

Packing of HPL and Gaps

A few notes indicating the direction we should take to ensure ,or at least reduce the risk of loss of HPL or gaps during their movement around the world

HPL (Bakelite) is very heavy. These two pictures come from the resistivity measurement trolley in Pan Pla.



The base of any packing must therefore be solid.

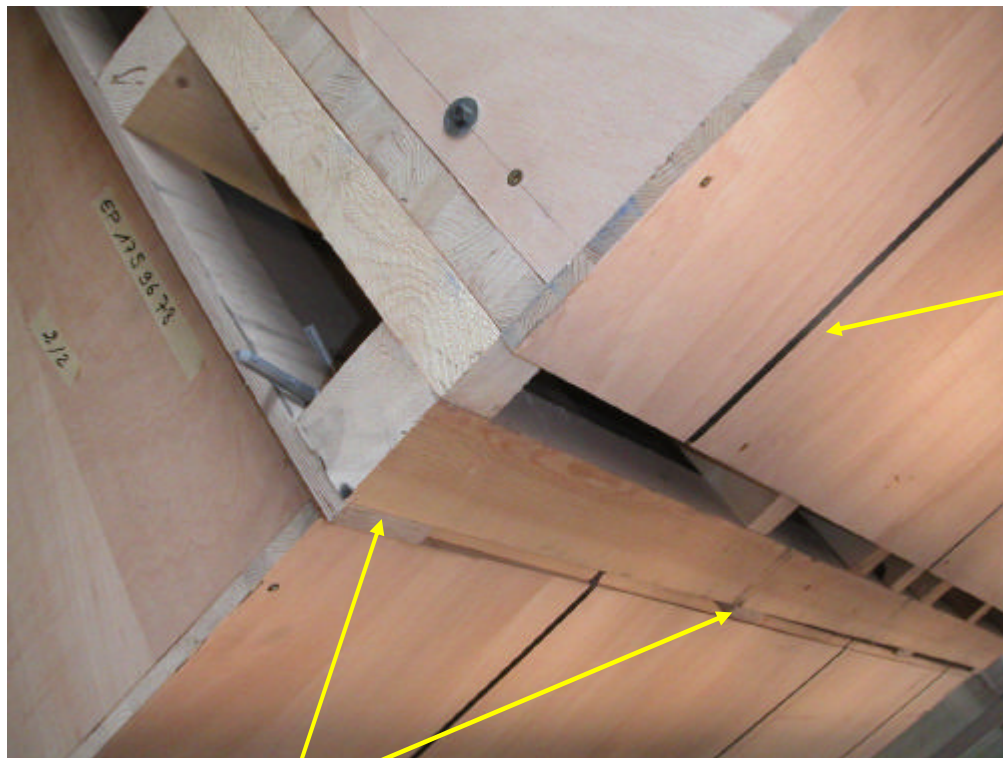


This was the last delivery from Korea and only just survived the transport. CERN is at present going through a legal process with the transporters to claim damages. These of course do not help us out with production of chambers

The base structure is open to shear forces from the forklift truck as they attempt to align the forks resulting in collapse and lose of floor rigidity. This may result in more violent maneuvers to insert or remove the forks.

Solid sections of wood, 100mm x 100mm are better if screwed using large screws (diam 8- 10 mm) vertically through the structure.

An example of a base structure that should survive somewhat longer.



The marine Plywood shear plates screwed to the base

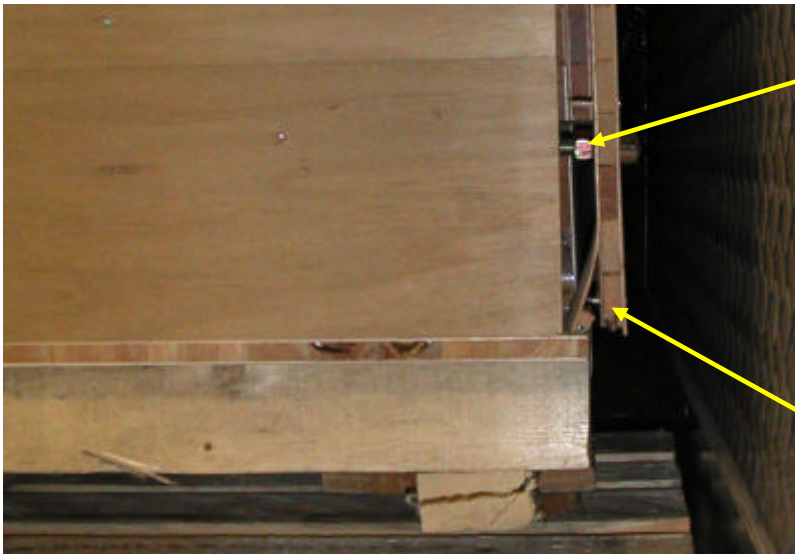
Steel Straps

The already strong beams are now held together at the base to resist the shear load previously mentioned that comes from the Forklift truck operations.

The box has also been 'strapped' with steel bands. This despite it being empty!

The layout of the beams is not necessarily the best as access with a Transpalet is only possible from the ends and will not work unless the centre of gravity is kept sufficiently close to one end AND the box is taken from the same end!

The load must be secured in the box so it can't slid or tilt

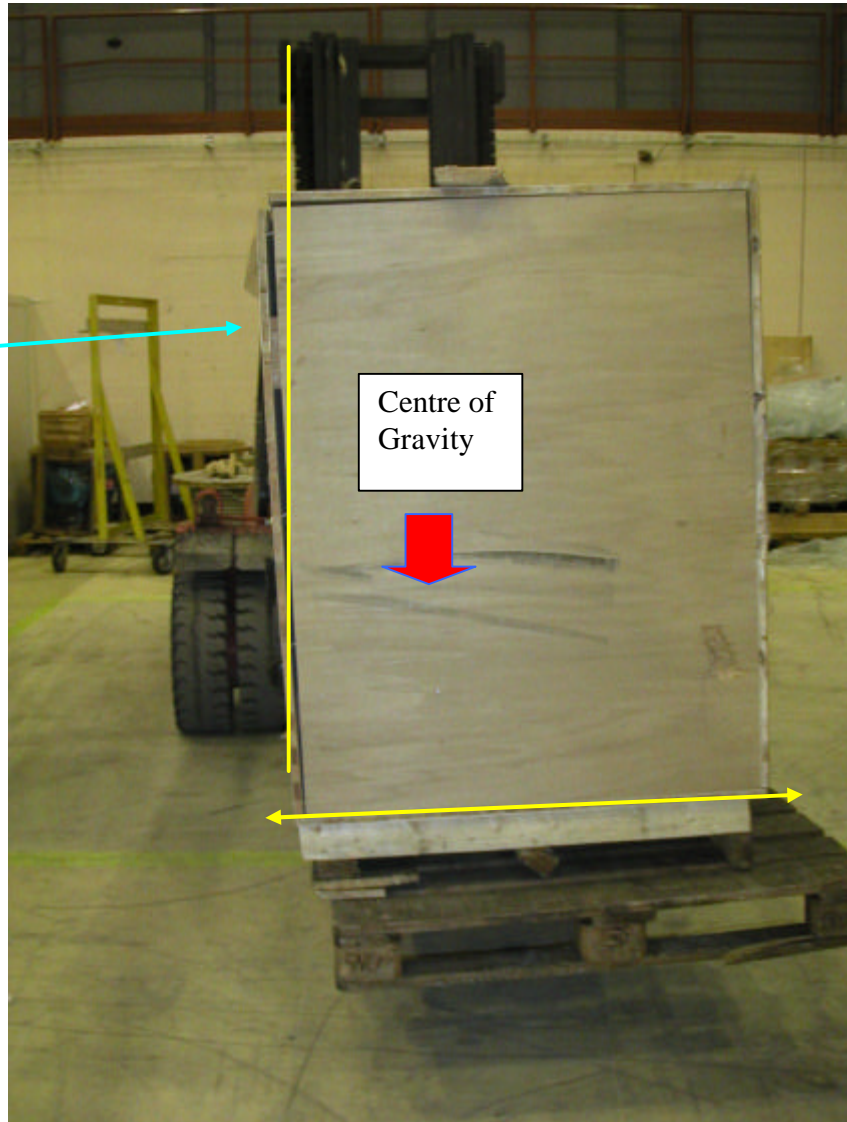


Here the massive 20mm threaded bar clamping the load are not secured to the base and so allow the load to shift further to the outer edge so decreasing the already reduced stability of the asymmetric load.

The side panel that effectively secures the load inside the box is attached with 30-40mm thin dia. wood screws. **THIS IS NOT** sufficient for 600kg.

Another picture of the same box. The load is off-centre so increasing the risk of tipping over.

The box is tilting despite the rigidity of the Fork lift



The load has shifted inside by sliding on the floor and has started to leave the box. The fork lift truck is very much off centre indicating the centre of gravity is far from the box centre. If this is absolutely necessary then clear indications of the C. of G. MUST be made on the outside of the packing. It is potentially dangerous for both man and machine.

A space of at least 10cm must be maintained around the gaps/HPI as a safety zone in case of 'accidental' perforation of the light weight exterior panels.

Box perforation due to forklift Truck.



Another case of perforation in August 04.

This is the result catching the edge of the box



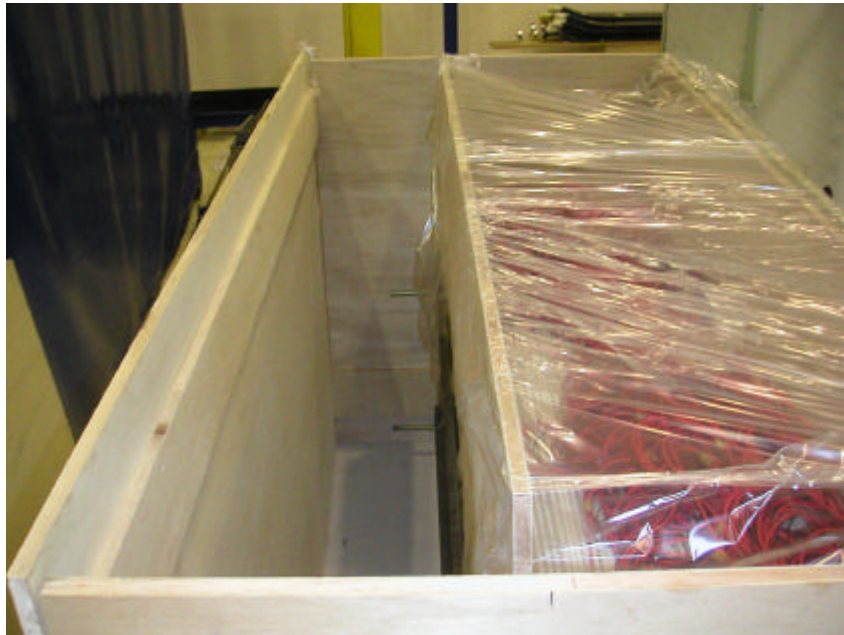
Edge panel
separation

This damage is again due to Forklift Truck drivers who.....

The screws attaching the side panels must be moved to more solid wood once they have been used a few times. Perhaps we should use larger ones.

Steel straps must be used in at least one sense.

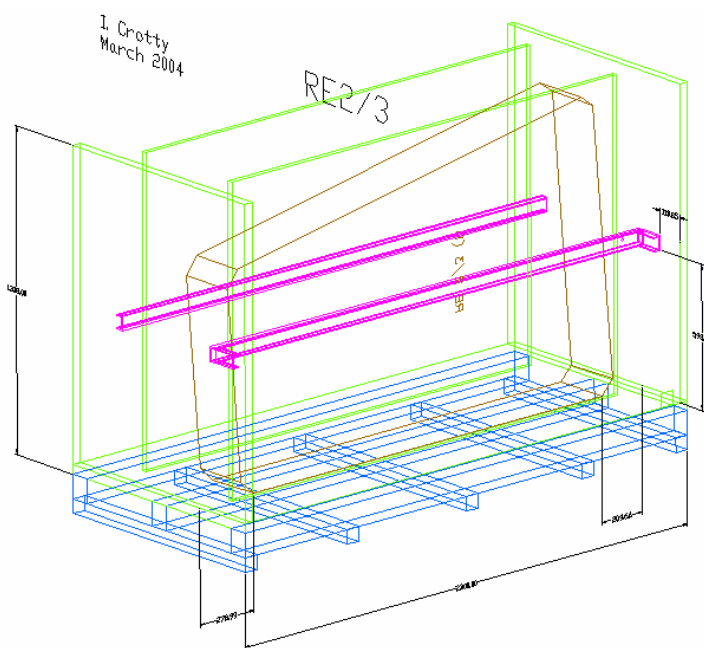
The Load should be positioned so as to maintain the Centre of Gravity somewhere near the centre of the box.



This is not a good example. This may have been the complimentary cause of failure in the previous delivery. The load is on the same side as the narrow base beam collapse shown on page 2

The drawing available on the web gives some dimensions and ideas of sizes. IT IS NOT complete as development has gone on since these first versions, notably the reinforcements of the end plate panels to the floor that is now done with 60mm x 60mm wood bolted through the end plate and floor with M8 or 10 bolts placed every 200mm and at 90 degrees to each other.

Using 2 levels of beams at different heights and they should be of the pre-stressed type using 2 bolts in the length of the beam to maintain the inner most one straight.. This means that 87 beams in total are required but only 2 are attached to the end plates.



The address is

<http://project-cms-rpc-endcap.web.cern.ch/project-cms-rpc-endcap/rpc/Production/Oil%20&%20Bakelite/Packing/>

Look for the two files 'PackingRE22.dwg' and 'PackingRE23.dwg'. These dimensions have been calculated to cover all RE cases.

The floor must not represent a danger to the gaps, screw in this case
This was the cause of the loss of some gaps. Sorry no photos here.

Packing can be done in a very serious manner as shown below.



In some projects at CERN Forklift trucks are banned in favour of cranes or of course if designed as above they are autonomous .

Ian Crotty

10 May 2005.