



DESIGN OF STEEL STRUCTURE

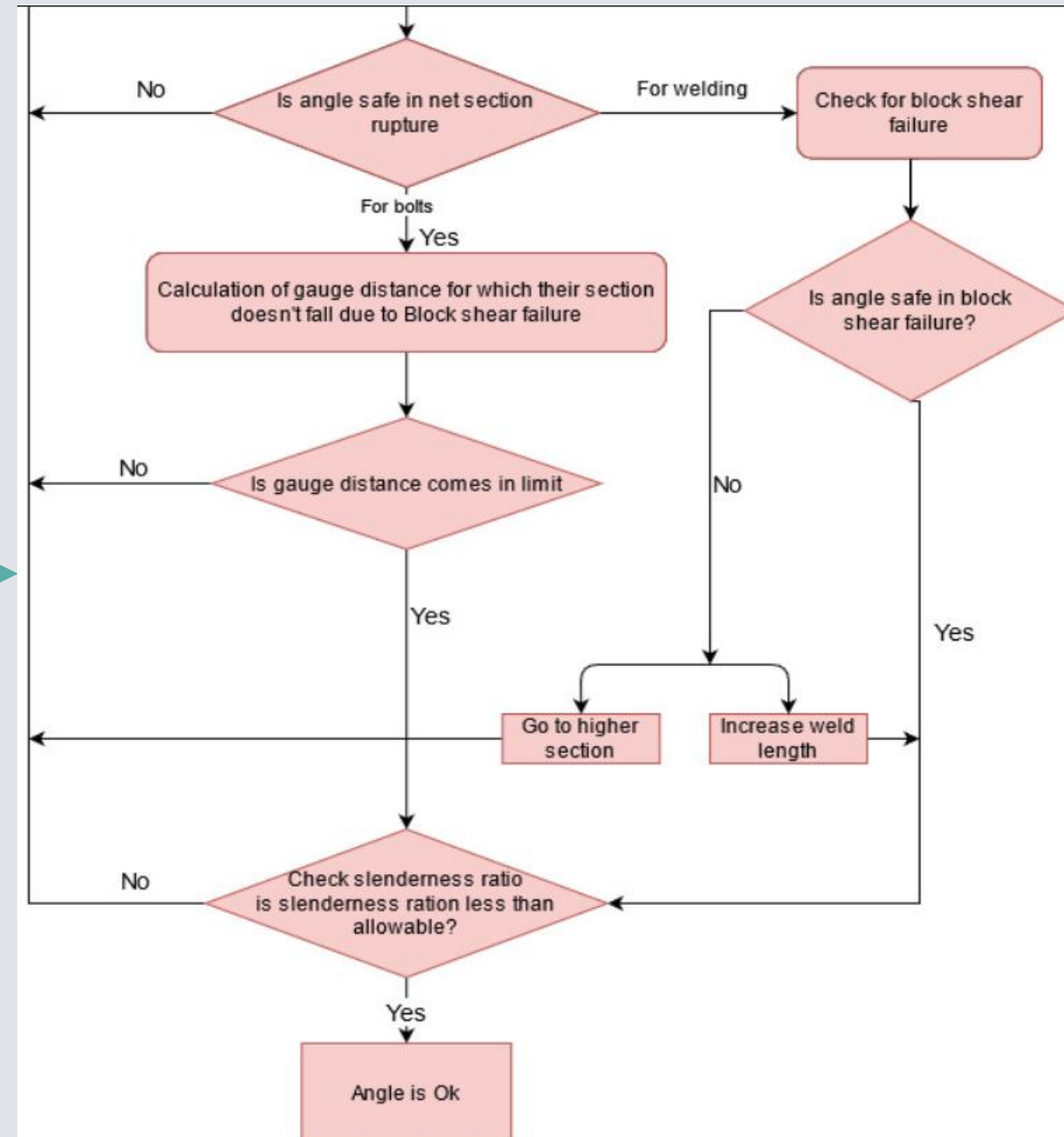
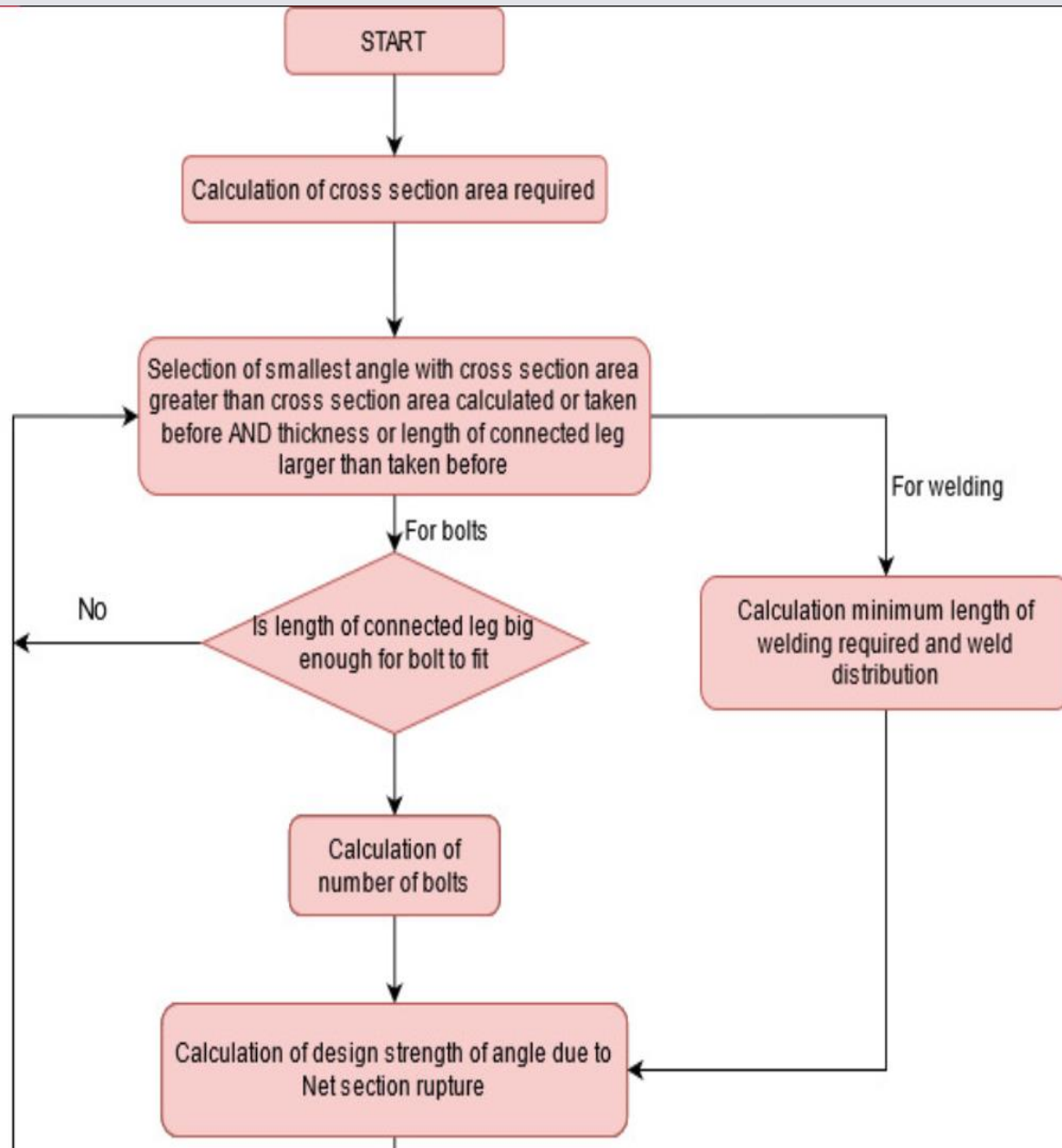
GUI PROJECT

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WORKFLOW OF THE CODE



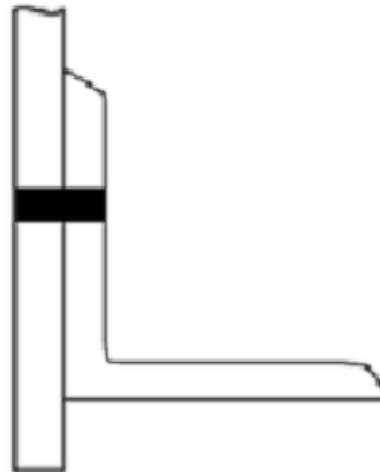
Test Case- Screen 1

Design Of Tension Member



Select Type

- ☒ Single Angle Section with bolted connections
- ☐ Single Angle Section with welded connections
- ☐ Double Angle placed same side of gusset plate with bolted connection
- ☐ Double Angle placed opposite side of gusset plate with welded connection



GET INPUT VALUES

SELECTING A TENSION MEMBER
OUT OF THE OPTIONS GIVEN IN
THE SCREEN NUMBER 1

Test Case- Screen 2

Single Angle Section with bolted connections

Inputs

| | |
|--------------------------------|-----------------------------------|
| Factored Load in KN | <input type="text" value="200"/> |
| Length of tension member in mm | <input type="text" value="3000"/> |
| Allowable Slenderness Ratio | <input type="text" value="350"/> |

Properties of Steel

| | |
|---|----------------------------------|
| <input checked="" type="checkbox"/> Fe410 Steel | |
| Ultimate Tensile Stress in Mpa | <input type="text" value="410"/> |
| Yield Stress in MPa | <input type="text" value="250"/> |

Partial Safety Factors

| | |
|---|-----------------------------------|
| <input checked="" type="checkbox"/> Take according to IS800 table 5 (cl. 5.4.1) | |
| Governed by ultimate strength (γ_{m1}) | <input type="text" value="1.25"/> |
| Governed by yielding (γ_{m0}) | <input type="text" value="1.1"/> |

Type of Design

| | |
|--|--|
| <input checked="" type="radio"/> Design for economical section | |
| <input type="radio"/> Check for a particular section | |

Properties Of Bolts

| | |
|--|----------------------------------|
| <input checked="" type="radio"/> Grade 4.6 | <input type="radio"/> Grade 8.8 |
| Ultimate tensile strength in MPa | <input type="text" value="400"/> |
| Diameter of bolt in mm | <input type="text" value="20"/> |

Pitch and End Distance

| | |
|--|---------------------------------|
| <input checked="" type="checkbox"/> Take min. value according to IS800 | |
| Pitch in mm | <input type="text" value="50"/> |
| End Distance in mm | <input type="text" value="30"/> |

Partial Safety Factor

| | |
|---|-----------------------------------|
| <input checked="" type="checkbox"/> Take according to IS800 table 5 (cl. 5.4.1) | |
| Custom safety factor (γ_{mf}) | <input type="text" value="1.25"/> |

Type Of Section

| | |
|--|---|
| <input checked="" type="radio"/> Equal | |
| <input type="radio"/> Unequal | <input type="text" value="Outstanding Leg Larger"/> |

Choose ISA Section

| | |
|--------------------------------------|--------------------------------------|
| <input type="text" value="65X65X8"/> | <input type="text" value="30X20X3"/> |
|--------------------------------------|--------------------------------------|

OPEN

INPUT ALL THE GIVEN VALUES
FOR THE TENSION MEMBER. THE
PROGRAM PROMPTS THE USER
TO COMPLETELY FILL THE INPUT
BOXES

OPEN THE OUTPUT FILE

Test Case- Output

Single Angle Section with bolted connections

The choosen section is **65X65X8**, is OK and the **OPTIMUM ONE** under the given load configuration

Output File

```
An = 800.0 mm^2
Tdn = alpha x An x fu/ym1
Tdn = 209.92 kN

->Block Shear Failure:
Avg = 1840.0 mm^2
Avn = 1048.0 mm^2
Atg = 288.0 mm^2
Atn = 200.0 mm^2
Tdb1 = 0.9xAvnxFu/(root(3)xym1) + AtgxFy/ym0= 244.069 kN
Tdb2 = AvgxFy/(Math.sqrt(3)xym0) + 0.9xAtnxFu/ym1 = 300.477 kN
Tdb = Min(Tdb1,Tdb2) = 244.069 kN

->Check for Slenderness Ratio:
lambda = Length of Tension Member/Rvv = 3000.0/24.7 = 121.457
As we can see, ( 121.457 < 350.0 ), so OK
Hence, the choosen section, 65X65X8 is OK and the OPTIMUM ONE under the given load configuration
```

GET THE RESULT OUTPUT FILE.
GIVES OUT THE DIMENSION FOR
THE OPTIMUM SECTION TO USE.

65X65X8 IS THE OPTIMUM ONE
IN THIS CASE.

 **REDESIGN**



REDESIGN OR CLOSE THE
SECTION AS NEEDED

Test Case- Calculations

$$A_n = 800.0 \text{ mm}^2$$

$$T_{dn} = \alpha \times A_n \times f_u / y_{m1}$$

$$T_{dn} = 209.92 \text{ kN}$$

->Block Shear Failure:

$$A_{vg} = 1840.0 \text{ mm}^2$$

$$A_{vn} = 1048.0 \text{ mm}^2$$

$$A_{tg} = 288.0 \text{ mm}^2$$

$$A_{tn} = 200.0 \text{ mm}^2$$

$$T_{db1} = 0.9 \times A_{vn} \times f_u / (\sqrt{3} \times y_{m1}) + A_{tg} \times f_y / y_{m0} = 244.069 \text{ kN}$$

$$T_{db2} = A_{vg} \times f_y / (\sqrt{3} \times y_{m0}) + 0.9 \times A_{tn} \times f_u / y_{m1} = 300.477 \text{ kN}$$

$$T_{db} = \min(T_{db1}, T_{db2}) = 244.069 \text{ kN}$$

->Check for Slenderness Ratio:

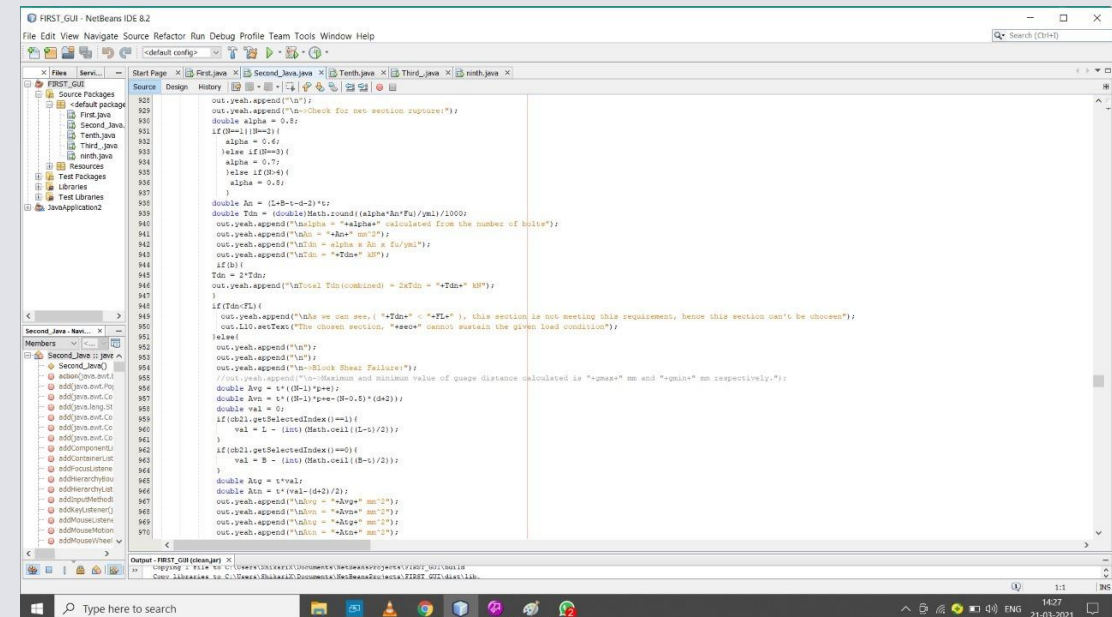
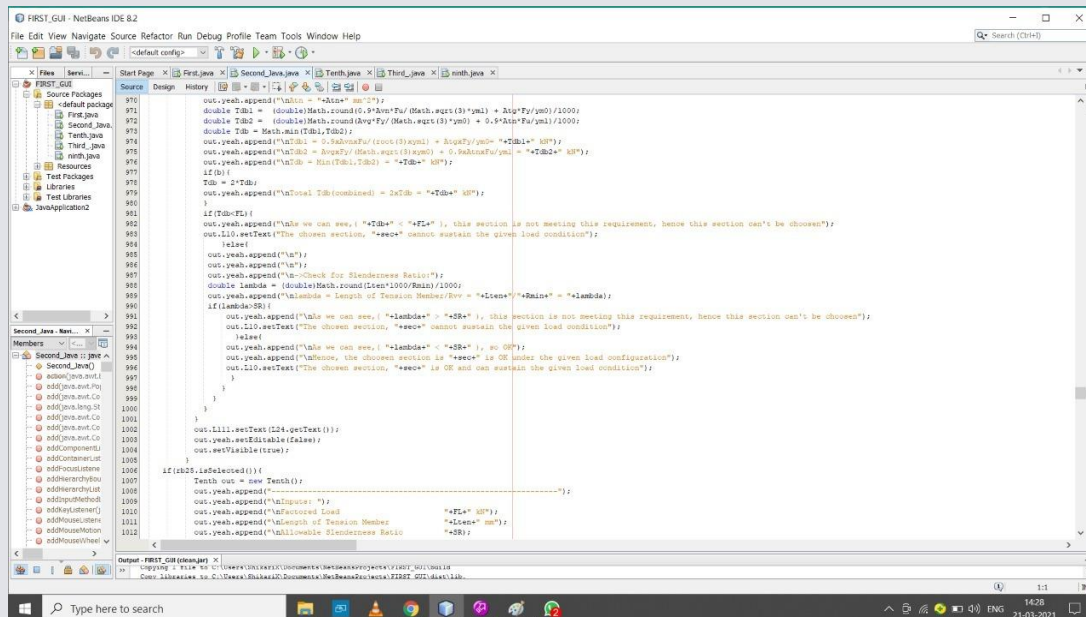
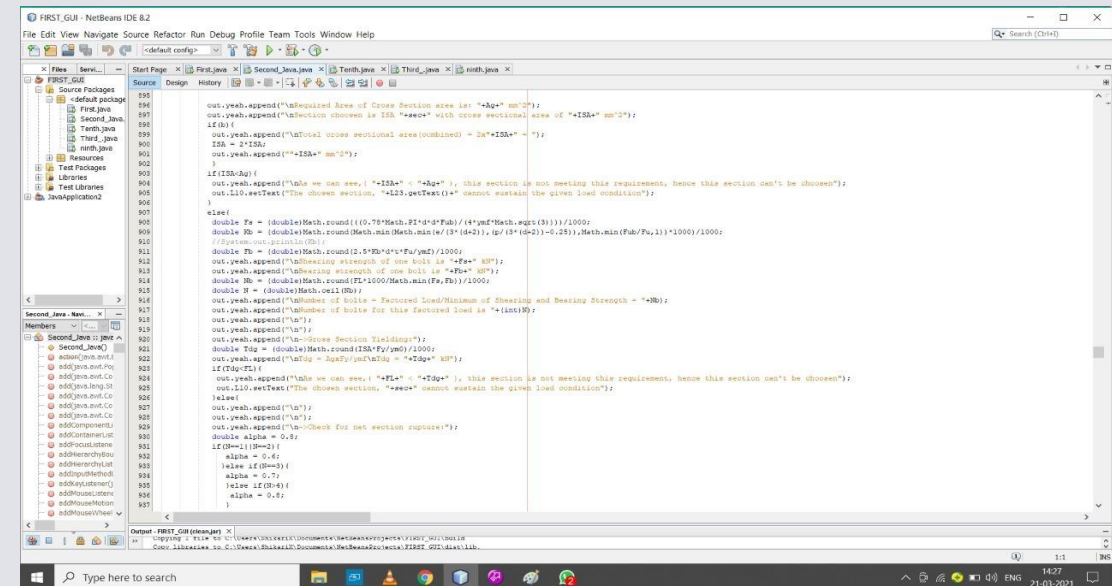
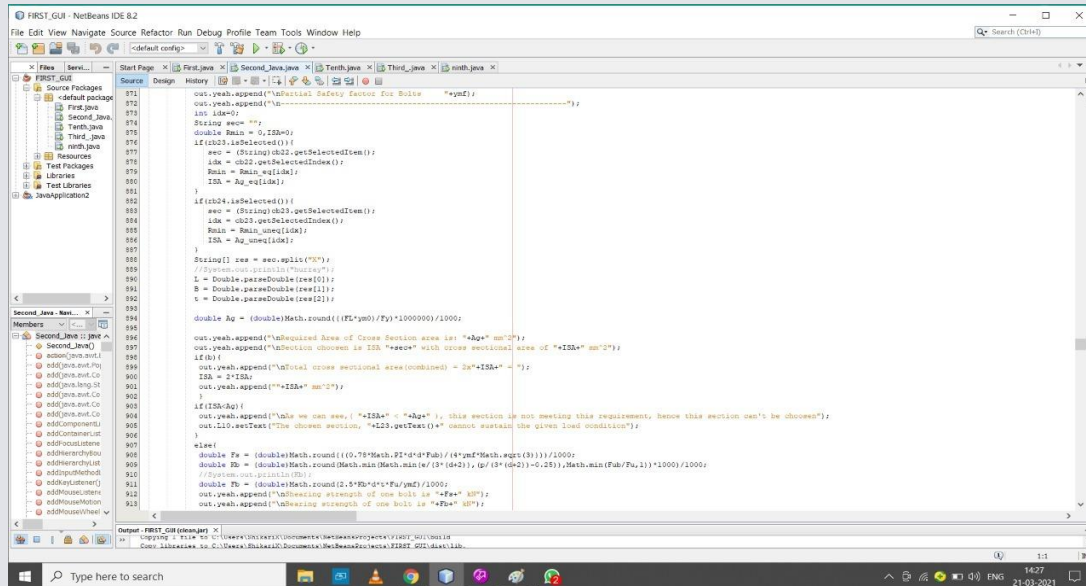
$$\lambda = \text{Length of Tension Member} / R_{vv} = 3000.0 / 24.7 = 121.457$$

As we can see, ($121.457 < 350.0$), so OK

Hence, the choosen section, 65X65X8 is OK and the OPTIMUM ONE under the given load configuration

SNIPPET OF CALCULATION AS SHOWN IN THE OUTPUT FILE

Code Snippet- Written in JAVA



THANK YOU