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**Specifications for high accuracy expression of route and
facility elements of electronic highway map**

电子公路图路线及沿线设施要素 高精度表达规范

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Specifications for high accuracy expression of route and facility elements of electronic highway map

1 Scope

This document specifies basic requirements, element selection rules and classification as well as the expression specifications for high accuracy expression of route and facility elements of electronic highway map.

This document applies to the production of electronic highway maps and the development of related information systems.

2 Normative references

This document has no normative references.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 electronic highway map

The highway map that is digitally stored and used via computer technology.

3.2 relative accuracy

The ratio of the absolute error to the true value.

NOTE: Relative accuracy also refers to the ratio between the absolute distance deviation value and the true value between two measurement objects.

3.3 absolute accuracy

In a specific coordinate system, the distance difference between the coordinate value measured by the measuring instrument and the real coordinate value of the measurement object.

4 Basic requirements

4.1 Coordinate system

The 2000 National Geodetic Coordinate System (CGCS2000) shall be used.

4.2 Elevation datum

The 1985 national elevation datum shall be used.

4.3 Projection

Data producers can specify the projection method of the data set according to the relevant national regulations and the needs of data users.

4.4 Dataset storage

Electronic highway map data can be managed hierarchically according to element content. Mapping areas are managed in blocks according to administrative divisions or rectangular map sheets.

5 Element selection rules and classification

5.1 Selection rules

In the highway route and the facilities along the route, select elements that require high accuracy expression in fine highway management, vehicle-highway coordination, and automated driving. The elements not covered in this document are regulated by the data producers themselves according to the relevant national regulations and the needs of data users.

5.2 Classification

According to the selection rules of 5.1, the elements that need high accuracy expression in the electronic highway map are divided into four categories: basic elements, traffic safety facility elements, service and management facility elements, and other highway facility elements. Each category is subdivided into several subcategories.

The electronic highway map route and the classification of facilities along the route are shown in Figure 1.

6.2.4 Route intersection

6.2.4.1 Element definition

A route intersection is the intersection of two or more roads.

Route intersection is divided into:

- Plane intersection: the intersection of road and road in the same plane. The forms mainly include straight intersection, oblique intersection, circular intersection, T-shaped intersection, and dislocation intersection;
- Overhead intersection: the three-dimensional space intersection of road and road or road and railway at different elevations. The forms mainly include separated overhead intersection, intercommunicate overhead intersection and cloverleaf overhead intersection.

[Source: Section 3 Road Intersection, Chapter 4, JTJ 002-1987, modified]

6.2.4.2 Element attributes

The attributes of route intersection elements shall include number, name, type, intersection spacing, design service level, and approach road sight distance.

6.2.4.3 Geometric expression specification

The plane intersection geometry shall be expressed by point elements (division and confluence) or area elements (plane intersections). The overhead intersection geometry is expressed by area elements.

6.2.4.4 Spatial geometry acquisition method

A plane intersection is a ramp or level crossing. The ramp intersection obtains route intersection. The level crossing obtains intersection area. The spatial geometry acquisition method of typical category plane intersection is shown in Figure 6.

The overhead intersection is the intersecting area surface of a highway and a highway OR a highway and a railway three-dimensional space. Figure 7 shows the spatial geometry acquisition method of typical overhead intersection.

characters, patterns, facade marks, physical marks, protruding road signs and contour marks drawn or installed on the road.

[Source: GB 5768.3-2009, 3.1]

According to the expression form of road traffic markings, it is divided into four categories: lines, characters, protruding road signs and contour marks.

6.3.1.2 Lines

6.3.1.2.1 Element definition

Lines are solid or dashed lines applied to pavements, curbs, or facades.

[Source: GB 5768.3-2009, 3.5]

6.3.1.2.2 Element attributes

The attributes of line elements shall include number, type, function, color, highway to which it belongs, and lane to which it belongs.

6.3.1.2.3 Geometric expression specification

The geometry of lane lines, deceleration markings, and stop lines shall be expressed by linear elements.

The geometry of diversion strips and pedestrian crossing lines shall be expressed by surface elements.

6.3.1.2.4 Spatial geometry acquisition method

Lane line obtains the straight line or broken line of the center position of the actual boundary line. If the scene is double-line, it needs to obtain the double-line. If there is no actual lane boundary line or is missing, the virtual lane boundary line shall be obtained according to the scene. The spatial geometry acquisition method of lane lines is shown in Figure 8.

The diversion line gets the outermost polygonal wireframe of its outline. The direction is clockwise. See Figure 9 for the schematic diagram of the spatial geometry acquisition method of the diversion line.

The pedestrian crossing line gets its outline outermost polygonal wireframe. The spatial geometry acquisition method of pedestrian crossing lines is shown in Figure 10.

The deceleration line gets a straight or broken line along the inside of the lane. See Figure 11 for the spatial geometry acquisition method of the deceleration line.

The stop line single-line or double-line obtains the straight line at the innermost position in the direction of travel. The spatial geometry acquisition method of the stop line is

6.3.2 Traffic signs

6.3.2.1 Element definition

Road traffic signs refer to facilities that convey information to road users in terms of color, shape, content, text, and graphics, and are used to manage traffic.

[Source: GB 5768.2-2009, 3.1]

The elements of road traffic signs include warning signs, prohibition signs, instruction signs, guide signs, tourist area signs, work area signs, notice signs and other auxiliary signs.

6.3.2.2 Element attributes

The attributes of road traffic sign elements shall include number, type, color, shape, character, image, highway to which they belong, and lane to which they belong.

6.3.2.3 Geometric representation specification

The geometry of road traffic signs shall be expressed by surface elements.

6.3.2.4 Spatial geometry acquisition method

Road traffic signs obtain the circumscribing surface along the actual outer contour clockwise.

The spatial geometry acquisition method of typical types of road traffic signs is shown in Figure 18.

Figure 18 -- Schematic diagram of the spatial geometry acquisition method of road traffic signs (continued)

6.3.3 Guardrails

6.3.3.1 Element definition

Guardrail refers to a belt-shaped energy-absorbing structure set on the outside of the roadway or the central divider. When a vehicle collides, it absorbs the collision energy through self-deformation or vehicle climbing, thereby reducing the degree of injury to the occupants.

[Source: JTG B05-01-2013, 2.0.1]

6.3.3.2 Element attributes

The attributes of guardrail elements shall include number, type, protection level, and the highway to which they belong.

6.3.3.3 Geometric expression specification

Guardrail geometry shall be represented as linear elements.

6.3.3.4 Spatial geometry acquisition method

The guardrail gets a straight or broken line of the top inside edge. See Figure 19 for the spatial geometry acquisition method of the guardrail.

inspection, forestry, environmental protection. The inspection/testing station is a comprehensive element, including lanes, safety facilities, other facilities, and inspection station surfaces.

6.4.2.2 Element attributes

The element attributes of inspection/testing station shall include number, name, type, and highway of the inspection station.

The attributes of lanes, safety facilities and other facility elements in the inspection/testing station shall comply with the provisions of 6.2 and 6.3.

6.4.2.3 Geometric representation specification

The surface geometry of inspection/testing station shall be expressed by surface elements.

The geometric expression specifications of lanes, safety facilities and other facility elements in the inspection/testing station shall comply with the provisions of 6.2 and 6.3.

6.4.2.4 Spatial geometry acquisition method

Inspection/testing station surface gets the polygonal polygon of the outermost area at the top of the inspection box. See Figure 22 for an illustration of the spatial geometry acquisition method of the inspection/testing station surface.

The spatial geometry acquisition method of lanes, safety facilities and other facility elements in the inspection/testing station shall comply with the provisions of 6.2 and 6.3.

6.4.3 Parking lot

6.4.3.1 Element definition

A parking lot refers to a place outside the road for storing vehicles. The parking lot is a comprehensive element, including the lanes in the parking lot, safety facilities, other facilities, parking surfaces, parking spaces.

[Source: JTJ 002-1987, 4.4.24, modified]

6.4.3.2 Element attributes

The element attributes of the parking lot shall include number, name, entrance and exit width, channel slope, and the highway to which it belongs.

Parking spaces include motor vehicle parking methods, minimum parking space width, and lane width and other attributes.

The attributes of lanes, safety facilities and other facility elements in the parking lot shall comply with the provisions of 6.2 and 6.3.

6.4.3.3 Geometric expression specification

The parking lot surface and parking space geometry shall be represented by surface elements.

The geometric expression specifications of lanes, safety facilities and other facility elements in the parking lot shall comply with the provisions of 6.2 and 6.3.

A toll plaza is a place where a toll road is widened at a certain position to set up multiple toll lanes. It is divided into two main lines and interchange ramps.

[Source: GB/T 18277-2000, 3.8, modified]

6.4.4.2 Element attributes

The element attributes of the toll plaza shall include number, name, number of toll lanes, width of toll lanes, and the highway to which they belong.

The attributes of lanes, safety facilities and other facility elements in the toll plaza shall comply with the provisions of 6.2 and 6.3.

6.4.4.3 Geometric expression specification

Toll plaza polygon geometry shall be represented by polygonal elements.

The geometric expression specifications of the lanes, safety facilities and other facility elements in the toll plaza shall comply with the provisions of 6.2 and 6.3.

6.4.4.4 Spatial geometry acquisition method

Toll plaza surface get the polygonal polygons of the outermost area. See Figure 25 for the spatial geometry acquisition method.

The spatial geometric collection method of lanes, safety facilities and other facility elements in the toll plaza shall comply with the provisions of 6.2 and 6.3.

6.5 Other elements of highway facilities

6.5.1 Rod-shaped objects

6.5.1.1 Element definition

Rod-shaped objects refer to cylindrical or rectangular objects used to support road

6.5.3 Roadside monitoring and communication equipment

6.5.3.1 Element definition

Roadside monitoring and communication equipment refers to the roadside equipment formed in the monitoring system and vehicle-highway coordination system. It includes radar, camera, vehicle detector, and other vehicle detection units, computing processing units, communication units. It is used for acquisition, transmission, and analysis of road traffic data, so as to realize the real-time supervision of traffic operation status, as well as vehicle-vehicle and vehicle-highway dynamic real-time information interaction and collaboration.

6.5.3.2 Element attributes

The element attributes of roadside monitoring and communication equipment shall include number, type, angle, coverage, relative road orientation, highway to which it belongs, and lane to which it belongs.

6.5.3.3 Geometric expression specification

The geometry of roadside monitoring and communication equipment shall be represented by point elements.

6.5.3.4 Spatial geometry acquisition method

The roadside monitoring and communication equipment obtains the location of the center point of the equipment.

Figure 28 shows the spatial geometry acquisition method of roadside monitoring and communication equipment.

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