housing density, visual interest, legibility and a sense of identity through the three-dimensional space occupied by the building blocks. Building mass will be influenced by the arrangement of blocks in a site and vice-versa.

APPLICABILITY

The guidelines will apply to the design of various aspects of the building form.

GUIDELINES

- 5.2.3.1 Large buildings must be divided into smaller and legible parts, to avoid forms that are not to human-scale.
- 5.2.3.2 Where appropriate, a large building should be able to be read as a series of discrete forms. This reduces visual dominance, creates interest, and can help users to understand how the building is occupied.⁶⁰ It can be achieved by visual quality elements such as material and color treatment.
- 5.2.3.3 The column arrangement at the stilt floor should be legible and efficient to facilitate circulation and avoid inaccessible spaces.
- 5.2.3.4 In the case of high-rise buildings abutting the street, upper floors can be stepped back or a lower-level podium can be introduced to maintain a human-scale.
- 5.2.3.5 Horizontal emphasis on tall buildings and vertical emphasis on wide buildings (e.g., through materials, color, etc.) can be introduced to balance the overall size and minimize negative visual impact.⁶¹



Figure 28 Building Massing that Creates Visual Relief

5.2.4 CONNECTED BLOCKS

INTENT

Create longer blocks while avoiding long corridors and the need to earmark land area for building-to-building distances in constrained sites.

APPLICABILITY

The guidelines will apply to the planning and design of connectivity between blocks.

GUIDELINES

- 5.2.4.1 Connected blocks can help consolidate residual spaces and provide larger open spaces in the masterplan.
- 5.2.4.2 In high-rise buildings, blocks can be connected by skywalks which will enable interactions at upper levels; these skywalks can be provided at regular intervals e.g., every five floors, etc.
- 5.2.4.3 Exterior niches that are formed through connected blocks can be landscaped; seating can also be included to make it a small congregation space, as relevant.

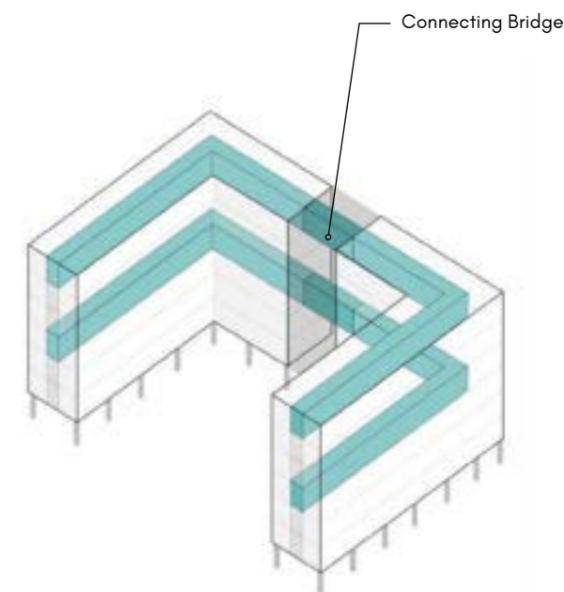


Figure 29 Connected Blocks- Option One

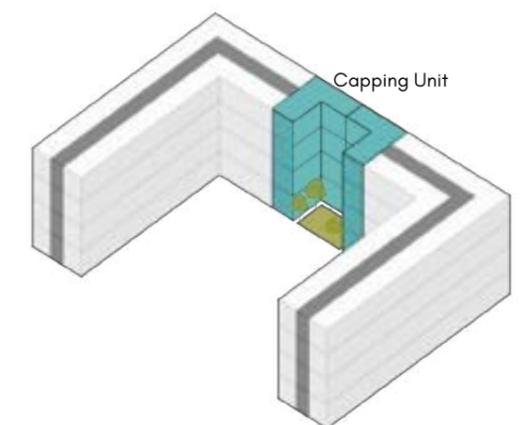


Figure 30 Connected Blocks- Option Two

5.2.5 CORNERS

INTENT

Respond to the masterplanning design orientation through appropriate built forms. Divide long corridors into smaller sections, in order to reduce the perceived length. Accentuate and create places of interest along internal corridors as well as the building exterior.

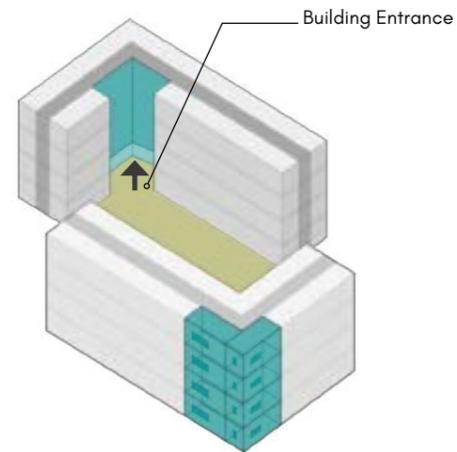
APPLICABILITY

The guidelines will apply to the design of building form and corridors.

GUIDELINES

- 5.2.5.1 Inaccessible internal corners must not be created.
- 5.2.5.2 Corners must have proper lighting and ventilation.
- 5.2.5.3 Internal corners can be designed to allow entry into the block or can serve as seating niches in the abutting open space.⁶²
- 5.2.5.4 External corners can be accentuated through customized unit types (e.g., capping units with balconies, etc.) or other architectural interventions (e.g., viewing decks, etc.) to add definition to the block.

CORNER ARTICULATION



CORNER UNITS DESIGN VARIATION

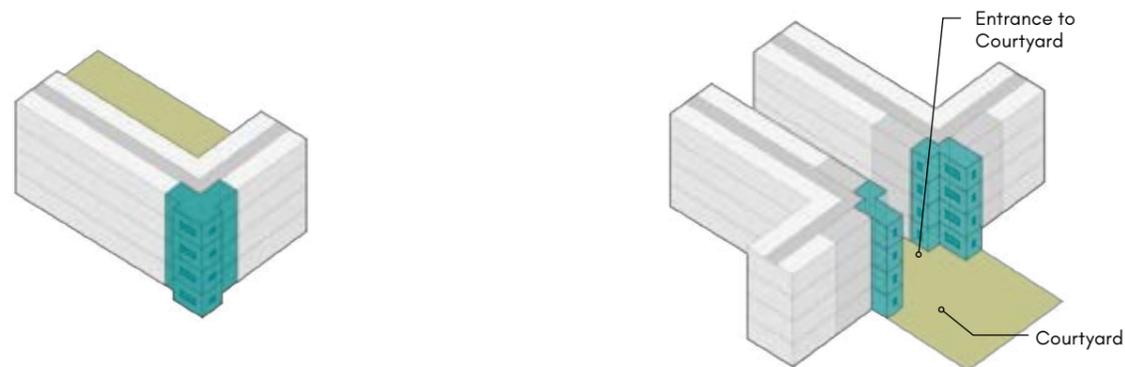


Figure 31 Articulation of Building Corners

5.2.6 UNIT BALANCE

INTENT

Ensure a balance of unit types in the design for equitable distribution and allocation.

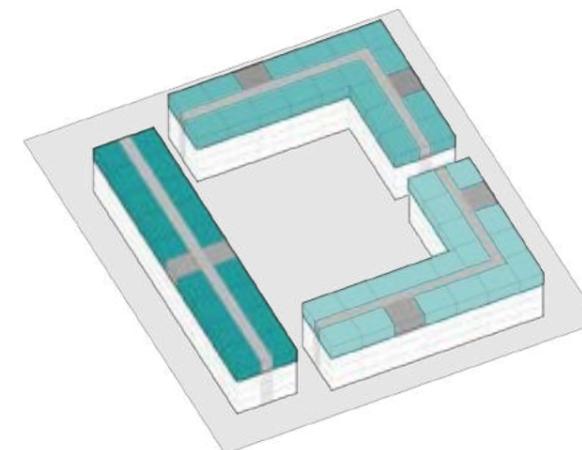
APPLICABILITY

The guidelines will apply to the planning and design of units, blocks and neighborhoods across the site.

GUIDELINES

- 5.2.6.1 If the design has more than one unit type, it is preferable to balance them across the masterplan equitably.
- 5.2.6.2 Mixing of unit types can be across blocks or within a block, as applicable for the design.

UNIT DISTRIBUTION ACROSS BUILDINGS



UNIT DISTRIBUTION WITHIN BUILDINGS

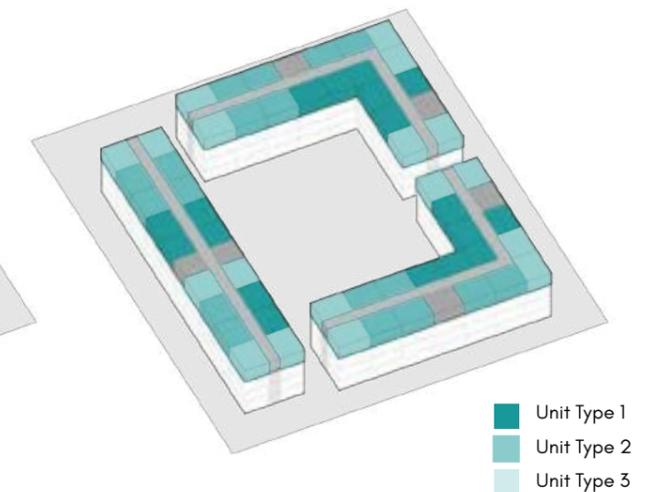


Figure 32 Balancing Unit Types-Options

5.3 UNIT DESIGN

01

UNIT SIZE AND LAYOUT

Design and placement of components of an individual residential unit including living, bedroom, kitchen, balcony / utility, toilet and bathroom.

02

STORAGE

Includes all open and closed areas provided within the unit to store things.

5.3.1 UNIT SIZE AND LAYOUT

INTENT

Create an optimal unit factoring in cost constraints while providing a comfortable home.

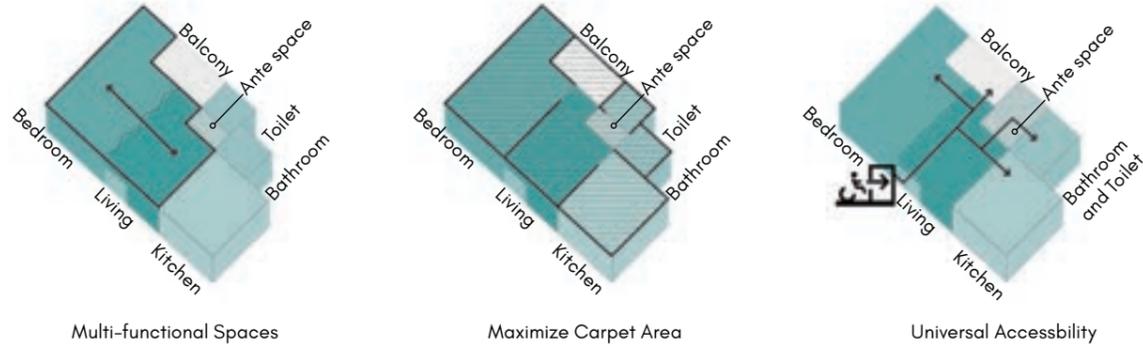
APPLICABILITY

The guidelines will apply to the design of the individual unit.

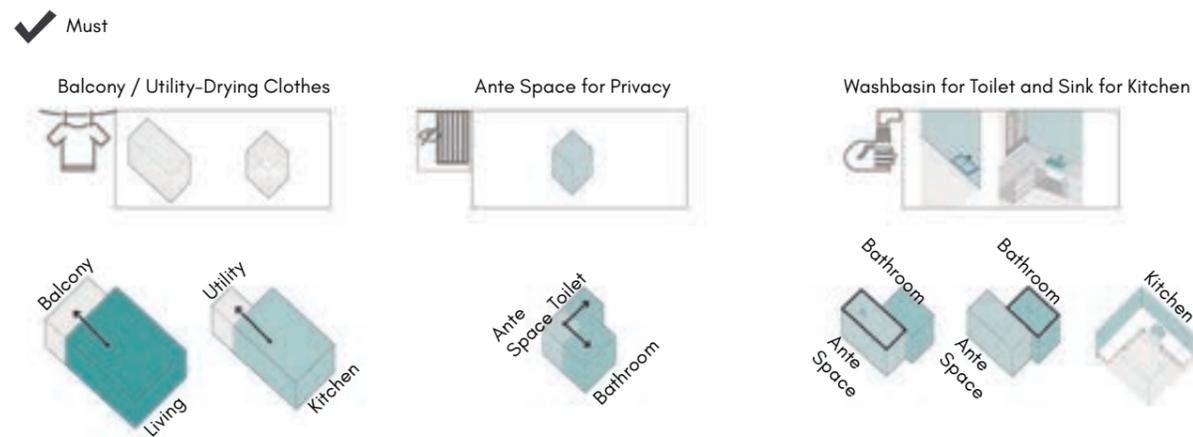
GUIDELINES

- 5.3.1.1 Units designed for universal accessibility must adhere to National Building Code.
- 5.3.1.2 Child safety measures (e.g. design of window grills, provision for future addition of mosquito nets etc.) must be integrated into the unit design.
- 5.3.1.3 The carpet area must be maximized and excessive internal circulation corridors must be avoided.
- 5.3.1.4 The kitchen must have a sink with a plumbing and drainage connection.
- 5.3.1.5 An ante space should be provided for the bathroom and toilet to ensure privacy from living areas; the door of the bathroom or toilet should not open directly into the kitchen.
- 5.3.1.6 A washbasin should be provided either in the bathroom or in the ante space area.
- 5.3.1.7 Each unit can have either a balcony or a well-ventilated utility to provide space for drying clothes etc. The utility space should have a plumbing connection to accommodate a washing machine.
- 5.3.1.8 Internal furniture layouts should be visualized while designing the unit to address the various needs of the residents such as sofas, dining tables, refrigerator wall space for TV etc.
- 5.3.1.9 Internal Open-To-Sky (OTS) spaces within the unit should be avoided. If provided, care should be taken to ensure safety and privacy.
- 5.3.1.10 Doorways for bathroom and toilet should be not less than 0.75m clear width⁶⁵; other doorways should be minimum 0.9m clear width.
- 5.3.1.11 Multifunctional spaces can be introduced to provide flexibility for users (e.g., living and bedroom separated by a collapsible door will allow it to be a larger space during the day and divided into two rooms when privacy is required).

UNIT DESIGN (SAMPLE ILLUSTRATION)



NECESSARY ELEMENTS FOR THE UNIT DESIGN



RECOMMENDATIONS FOR SPACE ADJACENCY

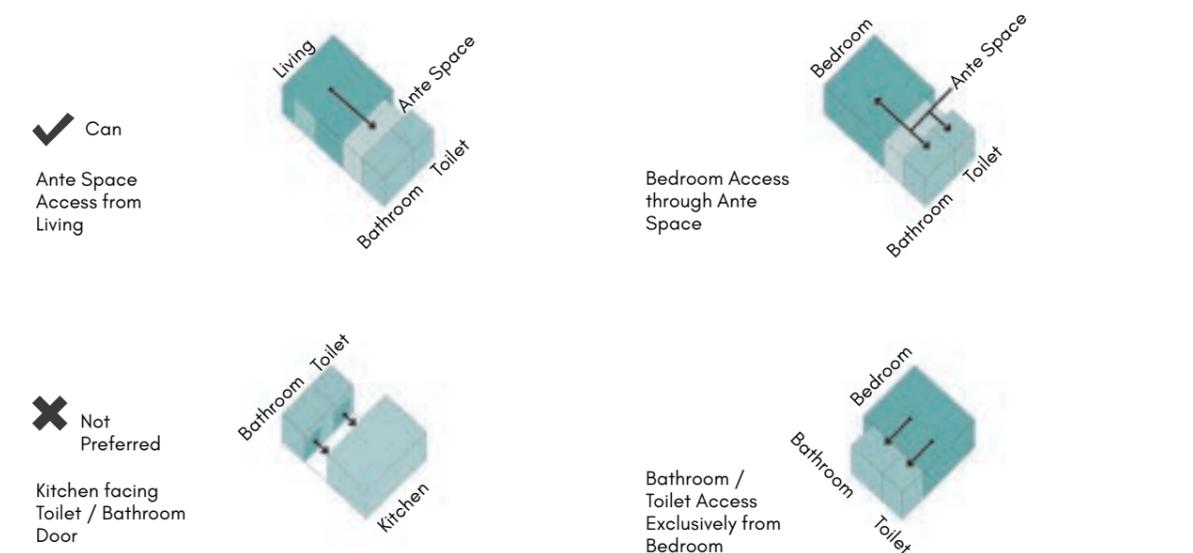


Figure 33 Unit Size and Layout

5.3.2 STORAGE

INTENT

Reduce the accumulation of objects in the living spaces.

APPLICABILITY

The guidelines will apply to the design of storage units and areas in the rooms of a unit.

GUIDELINES

- 5.3.2.1 Overhead storage must be provided in all habitable rooms, at least on one side.
- 5.3.2.2 A minimum clear head-room of 2.2m must be provided while planning overhead ledges or lofts.
- 5.3.2.3 All rooms including the bathroom and toilet should be provided with wall storage (open or closed) and planned as part of the furniture layout.

- 5.3.2.4 Kitchen storage should have a sufficiently sized, dedicated space for gas cylinders under the counter.
- 5.3.2.5 Storage racks for shoes can be provided within or just outside the unit door, as relevant.
- 5.3.2.6 Where possible, storage units can be closed for visual quality considerations.

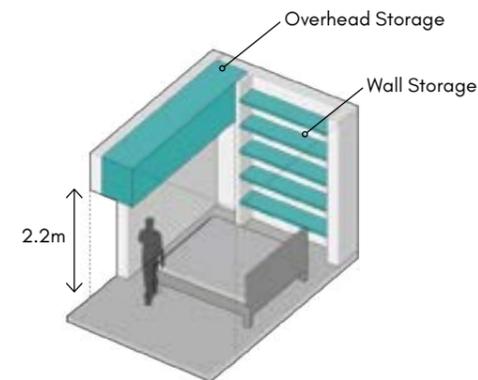


Figure 34 Bedroom Storage- Overhead Storage and Shelves

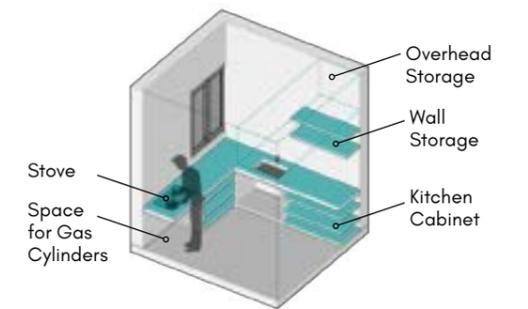


Figure 36 Kitchen Storage- Overhead Storage and Shelves

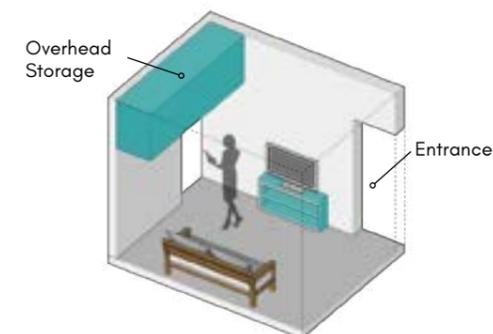


Figure 35 Living Room Storage- Overhead Storage

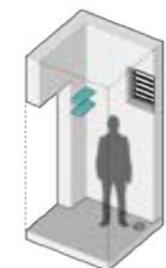


Figure 37 Bathroom Storage

5.4 INDOOR ENVIRONMENTAL QUALITY

01 NATURAL VENTILATION

Supply of outside air into a building through windows or other openings, due to the prevalent wind and convection effects arising from temperature or vapor pressure differences (or both) between the inside and outside of a building.⁶⁴

02 DAYLIGHT ACCESS

Natural lighting for interiors through fenestrations.

03 THERMAL COMFORT

The condition of the thermal environment under which a person can maintain a body heat balance at normal body temperature and without perceptible sweating.

5.4.1 NATURAL VENTILATION

INTENT

Provide a comfortable indoor environment without the need for mechanical services like air-conditioning.

APPLICABILITY

The guidelines will apply to the design of units like provision of windows, their sizes and placement.

GUIDELINES

- 5.4.1.1 Rooms must have (for the admission of light, air and promoting cross ventilation), one or more openings such as windows and ventilators, opening directly to the external air or into an open verandah, balcony or internal court.
- 5.4.1.2 Cross ventilation within the unit should be provided through appropriate placement of windows, so as to create airflow through the internal spaces at the body level, i.e. in the 'living zone' (up to 2m in height). Such openings should preferably be large and fully operable.

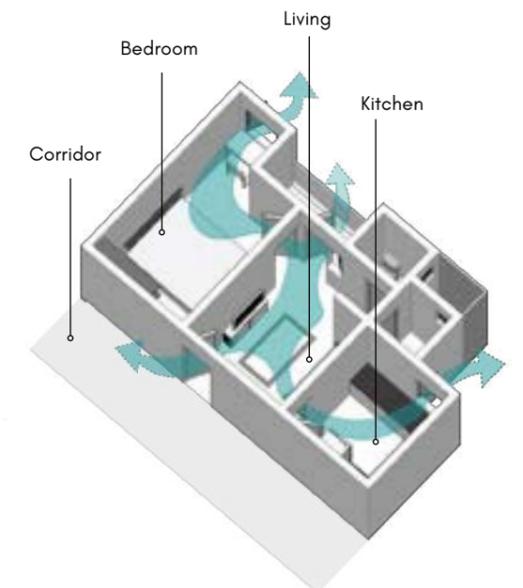


Figure 38 Demonstration of Unit Level Ventilation

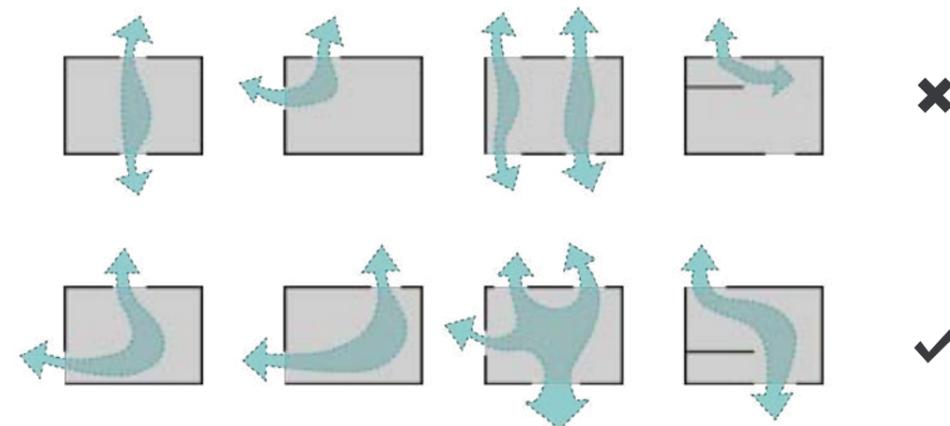


Figure 39 Cross Ventilation

5.4.2 DAYLIGHT ACCESS

INTENT

Access to light in the interior spaces without the need for electrical appliances.

APPLICABILITY

The guidelines will apply to the design of units like the provision of windows, their sizes and placement.

GUIDELINES

- 5.4.2.1 Every room must have daylight access.
- 5.4.2.2 When used, recessed windows must not be too deep since it will reduce the amount of daylight that enters the space.
- 5.4.2.3 Kitchen windows can be placed away from the stove to avoid putting out of the stove flame.
- 5.4.2.4 Where possible, double, full-height or clerestory windows can be introduced to increase the amount of daylight access and make the space appear more spacious.
- 5.4.2.5 Where applicable, perforated screens can be introduced to enhance daylight access.

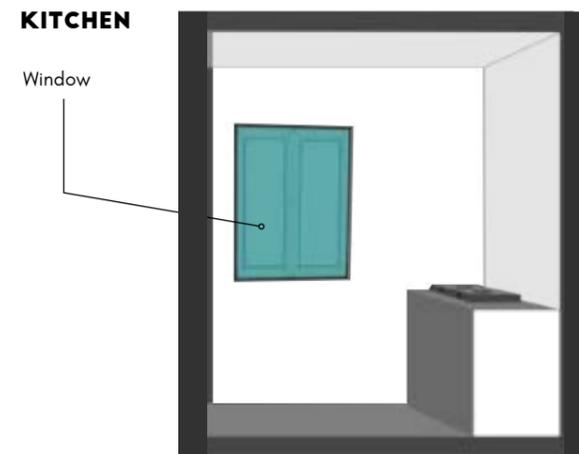


Figure 40 Daylight Access- Kitchen

BEDROOM

LIVING



Figure 41 Daylight Access - Living and Bedroom

5.4.3 THERMAL COMFORT

INTENT

Create comfortable ambient temperature within the unit through passive design and also reduce energy consumption for mechanical cooling and ventilation.

APPLICABILITY

The guidelines will apply to the design and placement of windows and choice of building materials.

GUIDELINES

- 5.4.3.1 The building orientation must consider the sun direction.
- 5.4.3.2 Sunshades must be designed to minimize heat gain; for example, vertical fins can be introduced to avoid the west sun.
- 5.4.3.3 Design of the windows and walls should consider the local climatic conditions and employ passive cooling techniques.
- 5.4.3.4 Openings should be placed suitably in relation to the prevailing breezes to permit natural airflow within the unit.
- 5.4.3.5 Building materials such as Autoclaved Aerated Concrete (AAC) blocks and conventional brick walls can be implemented for better thermal comfort, wherever applicable.
- 5.4.3.6 Whenever possible, preference can be given to locally available materials and construction techniques to achieve thermally comfortable interiors.

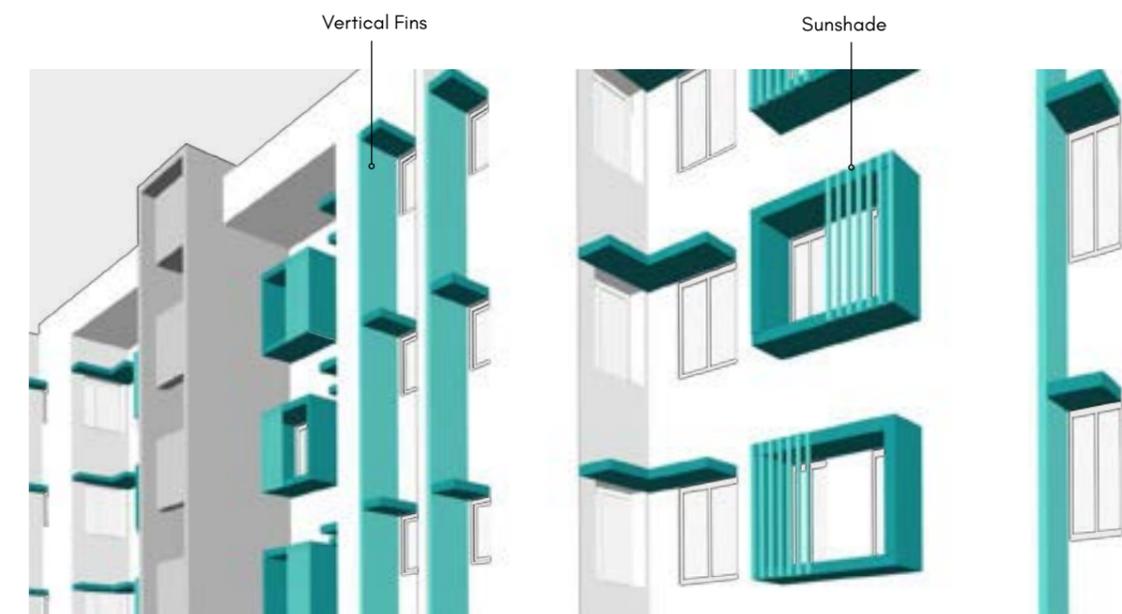


Figure 42 Thermal Comfort- Shading Devices

5.5 COMMON AREAS AND SERVICES

03 LIFT

An appliance designed to transport persons or materials between two or more levels, in a vertical or substantially vertical direction by means of a guided car or platform.⁶⁷

01 BUILDING ENTRANCE

The threshold between the exterior and interior; the entrance may lead into a common entry foyer, and onwards to the lift and stair core.⁶⁵

04 CORRIDOR

A common passage or circulation space within a building.⁶⁸

02 STAIRCASE

Element designed to bridge a large vertical distance by dividing it into smaller vertical distances, called steps.⁶⁶

05 BUILDING SERVICES

The systems installed in buildings to make them comfortable, functional, efficient and safe.⁶⁹

5.5.1 BUILDING ENTRANCE

INTENT

Provide functional access to the building while enhancing the entry experience.

APPLICABILITY

The guidelines will apply to the approach, dimensions and placement of building entrances.

GUIDELINES

- 5.5.1.1 All building entrances must adhere to universal accessibility standards e.g. provision of ramps. Universal accessibility must be indicated by proper signage.⁷⁰
- 5.5.1.2 Building entrances must be free of obstruction, easy to identify and preferably covered to provide weather protection.
- 5.5.1.3 Building entrances can preferably be accessed from the open space and connected to the parking to promote passive surveillance.
- 5.5.1.4 Seating can be provided near building entrances to activate the space and promote passive surveillance.



Figure 43 Building Entrance Articulation

5.5.2 STAIRCASE

INTENT

Provide access to upper floors without mechanical assistance.

APPLICABILITY

The guidelines will apply to the design, placement and number of staircases within the development.

GUIDELINES

- 5.5.2.1 Staircases in a building provided for fire exit must be usable in case of emergencies and therefore must be unobstructed; the clear width must adhere to National Building Code.
- 5.5.2.2 Staircases must not be arranged around a lift shaft and must be ventilated to the atmosphere at each landing and through a vent at the headroom level.⁷¹
- 5.5.2.3 Living spaces, store or other fire risks must not open directly onto staircases.⁷²
- 5.5.2.4 A fire enclosure must be provided in high-rise buildings, surrounding a staircase and a fire-rated lift, to allow firefighters to access the upper floors and engage in rescue operations.
- 5.5.2.5 Exit doors of fire enclosures at ground level must open directly to open spaces or must be reached without passing through any door other than a door provided to form a draught lobby.⁷³
- 5.5.2.6 Tactile ground surface indicators (warning type) must be installed 300mm before the beginning and 300mm after the end of each flight of steps to aid people with visual impairments.⁷⁴
- 5.5.2.7 Staircases should be kept bright with daylighting and be well ventilated.
- 5.5.2.8 Staircases can be made legible and visually prominent through the introduction of an ante space, color and material treatment, etc.



Figure 44 Enhanced Visibility for Staircase Cores through the Introduction of Color

5.5.3 LIFT

INTENT

Provide easy access to upper floors by means of mechanical assistance.

APPLICABILITY

The guidelines will apply to the dimension, number, capacity and placement of lifts.

GUIDELINES

- 5.5.3.1 Lifts must not be considered as a means of escape in case of emergencies.
- 5.5.3.2 In high rise buildings, at least one lift must be universally accessible and able to accommodate stretchers⁷⁵
- 5.5.3.3 For buildings more than 15 m in height, collapsible gates must not be used.⁷⁶
- 5.5.3.4 All the floors should be accessible 24 hours by lifts. In the case of restricted operating hours, provisions should be made to ensure access in case of emergency.⁷⁷
- 5.5.3.5 Lifts can be made legible and visually prominent through the introduction of an ante space, color and material treatment, etc.

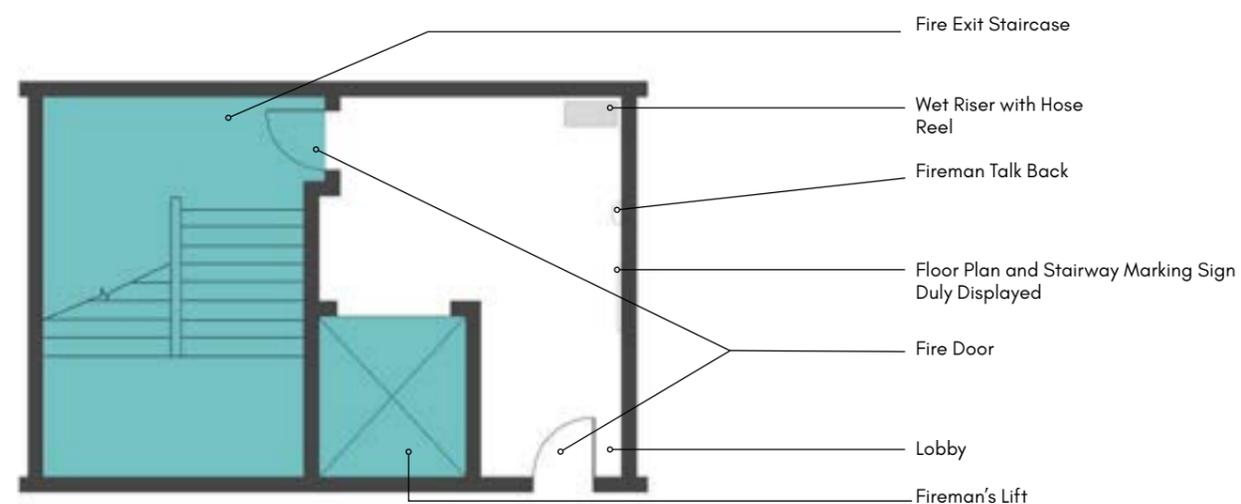


Figure 45 Fire Fighting Shaft

5.5.4 CORRIDOR

INTENT

Create comfortable and legible horizontal access to units from the staircase and lift (in upper floors) or from the building entrance (at the ground floor).

APPLICABILITY

The guidelines will apply to the dimensions, length and other design considerations of the corridor.

GUIDELINES

- 5.5.4.1 Minimum width of the corridor must adhere to universal accessibility requirements of TNCDDBR.
- 5.5.4.2 Corridors must be bright, well ventilated, clear of obstructions and designed in a manner that allows easy wayfinding.



Figure 46 Bright, Well-Ventilated Corridor

5.6 VISUAL QUALITY

5.5.5 BUILDING SERVICES

INTENT

Provide the basic requirements for the house like plumbing, electricity, etc., in an efficient manner.

APPLICABILITY

The guidelines will apply to the placement of the kitchen, bathroom and toilet (and its fixtures) in a unit, as well as the number of shafts.

GUIDELINES

- 5.5.5.1 Shafts must be open at least on one side and must be sized such that they are easily accessible for repair and maintenance work.
- 5.5.5.2 The kitchen, bathroom and toilet (plumbing requirements) of the same unit or adjacent units can be placed next to one another for ease of installation as well as minimizing the number of shafts (and consequently reducing cost).
- 5.5.5.3 It is preferable to avoid a common OTS space for the kitchen and bathroom / toilet.
- 5.5.5.4 Buildings with more than five storeys can have a refuse chute system to collect domestic waste.

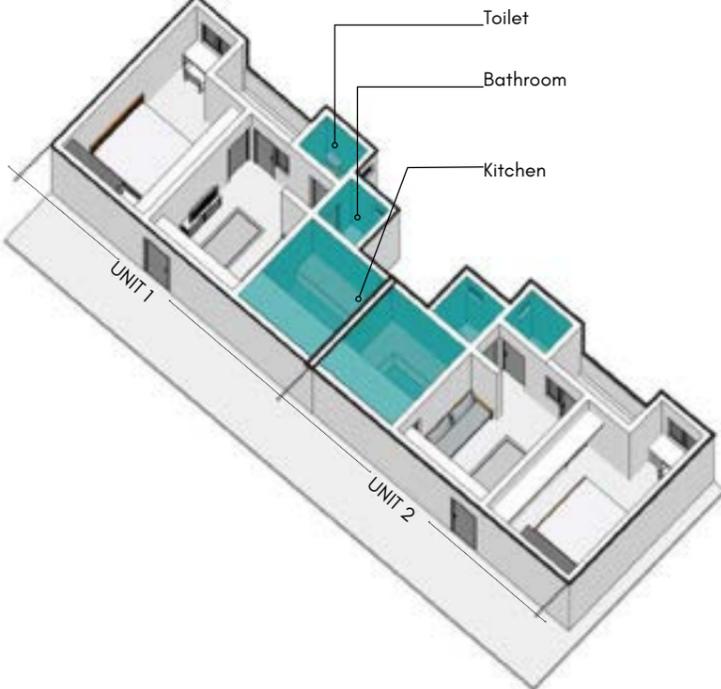


Figure 47 Grouping of Shafts (Kitchen and Toilet Core)

01

BUILDING ELEVATION

Front façade and other faces of the building.⁷⁸

02

MATERIALS AND COLOR

The aesthetic and material quality of surface treatments on a building.

5.6.1 BUILDING ELEVATION

INTENT

Enhance the visual quality of the building exterior.

APPLICABILITY

The guidelines will apply to the design of the building envelope including its climate responsiveness, porosity, etc.

GUIDELINES

- 5.6.1.1 The building elevation can be more than the aggregate of unit facades and be crafted to look aesthetically pleasing and cohesive.
- 5.6.1.2 Elevations must be designed factoring in cost considerations; it is preferable to have simple, clean facades that enhance the building appearance, while being economical.
- 5.6.1.3 Design and material selection for building elevations should help achieve sustainability goals.
- 5.6.1.4 Architectural elements such as balconies, perforated walls, sloped sunshades, etc. can be introduced to enhance the visual quality.



Figure 48 Building Elevation

5.6.2 MATERIALS AND COLOR

INTENT

Enhance the visual quality of the building (exterior and interior spaces).

APPLICABILITY

The guidelines will apply to the design of the color scheme, material choice, etc.

GUIDELINES

- 5.6.2.1 All bathrooms must have wall tiles upto 5 ft height for ease of maintenance.
- 5.6.2.2 The kitchen must be provided with dado tiles upto 2 ft height.
- 5.6.2.3 The toilet must be provided with wall tiles upto 5 ft height.
- 5.6.2.4 All internal and external walls should be painted with light colors that will reflect maximum light and should be easy to maintain.
- 5.6.2.5 Color and materials (includes plastering techniques, cladding or any other element added to the external surface) should be chosen such that it creates harmony among the buildings.
- 5.6.2.6 Paints and other materials used in the interior and exterior of the building should not cause adverse health outcomes such as allergies, respiratory issues, etc.
- 5.6.2.7 Whenever possible, preference should be given to locally available materials for cost, aesthetic and environmental considerations. This includes tiles, colors, etc.
- 5.6.2.8 Colors can be used as tools to enhance the visual perception of the building massing. For example, bright highlight colors can be used selectively to enhance the elevation and break the monotony.



Figure 49 Coloured Sunshades and Staircase Core

OPEN SPACE DESIGN

Open Space Network and Elements
Block Level Open Spaces



The role of open spaces in ensuring vibrant, inclusive and safe communities cannot be overstated. If good public spaces are provided, people will congregate and enliven the spaces.

EXECUTIVE SUMMARY

In urban design, spaces are equally important as the building themselves. In reality, they are completely interdependent and mutually generative. Much of the lived-in experience of a project depends on the quality and flow of spaces as enclosed by building facades, which become the 'walls of the space', giving them a more humane scale. This has a positive psychological effect on the inhabitants.

Open spaces provide an extension to the life of public housing residents. Especially in low-income families, a lot of time is spent in semi-public spaces; therefore, ensuring vehicle-free spaces for outdoor activities contributes to improved quality of life. Careful pedestrian/vehicular segregation, as well as the clear delineation of parking and play areas enhances the usage of open spaces for outdoor activities. If spaces are designed contiguously across different housing clusters, they can also promote safe access to social amenities. Fully grown trees are another design indicator for locating open spaces, as trees need to be protected.

During the commencement of the urban design process, the contours of the site must be analyzed and variations in the land profile should be used to enhance the design of open spaces (for example, children enjoy variations in their play spaces). Carefully clustering spaces for different groups of people, such as women, elder adults with

children's spaces, improves security, mutual dependence and interest.

In addition to these functions, open spaces also form the lungs of an urban environment and provide important ecological and regulatory functions. The economic benefits of open spaces may also be explored through design. For example, the introduction of urban farming will encourage residents to sell the produce in a market, thereby contributing to income generation. Finally, the aesthetic dimension of landscapes should be layered on and a holistic approach to the visual quality of landscape and building design should be adopted.

Factoring in these myriad considerations, this chapter includes guidelines to various components, organized in two sub-chapters:

- **Open space network and elements-** includes aspects such as open space typology and hierarchy as well as guidelines for elements such as daylighting and shading, lighting etc.
- **Block level open spaces-** includes approaches for stilt level, mid-level and terrace level open spaces.

Notes:

1. This chapter should be read in conjunction with Chapter Two, Chapter Four, Chapter Five and Chapter Seven.
2. The guidelines should be addressed in addition to the applicable national and state regulations which must be adhered to.

6.1 OPEN SPACE NETWORK AND ELEMENTS

04

STRUCTURES AND STREET FURNITURE

Built entities that integrate with the open space network and play either a main or ancillary role in addressing the social, commercial and economic functions of open spaces.

01

OPEN SPACE TYPOLOGY AND HIERARCHY

An interconnected and often hierarchical system of undeveloped land that forms logical and seamless relationships with the built environment and fulfils the needs of all segments of the population.

05

SIGNAGE

A system to improve wayfinding within a development. Vehicular directional, pedestrian directional and building location signages are all integral to creating a complete wayfinding system. Signage includes textual, non-textual and tactile guides to navigate the urban environment.

02

DAYLIGHTING AND SHADING

Mutually dependent factors that influence the microclimate and usability of open spaces.

06

MATERIALS AND COLOUR

A palette for detailing open spaces.

03

LIGHTING

General and focussed illumination of objects and activities in open spaces in the absence of daylight.

07

VEGETATION

A key component of open spaces that performs essential ecological services and provides respite from heat for inhabitants.

6.1.1 OPEN SPACE NETWORK AND HIERARCHY

INTENT

Provide a balanced socio-ecological system and create spaces with recreational, didactic and productive value. Provide places for social interaction while fulfilling functional aspects such as air quality, erosion control and microclimate regulation.

APPLICABILITY

The guidelines will apply to the creation of environmentally sensitive open spaces and their connections, as well as community congregation spaces with or without social amenities adjacent to them.

GUIDELINES

- 6.1.1.1 When designing the open space system, clear typologies and hierarchies must be introduced. Primary, secondary and tertiary networks must be planned for. The primary network must connect pedestrians in and out of the site in addition to other programs and activities it may contain. Secondary open spaces can be programmed for recreation or other uses. Tertiary open spaces can lead to secondary open spaces and contain smaller programs.
- 6.1.1.2 Open spaces must be programmed such that they are active, safe and walkable at all times of the day and night; dead and unusable open spaces must be avoided.
- 6.1.1.3 It is preferable to surround the OSR with residential blocks / other programs that enable passive surveillance.
- 6.1.1.4 The open space network must incorporate walkability parameters for different genders, age groups and abilities. A comfortable 10 minute walk for adults in Indian weather conditions is 850-1000 m and for ITC is 150-300 m. ⁷⁹
- 6.1.1.5 If the site has contours, cut and fill must be minimized while planning the open space network.
- 6.1.1.6 Open spaces must be integrated within neighborhoods, streets, social amenities, nodes, gateways, buffers, setbacks and linkages, and wherever possible, be connected by dedicated pedestrian

- pathways in a manner that enhances the lived experience.
- 6.1.1.7 Streets are essential open spaces and should be safe, green, accessible, playful and inclusive.
- 6.1.1.8 A public housing site can consist of open spaces that range from a neighborhood park (1 for every 10000 people), playgrounds (1 for every 5000 people), tot lots (1 for every 2500 people) to tree cover.⁸⁰ These spaces can vary in size and shape, in accordance with the designated program/utility, relationship to buildings, climatic comfort and visual emphasis.
- 6.1.1.9 Thematic programming catering to particular age groups or livelihood requirements can be considered. Programs catering to different age and ability groups can be clustered together to enable mutually supportive activities and vibrancy.
- 6.1.1.10 As far as possible, open spaces can be landscaped to ensure sufficient green cover for the development in the form of trees, gardens and groundcover.
- 6.1.1.11 Buffers to protect the site from externalities or create a soft separation between two neighborhoods within the public housing project can be introduced within the overall network of open spaces.

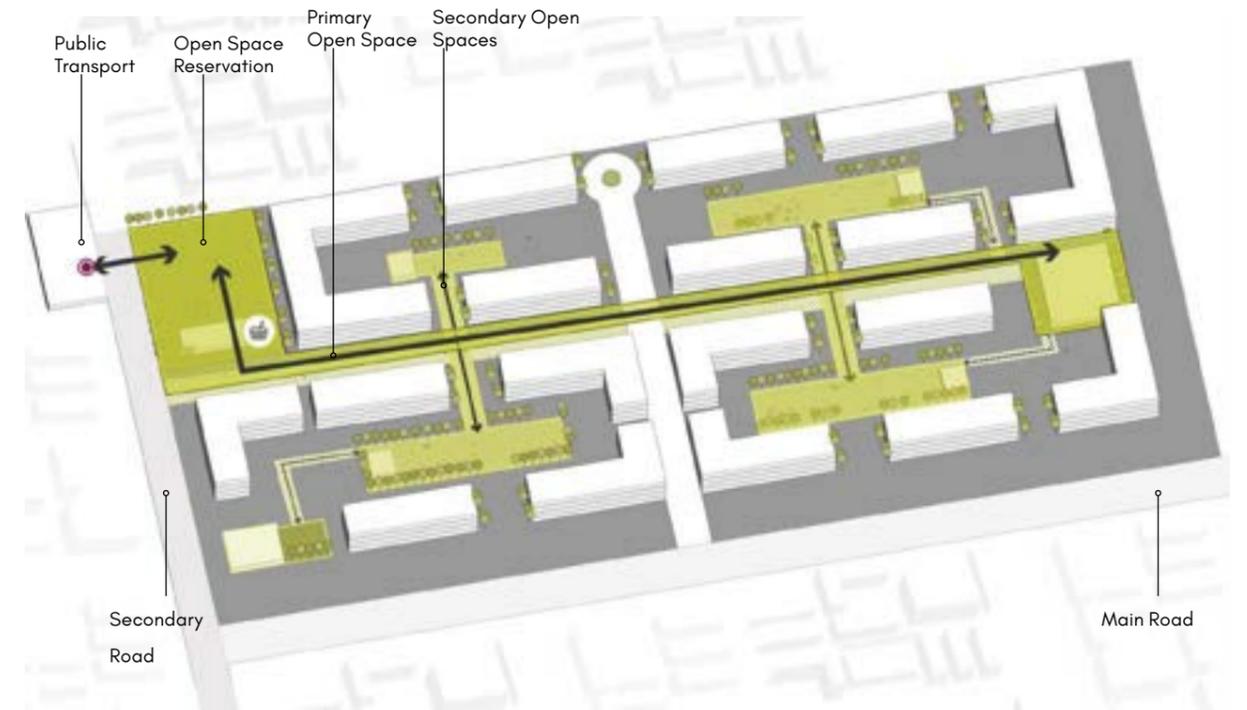


Figure 50 Hierarchy of Open Spaces

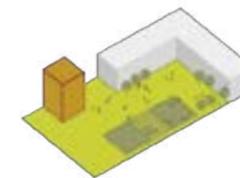


Figure 51 Landmark Open Spaces

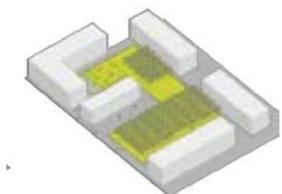


Figure 53 Courtyards

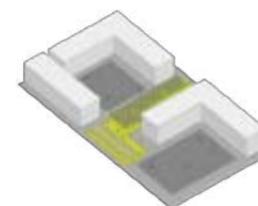


Figure 52 Connecting Buffer Spaces

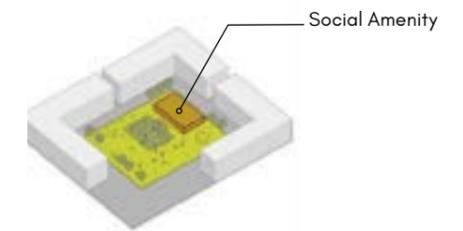


Figure 54 Social Amenity Spaces

6.1.2 DAYLIGHT AND SHADING

INTENT

Provide comfort while minimizing heat gain and radiation.

APPLICABILITY

The guidelines will apply to the creation of comfortable and safe open spaces for different types of activities and linkages throughout the year in a given climatic context.

GUIDELINES

- 6.1.2.1 Adequate shade can be provided, in the through built form elements such as shade structures, niches, projections, as well as vegetation in order to mitigate heat island effects and improve the quality of the microclimate in active public spaces, while not interrupting clear vehicular and pedestrian sightlines.
- 6.1.2.2 Buildings abutting open spaces should be designed in a manner that addresses the amount of daylight and shade required for comfortable use of the spaces. Such a regulation of daylight exposure can be used as a design tool to improve usability during different times of the day and different months of the year. It can also improve health outcomes (e.g., exposure to Vitamin D, etc.)

- 6.1.2.3 Small-scale, semi-shaded spaces, such as spaces between two buildings, can provide respite from the heat; however, care must be taken to ensure that they are programmed and do not become dead spaces.

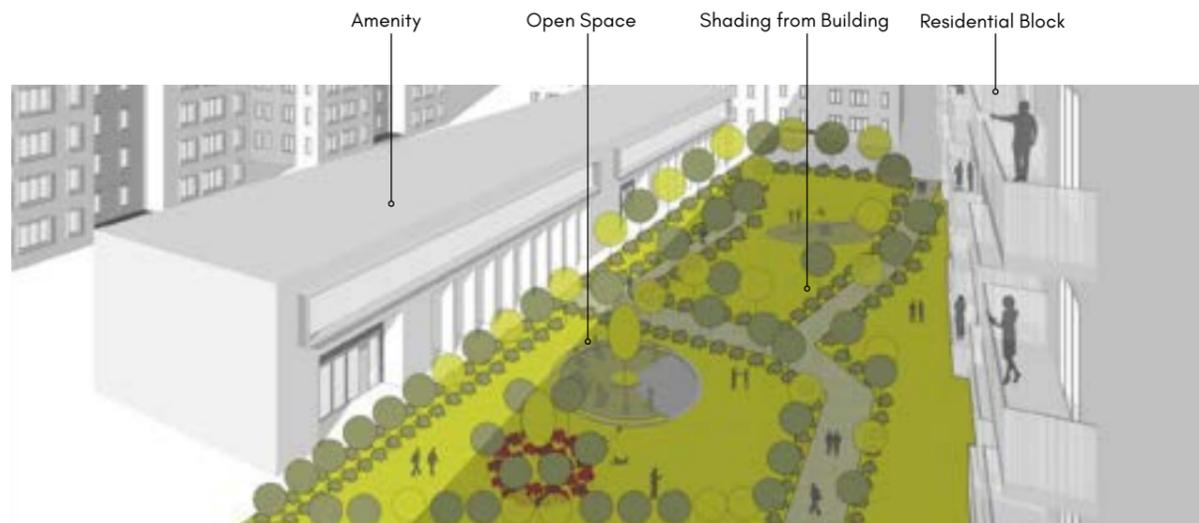


Figure 55 Daylight and Shading

6.1.3 LIGHTING

INTENT

Ensure safety and legibility of open spaces.

APPLICABILITY

The guideline will apply to the design of safe and secure open spaces during non-daylight hours to encourages activities for all groups of people, with differing needs and abilities.

GUIDELINES

- 6.1.3.1 Continuous and consistent lighting must be provided for night-time visibility and safety.
- 6.1.3.2 Adequate street lighting must be provided.
- 6.1.3.3 Consistent lighting must be provided along the length of all pedestrian and bicycle pathways, along the perimeter and focus areas of open spaces, as per the prevailing safety and operational standards; care must be taken to ensure that there are no concealed spaces or dark lanes.
- 6.1.3.4 General lighting at entrances and other architectural details, gates, fences, posts and other elements must be provided.
- 6.1.3.5 Lighting must not be obscured by the presence of open space structures, building form or trees.
- 6.1.3.6 A gradual transition between brighter-lit to dimmer-lit areas should be provided.
- 6.1.3.7 Design should ensure that surrounding biodiversity is not adversely impacted by the open space lighting.

- 6.1.3.8 Energy consumption should be minimized through the use of energy-efficient luminaires.
- 6.1.3.9 Where possible, renewable energy technologies e.g., photovoltaics can be used.
- 6.1.3.10 The type, colour and dimension of lighting fixtures can be such that they are compatible with open space elements such as furniture, materials, colors and finishes. For example, metal halide as a light source produces a soft, white glow that renders color accurately, offers better visibility and requires less wattage for the same perceived visibility.⁸¹
- 6.1.3.11 Where possible, use unobtrusive lighting such as 'bee' lights in trees.⁸²
- 6.1.3.12 Colored lights can be incorporated for places of interest or to break the monotony of the landscape in the evenings. Such lights can be integrated with street furniture or building elements.

6.1.4 STRUCTURES AND STREET FURNITURE

INTENT

Enhance and engage with nodes, anchor open spaces with functional / recreational activities, while providing active or passive surveillance, comfort and wayfinding.

APPLICABILITY

The guidelines will apply to small social amenity buildings, semi-open / shade structures, seating / outdoor furniture, infrastructure components and covered walkway structures.

GUIDELINES

- 6.1.4.1 Design integration of services such as stormwater drainage, sewage disposal (manholes / inspection chambers), water supply, fire equipment, telephone and underground cable, fuel and gas line (storage), electrical works must be seamlessly integrated into the open space network as mandated.
- 6.1.4.2 Adequate circulation space must be provided around structures in the open space.
- 6.1.4.3 Street furniture must be provided as per universal accessibility norms. In addition, two or more street furniture functions can be combined or co-located into a single object (e.g., seating and charging points⁸⁵).
- 6.1.4.4 Public toilets, trash bins and associated amenities must be provided at strategic locations in open spaces. For example, it is preferable to provide trash bins at a minimum distance of 2m⁸⁴ from public seating or play areas.
- 6.1.4.5 Seating should be oriented with backs against a wall or fence, facing forwards, with an interesting view to open space activities. Places where people sit and relax need good sightlines of the whole space and its entry points.⁸⁵
- 6.1.4.6 Small buildings and structures should be visible from a distance and preferably be adjacent to a busy pedestrian route; they should not obstruct pedestrian and bicycle paths.
- 6.1.4.7 Structures should provide shelter from wind, rain and sun.
- 6.1.4.8 To ensure safety and security, structures should be designed in a manner that eliminates potential dark or narrow, concealed spaces.
- 6.1.4.9 Public art can be included as an integral part of building and streetscape design to establishing identity and distinction.
- 6.1.4.10 Small-scale open spaces can be designed to offer good opportunities to integrate smart infrastructure and digital technology, making them more accessible and engaging for all members of the community. For example, open access Wi-Fi points (in the future), smart street furniture and innovative play infrastructure can be introduced.⁸⁶
- 6.1.4.11 Space can be allocated for temporary objects such as on-street shop display, cafe tables, vendor stalls, advertising boards, temporary barriers and signs.

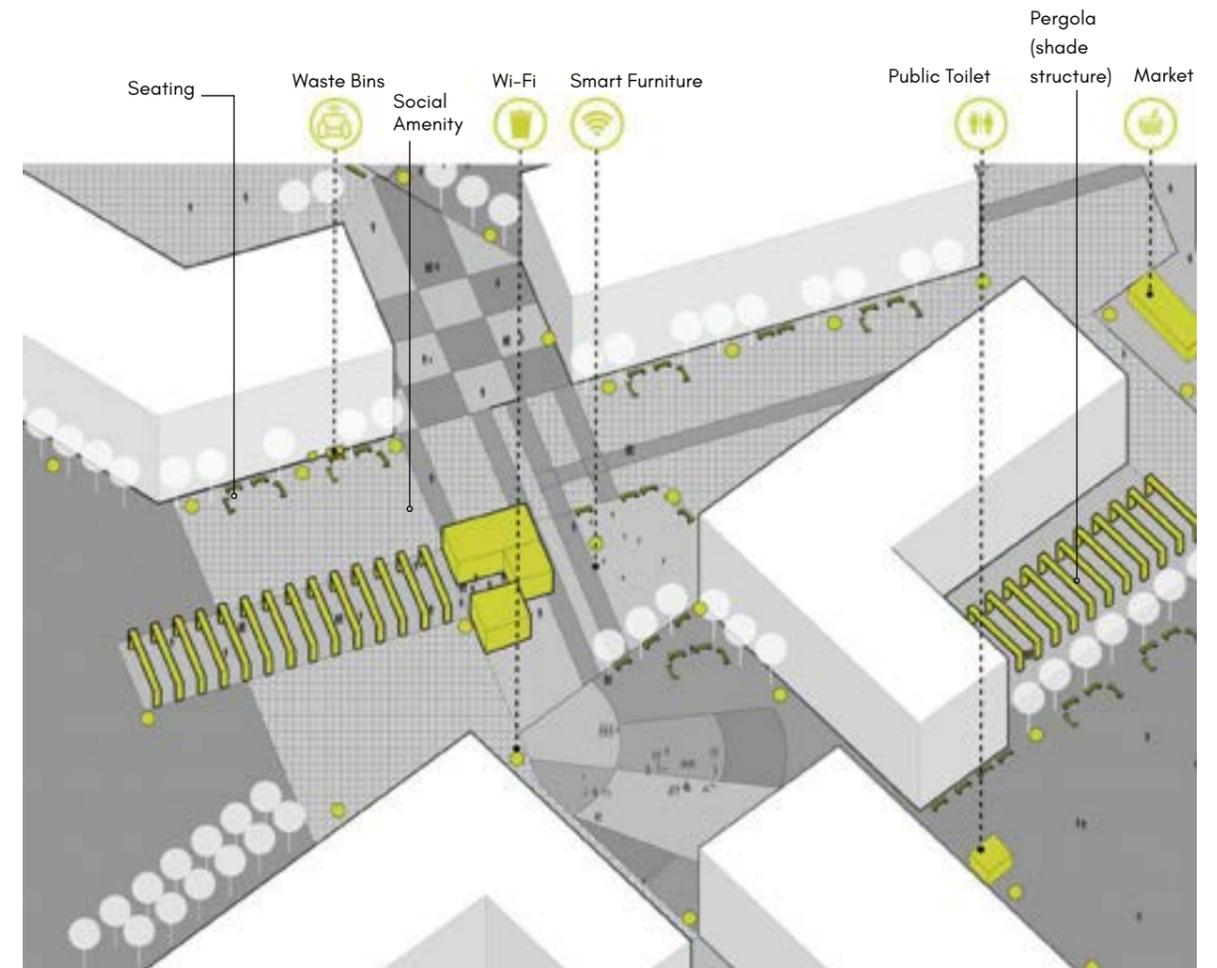


Figure 56 Structures and Street Furniture

Legend
● Waste Bin

6.1.5 SIGNAGE

INTENT

Promote legibility, wayfinding, comfort and a sense of belonging.

APPLICABILITY

The guidelines will apply to the design of signage and other place markers for pedestrian access, parking, vehicular circulation, open space programs, neighbourhood spaces, amenities and residential buildings.

GUIDELINES

- 6.1.5.1 Signs must be simple, legible, universally accessible (e.g., information boards in braille, international symbol mark for wheelchairs, etc.) and be well-illuminated for night-time viewing.
- 6.1.5.2 Protrusions must be avoided to ensure safety.
- 6.1.5.3 Local language should be included in textual signage.
- 6.1.5.4 Signage can include maps in open spaces to provide an overview of the development and help in orientation; they can also be installed on buildings (e.g., residential block number on housing blocks etc.)
- 6.1.5.5 Non-textual entities such as color, vegetation, nodes, street art, familiar/unique sights, sounds, smell and other visual and tactile cues can also be used as signage for wayfinding.
- 6.1.5.6 Signage can help provide cues to parents about things to show or teach their children (e.g., using playground equipment, etc.)
- 6.1.5.7 Signage treatment can be done using a cohesive graphic design language, such as uniform font types, hierarchy of font sizes and colors used for the same.



Figure 57 Signage

6.1.6 MATERIALS AND COLOUR

INTENT

Ensure vibrant, interesting, inclusive and environmentally sustainable places.

APPLICABILITY

The guidelines will apply to planning surface treatment of different kinds of open spaces, creating interesting spaces such as sites of social amenities, gathering spaces, buffer zones, setbacks, grounds, parks and streets.

GUIDELINES

- 6.1.6.1 The use of impervious surface and hard landscaping must be kept to a minimum and when used, they must be aesthetically pleasing, structurally robust, with good weathering characteristics and minimal maintenance requirements; permeable paving, tree planting holes and other methods to increase groundwater infiltration while preventing seasonal flooding must be introduced.
- 6.1.6.2 Wherever possible, hard landscaped areas should be designed with flexibility (e.g., on-street parking, parking courts, etc.) such that these spaces can be converted into parklets or small green spaces, when not required for parking temporarily or permanently.⁸⁷
- 6.1.6.3 Recycled construction materials should be used for surface treatment, where appropriate.
- 6.1.6.4 Colors and patterns should be used in a manner that addresses the needs of people with different abilities and health conditions. For example, a varied mix of colors tends to be confusing for people affected by certain health conditions including dementia. A variety of patterns can create an illusion that there is no clear route to follow and result in disorientation and anxiety.⁸⁸
- 6.1.6.5 Consideration should also be given to the potential for conflict between the provision of tactile surfaces designed for the blind or partially sighted, and the implications of such surfaces on accessibility for less mobile people, who may be using wheelchairs or other walking aids.⁸⁹
- 6.1.6.6 A wider space can have a higher proportion of soft or planted surface area, as otherwise the space would be dominated by a monotonously large expanse of paving. If required, a tighter, more enclosed space can be hard-paved without creating the same negative effect.

6.1.7 VEGETATION

INTENT

Improve the natural ecology, biodiversity, air and water quality and promote environmentally sensitive urban design; regulate the microclimate while reducing heat and noise pollution.

APPLICABILITY

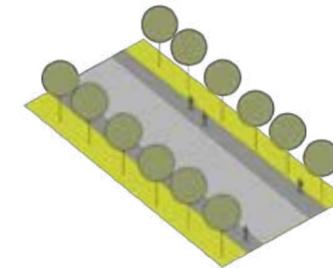
The guidelines will apply to improving the appearance of buildings, ensuring privacy buffers for ground floor units, creating clear sightlines for vehicular and pedestrian circulation, parks and gardens.

GUIDELINES

- 6.1.7.1 To the maximum extent possible, existing vegetation must be retained on the site while developing the public housing masterplan. Compensatory planting for felled and transplanted trees must be provided as per mandatory requirements.
- 6.1.7.2 Groundcover plants must be used to stabilize soil on steep slopes and can be used in contrast with paving materials and as a subtle means to demarcate spaces. This serves as a low-maintenance alternative for grass.
- 6.1.7.3 Landscaping must be provided in parking lots and other hard paved areas.
- 6.1.7.4 In addition to adhering to mandatory requirements on number of trees, the proposed landscape should include native species. Plantation chosen should be hardy with a long life span, deep-rooted, fast-growing and wind-resistant.

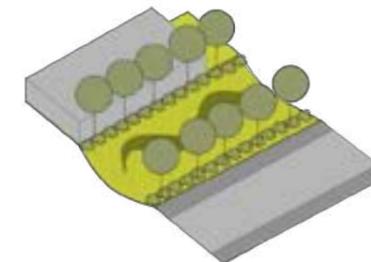
- 6.1.7.5 Planting considerations should include, but not be limited to, criteria on climate and soil context, maintenance requirements, availability of water and light.
- 6.1.7.6 Landscaped areas frequented by people should be free of low limbs, thorn-bearing plants, overgrown shrub beds or tripping hazards such as potholes, irrigation heads or plant stumps.⁹⁰
- 6.1.7.7 Planting can be formal, such as avenues or groups and informal such as vegetative buffers.
- 6.1.7.8 Urban farming can be included as open space programs to enable self-sufficiency and sustainability.
- 6.1.7.9 Plantation can include flowering and herbal shrubbery or plants.
- 6.1.7.10 Buffer areas and areas that require soil stability can be programmed to include Miyawaki plantation.

STREETS

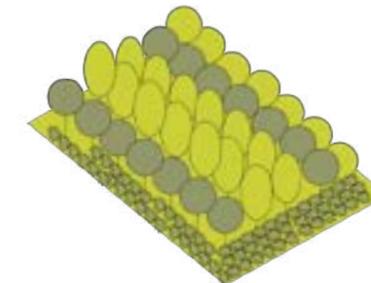


Boulevard

BUFFER SPACES

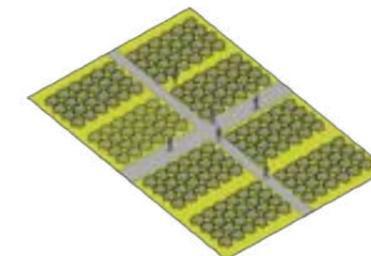


Bioswales

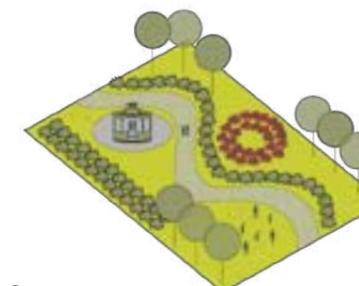


Miyawaki Plantation

PUBLIC OPEN SPACE



Urban Farming



Gardens

Figure 58 Open Space Typology-Vegetation Options

6.2 BLOCK LEVEL OPEN SPACES

01 TERRACE-LEVEL OPEN SPACE

A functional, recreational or productive space on the roof of a building.

02 MID-LEVEL OPEN SPACE

Open spaces at the mid-levels of a building to break the monotony of building form, especially in high-rise buildings; these spaces may include functional and recreational activities.

03 STILT-LEVEL OPEN SPACE

Stilt floor is the ground level portion of a building, which is used for parking and as covered open spaces. It typically comprises of columns supporting the super structure, and does not have any enclosures.⁹¹

6.2.1 TERRACE-LEVEL OPEN SPACE

INTENT

Ensure slowing down rainwater runoff, keep the building cool and ameliorate the 'urban heat island' effect, contribute to the filtration of pollutants from the atmosphere. Provide additional space for recreation, community development and energy farming.

APPLICABILITY

The guidelines will apply to the design of safe and durable public spaces and renewable energy infrastructure on the terrace level of building blocks.

GUIDELINES

- 6.2.1.1 The design of roof landscape must ensure structural integrity of the buildings and include good drainage design.
- 6.2.1.2 Solar panels and other necessary infrastructure must be provided.
- 6.2.1.3 Plants chosen should be hardy with a long life span, fast-growing, wind-resistant and should comprise of native species.
- 6.2.1.4 Programs at the terrace level can include social amenities and /or programs such as urban farming.
- 6.2.1.5 Terrace level open spaces can also be used as viewing decks (with adequate safety measures provided); this can help provide panoramic views to assets within and around the site.
- 6.2.1.6 Multiple terrace levels can help create an interesting skyline, especially in high-rise developments.



Figure 59 Terrace-Level Open Space



Figure 60 Terrace-Level Program

6.2.2 MID-LEVEL OPEN SPACE

INTENT

Enhance daylight and ventilation at the block level, while also providing continuity of public open spaces, interlinking the vertical and horizontal axes.

APPLICABILITY

The guidelines will apply to providing relief and refuge spaces in high-rise developments.

GUIDELINES

- 6.2.2.1 Mid-level open spaces can include punctures through the building mass and span multiple floors (based on aesthetic considerations).
- 6.2.2.2 Programming of these spaces can include social activities such as play areas for children, physical recreational zones, convenience stores and others.
- 6.2.2.3 Building façades can be treated with vertical gardens as a type of mid-level landscaping feature to improve the microclimate and filter air-pollutants.



Figure 61 Mid-Level Open Space

6.2.3 STILT-LEVEL OPEN SPACE

INTENT

Improve passive and active surveillance and enable ease of pedestrian movement as part of the larger open space network.

APPLICABILITY

The guidelines will apply to the design of stilt floors to be used for both parking and recreational activities by the inhabitants.

GUIDELINES

- 6.2.3.1 The stilt floor can be used to create continuous and unobstructed pedestrian pathways.
- 6.2.3.2 The stilt floor can be equipped with active surveillance technology such as CCTV cameras.
- 6.2.3.3 Plants chosen should be hardy with a long life span, fast-growing, wind-resistant and should comprise of native species.
- 6.2.3.4 Since stilts are, primarily, provided for flood resilience, no expensive equipment like computers, etc. should be encouraged within these uses. Major electrical equipment, firefighting systems, lift pits, etc., also should be ideally located above the stilted area, and accessed by ramps to ensure universal accessibility.
- 6.2.3.5 Planting strips and rest zones that include outdoor seating can be included at the stilt level.

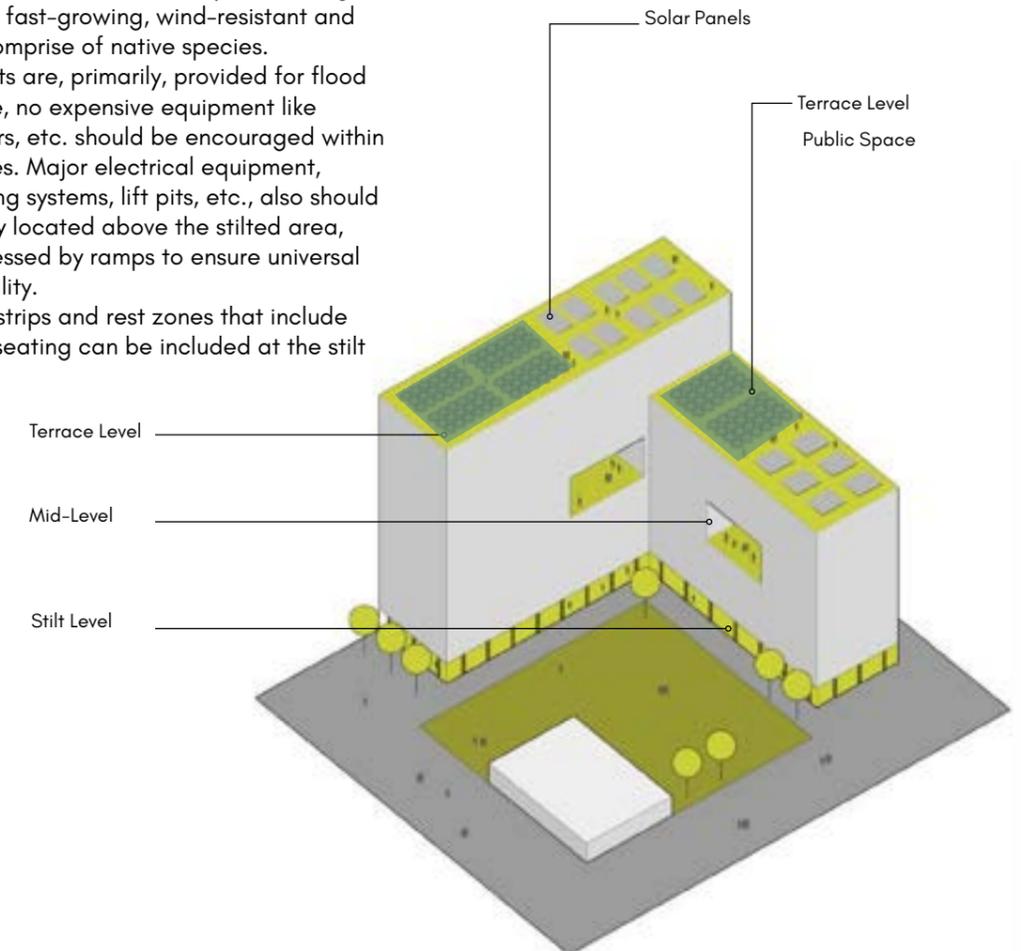


Figure 62 Block Level Open Spaces

LIVELIHOOD AND AMENITIES

Livelihood and Social Amenity Provisions



When families move to new homes, rebuilding their lives by ensuring adequate livelihood opportunities is the most important piece of the puzzle.

EXECUTIVE SUMMARY

Generating a sense of collective responsibility amongst residents is the foundation of a successful and cohesive public housing project. A participatory approach can foster this and should be adopted from the planning, through to implementation and post-occupancy stages. In terms of design, this entails engaging with the community right from the initial design brief development to inform the preliminary design scheme. The scheme thus prepared should be finalized in discussion with the community. Three-dimensional models and interactive engagement techniques can effectively improve community understanding of the design and elicit appropriate responses. It is equally important to share the final design to the community and reiterate where and how their inputs have shaped the ultimate outcome. These processes have been further elucidated in the *Social Sustainability and Grievance Management Framework* document. Participatory planning also helps identify potential community leaders amongst the residents, who can be mobilized to provide continued leadership post-construction and occupation. Co-opting an existing leadership (political and social) can also help harness the youth amongst the residents. This group can begin the initial collective organization of residents to form the RWAs for facility management and social leadership. It is important to ensure gender balance within the leadership groups in the formative stages through participation, as the well-being of women is central to the well-being of the residents, children and the aged.

The design of housing blocks is a significant part of the concept masterplan. Equally critical is the provision of adequate, accessible and appropriate social amenities like play schools, health centers etc. The demographic profile of the community can yield the quantum and nature of amenities to be provided, which should be addressed right from the initial planning stages, if beneficiaries are known. Demographic analysis is a critical tool to guide the provision of the type of social amenities as well. When a large, low-income residential community (whose social indicators are normally far below the average obtained in the host city) is brought into a new location, a gap analysis for the amenities should be undertaken. Appropriate institutional arrangements can also ensure that the infrastructure provided is well-staffed as the functioning of these amenities is dependent upon several other agencies (e.g., Department of Health, Education etc.). Necessary steps must be undertaken to address this in a holistic manner, as the lack of social infrastructure will have a negative impact to the quality of life provided, increase crime incidence etc. Thus, this chapter reinforces the need for adequate livelihood opportunities and social amenities.

Notes:

1. This chapter should be read in conjunction with Chapter Two, Chapter Four, Chapter Five and Chapter Six.
2. The guidelines should be addressed in addition to the applicable national and state regulations which must be adhered to.

7.1 LIVELIHOOD AND SOCIAL AMENITY PROVISIONS

The most critical factor that determines the successful acceptance of greenfield housing projects is the access to livelihood. People migrate to cities for jobs, not for housing. The awareness about the importance of access to work overtakes the prospect of owning a home in the city. Those who have had to move from inner city slums to peripheral housing locations without access to work opportunities spend huge sums of money and time in commuting. This effectively increases real poverty among the residents.

PROGRAM AND DESIGN POSSIBILITIES

Stilt Area:

The design approach to amenities gives rise to a number of physical urban design decisions. Proper site planning, coupled with the provision of stilt areas create interesting opportunities to incorporate amenities within the site e.g., on the terraces of buildings and within the building bulk itself, if design provisions are made for easy access. For example, stilted areas are paved, all weather-spaces. When planned, they tend to become excellent spaces to accommodate nurseries, crèches and active functions for slightly older children. If these are surrounding the central courtyards of the masterplan, they can serve as school spaces in the day and safe play areas in the evenings. They can also include social amenities for women.

The social health of a community is often contingent on the well-being of women. In addition to contributing to the family income, they are also the

primary caregivers for the children and aged. However, till date, cities often do not include adequate provisions and amenities for women. The housing environment provides an excellent opportunity to address this issue, as it is here that women nurture their families and themselves. These are some examples of social amenities that could cater to women while being compatible with other functions:

- Health centre and toilets with sanitary napkins dispensers.
- Women's room with gym facilities.
- Reading room.
- Household Industries production centre with shared services.
- Crèches for all genders.
- Family counselling centre.
- Tot lots and outdoor recreation centres for children of all genders.
- Small shops.
- Service centers and repair of domestic equipment and mobiles.

Stilted spaces or open spaces with some of the above social amenity provisions in them can also be a revenue source for the RWAs. They can provide services to the residents as well as surrounding city areas, while being a source of employment for the youth within the housing scheme. The revenue thus earned can cross-subsidize some of the services upkeep within the housing.

Innovative Program Mix and Housing Typologies:

In-situ redevelopment offers an opportunity to cross-subsidize the new housing by utilizing the opportunity-cost available in the location. Without diluting the public housing dimensions, certain cost recovery can be attempted by introducing mixed-use commercial components in these sites. In such housing, subsidy components can be brought down by cost recovery. In addition, introduction of self-managed facility management systems can reduce the government liability in upkeep. These can be successful only if a participatory method of planning and execution is made part of the design of the scheme. The RWAs can also play a proactive role in recovery framework, payments for services etc. while playing a mediator role in financial management.

While this can be effectively introduced in central locations in housing, actual in-situ tenement construction of existing slums present a different set of problems that will continue to demand a more affordable production process.

In both redevelopment and greenfield projects, high land values, escalating land scarcity as well as incessant migration into cities are increasing the need to pack more built-form into housing sites. To address this, some out-of-the box thinking is required. The solution lies in mixed-use, mixed-income developments and accompanying typological resolutions that ensure segregation of entrances and stacking of non-residential uses below residential apartments. Upper floors can also be mixed with larger unit sizes that can be provided a segregated lift access and separate parking areas in stilts.

However, the housing unit type mix should be socially and economically compatible to create a cohesive residential environment. Design typology can ensure minimal erosion of residential quality for all resident

groups. For instance if 40 sq.m is the unit size for the affordable housing with Ground+ 3 floors, the upper housing can be 60 sq.m-80 sq.m with a judicious mix of commercial and planned social amenities.

The upper floors can be open partly for rental and partly for owner occupation, depending on market demand. Certain floors (e.g from Ground+ 5 floors and above) can be converted to commercial uses or flatted factories that provide jobs and increased household income for all residents. Connecting blocks by bridges at these common use floors can also facilitate user mobility from one block to the other. These connections are also refuge spaces in case of fire and provide better structural stability to high-rise blocks. This solution through application of urban design principles vested in mixed-use typologies can contribute to cost recovery while permitting better intensity of use of scarce urban land in inner cities.

CONCLUSION

Way Forward



8.1 WAY FORWARD

Over the last fifty years of its existence, TNSCB has delivered a significant amount of housing and their successes have been emulated in many other Indian states. However, the undeterred focus on providing much needed housing for large populations has placed emphasis on cost and efficiency, often at the expense of enhancing the lived experience of inhabitants. In light of new perceptions about the quality of living environments all around the world, TNSCB's vision for public housing and its production processes need to be revisited. In addition to enhanced site planning and housing design, providing adequate social amenities introducing mixed-use typologies, improving facility management and adopting innovative cost recovery mechanisms are few examples that need new management systems and professional production within the organization. Interventions are broadly required across two levels, as outlined below.

■ **Creating a commitment to shared aspirations across all levels of the organization:** from the perspective of changing parameters in metropolitan low-income housing needs, providing a wholesome residential environment has become far more complex than meeting the mere quantum of housing based on densities. Thus, this RUDF document outlines two core vision tenets, namely (a) Enriching the lived experience and (b) Building resilient communities. Adopting this, and the associated goals and strategies outlined in Chapter Two will enable TNSCB to become an exemplar in the provision of next-generation public housing. In order to realize this, a shared

commitment across different stakeholders, beneficiaries and other actors in the ecosystem is paramount.

- **Augmenting TNSCB's current capacity to achieve the vision tenets:** this includes both the institutional as well as technical capacities of the organization.
 - + **Institutional Capacity:** in order to balance parameters of cost and engineering with a people-centric approach, it is imperative to expand the organization to include a spectrum of professional inputs. This presents an opportunity to redefine the current organizational structure to include increased engagement from the disciplines of urban design, social planning, financial management, etc. to support core engineering, in addition to the professional administrative support provided by the Tamil Nadu Government. Further, an expanded role and enhanced resourcing for the Community Development Wing (CDW) can help address the myriad requirements on the ground right from the design development phase (esp. stakeholder engagement activities) through till post-occupancy.
 - + **Technical Capacity:** in order to stay abreast with technological advancements in the field of public housing design and delivery, it is essential to introduce new skills and technologies to the in-house team.
 - **Planning process:** this can be enhanced through the appropriate use of GIS. For example, a central web repository with information on land available for TNSCB developments as well as details of previous projects under different government initiatives can be developed and periodically updated on a GIS platform. The platform could also include spatial surveys of slums to improve design insights. Information thus

gathered, should be made available to the planning, design and engineering teams, as inputs for future designs.

- **Design quality and efficiency:** to successfully address these parameters, staff should be trained on essential software and modelling techniques. For example, Building Information Modeling (BIM) can be adopted to enhance the overall quality of design and construction as it extends throughout the building life cycle. In addition, computational software may also be used to assess design parameters such as radiation, daylighting, wind flow etc. This empirical analysis can provide a data-driven approach to masterplanning.
- **Design thinking and communication:** TNSCB's traditional approach has included the development of two-dimensional plans with little to no focus on 3D visualization. Three-dimensional studies are critical tools to developing human-centric designs and many of the relevant design considerations have been highlighted in this document. Modelling software can be introduced and used at every stage of the design process to ensure best outcomes. Further, the use of physical 3D models can be encouraged during community engagement for increased participation and greater understanding by the beneficiaries.
- **Integrating smart technologies:** TNSCB's capabilities to embrace Internet of Things (IoT) and other digital advancements during the design process as well as post-occupancy is critical to the creation of world-class, future-ready developments. Specific training can be imparted for the same.

While in-house capacity building is imperative, TNSCB can also augment capacities by hiring relevant expert consultants, as needed. Enhanced internal capacity will enable TNSCB identify such consultants with the right type and level of expertise to successfully deliver the designs, if outsourced. Further, consultations with think-tanks and academia can enhance its capacities to produce cutting-edge design solutions.

In 2015, the United Nations (UN) declared the new Sustainable Development Goals (SDGs) that sets the standard for global development. India is also a signatory to this document and its progress is periodically reported to the UN. Of the 17 SDGs, only Goal no.11 addresses the sustainable cities directly but all the others indicate the holistic health of development. The UN SDGs mark a paradigm shift in sustainability by focusing on human sustainability, instead of merely sustainable resources. The importance of Human Development Index (HDI) in housing is reflected in the emphasis given to social amenities and participatory planning. TNSCB's housing projects can address these issues through proper planning for which more than mere engineering solutions are required. This points to the SDG's Goal no.17- 'Partnership for the Goals', indicating the need to diversify human resources within TNSCB and to address the need to create partnerships with relevant government departments to create sustainable communities in public housing.

Thus, at the core of the RUDF document is the aspiration to build people-centric, resilient and future-ready homes, enabling an upward economic growth of low-income families in the state of Tamil Nadu.

APPENDIX

Glossary
Endnotes



9.1 GLOSSARY

TERMS USED IN THIS DOCUMENT

Anganwadi

A child care center run for Economically Weaker Sections of the society.

Bioswales

A long, channeled depression or trench that receives rainwater runoff, (eg., from parking lots), and has vegetation (such as grasses, flowering herbs, and shrubs) and organic matter (such as mulch) to slow down water infiltration and filter out pollutants.

Building Depth

Dimension measured from the front to the back of the building floor plate.

Building Elevation

Front façade and other faces of the building.

Building Entrance

The threshold between the exterior and interior; the entrance may lead into a common entry foyer, and onwards to the lift and stair core.

Built Form

The three dimensional aspect of the built environment.

Building Height

The vertical distance measured, in the case of flat roofs, from the average level of the ground around and contiguous to the building to the terrace of the last livable floor.

Building Length

The dimension of the building, one shorter side to the other.

Building Mass

Perception of the general shape, size, as well as form of a building.

Building Services

The systems installed in buildings to make them comfortable, functional, efficient and safe.

Can

A verb suggesting possibility / opportunity.

Connected Blocks

Clusters of buildings, when joined back to back and / or on sides.

Corners

The juncture at which two corridors / units meet at an angle.

Corridor

A common passage or circulation space within a building.

Courtyard

A block profile that allows a building to enclose an exterior space. Most common courtyard block types are U-shaped blocks and perimeter blocks.

Daylight Access

Natural lighting for interiors through fenestrations.

Daylight and Shading

Mutually dependent factors that influence the microclimate and usability of open spaces.

Double-Loaded

A corridor that is enclosed within the building. Units are accessed from both sides of the corridor.

Driveway

Portion of the 'Right of Way' in a road that is dedicated to vehicular traffic.

Dwelling

A unit or other place of residence.

Entrance Gateways

Locations that act as transitions between the inside and outside and anchor entry or departure points, commonly manifested as a clearly defined and visually impressive space.

Footpath

It is a portion of Right of Way of road used for the movement of pedestrian traffic.

High Rise

All buildings greater than 18.3m in height.

Jali / Screenwall

A screen/lattice, non-load bearing wall, erected around a part of a building, to improve visual and thermal quality.

Lifts

An appliance designed to transport persons or materials between two or more levels in a vertical or substantially vertical direction by means of a guided car or platform.

Lighting

General and focused illumination of objects and activities in open spaces, in the absence of daylight.

Low Rise / Non-High Rise

All buildings not exceeding 18.3m in height.

Luminaires

It is an electrical device that contains an electric lamp that provides illumination.

Materials and Colour (Building Design)

The aesthetic and material quality of surface treatments on a building.

Materials and Colour (Open Space Design)

A palette for detailing open spaces.

Mid-Level Open Space

Open spaces at the mid-levels of a building to break the monotony of building form, especially in high-rise buildings; these spaces may include functional and recreational activities.

Must

A verb expressing the highest order of obligation / importance.

Natural Ventilation

Supply of outside air into a building through windows or other openings due to the prevalent wind and convection effects arising from temperature or vapor pressure differences (or both) between the inside and outside of a building.

Neighborhoods

A spatial unit that has a specific geographic area and functions as a set of social networks which foster face-to-face interactions in personal settings and situations.

Nodes

Strategic and important points in a site, that include street intersections or junctions, landmark programs of a site or community gathering spaces, serving as either destinations, or points of transition.

Open Space

An area forming an integral part of the site left, open to the sky. It includes any piece of land that is undeveloped and is accessible to the public. Open spaces may be landscaped (e.g., parks), hold programs (e.g., playgrounds, public plazas, etc.) or activate social amenities. It can also include land reserved for the Sewage Treatment Plant (STP), vacant lots, to name a few.

Open Space Typology and Hierarchy

An interconnected and often hierarchical system of undeveloped land that forms logical and seamless relationships with the built environment and fulfils the needs of all segments of the population.

Parcel / Site

Terms, used interchangeably, refer to the piece of land that TNSCB will build upon.

Parking

An area enclosed or unenclosed, covered or open, sufficient in size to park vehicles, together with a driveway connecting the parking space to a street or alley and permitting ingress and egress of the vehicle.

Pathway

Recreational feature of a landscape, a meandering route, often made from rustic materials; appropriate for more natural settings, such as gardens, where they provide a means for enjoying landscape features at leisure.

Pedestrian Network

Spaces that are pedestrian-friendly and include footpaths along the streets, walkways connecting amenities across the site as well as pathways within the landscape.

Public Housing / Housing Scheme / Development

Terms, used interchangeably, refer to TNSCB projects.

Public Realm

These are the everyday spaces that we move through and linger within; the places where we live, work

and play; external places that are accessible to the public.

Regular

Block profiles with varying unit arrangements i.e., units may be placed in different ways to form an 'I' block profile, 'L' block profile etc.

Residents / Inhabitants / Beneficiaries

Terms, used interchangeably, refer to the residents of public housing projects.

Road

Road is a long, narrow stretch (with a smoothed or paved surface, made for traveling by motor vehicles) between two or more points.

Safety and Security

Safety is the condition of being protected from harm or other non-desirable outcomes, caused by unintentional failure of design and other human or natural externalities. Security is the condition of being protected from harm or other non-desirable outcomes caused by intentional human actions or behavior.

Should

A verb suggesting the second order of obligation / necessity.

Signage

A system to improve wayfinding within a development. Vehicular directional, pedestrian directional and building location signages are all integral to creating a complete wayfinding system. Signage includes textual, non-textual and tactile guides to navigate the urban environment.

Single-Loaded

A corridor that runs along an external or atrium face of a building. The associated units are accessed from one side of the corridor only.

Site Access

A clear approach to a plot.

Site Setback

Open space at the front, sides, or rear of a plot between the building and street or boundary of the plot, as the case may be.

Skyline

A horizon that is interrupted by verticals, expressed and articulated as a variation in built form heights. It creates a collective, coherent image and a silhouette against the sky.

Space between Buildings

The minimum distance between any two building blocks within the site.

Staircase

Element designed to bridge a large vertical distance by dividing it into smaller vertical distances, called steps.

Stilt-Level Open Space

Stilt floor is the ground level portion of a building, which is used for parking and as covered open spaces. It typically comprises of columns supporting the super structure, and does not have any enclosures.

Storage

Includes all open and closed areas provided within the unit to store things.

Street

Street is a public road in a city, town, or village, typically with houses and buildings on one or both sides.

Street Frontage

External street frontage refers to the property boundary that abuts the street (in some cases two or more streets). Street frontage also includes the space between the building façade and the through zone of the pedestrian realm of the street. Internal street frontage refers to the buildings and spaces that define internal streets.

Structures and Street Furniture

Built entities that integrate with the open space network and play either a main or ancillary role in addressing the social, commercial and economic functions of open spaces.

Terrace-Level Open Space

A functional, recreational or productive space on the roof of a building.

Thermal Comfort

The condition of the thermal environment under which a person can maintain a body heat balance at normal body temperature and without perceptible sweating.

Treatment Plants

The equipment required for the process of removing contaminants from wastewater, primarily from household sewage. The by-product of sewage treatment is usually a semisolid waste or slurry, called sewage sludge that has to undergo further treatment before being suitable for disposal or further application.

Typology

Classification based on types or categories of building design.

Unit Balance

Distribution of different unit types across the site.

Unit Size and Layout

Design and placement of components of an individual residential unit including living, bedroom, kitchen, balcony / utility, toilet and bathroom.

Universal Accessibility

The design and composition of an environment that can be accessed, understood and used to the greatest extent possible by all people regardless of their age, gender, or ability.

Urban Design

Urban design is the process of giving form, shape, and character to groups of buildings, to whole neighborhoods, and the city. It is a framework that orders elements into a network of streets, squares, and blocks. It blends architecture, landscape architecture, city planning, and other disciplinary realms together to make urban areas functional and attractive.

Vegetation

A key component of open spaces that performs essential ecological services and provides respite from heat for inhabitants.

Vehicular Circulation

The road network and other shared spaces that permit vehicular entry. A street is the basic unit of a road network, through which people experience a

city. Streets are dynamic spaces that adapt over time to support environmental sustainability, public health, economic activity, and cultural significance.

Walkway

Utilitarian paved (preferably porous paved) surfaces used to facilitate foot traffic.

Wayfinding

The information systems that guide people through a physical environment and enhance their understanding and experience of the space.

9.2 ENDNOTES

Introduction

- 1 Government of Tamil Nadu (2019). *Tamil Nadu Combined Development and Building Rules, 2019*. Retrieved from <https://www.chennaicorporation.gov.in/images/TNCDRBR-2019.pdf>
- 2 Document available online at: <http://www.indiaenvironmentportal.org.in/files/file/MODEL%20BUILDING%20BYE%20LAWS-2016.pdf>
- 3 Town and Country Planning Organisation, Ministry of Urban Development (2016). Model Building Bye-Laws, 2016, pp. Prelude. Retrieved from <http://www.indiaenvironmentportal.org.in/files/file/MODEL%20BUILDING%20BYE%20LAWS-2016.pdf>
- 4 Document available online at: <https://bis.gov.in/index.php/standards/technical-department/national-building-code>
- 5 Document available online at: <http://mohua.gov.in/link/urdpfi-guidelines.php>
- 6 Document available online at: <https://www.rera.tn.gov.in/homePageFiles/Regulations.pdf>
- 7 Document available online at: <https://cpwd.gov.in/publication/harmonisedguidelinesreleasedon23rdmarch2016.pdf>
- 8 Document available online at: [http://mohua.gov.in/upload/uploadfiles/files/G%20G%202014\(2\).pdf](http://mohua.gov.in/upload/uploadfiles/files/G%20G%202014(2).pdf)
- 9 Document available online at: <https://www.cpwd.gov.in/Publication/LandscapeBook.pdf>
- 10 Document available online at: https://smartnet.niua.org/sites/default/files/resources/cfn_-_design_guidelines.pdf
- 11 Document available online at: <https://go.itdp.org/download/attachments/60296563/IRC%202012%20%28Guidelines%20For%20Pedestrian%20Facilities%29.pdf?api=v2>

Vision and Goals

- 12 Housing and Urban Development Department, Government of Tamil Nadu (2019). *Policy Note of Housing and Urban Development Department*, pp. 82. Retrieved from <https://www.tn.gov.in/documents/dept/15/2019-2020>
- 13 JNNURM was implemented from 2005 to 2015 by the then Ministry of Urban Development (MoUD) and the Ministry of Housing and Urban Poverty Alleviation (MoHUPA). It had two components: (i) Urban Infrastructure and Governance (UIG) implemented primarily by MoUD, and (ii) Basic Services for Urban Poor (BSUP) implemented primarily by MoHUA; both components were targeted at 63 metro/capital cities.
- 14 Implemented in 2009-2014, RAY promoted a slum-free India focused on bringing all existing slums, notified or non-notified to the formal system by assigning tenure rights to slum dwellers, as well as planning and facilitating affordable housing stock.
- 15 Housing and Urban Development Department, Government of Tamil Nadu (2019). *Policy Note of Housing and Urban Development Department*, pp. 83. Retrieved from <https://www.tn.gov.in/documents/dept/15/2019-2020>
- 16 EWS in India is a subcategory of people having an annual family income less than 3 lakhs and who do not belong to any reserved category such as Scheduled Caste/Scheduled Tribe/ Other Backward Class (central list). Information available online at: http://mohua.gov.in/upload/uploadfiles/files/5CLSS_EWS_LIG_English_Guidelines_wb.pdf
- 17 Housing and Urban Development Department, Government of Tamil Nadu (2019). *Policy Note of Housing and Urban Development Department*, pp. 9. Retrieved from <https://www.tn.gov.in/documents/dept/15/2019-2020>
- 18 Sustainable City. Retrieved from https://en.wikipedia.org/wiki/Sustainable_city

- 19 Vihanninjoki, V. (2019). Urban Places as Aesthetic Phenomena: Framework for a Place-Based Ontology of Urban Lifeworld. *Topoi*. doi:10.1007/s11245-018-9601-1
- 20 The Ministry of Earth Science has launched Seismic Hazard Micro-zonation project in major cities of India. More information available online at: <https://currentaffairs.gktoday.in/goi-launches-seismic-hazard-microzonation-to-minimize-earthquake-disasters-012020323731.html>
- 21 An enormous quantity of water is used every day cumulatively by every housing scheme. Multiple use of water through a cyclic system is critical from a water security perspective.
- 22 The manure can be used for public areas or sold at a minimal rate to residents who may like to green their own homes.

Site Planning

- 23 Road is a long, narrow stretch with a smoothed or paved surface, made for travelling by motor vehicles, between two or more points. Street is a public road in a city, town, or village, typically with houses and buildings on one or both sides.
- 24 More information available at: <https://globaldesigningcities.org/publication/global-street-design-guide/defining-streets/what-is-a-street/>
- 25 Definition source - Town and Country Planning Organisation, Ministry of Urban Development (2016). Model Building Bye-Laws, 2016, pp. 10. Retrieved from <http://www.indiaenvironmentportal.org.in/files/file/MODEL%20BUILDING%20BYE%20LAWS-2016.pdf>
- 26 More information available online at: <https://www3.epa.gov/region1/eco/uep/openspace.html>
- 27 Definition adapted from - Aspen Institute Roundtable on Community Change (2006). Promoting Safe and Healthy Neighborhoods: What Research Tells Us about Intervention. Edited by Karen Fulbright-Anderson and Patricia Auspos. Community Change: Theories, Practice, and Evidence. Washington, D.C.: Aspen Institute.
- 28 Definition available online at: https://www.urban-design-guidelines.planning.vic.gov.au/toolbox/glossary#letter_F
- 29 Lynch, K. (1960). *Image of the City*. Cambridge, Massachusetts, and London, England: The M.I.T. Press
- 30 More information available online at: <https://www.skyscraper.org/skyline/>
- 31 More information available online at: <https://www.coursera.org/lecture/security-safety-globalized-world/what-is-safety-and-security-VXD42>
- 32 More information available online at: <http://universaldesign.ie/What-is-Universal-Design/>
- 33 More information available online at: <https://www.theguardian.com/sustainable-business/2017/feb/21/urban-heat-islands-cooling-things-down-with-trees-green-roads-and-fewer-cars#:~:text=Smart%20cities-,Urban%20heat%20islands%3A%20cooling%20things%20down%20with%20trees,green%20roads%20and%20fewer%20cars&text=When%20it%20comes%20to,than%20surrounding%20non%20urbanised%20areas.>
- 34 Guidelines recommend 1.8m as the minimum width for footpath - Indian Roads Congress (2012). Guidelines for Pedestrian Facilities, pp. 8. Retrieved from <https://go.itdp.org/download/attachments/60296563/IRC%202012%20%28Guidelines%20For%20Pedestrian%20Facilities%29.pdf?api=v2>
- 35 Bureau of Indian Standards (2016). National Building Code of India 2016, Vol 1, Part 3, pp 70.
- 36 Clarence Perry's Neighborhood concept. More information available online at: https://link.springer.com/referenceworkentry/10.1007%2F978-94-007-0753-5_3335

37 Chandler Police Department (2010-12). CPTED Crime Prevention Through Environmental Design, pp.44. Retrieved from <https://www.chandlerpd.com/wp-content/uploads/2010/12/CPTED-Handbook-v4-20170627.pdf>

38 National Crime Prevention Council (2003). Crime Prevention Through Environmental Design Guidebook, pp. 29. Retrieved from https://rems.ed.gov/docs/Mobile_docs/CPTED-Guidebook.pdf

39 Definition source – Bureau of Indian Standards (2016). National Building Code of India 2016, Vol 1, Part 3, pp 52.

40 Definition source – Town and Country Planning Organisation, Ministry of Urban Development (2016). Model Building Bye-Laws, 2016. pp. 1. Retrieved from <http://www.indiaenvironmentportal.org.in/files/file/MODEL%20BUILDING%20BYE%20LAWS-2016.pdf>.

41 Definition source – Government of Tamil Nadu (2019). Tamil Nadu Combined Development and Building Rules, 2019, pp. 12. Retrieved from <https://www.chennaicorporation.gov.in/images/TNCDRBR-2019.pdf>

42 Definition source – Bureau of Indian Standards (2016). National Building Code of India 2016, Vol 1, Part 3, pp. 12.

43 Definition source – Bureau of Indian Standards (2016). National Building Code of India 2016, Vol 2, Part 9, Section 2, pp. 61.

44 Definition source – <https://www.ukfrs.com/promos/17144#:~:text=A%20substation%20is%20a%20part,of%20several%20other%20important%20functions.&text=Generally%2C%20substations%20are%20unattended%2C%20relying%20on%20remote%20supervision%20and%20control>.

Building Design

45 The EDGE software shows within minutes how committing to a few practical energy and water-saving options improves building performance at little or no cost. The numbers are brought to the forefront to reveal the most economically viable path to building green. EDGE- Excellence in Design for Greater Efficiencies, Green Buildings for a smarter world. Information available online at: <https://www.ifc.org/wps/wcm/connect/1d62d34a-b033-457f-97f5-029b3df6eb7/EDGE-brochure-Eng.pdf?MOD=AJPERES&CVID=kt2CALH>

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DIAGRAMS

All diagrams were prepared exclusively for this document.

TAMIL NADU SLUM CLEARANCE BOARD

