AGENTURA OCHRANY PŘÍRODY A KRAJINY ČESKÉ REPUBLIKY

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NATURE AND LANDSCAPE MANAGEMENT STANDARDS

ARBORIST STANDARDS	CARE OF WOODY PLANTS ALONG PUBLIC TRANSPORT INFRASTRUCTURES	SPPK A02 010: 2020
Series A		

Péče o dřeviny kolem veřejné dopravní infrastruktury
Pflege der Gehölzen entlang Fahrstrassen und Eisenbahnstrecken

This standard is intended to define technical and work procedures used in establishment and management of trees and shrubs growing along public transport infrastructure (PTI) – all categories of roads and railways, including facilities.

References:

EU Regulation no. 995/2010 on the placing timber and timber products on the market
Government Regulation no. 339/2017 Coll., laying down work and work procedure organisation methods that employers have to ensure in forest work and workplaces of similar nature
Government Regulation no. 362/2005 Coll., on detailed requirements on occupational health and safety in workplaces with a risk of fall from a height or into a depth

ČSN 736101 (2018): Road and motorway design
ČSN 839001 (1999): Orchard and landscape management – Terminology, basic professional terms and definitions
ČSN 839051 (2006): Vegetation technology in landscaping – Care of vegetation during development and maintenance in green areas
ČSN 839061 (2006): Vegetation technology in landscaping – Protection of trees, plantations and vegetation areas during construction work.
ČSN 83 9011 (2006): Landscape vegetation modification techniques – Work with the soil
TP 99: Planting and treatment of road vegetation, Ministry of Transport of the CR, 2004
TKP 13: Vegetation treatment, Ministry of Transport of the CR, 2006
TKP 13: Technical qualitative requirements for national railway construction, RIA, 2013
Act no. 13/1997 Coll. on Roads, as amended
Act no. 89/2012 Coll., the Civil Code, as amended
Act no. 114/1992 Coll. on Nature and Landscape Protection, as amended
Act no. 183/2006 Coll. on Spatial Planning and Building Rules (Building Act), as amended
Act no. 266/1994 Coll. on Railways, as amended
Act no. 500/2004 Coll., Rules of Administrative Procedure, as amended
Act no. 20/1987 Coll. on State Heritage Management, as amended
Act no. 289/1995 Coll. on Forests, as amended
Act no. 156/1998 Coll. on fertilizers, auxiliary soil agents, auxiliary plant preparations and substrates and on agrochemical testing of agricultural lands (Fertiliser Act), as amended
Act no. 326/2004 Coll. on Phytosanitary Care and on amendment of certain acts, as amended
Act no. 458/2000 Coll. on Requirements for Business and Public Administration in Energy Industries and on amendment of certain acts (Energy Act), as amended
Act no. 226/2013 Coll. on Marketing of Wood and Timber Products, as amended

Decree no. 104/1997 Coll., executing the Road Act, as amended
Decree no. 189/2013 Coll. on Tree Protection and Felling Permission, as amended
Decree no. 395/1992 Coll., executing some provisions of Czech National Council Act no. 114/1992 Coll. on Nature and Landscape Protection, as amended
Decree no. 32/2012 Coll. on preparations and other products for plant protection, as amended
Decree no. 378/2010 Coll., establishing the list of species of cultivated plants, as amended
Decree no. 177/1995 Coll., issuing the Railway Construction and Technical Rules, as amended

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Contents

1 Purpose and contents of the standard

1.1 Standard purpose

1.1.1 The standard "Care of woody plants along roads and railway lines" defines the scope and techniques of interventions in woody plants implemented in order to assure traffic safety on all classes of roads pursuant to Act no. 13/1997 Coll. and on railway lines pursuant to Act no. 266/1994 Coll.

1.1.2 The standard describes rules relating to planting and the scope of permissibl interventions so as to minimise the possibility of non-permitted interventions in nor forest trees and shrubs (see Section 2 of Decree no. 189/2013 Coll. and Act nc 114/1992 Coll.).

1.1.3 The standard is intended to be applied to trees and shrubs growing as vegetation accompaniment of public transport infrastructure (PTI) regardless whether they are trees and shrubs growing on land outside forest or on land intended to perform forest functions.

1.1.4 Care of vegetation accompaniment of roads in sections inside municipalities on land managed by the road administrator is the responsibility of the road administrator.

1.1.5 Basic responsibility for traffic safety of trees is with their owner.

1.1.6 The standard considers potential safety risks typical of PTI accompaniment.

1.1.7 Inspections and cultivation interventions may concern vegetation growing inside protective zones of roads or railways. The extent of protective zones is defined in 3.1.

1.1.8 Unless this standard specifies otherwise, care of woody plants along PTI respects the remaining Nature and Landscape Management Standards (SPPK), notably series A (arborist standards), series C (TSES and landscape-forming elements) and series E (special species protection measures)[1].

1.2 Qualifications of persons

1.2.1 The scope of qualification of persons making interventions in trees and shrubs growing as vegetation accompaniment of roads or within railway line land or protective zones is defined by the administrator of the road or railway line with a view to potential safety risks and legal requirements in force. The administrator also defines whether interventions in vegetation accompaniment require supervision and what is the minimum qualification (see Annex 2).

1.2.4 **Basic inspection of trees** as part of inspections of vegetation accompanying public transport infrastructure is provided by persons authorised by their legitimate administrator.

1.2.5 **Comprehensive tree assessment** is of an interdisciplinary nature and involves analysis of a wide range of factors. It is an expert activity that has to be done by qualified persons, who may be:

- judicial experts under Act no. 36/1967 Coll. with a specialisation including tree assessment or similar, or

[1] http://standardy.nature.cz/seznam-standardu/

- experts with education in forestry, horticulture, science, environmental management, etc., where tree assessment issues are taught, or
- holders of a national or international proof of expert knowledge (certification) in the area.[2]

1.2.6 The recommended qualification for persons providing **shrub and tree planting**, including post-planting management, is completed horticultural vocational school or higher education in the area of expertise, or another national or international proof of expert knowledge (certificate).

1.2.7 The recommended qualification for persons performing **tree pruning at heights** is a recognised national or international proof of professional knowledge (certificate) in the area of arboriculture, qualification for safe movement in the tree crown using climbing equipment or lift platform and safe handling of the chainsaw.[3]

[2] For example, Czech Certified Arborist – Consultant, European Tree Technician, etc.

[3] For example, European Treeworker, ISA Certified Tree Worker Aerial Lift Specialist, ISA Certified Tree Worker Climber Specialist, ABA International level A2, European forestry and environmental skills council (EFESC), Czech Certified Arborist – Platform Worker, Czech Certified Arborist – Tree Climber, Arborist Technician, etc.

2 Legal framework

2.1 **Act no. 114/1992 Coll.** on Nature and Landscape Protection (Section 5, Para. 4 and 5, Section 16, Para. 1, item (f), Section 26, Para 1, item (d), Section 29, item (e) and Section 34, Para. 1, item (d)) regulates deliberate dissemination of introduced plant species and crossbreeds in the landscape, and deliberate dissemination of introduced plant species in specially protected natural areas (national parks, protected landscape areas, national nature reserves, nature reserves).

2.2 **Act no. 13/1997 Coll.** on Roads (Sections 15, 30, 33, 35) defines conditions for planting of trees and shrubs along roads in terms of viewing conditions, and road vegetation on auxiliary land along roads and other suitable land comprising parts of motorways, highways or local roads in terms of road use safety and road maintenance or management of adjacent land.

2.3 **Act no. 266/1994 Coll.** on Railways (Sections 4, 8, 9 and 10) defines the railway land and protective zones and activities that are acceptable in said zones, as well as activities that owners of respective plots have to tolerate, as well as basic rights and obligations of railway owners and operators (Sections 20 to 22).

2.4 **Act no. 458/2000 Coll.**, Energy Act, defines activities that can be carried out around electrified railway lines.

2.5 **Act no. 89/2012 Coll.**, Civil Code (Sections 1016 and 1017) defines civil-rights relationship between owners of trees and owners of adjacent land.

2.6 **Act no. 20/1987** on State Heritage Management defines the obligation to have a binding position statement (permit, approval) of a heritage management authority for cutting and planting of any trees and shrubs on the territory of cultural monuments and trees and shrubs located in heritage zones and reserves and protective zones of such monuments and areas. The obligation to apply for a binding position statement of a heritage management authority may be eliminated for certain properties or certain activities, either by the protection plan of a heritage reserve or heritage zone or by a decision promulgating a protective zone. Cultivation interventions in trees and shrubs (pruning) growing on the territory of a cultural monument require approval of a heritage management authority (such interventions are subject to Section 14, Para. 1, Restoration of cultural monuments).

2.7 **Pruning of trees and shrubs** in non-forest environments can generally be performed by the owner or another authorised person without prior permission or notification of a nature protection authority to the extent and using a technique that does not result in unpermitted intervention in non-forest trees (see Section 7, Para. 1 of Act no. 114/1992 Coll. and Section 2 of Decree no. 189/2013 Coll.[4]).

2.8 An exception from 2.6 comprises trees and shrubs with a special protection regime pursuant to Act no. 114/1992 Coll., notably:

[4] (1) Unpermitted interventions in trees and shrubs in contravention of requirements for their protection include interventions causing damage or destruction to trees and shrubs which lead to substantial or permanent reduction in their ecological or social functions or cause their immediate or subsequent death.

(2) An intervention pursuant to Paragraph 1 is not unpermitted if done for the purpose of retention or improvement of a function of a tree or shrub, as part of management of a specially protected plant or animal species, or done in accordance with the management plan of a specially protected area.

- trees and shrubs promulgated as memorials,
- trees and shrubs that are a biotope for other organisms protected under Act no. 114/1992 Coll. in the categories endangered species, severely or critically endangered species or species of European importance,
- specially protected species of wild trees and shrubs, i.e., European yew, Bohemian rowan, Sudeten rowan, dwarf common juniper, downy oak,
- trees and shrubs where the intervention could result in damage or destruction of nests and eggs of wild birds or their death or significant upsetting, particularly during nesting, unless the nature protection authority has specified a different procedure (Section 5b, Para. 1),
- trees and shrubs that are part of a prominent landscape feature (PLF).

In such cases, tree treatment requires adequate administrative action of the applicable nature protection authority.

2.9 **Regulation EU no. 995/2010** laying down the obligations of operators who place timber and timber products on the market. Everyone who places timber and timber products on the EU market is obliged by the Regulation primarily to have in place and periodically update a due diligence system. It shall consist of three components:

- access to information relating to timber supplies to the market;
- assessment of risk of placement of illicitly logged timber or timber products from it on the market;
- mitigation of identified risk in the case of non-negligible risk of placement of illicitly logged timber or timber products from it on the market.

2.10 **Act no. 226/2013 Coll.** on marketing of timber and timber products defines "central records", which are used for inspection of due diligence systems (see 2.9), and defines the jurisdiction and powers of public authorities and penalties for administrative violations in relation to Regulation EU no. 995/2010.

2.11 **Act no. 289/1995 Coll.** on Forests (Section 22) defines requirements for assurance of safety of persons and property in connection, among other things, with trees and shrubs growing on land intended to perform forest functions.

2.12 **Act no. 326/2004 Coll.** on Phytosanitary Care (Section 3) defines requirements for natural persons and legal entities with respect to identification and restriction of spreading of harmful organisms, including weeds, and defines jurisdictions of authorities in the sector.

3 Records and inspections

3.1 PTI protective zones and railway land

3.1.1 **Railway protective zone** is defined by Act no. 266/1994 Coll., Section 8.

3.1.2 A railway protective zone is an area on either side of a railway line the boundaries of which are delineated by a vertical plane intersecting:

a) for national and regional railway lines, 60 m from the axis of the outermost track, but no less than 30 m from the boundaries of the railway land;
b) for national railway lines built for speeds in excess of 160 km/h and for test railway lines, 100 m from the axis of the outermost track, but no less than 30 m from the boundaries of the railway land;
c) for local railway lines and railway sidings, 30 m from the axis of the outermost track.

3.1.3 **Railway land**[5] is the territory designated by a zoning decision for the location of a railway construction project. For national and regional railway lines, railway land is delineated by vertical planes intersecting boundaries of plots designated for the location and maintenance of railway lines. For other railway lines, it is delineated by vertical planes intersecting 3 m from the axis of the outermost track, outermost load-bearing or running cable, outermost traction line wire or boundaries of plots designated for the location and maintenance of railway lines, but never less than 1.5 m from the outermost edge of the railway structure, unless the railway traffic line runs on a road.

3.1.4 **Road structure land** is the territory designated by a zoning decision for the location of the road structure and Act no. 13/1997 Coll. and Decree no. 104/1997. The land is delineated by the property boundary of the structure, and plots and structures on it are primarily designated for the road structure and its management. Vegetation within the road land is road accessories pursuant to Act no. 13/1997 Coll.

3.1.5 **Road protective zones** are defined by Act no. 13/1997 Coll., Section 30. A road protective zone for a newly built or renovated motorway, 1st or 2nd class road and local road is established by the project location decision.

3.1.6 For the purposes of the Act, a road protective zone refers to an area delineated by vertical lines reaching up to a height of 50 m and extending:

a) 100 m from the axis of an adjacent motorway traffic lane and/or axis of motorway intersection branch; if the zone so defined does not cover the entire rest area, the zone boundary is the road property boundary;
b) 50 m from the axis of a carriageway or adjacent traffic lane of other 1st class roads and other 1st class local roads;
c) 15 m from the axis of a carriageway or adjacent traffic lane of 2nd or 3rd class roads and 2nd class local roads.

3.1.7 A road protective zone can be established with a view to the set requirements only on one side of a motorway, road or 1st and 2nd class local road.

[5] Act no. 266/1994 Coll., Section 4

3.1.8 At the same time, **protective zones of public technical infrastructures** have to be respected pursuant to SPPK 02 011 Care of woody plants along utility lines.

3.2 Tree and shrub stand records

3.2.1 Tree and shrub stand records are made while respecting SPPK A01 001 Tree assessment and SPPK A02 008 Woody plant stand establishment and management.
3.2.2 Tree and shrub stand records include shrub stands and tree groups.
3.2.3 Tree stands cover trees for which clear identification and location is impossible or not meaningful, and trees with the same type or intervention. In that case, parameters have to be specified for pricing the proposed cultivation interventions.
3.2.4 Tree and shrub stand records include:
- reference information on the road number or railway line and its distance point,
- size of the stand area (ground projection of shrub or tree crowns),
- list of species with their proportion (in numbers or percent).

3.3 Tree records

3.3.1 Individual tree records shall respect SPPK A01 001 Tree assessment.
3.3.2 Tree records are made by a qualified person as per 1.2.
3.3.3 Tree records primarily include tree promulgated as memorial under Act no. 114/1992 Coll. the protective zone of which interferes with a road or railway land plot or that are a part of a prominent landscape feature.
3.3.4 As concerns **roads**, the recommendation is to gradually make complete records of trees and tree groups growing along roads.
3.3.5 As concerns railways, the recommendation is to make complete dendrological survey primarily for publicly accessible structures.
3.3.6 Only memorial trees are registered obligatorily along railway lines (see 3.3.3). Dendrological survey of other trees and shrubs on railway land is made only in justified cases (for example, as part of an application for/notification of permit for felling of non-forest trees and shrubs).
3.3.7 The recommendation is to register vegetation elements that overlap with territorial nature protection (PLA, PLF, SPA, etc.).
3.3.8 The tree records encompass two levels of detail:
- a simplified listing of all trees in the study area (see 3.3.9),
- a complete listing of trees (see 3.3.12) and dendrological survey (see 3.3.13) for prominent individual trees.

3.3.9 **Simplified listing of trees** includes the following items:
- tree location,
- determination of tree species,
- identification of crown ground projection,
- for trees recommended for felling (overall condition = 5, see 3.3.10), measured diameter of trunk in breast height (DBH),
- photo documentation (overall view of the tree),
- overall condition classification (see 3.3.10),
- definition of safe distance (see 3.3.11).

3.3.10 **Overall condition** describes the basic parameters of a tree from the perspective of the transport infrastructure administrator's needs. The scale is as follows:

1. newly planted trees and trees in the acclimatization phase needing to establish a crown,
2. adolescent and adult trees not interfering over the passable profile of the road,
3. adolescent and adult trees interfering over the passable profile of the road,
4. adult and senescent trees of major importance needing detailed assessment,
5. trees recommended for felling.

3.3.11 **Safe distance** describes the distance of tree trunks (or outermost trunks in a tree stand) from the edge of the road embankment. The scale is as follows:

1 located at a safe distance (or farther) from the edge of the embankment (see ČSN 73 6101) of a road without a crash barrier,

1s located behind a crash barrier outside its deformation zone (depending on the interception capacity of the crash barrier type),

2 located closer to the edge of the embankment than the safe distance, but not interfering with the drainage system (ditch), roads without crash barriers,

3 located at the edge of the drainage system and influencing it, roads without crash barriers,

3s located behind the crash barrier at the edge of the drainage system and influencing it,

4 growing immediately in the road body without a crash barrier,
located behind the crash barrier inside its deformation zone.

3.3.12 **Complete listing of trees** includes:

- tree location,
- determination of tree species,
- tree height,
- tree trunk width (DBH),
- crown ground projection,
- crown bottom height.

Definitions of all the items are provided in SPPK A01 001 Tree assessment.

3.3.13 **Dendrological survey** includes the following items besides a complete listing:

- physiological age,
- outlook,
- health condition,
- vitality,
- stability.

It also includes proposed intervention of the following scope:

- intervention technique,
- intervention urgency,
- proposed repeated interventions.

Definitions of all the items are provided in SPPK A01 001 Tree assessment.

3.4 Conditions for checks, inspections and updates

3.4.1 Conditions for road checks are defined by Decree no. 104/1997 Coll.; railway line checks are defined by Decree no. 177/1995 Coll.

3.4.2 The checks are divided into:

- regular,
- principal,
- extraordinary.

3.4.3 **Regular checks** take place at periods set by the applicable Decree, see 3.4.1.

3.4.4 As concerns vegetation accompanying roads and railway lines, the recommendation is that **regular checks** include the following checks:

- whether vegetation covers vertical traffic signs and signalling equipment,
- whether parts of vegetation interfere with passable profile of the road or railway line,
- whether there is any obvious and immediate violation of PTI traffic safety, particularly by trees, in which primarily significant defects are checked (see 3.5).

3.4.5 Regular checks are made by an authorised employee of the road or railway line administrator with adequate training.

3.4.6 **Principal checks** should proceed in accordance with 3.4.9, otherwise at the following times:

- when commissioning a new or renovated section of road or railway line and before the end of the warranty period,
- when inventorying a road or railway line.

3.4.7 As concerns vegetation accompanying roads, the recommendation is that **principal checks** include the following checks:

- tree and shrub stand recording (as per 3.2),
- tree recording (as per 3.3).

3.4.8 Principal checks are made by an expert entity upon order from the road or railway line administrator or an authorised employee of the road administrator with required qualification. The period for repeated updates of records that are a part of a principal check should not be longer than:

- 4 – 6 years for motorways and 1st class roads,
- 10 years for 2nd and 3rd class roads,
- 10 years for railway lines.

3.4.9 **Extraordinary checks** are made by the road or railway line owner or administrator outside the dates of regular and principal checks, notably when:

- a road or railway line suffers sudden damage (for example, due to a traffic accident, natural disaster, etc.),
- the traffic volume changes significantly (on roads, for example, when a detour is decreed).

3.4.10 As concerns vegetation accompanying roads and railway lines, the recommendation is that extraordinary checks include primarily checks of trees:

- with impaired stability,
- with safety bonds installed,

- along sections affected by extreme climate conditions.

3.4.11 The **recommended conditions for inspections** focused on tree/vegetation condition in **forests crossed by PTI** are specified in 3.4.12.

3.4.12 **Regular inspections**:

- are advisable in a strip whose width is at least twice the maximum height of the stand,
- once a year for railway lines and busy roads,
- once every two years for others.

Extraordinary inspections:

- always after extreme climate events (windstorm, rime, heavy snow, etc.).

3.4.13 Based on the inspection results, it is necessary to continuously remove trees with major defects (see 3.5), dead trees, hanging and otherwise damaged trees from this area.

3.5 Major tree defects

3.5.1 **Significantly dead tree.** Necrosis of more than 50% of the crown, including primary boughs, can be a reason for felling.

3.5.2 **Cracked primary branching**. An evident crack in the area of primary branching can be a reason for felling. This includes notably narrow forks with ingrowing bark (known as pressure forks).

3.5.3 **Massive infection by wood decaying fungi.** Presence of fungal fruiting bodies on the trunk, primary limbs or in the immediate vicinity of the trunk base can be a reason for assessment of valuable trees by a professional arborist – consultant.

3.5.4 **Presence of cavities.** Open cavities in the bottom part of the trunk or in the area of primary branching can be a reason for felling the tree. Due to the high potential of biological value of trees with cavities, the option to leave a torso instead of complete felling is considered notably in rural areas (see 6.1.4 and 6.1.5). Assessment of trees with detected cavities by a professional arborist – consultant is advisable.

3.5.5 **Extreme inclination.** A tree can be felled because of a strong inclination towards PTI components, accompanied by signs of uprooting or cracks in the area of the trunk base.

A similar situation can be caused by a significantly asymmetric crown without the possibility of making it symmetric by local reduction. Assessment by a professional arborist – consultant is therefore advisable.

4 Planting and establishment of vegetation elements

4.0.1 Planting along roads has to respect the internal and disciplinary regulations TP 99 and TKP 13 (see References).

4.0.2 For railways, it has to respect the internal regulation TKP 13 (see References).

4.1 Taxon choice

4.1.1 In particular, habitats along very busy roads and newly built PTI sections show signs of extreme habitats for planting trees and shrubs. These include notably:

- very drought-prone areas,
- areas affected by winter road maintenance,
- habitats without natural soil structure and any humus-enriched layer.

4.1.2 Planting of geographically introduced species and hybrids in landscape (Section 5, Para. 4 and 5 of Act no. 114/1992 Coll.) is only possible with permission of a nature protection authority (with the exception of cases of management according to approved forest management plan or adopted forest management scheme).

4.1.3 Planting of trees and shrubs in open country should not use invasive species (see SPPK A02 001 Planting of trees) or species invasive by nature.

4.1.4 Planting **along roads** should use species with respect to the techniques and extent of winter maintenance. Tree and shrub taxa more tolerant to salt application are preferred. Tree species sensitive to salinity are listed in SPPK A02 001 Planting of trees.

4.1.5 In the case of extremely drought-prone habitats and habitats on rocky subgrade with minimal cover of rootable soil, tree-shaped plants should not be planted.

4.1.6 **Fruit trees (and shrubs)** can be planted in justified cases along 2nd and 3rd class roads and local and utility roads. Fruit trees are not planted along motorways and expressways[6]. Suitable species and varieties are listed in Annex 4.

4.2 Shrub planting

4.2.1 Planting of shrubs follows SPPK A02 003 Planting and pruning of shrubs and climbing plants or SPPK C02 003 Planting of fruit trees in the agricultural landscape.

4.3 Planting of trees and tree groups

4.3.1 General principles

4.3.1.1 Planting of trees follows SPPK A02 001 Planting of trees or SPPK C02 003 Planting of fruit trees in the agricultural landscape.

4.3.1.2 The site for planting has to allow the development of a crown to the dimensions of a grown-up individual of the given species. Exceptions may include plantings of trees for further shaping and temporary plantings (see 4.3.4). Consideration has to

[6] Expressways are 1st class roads marked as expressways pursuant to an applicable legal regulation.

be taken of surrounding buildings, street furniture, overhead utility networks and PTI structural elements, surrounding trees and shrubs, etc. Any necessary pruning intervention in crowns of existing trees or removal of other vegetation are part of the planting technique.

4.3.1.3 The distance between planted trees (pitch) has to correspond to the target dimensions of the crown of the grown-up tree of the given species/cultivar, the PTI type and the planting purpose.

4.3.1.4 Such species have to be chosen that can achieve sufficient clear underpass height (see Annex 1). Gradual increase in the crown bottom height by comparative and juvenile pruning is a mandatory part of vegetation management and respects SPPK A02 002 Tree pruning.

4.3.1.5 When planting **solitary trees**, the standard procedure is to use grown-up trees with an established crown and trunk circumference at least 12 cm, with the exception of standard nursery fruit trees, for which the trunk circumference is not set. Only tall-growing varieties of fruit trees are used.

4.3.1.6 When establishing **tree stands**, the standard procedure is to use pole/pyramid tree shapes; smaller transplants can be used if the process follows forestry procedures and SPPK A02 008 Tree stand establishment and management.

4.3.1.7 When establishing groups, natural rejuvenation can be used and groups can be established using coppices.

4.3.2 Planting along roads

4.3.2.1 Trees and shrubs must not be planted in the road shoulder.[7]

4.3.2.2 Trees and shrubs whose growth with respect to the ground level would disturb views necessary for road traffic safety must not be planted in the road protective zone on the inner side of a 1st or 2nd class highway or local road curve with a radius of 500 m and less, and inside the viewing triangles of intersections of such roads; this does not apply to forest stands with a shrub layer ensuring stability of the forest edge. The sides of viewing triangles are 100 m for main roads and 55 m for auxiliary roads[8].

4.3.2.3 Roadside vegetation on auxiliary land to roads and other suitable land comprising parts of motorways, highways or local or utility roads should only be planted at a **distance where it does not pose a solid obstacle** pursuant to Act no. 13/1997 Coll. and standard regulations (notably ČSN 73 6101).

4.3.2.4 Solid obstacles exclude trees and shrubs with branch/trunk diameter of less than 10 cm (as adults).

4.3.2.5 Along **motorways and expressways**, the planting needs to fully respect the minimum recommended distances of trees and shrubs from such roads as per ČSN 73 6101 (see Annex 1).

4.3.2.6 Along **1st, 2nd and 3rd class roads**, the planting distance as per ČSN 73 6101 (see Annex 1) can be reduced to one half in justified cases and with low traffic intensity. Permanent functionality of drainage measures (ditches) has to be assured.

4.3.2.7 Along **local and utility roads**, trees and shrubs can be planted at a distance that respects functionality of drainage measures (ditches) in accordance with ČSN 73

[7] Section 29, Para. 1 and 2 of Act no. 13/1997 Coll.
[8] Section 33 of Act no. 13/1997 Coll.

6101 in light of local conditions and traffic importance of the utility road.

4.3.2.8 Along sections of **roads, local and utility roads** with the highest permitted or limit speed below 60 km/h, trees and shrubs can be planted at a distance that respects functionality of drainage measures (ditches) in accordance with ČSN 73 6101.

4.3.2.9 Along roads with installed crash barriers, the distance to the solid obstacle (tree) pursuant to ČSN 73 6101 (see Annex 1) does not have to be observed, but the minimum distance between the tree trunk and the crash barrier should be observed, given by the deformation zone of the crash barrier (as set by the manufacturer) and the lateral distance between tree or shrub branches and the edge of the carriageway pursuant to ČSN 73 6101 (see Annex 1) should be observed.

4.3.2.10 Planting of trees does not have to be limited to a 3 m distance from the boundary of the neighbouring plot if there is an agreement between the road owner and the owner of the adjacent (neighbouring) plot (see Section 1017, Para. 1 of Act no. 89/2012 Coll.).[9]

4.3.2.11 When choosing the place for planting trees, the following parameters have to be considered in particular:

- road category,
- terrain gradient (cut, backfill, embankment),
- distance from utility elements (traffic signs, traffic lights, etc.),
- presence of utility networks,
- structural elements of public transport infrastructure (PTI),
- size and typical properties of adult individuals of the given species.

4.3.2.12 When planting grown-up trees on extreme sites (see 4.1.1), it is advisable to make larger planting holes with an edge length of at least 1 m.

4.3.2.13 Renewal of tree planting by adding trees under existing grown-up trees is not advisable due to limited conditions for successful development.

4.3.3 Planting along railway lines

4.3.3.1 Planting of trees and tree stands on railway land (see 3.1.3) can be done on suitable sites:

- at a distance greater than 5 m from the axis of the outermost track; the limit is 10 m from the axis of the outermost track on the inner side of bends,
- where they do not pose an obstacle to view, including visibility of signals, and where they guarantee adequate traffic safety,
- in operating infrastructure precincts (stations, halts – transport points and traffic posts),
- on sites where tree stands can serve as snow shields (protection from snowdrift formation), protection from soil erosion or for slope stabilisation.

4.3.3.2 When choosing the site for planting trees and shrubs, terrain gradient, distance from utility elements, structural PTI elements and the size of grown-up individuals of the chosen species have to be considered among other things.

4.3.3.3 When establishing stands, it is advisable to make height-differentiated stand edges.

[9] In that case, we recommend obtaining a written consent from the owner or making a written agreement of both parties on the planting.

4.3.3.4 When designing plantings, the designer has to conform with current legislation and standards.

4.3.4 Alternative procedures for planting trees and shrubs

4.3.4.1 The distance of a solid obstacle (such as a tree) from the edge of the embankment can be reduced in compliance with legal regulations, for both existing or newly installed **crash barriers** along roads.

4.3.4.2 In conflicting places where there is an interest in retaining aesthetic, social and ecological functions of trees and shrubs, temporary planting is possible.

4.3.4.3 **Temporary planting of trees and shrubs** is a special type of planting where trees and shrubs are planted in a periodic cycle and then reduced by subsequent cultivation interventions so as not to form a solid obstacle (trunk/branch thickness in excess of 10 cm) or interference with technical profiles. In justified cases (see 4.3.4.2), this type of planting is also possible without respecting 4.3.2.3 through 4.3.2.5.

4.3.4.4 Temporary plantings are not established with regular spacing and should be made so as to prevent a canopy stand.

4.3.4.5 When doing temporary planting, it is advisable to avoid fast-growing species and to plant trees of the pole/pyramid shape.

4.3.4.6 Temporary plantings can be established from stumps of species capable of coppicing.

4.3.4.7 In cases where tree or shrub plantations or coppice plantations are established on farmland within protective zones of PTI, the maximum period of a cultivation cycle (the felling interval) should not exceed 10 years.

5 Management of vegetation elements

5.1 Management of shrub groups

5.1.1 Pruning of shrubs shall respected SPPK A02 003 Planting and pruning of shrubs and climbing plants. Pruning of fruit species can be done in accordance with SPPK C02 005 Management of functional plantings of fruit woody plants.

5.1.2 In median strips and in places where shrub groups would pose and obstacle to view (see 4.3.2.2), species that are normally not suitable for shaping can be shaped.

5.1.3 The pruning can be done using appropriate machinery in order to maintain the distance between shrub branches and the road.

5.1 Management of solitary trees

5.2.1 The tree pruning shall respect SPPK A02 002 Pruning of trees. Pruning of fruit trees can be done in accordance with SPPK C02 005 Management of functional plantings of fruit woody plants or SPPK A02 002 Pruning of trees.

5.2.2 Local reduction towards an obstacle, or another intervention, has to be made when trees or shrubs reach closer than 2 m from structural elements.

5.2.3 The railway operator has to constantly secure such railway land condition that does not pose danger to the railway or its components or to railway traffic, and to prevent all danger to the railway.

5.2.4 The railway operator shall, at its own expense, take necessary measures consisting in felling or pruning of trees and shrubs even on land adjacent to the railway owned by third parties, if it is necessary for assuring safety and operability of the railway and if there is a danger to railway safety and operability due to railway construction or operation or natural influences. Owners of such land are required to tolerate such measures.

5.2.5 Owners of immovable property adjacent to railways are required to take, at their own expense, necessary measures consisting in felling or pruning of trees and shrubs for assuring safety and operability of the railway if a danger to safety and operability of the railway is caused by such owners (including neglect). The railway operator is authorised to invite owners to take such measures and set a deadline for them; the invitation has to include the owner's action that has caused the danger. In the case of doubt, the railway authority shall decide on the extent and method of performance of necessary measures and on who shall perform them. The railway operator is required to inform the owner about that option in the invitation.

5.2.6 Owners or users of immovable property inside the **PTI protective zone** (including trees, shrubs and their stands) are required to maintain them in a condition that does not pose a threat to the PTI and its components or traffic on the PTI, and to prevent all danger to the PTI.

5.2.7 Use of machinery that does not permit detailed routing of cuts of each individual part of a branch or trunk being removed for managing trees along PTI is ruled out.

5.2.8 Installation of **safety bonds** (cabling/bracing systems) shall proceed respecting SPPK A02 004 Safety bonds and other stabilisation systems.

5.2.9 Stabilisation of trees using technical means (safety bonds) shall only be done in

justified exceptional cases where adequate stabilisation cannot be achieved by pruning and where the tree cannot be removed.

5.2.10 For existing trees growing in the road shoulder, the road administrator can resolve the situation by taking a traffic or technical measure.

5.3 Management of tree and shrub stands

5.3.1 Cultivation interventions in tree and shrub stands proceed respecting SPPK A02 008 Tree and shrub stand establishment and management.

5.3.2 The maximum recommended period for cultivation interventions in tree and shrub stands along PTI is 10 years.

5.4 Use of plant protection products

5.4.1 Protection of trees and shrubs from harmful organisms and diseases and limiting of undesirable tree and shrub growth is possible using products permitted under Act no. 326/2004 Coll. and other legal regulations.

5.4.2 It is necessary to maintain the protective zones of plant protection products when using them in accordance with the manufacturer's material safety data sheet or label.

5.5 Tree and shrub protection from game

5.5.1 Protection from damage by game (gnawing, biting, peeling) is always done in young trees and shrubs and in older ones as needed.

5.5.2 The work procedures for protection from game are described in SPPK D02 005 Measures to improve the structure of forest stands.

5.5.3 Fruit trees always required protection from damage by game pursuant to SPPK C02 003 Planting of fruit trees in the agricultural landscape.

5.5.4 Mechanical protections have to be removed in time depending on their type.

5.5.5 Trees and shrubs can also be protected permanently using device against game entry (fencing, noise barriers).

5.6 Destruction of invasive plant species

5.6.1 A list of invasive plant species is published continuously at www.invaznidruhy.nature.cz.

5.6.2 Work procedures for destruction of invasive plant species are described in SPPK D02 007 Destruction of selected invasive species.

6 Felling of trees and shrubs

6.1 Felling of trees along PTI

6.1.1 The tree felling shall respect SPPK A02 006 Tree felling.
6.1.2 It is advisable to reduce stumps left along PTI by cutting at the ground level or to remove them.
6.1.3 Stumps with a height over 200 mm, left at a distance where they pose a solid obstacle pursuant to ČSN 736101, are inadmissible.
6.1.4 Leaving of torsos in road shoulders is impossible.
6.1.5 Leaving of torsos along PTI can only be considered where they do not pose a solid obstacle and where their collapse onto PTI is not a risk.
6.1.6 Establishment of beetle piles and temporary log stocks is only possible at a safe distance from roads (see 4.3.2.3 through 4.3.2.6) and outside the passable profile of railway lines.

6.2 Formal requisites

6.2.1 If an intervention in a tree or shrub (or trees and shrubs) can reduce or alter the landscape character (by reducing its aesthetic and natural value), the intervention cannot be permitted unless the applicable nature protection authority issues an approval pursuant to Section 12, Para. 2 of Act no. 114/1992 Coll. on Nature and Landscape Protection.
6.2.2 Increase caution is necessary, in particular, in areas of concentrated aesthetic and natural values (e.g., nature parks, PLA) as well as in cases of interventions in larger groups of trees and shrubs, avenues or prominent solitary elements that have a visual importance in landscape and frequently constitute a prominent component of natural and cultural-historical values of landscape character.
6.2.3 If in doubt whether it may lead to interference in landscape character, it is advisable to turn to the applicable nature protection authority, which shall assess the potential degree of influence on landscape character.
6.2.4 New plantings of trees and shrubs should respect landscape character or the area or place (particularly in terms of the nature and location of the planting and its species composition).

Annex 1 Minimum distance of tree and shrub planting and branches from carriageways

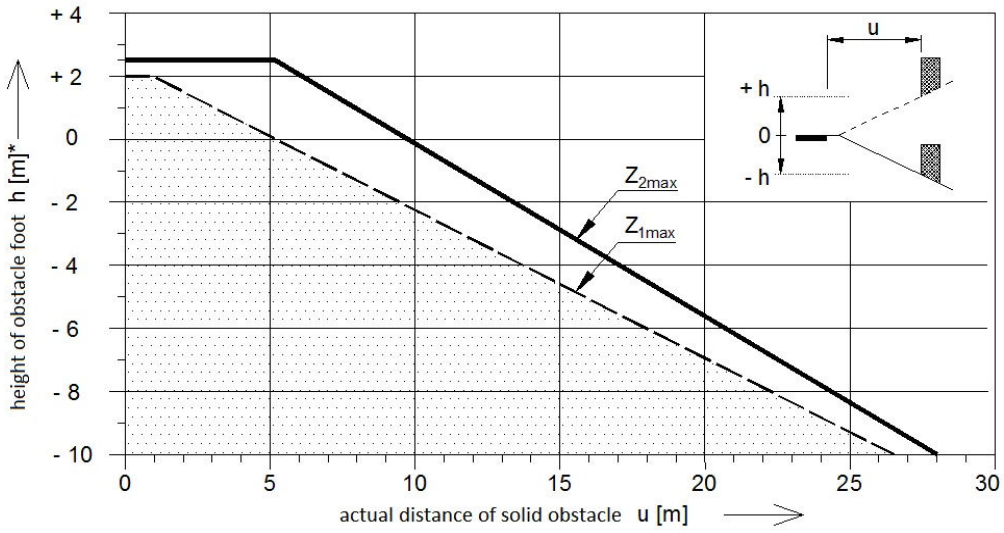
The following information is adopted from ČSN 73 6101 Road and motorway design. The standard applies to designing roads, motorways and publicly accessible utility roads in open country, namely for new construction, relocation and renovation associated with reconstruction of the embankment, as well as designing service facilities and their connection to roads and motorways. It does not apply to forest and field tracks.

As concerns vegetation accompanying roads, solid obstacle refers to:

- trees and shrubs with a branch/trunk diameter in excess of 100 mm,
- stumps higher than 200 mm over adjacent ground.

A – greatest critical distance of solid obstacle (no crash barriers):

u	actual distance of solid obstacle
h	height of obstacle foot (in cuts: height of obstacle foot from bottom of ditch)
Z_{1max}	critical distance for roads (in justified cases, can be reduced to 50% if traffic intensity is low)
Z_{2max}	critical distance for motorways and expressways



Planting can be done without problems beyond this distance.

B – distance of tree and shrub branches from edge of carriageway (embankment):

a) when definitions of view areas and clear heights of traffic space do not require greater distances of tree and shrub branches from edge of road or motorway carriageways, the following minimum distances have to be observed:

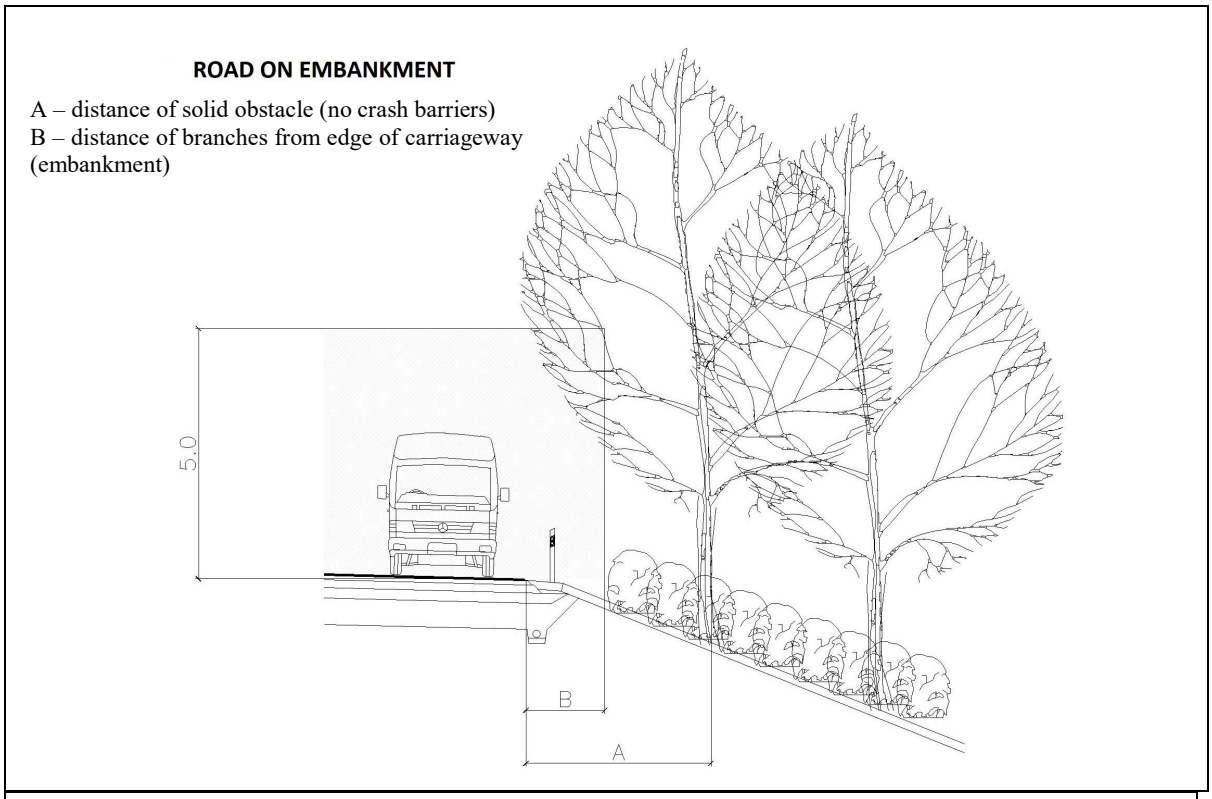
- for **single-carriageway** roads with total carriageway width:
  - ≤ 10 m 1.5 m
  - > 10 and ≤ 15 m 2.0 m
  - > 15 m 2.5 m
- for **dual-carriageway** roads or motorways 3.5 m

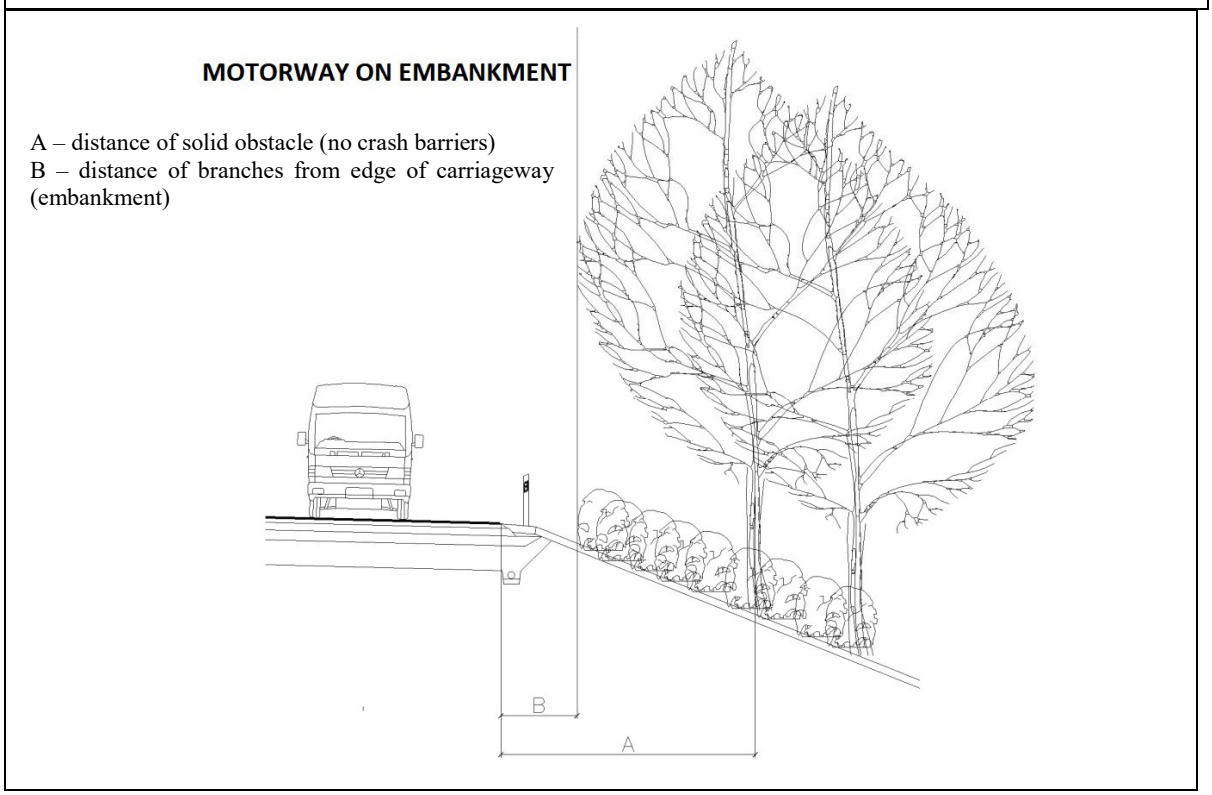
If there is a ditch or gutter past the crown edge, branches of grown up trees and shrubs can be no closer than 1.0 m from its outer edge (see figures below);

b) branches of trees and shrubs have to be at least 2.0 m from all components of bridge structures, tunnels, retaining walls, safety installations, noise barriers, etc.; this distance also has to be observed on cut slopes from the outer top edge of revetment walls.

C – underpass clearance of trees

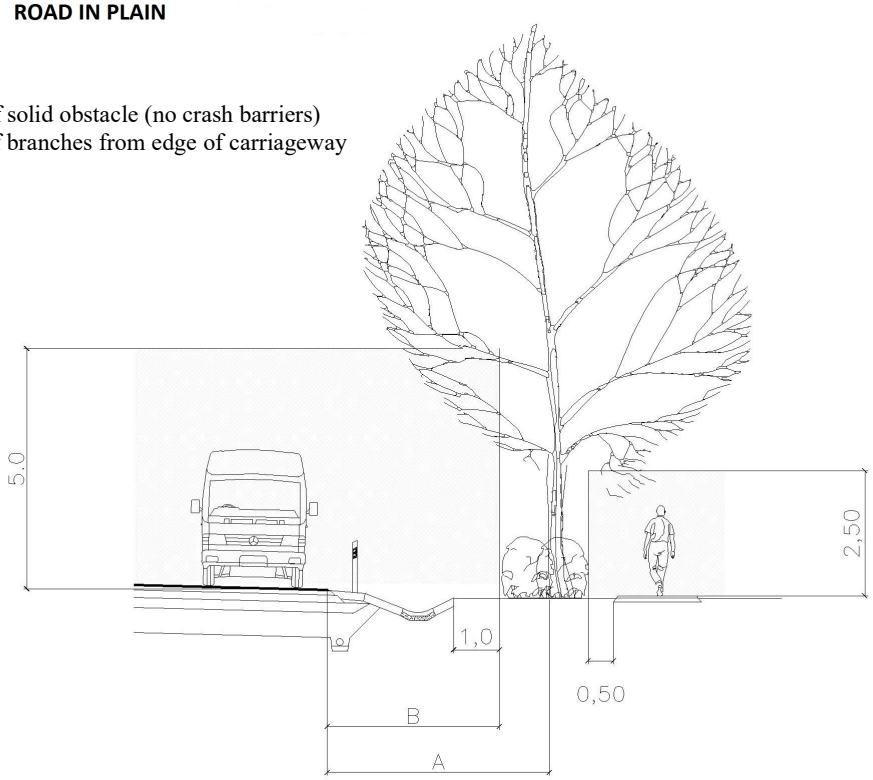
Along motorways, no branches may extend over the carriageway or the ditch area.
Along roads, no branches may extend lower than 5 m over the carriageway and the ditch area.
The underpass clearance for pedestrian and cycling trails is 2.5 m.





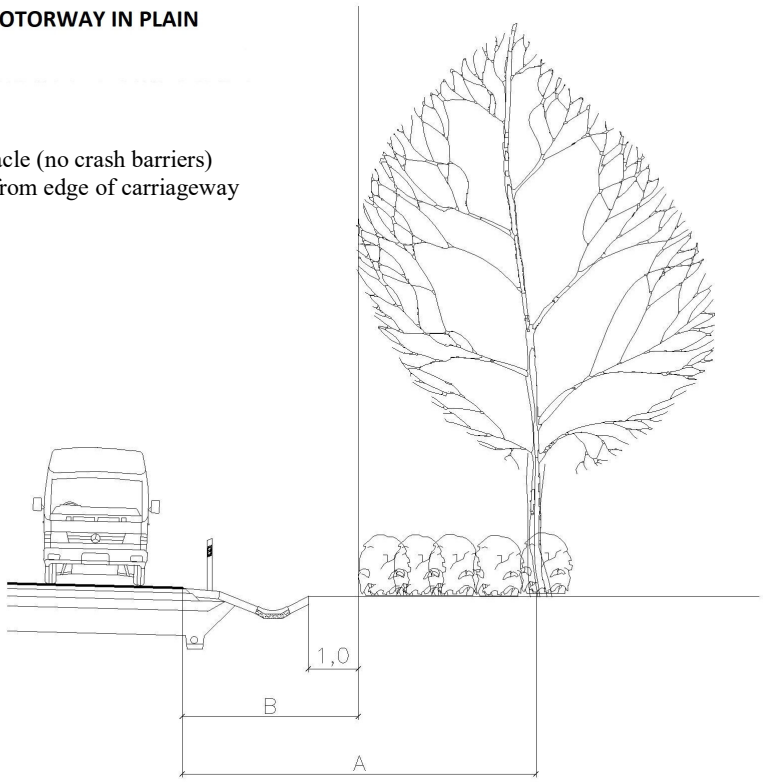
ROAD IN PLAIN

A – distance of solid obstacle (no crash barriers)
B – distance of branches from edge of carriageway (embankment)



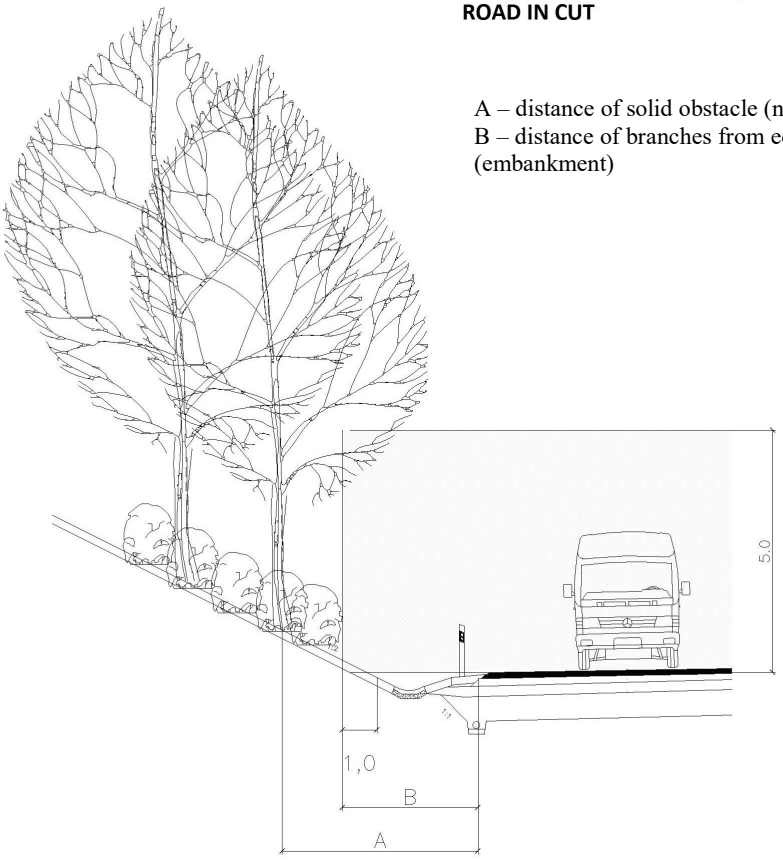
MOTORWAY IN PLAIN

A – distance of solid obstacle (no crash barriers)
B – distance of branches from edge of carriageway (embankment)



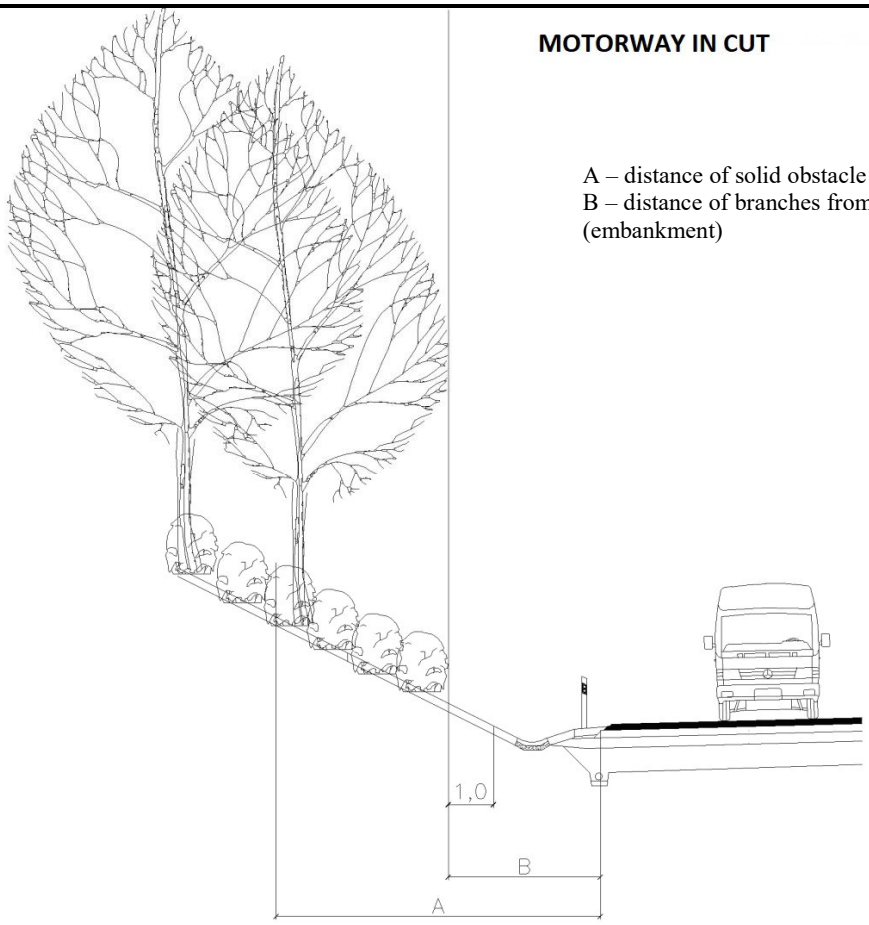
ROAD IN CUT

A – distance of solid obstacle (no crash barriers)
B – distance of branches from edge of carriageway (embankment)



MOTORWAY IN CUT

A – distance of solid obstacle (no crash barriers)
B – distance of branches from edge of carriageway (embankment)



Annex 2 Scope of qualification of persons working on PTI components

Felling on railway land can only be done by persons with a valid occupational safety test and a permit to enter railway infrastructure in operation.

Everyone who **enters buildings on railway land** has to:

- have a proof of medical fitness,
- take a training in occupational health and safety regulations,
- have a contractual relationship or agreement with the railway owner or operator.

Based on these requisites, the person receives a document authorising them to enter pursuant to railway owners' and operators' internal regulations.

Persons present on motorways and 1st class roads have to take a training according to internal regulations of the RMD CR. Qualification requirements for 2nd and 3rd class roads are set by their administrators according to internal regulations.

Developed based on:
ČD O2 – Regulation on issuance of employee passes and permits to enter spaces of Czech Railways, a.s., and issuance of passes for external companies.
ČD Op 16 – ČD regulation on occupational health and safety.

Annex 3 List of trees and shrubs recommended for planting along roads

TAXON		SUITABLE LOCATION:					Indigenous species and cultivars (P) / Introduced species (N)	Dimensions (m) height/width	REMARK
LATIN NAME	ENGLISH NAME	motorways and expressways	1st and 2nd class roads	3rd class road, local and utility roads	Sections in municipalities	Rest areas with filling stations and railway stations			
Broadleaf trees									
Acer campestre	field maple	+++	+++	+++	++	++	P	6-12/6-8	
Acer campestre 'Elsrijk', ´Elegant´	field maple	++	+++	+++	+++	+++	P	6-10/4-6	
Acer platanoides	Norway maple	+++	++	++	++	++	P	18-25/15-20	
Acer platanoides 'Globosum'	Norway maple	-	-	-	++	++	P	5-6/5-6	
Acer platanoides 'Royal Red'	Norway maple	+	-	-	++	++	P	8-12/8-10	
Acer platanoides ´Schwedleri´, ´Deborach´	Norway maple	+	+	+	++	++	P	8-12/8-10	
Acer platanoides 'Cleveland'	Norway maple	++	+++	+++	+++	+++	P	8-12/ to 6	
Acer platanoides 'Drumondii'	Norway maple	-	-	-	++	++	P	10-12/7-9	
Acer platanoides 'Emerald Queen'	Norway maple	++	++	+++	+++	+++	P	12-15/6-8	
Acer platanoides 'Farlake's Green'	Norway maple	++	++	+++	+++	+++	P	12-15/6-10	
Acer platanoides 'Columnare'	Norway maple	-	+	+	++	++	P	8-10/6-8	
Acer platanoides 'Olmsted'	Norway maple	-	+	+	++	++	P	10-12/4-5	
Acer pseudoplatanus	sycamore maple	+++	+++	+++	+++	+++	P	20-25/12-18	
Acer pseudoplatanus 'Atropurpureum'	sycamore maple	+	+	++	++	++	P	20-25/12-18	
Acer pseudoplatanus 'Erectum', ´Negenia´	sycamore maple	++	++	+++	+++	+++	P	15-20/8-10	
Acer rubrum	red maple	-	-	+	++	++	N	10-15/7-10	allergen
Aesculus carnea 'Briotii'	red horse-chestnut	+	-	+	++	++	N	10-15/8-12	sensitive to salinity, resistant to horse-chestnut leaf miner
Aesculus hippocastanum	horse chestnut	-	+	+	+	+	N	20-30/15-20	horse-chestnut leaf miner, great quantity of fruits
Aesculus hippocastanum ´Baumannii´	horse chestnut	+	+	+	++	++	N	20-25/12-15	almost no fruits, horse-chestnut leaf miner
Alnus glutinosa	European black alder	++	+	+	+	+	P	10-15/ to 10	sensitive to salinity, humid habitats
Alnus glutinosa 'Laciniata'	European black alder	-	-	-	+	+	P	10-12/7-9	sensitive to salinity
Alnus incana	grey alder	+	+	+	+	+	P	10-20/8-12	sensitive to salinity, strong allergen
Amelanchier lamarckii 'Ballerina'	common juneberry	++	++	++	+++	+++	N	4-5/4-6	tolerates salinity
Amelanchier arborea'Robin Hill'	downy juneberry	++	++	++	+++	+++	N	5-7/4	tolerates salinity
Betula pendula	white birch	+++	+++	+++	++	++	P	16-22/7-9	short-lived
Betula pendula 'Fastigiata'	white birch	+	+	++	++	++	P	10-15/5-7	short-lived
Carpinus betulus	common hornbeam	++	++	++	++	++	P	12-15/15-20	sensitive to salinity
Carpinus betulus 'Fastigiata'	common hornbeam	-	-	+	++	++	P	9-12/5-7	sensitive to salinity
Catalpa bignonioides	southern catalpa	-	-	-	++	++	N	9-14/10-12	sensitive to salinity
Celtis occidentalis	common hackberry	-	-	-	+++	+++	N	15-20/15-20	tolerates salinity

TAXON		SUITABLE LOCATION:					Indigenous species and cultivars (P) / Introduced species (N)	Dimensions (m) height/width	REMARK
LATIN NAME	ENGLISH NAME	motorways and expressways	1st and 2nd class roads	3rd class road, local and utility roads	Sections in municipalities	Rest areas with filling stations and railway stations			
Corylus colurna	Turkish hazel	-	-	+	++	++	N	15-20	less tolerant to drought, larger quantity of fruits
Crataegus laevigata	midland hawthorn	++	++	++	++	++	P	5-7/ to 6	sensitive to salinity
Crataegus laevigata 'Paul's Scarlet'	midland hawthorn	-	-	++	+++	+++	P	5-7/4-6	sensitive to salinity
Crataegus monogyna	single-seeded hawthorn	++	++	++	++	++	P	5-7/ to 6	sensitive to salinity
Crataegus monogyna 'Stricta'	single-seeded hawthorn	-	-	-	++	++	P	4-5/ to 2	sensitive to salinity
Crataegus x prunifolia ´Splendens´	plumleaf hawthorn	+	+	++	++	++	N	5-7/4-5	sensitive to salinity
Cornus mas (avenue tree)	European cornel	++	++	++	+++	+++	P	5-7/4-7	calcareous soil
Fagus sylvatica	European beech	+	+	+	++	++	P	25-40/20-30	sensitive to salinity and dry soil
Fagus sylvatisa f. purpurea	European beech	+	+	-	++	++	P	25-30/25-30	red-leaved seedling – colouration varies, limited local use
Fagus sylvatica 'Dawyck'	European beech	-	-	+	++	++	P	15-20/3-4	sensitive to salinity
Fagus sylvatica 'Riversii'	European beech	-	-	-	++	++	P	15-20/10-15	sensitive to salinity
Fraxinus excelsior	common ash	+++	+++	+++	++	++	P	25-30/15-30	ash dieback disease
Fraxinus excelsior 'Atlas'	common ash	+++	+++	+++	++	++	P	15-20/ to 12	ash dieback disease
Fraxinus excelsior 'Globosum'	common ash	-	-	-	++	++	P	4-6	ash dieback disease, round-shaped
Fraxinus ornus	manna ash	+	+	+	+++	+++	N	6-15/6-10	only warmer areas of CR, pollen allergen
Gleditsia triacanthos (incl. f. inermis)	honey locust	-	-	-	+++	+++	N	15-25/10-20	
Gleditsia triacanthos 'Skyline'	honey locust	-	-	-	++	++	N	15-20/7-10	tolerates salinity and drought
Gleditsia triacanthos 'Sunburst'	honey locust	-	-	-	++	++	N	8-12/6-10	tolerates salinity and drought
Juglans nigra	Eastern black walnut	-	-	-	+++	+++	N	25-30/15-20	
Koelreuteria paniculata	varnish tree	-	-	-	++	++	N	5-8	sensitive to salinity, tolerates drought and urban environment
Malus sylvestris	European crab apple	++	+	++	++	++	P	under 10	generally modest, grows better in nutrient-richer soil
Malus baccata 'Street Parade'	Siberian crab apple	++	+	++	+++	+++	N	5-8/4-5	sensitive to salinity, decorative blossoms and fruits
Malus 'Evereste'	apple	++	+	++	+++	+++	N	6-8/ to 6	sensitive to salinity, decorative blossoms and fruits
Malus 'Professsor Sprenger'	apple	++	+	++	+++	+++	N	5-8/4-6	sensitive to salinity, decorative blossoms and fruits
Malus 'Red Sentinel'	apple	++	+	++	+++	+++	N	5-7/3-4	sensitive to salinity, decorative blossoms and fruits
Malus 'Rudolph'	apple	++	+	++	+++	+++	N	6-8/5-7	sensitive to salinity, decorative blossoms and fruits
Malus 'Wintergold	apple	++	+	++	+++	+++	N	5-7/4-6	sensitive to salinity, decorative blossoms and fruits
Platanus x hispanica	London planetree	+	-	-	+++	+++	N	20-30/20	tolerates salinity and urban environment
Platanus x hispanica 'Alphen's Globe'	London planetree	-	-	-	+++	+++	N	8-10/10	tolerates salinity and urban environment
Platanus x hispanica 'Huissen'	London planetree	-	-	-	+++	+++	N	20-25/ to 15	tolerates salinity and urban environment
Platanus x hispanica 'Pyramidalis'	London planetree	-	-	-	+++	+++	N	15-20/10-12	tolerates salinity and urban environment
Platanus x hispanica 'Tremonia'	London planetree	-	-	-	+++	+++	N	15-20/7-10	tolerates salinity and urban environment

TAXON		SUITABLE LOCATION:					Indigenous species and cultivars (P) / Introduced species (N)	Dimensions (m) height/width	REMARK
LATIN NAME	ENGLISH NAME	motorways and expressways	1st and 2nd class roads	3rd class road, local and utility roads	Sections in municipalities	Rest areas with filling stations and railway stations			
Platanus occidentalis 'Obelisk'	American planetree	-	-	-	+++	+++	N	20-30/6-10	tolerates salinity and urban environment
Populus alba	silver poplar	-	+	+	+	+	P	20-30/ to 25	generally very resilient, tolerates salinity well
Populus tremula	quaking aspen	-	+	+	+	+	P	15-25/7-12	generally very resilient, tolerates salinity well
Prunus avium, P. avium 'Plena'	wild cherry	++	++	++	++	++	P	10-20/10-15	sensitive to salinity
Prunus cerasifera 'Nigra'	cherry plum	-	-	-	++	++	N	3-7/4-6	
Prunus x hillieri 'Spire'	Hillier's plum	-	-	+	++	++	N	5-8/2-3	sensitive to salinity
Prunus mahaleb	mahaleb cherry	++	-	+	+	++	P (SE Moravia)	4-10/4-8	sensitive to salinity
Prunus padus	European bird cherry	++	++	++	++	++	P	10-15/6-10	sensitive to salinity, humid humus-richer habitats
Prunus padus 'Nana'	European bird cherry	-	-	-	++	++	P	3-4	sensitive to salinity
Prunus padus ´Watereri´	European bird cherry	+	+	++	+++	+++	P	6-12/6-10	sensitive to salinity, longer and more prominent blossoms, fragrant
Prunus sargentii 'Rancho'	Sargent's cherry	-	-	-	++	++	N	6-9/ to 3	sensitive to salinity
Prunus x schmittii	Schmitt's cherry	-	-	-	++	++	N	5-8/2-3	sensitive to salinity
Prunus serrulata ´Kanzan´	Japanese cherry (sakura)	-	-	-	++	++	N	7-10/5-8	sensitive to salinity, tried and tested
Prunus serrulata 'Royal Burgundy'	Japanese cherry (sakura)	-	-	-	++	++	N	6-8/4-6	sensitive to salinity
Prunus serrulata 'Sunset Boulevard'	Japanese cherry (sakura)	-	-	-	++	++	N	6-8/4-6	sensitive to salinity
Pyrus calleryana 'Chanticleer'	Callery pear	-	-	-	++	++	N	7-9/ to 5	sensitive to salinity
Pyrus communis	common pear	++	++	++	-	-	P	7-10/5-7	sensitive to salinity, 10 cm fruits
Pyrus communis ' Beech Hill'	common pear	++	++	++	++	++	P	7-9/5-7	sensitive to salinity, tolerates drought and urban environment
Quercus cerris	Turkey oak	+	-	-	-	-	P (Moravia)	20-30/10-20	tolerates salinity, warmer parts of CR
Quercus frainetto	Hungarian oak	++	+	+	-	-	P (locally S Moravia)	20-30/15-25	
Quercus palustris	pin oak	-	-	-	++	++	N	15-25/10-15	
Quercus petraea	sessile oak	++	++	++	+	+	P	20-30/15-20	tolerates salinity
Quercus pubescens	downy oak	++	++	++	+	+	P	up to 15 /up to 15	specially protected species!
Quercus robur	pedunculate oak	++	++	++	+	+	P	20-40/15-30	tolerates salinity, prone to powdery mildew
Quercus robur 'Fastigiata Koster'	pedunculate oak	-	-	-	+	++	P	10-15/3-5	tolerates salinity, prone to powdery mildew
Sophora japonica	Japanese pagoda tree	-	-	-	+	+	N	15-25/12-20	warm areas, tolerates salinity
x Sorbopyrus auricularis	shipova tree	++	++	++	+	+	N	10-20/6-10	2.5-3 cm fruits
Sorbus aria 'Magnifica'	common whitebeam	++	++	++	+++	+++	P	8-10/4-6	slower-growing under unsuitable conditions
Sorbus aucuparia	mountain ash	++	++	++	+++	+++	P	8-12/4-7	slower-growing under unsuitable conditions, more suitable primarily for higher and moister areas
Sorbus aucuparia 'Edulis'	mountain ash	++	++	++	+++	+++	P	10-15/ to 6	slower-growing under unsuitable conditions, more suitable primarily for higher and moister areas
Sorbus intermedia	Swedish whitebeam	++	++	++	+++	+++	N	8-12/ to 12	sensitive to salinity

TAXON		SUITABLE LOCATION:					Indigenous species and cultivars (P) / Introduced species (N)	Dimensions (m) height/width	REMARK
LATIN NAME	ENGLISH NAME	motorways and expressways	1st and 2nd class roads	3rd class road, local and utility roads	Sections in municipalities	Rest areas with filling stations and railway stations			
Sorbus intermedia 'Brouwers'	Swedish whitebeam	++	++	++	+++	+++	N	8-12/6-9	sensitive to salinity
Sorbus thuringiaca 'Fastigiata'	Thuringia ash	-	-	+	+++	+++	N	5-7/ to 3.5	sensitive to salinity
Sorbus torminalis	wild service tree	+	+	+	+	+	P	10-20/7-12	warmer and dryer parts of CR
Tilia cordata	small-leaved linden	++	++	++	+++	+++	P	18-25/10-15	sensitive to salinity, suffers drought
Tilia cordata 'Greenspire'	small-leaved linden	++	++	++	+++	+++	P	15-18/10-12	sensitive to salinity, suffers drought
Tilia cordata 'Rancho'	small-leaved linden	++	++	++	+++	+++	P	8-12/4-7	sensitive to salinity, suffers drought
Tilia cordata 'Roelvo'	small-leaved linden	++	++	++	+++	+++	P	12-15/8-12	sensitive to salinity, suffers drought
Tilia x vulgaris 'Pallida'	common linden	++	++	++	+++	+++	P	20-30/12-20	sensitive to salinity
Tilia platyphyllos	large-leaved linden	++	++	++	+++	+++	P	20-40/18-25	sensitive to salinity
Tilia platyphyllos 'Fastigiata'	large-leaved linden	+	++	++	+++	+++	P	10-15/5-8	sensitive to salinity
Tilia tomentosa 'Brabant'	silver linden	-	-	+	+++	+++	N	20-25/15-20	sensitive to salinity
Tilia tomentosa 'Silver Globe'	silver linden	-	-	+	+++	+++	N	4-6/4-6	sensitive to salinity
Ulmus glabra	wych elm	+	++	++	+	+	P	25-30/ to 20	suffers from Dutch elm disease, areas of higher altitude
Ulmus minor	field elm	+	++	++	+	+	P	25-30/ to 20	suffers from Dutch elm disease
Ulmus 'Clusius'	elm	-	+	+	++	++	N	15-20/8-10	sensitive to salinity, resistant to Dutch elm disease
Ulmus 'Dodoens'	elm	-	+	+	++	++	N	12-15/5-6	sensitive to salinity, resistant to Dutch elm disease
Ulmus 'Lobel'	elm	-	+	+	++	++	N	12-15/5-6	sensitive to salinity, resistant to Dutch elm disease
Ulmus 'New Horizont'	elm	++	+	+	++	++	N	12-15/ to 10	resistant to Dutch elm disease
Ulmus 'Regal'	elm	++	+	+	++	++	N	18-20/ to 8	resistant to Dutch elm disease
Ulmus 'Rebona'	elm	++	++	++	+++	++	N	20-25/ to 10	tolerates salinity, resistant to Dutch elm disease
Conifers									
Juniperus communis	common juniper	-	-	-	-	++	P	5-6/2-4	rest areas, roundabouts
Juniperus communis 'Compressa', 'Repanda'	common juniper	-	-	-	-	++	P	0.3-0.8	rest areas, roundabouts
Juniperus communis 'Green Carpet'	common juniper	-	-	-	-	++	P	0.3-0.5	rest areas, roundabouts
Juniperus horizontalis 'Glauca', 'Wiltonii'	creeping juniper	-	-	-	-	++	N	0.3	rest areas, roundabouts
Ginkgo biloba	ginkgo tree	-	-	-	++	++	N	15-30/10-15	resistant to road salt, only male plants for streets
Ginkgo biloba 'Tremonia'	ginkgo	-	-	-	++	++	N	15-20/3-8	resistant to road salt, no seeds
Microbiota decussata	Siberian carpet cypress	+	-	-	++	++	N	0.5-1/2-5	
Picea omorika	Bosnian spruce	++	+	++	++	+++	N	15-25/2.5-4	slender, sensitive to salinity
Picea pungens - seedling	blue spruce	+	-	-	+	+	N	15-20/6-8	anchors better than P. abies
Pinus banksiana	Jack pine	++	-	-	+	++	N	up to 20/7-10	
Pinus mugo, P. mugo'Gnom'	creeping pine	+	-	-	-	++	P	2-3/2-3	shrub groups, not near roads
Pinus nigra	**black pine**	+	-	-	-	-	N	20-25/8-10	**invasive potential – only justified uses + monitoring**; resistant to salt aerosols

TAXON		SUITABLE LOCATION:					Indigenous species and cultivars (P) / Introduced species (N)	Dimensions (m) height/width	REMARK
LATIN NAME	ENGLISH NAME	motorways and expressways	1st and 2nd class roads	3rd class road, local and utility roads	Sections in municipalities	Rest areas with filling stations and railway stations			
Pinus sylvestris	Scots pine	++	+	+	+	+	P	10-30/7-10	salt aerosol causes needle burns
Large shrubs (over 3 m) and shrub-shaped trees		**Adult trees are solid obstacles under ČSN 736101**							
Amelanchier spicata	dwarf serviceberry	++	++	+	+	++	N	1-4	
Amorpha fruticosa	false indigo-bush	++	+	-	-	-	N	1-4	**invasive potential – only justified uses + monitoring**,
Amelanchier sp.	serviceberry	++	++	++	+++	+++	N	4-5/4-6	tolerates salinity
Buddleja alternifolia	alternate-leaved butterfly-bush	++	+	-	++	+	N	2-6	suitable for drier slopes, ideally warmer areas
Cotinus coggygria	European smoketree	++	+	-	**	**	N	2-5	grows well on dry stony or skeleton-rich soil
Cotoneaster bullatus	hollyberry cotoneaster	++	++	+	++	++	N	2-4	recovers well after freezing
Cotoneaster salicifolius	willow-leaved cotoneaster	+	+	-	+	++	N	2-5	recovers well after freezing
Crataegus laevigata	midland hawthorn	+	+	+	-	-	P	5-7	sensitive to salinity
Crataegus monogyna	single-seeded hawthorn	+	+	+	-	-	P	5-7	sensitive to salinity
Cornus mas	European cornel	++	++	++	++	++	P	4-5	calcareous soil
Corylus avellana	common hazel	+++	+++	+++	++	+	P	5-6	
Euonymus latifolius	broadleaf spindle	++	++	++	+++	+++	N	2-5	
Hippophae rhamnoides	common sea buckthorn	+	+	-	-	+	N	3-6	thorny, tolerates salinity
Kolkwitzia amabilis	beauty bush	++	+	-	++	++	N	under 4	modest in terms of habitat, very decorative in blossom
Lonicera xylosteum	fly honeysuckle	+++	+++	+++	++	++	P	3-4	
Philadelphus coronarius	English dogwood	++	++	++	+++	+++	N	3-4	white blossoms
Rhamnus cathartica	common buckthorn	+++	+++	++	+	+	P	4-6	
Frangula alnus	alder buckthorn	++	++	++	+	+	P	3-5	
Sambucus nigra	black elder	++	++	++	+	+	P	3-5	
Sambucus racemosa	red-berried elder	++	++	++	+	+	P	3-5	
Viburnum opulus	European cranberrybush	++	++	++	+	+	P	3-5	black bean aphids
Shrubs (1-3 m)									
Amelanchier ovalis	snowy mespilus	++	++	+	+	++	N	1-3	grows wild sporadically
Aronia melanocarpa	black chokeberry	+	+	+	++	++	N	under 2	
Berberis thunbergii cv.	Japanese barberry	+++	+++	+++	+++	+++	N	1-1.5	
Berberis vulgaris	common barberry	++	++	++	++	++	P	1-1.5	intermediate host to stem rust
Buxus sempervirens	European box	-	-	-	-	+	N	2-3	evergreen, sensitive to salt
Caragana arborescens	Siberian peashrub	++	++	+	++	++	N	2-3	
Cornus alba cv. (only green-leaved cv.)	white dogwood	++	+	-	++	++	N	2-3	**invasive potential – only justified uses + monitoring**, more suitable than C. sang.

TAXON		SUITABLE LOCATION:					Indigenous species and cultivars (P) / Introduced species (N)	Dimensions (m) height/width	REMARK
LATIN NAME	ENGLISH NAME	motorways and expressways	1st and 2nd class roads	3rd class road, local and utility roads	Sections in municipalities	Rest areas with filling stations and railway stations			
Cornus sanguinea	common dogwood	+++	+++	+++	++	++	P	2-3	
Cornus stolonifera cv.	red osier dogwood	++	+	-	++	++	N	2-3	**invasive potential – only justified uses + monitoring**, tolerates drought and salinity, yellow-green shoots
Cotoneaster dielsianus	Diels' cotoneaster	++	++	++	++	++	N	2-3	deciduous
Cotoneaster divaricatus	spreading cotoneaster	++	++	++	++	++	N	1-2/3	spreads in the surroundings with age
Cotoneaster integerrimus	common cotoneaster	++	++	++	++	++	P	under 2	for very dry-prone habitats, warmer parts of CR
Cotoneaster melanocarpus	black-fruited cotoneaster	++	++	++	++	++	P (Moravia only)	under 3	resistant to low temperatures
Cotoneaster multiflorus	showy cotoneaster	++	++	++	++	++	N	2-3	
Chaenomeles sp.	Japanese quince	+	-	-	++	+++	N	under 3	modest
Euonymus alatus	winged spindle	++	++	++	+	+	N	under 2.5	
Euonymus europeus	European spindle	++	++	++	+	+	P	2-3	massively infested with bird-cherry ermine
Euonymus verrucosus	spindletree	++	++	++	+	+	P	2-3	only in warmer parts of Moravia
Forsythia intermedia cv.	border forsythia	++	++	++	++	++	N	1.5-2.5	use of cultivars is advisable
Hydrangea arborescens	smooth hydrangea	-	-	-	-	++	N	under 3	local use
Hydrangea paniculata	panicled hydrangea	-	-	-	-	++	N	under 1.8	local use
Ligustrum vulgare cv.	common privet	+++	+++	+++	+++	+++	P	2-3	
Philadelphus sp.	mock-orange	++	++	++	++	++	N	1-1.5	
Physocarpus opulifolius (only green-leaved cv.)	**common ninebark**	++	+	-	++	++	N	2-3	**invasive potential – only justified uses + monitoring**, resilient
Prunus laurocerasus	common laurel	-	-	-	++	++	N	1-2	tolerates salinity, freezes frequently
Pyracantha coccinea cv.	**scarlet firethorn**	-	-	-	++	++	N	2-2.5	**invasive potential – only justified uses + monitoring**, evergreen, decorative fruits
Ribes sanguineum cv.	flowering currant	++	++	++	++	++	N	1.5-2	
Rosa glauca	redleaf rose	++	++	++	++	++	P	1.5-2.5	higher elevations
Rosa rubiginosa	sweet briar	++	++	++	++	++	P	do2	suitable for sunny slopes
Salix purpurea	purple willow	++	++	++	+	+	P	under 3	moist to waterlogged sites
Sorbaria sorbifolia	false spiraea	++	+	-	+	-	N	under 3	expansive, tends to grow wild
Spiraea x bumalda (only green-leaved cv.)	Bumald's spiraea	+	-	-	++	++	N	0.5-1.5	resilient, modest
Spiraea betulifolia	white meadowsweet	+	-	-	++	++	N	0.5-1.5	resilient, modest
Spiraea x cinerea, S. nipponica	ash bridewort, Japanese meadowsweet	++	++	++	++	++	N	1-1.5	low management demands
Spiraea douglasii	Douglas' meadowsweet	++	++	++	++	++	N	1-1.5	
Spiraea prunifolia	plumleaf meadowsweet	++	++	++	++	++	N	under 3	may freeze
Spiraea x vanhouttei	Van Houtte's spiraea	++	++	++	++	++	N	2-2.5	
Staphylea pinnata	European bladdernut	-	-	+	++	++	P	2-3	local use

TAXON		SUITABLE LOCATION:					Indigenous species and cultivars (P) / Introduced species (N)	Dimensions (m) height/width	REMARK
LATIN NAME	ENGLISH NAME	motorways and expressways	1st and 2nd class roads	3rd class road, local and utility roads	Sections in municipalities	Rest areas with filling stations and railway stations			
Syringa vulgaris	**common lilac**	+	+	-	++	++	N	2-3	**invasive potential – only justified uses + monitoring**, tolerates salinity
Syringa × chinensis	Chinese lilac	+	+	-	++	++	N	2-3	
Tamarix sp.	tamarisk	+	-	-	+	+	N	2-3	also for median strips
Viburnum lantana	wayfaring tree	+++	+++	+++	+++	+++	P	2-3	tolerates salinity
Weigela florida (only green-leaved cv.)	oldfashioned weigela	++	+	+	+++	+++	N	2-3	rest areas
Shrubs (up to 1 m)									
Cotoneaster dammeri	bearberry cotoneaster	+	+	+	+++	+++	N	0.2-0.3	creeping, evergreen, for slopes
Cotoneaster horizontalis	wall cotoneaster	+	+	+	++	++	N	0.7	evergreen, for slopes
Cotoneaster salicifolius ´Gnom´, ´Repens´, ´Parkteppich´	willow-leaved cotoneaster	+	+	+	+++	+++	N	0.3-0.4	creeping, evergreen, replaces lawns on slopes
Cytisus nigricans	black broom	+++	+	+	+	+	P	under 2	suitable for nutrient-poor stony slopes
Deutzia gracilis	slender deutzia	+	+	++	++	++	N	under 1	non-drying soil, totally frost-resistant, decorative
Euonymus fortunei cv. (except yellow-leaved varieties)	Fortune's spindle	+	+	+	+	+++	N	0.3-0.5	evergreen, for slopes
Genista tinctoria	dyer's broom	++	+	+	+	+	P	under 1	nutrient-poor stony soil
Chaenomeles sp.	Japanese quince	+	-	-	++	+++	N	under 1	modest, local use
Jasminum nudiflorum	winter jasmine	-	-	-	+	+	N	1-3	drooping branches, flowers in Jan-Mar
Lonicera nitida	box honeysuckle	-	-	-	+	++	N	0.7-1	sometimes freezes
Potentilla fruticosa cv.	shrubby cinquefoil	++	++	+	+++	+++	N	0.5-1	long flowering, for slopes
Prunus fruticosa	dwarf cherry	++	++	+	+	+	P	under 1.5	warm drought-prone habitats
Prunus tenella	dwarf Russian almond	++	+	+	+	+	P	under 1	warm drought-prone habitats
Ribes alpinum	alpine currant	+++	+++	+++	+++	+++	P	1-1.2	
Rosa pimpinellifolia	burnet rose	++	+	+	+	+	P	under 1	drough-prone slopes
Rosa rugosa	beach rose	+++	+++	+++	+++	++	N	1-1.3	permeable soil, tolerates salinity
Rosa sp. - groundcover sorts	rose	+	+	+	+++	+++	N	under 1	limited use, needs correct choice of size for each habitat
Stephanandra incisa	lace shrub	+	+	+	+++	+++	N	under 1.2	reinforces slopes
Symphoricarpos x dorenboosii	Dorenbos' snowberry	+	+	+	+++	+++	N	under 1.5	totally modest, almost no runners
Symphoricarpos x chenaultii 'Hancock'	Chenault coralberry	+	+	+	+++	+++	N	0.5-1	slopes
Syringa meyeri	Meyer's lilac	+	+	+	+++	+++	N	1	
Syringa microphylla	small-leaved lilac	+	+	+	+++	+++	N	1	
Vinca major	greater periwinkle	+	+	+	++	++	N	0.1-0.3	retaining walls
Vinca minor	lesser periwinkle	+	+	+	++	++	P	0.1-0.3	replaces lawn, for shade
Climbing woody plants									

TAXON		SUITABLE LOCATION:					Indigenous species and cultivars (P) / Introduced species (N)	Dimensions (m) height/width	REMARK
LATIN NAME	ENGLISH NAME	motorways and expressways	1st and 2nd class roads	3rd class road, local and utility roads	Sections in municipalities	Rest areas with filling stations and railway stations			
Actinidia arguta	*hardy kiwi*	+	+	+	++	++	N	3-5	requires framework
Celastrus orbiculatus	*Oriental bittersweet*	++	++	++	++	++	N	10+	resilient, modest, requires framework
Clematis montana	*mountain clematis*	+	+	+	+++	+++	N	3-5	urban areas, rest areas, requires framework
Clematis tangutica	*golden clematis*	+	+	+	+++	+++	N	3-5	vital, rich flowers, rest areas, requires framework
Hedera helix	*common ivy*	++	++	++	++	++	P	4-6	evergreen, self-climbing, grows slowly at first, north facing
Hydrangea petiolaris	*climbing hydrangea*	++	++	++	++	++	N	4-10	self-climbing, suitable for dappled to shady spots, very effective, prominent flowers
Lonicera sp.	*honeysuckle*	-	-	-	++	++	N	2-4	limited use, requires framework
Parthenocissus tricuspidata cv.	*Japanese creeper*	+++	+++	+++	+++	+++	N	8-12	self-climbing, most suitable, noise barriers
Parthenocissus quinquefolia	***Virginia creeper***	++	+	-	++	++	N	8-15	**invasive potential – only justified uses + monitoring**, noise barriers
Campsis radicans	*trumpet vine*	-	-	-	+++	+++	N	15-20	rest areas, urban areas, requires framework
Wisteria sp.	*vistárie*	-	-	-	++	++	N	15-20	twining, requires solid framework
Humulus lupulus	*common hop*	+	+	+	+	+	P	6-8	perennial herb, twining, requires solid framework, limited use, e.g., gabion walls
Vitis coignetiae	*crimson glory vine*	++	++	++	++	++	N	10	requires moister and humus-richer soil

Explanations:

+++	very suitable species
++	suitable species
+	less suitable species
-	unsuitable species
cv.	including cultivars

Developed based on:

Koblížek, J., 2006: Jehličnaté a listnaté dřeviny našich zahrad a parků. Sursum, Tišnov.
Úradníček L., Maděra P. et al., 2001: Dřeviny České republiky. Matice Lesnická, spol. s.r.o., Písek.
Málek Z., Horáček P., Kiesenbauer Z., 2012: Stromy pro sídla a krajinu. Vydavatelství Ing. Petr Baštan, Arboeko, s.r.o., Olomouc.
Bažant V., Úradníček L., 2018: Keře. Academia, Praha.

Annex 4 Fruit tree and shrub species and varieties for planting along 2nd and 3rd class, local and utility roads

Apples	Pears	Cherries	Plums
Astrachán bílý	Ananaska česká	Annonayská	Anna Späth
Banánové zimní	Avranšská	Badacsonská černá	Čačanská lepotica
Batul	Boscova lahvice	Burlat	Čačanská najbolja
Baumannova reneta	Clappova	Dönissenova	Čačanská raná
Bernské růžové	Dielova	Doupovská černá	Elena
Black Ben	Hardyho	Droganova	Erssingerská
Boikovo	Hohensaatenská	Grollova	Esslingenská
Cikánka	Charneuská	Hedelfingenská	Haganta
Croncelské	Jakubka česká	Chlumecká raná	Hanita
Červené tvrdé	Konference	Karešova	Herman
Hammersteinovo	Koporečka	Kassinova raná	Chrudimská
Herrnhutské	Kozačka štuttgartská	Kaštánka	Malvazinka
Hvězdnatá reneta	Madame Verté	Koburská raná	Mirabelka Nancyská
Karmelitská reneta	Máslovka římská	Kordia	Oullinská
Kasselská reneta	Mechelenská	Ladeho pozdní	Presenta
Kožená reneta zimní	Merodova	Libějovická	Stanley
Landsberská reneta	Muškatelka letní	Lyonská raná	Špendlík žlutý
Matčino	Muškatelka šedá	Medovka	Valjevka
Nathusiovo	Muškatelka turecká	Napoleonova	Wangenheimova
Ontario	Nagevicova	Pivovka	Wazonova renkloda
Panenské české	Pařížanka	Rychlice německá	
Parména zlatá zimní	Pstružka	Skalka	
Punčové	Salisburyho	Srdcovka přeúrodná	
Schmidtbergerova reneta	Solanka	Těchlovická	
Strauwaldova parména	Solnohradka	Troprichterova	
Strýmka	Šídlenka	Tygrovaná	
Watervlietské mramorované	Špinka	Vítovka molitorovská	
Wealthy	Virgule	Vlkova obrovská	

Elaborated by:
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Annex 5 List of Nature and Landscape Management Standards (Arborist Standards) developed

01	Inspection, assessment, planning
01 001	Tree assessment
01 002	Protection of woody plants during development activities
02	Work procedures
02 001	Planting of trees
02 002	Pruning of trees
02 003	Planting and pruning of shrubs and climbing plants
02 004	Crown security systems (cabling / bracing)
02 005	Tree felling
02 006	Protection of trees against lightning strike
02 007	Modification of woody plant site conditions
02 008	Woody plant stand establishment and management
02 009	Special tree treatment
02 010	Management of woody plants along public transport infrastructures
02 011	Care of woody plants along utility lines

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