

Assembly Procedures of Steel Protection by Boards



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1. Lining Thickness

The thickness of the fire lining made of Grenamat AL Boards is defined based on the required fire resistance of 15 – 240 min, design steel temperature of 350°C - 700°C, if not defined, the design steel temperature of 500°C is used, and based on the ratio of A_p/V (A_p is circumference and V is the area of the steel profile cross-section). The area of standard profiles is in the tables of the profile producers).

Example of A_p/V calculation:



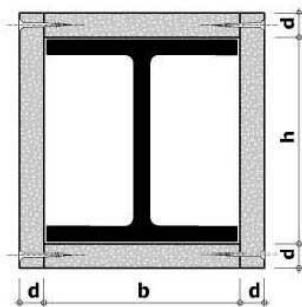
Example of A_p/V calculation

Column

protected from 4 sides

HEB 160

$V = 5\,430\text{ mm}^2$



$$A_p/V = \frac{2h + 2b}{V}$$

$$A_p/V = \frac{4 \times 0,16}{0,00543}$$

$$A_p/V = 117,9$$

From the table

R30 $d = 10\text{ mm}$

R45 $d = 13\text{ mm}$

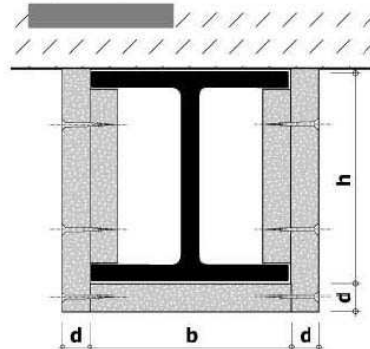
R90 $d = 29\text{ mm}$

Beam

protected from 3 sides

HEB 160

$V = 5\,430\text{ mm}^2$



$$A_p/V = \frac{2h + b}{V}$$

$$A_p/V = \frac{3 \times 0,16}{0,00543}$$

$$A_p/V = 88,4$$

From the table

R30 $d = 10\text{ mm}$

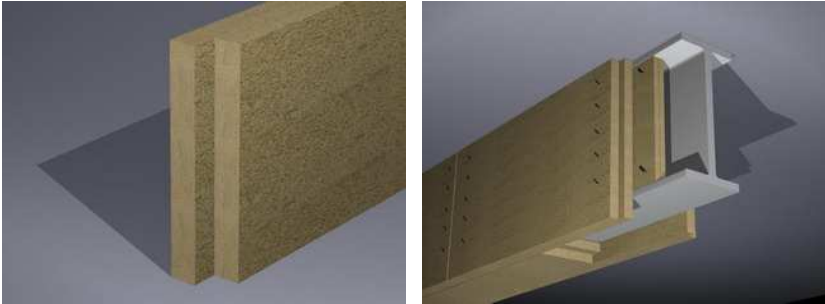
R45 $d = 10\text{ mm}$

R90 $d = 23\text{ mm}$

**Figures are valid
for critical temperature 500 C**

2. Board Preparation

Cut the boards according to the dimensions of the beam into sections being 1 200mm long. Make rabbets at the ends (Fig.) which shall be a half of the thickness of the board, always being in the opposite position to get as precise and safe connection as possible. As to the double-layer linings, overlap the joints without having to mill the rabbet. Consider the beam tolerance of +1,+5mm when cutting the boards, make the lining wider by this tolerance (Fig.).

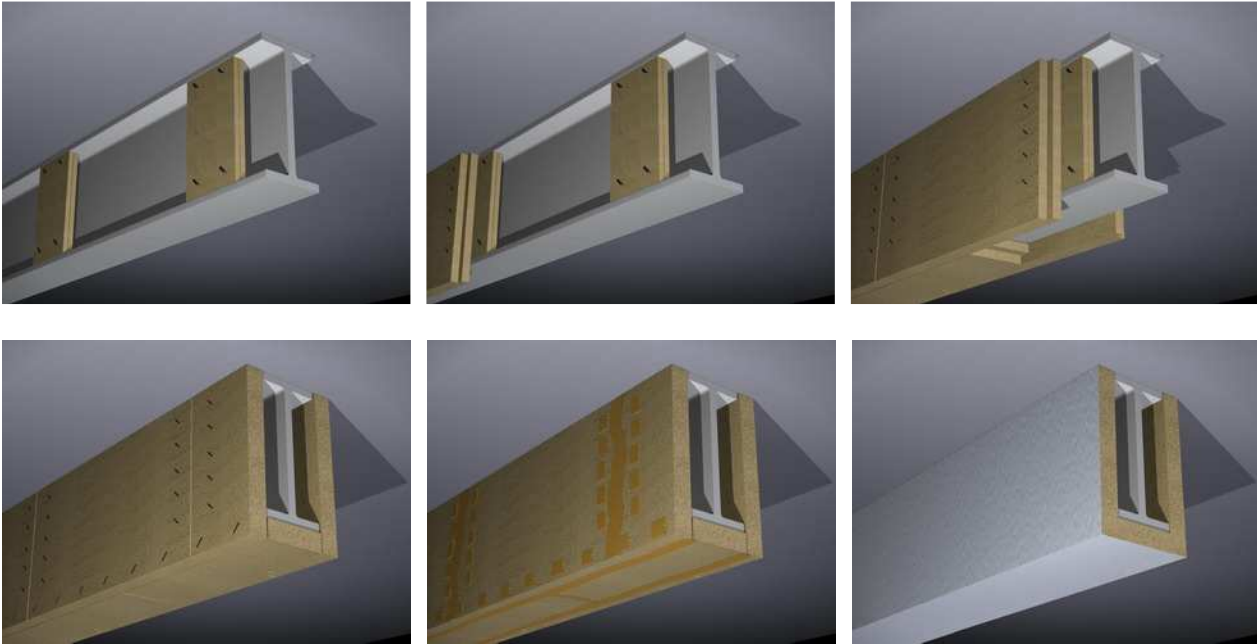


As to the beam lining, prepare fixing plates of Grenamat AL boards being 12 mm thick, 150 mm wide. Define the length according to the particular length of the beam to be lined (Fig.). Join the two 12 mm thick fixing plates using at least 4 clips. Use 30-50mm long and at least 10 mm wide clips.



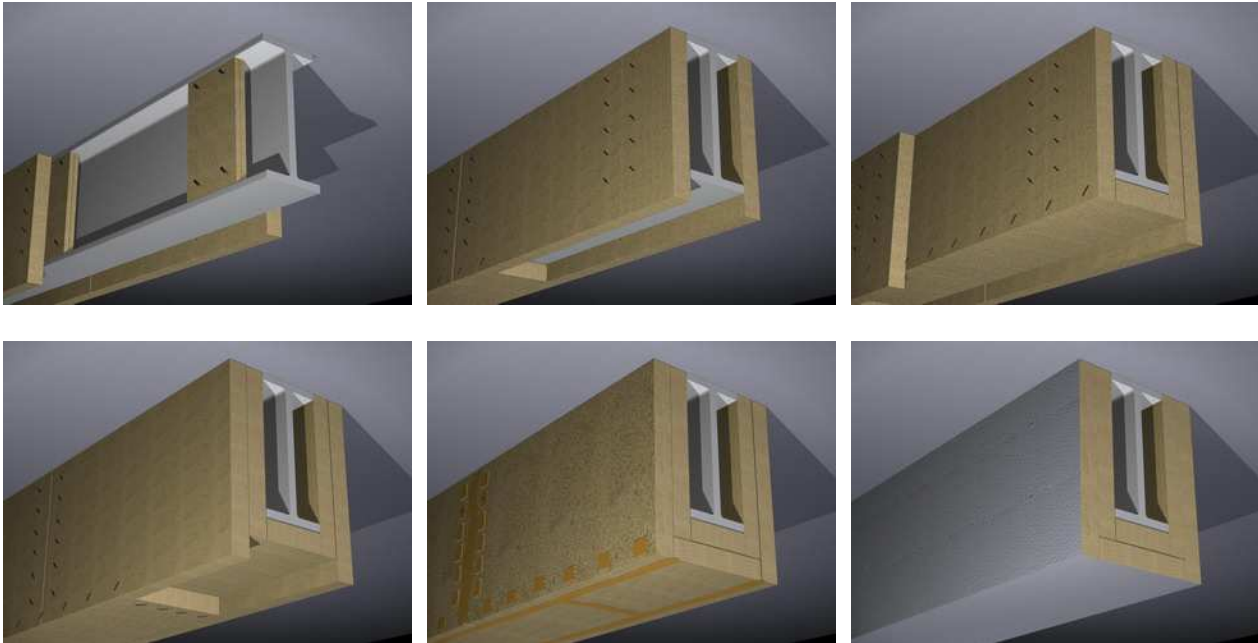
3. Beam Lining (one-layer lining)

Put the fixing plates, being 24 mm thick in total, into the beam (Fig.). Insert the plates into the beam tightly but gently to prevent the plate from breaking. Insert the plates in such a manner that the protruding clip ends will face the centre of the profile of the beam to be lined and will not obstruct the assembly. Place the plates maximally 610 mm apart. Clip the lining to the plates. The fixing plates shall be under the joints of the lining with one plate in the middle (Fig.). Use the 10 mm wide and 30 mm long clips for the boards of 28 mm thick and less and the 50-60 mm long clips for the boards of 28 mm thick and over. The spacing of the clips is maximally 50 mm. Set the pressure of the clipping device to such a value that the clips will extend about 1-2 mm into the board. Seal the clips and joints using the fire resistant paste. [Grena Klebepaste](#) (Fig.).



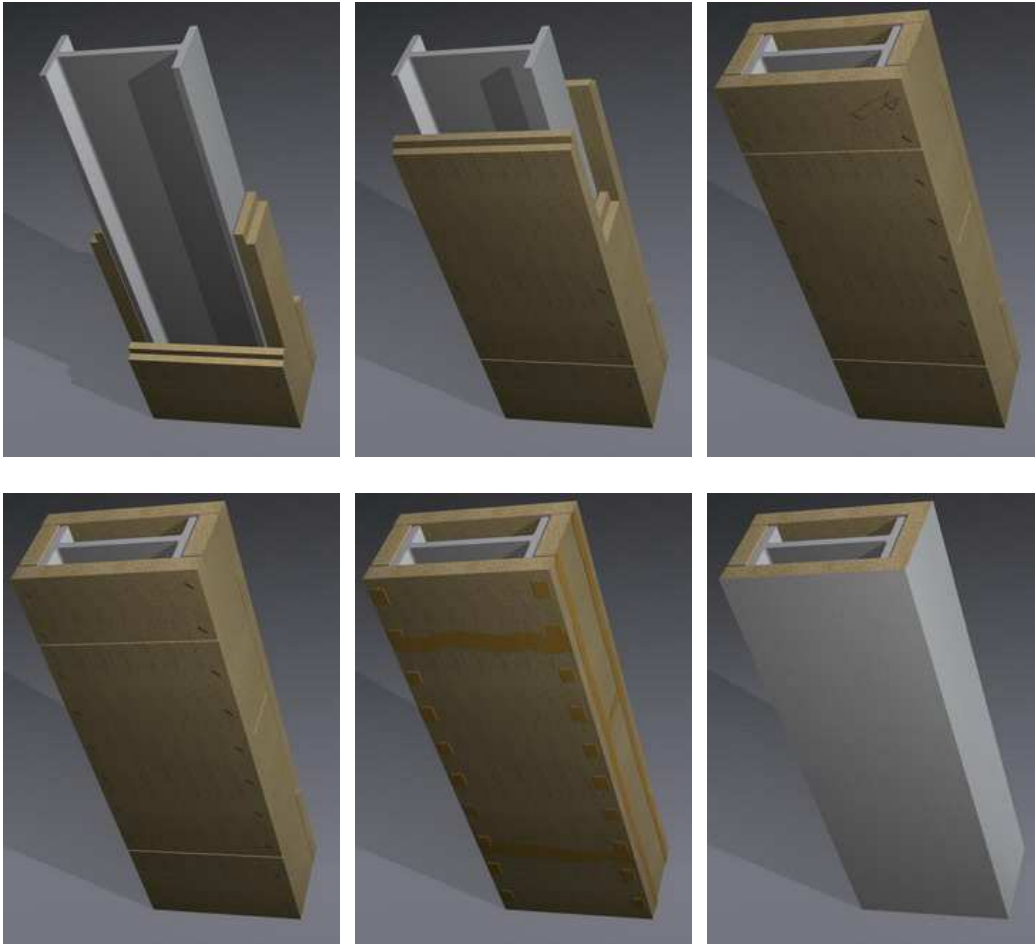
4. Beam Lining (double layer lining)

Put the fixing plates, being 24 mm thick in total, into the beam. Insert the plates into the beam tightly but gently to prevent the plate from breaking. Insert the plates in such a manner that the protruding clip ends will face the centre of the profile of the beam to be lined and will not obstruct the assembly. Place the plates maximally 610 mm apart. Clip the first layer of the lining to the plates. The fixing plates shall be under the joints of the lining with one plate in the middle. Overlap the joints of the first lining using the second layer. Use the 10 mm wide and 30 mm long clips for the boards of 28 mm thick and less and the 50-60 mm long clips for the boards of 28 mm thick and over or for the second layer. The spacing of the clips is maximally 50 mm. Set the pressure of the clipping device to such a value that the clips will extend about 1-2 mm into the board. Seal the clips and joints of the second external layer using the fire resistant paste [Grena Klebepaste](#) (recommended procedure in the Figure).



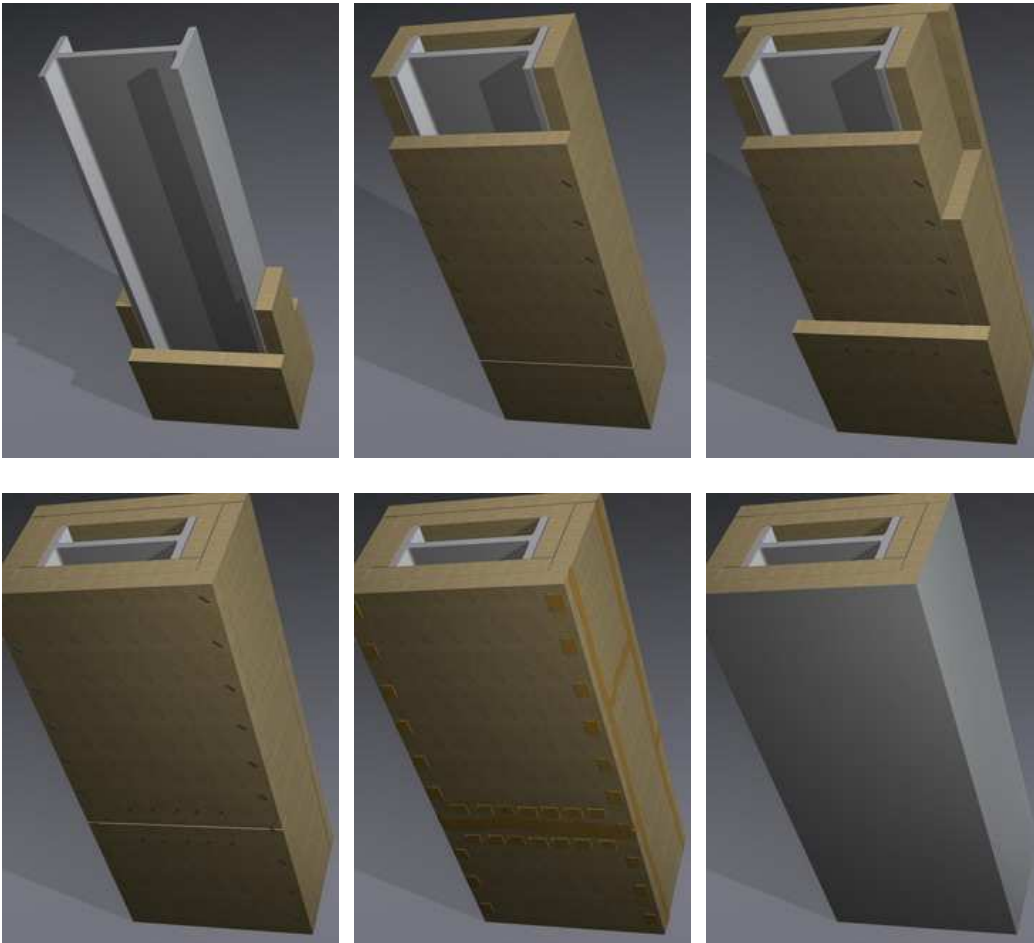
5. Column Lining (one-layer lining)

Join the lining sections using the clips to get the edge. As to the equilateral profiles (the height equals the width of the profile), choose the lining with two narrower and two wider lining sections or with the same width of the lining sections. Use the 10 mm wide and 30 mm long clips for the boards of 28 mm thick and less and the 50-60 mm long clips for the boards of 28 mm thick and over. The spacing of the clips is maximally 50 mm. Set the pressure of the clipping device to such a value that the clips will extend about 1-2 mm into the board. Seal the clips and joints using the fire resistant paste [Grena Klebepaste](#) (recommended procedure in the Figure).



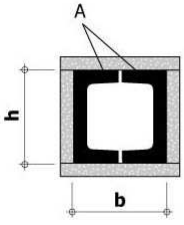
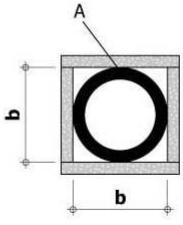
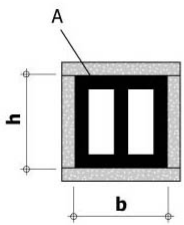
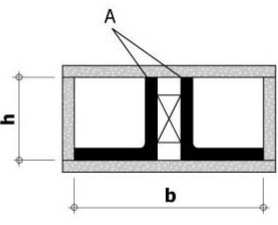
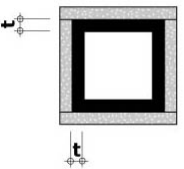
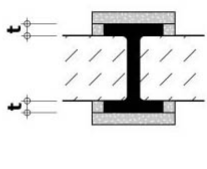
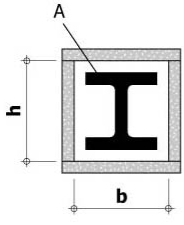

6. Column Lining (two-layer lining)

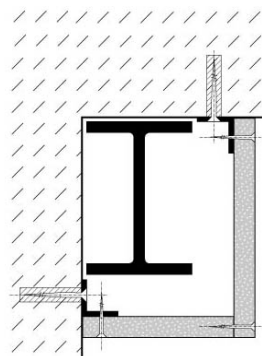
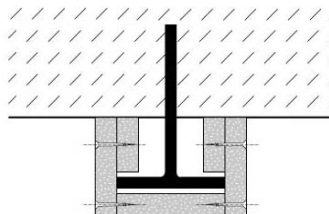
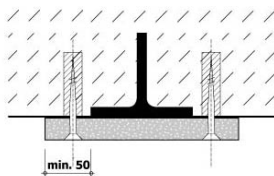
Join the first layer of the lining sections using clips to get the edge. As to the equilateral profiles (the height equals the width of the profile), choose the lining with two narrower and two wider lining sections or with the same width of the lining sections. Use the 10 mm wide and 30 mm long clips for the boards of 28 mm thick and less and the 50-60 mm long clips for the boards of 28 mm thick and over or for the second external layer. The spacing of the clips is maximally 50 mm. Set the pressure of the clipping device to such a value that the clips will extend about 1-2 mm into the board. Fix the second layer as the first one, cover the joints of the bottom layer by the second layer of the lining. Seal the clips and joints using the fire resistant paste [Grena Klebepaste](#) (recommended procedure in the Figure).



7. One-side lining or special lining

The ratio of A_p/V of the one-side and special lining is defined in a different way
 Example:

 $A_p/V = \frac{2h + 2b}{v}$	 $A_p/V = \frac{4b}{v}$
 $A_p/V = \frac{2h + 2b}{v}$	 $A_p/V = \frac{2h + 2b}{v}$
 $A_p/V = \frac{1,0}{t}$	 $A_p/V = \frac{1,0}{t}$
 $A_p/V = \frac{2h + 2b}{v}$	 $A_p/V = \frac{2,0}{t}$



When applying the lining, you need to adhere to important requirements such as thickness of the lining, overlapping of the joints, spacing of the clips and plates, clip size, clips extending 1 -2mm into the board, sealing of the joints and plates. If the lining is to be fixed on the ceiling, use the steel dowels, 4 mm screws, the length determined by the material thickness plus a minimum of 1/3 of the material thickness.

8. Lining Finishing

The lining may be treated as the elevation one. Thin-wall plaster is the simplest and cost effective way.

Procedure:

After the plaster is mixed according to the producer's recommendation, apply the plaster directly onto the lining, Grenamat AL boards. After a short cure time (about 15 minutes), use a steel finisher to make the surface smooth and let it dry.

In case you have other requirements for the finish treatment, do not hesitate and contact our technical department.

