

STACKING TECHNIQUES

Source: Safe Stacking and Storage. Published by the Occupational Safety and Health Service. Department of Labour. Wellington. New Zealand. ISBN 0-477-03449-7. First published: 1985. <https://cdn.auckland.ac.nz/assets/science/for/current-students/HR/health-safety-wellness/documents/SafestackingandStorage.pdf>

Stacking is a cost-efficient storage solution for articles that can be stacked on top of each other. The most suitable stacking technique is determined by the size, shape, weight, and durability of the articles.

Articles are typically stacked into a column, square, pyramid, stepped, triangular, or lean-to stack.

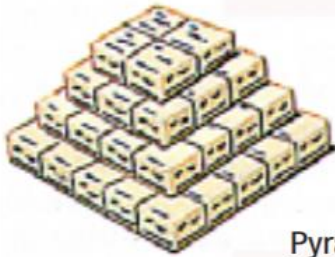
Column stack – A stack with boxes of the same size stacked on top of each other facing in the same direction.



Square stack – Any stack (other than a column) with all sides vertical.



Pyramid stack – A stack in which the plan area is reduced in every succeeding tier.



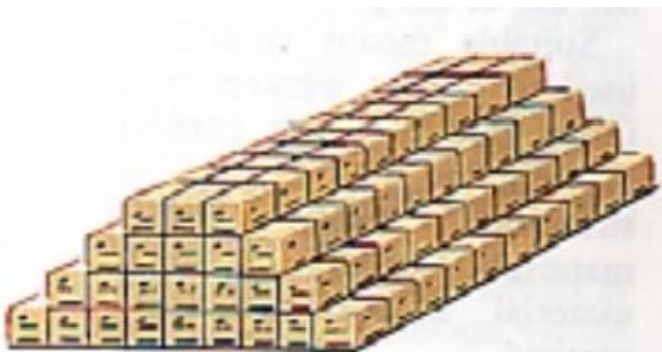
Pyramid stack

Stepped stack – Like a pyramid stack, but the number of boxes decreases after every two or more layers.



Stepped stack

Triangular stack – Two sides are stacked like a pyramid or stepped stack, the other two sides being vertical.



Triangular stack

Lean-to stack – A stack with a pyramid or stepped pattern on one side and vertical on the other three sides.



The stability of the stack depends on the following factors:

- The height of the stack in relation to the width of the base
- Sound interlocking of the goods
- The content of the sacks or cartons
- The structure of the sacks or cartons
- The shape of the articles
- How well the articles on the bottom withstand and support the weight of the articles on top
- Proper planning

If necessary, the stack must be secured, for example, by lashing or using shrink film, nets, wedges, or tarpaulins. You may also place, for example, cardboard sheets between the layers to support the structure.

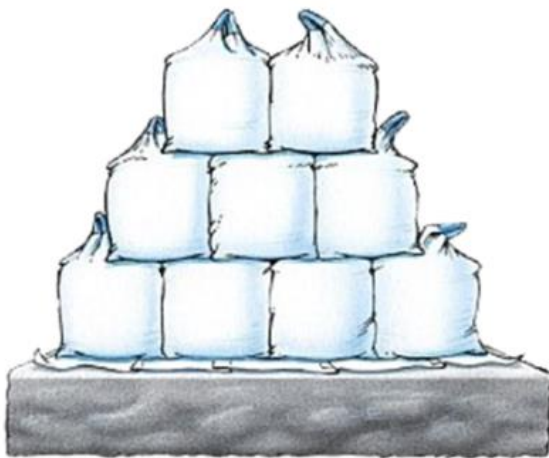


Figure 1. Fertiliser bags in a pyramid stack. (Yara, 2021)

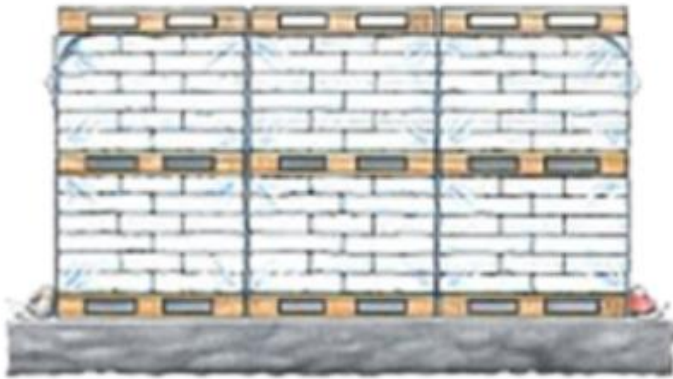


Figure 2. A combined column and square stack. (Yara, 2021)

Stacking different types of goods and packages

The shape and material of the goods or packages must be taken into account when stacking. In addition, you should always ensure the stability of the stack and use proper tools and equipment when handling the stack. Below are a few examples of how you can stack different types of goods.

When stacking sacks, you should stack the sacks in interlocking rows and make sure that the layers are as even as possible. If possible, place the sacks in such a way that their open-end seam is to the inside of the stack. If there is a risk of the sacks slipping, or if the stack is high, you can place pallets or cardboard sheets between the layers. Sacks made from synthetic materials in particular may slide easily.



Figure 3. Stacks of sacks (Photo: Pixabay)

When stacking cardboard boxes, it should be noted that vibrations and humidity may affect the durability of the boxes. The boxes on the bottom may not withstand the weight of the load if they are damaged. Boxes should be aligned in an interlocking pattern whenever possible.



Figure 4. "Fireworks Cartons Stacked and Ready for November the 5th" by EpicFireworks.

When stacking bales, make sure that the stack is stable and that the bales lean towards the centre. Bales packed in plastic in particular may slide easily.



Figure 5. Waste bales. (Photo: YLE / Heli Venho)

Bottles can be stacked side by side in small quantities, using wedges if necessary.



Figure 6. "Old water cooler bottles" by Earl - What I Saw 2.0 is licensed under CC BY-NC-SA 2.0"

When stacking bottles vertically, the stack must be properly supported, for example by placing boards between the layers of bottles.



Figure 7. "Cermic bottle stack" by Krista76 is licensed under CC BY-NC-SA 2.0



Figure 8. "no house wine bottle stock" by FLY2005 is licensed under CC BY 2.0

Barrels can be stacked sideways or upright, depending on the manufacturer's instructions. If the barrels are stacked sideways, the stack must be secured with wedges or using vertical supports on the sides, for example. Barrels can also be stacked using barrel racks.



Figure 9. "2007" by isado is licensed under CC BY-ND 2.0



Figure 10. "Stacked Drums" by gelund is licensed under CC BY-NC-ND 2.0



Figure 11. Barrel rack (ajtuotteet.fi)

When stacking pipes, poles, and bars, the stack should be supported by wedges, planks, or racks to prevent the items from rolling.



Figure 12. "Pipe storage" by markvall is licensed under CC BY-NC-SA 2.0



Figure 13. "Pipe storage" by Richard Webb is licensed under CC BY-SA 2.0