



NATURE AND LANDSCAPE MANAGEMENT STANDARDS

ARBORIST STANDARDS

SERIES A

PRUNING OF TREES

SPPK A02 002:2015
I. REVISION 2015

Pruning of trees Schnitt der Bäumen

This standard is designed to define technical and work procedures for pruning of trees growing outside forest.

References:

EAC (2005): European Tree Pruning Guide, European Arboricultural Council, Hamburg

FLL (2008): ZTV Baumpflege, Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V., Bonn

BSI (2010): British Standard 3998:2010, BSI Standards Publication, London

ČSN 83 9001 (1999): Vegetation technology in landscaping - Terminology - Fundamental special terms and definitions

ČSN 83 9051 (2006): Vegetation technology in landscaping – Care of vegetation during development and maintenance in green areas

ČSN 46 4902 – 1 (2001): Cultivates of ornamental plants. General provisions and quality indicators

ČSN 73 6201 (2008): Design of bridge structures

Regulation EU no. 995/2010 laying down the obligations of operators who place timber and timber products on the market

Act no. 114/1992 Coll. on Nature and Landscape Protection, as amended

Act no. 89/2013 Coll., the Civil Code, as amended

Act no. 326/2004 Coll. on Medical Plant Care, as amended

Act no. 20/1987 Coll. on State Heritage Management, as amended

Act no. 183/2006 Coll. on Spatial Planning and Building Rules (Building Act), as amended

Decree no. 395/1992 Coll., implementing certain provisions of Czech National Council Act no. 114/1992 Coll. on Nature and Landscape Protection

Decree no. 189/2013 Coll. on Protection of woody plants and permission of their cutting as amended by Decree no. 222/2014 Coll.

Decree no. 32/2012 Coll. on preparations and other products for plant protection

Standard development:

Developed for the NLPA CR by the Faculty of Forestry and Wood Technology, Mendel University in Brno, in 2011–2015

Second reader institution:

Faculty of Horticulture, Mendel University in Brno

Faculty of Horticulture and Landscape Engineering, Slovak University of Agriculture in Nitra

Authorial collective:

Ing. Jaroslav Kolařík, Ph.D. (coordinator), David Hora, DiS., Ladislav Kejha, Ing. Zdeněk Kovářík, Ing. Petr Růžička, Ing. Jiří Skotnica, Doc. Ing. Luboš Úradníček, CSc., RNDr. Irena Vágnerová

Illustrations:

Bc. David Ladra

Documentation for standard development is available in the library of NLPA CR.

Standard approved by

RNDr. František Pelc, mp
Director of NLPA CR

Contents

1. Standard purpose and contents.....	3
1.1 Standard purpose	3
1.2 Qualification.....	3
1.3 Legal framework	3
2. Pruning technique	6
2.1 Pruning styles.....	6
2.2 Pruning wound size	8
2.3 Wound treatment	9
2.4 Tree and site protection during pruning.....	9
3. Tree pruning process categories.....	10
3.1 Establishment pruning.....	11
3.1.1 Crown cultivation (S-RZK)	11
3.1.2 Comparative pruning (S-RK)	11
3.1.3 Juvenile pruning (S-RV).....	12
3.2 Maintenance pruning	13
3.2.1 Medical pruning (S-RZ)	13
3.2.2 Safety pruning (S-RB)	13
3.2.3 Local reduction pruning (S-RL)	14
3.2.4 Removal of leader shoots (S-OV).....	15
3.3 Stabilisation pruning	15
3.3.1 Perimeter reduction (S-RO).....	15
3.3.2 Secondary crown stabilisation (S-SSK).....	16
3.4 Shaping pruning.....	17
3.4.1 Pruning to head (S-RTHL)	17
3.4.2 Pruning to pin (S-RTPP).....	18
3.4.3 Pruning of hedges and tree walls (S-RTZP)	18
4. Site management after pruning	19
4.1 Site cleaning	19
Annex 1 Tree taxa by compartmentalisation ability	20
Annex 2 Underpass clearance	24
Annex 3 Illustrations	25
Annex 4 List of Nature and Landscape Management Standards (Arborist Standards) developed 31	

1. Standard purpose and contents

1.1 Standard purpose

- 1.1.1 The standard “Pruning of trees” defines common types and techniques of interventions carried out primarily on trees growing outside forest in order to restore, maintain or improve their performance of aesthetic and ecological functions and ensure their operating safety.
- 1.1.2 The standard is designated for application to trees performing non-production functions the main purpose of which is not production of fruit, wood or other commodities.
- 1.1.3 The standard does not define work procedures for **special treatment of trees**. Such procedures are covered by SPPK A02 009 – Special treatment of trees (such as management of senescent trees, biodiversity promotion, etc.).
- 1.1.4 Specific procedures in management of **fruit woody plants** are defined by standard SPPK C02 005 – Management of functional plantings of fruit woody plants.

1.2 Qualification

- 1.2.1 Pruning of trees is ensured by their owner or another authorised person (the owner of a woody plant is the owner of the plot on which the woody plant grows).
- 1.2.2 Pruning of trees and its inspection is a professional activity. Interventions on woody plants are irreversible; therefore, it is necessary that they be done by competent persons. Activities associated with pruning of trees are therefore operations requiring qualification.
- 1.2.3 The recommended qualification for persons pruning trees off the ground is a successfully passed certification test for Czech Certified Arborist¹.
- 1.2.4 The recommended qualification for persons pruning trees at heights is successfully passing one of the following certification tests:
- Czech Certified Arborist – Specialist for works done using tree climbing techniques¹,
 - ISA Certified Tree Worker Aerial Lift Specialist^{®2},
 - ISA Certified Tree Worker Climber Specialist^{®2},
 - European Treeworker³.

1.3 Legal framework

- 1.3.1 In some cases, law⁴ specifies a special regime:

¹ Certification scheme provided by the Faculty of Forestry and Wood Technology of the Mendel University in Brno

² Certification scheme provided by the International Society of Arboriculture

³ Certification scheme provided by the Czech Landscape and Garden Society

⁴ Act no. 114/1992 Coll. on Nature and Landscape Protection, as amended.

- for trees promulgated as memorial trees⁵;
- for specially protected tree species^{4,5};
- for trees registered as prominent landscape features (PLF) or are part of another PLF, whether by law or registered under law⁴;
- for trees that provide a biotope for specially protected species, or species of European significance^{4,5};
- for trees growing in protected heritage buildings and zones that are cultural monuments, national cultural monuments or heritage reserves, heritage zones or within the protective zones of immovable cultural monuments, immovable national cultural monuments, heritage reserves, or heritage zones⁶;
- for trees growing in protective zones of aboveground utility networks^{7,8},
- for trees whose pruning may be interpreted, in the specific case, as an activity that might impair or alter landscape character⁴;
- pruning operations have to respect legal requirements for protection of wild birds⁴;
- in addition, pruning operations have to respect basic and detailed protection requirements for specially protected areas and their protective zones⁴;
- for pruning operations done as prophylactic to prevent the spread of regulated pathogenic organisms⁹.

1.2.3 Work procedures specified as the standard may be violated to the necessary extent in the case of *acute danger* of failure of a tree or its part, i.e., cases where there is an *evident and immediate* risk to human health or large-scale property damage and a risk of delay.

⁵ Decree no. 395/1992 Coll., implementing certain provisions of Act no. 114/1992 Coll. on Nature and Landscape Protection, as amended.

⁶ Act no. 20/1987 Coll. on State Heritage Management, as amended.

⁷ Act no. 127/2005 Coll. on Electronic Communications, as amended.

⁸ Act no. 458/2000 Coll. on Requirements for Business and Public Administration in Energy Industries (Energy Act), as amended.

⁹ Act no. 326/2004 Coll. on Medical Plant Care, as amended.

- 1.3.3 The pruning contractor is required to act so as to prevent damage to health, property, nature and the environment. The pruning contractor is liable for damage that it has caused by violation of its legal obligation unless it proves that it did not cause the damage¹⁰.
- 4.3.1 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.

¹⁰ Act no. 89/2013 Coll., the Civil Code, as amended.

2. Pruning technique

2.1 Pruning styles

- 2.1.1 **Pruning to branch collar (branch ring)** – pruning of side branches is done at the exact boundary of wood of the daughter and parent branch (or trunk). The cut is made immediately past the bark ridge and follows the “collar” of the trunk or parent branch so as not to damage it (Annex 3, Fig. 1).
If there is no visible branch collar, the cut is made at the exact boundary of wood of the branch and the trunk. It may also be made parallel to the trunk (without damaging it). This style is typically used on coniferous trees.
- 2.1.2 **Pruning to side branch** is a pruning technique used for shortening (reduction) of a thicker branch to a thinner one so that the remaining part is able to take over the function of the removed branch. The cut is made past the bark ridge on the opposite side than in pruning to branch collar. The “one-third rule” is observed.
- 2.1.3 **Pruning to bud** – a pruning technique in which the removed part is reduced to a lateral bud. The cut starts above the bud and runs obliquely at an angle of no more than 45° in a way to prevent damage to the bud. A pin 5–10 mm long can be left above the bud to protect the bud from drying (Annex 3, Fig. 5). The length of the pin left is determined by the maturity of the shoot and the tree species. The cut can be made to an outer or inner bud depending on the pruning objective (Annex 3, Fig. 9 and 10).
The technique of pruning to an **outer** and **inner bud** is defined by SPPK C02 005 – Management of functional plantings of fruit woody plants.
- 2.1.4 **Leader shoot pruning** – pruning done parallel to the parent branch or trunk as deep as to remove as much of the leader shoot as possible. Shoots that have not yet lignified can be removed by breaking out. If the situation requires (in the case of stump shoots), the soil substrate covering the shoot connection can be removed.
- 2.1.5 **Shoot pruning to pin** – a very short cut to 1-3 lateral buds. Promotes vegetative growth very strongly (Annex 3, Fig. 7).
The technique of pruning to a **dead** physiologically passive **pin** and Zahn pruning is defined by SPPK C02 005 – Management of functional plantings of fruit woody plants.
- 2.1.6 **Shoot pruning to base** – a very short cut made immediately above the shoot base so that the basal dormant buds are retained and can make new shoots (Annex 3, Fig. 7).
- 2.1.7 **“Blind” pruning** – a pruning technique used for reducing branches that cannot be reduced by pruning to lateral branches or to bud. It is applied mostly to woody plants with good crown regeneration. Afterwards, once the secondary shoots start to grow, remedial pruning can be done: removal of withered portions of branches.
- 2.1.8 **Dead branch pruning** – withered branches have to be removed to prevent injury to living tissues of the parent branch or trunk. Dead branches can also be removed by

breaking out.

- 2.1.9 **Codominant branch pruning** – removal of one of similarly dominant branches by making an oblique cut along a line from the bark ridge to the base of the branch to be removed (Annex 3, Fig. 4). In the case of pressure branching, follow 2.1.10.
- 2.1.10 **Pressure branch pruning** – removal of branch produced by defective branching by making a cut starting at the bottom base of the branch and running to the boundary of the ingrown bark and the adhesion to the other branch. The cut angle and depth are decided individually so as to remove the branch completely without injuring the remaining portion.
- 2.1.11 **Pruning to bark bridge** – describes a cut in two parallel branches so as to produce not a single large wound but two smaller separate ones, not connected to each other. The remaining intact bark bridge should be at least the same size as the diameter of the larger of the two wounds.
- 2.1.12 Pruning styles typical of management of **senescent trees** are defined by SPPK A02 009 – Special interventions in trees.
- 2.1.13 Pruning techniques typical of **fruit woody plants** are defined by SPPK C02 005 – Management of functional plantings of fruit woody plants.

2.2 Pruning wound size

- 2.2.1 The pruning wound size has to be minimised by removing only those parts of the crown necessary to meet the pruning objective. Due to physiological response, it is advisable to make more smaller cuts rather than a few larger cuts lower in the crown.
- 2.2.2 **One-third rule** – as a standard, the diameter of the lateral branch to remove has to be no more than 1/3 of the diameter of the trunk or the parent branch. Conversely, when reducing to a lateral branch, the remaining branch has to be at least one-third the diameter of the branch being cut off.
- 2.2.3 The one-third rule applies mainly to pruning of young trees (S-RZK, S-RK, S-RV) and to pruning to a lateral branch.
- 2.2.4 As a standard, the size of the pruning wound should not exceed 100 mm in diameter.
- 2.2.5 In species with poor compartmentalisation ability (Annex 1), the wound size should not exceed 50 mm in diameter as a standard.
- 2.2.6 In the case of pruning of trees with **neglected management** or trees requiring stabilisation pruning (mainly S-SSK, S-RS; see Chapter 3), the wound size may generally exceed the sizes indicated above.
- 2.2.7 In the case of management of **senescent trees**, the pruning wound size parameter is defined by SPPK A02 009 – Special interventions in trees.

2.3 Wound treatment

- 2.3.1 Wounds left after pruning are not brushed over as a rule.
- 2.3.2 Brushing over pruning wounds makes sense, for example, in cases where excessive evaporation off the wound surface has to be prevented, or for aesthetic reasons.
- 2.3.3 If brushing over wounds, the products used have to be registered as “auxiliary plant protection products” in the official registry pursuant to Section 54, Para. 1 of Act no. 326/2004 Coll. (Decree no. 329/2004 Coll.).
- 2.3.4 Brushing over **living tissues** must not use primer products or products that form an impermeable (insulating) cover (with the exception of products conforming to 2.3.3).
- 2.3.5 Wounds left after removing **dead branches** are never brushed over.
- 2.3.6 Pruning in species with **intense spring sap flow** in early spring is possible. No causal relationship with serious damage to the woody plant has been proven. Profuse discharge of sap from the wounds is not interpreted as a process error.

2.4 Tree and site protection during pruning

- 2.4.1 Parts of the trunk and branches retained must not be injured, including disruption of the epidermis. Trees in the surroundings of the individual being treated must not be damaged.
- 2.4.2 **Branch cutting “in three goes”** – in branches that cannot be (due to their weight) safely carried in one hand, a cut is first made from the bottom to the centre (approximately to 1/4 or 1/3 of the branch diameter) at approx. 100–300 mm from the branch collar. Another cut is made from the top down past the bottom cut (outwards) until the branch falls off without snagging bark or bast. The remaining stub is removed by a cut to branch collar or another suitable technique (Annex 3, Fig. 2).
- 2.4.3 Use of climbing irons damaging remaining living tissues of the tree for pruning is impermissible.
- 2.4.4 Use of installation (lift) platforms and other machinery must not result in compaction of soil within the projected area of the crown of a tree growing in an open area.
- 2.4.5 Pruning of a tree must not cause an acute reduction in the treated individual’s operating safety or stability.
- 2.4.6 Pruning should ideally not result in a reduction to the value of the biotope comprising the tree and its surroundings.

3. Tree pruning process categories

For ease of assignment and inspection of arborist operations, the different pruning types are classified by purpose into the following process categories. They are shown including the recommended codes, which are used in arborist work designs and in development of management plans.

Establishment pruning		
<i>S-RZK</i>	Crown cultivation pruning	
<i>S-RK</i>	Comparative pruning	
<i>S-RV</i>	Juvenile pruning	
Maintenance pruning		
<i>S-RZ</i>	Medical pruning	
<i>S-RB</i>	Safety pruning	
<i>S-RL</i>	Local reduction pruning category	
	<i>S-RLSP</i>	Local reduction towards obstacle
	<i>S-RLLR</i>	Local reduction for stabilisation
	<i>S-RLPV</i>	Adjustment to underpass clearance profile
<i>S-OV</i>	Removal of leader shoots	
Stabilisation pruning		
<i>S-RO</i>	Perimeter reduction	
<i>S-SSK</i>	Secondary crown stabilisation	
<i>S-RS</i>	Removal pruning	
Shaping pruning		
<i>S-RTHL</i>	Pruning to head	
<i>S-RTPP</i>	Pruning to pin	
<i>S-RTZP</i>	Pruning of hedges and tree walls	

3.1 Establishment pruning

The purpose of establishment pruning is to establish and train crowns of juvenile trees that will be free of fundamental defects when grown-up and will match their site with their architecture, crown shape and size. Therefore, trees are pruned in a way that forms the crown to attain a shape natural for the taxon or a shape required by the cultivation project.

Establishment pruning may include commencement of crown shaping.

3.1.1 Crown cultivation (S-RZK)

- 3.1.1.1 The objective of S-RZK is to establish a crown in broadleaf tree maiden whips.
- 3.1.1.2 Crown establishment has to respect its architecture and shape when grown-up.
- 3.1.1.3 When establishing a crown on a maiden whip, the terminal shoot can be reduced by pruning to bud.

3.1.2 Comparative pruning (S-RK)

- 3.1.2.1 If necessary, comparative pruning is done as part of the tree planting (see SPPK A02 001 – Planting of trees). The pruning extent depends on the taxon, transplant type and condition, the planting time, site conditions and follow-up management capacities.
- 3.1.2.2 The objective of S-RK is to create conditions for achievement of a functional balance between the root system and the assimilation organs in the tree crown.
- 3.1.2.3 S-RK preferentially removes branches and shoots that are damaged and proceeds to remove branches following the rules of juvenile pruning (see 3.1.3.2 to 3.1.3.6). If more branches have to be removed, the pruning proceeds to brighten the crown.
- 3.1.2.4 The role of the terminal shoot is promoted by removing or reducing competing lateral shoots.
- 3.1.2.5 In species that produce a running terminal bud, it is not removed. It may only be reduced, or removed, in exceptional justified cases.
- 3.1.2.6 Whole shoots are removed preferentially; they are reduced only in justified cases.
- 3.1.2.7 S-RK is done simultaneously with tree planting (see SPPK A02 001 – Planting of trees).

3.1.3. Juvenile pruning (S-RV)

- 3.1.3.1 The objective of S-RV is to promote the characteristic architecture and crown shape typical of the species or cultivar and provides a good chance of the development of a healthy, vital, functional and stable crown when the tree is grown-up.
- 3.1.3.2 The role of the terminal shoot is promoted by removing or reducing competing lateral shoots.
- 3.1.3.3 In species that produce a running terminal bud, it is not removed. It may only be reduced, or removed, in exceptional justified cases (e.g., damaged terminal or start of shaping pruning).
- 3.1.3.4 Structurally inappropriate branches or shoots are removed (e.g., with pressure branching, growing in whorls), mechanically damaged branches, and branches growing towards an obstacle.
- 3.1.3.5 When reducing lateral branches or shoots, prune to bud or lateral branch or shoot.
- 3.1.3.6 The crown bottom is raised gradually until the necessary underpass clearance of the tree is achieved, where it may be desirable with reference to their location (Annex 3, Fig. 6). Conversely, the bottom branches are not removed pointlessly from trees growing in the open country, at the edges of vistas and where sites conditions permit.
- 3.1.3.7 When raising the crown bottom to achieve an underpass clearance, always observe the 3 : 2 maximum ratio between the trunk and crown heights (Annex 3, Fig. 3).
- 3.1.3.8 In some cultivars without a clear terminal shoot grafted in the crown, the crown bottom cannot be raised to achieve an underpass clearance. Therefore, the grafting height has to be considered.
- 3.1.3.9 S-RV also involves crown cultivation for subsequent shaping pruning (see 3.4).
- 3.1.3.10 A single intervention on a broadleaf tree should typically remove no more than 30% of the assimilation organs in the growing season or 50% in the bare condition.
- 3.1.3.11 Intervals between juvenile pruning interventions are typically 2-3 years, or up to 5 years in justified cases.

3.2 Maintenance pruning

The objective of maintenance pruning is to manage adolescent and adult trees with an emphasis on operating safety, cultivation requirements, as well as potential changes to their crown size and shape as per site requirements, cultivation objective and extension of functional life. Maintenance pruning repeats periodically at intervals depending on the taxon, pruning purpose, site requirements and tree vitality.

3.2.1 Medical pruning (S-RZ)

- 3.2.1.1 The objective of S-RZ is to secure long-term functioning and outlook for the tree by maintaining its good health, vitality and operating safety. The goal is to retain the crown architecture desirable for the taxon and physiological age of the individual. S-RZ does not deal with the current structural condition of the individual as a whole (e.g., risk of windfall, trunk breakage, crown disintegration, etc.).
- 3.2.1.2 The following structural branches and shoots are removed or reduced:
- unsuitable for the structure (codominant shoots, secondary shoots growing into the crown, intersecting branches, etc.);
 - with pressure forks or otherwise defective branching;
 - mechanically damaged, broken, of reduced stability;
 - suffering from disease or pests;
 - dying and dead.
- 3.2.1.3 S-RZ does not result in an evident disruption to the habitus of the treated tree.
- 3.2.1.4 Retention of small dead branches in the crown is not considered an error in S-RZ.
- 3.2.1.5 In justified cases, a stable stub can be left on the trunk or main branches if its diameter exceeds 100 mm and its length exceeds 500 mm.
- 3.2.1.6 S-RZ must not result in the removal of more than 20% of the assimilation organs.
- 3.2.1.7 S-RZ is ideally carried out in full growing season. Non-adherence to the optimum date is not a process error.
- 3.2.1.8 In trees infected by regulated pathogenic organisms, pruning has to be done according to instructions of the applicable nature protection authority or the Central Institute for Supervising and Testing in Agriculture. In this case, the pruning process may differ from the S-RZ definition shown above.

3.2.2 Safety pruning (S-RB)

- 3.2.2.1 This pruning type focuses only on current operating safety of a tree, but does not deal with comprehensive structural conditions of the individual as a whole, such as risk of windfall, trunk breakage, crown disintegration, etc.

- 3.2.2.2 S-RB is intended to remove or reduce branches impairing the current operating safety, such as:
- thick dead branches impairing operating safety;
 - broken or cracked, of reduced stability;
 - mechanically damaged;
 - secondary (overgrown structurally risky shoots produced by adventitious or dormant buds);
 - with defective branching;
 - hanging loosely.
- 3.2.2.3 S-RB can be carried out at any time of year.

3.2.3 Local reduction pruning (S-RL)

The specified parameters apply to the following prune types:

- S-RL Local reduction pruning category
- S-RLSP Local reduction towards obstacle
- S-RLLR Local reduction for stabilisation
- S-RLPV Adjustment to underpass clearance profile

- 3.2.3.1 The object of S-RLSP and S-RLPV is to adjust the underpass clearance, reduce the crown in the direction towards an obstacle (Annex 2), attain a span distance defined by law, standard, etc., or produce a vista.
- 3.2.3.2 Local reduction pruning done near overhead power lines and other types of product pipelines is governed by SPPK A02 011 – Management of woody plants along public technical infrastructures.
- 3.2.3.3 The objective of S-RLLR is local reduction in order to make a part of the crown lighter or more symmetrical and thus increase its stability.
- 3.2.3.4 The focus of S-RL has to be clearly defined in the treatment design.
- 3.2.3.5 S-RL has to be followed by periodic follow-up management of the tree inspecting how the pruning objective has been met in respect of operating safety.
- 3.2.3.6 The S-RL repeating interval has to consider the site, tree species, tree condition and nature of obstacle, extent of destabilisation as necessary, etc.
- 3.2.3.7 S-RL primarily employs the technique of pruning to a lateral branch.
- 3.2.3.8 Underpass clearance issues are governed by Annex 2, unless specified otherwise. Specific procedures in management of trees along roads are defined in SPPK A02 010 – Management of woody plants along public transport infrastructures.
- 3.2.3.9 S-RL can be carried out at any time of year.

3.2.4 Removal of leader shoots (S-OV)

- 3.2.4.1 The objective is to remove root and stump shoots from the bottom parts of the trunk and around the tree.
- 3.2.4.2 The repeating interval depends on the dynamics of leader shoot development.
- 3.2.4.3 The intervention consists in the leader shoot removal technique (see 2.1.4 above).
- 3.2.4.4 S-OV can be carried out at any time of year.

3.3 Stabilisation pruning

Stabilisation pruning is intended to reduce the tree crown size exclusively in order to reduce the risk of windfall, trunk breakage or overall crown disintegration in trees of impaired stability. Implementation of stabilisation pruning on healthy trees with a primary crown without a justification may lead to permanent damage to the tree.

Strong reductions (particularly S-SSK, S-RS) need to be carried out during periods of vegetative rest, ideally in the latter half. In cases of significantly impaired stability and risk of delay, the intervention can be made at any time.

The extent of proposed stabilisation pruning has to be clearly defined in the management plan.

Stabilisation pruning has to be followed by periodic follow-up management of the tree inspecting how the pruning objective has been met.

3.3.1 Perimeter reduction (S-RO)

- 3.3.1.1 S-RO is carried out particularly on trees with a primary crown in the top third of the crown in order to reduce the strained surface of the crown and lower the tree's centre of gravity. Branches in the top part of the crown are reduced the most; the reduction length decreases downwards (Annex 3, Fig. 11).
- 3.3.1.2 Each intervention should not remove more than 30% of the assimilation organs. A more radical reduction is only possible in cases of immediate danger of tree failure, if there is a justified interest in retaining it.
- 3.3.1.3 Larger reduction of crowns has to proceed gradually, in several stages with an interval of 5–10 years, depending on the tree's response to previous interventions. The repeating interval has to consider the site, tree species and vitality, its response to previous interventions and operating safety.
- 3.3.1.4 The choice of S-RO intensity has to consider the physiological age, species properties, vitality, shading by neighbouring individuals, etc.
- 3.3.1.5 If possible the pruning should not alter the crown shape desirable and typical of the species or cultivar.

- 3.3.1.6 S-RO cannot be carried out juvenile and middle-aged trees in the dynamic length increment stage; it is intended for grown-up and senescent individuals (physiological age 3 according to the SPPK standard Assessment of tree condition).

3.3.2 Secondary crown stabilisation (S-SSK)

- 3.3.2.1 This intervention is intended for overgrown unstable secondary crowns of trees in order to stabilise the crown. The intervention is a solution to a non-standard situation.
- 3.3.2.2 It is carried out mainly on individuals whose primary crown was reduced radically in the past (by pruning or natural phenomena) without adequate follow-up management.
- 3.3.2.3 S-SSK consists in a radical perimeter reduction of overgrown secondary shoots using the technique of pruning to a lateral branch or “blind” pruning. It can be combined with selecting thinning of shoots (Annex 3, Fig. 12).
- 3.3.2.4 S-SSK has to proceed gradually (in several stages) with continuous monitoring of the tree’s response to previous interventions.
- 3.3.2.5 The objective of S-SSK is to maintain the secondary crown in a stable condition, or transition to shaping pruning.

3.3.3 Removal pruning (S-RS) of taxa with significantly impaired material properties, poor compartmentalisation and good crown regeneration.

- 3.3.3.1 Removal pruning refers to a deep reduction to the primary crown down to the main branches or to the trunk. The intervention is destructive for the tree, resulting in a worsening of its health condition.
- 3.3.3.2 S-RS is only possible in cases of immediate danger of structural tree failure, if there is a justified interest in retaining it. It can be carried out only on trees with significantly impaired wood material properties and a risk of spontaneous failure (*Populus* spp. – poplar genus, and *Salix* spp. – willow genus).
- 3.3.3.3 The condition of trees treated in this fashion has to be periodically monitored and the crown successively adequately reduced at intervals of 5 (max. 10) years. The intervention temporarily extends or restores the individual's functional life on the site.
- 3.3.3.4 S-RS has to be carried out during periods of vegetative rest. The exception is urgent solutions to critical tree condition (for example, after a gale).
- 3.3.3.5 Special tree crown reductions, focused on increasing their biological value, are defined in SPPK A02 009 – Special interventions in trees.

3.4 Shaping pruning

These pruning methods are used as part of juvenile pruning or after achievement of desired height and repeated at short intervals throughout the tree's life. The objective of shaping pruning is to maintain the tree crown in the desired shape by repeated prunes implemented at frequent periodic intervals.

3.4.1 Pruning to head (S-RTHL)

- 3.4.1.1 This is periodically repeated pruning typically of one-year to three-year-old shoots.
- 3.4.1.2 The shoots are reduced to cultivated swellings ("heads") usually once every year to three years; the interval may be longer in justified cases. The pruning technique employed is removal of leader shoots or pruning to base.
- 3.4.1.3 S-RTHL is carried out in the bare condition, ideally just before leaves start to grow.
- 3.4.1.4 It is applied only to trees with good crown and trunk regeneration.

3.4.2 Pruning to pin (S-RTPP)

- 3.4.2.1 Pruning to pin is repeated shaping pruning of shoots that enables gradually increasing the shaping height.
- 3.4.2.2 Shoots are cut to pins or thicker reduced shoots using the “blind” pruning technique. The other shoots are removed completely by removal of leader shoots or pruning to base.
- 3.4.2.3 S-RTPP is carried out in the bare condition, ideally just before leaves start to grow.
- 3.4.2.4 It is applied only to trees with good crown and trunk regeneration.

3.4.3 Pruning of hedges and tree walls (S-RTZP)

- 3.4.3.1 Hedges and tree walls can be shaped if made of tree species with good crown regeneration tolerant to shaping.
- 3.4.3.2 The pruning is typically done once or twice a year. The pruning repeating interval may be longer in justified cases.
- 3.4.3.3 The height and shape of a hedge or tree wall depends on the cultivation intention, growth rate and other properties of the taxon used and the site conditions.
- 3.4.3.4 A significant change in the shaping height (pruning “to old wood”) is only possible in exceptional cases in trees with very good trunk and crown regeneration (e.g., *Taxus baccata* – European yew, *Carpinus betulus* – common hornbeam).

4. Site management after pruning

4.1 Site cleaning

- 4.1.1 The ground surface shall be put into its original condition after pruning of trees is complete.
- 4.1.2 No cut-off branches may remain hanging in the tree crown.
- 4.1.3 Remains of branches from pruned trees have to be removed from water bodies.
- 4.1.4 Wood material left after pruning shall be stored in stable piles with a maximum pile height of 1.5 m at a distance within 20 m of the pruned tree in places agreed with the contracting authority.
- 4.1.5 Thick branches shall be cut to lengths with a weight up to 30 kg.

Annex 1 Tree taxa by compartmentalisation ability

Taxon		Compartmentalisation ability
<i>Abies</i> spp.	fir genus	Good
<i>Acer campestre</i>	field maple	Good
<i>Acer negundo</i> (<i>Negundo aceroides</i>)	ashleaf maple	Poor
<i>Acer platanoides</i>	Norway maple	Poor
<i>Acer pseudoplatanus</i>	sycamore maple	Good
<i>Acer saccharinum</i>	silver maple	Poor
<i>Aesculus</i> spp.	chestnut genus	Poor
<i>Ailanthus altissima</i>	tree of heaven	Poor
<i>Alnus</i> spp.	alder genus	Poor
<i>Betula</i> spp.	birch genus	Poor
<i>Carpinus betulus</i>	common hornbeam	Good
<i>Carya ovata</i> (<i>C. alba</i>)	shagbark hickory	Good
<i>Castanea sativa</i> (<i>C. vesca</i>)	sweet chestnut	Poor
<i>Catalpa</i> spp.	catalpa	Poor
<i>Cedrus</i> spp.	cedar genus	Good
<i>Celtis</i> spp.	hackberry genus	Good
<i>Corylus colurna</i>	Turkish hazel	Good
<i>Crataegus</i> spp.	hawthorn genus	Good
<i>Cryptomeria japonica</i>	Japanese red-cedar	Good
× <i>Cupressocyparis leylandii</i>	Leyland cypress	Poor
<i>Fagus sylvatica</i>	European beech	Good
<i>Fraxinus</i> spp.	ash genus	Good
<i>Ginkgo biloba</i>	ginkgo tree	Good
<i>Gleditsia triacanthos</i>	honey locust	Good
<i>Gymnocladus dioica</i>	Kentucky coffeetree	Poor
<i>Chamaecyparis</i> spp.	cypress genus	Poor
<i>Juglans</i> spp	walnut genus	Poor

SPPK A02 002:2015 Pruning of trees
I. Revision 2015

<i>Juniperus communis</i>	common juniper	Poor
<i>Koelreuteria paniculata</i>	varnish tree	Good
<i>Larix decidua (L. europaea)</i>	European larch	Good
<i>Liquidambar styraciflua</i>	American sweetgum	Poor
<i>Liriodendron tulipifera</i>	tulip tree	Good
<i>Magnolia acuminata</i>	cucumber magnolia	Good
<i>Magnolia kobus</i>	Kobushi magnolia	Poor
<i>Malus</i> spp.	apple genus	Poor
<i>Metasequoia glyptostroboides</i>	dawn redwood	Good
<i>Morus</i> spp.	mulberry genus	Good
<i>Paulownia tomentosa (P. imperialis)</i>	foxglove tree	Poor
<i>Phellodendron amurense</i>	Amur cork tree	Good
<i>Picea</i> spp.	spruce genus	Poor
<i>Pinus</i> spp.	pine genus	Poor
<i>Platanus ×hispanica (P. ×acerifolia)</i>	London planetree	Good
<i>Platycladus orientalis (Thuja orientalis)</i>	Oriental arborvitae	Poor
<i>Populus</i> spp.	poplar genus	Poor
<i>Prunus</i> spp.	plum genus	Poor
<i>Prunus armeniaca (Armeniaca vulgaris)</i>	Tibetan apricot	Poor
<i>Prunus cerasus (Cerasus spp.)</i>	sour cherry (cherries and sour cherries)	Poor
<i>Prunus padus (Padus avium)</i>	European bird cherry (bird cherries)	Poor
<i>Prunus persica (Persica vulgaris)</i>	peach tree	Poor
<i>Pseudotsuga menziesii</i>	Douglas fir	Good
<i>Pterocarya fraxinifolia (P. pterocarpa)</i>	Caucasian wingnut	Good
<i>Pyrus</i> spp.	pear genus	Good
<i>Quercus cerris</i>	Turkey oak	Good

<i>Quercus frainetto</i> (<i>Q. confera</i> , <i>Q. pannonica</i>)	Hungarian oak	Good
<i>Quercus palustris</i>	swamp Spanish oak	Good
<i>Quercus petraea</i>	sessile oak	Good
<i>Quercus pubescens</i>	downy oak	Good
<i>Quercus robur</i> (<i>Q. pedunculata</i>)	pedunculate oak	Good
<i>Quercus rubra</i> (<i>Q. borealis</i>)	northern red oak	Poor
<i>Robinia pseudoacacia</i>	black locust	Good
<i>Salix</i> spp.	willow genus	Poor
<i>Sequoiadendron giganteum</i> (<i>S. gigantea</i>)	giant sequoia	Good
<i>Sophora japonica</i>	Japanese pagoda tree	Good
<i>Sorbus</i> spp.	rowan genus	Poor
<i>Taxodium distichum</i>	bald cypress	Good
<i>Taxus</i> spp.	yew genus	Good

SPPK A02 002:2015 Pruning of trees
I. Revision 2015

<i>Thuja</i> spp.	arborvitae genus	Poor
<i>Thujaopsis dolabrata</i>	false arborvitae	Poor
<i>Tilia</i> spp.	linden genus	Good
<i>Tsuga</i> spp.	hemlock genus	Good
<i>Ulmus</i> spp.	elm genus	Good
<i>Zelkova</i> spp.	zelkova genus	Good

Developed based on:

- Armstrong, J.E.; Shigo, A.L.; Funk, D.T.; McGinnes, E.A. Jr.; Smith, D.E. ,1981: A macroscopic and microscopic study of compartmentalization and wood closure after mechanical wounding of Black Walnut trees. Wood Fiber 13, 275-291.
- Dujesiefken, D., Liese, W., 2006: Die Wundreaktionen von Bäumen – CODIT heute. In: Dujesiefken, D.; Kockerbeck, P. (Hrsg.): Jahrbuch der Baumpflege 2006. Thalacker Medien, Braunschweig, 61-73.
- Dujesiefken, D.; Stobbe, H., 2002: The Hamburg Tree Pruning System - A Guideline for proper pruning. Urban Forestry and Urban Greening 1: 75-82.
- Shigo, A.L., 1984a: Compartmentalization: A conceptual framework for understanding how trees grow and defend themselves. Ann. Rev. Phytopathology. 22, 189-214.
- Shigo, A.L.; Marx, H., G., 1977: Compartmentalization of decay in trees. U.S. D.A. For. Serv. Agric. Bull. No 405, 74 S.

Expanded with own observations.

Terminology adopted from:

- Hoffman, M.H.A., 2010: List of names of woody plants. Plant and Omgeving, Lisse. ISBN 78-90-76960-04-3
- Hurych, V., 2003: Okrasné dřeviny pro zahrady a parky. Květ: Český Těšín. 2. ed. ISBN 80-85362-46-5
- Koblížek, J., 2006: Jehličnaté a listnaté dřeviny našich zahrad a parků. Sursum, Tišnov. ISBN 80-7323-117-4

Annex 2 Underpass clearance

Road type	Vehicle underpass clearance	Pedestrian underpass clearance
Motorway, expressway, 1st and 2nd class road	4.8 m	2.5 m
3rd class road and local roads for expressways and collectors	4.5 m	2.5 m
Local service roads and public utility roads	4.2 m	2.5 m

Developed based on:

ČSN 736201. *Design of bridge structures*. [s.l.] Český normalizační institut, 2008. 60 pp.

ČSN 736101. *Design of highways and motorways* Český normalizační institut, 2004. 125 pp.

Annex 3 Illustrations

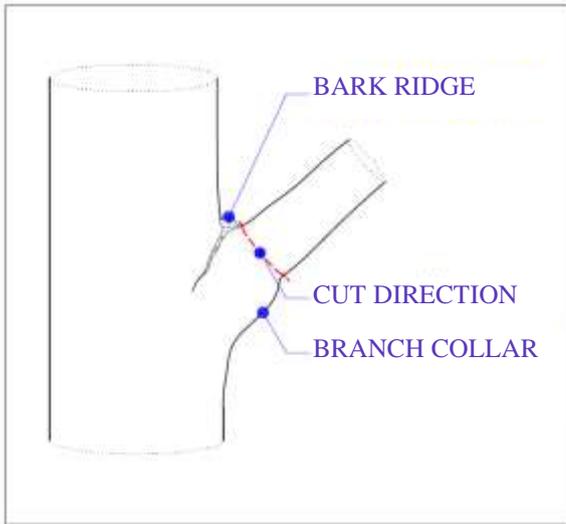


Fig. 1: Pruning to branch collar (2.1.1).

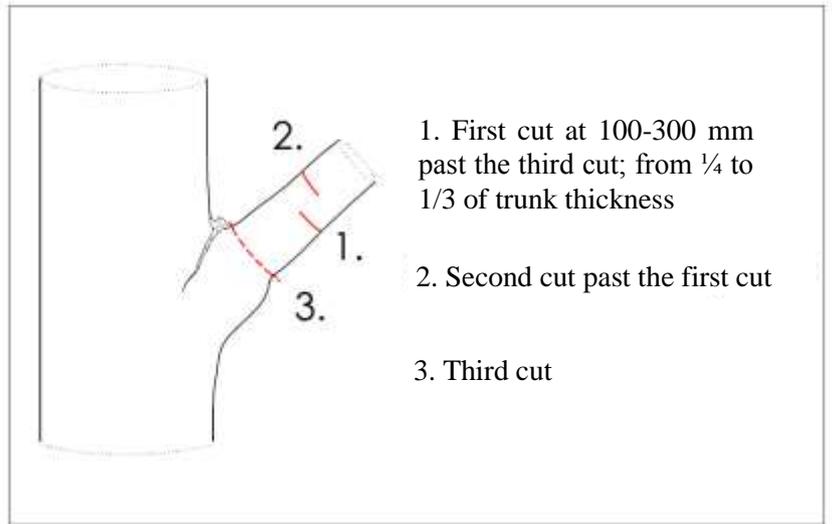


Fig. 2: Pruning “in three goes” (2.4.2).

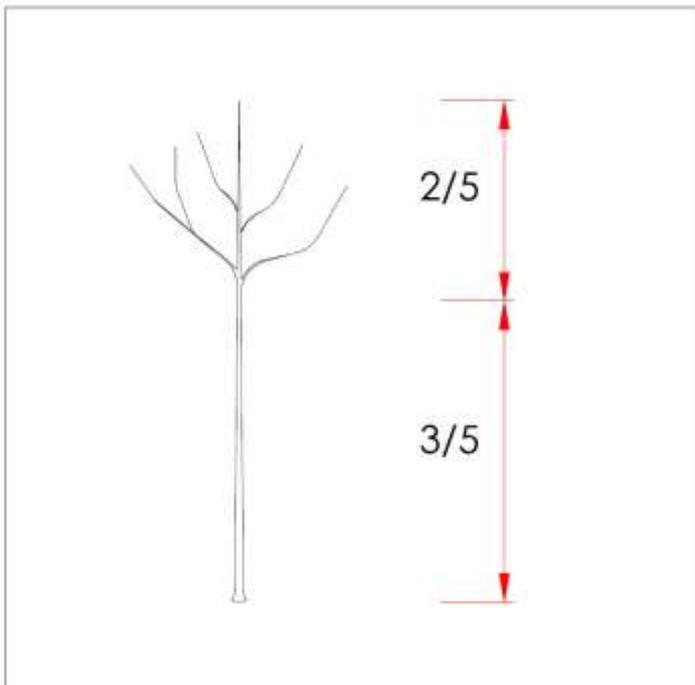


Fig. 3: Trunk-to-crown ratio when raising the crown bottom to achieve an underpass clearance (3.1.3.7).

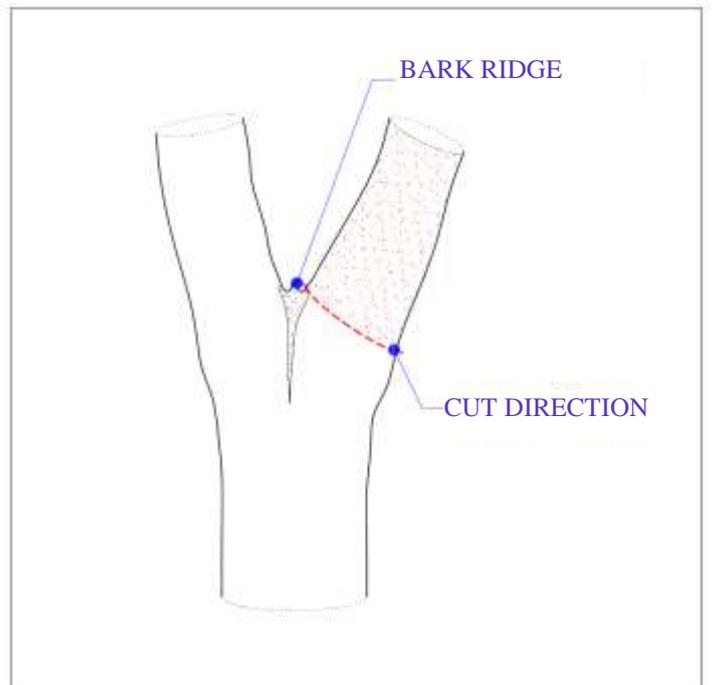


Fig. 4: Pruning of codominant branching (2.1.9).

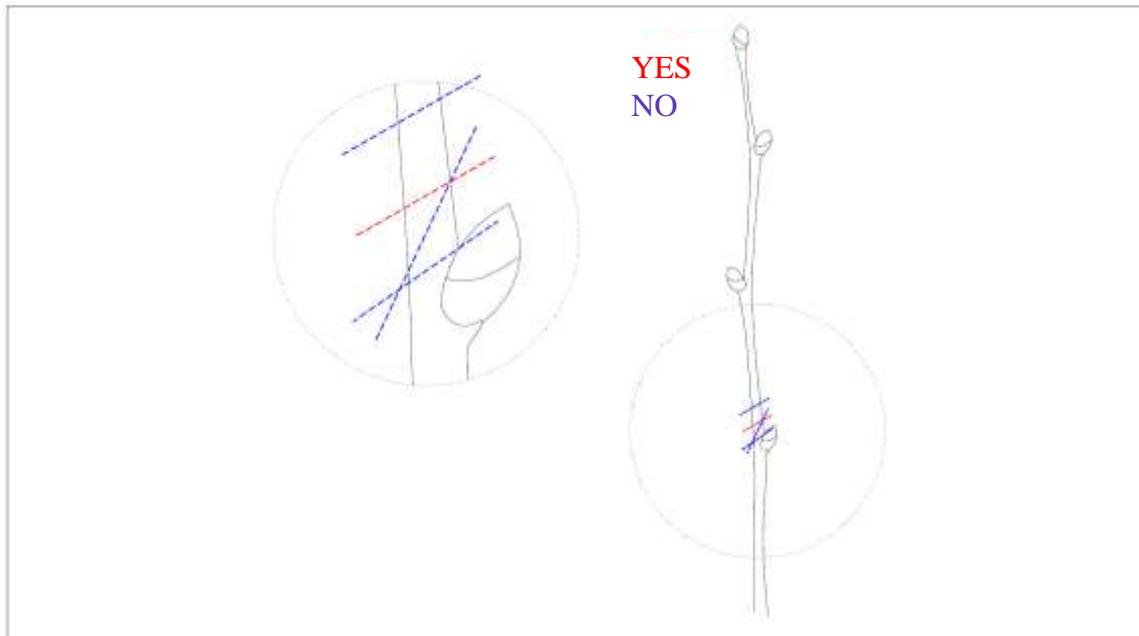


Fig. 5: Pruning to bud technique (2.1.3).

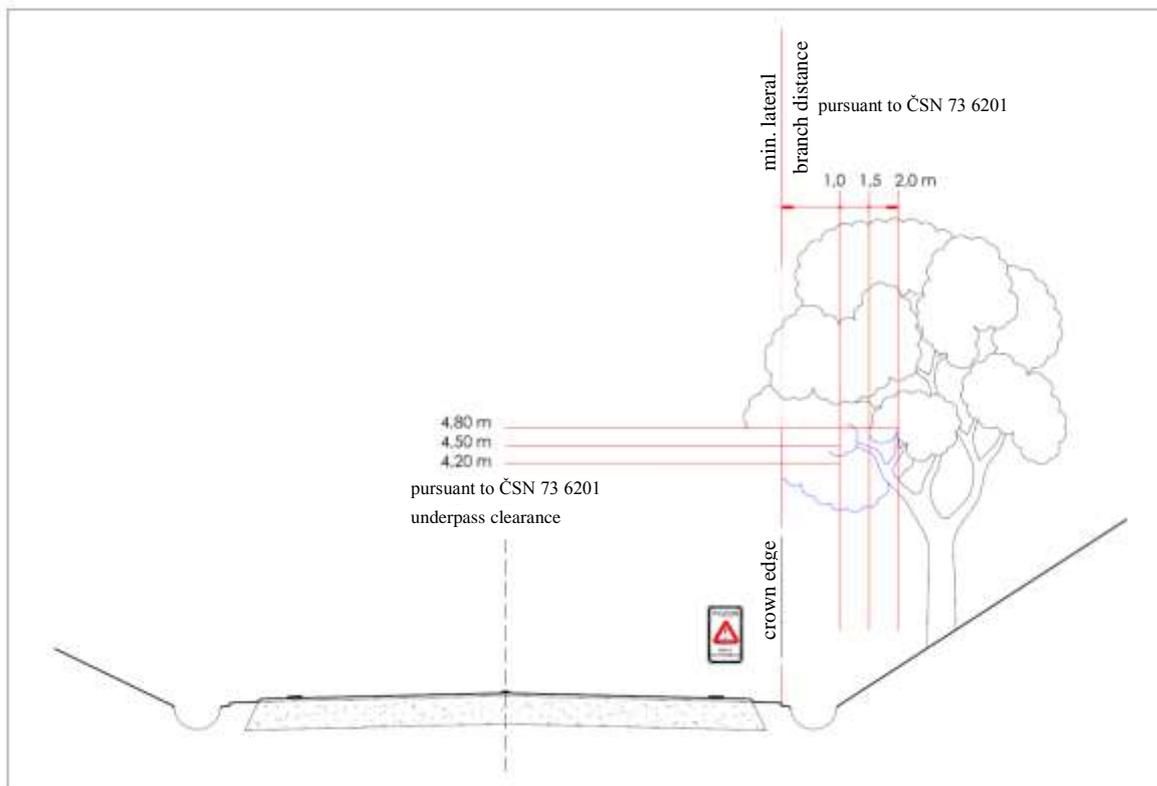


Fig. 6: Example of underpass clearance adjustment (3.2.3.6).

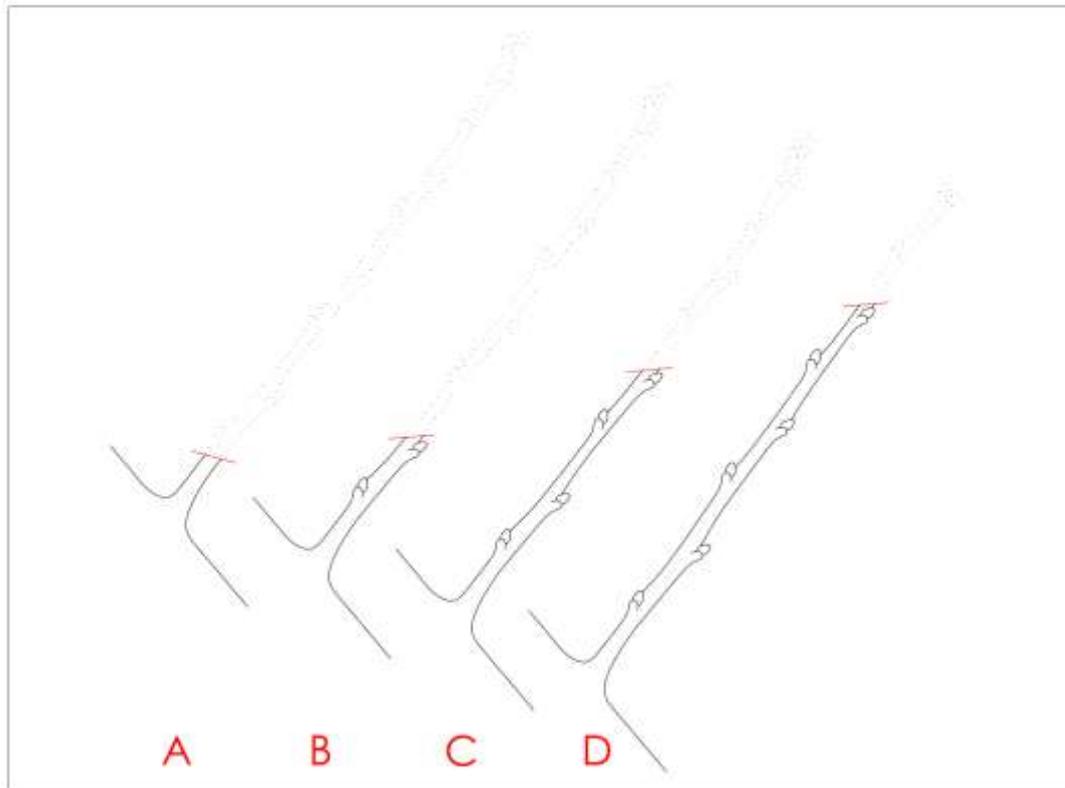


Fig. 7: Shoot reduction pruning: (A) to base (2.1.6); (B) to pin (2.1.5), (C) medium-length (SPPK C02 005); (D) long cut (SPPK C02 005).

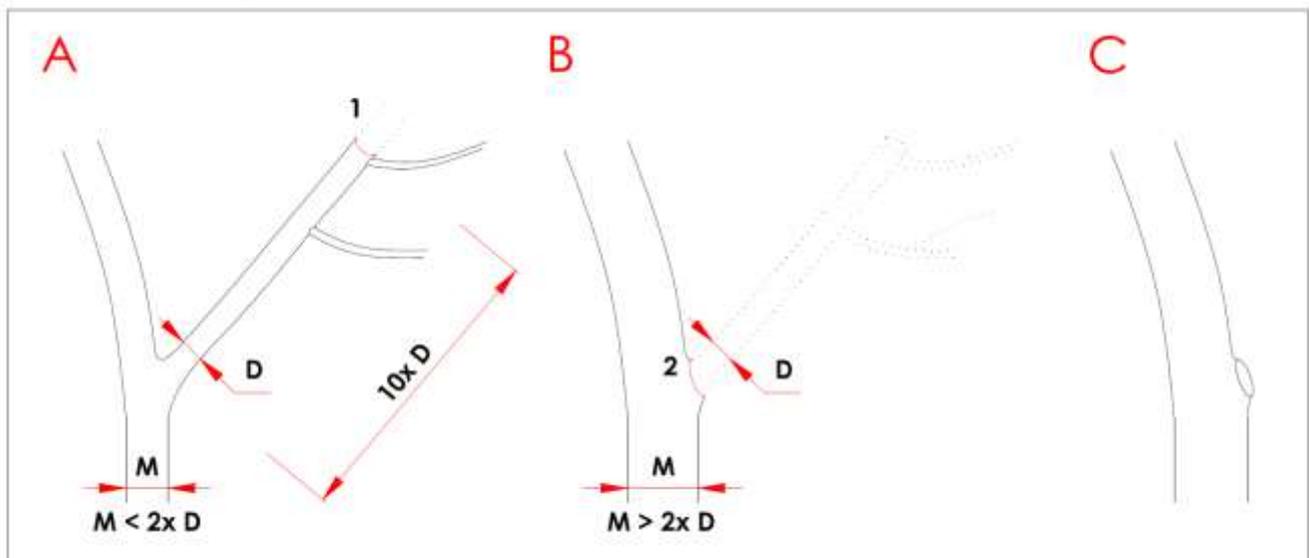


Fig. 8: Zahn pruning: (A) formation of long pin on daughter branch; (B) enhancement of parent branch; (C) stub removal (2.1.5).

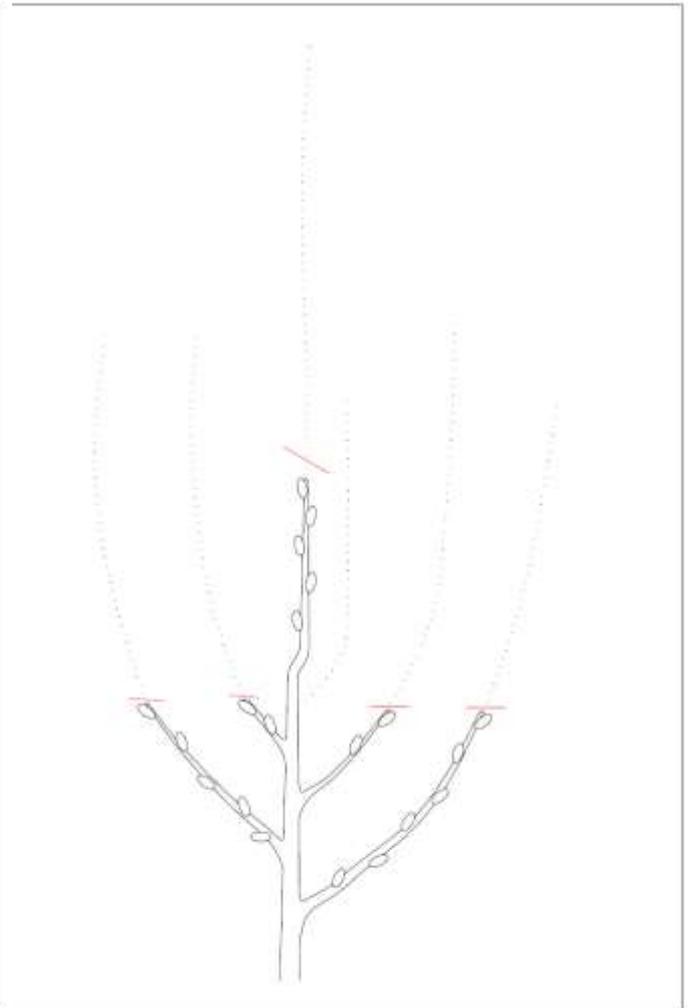
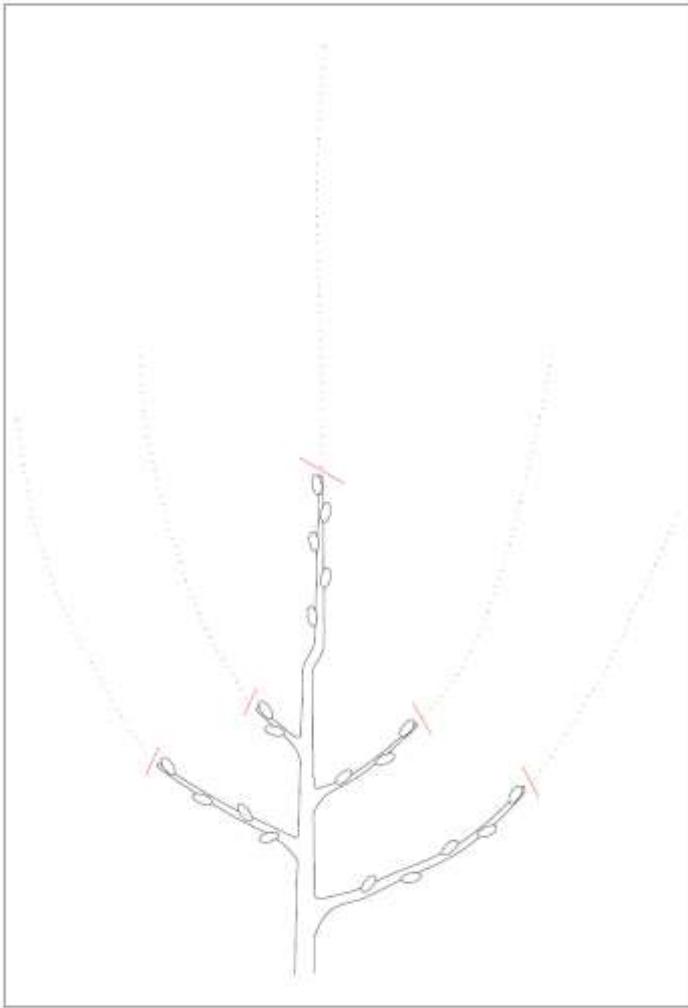


Fig. 9: Pruning to inner bud (2.1.3)

Fig. 10: Pruning to outer bud (2.1.3)

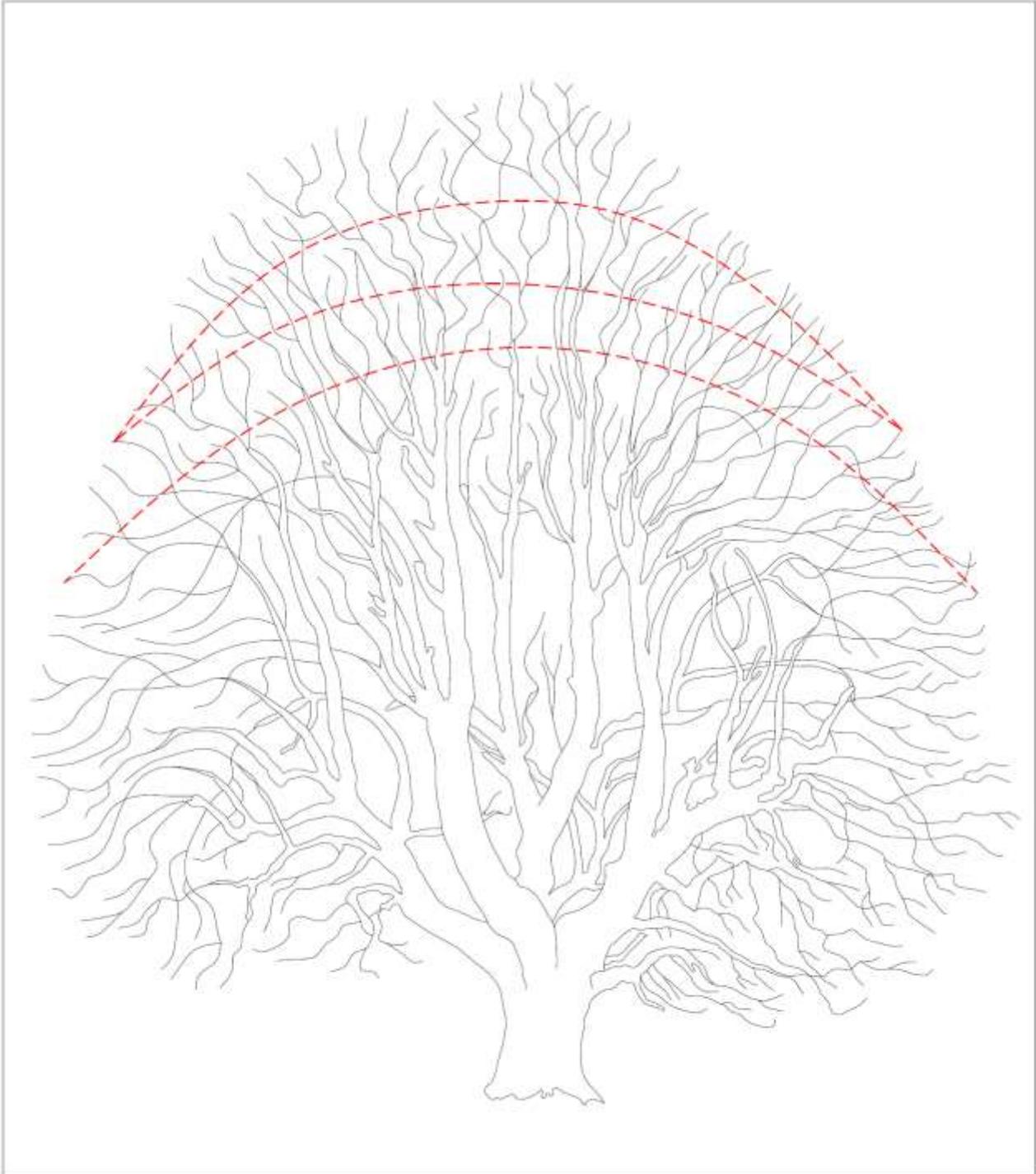


Fig. 11: Model example of perimeter reduction (3.3.1).

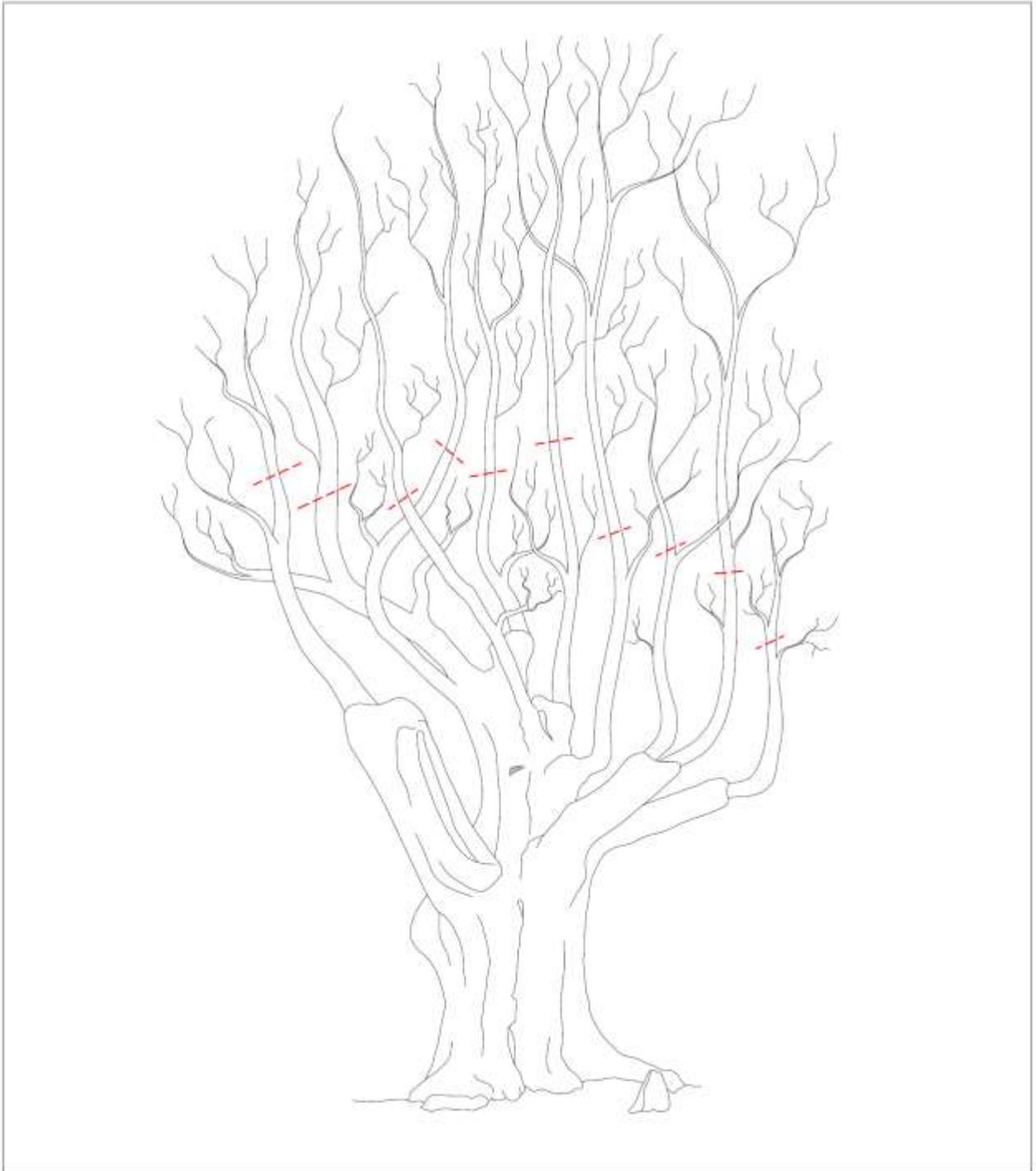


Fig. 12: Model example of secondary crown stabilisation (3.3.2).

Annex 4 **List of Nature and Landscape Management Standards
(Arborist Standards) developed**

00 **General**

00 001 Terminology

01 **Inspection, assessment, planning**

01 001 Assessment of tree condition

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 Safety bonds and other stabilisation systems

02 005 Cutting of trees

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 interventions in trees

02 010 Management of woody plants along public transport infrastructures

02 011 Management of woody plants along public technical infrastructures

© 2015 Mendel University in Brno
Faculty of Forestry and Wood Technology
Zemědělská 3
613 00 Brno

© 2015 Nature Conservation Agency of the Czech Republic
Kaplanova 1931/1
148 00 Praha 11

SPPK A02 002
www.standardy.nature.cz

2015

- 32 -