PROJECT:
DEVELOPMENT OF CONSTRUCTION BY-LAWS FOR EDUCATION CITY PROJECT

Client:

Project Implementation Unit,
Education City Project,
Government of Sindh, Karachi

Submittal:

FINAL APPROVED BY-LAWS

Consultant:

M/s. CGD Consulting Pvt Ltd

23rd November, 2022

CGD CONSULTING

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PREFACE

The Master Plan document of Sindh Education City has been prepared by a consortium of consultants comprising ARCOP LTD, CHAN KRIERGER NB, ARIF HASSAN and Associates, HALCROW, ERNST & YOUNG in 2012. Sindh Education City lies on 8,921.00 acres, approximately, of sub-urban, "greenfield" land in Deh Chuhar of Gadap Town in the District Malir, Sindh, Pakistan

This document has aimed to produce the set of Construction By-Laws for the Education City Project, District Malir, Karachi as per the approved Master Plan with the objective to enable the Education City Board to initiate the future development of Sindh Education City as per the spirit of the approved Master Plan and in line with globally recognized planning and building standards and practices. The document will provide guidance to ensure the sustainable development besides encouraging a friendly environment for Education City.

In order to carry out the assignment, the M/s. CGD Consulting Pvt Ltd was assigned the subject work for the preparation of construction by-laws for Education city as per approved master plan. The Firm deployed a diverse team of professionals providing a wide range of services. The team included Architects, Planners, Civil Engineers, Urban Designers, and Legal experts who rendered their professional services keeping in view up-to-date practices and international planning standards.

The Construction by-laws compiled in this document contain enough technical knowledge and control mechanism to execute the urban fabric in line with world level development as a model of smart city. The document consists of different chapters and each chapter has been elaborated comprehensively. These by-laws are developed in the light of ToRs. The by-laws cover all aspects of the planning and architectural controls besides establishing standards for infrastructure development. These by-laws provide a comprehensive guideline for zoning which covers all proposed districts and clearly define the permissibility and prohibition. These also includes detailed architectural guidelines covering control mechanism for all aspects of the building developments and include measure with regard to maintaining an identifiable architectural character with the sense of regional identity. This will help in ensuring that overall built form and façades of individual buildings falling within the domain of the education city are developed with architectural harmony.

These By-laws help establish standards with regard to density, FAR, urban design standards etc. They also suggest appropriate use of urban streets, transport system, and public realm etc.

The By-laws also provide a comprehensive guideline for public spaces, green spaces, sustainable agriculture preservation and ecology, as well as define and elaborate implementation mechanism of the by-laws for ensuring the Sustainable Development Goals 2030 in comprehensive manner. Moreover, the document also provides and recommends general policy guidelines which could be adopted so as to provide basis for future course of development.

We are thankful to Project Director of PIU Education City Project and the entire team for their guidance and technical support which enabled M/s. CGDC to complete this document in a timely and meaningful manner.

AIMS AND OBJECTIVES OF THE PROJECT

This document has aimed to produce the set of Construction By-Laws for the Education City Project, District Malir, Karachi as per the approved Master Plan with objective of the **Education City Board** to initiate the future development of Sindh Education City **as per the spirit of the approved Master Plan** and in line with globally recognized planning and building standards and practices. The document will provide guidance to ensure the sustainable development besides encouraging a friendly environment for Education City.

OBJECTIVES

- To Develop the Education City in line with the international standards
- To ensure a sustainable development of Education City on Smart City concept
- To encourage a human friendly environment with low carbon omission and pedestrian friendly development
- To provide guidelines to the planners, architects and engineers. It becomes easier to pre-plan building provisions and activities
- To ensure that the spirit of Approved master Plan is followed through these Construction By-laws in its implementation
- To ensure that the education city besides meeting all the international planning and building standards also respond to the socio-cultural aspects of the region, a region which is rich in its heritage
- To emphasize on the planned improvement of environment, green spaces within educational communities, as well as, emphasize on **R&D for** the development of **special green zones using** most modern technologies Special emphasis on **sustainability**, **rain water harvestery, recycling of waste to support energy** and other requirements

METHODOLOGY

1. APPROACH ADOPTED

- **The preparation of by-laws is imperative to drive the quality of development in a sustainable manner.** It provides pivotal multi-dimensional views to the built environment. The preparation of by-laws is imperative to drive the **quality of development in an** environment where spatial development could be translated on the ground without compromising the natural landscape.
- A set of rules, if implemented in letter and spirit shall ensure the **sustainable development.**
- Building by-laws help create a more attractive, lucrative, and friendly built environment by

applying a **rationalised mix of land coverage, FAR and density,** etc.

It was imperative for the preparation of by-laws to consult the existing **local and international policies**, **guidelines, standards, codes, case study, successful practices, protocols, national plans, visions, goals, and procedures–so** that a comprehensive set of rules could be developed.

2. MOBILIZATION

Immediately after award of work, the proposed team and technical staff were mobilized to initiate the assignment. The proposed methodology and work plan were discussed with the Client and finalized at the time of kick-off meeting. Support and assistance needed for the assignment were also discussed and agreed upon so that the work is carried out according to the proposed schedule.

3. COLLECTION OF AVAILABLE DATA

- The Consultant's team accessed in detail, the existing approved master plan report relevant information pertaining to the assignment as available with the and other Client.
- A number of successful relevant case studies were reviewed.
- Relevant applicable sets of rules, policies, standards, protocols etc at national, regional and global level were consulted as to ensure the quality of work and to avoid any contradiction with proposed by-laws.

Location Map of Education City

ACRONYMS

CSR	**:**	**Corporate Social Responsibility**
COS	**:**	**Compulsory Open Space**
EB	**:**	**Educational Board**
EC	**:**	**Educational City**
ECB	**:**	**Educational City Board**
KW	**:**	**Kilo Watt**
MU	**:**	**Mixed Use**
MW	**:**	**Mega Watt**
NACTO	**:**	**National Institution of City Transportation Officials**
P&B	**:**	**Planning & Budgeting**
ROW	**:**	**Right of Way**
TECHNO ZONE	**:**	**Technological Zone**
UV	**:**	**Ultraviolet**
UBC	**:**	**Uniform Building Code**
UBC	**:**	**Uniform Building Code**
VOC	**:**	**Volatile Organic Compound**

1. ZONING GUIDELINES FOR DISTRICTS

Zoning is a tool used by planners and planning authorities to prescribe the acceptable use and form of development of an area of land. Zoning defines the use category of the land, prescribing allowable and non-allowable activities and developments on a parcel of land within a specific zone. The zoning distribution is an essential and integral part of the Master Plan. Within a master plan, each individual parcel of the land is prescribed a permissible use/s. Zoning, however, allows a range of uses which are defined to a specific use for the land parcel in the Master Plan. Such uses provide the basis for quality of life besides strengthening physical environment and ensure sustainable development in a meaningful manner. Furthermore, it may also prescribe, as part of the detailed Master Plan that cover the form of the development and other considerations that must be observed by those developing or using the land. These may include:

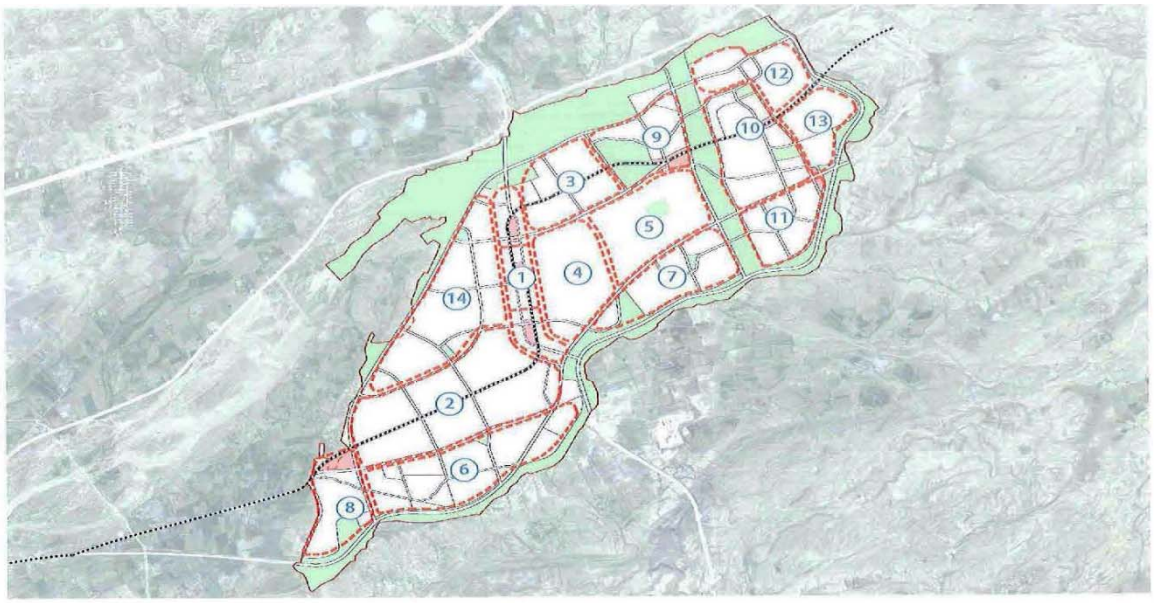
- The land coverage of the construction on a plot in the zone, if not covered by the Planning Standard relevant to that particular Land Use
- The form of the construction on the land
- The height of the buildings if not prescribed in the Planning Standards for the particular Land Use
- The materials used in the facade or construction of buildings on the land
- The colour of buildings or the doors windows and/or roofs of the building constructed
- Requirements to preserve existing trees
- Requirements for the preservation of existing structures or any natural vegetation
- Requirements for landscaping or tree planting that has significant impact on habitat
- Sanitation requirements for the all developments within a designated area
- Environmental protection requirements

Zones are defined as an area whose boundaries can be accurately geo-referenced and adjusted according to the area and may vary with respect to their area. The zones are defined in the Master Plan and determine the types of development that will be detailed at plot level in a

Detailed Land Use Plan of the Master Plan.

The approved master plan is divided into different districts with their specific uses. These districts divided as per their usage keeping in view the further requirements as well.

Figure 1: Approved Master Plan of Education City



Source: Approved Master Plan, 2012

1.1 Development Zones

1.1.1 Division of a land uses into different districts

To ensure that land use activities are located in areas which best suit their functions and also mitigate the adverse impacts associated with noise, traffic, safety of operation and amenity, all land within the education city will be zoned appropriately as to establish effect zoning system. The Master Plan is a binding document for controlling and strict the zoning and land uses. A city divided into different districts. All districts have specific and certain general uses in order to provide a cohesive environment to land uses for the end user in a sustainable manner.

1.1.2 Permissible Use of Land in Specified Districts

The Master Plan identifies the broader land uses. The detailed land use plan on the other hand defines the specific use of each plot or parcel of land in the specified district/s. Developments which may be permissible on land with a general land use classification are listed in land use

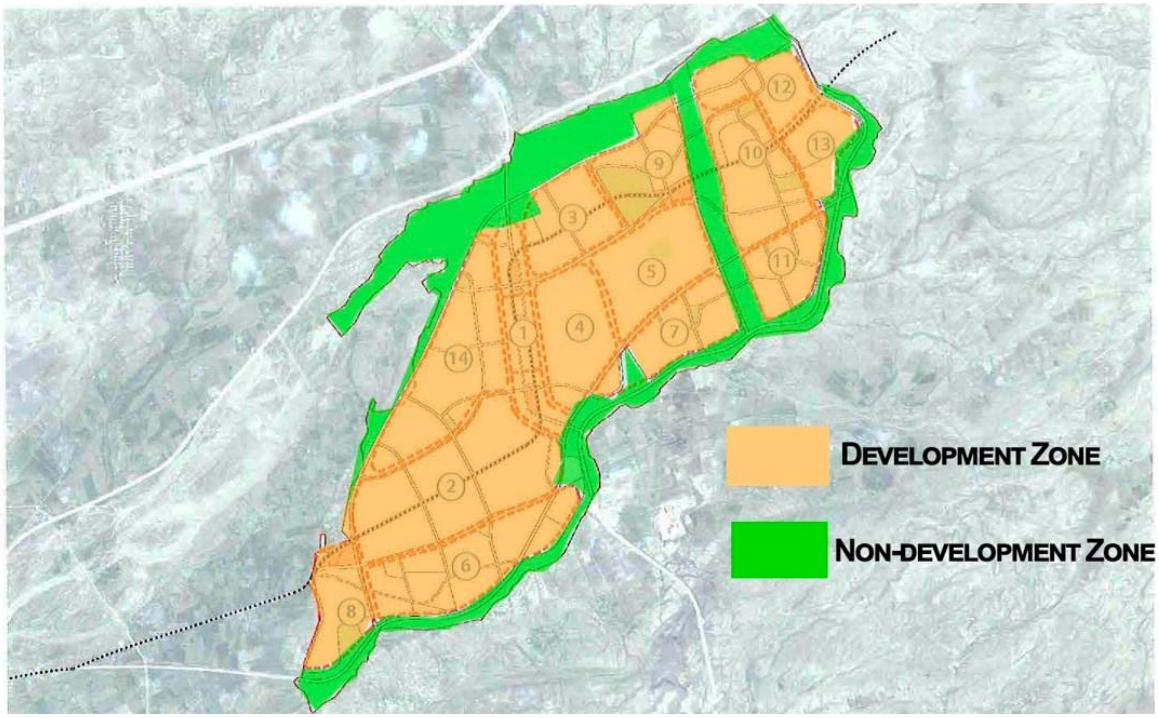
classification section applicable to development zone. However, the developments that do not conform to the General Zoning Classification must not change the predominant zoning classification. The Education City Board will determine whether the proposed detailed land uses effectively change the predominant zoning classification. To help clarify the use of land, Column 2 identifies specific land uses that will not be acceptable under any circumstances without the rezoning of the area.

Permission shall be obtained in writing from the Education City Board to carry out any development within their area of jurisdiction. All development shall be subject to the Planning Standards applicable to the land use classification and to other conditions as may be applied by the Statutory Planning Committee, or required by the other local or national Agency.

1.1.3 Description of Development Zone

The list of zoning schedules includes 'Permitted Uses' and "Prohibited Use'. The Permitted Use covers all types of development that may be approved in an area zoned for that use. The Prohibited Use is any use not included in the Permitted Use, but this column is to clarify the types of uses which would never be acceptable and would require the area be re-zoned.

Figure 2: Development and Non-development Zones of Education City



Source: Developed by CGD Consulting Team

1.2 Central Zone (Education City Cultural Spine)

The cultural spine is located centrally and it will function as Central Zone, it will attract international, national and local educational institutes, civic and cultural organizations, government business (civic centres), education business and commerce, small scale business, real estate and truism. This makes the use of space in such areas highly competitive. The subsequent relatively high land values call for corresponding high profile property development to justify the high investment in land. The centre should provide examples of the best architectural and urban design practices; also, careful consideration is given to building façade, spaces, connectivity and accessibility as proposed in this Zone. This will promote the architectural value; and their special character makes them a potential tourist attraction. central Zone will be permitted for the followings uses: civic and cultural, commercial, public realm, urban recreation, squares, souk, lively streets, open air theatres, apartments, mixed uses nodes, light rail, residential apartments, hotels, restaurants, offices, indoor games, offices, mixed use retails, recreational open spaces, plazas, stadium, open air theatre, Jamia Masjid, other religion places, green court yards, public toilets and transit stops. Moreover, provision of public toilets shall be mandatory in all public spaces with appropriate arrangements for disable students/persons as per Design Guidelines for disable persons / special needs. These guidelines also mandatory to be followed in a building design, roads as well as where necessary.

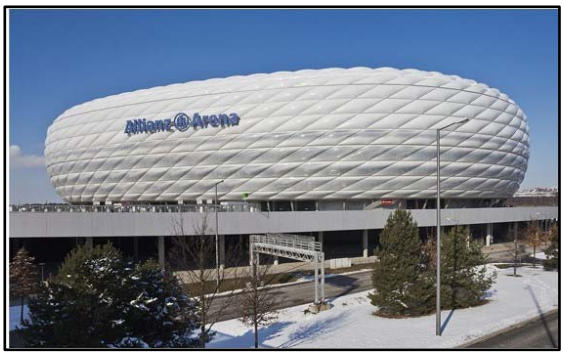
To ensure the district function efficiently, strict measures will be applied to traffic management, servicing and building design. The standards of engineering services will be high to ensure that businesses have reliable supply of electricity, water, internet access, telecommunication and waste management. Aesthetics in the district will be enhanced through the development of a network of public open spaces and landscaping as part of the street furniture. Moreover, location of the fuel stations and other services/utilities shall be cultivated as per approved master plan and standard should be followed as Permissible and prohibited uses in the district is shown in the table of development below.

Table 1.1 Development Permits for Central District

Permitted Uses	Prohibited Uses
▪ Business premises ▪ Commercial office development ▪ Shops and restaurants ▪ Government business ▪ Banks ▪ Public open space ▪ Leisure Facilities ▪ High rise flats and apartments ▪ Hotel accommodation ▪ Central car parking ▪ Transport stations ▪ Clinic/dispensary/general hospitals ▪ Pharmacies ▪ Fire Stations ▪ Public gathering event places	▪ Single unit residential development ▪ Industrial development ▪ Major Warehousing ▪ Animal husbandry ▪ Cemeteries/ Crematorium ▪ Manufacturing ▪ Animal slaughter houses ▪ Farm houses ▪ Large Playgrounds ▪ Research Centers ▪ Agricultural activities ▪ Students hostel accommodation

Figure 3: Central Zone (Education City Cultural Spine)

CINEMA



STADIUM

MARKETS

1.3 Residential Zone

This Zone is intended to provide for a variety of residential uses with multiple densities low, medium and high as the district is located centrally within inner city. Therefore, its location would attract a sizable population. The form of development will comprise a mixture of detached, attached, and row houses, compound houses, mixed uses, open spaces, urban recreation, parks playground, commercial, amenities etc. moreover, community dwellings, residential hostels, institutional housing, boarding and guest houses (at certain level) will be permitted.

Some mixed land uses may also be permitted in the case of hotel development, but it is generally intended that commercial and industrial development be excluded from residential village and district. Landscaping to improve the amenity and privacy will be encouraged in this area. Public transport facilities, educational, public open spaces, local markets and mixed uses will be allowed to enhance livability and to maintain the quality of life. Accommodation facilities for the general students to be provided, as well as car parking and open space requirements will be determined as per the actual requirement. On arterial road close to public transport, near university area adjacent to facilities will attract dense built-up characters there will be a need to make provision for small scale open spaces to mitigate congestions, noise and carbon dioxide emission (CO2).

Commercial and industrial development will be excluded from the residential areas, small scale business enterprises and local shops servicing at community level and other business as per need basis shall be permissible. The maximum height or number of stories will be determined by the EC Board / Administration depending on the location, size of the plot as defined in the approved updated Master Plan. Urban kitchen garden may also be permitted.

Table 2: Development Permits for Residential Zone

Permitted Uses	Prohibited Uses
▪ Detached, Duplex, Row Houses ▪ Compound Houses ▪ Public Open Space ▪ Local Shop ▪ Primary School, ▪ Secondary School ▪ Childcare Centre ▪ Community Services ▪ Public Building ▪ Banks ▪ Post Offices ▪ Markets for vegetable, fish, meat ▪ Bakery ▪ Dairy ▪ Fuel/ Energy/ CNG stations ▪ Home business ▪ Parks & Playground ▪ Bus stops ▪ Pharmacy ▪ Outdoor/Indoor Recreation ▪ Day / old care centers ▪ Multi-storey flats, ▪ Apartment buildings ▪ Shops at ground floor level only ▪ Civic & Recreation facilities serving the community ▪ Community dwelling ▪ Guest houses ▪ Hotels / Restaurants	▪ All industrial development ▪ Animal Husbandry ▪ Cemetery or crematorium ▪ Transportation depots ▪ Major Commercial development except as noted in column 1 permitted uses ▪ Warehouses ▪ Large Sports / Recreation facilities

a) Sukhan Nala West and East

Land in these zones is intended to remain as an area for low density residential development, with a low housing density of 10-15 dwellings units per hectare. The predominant development will be detached houses on plot sizes of not less than 400 sq. yds. Industrial, Commercial and mixed land use activities will be excluded from these zones so as to maintain a spacious, environment, free from intrusion by incompatible land use as the district located at vicinity of Sukhan Nala. However, any further changes in the buffer will be based on future hydrology studies and reviewed Master Plan. So that, maximum natural free environment of the site can be utilized in a suitable manner.

High density block of flats/apartments, institution or community dwelling facilities will not be permitted in such zones, but official residences, guest houses, educational, child care facilities

and places of public worship may be permitted depending on the location and size of the development as proposed in the updated Master Plan. Recreation and eco-tourism activities may be permitted where seasonal natural recreation of the venue can be cultivated in meaningful manner.

Some small retail development would be permissible in these districts in selected areas, to accommodate the day-to-day shopping needs and to meet the tourist's population. To ensure that an adequate level of amenity is achieved, small areas of public open spaces will be intermixed.

Major commercial, industrial transportation activities will be excluded from these districts so as to minimize traffic congestion and preserve the residential character of the peace environment.

Farm house, boarding, hostels lodge, guest will be allowed. The size of the site to be developed, the nature and type of accommodation facilities to be provided, as well as car parking and open space requirements will be determined as per the requirements of the population.

Major commercial and industrial development will be excluded from the zone; mixed residential development will be permitted with the encouragement of first floor residential and small-scale ground floor business enterprises.

Urban kitchen gardens shall also be permitted for their daily consumption at certain level, but at commercial scale shall not be permitted.

Table 3: Development Permits for Sukhan Nala West and East

Permitted Uses	Prohibited Uses
▪ Farm Houses, Guest houses ▪ Hotels with accommodation ▪ Detached/Duplex/Compound Houses ▪ Public Open Spaces ▪ Food street for tourists ▪ Limited fishing spot/boating ▪ Corner Shops, clinics, dispensary ▪ Educational and Childcare facilities ▪ House-based small family businesses ▪ Public places and Masjid ▪ Minor Government Business ▪ Limited road to provide access ▪ Markets with lower repair workshops ▪ Market for tourist shopping	▪ Transportation services expect mechanic shops and petrol fuel station ▪ Block of Flats ▪ High density residential block ▪ Industrial Development ▪ Large Commercial Development ▪ Animal Husbandry ▪ Mass Transportation ▪ Warehousing ▪ Major Sports Facilities ▪ Cemeteries

Figure 4: Residential Districts

RESIDENTIAL BUILDINGS

RESTAURANTS

LOCAL SHOPS

1.4 Educational Zone

Land in educational zone is intended to be used for the teaching, training or teaching of persons and research into specialized areas. Education facilities to be located in the educational zone. These should be easily accessible areas near community facilities but serene enough for high academic work. Facilities to be provided in this zone will include students' hostels, residential accommodation for lecturers, and other staff, lecture halls, admin buildings, laboratories, workshops, parks, playgrounds, parking, mixed-uses buildings, masjids, other worship places as per the requirements, police station, clinics/ hospitals, research stations and their facilities, commercial buildings for shops, banks, post offices, exhibition centers, Expo-centers, halls, printing press, fuel/energy station as per the approved master plan, public realm, leisure, recreation, urban scape. It is important that Nursery and Primary schools are located within a residential zone with easy vehicular and pedestrian access network system. Facilities to be provided in schools shall include playgrounds, classroom blocks, hostels (where necessary),

offices, canteens, places of convenience, libraries. Prohibited uses include large scale commercial activities, industries, transportation and warehouses, slaughter houses, garages and warehouses, and animal husbandry.

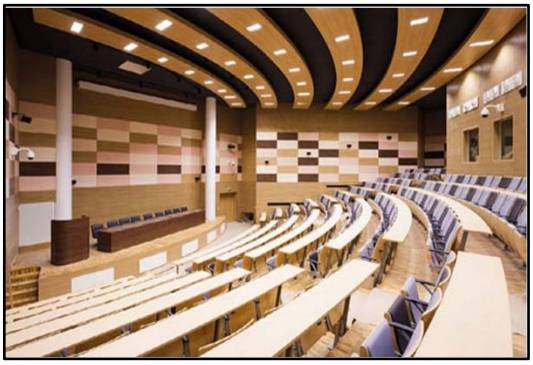
Table 4: Development Permits for Educational Zone

Permitted Uses	Prohibited Uses
▪ Accommodation/hostels ▪ Classrooms / Seminar Halls ▪ Admin Blocks, Public buildings, Banks ▪ Office/Admin Blocks ▪ Canteens/cafeteria/Restaurants ▪ Laboratories/Workshops ▪ Libraries, Post Office ▪ Police Station/Check post ▪ Auditorium hall ▪ Parks & Playgrounds, Indoor games ▪ Open / green spaces ▪ Bookshops, Printing press ▪ Small repair maintenance shops ▪ Public realm ▪ Masjid and other workshop Spaces ▪ Restaurants /café/canteens ▪ kiosk/ corner shops/ PCO booths ▪ Sports club / Gym ▪ Agriculture activities for R&D	▪ Transportation and Warehouses ▪ Animal Husbandry ▪ Slaughter Houses ▪ Industries ▪ Crematorium/Cemeteries ▪ Markets ▪ Warehouse ▪ Animal Husbandry other than for Research ▪ and Teaching ▪ Mining ▪ Large Markets ▪ Sawmilling ▪ Fuel station/services station as per approved updated Master Plan ▪ Agriculture cultivation

Figure 5: Educational Zone

ADMINSTRATION COMPLEX

LIBRARIES



LECTURE HALLS

1.5 Innovation and Technological Zone

Land included in these districts are intended to accommodate all research activities on a wide range of industrial and related development including manufacturing, food processing, preservation, machinery, equipment, vehicles, appliances, agro-based industries, agriculture, fishery, electronic, electric, light industry, telecommunication, computer, and IT based etc. A limited range of accommodation, hostel, residential, retail, commercial offices will be permitted in these districts. Large parking space(s) will be required in accordance with parking standards for the districts. Green open scape and general landscaping will be required along technological centers.

Table 5: Development Permits for Innovation and Technological Zone

Permitted Uses	Prohibited Uses
▪ Research centers ▪ Low rise residential development ▪ Small retail commercial ▪ Green open spaces ▪ Hostel accommodation ▪ Offices ▪ Exhibition centers ▪ Civic uses w.r.t need ▪ Parking ▪ Animal research centers for breeding or other purposes ▪ Laborites ▪ Labs	▪ Any Industrial development ▪ Large scale commercial ▪ Animal husbandry ▪ Agricultural ▪ Large recreation ▪ Park and Playgrounds ▪ Mixed land use ▪ High rise building development

Figure 6: Innovation and Technological Zone

EXHIBITION CENTER

LABORATORIES

RESEARCH CENTRE

1.6 Agricultural Zone

Land in an Agricultural Zone is intended to be retained for agricultural uses such as grazing, cropping, cultivation, animal husbandry and plantation which will fulfil the requirement of the education city keeping in view the future demand as well. The area is contained more than 500 acres of active agriculture—fertile arable lands, high quality soils specially, suitable for intensive farming or farm related activities. Therefore, care of such land has to be taken in its use. No intensive urban settlement, other than village settlements and supporting community facilities and cottage industry related to the agricultural farming would be allowed. The district is intended to protect water supply catchments and also conserve the area from the potential impacts of soil erosion and flooding near Sukhan and Malir river area.

Agriculture lands shall be prevented from large urban settlements. Moreover, large scale industrial and commercial developments are not permissible within agriculture area except for

small cottage industry which are supportive for agricultural growth and its extension in appropriate circumstance, but these shall be subject to an environmental impact assessment study. The impact assessment should be satisfied by the local Environment Agency i.e. SEPA and Education City Board that no long-term negative impact will occur as a result of such activity, or an appropriate mitigation plan has been formulated to address the negative impacts. Flood protection works will be permitted in this zone as well as irrigation projects.

Table 6: Development Permits for Agricultural Uses

Permitted Uses	Prohibited Uses
▪ Agricultural uses ▪ Forestry / forests ▪ Trees, crops, plantations, ▪ Urban agricultural, ▪ Smart agricultural ▪ Open Space ▪ Cottage Industry related to agricultural services only zero CO2 emissions ▪ Community Facilities ▪ Stockyard/ small silos ▪ Limited transport Facilities ▪ Poultry farming ▪ Dairy farming ▪ Livestock /Animal Husbandry ▪ Intensive Cultivation ▪ Plantation, Nurseries ▪ Detached & Compound Dwelling ▪ Farm Houses, Public Open Space	▪ Large Scale Industrial Development ▪ Intensive, mechanized agriculture ▪ Large scale Commercial Development ▪ Intensive Residential Development ▪ Mass Transport Facilities ▪ Large Scale Warehousing ▪ Large scale animal rearing ▪ Any conversion is prohibited except agriculture related

Figure 7: Urban Agricultural District

ANIMAL HUSBANDARY

POULTRY FARMS

SMART URBAN AGRICULTURE

1.7 Mixed Used Zone

Land in Mixed use Zone is intended for multiple uses such as lower intensity commercial, residential, offices, business development and retail display on the fringes of the zone and adjacent to major rapid transit line. Development will be predominantly free standing with adequate provision for mixed land uses and access to all basic facilities such as parks playground, open spaces, health, school shall be permitted in these districts.

Major manufacturing, industries, major commercial, and repair business will be excluded from these districts, and residential development will be confined to above ground floor of commercial premises. Control over change in land use will be maintained as to keep the mixed-use character in the districts which will provide aesthetic environment to the end user and will maintain the uniqueness of the mixed uses. Special provisions will apply to traffic management to ensure pedestrian safety, and minimize congestion.

Moreover, Mixed-Use Zone is to provide for a mixture of retail, business, residential, institutional, tourist accommodation, personal services, light industries, and entertainment opportunities associated with highly active and vibrant precincts within Districts. The size and type of activities, building typologies, and the range of mixed-use density differs from one Centre to another according to their Zoning restrictions and flexibility to land use permits.

The desired urban character of a Mixed-Use Zone is for a highly active, visually attractive and vibrant precinct, with a high level of pedestrian accessibility to services at human scale distance. The built form must encourage street edge development that promotes a continuous active street connection between building blocks (e.g. through the use of arcades, colonnades, landscaping, passages, shades) and which provides a safe and pleasant pedestrian environment

to end user in a meaningful manner. The introduction of civic spaces, features of public art and entertainment, and shopping plaza spaces should be encouraged by applying friendly guidelines.

Moreover, small mixed-use spaces may be permitted near major arterial road intersections, major transit stops or metro stations to ensure a high level of accessibility by car and public transport services, and to facilitate the development of transit-oriented facilities of such zones would need to be defined in the approved updated Master Plan at the central level.

The attributes deriving the mixed-use zoning within the Zones

The Mixed-Use Zoning for Centers (within the zones) is to establish a good planning instrument for maintaining and nurturing the local economic growth whilst controlling the spatial expansion.

The following are the basic rationales to determine the mixed-use zoning regulations within the Zones:

- Generate urban vitality and street life
- Provide convenient access to facilities
- Focus on public realm comfort and continuity
- Prevent congestions
- Encourage social interaction and cohesion
- Provide visual stimulation of different buildings within close proximity of the services;
- Increase surveillance with ‘eyes on streets’ allowing for a better feeling of safety and security
- Allow more choice of lifestyle
- Increase viability of urban facilities
- Encourage small and medium enterprises to flourish

Table 7: Development permits for Mixed Use Zones

Permitted Uses	Prohibited Uses
▪ Commercial offices ▪ Local government offices ▪ Professional Offices ▪ Markets ▪ Residential uses ▪ Child Care Centre ▪ Car Park ▪ Medical Clinics, Pharmacy ▪ Sales and Services centers ▪ Fuel Service Station, ▪ Parks & Playground, ▪ Restaurants /hotels	▪ Industrial development ▪ Repair works ▪ Dwelling at ground level ▪ Animal husbandry ▪ single units ▪ individual markets ▪ large markets

Key Purpose of Mixed-Use

Depending upon the location, context, and size of the lot, the mixing of land uses may occur vertically or horizontally, or combination of both in the same development proposal.

Vertical mixed use is stacking up the uses, with different uses on different floors in one building. This is the principal method of mixing uses within the zoning regulations.

Horizontal mixed use is combining different single uses within one lot or development. This requires individual approach and is feasible on larger lots.

Combining vertical and horizontal uses brings greater flexibility and various development possibilities in the districts.

These Zones can be divided into 3 mixed use zones. These are Mixed Use 1 (MU1), Mixed Use 2 (MU2) and Mixed Use 3 (MU3). Each mixed-use zone will have a leading (not predominant) land use which is appropriate to its context within the Zones features and their uses.

Mixed Use 1 - The primary objective of MU1 is to provide for mixed use development led principally by retail development but also supported by office and residential development there are mostly located in the center of the districts.

Mixed Use 2 - The primary objective of MU2 is to provide for mixed use development led principally by institutes, offices development but also supported by retail and residential development.

Mixed Use 3 - The primary objective of MU3 is to provide for mixed use development led principally by Residential development but also supported by retail and office development at certain level as per need.

PERMITTED	CONDITIONAL	PROHIBITED
Retail, university campuses, institute, offices, hotel rooms, residential units, religious places, open spaces, parking, transit stations, park and ride	Any permitted development seeking variation under the small lot variation control. This does not apply to alterations and additions to existing small lots. Any permitted activity that does not comply with the permitted activity regulations. Any permitted activity that includes single or multiple buildings that have a combined GFA exceeding 11,960 Sq. Yds. Hotels and hotel apartments (in MU2) Community Facilities Recreation Facilities, Sports Facilities	All development not listed as a permitted or a conditional activity.

NOTE:
MU1, MU2 and MU3 shall also apply at districts center which are located along the metro line/ Transit corridor in the shape of Node, center concentration in order to utilize maximum benefits of the metro/public transport with land use integration further may follow as per approved updated master plan.

Applying Mixed Use:

Required mix of uses each lot should have at least two of the three uses (retail, office, institute, residential).

Table 8: Applying Mixed Use

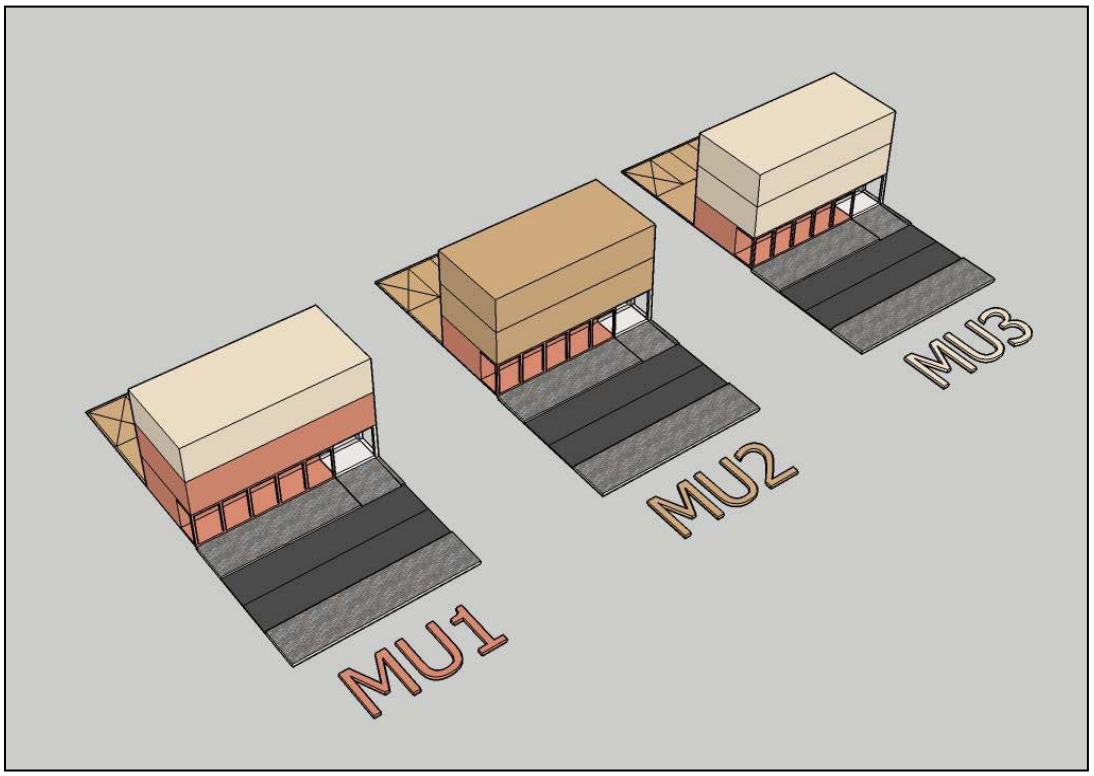
Minimum Lot Size With Reference To Heights and Building Typology for Mixed Uses		
BUILDING HEIGHTS	**BUILDING TYPOLOGY**	**MINIMUM LOT SIZE**
G+6	Commercial Strip	400-599 Sq. Yds
G+6 to G+9	Attached Blocks	600 Sq. Yds and Above
G+10 & above	Podium and Tower	1200 Sq. Yds and Above

Building Depth and Width

Building Depth (max) Not more than 120 feet (All typologies) and Not more than 180 feet (Podium - Podium and Tower Development)

Building Width (max) Not more than 100 feet (All Levels – Commercial Strip, hostel accommodation, housing and Attached Block not more than 150 feet (Podium - Podium and Tower Development). These conditions also apply in other zones where mixed uses applied as per the approved updated master plan.

Figure 8: Mixed Use Detailed Regulations per Typology



Details of Mixed use (MU1):

Table 9: MUI (a) G+2

Typology			
Code	**Height**	**Leading Use**	**Building Typology**
MU1	G+2	Retail	Commercial Strip
Minimum Lot Size for Subdivision			
Lot Size	400 Sq.Yds	Lot Width	60 feet
Maximum Building Coverage per Lot			
Building Coverage*		Maximum	65% to 75%
Minimum Setbacks			
Front		Minimum	8 feet
Side		Minimum	7 feet each
Rear		Minimum	8 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	**Retail**	**Office**	**Residential**
Required uses (minimum 2)	Required	Option	Optional
Maximum number of floors	2	1	2
Floor Area Ratio (FAR)			
FAR**		Maximum	1.10
Podium / Ground Floor			
Number of Podiums		Maximum	0
Required Ground Floor Use			Retail
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	20 feet
		Maximum	n/a
Arcade Depth (if required by Active Frontage)		Minimum	7 feet

**Details of Plot see relevant section.*
***Details of FAR see relevant section.*

Table 10: MUI (b) G+3 to G+7

Typology			
Code	**Height**	**Leading Use**	**Building Typology**
MU1	G+3 to G+7	Retail	Attached Block
Minimum Lot Size for Subdivision			
Lot Size	600 Syds and above	Lot Width	80 feet
Maximum Building Coverage per Lot			
Building Coverage		Maximum	55% to 70%
Minimum Setbacks			
Front		Minimum	8 feet
Side		Minimum	8 feet each
Rear		Minimum	10 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	**Retail**	**Offic**	**Residential**
Required uses (minimum 2)	Require	Option	Option
Maximum number of floors	With respect to requirement / demand		
Floor Area Ratio (FAR)			
FAR		Maximum	2.50 to 4.00
Podium / Ground Floor			
Number of Podiums		Maximum	0
Required Ground Floor Use			Retail
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	20 feet
		Maximum	n/a
Arcade Depth (if required by Active Frontage)		Minimum	7 feet

Table 11: MUI (c) G+8 & above

Typology			
Code	**Height**	**Leading Use**	**Building Typology**
MU1	G+8 & above	Retail	Podium & Tower
Minimum Lot Size for Subdivision			
Lot Size	1200 Sq. Yds and above	Lot Width	100 feet
Maximum Building Coverage per Lot			
Podium	75%	Tower	50%
Minimum Setbacks			
Podium		**Tower**	
Front	0	Front	20 feet
Side	0	Side	15 feet each
Rear	20 feet	Rear	20 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	**Retail**	**Office**	**Residential**
Required uses (minimum 2)	Requir	Option	Option
Maximum number of floors	3	3	8
Floor Area Ratio (FAR)			
FAR		Maximum	4.00 to 6.00
Podium / Ground Floor			
Number of Podiums		Maximum	3
Required Ground Floor Use			Retail
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	20 feet
		Maximum	n/a
Arcade Depth (if required by Active Frontage)		Minimum	10 feet

Details of Mixed use (MU2):

Table 12: MU2 (a) G+2

Typology			
Code	**Height**	**Leading Use**	**Building Typology**
MU2	G+2	Office	Commercial Strip
Minimum Lot Size for Subdivision			
Lot Size	400 sq.yds	Lot Width maximum	60 feet
Maximum Building Coverage per Lot			
Building Coverage		Maximum	65% to 75%
Minimum Setbacks			
Front		Minimum	8 feet
Side		Minimum	7 feet each
Rear		Minimum	8 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	**Retail**	**Office**	**Residential**
Required uses (minimum 2)	Optional*	Required	Optional
Maximum number of floors	1	2	2
Floor Area Ratio (FAR)			
FAR		Maximum	1.10
Podium / Ground Floor			
Number of Podiums		Maximum	0
Required Ground Floor Use			Retail / Office
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	20 feet
		Maximum	n/a
Arcade Depth (if required by Active Frontage)		Minimum	7 feet

Table 13: MU2 (b) G+3 to G+7

Typology			
Code	**Height**	**Leading Use**	**Building Typology**
MU2	G+3 to G+7	Office cum institute	Attached Block
Minimum Lot Size for Subdivision			
Lot Size	600 sq. yds and above	Lot Width maximum	80 feet
Maximum Building Coverage per Lot			
Building Coverage		Maximum	55 to 75 %
Minimum Setbacks			
Front		Minimum	8 feet
Side		Minimum	8 feet each
Rear		Minimum	10 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	Retail	Office	Residential
Required uses (minimum 2)	Optional*	Required	Optional
Maximum number of floors	With respect to requirement / demand		
Floor Area Ratio			
FAR		Maximum	2.50 to 4.00
Podium / Ground Floor			
Number of Podiums		Maximum	0
Required Ground Floor Use			Retail* / Office
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	20 feet
		Maximum	n/a
Arcade Depth (if required by Active Frontage)		Minimum	7 feet

Table 14: MU2 (b) G+8 and above

Typology			
Code	**Height**	**Leading Use**	**Building Typology**
MU2	G+8 and above	Office cum institute	Podium & Tower
Minimum Lot Size for Subdivision			
Lot Size	1200 sq. yds and above	Lot Width	100 feet
Maximum Building Coverage per Lot			
Podium	75%	Tower	50%
Minimum Setbacks			
Podium		Tower	
Front	0	Front	20 feet
Side	0	Side	15 feet each
Rear	20 feet	Rear	20 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	Retail	Office	Residential
Required uses (minimum 2)	Optional	Required	Optional
Maximum number of floors	1	10	10
Floor Area Ratio			
FAR		Maximum	4.00 to 6.00
Podium / Ground Floor			
Number of Podiums		Maximum	3
Required Ground Floor Use			Retail / Office
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	20 feet
		Maximum	n/a
Arcade Depth (if required by Active Frontage)		Minimum	10 feet

Details of Mixed use (MU3) :

Table 15: MU3 (a) G+2

Typology			
Code	Height	Leading Use	Building Typology
MU3	**G+2**	Residential	Commercial Strip
Minimum Lot Size for Subdivision			
Lot Size	400 sq. yds	Lot Width	80 feet
Maximum Building Coverage per Lot			
Building Coverage		Maximum	65% to 75%
Minimum Setbacks			
Front		Minimum	8 feet
Side		Minimum	7 feet each
Rear		Minimum	8 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	**Retail**	**Office**	**Residential**
Required uses (minimum 2)	Optional*	Option	Require
Maximum number of floors	1	1	2
Floor Area Ratio			
FAR		Maximum	1.10
Podium / Ground Floor			
Number of Podiums		Maximum	0
Required Ground Floor Use			Retail* / Office
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	n/a
		Maximum	40 feet
Arcade Depth (if required by Active Frontage)		Minimum	7 feet

Table 16: MU3 (b) G+3 to G+7

Typology			
Zone Code	Height	Leading Use	Building Typology
MU3	**G+3 to G+7**	Residential	Attached Block
Minimum Lot Size for Subdivision			
Lot Size	600 sq. yds & above	Lot Width	80 feet
Maximum Building Coverage per Lot			
Building Coverage		Maximum	65%
Minimum Setbacks			
Front		Minimum	8 feet
Side		Minimum	8 feet each
Rear		Minimum	10 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	**Retail**	**Office**	**Residential**
Required uses (minimum 2)	Optional*	Optional	Require
Maximum number of floors	With respect to requirement / demand		
Floor Area Ratio			
FAR		Maximum	2.50 to 4.00
Podium / Ground Floor			
Number of Podiums		Maximum	0
Required Ground Floor Use			Retail* / Office
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	n/a
		Maximum	40 feet
Arcade Depth (if required by Active Frontage)		Minimum	7 feet

Table 17: MU3 (c) G+8 & above

Typology			
Zone Code	**Height**	**Leading Use**	**Building Typology**
MU3	G+8 & above	Residential	Podium & Tower
Minimum Lot Size for Subdivision			
Lot Size	1200 sq. yds and	Lot Width	100 feet
Maximum Building Coverage per Lot			
Podium	75%	Tower	50%
Minimum Setbacks			
Podium		Tower	
Front	0	Front	20 feet
Side	0	Side	15 feet each
Rear	20 feet	Rear	20 feet
Use Split – Required Uses and Number of Floors per Use			
Uses and Number of floors	Retail	Office	Residential
Required uses (minimum 2)	Optional*	Optional	Required
Maximum number of floors	1	1	11
Floor Area Ratio			
FAR		Maximum	4.00 to 6.00
Podium / Ground Floor			
Number of Podiums		Maximum	3
Required Ground Floor Use			Retail* / Office
Retail/Office Depth in Ground Floor and Podium Floors		Minimum	n/a
		Maximum	40 feet
Arcade Depth (if required by Active Frontage)		Minimum	10 feet

1.8 Non-Development Zone

1.8.1 Buffer, Ecological and Open Spaces Conservation Zone

This zone, generally called conservation zone, is protected from any physical development activities which could threat to its uniqueness; besides, it is prohibited from all development activities which are permitted in other districts as to keep their special value to be maintained in order to ensure sustainable development in the education city. They vary from Development Zone, which cover areas with qualities that are to be preserved. Land in a conservation zone is intended to be retained in its natural or modified state for conservation purposes. A conservation zone may include areas of outstanding natural beauty, areas of archaeological importance, forest, natural vegetation, wild life, estuary, habitats, land in water catchments area, endangered hills, steep slopes, depression, soil erosion, hazard prone areas etc.

It is not intended to exclude development from a conservation zone. Activities which are incompatible with the intent of the zone will be prohibited, especially urban development and industry. Access to conservation zone will be restricted to selective areas where the intensity of use can be more effectively managed. Besides ecological corridor shall be maintained for animal movements without any hindrances as to protect natural habitat, besides, provides a sustainable environment where growth of natural habitats could be managed in a meaningful manner. Developers are required to provide public places of convenience in recreational and other tourist sites after conducting relevant studies as per approved updated master plan.

Land in the River buffer may be described as land within the immediate vicinity of a water body, which is subject to special protected status. The land may include sand beaches, lagoon sides, banks of rivers, ponds, dhoras, lakes and other water bodies. The extent of the protected river buffer at least shall be 200 meters. River buffer lines which may be affected by erosion, or a seasonal rise water level will form part of a protected to ensure that no development occurs in the proximity. The width of the river buffer will vary according to protection measures required. Land outside the protected area to be consider planning regulations and Sindh Environmental Protection Agency (SEPA) guidelines shall be observed.

Land included in the open space is primarily intended for informal or casual recreation pursuits. Open Spaces include natural open space, ecological corridors, open areas used for buffers between different land use activities.

Permitted uses may be classified as follows:

Urban forest, Re-vegetation/ Re-forestation, golf course without compromising ecology of the

area , sand beaches, amusement center, natural land scape, boating, and fishing at certain level for tourists attraction.

Prohibited activities include sand winning, animal husbandry, transportation, garages/ fitting/ mechanical workshops, dumping site, large scale commercial activities/markets, raw solid and liquid waste disposal, cemeteries/crematorium; any heavy or largescale industry.

Education Board shall liaise with the Environmental Protection Agency to determine the applications for development which need environmental impact assessments or initial environmental examination (EIA/IEE) studies.

Figure 9: Buffer, Ecological and Open Spaces Conservation

WATERBODIES WITH NATURAL VEGETATION

GREEN PASSAGE FOR HABITATS

URBAN RAIN FOREST

Table 18: Development permits for Non-Development Zone

Permitted Uses	Prohibited Uses
▪ Urban Forest ▪ Rain forest ▪ Natural Vegetation ▪ Sand Beaches ▪ Wild life ▪ Truism ▪ Recreation ▪ Urban jungle ▪ Open spaces ▪ Fishing ▪ Boating ▪ Natural landscape ▪ Seasonal cultivation ▪ Scenic spot, ▪ Estuary ▪ Water bodies	▪ Residential development ▪ commercial development ▪ Industrial development ▪ Transportation ▪ Intensive cultivation ▪ Animal husbandry ▪ Open dumping and discharge of solid or ▪ Liquid waste ▪ Land fill site/waste disposal sites

2. GENERAL GUIDELINES FOR LAND USE CLASSIFICATION

In this section land use classification is described in detail. In zoning section of the district guidelines, however, the land use guides permitted and nonpermitted use predominantly. Here land uses illustrated a comprehensive usage of the entire land uses further into a detail description where land use to be controlled in a satisfactory manner. Land use classification, as elsewhere in this section, the term 'includes or 'including' indicates that the listed items are intended to be illustrative and not exclusive of such usage. Moreover, where land includes mixed uses, the designations of the various uses classes may be combined as appropriate (e.g. "commercial-cum-residential, or more than one use").

2.1 Urban Uses

2.1.1. Residentiary

Residential uses: includes all land used for dwelling facilities, but does not include land used for lodging facilities operated on a commercial basis.

2.1.2. Other Residentiary Uses

a. **Government Uses**: includes the use of land for all governmental purposes such as offices, post offices, police stations, jails and foreign missions, other than uses specifically included in other classifications.

b. **Education uses**: includes all land uses for nursery schools, kindergartens, primary schools, secondary schools, high schools, colleges, special colleges, technical colleges, universities for medical, engineering general sciences & technology, art, or any other specialized like port, agriculture, war & security etc. research institutes, madrassahs, all such institutions related with education purposes, including green and open spaces essential which are pivotal for the proper functioning of such institutions. Primary and secondary schools are low rise buildings surrounded by recreational fields and located in residential areas away from high traffic volumes and not located on main arterial roads.

c. **Health and Welfare Uses**: This includes land used for health and social welfare services such as health center, medical & dental clinics, hospitals, maternity homes, medical research institutions, nurseries, mother and child care centers, homes or other institutions for physically disabled persons, mental institutions, homes for the elderly, and veterinary clinics/hospitals including green areas and open spaces essential for the proper functioning of such institutions.

Note: The sites reserved or granted permit for educational use or purpose of education cannot be converted or changed into any other use, it is strict and prohibited under Education City by-laws.

d. Assembly Uses: includes all land used for libraries, cinemas, theatres, open air theaters, event management places, crowd gathering areas, concert halls, planetarium, aquaria, galleries, non-sportive clubs, exhibition halls, and exhibition grounds etc. having scientific, historical, or artistic value. With the exception of exhibition grounds, open areas of these facilities will be limited by their actual operational needs. Buildings, places, or institutions devoted to the acquisition, conservation, study, exhibition, and educational interpretation of objects e.g. museums, libraries, art galleries, public and exhibition halls.

e. Religious uses: includes all land used by masjids, jamaat-Khanas, monasteries, churches, synagogues, shrines, temples, dargahs, imambargahs, and tombs including ancillary green and open spaces belonging to the religious body owning the land.

f. Commercial (trade) uses: includes only the land used for the activity in question, though this may be increased by additional open or green space, if the operation of the facility concerned requires it. Commercial (trade) uses includes:

1. Whole sale trade: sabzi mandi, fruit mandi, whole sale markets.
2. Retail shopping: including shops, shopping centers, department stores, bazaars, markets and hawkers / predators' areas, juma bazar or weekend bazar / stalls, warehouses and supermarkets.

Shops: where the primary use is the sale of food and drink for consumption off the premises e.g. sandwich bar, hot-food take-aways etc.

3. Personal services: including barbers, hair-dressers, beauty-parlors/salons, massage centers, baths, tailoring, shoe-making, laundries and dry cleaners;
4. Catering: including restaurants, banquet halls, marriage gardens/hall, refreshment stalls, buffets,
5. Lodging: including hotels, motels, guest houses and clubs, bachelor hostels for students and working female / male providing lodging;
6. Business offices and professional uses includes banks, building societies, estate and employment agencies and insurance brokers/agents.

7. Fuel stations: including petrol stations, battery charge stations, vehicle service stations or any other associated use.
8. Internet cybershop or cafes, where primary purpose is sale of access to internet services and computer-based services.

g. Offices uses: include followings:

- Offices of federal, provincial and local government, company offices, and other general offices.
- Offices for research and development and testing of products or processes.
- Offices hosting scientific facilities and laboratories.
- Business meeting places and centers.
- Art studios, music recording and film studios.

h. Recreation and Leisure

Parks and playgrounds: include all green spaces, including various related cultural or recreational facilities such as greenhouses, zoological and botanical gardens and their related facilities, toilet for both sex as well as for disables, and first aid facility it is mandatory to be provided at all public places, but excluding open green spaces ancillary to welfare or educational facilities, and excluding median or other dividing green strips in road rights-of-ways;

1. Outdoor amenity and open spaces

- Outdoor amenity and open spaces e.g. gardens, parks, zoos, picnic areas and play areas.
- Civic spaces e.g. civic squares, plazas, river fronts or water bodies.
- Heritage sites and monuments.

2. Amusement and show places

Places for amusement and entertainment e.g. cinemas, theatres, concert halls and arenas, broadcast studios, aerobic, dance halls, bingo halls, clubs, gaming and other social purposes.

3. Amusement arcades, fun fairs and circuses.

4. Visitor centers and interpretation centers.

5. Aquatic Recreational Areas: River front, lakes, scenic view, spot, estuary, rivers, ponds, water falls, boating basins, marine promenade, marine clubs, yachting clubs, seasonal reaction, wild life migratory places.

6. Holiday parks and camps uses: including holiday park with chalets, hotels, entertainments for holidaymakers and camp site for tents, touring caravans, camper vans and farm houses etc.

i. Play Ground

All open spaces designated for all indoor or outdoor sports activities of all types whether fully developed or not; and

All structures serving sports activities, like sports complex, gymnasia, swimming pools, stadium, race-courses, sports clubs of all kinds, whether they are part of an open space designated for sports activities or are independent structures.

Note: Spaces reserved for parks and play grounds shall not be converted for any other amenity or for any other use.

j. Burial grounds: includes disposal of human remains e.g. graveyards of any religious denomination, towers of silence and crematoria, burial ground, cemeteries etc.

k. Transportation right-of-way: includes primary arterial, secondary arterial, green connector, light rail / bus transit and streets, parking and loading areas therein, green belts, green channels and pedestrian lanes, utility corridors space for water closet and fire use or green spaces and area designed for public realm activities.

i. Parking: includes driveway, parking spaces on street, off-street, bus bays, loading un-loading spaces used for cargo, bus stops, parking lots, ramps, and buildings used wholly for parking purposes.

2.2.1 Non residentiary:

1. **Wholesale uses**: includes all warehousing, godowns, and wholesale markets for bulk dealing of raw materials, supplies, machinery and livestock. Wholesale uses are distribution places for food and drink, petroleum and other non-food products.
2. **Construction uses**: includes yards of construction, open storage of construction materials, pre-processing of constructional materials, and small pre-fabrication plants serving particular construction projects, but does not include a site under construction which is intended for another ultimate use.

3. **Utilities and Municipal Service facilities**: includes all facilities for utility services, excluding those parts of utility networks that are under or above transportation rights-of-way. Utilities and municipal services facilities may be included:
4. **Water supply**: including protected water resources areas, water purification plants, pumping stations, water mains, water conduits rising mains and water reservoirs;
5. **Sewerage**: including treatment plants, sewage farms, oxidation ponds, sludge ponds, pumping stations and main trunk sewers;
6. **Solid waste disposal**: including composting plants incinerator and general or special dumping grounds and landfill sites;
7. **Electricity**: including power stations, step-down stations, transformers in separate structures, and high-tension lines, area use for renewable energy sources such as biomass, solar park, wind mills and other sources of energy may come under such land use.
8. **Gas**: including gas works, pressure reducing stations and main gas conduits;
9. **Communication**: including Radio, TV, communication towers, wireless stations, boosting stations and telephone exchanges etc.
10. **Others**: including storm water drains, flood embankments fire-brigade stations, depots of public works supplies and equipment, and civil defense depots, evacuation grounds for any kind of adverse situation or disaster may occur.
11. **Transportation terminals**: includes airports, jetty, light rail stations and yards, bus terminals, rapid bus stands, bus depots, truck stands, taxi stands, and light rail transit stops/terminals.
12. **Protection Zones**: includes buffer areas around river bodies or river beds, which must be kept vacant to protect nearby uses from such facilities or terminals, but does not include buffer areas suitable for agriculture purposes.

2.2 Semi-Urban Uses

Vacant improved land: includes land reclaimed for development, such as through the provision of major roads and trunk utility lines, but not yet developed.

Restricted land: includes land the use of which is governed by national security regulations in public interest.

2.3 Non-Urban Uses

2.3.1 Agriculture Uses

Agriculture includes horticulture, fruit growing, seed growing, dairy farming, the breeding and keeping of livestock (including any creature kept for the production of food, wool, skins or fur), the use of land as grazing land, meadow land, osier land, market gardens and nursery grounds, and the use of woodlands where that use is ancillary to the farming of land for other agricultural purposes.

Land under agricultural rotation whether for crops or grassland or left fallow.

- Land under permanent crops, including orchards and other cultivated trees and flowering shrubs.
- Land used for horticulture e.g. glass houses, nurseries, hop fields and market gardens.
- Enclosed intensively managed improved pastures used for grazing and/or fodder production.
- Enclosed unimproved or little-improved grasslands with little or no management used for grazing.
- Set-aside and fallow land.
- Low-intensity agricultural use (e.g. land used for intermittent grazing and foraging by livestock).
- All ancillary land, e.g. uncultivated patches, river banks, footpaths, ditches, headlands and shoulders.
- All associated buildings and hard surface areas on farm holdings e.g. places for crop conditioning, grading and storage, and places for livestock or poultry (as defined above) servicing, breeding, rearing and animal product processing. Excludes farm dwellings and farm shops.

2.3.2 Forest and woodlands

Managed either wholly or in combination includes for timber production, recreation and amenity, nurseries, urban forests, urban rain forests, conservation and environmental uses. moreover, forestlands is an important uses environmentally, because it affects air quality, water quality, wildlife, natural habitat, climate, and many other aspects of the ecology of an area.

2.3.3 Woodland used

For seasonal grazing and foraging by livestock, and where timber is used on-farm, e.g. as a source of fencing material, or as a short-term crop in its own right (e.g. coppiced woodland for energy crops purposes). Felled woodland and land cultivated for afforestation. Excludes woodland managed principally for agricultural purposes.

2.3.4 Fishing: includes fish ponds and fish farms or hatcheries in fresh water areas.

- Other fishing activities e.g. inshore or estuarial fishing using nets and pots (where these are the primary use of land and associated waters and can be clearly delineated).

2.3.5. Irrigation

Includes irrigation canals, ditches and drip irrigation system, ponds/storage, dams/large dig holes for seasonal storage later uplifted by motor i.e dhora's etc.

2.3.6 Wetlands uses

The wetlands are those areas that are inundated or saturated by surface or ground waters at a frequency and duration sufficient to support vegetation adapted for life in saturated soil conditions. Included in these uses are naturally vegetated swamps, marshes, bogs and savannas which are normally associated with topographically low elevations but may be located at any elevation where water perches over an aquiclude. Wetlands that have been modified for recreation, agriculture, or industry will not be included here but described under the specific uses.

2.4 Non-Urban Vacant

- Developable vacant: includes vacant land, whether developable for urban or non-urban use, other than vacant land under.

  Land which is now vacant and could be redeveloped without treatment, where treatment includes any of the following: demolition, clearing of fixed structures or foundations and levelling.

  Vacant buildings that are structurally sound and in a reasonable state of repair (i.e. capable of being occupied in their present state) where re-letting for their former use is not expected or that have been declared redundant.

- Residual Vacant Land: including areas prone to risks/hazards detrimental to human

lives, all land not capable of development, including land subject to annual flooding.

- Water bodies, lake, pond, rivers, dhoras, artificial storage or seasonal storage.
- Land so damaged by previous development that it is incapable of beneficial use without treatment, where treatment includes any of the following: demolition, clearing of fixed structures or foundations and levelling.
- Tourist resorts/Holiday Towns and Historical sites and heritage.

3. GUIDELINES FOR DEVELOPMENT CONTROL

Control on developments plays a crucial part in the overall management of the built-up area. Development control guidelines shall be supportive, friendly, and provide leverage in the shape of FAR, height, density, and land coverage. These guidelines drive the over the outlook of the urban fabric structures and building built-environment. It will provide set of rules for urban development which will provide a friendly environment for built environment by adopting multiple new buildings and urban design beside planning standards and norms to assure sustainable developments in all zones by and large.

The spatial dimension will always guide the physical density. By using appropriate FAR and sustainable densities /spatial demission shall be ensured. FAR will be effective if considered street Right of Way in certain cases. This will get leverage or relaxation in special cases as per the requirements or depend upon the topography and local landscape of the Zones. FAR will be allowed as per the street or road type besides plot sizes to all buildings. Building masses, façades, patios, courtyards and compulsory open spaces will be treated in the light of the proposed FAR and as per the streets and roads Right-of-Way (RoWs) as per approved updated master plan updated from time to time.

Following key elements of the development control shall be supportive to achieve suitable development in the area without compromising environmental considerations in a satisfactory manner.

3.1 Density Standards

Residential density

Residential density is defined as people per unit area the number of dwelling unit permitted per hectare is the method of controlling density. Unit plot sizes are generally expected to be larger in the low and medium density areas and smaller in the higher density areas. The range of residential density envisaged to result from adoption of standard plot sizes are given following table.

Residential density means the average number of persons residing on 1 acre (4067.22Sq.m) of residential area. For the purposes of this clause “residential area” means an area devoted to residential uses and does not include streets or lanes or other residential uses.

“Residentiary density” means the average number of persons residing on or occupying 1 acre of residential area. For the purposes of this clause “residential area” means an area devoted to

residential uses, other than residential uses.

The following residential density requirements shall apply:

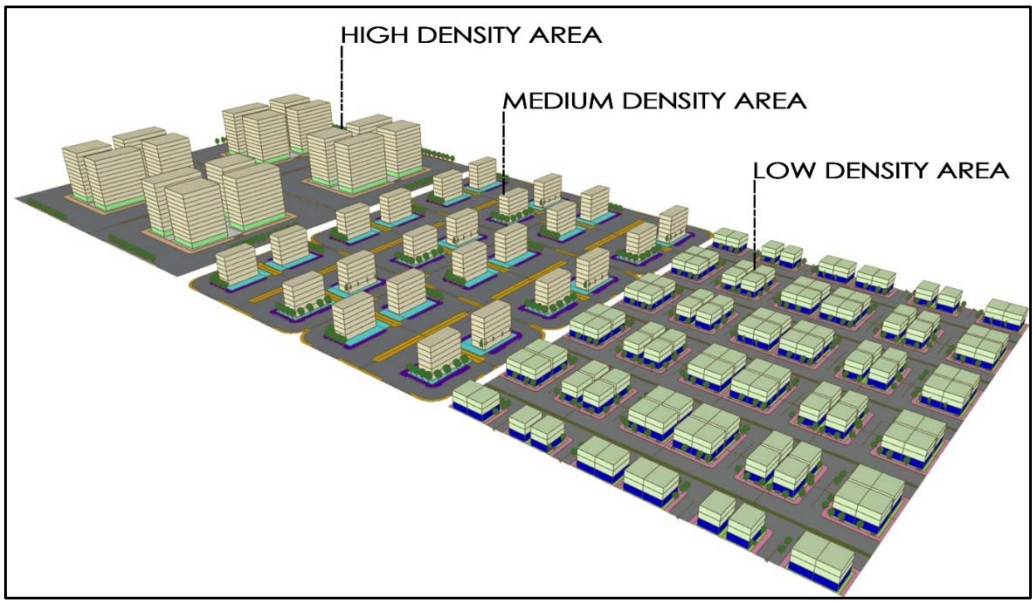
Table 19: Density Zone Details

Density zone	Residential type	Dwellings/hectare	People/hectare
Low	Mainly large plots	14-20	70-160
Medium	Mainly medium plots	20-44	120-396
High	Mainly small plots	44-69	264-690

(average house hold size ranges from 4 to 6 in upper income communities and 7-10 in low income communities)

- Flats for low-income groups: no more than (650) six hundred fifty persons per acre (0.404 hectare) of residential area;
- Flats for medium income groups: no more than 500 persons for acre (0.404 hectare) of residential area;
- Flats for high income groups: no more than (325) three hundred twenty-five persons per acre (0.404 hectare) of residential area.

Figure 10: Density Standards

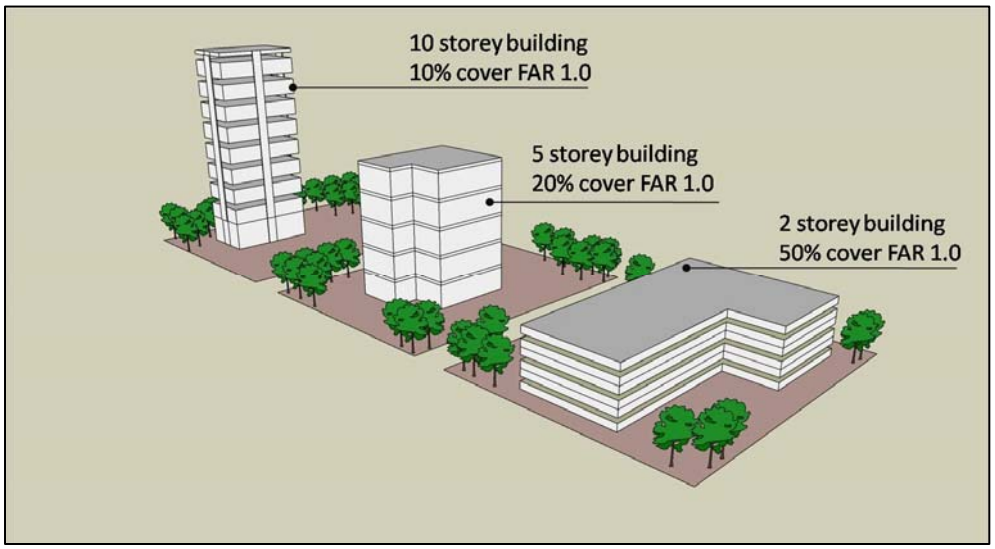


3.2 Floor Area Ratio

The floor area ratio of a plot is obtained by dividing by gross floor space (minus all enclosed parking) by the total plot area. use of floor area ratio as a regulatory device in congestion with over all height limits will encourage a varied skyline, long views and the circulation of cooling breeze. Rigid application of a simple height limit policy will result in a uniform skyline, poor control of density and few possibilities for long views. When design an area, the planner should

envision the optimum height for all adjacent properties, a sign of floor area ratio number based on the number of floors.

Figure 11: Floor Area Ratio (FAR)

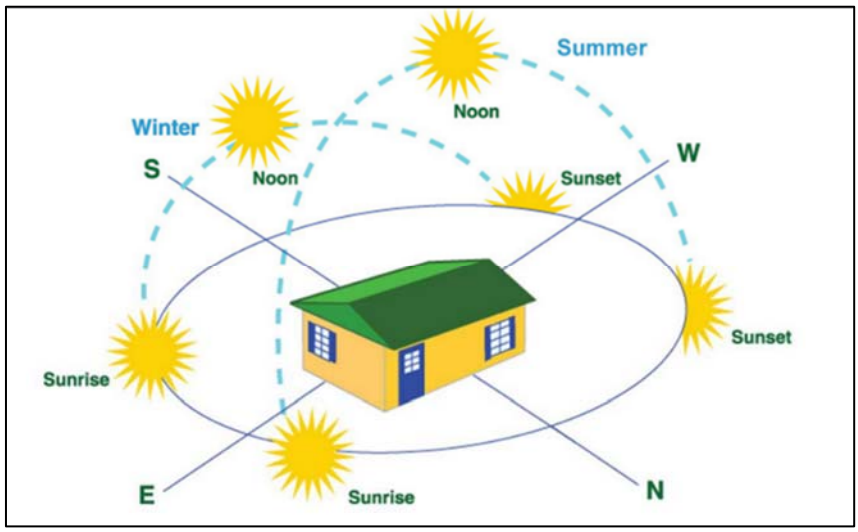


3.3 Orientation

Orientation is the positioning of a building in relation to seasonal variations in the sun's Orbits as well as prevailing wind dimensions. Good orientation can facilitate or enhances the energy efficiency of Building, making it more pleasant to live in and maintains at lower cost.

It is observed that people do not ask any questions regarding the orientation of the buildings. It is one of the most important aspects getting natural light and wind is its prime importance. Nevertheless, if you want to your Buildings to be natural and sustainable, building orientation is one thing you must keep in mind.

Figure 12: Oorientation of the Building



Building orientation is an essential part of building design. By using benefits of natural light and maximum ventilation in all seasons and climate conditions. The building orientation ensures comfort within the building, and it can save energy. The orientation of a building can also mitigates from the negative effects of inclement weather:

- The building orientation is generally used to refer solar orientation while planning of buildings with respect to sun path. The orientation can refer to a particular room or most important, the building facade.
- The word 'building orientation' is basically the positioning of a building with respect to the sun, usually done to maximize solar gain at the appropriate time of the year when required in cold climate and to minimize solar gain in a hot climate.
- South building facade or orientation receives maximum solar radiation during winters, which is preferable. As South building façade has the advantage of receiving more solar radiation during winter than that of receiving during summer. For Buildings windows & doors or openings on the south facade, small overhang or curtains can cut off direct solar penetration during summer and allows it during winter. This is a most beneficial aspect, not available on any other facade.
- East and west receive maximum solar radiation during summer. West is a crucial orientation because high intensity of solar radiation is received during evening hours, when the internal gains are also at its peak.

Objectives of Building Orientation

- The most frequently used rooms during the day are oriented in the East and the North whereas the rooms that are used mostly at night are restricted to the South and the West, which are hotter directions.
- Plan your Building windows & doors in the East to allow the Sun's UV rays to penetrate into the house in the mornings.
- The orientation of kitchen should be towards the east to allow the UV rays to destroy the germs that tend to multiply in the presence of moisture & food.
- The design of Buildings should be in such a way that all rooms get the maximum benefit of the sunlight whether the occupants desires.
- While deciding the building orientation, one must also take into consideration the location of landscape feature in a plot, i.e. trees, planters, etc which will affect the building depending on sun direction and sun path.

- Trees and tall shrubs should be planted towards south and west of the site to protect the inmates from the afternoon heat and to provide them with oxygen. The open water bodies in gardens should be kept in the north-east to enable the morning UV rays of the sunlight to destroy germs & bacteria before using it.
- The chief aim of the best Building orientation is to provide physically and psychologically comfortable living inside the building to give good health & happiness to the user in a secure way.

Wind orientation

The wind direction and velocity should be studied at your site for the whole of the year. The building should be oriented in such a manner that the wind flow should be more in the building during the humid season than in other seasons. The prevailing winds at your location can create natural ventilation, especially in highly humid conditions. The windows and doors should be at the proper locations to provide maximum advantage due to wind.

Rains and clouds

Rains and clouds have lower importance while planning building orientation. The openings and glazing should be planned according to the rain direction, as the rain direction is same as the wind's direction during storms. If your architect does design glazing for your building, then you should cover it with a sunshade. Thinner walls of the building should not be oriented towards heavy rain direction.

Humidity

Humidity does not affect the orientation of a building directly, but properly planning according to wind orientation, which will ventilate your home naturally, will give you relief from humid heat, even when there is little natural breeze.

Energy Saving

- The main benefit of building orientation is to maintain energy cost and efficiency of your Building. It saves the heating, lighting and cooling cost of your building. Avail natural light, winds and sun to your building so that you can enjoy the warmth of the sun in winter, and cool breezes during summer. These will also reduce the cooling and heating cost..

Natural air in humid climates

- Your building orientation can give you the advantage of the natural breeze in humid and warm climates. Similarly, in dry and hot climatic conditions, the orientation prevents hot winds from entering your buildings.

- Buildings which are constructed according to the sun and wind orientation, are also known as Passive Solar Buildings.
- The lounge, kitchen etc should be oriented towards the sunlight and the rooms which are least used should be on the part of your building which is in shade. Open plan interiors are not favorable in passive solar buildings.
- Your building should be designed keeping in consideration the weather or climate of the whole year and not for just one season.

3.4 Built-Form by Climatic Region

Climatic zone:

Building design guidelines from the traditional solution,

- Implication for plot shape, size and orientation by summer and winter seasons as basic guidelines as follows:

Figure 13: Seasonal Sun Orientation

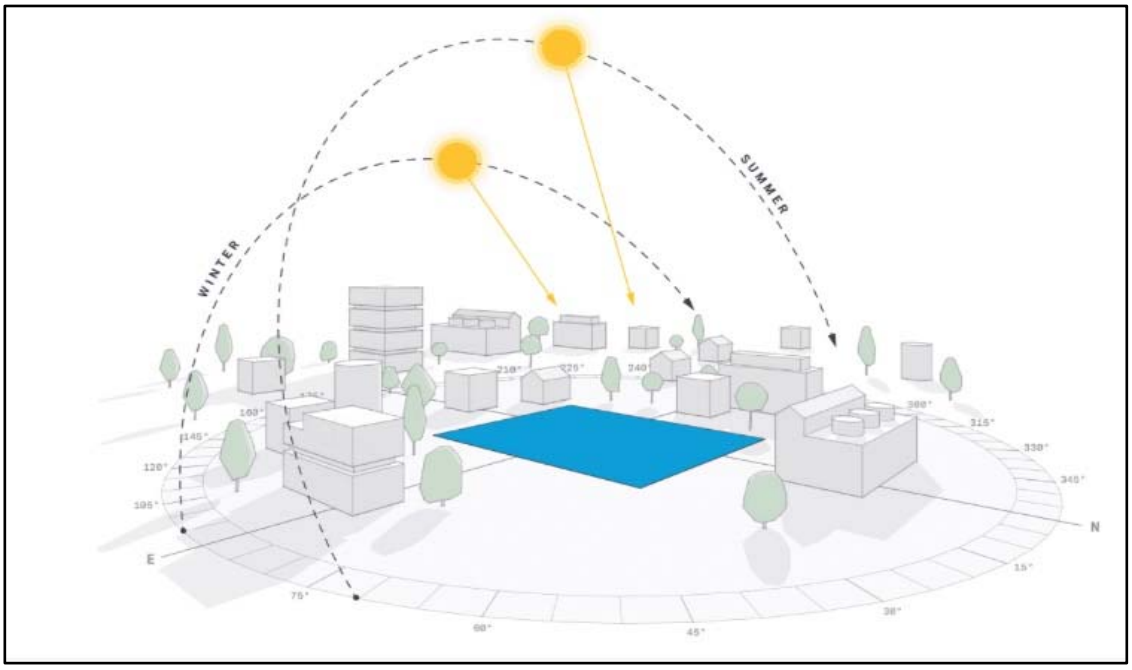
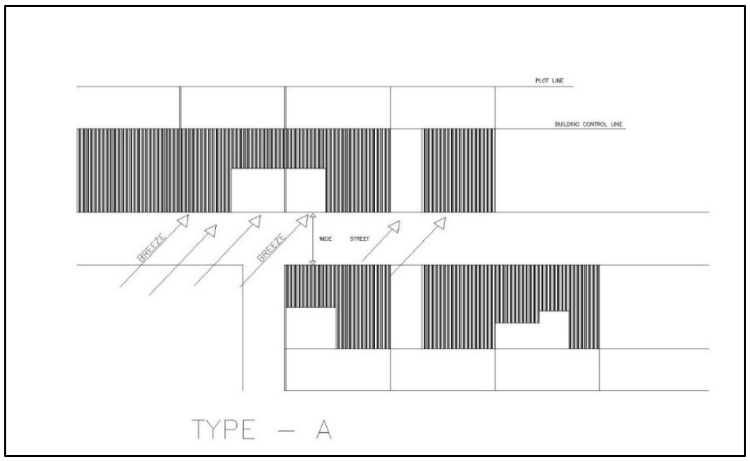


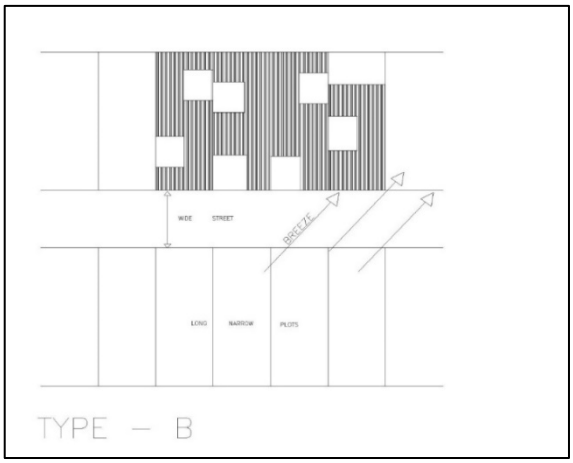
Table 20: Details of Climatic Zone

Climatic Region	Building Design Guidelines from the Traditional Solution	Implication For Plot Shape, Size and Orientation.
MARITIME	Preference for inviting breeze into the houses and for minimizing houses at the leeward sit of the breeze.	orientation of openings/plots directed to admit -the prevalent breeze suggests wide street, squarish plot opposed building control lines & staggered openings in multistorey development. & Long narrow plots with staggered openings for single storey development.
INLAND MARITIME	Inland maritime conditions necessitate care to minimize direct solar conditions all year round. Suitable wind channeling devise are indicated. Where window is to be avoided, the wind catcher installed on the roof is a traditional solution.	A street orientation that facilitates passage of breeze while reducing ingress of direct /indirect solar radiation is to be preferred.

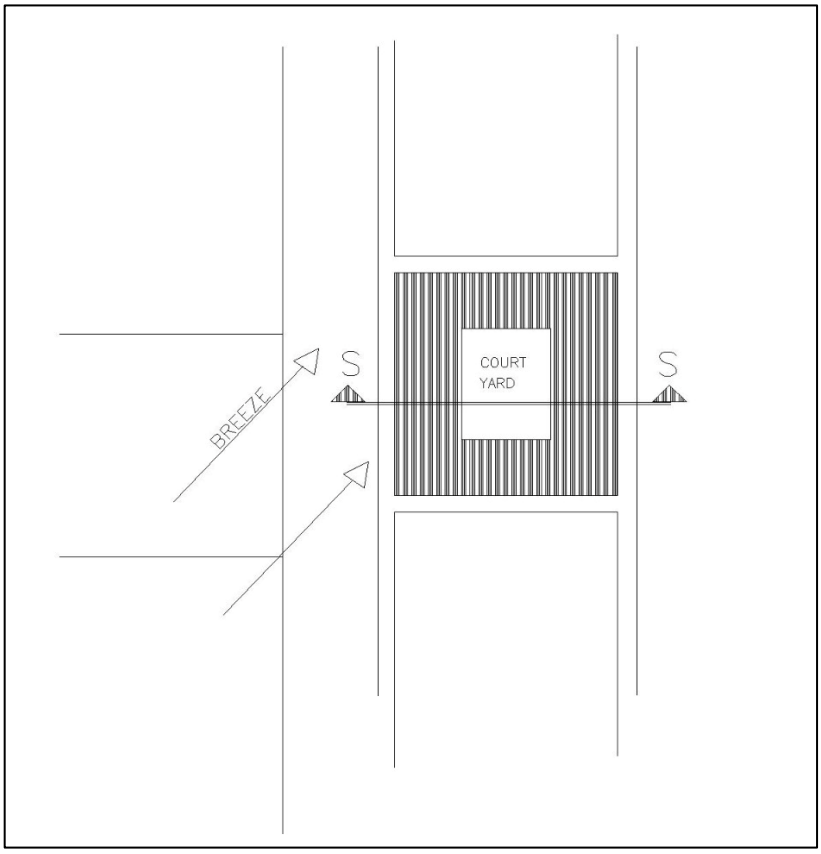
Figure 14: Layout for Buildings

a. MARITIME CLIMATE





b. INLAND MARITIME



3.3 Land Allocation

Land allocation refers to assigning land to be used in a certain manner, however it may not mean that the actual use of the land reflects the initial plan of its allocation. Land use instead is a more specific term that unlike land allocation describes more specifically how land is being employed (e.g.: residential, commercial, amenities, open green spaces, roads and other purposes.). Such distribution actual provides strengths to the land development where quality of built environment could be ensured and use of land can be benefited in a satisfactory manner.

Allocations for various land uses for major sub-division into various where residential activities as zoning are permitted. therefore, following considerations shall be as follows.

Residential area for residential uses shall be allowed up to maximum 55% of the total area of land.

Commercial area for commercial uses as defined shall be allowed up to maximum 5% of the total area of land.

Amenity area for other residential uses shall be as under:-

a) Roads/Streets, right of way minimum 25% of the total area of the land.

b) Parks and playground minimum 8% of the total area of the land.

c) Public Uses including Religious Building and Health Centre uses etc. minimum 4% of the total area of the land.

d) Educational uses minimum 3% of the total area of the land (such land may use for basic needs ap per reside population requirement).

Area where low density and where Farm House will be Allowed as per Master Plan updated from time to time.

Farm House means a hutment, small dwelling, sub-urban construction giving a farm house look along with cultivation of gardens / orchards, vegetables / dairy etc.

Following land use allocation shall be allowed for Low density areas and Farm House Project/Schemes.

- Area for low density / Farm House Plot Max. 60%
- Circulation / Road / Car Parking area etc. Min. 40%
- Open area within low density and Farm House Plot Min. 80%
- Landscaping/agriculture/green open spaces etc.
- Constructed area of Farm House Max. 20%
- The low-density area building shall be limited to Ground & 1st Floor only.
- The farm house building shall be limited to B+Ground & 1st Floor only.
- Minimum plot area for single Farm House shall not be less than 2000 Sq. yds.
- Minimum plot area for low density as defined in above table.

Allocations for various land uses for major sub-division into various universities, therefore, following considerations shall be as follows.

Category-I

Area between 50 Acers to 100 Acers

- Total Built-up area allowable maximum 50% of the total area.
- Other Area allowable maximum 50% of the total area
- Green open space and recreation area shall be reserved 50% of the other area.
- Roads Infrastructure and other services /facilities shall be 50% of the other area.

Category-II

Area between 101 Acers to 500 Acers

- Total Built-up area allowable maximum 45% of the total area.
- Other Area allowable maximum 55% of the total area
- Green open space and recreation area shall be reserved 70% of the other area.
- Roads Infrastructure and other services /facilities shall be 30% of the other area.

Category-III

Area between 501 Acers to 1000 Acers & above.

- Total Built-up area allowable maximum 30% of the total area.
- Other Area allowable maximum 70% of the total area
- Green open space and recreation area shall be reserved 80% of the other area.
- Roads Infrastructure and other services /facilities shall be 20% of the other area.

3.4 Plot Size Areas

For all new major sub-division, the following standard plot areas shall be observed:

- Minimum plot area shall be 120 Sq.yds. (100.33 Sq.m.) in all districts for residential
- Maximum Plot area shall be 1000 sq.yds. (836.2 Sq.m). in all districts residential
- Note: In case of corner plots, irregular plots or on account of any other physical constraint, deviation of size upto + 20% shall be allowed.
- Minimum Commercial plot not less than 400 Sq. yds, (334.45 Sq.m.) in all districts
- Maximum Commercial plot shall be 3000 Sq. yds, (2508.38 Sq.m.) in all districts
- Minimum Mixed-Use plot not less than 400 Sq. yds, (334.45 Sq.m.) in all districts
- Maximum Mixed-use plot shall be 3000 Sq. yds, (2508.38 Sq.m.) in all districts

Plot size may set higher minimum levels in the Master Plan as per principal use of the Zones, but may not reduce them beyond the sizes as defined above.

Note: For educational institutes shall be adjusted as per occupancy load or per student and at least gross area follows as below specifically in high density area:

- Minimum Area for Schools 2.00 Acres with playing field.
- Minimum Area for College 4.00 Acres with playing field
- Minimum Area for University at least 10 Acres keeping view the future expansion.

Note: 1) These conditions shall apply in high density areas keeping in view the future growth of the Education City.

2) Following standards are recommended for primary school, secondary school and colleges:

- Primary school: 1.00 Acres (Playground, green spaces, parking area is mandatary to be within the plot area.
- Secondary school: 2.5 Acres (Playground, green spaces, parking area is mandatary to be within the plot area as per the requirements).
- Degree College/Technical College: 5 to 8 acres ((Playground, green spaces, parking area is mandatary to be within the plot area.)

3.5 Plot Shape

Plot shapes shall generally be rectangular quadrangles; provided, however, that where this would cause spatial difficulties arising from irregular or unique features of a plot/site, the developer may apply for an exception. In any case:-

The ratio of frontage to depth plots shall be no less than 1:1 and no more than 1:3.

Minimum width plot shall not be less than 40ft. (12 m.).

3.6 Building Lines and Height

- The general principal for multiunit dwellings is that it is convenient to construct one plus two storeys without lifts and one plus three storeys may be permitted in densely populated areas without installation of lifts but others must ensure that the installed lifts are as per the Usage.
- To ensure adequate light and air, privacy in fire break the general rule for minimum horizontal distance between two multi-unit dwellings is:
  hight of building ‘A’ hight of building ‘B’ divide by two. This shall also regulate for all uses.
- Angle of repose may be used to determine the set back of multi-unit dwellings and other buildings as well from the age of the road way leave. The general rule is set back from plot line is equal to height of building dived by Tan 60 degree (1.732, approx).

  For example: if height is equal to 15 meters, then set back from plot line is equal to 15 / 1.732 =8.66 meter, approx.

- Angle of repose formula does not apply to residential flats on top of commercial outlet in commercial cum residential buildings. in such cases, the primary consideration in determining requisite set back is dedicated vehicle parking spaces. alternatively, basement / subbasement parking may stipulate.
- Installation of communication towers is prohibited on the all-building roof except in such case where security Radar Systems required for security purposes only. Communication towers shall be installed as per the location defined in the approved updated Master Plan.
- Height of the buildings shall be maintained strictly no any other structure shall be allowed top of the building's roof.
- Helipad in certain level is permissible to proposed on the top of the roof in high rises buildings after fulfilling the building structure and safety guidelines.

3.7 Pedestrian Lanes

Thoroughfares intended exclusively for pedestrian traffic, referred to as "pedestrian lanes", and shall not be less than 12 ft. (3m.) wide.

Pedestrian lanes, if abutting plots on both sides, shall have uninterrupted length not greater than 30 times its width provided that interruption shall be created by other pedestrian lane or vehicular street.

The grade of pedestrian lanes in cross-section shall be level, and their longitudinal slope may not be greater than 5 degree, provided however, that:-

If the slope of the terrain is greater than 5 degree, the difference in slope may be made up by an appropriate number of steps; the series of steps for each 5 degree higher slope shall be separated by a landing at least 6.5 ft. (1.97m) wide also there should be a ramp for wheel chair.

If the lane is along double or single rows of plots in a terrain sloping more than 5%, the difference in slope may be made up by an appropriate number of steps at the bottom end of each double or single row of plots, as the case may be also. Ramps for wheel chair etc for special persons shall be provided.

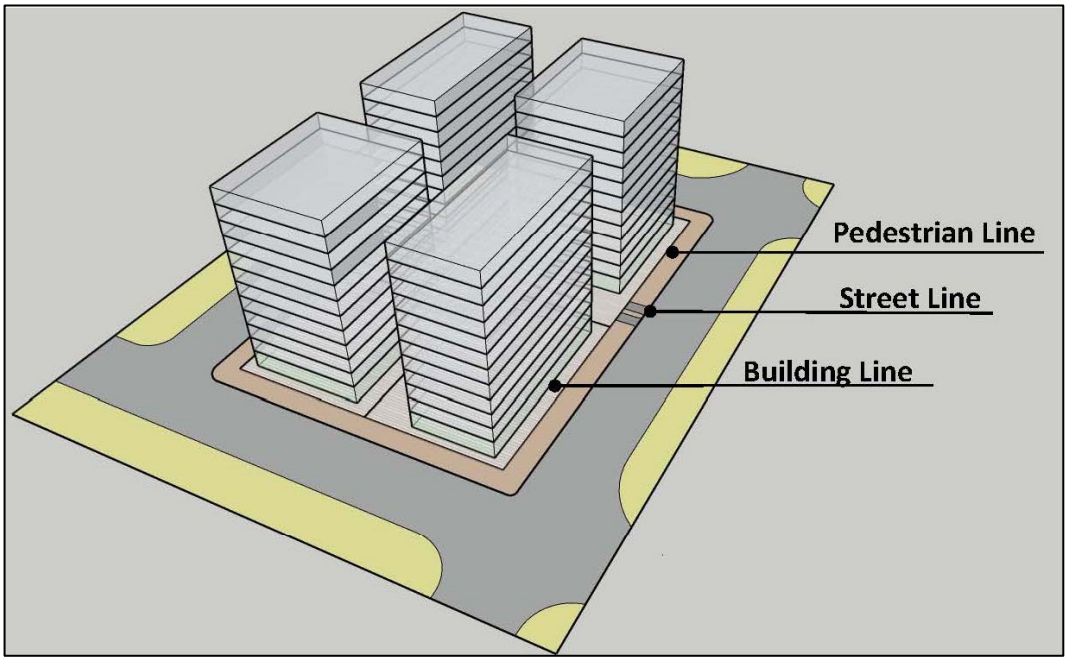
3.8 Street Lines and Building Lines

Street right-of-way shall be regarded as distance between plot lines on opposite side of the street.

No structure projections, mases or part of a structure of ground floor may project beyond such

building line or building setback line.

Figure 15: Pedestrian, Street and Building Line



3.9 Visibility at Cross Roads

In the interests of pedestrian safety and vehicular traffic visibility at cross roads, no trees or any other impediment/structure will be planted within 30 ft. (9.13 m) of any street right-of-way limit.

The streets shall be champhered where needed as per their sizes and meet minimum turning radius.

3.10 Projections

- Boundary walls or any other structures of the buildings or the parts of the buildings in the front of the plot shall be totally within the plot boundary / with property line of Buildings or parts of the buildings.
- For those sides of buildings which abut property line, no openings, projections or attachments of any nature whatsoever shall be permitted, except for those buildings where property lines abut on to a public street or a permanently open space.

3.11 Ancillary Structures

Area of the car porch in house shall not be included in FAR, up to a maximum of 380Sq.ft. (35Sq.m). If car porch is constructed in the front or side COS, maximum clear overall height

shall not exceed 8ft. (2.43m) from the floor level of the plot, and a maximum depth of 20ft. (6m) shall be allowed along the property line. No construction or occupancy shall be allowed over it within COS. However, any construction above car porch outside the COS shall be included in the FAR.

Guard room of maximum 64Sq.ft.(5.95Sq.m) area having maximum height of 10ft.(3m) from centre of the road shall be allowed in the front COS in all type of plots having an area of 400 Sq.yds (335Sq.m) and above.

3.11.1 Space between blocks in Residential Plots

In case where a number of Blocks are designed within the plot boundary, open space between two blocks on front and rear sides of the blocks shall be 50% of the height of the block with minimum 24ft. (7.31m) and minimum open space between the blocks on other two sides of the blocks shall be 20% with minimum 15ft. (4.56m) of the height of the block.

Wherever more than one residential building / town houses are permitted within the plot boundary, for buildings of maximum two stories height open space on front and rear of the building shall be minimum 15ft. (4.56m) and minimum open space between the buildings

3.11.2 Exemptions from FAR & Footprint

In all commercial, public sale, public use, Amenity buildings the following areas upto maximum 30% of total FAR shall be excluded from foot print except activates defined in (a), (d) & (e):

a) Car parking including ramps and driveways.

b) Lift shafts, Garbage chute and Garbage collector, Electric Sub-station and Emergency stair case & its tower. Building Services areas, such as plant rooms, electrical and mechanical ducts and electric power generator space, corpse room with washing area, driver sitting area with bathroom, guard room with bathroom etc.

c) Passage and stair case area.

d) Arcades, if provided.

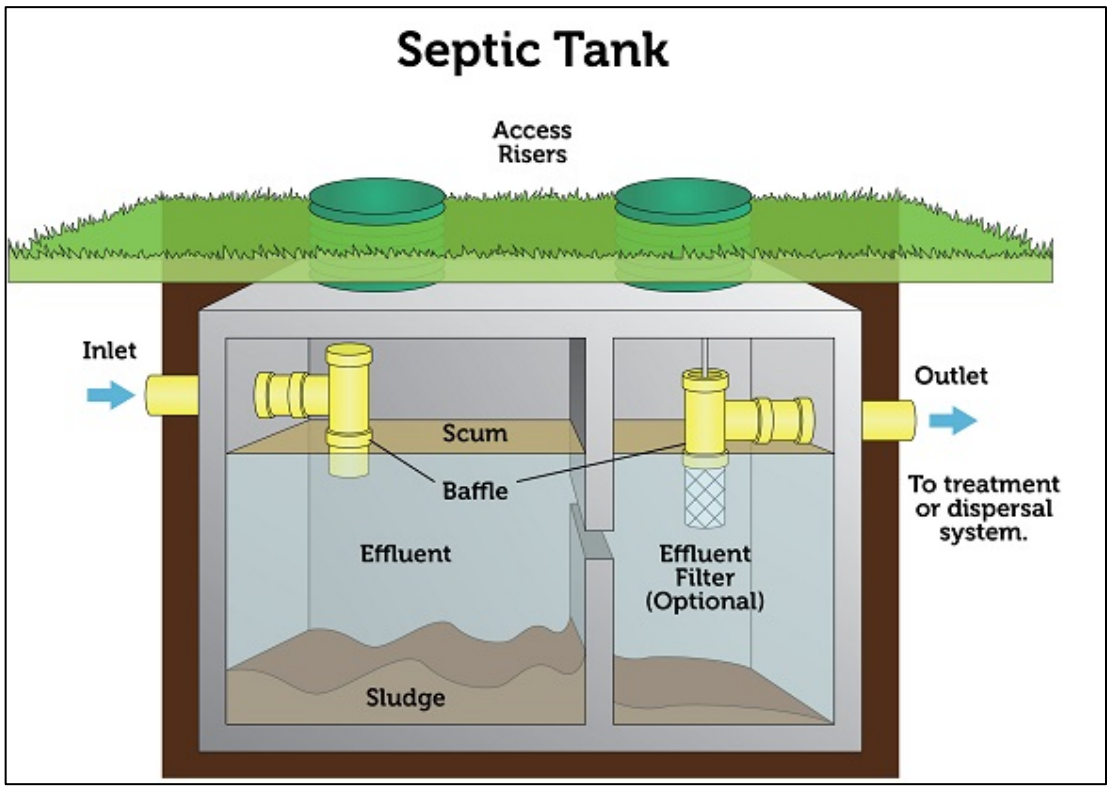
(e) Staircase tower over the stair shaft shall be allowed with maximum clear height of 8 ft. (2.43 m).

3.11.3 Recycling Plant & Septic Tank

In all High-rise building i.e. above G+4 floors, recycling plant for the treatment of

effluent/sewage of adequate size and dimension shall be mandatory provided by the owners at an appropriate location of the plot/ building in accordance with the requirement for construction and maintenance is set by National Environmental Quality Standards (NEQS). Arrangements for the disposal of sewerage shall be made through septic tank of adequate size and capacity, disposal of treated sewage and the sludge so created shall be disposed of through transportation to the designated sites indicated by EC Board / Admiration. Treated water shall be used for landscaping Purpose and dispose in main lines after treatment. Moreover, without treatment shall not permitted. The above area shall be exempted from FAR.

Figure 16: Septic Tank



3.12 Residential

All Residential houses/bungalows/buildings shall observe the following standards:

Table 21: Residential Building Bulk Standards

PLOT SIZE (sq.yds.)	FOOT PRINT	FAR	MINIMUM COS FRONT	MINIMUM COS SIDES	MINIMUM COS REAR
120-199 (100.8-167m2)	70%	1:2	3ft. (0.9m)	-	3ft. (0.9m)
400-499 (336-419.3m2)	65%	1:1.3	7ft. (2.13m)	5ft. (1.5m)	7ft. (2.13m)
1000 (840.3m2) & Larger	50%	1:1	15ft. (4.56m)	7ft. (2.1m)	10ft. (3.m)

Other Conditions

Height of all houses/bungalows measured from Plinth level, but excluding parapet, overhead tank, lifts machine room if required, staircase tower, and barsaati, shall not exceed 25ft. (10.65m) or two stories whichever is less up to plot area 399 sq. yd. (335.2m2).

Plots abutting a public street, lane and permanent open space on the rear shall be exempted from the provision of rear COS up to Plot size of 119sq.yds. (100sq.m), for plots greater than 119sq.yds (100sq.m), the rear COS shall be 50%.

One basement at residential plots having minimum plot area of 400 Sq. yds. Shall be permissible by maintaining the compulsory Open Space and max height of plinth shall not exceed 2 ft. – 6 inches from Ground level. However; Road finish level (RFL) shall be maintained whenever new construction of the road take place existing levels shall be maintained in order to avoid any hindrance in the level. No over carpeting and finishes on the surface of the road shall be permitted and utilities shall be designed accordingly.

Area of such basement shall not include in permissible FAR but betterment charges shall be applicable decided by EC Board.

3.13 Commercial

All Commercial plots shall observe the following standards:

Table 22: Commercial Building Bulk Standards

Plot Size (Sq.Yds.)	Foot Print (Min-Max)	FAR/ Max No. of floors	Minimum Arcade	SIDES COS	REAR COS
400 - 720 (334.45 – 605.04 m2)	65-75%	1:4/ B+G+6	8 ft. (2.43 m)	7 ft. (2.13 m) (one side)	8 ft. (2.43 m)
721 -999 (605.88 – 839.49 m2)	Ground Floor 75% (Max) Upper Floor 65% (Max)	1:5 / B+G+10	8 ft. (2.43 m)	8 ft. (2.43 m) (one side)	10 ft. (3.04 m)
1000 – 1200 (840.33 – 1003.35 m2)	Ground Floor 65% (Max) Upper Floor 55% (Max)	1:5.5 / B+G+10	10 ft. (3.04 m)	10 ft. (3.04 m) (Both side)	10 ft. (3.04 m)
1201 & above (1004.89m2)	Ground Floor 50% - 60% Upper Floor 40% - 55%	1:8 (15 floors)	20 ft. (6.09 m) set back & 8 ft. (2.43)	15 ft. (3.65 m) (Both side)	20 ft. (3.04 m)

Note:

(1) The No. of parking floors are in addition to the No. of Max. floors mentioned above against different plots sizes. (2) In case any plot exists in height restricted area/flying gap funnel area or ground terrain no suitable than no setback shall be applicable on plot size 1500 Sq. Yds. (1254.19 Sq. m) and above.

(3) Maximum FAR provisions especially in high density areas shall be treated as per the approved updated Master Plan of Education City.

Other Conditions

(1). For plots abutting public street at the rear, rear COS shall be exempted in case width of road is 40ft. and above whereas less than 40ft. the COS shall be provided as specified.

(2). Plots where the allotment conditions or previous rules permit for higher FAR than the FAR noted in the above chart, the allotment conditions or previous regulations which provide for higher FAR shall be adopted.

(3). In case of corner plot, COS on sides abutting the lane or road 40ft. wide and above shall be condoned otherwise COS shall be provided as specified. No opening of shops shall be

allowed on side 40ft. wide road, however the entry and exist into the building/parking shall be allowed from 40 ft. wide road and above.

(4) Arcade on front/sides not required if building line set back 8ft.(2.5m) or more from the property line.

FLAT SITES CATEGORY *Sr. No.	Plot Size	Foot Print	F.A.R.	Minimum COS Front	Minimum COS Sides	Minimum COS Rear
1.	Less than 1/2 Acres	50% Max.	1:2.75	15ft. (4.57 m)	15ft. (4.57 m)	15ft. (4.57 m)
2.	More than 1/2 Acres	40% Max.	1:4.0	20 ft. (6 m)	20 ft. (6 m)	20 ft. (6 m)

Following ratio shall be applicable to health and education:

Table 23: FAR for Health and Education Buildings

Level of activity	Radius As per km	Min. Road width	Plot Size (Sq. Yds.)	F.A.R.	No. of Floors	Min. COS Front	Min. COS Sides	Min. COS Rear
Primary School /Clinic	0.5KM	60 ft.	Up to 600	1:2.0	G+2	3 ft.	---	3 ft.
Secondary School/Day care centre/ Dispensary/ Health Centre	1.25KM	80 ft.	601-1000	1:2.0	G+2	6 ft.	5 ft.	6 ft.
College/ Hospital	2.75KM	100 ft.	1001-1500	1:2.5	G+3	8 ft.	5 ft.	8 ft.
College / University	2.75KM	100 ft.	1501-1999	1:6.5	G+10	10 ft.	7 ft.	10 ft.
College/ University Chartered by HEC for University/ Hospital	2.75KM	150 ft.	2000 & Above	1:8	G+14	20 ft.	15 ft.	20 ft.

Note:

- If additional public / visitors parking floors are proposed in addition to the required parking as per these regulations for Plot mentioned in Sr. No. 4 & 5 only, an enhanced

FAR up to a maximum of 50% of the additional proposed public/visitors parking area shall be added to the allowable FAR mentioned above.

- (3) Maximum FAR provisions especially in high density areas shall be treated as per the approved updated Master Plan of Education City.
- University / College shall open compulsory open space at least 30-40% of the total plot.

3.14 Dairy Plots

- These are special type of plots, where processing of milk into various items will be done. Cattle or other livestock will not be allowed on these plots.
- Not more than 1/3rd of the plot area shall be allowed to be covered including all ancillary structures.
- Compulsory open space of 20ft. (6m) all around shall be left.
- Dairy plots shall be permitted in to Agriculture zone.

3.15 Cinema Houses

In addition to the Cinematograph Act Confer, the following standards shall be adopted:

- The spacing between the rows of seats shall be calculated as follows;
- Minimum width of the seats shall be 18inches (0.5m).
- Minimum back to back space between the rows of the seats shall be 3ft. (0.91m).
- Minimum width of the gangway shall be 4ft (1.21m).
- No cinema shall be planned within 700ft. (213.21m) of any mosque, religious building, hospital, public building or school. Provided that these buildings have been constructed on plots originally designated as such in the approved master plan as updated from time to time.
- Floor area ratio shall be followed 1:1 for plots meant for cinema houses.
- No residential accommodation except a single room accommodation of a maximum covered area not more than 250Sq.ft. (23.23Sq.m) shall be allowed.
- The size of the cinema shall be calculated on the basis of number of seats @ 20Sq.ft. (1.86Sq.m) per seat.

3.16 Petrol / Fuel Stations

Subject to the general conditions as follows:

- For the purposes of this the term “Petrol Station” means a station for the sale, at retail, of petrol and ancillary products for motor vehicles.
- A petrol station may be located only on a main collector streets or secondary arterial roads.

- A petrol station may not be located within 1.5 km radius of the site of an existing or approved petrol station unless the petrol station and the other such site or sites are located on the opposite side of a street having a right-of-way of not less than 100ft. (30m) and a dividing median strip.
- The minimum street frontage of a petrol station shall be 80 ft. (24.39m).
- No other location / plot shall be permitted for the installation/establishment of fuel/petrol station except plots/location mentioned/identified/located in the approved updated master plan as updated time to time.

Note: No CNG / LNG fuel station shall be permitted in Education City.

3.17 Urban Roads

Roads play a significant role in any development of the area. The primary contribution of such roads is to facilitate spatial growth, FAR, circulation, accessibility, connectivity, smooth vehicular movement, passage to utilities and network. Besides it has multiple uses w.r.t need and demand of the area. Road's guidelines will be facilitated street furniture, FAR, landscape, spatial growth, transport network, etc. The following road types illustrate the overall concept of roads that how urban structures and their uses can be accommodate at large.

Pavers for all roads are recommended only main arterial and collector roads will be allowed for top-carpeted i.e. bitumen and spalt/concreating. All institutes and major buildings should ensure pavers for internal road system. Pavers promotes sustainable development in the area besides discourage the vehicular movement and encourage people to use pedestrians and cycling. It increases life on streets and most of the area used by public frequently. It also helps to use such streets for different purposes without damaging public prosperity and provide healthy and attractive environment to end user. Paver creates lucrative environment and quality road system in the city. Moreover, pavers can be refixed and reused and it provides sizable economic benefits.

- **Ramps for Buildings:**

Note:

1:6 is recommended to be used for ramps at the main entrances of the buildings.

Figure 17: Paver Road

Following figures describe the cross-sections of the roads in details:

Figure 18: Secondary Arterial

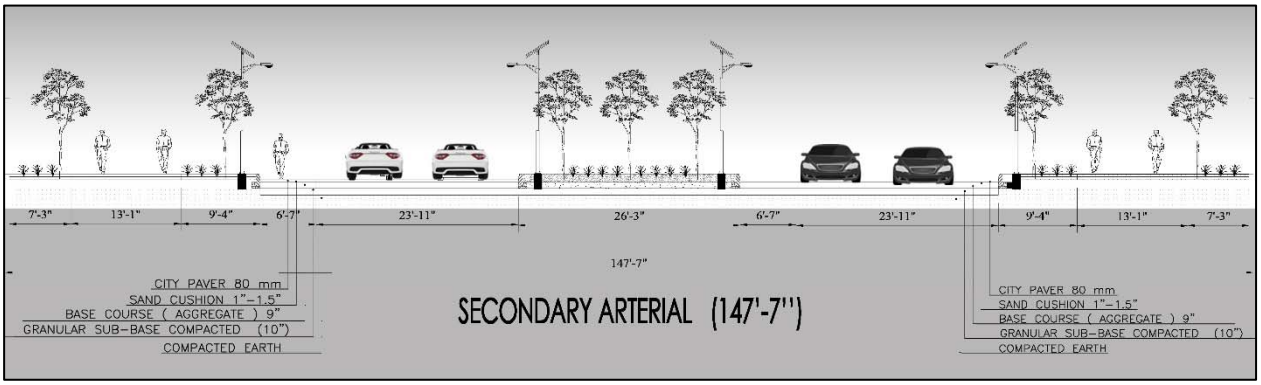


Figure 19: Secondary Arterial + Transit

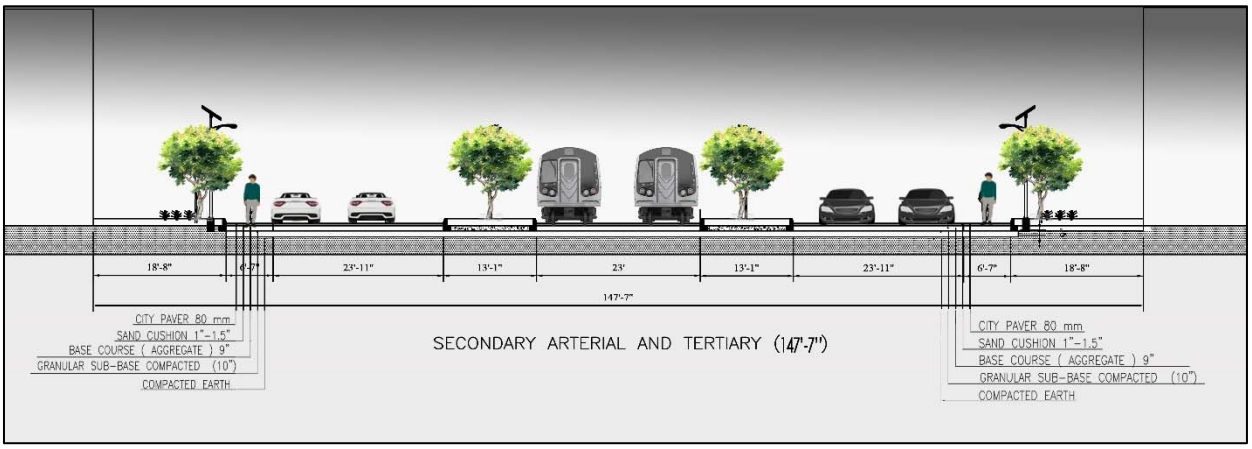
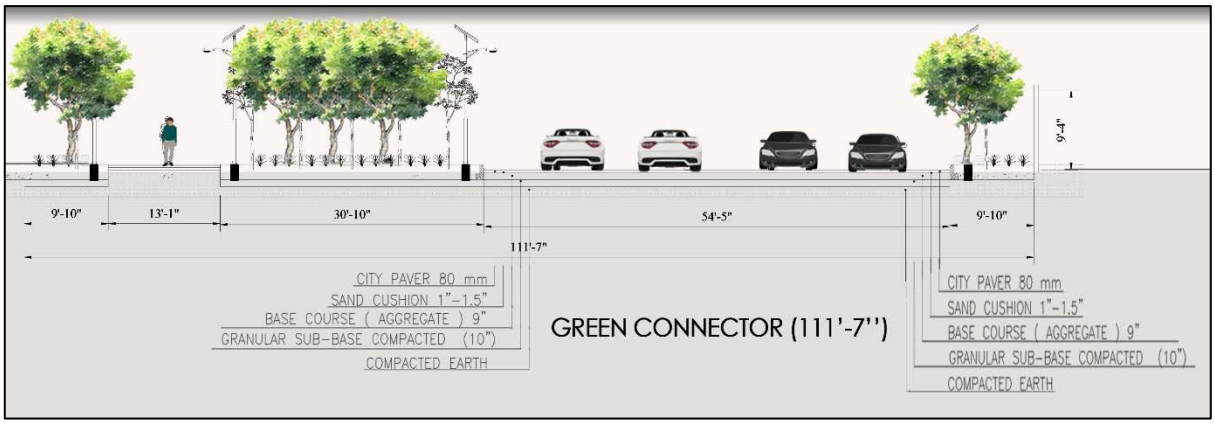


Figure 20: Green Connector



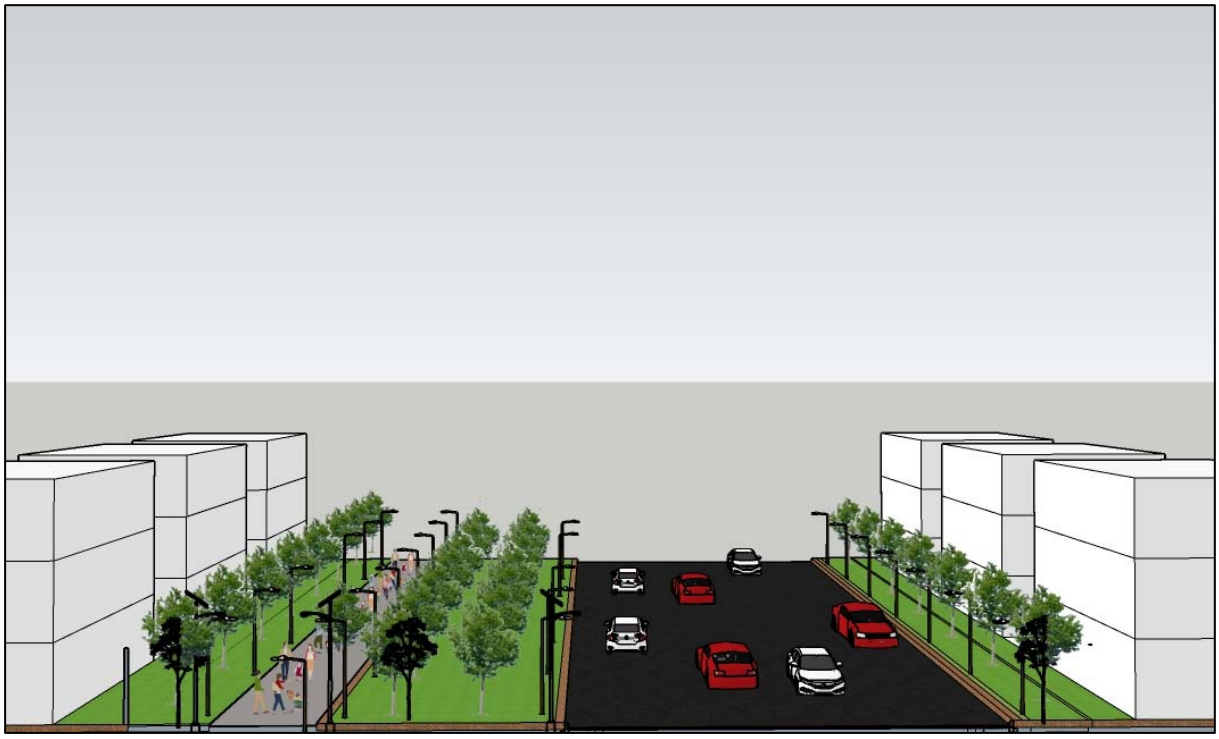


Figure 21: Transit/Pedestrian

Figure 22: Local Street

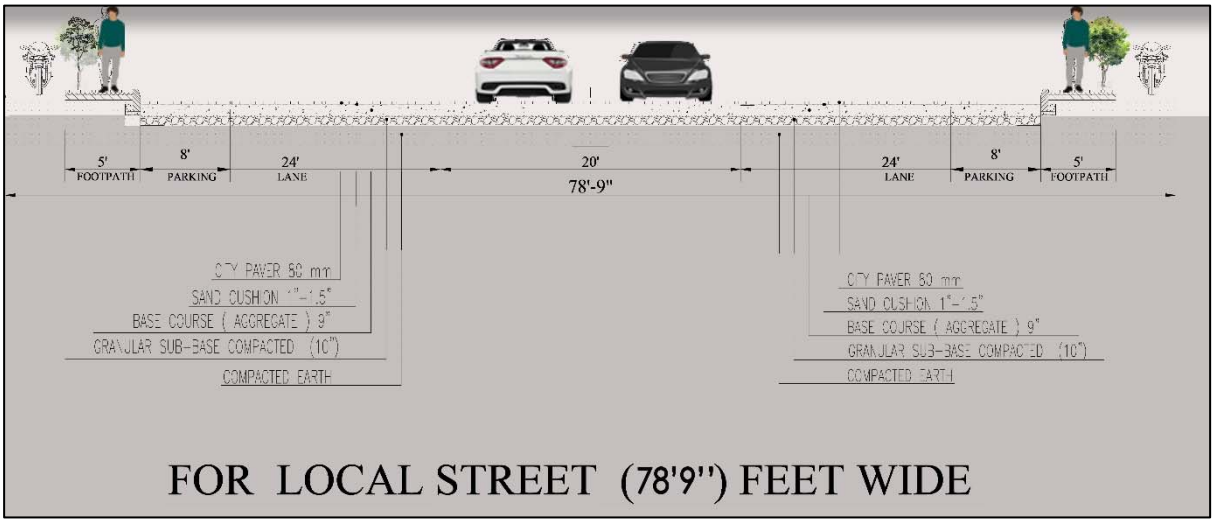
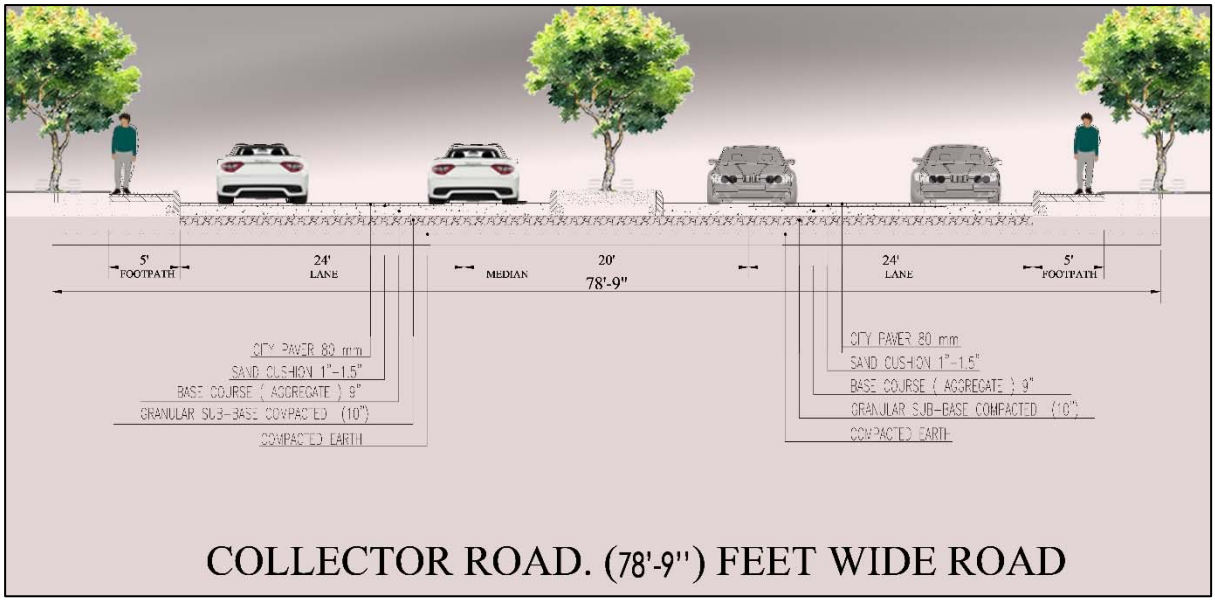


Figure 23: Collector Road/Neighborhood connector



Note:

1) Road finish level for all roads streets shall be maintained as to avoid any damage to public properties. New construction or any repair maintenance shall ensure the exiting level of the urban structures i.e roads, footpath etc.

2) Overlaying the construction over construction on exiting roads/street shall be prohibited and ensure road finish level and buildings plinth level accordingly before installation or any construction.

3) Moreover, all Cables i.e Fiber Optic Cables networking, telecommunications, electric, closed-circuit television (CCTV), closed circuit system, 4G/5G, WiFi network, Artificial Intelligence (IA), surveillance security system or any other application etc. shall be covered underground appropriately in the Utility Corridors section as reserved in Right of ways for Roads/Street. Open wiring system is prohibited in the Education City.

4) Green channels or those spaces that come in median, footpaths, pedestrian, driveways etc may be below 1 (one) feet from Road level. It is because in the rainy season such spaces will cater to major portion of the stormwater.

4. DETAILED ARCHITECTURE GUIDELINES

4.1 Aesthetic, Style, Material and Fenestration

4.1.1 Sustainable Building Concept

Education City is the first city in Pakistan that will be developed on smart sustainable principles which will provide a set of guidelines to architectural styles where different combination will be fascinating with vernacular architecture of the area. It will provide a healthy aesthetic value to the development where quality of urban beauty can be observed at length. Besides, it is encouraged to adopt local building architecture facades, elevation and courtyard concepts in building facades, elevation and elements.

The architectural developments in its physical expression shall be developed with regard to responsiveness with the socio-cultural aspects of the region. The built structure shall regard to the indigenous character of the local architecture and building traditions. The building standards shall however comply with all modern and contemporary technological usage.

4.1.2 Facade Elements (Culturally Responsive Building Designs)

In order to achieve a harmony in the development of the physical and spatial environment of the Education City and to bring the entire development in line with the objective character of architecture, therefore, it is essential that such developments respond to not only contemporary usage and modern technology but also to the traditional architecture, regional heritage with close consideration to the need for responsiveness towards the socio-cultural desire and need of the people of region. Such an architecture and urban development may be developed with regard to the architectural heritage of Sindh that has its roots starting from the spatial characteristics that prevailed in the urban development of Indus Valley Civilization, Islamic architecture with influence of central Asian styles, colonial styles, Raj architecture etc.

In addition to this, the vernacular architectures of Sindh also have to be regarded. It has its unique identity in the shape of balconies, carving, wind catcher, courtyards and many more. However, features may be blended with the requirements of the use of contemporary technologies & building techniques.

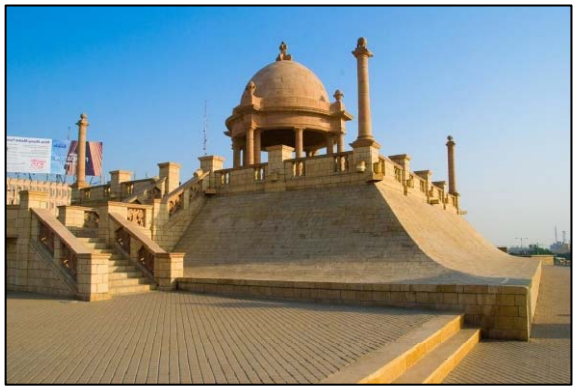
PRE-HISTORIC TRADITIONAL ARCHITECTURE OF SINDH

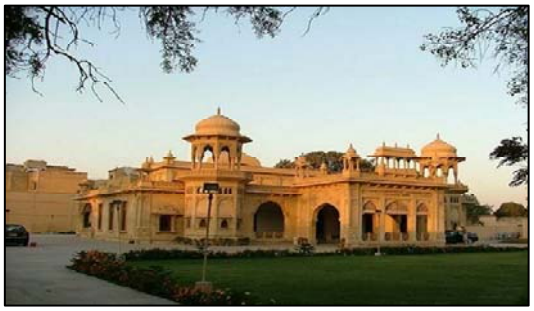
ISLAMIC ARCHITECTURE

CENTRAL ASIAN INFLUENCE

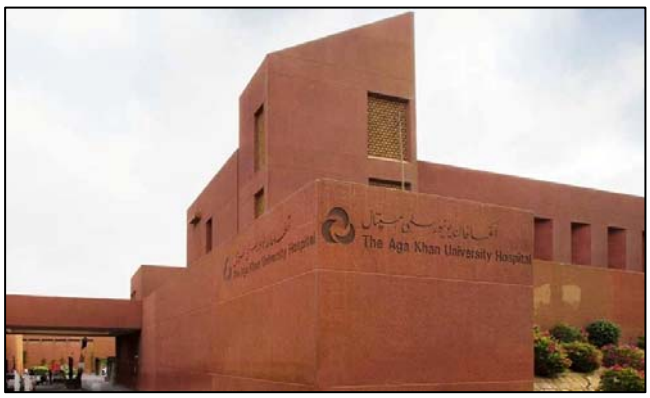
VERNACULAR ARCHITECTURE OF SINDH REGION

RAJ/COLONIAL ARCHITECTURE





MODERN ISLAMIC ARCHITECTURE



4.1.3 Sustainable Facade Elements

Based on the Sustainable Image Concept of the Buildings, Education City's buildings are required to have sustainable facade with standards of specifications and use of building material that should not only respond to the desired architectural character but should also be robust. Modern material usage is highly recommended but use of such appropriate materials should not damage the required architectural character of buildings.

The minimum standard of building material to be used in building facades as well as in building construction that should include:

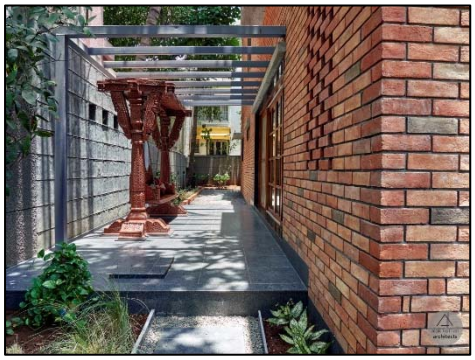
1. Exposed brick work with innovative/ decorative entire;
2. Stone cladding system (traditional sand storm like that of Makli);
3. Use of local/ indigenous tiles like that being produced in Hala & other places of Sindh to incorporate local crafts;
4. Fair faced cast in place concrete/ precast cladding systems etc;
5. Architectural wall panels (metal wall cladding system);
6. Carton wall system;
7. Local/ Indigenously produced lallice work/ Jafery work to promote local crafts;
8. The facades should also respond to local climate needs. Creation of sun shades, offsets for windows be incorporated. However, their modern affects are required at curtain walls/ large windows are designed, then the specifications must be enough to provide required insulations with the use of double-glazed system or in use of solar reflective panels/ films.

Any other sustainable and maintenance free material may also be allowed with special permission by Education City Board/Administration provided that the approved colour scheme of that area along with its overall ambience is not affected.

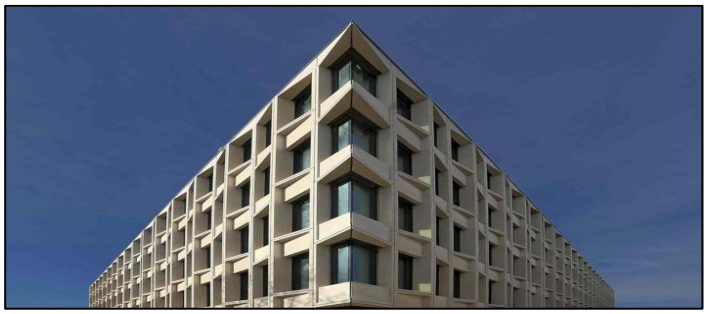
The approved front elevation of the building shall be strictly followed. The front elevation restriction includes boundary wall, gate design, finishing material and aluminium / UPVC or wood frames for windows.

Ready mixed concrete to be used for medium and high-rise buildings keeping the quality control in check. Concrete testing strength report should be prepared and submitted to EC Board/Administration.

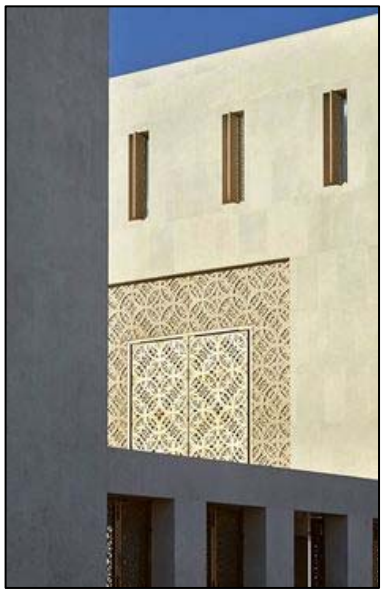
MATERIALS
EXPOSED BRICKS WALLS



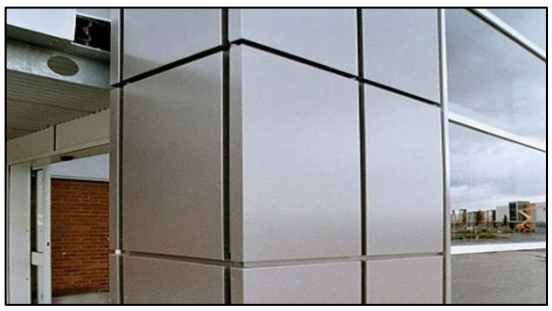
FARE FACE CONCRETE



SAND STONE CLADDING



ARCHITECTURAL PANELS
(METAL CLADDING)



4.1.4 External Walls (Insulated)

All external walls shall be provided with Insulation on hollow blocks, light weight insulation blocks or blocks with insulation etc on south and west facades of all buildings for energy conservation with emphasis on following: -

External Walls and Floors

Building elements forming the external walls and floors (where one side of the floor is exposed to ambient conditions) must have an average thermal transmittance (U Value) which does not exceed U = 0.57 W/m2K.

Where the floor is in contact with the ground, the insulation should be applied up to one meter (1m) below from the top most point in contact and shall be all around perimeter of the building.

4.1.5 Plumbing & Other Services

To ensure that the buildings will look aesthetically pleasing, no pipes are to be visible on front and back elevations. Independent pipe chases, ducts or shafts shall be required to be provided.

Side Walls: In case plot on which the construction is proposed has an empty plot/s adjacent to it, the plot owner shall ensure to provide side walls to be plastered with grooves and to provide paint (similar colour of cladding or paint) and to keep it maintained.

Corner Plots: All sides of a corner plot are to be treated as front elevation i.e. no visible plumbing, no external air conditioning units to be placed on any elevation from any road facing side. All external air conditioning units to be placed on roof, balcony or in ducts via pipe chases.

External Air Condition Units: No external AC units to be placed on any elevation of all buildings and all external units to be placed on roof balcony in duct via pipe chase.

4.1.6 Signboards:

To control defacing of buildings in Education City, all signboards on all commercial buildings are to be in-line with the E-Signboard Policy. Signboards sizes and shapes are to be first submitted to Town Planning and Building Control section of Education City Board or policy. Planning & Building Control Committee / Project Directorate, Education City on A3 paper size (in triplicate) showing the signboards shapes & sizes shown in colour prior to installation. After installation, a photograph on A4 size is to be submitted also for the record of Education City Board/Administration. Signboards for shops in commercial buildings will be of size having length covering entire length of the shop or, part thereof, width of 3 ft and 1 ft raised from the wall. For display of the name of the Commercial building, Group etc size

will be appropriately selected and approved by committee.

However, Education City Board/Administration may allow variant size of the sign board based on aesthetics corresponding the size of the building, building front, shape of the building. Signboards may be allowed more than one depending upon size, shape and view from different sides of the building keeping view the building façade and over all elevation besides building height.

Building façade shall not be covered by any signboard. Installation of signboards on the top of the building roof is also prohibited keeping in view the aesthetic, safety and unforeseen incident occurred due to any disaster. Safety parameters shall be ensured while fixing the signboards on at appropriate places as approved in the updated Master Plan

4.1.7 Glazed Elements Fenestration Requirements:

- In case the total area of external walls that let in light is upto thirty percent (30%) of the external wall area, then the glazing elements must meet the following performance criteria:
- Thermal Transmittance (Summer U Value) U = 2.1 W/m2K (max.)
- Shading Coefficient (SC) - 0.4 (max.)
- Light Transmittance - 27%
- In case the total area of external walls that let in light is between thirty percent (30%) and seventy percent (70%) of the external wall area, then the glazing elements must meet the following performance criteria:
- Thermal Transmittance (Summer U Value)
- U = 1.9 W/m2K (max.)
- Shading Coefficient (SC) - 0.32 (max.)
- Light Transmittance - 20%

Note: The owners are required to submit with completion plan certification from glass supplier/manufacturer that the glass used in the said building is fulfilling the requirements numerated above.

4.1.8 Balcony Parapets: All Balcony parapets are either to be of block masonry with aluminium cladding on it or in case railing is used, it is to be of stainless steel or any other

maintenance free non corrosion material.

4.1.9 The Courtyard Principle

Spaces and courtyard are encouraged to be used in building design.

- The use of passive design techniques that is both sustainable and responsive to the climate by providing shade and shelter from the sun.
- Privacy from overlooking by adjacent plots and the separation of the private family space from the semiprivate guest space.
- The courtyard creates a sheltered micro-climate in which flowers, shrubs and trees are easily grown.
- Houses are oriented inwards onto central court, forming a garden, fountain or pool area, provides great opportunity for usage and privacy
- Such spaces/ courtyard may be formed by creating spaces surrounded by different buildings around.

Figure 24: Central Courtyard concept

4.2 Building Design Guidelines

The purpose of these design guidelines is to encourage individual creativity while fostering a unity of materials and finish to ensure that the overall development harmonizes to create a balanced lifestyle for Education City and which would reflect the modern regional character.

The main emphasis in these guidelines is on reducing visual impact of the buildings by means of sensitive integration into the landscape. This is achieved by breaking up the building forms into separate elements, carefully placed within natural contours, terracing down the slope with minimal cut and fill. Separate forms with individual roofs are an option – it will safeguard views from neighbouring properties and minimize the building masses.

The following guidelines will be implemented to ensure a sensitively constructed environment with a high-quality aesthetic value and maximum privacy:

1. Construction and improvements must commence within maximum 24 months from the date of **first** registration of transfer of ownership of the particular stand. In order to reduce inconvenience to neighbours, as well as unsightliness, construction must proceed without lengthy interruptions and must be completed within 18 months from the date of commencement. Phased design and construction must be handled in such a way that the end of each phase is to be aesthetically acceptable to the EC Board / Administration.
2. The design of the buildings with respect to Zoning permitted and the entire stand must show a special sensitivity to the existing natural features, flora and topography.
3. Permission is required before any existing trees are removed and all existing trees are to be shown on the site plan. Details of surrounding structures besides elements must be taken into account in the design process.
4. No plot may be subdivided or rezoned for any other use as specified in the approved master plan updated from time to time.
5. All buildings must be designed to conform with these architectural guidelines to the satisfaction of the EC Board/Administration. The objective is to achieve an interesting range of mutually compatible building designs within the flexibility afforded by the approved architectural style, whilst avoiding monotonous uniformity.
6. All plans must be submitted for approval to the EC Board/Administration on prescribed format for the approval. It is the owner's responsibility to ensure that all plans are submitted and approved by EC Board/Administration prior to construction.
7. All buildings elements shall be retained as per original plan/s.
8. Health / Maintenance certificate may also be ensured to be received from EC Board / Administration after getting Building Inspection/s done after 2 to 3 years.

9. It is mandatory to ensure Safety certificate for building structure/s in case of any hazardous condition may occurred. Therefore, proper building inspection is required and same may be done for all buildings on routine basis after 2 years in order to be maintained buildings health.

4.2.1 Height Restriction

No double storey shall be higher than 10m from Natural Ground Level ("NGL") contours at any point, the primary consideration of which will be to safeguard the privacy of residents on adjacent stands. Not more than two storeys shall be erected vertically above each other, nor shall the height of any part of the structure exceed 10 (ten) meters above the NGL vertically below that point (excluding the height of chimney stacks). For further building height restrictions see FAR table in FAR section. Building height restricted in Education City between 55 meters to 70 meters. No building height is higher than 70 meters or it may treat as per approved updated master plan of Education City.

4.2.2 Building Lines

No structures or any projections shall be erected within the building lines imposed.

4.2.3 Stand Boundaries

1. Street boundary

a) Side boundaries:

- Walling between stands shall not exceed 2.4m in height, shall be plastered and painted on both sides, and shall be of design and finish approved by EC Board/Administration.
- Owners are encouraged not to use fencing on the street boundary or within 2 meter from the street boundary, but rather to use bermed landscaping and/or structure of the buildings to create privacy and enclosure for their use.
- Walling below ground level must be waterproofed down to foundation level to prevent damage caused by dampness to neighbours' side of wall
- No portion of the new boundary wall may extend beyond the existing wall whatsoever.
- Provision must be made for weepholes into boundary walls to allow for stormwater passage. Weepholes may not be closed up, blocked or obstructed in any manner whatsoever that will prevent the free passage of stormwater from a neighbouring property.

- No security spikes, razor wire, electric shock wires or any similar devices shall be permitted on the side boundary walls.

b) Retaining walls

- To be appropriately designed keeping in view soil quality and appropriateness of – used such material shall be in harmony with rest of the external development recommended material include fair faced concrete, stone, brick wall etc.

c) Boundary walls

- No public spaces, parks, play grounds or any leisure public realm uses / places etc shall have any boundary wall. Security may be maintained by using other modern equipment such as CCTV and surveillance devices.
- All external boundaries of institutions/ universities/ colleges/ schools/ premises can have only protection of see-through fencing keeping view the aesthetic and beauty of the built environment. They shall be allowed to use electronic security systems.
- Private houses / apartments or public buildings including theaters, cinema, halls, clubs etc may have boundary/ fence not more than 4 feet in height. Fences are highly recommended without compromising the aesthetic value of the built-environment.
- They can however be allowed to use electronic surveillance system and it shall be also link with central system as to prevent security mishaps.

4.2.4 Doors and Windows

- Natural timber frames are preferred.
- Aluminium frames

4.2.5 Terraces, Paving & Driveways

All universities/ institutions and other individual developments shall not be allowed to use asphalted roads in their premises. They may however use following materials of vehicular and pedestrian movements:

- Cast in concrete;
- Natural stone;
- Brick pavers;
- Exposed aggregate pavers;

- Terracota tiles;
- Cobbles of granite or dark tinted cement;
- Flagstones of pigmented cement;
- Driveway maximum crossover width not to exceed 6 meters;
- All pedestrian crossing shall be at the level of foot-paths to allow easy pedestrian movements and that of wheelchairs.

4.2.6 External Lights

Well-designed, soft lighting of the building exterior and surroundings will be permitted, provided that the light source is not visible and that it complements the architecture and landscaping. Lighting should not be intrusive into the conservation area or the surrounding natural area thereby disturbing sensitive natural habitat.

The building plans shall incorporate well considered illumination themes for approval by Education City Board/Administration.

4.2.7 Prohibited Building Materials

- Unpainted plaster or unplastered stock brick walls.
- Unpainted or reflective metal sheeting.
- Galvanised IBR sheeting
- Use of fiber glass sheds are not allowed in the front and side setback of the building.
- Erecting any fences out the side building and green belt is not allowed.

4.2.8 Time Limits for Construction

The construction of improvements should begin within **24 months (02 years)** from the date of first registration of transfer of ownership from the developer. In order to reduce inconvenience to neighbours and unsightliness, construction should proceed without lengthy interruptions, and should in any event be completed within eighteen months from commencement. If construction will exceed a period of **18** months, written approval must be obtained from the Education City Board/Administration for extension. For giant ventures, it is necessary to provide time schedule phase wise while submitting their building plans or master plans of their area.

4.2.9 Occupation of Dwelling

To ensure an aesthetical pleasing and maintain high living standards, thereby protecting the investment value of owners, no dwelling shall be allowed to be occupied without an Occupation Certificate issued by the EC Board/Administration.

- No partially completed dwelling will be allowed to be occupied;
- Landscaping, green space/tree plantation must be completed within 3 months from occupation;
- A building is considered completed when all of the following requirements are complied with: The building is completed according to the approved plans / design/drawings as submitted to EC Board/Administration for approvals.
- All external finishes are completed including boundary walls from all sides where it is provided;
- All Mechanical Electrical Plumbing (MEP) and related amenities are installed to the required standards;
- Completion certificated issued by EC Board/Administration

4.2.10 Pergola

A pergola shall not be permitted within the minimum mandatory open spaces required under these Building Regulations.

4.2.11 Chamfer

In case of multi-storey buildings, a minimum chamfer of 6x6 ft shall be provided at the rear two corners of the building at ground level.

4.2.12 Mezzanine Floor

An intermediate floor just above ground floor of a building exclusively designed for commercial purposes and having head room not less than seven feet and not more than nine and half feet and with independent entrance from ground floor only whose floor area is not more than 75% of the ground floor may be permitted with separates stairs for it.

4.2.13 Basement

Where a basement is to be constructed, it shall be subject to the fulfillment of the following conditions:

- that a basement shall be served with an independent entrance and in addition it shall have an emergency exit except for houses;
- that the level of the main sewer permits gravity flow at a gradient of not less than 1:40 or if this may not be possible, pumping arrangement shall be installed;
- that the sewer passing under the basement is gas tight;
- that the minimum clear height of any basement room shall be 9 feet.
- that in case of houses, the minimum area of the basement shall be 100 sq ft (9.29 sq m) and shall be constructed after leaving the mandatory open spaces required under these Regulations. However, a minimum of 5 ft (1.52 m) space shall be kept clear towards the dead walls.
- That shall ensure Road Finish Level (RFL) with respect to basement level as to avoid flooding during rainy season keeping in view the climate in Sindh Region is rapidly changing and hefty rain spells frequently observed in Karachi area.
- The emergency exist shall also be ensure in basement and are in all types of buildings where basement provision is provided.
- The basement shall have appropriate ventilation system design of basement shall also be ensure all advanced condition which could occur i.e fire protection, urban flooding or any ground surface seepage etc
- that the foundations of the basement shall not intrude into the adjoining properties.

4.3 Specifications

Residential Room

- The minimum area of a room meant for human habitation shall be 100 sq ft (9.29 sq m) having a minimum width of 10 ft. (3m).
- The minimum floor area of a kitchen shall be 50 sq ft (4.65 sq m) having a minimum width of 8 ft.
- The minimum height of any habitable room from finished floor level to the roof ceiling shall not be less than 10 ft (3m).
- Inter floor shall only be permitted in rooms other than those meant for habitation purposes, such as bath rooms, stores, kitchens, pantries, passage and garages etc., if

combined with the main building.

- A minimum clear height of all the rooms referred in iv above shall be 7 ft 6 in (2.29 m) and the inter floor shall have a minimum clear height of 5 ft 6 in (1.70 m).

Shops

- The minimum floor area of a shop shall be 100 sq ft (9.29 sq m) having a minimum floor
- width of 12 ft.
- Minimum height of any shop shall not be less than 10 ft without any gallery (storage space) or 16 ft with gallery (storage space).
- The minimum height of inter-floor or room shall conform with the prescribed height applicable to the buildings in which they are being provided, with the exception of shops where the height may be reduced to 7 ft (2.13 m) provided that:
- the total area of any inter-floor or loft in any shop shall not exceed 1/3rd of the total area of the shop.
- Every inter-floor or loft shall be open except a protection wall or railing not exceeding 3 feet (0.91 m) in Building Height.
- Minimum height of parapet wall shall be 2 ft-9 inches (0.84 m) and maximum not more than 5 feet.

Arcades

- The minimum clear width of arcade without destruction of column areas in all Zones shall be 10ft. In case of neighborhood / residential shops/centers the minimum width of arcade shall not be less than 8 ft (2.43meter). This will also be applicable in all approved private neighborhood residential and other commercial areas.
- The level between the arcade and shopping floor shall not exceed 1 ft 6 inches (0.46 m) whereas the level of arcade from the center of the road crest shall not exceed 6 inches (0.15m).
- Arcade (where specified) to be used as foot-path for pedestrians shall be constructed in front of shops throughout and no building obstruction of any kind shall be allowed within the arcade. In addition, such area shall not be permitted to use any commercial or business promotion activities or petty traders. It is observed that such areas being

used by shopkeepers illegally and encroached the space which creates significant impact on pedestrian life vis-à-vis block the view of the building such type of practices create problems in terms of traffic jams, overcrowding, and disturbance for business activities.

Ramp & Toilet for Disabled Persons

In all commercial buildings, public, educational, amenity buildings and apartments open spaces where public toilets are provided a ramp of minimum 6-feet width and having maximum gradient of 1:6 should be provided. In case of non-provisions of lifts, each floor should be accessible through this ramp. A toilet for disabled must also be provided w.r.t requirement. For specially abled person for ADA standards.

Incentives for Additional Facilities

If large open/green areas are provided over and above the requirements in multi storey buildings for recreational and landscaping purposes, the building plan fee shall be reduced by 10%.

Internal Lighting and Ventilation Specifications

Size of External Openings

Every room other than rooms used predominantly for the storage of goods shall, except where mechanical arrangement is provided, shall have a combined glazed area of not less than 8% of the floor space of such room, and 50% of such openings shall be capable of allowing free un-interrupted passage of air.

Toilet, Water Closet and Bathrooms

Every toilet, water closet, urinal stall and bath room shall be provided with day lighting and ventilation by means of one or more openings in external walls having a combined area of not less than 2 sq ft (0.19 sq m) per water closet, urinal stall or bath room and such openings shall be capable of allowing free un-interrupted passage of air.

Internal Air Wells

Kitchens, toilet, water closets and bath rooms may have sources of daylight and ventilation like room internal air wells. In such cases, air wells shall conform to the following minimum sizes:-

Table 24: Internal Air Wells

i.	area of air well for building up to 2 storeys in Building Height : minimum width of air well	50 sq ft (4.65 sq m) 6 ft (1.83 m)
ii.	area of air wall for building from 3 to 7 storeys :	100 sq ft (9.29 sq m)
	minimum width of air well :	8ft (2.44 m)
iii.	area of air well for building higher than 8 storeys:	200 sq ft (18.59 sq m)
Iv	minimum width of air well:	10 ft (3.05 m)

- The floor of each air well shall have impervious paving and shall be adequately drained.
- Reasonable access shall be provided at the bottom of each air well.
- No internal air well or portion thereof shall be roofed over, except with fiber glass or other similar material.

NOTE:

1) Where permanent mechanical air-conditioning is intended to be provided; the Regulations dealing with the internal lighting of rooms will not be applicable.
2) Time standards and local education guidelines shall be recommended for Internal space using such that HEC guidelines for universities.

4.4 Parking Space Standards

1. Apartment buildings

The following minimum parking space provisions shall be made:

- One car space for every 1200 sq ft. (111.52 sq m) of covered area subject to a minimum of one car space for every housing unit; and

NOTE:

In an apartment building, if any portion is intended to be used for a purpose other than residential, the parking standards prescribed hereunder shall apply in accordance with the nature of intended use.

2. Offices, Commercial Including Large Stores & Retail Shops, Hospitals & Exhibition Halls

- One car space for every 1000 sq ft (92.95 sq m) of floor area; and

3. **Hotels**

- One car space for every 6 rooms, provided that in case of family suites, each room will be counted separately as one room for calculation of parking spaces.
- One car space for every 800 sq ft (75 sq m) of shopping area.
- One car space for every 1000 sq ft (92.95 sq m) of office area.
- One car space for every 500 sq ft (46.47 sq m) of floor area under restaurant, café and banquet hall.

4. **Restaurants, Clubs & Cafes**

- One car space for every 250 sq ft of floor area; and

5. **Marriage Halls, Banquet Halls & Community Centres**

- One car space every 350 sq ft of floor area; and

6. **Cinema, Theatres & Concert Hall**

- One car space for every 5 seats; and

7. **Post Offices & Police Stations**

- One car space for every 2000 sq ft (185.90 sq m) of floor area; and

8. **Warehouses & Godowns**

- One car space for every 400 sq ft of floor area of the administrative block of the building for the staff.
- One car space for every 2000 sq ft (185.9 sq m) of floor area for the workers; and

9. **Schools, Colleges and Educational Institutions**

- One car space for every 2000 sq ft (185.9 sq m) of floor area.
- 40% of car parking space shall be reserved for motor cycles and buses

10. **Motor Cycles**

- 16% of the total car parking area shall be reserved for motor cycle.

Parking Spaces Specifications

4.4.1 Calculating the Parking Requirements

- For the purpose of calculating parking requirements, the gross floor area shall not include the area of mechanical plant rooms, air conditioning plants, electric sub station, space provided for prayer, ducts, service shafts, public toilets for common use, lifts, escalators, stairs, covered parking and circulation of vehicles.
- If corridors and arcades provided are more than 10 ft in width then additional area under

corridors and arcades shall be excluded for calculating the car parking requirements.

- In case of additions/alterations additional parking will have to be provided for the additional floor area according to the standards given in these Regulations.

Note: Appropriate parking arrangements would be compulsory for all institutions as per their requirements. It is mandatory for all institutions to identify their parking lots while submitting Layout Plan with future calculations/projections. Parking facilities at city level will be treated as per approved updated master plan.

4.4.2 Floor Height

- Minimum clear height of parking floors shall be 8 feet (2.44 m).

4.4.3 Parking Geometry

- Configuration of parking spaces and drive way etc shall conform to the following minimum standards:

Table 25: Parking Geometry

Components	M/car	M/Cycle
Stall width	8ft (2.44m)	2ft-6 in
Stall length	16ft (4.88m)	6ft(1.83m)
Turning radius (measured from middle of two way ramp or outer curve of one way ramp) Lot turning radius	20ft (6.1m)	6ft (1.83m)
Approach ramp width/driving lane • One way • Two way	 10ft (3.05m) 18ft (5.49m)	 3ft (0.91m) 6ft (1.83m)
Width of approach ramp would increase at the turns allowing for turning radius of 20ft.		
Gradient of Ramp	1:10	1:10
The ramp slopes may be increased to maximum 1:5 provided that for slopes over 1:10, a transition at least 8ft (2.44m) long is provided at each end of the ramp at one half the gradient of the ramp itself as shown in figures-5.1 & 5.2.		

Aisle width (minimum) • One way - 90 degree stall - Less than 90 degree stall	 16ft (4.88m) 14ft (4.27m)	 6ft (1.83m) 6ft (1.83m)
• Two way	18ft (5.49m)	6ft (1.83m)

4.4.4 Ventilation & fire protection in parking area

Adequate means of ventilation, fire protection and emergency exits shall be provided in the parking areas.

4.4.5 Lighting Arrangement

All parking areas must be properly lit for clear visibility and safety.

4.4.6 Basement, Ramp, Parking

- The lower ground floor/basement if used for car parking purposes can be constructed after leaving 4ft (1.22 m) space all around within the plot. This would apply in the case where only one basement is provided with a maximum excavation of 12 ft (3.66 m). Ramp may be provided in the mandatory open spaces in the basements subject to the condition that it shall not obstruct these spaces on ground level.
- For the construction of basement beyond 12 ft (3.66 m) depth from road level, the entire plot area can be covered subject to the provision of RCC piling along all four sides of the plot.
- No ramp is allowed inside and rear spaces at ground level if these spaces are not abutting a road.
- However, the level of the roof of the basement in the mandatory open spaces required to be provided under these Regulations shall not exceed 6 inches above the crown of the road.
- The lower ground floor/basement if used for purposes other than car parking shall be constructed after leaving all the mandatory open spaces as required under these Regulations.
- No Ramp shall start within 10ft clear space from the plot line for entry and exit purposes. Such ramp should have a maximum slope of 1:5, with transition slopes minimum 8ft long and maximum 1:10 gradient at both ends. (see following figure)
- Where entry/exit to the basement is from the rear mandatory open space, a minimum

chamfer of 6x6 ft shall be provided at the rear two corners of the building at the ground floor level.

- In case, a commercial building is proposed to be used for multi-purposes like hotel, banquet hall or apartments etc. the parking requirements for these uses shall be calculated separately on the basis of proposed uses as per these Regulations.

4.4.7 Signage

The building plans should clearly show entry, exits, gradient of ramp, turning radius, storage spaces, circulation and movement of vehicles etc.

Proper parking signage such as entry and exit, directional arrows and road marking must be provided.

4.4.8 Construction of partition walls

No partition walls shall be constructed in parking areas.

4.4.9 Incentive for provision of additional Parking

Following incentives shall be given to the builder for providing car parking spaces over and above the requirements:

- If the car parking spaces are 10% more than the requirement then the building plan fee shall be reduced by 10%
- If the car parking spaces are 20% more than the requirement then the building plan fee shall be reduced by 20%.

4.5 Miscellaneous Architectural Guidelines

- The privacy and views of surrounding properties must be considered as a premium without compromising the cultural norms. As a general rule no windows or balconies on the upper level may overlook the living space of the adjacent dwelling/buildings.
- The aesthetics of the design of parapets, fascias, capping eaves, roof trim, guttering and roofing materials in general will be considered.
- All external finishes and colours should be specified, and the colour samples will be requested. The use of local building material and building elements are highly encouraged.
- Awnings and other items that do not form part of the basic structure should be clearly shown and annotated.

- Solar panels, if used, should be incorporated into the buildings to form part of the basic structure and should be clearly shown and annotated. Use of such elements should be in line with the architecture form. The plan for such usage to be submitted to Education City Board/Administration for approval.
- Outbuildings and additions should match the original design and style, both in elevation and in material usage.
- Access to staff accommodation and kitchens out houses must be from a screened courtyard or patio.
- Yard walls/ fence etc should complement the basic materials of the buildings.
- No staff accommodation should be nearer to the street than the main dwelling unless contained under the same roof or integrated into the total design.
- Careful consideration should be given to plinth heights – building/s to be designed to follow the contours of the land.
- All retaining walls should be clearly shown on the plan.
- All double storey and above plumbing should be in ducts/ shafts.
- All exposed plumbing lines must be fully screened and not be visible from the street elevations and other elevations onto adjoining properties/building.
- Smoke free type fireplaces are permitted.

Mechanical equipment such as air-conditioners (and grills), ducts, pool pumps etc. must be designed into the buildings and/or adequately enclosed or screened off from view. External door frames are to be of robust material such as hardwood or aluminium, and balustrades are to be hardwood, wrought iron, stainless steel or tempered glass and aluminium

5. PUBLIC STREETS GUIDELINES

The Urban Street design guide gives an overview of the principles that urban planner/designer are using to make streets safe, friendly, and inviting to encourage people for walking, shopping, cycling, parking, and driving in an urban context. These principles are about creating real spaces for people on city streets. Economic development is integrally tied into such transformation, since great streets support city businesses and paramount to all of this is the safety of people, old and young, on city streets.

The Public Street design guide lays out the principles and vision for a new generation of city street design in a dynamic, engaging visual context both online and in print. It is a mirror of the new city street, easy to use and inviting for all. Many cities have already gone through the process of developing a local street design manual in the interest of creating internal design consensus between different local stakeholders. NACTO references materials from a selection of these guides and urges Education City administration to use the Street guidelines as a basis for the creation of local standards.

Streets play pivotal role in the city development besides it guides spatial growth, are the lifeblood of our communities and provides foundation to our urban economies. They make up more than 80 percent of all public space in cities and have the potential to foster business activity, serve as a front yard for residents, and provide a safe place for people to get around, whether on foot, by bicycle, car, or transit. The vitality of urban life demands a design approach sensitive to the multifaceted role streets play in our cities.

5.1 Urban Street

5.1.1 Design Principles for Public Street

Design Principles over-arching urban design goals and principles that have helped shape the development codes are summarized below:

5.1.2 Climate responsive

The need to provide shelter, shade and protection to address extreme temperatures and solar exposure during the summer months.

5.1.3 Cultural inspiration

Designs that enhance and enforce unique cultural identity, emphasize family and hospitality and provide a blend of tradition and modernity.

5.1.4 Character

Creating distinct places of character with a strong sense of identity, responding to local environmental factors, such as wadis and topography.

5.1.5 Ease of movement

Providing an accessible, well connected, pedestrian friendly environment that priorities pedestrians, cyclists and transit users before motor vehicle traffic.

5.1.6 Liveability

By ensuring that streets and public spaces are valued places where people enjoy spending time, not just places to be rushed through or avoided, by making them clean, safe and attractive environments.

5.1.7 Places of quality

By helping create places of quality that people will take pride in and enjoy observing and using in their own right.

5.1.8 Sustainability

By making sure that street planning and design promotes ‘greener’ transport modes, such as walking, cycling and public transport and reduces carbon emissions.

5.1.9 Social inclusion

By ensuring that streets are physically and culturally accessible to all, that the varying needs of different user groups are acknowledged and catered, for example, the safety and security of women and children.

5.1.10 Legibility

The creation of legible sequence of places that are readily understandable and link up in a logical way to form an easily navigable environment defined by landmarks, nodes and gateways.

5.1.11 Vitality

By helping to promote lively and economically successful places through the location, format and design of streets and spaces which encourage local economic activity and attract investment

5.1.12 Shading the Pedestrian Realm

Shade and shelter from the sun, as well as climate attenuation through wind capture, tree planting and selection of suitable materials, will be critical in creating a comfortable pedestrian realm.

Streetscape elements that attenuate the hot desert climate will be important for encouraging multi-modal travel. Thermal comfort for cyclists and pedestrians is a key factor in mode choice. In traditional ancient cities streets and alleys were narrow and shaded by buildings. Where additional or temporary shade was needed, fabric or wooden coverings were constructed to span over areas of the street adjacent to buildings, particularly where pedestrian activity was focused.

Unfortunately, the need to accommodate the car and wide utility corridors has meant that it is difficult to re-create the compact shaded streets of traditional settlements. The introduction of the car has led to buildings being pushed further apart from one another, creating streets that are fully exposed to the sun. The need to accommodate parking within plots has further increased the width between buildings.

Figure 25: Public Street

5.1.13 Chicane

- Offset curb extensions on residential or low volume downtown streets create a chicane effect that slows traffic speeds considerably.
- Chicanes increase the amount of public space available on a corridor and can be activated using benches, bicycle parking, and other amenities**.**

Figure 26: Chicane

Note: All public street spaces shall be maintained/utilized as per the ROW as mentioned in the cross-section of the roads follow Figure 12-17. All allotees shall maintained the size and type of the roads as per approved updated master plan.

6. PUBLIC REALM STANDARD

The public realm should be designed and constructed using surfacing materials as set out in this document. The aim is to use a palette that will provide a coordinated paving strategy that will ultimately improve the quality of the streets and spaces and encourage more walking and cycling in the education city districts.

To encourage consistency of design and workmanship, this specification includes color, stone dimensions and laying techniques.

All paving should be of high quality and suitable to withstand the function of the area. Durability, lifespan and visual appreciation should all be considered when specifications are being determined. The choice of natural stone is made for the following reasons:

- Appropriate to the heritage of the area.
- Durability - when laid on a concrete base, it will achieve a long lifespan with minimal maintenance.
- Stone products improve in appearance with natural weathering.
- Depending on color and source, the material cost difference compared to concrete products is minimal.

A high-quality public realm is essential to achieving an attractive development experience at the human scale. It can encourage people to use sustainable transportation modes – walking, cycling, transit by offering improved connections between places, and making those connections into memorable spaces as well.

It can nurture community by providing gathering spaces that are appealing and functional. The public realm plays an important role in enhancing the quality of life in a community which, in turn, can improve its desirability as a place to live and work. To achieve these benefits, the Public Realm outlines a comprehensive guidelines and approach to how the public realm is developed, enhanced and maintained.

6.1 Streets as Public Spaces

- Collectively streets make up the largest public space in most cities. The way in which people and vehicles move through the street network have a significant impact on the overall experience of a city's public realm. The first step in making cities safer and more pleasant places to live is to inspire residents to view their streets as public spaces.

- Long-term planning as well as inexpensive tactical transformation strategies can be powerful tools to encourage public participation and improve quality of life.

6.2 Ribbon Sidewalk

Ribbon sidewalks are common in most residential areas. Design the pedestrian through zone to be roughly equal to the planted area, using pervious strips where applicable to help manage stormwater Street trees enhance city streets both functionally and aesthetically. Trees provide shade to homes, businesses, and pedestrians. Street trees also have the potential to slow traffic speeds, especially when placed on a curb extension in line with on-street parking, and may increase pavement life by avoiding extreme heat. Aesthetically, street trees frame the street and the sidewalk as discrete public realms, enriching each with a sense of rhythm and human scale.

Figure 27: Ribbon Sidewalk

6.3 Neighbourhood

Narrow Sidewalk

Narrow neighborhood sidewalks should be redesigned to provide a wider pedestrian through zone and street furniture zone whenever practicable to the people of the city to move conveniently from one place to the other.

Figure 28: Narrow Sidewalk

6.4 Pedestrian Friendly Streets

Increase the number of connections to collector streets. Design Street patterns to avoid concentrating volumes on a Subdivisions, and neighborhood streets are to be designed to discourage excessive traffic volumes and vehicle speeds. The preferred method is with passive street alignment and street patterns that discourage these actions. The following policy goals have been identified to create pedestrian-friendly streets:

- Residential Street cross sections, alignments, and networks should discourage speeds in excess of 25 mph.
- Traffic volumes and speeds should be maintained at a level appropriate to residential areas. Street alignments and networks should result in traffic volumes less than 4,000 vehicles per day.
- Provide connectivity between districts centers, and between neighborhoods and activity centers.
- Enhance and improve the pedestrian safety and comfort by constructing landscape buffers (planter strips) between curbs and sidewalks on streets.
- Design streetscapes and transportation networks to encourage walking, bicycling, and interaction between neighbors.

The following design standards are to be considered to achieve “pedestrian friendly streets”:

- Shorten Street segments or less.
- Realign local streets to eliminate direct, through connections to arterials.

- Small number of streets.
- Avoid connecting residential streets to: two arterials, two collectors, or to an arterial and collector.
- Avoid adjacent to another street unless there is a specific pedestrian destination where access should be provided for
- Orient openings toward likely pedestrian destinations when feasible (e.g., parks, schools, shopping, transit stops, etc.).
- Increase the frequency of intersections with collector streets to create side-on lots.
- Construct traffic calming devices on streets expected to have traffic volumes in excess of 3,000 vehicles per day.
- Construct bulb-outs to shorten walking distance across intersections.

Figure 29: Pedestrian Friendly Streets

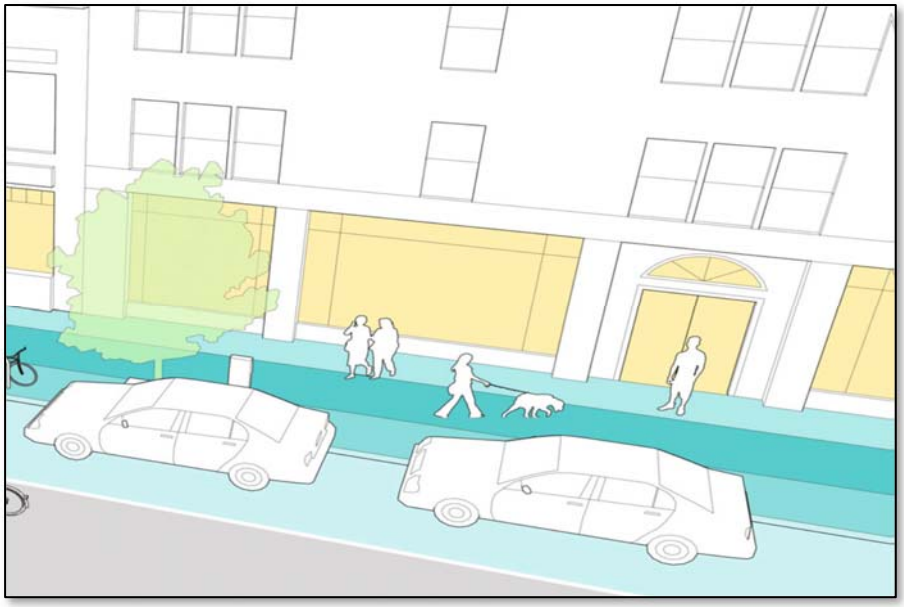


Table 26: Table Street Designation

Street Designation	Purpose
Alley	Provide access to the rear of parcels and public utilities.
Local Residential	Serves residential land uses.
Local Commercial	Serves commercial land uses.
Collector- Minor & Major	Connects local streets to arterials.
Arterial	Provides mobility and regional connectivity

Street Designation	Purposes
Green Connector	Provide access to the rear of parcels and public Utilities
Local Residential	Serves Residential land Uses
Local Commercial	Serves Commercial land Uses
Collector-Minor or Major	Connects Local Streets to arterials
Arterial	Provides mobility and regional connectivity

6.5 Best Practices

- Identity of Place Create public spaces with authentic character and identity.
- Diversity of Use Provide a mix of varied public spaces to support the diversity and uniqueness of the precincts and to meet the needs of current and future populations.
- Community Focus ensure public spaces engage the local community and contribute to community health and wellbeing.
- Sustainability Design a public realm that improves environmental, material, financial and social sustainability. Interfaces Provide diverse and engaging building interfaces with streets, waterfronts and public space, attracting daily activities and enriching street life.
- Accessibility Incorporate universally accessible design into the public realm to allow barrier-free access.
- Connectivity Ensure permeability and safe linkages within Downtown by enhancing unique network of lanes and passages.

6.6 Typical Street Designations and Design Criteria

6.6.1 Side Walk

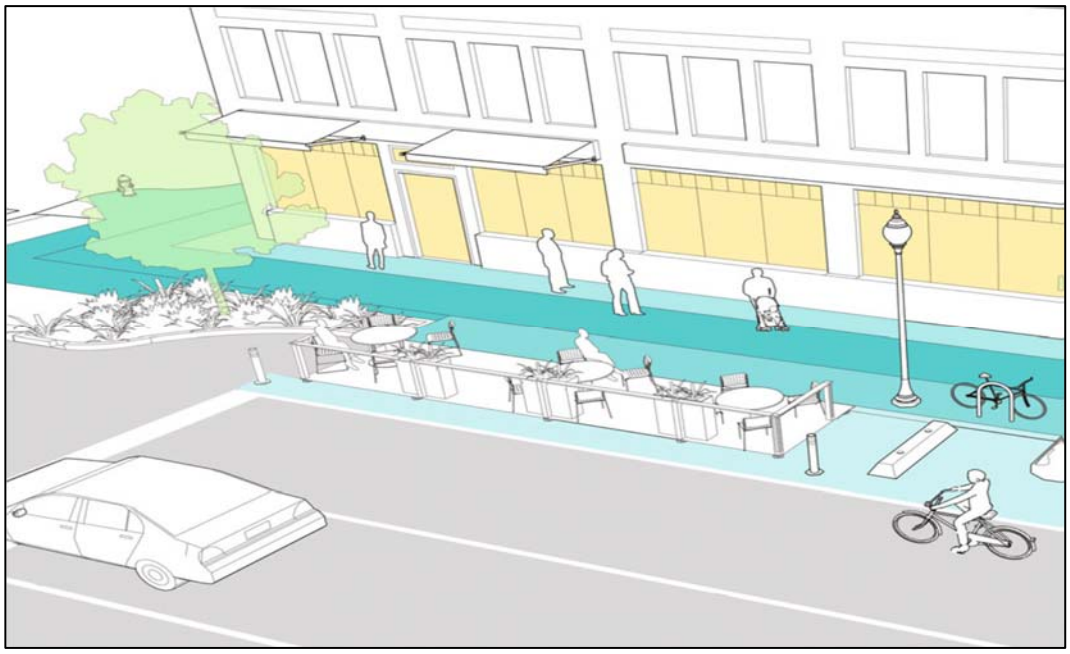
- The maximum sidewalk shall be provided along with the road 12ft and minimum sidewalk would be 8 ft and it should be considered along with road lane.
- 12ft road consist of 4 lanes for the people and 8 ft road consist of 3 lanes.

6.6.2 Side Walk Design

In an urban area the side walk area plays an important role. An area where people interface with one another and each other and with businesses most directly in an urban environment.

Designs that create a high-quality experience at street level will enhance the economic strength of Commercial areas and the quality of life of neighborhoods area.

Table 27: Side Walk Design



6.6.3 Recreation Area

A mix of only four key paving materials in different proportions throughout will simplify but allow for diversity. Proposed materials allow for a variety of finishes and sizes to ensure accessibility and to accommodate various user groups in all districts.

- Brick
- Stone
- Concrete Pavements
- Concrete Unit Pavements

6.6.4 Light Standards

Sidewalk design should go beyond the bare minimums in both width and amenities. Pedestrians and businesses thrive where sidewalks have been designed at an appropriate scale, with sufficient lighting, shade, and street level activity.

These considerations are especially important for streets with higher traffic speeds and volumes, where pedestrians may otherwise feel unsafe and avoid walking. Sidewalks should be provided on both sides of all streets in all urban areas.

On shared streets, the street itself serves as the path of travel and should be designed in accordance with accessibility recommendations outlined in the shared street section of these guidelines. In certain instances, such as on more rural or urban roads connecting urban areas, it may be advantageous to build a shared use path adjacent to the main roadway as a substitute for a sidewalk. In this case, the shared use path should meet the general criteria to serve adequately as a sidewalk or pathway.

The Globe Light is an iconic element in public streets. To enhance the character and identity of the area, the use of Globe Lights will be focused a new “modern heritage” style lamp standard will be used to complement the mix of more contemporary architectural styles and create contrast with the other. It will also help create a robust long-term strategy to minimize maintenance cost as well. Solar Powered Street lights are highly encouraged.

Development Condition:

1. A street tree spacing of between 8 - 10 meters are highly desired;
2. Tree grates should be set in a concrete band that runs across the sidewalk from curb to building face with trowel joint defining the band always aligned with tree grates;
3. Street trees should be sited to correspond with architectural features of building frontage when possible.

6.6.5 Streetscape Elements

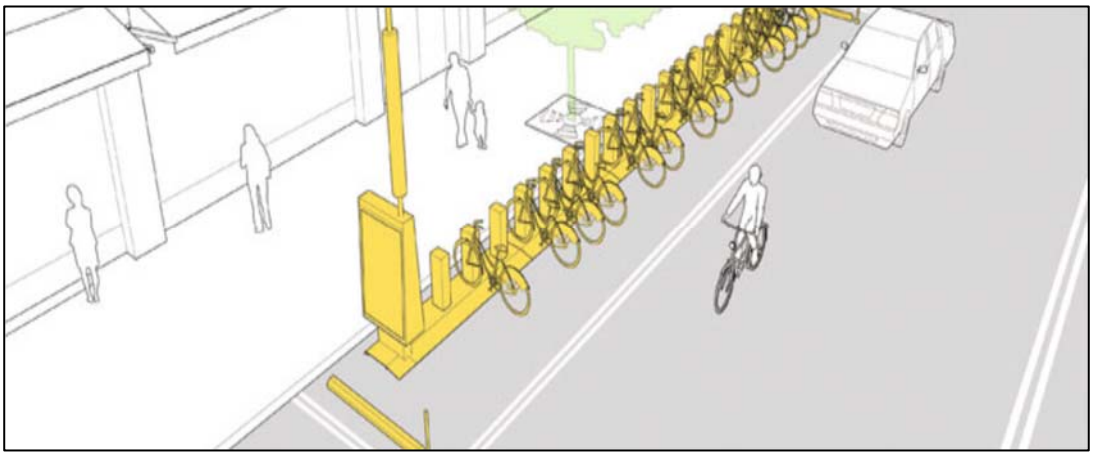
- BOLLARD

- TRASH BIN
- FIXED SEATINGS CHAIR
- FIXED SEATING BENCH
- TREE SURROUNDS
- PEDESTRIAN LIGHT
- GROUND PLANE MATERIALS

6.6.6 Bicycle Boulevard

The **"Bicycle Boulevard"** prioritizes movement for students riding bikes while actively reducing the priority for motor vehicles. Speeds are limited to 30-40km/h and vehicles are forced to turn at many intersections.

Figure 30: Bicycle Boulevard



6.6.7 Mini Roundabouts

Mini roundabouts, also known as neighborhood traffic circles, lower speeds at minor intersection crossings and are an ideal treatment for uncontrolled intersections. Mini roundabouts may be installed using simple markings or raised islands, but are best applied in conjunction with plantings that beautify the street and the surrounding neighborhood. Careful attention should be paid to the available lane width and turning radius used with traffic circles.

Figure 31: Figure Roundabout

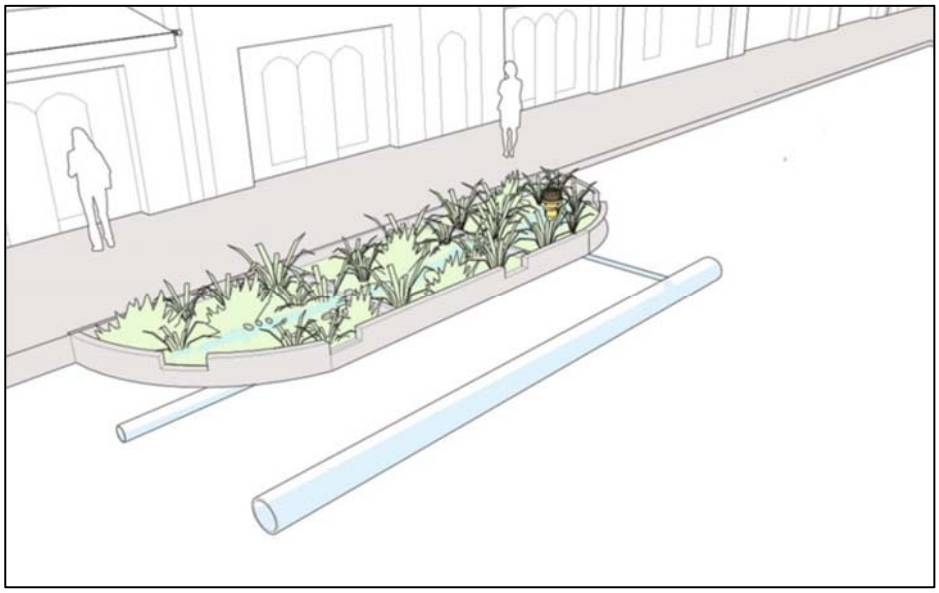
6.6.8 Street Corners

- The pavement is not suitable for disabled people or elderly movement that is due to the lack of ramps.
- Each street crossing should have a barrier free ramp.
- Street corners should provide amenities such as landscaping, trash receptacles, seating spaces, and lightings.

6.6.9 Planters

- Planters confined only in median negatively affect environmental aspects and urban image.

- Planter location should consider all other streetscape elements, such as, street lighting, underground utilities, and benches. Avoid planting too close to buildings and sidewalks.



6.6.10 Benches

- Benches in the Street shall be provided not only at bus stations/stops but also be provide common places or at nodes in order to be promote social relations of people;
- A seat wall/planter should be used;
- Users should be able to reach benches directly from public sidewalks. Benches should be convenient and in an accessible from, but not obstructing the pedestrian pathway.

6.6.11 Lighting

- Streets shall be well lit and provided as per standards. Lighting elements shall be energy efficient.

6.6.12 Trash Receptacles

- Trash bins shall be provided at sitting and meeting areas of people and it should be prohibited in an isolation where could not utilize appropriately.

6.6.13 Bus Shelter

- Bus shelters are characteristically in modern style. However, lack many of the contemporary elements such as trash receptacles, signage, and lighting units, and lack

of follow-up maintenance operations will led to its degradation because they stick out with some images that negatively affect

6.6.14 Bicycle Facilities

Bicycle facilities are important elements of streetscape design. These facilities, which negatively affect in achieving a sustainable and unpolluted streetscape.

6.6.15 Crossing

It shall be provided with appropriate marking besides visibility and control by signals for comfortably crossing.

6.6.16 Public Art

Public art is limited normally in cities. streets are public propriety; therefore, appropriate spaces shall be located on publics street for Local art work. Such art work provide the overall picture of the society besides provide an information to general public and provide esthetic value to the public streets and places which strengthen urban beauty. Such places shall also be permitted for public advertisement and campaigns related to public awareness.

6.6.17 Cafe Spaces

It shall be provided where people common meets such junctions, nodes and intersection, corner or any suitable places with minimum coverage street spaces. In most cases there are impeding pedestrian movements on the sidewalk.

6.6.18 Planter

Planter location should consider all other streetscape elements, such as, street lighting, underground utilities, and benches. Avoid planting too close to buildings and sidewalks.

6.7 Public Realm Objectives

- To create a more simplified palette, or a ‘quiet canvas’, that provides an unfettered backdrop for the rich built environment and diversity of storefronts and activities that as well as provide wayfinding clarity.
- To connect the network of green alleys, mid-block passageways, plazas, waterfront pathway and other pedestrian open-spaces can be better linked to create a connected whole. This would create an alternative network to complement the more central and busier promenades.
- To prioritize and focus on key public space improvements, and coordinate implementation with new private developments, and ongoing capital and maintenance projects.
- To introduce streets and public spaces with playful elements that invite all generations to explore and discover play in an urban environment. From small temporary interventions to permanent displays.

7. GUIDELINES FOR EFFICIENT USE OF ENERGY, WATER, GREY WATER, HEAT, ALTERNATIVE SOURCES AND UNDERGROUND WATER

In this section, the following guidelines will enable to achieve the suitability in the buildings system besides ensuring the maximum optimization of natural resource by adopting certain guidelines. Such guidelines will provide immense platform of understanding where sustainable development goals can be meet in a meaningful manner keeping view the future requirements as well.

7.1 Mixed Use and Institutional Buildings:

- To promote and support the use of low emitting, at least 5% of the total vehicle parking spaces reserved for low-emitting, fuel-efficient vehicles.
- To promote and encourage besides support the use of bicycles, they should be provided within the building or within a shaded area located no more than 30-50 meters from a building entrance within the plot limit.
- Minimum one motor vehicle parking space shall be provided for every 1500 Sft of floor area for hospitals.
- Where car lifts are provided there shall be a minimum of two car lifts with facilities of standby generator where-ever so required.

7.2 Green and Insulated Roofs

Building roofs should have the following:

- All roofs shall be provided with water proofing membranes along with insulation / Insulated tiles or green roof to ensure minimum envelope performance requirements to ensure an average Thermal Transmittance (U Value) which does not exceed a U Value = 0.3 W/m2K.
- Also, where Green roofs are provided, they should be provided with proper root barrier and drainage and irrigation systems. The owner/developer shall be required to provide documentary proof in the shape of approval of the same to EC Board / Administration.

7.3 Solar Water Heaters (SWH)

Building should have:

For all institutional, commercial and mixed land use buildings, use of Solar Water Heaters (SWH) with automatic Electric backup system and/or Electrical Heater is recommended. All

SWH works to be done by the specialized vendors.

All Pipe materials to be used for SWH, plastic materials shall preferably be used, which are resistant to UV radiation and to the temperatures upto 95°C. All hot water pipes connected to SWH are preferably to be insulated to reduce heat losses from hot water mains.

Integration of backup system is also mandatory (electrical or gas, however, electrical is mostly recommended backup system as only electrical rod is required with no extra piping will be required).

At the time of submission of building plans, the owner/developer is required to submit backup systems which he is planning to use, for the approval of Education City. Also, at the time of completion of building construction work, the owner/developer is required to submit pictures of the roof showing the installed SWH on building.

Water Saving Devices: It is mandatory to use water saving faucets, showers fittings, and flushing devices (water conservation) in all new commercial buildings.

Water Efficient Fittings (for all commercial buildings):

Water efficient system and fitting shall be used.

a. Water-conserving fixtures must be installed, meeting the following criteria.

Table 28: Water efficiency standard

S.No	Use	Standard
(1)	Showerheads	8 Liters per minutes
(2)	Hand wash basins	6 Liters per minutes
(3)	Kitchen sinks	7 Liters per minutes
(4)	Dual flush toilets	6 Liters full flush, 3 Liters part flush
(5)	Urinal	1 Liter per flush or waterless

Dual Flush toilets must be used.

Automatic (proximity detection) / push button faucets must be installed in all public facilities. Cisterns serving single or multiple urinals in commercial, educational buildings must be fitted with manual or automatic flush controls that are responsive to usage patterns. Only sanitary flushing is acceptable during building closure or shutdown.

Energy: Energy conservation have to be kept in all designs in Education city (EC) buildings.

To promote sustainable design therefore followings to be followed and adopted as to achieve building sustainability in EC:

- Provide adequate natural daylight to reduce reliance on electrical lighting and to improve conditions for the occupants / end users.
- Residential and public buildings must provide direct line of sight (views) to the outdoor environment.

To ensure high quality indoor spaces:

- All ventilation system outdoor air intakes must be located at suitable distance from potential sources of contamination to reduce the possibility of odor or air contaminants entering the ventilation.
- Exhausted air must be discharged in a manner to avoid it being drawn back into the building.
- Indoor air quality testing must be carried out prior to occupancy.
- Air Quality testing must be carried out by an air testing company or laboratory accredited by relevant department/s and licensed/permit issued by the EC Board/Administrations.
- Testing equipment must have initial and periodical calibration certificate from an external calibration facility accredited by relevant department/s and endorsed by the EC Board/Administrations;
- Air Quality Test report must be provided with completion plan of all institutional, commercial and where it is considered as essential.

Table 29: Maximum Limit for Air Containment

Sampling	Type of	Maximum	Sampling
Pre- Occupancy	Formaldehyde	< 0.08 parts per million (ppm)	8-hour continuous monitoring (8 hour time- Weighted average[TWA])
	Total Volatile Organic Compound (TVOC)	< 300 micrograms/m3	
	Suspended Particulates (<10 microns)	< 150 micrograms/m3	

Air protection systems for hazardous fumes: Where activities produce hazardous fumes or chemicals, spaces must be provided with separate air extraction systems to create negative pressure and exhaust the fumes or chemicals to ensure they do not enter adjacent rooms.

HVAC maintenance standards: The cleanness of HVAC systems must be maintained and all parts must be inspected and cleaned by licensed specialized maintenance companies by Education City Board/Administrations.

Air quality in Parking Spaces: Mechanical ventilation must be provided to ensure that the Carbon Monoxide (CO) concentration in the enclosed parking area is maintained below fifty (50) parts per million (ppm) by:

- Providing a minimum of six (6) outside air changes per hour, or
- Installing a variable volume ventilation system controlled in response to input from a minimum of one CO sensor per four hundred square meters (400 m2) floor area of parking.

To enhance Building Envelope Performance:

- Building elements forming the external walls, roofs, and floors (where one side of the floor is exposed to ambient conditions) must have an average thermal transmittance (U Value) which does not exceed specific values.
- Double glazed units for windows and roof lights must meet specific performance criteria.

To minimize Thermal Bridges:

- Thermal Bridges must be eliminated or insulated to reduce the amount of heat transfer. For this reason, the use of External Thermal Insulation Composite Systems shall preferably be installed.
- Other than houses, all regularly used air-conditioned entrance lobbies must be protected by a door design which acts as a barrier to the loss of conditioned air.

To Eliminate Urban Heat Island Effect and promote thermal and occupant comfort:

- All opaque external roofing surfaces must comply with a minimum Roof Solar Reflective Index (SRI) value for a minimum of 75% of the roof area.
- Normal occupied spaces should have an average air velocity between (0.2 – 0.3) m/s.
- HVAC system must be capable of providing a range of conditions as follows for 95% of the year.

- To optimize lighting features, for optimum and efficient lighting ceilings should be able to reflect light back into the space. The reflective ability of a ceiling is indicated by its Light Reflectance or LR value High light reflectance or Hi-LR ceilings should be used with an LR of 0.83 or higher.
- To establish energy efficiency in the building sector, all buildings should acquire an energy certificate indicating energy class and consumption.

To promote energy efficient lighting features:

- All light fixtures intended for the general illumination of interior or exterior spaces must be fitted with Fluorescent Lamps or Light Emitting Diodes (LED).
- High frequency electronic ballasts must be used with fluorescent lights and metal halide of 150 W and less. High frequency electronic ballasts must be labeled as conforming to an international standard approved by the EC Board /Administration.

To increase energy efficiency of lighting system:

- The average Lighting Power Density for the interior connected lighting load for specific building types must be no more than the watts per m² of gross floor area given in the Table.

Table 30: Maximum Average W/m2 Requirements across total building area

Building Type	Maximum average W/m²
Commercial/Public: Offices, Hotels, Resorts, Restaurants	10
Educational	12
Manufacturing at small scale	13
Retail Outlets, Shopping Malls , Workshop	14
Warehouses	8

- Lighting Power Densities for building types not listed in the above Table should be no greater than those values given in ASHRAE 90.1-2010 or equivalent as approved by the EC Board / Administration.

To increase energy efficiency of lighting in outdoor spaces:

- The average Lighting Power Density for the exterior connected lighting load for specific building types must be no more than the watts per m² of gross floor area given in the Table.

Table 31: Maximum Average W/m2 Requirements across total building area

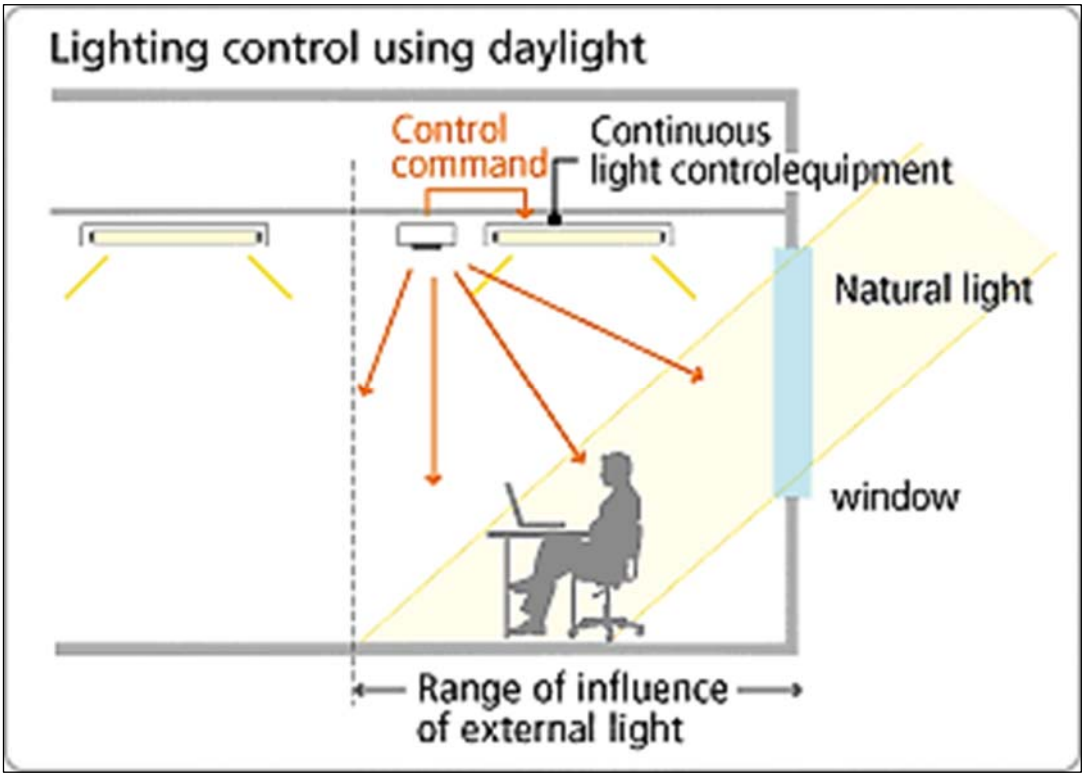
Building Area	Maximum W/m² or linear meter
Uncovered parking lots and drives	1.6 W/m²
Walkways less than 3 meters wide	3.3 W/linear metre
Walkways 3 meters wide or greater	2.2 W/m²
Outdoor Stairways	10.8 W/m²
Main entries	98 W/linear meter of door width
Other doors	66 W/linear meter of door width
Open sales areas	5.4 W/m²
Building Facades	2.2 W/m² for each illuminated wall or surface or 16.4 W/linear meter for each illuminated wall or surface length
Entrances and gatehouse inspection stations at guarded facilities	13.5 W/m²
Drive-up windows at fast food restaurants	per drive-through

- Lighting Power Densities for building types not listed in the above Table should be no greater than those values given in ASHRAE 90.1-2010 or equivalent as approved by EC Board / Administration.

Increase energy efficiency through lighting control:

- Occupant Lighting Controls must be provided so as to allow lighting to be switched off when daylight levels are adequate or when spaces are unoccupied and to allow occupants control over lighting levels.

Figure 32: Lighting Control using daylight

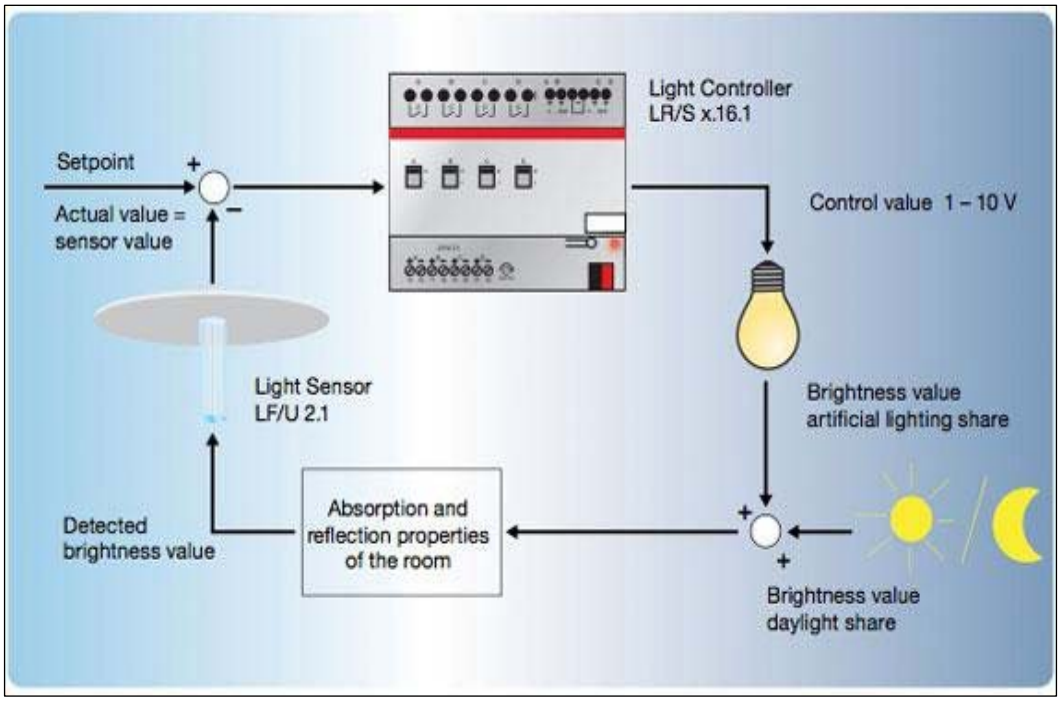


- Corridors and lobbies should reduce lighting levels to no more than 25%-40% of normal when unoccupied.
- In office and education buildings all lighting zones must be fitted with occupant sensor controls capable of switching the electrical lights on and off.

To Increase energy efficiency through lighting control:

1. The artificial lighting in spaces within 6 meters in depth from exterior windows must be fitted with lighting controls incorporating photocell sensors capable of adjusting the level of electric lighting to supplement natural daylight only when required.
2. The combined artificial and daylight must provide an illumination level at the working plane between 400 and 500 lux. When there is 100% daylight, the lux levels may exceed 500lux.

Figure 33: Energy Efficiency through Light Control



Achieve energy efficiency in HVAC systems (in accordance with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 90.1-2010.

- Sub-division of systems into separate control zones to correspond with each area of the building that has a significantly different solar exposure, or cooling load, or type of use.

All separate control zones must be capable of:

a. independent temperature control;

b. inactivation when the building, or part of building served by the system, is not occupied.

- The operation of central plant only when the zone systems require it.

To minimize heat loss and prevent condensation:

- Pipes and ducts passing through conditioned spaces must be insulated in accordance with BSI British Standard BS 5422:2009 or other insulation standards approved by the EC Board / Administration.
- Insulation materials used must meet the requirements of By-laws, Thermal and Acoustical Insulation Materials or BS 5422:2009, whichever is the more stringent. All insulation installations must have a suitable vapour barrier and protection from UV light.

To minimize heat loss and prevent condensation, Pipes passing through outside or unconditioned spaces must be insulated with the minimum insulation thickness:

Table 32: Temperature of Contents

Steel pipe nominal pipe size (mm)	Temperature of contents (°C)					
	10° C		5° C		0° C	
	Minimum Insulation Thickness (mm)					
	λ= 0.018	λ= 0.038	λ= 0.018	λ= 0.038	λ= 0.018	λ= 0.038
15	50	30	45	30	45	30
20	60	30	55	30	45	30
25	60	40	55	35	55	30
32	65	40	55	35	55	30
40	65	40	60	35	55	30
50	70	45	60	40	60	30
65	70	45	60	40	60	40
80	75	45	65	40	60	40
10	75	45	65	40	70	40
15	90	50	80	45	75	40
20	90	55	80	45	75	45
25	100	55	80	55	75	45
300+	100	80	100	75	80	70

To provide accurate records of electricity consumption:

- Additional electrical sub-metering must be installed in all buildings with a cooling load of at least 1MW or gross floor area of 5,000 m² or greater. All major energy consuming systems with a load of 100kW or greater, must be sub-metered.
- Each individual tenancy shall have a sub-meter installed.
- Meters used must be specifically designed for the measurement of chilled water rather than for hot water.
- All meters must be capable of remote data access, have data logging capability and be used for demand management and cost allocation purposes.

7.4 Small to Medium Scale Embedded Generators

When a building incorporates on-site generation of electricity from small or medium scale embedded generators using renewable energy sources; the equipment, installation and maintenance of the system must be stand- alone (off-grid) or, if connected to the local Electricity grid, comply to all specifications and standards set by the electricity utility company and the manufacturer.

7.5 Operation of Solar Water Heating System

For all hostels, guest houses, hotels, residential houses and sports facilities, a solar water heating system shall be recommended to provide 75% of domestic hot water requirements. Solar water heating installations must be fitted with insulated storage tanks and pipes, sized and fitted in accordance with the solar panel manufacturer's requirements for each specific application. The supplementary heating system shall be controlled so as to obtain maximum benefit from the solar heater before operating.

7.6 Energy Efficient Elevators and Escalators

Escalators shall change to a slower speed or automatic sensor operated or when no activity has been detected for a period of a maximum of 3 minutes and shall shutdown for 15 minutes inactivity. Energy efficient soft start technology or latest should be used. The escalator shall start automatically when required; the activation shall be by photocells installed in the top and bottom landing areas.

Elevators should use AC Variable-Voltage and Variable- Frequency (VVVF) drives on non-hydraulic elevators. Energy efficient lighting inside the elevator including controls to turn lights off when the elevator has been inactive for a period of a maximum of 5 minutes.

7.7 Minimize Duct Work Air Leakage

Ductwork with its equipment with an external static pressure exceeding 250Pa and all ductwork exposed to external ambient conditions or within unconditioned spaces must be pressure tested prior to occupancy in accordance with a method approved by EC Board / Administration and a compliant amount of air leakage achieved.

7.8 Ductwork Leakage Testing

Must be carried out by a company approved by EC Board/Administration to conduct commissioning of buildings.

7.9 Set HVAC Maintenance Standards

- HVAC systems must be accessible for regular inspection, maintenance and cleaning of the equipment.
- A maintenance manual and schedule should be developed by the manufacturers or suppliers of equipment or according to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 62.1 – 2010 or equivalent as approved by EC Board / Administration.
- Service records including details of both preventative and corrective maintenance must

be kept onsite and be readily available for inspection by EC Board / Administration.

Ensure the proper operation of Building Services in new buildings with a cooling load of 1MW or greater.

Commissioning must be carried out in accordance with the CIBSE Codes listed below or any other commissioning Standard or Code approved inspection by EC Board / Administration.

- Commissioning of buildings must be carried out by a licensed company of Education City.
- Commissioning results must be recorded and available for inspection by local Administration. A systems manual must be developed and provided to the building owner or facilities operator following commissioning.

7.10 CIBSE Codes

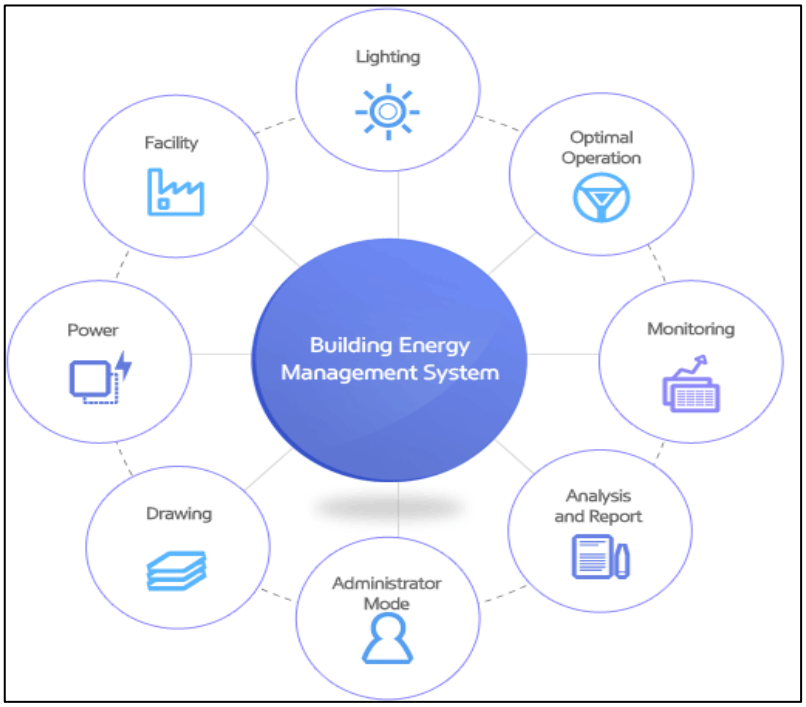
- The Chartered Institution of Building Services Engineers (CIBSE) Commissioning Code, Air Distribution Systems, Code A-2006
- CIBSE Commissioning Code, Water Distribution Systems, Code W-2003
- CIBSE Commissioning Code, Lighting, Code L-2003
- CIBSE Commissioning Code, Automatic Controls, Code C-2001" for central control and Building Management System (BMS)
- CIBSE Commissioning Code R: 2002 Refrigeration Systems
- CIBSE Commissioning Code B: 2002 Boilers.

Ensure the proper operation of Building Services in existing buildings with a cooling load of 2MW or greater. The re-commissioning of ventilation, water systems central plant, lighting and control systems must be carried out at least once every 5 years.

7.11 Provide full central control of all the building's technical systems

a) For all new buildings with a cooling load of 1 MW or gross floor area of 5,000 m² or greater, the building must have a central control and monitoring system capable of ensuring that the building's technical systems operate as designed and as required during all operating conditions, and that the system provides full control and monitoring of system operations, as well as diagnostic reporting.

b) At a minimum, the system must control the chiller plant, HVAC equipment, record energy and water consumption and monitor and record the performance of these items.



c) **Water**

1. To promote water conservation:

- Water-saving fixtures should comply with minimum flow rates given.
- Dual Flush toilets, Automatic (proximity detection) / push button faucets in public spaces and Cisterns with manual or automatic flush controls should be installed.
- Faucets installed as a component of a specialized application may be exempt from the flow rates upon application to EC Board /Administration.

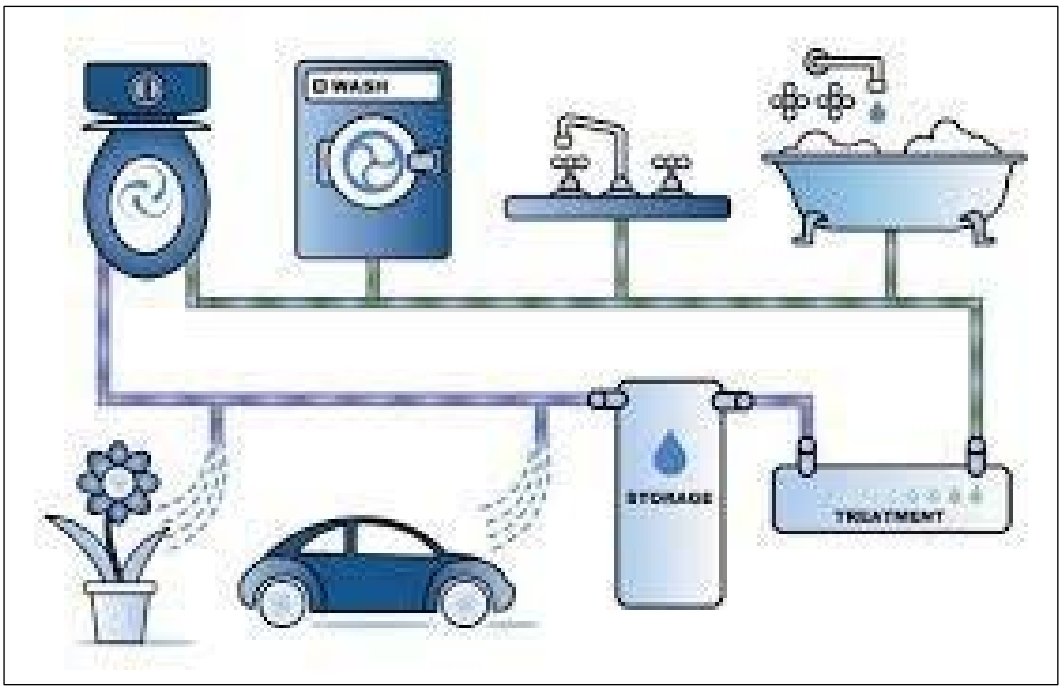
Table 33: Maximum Flow Rate

Fixture Type	Maximum Flow Rate
Showerheads	7 Liters Per Minute
Hand wash basins	5 Liters Per Minute
Kitchen sinks	5 Liters per minute
Dual Flush Toilets	6 Liters Full flush, 3 Liters Part flush
Urinal	1 Liter per flush or waterless

- To promote water recycling, For all new buildings with cooling loads equal to or greater than 400KW, condensate water from all air conditioning equipment units handling outside air, or a mixture of return air and outside air where the outside air is not preconditioned, must be recovered and used for irrigation (after fulfilling all codal

formalities), toilet flushing, or other onsite purpose where it will not come into contact with the human body and/or any threat to natural environment.

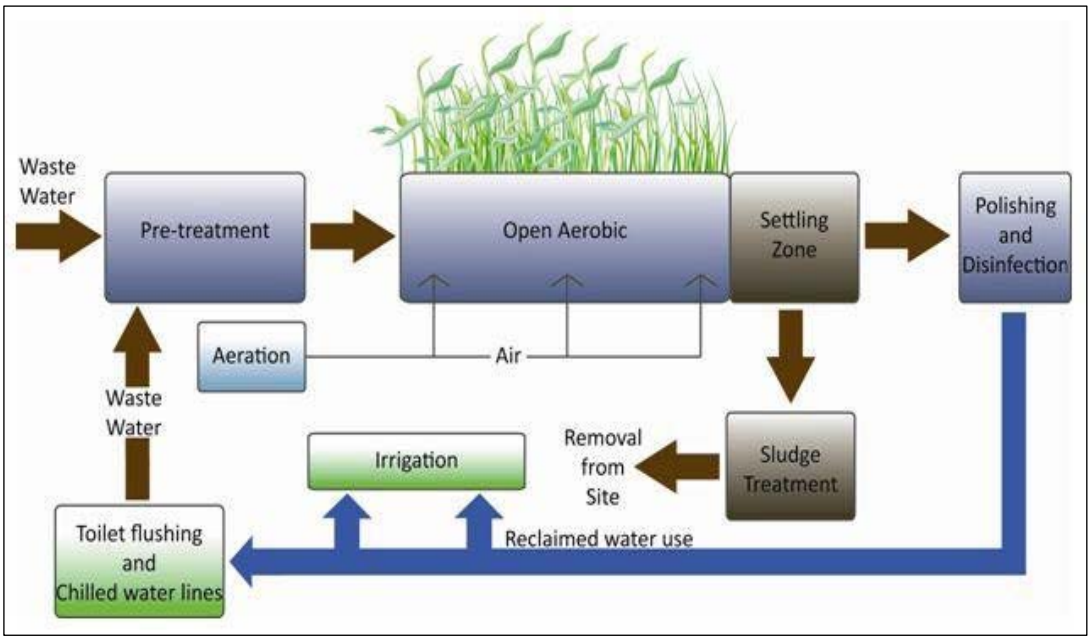
Figure 34: Water Recycling System



To promote water efficiency in Irrigation:

- 100% of the total exterior landscaping must be irrigated using non-potable water or drip or subsoil water delivery systems.
- All irrigation systems must incorporate, at any point that they connect to a portable water supply, backflow prevention devices which must be checked 12 months. Testing must be in line with the manufacturer's recommended practice for field testing or any other testing regime approved by EC Board /Administration.

Figure 35: Water Efficiency



To achieve water conservation and savings through water metering:

- For all buildings with a cooling load of at least 1 MW or gross floor area of 5,000m² or greater, additional water metering must be installed.
- The building operator shall be responsible for water metering.
- All meters must be capable of remote data access and must have data logging capability and complying with international and local specifications.
- Water metering should be integrated into BMS where it exists.
- Sub-meters should be used for demand management and cost allocation purposes.

To promote Grey water reuse:

The building must be dual-plumbed for the collection and recycled use of grey water. Pipes which transport grey water must be colour-coded differently from pipes that are used for potable water and be labeled 'Not Suitable for Drinking'.

Figure 36: Grey Water Collection & Recycle Process

- There must be a minimum air break of 25mm between any potable water sources and grey water collection systems.
- Grey water must not be used for purposes where it will come into contact with the human body. It must be treated to the standard required by EC Board /Administration.

To Promote health and safety: All Water Features with a water storage volume of over 1000 liters and which create a water spray or aerosol including but not limited to waterfalls, ponds, streams etc., must be maintained, cleaned, disinfected and checked periodically to minimize the risk of Legionella bacteria or germs contaminations etc and not exceed the maximum limits outlined in the technical guidelines issued by EC Board /Administration.

d) **Waste**

To promote recycling:

- Domestic kitchens must have a minimum storage facility of two 10 liters waste receptacles clearly labeled for „recyclable“ and „non- recyclable“.
- All new apartment, office, educational and recreational buildings must have a garbage room with a minimum area of 12 m2 (129.18 sq.ft) where non-recyclable and recyclable waste can be stored until collected/transported. This facility must be easily accessible and sized as a percentage from the total Built Up Area (BUA) of the building in

accordance with the following Table.

Table 34: Minimum Requirement for Storage of Recyclables

Built Up Area (BUA)	Minimum Space for Storage of
Less than 500 m2	7.5m2
1,000 m2	2% of BUA
5,000 m2	0.45% of BUA
10,000 m2 or greater	0.30% of BUA

- To Support waste management, for all new apartment, office, educational, commercial and recreational buildings and public spaces, an area must be provided for occupants to place items of bulky waste such as furniture etc. The area provided must cover an area of approximately 10 m2 (107.63 sq.ft) and be reachable but not restrict access to the building.
- **NOTE:**
  All Universities must ensure that all storage shall be accommodated adequately without compromising environmental standards.

e) **Materials**

To promote occupants‟ health and safety through thermal and acoustical insulation materials:

- Insulation manufactured without the use of Chlorofluorocarbons (CFCs), non-toxic and not release toxic fumes during combustion, have a Threshold Limit Value (TLV) of 0.1 or less of Individual VOCs and be fire resistant in accordance with the local requirements.
- They should achieve all the requirements of the approved specifications by applicable By-laws.
- All thermal and acoustical insulation must be installed as per the manufacturer's instructions.

To improve indoor air quality and protect occupants' health:

- All paints and coatings used should not exceed locally allowed limits of Volatile Organic Compound (VOC).
- Paints, coatings, adhesive bonding primers, adhesive primers, sealants and sealant primers must be accredited/ certified from specialized labs or any source approved by

the EC Board /Administration.

To eliminate the use of hazardous materials:

- Asbestos containing materials shall not be permitted for using in the construction and maintenance of buildings.
- Lead or Heavy Metals Containing Materials must be accredited /certified according to international/local standards by any source approved by the EC Board /Administration.

To protect natural resources, reduce waste, strengthen local community and economy:

- Recycled content must account for at least 5% of the total volume of materials used in the construction of the building.
- Building materials sourced regionally must constitute at least five 5% of the total volume of materials used.

To protect the ozone layer: The installations HVAC equipment must contain refrigerants with zero ozone depletion potential (ODP) or with global warming potential (GWP) less than 100, with the exception of equipment containing less than 0.23 kilograms (kg) of refrigerant.

Open Spaces:

1. **To protect the ecosystem**, a minimum of 25% of the total planted area of a building plot, including vegetated roofs, must utilize plant and tree species indigenous a climate friendly as recommended by Forest department, Govt. of Sindh and an approved list as per updated Master plan.

2. To minimize exterior lighting pollution:

- All exterior light fixtures must be shielded so that all of the light is projected below the horizontal plane passing through the lowest part of the fixture.
- Wall washing lights must spill no more than 10% of the lighting past the building façade.
- Downward directed lighting must be used for lighting of signage.
- All exterior lighting must be fitted with automatic controls to ensure that lights do not operate/use during daylight hours.

3. **To Optimize construction of paved areas, 50% of the hardscape of the development must:**

   - Demonstrate a Solar Reflective Index (SRI) of at least twenty nine (29), or
   - Use an open grid pavement system, or
   - Be shaded by vegetation or
   - A combination of the above.

4. **To Promote solar control in outdoor spaces:** In all buildings other than houses all pedestrian linkages within the plot/lot area must be shaded using materials with an SRI equal to or greater than those specified in the table or covered by shaded trees where required.

Table 35: Minimum Roof SRI Requirements

Type of Roof	Minimum Roof SRI
Steep Sloped Roofs (slopes steeper than 1:6)	≥ 29
Flat and Low Sloped Roofs	≥ 78

8. GUIDELINES FOR STRUCTURE DESIGN

The structure design guidelines summarize the codes and standards and standard design criteria and practices that shall be used during the project engineering, design and construction of all the Buildings in Education City. These criteria form the basis of the design for the structural components and systems for the project. More specific design information shall be developed during the detailed design phase to support construction specifications, accordingly.

8.1 Design Criteria

Criteria shall be established to permit the most economical design that is compatible with life expectancy and service of structures.

8.2 Codes of Practice

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

i. Building Code of Pakistan;
ii. Uniform Building Code (UBC-1997);
iii. ACI 318, Building Code Requirements for Structural Concrete and commentary (ACI 318R);
iv. AISC, Specification for Structural Steel Buildings;
v. ASCE-7, Minimum Design Loads for Buildings and Other Structures;
vi. AASHTO (GDHS-2), A Policy on Geometric Design of Highways and Streets;
vii. Govt. of West Pakistan - Code of Practice Highway Bridges;
viii. ASTM A615/A615, standard Specification Deformed and Plain Billet-Steel Bars for Concrete Reinforcement;
ix. ASTM A36/A992, Standard Specification for Structural Steel;
x. ADA Standards.

8.3 Geotechnical Investigation

A Geotechnical Engineering Investigation for the project shall be conducted during the early stages of engineering. Geotechnical exploration, testing, and analysis shall establish parameters required in the engineering of foundations and for selection of seismic parameters required for the design of different components of project.

8.4 Structural System

Structural systems are those elements that are designed to form a part of building structure either to support the entire building (or other built asset, such as a bridge or tunnel) or just a part of it. There are various types of structural systems depending on the natural environmental conditions, loading condition and ease of construction. The selection of structural system should be such that it is most economical and best suitable for the structure as well as capable of transferring all loads safely in a scientific manner.

8.5 Design Loads

Design loads for structures and foundations shall comply with all applicable building code requirements.

8.6 Dead Loads

Dead loads shall consist of the weights of structure and all equipment of a permanent or semi-permanent nature including floor finishes, wall panels, partitions, roofing, drains, piping, cable trays, ducts etc.

8.7 Live loads

Live load shall consist of uniform floor live loads and equipment live loads. Uniform live loads are assumed equivalent unit loads that are considered sufficient to provide for movable and transitory loads, such as the weights of people, portable equipment and tools, small equipment or parts, which may be moved over or placed on the floors during maintenance operations, and planking.

8.8 Seismic loads

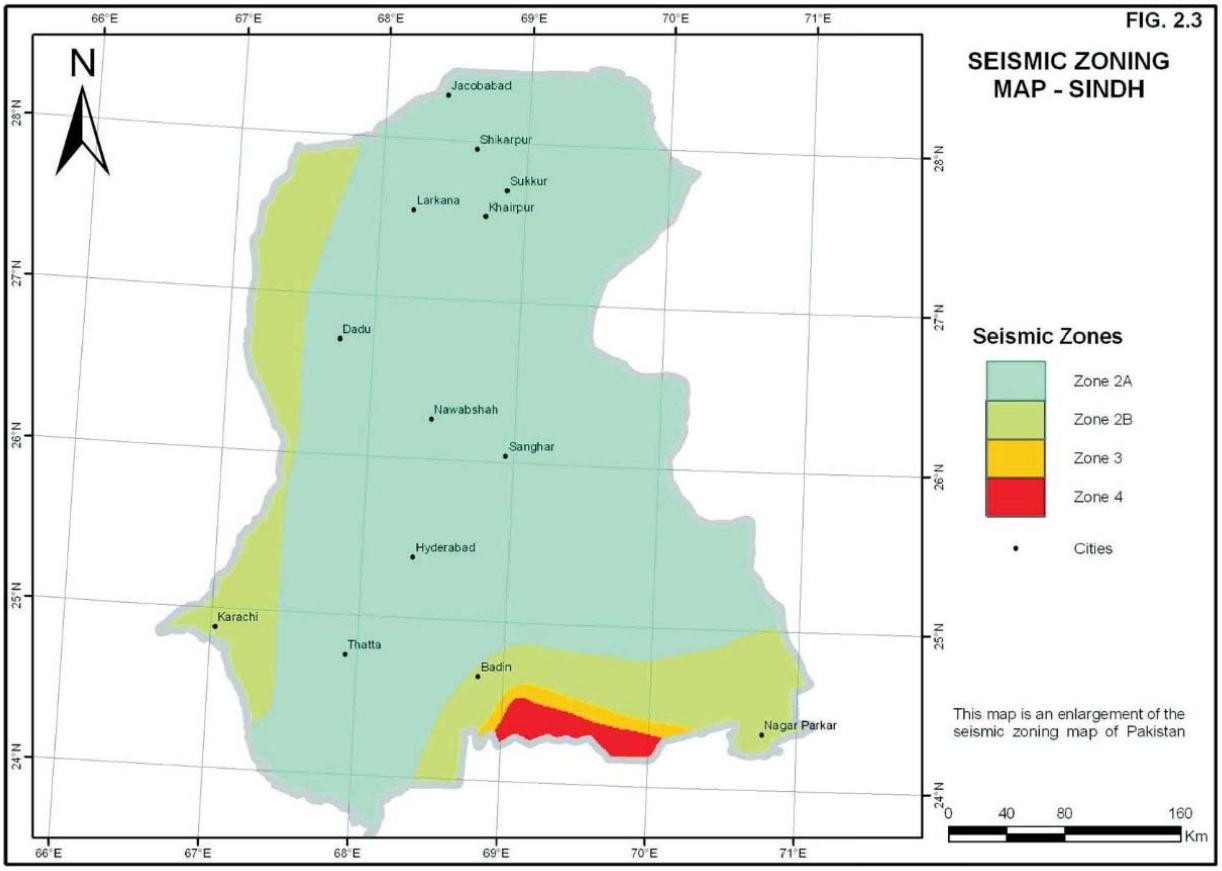
Structures shall be designed and constructed to resist the effects of earthquake loads. The site is located on Seismic Zone 2B. Seismic parameters will be obtained from the geotechnical report.

Figure 37: Details of Seismic Zone

S.no	District	Seismic zone
1	Karachi East	2B
2	Karachi West	2B
3	Karachi South	2B
4	Karachi Centre	2B
5	Malir	2B
6	Kemari	2B

Source: Pakistan Building Codes

Figure 38: Sindh Seismic Zones



Source: Pakistan Building Codes

8.9 Wheeled Loads

Loads exerted on roadway pavements, buried piping, box culverts, bridges and embankments will be reviewed and selected prior to design of the underlying items.

8.10 Analysis and Design

Besides manual methods computer applications shall also be utilized for the analysis and design of different components of project i.e. Etabs, Safe, Sap, Prokon etc.

9. DESIGN GUIDELINES

FOR PROVISION OF LIFE SAFETY, FIRE PROVISION & SECURITY

9.1 Essential Safety Requirement for Fire Provision

Emergency Access to Buildings

All Multistory buildings shall be constructed only on roads minimum 60 feet wide as specified in the approved updated Master plan or to allow easy access to emergency and Fire vehicles. The emergency and fire vehicles shall be able to easily access the emergency exit staircase of the building. Appropriate parking for all occupants of the buildings shall be ensured so that the safe passage to Emergency and Fire vehicle ensured.

The route of all outdoor wires/ cable shall be managed underground cabling system in such a way so that they do not create overhead obstruction in emergency operation and movement of emergency and fire vehicles.

9.2 Standard of Emergency Staircase

The emergency staircase in a building shall be located in such a way that it provides a clear access to the road for rescue operation/s and firefighting system. If may also be used by the occupants of the building routinely to access to the road so that it remains obstruction free all the time and rescue operations can be carried out in a meaningful manner without out damaging to any public asset.

The staircase shall be separated from the main building by two fire doors, opening outwards. The fire doors shall be hinge type with a cleared width of at least 3 feet and minimum one hour fire resistant rating.

The staircase shall have an accessible window or opening towards the road with adequate size (minimum 2.5x 3 feet) to enable evocation of persons in case of an emergency.

The staircase (s) route shall be adequately illuminated at all times and free from all obstruction.

A building having over 10,000 square feet area per floor shall have minimum two staircases, one on each side of the building. The maximum travel distance to a staircase shall not exceed over 100 feet.

9.3 Emergency Exit Signs

Each staircase shall be clearly marked by a sign reading “EXIT” in plainly legible letters not less than 6 inches high.

9.4 Fire Extinguishers

All building shall have one multipurpose (A, B, C) dry chemical powder 6 Kg Fire Extinguishers for each 2000 square feet of floor area. At least two fire extinguishers of 6 kg each shall be placed on each floor (if floor size is less than 2000 square feet).

The maximum travel distance to a fire extinguisher shall not exceed 75 feet but for kitchen areas this distance is 30 feet.

9.5 Standards for Fire Hydrant System

All multistory buildings having four to ten floors or above shall have a pressurized internal fire hydrant system which independent over – head water tank of minimum 7500 gallons and external under – ground water lank of 15000 gallons. In case where the building is over 10 storeys high, it shall have an independent overhead tank of 15000 gallons and external under – ground water tank of minimum 30000 gallons. The external under – ground tank shall accessible to the Fire – fighting vehicles at all times.

The pressurized internal fire hydrant system shall be independent and separable from the normal water supply system and shall be maintained at 3-5 bar pressure at all floors through an electric pump of suitable capacity for fire-fighting, which remains operational even if the power supply of main building is shut off.

The hydrant system shall have two compatible standard inlets at ground level for connecting with the emergency fire vehicles.

The pressurized internal fire hydrant system shall have a water hydrant outlet (with shutoff valve and a pressure gauge) connected to a 1.5 inch X 100 feet fire hose stored in metallic hose cabinet at or near an emergency staircase.

All firefighting pumps shall be placed in such a manner that their base is at least two feet below the bottom of the water tank.

9.6 External fire Hydrant System

All building shall have engine operated standby external firefighting pump connected to an adequate water source and supplying water to an external pipeline serving to external fire hydrants.

The external fire hydrant shall be located at least six feet away and not more than fifty feet from the building. The distance between any two hydrants shall not exceed more than 100 feet.

9.7 FIRE ALARM SYSTEM

The basic purpose of an automatic fire alarm system is to detect a fire in its early stages, notify the building occupants that there is a fire emergency and report the emergency to first responders.

Fire Alarm Control Panel (FACP) This is the center of the fire alarm system.

A fire alarm system warns people when smoke, fire, carbon monoxide or other fire-related emergencies are detected. These alarms may be activated automatically from smoke detectors and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations.

Alarms can be either motorized bells or wall mountable sounders or horns. They can also be speaker strobes which sound an alarm, followed by a voice evacuation message which warns people inside the building not to use the elevators. Fire alarm sounders can be set to certain frequencies and different tones including low, medium, and high, depending on the country and manufacturer of the device. Most fire alarm systems in Europe sound like a siren with alternating frequencies

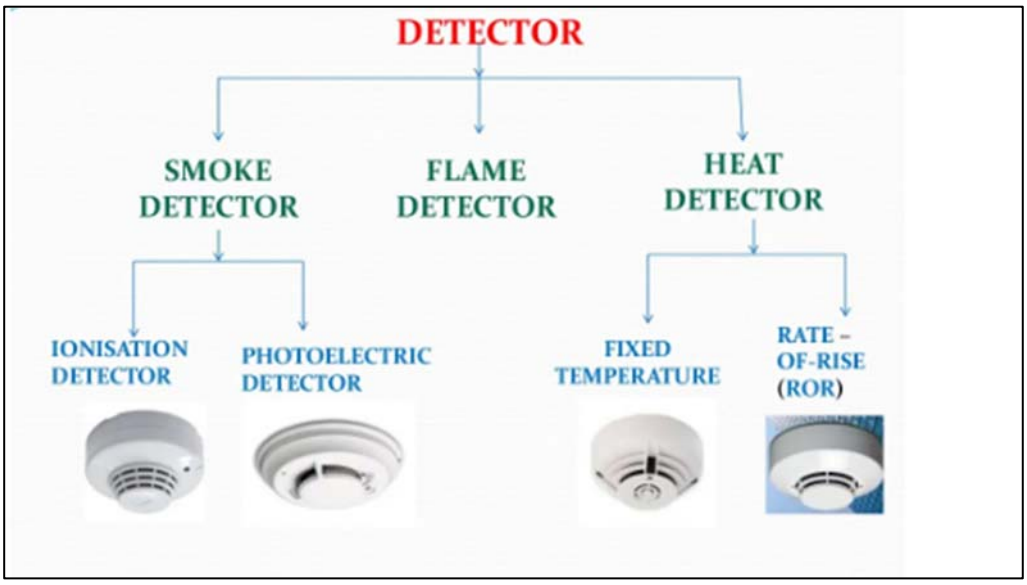
Audible Output Devices

1. An audible alarm signal lets people know the alarm system has been activated Devices may be mounted inside or outside based on level of protection required May consist of:
2. Bells
3. Buzzers
4. Voice Drivers Output Devices

ELECTRONIC HOOTERS

Electronic hooters are used in fire alarm systems to alert people in case of fire. It is usually fully solid state with an audio output that is high enough for it to be heard at a distance that is not less than 50 m. The hooters generally have a facility to adjust the output volume based on the requirements on site.

TYPES OF DETECTORS



SMOKE DETECTORS

A smoke detector is a device that senses smokes, typically as an indicator of fire.

Commercial and residential security devices issue a signal to a fire alarm control panel as part of a fire alarm system. ¬

These devices operate on a light scattering principle. ′

In the normal case, the light from the light source on the left shoots straight across and misses the sensor. ′

When smoke enters the chamber, however, the smoke particles scatter the light and some

amount of light hits the sensor.

A smoke alarm is a stand-alone device with a built-in audible sounder, a control component such as a power supply (typically battery or electric with battery backup), and a sensor. ′ Combination of sounder base with a smoke head.

HEAT DETECTORS

The heat detector senses the heat or the Rate-of-Rise (ROR) in the air temperature of the environment in which it is located. The heat detector is comprised of electronic circuitry and a mechanical package that is designed to sense the ROR of the air temperature in an expedient and reliable fashion. Upon detection of an abnormal increase in air temperature, or ROR in air temperature, the electronics indicate an alarm by increasing the amount of current draw from the monitor zone it is connected to it

SMOKE ALARM

A smoke alarm is a stand-alone device with a built-in audible sounder, a control component such as a power supply (typically battery or electric with battery backup), and a sensor. ′ Combination of sounder base with a smoke head.

Following detectors may also be highly recommended to be installed i.e. Fire–Gas Detector, Fixed-Temperature Detector, Flame Detector, Gas Detector Heat Detector.

For further references, may see Building Code of Pakistan for safety provision updated from time to time.

9.8 AUTOMATIC FIRE SUPPRESSION

Automatic fire suppression is a system that can detect and extinguish, or contain, a fire without having to rely on human intervention. In their simplest form, these systems have a means of detection, actuation and delivery.

Fully automatic fire suppression systems take away the need to depend on a person to discover and tackle a fire. Automatic fire suppression systems react to a rapid rise in heat, or fire situation, without any human intervention. These systems contain the same general components: Detection element, such as pneumatic tubing or a smoke detector

- Suppression agent cylinder
- Pressure switch (optional)
- Manual release (optional)

Within seconds of a fire occurring, the detection system detects the radiant heat from the fire, automatically actuates the system and delivers the extinguishing agents straight into the heart of the fire. Fire suppression systems may be activated manually or automatically when a fire is detected.

This illustration exhibits the automatic fire suppression system.

9.9 Emergency Evacuation Plan

The emergency evacuation plan shall be displayed at conspicuous places in all types of buildings.

The plan shall describe layout of the building with complete fire-fighting equipment and emergency exits.

An emergency assembly area shall be clearly marked outside the building.

Air- conditioning System

The central air conditioning where provided shall have ventilation ducts and false ceiling made of non – inflammable material.

Fire Alarm System

An automatic fire alarm system shall provide in buildings. The control panel of system shall be placed in the watch/ guard room preferably at the entrance of the building which shall be

manned at all times.

Sprinkler System

All internal car parks below ground level shall have adequate automatic water sprinkler system connected to the pressurized internal fire hydrant system.

9.9 Guidelines for Safety Measures

9.9.1 Site Hoardings

No person or contractor/consultant shall start building works on a site abutting on a street without having first provided hoarding or barriers to the satisfaction of the Planning committee/Board along the whole length of such site so as to prevent danger or injury to the public or to the persons employed in the work; provided however that this Regulation does not apply in the case of building works in connection with structures situated at least 15ft.(4.5m) away from a public street and being not more than 25ft.(7.5m) in height.

9.9.2 Use of Public Streets

No part of any street shall be used in connection with the construction, repair or demolition of any building except with the written permission of the Planning committee/Board. Any person holding such permission shall put up and maintain to the satisfaction of the Planning committee/Board, fences or barriers in order to separate the building work from such street. Where such separation is not possible he shall make arrangement for the security of public to the satisfaction of the Planning committee/Board.

Obstruction to be lit & marked

Any person causing any building material or other things to be deposited, any excavation to be made, or any hoarding to be erected shall at his own expense cause sufficient and adequate red lights to be fixed upon or near the same and shall continue such lights every night from sunset to sunrise while such materials, hoardings, things or excavation remain. In addition to above, red flags of reflectorized material shall be provided during day time.

Any excavation is to be sufficiently fenced to a height of at-least 4ft.(1.21m) until it is filled up.

Utility Services not to be Obstructed

All material, hoarding, fences or other obstructions on any street shall be kept clear of any fire hydrants if any, and, other utility service installations, or alternative arrangements shall be made and precautions shall be taken according to the laid down procedure of the utility agencies and to the satisfaction of the Education Board / Administration to divert or keep clear of

obstruction of any roadside or other drain during the period of temporary obstruction.

Removal of Obstruction after Completion of Works

All obstructions shall be removed within seven (7) days of the completion of the construction work and the street and all drains and public utility installations shall be left in clean, tidy and in serviceable conditions.

Dangerous Obstruction

If any material, hoarding, excavation or any other thing near or on any street, shall be, in the opinion of the Planning committee/Board, dangerous to the passers-by along such street, the Concerned Authority shall cause the same to be removed, protected or enclosed so as to therefrom and shall be entitled to recover the expenses thereof from the owner of such materials or from the person who made such hoarding, excavation or other thing to become dangerous.

Stability of Adjacent Buildings

No excavation or dewatering or earthwork or demolition of a building which is likely to affect the stability of adjacent building shall be started or continued unless adequate steps are taken before and during the work to prevent the collapse/damage of any adjacent building or the fall of any part of it.

Filling of Excavated Site

A site once excavated shall not kept open and idle for a period beyond six months, failing which the Authority shall not revalidate the building plans and shall inform the Planning committee/Board for further appropriate remedial measures. In case of any mishaps the owner shall be responsible for life and property of the affectees.

9.9.3 Adequate Safety Measures

Adequate safety measures shall, where necessary, be provided and used to protect any persons from falling on earth rock or other material of or adjacent to any excavation or earth work. Material shall not be placed or stocked near the edge of any excavation so as to endanger persons working below. No load shall be placed or moved near the edge of any excavation, where it is likely to cause a collapse of the side of the excavation and/or endanger any person. Where vehicles or machines are used close to any excavation there shall be measures to prevent the vehicles or machines from over-running and falling into the excavation or causing collapse of any side of the excavation.

In all buildings of greater than 20ft.(6m) height, temporary rails/ scaffolding/barriers shall be

installed during construction at the edge of slabs and around all openings such as lift, stairwell, etc.

1. Supervision of Demolition work

The demolition of a building and the operations incidental thereto shall only be carried out under the direct supervision of a Professional/s.

2. Safe Loading

No roof, floor or other part of the building shall be so overloaded during demolition and construction with debris or materials as to render it unsafe.

3. Scaffolds

Suitable and sufficient scaffolds shall be provided for all work that cannot safely be done from the ground or from part of the building or from a ladder or other available means of support, and sufficient safe means of access shall be provided to every place at which any person has to work at any time.

Every scaffold and means of access and every part thereof shall be adequately fabricated with suitable and sound material, and of required strength for the purpose for which it is used, shall be properly supported and shall where necessary be sufficient and properly strutted or braced to ensure stability. Unless designed as independent structures they shall be rigidly connected to a part of the building which is of sufficient strength to afford safe support. All scaffolds, working platforms, gangways, runs and stairs shall be maintained to ensure safety and security.

All vertical members of scaffolds on ground level facing road side should be adequately wrapped with spongy material upto a height of at least 7 ft.(2.13m) and for any horizontal member if used, upto a height of 7 ft. (2.13m) from ground, should be wrapped all along its length with such material

4. Road Side Protection

To ensure adequate safety of the pedestrian and other road users, all buildings having a height of over ground+2floors should have adequate arrangement by way of providing protective covering of suitable material such as Hessian sheets/Burlap etc. as per requirement.

Adequate provision of safe passage for pedestrian shall be provided, in case the scaffolding covers part of the road/footpath.

5. Working Platform

Every working platform from which a person is liable to fall which is more than 7ft. (2.13m) height shall be at least 2ft.(0.6m) wide provided the platform is used as a working platform only and not for the deposit of any material.

A clear passage-way at least 1.5ft.(0.45m) wide shall be left between one side of any working platform and any fixed obstruction or deposited materials

6. Guard Rails

Every side of a working platform, gangway and stair shall be provided with a suitable guard-rail of adequate strength, to a height of at least 3'-3" (1m) above the; platform, gangway or steps.

7. Ladders

Every ladder shall be of good construction, sound material and adequate strength for the purpose for which it is used.

Every ladder shall be securely fixed when in use and shall not have any missing or defective rungs.

8. Work on Sloping Roofs

Where work is to be done on the sloping surface of a roof, suitable precautions shall be taken to prevent persons employed from falling off.

Suitable and sufficient ladders or boards, which shall be securely supported, shall be provided and used to avoid concentration of loads leading to unsafe conditions.

Where persons are employed in a position below the edge of a sloping roof, and where they are in position of being endangered by work done on the roof, suitable precautions shall be taken to prevent tools or materials falling from such roofs so as to endanger such persons or passers-by.

9. Precautions for Raising and Lowering Loads

For raising or lowering loads or for suspending them by either hand or power operation the following precautions shall be observed:-

- No broken wire rope shall be used;
- No chain shall be used which has been shortened or jointed to another chain by means of bolts and nuts;
- No chain or wire rope shall be used which has a knot tied in any part which is under direct tension;
- Provided with an efficient device to prevent the displacement of the sling or load from the hook; or of such shape as to reduce as far as possible the risk of such displacement;
- All debris and waste material during construction shall be disposed off through well

designed chutes from each level of under construction building of height over G+2 floors or more;

- The vertical hoist platform used shall be enclosed/protected by proper barrier. Every opening of lift, shaft or other such vertical voids or openings in slab etc. where a person is likely to fall shall be protected by safety barrier and properly lit. Any area e.g. basement, where natural light is not available or which is dark shall be so illuminated as to eliminate any risk of life or hazard to users;

9.10 Security Recommendations for Education City

To ensure security to staff and students of education institutions at Education City Karachi, the following security measures are hereby recommended to be adopted.

1. Physical Security System

The physical security measures are comprised of the followings as essential measures:

i. Premises Boundary Wall & Fencing

a. All education institutions may have its own boundary wall or fencing system with concertina wire over it. The height of the boundary wall for all universities may be 10 feet from ground level preferably.

ii. Watch Towers and Lighting

a. The education institutions / universities may also construct watchtowers at boundary walls of their respective institutions at each corner.

b. The watch towers may have CCTV cameras and searchlights on all sides (inner and outer area) along with the fence.

iii. Guard Room

a. The guard room of all education institutions / universities may be constructed along with main entrance of the facility. The same shall contain main control room equipped with monitors showing live footages of CCTV cameras installed around the fence and main points.

b. The guard room may also have a radio communication room to be in contact with official vehicles of the education institution.

c. The guard room may have a store room to keep metal & explosive detectors, vehicle bottom scanning mirrors, etc.

d. The guard room building may have ample quantity of firefighting equipment e.g. water and sand buckets, long rod, extinguishers, water connection with hose, etc.

iv. Metal and Explosive Detectors

a. The guards posted at entry / exit gate may be equipped with metal detectors for search of individual visitors.

b. The guards posted at entry / exit gate may be equipped with explosive detectors for search of visitors' vehicles entering in the education institution.

c. The vehicle explosive scanner may be installed at main entrance of the education institution.

v. Queue Channels and Walk-Through Scanner Gates

a. Concrete blocks may be placed or steel fixtures may be used for maintaining the queues for visitors.

b. On each queue scanner walkthrough gates may be installed.

vi. Electronically Controlled Barriers

a. On main entrance of vehicles, the electronically controlled barriers may be installed at each education institution, to avoid any mishap.

b. The staff vehicles may have identification stickers to use a separate lane for hindrance free entrance.

2. Warning Devices

The warning devices are essential during modern era. The installation of following devices is recommended:

i. The sensors may be installed in boundary wall / fence / bollards of each education institution / university.

ii. Fire Alarms / Sensors are important to be installed inside each education institution / university, in case of any fire emergency.

3. Video Surveillance

The security through installation of close circuit television cameras is inevitable nowadays. The following are recommendations in this regard:

i. These cameras must be installed at watchtowers at boundary wall / fence and entry / exit points of the education institutions.

ii. Each education institution / university may also install cameras at main entrance, boundary walls covering inside and outside, and other important locations inside the building.

iii. The CCTV cameras must have specification of 12 Megapixels or above of good quality with sufficient storage capacity of at least 30 days.

iv. The most important point is that all the cameras shall be connected with control room at police station for surveillance.

v. There shall be a security control room at guard room of education institution for live surveillance and monitoring.

4. Biometrics

The attendance of staff and students may be through biometric devices or face recognition systems, to control upon unauthorized intrusion.

5. Safety & Security Standards

For maintaining a safe environment, the following laws are required to be implemented within premises of the education institution, in due letter and spirit:

a. The Civil Defense Act 1952 (& Amendment 1994)

b. Sindh Buildings Control Ordinance, 1979

c. Karachi Building and Town Planning Regulations 2002.

d. The Protection Against Harassment of Women at the Workplace Act 2010

e. The Poisons Act 1919

f. The Sindh Child Protection Authority Act, 2011

6. Parking Areas

a. The parking of staff vehicles, visitors' vehicles and education institution's vehicles may be separated.

b. The visitors' parking may be next to main entrance

c. The parking of staff of education institution / university may be inside the premises of such institution, near their workplace.

d. The official vehicles of the education institution may be in some appropriate sheds at a suitable distance from education buildings.

e. Class wise parking permission stickers must be issued to each vehicle of the education institution.

7. Communication

a. Radio Sets

Each official vehicle of education institution may have a radio set to communicate with control room at Police Station.

Each education institution may have its approved radio frequency for communication with its vehicles.

b. PABX and Internal Connectivity

The guard room of education institution may be in contact with other entrances control rooms. For such purpose an internal telephone exchange must be established ample enough to cater the requirements of the education institution. The same guard room may be in contact with police station.

8. Evacuation Plan & Assembly Points

Each education institution may have its own evacuation plan in case of any fire emergency or calamity like earthquake, etc. Each institution may share details of his assembly point with Police Station, for joint efforts to rescue staff and students.

9. Information & Public Address System

a. Each education institution / university may be equipped with a reception / information desk to facilitate the students and visitors.

b. The education institution / university may also be equipped with public address system connecting all of its departments and faculties.

10. GUIDELINES FOR OPEN SPACES, RIVERS, BUFFER ZONES AND ECOLOGICAL CONDITIONS

The intention in the greater landscape conservation, rehabilitation, design and construction of the nature reserve itself, is to preserve and protect the unique qualities of the Education City's open spaces that is characterized by its social, ecological and conservation where people can be befitted and enjoy such spaces in a meaningful manner.

The approved Master Plan preserves substantial areas for natural habitat, ecological buffer zone for wild life and vegetation type indigenous to all zones. The social landscape within the district areas must continue and integrate with the surrounding nature area.

In order to maintain continuity in the overall open space landscape character owners/developers are required to design and implement landscaping in accordance with the approved updated Master Plan with certain conditions, specifications and restrictions.

In this way the collective natural landscape of the open spaces will be preserved for the appreciation and benefit of all in a sustainable manner.

10.1 Open Spaces

10.1.1 Conditions

- A landscaping plan, complete with list of plant species to be planted, for each district must be submitted for approval by the EC Board / Administration.
- This plan shall be to a scale of 1:100 and shall show the following:
  - Adjacent areas of nature reserve or erven;
  - All grading, retaining and terracing intended to be undertaken, including gradients and structural elements;
  - All plant material, species, numbers, spacing and size must be indicated, including species for parks. This list of species must comply with restrictions in the approved updated master plan;
  - All paving, water features, swimming pools, pumps, filters, fences and gazebos and any other structural elements must be indicated and the intended finishes specified. This must include detail of storm water handling and elevation where relevant;
  - The irrigation layout, pipelines, head types and intended coverage area must also be shown;

- Stormwater management must be indicated and all possible consideration given to minimize passage to neighbouring properties. It is preferred that stormwater be channelled along natural contours to the road where possible;
- Hard landscaping areas must be indicated and not to exceed 40% of area outside footprint of the building area;
- Washing lines, dustbin storage areas and other utility areas and their screening must be indicated.

10.1.2 Restrictions

- No extension of a garden/park into an immediately adjacent area of nature reserve shall be permitted. This includes irrigation, plantings, storage, fencing, pool equipment, earth mounds or portions of embankments or cut slopes;
- No tree, plant, rock, landscaping, natural vegetation or other plantings may be removed from the nature reserve areas as approved in the updated Master plan;
- All declared invasive alien plants, trees, shrubs and grasses are not permitted within the proposed districts and may not be cultivated in gardens/parks;
- Fences shall comply in height, position and construction with the Design Guidelines for boundary walls;
- Above ground pools – porta pools – are not permitted; i.e top of the roof/ Terraces etc
- No temporary structures are permitted within open spaces;
- No Boundary wall shall be permitted only facing at certain levels as defined in the approved updated Master Plan.

10.1.3 Plant Species Permitted

Based on the approved updated master plan and in line with a nature only indigenous species, suitable to the local climate may be planted for landscaping. A suggested Plant List is available in the Master Plan to be updated from time to time.

10.1.4 Hard Landscaping

Hard landscaping surfaces, i.e. brick paving, paver tiling, etc around houses will not be permitted to cover the entire site. Cumulative paving shall not cover more than 40% of each landscaped area, excluding house footprint and a minimum of 40% of each erf must be soft landscaping.

10.1.5 Lights

- All lights must comply with the approved updated master plan and must be insect friendly. Lights must be “muted” or “soft” and shine downward.

- All external lighting must be used in keeping with a nature and must be used exclusively for entertainment and navigational purposes and may not be left on all night.

10.2 River Buffer and Ecological Corridor

10.2.1 Natural Conservation Areas

These areas are protected owing to their distinct natural characteristics. Natural conservation areas are categorized into four types:

- Nature conservancies
- Storm water channels, flood and water resource protection areas.
- Ecological Corridor
- River Buffer

10.2.2 Nature Conservancies

Areas, within the city scape, having thick ground cover of grasses, reeds, shrubs, trees or other vegetation of significant landscape value may be designated as nature conservancies with the following planning rationale:

- To reduce urban density;
- To provide active and/or passive recreational facilities;
- To dilute air pollution in highly polluted prone areas;
- To develop micro climatic zones in order to enhance built environment in the area;
- To complement and enhance the aesthetic quality of overall settlement or part thereof;
- To act as bio-sphere reserve for the conservation of genetic resources, notably wild crop relatives, wild life, forest species and ancestors and close relatives of domesticated animal species, in order to safeguard the genetic diversity of species on which their continuing evolution depends.

10.3 Ground Water Guidelines

Groundwater extraction in Pakistan especially in Sindh province has risen sharply over the last 30 years. The unregulated digging and installation of submersible and underground pumps for agricultural, commercial, industrial, and domestic purposes are depleting the water table often to dangerously low levels in many parts of the province. In addition, more villages across the country have installed electrical power, making it possible to pump groundwater from greater depths. Pollution and contamination also present threats to groundwater. Since groundwater is an important source of drinking water in both rural and urban areas, this depletion and pollution is a serious problem. Therefore, following guidelines to be derived as to ensure sustainability

of groundwater usage in sophisticated manner keeping in view the future and present demands of the city:

- Regulating and controlling groundwater usage and distribution in a manner that prioritizes drinking and domestic needs and the irrigation needs of small and landless farmers;
- Recognizing the fundamental right to water by declaring that every person shall have access to water without any discrimination and promoting its equitable distribution;
- Recognizing groundwater as a common property resource that needs to be managed under public trust, extinguishing all private rights therein;
- Regulating overextraction of groundwater to ensure the sustainability of groundwater resources, the equity of their use and distribution, and the protection of ecosystems;
- Promoting and protecting community-based participatory mechanisms of groundwater management by involving all stakeholders at the local level; i.e Neighbourhood level.
- Protecting areas of land crucial for the sustainable management of groundwater resources and ensuring that high-groundwater-consuming. Industrial developments are not proposed in any zone in education city;
- Protecting and regulating groundwater so that it is integrated with the protection, conservation, and regulation of surface water resources;
- Holding groundwater users responsible for ensuring the protection of the resource from contamination, pollution, and waste;
- Creating effective pricing of groundwater bulk usage; and may impose penalties for noncompliance, if any.

11. GUIDELINES FOR WASTE WATER MANAGEMENT

A complete wastewater management system comprises collection, transport, treatment and disposal of wastewaters received from domestic, commercial, intuitional, and industrial resources, Wastewater management system which involve the construction of infrastructure facilities can be broadly classified into three categories:

1. Centralized Treatment System
2. Local Treatment System
3. Smart Treatment System

11.1 Centralized Treatment System

In this system, wastewater is collected and transported under gravity, by an underground sewerage network to one or more treatment plants. After treatment the effluents can either be disposed of to surface water bodies or can be reused for irrigation, arboriculture and others. It must be of appreciated, however, that reuse of effluents demands a higher effluent quality which might need some additional treatment that what is required for disposal. The general waster water treatment system is illustrated in following figure 31.

The system is mostly employed in cities and urbans communities where it may not be possible the accommodate local treatment units (e.g. septic tank) within the premises. In addition to avoid any direct human contact with the sludge sewerage, provision of underground sewers fulfilled the desired health standards. Stream or Marines water quality standards, (whichever be the disposal sink), can be satisfactorily maintained due to the higher efficiencies (80%-90%) provided by central treatment plants.

Moreover, economically, the cost of centralized treatment plant is less than the cumulative costs of local treatment units, due to the economies of scale. However, since all the facilities (treatment, transport and disposal) are part of the infrastructure, this system exerts more financial burden upon public funds, than local treatment system.

11.2 Local Treatment System

This system precisely, differs from the centralized treatment system in three ways. In contrast to the centralized treatment, local treatment is partial (efficiency range from 50% to 60%) and therefore pollution disposed to the receiving water bodies (streams, rivers etc.) is more.

The treatment (partial) is carried out before the transportation. Since treated effluents are to be conveyed instead of raw sewage to the disposal site, covered drains may be provided instead

of conventional sewers, without any hazard.

Local treatment with covered drains, is essentially a low-finance option for wastewater management because the treatment part is excluded from infrastructure facilities. The system may additionally prove to be a low-cost option (especially for low population densities), if the cost differential between the alternatives of underground sewer and covered drains is more than the cost difference between centralized treatment plant and cumulative local treatment units.

The system is better suited to rural areas and small towns, where the funds allocated for infrastructure facilities are relatively less, population densities are low and space for setting local treatment units within premises is not so a problem.

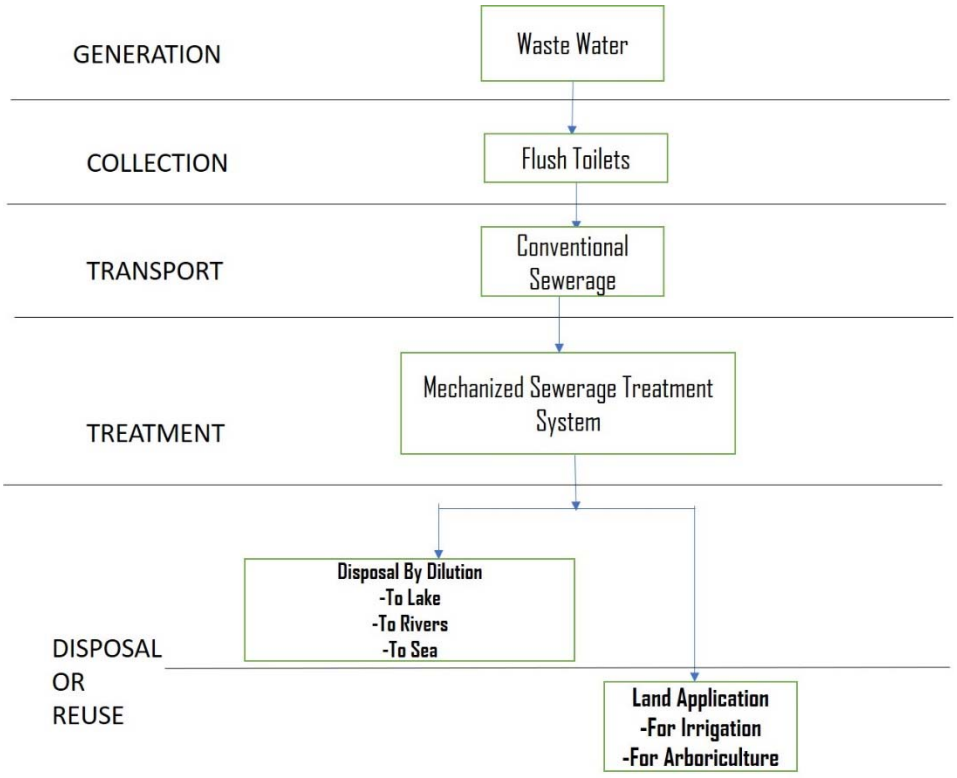
11.3 Smart Treatment System

University shall install individual smart wastewater/sewerage treatment plants keeping in view the all national and local environment guidelines i.e SEPA. All treated water shall be reused.

METCAL, USA, Pakistan National Environmental Quality Standard (NEQS) and SEPA guidelines and specified procedures for wastewater treatment or recycling shall be followed.

Note: (i) 1.00 MGD wastewater treatment plant shall be designed on at least 2 Acres of land.

Figure 39: Waste Water Treatment System



Wastewater Conveyance

As discussed earlier, the raw wastewater shall always be carried to the central treatment site by conventional sewerage but effluents from septic tanks may be conveyed to the disposal site by covered drains.

11.4 General Description of Conventional Sewerage Institutions

Wastewater from institutional buildings and others are carried by a service connection to the public sewer, sometimes called lateral sewer. The branch sewer received sewerage or domestic wastewater from laterals and feeds it to the trunk sewer which conveys it to the wastewater treatment plant.

Manholes are to be provided at every intersection and at every change in grade, level, diameter or direction. Additionally, in developed areas, manholes shall be spaced so that each plot can discharge its sewage in a manhole.

Table 36: Design Guideline for Conventional Sewerage

-Minimum dia of pipe = 9 inch
-Minimum depth of cover = 2.5 ft.
-Manhole spacing:

Pipe Dia (in.)	Max. spacing (ft.)
9	150
12	200
15-24	250
27-39	300
42-60	400
above 60	500

-Area Reservation along street shoulder.

Pipe Dia (in.)	Max. spacing (ft.)
9-27	6

11.5 Effluent Drains

Drains for septic tanks effluent may be rectangular or trapezoidal in cross-section, depending upon the space available for the purpose. Trapezoidal drains are more economical and efficient while rectangular drains need less space. Only the soil waste (wastewater coming from flush toilet) needs to be treated in septic tank while the sullage (wash water, water used in kitchen), may be discharged directly to the drain after passing through traps. The drains may be constructed with brick masonry or concrete whichever is economical and more desirable in a particular situation. The typical network of effluent drains consists of lateral, collection and transmission drains. The lateral drains collect effluents from the houses. The collection drains receive effluents from several lateral drains. The transmission drain conveys effluents to the point of ultimate disposal.

Area reservation for drains, along the shoulder of road is as follows:

Lateral drain 2’ on both side of street

Collection drain 2-3 ft.

Transmission drain 3-4 ft.

11.6 Wastewater Treatment

The objectives of wastewater treatment are as follows:

i. Health criteria: To protect public health by reducing pathogenic organisms and toxic substances in wastewater before disposal.

ii) Ecological criteria : To prevent pollution of natural waters, by reducing BOD of wastewater.

iii) Recreational criteria : To avoid nuisance and septicity in natural waters.

The quality control requirements for treatment facility are governed either by receiving water standards or by effluent standards. Receiving water standards are difficult to monitor and more difficult task is to allocate the responsibility of pollution when several polluters are discharging their waste to the same receiving water. Effluent standards are easy to monitor whereby the limiting value of parameters defining the effluent quality are set.

Secondary effluent standards as promulgated by U.S EPA are produced in Table.

Parameter	Monthly Average	Weekly Average
BOD,mg/l	30	45
SS, mg/l	30	45
Fecal coliform bacteria, number/100 ml	200	400
pH	Within range of 6.0 to 9.0	

The degree of treatment required depends upon the characteristics and flowrates of waste water, receiving-water standards to be met and assimilative capacity of the receiving -water.

11.7 Wastewater Treatment System (Centralized)

- Wastewater treatment processes are generally classified as primary, secondary and tertiary. A combination of these processes forms what we call a treatment system.
- The primary or physical treatment processes include screening, comminution, grit removal, floatation and primary sedimentation. Most commonly employed processes are coarse screening, grit removal and primary sedimentation for the removal of coarse solids, grit and organic suspended solids from the wastewater respectively.
- The objective of secondary or biological treatment which constitute by far the most important treatment process, is to remove dissolved organic matter from the wastewater. Various alternate processes are available. Most commonly used are conventional activated sludge process, trickling filter process, oxidation ditch process and waste stabilization pond system.
- The purpose of tertiary treatment is to improve the quality of effluents received after biological treatment. Some of the processes employed are micro straining, biofiltration, maturation pond and disinfection. A tertiary treatment may be required when strict water quality standards are to be maintained in receiving waters. Generally, tertiary treatment is not necessary so it is not discussed in detail hereafter.
- Suspended solids which settle in primary and secondary clarifiers are called sludge. A part of secondary sludge is recycled in activated sludge and oxidation ditch process. The remaining part of secondary sludge is generally mixed with the primary sludge and is disposed of for land application after proper treatment. The most common methods employed for sludge treatment are thickening, anaerobic digestating an drying.

Four most commonly used treatment systems for centralized treatment plants a brief description of each as follows:

1. Activated Sludge Process (Conventional)

After the physical or primary treatment, the settled sewage is fed to aeration tank where oxygen is supplied either by mechanical agitation or by diffused aeration. The aerobic bacteria present in the tank removes dissolve organic matter from wastewater, by converting it to new bacterial cells and mineralized gases such as CO2, NO3, SO3 etc. The new bacterial cells are removed in the secondary clarifier, in the form of “activated sludge” by settling. In order to maintain high cell concentration, most of the sludge is recycled form clarifier to the aeration tank inlet. The remaining secondary sludge is mixed with the primary sludge and is disposed of after

treatment.

2. Tricking Filter Process

The trickling filter is a circular bed of coarse aggregates. The settled sewage is distributed over the bed and trickless down over the bed and trickles down over the surface of aggregates. On these surfaces, a microbial film is developed and the bacteria which constitute most of this film, absorb organic matter from the wastewater and convert it to new bacterial cells and mineralized gases. With the production of new cells, the microbial film grows. Some of the new cells are washed away from the film by hydraulic action of trickling wastewater. These cells are separated from the wastewater stream in secondary clarifier, by settling in form of humus sludge. The clarified effluent is discharged to the receiving water body and humus sludge is pumped to the sludge treatment unit.

3. Oxidation Ditch System

It is a modification of conventional activated sludge process. Its essential features are long retention times, continuously recirculating flow and that it received screened and grit remove sewage. Primary sedimentation is generally no necessary. The oxidation ditch is a long channel usually oval in plan and ditch liquor is aerate by one or more cage rotors. The sludge production is less as compared to conventional activated sludge process.

4. Stabilization Pond System

Waste stabilization ponds are large shallow basins in which raw sewage is treated entirely by natural process, involving both algae and bacteria. They are the most important method of sewage treatment in hot climates. However, since the rate of oxidation is slow so large area are required for their construction. Their specific advantages are low construction and maintenance cost, simple operation and no sludge management problem.

11.8 Recycling Plant and Treatment of Effluent/Sewage

In case recycling plant or treatment of effluent / sewage are provided, all requirements for construction and maintenance as set by National Environmental Quality Standard (NEQS) shall be followed:

1. Sanitation and Solid Waste

- All medical & hospital waste shall be safely collected, transported and disposed off in accordance with the public health standards (as prescribed by Sindh Environmental Protection Agency) and up to satisfaction of the EC Board /Administration.

- All industrial waste shall be treated in accordance with the National Environment Quality Standards (NEQS).
- All hospitals shall provide the disposal of medical waste as per National Environment Quality Standard (NEQS).
- In all institutional and public sale projects the central waste disposal system shall be provided keeping in view the future requirements as well.

2. Digester /Septic Tank

Where no public sewer is in existence, all sewage shall be disposed off after properly treating, through digester or septic tank, and effluent shall be discharged safely into a soak pit as a temporary measure till such time as a system is laid out.

3. Soil Pipes, Waste Pipes and Ventilating Pipes

A trap shall be used to maintain the water seal and make system fool proof against closing and blockages.

In no case shall the internal diameter of a soil pipe or waste pipe be less than the internal diameter of any pipe or of the outlet of any appliance which discharges into it.

All the joints shall be:-

- Properly prepared by the use of rubber gasket or water sealant materials for jointing;
- Adequately supported throughout its length without restraining thermal movements, any fitting which gives such support being securely attached to the building;
- So placed as to be reasonably accessible for maintenance and repair.
- Ventilating pipe shall be provided in all stacks carrying wastewater or sewage, in accordance with the plumbing code.
- Drain water pipe of appropriate dimension shall be provided as per approved standard.

4. Manholes and Inspection Chambers

- At every change of alignment, gradient or diameter of a drain, there shall be a manhole or inspection chamber. Bends and junctions in the drains shall be grouped together in manholes as far as possible. The spacing of manholes in case of pipe having a diameter 6inch/8inch (150mm./200mm) shall be 50ft./110ft. (15.2m./35.5m)

according to respective diameter, and in case of diameter more than 8inch (200mm) the distance shall be not more than 150ft.(45m).

- The chamber shall be so designed to make the cleaning and inspection conveniently.

11.9 Strome Water Drainage

The function of storm water drainage is to intercept the surface run of from roofs, yards, roads etc., carry it safely to the downstream of the area and discharge it to the natural water bodies. the design of the drainage system, therefore depends upon rain fall intensity, storm duration and frequency, extent and characteristics of area to be drained. generally, open drains are provided for surface for water drainage. small interceptions may be rectangular in cross-sections but bigger transmission drains shall preferably be trapezoid. Additionally, where an open drain crosses the road culverts are provided for roads. for road drainage, sometime catchpits are provided along the curb of road, which are connected to the drain running along roadside or in median divider.

Design Criteria:

a) Rain Fall

Rainfall intensity-duration curves for different return periods are available for Karachi. these curves may be used to find design rainfall intensity for areas lying near these regions:

1. Return Period: for smaller urban sectors = ½ -1-2 years

Major urban sector = 1-2-3 years

for high value urban sectors = 3-5-10 years

b) Quantity of storm water:

1. two general methods available for the determination of peak storm runoff i.e. rational method and hydrography method may be employed depending upon the extent and nature of data available.

2. Run of coefficient:

Sno.	Type of Surface	Coefficient
1	Roofs	0.70 – 0.95
2	Pavements	0.85 – 20.90
3	Parks and Gardens	0.05 – 0.25
4	Residential Area with detached houses	0.25 – 0.50
5	Densely built-up area	0.70 – 0.90

11.10 Storm Water Drainage

The roofs of every building, and the floor or balconies abutting on a street or constructed over a street, shall be so constructed or framed as to permit effectual drainage of the rain water there from, by means of a sufficient number of leaders of adequate sizes, so arranged, jointed, and fixed as to ensure that the rain water is carried away from the building without causing dampness in any part of the walls, or foundations of the walls, or foundations of the building, or those of an adjacent building, provided the fall is not greater than 20ft.(6m). in case of spouts.

A leader shall not discharge into or connect with any soil pipe or its ventilating pipe, or any waste pipe or its ventilating pipe, nor shall it discharge into a sewer.

Rain water from leader spouts etc. shall not discharge onto a public street at a height greater than 12inch (300mm) from that street, or onto a neighboring property.

11.11 Storm Water Design Criteria

Hydraulic design:

a) Minimum velocity

Unlined channel = 1.5 fps.
Lined channel = 2.0 fps.

b) Roughness coefficient,

Unlined rough channel = 0.024
Unlined dressed channel = 0.020
Brick lined channel = 0.015
Concrete finished
Channel = 0.013

c) Slide Slop

Earther channel = 1:1.5 to 1:2
Lined channel = 1:1

11.12 Water Supply, Drainage & Sanitation

Water Service Pipe

Except as permitted in the following paragraph (12-1.2), underground water service piping and the building sewer line shall be not less than 7ft.(2.13m) apart horizontally and shall be separated by undisturbed or compacted earth.

The water service pipe may be placed within 7ft. (2.13m) of sewerage line provided that the bottom of the water service pipe is at least 12 inch (300mm). Above the top of the sewer line

Minimum Storage Capacity for Buildings

- Minimum capacity of water storage tanks in buildings shall be:
- Overhead tank = 1 day+ 25% reserved for fire fighting
- Underground tank = 21/2 days out of the reserved capacity 25% shall be kept reserved for fire fighting purposes by making suitable arrangements.
- Distribution of Water within the premises.
- The design of water supply pipe work, underground and overhead tanks shall be in accordance with the following schedule:-

Table 37: Per capita water requirements/demand for various occupancies

Sr.#.	Type of occupancy	Consumption Per Per Head / day (in liter)
1.	Residential	135
2.	Institutional a) Day Schools b) Boarding Schools c) Medical Hospitals d) Medical Quarters & Hostels	45-100 135-225 450 135
3.	Assembly-Cinema, Theater Auditorium etc. (per seat of accommodation).	45
4.	Government or semi-public business.	45
5.	Mercantile (commercial) a) Restaurants b) Shopping Centers, Stores (Per toilet fixture) c) Other Business Buildings	90 200 45
6.	Hotels	225
8.	Storage including warehouse	30
9.	Service Station	200
10.	Bus/Truck Stands (per vehicle)	200
11.	Live Stock (per animal)	45-150
12.	Poultry (per chicken)	45

- Proper benching shall be provided equal to half the diameter of pipe in semi-circular shape with proper slope in either direction so that no solid shall accumulate in the Manhole/Inspection Chamber.
- C.I. Rungs shall be provided at 16inch(400mm) center to center in all manholes over 4ft. (1.2m) in depth. The size of the manhole cover shall be such that there is a clear opening of at least 2ft.(60cm) in diameter for manholes exceeding 4ft. (1.2m) in depth.

12. SOLID WASTES MANAGEMENT GUIDELINES

Solid wastes are generally taken to include all non-gaseous, non-liquid wastes resolution from the wide range of community, industrial, commercial and agricultural activities. Effective solution to the problems of solid wastes collections, treatment, conversion, re-sue and disposal is a basic health requirement, otherwise indiscriminate dumping of these wastes in a populated community will cause many serious health hazard problems.

12.1 Quantities of Solid Waste

The amounts of solid waste generated by a community depend upon the socio-economic level of that community and such amounts by each person each day are increasing as a result of social, economic and technological changes. Careful sampling and actual weighing in the U.S.A have indicated a figure of 1.5 kg. to 2.5 kg per capita-calendar day, with the annual increase between 1% to 2% per year. Similar trends have also been observed in Western Europe although the quantities are roughly one half to two third of those in the U.S.A.

Considering the local socio-economic levels of our urban communities such amounts are likely to be much less than those indicated above. Some studies carried out for Karachi, Hyderabad and Lahore have indicated a generation rate of 0.62 to 1.00 kg person per calendar day, and such figures for other urban areas are likely to be less. A figure in the range of 0.5 to 0.8 kg per capita per day may be adopted, depending upon the socio-economic level of the urban center.

12.2 Characteristics of Solid Wastes

The most significant characteristics of solid waste are density, moisture, combustible and compostable contents and thermal values and each of these characteristics varies widely. The characteristics are mainly affected by seasonally and locally variable type of collection system, standard of living, extent and type of commerce and industry involved, prevailing climate and other considerations. The density of solid waste is an important criterion in the context of planning for collection system. Tis range reported in the USA is 89 kg per cubic meter to 267 kg per cubic meter with an average of 128 kg per cubic meter.

Average figure for Europe is about 230 kg per cubic meter. Not such estimates are available for the local conditions. The density can be reasonably estimated as 250 kg per cubic meter and is likely to decrease with increase in the standard of living.

12.3 System of Solid Waste Management

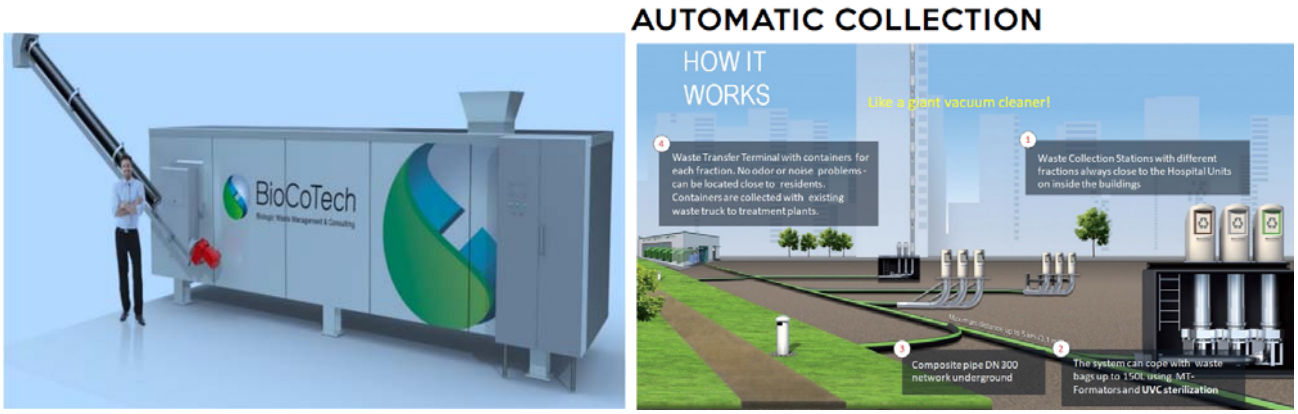
The system of solid waste management can b e divided in the following operations:

- Storage
- Collection
- Disposal

HI TECH SOLUTIONS FOR WASTE TO ENERGY

- **SOLID WASTE MANAGEMENT**
- All Universities shall develop individual disposal system and shall maintain solid waste management system appropriately keeping view the all-environmental guidelines.
- these institutions are encouraged to use **Hi Tech solutions for Waste to Energy**

Figure 40: Hi Tech solutions for Waste to Energy

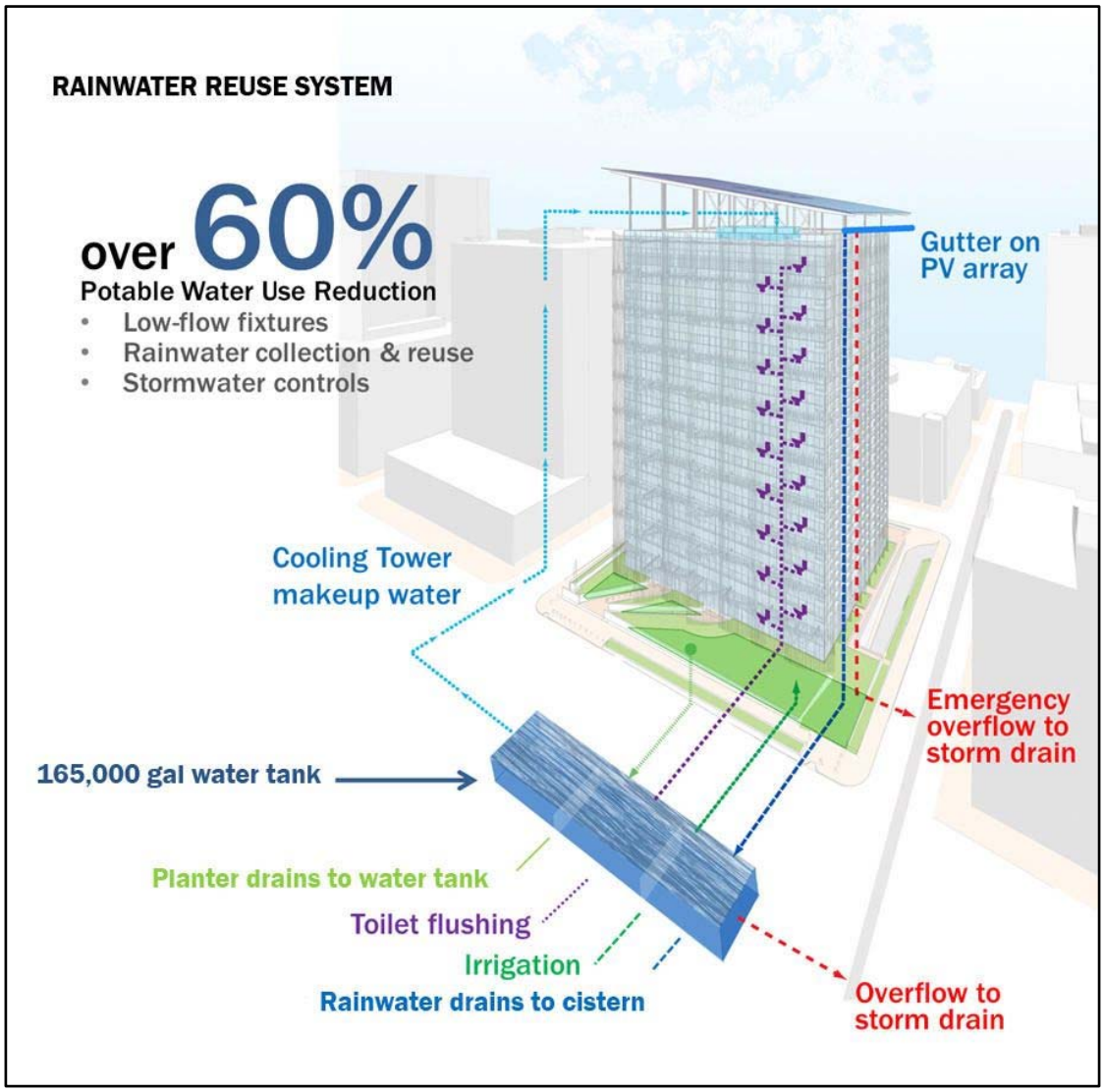


RAIN WATER HARVESTORY

- The function of storm water drainage is to intercept the surface run of from roofs, yards, roads etc., carry it safely to the downstream of the area and discharge it to the natural water bodies.
- The roofs of every building, and the floor or balconies abutting on a street or constructed over a street, shall be so constructed or framed as to permit effectual drainage of the rain water there from, by means of a sufficient number of leaders of adequate sizes, so arranged, jointed, and fixed as to ensure that the rain water is carried away from the building without causing dampness in any part of the walls, or foundations of the walls, or foundations of the building.
- Rain water from leader spouts etc. shall not discharge onto a public street or onto a neighboring property.
- All institutions should ensure the storm water management system for their proper uses including storage and reuse as to maintain their water requirements

- All university should ensure the storm water management system for their proper uses including storage and reuse as to maintain their water requirements .

Figure 41: Rain Water Reuse System



12.3.1 Storage

The storage refuse (solid waste) is temporarily stored on the premises and this requires adequate number of suitable containers to store the refuse accumulation between collections. The weight and size of this container is to be kept within the limits that can be easily and functionally handled by the collection crew. Weight should preferably not exceed 30 kgs. Where mechanical lifting and dumping is involved, this weight can be increased manifolds. Light weight plastic containers are fast growing in the developed countries and can be adopted under the local. Circumstances. Such type of container should receive attention because it is low cost, coupled with its good appearance, cleanliness, noiselessness and reasonable

resistance to chemicals and fire.

For multistoried housing units and large blocks of flats, noiseless, water proof, fire proof and rodent proof, chutes discharging by gravity into large containers in the basements or ground are to be preferred.

12.3.2 Collection

The frequency of collection will depend on the quantity of refuse, time of the year and others. In business districts, refuse should be collected daily except on Fridays while in residential areas twice a week, may be the norm during warm months of the year, whereas once a week should be the maximum permissible interval. Collection by tied-body open truck with a convenience or metal cover is to be gradually replaced by automatic load truck with packer to compact refuse dumped in the truck during collection. Compaction-type bodies have twice the capacity of open trucks. Low level closed-body trailors to eliminate the strain of lifting cans are also available now. Such type of collection trucks have capacities of about 20 to 25 cubic meter, although high in capital cost, have much lower maintenance and amortization cost.

12.3.3 Disposal Systems

Refuse disposal methods include open dumping incineration, grinding and discharge into natural stream, sanitary fill, dumping at sea, reduction and fermentation or biological digestion. Amon these methods, three generally accepted methods of treatment and disposal of solid wastes are; sanitary land filling, composing and incineration.

12.3.4 Sanitary Land Fill

The sanitary land filling system of refuse disposal is simple, effective, inexpensive and most desirable under the local circumstances. A properly engineered, managed and controlled sanitary land filling operation can be successful and economical besides meeting public acceptance and health hazards and in addition is capable of reclaiming non-useable land for recreational and other development.

While selecting the site for sanitary land fill, following main points should be carefully considered:

- Area to be as near as possible to the populated fringe.
- Purchase price of land is to be within reasonable limits.
- Type of top soil and special surface condition should be investigated.

- The water table is to be at least 3’ to 4’ lower than the bottom of land fill.
- All weather access road leading to the disposal area is desirable.
- The land area required for a landfill is estimated at half acre to one acre a year per 10,000 population with the depth of compacted refuse at 6 feet.

12.3.5 Composing

Composing is the aerobic thermophilic decomposition of solid wastes to produce a relatively humus like material with principal by-product as carbon dioxide, water and heat. The end product is a good soil builder or conditioner containing small amounts of major plants nutrients. The system is relatively costly and is generally not adopted in developing countries. Such plants are normally not able to cover its capital service cost and expenses through income from sale of compost and salvage.

12.3.6 Incineration

Incinerators are designed to burn refuse under control, nuisance free conditions at relatively high temperatures which results in an inert organic-free residue that can be readily disposed of in a landfill. The capital as well as operating costs are relatively higher and are increasing as environmental standards rise and equipment becomes more complex and expensive to purchase and operate.

12.4 Existing Practices in the Country

The prevalent system of solid wastes management in our urban areas consists of bins and filth depts for communal storage. Trucks, tractor trolleys, carts and special vehicles set for garbage waste collection are used to transport waste to transfer stations from where the waste is dumped without cover in low lying areas/swamps in and around the cities. The system is therefore, totally unhygienic and is quite inadequate in almost all the urban centers and suffering from such conventional practices. Keeping in view the local circumstances, in terms of technological and economic constraints, the deficiencies are to be identified and suitable alternative adopted. Some studies although with limited scope have been carried out for Karachi and Lahore. Recommended standards have been based on these studies.

15.5 Recommended Standards

Recommended standards for solid wastes management are given in Table.

Table 38: Solid Waste Management Standards

Description	Standard
Generation Rate	0.5-0.75-1 kg/capita-days
Density	200-250-300 kg/cu.m.
Storage Bin (Container)	25-30-40 kg.
Pick-up	Districts Centers-Daily except on Friday.
	Residential- Twice a week
Sanitary Landfill	0.5-0.75-1 acres – per year per10,000 population.
Total area requirement	For minimum 1 year period preferably 5 to 10 years.

Note: All Universities shall develop individual their disposal system and maintained solid waste management system appropriately keeping view the all-environmental guidelines as attached.

13. RECOMMENDATIONS AND GENERAL POLICY GUIDELINES

Following guidelines are imperative and shall be treated as under general policy guidelines that provides understanding which is not covered in above sections as elaborated below:

1. All universities shall establish their own smart treatment plants, solid waste management disposal system and stormwater management system keeping in view the all-applicable environmental standards and policy guidelines as issued by relevant quarters i.e SEPA. Besides, international best practice may also be considered in order to be ensured sustainable development goals 2030.
2. All universities shall not be permitted to dispose their wastes or any other liquid or sludge directly into the main stream / network or any open spaces or green or water bodies. Permission would be allowed only after getting treated.
3. It is highly recommended for universities or large commercial/residential projects to use pavers for internal/local street/s in order to encourage the low-cost maintenance, reduce, traffic volume, friendly pedestrian movements. This will provide highly aesthetic environment to all built-up area; besides, it will encourage inventors and general public.
4. All universities /stakeholders shall maintain land uses strictly as prescribed in the by-laws and approved updated master plan.
5. No change in land use shall be permitted in all universities, commercial, residential projects maintain their by-birth uses as per approved layout plan or detailed land use plan of approved updated master plan. Moreover, area reserved for open spaces and amenities or any public services may also not allowed for any change alternative/subtraction or any conversion in initial/basic land use.
6. All buildings heights shall be maintained strictly. University shall maintain their buildings heights in the specified areas as per by-laws provision no other height provision shall be permitted.
7. All universities shall maintain 50% area of allotted for open and green spaces.
8. All universities will adopt smart building concept as per approved updated master plan.
9. It is proposed that the by-laws shall be updated inconsonance approved updated master plan as updated from time to time as and when required. It is also proposed that after 3 to 5 years these by-laws can be modified and updated keeping in view development growth of the Education City.
10. All universities and allottees should ensure rain water harvesting system and also storage system for storm water for their consumptions, accordingly.

11. All universities/allottees at least minimum 25% to 40% Energy needs should ensure by using renewable energy resources as to maintain smart self-sufficient building concept in the Education City without compromising any environmental obstacle.
12. No other permission shall be permitted except only connection of utilities and general provision of services to all entities.
13. All university and other entities shall maintain the Community Social Response (CSR) policy as modified by the government from time to time-such initiatives shall encourage social welfare projects/ rehabilitation for uplifting the economic conditions of the local population.
14. General water proofing system for all structure is permitted.
15. All universities shall reserve the separate water storage tank for firefighting provision keeping view the all-firefighting provisions and guidelines of the government updated from time to time.
16. All existing settlements or any development / new construction shall be integrated in detailed land use planning and infrastructure planning as per approved updated master plan and under these guidelines will be monitored and enforced as to create harmony in the development patterns vis-à-vis ensure sustainable development in the Education City.
17. No any signboard or any other tower or any other structure top of the buildings or associated with it which is not part of building plan shall not be permitted. Sperate places shall be identify for advertisements as per approved updated Master Plan.
18. It is mandatory for medical science institutions to install Incinerators for hospital waste. Education City administration shall provide central incinerators at certain level. . For the installation of incinerators SEPA environmental guidelines are recommended to be followed in order to ensure sustainable development in the Education City.
19. It is mandatory for all universities to make appropriate technological arrangements for the treatment of biomedical waste or any other toxic material waste which has direct or indirect threat to the built and living environment.
20. Appropriate parking arrangements shall be compulsory at city level as well as individual building/institutional level.
21. It is proposed that PIU should established a mechanism for **control & approval of the planning and building development** in order to meet the high-quality standards of the development and to ensure the objective of a sustainable development in the Education City in meaningful manner where all quality standards to be met accordingly.

The following steps are essential to be followed in the mechanism

i. **Planning Approval:** In this stage conceptual plan and detailed use or subdivision plan is requested to be approved.

ii. **Building and Structural Approvals:** in this stage detailed architecture building design and structure of the buildings are required to be approved

iii. **cultural harmony and consistency approval**: this stage mainly deal to evaluate the consistency in the building architecture that cultural socio- cultural responsiveness of the Sindh Region is appropriately followed/adopted in all developments.

iv. **Environmental approval:** in this stage to evaluate the results of the environmental studies that basic requirements of the environment is followed and what measure strictly proposed to be mitigated for emerging issues in the plan/dwg.

v. **Planning and Building By-laws:** to evaluate the proposed by-laws strictly that it is followed in the planning and design of the buildings.

REFERENCES

1. NATIONAL AND REGIONAL BY-LAWS

- SBCA Building and Town Planning Regulation
- Advisory Guideline IRB&TPR_2018
- DCK By-laws
- DHA-BC&TP-2020
- Clifton By-laws
- CDA By-laws
- GDA By-laws
- RDA By-laws
- Lahore Development Authority
- Punjab Land Use Regulation
- KPK Building By-laws
- NTHP By-laws
- National Reference Manual

2. INTERNATIONAL BY-LAWS

- ARCHITECTURAL AND AESTHETIC GUIDELINES, 2017
- Open Space and Sport facilities Development Guidelines, 2017
- Urban Design Principle, USA
- Urban Planning for Renewable Energy
- Best Practices for Open Spaces
- Centre Plans and Zoning Regulations, Vol. 4, Qatar.
- Guidelines for Waste Management, Australia
- Urban Planning Guidelines, Oman
- ADA Standards

3. BOOKS, ARTICLES ETC.

- Conservation Agriculture
- NACTO
- Time-saver Standards for Building Types
- Time-saver Standards for Urban Design
- Street Manual and AASHTO-Green Book etc.