IsoTimber Guide for Deconstruction

Purpose of the document

This document is provided to customers at the delivery of an IsoTimber structure [1]. It contains information about the timber wall that is valuable to know when deconstructing the building. The overall aim is to encourage the reuse of IsoTimber walls, in line with IsoTimber's goal of enforcing a circular economy, see Fig.1. The information provided here is partly based on the principles defined in the SEDA Design Guides [2].

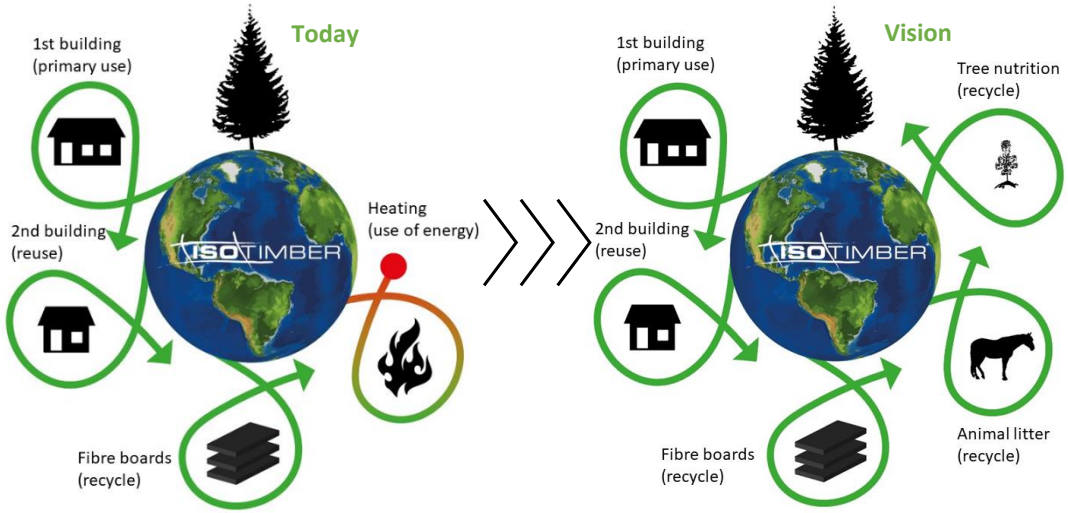

Fig.1: The IsoTimber idea of enhancing a circular economy, by cascading the material and developing ways to complete the circle. Keeping the raw material in a longer service life by reusing the wall panels is a first step. The company works to complete the circle and get the material back to nature by substituting the adhesive to be biobased and 100 % fossil free.

Strategy for reuse

The IsoTimber panels are designed for a long service life, estimated to last more than a hundred years, and for reuse either as full size wall elements as delivered, see Fig.2, or by separating them as individual panels, see Fig.3, and resuse them in a new wall with a different technical or architectural design. However, since it is difficult today to define the actual service life of the adhesive used in the elements, see page 7, a reuse in form of elements might be most likely. The prefabricated wall elements are assembled by screws at the first building site, hence easy to deconstruct.

Note! At each time of reuse, national building regulations specific to each country at that moment in time must be followed and the properties of the wall panels/elements must be verified that they comply requested limit values of the regulations at the time.

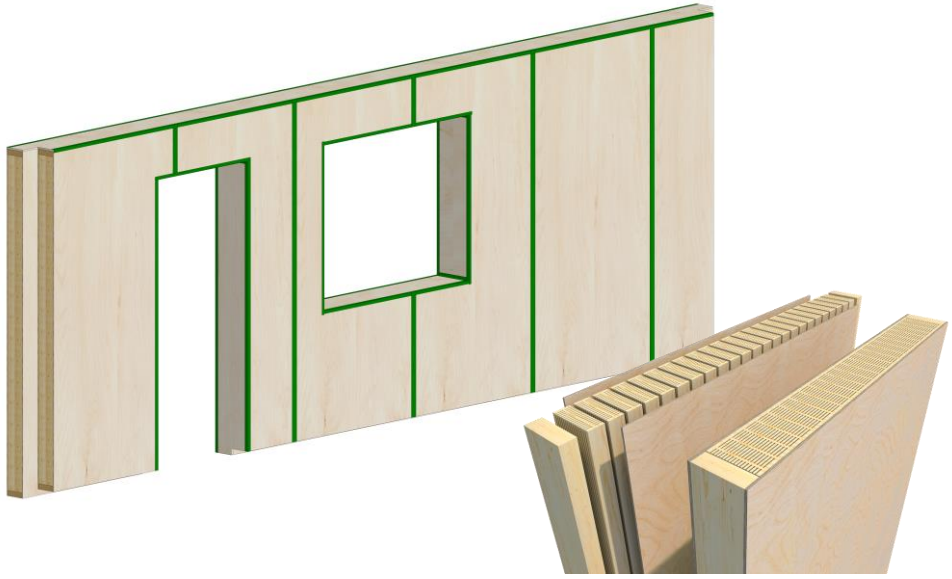

Fig.2: IsoTimber wall element.

Fig.3: IsoTimber panels.

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List of information to keep safe

General product information is provided to the customer at the delivery of the house framework;

- A **Delivery specification** [3] informs e g about general functionality and delivery conditions.
- The **IsoTimber Technical Handbook** [1] describes e g construction details and wall properties.
- eBVD, **electronic building material declaration** [4] defines the content of the wall panels, with details on the material used.
- A **product assessment,** BVB (Byggvarubedömningen), based on **sustainability requirements** [5].

Additionally, the following **customer specific information** regarding the customer's specific structure is provided;

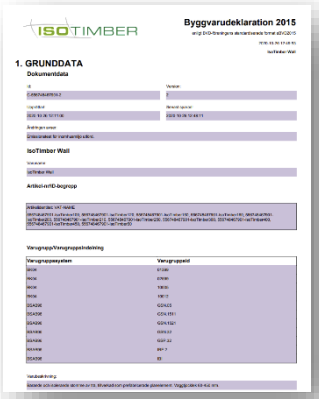
- **Assembly drawings and instructions**, with specific technical details, see example in Fig.4. It includes a 3D view with the panel's weight and a loading plan for the transportation.
- **Material Specification**, listing the dimensions and volumes in the delivery, including the names of suppliers of the complementary materials, see example in Fig.5.

The listed documents alltogether provide detailed information about the structure regarding: function, material and instructions on how to assembly it. It is recommended to keep this information safe at all times, as it is valuable at the deconstruction and reassembly process.

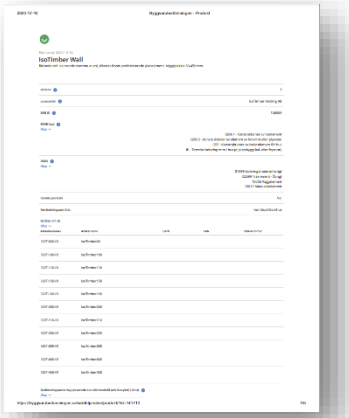
Even more detailed information is stored at IsoTimber if needed, the manufacturing drawings, see example in Fig.6.

Delivery specification

IsoTimber Technical Handbook



eBVD



BVB

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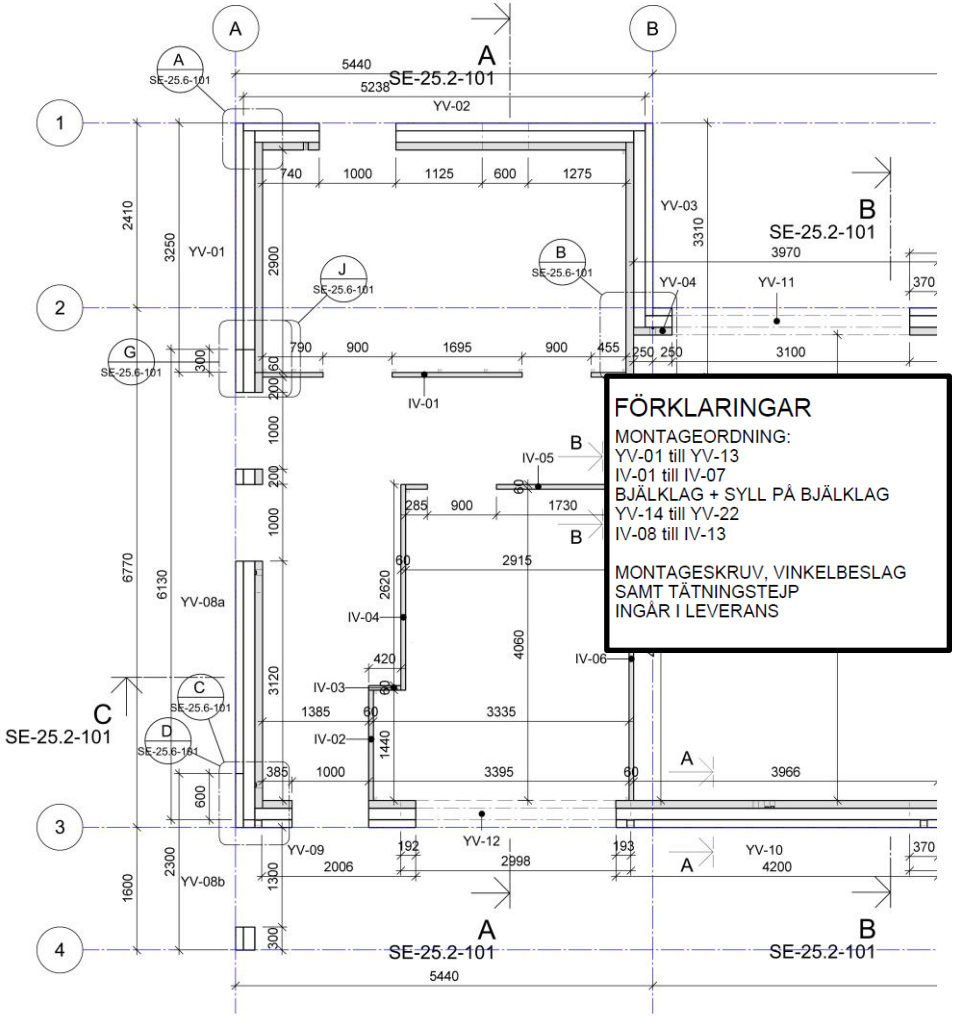

Fig.4: Example, part of assembly instructions of external wall elements on first floor. In this case the assembly order is defined by YV-01 to YV-13 (external wall elements), and IV-01 to IV-07 (interior wall elements). The physical elements are labelled with YV-01, YV-02 and so on.

IsoTimber Yttervägg	eBVD	Leverantör	S:a mängd	Enhet
IsoTimber 300 mm	C-556748467901-2	IsoTimber	203,00	m2
Fönsterram plywood 21x 300mm		Beijer	31,93	m2
Takstomme		**Leverantör**	**S:a mängd**	**Enhet**
Råspontlucka 23x540 3,6m		Beijer	370	m2
1,5x25M Underlagstäckning RAW HP235 difföppet		Beijer	11	rl
Limträbalk		Martinsons	9	lpm
Limträpelare		Martinsons	12	lpm
NST	enligt order	4105365 -2021-04-12	1	st
Ritningar			**S:a mängd**	**Enhet**
Lastnedberäkningar			1	st
Montageritning			1	st
Tillverkningsritning			1	st
Avväxlingar		**Leverantör**	**S:a mängd**	**Enhet**
LVL Balk		Beijer	77	m
Plywood, ök IsoTimber vägg 12x300		Beijer	77	m
Transport			**S:a mängd**	**Enhet**
Transport			1	bilar m/släp
Fasadpanel		**Leverantör**	**S:a mängd**	**Enhet**
Luftningsläkt, träregel 22x45mm S500		Beijer	420	m
Musband		Beijer	77	m
Montage musband,läkt och panel		IsoTimber	210	m2
Montagematerial		**Leverantör**	**S:a mängd**	**Enhet**
Byggtape 50mmx25m		Rotho Blaas	10	rl
Träskruv 6x280mm, fabriksmaterial		Würth	500	st
Lyftstroppar sling		Kedjan	36	st
Rundstav 33mm, för kranlyft		Beijer	36	st

Fig.5: Example of a customer specific Material Specification (in Swedish), a list of materials with dimensions and volumes. The manufacturer of all material is defined in the list.

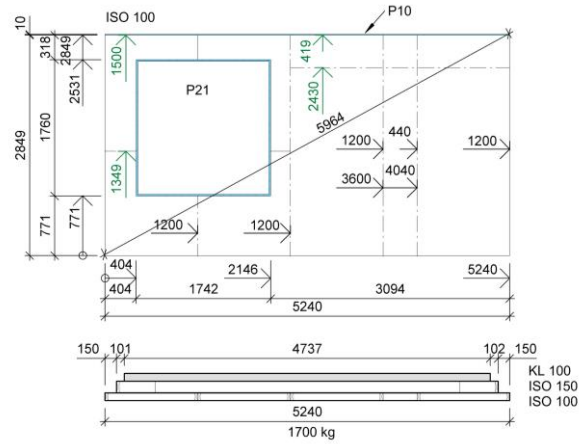

Fig.6: This is a drawing/instruction for manufacturing the external wall element identified as YV-15. Dimensions are specified and the total weight of the element is given (1700 kg). All elements manufactured in the IsoTimber-factory follow such specification.

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Description of typical connections in a house framework with IsoTimber elements

All deliveries from IsoTimber are customized, i.e. the information mentioned above should preferably be at hand when planning the decontruction of the building. However, many connections are the same, such typical connections are described in Fig. 7 - 11.

Top view

Fig.7: Typical corner in an IsoTimber wall.

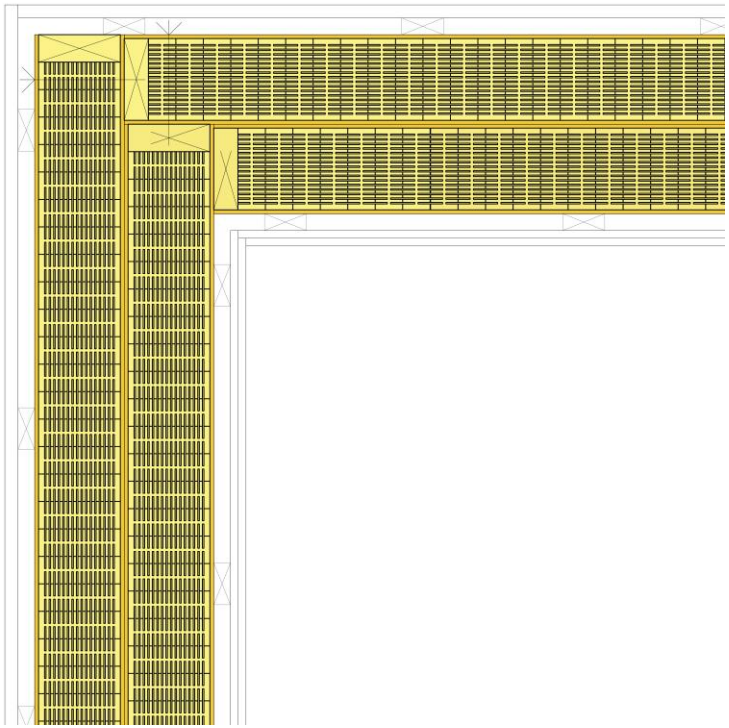
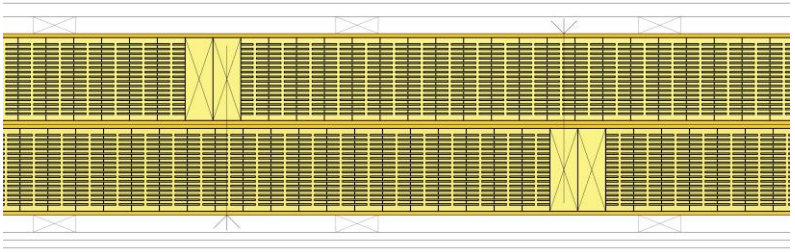


Fig.8: Typical IsoTimber panel joint.



Side view

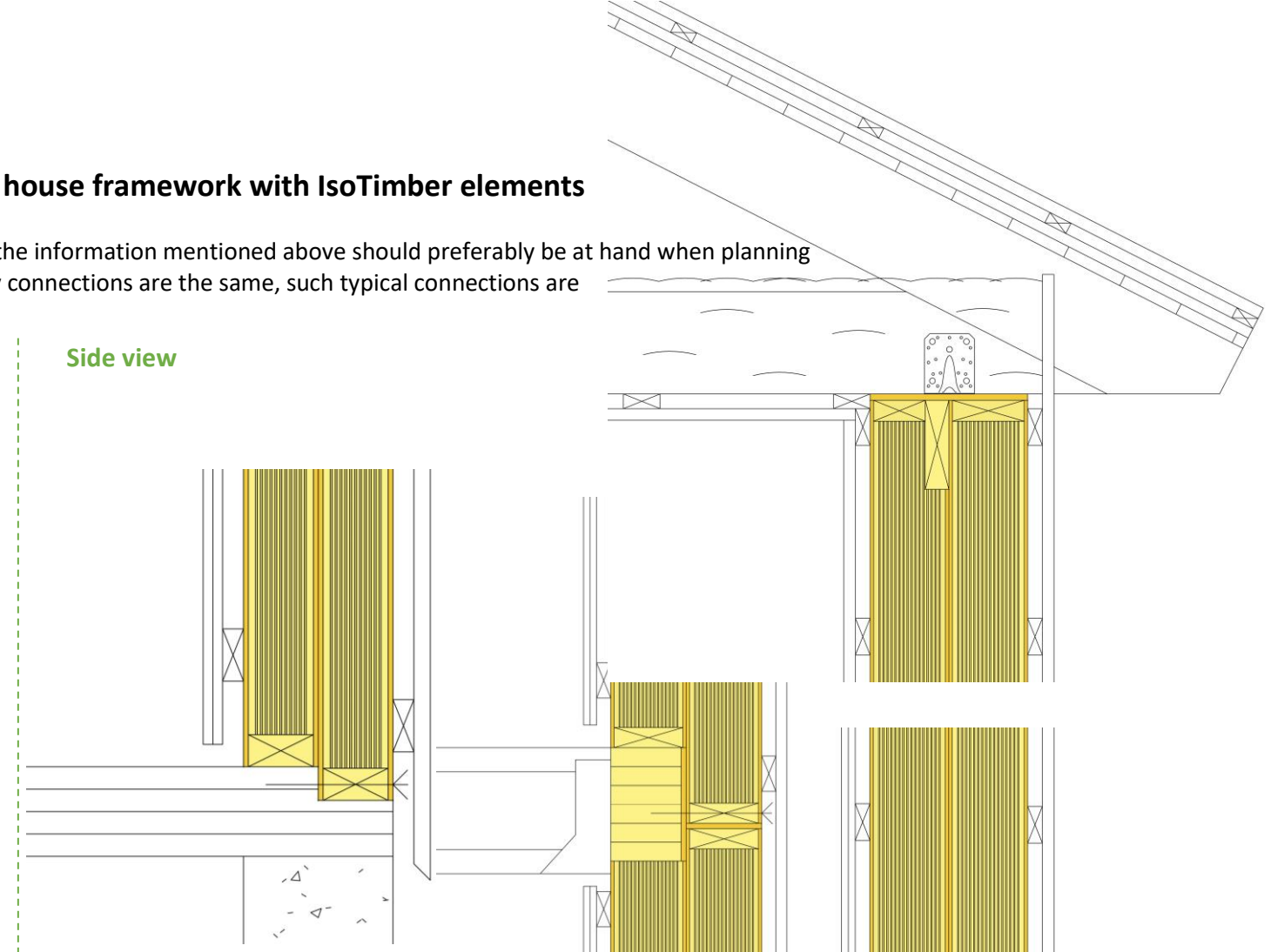


Fig.11: Two examples of intermediate floor solutions combined with IsoTimber walls. To the left: CLT (cross laminated timber) panels. To the right: a suspended solution.

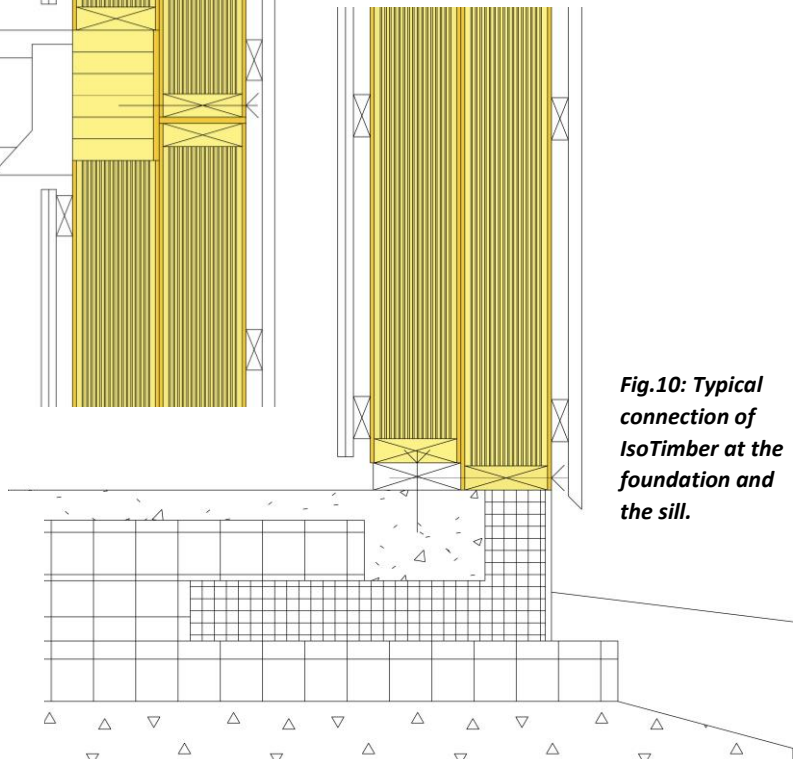


Fig.10: Typical connection of IsoTimber at the foundation and the sill.

Prepatory work

 **Decide how to reuse the structure**, as IsoTimber wall elements or as panels (please read the important information on page 7). Plan the deconstruction process with that purpose of reuse in mind.

 Each specific IsoTimber building has it's own specific dimensions of wall elements, connections and screws. This must be considered and preferably the information should be retrieved from the documents mentioned in the ***List of information to keep safe***.

 All **element weights** are stated in the ***Assembly drawings and instructions***. However, if the documentation of the specific element cannot be found, the dimensions of the elements must be measured. A density of ~420 kg/m^3 could be used to estimate the element weight. Add an extra margin for precaution.

 The deconstruction process is basically a reversed assembly process, that is why the ***Assembly drawings and instructions*** are useful information to have. They specify in which order the elements are mounted.

 Be well prepared by **planning the logistics** of the deconstruction process by planning exactly in which storage place (temporarily or long term) to place each part of the building, not only the structure described here. The most efficient process is probably to load the elements directly to a transportation truck if possible. An appropriate location for the crane must be found and a good position for the truck(s).

 Prepare even small things, such as defining **buckets/boxes for sorting screws** and **angle brackets** for a more efficient reuse.

 **Weather protection** should be available if needed, both for the recovered building material and the building itself during the process.

 Make sure all **tools** and **manpower** needed for the deconstruction are available, and **transportation** booked if needed.

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Tools suggested for the deconstruction of IsoTimber elements

⚠ Please be reminded that this instruction focuses on deconstructing wall elements only. Other tools are needed for removing the remaining building parts.

Tools suggested: scaffolding, crane, truck, lifting sling, supporting struts, electric screwdriver and as listed below:

Club hammer

Ladder

Marker pen

Knife

Drill

*Fig.12: **Scaffolding** might be needed depending on the height of the building.*

*Fig.13: A **crane** with sufficient lifting capacity must be in place. Make sure to plan for its moving radius and stability on the ground.*

*Fig.14: **Truck** for transportation and **lifting sling** of appropriate lifting capacity, both for lifting packages and individual elements.*

*Fig.15: **Supporting struts** must be available when starting the deconstruction process.*

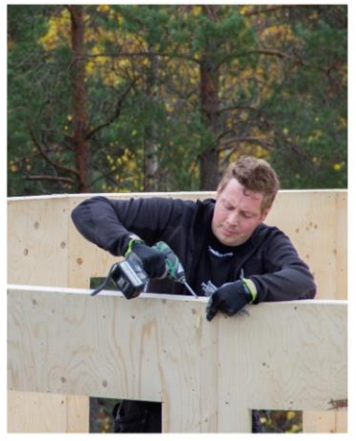

*Fig.16: An **electric screwdriver** is a must have, all elements are fixed together by screws.*

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Instructions on how to deconstruct the IsoTimber structure

! The IsoTimbers walls are expected to have a very long service life, a hundred years or more. This is in case of normal humidity conditions and the elements being protected from UV radiation by a façade material. The actual service life of the adhesive used in production cannot be defined though for this long timespan. On the other hand, the adhesive does not have a load bearing function in the wall element, the wall panels are assembled and held by screws. The main function of the adhesive is supporting the structure at the manufacturing and assembly process. Therefore, the functionality of the adhesive should be investigated at the time of deconstruction in case the plan is to reuse the individual panels from the wall. In case the idea is to reuse wall elements, it shouldn't be necessary.

! Jugde the condition of existing windows and doors. If they are in good condition, they can be kept in the wall elements if the elements will be reused as is. A façade panel is probably difficult to keep. It is likely to be damaged while lifting the elements.

! The original IsoTimber building was assembled by screws. It is expected that those screws can be unscrewed, and probably reused, at the time of deconstruction. As described above, no major movements can take place in the elements, why this assumption can be made.

! The IsoTimber walls can be combined with a variety of construction solutions for the roofing, intermediate floor and foundation. All with specific connections. Hence this instruction describes the deconstruction concerning the IsoTimber elements and panels alone. The deconstruction of the other building parts should be planned as carefully.

! No particular precautions need to be taken when deconstructing an IsoTimber wall with aspect of implications for health or environment. Safety aspects, such as securing the wall elements during deconstruction with supporting struts, should be carefully planned though and performed accordingly.

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Deconstruction step		Instructions	Tools
0	**Prepatory work**	Make sure the prepatory work listed above is completed. When performing the steps below, it is presumed that all other necessary building parts are removed, with the wall elements all clear.	*Sharp mind*
1	**Secure the elements**	Secure the elements with supporting struts, to make sure there is no risk of any element falling during the deconstruction process.	*Supporting struts* *Electric screwdriver*
2	**Prepare lifting the elements**	Fasten lifting slings in window openings (if windows are removed). Knock out the wooden rod from the previous hole used to lift the element (figure). In case previous holes and openings are not available, new holes must be drilled. Be careful to consider an even weight distribution in that case. Fasten lifting slings in the panels. Tear off the construction tape from the element joints (combustible waste). Remove any angle brackets potentially left at the top of the elements remaining from the roof fastenings. 	*Ladder* *Club hammer* *Drill* *Lifting sling* *Knife* *Electric screwdriver*
3	**Unscrew and lift down elements**	Successively, in the order defined by the reversed *Assembly drawing and instructions*, unscrew each element from the sole plate (5 screws per 2 meters) and the joints of the neighbouring elements (typically 12 screws). Both exterior and interior. Scaffolding and ladder are used if needed. After securing the sling to the crane, unscrew the supporting struts, and lift the element down to a truck or to ground. Make sure the elements at ground are secured at all times.	*Scaffolding* *Ladder* *Crane* *Truck* *Electric screwdriver*

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		A guide value of 20 minutes per element is estimated for assembling the IsoTimber element, this serves as the best estimation also for the deconstruction time.	
4	**Labelling for reassembly**	In case the elements will be reused, please identify each element according to the *Assembly drawing and instructions* and make sure the individual identification label is still visible, or relabel if not. This makes the reassembly process easier.	*Marker pen*
5	**Remove the sill**	Unscrew the sole plate (reuse if not damaged), and remove the sole plate gasket (combustible waste).	*Electric screwdriver*
6	**Multi storey building**	Repeat step 1 to 5 above in case of a multistorey building. The intermediate floor structure is removed before step 1 in that case, and rememeber to remove any potential fastenings left at the top or side of the wall elements before lifting them off.	
7	**Transportation**	At delivery the wall elements are loaded standing on the transportation, in packages of 3–5 elements secured to each other (figure). Normally the maximum weight of such package is restricted to approx. 5 tonnes. That could be a guideline also for the deconstruction. Preferably the loading plan could be reused. If the elements are not lifted directly to a transportation, they should be placed on a dry flat surface on the ground, and secured to each other. Please note to make sure the elements are secured for any weather impact, such as strong winds for example. 	*Truck*
8	**Store, reuse or recycle**	Store the element weather protected until reuse, reconditioned or recycled. The sole plate and screws must also be weather protected if to be reused. Recycle as wood/metal otherwise.	

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Reassembly – the second building

At each time of reuse, current building regulations must be followed and the properties of the wall elements or panels must be verified as requested by regulations at the time. After an approved visual inspection there might be requirements on certain qualities such as load capacity, acoustics, moisture etc, that have to be verified by testing and/or assessed by a third party body.

Help pursuing the basic idea of circular economy

In case it is decided, for some reason, that the wall panels will not be reused, IsoTimber kindly urge them being recycled instead. For example by grounding the elements down and use the material in wooden fibre boards. To follow the concept of circular economy and keep the material in a service life as long as possible in order to keep the carbon storaged meanwhile.

References

Ref	Document	Comment
[1]	INFO-012 IsoTimber stomsystem Teknikhandbok	Technical handbook describing the IsoTimber construction method. In Swedish only.
[2]	SEDA Design Guides for Scotland: No 1	Guidelines considering important aspects of how to 'Design for Deconstruction' DfD.
[3]	INFO-005 Leveransdeklaration - IsoTimber väggelement	Delivery specification, info about general function and delivery conditions. In Swedish only.
[4]	eBVD (ID No. C-556748467901-2)	Electronic building material declaration that defines the content of the wall panels. See https://byggmaterialindustrierna.se/byggvarudeklaration-ebvd1-0/sok-ebvd-1-0/
[5]	BVB (ID No. 136559)	A product assessment, BVB (Byggvarubedömningen), based on sustainable requirements. See https://byggvarubedomningen.com/

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