TECHNICAL STANDARDS
DETAILED TECHNICAL CONDITIONS FOR THE CONSTRUCTION OF THE RAILWAY INFRASTRUCTURE OF THE SOLIDARITY TRANSPORT HUB – DESIGN GUIDELINES

VOLUME VIII.3
STRUCTURES

Version 1.3.0, closed on 05.08.2021

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The list of volumes constituting the detailed technical conditions for the construction of the railway infrastructure of the Solidarity Transport Hub:

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Revisions of the document “Detailed technical conditions for the construction of the railway infrastructure of the Solidarity Transport Hub; Volume VIII.3; Structures”:

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1 Introduction

This volume VIII.3 of the Technical Standards – Design Guidelines is one of 30 volumes containing a description of detailed technical conditions for the construction of railway lines up to a speed of Vmax ≤ 350 km/h.

1.1 Technical scope

These guidelines apply to all categories of the STH railway lines. The guidelines shall be applied when designing the following structures:

– platforms,
– platform umbrella roofs and halls,
– loading yards,
– loading ramps,
– base stations.

1.2 Links to other volumes

The links between this volume of Standards with other volumes are presented in Table 1.

Table 1

Volume No	Volume title	Relation content
I.1	Railway track – layout geometry	Arrangement of platforms at stations and stops.
I.4	Railway track – gauge	Requirements concerning the height of the platform and ramps and the distances of the platform and ramps from the track axis.
IV	Non-traction power sector	Requirements concerning the electrical systems.
VII.1	Wired and wireless communication and data transmission	Requirements concerning the radio communication facilities.
VII.2	Telecommunication systems and telematics	Requirements concerning the areas of supply and installation of communication components.
VIII.4	Structural landscaping	Requirements concerning the platform equipment.
XIII	Technical support facilities	Design requirements for loading yards and loading ramps.
XIV	Health and safety support systems for people and property	Requirements for the visual monitoring system.
XVI	Rolling stock	Platform height.

1.3 Definitions of terms used

1) Railway structure

Technical and operational whole including the land on which it is situated, as well as systems and equipment, used for the traffic of railway vehicles, organisation and control of that traffic, enabling transportation of people and goods, in particular: standard-gauge, broad-gauge and narrow-gauge railway tracks, unconventional railways, earth structures, bridges, flyovers, culverts, retaining structures, ramps, platforms, loading yards, crossings of railway lines with public roads at the same level, aboveground and underground pedestrian crossings, electric OCL equipment, traffic protection and control equipment, non-OCL power engineering equipment and technical equipment, and other structures situated in the railway area and used for running railway traffic and railway line maintenance.

[as defined in the Railway Structure Regulation]

2) Structure type

The structure intended for running railway traffic with specified repeatable technical and operational parameters
[as defined in the Railway Transport Act]

3) Railway track

A railway track or tracks together with elements listed in points 2–12 of Annex No 1 to the Act, provided that they are functionally connected with them, regardless of whether they are managed by the same entity.
[as defined in the Railway Transport Act]

4) Railway infrastructure

Elements specified in Annex No 1 to the Act
[as defined in the Railway Transport Act]

5) Railway line

A railway track designated by the infrastructure manager and adapted to train traffic.
[as defined in the Railway Transport Act]

6) Infrastructure manager

An entity responsible for managing the railway infrastructure, its operation, maintenance, renewal or participation in the development of the infrastructure, and in the case of construction of new infrastructure, an entity that commenced its construction as the investor.
[as defined in the Railway Transport Act]

2 Essential, basic and general requirements for the STH railway infrastructure

Table 2 defines the link between the detailed technical conditions and the essential, basic and general requirements for the STH infrastructure.

Table 2

sub-chapter of this volume defining detailed technical conditions	essential requirements (Railway Interoperability Directive)						basic requirements	general requirements for the STH railway infrastructure			
	1.1. security	1.2. reliability and accessibility	1.3. health	1.4. environmental protection	1.5. technical compliance	1.6. accessibility	2.1. mechanical resistance and stability 2.2. fire safety 2.3. hygiene, health and the environment 2.4. safety and accessibility in use 2.5. protection against noise 2.6. energy economy and heat retention 2.7. sustainable use of natural resources	3.1. oriented towards the needs of the economy	3.2. orientation towards the needs of passengers	3.3. orientation towards the needs of carriers	3.4. compatibility with the railway infrastructure connected with the STH railway infrastructure
3.1	1.1.1. 1.1.3 1.1.5	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	1.6.1	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	-	-	-	-
3.2	1.1.1. 1.1.3 1.1.5	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	1.6.1	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	-	-	-	-
3.3	1.1.1. 1.1.3 1.1.5	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	1.6.1	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	-	-	-	-
3.4	1.1.1. 1.1.3 1.1.5	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	1.6.1	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	-	-	-	-
3.5	1.1.1. 1.1.3 1.1.5	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	1.6.1	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	-	-	-	-
3.6	1.1.1. 1.1.3 1.1.5	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	1.6.1	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	-	3.2.1.	-	-
3.7	1.1.1. 1.1.3 1.1.5	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	1.6.1	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	-	3.2.2. 3.2.3. 3.2.4. 3.2.5.	-	-
3.8	1.1.1. 1.1.3 1.1.5	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	1.6.1	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.5.1., 2.6.1., 2.7.1	-	-	-	-
4	1.1.1. 1.1.3	-	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	-	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	3.1.1 3.1.2	-	-	-
5	1.1.1. 1.1.3	-	1.3.1 1.3.2	1.4.1 1.4.2	-	-	2.1.1., 2.2.1., 2.3.1., 2.4.1., 2.7.1	-	-	-	-
6	1.1.4	1.2.2	1.3.1 1.3.2	1.4.1 1.4.2	1.5.1 1.5.2	-	2.2.1	-	-	-	-

Cybersecurity

Technical solutions which collect, store, process, make available or transmit data ensuring compliance with the essential requirements with respect to safety (requirements from 1.1.1. to 1.1.11. specified in Volume A of the STH railway standards) and general requirements for the STH rail infrastructure with respect to protection (requirements from 1.1.12. and 1.1.13 specified in Volume A of the STH railway standards) should be designed taking into account cybersecurity, i.e. “security of network and information systems”, which is defined in the Directive concerning measures for a high common level of security of network and information systems as follows:

> “security of network and information systems” means the ability of network and information systems to resist, at a given level of confidence, any action that compromises the availability, authenticity, integrity or confidentiality of stored or transmitted or processed data or the related services offered by, or accessible via, those network and information systems;
>
> *[as defined in Article 4 of Directive 2016/1148]*

Cybersecurity includes two types of threats resulting from unauthorised access to the systems/equipment/networks that collect, store, process, make available or transmit data:

1) physical security threats

   It is necessary to secure systems/equipment/networks against direct access which could enable causing (intentionally or unintentionally) threats to functional safety.

2) IT security threats

   It is necessary to secure systems/equipment/networks against logical access via IT systems/equipment/networks, which could enable causing (intentionally or unintentionally) threats to functional safety.

Cybersecurity defined this way applies both to information systems used for rail transport purposes and to operational systems used for rail transport purposes, but the STH railway standards do not include requirements for information systems, e.g. timetabling systems.

Physical security threats and IT security threats for operational systems for which requirements are defined in the STH railway standards should be addressed by railway operators as part of the risk assessment and by design engineers/manufacturers/contractors as part of threat control. Additionally, it is required for the applied protections to be documented and verified in accordance with the requirements included in Volume XVIII of the STH railway standards.

Cybersecurity within the scope of this volume of the STH railway standards

Currently, in the area covered by this volume of standards, there are no networks and information systems whose security could be endangered. However, it is possible that such networks and information systems or technical solutions that collect, store, process, make available or transmit data may arise. For example, a system of sensors may be used that, through wired or wireless networks, public or non-public networks or directly, will connect to, for instance, an infrastructure manager’s system. Then, they should be protected against physical security and IT security threats in a manner compliant with the requirements of the Information Safety Management System (ISMS) implemented by the STH company.

At the same time, it should be kept in mind that the ISMS will be subject to changes because maintaining the required level of cybersecurity is not possible by meeting requirements of the standards once since cybersecurity is a process rather than a state. In order to minimise the number and magnitude of cyber threats, the requirements (duties) mentioned in the Act of 5 July 2018 on the national cybersecurity system, in its Chapter 3 for operators of key services and in Chapter 5 for public entities, should be continuously followed in operational processes and only services of digital service providers fulfilling the obligations described in Chapter 4 of that Act should be used.

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3 Platforms

3.1 One-side and island platforms

3) The arrangement of platforms at a station results, among other things, from the category of railway lines running through the station or stop and the forecast number of passengers to be served by the designed station or stop.
4) It is recommended to place island platforms between the main secondary tracks. Regardless of the line category, island platforms are not located between main secondary tracks (at stations) or between open lines (at stops).
5) If an island platform is used, where it is possible for trains to pass without stopping at a speed exceeding 160 km/h at least at one of the edges, architectural solutions (e.g. in the form of supporting walls of umbrella roofs) should be envisaged to provide passengers on the platform with a shelter from blasts caused by the passing vehicle.
6) Platforms shall not be located at tracks where trains run at a speed higher than 200 km/h. For platforms where future operation at a speed higher than 200 km/h is envisaged, space should be provided for special solutions set out in the Regulation [8].
7) Locating platform edges at tracks laid in an arc with a cant should be avoided.

3.2 Platform width

8) The platform width parameter should be determined in each case on the basis of the requirements of:
    - Commission Regulation (EU) No 1300/2014 [2, 3],
    - Regulation of the Minister of Transport and Maritime Economy [8].

3.3 Platform height

1) The nominal platform height, measured as the distance from the rail head surface to the edge of the platform, should be 760 mm.
2) It is allowed to design, with written consent of the Investor, a nominal platform height other than 760 mm, but it should be justified by an analysis taking into account, among other things, the height of the rolling stock floor which will stop at a given platform. In some cases, this is going to involve the need to acquire appropriate derogations from the regulations.

3.4 Platform length

1) The platform length parameter should be determined in each case on the basis of the requirements of:
    - Commission Regulation (EU) No 1300/2014 [2, 3],
    - Regulation of the Minister of Transport and Maritime Economy [6];

    taking into account predicted traffic.
2) The design documentation should contain the locations of the W4 and W32 indicators. The indicators should be located in a way as to ensure the shortest possible route of passengers to the train.
3) Platforms over 200 m in length should be divided into sectors. The length of a sector should not be more than 3 cars, according to the UIC standard (25÷27 m each), i.e. it should be approx. 75 m.
4) The division and identification of sectors on an island platform and on opposite platforms should be common to the edge(s) of the platform(s) and traffic directions, and consistent with the kilometres of the railway line considered to be the primary one in the area of passenger infrastructure. An

exception is the case when the entrance to the platform is only from the front – then the division into sectors should start from the entrance to the platform.

5) On platforms where the use of automatic baggage check-in systems is envisaged, a designated space should be provided for loading the baggage checked in in the station building, which shall be located at the ends of the platform and shall not be accessible to passengers. The dimensions of that part of the platform should be adapted to the specific baggage check-in system planned to be used.

3.5 Platform structure requirements

1) Structural calculations of platform components should be performed in accordance with PN-EN 1990, PN-EN 1991-1-1, PN-EN 1991-2, PN-EN 1992-1, PN-EN 1992-2, PN-EN 1994-1, and PN-EN 1994-2 for concrete structures and geotechnical standards for soil loads (PN-EN 1997-1).
2) In addition to the standard platform loads, special loads, e.g. loads of special vehicles, operation of machinery and mechanical snow removal and cleaning equipment, should also be taken into account in the calculations. The calculation scheme should be adopted in accordance with PN-EN 1991-2 point 5.6.3, except for section 4.
3) The pedestrian traffic load should be adopted as on public roads – characteristic value min. 5 kN/m^2.
4) For platforms with a support slab, loads as for a truck with wheel base 1.58 m, wheel gauge 0.5 m, gross weight 3.5 kN and pressure 0.875 kN should be assumed.
5) Depending on the location, platform structures may be made in the form of:
    - platform wall with a special platform curb;
    - L-type platform wall and P-type platform slab, standard or with exposed aggregate;
    - special prefabricated systems for platforms without a soil body;
    - platform structures integrated with a structure of civil engineering structures;
    - walls made on the construction site and slabs made of flamed granite;
    - other, as agreed with the Investor.

3.6 Platform pavement requirements

1) Depending on the location, the platform pavement may be made of concrete or stone paving slabs, concrete paving blocks or paving stone (smooth, without chamfering).
2) The requirements for tactile and visual marking are given in volume VIII.1, Station and railway station buildings.
3) Slopes of the platform pavement should be assumed in accordance with the Regulation [8]. The selection of slopes should take into account the type of platform cover used – for pavements not exposed to atmospheric conditions, a slope may have minimum values.
4) The required technical properties of concrete used for the production of concrete prefabricated members are shown in Table 3.

Table 3

Properties	Requirements for individual elements			Test method
	Platform slab with exposed aggregate	Platform walls, standard platform slabs	Paving slabs with tactile elements	
Minimum compressive strength class	C40/50	C30/37	C30/37	PN-EN 12390-3
Bending strength [MPa]	-	-	$T_{ch} \geq 5$ $T_i \geq 4$	PN-EN 13748-2
Absorbability [%]	≤3	≤5	≤6	PN-EN 13369 Annex D
Freezing/defrosting resistance when using de-icing salts (mass loss) [kg/m^2]	After 112 cycles average ≤ 0.1 single result ≤ 0.2	FT1 (after 28 cycles, an average value ≤ 1.0, with no single result > 1.5)	FT1 (after 28 cycles, an average value ≤ 1.0, with no single result > 1.5)	PKN-CEN/TS 12390-9
Abrasion resistance	15 mm method A 13500 mm^3 method B	20 mm method A 18000 mm^3 method B	20 mm method A 18000 mm^3 method B	PN-EN 14157 (or equivalent)
Slip resistance (USRV)	≥55	-	-	PN-EN 1339
Depth of penetration of water under pressure	≤20	≤50	-	PN-EN 12390-8
Total alkali content in concrete Na_2O_{eq} [kg]	≤3	≤3	≤3	Based on calculations of alkali content in concrete mixture ingredients.

3.7 **Platform equipment and rules of its arrangement**

1) The equipment and arrangement of structural landscaping elements is specified in volume VIII.3, Structural landscaping.
2) The arrangement of all platform equipment elements should be presented in the design documentation in the form of a location plan, in characteristic cross-sections and visualisations.
3) Facilities such as: information posts, lighting poles, etc. should be arranged in one designated line in the platform development zone. In the case of one-side platforms, it is recommended to place lighting poles and supporting constructions of traction contact lines out of the platform.
4) Proper arrangement of foundations for supporting structures for passenger information displays should be provided for in the platform structure.
5) Technical equipment (e.g. drainage units, power supply ducting with manholes) should not interfere with the tactile and visual marking of the platform pavement. Drainage units should be robust, taking into account not only pedestrian traffic load but also that of special vehicles. The guidelines for drainage are given in volume I.3.
6) For one-side platforms, it is recommended to place drainage on the opposite side of the platform edge (not in its axis), while taking the type of roofing into consideration.
7) It is recommended to design water points (drinking troughs) on platforms, intended for passengers.
8) Water intakes should be provided for on platforms, necessary to keep platforms clean, as well as electrical systems enabling to connect power tools or multimedia devices, etc.
9) It is recommended to place internet access points (Hotspots) on platforms.

10) In order to protect railway lines against access of outsiders and unauthorised persons, the possibility of movement of persons from the space available to passengers (in particular from platforms) to the remaining fenced-off area of the railway line should be limited. In particular, fencing (with a height of at least 1.3 m) should be used in the following areas:
    a) in the front parts of island platforms,
    b) at entrance points to platform tunnels in a manner preventing passage to the platform using the station plane (at the track level),
    c) on one-side platforms, on the inactive edge side (only in areas where no fencing would pose an above-standard risk to passengers).

3.8 Platform umbrella roofs and halls

1) The technical and construction regulations and design principles specified in the standards concerning the design of civil engineering structures should be applied when designing platform umbrella roofs and halls.
2) When designing platform umbrella roofs and halls, factors such as the nature of the railway line, surrounding architecture and representative function of the facility should be taken into account. It is recommended to use repeatable umbrella roof structures on a given railway line, with a possibility of modular change in their length.
3) The location of the supporting structures of platform umbrella roofs and halls should take into account the requirements related to the distances necessary to comply with the PRM TSI specifications and other regulations.
4) Classification of umbrella roofs depending on the size of the space being sheltered:
    a) seat (“stop”) umbrella roofs where the roofing covers seats, handrails for resting while standing, wheelchair space and small space designed for passenger standing room,
    b) sector umbrella roofs where the roofing covers the entire platform width,
    c) open hall-type umbrella roofs where the roofing covers the entire platform, including adjacent tracks and intertrack space, but there are no side walls.
5) Platform halls (closed hall-type umbrella roofs) are facilities where the roof is structurally connected to the side walls of the shelter along the entire length (or most of it) of the platform(s).
6) Seat umbrella roofs should be made of vandal-proof materials, adequately protected against adverse effects of atmospheric conditions and those resulting from the operation of the railway line.
7) The structure of sector umbrella roofs should ensure effective protection against precipitation as well as enable the installation of passenger information equipment and (if necessary) the installation of the control command and signalling equipment, such as trackside indicators and signalling devices.
8) The structure of platform halls should enable safe routing of installation wires as well as the suspension of passenger information equipment.
9) Demarcated waiting rooms may be located under a platform umbrella roof.
10) Stairs and ramps leading below the ground level should be provided with roofing effectively protecting against excessive inflow of precipitation water to subways.

4 Loading ramps and yards

1) Loading ramps and yards should be designed, among other things, at stations where handling of goods or vehicles or shutdown and servicing of machinery for track works are envisaged. Additional requirements for loading ramps and yards in the areas of technical support facilities are shown in volume XIII.
2) The total usable length of loading yards at a given station should be adjusted to the forecast requirements in that respect. The length of a single loading yard edge should not be less than 150 m.
3) In tracks located at loading ramps and yards, it is recommended to apply slab track. At least in one area at a station, the track should enable easy re-railing of two-way machines by using a crossing track in a section of at least 12 m. The location and form of the re-railing areas should be determined on the basis of the requirements in volume XIII.
4) The structure of loading ramps and yards should take into account the transfer of loads of vehicles envisaged to be in use.
5) Any poles and masts located on a yard or its periphery should be enclosed with black and yellow tubular guards up to a height of min. 1.35 m. The guards may be made of steel or plastic and should be of sufficient strength in order to suppress impact energy, preventing damage to poles and masts.
6) Loading yards should meet the requirements for fire roads and be equipped for fire-fighting operations.
7) Loading ramps and yards should be equipped with:
    a) electrical systems and connections enabling repairs of machinery with the use of typical power tools powered with three-phase current,
    b) water supply systems necessary to connect staff accommodation containers for up to 50 persons,
    c) lighting controlled in a designated location protected against unauthorised access.
8) Tracks at loading ramps and yards should not have an overhead catenary system. It is not allowed to run fixed electrical systems above ramps and yards.
9) The drainage of ramps and yards should be independent from the drainage of the track superstructure at the station.
10) If a ballasted track is envisaged in the track adjacent to a loading yard, the loading yard should be limited from the side of the track with a retaining prefabricated member set below the frost penetration level, located at a distance of 1.6 m from the track axis and a height of 0.3 m above the rail head surface.
11) The ramp height is the distance between the rail head surface and the top ramp surface. The height of the useful edge of the side ramp above the rail head surface should be 1.1 m, whereas the that of the front ramp should be 1.23 m. Different dimensions are allowed with written consent of the Investor.
12) The maximum ramp upgrade gradient should not exceed 10%.

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5 Base stations

1) The technical/construction and environmental regulations as well as design principles specified in the standards concerning the design of civil engineering structures should be applied when designing base stations. The distance from a base station to the axis of the outermost track should be min. 10 m.
2) An access road should lead to each base station.
3) A base station consists of the following elements:
    a) free-standing radio tower containing GSM-R antennas and possibly a radio line antenna used to transmit signals to a base station controller (BSC);
    b) telecommunication container as a room containing the BTS base station equipment, remote transmission equipment for transmitting signals to a base station controller (BSC) (backhaul) and power supply equipment (batteries, UPS).
4) The requirements concerning a telecommunication container are specified in volumes VII.1 and below:
    a) for each base station, a telecommunication container should be sized to accommodate a base station and associated equipment in it,
    b) the container should be made in the form of a concrete prefabricated member (with written consent of the Investor, it is allowed to make a container in the steel sandwich panel technology with a self-supporting structure),
    c) the container should be provided with good thermal and moisture insulation (heat transfer coefficient U for walls should be assumed at max. 0.23 and for flat roofs max. 0.18),
    d) the container should have complete technical documentation,
    e) the container should be equipped with a complete electrical system including a connection board, a potential equalisation busbar and an integrated ventilation and heating system ensuring stable thermal conditions. The container should be equipped with an alarm system with motion, door opening/closing, moisture, smoke and temperature detectors (detailed requirements are set out in volumes IV, VII.1, VII.2 and XIV),
    f) the container should have an anti-theft door with an anti-panic lock,
    g) the container should be equipped with a grommet for antenna cables, grommets for power and communication cables,
    h) the connection board in the container should contain overvoltage protection, connection feeders for the power supply of obstacle lights and process consumers, as well as a switch enabling to switch to power supply from a mobile power generator set,
    i) the floor strength should ensure the installation of all telecommunication equipment,
    j) the roof and the cable rack between the container and the tower should be protected against ice falling down; the roof should be provided with a reflective coating,
    k) the process container cannot be a source of acoustic nuisance, noise of measurable values or electromagnetic field emission.
5) Requirements for the radio (antenna) tower:
    a) in the BTS base station locations, it is required to use, on a standard basis, prestressed concrete towers made in the spinning technology (hot-dip galvanised steel towers are allowed with written consent of the Investor),
    b) the number of segments that each tower is made of must depend on the total operating height of the tower and local field conditions,
    c) when designing the tower, the wind zone in which the location is planned should be taken into account; the height of the tower must depend on the height at which the GSM-R antennas are going to be suspended,

d) when selecting tower parameters, it is necessary to take into account such parameters as weight and surface area of wind pressure for devices, antennas, cabling and other components installed on the tower, as well as other characteristics that may influence the tower design requirements,

e) the parameters of the delivered tower must ensure the possibility of installation of devices, antennas and cabling envisaged in a given location on it,

f) the tower must ensure a reserve of load resulting from the surface and weight of the devices being designed together with cabling at the level of 30% in relation to the value resulting from the expected demand,

g) all necessary systems shall be designed separated on the tower in accordance with the applicable regulations,

h) the tower must be designed with all necessary systems in accordance with the applicable provisions of law, i.e.:
   - lightning protection system,
   - earthing and equipotential bonding system,
   - obstacle marking in accordance with the Polish Aviation Law,
   - service platform with fall protection enabling the installation and maintenance of antennas and other devices installed on the tower,
   - ladder enabling access to the service platform; the ladder must be protected against access of unauthorised persons and be equipped with a fall protection system on the ladder and service platform compliant with PN-EN 353-1; the possibility of two persons using the ladder at the same time should be envisaged (including one person for each three metres of the ladder),
   - exit to the service platform directly from the ladder,

i) the tower must be protected against environmental impacts so that for at least 15 years it is not needed to carry out additional maintenance and protection activities,

j) All towers and other antenna unit supports must imperatively include the option of earthing to provide lightning protection. During installation, the aforementioned components should be connected to the lightning protection network.

k) For the tower steel structure, it is required that all steel components of the structures under the antennas and cable racks be hot-dip galvanised in order to protect them against corrosion. This requirement also applies to mounting components (bolts, nuts, washers, clamps, etc.). Mounting components must be selected for their tensile and shear strength. In cases when any damage to the zinc coating occurs, damage spots should be painted with zinc paint in a manner ensuring appropriate protection against corrosion. One should avoid direct contact between components made of different metals (e.g. non-galvanised steel bolts with galvanised components) to prevent the formation of corrosion spots. Any and all sharp edges must be graded and protected against corrosion.

6 Fire protection requirements

1) The structures covered by the scope of this study and the devices installed therein should comply with the regulations of the Construction Law [6] applicable in Poland with respect to fire protection, as well as the regulations related thereto [6, 7, 9, 10, 11].
2) The structures should be designed and constructed so that the possibility of a fire is limited, and if it occurs, the propagation of fire is minimised and safe evacuation is ensured.

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7 Reference documents

The following reference documents were used to prepare Volume VIII.3:

7.1 EU legal documents

[1] Rozporządzenie Komisji (UE) nr 1299/2014 z dnia 18 listopada 2014 r. dotyczące technicznych specyfikacji interoperacyjności podsystemu „Infrastruktura” systemu kolei w Unii Europejskiej (Dz.U.UE L 356/1 z dnia 12.12.2014)

[2] Rozporządzenie Komisji (UE) nr 1300/2014 z dnia 18 listopada 2014 r. w sprawie technicznych specyfikacji interoperacyjności odnoszących się do dostępności systemu kolei Unii dla osób niepełnosprawnych i osób o ograniczonej możliwości poruszania się (Dz.U. L 356/110 z dnia 12.12.2014)

[3] Rozporządzenie wykonawcze Komisji (UE) 2019/772 z dnia 16 maja 2019 r. zmieniające rozporządzenie (UE) nr 1300/2014 w odniesieniu do wykazu majątku w celu identyfikacji barier w zakresie dostępności, zapewnienia informacji dla użytkowników oraz monitorowania i oceny postępów w zakresie dostępności (Dz.U.UE L 139I z dnia 27.5.2019)

[4] Rozporządzenie wykonawcze Komisji (UE) 2019/776 z dnia 16 maja 2019 r. zmieniające rozporządzenia Komisji (UE) nr 321/2013, (UE) nr 1299/2014, (UE) nr 1301/2014, (UE) nr 1302/2014 i (UE) nr 1303/2014, rozporządzenie Komisji (UE) 2016/919 oraz decyzję wykonawczą Komisji 2011/665/UE w odniesieniu do dostosowania do dyrektywy Parlamentu Europejskiego i Rady (UE) 2016/797 oraz realizacji celów szczegółowych określonych w decyzji delegowanej Komisji (UE) 2017/1474 (Dz.U. L 139I z dnia 27.5.2019)

7.2 Legal documents of the Republic of Poland

[5] Ustawa z dnia 28 marca 2003 r. o transporcie kolejowym (t.j. Dz. U. z 2020 r., poz. 1043 z późn. zm.)

[6] Ustawa z dnia 7 lipca 1994 r. Prawo budowlane (t.j. Dz. U. z 2020 r., poz. 1333 z późn. zm.)

[7] Ustawa z dnia 24 sierpnia 1991 r. o ochronie przeciwpożarowej (t.j. Dz. U. z 2020 r., poz. 961 z późn. zm.)

[8] Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 10 września 1998 r. w sprawie warunków technicznych, jakim powinny odpowiadać budowle kolejowe i ich usytuowanie (Dz U. z 1998 r, nr 151, poz. 987 z późn. zm.)

[9] Rozporządzenie Ministra Infrastruktury z dnia 12 kwietnia 2002 r. w sprawie warunków technicznych, jakim powinny odpowiadać budynki i ich usytuowanie (t.j. Dz. U. z 2019 r., poz. 1065 z późn. zm.)

[10] Rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 7 czerwca 2010 r. w sprawie ochrony przeciwpożarowej budynków, innych obiektów budowlanych i terenów (Dz. U. z 2010 r. Nr 109, poz. 719 z późn. zm.)

[11] Rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 20 czerwca 2007 r. w sprawie wykazu wyrobów służących zapewnieniu bezpieczeństwa publicznego lub ochronie zdrowia i życia oraz mienia, a także zasad wydawania dopuszczenia tych wyrobów do użytkowania (Dz. U. z 2007 r. Nr 143, poz. 1002 z późn. zm.)

7.3 Normative documents

[12] PN-EN 353-1+A1:2018-03 Środki ochrony indywidualnej przed upadkiem z wysokości -- Urządzenia samozaciskowe z prowadnicą -- Część 1: Urządzenia samozaciskowe ze sztywną prowadnicą

[13] PN-EN 1339:2005 Betonowe płyty brukowe -- Wymagania i metody badań

[14] PN-EN 1990:2004 Eurokod -- Podstawy projektowania konstrukcji

[15] PN-EN 1991-1-1:2004 Eurokod 1: Oddziaływania na konstrukcje -- Część 1-1: Oddziaływania ogólne -- Ciężar objętościowy, ciężar własny, obciążenia użytkowe w budynkach

[16] PN-EN 1991-2:2007 Eurokod 1: Oddziaływania na konstrukcje -- Część 2: Obciążenia ruchome mostów

[17] PN-EN 1992-1-1:2008 Eurokod 2 -- Projektowanie konstrukcji z betonu -- Część 1-1: Reguły ogólne i reguły dla budynków

[18] PN-EN 1992-2:2010 Eurokod 2: Projektowanie konstrukcji z betonu -- Część 2: Mosty z betonu -- Obliczanie i reguły konstrukcyjne

[19] PN-EN 1994-1-1:2008 Eurokod 4 -- Projektowanie zespolonych konstrukcji stalowo-betonowych -- Część 1-1: Reguły ogólne i reguły dla budynków

[20] PN-EN 1994-2:2010 Eurokod 4 -- Projektowanie konstrukcji zespolonych stalowo-betonowych -- Część 2: Reguły ogólne i reguły dla mostów

[21] PN-EN 1997-1:2008 Eurokod 7 -- Projektowanie geotechniczne -- Część 1: Zasady ogólne

[22] PN-EN 12390-3:2019-07 Badania betonu -- Część 3: Wytrzymałość na ściskanie próbek do badań

[23] PN-EN 12390-8:2019-08 Badania betonu -- Część 8: Głębokość penetracji wody pod ciśnieniem

[24] PN-EN 13369:2018-05 Wspólne wymagania dla prefabrykatów z betonu

[25] PN-EN 13748-2:2006 Płytki lastrykowe -- Część 2: Płytki lastrykowe do zastosowań zewnętrznych

[26] PN-EN 14157:2017-11 Metody badań kamienia naturalnego -- Oznaczanie odporności na ścieranie

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