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INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY (DEEMED UNIVERSITY)

ANALYSIS OF STRUCTURAL FRAMES USING MATLAB

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OUTLINE

- ❑ Basic Introduction of 2-D Structural Frames
- ❑ Analysis of 2-D Structural Frames
- ❑ Workflow
- ❑ Application Tool and it's features
- ❑ Structural Parameter Diagrams
- ❑ Benefits of Tool

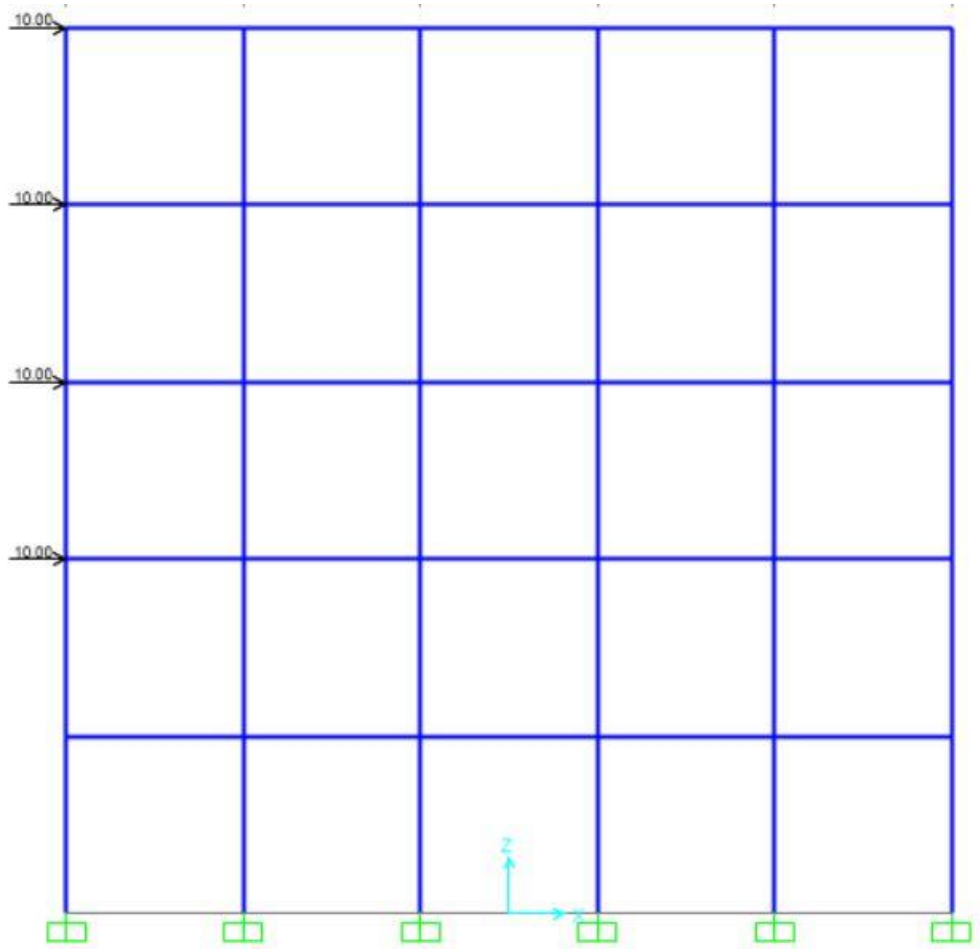


MATLAB To Civil Engineers

- ✓ Provides arrays and linear algebra routines, however has more convenient syntax.
- ✓ By comparing full OLS estimation functions for against Python, MATLAB is roughly 3 times faster.
- ✓ Easier to analyse the multidimensional element like space frame, space truss we can easily write the Stiffness Member Approach algorithms.
- ✓ Helpful to learn and understand the programming of different Civil Engineering software such as STAAD.PRO, E TABS, SAP 2000



2-D STRUCTURAL FRAMES



2-D Structural Frames consist of:

- ✓ Different Length
- ✓ Different c/s Area
- ✓ Different Height
- ✓ No. of Bays and storeys
- ✓ Different Lateral load



ANALYSIS OF 2-D STRUCTURAL FRAMES

Approximate Methods for Analysis:

- ✓ Cantilever Method
- ✓ Portal Method



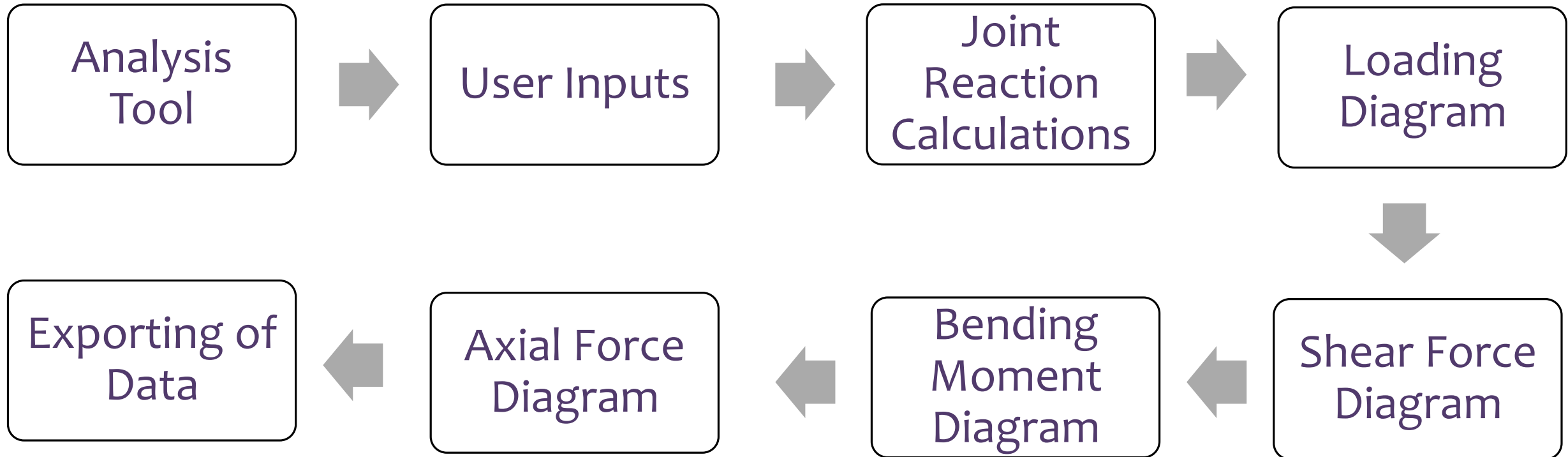
Complexity in Analysis:

- ✓ Lengthy and Tedious Calculations
- ✓ Different c/s of columns
- ✓ For quick approximate analysis, Traditional software are much comprehensive than required

WORK FLOW



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Approximate Method For Analysis of Frames

HELP

Select Analysis Method

☐ Cantilever Method ☐ Portal Method

Inputs

No. of Bays:

No. of Storeys:

Length(m) of bays:

Height(m) of stories:

Area(relative) of columns:

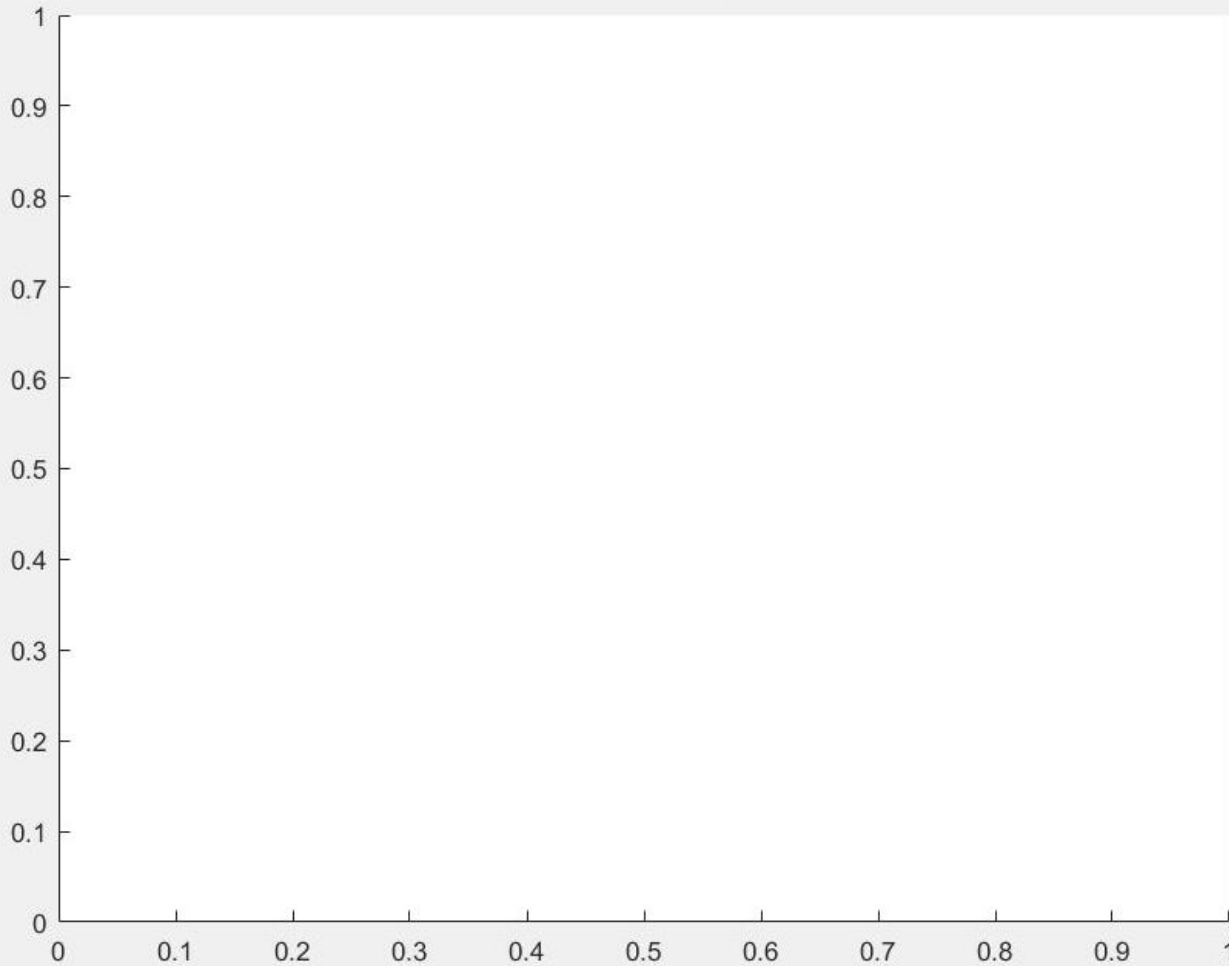
Load(kN) on stories:

Error

Errors will be displayed here!

Select Output

OK



 Analyze

Reset



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Figure: Application Tool

5

FEATURES OF TOOL

- ✓ User Manual
- ✓ Exporting of required data to Excel Sheet with single click
- ✓ Analytical figures for the 2-D structural frame design parameters
- ✓ A platform to analyse structural frames with two different sets of assumptions



OUTPUT



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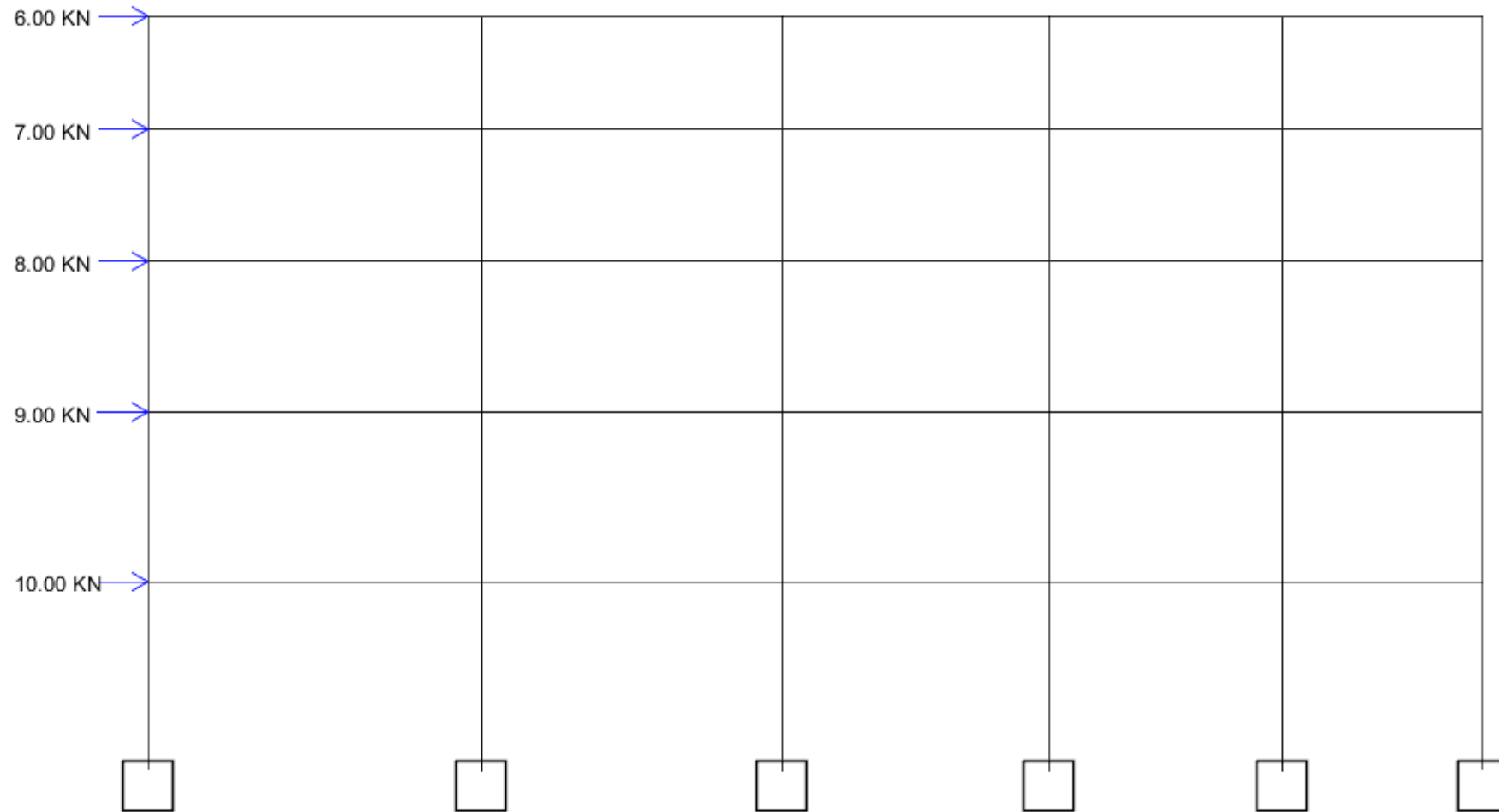


Figure: Loading Diagram

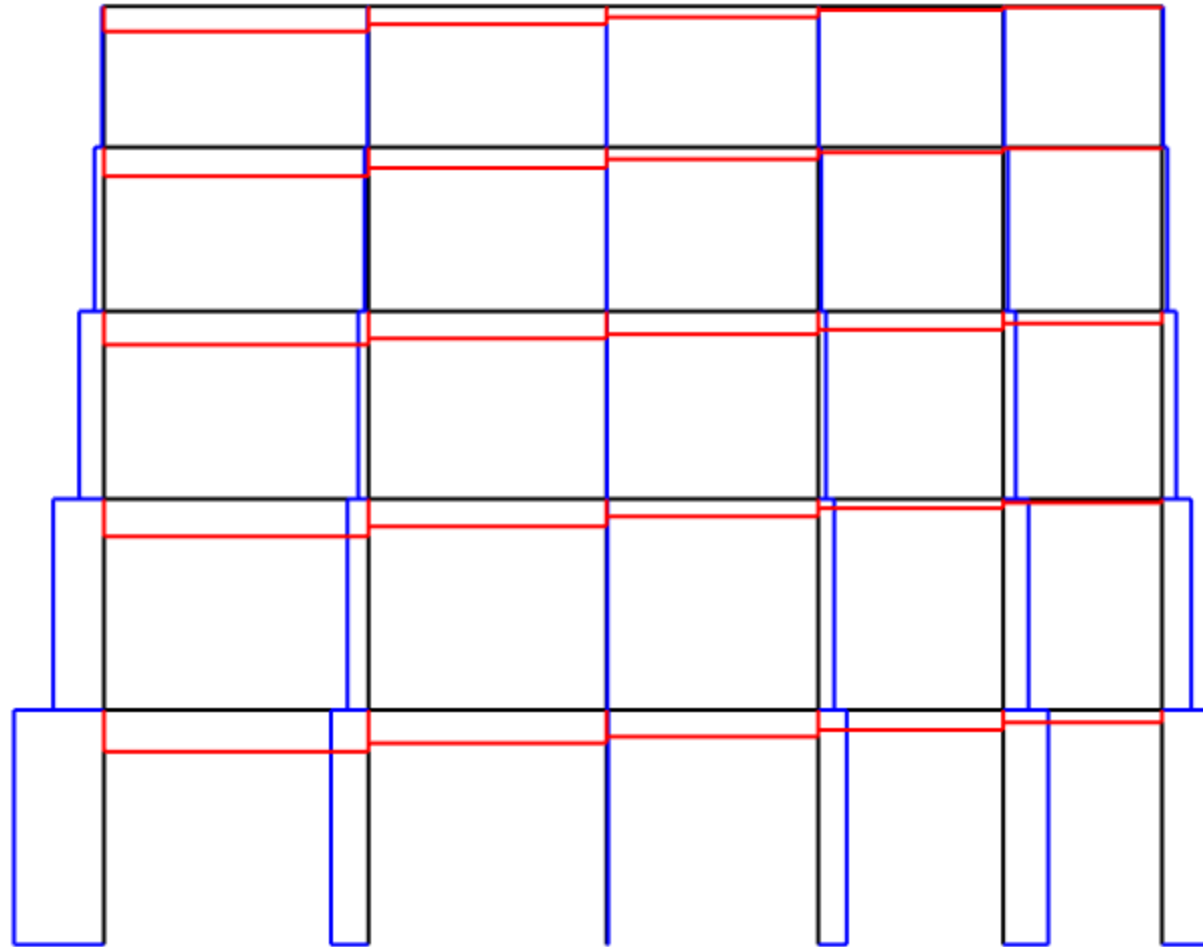


Figure: Axial Force Diagram

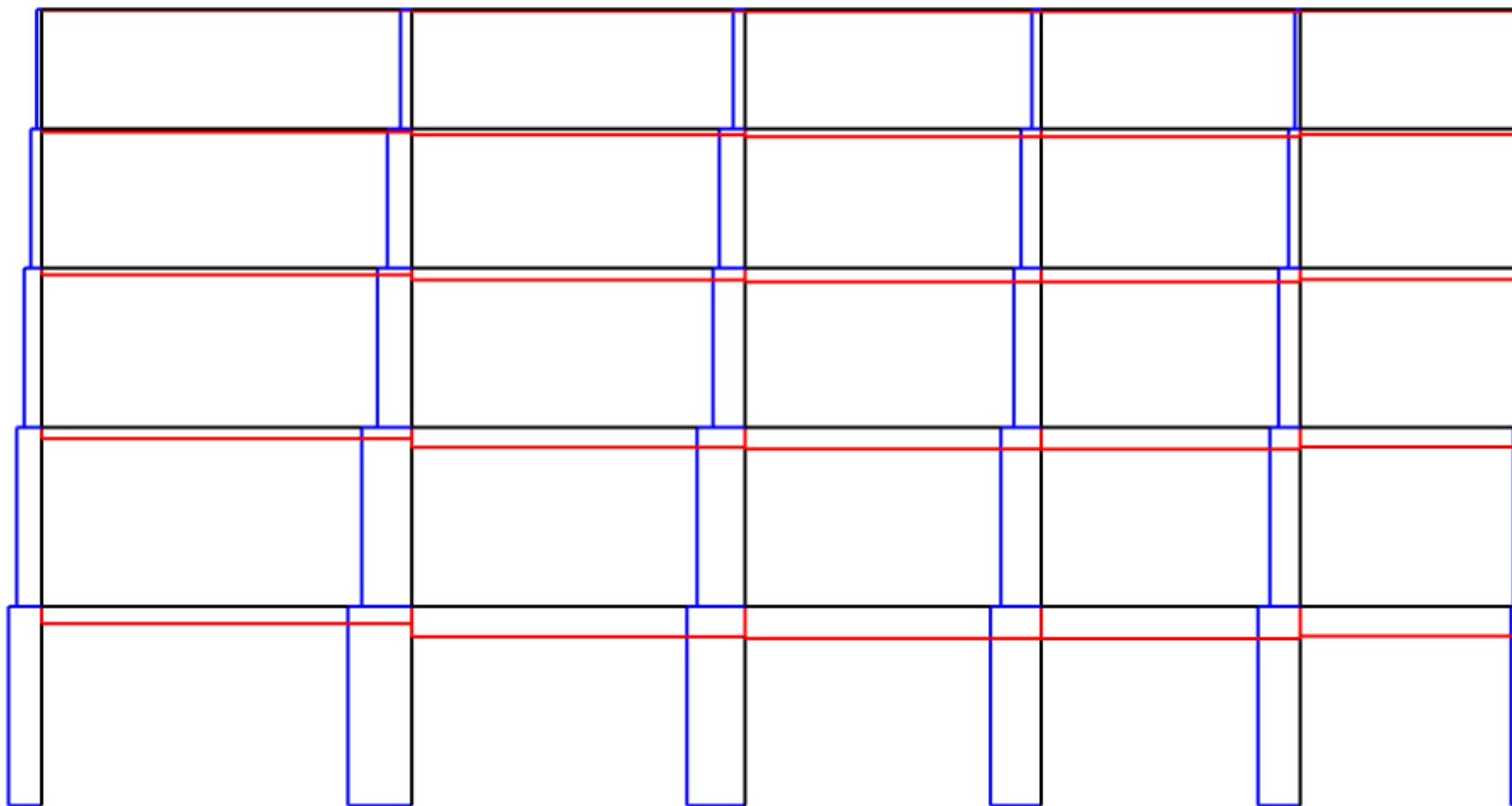


Figure: Shear Force Diagram

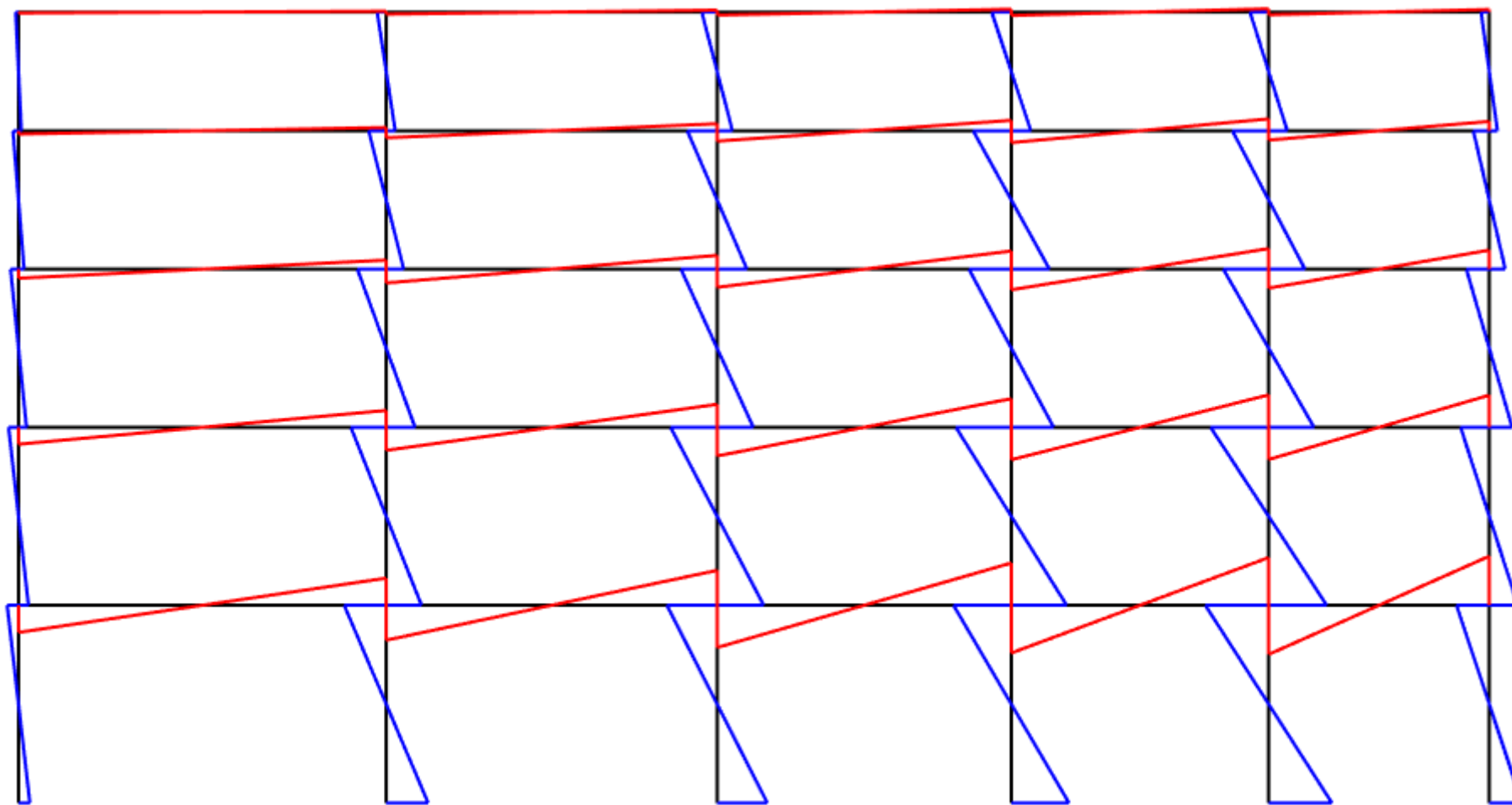


Figure: Bending Force Diagram

[illegible]

Figure: Extracted Data of Analysis

BENEFITS

- ✓ Quick Calculation (~~Tedious Calculation~~)
- ✓ Easier for any kind of structural frame (~~Complexity for larger structural frames~~)
- ✓ Provides all structural design parameters (~~Time taking procedure for plotting Shear force/Axial force/Bending Moment diagrams~~)
- ✓ Organizes and Exports required design parameters to Excel sheets (~~Increases effort in saving all records in computer~~)



How MATLAB Helped Us?

- ✓ User-friendly interface for making Graphic User Interface (GUIDE)
- ✓ Easy to make executable applications using MATLAB compiler which will work on any computer system
- ✓ Matrix operations makes easier process for the complex numerical as well as algebraic computations which helps to interpret the data in a smoother way.
- ✓ Easy variable management





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THANK YOU