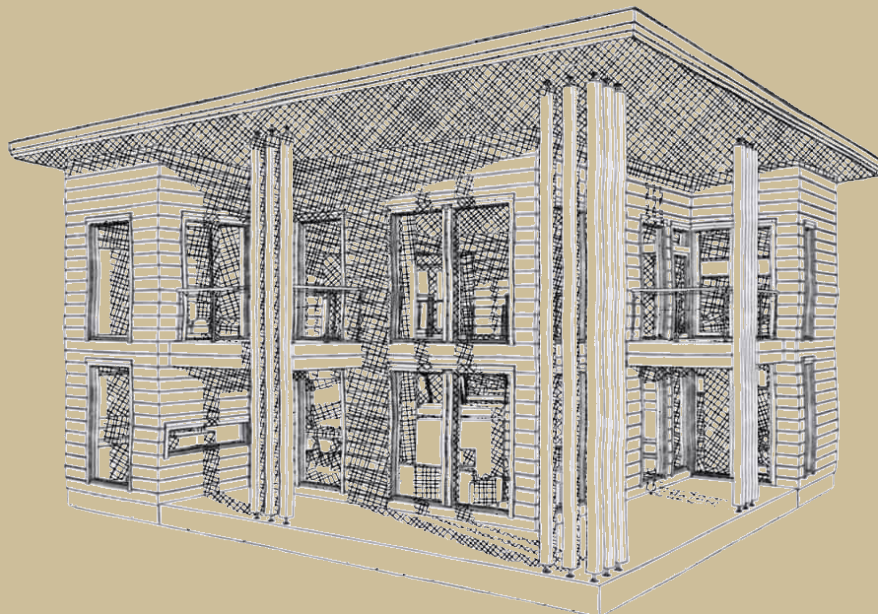


KONTIO

Designing a Log Building Architectural Guide



Introduction

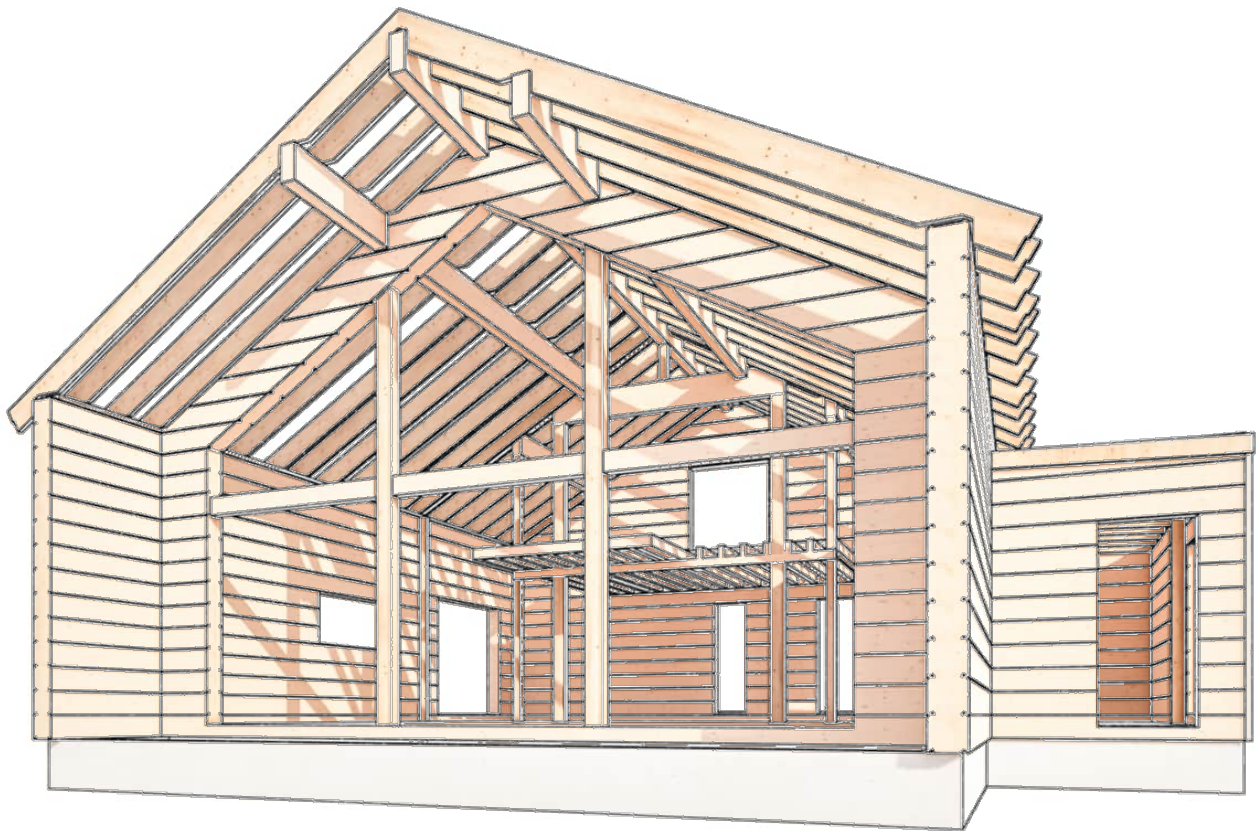
This design guide provides the fundamental information needed for the architectural design of a Kontio log building.

Log construction is a traditional building method, common in areas where nearby forests have provided a natural material - the log. Traditionally, logs were hewn and assembled with corner joints into a stable, rectangular log frame. Openings for doors and windows were sized so that the frame would remain structurally sound without additional support.

With the advancement of technology, both log production and processing have evolved, yet the essence of this centuries-old building tradition remains. This guide introduces the principles of designing a modern, warm, and inviting log house where the primary load-bearing structures are made of solid wood.

The guide focuses on buildings that use Kontio SmartLog non-settling logs as the load-bearing wall structure, modern miter corners (we call it "neo corner and "jiirinurkka" in Finnish) as the corner joint type, and a ground-bearing concrete slab as the base floor.

At Kontio, the height reference for buildings is defined so that the bottom surface of the ground floor log walls is at level ± 0.000 . The finished floor level depends on the foundation and floor structure type. In Finland, the typical finished floor level of a ground-bearing concrete slab is $+0.100$.



1 Log Walls

Kontio's non-settling log wall system is constructed from logs that are pre-cut to precise lengths at the factory. The logs are fastened together with screws. One log layer (one course of non-settling logs) increases the wall height by 263 mm, while the nominal height of a single log is 275 mm. Non-settling logs are available in three thicknesses: 135 mm, 205 mm, and 275 mm.

Each log is composed of cross-laminated timber lamellas, glued in alternating directions for dimensional stability. The exterior surface shows two horizontally glued pine lamellas, and the layered structure is clearly visible at the log ends.

For the most efficient design, wall heights should be determined so that all logs are full-height pieces: $X \text{ log courses} \times 263 \text{ mm}$.

The basic design principles for industrial log structures are presented in RT card RT 103762, and more detailed information on Kontio's log frame dimensions can be found in Kontio's own technical guidelines.

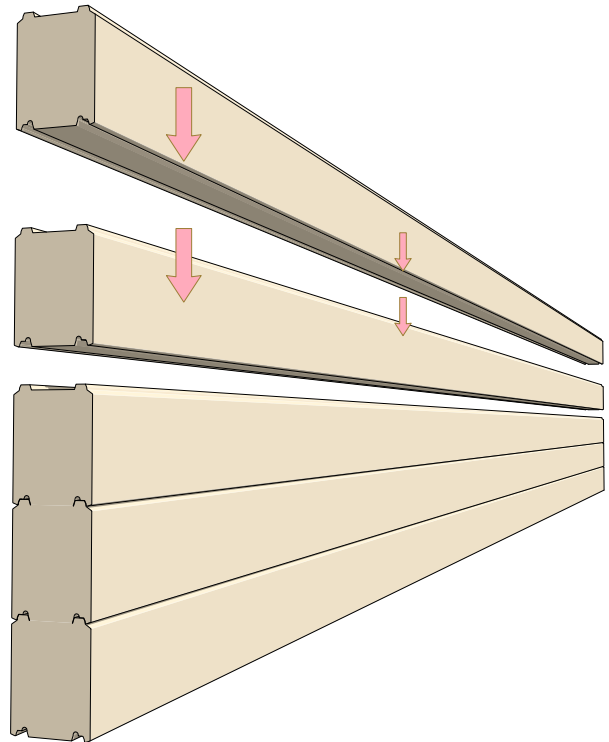
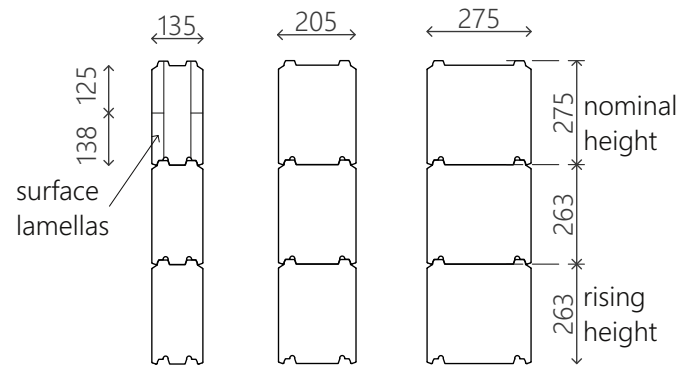


Photo: Log wall
(© Kontio)



Photo: Construction of log frame (© Kontio)

Log performance ratings

log type	fire rating	U-value W/m ² K	sound reduction index			emissions class
			R _w	R _w +C	R _w +C _{tr}	
width x height S- standard profile SL - smartlog			R _w	R _w +C	R _w +C _{tr}	
135x275 S SL	REI60	0,77	38 dB	37 dB	35 dB	M1
205x275 S SL	REI90	0,53	40 dB	39 dB	38 dB	M1
275x275 S SL	REI120	0,40	42 dB	41 dB	40 dB	M1

Log dimensions - maximum

A log wall can, in principle, be of almost any length or height. The maximum length of a single log is approximately 11,300 mm. Longer walls are created by joining logs together with dovetail joints, which leave only a narrow vertical seam visible at the connection point. These seams are staggered in adjacent log courses during structural design to improve stability.

To ensure the straightness of log walls, they must be supported by partition walls or support posts ("följären"). At each junction between a log wall and a partition wall (dry wall), there is always a concealed support post inside the wall frame. If partition walls are insufficient for support, separate visible posts can be added to the interior surface of the log wall. The typical cross-section of a support post is 135 × 135 mm, and for walls higher than three meters, 190 × 190 mm.

For 205 mm and 275 mm thick log walls, posts are required at intervals of no more than 9 meters. For 135 mm thick log walls, posts are required at intervals of no more than 6 meters.

The effect of openings on the need for supports is verified during structural design.

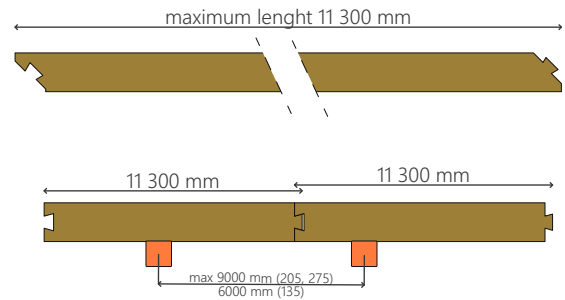


Photo: Seam on log connection point
(© Kontio)

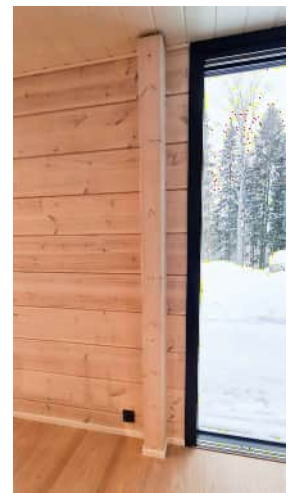
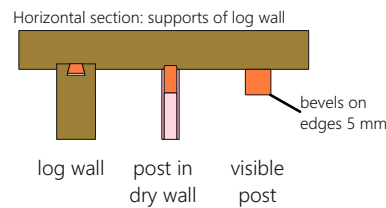


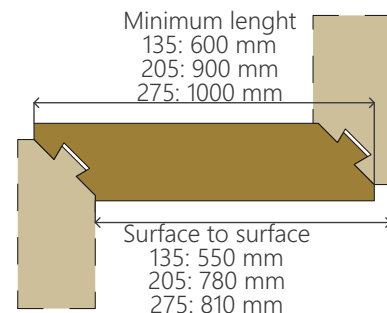
Photo: visible supporting post inside
(© Kontio)

Log dimensions - minimum

In architectural design, it is essential to consider the minimum dimensions of the log. These measurements ensure both the structural stability of the log frame and the efficient machining of the logs during production.

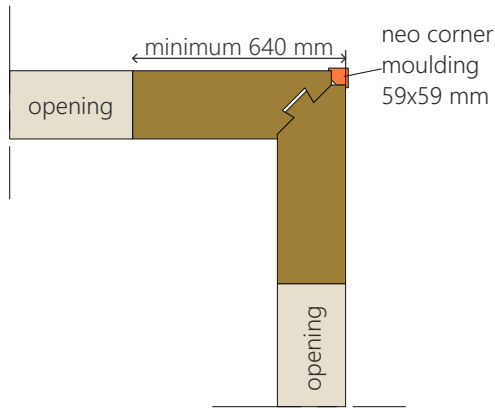
A log with corner joints at both ends must have a minimum length of 600–1000 mm, depending on the log thickness.

When designing the building, it is easiest to use the "surface-to-surface" measurement, as illustrated in the accompanying figure.



Log corner - minimum dimensions

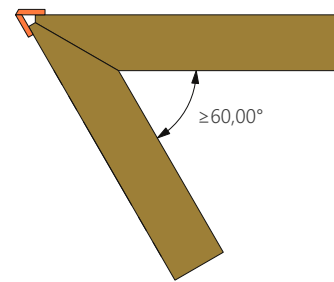
For adequate stability, the log extending into the corner must be at least 640 mm long. If all corners of the log frame are built using logs of only the minimum length, additional bracing elements must be designed together with Kontio's structural engineers.



Obtuse and sharp log corners

Kontio log structures can feature obtuse, sharp, or right-angle corners, depending on the architectural design intent. The sharpest practical angle that can be built using Kontio logs is 60°.

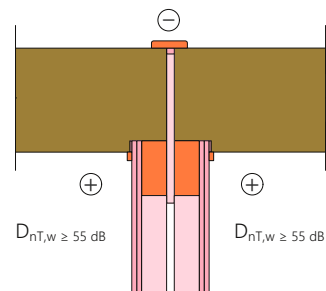
All neo corner joints have their exterior angles covered with trim boards, since exposed sharp miters would not remain visually neat over time. Kontio provides a standard corner trim profile for right-angle miters, while trims for other angles are designed on a project-specific basis.



Exterior wall joint between adjacent units

In buildings with multiple dwelling units, the exterior log wall must be cut between apartments to achieve sufficient sound insulation. This is done by leaving a 20 mm gap between the ends of the logs, filled with a flexible insulation material. Between apartments, a timber-framed partition wall with an air gap in the middle is used.

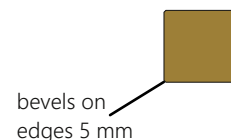
The joint in the exterior wall must be covered, for example, with a 19 × 95 mm cover board for protection and appearance.



Columns (support posts)

In log buildings, it is natural to use wooden columns, which are made of glued laminated timber. Typical dimensions are shown in the accompanying tables. When choosing the size of a column, both structural load and appearance should be considered. A 90 × 90 mm column is not used as a wall support post (följäri).

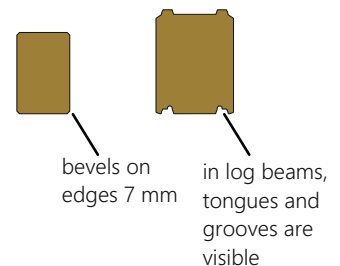
Column size	strength class
90x90	C18
115x115	C18
135x135	C18
190x190	C24



Beams

Log buildings often feature exposed load-bearing beams as part of the architectural expression. Typical exposed beam dimensions are provided in the figure. For achieving visual consistency, logs themselves can be used as beams. When using log beams, both the upper and lower tongues and grooves of the log remain visible.

Beam size	strength class
88x190	C24
95x165	C24
140x215	C24



2 Openings in Log Walls

Height of openings

The general goal is to position openings between full log layers whenever possible. If needed, the height of an opening can be adjusted by horizontal sawing of the logs above and below the opening. Factory-made horizontal saw cuts are at least 10 mm deep on the top end and 30 mm deep on the bottom end of the opening.

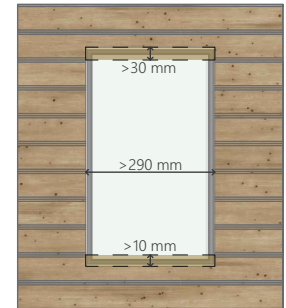
The bottom edge of doors is adjusted to meet accessibility requirements by using horizontal cuts. For example, by selecting a door frame height of 2260 mm, the top of the door frame aligns neatly between log courses (when the bottom of the log wall is at level 0.000 and the finished floor is at +0.100).

Windows can be positioned conveniently between full log layers. The accompanying figure below shows the window heights that fit directly between logs. Dimensions are given as external frame dimensions, and with these values, there is sufficient space for mounting space.

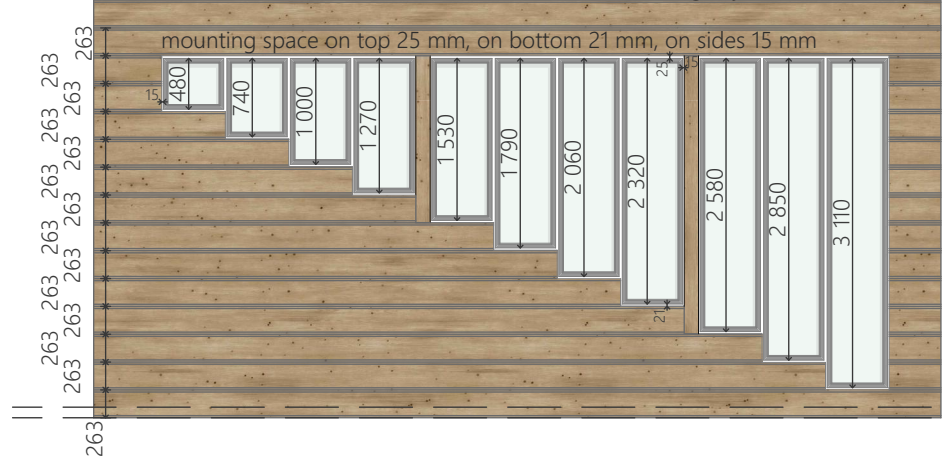
To align the bottom edge of windows with the floor level, horizontal cuts can also be used. In these cases as well, it is preferable for the top of the window to follow the line of full log layers. Log joints in the wall occur every 263 mm, measured from the base of the wall.



Horizontal saw cuts



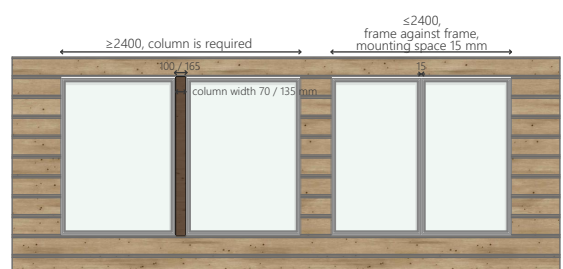
Frame measurements of windows fitted between log layers



Maximum width of openings

The maximum width of a continuous opening in a log wall depends on the structure above the opening and the loads applied to it. In typical single-family houses, a single log layer above the opening is sufficient, allowing an opening width of up to 2400 mm. For wider openings, one or more support posts are added.

If there are two log courses above the opening, the maximum continuous width can be approximately 4 meters.

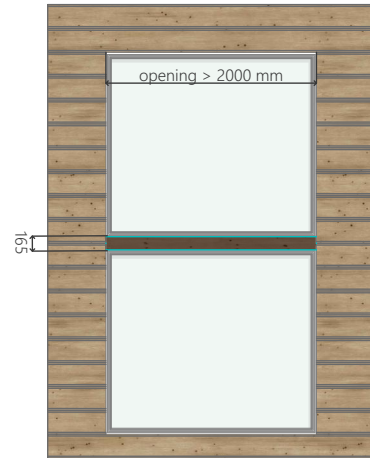


Windows stacked in one wall opening

When large window surfaces are created by placing multiple windows vertically within the same wall opening, a load-bearing beam is often required between the upper and lower window frames to provide adequate structural support. The size of the beam depends on the weight of the upper window and the width of the opening.

If the windows are wider than 2 meters, a supporting beam is always required. For windows between 0.7 and 2 meters wide, a beam is needed if the upper window weighs more than 100 kg. Narrower windows do not require additional support.

The beam dimension should be determined case by case, but as a general guideline, the spacing between the upper and lower window frames can be approximately 165 mm.



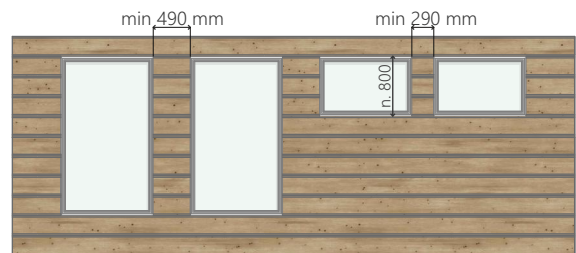
Short log wall between wall openings - minimum measurements

The minimum length of a log wall section between openings is 490 mm, provided that the wall section carries a load from above. Alternatively, a wooden column can replace this short log wall section between openings.

If a partition log wall connects to this wall section, the minimum lengths can be reduced slightly to:

- 420 mm (for 275 mm logs)
- 360 mm (for 205 mm logs)
- 290 mm (for 135 mm logs)

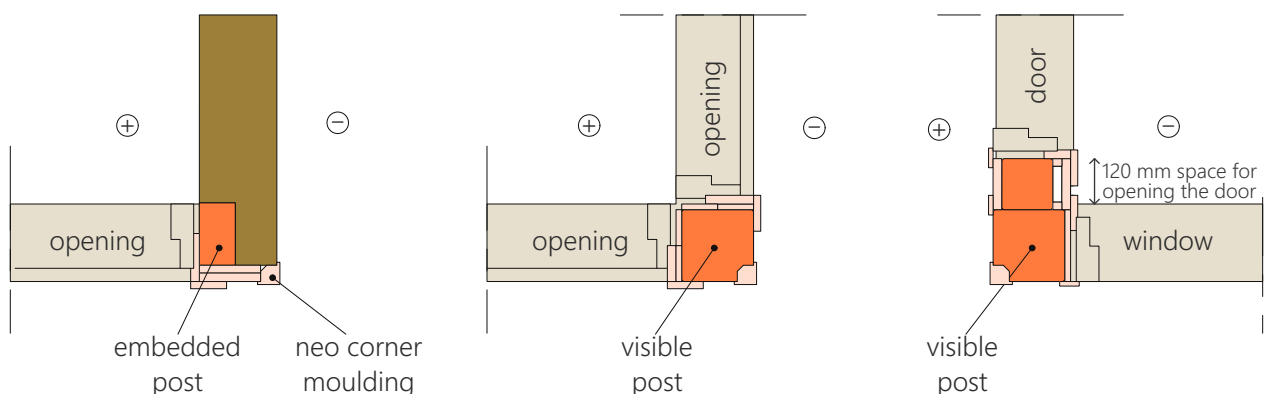
When openings are no more than three log courses high and the wall section between them is non-load-bearing, the minimum wall length is 290 mm.



Openings at the log corner

If an opening is placed close to a corner, it is built as a corner post structure. Different implementation options are shown below.

The corner post matches the height of the openings. A neo corner moulding covering the entire height of the wall is used to create a uniform appearance. The window frame is installed flush with the interior surface of the log wall.



Architraves

Doors and windows are installed so that the frame aligns with the interior surface of the log wall. Kontio's standard architrave set is the fully wooden "Original" model. On the interior side, a standard 12 × 52 mm cover moulding is typically used.



drip moulding



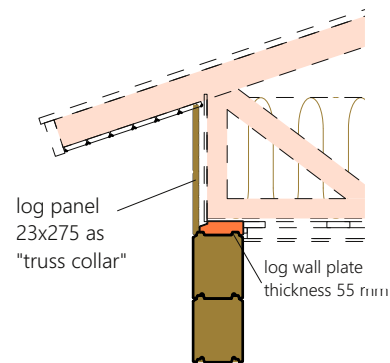
Photo: standard architrave for windows (© Kontio)

Log panel

Log panels are interior and exterior cladding panels with the same visible profile as the actual logs.

Solid log walls can, when needed, be replaced or complemented with log panels. Common uses include gable triangles and "roof truss collars", that is, the exterior surfaces between the log frame and the roof structure.

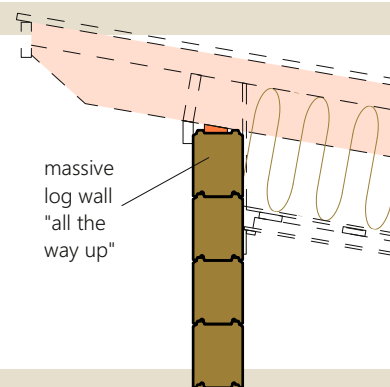
Inside the building, log panels are also suitable for covering dry walls, allowing a visually consistent log surface throughout the interior.



Roof support

The load-bearing roof trusses or beams are supported directly on top of the log frame. Examples are shown in the accompanying figures.

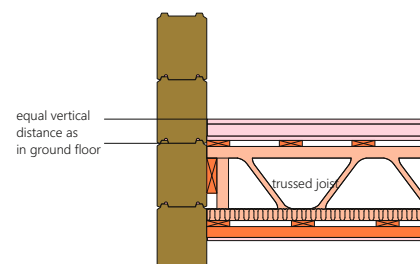
Kontio provides standard details showing different roof-to-wall connections for various bearing structures and insulation thicknesses.



Intermediate floor support

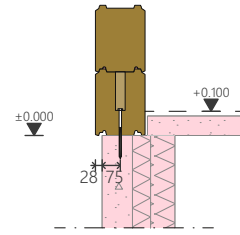
In single-family houses, the intermediate floor structure is typically attached to the side of the log wall, which allows flexible determination of the floor elevation. The illustration on the right shows an example of a trussed joist floor supported by a log wall.

If the upper floors are designed so that the finished floor level is at the same elevation relative to the bottom of the log as on the ground floor, then windows can be aligned vertically across all floors using the same logic.



Foundation connection

The bottom log is anchored to the foundation with screw connections, the size and spacing of which are determined by the structural engineer. The outer face of the bottom log is positioned 28 mm outside the edge of the concrete base or plinth.



3 Protection of Log Wall

Structural weather guard

A log wall is extremely durable when properly protected from weather exposure. Since logs are made of solid wood, they can dry only in one direction, not through their full thickness - meaning that they dry more slowly than thinner wood materials.

The most important protective feature are the eaves (roof overhang). A recommended overhang length, measured from the outer wall surface, is about 600-700 mm, while the minimum acceptable length is 400 mm. For eaves shorter than this, the log wall should be protected with cladding, for example vertical boarding as shown in the example image.



Photo: facade cladding on log wall, private house in Switzerland (© Kontio)

If the end of a non-settling laminated log remains visible outdoors, it should be covered with a board or similar protection. Due to the natural behavior of wood, unprotected log ends are prone to weathering and cracking over time.

Covering boards
for log ends



Photo: covering boards for log ends, a villa in Greece (© Kontio)

Surface treatment

Surface treatment protects the log wall from UV radiation, moisture, and biological decay such as mold and rot. The most important property of a coating for exterior logs is its vapor permeability.

Translucent wood stains are highly suitable for log surfaces - especially for solid wood logs, as they do not form a film that could trap moisture and slow down drying.

Without surface treatment and protected from excessive moisture, exterior wood surfaces naturally gray over time, as weathering removes everything except the cellulose fibers from the surface layer. This natural graying happens slowly and unevenly but can result in a visually pleasing, rustic patina.

Inside, in dry interior spaces, the log surface can be left untreated. Over time, the surface will naturally darken due to exposure to UV light.

The appearance of the log surface is also influenced by the secretion of resin from the wood's resin cells. Resin, a mixture of essential oils and natural resins, protects the wood from fungi and bacteria. It can appear on the log surface, especially around knots or machined areas that expose inner parts of the wood. Heat and sunlight can liquefy the resin, which then appears as small yellow droplets on painted surfaces, particularly on south-facing walls. The process cannot be completely prevented - it will continue as long as resin remains in the wood.

4 Inside a Log House

In a log building, the exterior and interior wall surfaces are naturally similar. Once the log frame is erected, the log surfaces are actually finished, requiring no additional cladding.

A log house provides the opportunity to leave both beautiful, natural wood surfaces and load-bearing structural elements visible. This creates interiors that are both architecturally expressive and warm in atmosphere.

The necessary load-bearing structures are defined in cooperation with the structural designer. In many cases, columns and beams can be concealed within walls or ceilings, but they can also be intentionally left exposed to emphasize the natural character of the structure.

The accompanying examples show how exposed structural elements can complement both modern and traditional interiors.

Below is a reference example of a contemporary log house interior - the Kontio Vehmas House, presented at the Oulu Housing Fair 2025, where it received excellent feedback and success in the public voting.

Photo: modern interior in a private house in Switzerland (© Kontio)



Photo: traditional interior in a private villa in Belgium (© Kontio)



Photo: Master bedroom in Kontio Vehmas House at Oulu Housing Fair 2025 (© Kontio)