SFD and BMD from Excel Sheet

This Python code is written to visualize the shear force and bending moment distribution along a beam using data stored in an Excel file. It starts by importing the necessary libraries — pandas for handling the Excel data, numpy for numerical operations (though not used much here), and matplotlib.pyplot for plotting the graphs. The file path of the Excel sheet is given, and the sheet named "Sheet1" is read into a DataFrame. This sheet contains three important columns: Distance (in meters), Shear Force (in kilonewtons), and Bending Moment (in kilonewton-meters). These values represent how the beam reacts internally when subjected to loads. Once the data is extracted, the code creates two subplots in a vertical layout — the upper one for the Shear Force Diagram (SFD) and the lower one for the Bending Moment Diagram (BMD). The shear force is plotted using blue dots connected by lines to show how it varies along the beam, and the bending moment is plotted using red squares and lines. Both diagrams include a horizontal black line at the zero level to clearly show where the values switch signs, which is important for identifying points of maximum stress or internal change. Labels for the axes, plot titles, legends, and grid lines are all added to make the graphs clear and easy to interpret. Finally, the plots are neatly arranged and displayed. These diagrams are very useful in structural and mechanical engineering, as they help in analyzing the internal forces acting on a beam, which is essential for safe and efficient design.

Develop a CAD drawing with PythonOCC of a Laced Compound Column as shown in the representative image.

Firstly, it creates a single I-section:

- An **I-section** is shaped like a capital letter "I". It's commonly used in construction because it's strong and lightweight.
- It is made using **three rectangles**:
    - A **bottom flange** (the base part),
    - A **top flange** (the upper part),
    - A **web** (the vertical piece that connects the top and bottom).
- The code places each part in the correct position to form the I shape, then joins them together.

Next, it duplicates the I-section:

- Now that we have one I-section, we need **two of them placed side by side**, with a small gap between.
- The code **copies** the first section and **moves** it to the right.
- Then, it **fuses** both together so they form a pair — this makes up the main vertical structure of the column.

After this, it adds battens:

- **Battens** are like horizontal plates that connect the two I-sections at their ends, giving extra stability.
- The code creates a small box shape (the batten) and places **one at each end** — left and right.
- These are attached (fused) to the two I-sections.

Then, it adds a diagonal lacing bar:

- **Lacing bars** connect the two I-sections diagonally and help distribute the load better.
- A long, flat rectangle is created to represent the lacing.
- It is rotated and positioned between the two columns to connect them diagonally.
- This bar is also fused into the overall structure.

Finally, the entire structure is displayed:

- After everything is built, the code uses a viewer window to **display the full 3D model** of the column.
- You can **zoom, rotate, and view** the structure from different angles.