

SCHEDULE 2

DESIGN AND CONSTRUCTION STANDARDS

1. Road design

1.1 List of Standards and Specifications for road design

- (a) Road Design Manual - Part I – Geometric Design of Rural Roads, January 1979, Road Department, Ministry of Works, Republic of Kenya
- (b) Road Design Manual - Part III - Materials and Pavement Design, August 1987, Road Department, Ministry of Works, Republic of Kenya
- (c) Technical Standard of Highway Engineering (JTG B01-2014)
- (d) Code for Design of Urban Road Engineering (CJJ 37-2012)
- (e) Design Specification for Highway Alignment (JTG D20-2017)
- (f) Specification for Design of Highway Subgrades (JTG D30-2015)
- (g) Guidelines for Design of Highway Grade-separated Intersections, JTG/T D21-2014.2
- (h) Specifications for Design of Highway Asphalt Pavement (JTD D50-2017)

1.2 Functional & Geometrical requirement

- (a) Road Classification: Class A.
- (b) Design Speed: Shall be in accordance with relevant design standards mentioned in 1.1 50km/h for ramps where possible.

1.3 Road cross section

The requirements for the cross sections of the Project Road are outlined in Table A-1.

Table A-1 - Typical Cross section of main line

Classification	Width			
	Mainline (m)	Single-lane Ramp (m)	Two-lane Ramp(m)	Two-lane Ramp(m)
Traffic lane	3.5×4/3.5×6	4.0	3.5×2	3.5×2

Classification	Width			
	Mainline (m)	Single-lane Ramp (m)	Two-lane Ramp(m)	Two-lane Ramp(m)
Hard Shoulder	2.5	2.0	1.0	1.0/2.5
Crash barrier	0.5	0.5	0.5	0.5
Median	1.6	0	0	0
Total Width	21.6/28.6	9.0	10.0	12.0

The vertical clearance above the carriageway shall be minimum 5.8m.

The vertical clearance above the rail shall be minimum 7.6m.

1.4 Horizontal Alignment

The horizontal profile parameters shall comply with the design standards mentioned in 1.1.

1.5 Vertical Alignment

The vertical profile parameters shall comply with the design requirements in those standards mentioned in 1.1.

2. Bridge design

List of Standards and Specifications for the bridge design includes:

- (a) General Specifications for Design of Highway Bridges and Culverts (D60-2015)
- (b) Wind-resistant Design Specification for Highway Bridges (JTG/T 3360-01-2018)
- (c) Specification of Seismic Design for Highway Engineering (JTG B02-2013)
- (d) Specifications for Design of Highway Reinforced Concrete and Prestressed Concrete Bridges and Culverts (JTG 3362-2018)
- (e) Specifications for Design and Construction of Highway Steel-Concrete Composite Bridge (JTG/T D64-01-2015)
- (f) Code for Design of Ground Base and Foundation of Highway Bridges and Culverts (JTG D63-2007)
- (g) Specifications for Design of Highway Steel Bridge (JTG D64-2015)

3. Drainage Work Design

The drainage design shall be designed in accordance with the following specifications.

- (a) Specifications for Drainage Design of Highway (JTG/T D33-2012)
- (b) Peak Flood Flow to be calculated by
- (c) TRRL East Africa Flood Model
- (d) (Transport and Road Research Laboratory)
- (e) Rational Method
- (f) Modified Rational Method (Rainfall Frequency Atlas)

4. Road furniture design

The Project Company shall provide warning road signs, direction signs and regulatory road signs and all road signs necessary for safe and effective traffic operations. The road signs shall be in accordance with Kenya national standards.

Sign boards dimensions for all road signs shall be suitable for a traffic speed of 80km/h for the Mainline, and 50km/h (where possible) for the Ramp.

The road furniture design shall be designed in accordance with the following specifications:

- (a) Standard for Lighting Design of Urban Road, The Republic of Kenya
- (b) Manual for Design Electric Power Supply Systems, The Republic of Kenya
- (c) Technical Specification Expressway Surveillance System, #3 Announcement, Ministry of Transport of People's Republic of China, 2012
- (d) Communication Rules of the Devices of Surveillance and Control System for Expressway (GB/T 34428.2-2017)
- (e) Network Tolling System for Toll Highway, #35 Announcement, Ministry of Transport of People's Republic of China, 2007
- (f) Highway Toll Collection Mode (GB/T 18277-2000)
- (g) Highway Toll Collection Manner (GB/T 18367-2001)

5. Road Marking design

The Road Marking design shall be designed in accordance with the following specifications:

- (a) Manuals for Traffic Signs and Road Marking (The Republic of Kenya)
- (b) Design Specifications for Highway Safety Facilities, JTG D81-2017
- (c) Specification for Layout of Highway Traffic Signs and Markings, JTG D82-2009

6. Toll station & Operation and Maintenance center design

6.1 Buildings Works Design

The building works design shall be designed in accordance with the following specifications:

- (a) KEBS/TC 077 Cements and Lime
- (b) KEBS/TC 078 Concrete and concrete products
- (c) KEBS/TC 079 Steel
- (d) KEBS/TC 080 Timber and timber products
- (e) KEBS/TC 083 Refractories
- (f) KEBS/TC 134 Construction technology
- (g) KEBS/TC 135 Sanitation and water treatment

The specifications for reference include:

- (a) Code for Design of Civil Buildings (GB50352-2005)
- (b) Code for Design of Dormitory Building (JGJ36-2016)
- (c) Code for Fire Protection Design of Buildings (GB 50016-2014)
- (d) Unified Standard for Reliability Design of Building Structures (GB50068-2018)
- (e) Load Code for the Design of Building Structures (GB50009-2012)
- (f) Standard for Classification of Seismic Protection of Buildings Constructions (GB50223-2008)

- (g) Code for Seismic Design of Buildings (GB50011-2010)
- (h) Code for Design of Masonry Structures (GB50003-2011)
- (i) Code for design of building foundation (GB50007-2011)

6.2 Electrical Works Design

The electrical engineering design shall be designed in accordance with the following specifications:

- (a) Code for Electrical Design of Civil Buildings (JGJ 16-2008)
- (b) Code for Design Protection of Structures against Lightning (GB 50057-2010)
- (c) Code for Acceptance of Construction Quality of Building Electrical Engineering (GB 50303-2015)

7. Environmental protection

The Project Company shall comply with the Applicable Law and the requirements indicated in the NEMA Licence.

8. Construction standards

The construction standards for the construction of the Works include:

- (a) Standard Specification for Road and Bridge Construction, Ministry of Transport and Communication, Republic of Kenya
- (b) Road Design Manual - Part III - Materials and Pavement Design, August 1987, Road Department, Ministry of Works, Republic of Kenya
- (c) Technical Specifications for Construction of Highway Asphalt Pavement (JTG F40-2004)
- (d) Technical Guidelines for Construction of Highway Road Base (JTG/T F20-2015)
- (e) Steel for the Reinforcement of Concrete – Part 2: Hot Rolled Ribbed Bars (GB/T 1499.2-2018)
- (f) Specification for Welding and Acceptance of Reinforcing Steel Bars (JGJ 18-2012)
- (g) Code for Acceptance of Construction Quality of Steel Structures (GB 50205-2001)

- (h) Code for Acceptance of Constructional Quality of Masonry Structures (GB 50203-2011)
- (i) Code for Quality Acceptance of Concrete Structure Construction (GB 50204-2015)
- (j) Technical Specification for Construction of Highway Bridge and Culvert (JTG/T F50-2011)
- (k) Technical Standard of Highway Engineering (JTG B01-2014)
- (l) Standard of Climatic Zoning for Highway (JTJ 003-1986)
- (m) Parallel Thread Rebar Splice with Upsetting End (JG 171-2005)
- (n) Inspection and Evaluation Quality Standards for Highway Engineering-Section 1 Civil Engineering (JTG F80/1-2017)
- (o) Inspection and Evaluation Quality Standards for Highway Engineering-Section 2 Electrical and Mechanical Engineering (JTG F80/1-2004)
- (p) Specification for Steel Component Anticorrosion of Highway Engineering (GB/T 18226-2015)
- (q) Laminated Bearing for Highway Bridge (JT/T 663-2006)
- (r) Steel Strand for Prestressed Concrete (GB/T 5224-2014)
- (s) Highway Bridge Expansion and Contraction Installation (JT/T327-2004)
- (t) Standard for Construction Safety Inspection(JGJ59-2011)

