



# RAVI URBAN DEVELOPMENT AUTHORITY

Housing Urban Development & Public Health Engineering Department  
Government of the Punjab



## NOTIFICATION

Lahore, the 31<sup>st</sup> December, 2021

The Ravi Urban Development Authority in exercise of the powers conferred under Section (55) of the Ravi Urban Development Authority Act, 2020 has been pleased to frame the **RUDA URBAN DESIGN REGULATIONS, 2021**:

### **CHAPTER-I** **PRELIMINARY**

#### **1.1. Short title and commencement**

- 1.1.1. These regulations may be cited as the RUDA Urban Design Regulations 2021.
- 1.1.2. They shall come into force at once.
- 1.1.3. They shall extend to the entire jurisdiction of Ravi Urban Development Authority.

#### **1.2. Definitions**

In these rules:

- 'Act' means the Ravi Urban Development Authority Act, 2020;
- 'Apartment Site' means a site earmarked for specific use of an apartment building;
- 'Authority' means Ravi Urban Development Authority;
- 'Chamfer' means the flat surface made by cutting of sharp edge or corner of a plot to enhance the visibility at the turning point;
- 'Community Facilities' mean buildings or places which may provide physical, social, cultural or intellectual development or welfare of the local community;
- 'Company' means a company registered from Security Exchange Commission of Pakistan (SECP) under the Companies Ordinance 1984(XLVII of 1984);
- 'Condominium Complex' means multi-unit complex where each unit is owned separately;
- 'Development Works' means the planning and execution of infrastructure of a zone/ such as roads, street lights, water supply and sewerage system, electricity, sui gas and such like amenities;
- 'Developable Area' includes the area to be developed for residential, commercial and public use other than roads and open spaces in a zone/city;
- 'Educational Institution' includes a school, college, university, research or training center, library or a madrassah;
- 'Farm House' means a dwelling place attached to a farm on a plot having an area not less

than four kanal;

**'Government'** means Government of the Punjab;

**'Horticulture'** means the art or practice of garden cultivation, tree plantation, arranging of grass and flowerbeds;

**'Infrastructure'** means the services including road network, water supply, drainage and sewerage system, telephone, gas, cable and power lines;

**'Kanal'** means a size of land equal to twenty marlas;

**'Landmark'** means an object or feature of a landscape or town that is easily seen and recognized from a distance, especially one that enables someone to establish their location;

**'Landscape Plan'** means a plan showing visible feature in an open space in a zone such as walkway, green area, fountain, flower bed, grass and trees;

**'Land use Zone'** means the area earmarked for a particular land use only in the land use plan of Ravi Urban Development Authority.

**'LOP'** means Layout Plan of zone proposed by sponsor to the authority;

**'Marla'** means a size of land equal to two hundred twenty-five square feet;

**'Land use Plan'** means the Land use Zoning Plan as part of Strategic Development Plan approved by the Ravi Urban Development Authority;

**'PEC Registered Engineer'** means Pakistan Engineering Council;

**'Promenade'** means a paved public walk way along riverfront for river sightseeing;

**'Property'** means a plot or a building in a zone/city;

**'Public building'** includes a dispensary, post office, police station, local government office, educational institution, hospital, clinic, mosque, fire station, community center, clubs, day care centres and such other public building;

**'Recreational Facilities'** mean those facilities constructed/planned for recreational use for public. These facilities may include, but are not limited to, parks, entertainment, sports complex etc.

**'Residential Marina'** means a dwelling place attached to riverfront, a plot having an area not less than two kanal;

**'Right of Way'** means the width of road or street between two opposite properties;

**'Saleable Area'** means an area under the residential, commercial and public building plots in a zone/city.

**'Scrutiny Committee'** means committee constituted by the Authority to scrutinize the Plans and Designs submitted by the Sponsor.

**'Sewage treatment'** means a process that removes the contaminants at maximum level from untreated waste-water or sewage and produces both a liquid effluent suitable for disposal to the natural environment and a sludge;

**'Strategic Development Plan'** means the strategic development plan approved by the Authority for the entire jurisdiction which may include the growth strategy, zoning plan, land use zoning map, transit network, road hierarchy, water channels, riverside activities plan, site cross section, infrastructure plan, solid waste management plan, dry services plan (power, communication), wet services plan (water supply, sewerage), utility plan etc.

**'Sponsor'** means a company or a cooperative society or a firm or group or consortium or an

owner of land who intends to develop an urban development project in RUDA jurisdiction or who has developed a large scale urban development project or housing scheme after approval;

**'Town Planner'** means a town planner registered with Pakistan Council of Architects and Town Planners;

**'Water Conservation'** means a prime practice of using water efficiently to reduce unnecessary water usage and wastage.

**'Waste management'** means the collection, transport, processing ( waste treatment), recycling or disposal of waste materials, usually ones produced by human activity and other, in an effort to reduce their accumulative impact on environment including human health or local aesthetics or amenity.

## **CHAPTER-II**

### **URBAN PLANNING STRATEGIES**

The Sponsor will incorporate the follow strategies while carrying out detailed urban planning & design of Land use Zone;

#### **2.1. Creation of Centers of Activities**

Clustering of the community facilities and open spaces shall create interesting centers of activities within zone to support the neighborhood community by providing open recreational facilities and pedestrian oriented spaces to support the needs of residents.

#### **2.2. Landmarks**

Signature buildings and innovative structures within the urban fabric shall create important landmarks that aid in way-finding within the site. These landmarks shall enhance the skyline and overall image of the urban development. Design for landmarks should reflect the aspirations of the city for world-class architectural design. These landmarks are planned to be located in strategic locations throughout the development.

#### **2.3. Sustainable Urban Design**

The Sponsor will follow the best practices and sustainable design principles around the globe. Broadly following sustainable design principles may be followed.

- a) Conservation of water and energy resources
- b) Greening & site Landscaping
- c) Enhancement of community life
- d) Preservation of existing flora and fauna
- e) Management of storm water runoff
- f) Passive natural cooling systems
- g) Promoting Walkability and Mobility
- h) Energy Efficiency Design
- i) Reduction of usage of private vehicle
- j) United Nation's Sustainable Development Goals (SDGs) will be used for reference in their entirety, for this purpose

#### **2.4. Pedestrian Oriented Development**

The following points will be considered by sponsor to create a Pedestrian Oriented Development (POD):

- a) Each Zone may be further divided into sectors which will have their own identity and facilities like commercial area, parks, and public uses.

- b) Residential development may be located within a five to ten-minute walk of the commercial and public areas (an average of roughly 400 metres).
- c) Parks and other open spaces will be equipped with community needs such as accessible playgrounds and seating facilities. They will not be located farther than a five-minute walk from all residential developments.
- d) Streets shall be shaded by rows of trees and canopy or other shade structures and may have intersections to slow traffic, creating an environment suitable for safe and easy pedestrian and bicycle movement.

## **2.5. View Corridors and Focal Points**

- a) All development in the zone, may preserve the visual corridors from any form of obstruction. View corridors and focal points may be developed wherever possible to identify special sites and to contribute to the overall sense of place.
- b) Panoramic views of the waterfront will be encouraged throughout the site via the open space corridors, terraced building heights and offsets.
- c) Maintaining views to other scenic resources (parks, orchards, etc.) may be encouraged.
- d) Buildings may be oriented to avoid visual barriers.

## **2.6. Skyline**

The legibility of the cityscape is determined by the ease with which its parts can be recognized and organized into coherent patterns. Iconic structures along the skyline shall make zone a recognizable landmark from a distance.

- a) Special attention may be given to the importance of providing gradual build-up of building structures to maximize views to the water. These will be complimentary to the prescribed character and land use of the zone.
- b) Other than achieving a balanced design, high/mid-rise building and apartment lots may be planned while maintaining privacy for the low-rise buildings.

## **2.7. Mixed Use Development**

Mixed-use development may be promoted in a zone to create a varied and interesting urban condition. Mixed-use development categories comprise a combination of the complimenting land uses, including residential, commercial, public use and recreational spaces.

Mixed uses need to be complimentary and supportive of each other. The primary benefit of mixed use developments is the elimination of long commutes and the promotion of walkable neighbourhoods, again supporting the larger sustainability objectives.

## **2.8. Open Space System**

- a) The zone may have an overall, integrated open space system. The Open Space Plan will consist of an organized network of open spaces that generate a well-established hierarchy of parks throughout the zone to provide a range of environments.
- b) Special attention will be given in public open spaces to address safety, comfort and usability. These open spaces may incorporate water features, pathways and community and recreational facilities to promote a comfortable, healthy and aesthetically pleasing environment for both residents and visitors of the community.
- c) Open spaces will reflect their location and intent, being formal at urban edges, such as at retail front, and natural and more organic at the waterfront.
- d) Open spaces with water features will be publicly accessible and may have several entrances from the street.
- e) Properties facing the waterfront will orient buildings to encourage views towards it.



- f) Residential clusters will face and have landscaped access to open spaces wherever possible.

### **2.9. Riverfront Promenade**

Pedestrian-oriented features introduced along the riverfront will create strong visual extensions of view corridors and connect residents and visitors with the river, enhancing the lifestyle of a waterfront community.

- a) Along the riverfront there will be a continuous promenade, where possible (20-50 meter wide approx.), to accommodate pedestrian flow and to encourage pedestrian activity and event areas at the waterfront. This promenade will have canopies and other shade devices along its path for pedestrian walkway. The landscape layout of the promenade shall relate to and integrate with the developments along it.
- b) Seating areas and pedestrian scaled lighting will be designed to reinforce the more formal nature of promenade.

### **2.10. Sector/Pocket Parks**

- a) Sector parks will consist of smaller open spaces that serve the immediate needs of each community in a sector. Many of these parks may be centrally located to form a central gathering point within a sector.
- b) Sector parks shall incorporate sufficient trees, canopies and other shade devices in close proximity to seating areas and pedestrian passages to encourage use and activity. The use of kiosks and small retail stands may also be encouraged in designated areas.
- c) Landscape elements such as water features, sufficient seating areas and play grounds shall be encouraged. Planting areas shall incorporate native species of plants and use height carefully to guarantee safety. Public art in any media whose form, function and meaning are created for the general public and water features that serve as focal points within open spaces shall be highly encouraged.

### **2.11. Integration of Community Facilities**

- a) Adequate provisions and diversity of public amenities shall be provided throughout zone development.
- b) All residents will have easy access to community and social facilities. Community facilities may be integrated with open spaces to create greater usability of the neighbourhood amenities. These facilities may be centrally located to enable shared use with the surrounding neighbourhood.
- c) Community facilities located within the waterfront development may provide with recreational access at the waterfront. All community facilities will be integrated with open spaces.

### **2.12. Integrated Design Approach for Urban Streets**

The design of urban streets should be devised to an integrated process that accounts for the needs of pedestrians, transit riders and bicyclists, as well as motorists. This integrated approach will address the following key areas:

1	<b>Safety</b>	The sponsor shall create safe streets for all users, considering the operating speeds, pedestrian crossings, and prioritization of vulnerable users to minimize conflicts between motor vehicles, cyclists, and pedestrians.
2		The sponsor will create streets with a strong sense of land use context, dictating the type of activities taking place along a street and shall

	<b>Land-Use context</b>	influence the pedestrian realm design to reflect the neighborhood character.
<b>3</b>	<b>Efficiency</b>	<p>The streets will be designed for the efficient movement of all modes of transport.</p> <ol style="list-style-type: none"> <li>There should be an increase in connectivity between blocks through the introduction of a fine-grained network of streets to provide shorter driving distances and greater route choice.</li> <li>There should be an increase of at-grade mid-block crossings to reduce pedestrian travel distances and the desire for illegal street crossing.</li> </ol>
<b>4</b>	<b>Sustainability</b>	<ol style="list-style-type: none"> <li>Streets should promote walking, cycling and transit use to steadily reduce per capita carbon emissions from transport.</li> <li>There should be a reduction in water requirements for irrigation and water features and in the use of groundwater along streets, through the use of more sustainable sources such as treated wastewater.</li> <li>There should be provision of shade in the public realm to reduce ambient temperatures and increase pedestrian comfort.</li> </ol>
<b>5</b>	<b>Public health</b>	The street design should promote higher rates of walking and cycling year-round. Reduced vehicle use improves air quality and, as a result, respiratory health.
<b>6</b>	<b>Public enjoyment</b>	The street design should allow for social interaction and activities such as strolling, sitting and sidewalk cafe dining.
<b>7</b>	<b>Economic development &amp; tourism</b>	High-quality provision for all modes will attract investment and tourism, supporting economic development in urban areas.
<b>8</b>	<b>Culture &amp; image</b>	The design should emphasize privacy and security for women and the creation of family-oriented neighborhoods to preserve and express local culture and traditions.

### 2.12.1 Streetscape design

Streetscapes refer to elements of a street including the sidewalk, median, street furniture, trees and open spaces that combine to form the street's character. Sponsor will consider following factors while designing streetscape;

1. Streetscapes will be designed to be complete systems that blend all components into a safe, functional, attractive and cohesive place.
2. Streets should be designed to present a strong relationship between streets and adjacent land uses.
3. Pedestrian spaces along the street shall support and enhance the uses of the buildings that front onto them.
4. Incorporate public art, pedestrian signs, wayfinding elements, sidewalk cafés, shade ways, climate appropriate trees and landscaping, noise attenuation strategies and various other types of outdoor spatial experiences to enhance the streetscapes to increase vitality and livability.
5. Climate adaptive trees along streetscaping shall be planted so as to lower ambient temperatures.

6. Streetscapes will be designed to use irrigation water efficiently. Treated Sewage Effluent (TSE) may be used for irrigation, thus reducing the demand for potable water.
7. Along with a site analysis, soils report, landscape plan and irrigation plan, sponsor shall submit a water management plan.
8. Lighting, whether to illuminate the street, pedestrian areas or crosswalks, is an integral part of street design. Lighting shall also be provided for adjacent public spaces.
9. A comprehensive system of signage and wayfinding elements shall be cohesively integrated into the different zones/sectors.

#### **2.12.2. Utility Integration**

The location of underground and above-ground utilities and requirements of engineering construction guidelines or engineering building codes shall be considered while designing streets. Design considerations for utility integration include:

1. Reduce clutter in the streetscape.
2. Ensure pedestrian safety and mobility by minimising disruption to pedestrian travel.
3. Minimise maintenance conflicts by maintaining necessary access to utilities.
4. Avoid locating utility covers for house connections near building entrances.
5. Use curb extensions to locate above-ground utilities, as long as they do not obstruct pedestrian routes and crossings.
6. Integrate utility covers and manholes with paving.
7. Use utility covers and other screening devices to improve the visual quality of streetscapes.
8. Provide proper slopes and drains to ensure efficient stormwater drainage.
9. Provide enough soil volume to sustain planting and tree growth and avoid conflicts between tree roots and underground utilities.

#### **2.13.3. Junction Design Considerations**

Some of the considerations need to be followed while planning road junctions are as follows:

1. Accommodate the needs and accessibility of all modes of transport.
2. Ensure a hierarchy of users:
  - Vulnerable users (pedestrians) first.
  - Least vulnerable (motor vehicles) last.
3. Provide good visibility, particularly between pedestrians and motorists. Trees, signs and other street furniture should not obstruct visibility.
4. Avoid extreme angles and complex junctions.
5. Minimize pedestrian exposure to moving vehicles by reducing crossing distance.
6. While road planning and junction planning, all the design requirements of engineering construction guidelines or engineering building codes shall be considered.

**CHAPTER-III**  
**URBAN PLANNING & DESIGN STANDARDS**

**3.1. Layout Planning of Zone**

1. The Sponsor will carry out the detailed Layout Planning of the Zone comprising of the following components:
  - a) Composite Land uses Plan at development plot level;
  - b) Commercial Plan (Commercial Distribution);
  - c) Residential Plan (Residential Distribution);
  - d) Public Facilities Plan (Schools and Amenities etc);
  - e) Green and Blue Plan (Open Space Distribution);
  - f) Landscape Plan (Streetscape, Parks and Gardens etc);
  - g) Transportation Plan (Road, Railways & water ways etc)
  - h) Road Network Plan (Primary, Secondary, Collector and Tertiary Roads)
  - i) Transit Plan/Public Transit Plan (Public Transit Routes/stations, Pedestrians/Cyclists Routes)
  - j) River Front Promenade Plan
  - k) Streetscape Plan (Public Realm Character)
  
2. The Sponsor shall ensure that a layout plan of Zone is prepared and in accordance with the following technical requirements:
  - a) Scale of layout plan is 1:1200 to 1:2400
  - b) Scale of location plan is 1: 4800
  - c) Size and dimension of each plot are given
  - d) Sector/Block, Road and Plots numbers
  - e) Chamfering of a corner plot up to one Kanal, by 5x5 feet and above one Kanal, by 10x10 feet
  - f) Size and dimension of public buildings and open spaces
  - g) Right of way of residential streets, collector, secondary, boulevard and primary roads
  - h) Designated parking area with parking layout
  - i) Boundary of a Mouza or a revenue estate
  - j) Name, number and boundary of each Khasra in a Mouza
  - k) Area statement and percentage of:
    - a. Residential use
    - b. Commercial use
    - c. Open spaces
    - d. Roads
    - e. Graveyard
    - f. Public buildings
    - g. Other land uses
  - l) Aggregate of various categories of plots with area and size
  - m) Area of existing graveyard, if any, excluding it from area required for a graveyard under these rules
  - n) Demarcation of existing physical features at site (manmade or natural)
  - o) Location of pumping station if any



- p) Location of overhead water tank, underground water tank and tube well if any
- q) Signatures of the consultant and a PCATP registered Town Planner
- r) Seal of the approving authority
- s) Cardinal sign indicating north
- t) Name of sectors along with zone
- u) Names and Areas of the mouzas/khasra falling in the Zone
- v) Legend with proper colors and symbols

### 3.2. Planning Standards & Guidelines

The Sponsor shall ensure that Zone is planned in accordance with the following land use planning standards:

#### 3.2.1. Land use Areas percentages

The Sponsor shall abide by following percentages of areas with respect to land uses :

Sr No.	Land Use Category	Broad land uses	Percentage
1	<b>Open space</b>	Parks Orchards Forests etc.	Min. 10 %
2	<b>Sports Facilities</b>	Hockey Ground Football Ground Cricket Ground Polo Ground Any other related Sports Facility Golf Course etc.	3% to 5 %
3	<b>Graveyard</b>	Muslim Graveyard Christian/Minorities Graveyard	1% to 2 %
4	<b>Commercial</b>	Mix Use Buildings Offices Retail Shops Malls Hotels / Motels Restaurants Cinema Amusement Park Play Land Private Hospital/Clinic etc.	5% to 10 %
5	<b>Public Buildings</b>	Emergency Services Post Office Govt Hospital Police Station Masjid Community Centre Clinics	3% - 10%

		Club Houses Day Care Centers Govt Offices etc.	
6	<b>Residential</b>	Residential Plots Apartments	35% to 45%
7	<b>Roads</b>	Residential Street Collector Road Secondary Road Boulevard Primary Road	

### 3.2.2. Planning Guidelines

Planning guidelines for different land uses and their sizes are mentioned in the table below:

Sr No.	Land Use	Sizes	Guidelines
1	Promenade	20-50 meter wide	Should be provided along riverfront & canal (if any)
2	Residential Plots	Min. 5 Marla Max. 4 Kanal	Standard Size Plots
3	Commercial Plots	Min. 5 Marla Max. 4 Kanal	Standard Size Plots
4	High Rise Mix-use Building	Lots (5-10 Acres)	Max Height for High Rise Buildings: G+30
5	Mid Rise Mix-use Building	Lots (3-6 Acres)	Max Height for Mid Rise Buildings: G+20
6	Residential Apartments	1-1.5 Acres	Height for Apartment Buildings: G+15
7	Site for Solid Waste Management	Min 1 Kanal Plot 500 Houses	Appropriately located to serve the purpose in the entire area
8	Grid Station	Appropriate plot size	As per requirements of LESCO or the Authority or the concerned Department

#### Note:

- While planning any sector along riverfront, waterfront villas of 2 Kanal and above may be planned.
- If an existing settlement is present inside the zone, it should be fully integrated in the design concept of zone.

- c. In case of high / mid-rise sector, 70% of total developable area of the sector shall be allotted to residential and 30% to commercial development besides public uses.

### 3.3. Right of Way (ROW) of Road Network

1. The sponsor will plan road network as per ROW given in table below:

Sr. #	Classes	Sub-Classes	ROW	Criteria
1	Major Roads	Primary Road	200 ft	All the major roads proposed in Transportation Plan will also be incorporated in the Detailed Land use Plan in addition to new roads.
		Boulevard	150 ft	
		Secondary Road	120 ft	
2	Internal Roads	Collector Road	70 ft	Internal roads will be connected with Major Roads.
		Residential Street	40 ft	

2. The road on which apartments, major public and commercial uses are provided should not be a dead end to ensure smooth flow of traffic. In case of apartments, major public and commercial uses, the width of access road shall not be less than 70 ft.
3. The maximum height of buildings provided on residential street shall be G+2.

### 3.4. Other Requirements

The Authority will ensure that the following additional requirements are met by the sponsor:

1. Incorporation of roads proposed in the transportation master plan of RUDA.
2. Location of a tube well, overhead reservoirs, pumping stations and disposal stations to be provided if required by Water and Sanitation Agency or any other department or agency.
3. Location of fire hydrant on the main water line in open space, commercial center and at regular interval along a road.
4. Location of sites for BTS/Antenna towers within zone.
5. Green strip/buffer under high tension electricity lines as per requirements of the concerned department or agency.
6. Minimum 5 ft wide footpath in road ROW shall be provided on both sides of road.
7. The developer donot overstep its jurisdiction or interfere/interrupt with public property in any way.

## **CHAPTER: IV**

### **REQUIREMENTS OF SERVICES DESIGN**

#### **4.1. Submission of documents**

Engage the services of a qualified civil and structural engineers, registered with Pakistan Engineering Council, for preparation of detailed design and specifications of service design. A Sponsor shall, after technical approval of land use plan, submit three sets of services designs to the Authority accompanied with the following documents:

- (a) Location plan;
- (b) Super imposed Land use Plan on latest google imagery;
- (c) Topographic survey plan; and
- (d) Soil Investigation Report from the govt approved laboratory.

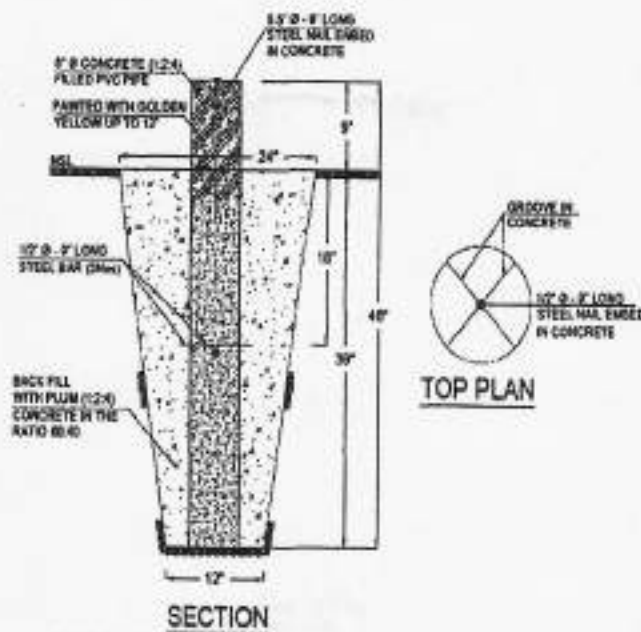
##### **4.1.1. Topographic Survey**

The Sponsor has to carry out surveys at their own cost and risks. This includes topographic survey, geo-technical survey, environmental survey, Hydrology, drainage and any other surveys required to carry out necessary works. If any survey is sought from RUDA, subsequent charges will be applicable.

Topo Survey conducted by Sponsor shall subject but not limited to the following;

- a) All necessary coordination with Survey of Pakistan department for the establishment of project survey control point
- b) All survey work shall be conducted/submitted in UTM coordinate system and in Metric system units
- c) Submission of Survey program, Methodology and Timeline
- d) Indication of North Direction
- e) Establishment of a minimum permanent survey markers/benchmarks. The design of marker shall adhere to NHA survey monument and it will be a made of concrete (1:4:8) with 75mm steel nail embedded at the centre. Using spray paint and stencil, the monument number shall be painted. Below is the section of NHA survey monument





- f) Establishment of horizontal & vertical control network
- g) The topographic survey of the site shall be plotted at 1:1000 with a 1m contour interval
- h) The survey control shall be established using state of the art equipment with an error not exceeding 3mm. A calibration certificate of equipment from a reputed laboratory should be provided. The coordinates (X, Y, Z) thus obtained will be used as datum coordinates, and the other three survey stations tied to the datum
- i) Demarcation of surface and major subsurface features (temporary and permanent) including, but not limited to, paving, trees, roads, vegetation, buildings (with its corner coordinates), abandoned construction, water features, fences, gates, sewer lines, water supply lines, transmission and electric lines, electric poles along with the height of cables from the ground, drains, cabinets, posts. etc.
- j) Identification and demarcation of manholes along with cover levels and invert levels of existing sewerage system in the vicinity and surroundings of the project site, if any
- k) Identification and demarcation of the size, invert levels of any existing Nullah, Drain, and Channels in the vicinity and surroundings of the project site, if any
- l) Invert levels and diameters of all pipes discharging into Nullahs, Drains and Channels
- m) Tie in points of all utilities into and out of the site premises to be marked on the drawing
- n) Finished floor levels of existing buildings inclusive of Footprints coming within the survey boundary
- o) Height of existing building structure
- p) Spot Elevations on Critical Features
- q) Any storm-water drainage features should be covered.
- r) Photos for the site along with clearly marked camera locations and directions marked on the drawing/CAD file
- s) The site dimensions and geometry documented on paper should be the same as the Actual Existing on the ground and shall be verified during Site Handing Over. The verified site boundary coordinates shall be marked on the final topographic survey plan with angles
- t) The resulting topographic data shall be provided in the soft form (i.e. as an excel spreadsheet, text files, and AutoCAD format)

- u) The drawing shall be in a proper sheet layout at a readable scale on A0 sheet size with the direction of True North, scale, legend, title, the coordinate system used, and Benchmark coordinates.
- v) The survey shall cover the complete site plus up to 100m zone surrounding the property line
- w) The report should provide information about the distances from the site of the major landmarks that should be mentioned

#### **4.1.1.1 Topographic Survey Deliverables**

1. Topo survey drawings in Auto CAD with superimposed Google Earth Image
2. Topo survey in ArcGIS digital model
3. All survey features and drawing objects i.e., spot levels, road levels, road edges, top-level, invert level, poles, drains, water bodies, building levels, trees, etc. shall be provided in separate CAD layers.
4. Excel sheet of survey points and features
5. KMZ file of topographic survey
6. 3 sets of reports on Topographic Survey
7. 3 sets of Topographic drawings
8. Photographs of site in soft form.

#### **4.1.2 Geotechnical Investigation**

Geotechnical Investigation conducted by Sponsor shall encompass but not limited to the following;

- a) To establish the presence and extents of various lithological units prevailing at the project site
- b) To ascertain the presence and location of groundwater for drinking and from the geotechnical viewpoint and to determine its quality from a construction perspective (if encountered)
- c) To identify/explore the zone(s) of soft or weak soil layer(s) within the project premises
- d) To determine the geotechnical design parameters for carrying out the design of foundations to be constructed at the proposed project site
- e) To furnish considerations which are to be considered for the construction of foundations and other geotechnical structures
- f) To determine the earth resistivity for earthing design and cathodic protection
- g) Complete chemical water analysis shall be performed
- h) Sponsor shall engage the services of a qualified civil engineers, registered with Pakistan Engineering Council, for geotechnical investigations.

##### **4.1.2.1. Laboratory Tests**

Performance of detail laboratory testing on selected soil and water samples to obtain the followings;

1. Soil classification
2. Index properties of subsoils
3. Strength and settlement characteristics of subsoils

4. Chemical analysis of soil/water samples for foundation construction
5. Detailed chemical analysis of ground water samples

To achieve above, list of tests including but not limited to followings can be performed;

1. Grain Size Analysis (ASTM C 136)
2. Hydrometer Analysis (ASTM D 422)
3. Atterberg Limits (ASTM D 4318)
4. Soil Classification ASTM D (2487)
5. Unit weight of soil (ASTM C 29)
6. Specific Gravity (ASTM D 854)
7. Nature Moisture Content (ASTM D 2216)
8. Bulk and Dry Density
9. Unconfined Compression Tests (ASTM D 2166)
10. Direct Shear Tests (ASTM D 3080)
11. Collapse/Swell Potential Soil Test (ASTM D 5333)
12. Consolidation Tests (ASTM D 2435)
13. Modified Proctor Tests (ASTM D 1557)
14. Points Soaked CBR Tests (ASTM D1883)
15. Complete Chemical Analysis on Soil and Water Samples (ASTM C 1580/BS1377)

#### **4.1.2.2. Geotechnical Investigation Deliverables**

The contents should include (but not limited to):

- a) Executive Summary
- b) Brief project description
- c) Scope of works, with summary of executed field and laboratory works
- d) Digitalized (corrected after lab. testing) logs (boreholes, test pits, etc.)
- e) Summary of test results (field and laboratory) in tabular and graphical format (where applicable)
- f) Original signed and stamped laboratory test result sheets for all the laboratory tests conducted
- g) Topographic, Geological, Seismicity and information on the structures in the vicinity of the project site
- h) Site-specific earth pressure coefficient(s) that may be adopted
- i) Seismic history including a brief description of previous earthquakes
- j) Site geotechnics
- k) Anticipated subsurface X-sectional profiles of soil layers
- l) Variation of field SPT and corrected SPT profile(s) along the elevation
- m) Geotechnical interpretation on the subsoil
- n) Geotechnical Design Criteria
- o) Summary of selected geotechnical design parameters
- p) Any site constraints

## 4.2. Water Supply System

This Section provides the guidelines for the design and construction of potable water utilities. The potable water utilities include the transmission and distribution network piping systems. Sponsor is responsible for design and construction of new potable water utility systems alongside with operation, maintenance, and replacement throughout the life cycle of the project.

A Sponsor shall be responsible for; but not limited to the following:

1. Optimal design of water distribution systems to deliver potable water over spatially extensive areas in required quantities and under satisfactory pressures together with cost-effectiveness and reliability in system design
2. Utilization of best international practices to ensure that water systems are designed to operate under optimum conditions and to maximize energy conservation and assets lifetime
3. Calculation of water consumption keeping in view the climate, standard of living, extent of sewerage, commercial or industrial activity, metering or cost of water, quality of water, availability of private sources, distribution system pressure, size of city, efficiency of the system, type of supply (continuous or intermittent), level of service
4. An imbedded hydraulic simulation software model for pressurized, looped pipe networks, which include multiple demand loading scenarios in the optimization
5. Development of procedures, design drawings, specifications, calculations, software models, operation & maintenance manuals, Regulations to monitor and control ground water extraction and by-laws. For all aforementioned documentation, at least three (03) sets of documents shall be submitted by the Sponsor to the Authority
6. Maintaining water quality in close liaison with WASA of LDA s, as well as a close follow up on treatment efficiency to make sure that produced water is according to the national standards
7. Engaging services of a qualified public health / plumbing and structural engineers, registered with Pakistan Engineering Council, for the preparation of detailed design and specifications of water supply.

Also, Sponsor shall institute service level improvements of water supply system by;

1. Avoiding direct water pumping from well fields to water networks and to use storage facilities as barrier to avoid health hazards and to eliminate pumping cost by using gravity systems wherever possible
2. Pressure management in the water supply network on the sector level to reduces energy consumption in supply system; this would be applied through gravity supply for the tertiary systems which connects the customers' meters
3. Local storage arrangement to overcome intermittent supply that could lead to water shortage and to avoid low supply-pressure problems
4. Demand management through public awareness campaigns to reduce water demand in urban and rural areas, as such to encourage using of water saving devices, and to change human water usage behaviors
5. Water harvesting at the household level and the local level shall be promoted to maximize benefits of storm water and free up domestic water supply sources
6. Water reuse as a key pillar by maximizing treated wastewater reuse for irrigation purposes



#### **4.2.1. Applicable Codes and Standards**

- a) Standards developed by LDA, WASA and Punjab Devolved Social Services Program (PDSSP)
- b) AWWA Standards - American Water Works Association Standards  
<http://www.awwa.org/>
- c) US EPA National Drinking Water Regulations;
  - 1. <http://water.epa.gov/drink/contaminants/>
  - 2. EPA – Environmental Protection Agency
- d) National Fire Protection Association (NFPA)
- e) Any other standards defined or enforced by the authority

#### **4.2.2. Hydraulic Modelling**

- a) Sponsor shall compete hydraulic modelling of water supply scheme based on the approved Urban Development Plan and following AWWA M 32 for full procedures associated with Computer Modeling of Water Distribution Systems or any other internationally recognized standard
- b) Modeling may be completed in standalone, CAD integrated, or GIS integrated modeling platform
- c) Model Scenarios shall be prepared for the following scenarios;
  - Average Day Demand
  - Peak Day Demand
  - Peak Hourly Demand
  - Peak Day + Fire Flow (if required to be associated with the model, otherwise fire hydrants shall be part of the sectors distribution networks and not part of the water transmission system)

#### **4.3 Sewerage System**

This Section provides the guidelines for the design and construction of Sewerage System. The Sponsor is responsible for design and construction of new sewerage system alongside with operation, maintenance, and replacement throughout the life cycle of the project.

A Sponsor shall be responsible for; but not limited to the following:

- a) Optimal design sewerage system for the project area which improves the environment by removing the sewage as it originates, prevents inundation of low-lying areas that may be otherwise caused by not providing sewers, prevents vector propagation by sewage stagnations and avoids cross connections with freshwater sources by seepage
- b) Estimation of design flows, types and hydraulics of sewers, design of sewer networks, types and construction of manholes, laying, jointing and construction of sewers
- c) Feasibility and design for sewerage treatment plants alongside with identification of potential risks associated with wastewater management. A major issue that needs to be considered is the issue of treated wastewater effluent disposal
- d) Justification and design for lift stations, if required. The pumping station shall be readily accessible by maintenance vehicles during all weather conditions. The facility shall be located off the traffic way of streets and alleys. Security fencing and access hatches with locks shall be provided. Sewage pumping station structures and electrical and

mechanical equipment shall be protected from physical damage by the 100-year flood. Sewage pumping stations shall remain fully operational and accessible during the 25-year flood

- e) Industrial Wastewater shall require pre-treatment following any internationally recognized environmental regulation applicable to the area. Industrial waste shall be separated from domestic wastewater. The wastewater system in Ravi Riverfront development will be only capable to handle and manage wastewater from domestic sources and pretreated non domestic wastewater
- f) Development of procedures, design drawings, specifications, calculations, software models, operation & maintenance manuals and by-laws. For all aforementioned documentation, at least three (03) sets of documents shall be submitted by the Sponsor to the Authority
- g) Engaging services of a qualified public health / plumbing and structural engineers, registered with Pakistan Engineering Council, for the preparation of detailed design and specifications of sewerage system

On the sectors level, the following guidelines shall be implemented:

- a) Storm water flow from household units (ex.: roof tops drainage) shall be totally separated from the wastewater system to avoid any potential overflow in wastewater system which could cause operational shortcomings that will lead to serious environmental hazards.
- b) Proper pretreatment facilities shall be provided for medium and light industrial facilities within sectors before discharging the pretreated wastewater to the primary wastewater system
- c) Proper institutional setup shall be in place to monitor and enforce discharge wastewater effluent quality from several non-domestic uses to sustain the quality of treated wastewater which will be reused for landscaping irrigation
- d) Focus shall be allocated for illegal connections and disposals to the wastewater systems to avoid operational problems

#### **4.3.1 Applicable Codes and Standards**

- a) Standards developed by LDA, WASA and Punjab Devolved Social Services Program (PDSSP)
- b) Any other internationally recognized standard applicable to the area.

#### **4.3.2 Hydraulic Modelling**

- a) Sponsor shall compete hydraulic modelling of sewerage system based on the approved Urban Development Plan
- b) Modeling may be completed in standalone, CAD integrated, or GIS integrated modeling platform

#### **4.4 Storm Water Drainage System**

This Section provides the guidelines for the design and construction of Storm Water Drainage System. The Sponsor is responsible for design and construction of new storm drainage system

alongside with operation, maintenance, and replacement throughout the life cycle of the project.

A Sponsor shall be responsible for; but not limited to the following:

- a) Feasibility and design for sustainable stormwater strategies that aim to minimize impervious cover. Development of well-integrated measures that perform multiple functions, including flood protection, pollution removal and groundwater recharge, as well as recreation, biodiversity and urban aesthetics
- b) Assessment of project climatology, existing storm water drainage systems, catchment characteristics, historic rainfall records, depth-duration-frequency analysis and development of IDF curves, discharge computations, systems design
- c) Development of procedures, design drawings including site grading and storm drainage plans, specifications, calculations, software models, operation & maintenance manuals and by-laws. For all aforementioned documentation, at least three (03) sets of documents shall be submitted by the Sponsor to the Authority
- d) Engaging services of a qualified public health / plumbing and structural engineers, registered with Pakistan Engineering Council, for the preparation of detailed design and specifications of storm drainage system

#### **4.4.1 Applicable Codes and Standards**

- a) Standards developed by LDA, WASA and Punjab Devolved Social Services Program (PDSSP)
- b) FHWA Urban Drainage Design Manual or any other internationally recognized standard applicable to RRUDP

#### **4.4.2 Hydraulic Modelling**

- a) Sponsor shall compete hydraulic modelling of storm drainage system based on the approved Urban Development Plan
- b) Modeling may be completed in standalone, Civil 3D, or GIS integrated modeling platform

#### **4.4.3 Groundwater**

##### **General**

- If separate infrastructure is provided for storm drainage and sewerage, the house and house owner will strictly adhere to use the correct connection. In such case, no house will be allowed to connect the storm drain of houses to the sewage system.
- Client/owner will seek NOC/License for extraction of groundwater by installing pumps or any other means. In case of violation, RUDA will be authorized to impose a fine up to the tune of Rs. 100,000 for commercial, Rs. 50,000 for industrial, and Rs. 20,000 for residential ventures.
- All new constructions shall be required to ensure installation of rooftop rainwater harvesting systems of adequate capacity, approved by RUDA in line with the building

codes of Pakistan Engineering Council. No layout/design/construction plan will be approved in the absence of rooftop rainwater harvesting facility.

- The developer will ensure that all water extracted from the ground shall be totally compensated in the form of groundwater recharge. Various methods of groundwater recharge may include
  - provision of groundwater recharge wells in homes
  - provision of porous concrete in parking areas
  - provision of groundwater recharge in green spaces
  - In case of, if extracted water is more than recharge water, the developer will pay the charges as imposed by the Authority
- The developer will strictly comply with any update in rules/regulations of RUDA or any other applicable rules/regulations.
- Underground water tank and septic tanks to be kept away from boundary wall.
- Compulsory open space shall always be free from any erection or obstruction except the following:
  - Septic Tanks
  - Collection Chamber for grey water
  - Underground water tank
- The designer/expert must design the storm water drainage network at 10-to-25-year return period.
- The Designer may allow surface water flow in small streets, if necessary, otherwise design/provide street side small drain for surface runoff.
- Inspection Chambers for main roads, Link roads and Service roads must be at 25-40m interval. Designer shall get the material (RCC/PCC/Fiber etc.) of inspection chambers approved from authority.

#### **Water Supply**

- Water supply scheme shall be approved by RUDA. Subsequently, the connection to each house, factory, commercial area or other shall be provided after approval by the authority.
- Construction of underground water tank to cooperate the extreme rainfall events and overhead water tank is mandatory.
- For the purpose of water supply/ irrigation for the lawn etc. at household level boring is strictly prohibited in the territory of RUDA except where necessary, after approval by the authority.
- Disruption in water supply from the network or via main storage tanks must be eliminated or reduced to the lowest risk possible.



- For Clean, safe, and hygienic water, the discussion must be made for the control of waterborne pathogens. For this purpose, the developer will perform annual testing of water supplied from registered lab and submit the results to the Authority.
- **Residential**
  - a. No water point / tap will be left outside the boundary wall.
  - b. Construction of underground water tank is mandatory but not on the slope side and be so located / designed that bowser filling is facilitated.
  - c. If any member is found violating the instructions on water supply, member will be asked to pay violation charges as per the RUDA water policy.
  - d. The wastage of water for the following activities shall be not allowed
    - i. Washing of Vehicles.
    - ii. Water flow through porch via roads.

### **Commercial**

- a. Separate water connection is required for all owners of apartment/flat in commercial building.
- b. For Commercial buildings overhead water tank must consist of two parts, one for fire-fighting and other for storage purpose.

### **Sewerage / Manhole.**

- WC discharge be connected with the manhole through septic tank. Whereas, Wash room and kitchen drainage must be connected directly to the over flow manhole of septic tank.
- Rain water / storm water must be disposed in open/close main storm drains or on the adjacent roads for surface as per design of the said Zone. Whereas, sewer drain can't be connected to storm water drain, it can be contacted with storm after the treatment of wastewater.
- Members are required to get their septic tanks inspected before covering their tops.
- Connection to the main sewer line shall be provided by RUDA on completion of house / building and member will not tamper with main sewer line. Defaulters will be charged as per the policies issued from time to time.
- Where a resident / member excavates basement as per his requirement and decides to have bath rooms / toilets, the sewerage disposal will be through mechanical pumps by the resident according to the guidelines of the RUDA.

### **RECOMMENDATIONS**

- All types of drains for all roads (main roads, link roads, service roads etc.) will not be in the centre of the roads.

- For resiliency in the system and not to solely depend on gravity roof water tank approach, the booster pumps will need to be connected to emergency power. This ensures that the potable water supply will be available to all sanitary fittings within the facility.

A Sponsor shall;

1. Pay charges to the authority on each tubewell installed for groundwater extraction, as imposed by the Authority.
2. ensure that all water extracted from the ground shall be compensated in the form of groundwater recharge. Various methods of groundwater recharge may include
  - provision of groundwater recharge wells in homes
  - provision of porous concrete in parking areas
  - provision of groundwater recharge in green spaces

#### **groundwater recharge of treated waste water**

#### **4.5 Road Network**

1) A Sponsor shall;

- (a) Engage the services of a qualified civil and structural engineers, registered with Pakistan Engineering Council, for preparation of detailed design and specifications of road network and bridges, overhead, underpasses, Transit Stations etc.
- (b) Ensure that the design and specifications are in accordance with rules/regulations and guidelines of agency responsible for approval of the same
- (c) Ensure the basic objectives of geometric design, to optimize efficiency and safety while minimizing cost and environmental damage. Th sponsor shall follow the AASHTO or ant equivalent globally recognized standard to ensure design, procurement, construction supervision, and post-construction assessments of road network
- (d) Ensure that foot paths and cycling tracks are provided on both sides of road and foot paths on both sides of residential streets
- (e) Ensure that the carriage ways, pedestrian walkways and medians etc. are provided as per guidelines of the approval authority
- (f) Ensure that each pavement subbase layer shall be spread by finisher and/or grader or other approved mechanical methods, watered, shaped to a compacted thickness not exceeding 150 mm and compacted to the required grade and cross section
- (g) Install All temporary signs and appurtenances shall be furnished, installed, maintained, and removed on completion of the work and shall include the following locations
  - Where roads are closed, partially closed, or where work is in progress
  - Where required to direct, inform or assist traffic in the area of construction

2) Sponsor shall submit three sets of the following documents to the Authority:

- (a) Design, specifications, calculations and software models for road network, bridge and foot path in accordance with rules/regulations and guidelines of the agency responsible for approval of the same;
- (b) geometric design, pavement design and cross section of road network and junctions;

- (c) design of appurtenance and structure;
- (d) road drainage design;
- (e) landscape design for a road network;
- (f) design of street furniture and fixtures; and
- (g) detail of traffic control devices.

#### **4.5.1 Applicable Codes and Standards**

- a) A Policy on Geometric Design for Highways and Streets by AASHTO
- b) AASHTO Guide for the Design of Pavement Structures
- c) ASTM – American Society for Testing and Materials
- d) Modulus of Elasticity – ASTM C469
- e) Compressive Strength – ASTM C39, AASHTO T22, T140
- f) Standard Test Methods for Laboratory Compaction Characteristics of Soil, ASTM D1557
- g) Bitumen Extraction Test – ASTM 2172
- h) Rating of Material using CBR – ASTM 2009
- i) Equivalent Axle Load Factor – AASHTO 1972
- j) Resistance Value and Expansion Pressure of compacted soils – AASHTO T90, ASTM D2844
- k) Triaxial Standard Test – AASHTO T274
- l) The Overseas Road Note 31
- m) U.S. Highway Engineers Group Index Method (using no soil strength tests)
- n) U.S. Navy and Flexible Committee Method (using soil strength tests)

#### **4.5.2 Software Modelling**

Sponsor shall submit road alignment, profiles and cross sections in Civil 3D software.

#### **4.6. Electricity and Street Light Plan**

- a) A Sponsor shall submit three sets of the following documents to the Authority:
- b) prepare design and specification of electricity and street lighting through the most energy efficient lights as may be specified by approving authority;
- c) submit these designs and specifications to concerned agency notified by the Government responsible for the provision of electricity and street lights for approval;
- d) ensure that designs are prepared by an electrical engineer, registered with Pakistan Engineering Council, and approved by the agency responsible for provision of electricity; and
- e) install or provide energy efficient lights for street lighting as may be specified by approving authority at the time of approval.
- f) Technical Specifications of the Street Lights may be Approved from RUDA.
- g) All Applicable Standards of the Urban Planning and Road Infrastructure may be Followed thoroughly with True Letter and Spirit. (Mentioned in IEC Standards 60598-2-3)
- h) Technical specifications must incorporate IEC IP-65 Ratings.
- i) All the Relevant Codes of the Pakistan Engineering Council i.e.EE11(vv) in the case of Solar /Renewable Energy Street Lights Installations Must be followed. Also RUDA will Give Power Supply system till Trunk infrastructure also it will be the Responsibility of the

Sponsor to Connect the Utility to the Zone Utilities Network as per the required standards of RUDA.

#### 4.7. Grid Station Selection

- a) Grid station will be Installed on the basis Load Calculation of that Particular Area Substation should be away from airport and defense establishments/Installations. Water supply and sewage system are the two most important facilities to be given due consideration. The substation should be located far from the crowded places. Efforts are always made to locate transmission substations outside the city areas
- b) Site Selection for Grid Station should be based technical aspects that can influence the site selection process could include the following: Land: choose areas that minimize the need for earth movement and soil disposal. Water: avoid interference with the natural drainage network. Vegetation: choose low productivity farming areas or uncultivated land as LESCO Standards and Specifications Particular Grid Code and Commercial Code may be assigned as per the Load Requirements from the National Grid as per the Latest Criteria of NEPRA/LESCO. Also, RUDA will Give Power Supply system till Trunk infrastructure also it will be the Responsibility of the Sponsor to Connect the Utility to the Zone Utilities Network as per the required standards of RUDA.

##### 4.7.1 U/G Cabling

- a) The conductor used in cables should be tinned stranded copper or aluminum of high conductivity. Stranding is done so that conductor may become flexible and carry more current.
- b) The conductor size should be such that the cable carries the desired load current without overheating and causes voltage drop within permissible limits.
- c) The cable must have proper thickness of insulation in order to give high degree of safety and reliability at the voltage for which it is designed.
- d) The cable must be provided with suitable mechanical protection so that it may withstand the rough use in laying it
- e) The materials used in the manufacture of cables should be such that there is complete chemical and physical stability throughout.
- f) As per the Specs and Standard Specification of the Concerned DISCO i.e., LESCO in that Particular Area.

#### 4.8. Transformer Rating Selection

The rating of transformer is given in terms of its kVA, HV/LV voltage and phase rotation (for three phase transformer). To calculate the rating of the transformer for both single phase and three phase, the load required to be fed and voltage at which load is to be fed must be known or should be calculated. In addition to this, the voltage of source to should also be known. The power factor of load may be assumed to be 0.85.

Rating of single-phase transformer in kVA:

$$= (V \times I) / 1000$$

Rating of three phase transformer in kVA:

$$= (\sqrt{3} V \times I) / 1000$$

The above calculation of transformer rating may also be verified by looking at the name-plate of the transformer, where the values of different parameters are given. For example,

**A nameplate of three phase transformer has the following parameters:**

Transformer rating = 100 kV

Primary voltage or H.V.= 11 kV

Primary current= 5.25 A

Secondary voltage or L.V.= 415 volts

Secondary current= 139 A

(It must be noted that a name plate has many more parameters like phase rotation, tap positions with voltage etc.)



Also, in addition to that Standard Specifications of the Local DISCO i.e., LESCO may be Followed as per the Guidelines Mentioned in the LESCO Technical Specifications of the Standard Criteria for Transformer Selection.

**Tariff Metering and Billing:** Tariff Metering and Billing must be Done by the Concerned DISCO i.e., LESCO as per the Distribution License and Distribution Code.

#### **4.9. Commercial Buildings Electrification Guide Lines**

An electrical system, within the context of a building, is a network of conductors and equipment designed to carry, distribute and convert electrical power safely from the point of delivery or generation to the various loads around the building that consume the electrical energy. set of conductors assembled within a nonmetallic sheath with PVC insulation and a nylon jacket, usually with a bare copper grounding conductor. This is generally used for lighting, switches and receptacle branch circuits in light commercial and residential construction.

Also, to Mention that all Electrical Codes Related to PEC and IEC/Standard Specifications may be Followed during the Installation of Control and Distribution Boxes/Junction Boxes.etc.

#### **4.10. Residential Building Electrification Guidelines**

An electrical system, within the context of a building, is a network of conductors and equipment designed to carry, distribute and convert electrical power safely from the point of delivery or generation to the various loads around the building that consume the electrical energy. set of conductors assembled within a nonmetallic sheath with PVC insulation and a nylon jacket, usually with a bare copper grounding conductor. This is generally used for lighting, switches and receptacle branch circuits in light commercial and residential construction.

Also, to Mention that all Electrical Codes Related to PEC and IEC/Standard Specifications may be Followed during the Installation of Control and Distribution Boxes/Junction Boxes etc.

#### **4.11. Public Building Electrification Guidelines**

An electrical system, within the context of a building, is a network of conductors and equipment designed to carry, distribute and convert electrical power safely from the point of delivery or generation to the various loads around the building that consume the electrical energy. set of conductors assembled within a nonmetallic sheath with PVC insulation and a nylon jacket, usually with a bare copper grounding conductor. This is generally used for lighting, switches and receptacle branch circuits in light commercial and residential construction.

Also, to Mention that all Electrical Codes Related to PEC and IEC/Standard Specifications may be Followed during the Installation of Control and Distribution Boxes/Junction Boxes etc.

#### **4.12. Earthing Guidelines**

Proper Earthing of Each and Every Equipment Installed within the Commercial Residential Buildings may be Installed for proper Earthing of that equipment as to avoid any Electrical Safety Hazard as per the Standard Specifications of the IEC and PEC Technical Specifications.

#### **4.13. Lightning Protection Guidelines**

Note that lightning protection systems do not prevent lightning from striking the structure, but rather intercept a lightning strike, provide a conductive path for the harmful electrical discharge to follow (the appropriate UL-listed copper or aluminum cable), and disperse the energy safely into the ground (grounding).

Proper Lightning /Surge Arrestors must be Installed on each and Every High-Rise Building in order to avoid any Lightning Damages Standard specifications of IEC and PEC may be Followed in True Letter and Spirit.

#### **4.14. Traffic Signals**

Traffic signal design procedure involves six major steps

These include

- a) Phase design,

- b) Determination of amber time and clearance time,
- c) Determination of cycle length,
- d) Apportioning of green time,
- e) Pedestrian crossing requirements,
- f) Performance evaluation of the above design.

Following are the guidelines for Traffic signals installation within urban plan.

- 1. Traffic Light- It will define the methods to change the state and report state.
- 2. Concrete State- It will be an implementation of Trafficking Interface.
- 3. Traffic Light- It will behave as a context for the traffic light or signal change.

#### **4.15. Solar Power Design**

Sponsor should be bound to follow all the Guide lines issued to him from RUDA on the Design and Implementation/Execution of the Solar Power Installation Testing and Commissioning as per the Specifications and Terms and Conditions issued to him from RUDA at the Time of Award of the Contract RUDA shall strictly check and Monitor the Specs as per the standards of IEC and PEC Standards.

#### **4.16. Landscape Plan**

- 1. A Sponsor shall;
  - (a) engage the services of a qualified Horticulturalist for preparation of detailed design and specifications of Landscape design;
  - (b) ensure that the design and specifications are in accordance with rules/regulations and guidelines of agency responsible for approval of the same;
  - (c) Sponsor shall submit three set of documents to the Authority for approval of a landscape plan for parks, open spaces, orchards and sports grounds etc.
- 2. Land scaping is further explained as under:
  - a) The sponsor shall undertake beautification and maintenance of areas required to be kept green by making necessary arrangements based on sustainable principles.
  - b) Where the sponsor maintains or beautifies a public park, green belt or green area, it will be ensured that 100% growth progress will be achieved keeping in view the replacement of mortality with same age/grown plants.
  - c) A list of species will be prepared and approved by the authority.
  - d) There will be provision for the approved species being used in the Landscape plan, and indigenous species will be used after approval. Those species will also be included who repel mosquitos or insects naturally.
  - e) Artificial falls will be provided in the landscape plan with water availability, drainage, energy efficient equipment to operate.
  - f) Invasive species will not be included in the approved list which would be deterrent to the growth of listed species.
  - g) The manure/compost will be used as per approval of the approved list of the authority.
  - h) The residences will follow tree plantation plan like 5 marla plot will plant at least two plants, 10 marla will plant at least 4, 1 kanal will plant at least 8, 2 kanal will plant at least 16, 4 kanal will plant 32.
  - i) The Tree plantation Plan will include tall trees with spacing 15-25 ft, dwarf trees with spacing 15-20 ft, and shrubs with 5 ft spacing. The space will also depend on the crown of the species. Water conservation species will be used, water guzzlers will be avoided.

- j) A tree plantation plan will be prepared before spring and monsoon period twice a year, it will include plantation of new plants and their maintenance with replacement of dead/dying plants species with same age plants species to create harmony in plantation.
  - k) Water conservation will be adopted considering scarcity of water, energy efficient sprinklers will be preferred and treated water or stored ablution tank water will be used. The team performing such functions will be fully equipped with the latest machinery.
  - l) There will be provision for evasion of stagnant water to avoid breeding habitats of mosquitos, dengue etc.
  - m) It will not be allowed to raise the green belt by occupier or developer of a property abutting to it or has been bricked over or concretized, any other use of green belt will be prohibited.
  - n) The cutting of trees will be prohibited, only mechanical cutting will be allowed with compensatory plantation with prior approval.
  - o) The ecology of the area will be preserved by taking necessary steps maintaining the flora and fauna of the existing environment.
3. The authority official shall review the landscape plan to determine compliance with these landscape regulations. The landscape plan shall also include sufficient information to determine compliance with this section, and shall as a minimum contain the following information:
- a) All existing and proposed buildings and other structures, paved areas, planted areas, power poles, light standards, fire hydrants, signs, fences, sidewalks, and other permanent features to be added and/or retained on the site.
  - b) The location and height of all trees to be preserved or retained.
  - c) The location of all plants and landscaping material to be used including paving, benches, screens, fountains, boulders, statues, or other landscape features.
  - d) A delineation of the designated landscaped area.
  - e) A list of the species of all plant material to be used.
  - f) A list of the size and height of all plant material to be used.
  - g) The spacing of plant material where appropriate.
  - h) Notes that an irrigation system including rain and freeze sensor controls will be provided for all landscaped areas.
  - i) The name, address, and telephone number of the focal person responsible for the preparation of the landscape plan.

#### **4.16.1. Horticulture**

The sponsor shall:

- a) Follow the provisions mentioned where applicable.
- b) Evaluate whether project requiring EIA/IEE.
- c) Consultant hiring for IEE/EIA report preparation.
- d) Select and acquire land formally.
- e) Prepare land for development of any public park, green belt, or green area;
- f) Develop, regulate and maintain public parks, green belts and green areas;
- g) establish and maintain botanical gardens where required.
- h) organize shows and exhibitions pertaining to horticulture, aviculture and cultural entertainment. Create awareness about horticulture and promote gardening among children also;
- i) protect trees and other vegetation with new and advanced variety introduced;

- j) procure machinery, equipment or material as may be required for the proper discharge of its functions;
- k) make arrangements for the maintenance of public parks, green belts or green areas to a company owned by it or to any other private or public limited company to fulfill purpose;
- l) constitute committees for performing specific functions as per prescribed rules.
- m) perform such other functions as may be ancillary, or as may be prescribed.
- n) The Heritage Park shall be maintained and developed in the prescribed manner.

#### **4.16.2. Green Areas**

- a) Planned area to be reserved and maintained as a public park, green belt or green area will be determined.
- b) The sponsor shall determine:
  - i. the level of green belts from the road and the method and way of their planting and maintenance;
  - ii. the percentage of a public park that may be reserved for parking and provision of food;
  - iii. the maintenance and usage of a public park; and
  - iv. the maintenance and usage of a green area.

#### **4.17. Solid Waste Management Plan**

1. A Sponsor shall;
  - (a) engage the services of a qualified Environmental Engineer or Scientist registered with Pakistan Engineering Council (PEC), for preparation of detailed Plan, Design and specifications of Solid Waste Management etc;
  - (b) ensure that the Design and specifications are in accordance with rules/regulations and guidelines of agency responsible for approval of the same;
  - (c) Sponsor shall submit three sets of documents to the Authority of Solid Waste Management Plan which shall include a plan showing location of the proposed dust bins, three bin systems, organic-inorganic waste, hazardous waste, storage places and collection and disposal of solid waste system.
2. The Waste Management Plan will be composed of the following components:
  - a. **Waste collection**
    - Container placement will include longitude, latitude, location, zone, sector, category, staff etc.
    - Current/present bins, bins required/repair, bins stolen record will be maintained for smooth operation.
    - Waste bins may be placed near the water bodies not to pollute by the public
  - b. **Mechanical sweeping**

Mechanical sweeping can be done on major roads. Number of vehicles, kilometers covered, detail of roads.
  - c. **Mechanical washing**



Mechanical washing will be considered for the sanitary operation.

**d. Manual sweeping**

Manual Sweeping will be done in three shifts i.e., Day, Afternoon and Night. Workers dressed in uniform are provided with health and safety gadgets along with necessary tools broom and waste pickers. The uniforms will make them

**e. Operations at markets/commercial area**

All SOPs will be developed for the markets/commercial areas to expedite the cleanliness activities in hard areas.

**f. Operations on special occasions**

A number of arrangements will have to be made to cater all occasional waste, their sources will be monitored and the sacrificial waste will be disposed accordingly.

**g. Mist machine**

A mist machine will be used at designated places.

**3. Manual or video wall monitoring of waste collection and disposal**

The amount of waste delivered by each designated vehicle can be made seen in real time with a picture of the vehicle through any web-based system or manually. The following steps will lead to sustainable waste management operation:

- Operational monitoring
- Mid-course correction, when required
- Gaps identification
- Operation analysis
- Monitoring of Real Time pictorial evidence of workers in all zones, sectors at selected assembly points
- Monitoring Real time tracking of vehicles route
- Monitoring of vehicles speed limit
- Real time monitoring of trips & weight
- Android based digital monitoring system

To efficiently manage a fleet of considerable vehicles, trackers can be installed on all operational vehicles including contractor's vehicles. It will be ensured that optimum utilization of vehicles for cost efficiency and satisfactory waste collection. It tracks vehicles routes, the speed of travel, distance covered, points where vehicles stop, get parked etc. A strict vigilance of waste transportation will be continued.

**4. Complaint Management and Resolution System**

The complaints lodged by the public for non-compliance of the waste collection system will be forwarded to the field staff, for record and further resolution under devised system. The sponsor will ensure that by error free and prompt escalation daily received complaints and citizen's problems are resolved to satisfactory level. A prompt action on the public complaint will be mandatory. A help line option can also be considered in advanced stages. A Penalty Management system will be devised for effective collection and disposal to the designated sites rather than throw away at any place. In time collection will be ensured from the designated points and no delay will be allowed.

**5. Hazardous and hospital waste**



All hospital and hazardous waste will be treated according to the available Rules and Regulations of the concerned departments like Hospital waste Rules and waste categorization will be provided as follows:

**Categorization:**

Types of solid waste	Description	Sources
Food waste	Waste from cooking, serving food, market reuse, handling storage	Households, institutes, hotels, stores, Restaurants.
Rubbish	Combustible (primary organic), paper, cardboard, cartons, wood, boxes, plastic, rags, metal foils, dirt, stones, bricks, etc.	
Ashes & residue	Residue from fires used for cooking & for heating buildings, cinders, clinkers, etc.	
Bulky wastes	Large auto parts, tires, stoves, refrigerators, furniture, etc.	
Dead animals	Small & large animals	
Street waste	Street sweepings, dirt, leaves, catch basin dirt, animal droppings	Streets, sidewalks, alleys, etc.
Construction & demolition waste	Lumber, roofing & sheathing scraps, concrete, plaster, rubber, pipe, wire, etc.	Construction, remodeling And repairing sites
Industrial waste & sludge	Solid waste resulting from industry process & manufacturing operations, such as food processing wastes, boiler house cinders, wood, plastic, metal scraps, etc., effluent treatment sludge.	Factories, treatment plants, etc.
Hospital Waste	Hazardous Waste from hospitals, clinics, etc.	

6. Waste Prevention, Recycling, Collection and Transport, Treatment and Disposal will be designed for Waste Management Plan. The waste prevention and disposal hierarchy is as follows:

- Prevention by Cleaner Production / Waste Minimization
- Recycling/Re-Use
- Recovery
- Composting
- Collection/ Transport
- Treatment/Physical
- Chemical treatment
- Incineration
- Standard terminology for the Waste Hierarchy
- Disposal/Landfilling

7. Landfill site, when needed, the following will be investigated primarily and require formal approvals:

- a) Land use
- b) Economic, social and cultural characteristics
- c) Geologic and hydrogeologic characteristics
- d) Natural environment characteristics
- e) Resource inventories
- f) Significant drainage features
- g) Transportation system
- h) Budgetary cost estimates including cost of land, on-site development costs, off-site costs, and anticipated annual operating costs.

#### **4.17.1. Site Selection**

1. Adequate land area and volume to provide the landfill capacity to meet projected needs for at least twenty-five years, so that costly investments in access roads, drainage, fencing and weighing stations are justifiable.
2. Areas characterized by steep gradients, where stability of slopes could be/are problematic.
3. No environmentally significant wetlands of important biodiversity or reproductive value, sensitive ecological and/or historical areas should be present within the potential area of the landfill development.
4. None of the areas within the landfill boundaries should be part of the ten-year groundwater recharge area for existing or pending water supply development.
5. There should be no private or public irrigation, or livestock water supply wells down-gradient of the landfill boundaries because they are at risk from contamination - alternative water supply sources are readily and economically available.
6. Area should not be in close proximity to significant surface water bodies, e.g., watercourses or barrages. Groundwater quality monitoring facilities need to be provided during the site development phase. Consideration has to be made for when there will be the need in the future to install a gas monitoring system near to buildings close to the site which may become at risk from gas migration once waste land filling has started.
7. No major lines of electrical transmission or other infrastructure (e.g., sewer, water lines) should be crossing the landfill development area, unless the landfill operation would clearly cause no concern or rerouting is economically feasible.
8. Unstable areas are not recommended - i.e., there should not be any significant seismic risk within the region of the landfill which could cause destruction of berms, drains, or other civil works, or require unnecessarily costly engineering measures.
9. Selection of landfill sites shall be based on examination of environmental issues. The concerned Federal/Provincial Environmental Protection Agencies shall co-ordinate with the concerned operator for obtaining the necessary approvals and clearances.
10. The landfill site shall be planned and designed with proper documentation of a phased construction plan as well as a closure plan.
11. The existing landfill sites which continue to be used for more than five years or prescribed time shall be improved in accordance of the specifications and guidelines.
12. Biomedical wastes shall be disposed of in accordance with the Guidelines for Hospital Waste Management, issued by the Environmental Health Unit, Ministry of Health, Government of Pakistan, as amended from time to time.

#### **4.17.1.1. Facilities at the Site**

- Landfill site shall be fenced or hedged and provided with proper gate to monitor incoming vehicles or other modes of transportation.
- The landfill site shall have wastes inspection facility to monitor disposed waste at landfill, office facility for record keeping and shelter for keeping equipment and machinery including pollution monitoring equipment.
- Provisions like weigh bridge to measure quantity of waste disposed at landfill site, fire protection equipment and other facilities as may be required shall be provided.
- Safety provisions including health inspections of workers at landfill site shall be periodically made.

#### **8. IEE and EIA requirements**

The sponsor shall;

- a) Consult an Environmental Engineer / Scientist before starting any project that either it requires EIA/IEE.
- b) Make sure that EIA/IEE must be carried out of the project.
- c) Submit the review fee as per rules and regulations before construction.
- d) Analyze the content of the report if there is need of any change, then do the updation as per prescribed procedure.

## CHAPTER V

### SMART PLANNING AND DESIGN STANDARDS

#### **5.1. Smart Road Design Guidelines**

1. The Sponsor shall ensure on smart road designs are by the following standards:
  - a. Roads can use
    - a. Sunlight and act as solar roads, where photovoltaic modules shall be placed directly on top of road surfaces to capture sunlight
    - b. Mechanical vibrations produced by vehicles to generate electrical energy
    - c. Piezoelectric devices
  - b. Solar energy may capture on roads shall be used to power
    - a. Street lights
      - i. AI enabled light
      - ii. Motion detector sensor
      - iii. Automatic street light sensor
      - iv. IR sensor
    - b. Signage
      - i. Laser sensor used for measuring height of vehicles
    - c. Traffic signals
      - i. Inductive loop sensors
      - ii. Infrared sensors
      - iii. Microwave sensors
      - iv. Video sensors.
  - c. The surplus solar energy harvested shall be stored or fed to the electric power grid.
  - d. Piezoelectric roads shall use piezoelectric devices to generate electrical energy
    - a. Piezoelectric crystals shall be placed about 5 cm below the asphalt surface
  - e. Smart Roads shall automatically weight logistics
    - a. Sensors shall be placed to weight, weigh-in-motion (WIM)
      - i. Fiber optics sensor
      - ii. PIEZO
  - f. Smart Roads with smart traffic violation detection, citation, and notification by using
    - a. Wireless digital traffic signs
      - i. Stolen vehicle detection system
      - ii. Automatic signal control system
      - iii. Emergency vehicle clear system
    - b. Drones
      - i. Speed and distance sensors
      - ii. Infrared and thermal sensor
      - iii. Image sensor
      - iv. Chemical sensor
    - c. Unmanned aerial vehicle (UAVs)
  - g. Smart roads with smart street lights
  - h. It shall control the on-off of street lights by
    - a. Connected street lights
    - b. Solar-powered Street lights
    - c. Motion-activated Street lights

- d. Street lights as Wi-Fi access points
- e. Data-analytics-enabled street lights
- f. Motion detector sensor
- g. Expansion and contraction sensor

## 5.2. Smart Farming Sensor Guidelines

1. The Sponsor shall ensure on smart farming designs are by the following standards:
  - a. Location sensors for using signals from GPS satellites to determine latitude, longitude, and altitude to within feet.
  - b. Optical sensors for using light to measure soil properties.
  - c. Electrochemical sensors for providing key information required in precision agriculture.
  - d. Mechanical sensors for measuring soil compaction.
  - e. Dielectric soil moisture sensors for assessing moisture levels by measuring the dielectric constant Airflow Sensors measure soil air permeability.
  - f. Agricultural weather stations for self-contained units that are placed at various locations throughout growing fields.
  - g. Smart Farming Applications
    - a. Camera for providing pictures of leaf health, lighting brightness, chlorophyll measurement, and ripeness level. Also used for measuring Leaf Area Index (LAI) and measuring soil organic and carbon makeup.
    - b. GPS for provides location for crop mapping, disease/pest location alerts, solar radiation predictions, and fertilizing.
    - c. Microphone for helping with predictive maintenance of machinery.
    - d. Accelerometer for determining Leaf Angle Index. Also used as an equipment rollover alarm.
    - e. Gyroscope for detecting equipment rollover.
  - h. Green Houses
    - a. Control micro-climate conditions to maximize the production of fruits and vegetables and its quality.
  - i. Golf Courses
    - a. Selective irrigation in dry zones to reduce the water resources required in the green
  - j. Meteorological Station Network
    - i. Study of weather conditions in fields to forecast ice formation, rain, drought, snow or wind changes.

## 5.3. Smart Cities Sensor Guidelines

1. The Sponsor shall ensure on smart cities designs are by the following standards:
  - a. Structural health
    - a. Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.
  - b. Noise Urban Maps
    - a. Sound monitoring in bar areas and centric zones in real time.
  - c. Smartphone Detection
    - a. Detect iPhone and Android devices and in general any device which works with Wi-Fi or Bluetooth interfaces.
  - d. Electromagnetic Field Levels
    - a. Measurement of the energy radiated by cell stations and Wi-Fi routers.



- e. Traffic Congestion
  - a. Monitoring of vehicles and pedestrian levels to optimize driving and walking routes.
- f. Smart Lighting
  - a. Intelligent and weather adaptive lighting in street lights.
- g. Waste Management
  - a. Detection of rubbish levels in containers to optimize the trash collection routes.
- h. Smart Roads
  - a. Intelligent Highways with warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams
- i. Smart Parking Sensors
- j. Building management Systems and Building Administration Systems
- k. Smart Electric Meters

#### **5.4. Smart Environment Guidelines**

- 1. The Sponsor shall ensure on smart environment designs are by the following standards:
  - a. Forest Fire Detection
    - a. Monitoring of combustion gases and preemptive fire conditions to define alert zones.
  - b. Air Pollution
    - a. Control of CO2 emissions of factories, pollution emitted by cars and toxic gases generated in farms.
  - c. Landslide and Avalanche Prevention
    - a. Monitoring of soil moisture, vibrations and earth density to detect dangerous patterns in land conditions.
  - d. Earthquake Early Detection
    - a. Distributed control in specific places of tremors

#### **5.5. Security & Emergencies Guideline**

- 1. The Sponsor shall ensure on smart security and emergencies designs are by the following standards:
  - a. Perimeter Access Control
    - a. Access control to restricted areas and detection of people in non-authorized areas.
  - b. Liquid Presence
    - a. Liquid detection in data centers, warehouses and sensitive building grounds to prevent break downs and corrosion.
  - c. Radiation Levels
    - a. Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.
  - d. Explosive and Hazardous Gases
    - a. Detection of gas levels and leakages in industrial environments, surroundings of chemical factories and inside mines.

#### **5.6. Domestic & Home Automation**

- 1. The Sponsor shall ensure on smart security and emergencies designs are by the following standards:
  - a. Energy and Water Use

- a. Energy and water supply consumption monitoring to obtain advice on how to save cost and resources like smart Metering.
- b. Remote Control Appliances
  - a. Switching on and off remotely appliances to avoid accidents and save energy.
- c. Intrusion Detection Systems
  - a. Detection of windows and doors openings and violations to prevent intruders.
- d. Art and Goods Preservation
  - a. Monitoring of conditions inside museums and art warehouses.

#### **5.7. Public Wi-Fi Guidelines**

- 1. The Sponsor shall ensure on public Wi-Fi is operated by fiber optics with maximum bandwidth

## **CHAPTER: VI**

### **APPROVAL PROCEDURE**

#### **6.1. Approval Procedure**

1. The Sponsor shall submit the 3 set of Complete Layout Plans & Services Design along all documents required under provisions of these regulations to the Authority.
2. The Authority shall forward the case to the Scrutiny Committee for evaluation as per provisions of these regulations.
3. After the recommendations of the Scrutiny Committee, the Chief Executive Officer, shall submit the Case and observations of the Scrutiny Committee to the Board for Approval and the board may approve, amend, defer or refer back the case amendments.
4. The Committee after approval from the Board shall sign and notify the approved Urban Design Layout and Services Design Plans.

#### **6.2. Scrutiny Committee**

The scrutiny shall consist of:

(a) Chief Executive Officer, RUDA	Chairman
(b) Executive Director (Engineering)	Member
(c) Executive Director (Land Acquisition)	Member
(d) Executive Director (Development and Building Control)	Member
(e) Executive Director (Legal)	Member
(f) Director Infrastructure	Member
(g) Director Hydrology	Member
(h) Director Environment	Member
(i) Director Smart Cities	Member
(j) Director Planning	Member

- 1) The Committee shall perform functions in accordance with the provisions of these Regulations.
- 2) The Chairperson may convene a meeting of the committee.
- 3) The Committee shall take decision by majority of the members present and voting.
- 4) One half of the total membership of the committee shall constitute quorum for a meeting of the Committee.

#### **6.3. Roles and Responsibilities of Concerned Departments**

The members of the scrutiny committee will scrutiny the documents, plans and designs as per their relevant expert areas/functions which are explained below:

##### **1. Land Acquisition & Enforcement Department**

This department will assess the complete documentation related submitted by the Sponsor regarding ownership details, list of Khasra numbers, Mouza and Khasra Plan superimposed on the Land use Zone Boundary and verify the status of confirmed land within the boundary of the Zone.

##### **2. Legal Department**

This department will assess the case with the respect to legal formalities as per provisions of the Act and these regulations and also check any litigations matter related to Land etc, with this particular area or zone in the courts and inform the committee.

### **3. Urban Planning & Design Department**

This department will scrutinize proposed Layout Plans (LOP) in accordance with the urban planning & design standards as per provisions of these regulations.

### **4. Smart Cities Department**

This department will assess the Plan and Services Designs with the respect to incorporation of smart city services provisions as per these regulations.

### **5. Engineering Department**

This department will check/verify the following aspects of the Plans and Services Design submitted by the Sponsor:

#### **a. Infrastructure Department**

- i. Alignment, Geometric Design and Cross sections of road network and junctions
- ii. Complete Services design of Water Supply, Sewerage, Drainage, Solid Waste Management Plan, Street Light and Electricity Plan etc.
- iii. Promenade Layout Plan connection and harmonization with River Channelization
- iv. Complete Services Design of Water Canals, Culverts Water Inlets etc.
- v. Complete Design of Bridges, Underpasses, Over Head etc.
- vi. Complete Design of Utilities Network
- vii. Geotech Investigation
- viii. Soil Investigations
- ix. Topographic Mapping
- x. Other requirements as per the provisions of these regulations

#### **b. Environment Department**

- i. Landscape Plan
- ii. Solid Waste Management Plan
- iii. Horticulture Plan
- iv. Open Spaces and Forests Plan (if any)
- v. IEE/EIA reports
- vi. Other requirements as per the provisions of these regulations

#### **c. Hydrology Department**

- vii. Ground Water Management Plan
- viii. Integration of Canal and River Channelization
- ix. Hydrological Aspects

  
**CHIEF EXECUTIVE OFFICER**  
**RAVI URBAN DEVELOPMENT AUTHORITY**