

# **Request for Proposal**

## **For**

### **Improvements of Roads/Foot Path/ Traffic Junctions (Package-I)**

#### **on**

### **DESIGN, BUILD AND OPERATE BASIS**

**Volume II: SCOPE OF WORK & SPECIFICATIONS**



## 1) GENERAL INFORMATION

Urban Infrastructure projects are implemented under various schemes of central as well as State government. Guwahati Smart City limited (GSCL) has the mandate to design, implement and maintain the Urban Development projects under the Smart City Mission.

GSCL proposes to undertake this work by improving different Junctions identified by GSCL. The scope of work for this package is as given below:

This is a single point responsibility contract. The Scope of Work under this Contract includes the Survey, Investigation, Designing, Constructing of Roads/Junction/Foot Path works complete.

Any item of work which have not been specifically mentioned in the specification but are necessary for safe and trouble free operation and guaranteed performance of the entire system shall be deemed to be included within scope of these specifications and shall be provided by the bidder without any extra price and time implication to the employer.

The successful bidder shall have to undertake detailed topographical survey, Traffic Surveys, Geotechnical investigation, Material Survey and Investigation, Road Inventory Survey, Utility Survey and Tree Counting and Numbering survey ,Designs, submission of Working Drawings including all layout, sections, typical details, Shop Drawings, as Built drawings etc complete for all components of works in consultation with Engineer

## 2) SCOPE OF WORK FOR BIDDER

The bidders will be responsible for detail scope of work as follows :

### 2.1. **Designing, constructing, operating and maintaining of Roads/Foot path/Traffic Junctions** (Package-I) along with Operation and Maintenance of Tendered works for Period of Five Years..

- 1 Contractors are requested to visit the site prior to fill/submit the tender and check all the necessary attributes/matters related for completion of this project.
- 2 All the activities required to be carried out for successful and timely completion of this project shall be carried out by the successful contractor.

The works under Contract comprises the construction of Improvement of Roads consisting of Up gradation and Augmentation of Foot path & Traffic Junctions and other Miscellaneous works along with Operation and Maintenance of Tendered works for Period of Five Years on Design, Build, Operate Basis in Guwahati

Details and drawings given in Tender document is for information purpose only and successful bidder shall undertake confirmatory survey for accuracy and completeness of data. It is in scope of successful Bidder to undertake all Site surveys, Geotechnical investigations, Underground Utility Surveying and Scanning of the roads for utility shifting, obtaining all required approvals from the relevant authorities, Carry out Design and Drawings for all the components of the work as per Employers requirement and submit the same to client for review and approval, Prepare Good for Construction Drawings, submit maintenance manual to client for approval before start of Maintenance period.

The successful bidder shall have to prepare and submit 'As Built Drawings' depicting the exact construction carried out on site, in soft and hard copy format.

Statutory and other charges for getting various required approvals shall be in scope of Successful bidder

## **2.2 The scope of work also includes:**

Construction and completion of the following

- a. Site clearance, demolition works, earthworks, temporary works, traffic diversion, barricading the construction site, utility shifting and all ancillary works deemed necessary for the carrying out of temporary & permanent construction works.
- b. Installing RPM, making road markings along the road edge, road center line & as per IRC guidelines, bus stop & junction improvements as per the drawings & in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- c. Construction of footpaths, kerbs, railings, vehicular impact guardrails and other road related facilities as per the guidelines of IRC in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- d. Construction of Bus Shelter at locations as approved by GSCL
- e. Supply and installation of new traffic signage, directional signage, street name signs & re-sitting of such existing signs & other road signs to be retained, inclusive of support & foundation as per Employers Requirement.

- f. Planting of trees, shrubs and installation of lawns as a part of Landscape work & installation of services for the same, as per the drawing in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- g. All other works and services ancillary or related to the full completion of the Works in accordance with the Employer's requirements

### **3.0 GENERAL REQUIREMENTS**

- 3.1 The Contractor shall ascertain, determine and verify the locations of all utility services by scanning the roads in the vicinity of the Works, and co-ordinate with utility agencies for the diversion of affected services and the laying of new services. The Contractor shall support and protect services that need not be diverted or pending diversion and remove all abandoned services. Contractor shall be responsible for relocation, reconstruction, reconfiguration of driveways, site accesses, temporary and permanent drains, pipe conduits and necessary connections for public lighting and traffic lighting, earth works, turfing, environmental assessments, necessary safety measures and protection works, sewer lines etc
- 3.2 The Contractor's responsibility for the design and build works includes the submissions to relevant government authorities / technical departments for obtaining all necessary clearances/approvals.
- 3.3 The Contractor shall co-ordinate and interfaces his works with that of all other contractors, subcontractors, utility services, statutory authorities, etc. and achieve the completion of the Works to the satisfaction of the Engineer
- 3.4 The Contractor shall verify the proposed road reserve, cadastral boundary and contract boundary and all dimensions on Site prior to submission of Tender. The Contractor is responsible for clarifying any discrepancy between the Drawings and actual condition on Site.
- 3.5 The Contractor shall make good all works including road surfaces, drains, concrete slabs, gratings, kerbs, pavements, turfing, railing, fence, boundary wall, etc. affected or damaged during the course of construction, to the satisfaction of the Engineer. The costs of making good all these defects shall be borne solely by the Contractor and deemed included in his Contract Sum
- 3.6 All works specified shall include the provision of all labour, tools, equipment, material, traffic control, transport and everything else necessary for the satisfactory completion of the Work by the Contractor to the satisfaction of the Engineer.
- 3.7 Description of the Works involved in this Contract is given in the Specifications for the guidance of the Contractor. The Contractor shall be solely and fully responsible for investigating and ensuring the actual extent and nature of the Works comprised in this Contract prior to submission of his Tender.

- 3.8 Construction, management and quality of the Works shall comply with the Drawings, Specifications and Employers requirement

#### **4. OTHER REQUIREMENTS:**

- 4.1. Bidders would need to submit their O&M expenditure information to the Engineer-in-Charge on a quarterly basis for the records of GSCL.
- 4.2. Any deviation from the proposed design needs to be approved by the GSCL.

#### **5. TESTING AND INSPECTION**

##### **5.1. Third Party inspection**

The charges for third party inspection, if any, would initially be borne by the Contractor.

##### **5.2. Site tests**

After erection at site, all components, equipment as described shall be tested to prove satisfactory performance and /or fulfilment of functional requirements without showing any sign of defect as individual equipment and as well as a system.

#### **6. PERIOD OF COMPLETION**

The work shall have to be completed within 09 months (including monsoon) from the date of the confirmed Letter of intent or handing over of site whichever is later.

## A. Specific Requirement

### 1.1.1 Foot Paths

It has been noted that the major corridors have a lane configuration ranging from 4 lanes to 6 lanes. Some of the East west connectors also have this configuration while the other main streets have a 2 lane configuration. The Footpaths are generally in average condition wherever available, but the rise of the footpath from the carriageway is on an unfriendly level making it difficult for the elderly and children to optimize the use of this facility.

### 1.1.2 Cross falls

Cross falls shall only be provided where absolutely necessary for drainage purposes and should be 1:50 maximum. Steeper gradients tend to misdirect buggies and wheelchairs. Where falls are not adequate, silt will accumulate after rain and cause the surface to become slippery. Any break in the surface, e.g. drainage channels or the gaps between boards on a walkway, shall not be greater than 12 mm and should cross perpendicular to the direction of movement.

### 1.1.3 Kerbs

#### I. Kerb Height

Maximum height of a pavement (including kerb, walking surface, top of paving) shall not exceed 150 mm from the road level. Only along Segregated Bus ways/BRT corridors, the kerb height of the Bus Stop could match the height of the bus floor.

#### II. Kerb radius and slip road (left turning pocket)

Smaller turning radii increase pedestrian safety in terms of reduction of crossing distances, increasing pedestrian visibility for drivers, decreasing vehicle turning speed; and making drivers look out for pedestrian while taking the turn. Maximum corner radius of kerb shall be 12 m, as this allows movement of the largest size of trucks, buses and emergency vehicles. Corner kerb radius may be reduced to 60 in residential areas to slow down turning buses, trucks etc. with the provision of a mountable kerb for turning of emergency vehicles.

#### III. Kerb ramps

Kerb ramp shall be provided for useful for a smooth transition, to overcome changes in level between the footpath and the road carriageway, at each pedestrian crossing on opposite sides of the street and in the vicinity of building entrances. Absence of kerb ramps prevents persons with disabilities and reduced mobility from crossing streets.

#### 1.1.4 Typical road Cross Section

Typical Cross sections of road at different locations are indicated in the respective Tender drawings as shown below:

- |                          |                              |
|--------------------------|------------------------------|
| Typical Cross-section- 1 | - TCE.10477A-CV-305-DW-30606 |
| Typical Cross-section- 2 | - TCE.10477A-CV-305-DW-30607 |

#### 1.1.5 Type of Pavement for Road

Flexible pavement consisting following layers is proposed for junction road.

Pavement Layer	Thickness (mm)
Bituminous Concrete (BC)	50
Dense Bituminous Macadam (DBM)	140
Wet Mix Macadam (WMM)	250
Granular Sub Base (GSB)	330
Subgrade (4%CBR)	500

Pavement composition for Footpath	Thickness (mm)
Paver Block	60
Sand Bedding	40
WMM	250
GSB	330
Subgrade (4%CBR)	500

**Annexure I:- List of Roads for Improvement, Footpath, island, Rotary****A. Salient Features of Roads for Improvement, Footpath, island, Rotary :****Jayanagar Chariali Junction**

<b>Description</b>	<b>Area</b>	<b>Perimeter</b>
Road Area	1250.36	0
Footpath	147.37	151.92
Island - 1	29.03	36.19
Island - 2	26.64	25.59
Island - 3	14.21	24.8
Rotary	283.529	59.69

**Beltola Junction**

<b>Description</b>	<b>Area</b>	<b>Perimeter</b>
Road Area	1069.837	0
Footpath	119.73	156.67
Island - 1	48.16	30.91
Island - 2	9.107	16.85
Island - 3	0	0
Rotary	0	0

**Dispur Last Gate Junction**

<b>Description</b>	<b>Area</b>	<b>Perimeter</b>
Road Area	1799.49	0
Footpath	229.35	181.93
Island - 1	29.03	36.19
Island - 2	26.64	25.59
Island - 3	14.21	24.8
Rotary	283.529	59.69

**RP Road Junction**

Description	Area	Perimeter
Road Area	4284.07	0
Footpath	500.43	323.76
Island - 1	255.01	80.6
Island - 2	55.51	38.33
Island - 3	33.62	30.87
Rotary	463.37	76.3

**Zoo Tiniali Junction**

Description	Area	Perimeter
Road Area	1022.851	0
Footpath	151.75	142.24
Island - 1	20.631	23.13
Island - 2	18.19	22.76
Island - 3	0	0
Rotary	0	0

## Summary of total Area of different junctions

S.No.	Junction Location	Area of Junctions (m)	Remarks
1	Jayanagar Chariali Junction	1751.139	Area included footpath, 3 islands and 1 Rotary.
2	Beltola Junction	1246.834	Area included footpath and 2 islands.
3	Dispur Last Gate Junction	2382.249	Area included footpath, 3 islands and 1 Rotary.
4	RP Road Junction	5592.01	Area included footpath, 3 islands and 1 Rotary.
5	Zoo Tiniali Junction	1213.422	Area included footpath and 2 islands.

**TENDER DRAWINGS**  
**FOR REFERENCE ONLY**

<b>Sr.No.</b>	<b>Title of Drawing</b>	<b>Drawing No.</b>
<b>Sr No</b>	<b>Drawing Title</b>	<b>Sheet No</b>
1	Jayanagar Chariali Junction	TCE.10477A-CV-3055-DW-30601
2	Beltola Junction	TCE.10477A-CV-3055-DW-30602
3	Dispur Last Gate Junction	TCE.10477A-CV-3055-DW-30603
4	RP Road Junction	TCE.10477A-CV-3055-DW-30604
5	Zoo Tiniali Junction	TCE.10477A-CV-3055-DW-30605
6	Typical Cross-section- 1	TCE.10477A-CV-305-DW-30606
7	Typical Cross-section- 2	TCE.10477A-CV-305-DW-30607

## SPECIFICATIONS

### APPLICABLE CODES AND SPECIFICATIONS

The following IS (Indian Standard) Codes and IRC (Indian Road Congress) Codes, specifications etc. shall be applicable. In all cases the latest revision of the codes and specifications shall be referred to:

Sr. No.	IS / IRC Code Nos.	Description
1	MORT&H	Specifications for Road and Bridge works, Fifth Revision, Ministry of Road Transport and Highways, New Delhi 2013
2	IRC : 35	Code of Practice for Road Markings.
3	IRC : 36	Recommended Practice for Construction of Earth Embankments and Sub-grade for road works.
4	IRC : 67	Code of Practice for Road Signs
5	IRC:SP:63	Guidelines for the use of Interlocking Concrete Block Pavement.
6	IS : 456:	Specifications for plain and reinforced concrete.
7	IRC:SP:62	Guidelines for the design and construction of cement concrete pavements for rural roads
8	IS : 2720 : (Part 5)	Method of Test for Soils: Determination of Liquid and Plastic Limit.
9	IS : 2720 : (Part 8)	Method of Test for Soils: Determination of water content – dry density relation using Light compaction
10	IS : 1124 :	Method of Test for determination of water Absorption, apparent specific gravity & porosity of Building stone.
11	IRC: 103-2012	Guidelines for Pedestrian Facilities

**TABLE OF CONTENTS**

<b>Sr. No.</b>	<b>MORT&amp;H No.</b>	<b>Description</b>
1.	-	Note
2.	201	Clearing and Grubbing
3.	301	Excavation for Roadway and Drain
4.	801	Road Delineators
5	-	MS Railing
6	-	Display/Advertisement Pole
7.	-	Bus Shelter
8.	-	Information And wayfinding Board
9.	-	City Information Panel (CIP)
10.	800	Traffic Signs
11.	900	Quality Control
12.	3005	Maintenance of Road
13.	-	Specifications for Paver Blocks

NOTE

1. Relevant clauses of Ministry of Road Transport & Highways (MORT&H) Specifications for Roads and Bridge works relevant to this tender only are reproduced.
2. In case of any variation between the reproduced specification and the original specification of MORT&H Publication, the reproduce publication shall prevail and shall be construed accordingly.
3. If MORT&H clauses referred to in the reproduced specifications herein are not included in the latter, the same shall be read from MORT&H specifications.

Topographic Survey, Traffic surveys & Geotechnical investigation

Contractor to conduct detail topographical site survey and Geotechnical investigation before execution of work and submit the same to the Engineer in charge for approval

Earthworks:

Earthworks shall involve of Clearing and Grubbing and excavation for roadway and drains, excavation for structures and embankment Construction for Footpath.

201.0 CLEARING AND GRUBBING

201.1 SCOPE

This work shall consist of cutting, removing and disposing of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, top organic soil not exceeding 150 mm in thickness, rubbish etc. which in the opinion of the Engineer are unsuitable for incorporation in the works, from the area of road land containing road embankment, drains, cross-drainage structures and such other areas as may be specified on the drawings or by the Engineer. It shall include necessary excavation, backfilling of pits resulting from uprooting of trees and stumps to required compaction, handling, salvaging, and disposal of cleared materials. Clearing and grubbing shall be performed in advance of earthwork operations and in accordance with the requirements of these Specifications.

201.2 PRESERVATION OF PROPERTY/AMENITIES

Roadside trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and all highway facilities within or adjacent to the highway which are not to be disturbed shall be protected from injury or damage. The Contractor shall provide and install at his own expense, suitable safeguards approved by the Engineer for this purpose.

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc. and where required undertake additional works to that effect vide Clause 306. Before start of operations, the Contractor shall submit to the Engineer for approval, his work plan including the procedure to be followed for disposal of waste materials, etc. and the schedules for carrying out temporary and permanent erosion control works as stipulated in Clause 306.3.

201.3 METHODS, TOOLS AND EQUIPMENT

Only such methods, tools and equipment as are approved by the Engineer and which will not affect the property to be preserved shall be adopted for the work. If the area has thick vegetation/roots/trees, a crawler or pneumatic tyre dozer of adequate capacity may be used for clearance purposes. The dozer shall have ripper attachments for removal of tree stumps. All trees, stumps, etc. falling within excavation and fill lines shall be cut to such depth below ground level that in no case these fall within 500mm of the sub-grade bottom. Also, all vegetation such as roots, undergrowth, grass and other deleterious matter unsuitable for incorporation in the embankment/sub-grade shall be removed between fill lines to the satisfaction of the Engineer. On areas beyond these limits, trees and stumps required to be removed as directed by the Engineer, shall be cut down below ground level so that these do not

present an unsightly appearance. All branches of trees extending above the roadway shall be trimmed as directed by the Engineer.

All excavations below the general ground level arising out of the removal of trees, stumps, etc., shall be filled with suitable material and compacted thoroughly so as to make the surface at these points conform to the surrounding areas.

Anthills both above and below the ground as are liable to collapse and obstruct free sub-soil water flow shall be removed and their workings, which may extend to several metres, shall be suitably treated.

201.4 DISPOSAL OF MATERIALS

All materials arising from clearing and grubbing operations shall be taken over and shall be disposed of by the Contractor at suitable disposal sites with all leads and lifts. The disposal shall be in accordance with local, State and Central regulations.

201.5 MEASUREMENT FOR PAYMENT

Clearing and grubbing for road embankment, drains and cross-drainage structures shall be measured on area basis in terms of hectares. Cutting of trees up to 300 mm in girth including removal of stumps, including removal of stumps up to 300 mm in girth left over after trees have been cut by any other agency, and trimming of branches of trees extending above the roadway and backfilling to the required compaction shall be considered incidental to the clearing and grubbing operations. Clearing and grubbing of borrow areas shall be deemed to be a part of works preparatory to embankment construction and shall be deemed to have been included in the rates quoted for the embankment construction item and no separate payment shall be made for the same.

Ground levels shall be taken prior to and after clearing and grubbing. Levels taken prior to clearing and grubbing shall be the base level and will be accordingly used for assessing the depth of clearing and grubbing and computation of quantity of any unsuitable material which is required to be removed. The levels taken subsequent to clearing and grubbing shall be the base level for computation of earthwork for embankment.

Cutting of trees, excluding removal of stumps and roots of trees of girth above 300 mm shall be measured in terms of number according to the girth sizes given below: -

- i. Above 300 mm to 600 mm
- ii. Above 600 mm to 900 mm
- iii. Above 900 mm to 1800 mm
- iv. Above 1800 mm

Removal of stumps and roots including backfilling with suitable material to required compaction shall be separate item and shall be measured in terms of number according to the sizes given below:-

- i. Above 300 mm to 600 mm
- ii. Above 600 mm to 900 mm
- iii. Above 900 mm to 1800 mm
- iv. Above 1800 mm

For the purpose of cutting of trees and removal of roots and stumps, the girth shall be measured at the height of 1 m above ground or at the top of the stump if the height of the stump is less than one metre from the ground.

#### 201.6 RATES

- 201.6.1 The contract unit rates for the various items of clearing and grubbing shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals necessary to complete the work. These will also include removal of stumps of trees less than 300 mm girth excavation and backfilling to required density, where necessary, and handling, giving credit towards salvage value disposing of the cleared materials with all lifts and leads. Clearing and grubbing done in excess of 150 mm by the contractor shall be made good by the Contractor at his own cost as per Clause 301.3.3 to the satisfaction of the Engineer prior to taking up Earthwork. Where clearing and grubbing is to be done to a level beyond 150 mm, due to site considerations, as directed by the Engineer, the extra quantity shall be measured and paid separately.
- 201.6.2 The Contract Unit rate for cutting trees of girth above 300 mm shall include handling, giving credit towards salvage value disposing of the cleared materials with all lifts and leads.
- 201.6.3 The Contractor unit rate for removal of stumps and roots of trees girth above 300 mm shall include excavation and backfilling with suitable material to required compaction, handling, giving credit towards salvage value disposing of the cleared materials with all lifts and leads.
- 201.6.4 The Contract unit rate is deemed to include credit towards value of usable materials, salvage value of unusable materials and off-set price of cut trees and stumps belonging to the Forest Department. The off-set price of cut trees and stumps belonging to the Forest Department shall be deducted from the amount due to the Contractor and deposited with the State Forest Department. In case the cut trees and stumps are required to be deposited with the Forest Department the Contractor shall do so and no deduction towards the off-set price shall be effected. The offset price shall be as per guidelines/estimates of the State Forest Department.
- 201.6.5 Where a Contract does not include separate items of clearing and grubbing, the same shall be considered incidental to the earthwork items and the Contract unit prices for the same shall be considered as including clearing and grubbing operations.

#### 201.0 EXCAVATION FOR ROADWAY AND DRAINS

##### 301.1 SCOPE

This work shall consist of excavation, removal and satisfactory disposal of all materials necessary for the construction of roadway, side drains and waterways, in accordance with requirements of these specifications and the lines, grades and cross-section shown in the drawings or as indicated by the Engineer. It shall include the hauling and stacking of or hauling to sites of embankment and sub-grade construction, suitable cut materials as required, as also the disposal of unsuitable cut materials in specified manner, with all leads and lifts, reuse of cut materials as may be deemed fit, trimming and finishing of the road to specified dimensions or as directed by the Engineer.

Excavated material shall be stacked off in the manner indicated at the site including stacking of excavated material up to any lead and lift. The rate shall only cover the cost of excavation, stacking and/or spreading of the material, if required at the site.

### 301.2 CLASSIFICATION OF EXCAVATED MATERIAL

#### 301.2.1 Classification.

All materials involved in excavation shall be classified by the Engineer in the following manner:

a) Soil:

This shall comprise topsoil, turf, sand, silt, loam, clay, mud, peat, black cotton soil, soft shale or loose moorum, a mixture of these and similar material which yields to the ordinary application of pick, spade and/or shovel, rake or other ordinary digging implement. Removal of gravel or any other nodular material having diameter in any one direction not exceeding 75 mm shall be deemed to be covered under this category.

b) Ordinary Rock (not requiring blasting) :

This shall include:

- i) rock types such as laterites, shales and conglomerates, varieties of limestone and sandstone etc., which may be quarried or split with crow bars, also including any rock which in dry state may be hard, requiring blasting but which, when wet, becomes soft and manageable by means other than blasting.
- ii) macadam surfaces such as water bound and bitumen/tar bound; soling of roads, cement concrete pavement, cobble stone, etc, compacted moorum or stabilized soil paths, etc. and hard core; compact moorum or stabilised soil requiring use of pick axe or shovel or both.
- iii) lime concrete, stone masonry in lime mortar and brick work in lime/cement mortar below ground level, reinforced cement concrete which may be broken up with crow bars or picks and stone masonry in cement mortar below ground level; and
- iv) Boulders which do not require blasting found lying loose on the surface or embedded in river bed, soil, talus, slope wash and terrace material of dissimilar origin.

c) Hard Rock (requiring blasting) :

This shall comprise:

- i) Any rock or cement concrete for the excavation of which the use of mechanical plant and/or blasting is required.
- ii) Reinforced cement concrete below ground level and in bridge/ROB/RUB/flyover piers and abutments.
- iii) boulders requiring blasting

d) Hard Rock (using controlled blasting)

Hard rock requiring blasting as described under (c) but where controlled blasting is to be carried out in locations where built-up area, huts, and are situated at within 200m of the blast site.

e) Hard Rock (blasting prohibited)

Hard rock requiring blasting as described under (c) but where blasting is prohibited for any reason like people living within 20 m of blast sites etc, and excavation has to be carried out by chiselling, wedging or any other agreed method.

f) Marshy Soil

This shall include soils like soft clays and peats excavated below the original ground level of marshes and swamps and soils excavated from other areas requiring continuous pumping or bailing out of water.

### 301.2.2 Authority for Classification

The classification of excavation shall be decided by the Engineer and his decision shall be final and binding on the Contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer.

### 301.3 Design Basis for Roads

#### Objective

The formulation of the design standards is required in order to avoid any inconsistency in design for different category of roads and from one section to the other as well. Design standards will provide desired level of service and safety.

This present section will give the details of the existing road network to the proposed site, internal road network with typical Right of way (ROW's), details for location of utilities, design methodology to be followed for geometric design of roads and flexible pavement thickness design.

#### Design basis and code for design standards

The objective of functional design is to arrange the physical elements of the project roads so as to suit in providing an inherent safety and increasing traffic capacity taking into account at the same time, the Vehicle Operating Cost and time savings. The criteria of safety are often incomplete and the design standards have to be an acceptable compromise.

For the study of this stretch the approach for Geometric design will be to set out design standards based on relevant IRC guidelines.

For this project, the standards given by the IRC codes will generally be followed viz as listed in **Error! Reference source not found.** given below:

**Table Error! No text of specified style in document.00-1 Specific Design Standards / Guidelines for different Road Elements**

Road Elements	Design Standards used for	
	Name of Code	Description
Ground Improvement	HRB - SR No. 14, 1994	State of the Art report: High Embankment on soft ground, Part B - Ground Improvement.

Embankment Fill	HRB - SR No. 3, 1999	State of the Art Report: Compaction of earthworks and sub grades.
Pavement Design	IRC:37-2012	Tentative Guidelines for the Design of Flexible Pavements.
	IRC:58-2015	Guidelines for the design of plain jointed rigid pavements for highways.
Inter locking paver blocks	IRC:SP:63-2004	Guide lines for the use of Interlocking Concrete Block Pavement
Surface Dressing	IRC:110-2005	Standard Specifications and Code of Practice for Design and Construction of Surface dressing
Road Markings	IRC:35 -2015	Code of Practice for Road Markings (with paints) (First Revision).
Road Signs	IRC:67 -2012	Guidelines for Pedestrian Facilities.
Landscaping	IRC:SP21-2009	Guidelines on Landscaping and Tree plantation.
Pedestrian Facilities	IRC:103-2014	Guidelines for Pedestrian Facilities.
Cycle Tracks	IRC:11-2015	Recommended Practice for the design and layout of Cycle tracks.
Safety Features	IRC:SP44-1996	Highway Safety Code.
Traffic Lights	IRC:93-1985	Guidelines on Design and Installation of Road Traffic Signals.
Junction / Medians	IRC:SP41-1994	Guidelines on Design of At Intersections in Rural and Urban Areas.
Structures	IRC:112-2011	Code of Practice for Road Bridges.
High Embankments	IRC:75-2015	Guidelines for the design of High Embankments.
Erosion Control	IRC:56-2011	Recommended practice for Treatment of Embankment and Road side slopes for Erosion control. (First Revision)
Slope Stability	HRB: SI.No:1 - 2000	State of the Art Report: Lime Stabilisation.
Kerb and Separator	IRC:86-1983	Geometric Design Standards for Urban Roads in Plains.

### 301.4 CONSTRUCTION OPERATIONS

#### 301.4.1 Setting Out:

After the site has been cleared as per Clause 201, the limits of excavation shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer. Clause 109 shall be applicable for setting out operations.

#### 301.4.2 Stripping and Storing Top Soil

When so directed by the Engineer, the top soil existing over the sites of excavation shall be stripped to specified depths and stockpiled at designated locations for re-use in covering embankment slopes, cut slopes, berms and other disturbed areas where re-vegetation is desired in accordance with Clause 305.3.3. Prior to stripping the topsoil, all trees, shrubs etc. shall be removed along with their roots with approval of the Engineer.

#### 301.4.3 Excavation - General

All excavations shall be carried out in conformity with the directions laid herein under and in a manner approved by the Engineer. The work shall be so done that the suitable materials available from excavation are satisfactorily utilised as deemed fit or as approved by the Engineer.

While planning or executing excavations, the Contractor shall take all-adequate precautions against soil erosion, water pollution etc. as per Clause 306, and take appropriate drainage measures to keep the site free of water in accordance with Clause 311.

The excavations shall conform to the lines, grades, side slopes and levels shown on the drawings or directed by the Engineer. The Contractor shall not excavate outside the slopes or below the established grades or loosen any material outside the limits of excavation. Subject to the permitted tolerances, any excess depth excavated below the specified levels on the road shall be made good at the cost of the Contractor with suitable material of similar characteristics to that removed and compacted to the requirements of Clause 305.

All debris and loose material on the slopes of cuttings shall be removed. No backfilling shall be allowed to obtain required slopes excepting that when boulders or soft materials are encountered in cut slopes these shall be excavated to approved depth on instructions of the Engineer and the resulting cavities filled with suitable material and thoroughly compacted in an approved manner.

After excavation, the sides of excavated area shall be trimmed and the area contoured to minimise erosion and ponding, allowing for natural drainage to take place.

#### 301.4.4 Methods, Tools and Equipment:

Only such methods, tools and equipment as approved by the Engineer shall be adopted / used in the work. If so desired by the Engineer, the Contractor shall demonstrate the efficacy of the type of equipment to be used before the commencement of work.

#### 301.4.5 Rock Excavation:

Rock, when encountered in road excavation, shall be removed up to the sub-grade top level or as otherwise indicated on the drawings. Where, however, unstable shales or

other similar materials are intersected at the sub-grade top level, these shall be excavated to the extent of 500 mm below the formation level or as otherwise specified. In all cases, the excavation operations shall be so carried out that at no point on cut formations the rock protrudes above the specified levels. Rocks and boulders which are likely to cause differential settlement and also local drainage problems should be removed to the extent of 500 mm below the formation level in the formation width including side drains.

Where excavation is done to levels lower than those specified, the excess excavation shall be made good as per Clauses 301.3.3 and 301.6 to the satisfaction of the Engineer.

Slopes in rock cutting shall be finished to uniform lines corresponding to slope lines shown on the drawings or as directed by the Engineer. Notwithstanding the foregoing, all loose pieces of rock on excavated slope surface which move when pierced by a crowbar shall be removed.

Where blasting is to be resorted to, the same shall be carried out to Clause 302 and all precautions indicated therein observed.

Where pre-splitting is prescribed to be done for the establishment of a specified slope in rock excavation, the same shall be carried out as per Clause 303.

#### 301.4.6 Marsh Excavation

The excavation of marshes/swamps shall be carried out as per the programme approved by the Engineer.

Excavation of marshes shall begin at one end and proceed in one direction across the entire marsh immediately ahead of back filling. The method and sequence of excavating and back-filling shall be such as to ensure, to the extent practicable, the complete removal or displacement of all muck from within the lateral limits indicated on the drawings or as staked by the Engineer.

#### 301.4.7 Excavation of Road Shoulders/Verge/Median for Widening of Pavement or providing treated shoulders:

In the works involving widening of existing pavements or providing paved shoulders, the existing shoulder/verge/median shall be removed to its full width and upto top of the subgrade. The subgrade material within 500 mm from the bottom of the pavement for the widened portion or paved shoulders shall be loosened and re-compacted as per Clause 305. Any unsuitable material found in this portion shall be removed and replaced with the suitable material. While doing so, care shall be taken to see that no portion of the existing pavement designated for retention is loosened or disturbed. If the existing pavement gets disturbed or loosened, it shall be dismantled and cut to a regular shape with sides vertical and the disturbed/loosed portion removed completely and re-laid as directed by the Engineer, at the cost of the Contractor.

#### 301.4.8 Excavation for Surface/Sub-surface Drains

Where the Contract provides for construction of surface/sub-surface drains to Clause 309, excavation for these shall be carried out in proper sequence with other works as approved by the Engineer.

#### 301.4.9 Slides:

If slips, slides, over-breaks or subsidence occur in cuttings during the process of construction, they shall be removed at the cost of the Contractor as ordered by the

Engineer. Adequate precautions shall be taken to ensure that during construction, the slopes are not rendered unstable or given rise to recurrent slides after construction. If finished slopes slide into the roadway subsequently, such slides shall be removed and paid for at the contract rate for the class of excavation involved, provided the slides are not due to any negligence on the part of the Contractor. The classification of the debris material shall conform to its condition at the time of removal and payment made accordingly regardless of its condition earlier.

**301.4.10 De-watering:**

If water is met with in the excavations due to springs, seepage, rain or other causes, it shall be removed by suitable diversions, pumping or bailing out and the excavation kept dry whenever so required or directed by the Engineer. Care shall be taken to so discharge the drained water as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair/restore to the original condition at his own cost or compensate for the damage.

**301.4.11 Use and Disposal of Excavated Materials:**

All the excavated materials shall either be reused with the approval of the Engineer or disposed off with all loads and lifts as directed by the Engineer.

**301.4.12 Back-filling :**

Back-filling of masonry / concrete/ hume pipe or drain excavation shall be done with approved material with all loads and lifts after concrete/masonry hume pipe is fully set and carried out in such a way as not to cause undue thrust on any part of the structure and/or not to cause differential settlement. All space between the drain walls and the side of the excavation shall be refilled to the original surface making due allowance for settlement, in layers generally not exceeding 150 mm compacted thickness to the required density, using suitable compaction equipment such as trench compactor, mechanical tamper, rammer or plate compactor as directed by the Engineer.

**301.5 PLYING OF CONSTRUCTION TRAFFIC**

Construction traffic shall not use the cut formation and finished sub grade without the prior permission of the Engineer. Any damage arising out of such use shall be made good by the contractor at his own cost.

**301.6 PRESERVATION OF PROPERTY**

The Contractor shall undertake all reasonable precautions for the protection and preservation of any or all existing roadside trees, drains, sewers or other sub-surface drains, pipes, conduits and any other structures under or above ground, which may be affected by construction operations and which in the opinion of the Engineer, shall be continued in use without any change. Safety measures taken by the Contractor in this respect, shall be got approved by him from the Engineer. However, if any of these objects is damaged by reason of the Contractor's negligence, it shall be replaced or restored to the original condition at his cost. If the Contractor fails to do so, within the required time as directed by the Engineer or if, in the opinion of Engineer, the actions initiated by the Contractor to replace/restore the damaged objects are not satisfactory, the Engineer shall arrange the replacement/restoration directly through any other agency at the risk and cost of the Contractor after issuing a prior notice to the effect.

### 301.7 PREPARATION OF CUT FORMATION

The cut formation, which serves as a sub-grade, shall be prepared to receive the sub-base/base course as directed by the Engineer.

Where the material, in the sub-grade has a density less than specified in Table 300-1, the same shall be loosened to a depth of 500 mm. and compacted in layers in accordance with the requirements of Clause 305 adding fresh material, if any required, to maintain the formation level as shown in the drawings. Any unsuitable material encountered in the sub-grade shall be removed as directed by the Engineer, replaced with suitable material compacted in accordance with Clause 305.

In rocky formations, the surface irregularities shall be corrected and the levels brought up to the specified elevation with granular base material as directed by the Engineer, laid and compacted in accordance with the respective specifications for these materials. The unsuitable material shall be disposed of in accordance with Clause 301.3.11. After satisfying the density requirements, the cut formation shall be prepared to receive the sub-base/base-course in accordance with Clause 310 and 311.

### 301.8 FINISHING OPERATIONS

Finishing operations shall include the work of properly shaping and dressing all excavated surfaces.

When completed, no point on the slopes shall vary from the designated slopes by more than 150 mm. measured at right angles to the slope, except where excavation is in rock (hard or soft) where no point shall vary more than 300 mm from the designated slope. In no case shall any portion of the slope encroach on the roadway.

The finished cut formation shall satisfy the surface tolerances described in Clause 902.

Where directed, the topsoil removed earlier and conserved (Clauses 301.3.1 and 305.3.3) shall be spread over cut slopes, shoulders and other disturbed areas. Slopes may be roughened and moistened slightly, prior to the application of topsoil, in order to provide satisfactory bond. The depth of topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 to 100 mm.

### 801.1 ROAD DELINEATORS

801.2 The design materials to be used and the location of the road delineators (roadway indicators, hazard markers and object markers) shall conform to recommended practice for road delineators, IRC:79 and to relevant drawings or as otherwise directed by the engineer. The steel drums such as empty bitumen drums shall not be used as they could pose safety hazards. The delineators shall be retro-reflectorized as shown on the drawings or as directed by the engineer. The reflectors on the delineators shall be retro-reflective sheeting with encapsulated lens and with the visibility of 300m under clear weather conditions, when illuminated by the upper beam of car headlights.

801.3 **Installation:** The delineators shall be so installed that their posts do not change their orientation and the reflectorized faces are always perpendicular to the direction of travel.

801.4 **Measurements for payments:** The measurement shall be made in number of delineators supplied and fixed at site.

801.5 **Rates:** The contract unit rates of delineators shall be payment in full compensation for furnishing all labour, materials, tools, equipment including incidental costs necessary to complete the work to those specifications.

MS RAILING

a	• Function, Sizing & Design	<ul style="list-style-type: none"> <li>• All structural steel shall conform to IS 226-1963 sections for grills and shall be free from loose mill scales, rusts, pitting or any other defects affecting its strength and durability.</li> <li>• The ms grill shall be fixed on concrete base and 500mm should be the visible height above the fixing finished surface.</li> <li>• MS posts with 50mm <math>\phi</math> shall be placed 1200mm c/c</li> <li>• The grills shall be fabricated to the design and pattern shown in the drawings.</li> <li>• Manufactured M.S. Grills then be fixed in between the posts, balusters, M.S. frame work etc. to correct alignment. Any undulations, bends etc. found shall be rectified by the contractor at his own cost. The complete assembly of rill / railing so fixed shall be firm and there shall not be any lateral movements.</li> </ul>
b	• Materials	<ul style="list-style-type: none"> <li>• All the steel parts shall be HDG – Hot dip galvanized powder coated to give longer life and better quality.</li> <li>• The Foundation shall be made in min M25 concrete. Cast iron, nuts bolts if any shall be rust proof, deep galvanized , powder coated etc.</li> <li>• M.S. grills, balusters, etc. also to be painted with flat two coats of oil paint of approved make and shade over one coat of approved primer or be powder coated of approved shade.</li> </ul>
c	• Maintenance	<ul style="list-style-type: none"> <li>• The edge of the M.S. flats shall be suitably mitred before welding to get the desired shape. The joints shall be filled to remove excess stay after welding screws, nuts, washers, bolts, rivets and any other miscellaneous fastenings devices shall be of steel and shall be provided by the contractor.</li> <li>• The approved grills shall be fixed in position where specified and shown in drawings including in soil, masonry walls, concrete kerbs etc. Any damages to walls, kerbs etc. caused during fixing the grills shall be made good by grouting with cement mortar/packing /repairing properly at the contractors cost.</li> </ul>
d	• Vandalism-proof	<ul style="list-style-type: none"> <li>• The railing shall not be fragile and safely secured to its foundation</li> </ul>
e	• Security & Safety parameter	<ul style="list-style-type: none"> <li>• There shall be no sharp edges visible or reachable by citizens,</li> <li>• Samples of grill and railings shall be submitted for approval of the Engineer-in-charge and to be got approved before taking up for mass fabrication.</li> </ul>
f	• Durability parameter	<ul style="list-style-type: none"> <li>• The stainless steel, Metal parts and blots shall be treated to be resistant in all weathers.</li> </ul>
g	• Design parameter	<ul style="list-style-type: none"> <li>• The looks shall be simple &amp; well designed to gel with the Smart City Theme.</li> </ul>

h	<ul style="list-style-type: none"> <li>• Measurement of the Railing</li> </ul>	<ul style="list-style-type: none"> <li>• Actual area of M.S. grill manufactured and fixed in position shall only be measured in square metre for payment. The rate is to include the cost of all materials, labour, transporting, fabricating, installing</li> </ul>
i	<ul style="list-style-type: none"> <li>• Modular</li> </ul>	<ul style="list-style-type: none"> <li>• Modular design is recommended for Street Furniture</li> </ul>
j	<ul style="list-style-type: none"> <li>• Environment parameter</li> </ul>	<ul style="list-style-type: none"> <li>• As far as possible recyclable materials shall be used for Street Furniture</li> </ul>
k	<ul style="list-style-type: none"> <li>• Universal design</li> </ul>	<ul style="list-style-type: none"> <li>• The furniture should also cater to differently abled users. Design and manufacture should comply with ISO requirements.</li> </ul>
l	<ul style="list-style-type: none"> <li>• Innovation parameter</li> </ul>	<ul style="list-style-type: none"> <li>• The design should be innovative in terms of adaptability in local context, compliant to local statutory norms, sustainable, cost effective, and responsive smart features as indicated in Smart City Mission guidelines issued by MoUD.</li> </ul>

DISPLAY/ADVERTISEMENT POLE

a	• Function & Sizing	<ul style="list-style-type: none"> <li>• Advertisement poles shall be placed along the footpath.</li> <li>• It shall have a display equipment with information area showing 300-450mm x 750-1000mm double sided, made of Aluminium frame work, 8mm toughened glass/ acrylic &amp; electronic circuit to control its lighting.</li> <li>• The display systems can have fixed or scrolling faces. The scrolling posters shall be driven by plastic belts in order to minimise the noise</li> <li>• The structure shall be safe to withstand wind pressure as per the regulations.</li> </ul>
b	• Materials	<ul style="list-style-type: none"> <li>• Use of steel, aluminium &amp; toughened glass/acrylic for better durability. The Foundation slab shall be made in min M25 concrete. The cast iron, nuts bolts, shall be rust proof, deep galvanized, powder coated etc. The stainless steel shall be treated to be resistant in all weathers.</li> <li>• The glazing shall be of polycarbonate material to offer good resistance against shocks and scratches.</li> </ul>
c	• Maintenance	<ul style="list-style-type: none"> <li>• The furniture shall be regularly cleaned &amp; all mechanical parts to be maintained by periodic servicing.</li> <li>• The display shall be covered with unbreakable glass or with acrylic &amp; shall be cleaned periodically.</li> <li>• All the metal parts shall be coated for rust protection.</li> </ul>
d	• Vandalism-proof	<ul style="list-style-type: none"> <li>• The supporting pole should be securely installed, either by bolting or with fixed to foundation by anchor fasteners.</li> <li>• All materials shall be non-flammable.</li> </ul>
e	• Security & Safety parameter	<ul style="list-style-type: none"> <li>• The parts used shall not be fragile and shall be safely secured to its foundation with anchor fasteners or chemical fasteners to make the furniture more stable and joint fasteners shall not be visible from outside..</li> <li>• The display shall not over hang on the road, to cause any accident by passing vehicle.</li> </ul>
f	• Durability parameter	<ul style="list-style-type: none"> <li>• The material used shall be unaffected by outdoor exposure</li> <li>• The material shall be Non-flammable.</li> </ul>
g	• Design parameter	<ul style="list-style-type: none"> <li>• The looks shall be simple and well designed to gel with the Smart City Theme</li> </ul>
h	• Co-ordinated design	<ul style="list-style-type: none"> <li>• All advert poles shall be of uniform shape, size, color on the same width of the road.</li> <li>• The location of the advert poles shall be on major streets, market area, &amp; public areas like bus stops etc.</li> </ul>
i	• Modular	<ul style="list-style-type: none"> <li>• Modular design is recommended for Street Furniture</li> </ul>
j	• Environment	<ul style="list-style-type: none"> <li>• As far as possible recyclable materials shall be used for Street Furniture</li> </ul>
k	• Universal design	<ul style="list-style-type: none"> <li>• The furniture should also cater to differently abled users. Design and manufacture should comply with ISO requirements.</li> </ul>
l	• Innovation	<ul style="list-style-type: none"> <li>• The design should be innovative in terms of adaptability in local context, compliant to local statutory norms, sustainable, cost effective, and responsive smart features as indicated in Smart City Mission guidelines issued by MoUD.</li> </ul>

**BUS SHELTER**

a	• Function & Sizing	<ul style="list-style-type: none"> <li>• Bus Shelter – BS shall serve as an all-weather shade for the bus commuters and the display area per shelter shall not exceed 20 sqmt.</li> <li>• The structure shall be designed to withstand wind load according to regulations.</li> <li>• The display systems can have fixed or scrolling faces with back light</li> <li>• The Side Display board to have 1100X400mm Electronic display on dual sides connected with WIFI to show schedules and bus Status.</li> </ul>
b	• Materials	<ul style="list-style-type: none"> <li>• Bus shelter shall be made of MS frame work, powder coated metal roofing, metal seating, toughened glass/ acrylic and electronic circuit to control its lighting.</li> <li>• All the steel parts shall be HDG –Hot dip galvanized and aluminium parts shall be anodized or powder coated to give longer life and better quality. The material used shall be unaffected by outdoor exposure</li> <li>• The material shall be Non flammable. The Foundation slab shall be made in min M25 concrete. The cast iron nuts, bolts shall be rust proof I deep galvanized powder coated etc.</li> </ul>
c	• Maintenance	<ul style="list-style-type: none"> <li>• The furniture shall be maintained by washing and periodic servicing.</li> <li>• The display shall be covered using toughened glass/ acrylic, with protective frames on its edges which shall be also cleaned periodically.</li> <li>• The poles and metal parts shall be coated for protection in case found damaged.</li> </ul>
d	• Vandalism-proof	<ul style="list-style-type: none"> <li>• The Parts used shall not be fragile and safely secured to its foundation with anchor fasteners which makes the furniture more stable and joint fasteners not visible from outside.</li> <li>• None of the joints shall be visible from outside the furniture and it is completely sealed. Opening shall be by specialized key.</li> </ul>
e	• Security & Safety parameter	<ul style="list-style-type: none"> <li>• There shall be no falling parts, no sharp edges involved in the furniture all the parts shall be well fastened.</li> <li>• The foundation used shall be designed in order to take loads from wind and persons leaning over the panel.</li> </ul>
f	• Durability parameter	<ul style="list-style-type: none"> <li>• The parts used shall be of steel, aluminium, toughened glass or acrylic for better durability.</li> <li>• The stainless steel shall be treated to be resistant in all weathers.</li> </ul>
g	• Design parameter	<ul style="list-style-type: none"> <li>• Looks shall be simple &amp; modern well designed to go with the Smart City Theme.</li> <li>• The electronic display board to be of LED Scrolling type with Oval, 4.3 x 5.1mm dia. Diffused. LED's having Amber colour.</li> </ul>
h	• Co-ordinated design	<ul style="list-style-type: none"> <li>• All BS shall be of uniform shape, size, &amp; colour on the same width of the road &amp; location as per the routes.</li> </ul>
i	• Modular	<ul style="list-style-type: none"> <li>• Modular design is recommended for Street Furniture</li> </ul>

j	• Environment friendly	• As far as possible recyclable materials shall be used for Street Furniture
k	• Universal design	• The furniture should also cater to differently abled users. Design and manufacture should comply with ISO requirements.
l	• Innovation	<ul style="list-style-type: none"> <li>• The design should be innovative in terms of adaptability in local context, compliant to local statutory norms, sustainable, cost effective, and responsive smart features as indicated in Smart City Mission guidelines issued by MoUD..</li> <li>• The display systems can have fixed or scrolling faces. The scrolling posters shall be driven by plastic belts in order to minimise the noise</li> </ul>

### INFORMATION AND WAYFINDING BOARD

a	• Function & Sizing	<ul style="list-style-type: none"> <li>• Information board, shall cater to way finding &amp; general information regarding the market areas in ABD.</li> <li>• The Information Panel shall be a light box on a stand having display area of dimension 600-900mm x 900-1200mm, on two sides.</li> <li>• It shall not hinder pedestrian movement.</li> <li>• The metal body shall be powder coated and with graphic imprints</li> <li>• Provide an internal structure sufficient to support the sides of the board and end and face panels and to ensure that the board unit remains centred and secured to pole. The internal structure shall be a one piece extrusion or welded module.</li> </ul>
b	• Materials	<ul style="list-style-type: none"> <li>• Centre Support Plate or Plates, as Applicable: Aluminium plate, minimum 0.25 inch thickness.</li> <li>• End plates: Aluminium plate, thickness as determined by structural design.</li> <li>• Recommended material shall be steel, aluminium, acrylic and tempered glass for better durability. All the steel parts shall be HDG –Hot dip galvanized and Aluminium parts shall be anodized or powder coated to give longer life and better quality.</li> <li>• The Foundation slab shall be made in min M25 concrete. The cast iron, nuts bolts, shall be rust proof, deep galvanized, powder coated etc.</li> </ul>
c	• Maintenance	<ul style="list-style-type: none"> <li>• The furniture shall be regularly cleaned &amp; all mechanical parts to be maintained by periodic servicing.</li> <li>• The display shall be cleaned periodically.</li> <li>• All the metal parts shall be coated for rust protection.</li> </ul>
d	• Vandalism-proof	<ul style="list-style-type: none"> <li>• Furniture parts shall be structurally safe, strong, and safely secured to its foundation with anchor fasteners or chemical fasteners which make the furniture more stable and joint fasteners not visible from outside.</li> <li>• Joints shall be fastened using anti-theft mechanism which can be operated only by specially designed keys.</li> </ul>
e	• Security & Safety	<ul style="list-style-type: none"> <li>• All surfaces shall be smooth without sharp angles &amp; non flammable.</li> </ul>

f	• Durability parameter	<ul style="list-style-type: none"> <li>• The stainless steel shall be treated to be resistant in all weathers.</li> <li>• The glass/acrylic shall be assembled with gaskets properly.</li> <li>• The furniture shall be made from materials unaffected by outdoor exposure.</li> </ul>
g	• Design parameter	<ul style="list-style-type: none"> <li>• Looks shall be elegant and smooth curves which make it aesthetically good &amp; appealing befitting the ABD.</li> </ul>
h	• Co-ordinated design	<ul style="list-style-type: none"> <li>• All information board shall be of uniform shape, size, colour on the same width of the road.</li> </ul>
i	• Modular	<ul style="list-style-type: none"> <li>• Modular design is recommended for Street Furniture</li> </ul>
j	• Environment	<ul style="list-style-type: none"> <li>• As far as possible recyclable materials shall be used for Street Furniture</li> </ul>
k	• Universal design	<ul style="list-style-type: none"> <li>• The furniture should also cater to differently abled users. Design and manufacture should comply with ISO requirements.</li> </ul>
l	• Innovation parameter	<ul style="list-style-type: none"> <li>• The design should be innovative in terms of adaptability in local context, compliant to local statutory norms, sustainable, cost effective, and responsive smart features as indicated in Smart City Mission guidelines issued by MoUD.</li> </ul>

#### CITY INFORMATION PANEL (CIP)

a	• Function & Sizing	<ul style="list-style-type: none"> <li>• City Information Panel shall be installed at major public spaces, &amp; in the market areas, equipped with touch/ smart panels.</li> <li>• CIP shall be display equipment with information area 600-900mm x 600-900mm double sided.</li> <li>• The metal body shall be powder coated and with graphic imprints.</li> </ul>
b	• Materials	<ul style="list-style-type: none"> <li>• It shall be made of Aluminium frame work as SF - 03, 8 mm toughened glass and electronic circuit to control its lighting, &amp; the touch panel.</li> <li>• It shall have 2 glazed doors, hinged on top of panel and kept in open position with gas struts.</li> <li>• The structure shall be designed to withstand wind load according to regulations.</li> <li>• Use of steel, aluminium &amp; toughened glass/acrylic for better durability. The Foundation slab shall be made in min M25 concrete. The cast iron, nuts bolts, shall be rust proof, deep galvanized, powder coated etc.</li> <li>• The screen shall be of Touch screen LED Display (integrated)</li> </ul>
c	• Maintenance	<ul style="list-style-type: none"> <li>• The furniture shall be regularly cleaned &amp; all mechanical parts to be maintained by periodic servicing.</li> <li>• The display shall be cleaned periodically.</li> <li>• All the metal parts shall be coated for rust protection.</li> </ul>
d	• Vandalism-proof	<ul style="list-style-type: none"> <li>• Furniture parts shall be structurally safe, strong, and safely secured to its foundation with anchor fasteners or chemical fasteners which make the it more stable and joint fasteners not visible from outside.</li> <li>• Joints shall be fastened using anti-theft mechanism which can be operated only by specially designed keys.</li> </ul>

e	• Security & Safety parameter	<ul style="list-style-type: none"> <li>• There shall be no falling parts involved in the furniture all the parts shall be well fastened. The foundation used shall be designed in order to take loads from wind and persons leaning over the panel.</li> <li>• All surfaces shall be smooth without sharp angles &amp; non flammable.</li> <li>• The display shall not overhang on the road to avoid any accident by passing vehicle.</li> </ul>
f	• Durability parameter	<ul style="list-style-type: none"> <li>• The stainless steel shall be treated to be resistant in all weathers.</li> <li>• The material used shall be unaffected by outdoor exposure</li> <li>• The material shall be Non flammable. LED screen should be water proof and dust resistant</li> </ul>
g	• Design parameter	<ul style="list-style-type: none"> <li>• The body shall have printed graphic celebrating the Smart City theme.</li> </ul>
h	• Co-ordinated design	<ul style="list-style-type: none"> <li>• All CIP shall be of uniform shape, size, colour on the same width of the road. The location of the CIP shall be near the public buildings, market areas, &amp; public areas like bus stops etc.</li> </ul>
i	• Modular	<ul style="list-style-type: none"> <li>• Modular design is recommended for Street Furniture</li> </ul>
j	• Environment	<ul style="list-style-type: none"> <li>• As far as possible recyclable materials shall be used for Street Furniture</li> </ul>
k	• Universal design	<ul style="list-style-type: none"> <li>• The furniture should also cater to differently abled users. Design and manufacture should comply with ISO requirements.</li> </ul>
l	• Innovation parameter	<ul style="list-style-type: none"> <li>• The design should be innovative in terms of adaptability in local context, compliant to local statutory norms, sustainable, cost effective, and responsive smart features as indicated in Smart City Mission guidelines issued by MoUD.</li> </ul>

**800 TRAFFIC SIGNS, MARKINGS AND OTHER ROAD APPURTENANCES**

Please refer to Clause 800 Traffic Signs, Markings and other road appurtenances, “in Specifications for road and bridge works”, (Fifth Revision) Ministry of Road Transport and Highways, Published by Indian Road Congress, New Delhi 2013.

**900 QUALITY CONTROL**

Please refer to Clause 900, Quality Control for Road works in “Specifications for road and bridge works”, (Fifth Revision) Ministry of Road Transport and Highways, Published by Indian Road Congress, New Delhi 2013.

**3000 MAINTENANCE OF ROAD**

Please refer to Clause 3005, Maintenance of Cement Concrete Road in “Specifications for road and bridge works”, (Fifth Revision) Ministry of Road Transport and Highways, Published by Indian Road Congress, New Delhi 2013.

**Paver Blocks**

Providing and fixing pre-cast Rubber Dye inter locking concrete block 60mm thick with grade of concrete M200 pneumatic compressed by mechanically pressed and as per approved design including 75mm Sand layer for levelling and filling the joint with sand in proper line and level etc complete.

**Scope work:**

The scope of work includes supplying and laying of precast paver blocks at site, as mentioned in the Item. All relevant provisions of IS 15658:2006 shall apply. Laying of paver blocks at site as per requirement in technical specification, within shortest possible time. The site is public place hence care should be taken to ensure that the routine activities shall not be disturbed. The job of laying may be required to be carried out during night also. The work shall be executed in perfect line and level as per instructions of Engineer in charge. Colored concrete paver blocks shall be manufactured as per specifications using approved color pigment. The color shade shall be as selected by employer before commencement of the work. The contractor shall guarantee that all material and components designed, fabricated, supplied and laid by him shall be free from any type of defect due to faulty material and/Workmanship/erection.

**Continuity and Consistency**

It is mandatory for footpaths to be continuous between junctions or where at-grade crossing is provided. A change in colour of pavers can emphasize and highlight the crossing area to all users. Consistency of design elements, colour and texture should provide visual continuity. Footpath interruptions must be avoided by minimizing cuts in kerbs. These acts

traffic calming measures and make such conflict points safer. Entrances, exits, side properties, gates and service lanes shall be accommodated by following points:

- Raised crossings, where the car lanes are raised by ramps of slope (1:10) and brought to the level of the footpath (+150 mm from carriageway).
- The pavers on the footpath shall continue over the raised crossings with vehicle load taken in to account for the area subjected to vehicular traffic.
- Minimize the number of driveways crossing the footpath shall be minimized to support pedestrian safety and continuous footpath.
- The continuity of footpath in the public right of way shall be maintained, incorporating existing wall openings, steps and other features that might obstruct the walkway.
- Connection for missing link shall be provided by installing footpath to connect pedestrian areas to each other.

Every change in level on the footpath (steps, kerbs or road-works) shall be made clearly visible through the use of bright contrasting colours and tactile pavers for persons with low vision impairment.

. Regular maintenance of footpath will ensure uninterrupted accessibility. Maintenance shall prevent or replace cracked and uneven paving slabs and those with loose joints, as they become tripping hazards and are difficult to walk on. They also cause puddles to form and can become slippery. The selection of paving materials should therefore be guided by the ease of repair and maintenance. These should be regularly checked before, during and after rains.

If the contractor fails to execute the repair Works in time, the same shall be carried out at his risk and cost. The mode of measurement shall be on Smt. basis.