Repair Foreva by Freyssinet

Strengthening solid timber structures

IMPROVE, PRESERVE, SECURE

FREYSSINET
SUSTAINABLE TECHNOLOGY

R IV 2

The Freyssinet Group

Freyssinet brings together **an unrivalled set of skills in the specialist civil engineering sector**. The company implements solutions with high added value in two major fields: construction and repairs.

Freyssinet is involved in numerous major projects on five continents, making it the world leader in its specialist areas of:

- Prestressing;
- Construction methods;
- Cable-stayed structures;
- Structural accessories;
- Repairs;
- Structural reinforcement and maintenance.

Freyssinet is highly involved in sustainable development issues and has set up a number of initiatives to reduce the environmental impact of its projects and enhance its social responsibility policy.

Freyssinet is a subsidiary of the Soletanche Freyssinet Group, a world leader in the soils, structures and nuclear sectors.

Cover photo: Church of Saint John, Elbeuf sur Seine, France

Contents

Foreva® Wood Solution	p3
Repairing timber and replacing damaged sections	p4
Increasing moment of inertia	p5
Reinforcing timber floors	p6
Reinforcement by tensioning	p7

FREYSSINET
SUSTAINABLE TECHNOLOGY

With seventy years of experience in structural reinforcement, specialist contractor Freyssinet puts its knowledge and expertise to good use strengthening its customers' timber structures.

Freyssinet uses its Foreva® Wood solutions to restore damaged elements and strengthen and protect structures, while protecting the integrity of the architectural concept and minimising operations that might detract from the authenticity of the old elements.

Timber structures can age, be attacked by fungi and insects or be subjected to excessive loads due to a change of use when a building is restored, for example. Defects such as rotting or damaged wood, excessive deformation, cracking or failure of elements can occur as a result.

Freyssinet supports its customers right from the strengthening project preparation phase and designs made-to-measure solutions in conjunction with the architect in charge of the renovation:

- **Protective measures**
- **Assistance with diagnosis**
- **Assistance with structural analysis and design**
- **Assistance with defining the strengthening strategy**
- **Performance of reinforcement work**

Reinforcing a beam by adding a resin concrete reinforcement
Drilling recesses for the tie rods

06/16

Foreva® Wood Solution

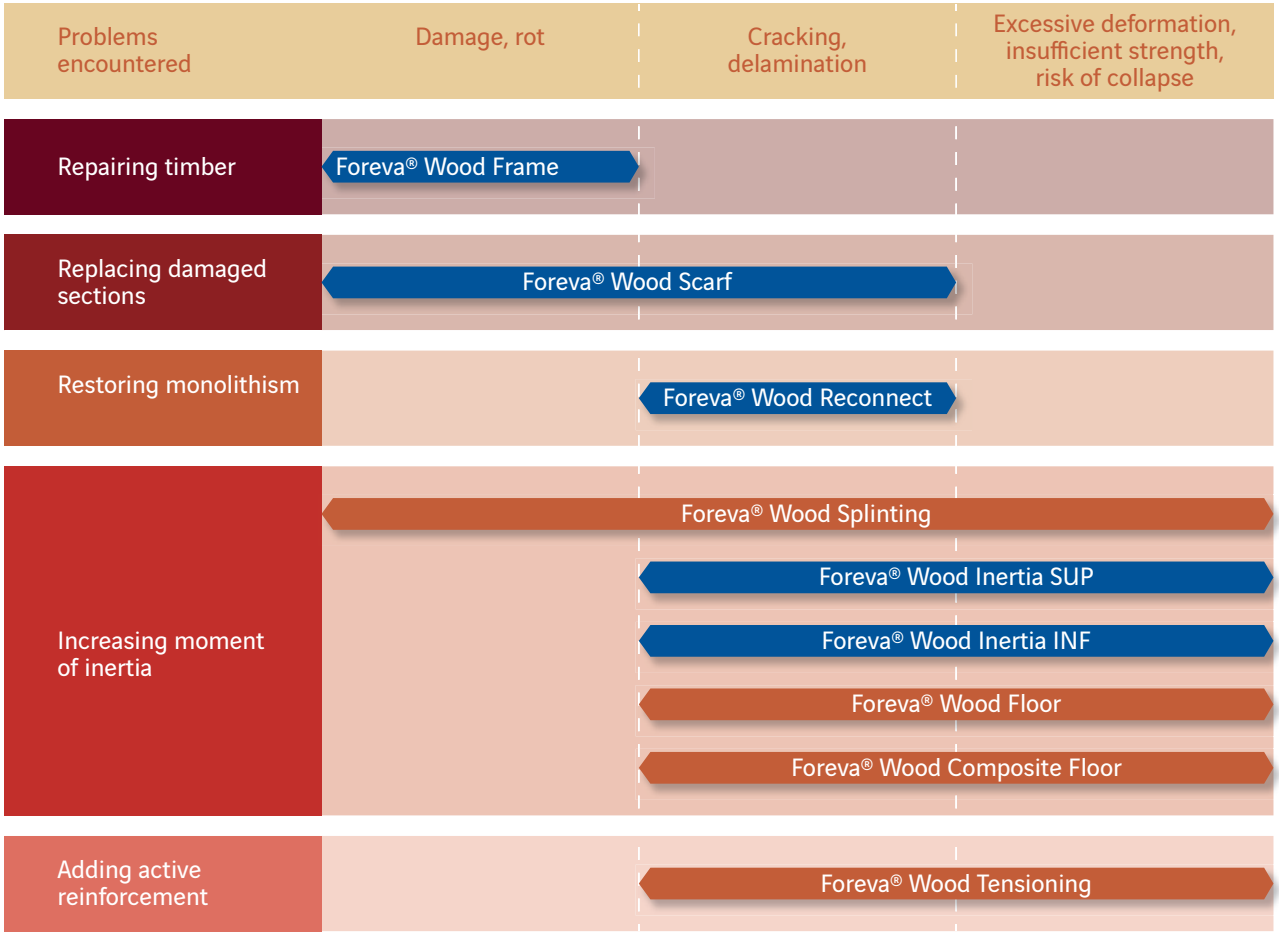
Foreva® Wood solutions are used to repair and reinforce solid timber structures regardless of how damaged they are:

- Damaged, rotten timber;
- Cracked or broken sections;
- Insufficient strength of elements;
- Insufficient stiffness and excessive bending of elements.

Foreva® Wood solutions are used to repair, reinforce and stiffen timber frameworks:

- By restructuring the defective material or replacing it using scarf joints;
- By adding passive reinforcements made up of internal tie rods working in tension or external timber elements working in compression or bending;
- By adding active tie rods.

1 - Beam broken due to mechanical failure
2 - Damaged timber

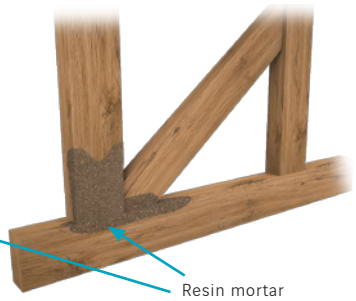


Foreva® Wood solutions are frequently used in combination to strengthen different areas of the same structure. Precise monitoring and a diagnosis are required to identify the areas to treat and define their criticality.

Freyssinet can, on request, offer advice in preparing an investigation, diagnosis and recommendation plan.

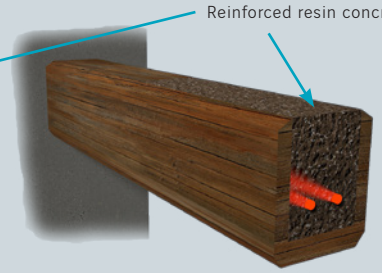
06/16

Repairing timber and replacing damaged sections



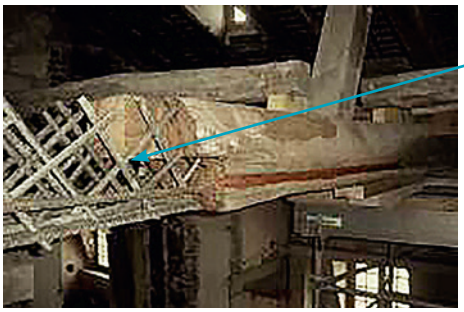
Joint restructuring

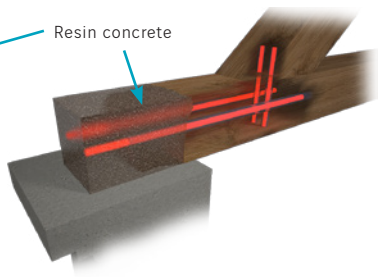
The **Foreva® Wood Frame** solution uses an epoxy resin mortar to restructure sections from which material has been lost as a result of localised rot or attack by micro-organisms. Composite rods can be added to reinforce the joint.



Beam restructuring

The **Foreva® Wood Frame** solution is used to restructure damaged sections of beams from which material has been lost, by pouring resin concrete and anchoring tie rods to the sound sections of the timber.

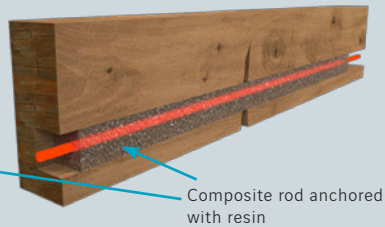




Resin concrete scarf jointing

When the end of a beam is too damaged for restructuring, the **Foreva® Wood Scarf** solution is used to remove the element and replace it with a new reinforced resin concrete section.

The through-coloured resin concrete is poured into formwork to obtain the appearance of continuous timber.



Seaming a cracked section

The **Foreva® Wood Reconnect** solution is used to reconnect cracked or broken sections by reinforcing them with composite rods to the area in tension.

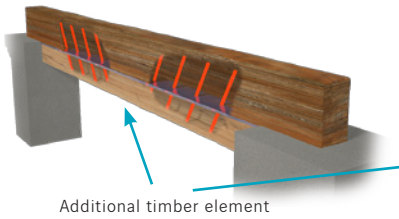
06/16

INCREASING MOMENT OF INERTIA

Increasing moment of inertia from underneath

The **Foreva® Wood Inertia INF** solution is used to increase the bending strength and stiffness of a beam by adding a timber reinforcement to the area in tension.

The timber foundation plate is secured to the existing element with epoxy resin adhesive and connected using reinforcement bars or composite rods.

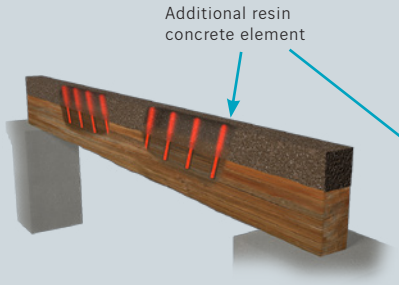


Increasing moment of inertia from above

The **Foreva® Wood Inertia SUP** solution is used to increase the bending strength and stiffness of a beam by adding a resin concrete compression flange.

This solution has the advantage of not altering the æsthetics of the underside of the floor.

The reinforcing plate is connected to the beam using resin shear keys and connecting rods.

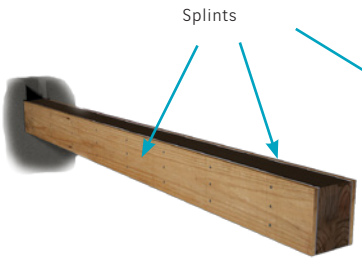


Splinting

The **Foreva® Wood Splinting** solution uses external timber panels secured to the element to be reinforced to increase its strength and bending inertia.

This solution can be applied in order to strengthen beams and columns, as well as for repairing damaged or under-sized structural joints.

This type of reinforcement can also be "active" if the structure is straightened by jacking before it is installed.



06/16

Reinforcing timber floors

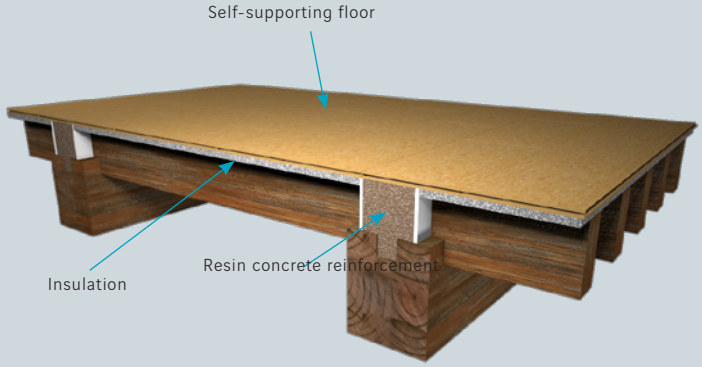
Self-supporting floor

The **Foreva® Wood Floor** solution is used to restore or increase the bearing capacity of floors.

It consists of adding a timber slab capable of absorbing all of the service loads and resting on the existing beams so that the load transfer is not altered.

The damaged or weak existing floor is left in place in order to retain the æsthetics of the underside of the floor. This solution can be advantageously combined with **Foreva® Wood Inertia SUP,** which is used to increase beam strength without the reinforcements being visible.

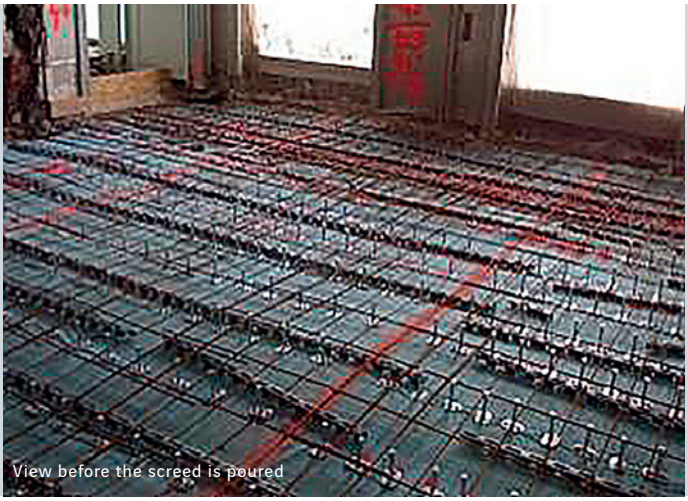
View before the insulation and floor are laid



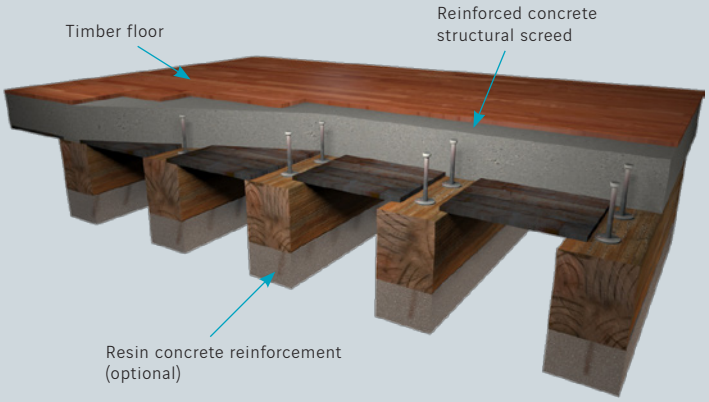
Timber-concrete composite floor

The **Foreva® Wood Composite Floor** solution is used to restore or increase the bearing capacity of floors.

It consists of combining a timber slab and a concrete foundation capable of absorbing all of the service loads.



View before the screed is poured



05/16

Reinforcement by tensioning

Active tie rods

The **Foreva® Wood Tensioning** solution uses active tie rods to increase the bending strength of beams or balance arch thrust.

The tie rods are attached to mechanical anchors pressing on the structure. They can also be connected to the structure using metal fasteners.

The tie rods are installed by qualified personnel using accurate, calibrated equipment in order to control the amount of force introduced into the timber structure.

Active tie rod

06/16

Over 60 locations worldwide

AMERICAS . Argentina . Brazil . Canada . Chile . Colombia . United States . Mexico . Panama . Peru . El Salvador . Venezuela .
EUROPE . Belgium . Bulgaria . Denmark . Spain . Estonia . France . Hungary . Ireland . Iceland . Latvia . Lithuania . Luxembourg . Macedonia . Norway . Netherlands . Poland . Portugal . Czech Republic . Romania . United Kingdom . Russia . Serbia . Slovenia . Sweden . Switzerland. Turkey .
AFRICA AND MIDDLE EAST . Abu Dhabi . South Africa . Algeria . Saudi Arabia . Dubai . Egypt . Jordan . Kuwait . Morocco . Oman . Qatar . Sharjah. Tunisia . ASIA . Brunei . South Korea . Hong Kong . India . Indonesia . Japan . Macau . Malaysia . Pakistan . Philippines . Singapore . Thailand . Taiwan . Vietnam . OCEANIA . Australia . New Zealand

FREYSSINET
SUSTAINABLE TECHNOLOGY

www.freyssinet.com

Find us on:

Freyssinet promotes the use of paper pulp from sustainably managed forests. The paper used in this catalogue is certified in accordance with the stringent rules of the PEFC (Program for the Endorsement of Forest Certification).
Publication: 06/2016 - R IV 2 - Printed in France

A SUBSIDIARY OF SOLETANCHE FREYSSINET