WORLD CONFERENCE ON TIMBER ENGINEERING 2025
BRISBANE, AUSTRALIA
Advancing Timber for the Future Built Environment

THE 2ND GENERATION OF THE EUROCODE FOR TIMBER BRIDGES

Antje Simon[1], Matthias Gerold[2], Hauke Burkart[3], Andreas Müller[4]

ABSTRACT: In Europe, the design of timber bridges is covered by Eurocode 5 part 2 (EN 1995-2), which has been extensively updated to fulfill the requirement of 100 years' design service life. The new Eurocode for timber bridges contains extended regulations regarding timber-concrete composite and integral bridges, laminated timber decks, bracings, bearings and foundations as well as the topics relating to the serviceability limit state (deflections, vibration and damping) and fatigue. Timber bridges can only be competitive if they achieve a comparable service life to bridges made of other materials. In addition, the costs for maintenance and inspection should not be significantly higher. For this reason, particular focus was assigned to the aspects of durability, maintenance and inspection when developing the new timber bridge code. Four categories were defined with regard to the service life of the bridge and its main load-bearing components. For each of these categories, the new standard provides information on structural timber protection measures as well as recommendations for allocation to Service Classes and Use Classes. This is the first structural standard that contains drawings to improve the implementation of structural protection measures. This paper presents its new structure and content, highlighting the improvements included, especially regarding durability, maintenance and inspection.

KEYWORDS: timber bridges, Eurocode, durability, maintenance, inspection

1 – INTRODUCTION

In 2004, Eurocode 5 (EC 5) was first published in Europe as the design standard EN 1995 "Design and construction of timber structures". The aim of developing the ECs was to standardise guidelines for the design of structures in the member states of the European Committee for Standardisation (CEN) by providing a common set of technical rules, thereby minimising barriers within Europe. To ensure that the Eurocodes reflect state of the art technology and current technical developments, the standards have been revised since 2012. The aims for the second generation of EC 5 were to improve its structure and enable ease of use. The consolidation regarded the reduction of Nationally Determined Parameters (NDPs) and alternative design methods. In addition, very specific design rules were moved to normative annexes. Since 2015, ten working groups have further developed the rules for timber constructions and coordinated their work with the National Standardisation Bodies. Based on their work results, six groups of experts (project teams) drafted the four parts of the new timber construction standard:

- EC 5-1-1: General rules and rules for buildings [1],
- EC 5-1-2: Structural fire design [2],
- EC 5-2: Bridges [3] and
- EC 5-3: Execution [4].

In the formal enquiry of 2023, 20 of the 31 member states approved the prEN 1995-2 draft of the code for timber bridges, the others abstained. 11 member states submitted a total of 1062 comments. 55 % of the comments were editorial and 30 % technical [5]. After processing and incorporating the comments received, the formal vote will take place in October 2025. The additional part EC 5-1-3 for timber-concrete composites (TCC) is now being developed on the basis of [6]. The new EC 5 series of standards will be available in all member states of the CEN and EFTA from autumn 2027. This paper presents the comprehensive revision and extension of the current version of the timber bridge part EC 5-2 [3]. It updates the status of 2023 [7] to include the standardisation work achieved in the past two years.

2 – OVERVIEW

The new EC for timber bridges has been restructured and extended. Previously, EC 5-2 comprised 32 pages including 2 annexes. The new version will contain 74 pages with 6 annexes (Figure 1). The intended simplification therefore does not entail a reduction in content. The standard now reflects the major advances in research, application and product development in timber construction over the last 20 years (e.g., cross laminated

[1] Antje Simon, Professor for Timber Structures, University of Applied Sciences Erfurt, Erfurt, Germany, antje.simon@fh-erfurt.de

[2] Matthias Gerold, Harrer Ingenieure Gesellschaft Beratender Ingenieure VBI mbH, Karlsruhe, Germany, M.Gerold@harrer-ing.net

[3] Hauke Burkart, Bane NOR, Oslo, Norway, hauke@burkart.no

[4] Andreas Müller, Professor em. for Timber Structures and Building Construction, Bern University of Applied Sciences, Biel, Switzerland, andreas.mueller@bfh.ch

https://doi.org/10.52202/080513-0006

timber (CLT), timber-concrete composites (TCC) and innovative fasteners).

In order to simplify work with all of the structural ECs, the first ten chapters now adhere to the same format. The following topics have been maintained and updated: basis of design, materials, durability, structural analysis, ultimate and serviceability limit states, fatigue, joints and connections. Due to the increasing construction of timber high-rise buildings, crane ways, wind mills and bell towers, for example, dynamic action has become more important for building construction. Therefore, most of the content of the section on fatigue design has been moved from what was previously Annex A for bridges to the main part of [1]. Also, most of what was previously Annex B (vibrations, damping) has been integrated into the main part of [3]. EC 5-2 has been extended to include provisions for durability, corrosion protection and structures like laminated timber decks, TCC and integral timber bridges. Laminated timber decks consist of solid-wood boards arranged side by side in the direction of span and clamped together. In [1] recommendations are given for their modelling using the Finite Element Method (FEM) as well as for friction coefficients. Additional information for stress-laminated timber decks in bridges are provided in [3] for design and the evaluation of tensioning forces. The new normative Annex A contains determination equations for the composite creep coefficients of the structural members of TCC bridges. The new informative Annex B provides recommendations for the calculation of dimensional changes due to variable environmental conditions such as temperature or timber moisture. Additional information on bearings can be found in the informative Annex C. A simplified verification of vibrations as an alternative to full dynamic analysis is given in the informative Annex F. One of the main issues when editing EC 5-2 was the implementation of the specifications of the second generation of EN 1990 [8] and EN 1991-2 [9], in particular, requirements for a design service life of 100 years. A new informative Annex D contains simplified drawings representing structural protection measures. Service life is also a topic in the new informative Annex E, which covers the inspection and maintenance of timber bridges. Table 1 shows the structure of the new standard compared to the current version.

Table 1. Comparison of the tables of content of the new and current Eurocode for timber bridges

EN 1995-2:2004		prEN 1995-2:2025	
1	Scope	1	Scope
		2	Normative references
		3	Terms, definitions, symbols and abbreviations
2	Basis of design	4	Basis of design
3	Materials	5	Materials
4	Durability	6	Durability
5	Structural analysis	7	Structural analysis
6	Ultimate limit states (ULS)	8	Ultimate limit states (ULS)
7	Serviceability limit states (SLS)	9	Serviceability limit states (SLS)
		10	Fatigue
8	Joints and connections	11	Joints and connections
9	Execution and inspection		
Annex A (informative):	Fatigue	Annex A (normative):	Effective composite creep coefficients for TCC
Annex B (informative):	Vibrations caused by pedestrians	Annex B (informative):	Dimensional changes due to environmental effects
		Annex C (informative):	Additional information on bearings
		Annex D (informative):	Durability: Construction measures and examples for detailing
		Annex E (informative):	Inspection and maintenance of timber bridges
		Annex F (informative):	Simplified verification of vibrations
		Bibliography	

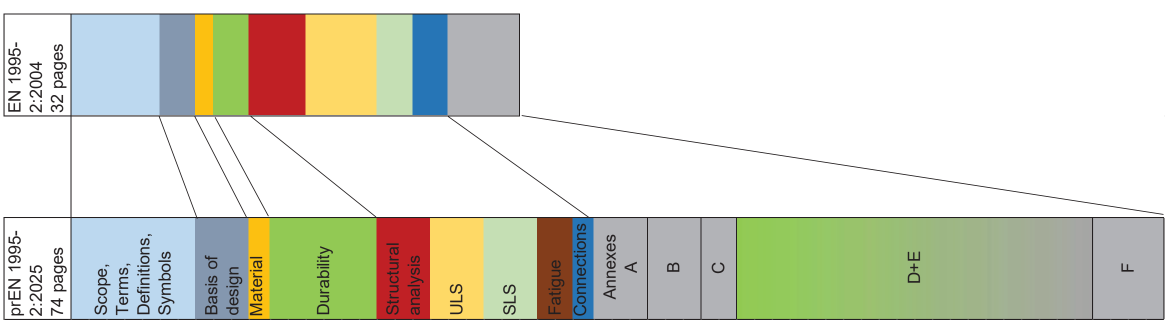


Figure 1. Comparison of the scope of the old and new version of the Eurocode for timber bridges

In the following, the main topics of the new EC5-2 are presented including extensions of the previous version. Due to its particular importance (see the green coloured parts in Figure 1), the paper focuses on the topics of durability, detailing, maintenance and inspection and explains their background in detail. Significant additions have also been made to the sections on TCC and vibrations. Details can be found in [10] and [11].

https://doi.org/10.52202/080513-0006

3 – EXTENDED REGULATIONS FOR DURABILITY

3.1 BACKGROUND

The comparison of scope in Figure 1 shows that the revision focuses on durability (clauses 4 and 6 and Annex D) and maintenance (Annex E). Bridges made of timber can only be competitive if they achieve the same design service life as bridges made of other materials and if their maintenance costs are not significantly higher. According to [8], the design service life of engineering structures should be 100 years. Numerous old timber bridges demonstrate that the sustainable building material timber can generally achieve this service life (Figure 2). At the same time, any cases of damage over the last 20 years show that consistent implementation of the principles of structural timber protection and responsible maintenance are essential requirements for timber bridges to have a long service life. The new standard therefore particularly emphasises the principles of structural timber protection. This is the first time that a structural standard also includes drawings (Annex D) that show examples of structural protection measures.

Figure 2. Old covered bridge (Wynigenbridge, Switzerland, built in 1776; photo: Doris de Marco, CH-Burgdorf)

3.2 CATEGORIES OF DESIGN SERVICE LIFE

General requirements regarding design service life are given as a basis for bridge design in Europe in [8] (Table A.2.2). The requirements for durability, inspection and maintenance are particularly important for timber bridges, together with recommendations on robustness and quality management. Different categories are defined for design service life. Irrespective of the material employed, bridges should achieve a design service life of 100 years. A shorter design service life of 50 years may be relevant for simple bridges used for recreational purposes, for example. An even lower service life is specified for replaceable structures (25 years) and temporary or unprotected bridges (10 years). This fundamental categorisation has been adapted for timber bridges (Table 2).

In clause 4 of [3], it is generally recommended to design timber bridges as protected bridges (Table 2, line 1). In the case of such bridges, all of the main structural members are protected and therefore not exposed to direct weathering such as rain, snow or other sources of moisture ingress. This definition given in clause 3 explicitly emphasises the application of the principles of structural timber protection. In the opinion of the authors and as confirmed by several cases of damage, a design service life of 100 years cannot be achieved for timber bridges solely by using of timber with high durability and/or the application of chemical wood preservation. Weather protection can be provided by means of a sufficient roof overhang in longitudinal and transverse directions and/or cladding and a sealed cover surface (Figure 3) so that moisture is unlikely to accumulate. Special attention should be given to the protection of truss nodes and end grain areas. Under certain circumstances, it may be necessary or useful to deviate from a design service life of 100 years, e.g., for bridges in low consequence classes (Table 2, row 2) or for bridges built for temporary purposes (Table 2, row 4). For bridges with reduced protection, some structural members could remain unprotected. This deviation should be specified by the relevant authority, or where not specified, agreed for a specific project by the relevant parties. Furthermore, timber bridges have components that cannot be structurally protected due to their location and/or function. These unprotected members include, for example, railings, cladding and deck planks. Components such as asphalt pavements, sealings, bearings and transition joints also do not achieve a 100-years service life and therefore need to be replaced during use.

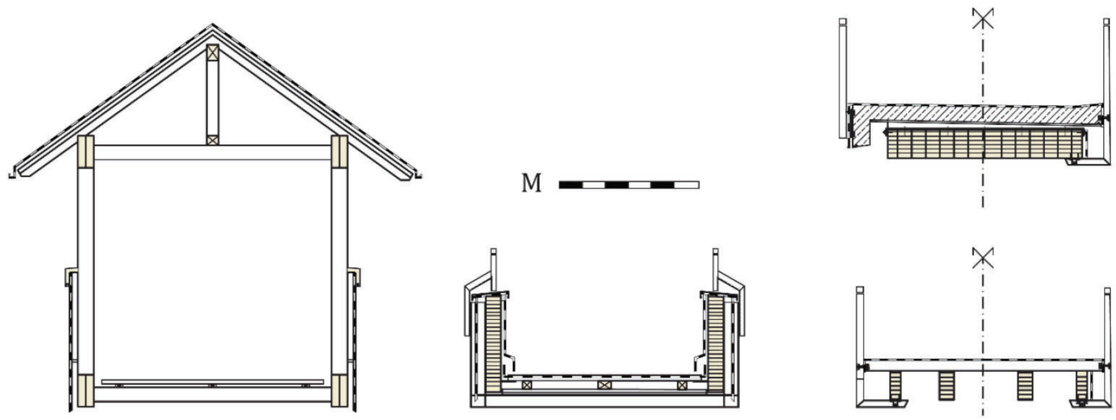
In Table 2, the measures for structural timber protection are reduced in ascending order of line number. In general, the use of timber with sufficient natural durability is always recommended. The natural durability of a type of wood relates to its ability to resist infestation by insects and fungi without additional measures. This resistance is categorised by assigning a wood species to a Durability Class (DC). A suitable type of timber should be selected depending on the Use Class (UC) in accordance with EN 335 [12]. The UC defines the way in which the respective timber component is installed, depending on the environmental conditions. The Service Class (SC), which quantifies the influence of wood moisture on the mechanical and rheological properties of the wood, is required to assess its load-bearing capacity and serviceability. FprEN 1995-2 [3] specifies assignments to the respective timber bridge categories for both classes (Table 2). Thereby, the definition of the modal verbs is crucial for their application. While the verb "shall" describes a strict requirement to be followed, the verb "should" indicates a highly recommended technical choice.

Wooden bridges of all categories shall be constructed in such a way that the upper limit of average annual moisture content $\omega_{up,mean}$ does not exceed 24 %. This ensures their allocation to SC 3. For protected timber components, $\omega_{up,mean}$ should be a maximum of 20 %, which corresponds to classification in SC 2. In Central and Northern Europe, a wood moisture content of 12-18 % can be assumed for protected members. For a maximum period of 3 months per year, the standard allows an increased wood moisture content of up to 24 % for protected timber components. In this case, it is important that sufficient air circulation guarantees rapid re-drying.

Table 2 is an NDP, i.e. the member states may nationally deviate from the definitions of the stated design service lives.

Table 2. Categories of timber bridges and parts of timber bridges based on their design service life (based on Table 4.1 of [3])

Row	**Category of timber bridges and parts of timber bridges [definition]**	**Protection measures**	**Application**	**Design service life, T_{lf} [years]**	**Recom-mended Service class (SC)**	**Recom-mended Use class (UC)**
1	Protected timber bridges [All load bearing members shall be protected (not exposed to direct weathering or moisture ingress).]	See Clause 6 of [3] (The measures in Clause 6 ensure that no water accumulates.) *Structural members **shall** be protected from run-off water and the accumulation of rainwater on flat surfaces.*)	Generally recommended for all wooden bridges	100	2 (should)	2 (should)
2	Timber bridges with reduced protection [Some main structural members may be unprotected.]	See [1] *Runoff water **shall** be redirected away from the structure and the accumulation of water **shall** be prevented.*	bridges of a low consequence class	50	3 (should)	3 (should)
3	Replaceable structural parts (of rows 1 and 2) [Structural parts that cannot be designed to achieve the intended service life of the bridge (100 or 50 years).]	may be installed without weather protection, but use timber with an adequate durability class (DC) *Runoff water **shall** be redirected away from the structure and the accumulation of water **shall** be prevented.*	e.g., handrails, deck planks, cladding, guard rails and transition joints	25	3 (should)	3 (should)
4	Temporary structures and unprotected timber members of timber bridges	*Runoff water **should** be redirected away from the structure and the accumulation of water **should** be prevented.*	e.g., bridges for temporary constructions	≤ 10	3 (shall)	3 (shall)



M - Sealant or other weather protection

Figure 3. Types of bridge protection by roof overhang and water resistant layer: covered bridge (left), trough bridge (middle), 3 deck bridges (right) (according to Figure 3.1 of [3])

3.3 CONSTRUCTION MEASURES FOR PROTECTED TIMBER BRIDGES

The requirements for a 100-year service life are outlined in clause 6 of [3] comprising criteria on general design for structural protection, sealing systems and corrosion protection. The required durability is achieved by appropriate detailing, a wise choice of material and corrosion protection systems. Cracking caused by moisture-induced swelling and shrinkage can significantly reduce durability. Therefore, deviations in moisture between production, transportation and during design service life should be considered. To minimize the risk of cracking, timber components should generally be

https://doi.org/10.52202/080513-0006

manufactured and installed with the wood moisture content expected during use. Depending on the ambient climate, an annual variation of average moisture $\Delta\omega_1$ of ± 3 % can be expected within a timber component during its design service life.

The protective measures outlined in [1] shall always be considered. The following additional measures also apply:

- Water accumulation shall be prevented (e.g., through: inclination of horizontal surfaces by at least 2.5 % in a longitudinal or transverse direction; compliance with a minimum inclination of 0.5 %; prevention of penetrating sealings by fasteners).
- Sufficient ventilation shall be provided by adequate spacing (e.g.: minimum distance of all timber components to the ground with hard landscaping 0.5 m and to the average level of flowing water and ground with soft landscaping 1.0 m).
- Top surfaces (except for deck planks) shall have a waterproofing layer.
- The underside of softwood members shall have a drip-nose or inclination to reduce hanging water.

A basic distinction is made between two types of construction for the waterproofing systems. In the case of road bridges, the horizontal forces from vehicle traffic must be transferred to the load-bearing structure via the waterproofing system. For this purpose, a prime coat or adhesive between the waterproofing system and the timber deck is necessary. A floating sealing system can be used for pedestrian bridges. A glass mat between the sealant and the timber deck prevents the transfer of shear forces. The sealant must be protected by a protective layer. The wearing surface is placed on top. The use of mastic asphalt is recommended for the wearing surface and the protective layer (Figure 4). The sealant should consist of polymer-bitumen.

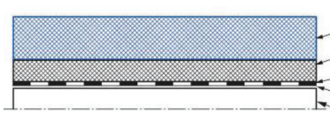


Figure 4. Example of a waterproofing system with mastic asphalt for wearing surface and protective layer [according to Figure 6.1 of [3])

The risk of sealant blistering can be reduced by limiting the thickness of the asphalt protective layer to a maximum of 25 mm. Additionally, the temperature of the asphalt should be reduced during paving.

A design service life of 100 years cannot be expected for the sealant, protective and surface layers of timber bridges. Table 3 therefore provides expected design service lives for waterproofing systems and wearing surfaces.

Table 3. Expected design service life of waterproofing systems and wearing surfaces (according to Tab. E.1 of [3])

Waterproofing systems and wearing surfaces	Design service life T_{lf} [years]
Sealant	25-30
Wearing surface (mastic asphalt)	25
Wearing surface (deck planks with DC1 and DC2)	25
Wearing surface (untreated deck planks)	15

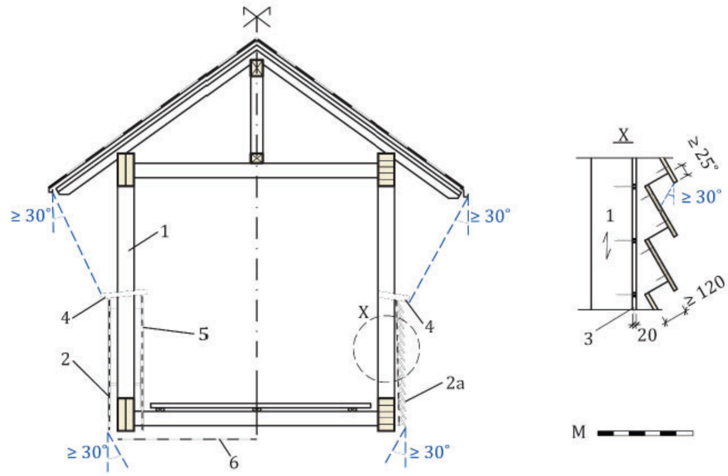
This is the first structural Eurocode to contain drawings that provide examples of details for structural timber protection. Annex D presents a total of 12 drawings (Table 4) with extensive technical comments on the individual details.

Table 4. Examples of structural detailing

Figure	Content
D.1	Examples of protected timber bridges
D.2	Commonly used connections in TCC bridges
D.3-D.7	Construction measures – weather protection • by roof and planking, • of trough bridge by cladding, • by waterproofing system, • by reinforced concrete-plates, • by glass fibre reinforced plastic planks
D.8-D.10	Transition joint • closed road surface with mastic asphalt – sliding bearing, • solution timber bridge with joint – sliding bearing, • solution timber bridge with mastic asphalt – fixed bearing
D.11-D.12	Edge waterproofing system on timber deck slab with concrete kerb - possibilities 1 and 2

Figure 5 shows an example of the drawings illustrating weather protection by roof and planking in detail. Sufficient protection of the surfaces of a bridge by an overhang and/or cladding should be ensured by a rainfall angle of 30°. Rainfall angles of up to 70° have been observed in specific local situations. Therefore, the standard requires the rainfall angle to be specified for the individual location.

https://doi.org/10.52202/080513-0006



Key
M sealant or weather-resistant layers
1 main girder
2 weather protection - closed variant
2a weather protection - open ventilated variant (several types of cladding)
3 air space
4 drip groove (notch)
5 for road bridges the lower chords and the truss nodes of the main girder also need to be protected inside
6 wood protection at bottom to prevent possible entry of moisture from below (directly over a waterfall)

Figure 5. Construction measures: Weather protection by roof and planking [according to Figure D.3 of [3])

3.4 CORROSION PROTECTION OF STEEL COMPONENTS

Corrosion protection of all steel construction elements is achieved by applying the SC, the atmospheric exposure category C_E and the timber exposure category T_E according to [1]. The atmospheric exposure category C_E evaluates the corrosivity of the atmosphere depending on relative humidity, air pollution, chloride content and weather exposure. The timber exposure category T_E describes the influence of wood moisture content, the pH-value due to the wood ingredients and the chemical treatment on the corrosion of the steel components. For timber bridges, the categories can vary between T_E3-T_E5 and C_E2-C_E5. The measures taken for corrosion protection should be derived from the highest exposure of these categories. The resistance of steel components should be indicated by the resistance categories T_R and C_R. FprEN 1995-1-1 ([1], Table 6.2 and 6.3) contains examples for these resistance categories, which could alteratively be found in the relevant European technical product specification. As an extension to [1], the protection measures given in [3] define requirements for a design service life of 100 years and 50 years. In principle, the table recommends a zinc coating or the use of stainless steel as corrosion protection measures. Also, protection systems may be alternatively used. The general procedure for selecting a suitable corrosion protection system is shown in Figure 6.

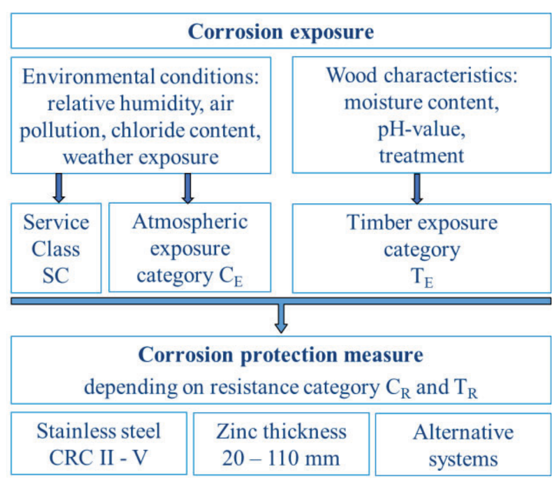


Figure 6. Procedure for selecting corrosion protection measures according to [3]

3.5 MAINTENANCE AND INSPECTION

With the introduction of the separate clause 6.4 and the separate Annex E, the particular importance of maintenance and inspection for the durability of timber bridges is emphasised. Timber bridges should be designed in a maintenance-friendly manner and be regularly and responsibly inspected. Maintenance-intensive components such as bearings and transitions joints should be minimised. The integral timber bridges that have been increasingly built in recent years are an excellent example of low-maintenance bridges (Figure 7).

https://doi.org/10.52202/080513-0006

Figure 7. Example of an integral timber bridge without bearings and transition joints (photo: Schaffitzel Holzindustrie)

A maintenance strategy is recommended for every timber bridge.

This strategy should contain:

a) a concept for protection and maintenance,
b) an inspection strategy and
c) a maintenance report.

Within the maintenance concept, the service lives of all load-bearing elements should be defined. Furthermore, the structural timber protection measures and the cycles for renewing corrosion, protective coatings, transition joints, bearings and seals should be specified. The concept also contains useful maintenance measures such as cleaning the deck, the benching and removal of the vegetation growing too close to the structure. A minimum distance of 2.0 m from tree crowns and large bushes is recommended to protect the timber from vegetation. To enable a hands-on inspection, the horizontal clearances between the bearings and between a bearing and the ballast wall of the abutment should be at least 0.5 m and 0.3 m respectively. The vertical clearance between the benching and the superstructure shall be at least 0.5 m.

The inspection strategy is divided into a visual and a main inspection. Both inspection types should be performed regularly by qualified personnel. The intervals for inspections are often regulated by national road authorities. For visual inspections intervals of 1-2 years and for main inspections intervals of 5-6 years are common.

The unrestricted inspectability of the main load-bearing components shall already be considered during the design phase of new timber bridges. Cladding to protect against weathering shall be designed to be removable, so that the main structural members behind can be easily inspected. An example of such removable cladding is shown in Figure 8 [13]. Open shuttering elements with a minimum spacing of 120 mm also enable easy inspection (see detail X of Figure 5).

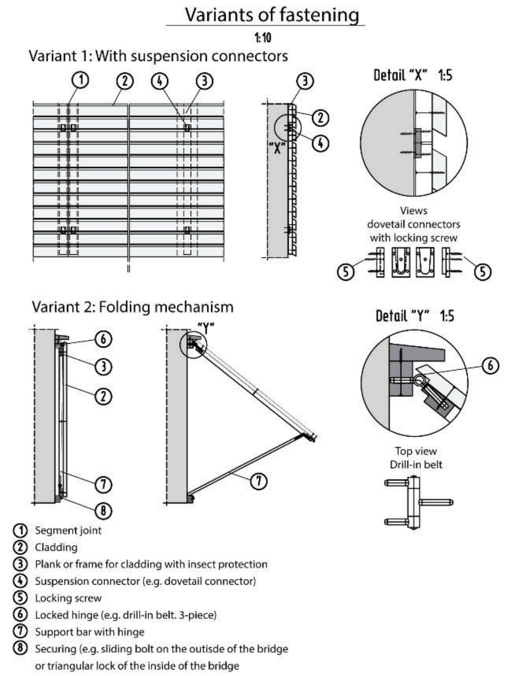
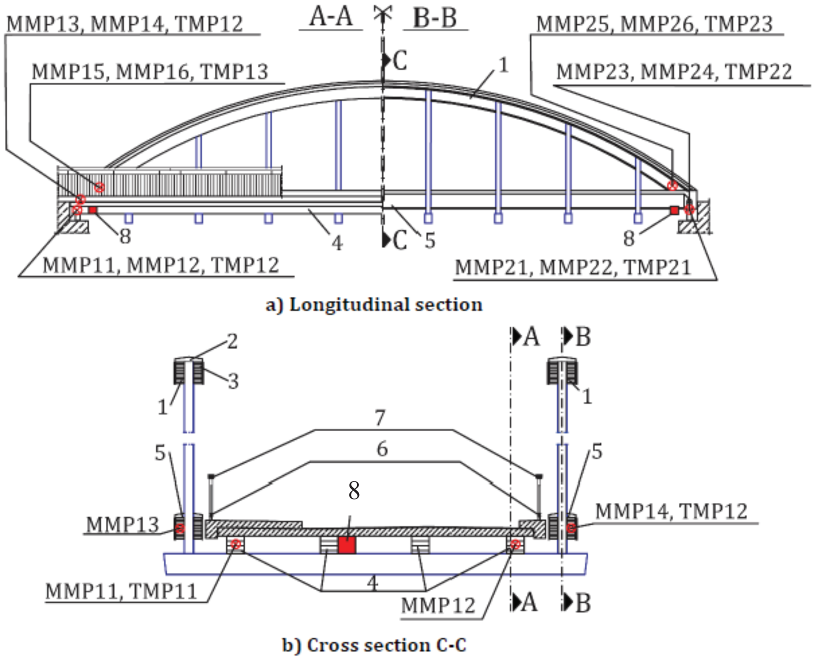


Figure 8. Examples of the construction of removable cladding [13]

Determining wood moisture content at critical points is an important tool for assessing the state of integrity of a wooden bridge. Due to its simple handling and sufficient accuracy, the resistance method according to EN 13183-2 is recommended for determining wood moisture.

Furthermore, the installation of wood moisture monitoring systems is recommended. It is advisable to plan a monitoring system at the design stage and to include it in new bridges. If the planned structural protection measures fail, the monitoring system can indicate the critical points at an early stage. Suitable wood protection measures may then be initiated in time to prevent serious consequential damage. An example of such a monitoring system is shown in Figure 9. As a basis for planning protection measures, the UC has to be defined for every single timber member according to [12]. Suitable structural protection measures should be derived from the UC. Also, the selection of an appropriate wood species and its Durability Class (DC) is based on the UC. Table 5 provides an example for the determination of the UC, the protection measures and the wood species with DC for the main components of the bridge shown in Figure 9.



Key

MMP Moisture measurement point
TMP Temperature measurement point
1 arch truss UC 2
2 roof board UC 3.1
3 lead sheet
4 longitudinal beam UC 2
5 pliers beam UC 2
6 railing vertical components
7 railing horizontal component UC 3.2
8 instrument box

Figure 9. Moisture monitoring – example arch truss (according to Figure D.13 of [3])

Table 5. Definition of UC, SC, protective measures, wood type and DC for the components of an arch road bridge (according to Table D.1 of [3])

Component	**Use Class (UC) [Service Class (SC)]** EN 335 [EN 1995-1-1]	**Protective measures** EN 1995-2	**Wood type** EN 13556	**Durability Class (DC)** EN 350:2016, Table B.1
Longitudinal beam	2 [2]	Weather protection through a closed deck plate and a waterproof transition joint, end-grain protection, protection against insect attack by technical drying, visibility and control of insect infestation	Larch or Pine or Douglas fir as glulam	4
Arch truss / pliers beam	2 [2]	Weather protection through cladding, protection against insects by technical drying and insect protection grid, visual inspection every 6 years by removal of cladding	Larch or Pine or Douglas fir as glulam	4
Railing	Vertical: 3.1 [3] Horizontal: 3.2 [3]	None, maintenance component	European Larch	3

4 – CONCLUSION

The second generation of EC 5-2 is a logical continuation of the experience and principles of the previous version. The regulations for the design of timber bridges have been extensively revised, extended and adapted to the current state of the art. The update of the standard has resulted in no reduction in scope. The new standard aims to reflect the enormous progress made in research and development, but also in the practical application of timber in structural engineering over the last 20 years. New materials (such as CLT) and construction methods (such as TCC) have been integrated into the new standard. Timber bridges can only compete on the market if they provide a comparable design service life with low maintenance costs. Consistent application of the principles of structural timber protection is necessary in order to also establish the 100-year standard for timber bridge construction. Particularly, the recommendations on durability, maintenance and inspection have been significantly extended in the new standard. This is the first time that a structural code contains detailed drawings as examples for the implementation of structural timber protection. Applying the recommendations of the new timber bridge standard should ensure a long service life for timber bridges and enable the structures to compete with bridges made of other materials.

https://doi.org/10.52202/080513-0006

5 – ACKNOWLEDGMENTS

The new EC 5-2 has been developed by Project Team 6 and the Working Group 6, in which experts mainly from Norway, Sweden, Finland, Germany, Switzerland, Austria and France are represented. Most of these experts work on a voluntary basis. Standardisation work is financially supported by the national standardisation bodies. The authors would like to thank them all for their technical and financial support.

6 – REFERENCES

[1] FprEN 1995-1-1:2024 *Eurocode 5 - Design of timber structures - Part 1-1: General rules and rules for buildings.* (Document date 2024-12-09)

[2] FprEN 1995-1-2:2024 *Eurocode 5 - Design of timber structures - Part 1-2: Structural fire design.* (Document date 2024-08-01)

[3] FprEN 1995-2:2025 *Eurocode 5 - Design of timber structures - Part 2: Bridges* (Document date 2025-02-05)

[4] FprEN 1995-3:2024 Eurocode 5 - Design of timber structures - Part 3: Execution. (Document date 2024-09-23)

[5] CEN/TC 250/SC 5 (2024) *N1870_CEN_TC_250_SC_5_CEN_ENQ_Evaluation* (internal working document).

[6] CEN TS 19103:2021 Eurocode 5: *Design of Timber Structures – Structural design of timber-concrete composite structures – common rules and rules for buildings*.

[7] Gerold, M.; Burkart, H. (2023) *Second Generation of Eurocode 5-2 on timber bridges, an overview.* Proceedings of the World Conference on Timber Engineering (WCTE) Oslo, Norway, 2023. https://doi.org/10.52202/069179-0391

[8] EN 1990:2023 *Eurocode - Basis of structural and geotechnical design.*

[9] EN 1991-2:2023 *Eurocode 1 - Actions on structures - Part 2: Traffic loads on bridges and other civil engineering works.*

[10] Schänzlin, J.; Dias, A. (2022) *Design of timber-concrete composite structures.* Proceedings of the 4th Internationals Conference on Timber Bridges, Biel/Bienne, Switzerland, 9-12 May 2022. https://doi.org/10.24451/ehwc-6323

[11] Hamm, P. (2022) *Vibration, Deflection.* Proceedings of the 4th Internationals Conference on Timber Bridges, Biel/Bienne, Switzerland, 9-12 May 2022. https://doi.org/10.24451/ys1x-9w56

[12] EN 335:2013 *Durability of wood and wood-based products – Use classes: definitions, application to solid wood and wood-based products*.

[13] Simon, A.; Arndt, R.; Jahreis, M.; Koch, J. (2019) *Entwicklung einheitlicher Richtlinien für den Entwurf, den Bau, die Überwachung und Prüfung geschützter Holzbrücken – Protected Timber Bridges (ProTimB).* Final research report. University of Applied Sciences Erfurt, Germany.

[14] EN 13183-2:2002 *Moisture content of a piece of sawn timber. Part 2: Estimation by electrical resistance method*.

[15] EN 350:2016 *Durability of wood and wood-based products – Testing and classification of the durability to biological agents of wood and wood-based materials*.