53 TRUSS MEMBER DESIGN

ABSTRACT

This program designs truss members, wood or steel, tension or compression in accordance with the 1969 AISC Specifications. Program has provision built in to accept input data from a time sharing terminal by means of the LN20 paper tape reader. Input data can be entered manually for designers without LN20. Price $95.00

INPUT

Axial force
Length of member
Bolt size and member thickness
Elasticity and yield strength
Radius of gyration

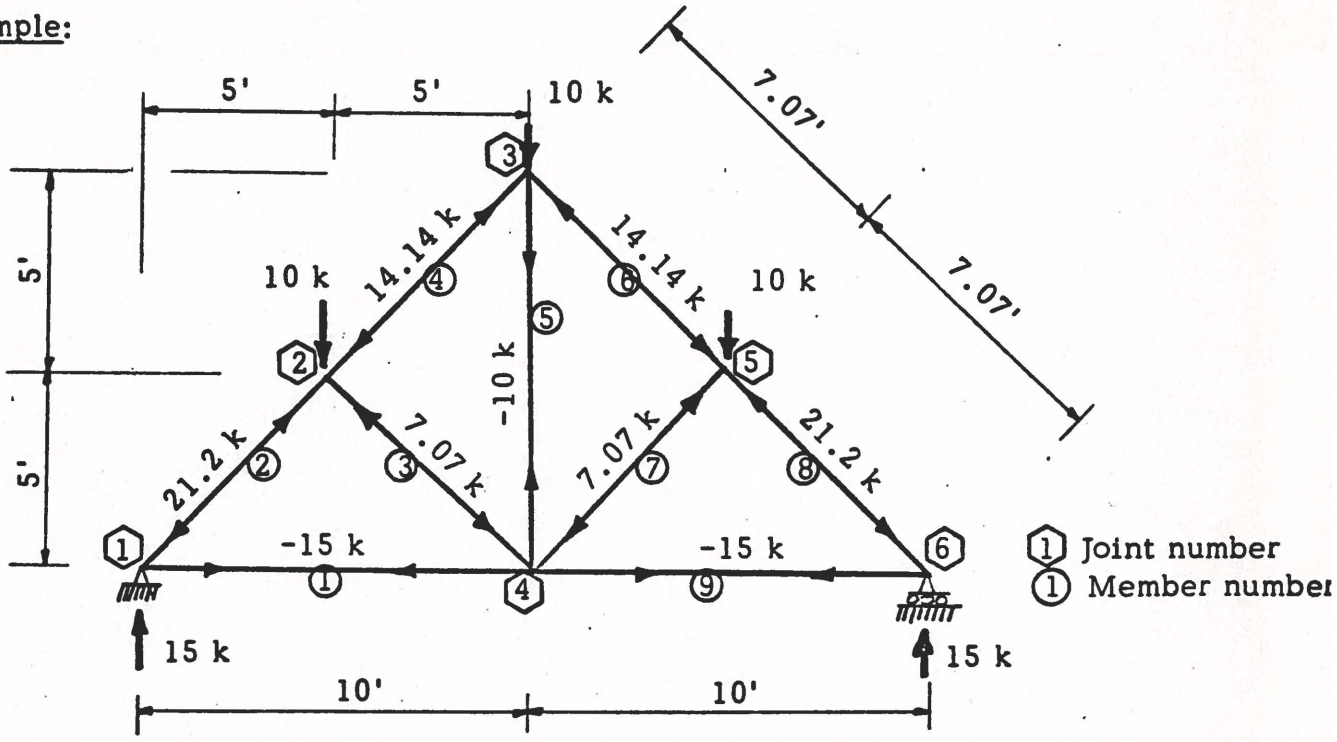
OUTPUT

Allowable stress
Allowable force
Slenderness ratio

TRUSS MEMBER DESIGN

C. P. 53

Example:



Given the truss shown above, design the members using A36 steel.

Number of members to be designed = 4
Manual input, input code = 1
A36 steel, Fy = 36 ksi
E = 29000 ksi

Design the bottom cord: members 1 and 9.

P = 15 kips tension
Member length, L = 10 ft.

Initial try: L 2-1/2 x 2 x 3/8

A = 1.55 in.^{2}
Use one row of bolts
Try 1/2 in. bolts

r_{min} = .577
Angle thickness = .375

Computations:
Slenderness ratio, Kl/r = 207.97
Effective area (area of section minus area of bolt holes) = 1.34 in.^{2}
P_{allow} = 28.9 kips

```
    4    S
    1    S
   36    S
29000    S

  -15    S
   10    S

 1.55    S
    1    S
  0.5    S

0.577    S
0.375    S
207.972  b0
  1.340  e0
 28.944  A0
```

Try smaller member, L 2-1/2 x 2 x 5/16

r_{min} = .584
Angle thickness = .3125
A = 1.31 in.^{2}

Computations:
Slenderness ratio, Kl/r = 205.5
Effective area = 1.135
P_{allow} = 24.516 kips

```
 0.584   S
0.3125   S
  1.31   S
205.479  b0
  1.135  e0
 24.516  A0

   0     S
```

USE L 2-1/2 x 2 x 5/16

Input 0 to design next member.

Design top cord: members 2,4,6, and 8.

P = 21.2 kips compression
Member length = 7.07 ft.

Initial try: L 3 x 2 x 1/2

$A = 2.25$ in.^{2}
$r_{min} = .546$

Computations:
Slenderness ratio, Kl/r = 155.38
Allowable stress, Fa = 6.18 ksi
P_{allow} = 13.9 kips

Try larger member, L 3 x 2-1/2 x 5/16

$r_{min} = .744$
$A = 1.62$ in.^{2}

Computations:
Slenderness ratio, Kl/r = 114.03
Allowable stress, Fa = 11.1 ksi
P_{allow} = 17.98 kips

Try larger member, L 3 x 2-1/2 x 7/16

$r_{min} = .729$
$A = 2.21$ in.^{2}

Computations:
Slenderness ratio, Kl/r = 116.38
Allowable stress, Fa = 10.77 ksi
P_{allow} = 23.81 kips

USE L 3 x 2-1/2 x 7/16

Input 0 to design next member.

```
21.2      S
7.07      S
2:25      S

0:546     S
155.384   D0
6:162     B0
13:909    A0

0.744     S
1.62      S
114:032   D0
11.098    B0
17.978    A0

0.729     S
2.21      S
116.378   D0
10:773    B0
23:808    A0

0         S
```

Design members 3 and 7.

P = 7.07 kips compression
Member length = 7.07 ft.

Initial try: L 2 x 1-1/2 x 1/4

A = .813 in.^{2}
r_{min} = .432

Computations:
Slenderness ratio, Kl/r = 196.39
Allowable stress, Fa = 3.87 ksi
P_{allow} = 3.15 kips

Try larger member, L 2-1/2 x 2 x 3/16

r_{min} = .6
A = .809 in.^{2}

Computations:
Slenderness ratio, Kl/r = 141.4
Allowable stress, Fa = 7.47 ksi
P_{allow} = 6.04 kips

Try larger member, L 2-1/2 x 2 x 5/16

r_{min} = .584
A = 1.31 in.^{2}

Computations:
Slenderness ratio, Kl/r = 145.27
Allowable stress, Fa = 7.07 ksi
P_{allow} = 9.26 kips

USE L 2-1/2 x 2 x 5/16

Input 0 to design next member.

```
7.07      S
7.07      S
0.813     S

0.432     S
196.388   DO
3.870     BO
3.146     AO

0.6       S
0.809     S
141.400   DO
7.465     BO
6.039     AO

0.584     S
1.31      S
145.273   DO
7.072     BO
9.264     AO

0         S
```

Design member 5.

P = 10 kips tension
Member length, L = 10 ft.

Initial try: L 3 x 2-1/2 x 3/16

A = .996 in.^{2}
Use one row of bolts
Try 1/2 in. bolts

r_{min} = .761
Angle thickness = .1875 in.

Computations:
Slenderness ratio, Kl/r = 157.69
Effective area = .891 in.^{2}
P_{allow} = 19.25 kips

Try smaller member, L 3 x 2 x 3/16

r_{min} = .583
Angle thickness = .1875 in.
A = .902 in.^{2}

Computations:
Slenderness ratio, Kl/r = 205.8
Effective area = .797 in.^{2}
P_{allow} = 17.215 kips

Try smaller member, L 2-1/2 x 2 x 3/16

r_{min} = .6
Angle thickness = .1875 in.
A = .809 in.^{2}

Computations:
Slenderness ratio, Kl/r = 200
Effective area = .704 in.^{2}
P_{allow} = 15.21 kips

USE L 2-1/2 x 2 x 3/16