



**ROADS DEPARTMENT OF MINISTRY OF
REGIONAL DEVELOPMENT AND
INFRASTRUCTURE OF GEORGIA**

**Preparation of Detailed Design for the
Upgrading of Tbilisi-Sagarejo and Sagarejo –
Bakurtsikhe Road Sections**

ROAD LIGHTNING

CONSTRUCTIONAL LOT 0

ACTIVITY 2

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**AECOM Ltd
ILF CONSULTING ENGINEERS**

Feldkreuzstraße 3, A-6063 Rum / Innsbruck, Austria
Tel: +43 512 2412-0 / Fax: +43 512 2412-5900
E-Mail: info.ibk@ilf.com



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1 GENERAL

Upgrading of Tbilisi-Bakurtsikhe, Tsnori-Lagodekhi Road and Detailed Design for the Upgrading of Tbilisi-Sagarejo and Sagarejo-Bakurtsikhe Road Project

Section from Tbilisi to Sartichala a two-way highway. In each direction the road has two lines of 3.75m width each and 2.50m and 1.0m wide roadsides. Total width of each way of the road is 11.0m, and there is the 3.0m wide demarcation strip between the ways.

In areas where highway crosses rivers and ravines, at variable relief sections and passages under the main road the highway runs on bridges. Opposite direction ways of road have separate parallel bridge structures. Width of road on each bridge structure is 11.0m. On bridges roads have 1.3m wide pedestrian walkways on one side. Pedestrian walkways and communication galleries are separated from road paving with protective barrier. Distance between parallel structures of bridges is 3.0m.

1.1 COMPONENTS OF ROAD LIGHTING NETWORK

Designed road lighting network comprises the following main components:

- 0,58/0,23kV voltage power distribution cable lines from connection points to lighting posts and lighting fixtures.

Power supply of LOT-0 is realized from SSP1 6/1 kV transformer substation of Lot1:

Lighting posts with lighting fixtures are divided into the following groups:

- Type “I” with 1x101W – 8.0m high lighting post on point foundation, without boom, lighting fixture inclination 20°.
- Type “III” with 1x101W – 8.0m high lighting post on point foundation, without boom, lighting fixture inclination 15°.
- Type “II” with 2x101W – 10.0m high lighting post on point foundation, with two-boom, boom inclination 5°
- Type “V” with 2x101W – 12.0m high lighting post on point foundation, with two-boom, boom inclination 5°
- Luminaire 36.8W – installed under bridge structure

2 ELECTRIC-TECHNICAL PART

2.1 1 KV LIGHTING NETWORK

Road lighting design is prepared with account of requirements of the Rules of Installation of Electrical Equipment” (ПУЭ) and Construction Standard СНиП 23-05-95 “Natural and Artificial Lighting”. Norms of lighting, restrictions on light flow from lighting fixtures, lighting pulsations and other qualitative parameters of lighting equipment and lighting systems are taken into account

in selection of road lighting system in according to requirements of normative documents enforced in Georgia. Selected lighting fixtures comply with fire safety norms.

In accordance with the Rules of Installation of Electric Equipment for lighting network the TN-C system of grounding is used (Article 1.7.61). For efficiency of TN-C system the earthing conductors should be indissoluble and safely connected to ground. Cross section of Neutral conductor is the same as cross section of Live (Phase) conductors (Article 6.1.31). Grounding of metal housing of lighting fixtures is arranged by connection of grounding pin to PEN conductor.

Metal posts that are installed on reinforced concrete foundations have connection to steel structure and steel bar reinforcement mesh of the foundation. Entrance of cables into body of posts is arranged via socle of post. Connection clamps and fuse are placed in the socle (Article 6.3.33). Wiring inside the body of post should be made with insulated wires in protective coating (double insulation) or with 3x1,5 mm² NYM cables (Article 6.3.34).

Distance between the road lighting posts on highway and the bridge is 40.0m.

Calculation was carried out to determine the height of lighting posts and elevation of lighting fixtures from road level based on normative illumination, lighting bulb power, distance between posts and width of road.

For each cross section of road was carried lighting calculations, see annexes.

Structure of foundations of lighting posts provides possibility for input-output of 1kV/0.23kV voltage cables to hollow space in body of posts from below. On each post is planned to install one voltage transformer 0.58/0.23 kV, for feeding of lighting fixtures..



TERMINATIONS AND FUSES INSIDE OF POLES

2.2 MAIN PARAMETERS OF LIGHTING POSTS AND LIGHTING FIXTURES

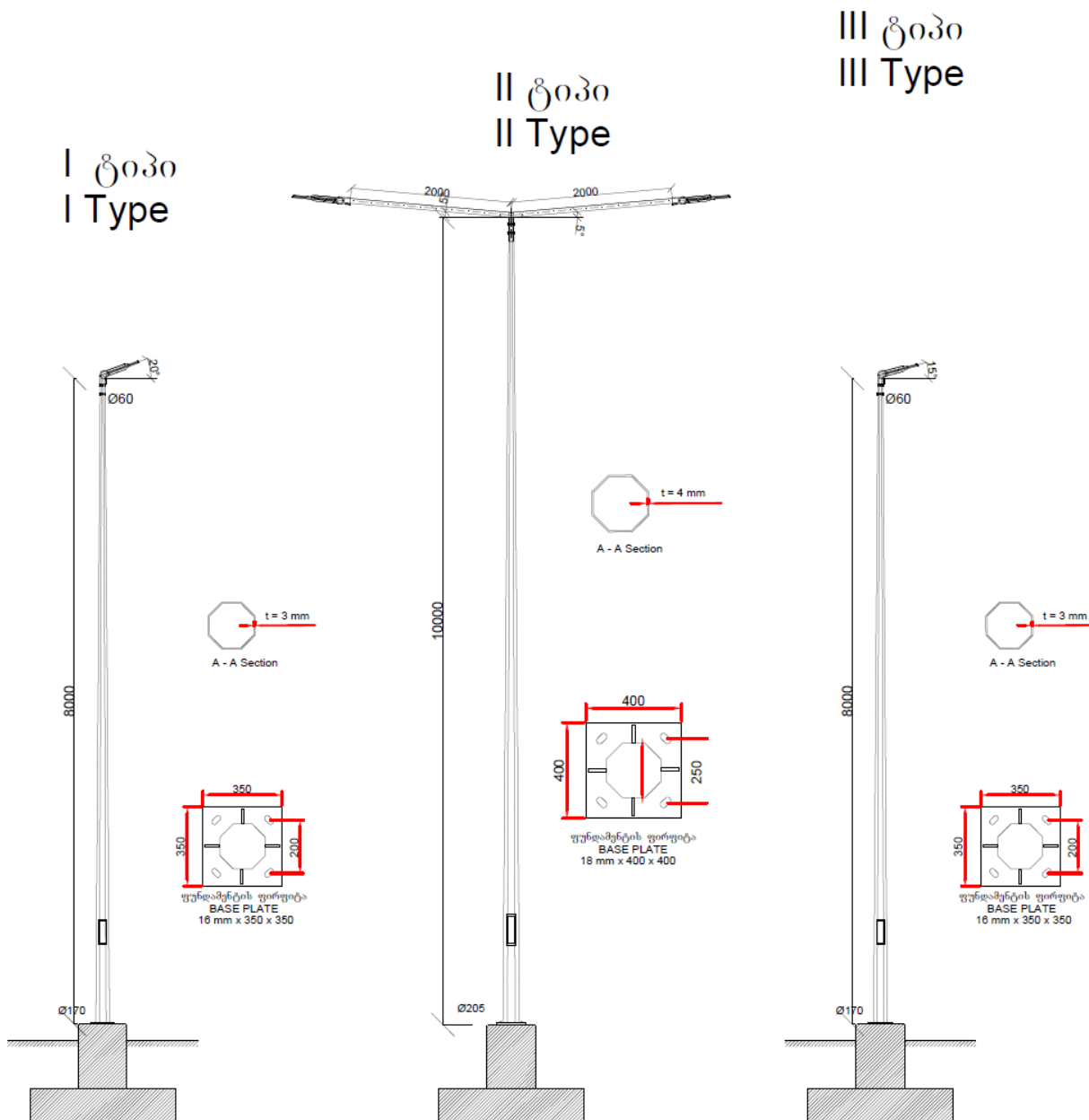
Lighting posts:

12.0m high, with 5.0mm wall thickness, octagonal cross section, conical shape, galvanized stainless steel, with bottom flange for anchoring D220mm, diameter at posts and fixture arm connection D60mm, arm diameter D60mm.

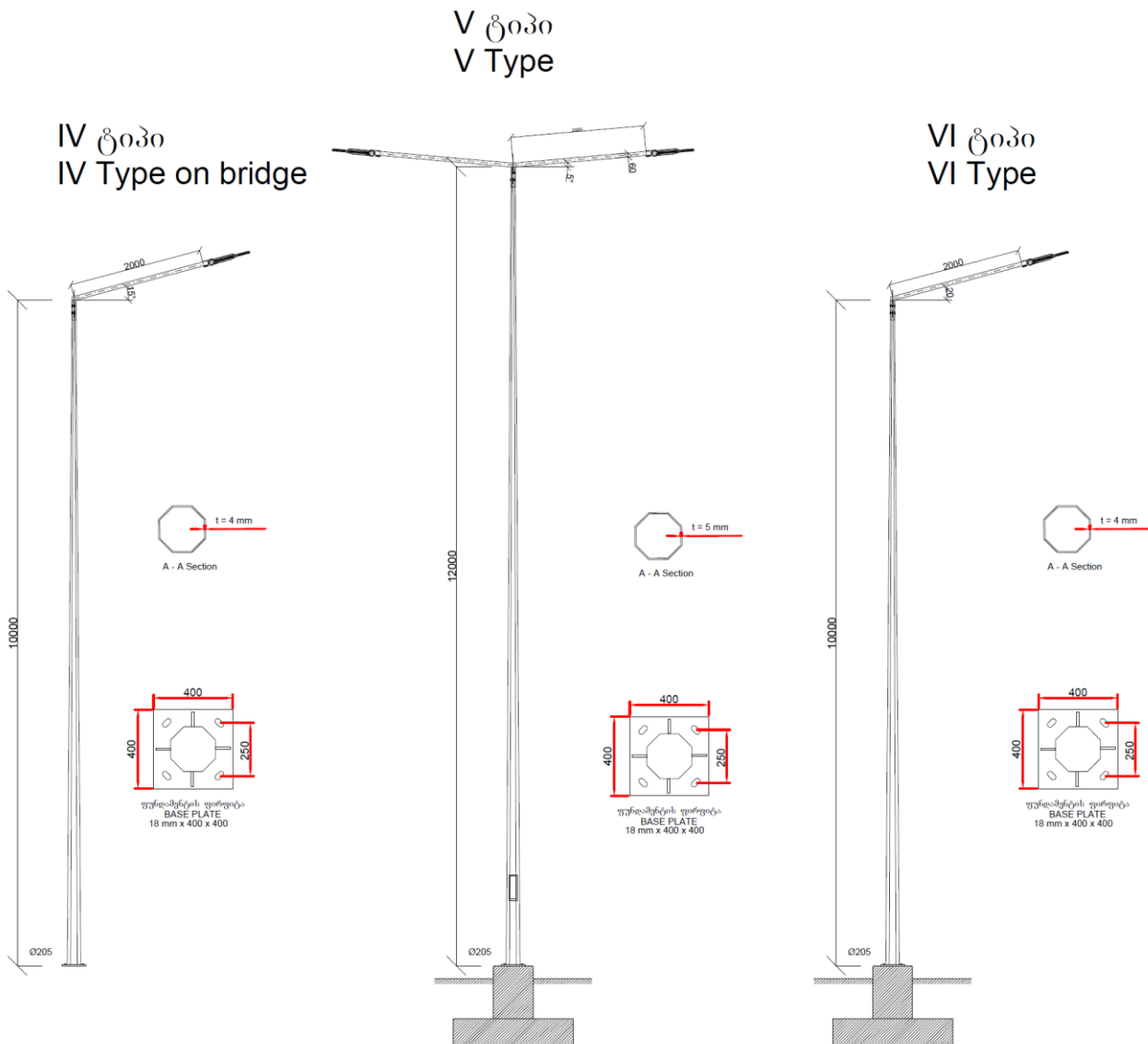
10.0m high, with 4.0mm wall thickness, octagonal cross section, conical shape, galvanized stainless steel, with bottom flange for anchoring D205mm, diameter at posts and fixture arm connection D60mm, arm diameter D60mm.

8.0m high, with 3.0mm wall thickness, octagonal cross section, conical shape, galvanized stainless steel, with bottom flange for anchoring D170mm, diameter at posts and fixture arm connection D60mm, arm diameter D60mm.

- galvanized post, metal standard S235;
- posts should be manufactured to resist maximal wind speed 150km/h;
- posts should be fixed on foundation anchors by means of bolts;
- in lower part posts should have connection boxes, where distribution panel and cables will be installed;
- distribution panel should be equipped with bolted clamps and one fuse (or automatic switch) with nominal current 6A;
- bottom part of post installed on anchors, fixing bolts should be covered with cement grout after installation of post.



GENERAL VIEW OF "I", "II" AND "III" LIGHTING POSTS



GENERAL VIEW OF “IV”, “V” AND “VI” LIGHTING POSTS

Lighting fixtures with bulbs on highway:

Power – 101W,

Color temperature – 4000K,

Illumination range (Nominal LED flow) – 12500Lm -13000Lm,

Luminous efficacy: 124.2 lm/W

Protection grade – IP66,

LED light-bulb,

Nominal voltage – 96-265 V,

Frequency – 50-60Hz,

Lighting fixtures with bulbs on highway:

Power – 36.8W,

Color temperature – 4000K,

Illumination range (Nominal LED flow) – 3500Lm -5000Lm,

Luminous efficacy: 115 lm/W

Protection grade – IP66,

LED light-bulb,

Nominal voltage – 96-265 V,

Frequency – 50-60Hz

Protection degree of optical part – IP66 standard IEC-EN60598 Protection degree of control part –
IP66 standard IEC-EN60598 Protection degree of glass from shocks – IK09 standard IEC-EN62262
Electric class I or II (European – IEC-EN60598, USA – CL1)

Housing material – aluminum, high pressure punching, floodlight protection – glass

Fixing: universal fixing with 60mm threaded pin



GENERAL VIEW OF LIGHTING FIXTURE

3 TECHNICAL REGULATIONS AND STANDARDS USED IN DESIGN ARE THE FOLLOWING

СНП 23-05-95 – Natural and Artificial Lighting; ПУЭ – Rules of Installation of Electrical Equipment; СП 35.13330.2011 – Bridges and Pipes;

EN 206-1:2009 – Concrete. Part 1. Requirements, parameters, manufacturing and correspondence; EN 1539:2009 – Performance of Special Geo-Technical Works. Drilled Piles;

EN 12464-2:2007 – Lighting of Working Areas. External Lighting; EN 40-2:2009 – Lighting Posts. Part 2. General Requirements;

EN 40-5:2009 – Lighting Posts. Part 5. Requirements on Steel Posts; BS 5489-1:2003 – Practical Manual of Road Lighting