artichouse

Log Construction Manual

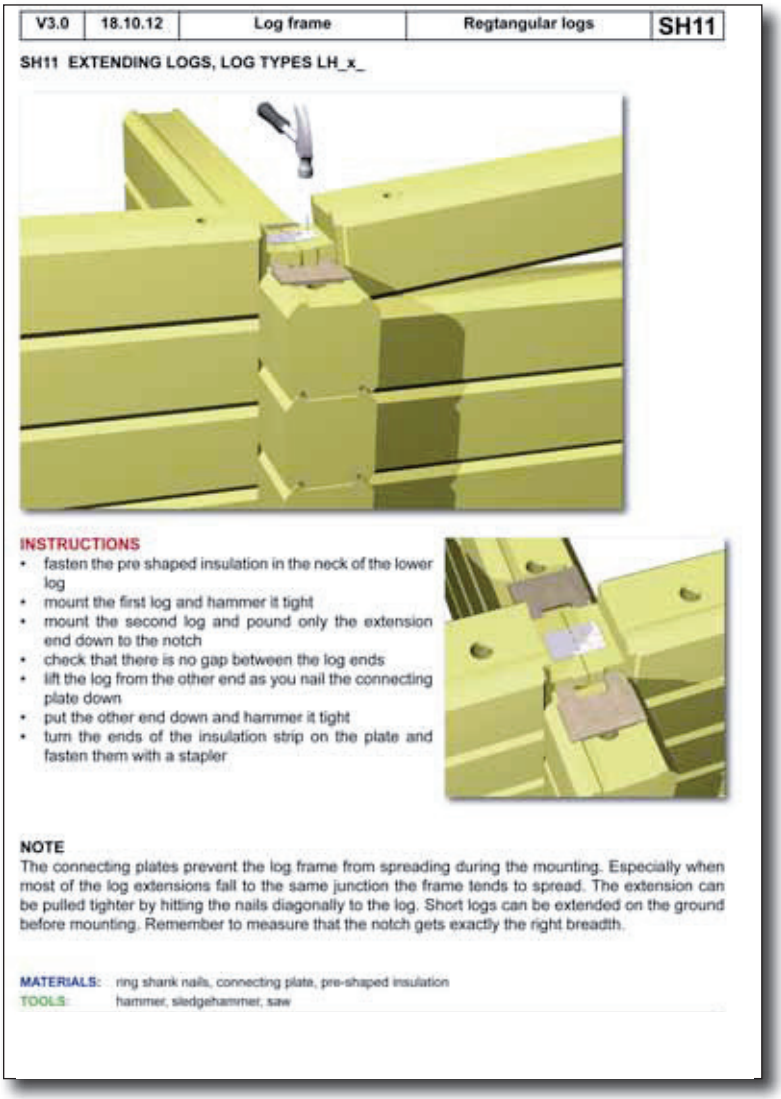
SISÄLLYSLUETTELO

Y3 READING THE LOG CONSTRUCTION MANUAL

The manual provides guidance for the practical implementation of construction work. Drawings give you the necessary technical details and dimensions. Before each construction stage, read the corresponding card in the manual. Carefully look at the drawings, too, and compare the log construction manual and the drawings. The manual consists of booklets.

The set of booklets includes the following parts:

- General instructions
- Log frame
- Roof structures
- Supporting structures
- Use and maintenance instructions
- Log building maintenance manual
- Painting work instructions


V3.0 | 18.10.12 | Log frame | Regtangular logs | SH11

SH11 EXTENDING LOGS, LOG TYPES LH_x_

INSTRUCTIONS
- fasten the pre shaped insulation in the neck of the lower log
- mount the first log and hammer it tight
- mount the second log and pound only the extension end down to the notch
- check that there is no gap between the log ends
- lift the log from the other end as you nail the connecting plate down
- put the other end down and hammer it tight
- turn the ends of the insulation strip on the plate and fasten them with a stapler

NOTE
The connecting plates prevent the log frame from spreading during the mounting. Especially when most of the log extensions fall to the same junction the frame tends to spread. The extension can be pulled tighter by hitting the nails diagonally to the log. Short logs can be extended on the ground before mounting. Remember to measure that the notch gets exactly the right breadth.

MATERIALS: ring shank nails, connecting plate, pre-shaped insulation
TOOLS: hammer, sledgehammer, saw

WORK CARDS

Each page of the log construction manual is a work card, which describes one construction stage. The cards are numbered. The order of the cards corresponds to the normal progression of construction work. Each card includes the following parts:

Figure or figures displaying the object of the construction stage. Figures give a general description of the object and are necessarily not similar to the corresponding object in your house. Not all the details presented in the log construction manual appear in all log houses.

INSTRUCTIONS are given in the order of implementation. The instructions present one feasible way of implementation. An experienced log construction professional can use another construction method. What is crucial is that the construction method used leads to a functional and good end result.

The **NOTE** chapter gives more detailed instructions if needed. This part also details reasons for certain tasks.

MATERIALS needed for the implementation of the construction stage described in the card. Material appears on the same name in the contents of delivery document, which is included in the delivery. Check this document to see which package the material is in. Depending on the delivery specification, some materials may not be included in the ex-works delivery. Acquire these materials well in time before you need them.

TOOLS needed for the construction stage described in the card are also presented in a list.

Y4 LOG CONSTRUCTION GLOSSARY

The glossary includes names for parts and things in the same form as they are used in this construction manual, contents of delivery document and other factory documents. The glossary consists of terms that are especially typical for log construction.

ANCHORING
Fastening the log frame to the foundation. For anchoring, you can use bolts cast to the foundation, threaded bars, reinforcement bars or other similar methods.

ANGLE BAR
A bar usually made of angle iron, used for stiffening a log wall.

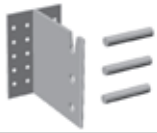
ANGLE BRACKET
A part manufactured from galvanised steel for fixing wood structures. Used for fastening roof trusses, for instance.

BED MOULDING
A wooden batten nailed to the lower surface of the lowest log in order to even out the load on the foundation. The moulding is only used for round log and only underneath the whole log.

CAPPED NUT
Used for example in railings and other places where it is desirable to cover the end of a threaded bar for aesthetic or safety reasons.

COACH SCREW
Ascrew used e.g. in connection of steel parts to transfer large forces. Always requires pre-drilling of wood. Coach screw is fastened with box spanner or combination spanner

CONCEALED JOIST HOLDER
A steel part used to fasten beams. The concealed joist holder will not be visible as it is embedded to the end of the beam.



CONNECTING PLATE
A galvanised steel plate used for extending logs or beams. Different types of logs need connecting plates of different sizes.

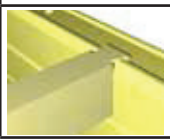
CONNECTING MUFF
A steel part used for extending threaded bars. There are two types of connecting muffs. One is hexagonal in profile and the other is round (cylindrical). The round muff is used with steel dowels.

COVERING PLATE
Sheet metal plate used for covering the tightening hole of a bolt. Is used in regtangular and laminated log walls. Is fastened with screw to log.

COVERING WOOD
Shaped piece of wood used for covering the tightening hole of a bolt. Is used in round log walls. Is fastened with screw to log.

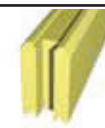
DRIP GROOVE
A groove sawn at the bottom surface of the lowest log. The purpose of a drip groove is to prevent water from running inside the wall through the lower surface of log.

DOVETAIL JOINT
A joint without steel parts, used for instance in attaching intermediate floor logs and joists to a log wall.



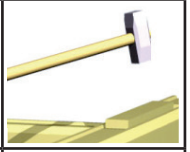
DOWEL
A wooden tenon used for stiffening a log wall and hammered to holes in the log.

GROOVE FOR JAMB
A groove cut at the end of a log for a jamb batten or tongued jamb.



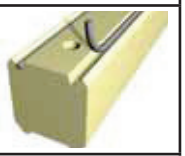
HALF LOG
A horizontally cut log. Half of the logs of the first floor are half logs. Sometimes also the topmost log of a wall is a half log.

HAMMERING PIECE
A secondary piece of wood used to protect log during hammering.



HORIZONTAL SLIT CUT
A cut made at the factory above and below the openings according to which the height of the openings is determined.

INSULATION STRIP d10/d14
Insulation strip used for sealing the laminated log seams.



INSULATION STRIP FOR ROUND LOGS
Insulation used for sealing round log seams.

JAMB BATTEN
Usually a 42x45 batten, which is nailed to a jamb plank to form a jamb in laminated and round log houses.

JAMB PLANK
A plank nailed to the jamb batten, used for the fixing of a door or window. Together with a jamb batten, forms a jamb in laminated and round log houses .

JOIST HOLDER
A steel part used for instance in fixing intermediate floor joists to a wall. The joist holder is made of galvanised steel plate. It is fastened with ring shank nails.

LAMINATED LOG
A log glued from two or more parts. The profile of a laminated log is rectangular.

LOG CORNER
An intersection between two log walls.

NAIL PLATE
A galvanised steel plate used in e.g. rafter joints at the ridge.

Y5 LOG CONSTRUCTION GLOSSARY

NECK
The thinnest part of a log notch. Neck insulation is mounted around the neck.

NECK INSULATION /LAMINATED LOGS
Insulation used for sealing the log corner.

NECK INSULATION /RECTANGULAR AND SMALL LAMINATED LOGS
Insulation used for sealing the log corner.

NECK INSULATION /ROUND LOGS
Pre-shaped insulation used for sealing the log corner of a round log.

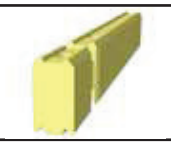
PERFORATED BAND
A galvanised and perforated steel band, used for instance as a bond in various joints.

PLATE MUFF
A steel part fastened at the top end of a threaded bar in order to anchor the top end of the bar. The plate muff is fixed to the log with a ring shank nail.

POST SUPPORT
A steel part used for fixing wooden pillars to the foundation. Post support is usually mounted on the foundation already during casting. Post supports shall be acquired by the customer.

P-TAPE FOR ROUND LOGS
Additional insulation which improves the water impermeability of a round log seam. Used in circumstances where horizontal rain may appear.

REGTANGULAR LOG
A rectangular log profile planed from a single trunk. A rectangular log can be extended longitudinally with a finger joint.

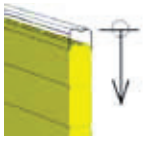


RING SHANK NAIL
A galvanised nail used for the fastening of steel parts. Nails usually come in two lengths: 40 and 60 mm. The shank of a ring shank nail features a grip improving profile.

ROUND LOG
A round log profile.

SCREW LEG
A steel part commonly used with pillars in order to adjust the length of the pillar in accordance with the settling of the log structure.

SETTLING
A change in wall height due to the drying of log walls and compression of seams. All structures leaning on log walls settle down with walls.



SETTLING SPACE
A space left between a sinking and non-sinking structure, ensuring a free settling of log walls.

SLIDING ANGLE BRACKET
A fastener enabling the parts to be fastened to move to one direction. Used for example for the fastening of a additional insulation frame to a log wall.

SLIDING BRACKET
A steel part used for the fastening of rafters, enabling a rafter to shift in accordance with the settling of log walls.

SOLE PLATE
Yellow passivated sole plate is used with a screw leg to lower the surface pressure against the log. Fastened with coach screws.

STEEL DOWEL
A steel tube used for stiffening a log wall. Used for example when it is necessary to place dowels and a threaded bar in the same hole.

THREADED BAR
A galvanised steel bar used for binding and tightening a log wall. Logs have pre-drilled holes for threaded bars. The threaded bars are mounted in these holes and can be extended with connecting muffs if needed.

TIGHTENING HOLE
A hole or hollow at the bottom of a log wall close to the hole of a threaded bar. The washer for the bottom of the threaded bar and a nut are mounted in the tightening hole.

TONGUED JAMB
A T-shaped planed moulding used at window and door frames and sometimes at the ends of log walls that remain visible. The tongue of the jamb is embedded to the groove at the ends of logs.

TP-INSULATION
TP-insulation tape as installed in the extension of a dovetail joint.

U-STEEL
Yellow passivated sole plate used with screw leg to lower the surface pressure against the log. Is fastened with coach screws.

WATERPROOFING STRIP
A sealing strip mounted between the foundation and the lowest log. Prevents humidity from rising up to the log and seals the space between the foundation and log.

Y6 REGULATORY REQUIREMENTS

BUILDING PERMIT

Building permit is almost always required when building a house. Contact your city or state building inspectorate before starting your project. Authorities will inform you about the required drawings and documents. This manual gives no precise guidance, because the laws, rules and regulations vary from country to country.

SOIL SURVEY

Soil survey is required also for living houses in some countries. It enables reliable foundation planning. The builder may even save money by soil survey, when oversized foundation and frost protection are avoided.

RESPONSIBLE PERSONS

Responsible persons vary by country, but it is very common that at least the following authorized persons, whose qualifications are defined e.g. in the construction law, are involved in the building project.

Principal planner:

Principal planner makes sure that all planners have adequate and equal information on matters affecting the planning of the building. Principal planner also ensures that different plans form a functional whole. **Planner of the log house factory cannot operate as the principal planner.** If the authorities approve, the site manager or the person who makes the site plan may operate as the principal planner as well.

Site manager:

Site manager is responsible for ensuring that the building is built according to the laws and regulations in force. He also makes sure that all regulatory inspections, that are required in the building plan conditions, are made and participates in them as well. The site manager is also responsible for making sure that safe work practices are followed at the building site. In addition, he keeps a journal at the building site, in which all inspections are recorded.

Water and sewer foreman:

Water and sewer foreman monitors the water and sewerage installations of the project.

Y7 PLANS REQUIRED FOR BUILDING

Building project requires usually at least the plans listed on this page. It is recommended to let a professional planner make the plans. Building control authorities provide information about the required planners of different sectors. Log house factory will send the main drawings and the dimensioned drawing of foundations in e-mail in .dwg format for other planners.

Building plans:

Building facilities, appearance, materials and building's location on the site are determined in the building plans. Building permit is usually applied on the basis of building plans made and signed by the building designer. Notice the country-specific regulations. **Artichouse does not provide these building plans.** Building plans delivered by Artichouse (including floor plans, facade drawings, section drawings), are so called contractual drawings, by which the house delivery is confirmed. Site plan is usually made by the principal planner.

Structural plans:

Structural plans concern strength and durability planning of a building. Structural plans of wooden structures included in the delivery are delivered from the factory. For foundation planning only a dimensioned drawing is delivered from the factory. Foundation planner must have adequate information about the soil, e.g. soil survey. Form for background information about loads must be sent to the factory so that dimensioning of wooden structures can be done.

HVAC and electrical plans: plans regarding building services

Factory delivers the main drawings in .dwg format for HVAC planners. Get instructions for HVAC planners from the building authorities, if necessary. Notice also, that when planning electrical and plumbing installations, the special characteristics of log buildings must be taken into account. Such characteristics would be e.g. settling of walls.

Statement of Energy Performance:

Artichouse makes no statements of energy performance, because the methods of calculating vary country by country. Find out the country-specific regulations. Local building authorities will provide additional information.
Notice: If this affects to the contents of delivery, please contact the factory.

Y8 DRAWINGS AND DOCUMENTS SUPPLIED BY FACTORY

Drawings are delivered in maps

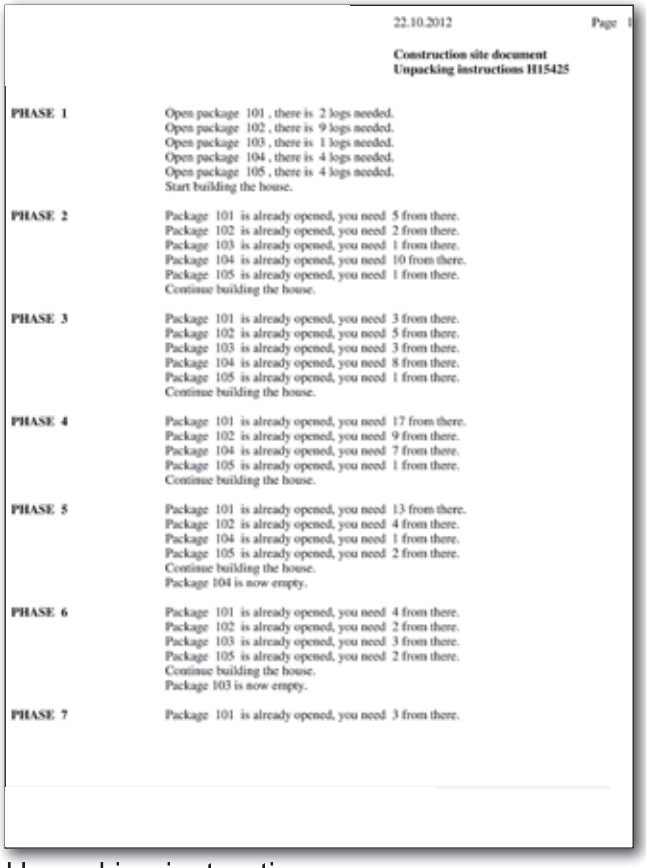
The factory supplies plans to the customer in accordance with the delivery specification. Depending on the scope of delivery, the set of drawings includes the following drawings among others:

- working drawings 1:50, with door and window markings
- dimensional drawing of foundation
- wall drawings with log numbering
- intermediate floor and roof plans
- joint details in A4-size booklets
- truss drawings

In addition, the factory supplies the following documents:

- Construction Manuals
- Contents of delivery
- Unpacking instructions of log packages
- Instructions on other products
- Log building maintenance manual

Artichouse delivers the floor plans for buyers in dvg form for making the HVAC plans.



22.10.2012 Page 1

Construction site document
Unpacking instructions H15425

PHASE 1
Open package 101 , there is 2 logs needed.
Open package 102 , there is 9 logs needed.
Open package 103 , there is 1 logs needed.
Open package 104 , there is 4 logs needed.
Open package 105 , there is 4 logs needed.
Start building the house.

PHASE 2
Package 101 is already opened, you need 5 from there.
Package 102 is already opened, you need 2 from there.
Package 103 is already opened, you need 1 from there.
Package 104 is already opened, you need 10 from there.
Package 105 is already opened, you need 1 from there.
Continue building the house.

PHASE 3
Package 101 is already opened, you need 3 from there.
Package 102 is already opened, you need 5 from there.
Package 103 is already opened, you need 3 from there.
Package 104 is already opened, you need 8 from there.
Package 105 is already opened, you need 1 from there.
Continue building the house.

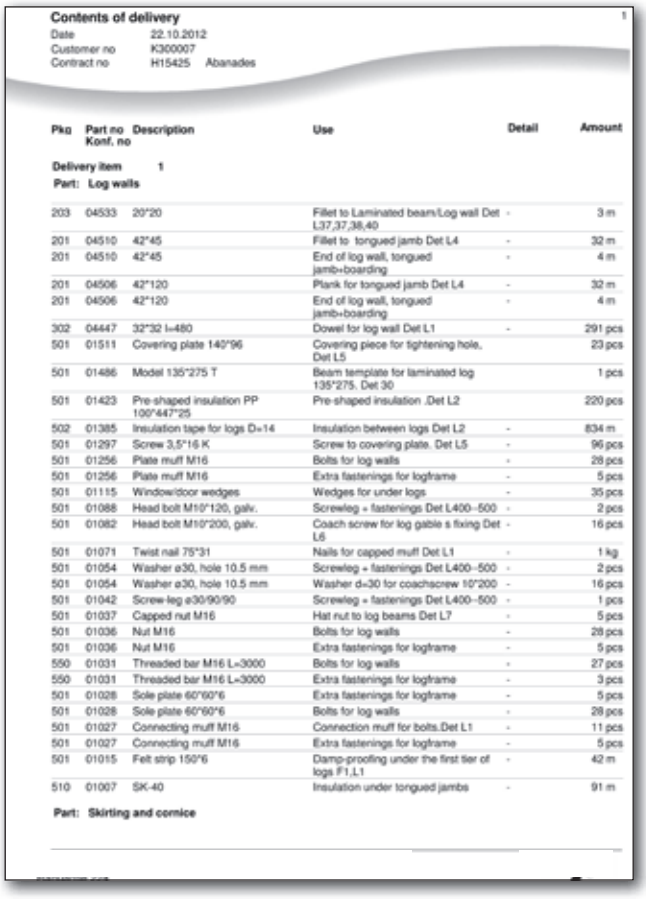
PHASE 4
Package 101 is already opened, you need 17 from there.
Package 102 is already opened, you need 9 from there.
Package 104 is already opened, you need 7 from there.
Package 105 is already opened, you need 1 from there.
Continue building the house.

PHASE 5
Package 101 is already opened, you need 13 from there.
Package 102 is already opened, you need 4 from there.
Package 104 is already opened, you need 1 from there.
Package 105 is already opened, you need 2 from there.
Continue building the house.
Package 104 is now empty.

PHASE 6
Package 101 is already opened, you need 4 from there.
Package 102 is already opened, you need 2 from there.
Package 103 is already opened, you need 3 from there.
Package 105 is already opened, you need 2 from there.
Continue building the house.
Package 103 is now empty.

PHASE 7
Package 101 is already opened, you need 3 from there.

Unpacking instructions



Contents of delivery

Date 22.10.2012
Customer no K300007
Contract no H15425 Abanades

Pkg	Part no Konf. no	Description	Use	Detail	Amount
Delivery item	1				
Part:	**Log walls**				
203	04533	20*20	Fillet to Laminated beam/Log wall Det L37,37,38,40	-	3 m
201	04510	42*45	Fillet to tongued jamb Det L4	-	32 m
201	04510	42*45	End of log wall, tongued jamb+boarding	-	4 m
201	04506	42*120	Plank for tongued jamb Det L4	-	32 m
201	04506	42*120	End of log wall, tongued jamb+boarding	-	4 m
302	04447	32*32 l=480	Dowel for log wall Det L1	-	291 pcs
501	01511	Covering plate 140*96	Covering piece for tightening hole, Det L5		23 pcs
501	01486	Model 135*275 T	Beam template for laminated log 135*275, Det 30		1 pcs
501	01423	Pre-shaped insulation PP 100*447*25	Pre-shaped insulation .Det L2		220 pcs
502	01385	Insulation tape for logs D=14	Insulation between logs Det L2	-	834 m
501	01297	Screw 3,5*16 K	Screw to covering plate. Det L5	-	96 pcs
501	01256	Plate muff M16	Bolts for log walls	-	28 pcs
501	01256	Plate muff M16	Extra fastenings for logframe	-	5 pcs
501	01115	Window/door wedges	Wedges for under logs	-	35 pcs
501	01088	Head bolt M10*120, galv.	Screweg + fastenings Det L400--500	-	2 pcs
501	01082	Head bolt M10*200, galv.	Coach screw for log gable s fixing Det L6	-	16 pcs
501	01071	Twist nail 75*31	Nails for capped muff Det L1	-	1 kg
501	01054	Washer ø30, hole 10.5 mm	Screweg + fastenings Det L400--500	-	2 pcs
501	01054	Washer ø30, hole 10.5 mm	Washer d=30 for coachscrew 10*200	-	16 pcs
501	01042	Screw-leg ø30/90/90	Screweg + fastenings Det L400--500	-	1 pcs
501	01037	Capped nut M16	Hat nut to log beams Det L7	-	5 pcs
501	01036	Nut M16	Bolts for log walls	-	28 pcs
501	01036	Nut M16	Extra fastenings for logframe	-	5 pcs
550	01031	Threaded bar M16 L=3000	Bolts for log walls	-	27 pcs
550	01031	Threaded bar M16 L=3000	Extra fastenings for logframe	-	3 pcs
501	01028	Sole plate 60*60*6	Extra fastenings for logframe	-	5 pcs
501	01028	Sole plate 60*60*6	Bolts for log walls	-	28 pcs
501	01027	Connecting muff M16	Connection muff for bolts.Det L1	-	11 pcs
501	01027	Connecting muff M16	Extra fastenings for logframe	-	5 pcs
501	01015	Felt strip 150*6	Damp-proofing under the first tier of logs F1,L1	-	42 m
510	01007	SK-40	Insulation under tongued jambs	-	91 m
Part:	**Skirting and cornice**				

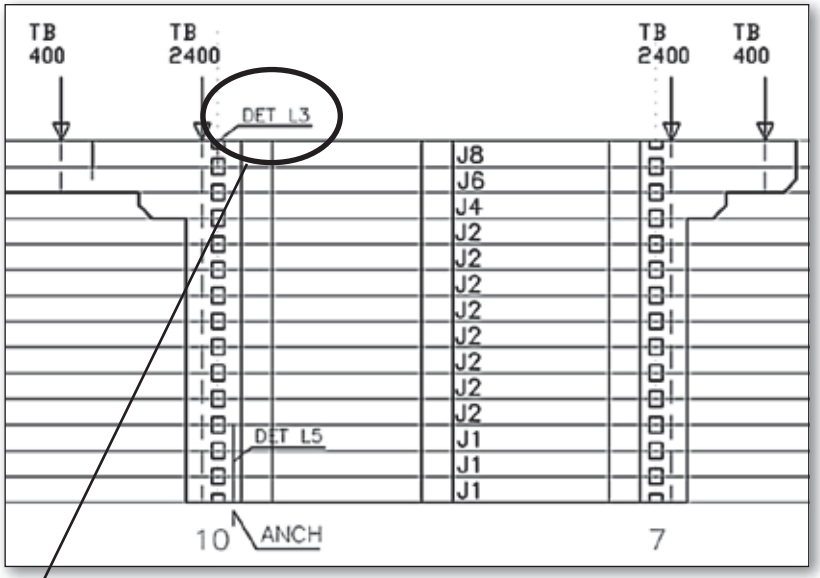
Contents of delivery

Y9 READING DRAWINGS

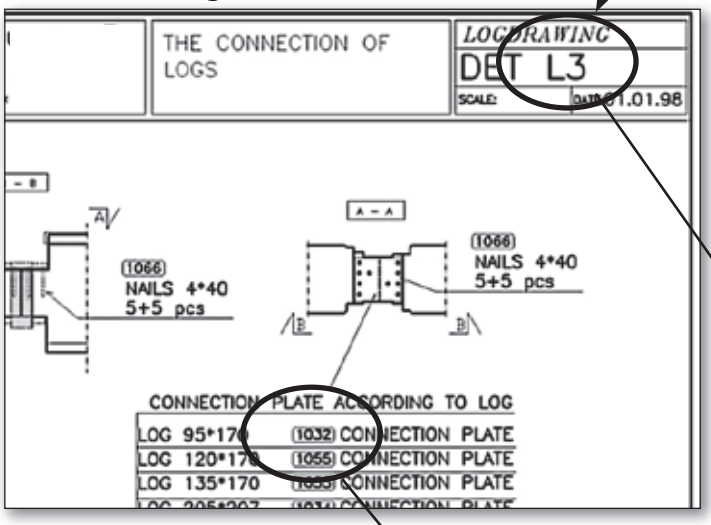
Thoroughly examine the drawings before starting construction. Drawings include references to detail drawings and the contents of delivery document. Always keep copies of the details and the contents of delivery at site. They make it easy to find the required material on the basis of the package number.

Details have been marked in the drawings as shown by the accompanying example. The letter denotes the detail group, whereas the number specifies the detail in question.

Drawing

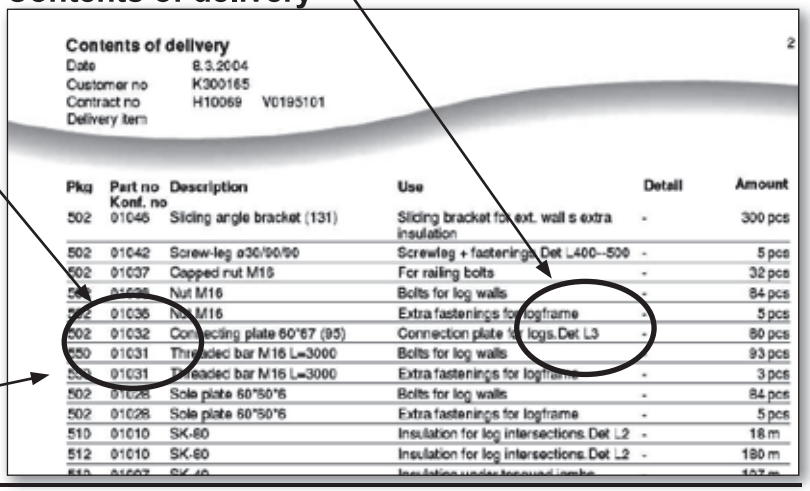


Detail drawing



The detail number is seen at the top right corner of the page.
Details may include references to product codes as in the accompanying figure. The code of fastening parts depends on the type of log. Choose the code corresponding to the log type of your house.

Contents of delivery



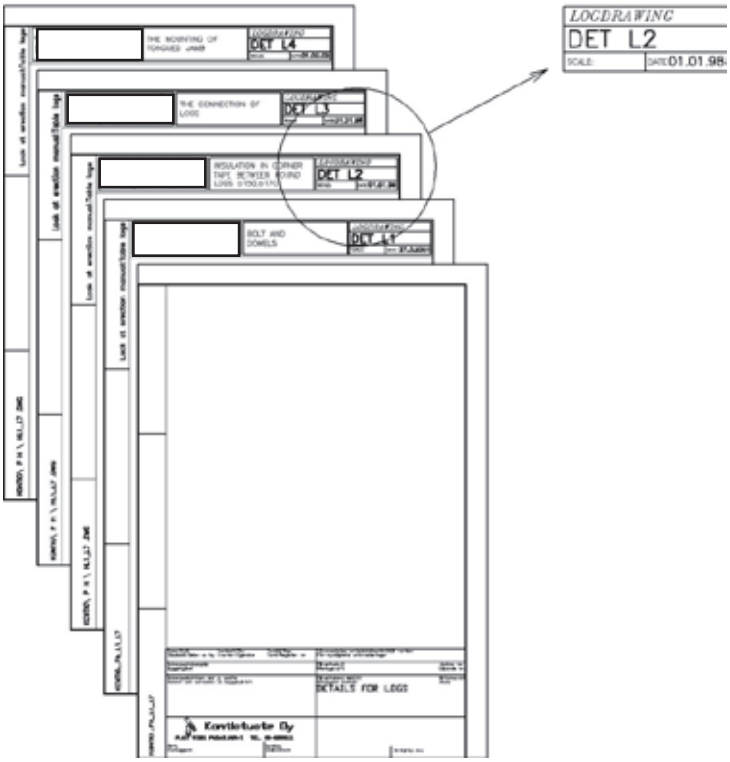
In the contents of delivery, you can see the intended use of each product code (the Use column). The number of the package including the part is also seen in this document.

Package number

Y10 DETAIL DRAWINGS

Detail drawings have been stapled in A4-size bundles. The title section of the cover page shows the structural detail group that these details belong to.

Detail drawings



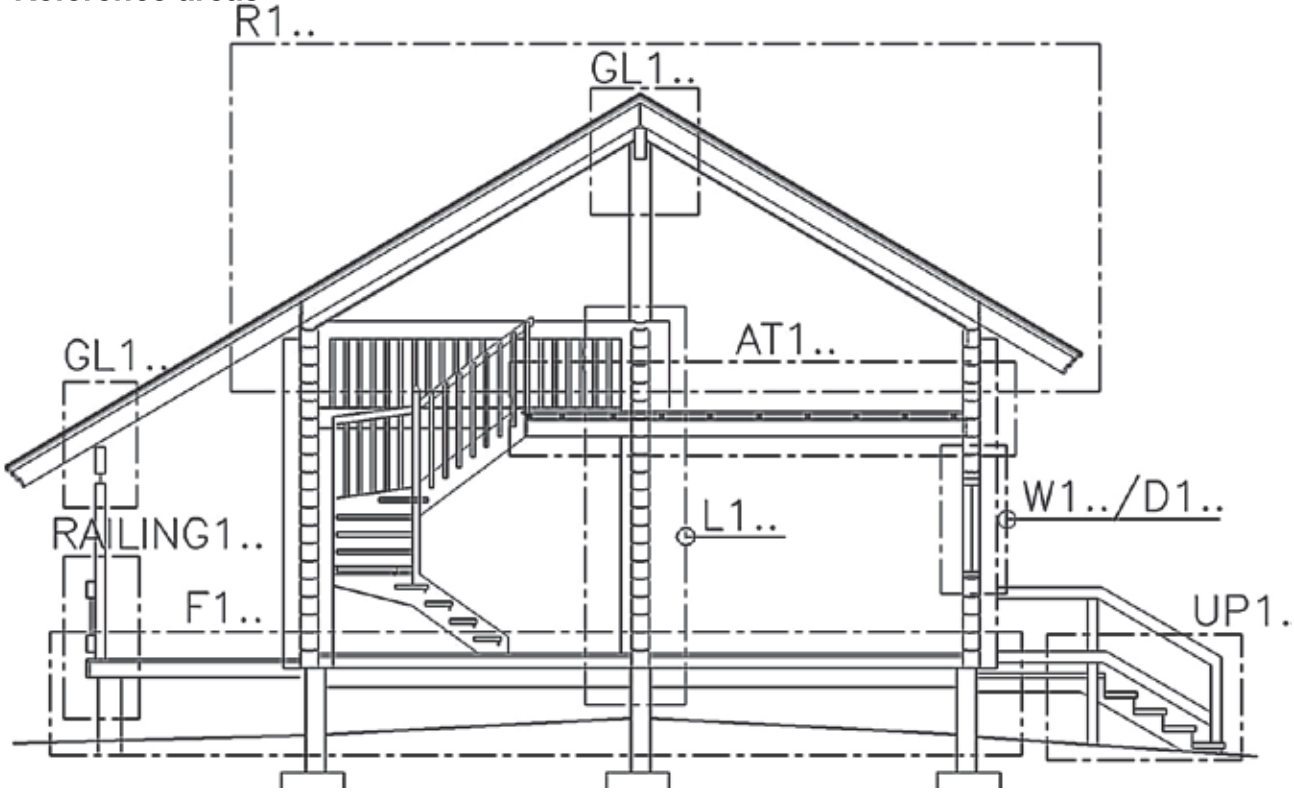
Detail number

The detail drawings have been numbered using the following system:

Details F1.. foundation structures
Details L1.. log structures
Details GL1... glued structures
Details AT1.. intermediate floor structures
Details R1.. roof structures
Details W1 window details
Details D1.. door details
Details UP1 exterior stairs
Details Railing1.. railings

Detail drawings give a detailed account of the use of materials and their connection to the surrounding structures. The drawings are meant for general use and are therefore not always drawn to scale. The detail drawings may also show structures which are not present at every site or which are not included in the delivery.

Reference areas



Y11 DIMENSIONING OF WINDOW AND DOOR OPENINGS

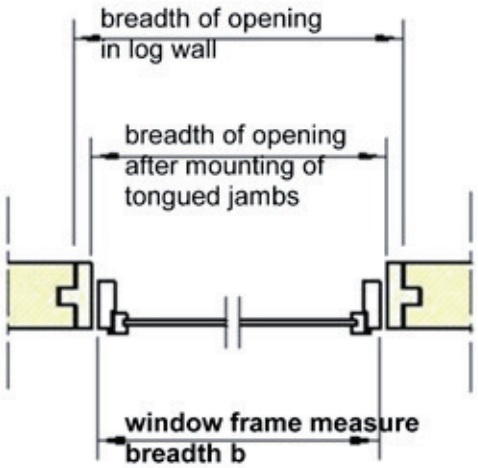
The Finnish way of marking the size of windows and doors as 10 cm module sizes may cause misunderstandings. This page clarifies the principles behind the dimensioning of openings.

The only important measures for the factory are the frame dimensions, h and b, of windows and doors. Factory designers have all the other information needed for dimensioning opening sizes. You do not have to calculate the size of an opening in a log wall; designers of log drawings at the factory will take care of that. If windows or doors are not included in the delivery, you will only need to inform the factory of the **frame measures, i.e. height h and breadth b.**

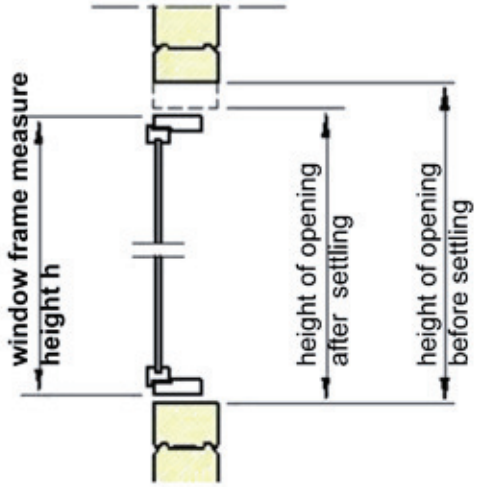
The figures below show the dimensioning of an opening and a frame. As an example, a mod-ule marking 8*12 refers to a window with a frame measure of 790*1190 mm (a mounting space of 10 mm has been deducted from the module size 800*1200). When an opening in a log wall is designed at the factory, a mounting space of 15 mm is left on each side. In addition to the mounting space, there is an additional settling space above a window.

WINDOWS

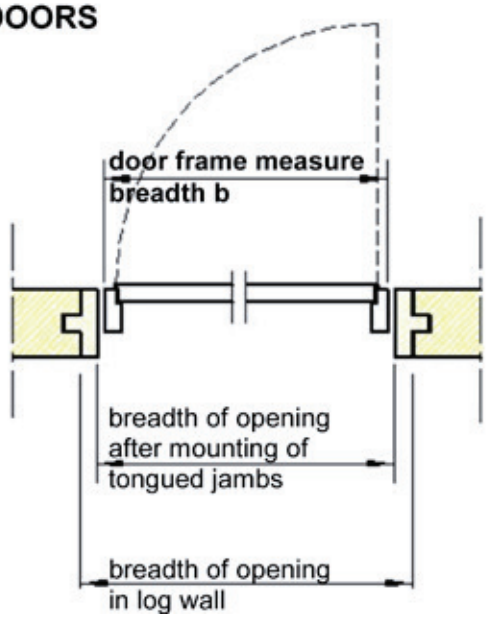
horizontal section

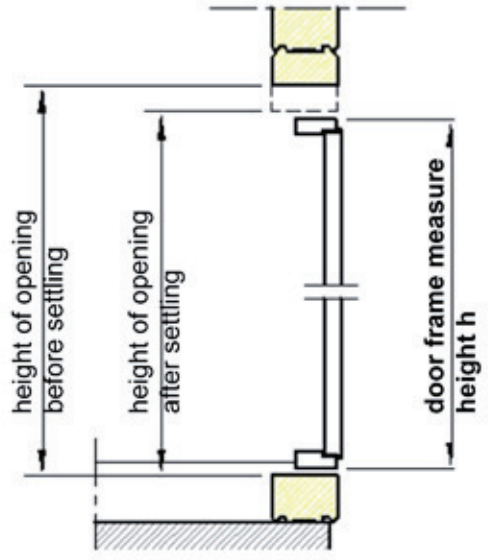


vertical section



DOORS





Y12 INSTRUCTIONS REGARDING BUILDING SERVICE TECHNOLOGY

In mountings related to log walls and to pipings penetrating through walls, settling must be taken into account already at the design stage. If it is not taken into account, problems are bound to appear later. Pipe connections may leak. Electric installations may cause a risk of fire.
Freezing of water pipes has to be taken into account especially in leisure homes which are periodically kept unheated or at a reduced temperature.

HVAC PLANNING

- drains, water pipes and ventilation pipes between floors require an adjusting space of at least the predicted amount of settling
- a vertical pipe can be attached in a fixed position only at the bottom of wall; other fasteners must be shifting
- when an opening penetrates through log walls, the opening has to be high enough in order to prevent settling from pressing the pipe down
- roof penetration point must allow for the settling and shifting of the roof
- pipes mounted in or below the suspended floor need to be protected against freezing
- in leisure houses the water pipes have to be thermally insulated and equipped with a drainage valve.

In walls with additional insulation, pipes must not be mounted on the cold side of thermal insulation because of freezing risk. This applies to regions where temperature may fall below 0°C.

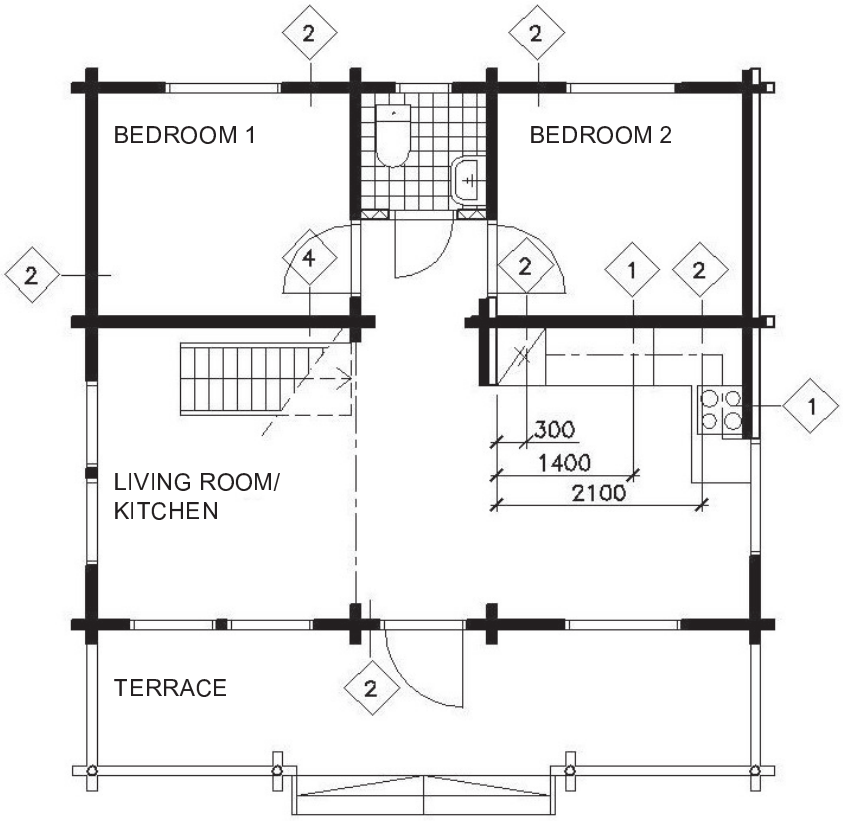
ELECTRICAL WIRING DESIGN

- electric wiring can be drawn as a concealed installation inside log walls
- if electric wires are installed in pipes inside log walls, it is necessary to use a flexible pipe at the upper end, for a length of at least 0.5 metres.
- if holes for electric wires are included in the delivery, the factory needs to be informed of the locations of the necessary holes at least 8 weeks before loading at factory.
- holes are always vertical
- hole size is ø40 mm
- no more than 3 cables can be mounted in one hole
- it is possible to work a hole for the socket in a log wall at site or to use surface mounting boxes
- always mount horizontal wires in the floor, ceiling or intermediate floor
- if the building has lightweight interior walls (panelled wooden walls), electric wiring can be implemented in them in the normal fashion
- it is recommended to install electric wires in lightweight interior walls
- if the building has a additional insulation frame inside external walls, electric wires must be mounted in this frame and not in the log wall.

Do not send electrical drawings to the factory, but ask your wiring designer to prepare a drilling diagram like the one shown in the sample figure on the next page, showing the holes needed in log walls.

Y13 MARKING HOLES FOR ELECTRIC WIRE IN DRAWINGS

GROUND FLOOR



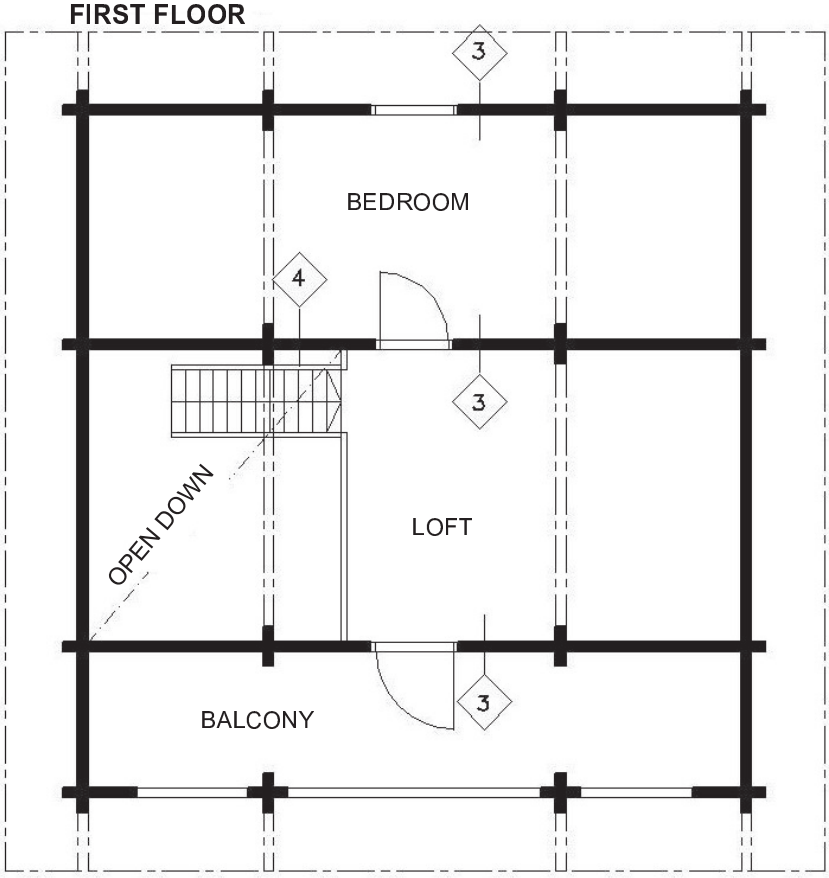
1 A HOLE FOR ELECTRIC WIRES 1 M UP FROM FLOOR

2 A HOLE FOR ELECTRIC WIRES FROM FLOOR OF GROUND FLOOR TO INTERMEDIATE FLOOR

3 A HOLE FOR ELECTRIC WIRES FROM INTERMEDIATE FLOOR TO ROOF

4 A HOLE FOR ELECTRIC WIRES FROM BOTTOM TO TOP THROUGH THE ENTIRE WALL

FIRST FLOOR



Do not put electric wires in short log corners. The hole must be at least 200 mm away from the door or window frame.

Use mainly lightweight walls for electric installations.

If a hole needs to be precisely in a certain place, mark the location of the hole calculated from the adjoining wall. If the location measure is missing, the designer of the log-frame takes the measure with a scale ruler.

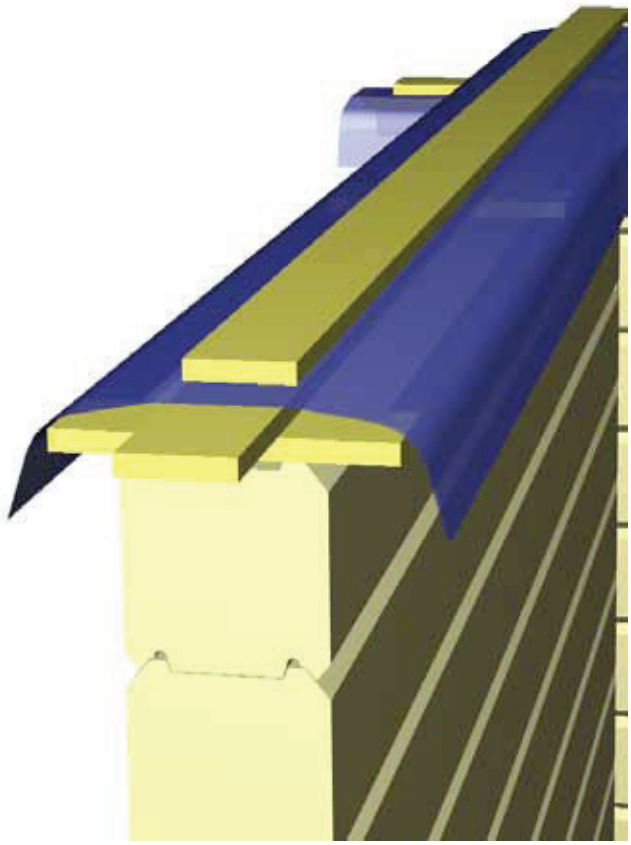
This drawing meant for the factory does not include wirings, wall sockets and other wiring design markings.

Keep the drawing simple; only mark in it the vertical drillings that are needed in logs.

Y14 WORKING CONDITIONS

WORK SAFETY

It is extremely important to take care of safety at work at each construction stage. Safety regulations, acts and decrees have to be followed at log construction sites as well. Careful advance planning can decrease the risk of accidents. Pay special attention to the following points:



- keep the site clean and everything in good order
- use fit and appropriate tools
- take care not to squash your fingers when lifting logs
- always use a hard hat and safety footwear and safety vest
- only use ladders and scaffoldings fulfilling safety requirements
- use a crane when mounting heavy logs
- mount scaffoldings as soon as they are needed; also mount safety barrier for the scaffold-ings
- the scaffoldings have to be robust enough for the handling of heavy logs.

WEATHER

It is not recommended to mount the log frame in a rainy weather. **A weak rain does not prevent working,** but makes it more difficult and dangerous. If seam insulation gets wet, it may cause mould damage. Wet scaffoldings and logs are slippery, thus increasing the risk of accidents.

If the mounting of a log frame is started and then suspended for a longer period, the logs and the frame have to be protected with waterproof covers against soaking and direct sunlight. **Make sure that there is proper ventilation underneath the waterproof covers; put, for example, planks between the cover and the log.** It is recommended to mount the log frame without interruption as quickly as possible and to build the roof at least to the underlayer stage. If structures get wet, they have to be dried before covering.

Protect unmounted logs and panels against direct sunlight during mounting. Put a waterproof cover on them whenever you leave the site.

Y15 WORKFORCE AND TOOLS

WORKFORCE

A suitable work group for the mounting of a log frame is 3 to 5 workers. At least one of them has to be a professionally skilled carpenter. With a group of this size, it takes approximately one work week to mount a mid-size log frame. It is advisable to distribute construction tasks so that each worker has a task of his own and is responsible for it for the whole mounting period. For example: 1 to 2 workers locate and carry logs, 1 worker attaches seam insulation to the logs, 1 to 2 workers mount the logs and 1 worker nails connecting plates and hammers dowels. The distribution of work can be changed depending on the number of workers available. After the log frame has been mounted, less brute force and more carpenter skills are needed. This work can be done by 1 to 3 carpenters, possibly aided by one construction worker.

Examine drawings and the corresponding card in the construction manual under the supervision of a carpenter before each construction stage. Work proceeds smoothly when everybody knows what the group is doing and why.

TOOLS

Normal carpenter tools are also suitable for the construction of a log house. There are, however, some tools that are specific to log construction. Examples include large-hole drills and heavy hammers. When heavy logs are lifted, it is advisable to use a small tower crane installed at site or a small truck crane. Electricity at site makes certain construction stages considerably easier.

CHECKLIST OF TOOLS SPECIFIC TO LOG CONSTRUCTION

Hand tools:

- 1–2 large sledgehammer, weight 5–8 kg
- 1–3 normal carpenter's hammers
- crowbar
- set of chisels, breadth 15–30 mm
- 2 construction knives
- axe
- 1–3 handsaws
- hack saw
- 1–3 staplers, 12–15 mm long staples
- spirit level
- water level hose or level laser
- measuring tape 30 m
- 2 measuring reels (8 metres)
- rope or lashing with ratchet (2 tn)
- alignment wire 50 m
- chalk line
- carpenter's pencils
- 2–3 plastic tape reels of different colours

Spanners:

- For screwleg 20: 30 mm
- For screwleg 30: 46 mm
- For threaded bars: 24 mm
- Box spanner set or spanners 8–17 mm for head bolts
- Torx bits 20, 25 and 30

Electric tools

- mitre saw, for 50 mm thickness, angle adjustment and stabiliser
- chain saw
- circular saw
- battery-powered drill, electric drill at least 1500W
- a set of wood drill bits
- frame nailer, finishing nailer
- electric plane
- grinder

Y16 MATERIALS TO BE ACQUIRED BY CUSTOMER

The contents of delivery document lists all the materials and supplies that are included in the delivery from the factory. Carefully examine the contents of delivery before mounting, and write down a list of the materials you will need to acquire yourself. The following items among others are usually not included in the delivery from the factory:

- bed timbers for packages
- tarpaulins
- scaffoldings and tools
- timber needed for temporary support of structures
- heat insulation
- roofing materials
- roof safety products
- rainwater disposal system
- surface treatment agents
- nails, screws and staples (however, ring shank nails and head bolts needed for the fastening of steel parts are always included in the delivery)

The drawings also show the materials that are essential for the structure but are not included in the delivery, such as heat insulation and roofing.

NAILS

Nail selection instructions

use	Nail length/ thickness	head	material
frame construction	75-150/2.8-5.1	normal	hot-galvanised
rough tongue and groove boarding	60-75/2.5-2.8	normal	hot-galvanised
fascia boards, frame boards	60-75/2.5-2.8	normal	hot-galvanised
floor boards	60-75/2.5-2.8	normal	hot-galvanised
terrace floor	75-100/2.8-3.4	normal	hot-galvanised
exterior log panel	60-75/2.3-2.8	normal	stainless or hot-galvanised
interior log panel	60-75/2.3-2.8	countersunk or brad nail	stainless or zinc-coated
interior STV-panel	35-50/1.7-2.0	countersunk or brad nail	stainless or zinc-coated
interior mouldings	35-60/1.4-2.3	countersunk or brad nail	stainless or zinc-coated

If you use pneumatic nailers, select nail sizes closest to the sizes mentioned.

Fastening pressure impregnated frame timber:

In all load bearing structures and structures which are relevant to personal safety and security shall be used fastenings, screws and nails manufactured from stainless AISI 304 steel (or acid-proof AISI 316 steel). In other structures (e.g. when fastening terrace floor boards) also hot dip galvanised fastenings, screws, nails and decking nails can be used. In this case, it should be taken into account that the life of hot dip galvanised fastenings might be shorter than the life of pressure impregnated wood.
Fastenings which are used together shall be the same material. Galvanised and stainless products must not be in contact with each other. (According to Finnish RT -instruction 37782).

Stainless steel fastenings, at least, should be used, because the active substances of pressure impregnated wood are copper compounds, which cause corrosion load in humid conditions. Corrosion load causes fast rusting of carbon steel fastenings (electrolytic galvanised or coated), that is why the above mentioned fastening types must be used.

Y17 PROPERTIES OF WOOD

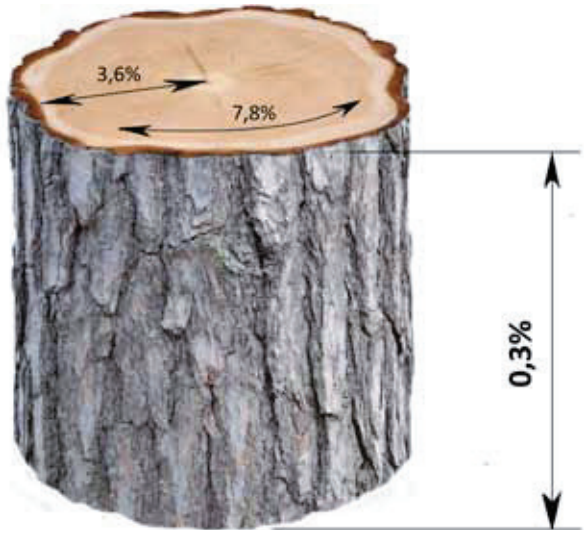
MOISTURE

When a tree is felled, it has a moisture content of 30 to 60 %. Log billets are dried at the factory before planing. The moisture content of dried timber is usually approximately 16 to 25% depending on log type. In log deliveries from the factory, moisture content is of the same magnitude. In a finished building, the moisture of a log wall varies from 10% in interior walls to 15% in exterior walls. The moisture content of walls varies to some extent in accordance with relative humidity. Shortterm wetting of wood does not cause decay or mould formation if the wet wood can dry freely.

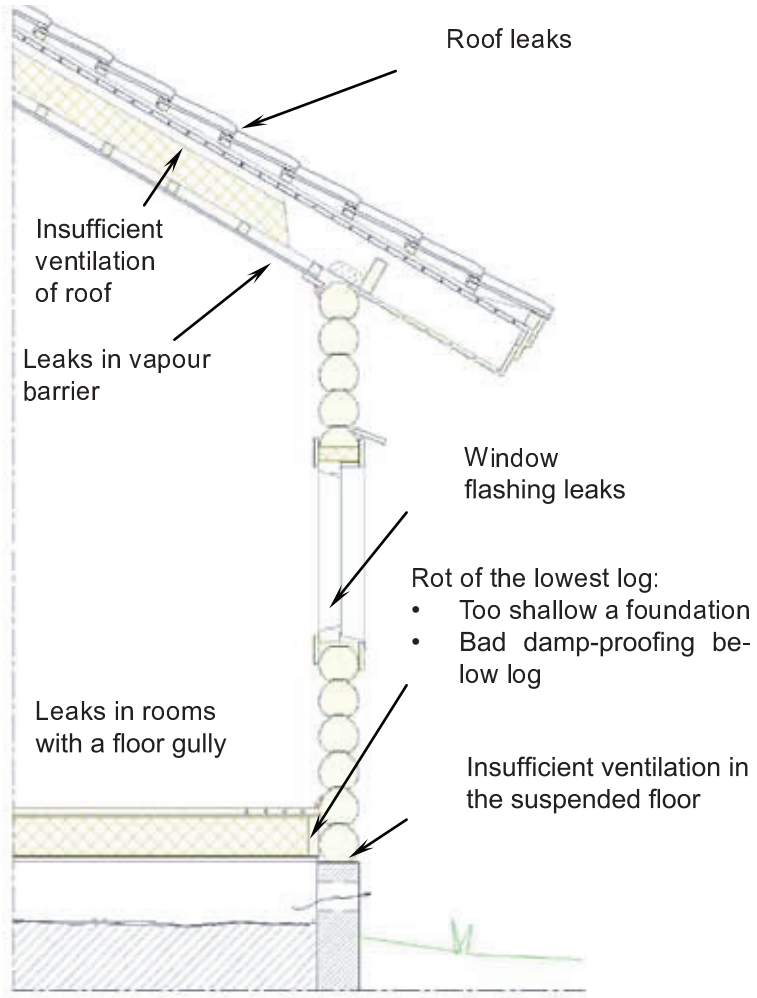
CRACKING

The surface parts of wood get dry quicker than the heart. Radial shrinking is less than half compared to tangential (perpendicular to radius) shrinking. Because of these factors, massive wood gets tensions that surpass the tensile strength of wood and make wood crack. Cracking can be controlled to some extent with the shape of log and by sawing grooves on the invisible surface of log, but it is not possible to prevent the cracking of massive log altogether. The thicker log is, the larger cracks there appear.

Cracking is a natural characteristic of wood, and cracks do not have a considerable impact on the strengthnes or heat insulation capacity of a log wall.



Radial, tangential and longitudinal shrinking of wood.



DURABILITY OF WOOD

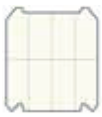
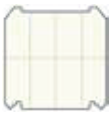
When protected against earth moisture and direct rain, wood is a very durable material. The oldest log structures are hundreds of years old.

Mould formation is possible in circumstances where wood moisture stays steadily at more than 20% and temperature at more than +5ºC. If logs get dirty, the risk of moulding increases.

Log walls have to be treated on the outside as quickly after mounting as possible, following the instructions given in Painting work instructions for log building.

The adjoining figure shows the most usual structural items where poor implementation and neglect of maintenance cause moisture damage and shorten the lifetime of a log building.

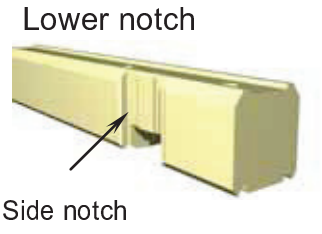
Y18 LOG PROPERTIES

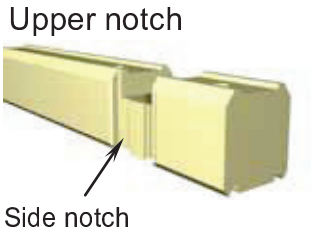
LOG	TYPE	EFFEC-TIVE HEIGHT mm	U-VALUE w/m²K	WEIGHT kg/m	LOG	TYPE	EFFEC-TIVE HEIGHT mm	U-VALUE w/m²K	WEIGHT kg/m
	RECTAN-GULAR LOG 95x170	162	1.04	7.7		LAMINATED LOG 205x275	263	0.53	28.2
	RECTAN-GULAR LOG 120x170	162	0.85	9.7		LAMINATED LOG 243x275	263	0.46	30.0
	LAMINATED LOG 95x170	162	1.04	7.7		LAMINATED LOG 275x275	263	0.40	34.0
	LAMINATED LOG 135x170	162	0.77	10.7		ROUND LOG 150	130	0.79	8.2
	LAMINATED LOG 180X170	162	0.60	13.9		ROUND LOG 170	150	0.72	10.7
	LAMINATED LOG 205x220	207	0.53	20.8		ROUND LOG 210	170	0.60	15.5
	LAMINATED LOG 135x275	263	0.77	16.7		LAMINATED ROUND LOG 230	176	0.53	17.9

Use the table to assess how heavy the longest logs of your house are and whether you need a crane at site. The U-values in the table refer to the heat insulation capacity of a finished log wall. They are approximate values. The λ_R value used in calculating the U-values is 0.12W/(m²K).

NOTCH PARTS

Depending on the location of the log, the notch may not have an upper or lower notch. Even in this kind of log, side notches extend to the top and bottom edge of the log. The side notches are visible e.g. below intermediate floor joists.





SETTLING

The settling of log walls differentiates log building from other ways of construction. Settling is mainly due to the fact that wood shrinks as it dries. Settling is partly caused by the incremental compression of seams and joints.

Settling is at its highest level during the first two years, but a log building continues to live practically throughout its life.

Settling is strongest in walls made of massive round log and mildest in laminated log walls. Settling amounts to about 2 to 3 % of wall height. In a dry indoor space walls settle more quickly than exterior walls. Settling must be taken into account when joining other non-settling structures to log.

Y19 GENERAL DESIGN PRINCIPLES

The durability of a log building and the need of maintenance can be affected by planning the building carefully. Some of the basic things to be taken into account are as follows.

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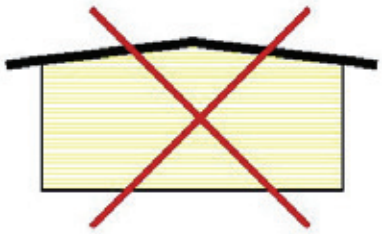
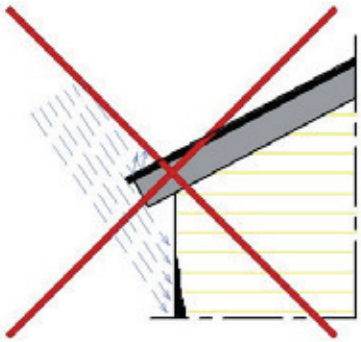
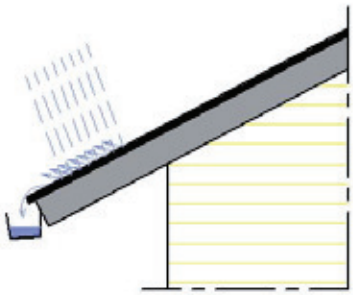


LIKE THIS

Roof pitch
The roof pitch of a building has to be sufficiently large in terms of the roofing chosen. Do not make the roof flatter than recommended by the roofing manufacturer.





Eaves length
Sufficiently long eaves provide a good protection for the walls. Supply the building with eaves gutters and drainpipes.

SURFACE TREATMENT OF EXTERIOR WALLS

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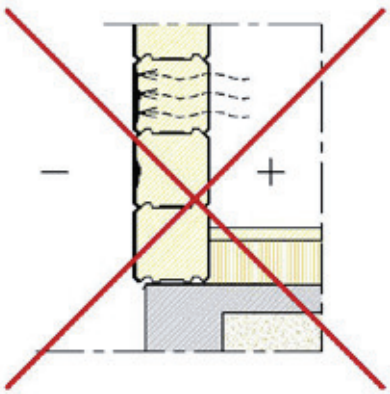

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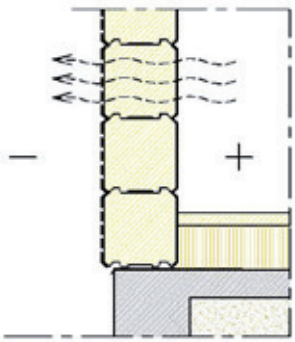

The paint must not form too tight and water vapour proof a coating on the outside of the log wall. Improper painting may rot the wall. For painting instructions, see the Maintenance instructions booklet.

Y20 VENTILATION OF STRUCTURES

Excessive moisture in a wrong place causes the biggest damage in wood structures. Because of this, you need to pay special attention to moisture management of structures. The ventilation of the roof structure and suspended floor is of utmost importance. This page contains a few general instructions for the ventilation of structures.

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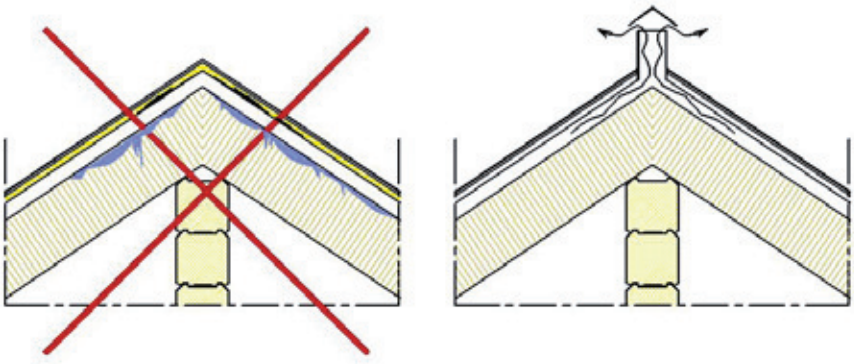
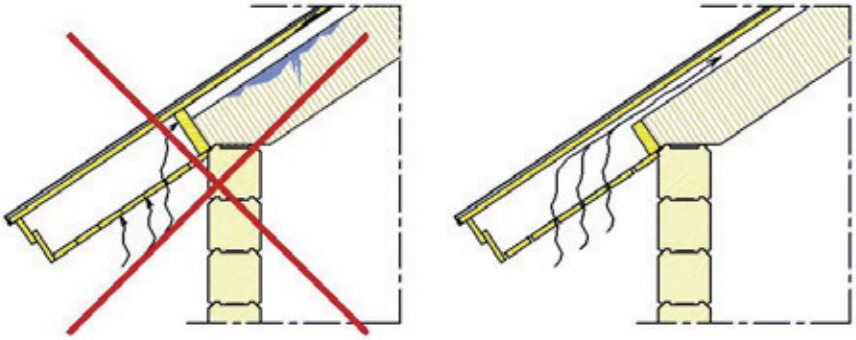


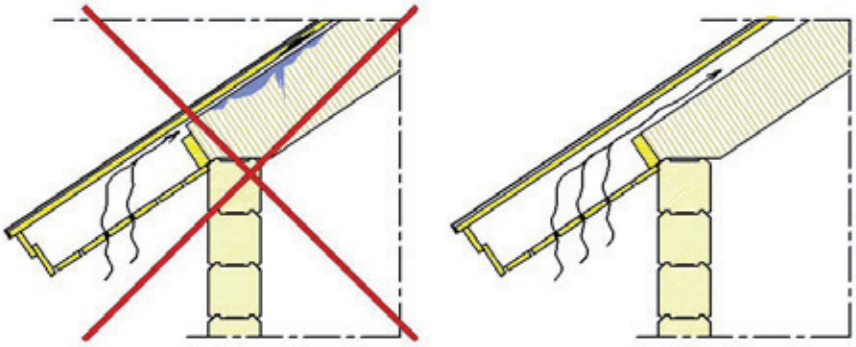
Ridge ventilation

The roof ridge needs proper ventilation, which can be ensured either with a ventilating ridge structure, or with ventilation valves. If there is an attic in the house, ventilation can be arranged through valves installed in the gables.



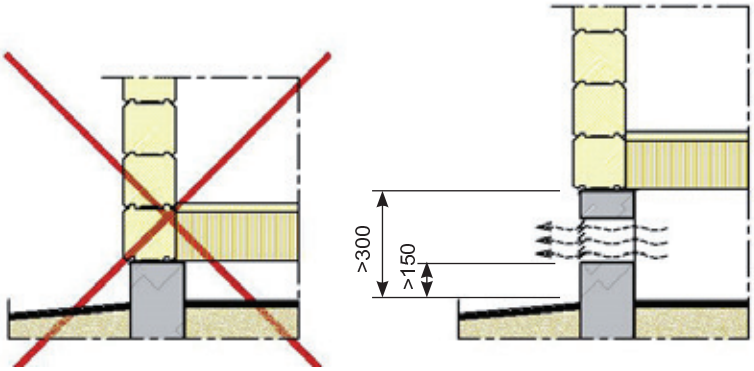
Eaves ventilation

Air must flow freely to the ventilation space in the roof structure. Do not make the boarding under the eaves too tight, and do not block up the hole between the support plank of insulation and underlayer.



Vent hole in roof structure

The vent hole between the insulation and underlayer must be at least 50 mm. The broader the pane, the bigger vent hole is needed.



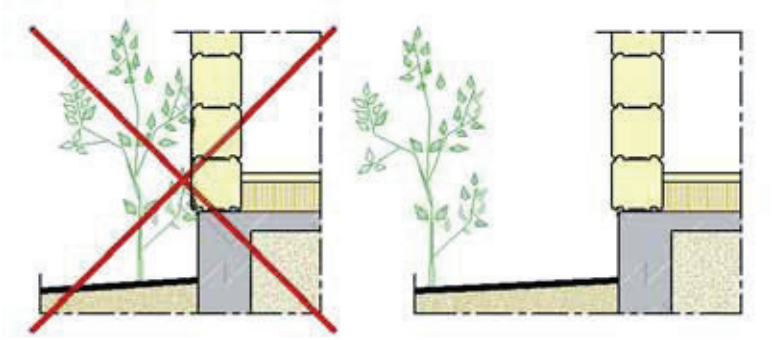
Suspended floor ventilation

The ventilation space has to be wide enough. In a proper ventilation space a human being can move by crawling. Make enough vent holes in the footing (0.4% of floor space).

Y21 FOUNDATION DESIGN PRINCIPLES

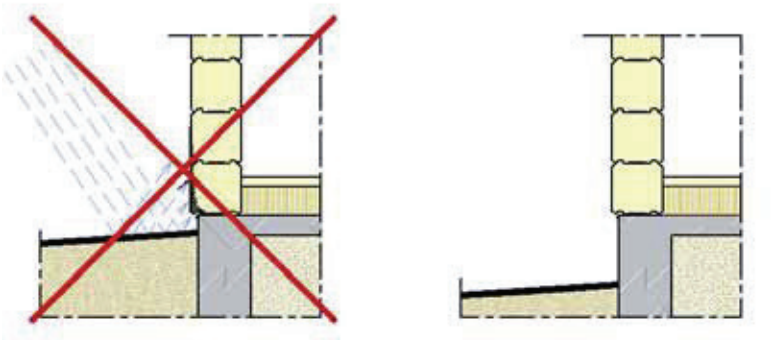
The foundation is the most important part of a building. Do it carefully in accordance with the drawings prepared by a skilled designer. Do not try to save in ground survey. If the foundation fails or freezes, you will face a really big renovation. If you have a cellar in the house, you have to inform the factory reseller of it when negotiating the deal.
The capillary rise of moisture from ground to the foundations and evaporation into crawl space must be prevented. Take into account the country specific regulations.

NOT LIKE THIS **LIKE THIS**



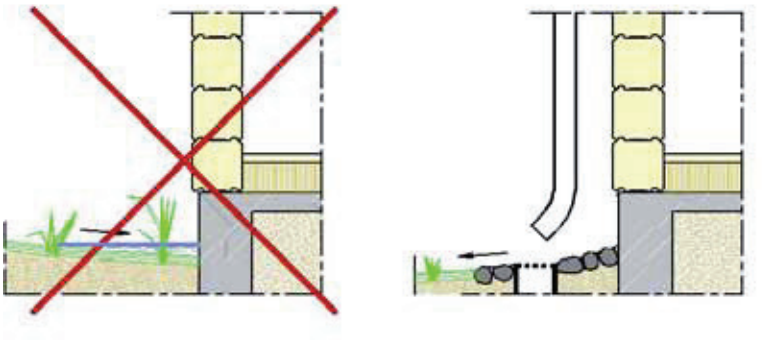
Trees and bushes

Trees and bushes planted close to a wall slow down the drying of the wall after rain and may rot the wall. Plant them at such a distance that branches will not reach the wall.



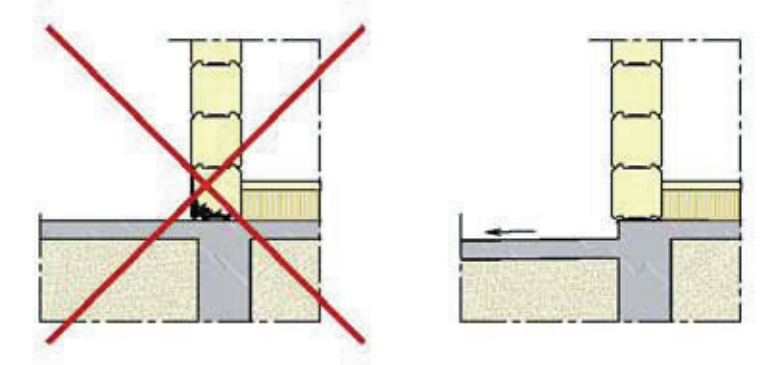
Height of foundation

Height is chosen so that the lowest log will be at least 300 mm above the ground.



Sloping of ground

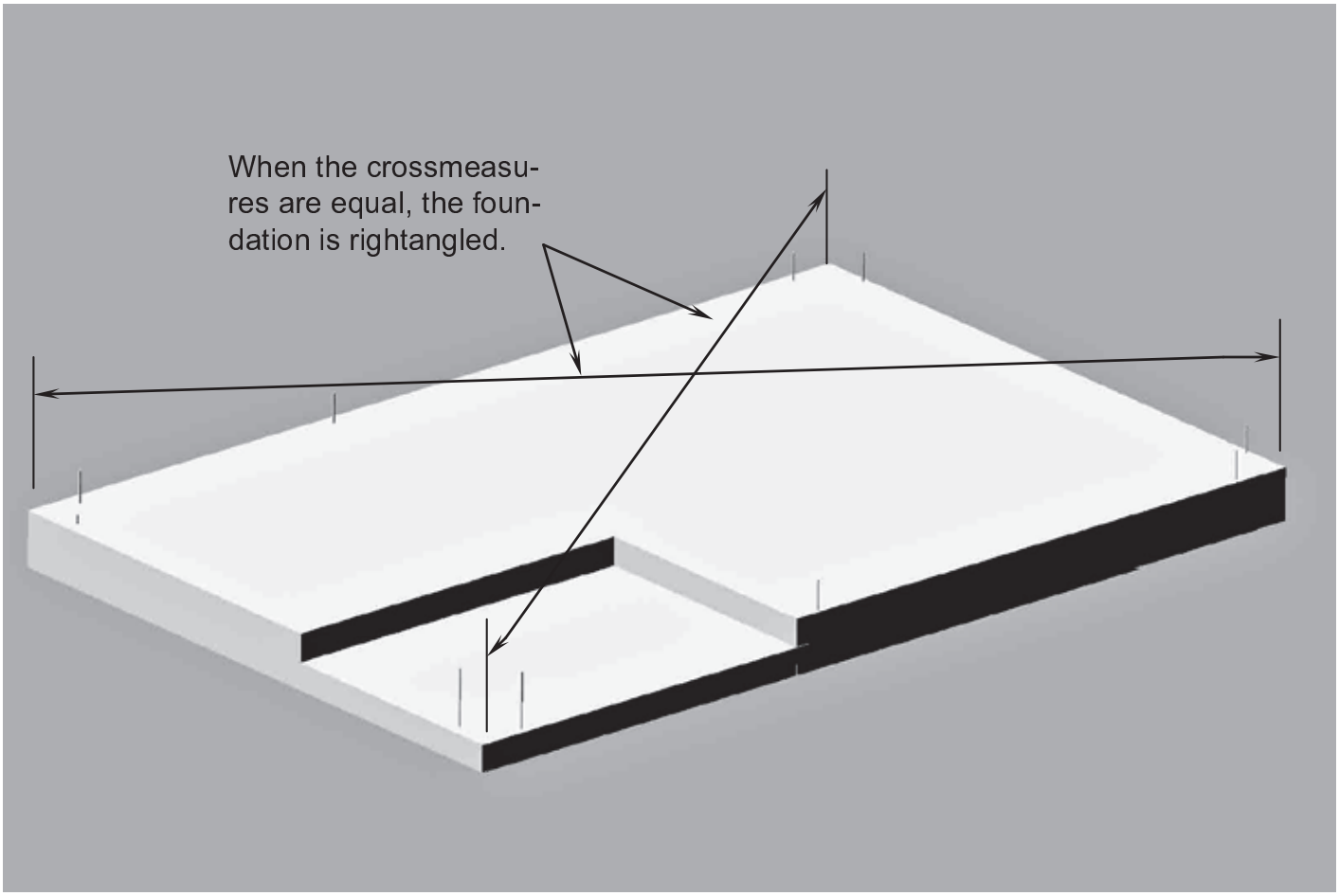
Ground outside of the foundation is sloped away from the building over 1:20 at least for 3 metres.
Rainwater coming from the roof is led directly to rainwater gullies. Ground next to the foundation is paved or coated in some other way to prevent vegetation growth.



Terrace floor

The concrete slab of the ter-race must not be on the same level as the upper surface of the foundation. The slab is cast at least 50 mm lower and sloped away from the wall 1:50.

Y22 DIMENSIONAL ACCURACY OF FOUNDATION



Many unnecessary tasks can be avoided in the mounting of the log frame if the dimensional accuracy of the foundation meets certain requirements. Especially in wide houses with large openings the height differences of the foundation become visible as soon as the first log is mounted above openings. Demand the person responsible for the foundation to keep the following tolerances for measures and heights:

Measure	Tolerance	Note!
Main dimensions, length, breadth	-5, +10 mm	
Location of interior walls	± 10 mm	
cross-measure (length 0-5m: ± 5mm, > 5m: ± 10mm)	± 5..10 mm	
Location of anchor bolts and elevated pillar posts	± 10 mm	
Elevation of the top surface of the foundation	- 5, +0 mm	

It is recommended that checking is made by e.g. foreman in charge, principal planner or foundation planner.

Check the height of the foundation at each notch corner. Use a felttip pen to mark height deviations on the top surface of the foundation. Set aside suitable plywood pieces to be placed under logs in order to adjust heights in case corners are lower by 5 mm or more.

Height differences of more than 10 mm have to be evened out by grouting.

Y23 RECEPTION OF DELIVERY

UNLOADING

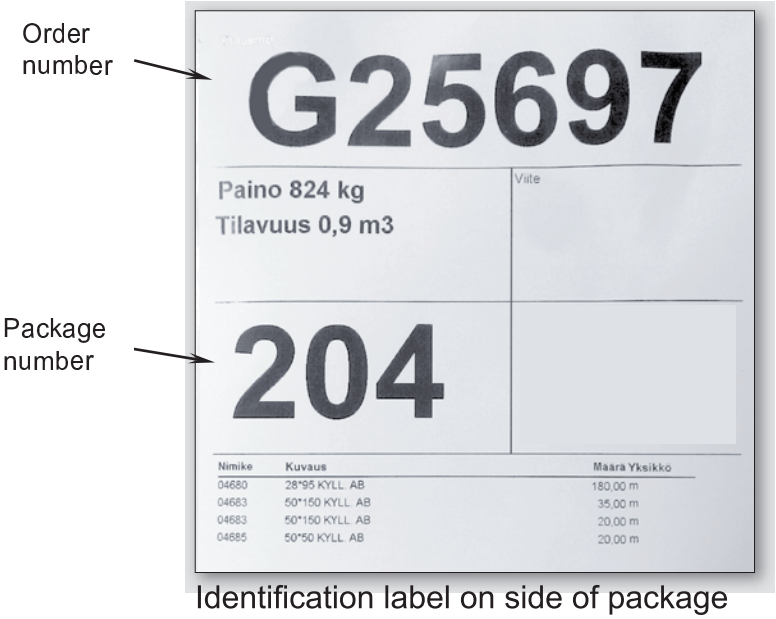
See to it in advance that there will be sufficiently space for the trailer and unloading. If the purpose is to drive the trailer to the site, check the breadth of the entry to site. The narrower the road leading to the site is, the broader the entry has to be. Also make sure that the bearing capacity at the entry to site is sufficient for heavy traffic. If needed, strengthen the road with a load-bearing gravel or crushed stone layer.

If the eurotrailer cannot drive to the site, there must be in the neighbourhood a suitable area where the trailer can be unloaded and the cargo transported to the site with lighter equipment (Note! reloading and onward transport are not included in the freight price). Find out the location of the reloading place in advance and inform the seller of it when agreeing upon the time of delivery.

Contact the seller of your house in all issues related to transport and unloading already when negotiating the deal, and in good time before the delivery is transported to the site.

ACCEPTANCE INSPECTION

During unloading, check that the delivery matches the freight bill. ***Defects and damage noticed are marked in the freight bill, and the driver is asked to sign it.*** The identification label has been taped on the side of a package. A package may contain several similar identification labels. Each log package contains a packing list, which details the logs the package contains. The packing list is inside the log package.



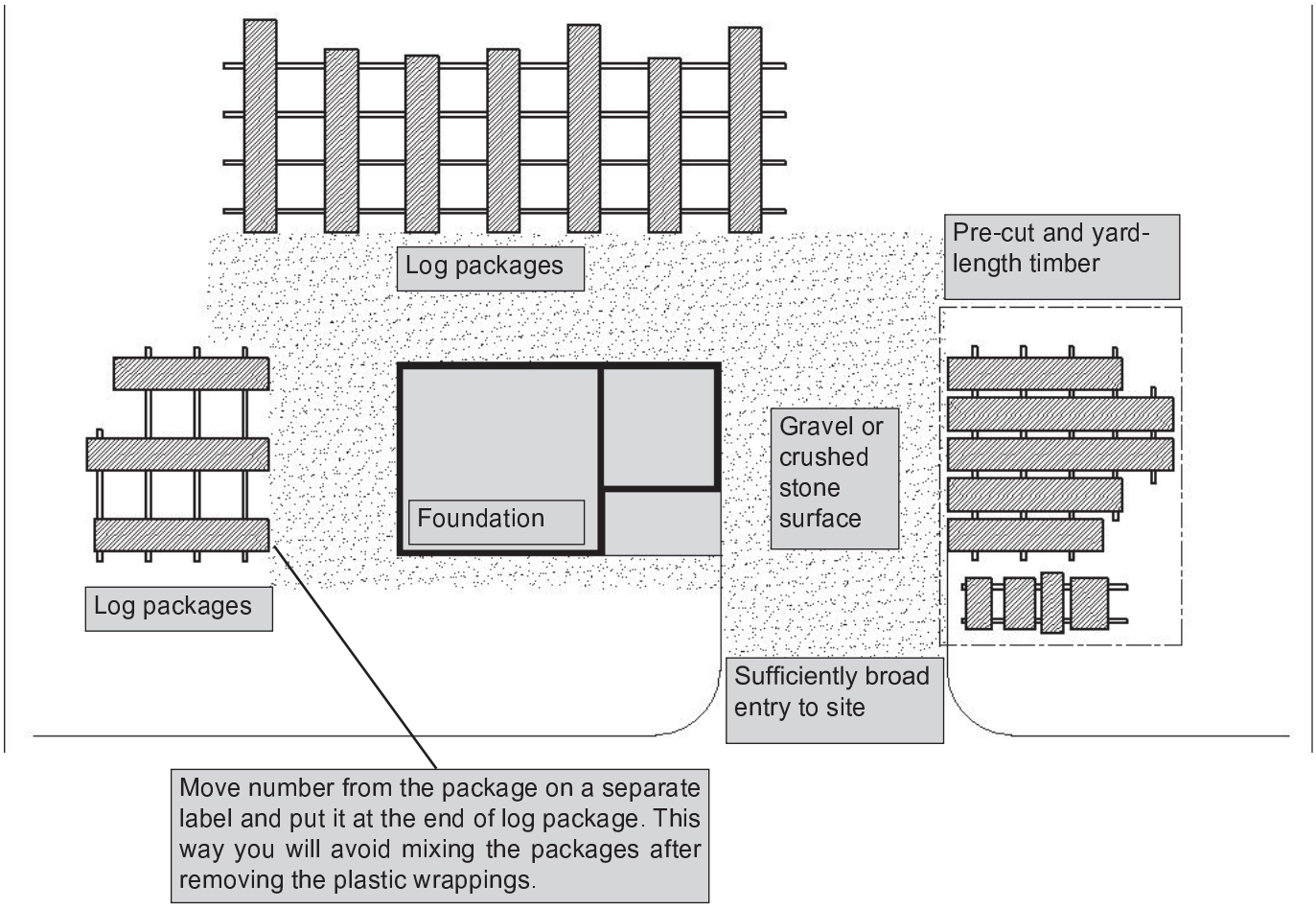
Identification label on side of package

The packages have been numbered in the following order:

Packages with numbers between	Materials included in the package
101 - 199	logs
201 - 299	yard length timber
301 - 399	pre-cut timber
401 - 499	roof joists
501 - 599	materials
601 - 699	windows, doors and other (e.g. furniture)
701 -	pre-fabricated units

Y24 LOCATION OF MATERIAL AT SITE

STORAGE AREA



If the soil is muddy or may puddle in the rain, spread a gravel or crushed stone layer on the storage area and around the building. Leave a free area of about 4 metres on each side around the foundation for working. Before the delivery, plan the location of the packages to ensure that the materials first needed are closest to the building. Place the log packages nearest the building, which are needed first according to unpacking instructions.

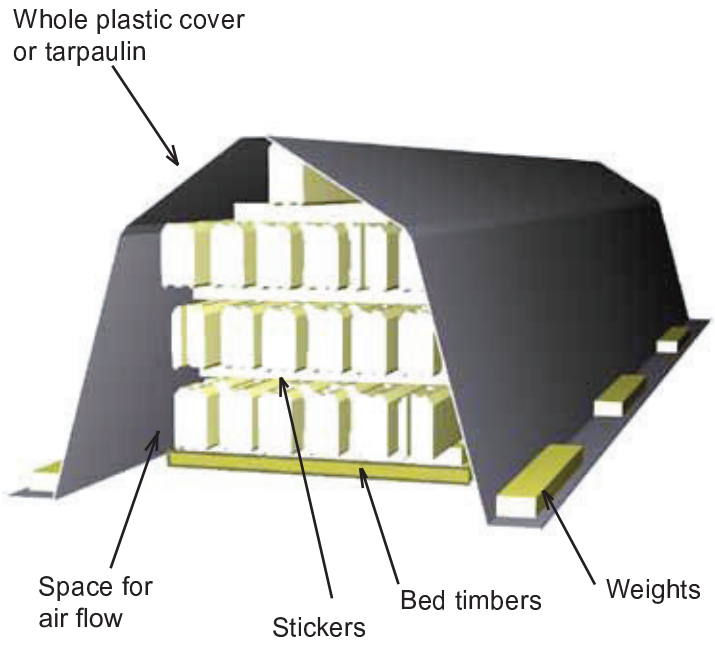
The size of packages is, on the average, 1.15x8 m and weight 1–3 tn. The longest packages may be as long as 12 m. Set aside beams or short planks (ca. 1,2 m long, 4–5 pcs/pkg) to be placed under packages in order to prevent packages from ever touching the ground. In longer-term storage, packages have to be at a height of about 300 mm from the ground so that air may flow freely under the packages.

Leave an empty space of at least 1.5 metres between log packages, because you will have to unload packages when looking for the correct logs. When opening a package, do not break the plastic cover protecting the package. The cover is handy as a temporary protection against e.g. bright sunshine. Always use unbroken tarpaulins to protect opened packages for longer breaks from the construction work.

Have enough tarpaulins at site for protecting the materials. The recommended size of tarpaulins is 6x9m. Plastic wrappings of possibly broken packages have to be taped or replaced with separate tarpaulins immediately. Tarpaulins are set in place with weights.

Y25 PROTECTION AND STORAGE OF MATERIAL

Protecting timber bundle with tarpaulin



Avoid long-time storage of material at site. If you can use a barn or other building, store wooden material there. Store also materials such as windows, doors and stairs, which are needed last, in dry and sheltered place.

Check the condition of package covers. If you notice that water has entered inside one of the packages, unpack the package and stack the timber by means of battens in a loose pile for drying. If water has entered inside packed floor boards or panel bundles, wet bundles have to be unpacked and the boards have to be stacked up with batten strips to make them dry.

In long-term storage, the protective plastic covers of the timber packages have to be opened at least at the ends in order to enable air flow. Also check if the protective plastic cover is whole; if it is broken, protect the package with a tarpaulin. Whole stretch film packages, window and door packages do not need to be opened. Remember to protect wooden material also against direct sunlight during storage.

Timber storage shelter

At site, timber is protected with waterproof covers. Mount the covers upon a supporting structure made of planks so as to enable air to flow under the covers but to prevent rainwater from ponding upon the cover.

If there is room at site, build a storage shelter that is open on one side (Note! The delivery does not include materials for storage shelter). If equipped with shelves, it serves as an excellent place for sorting and storing mouldings and boards of different sizes.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