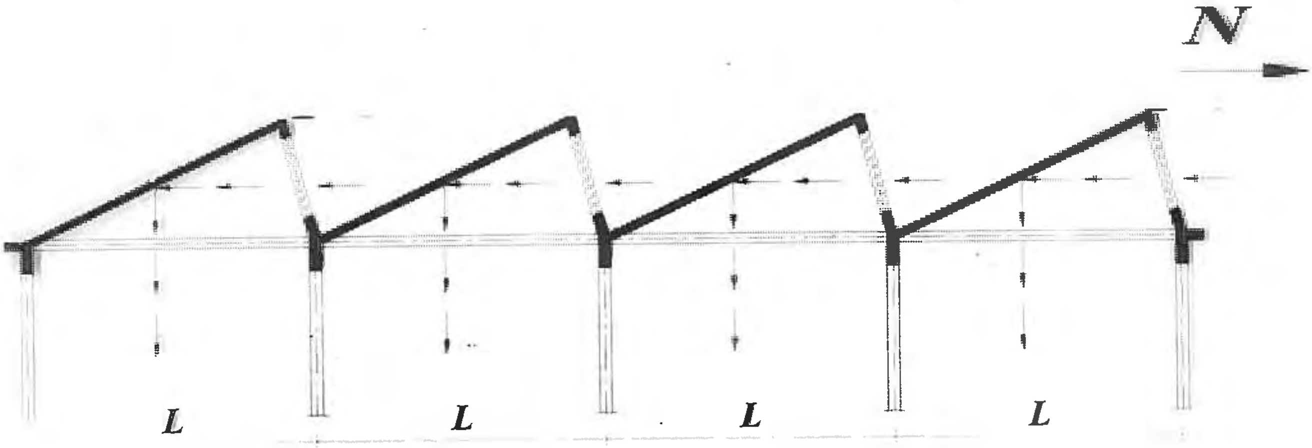
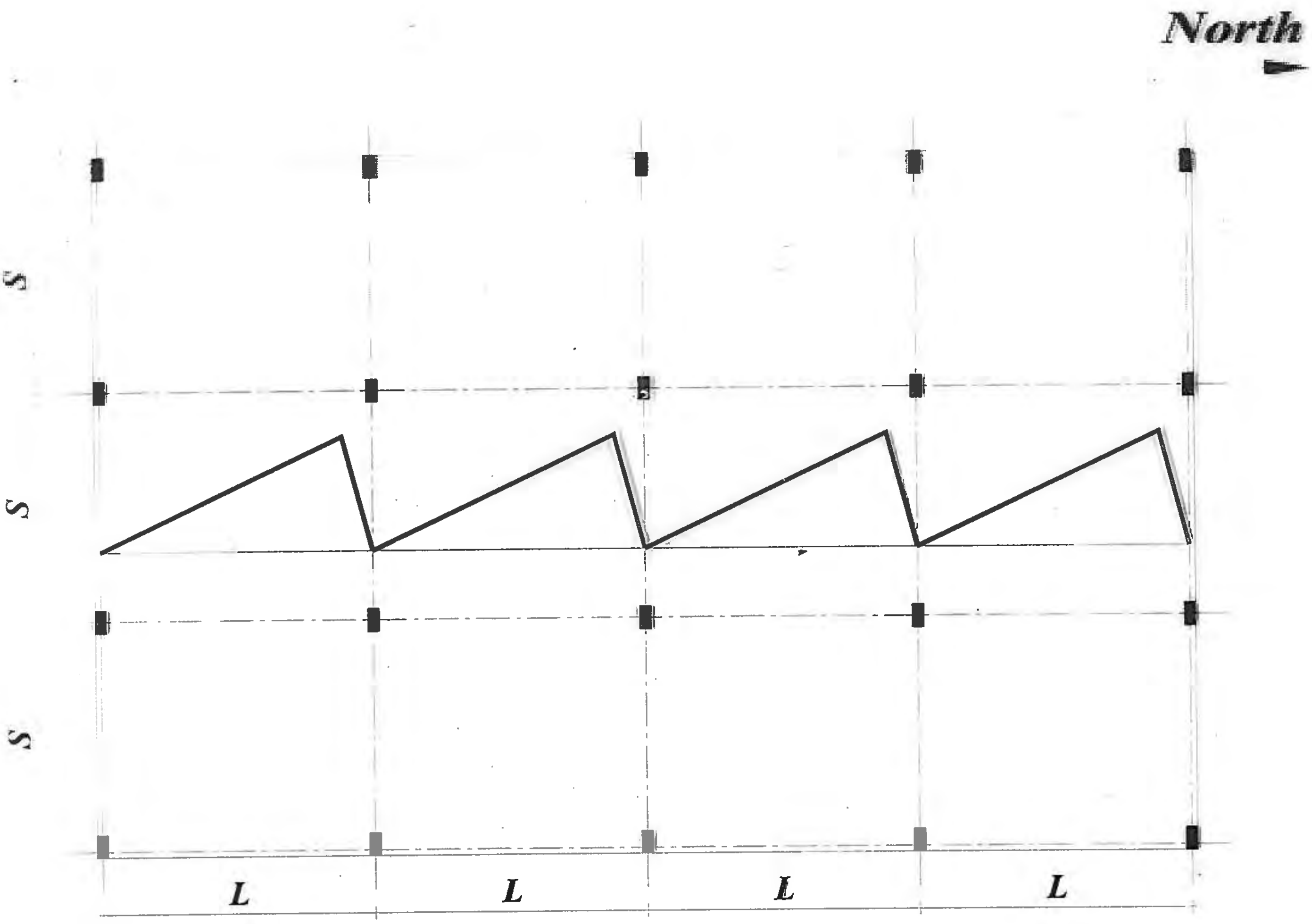
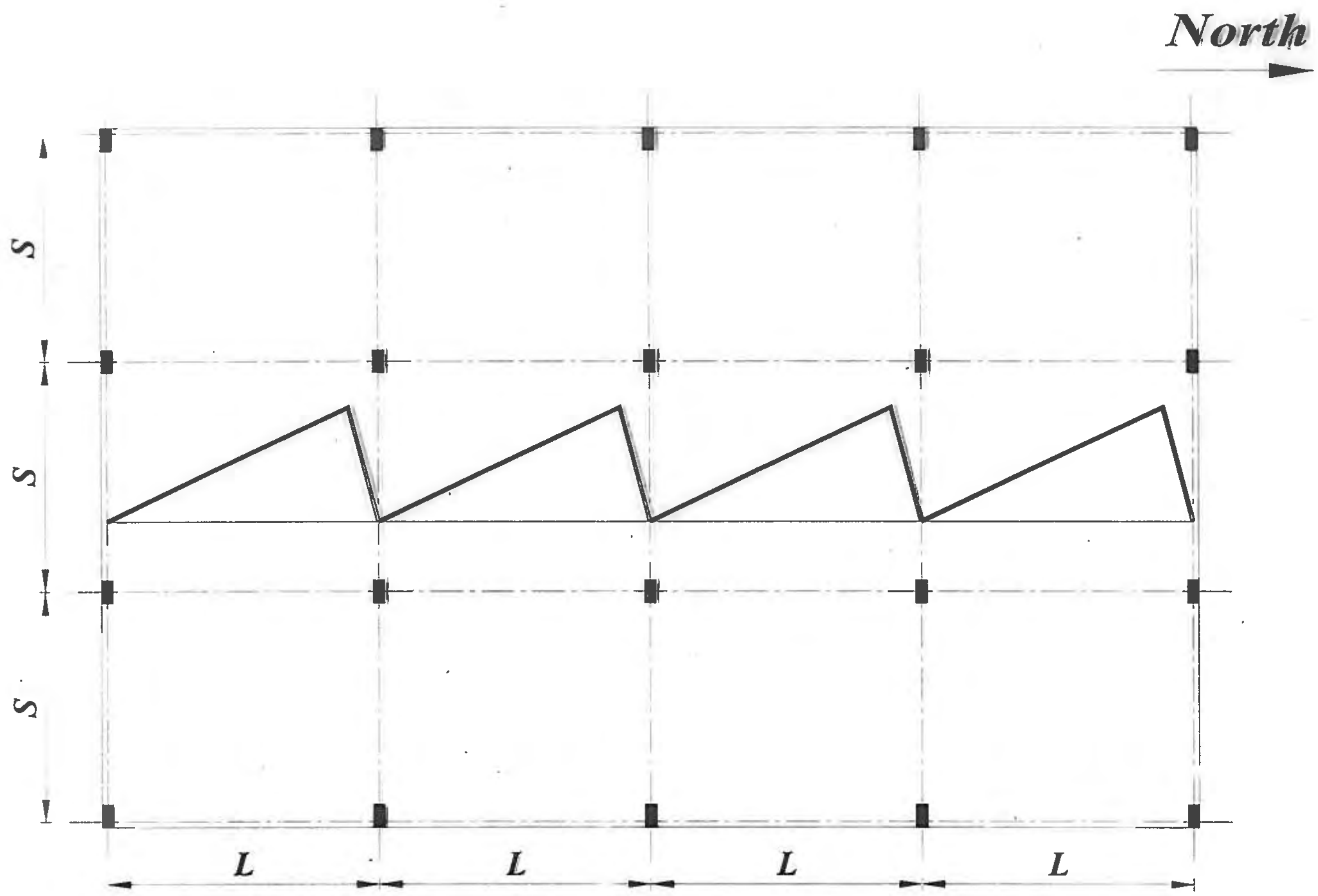


ELEV.



PLAN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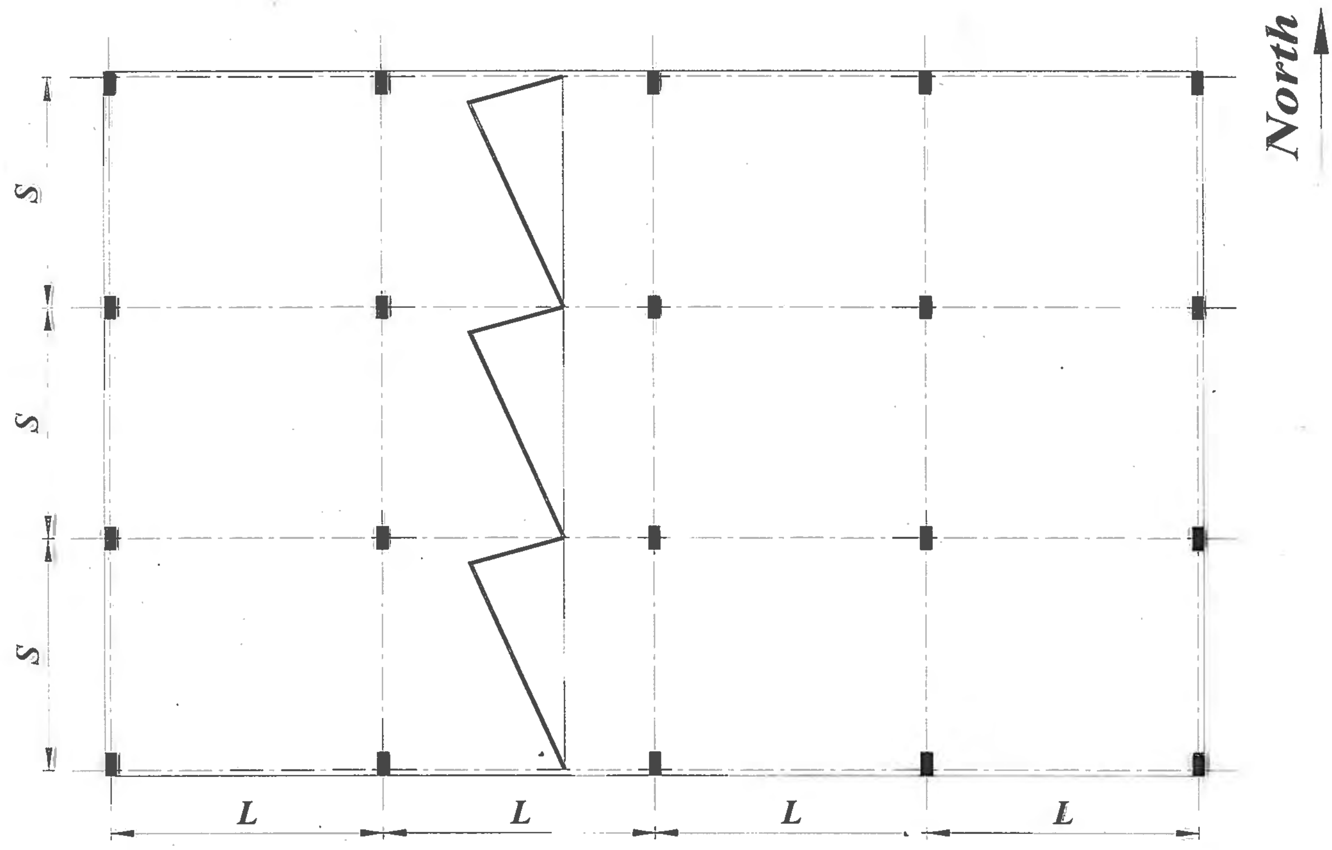
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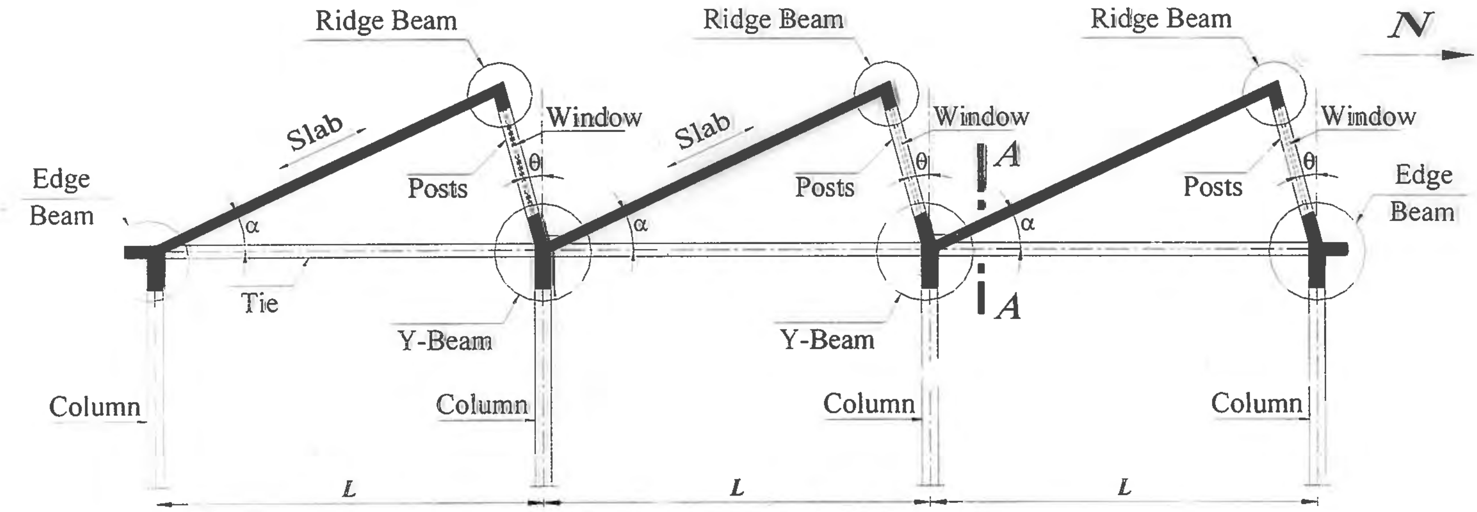
Ridge Beam
Ridge Beam
Ridge Beam
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Posts
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Y-Beam
Y-Beam
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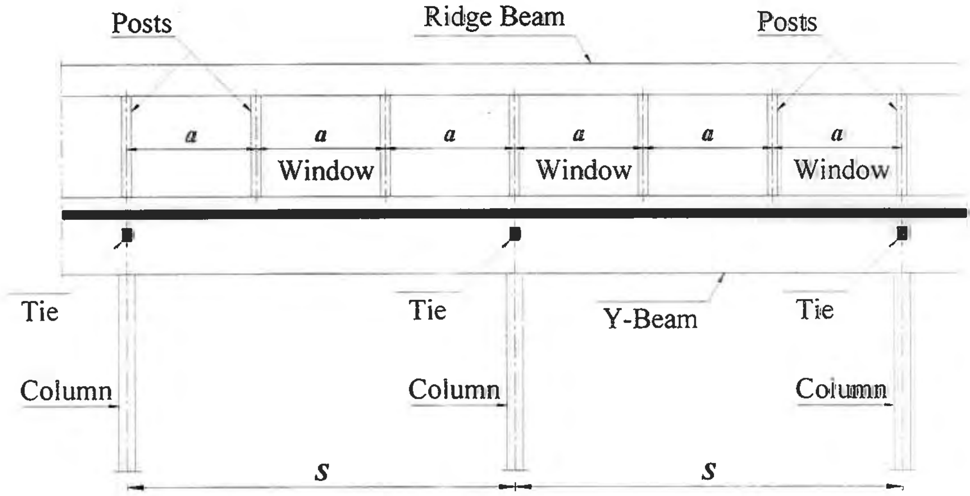
Posts
Ridge Beam
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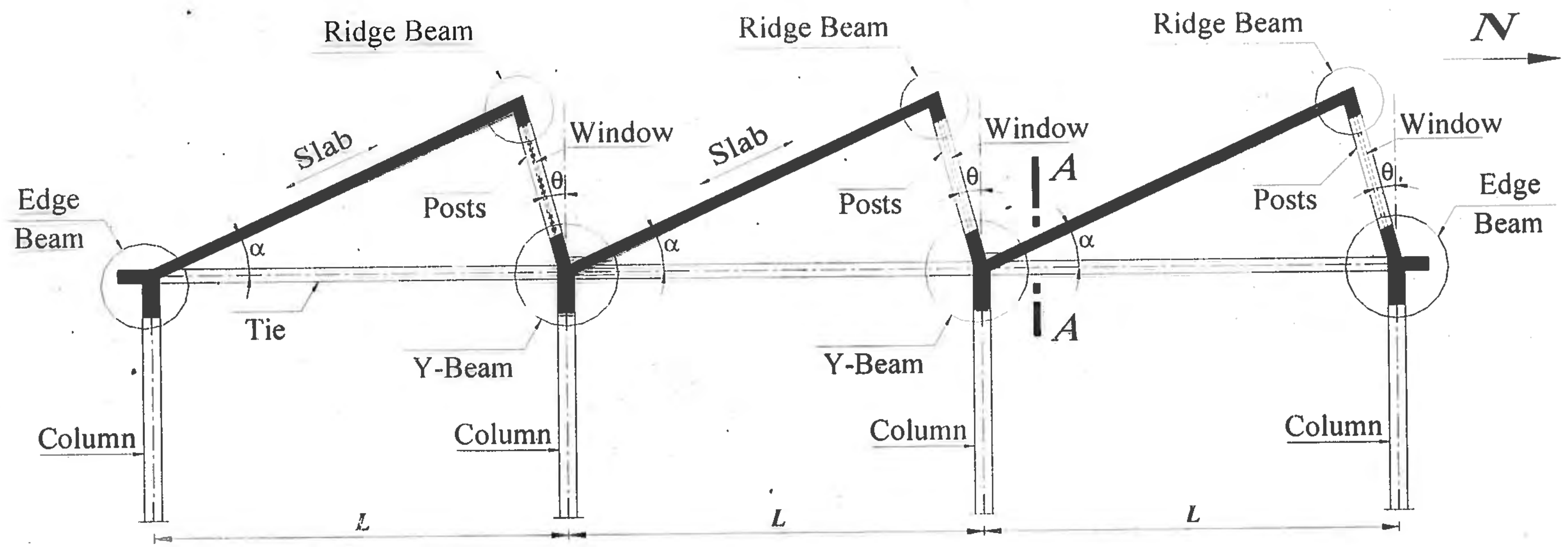
SEC. A - A


Ridge Beam
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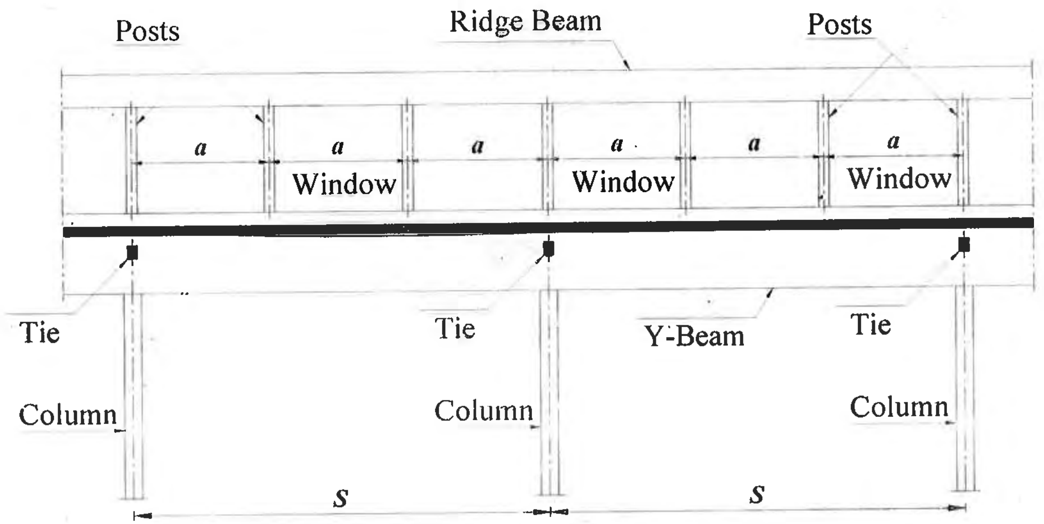
Posts
Ridge Beam
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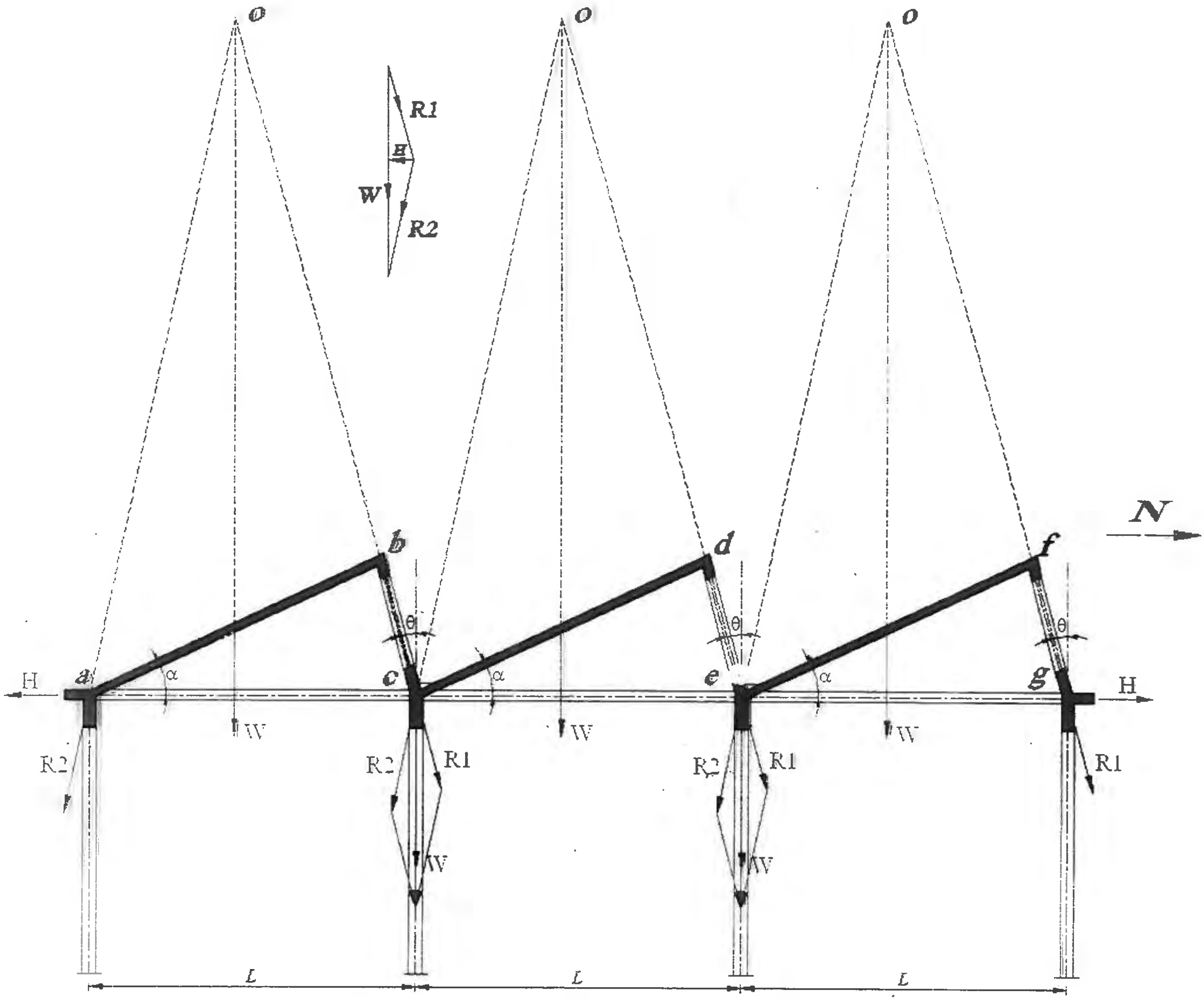
SEC. A - A



o
o
o
R1
H
W
R2
N
b
d
f
a
c
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g
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W
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R2
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W
W
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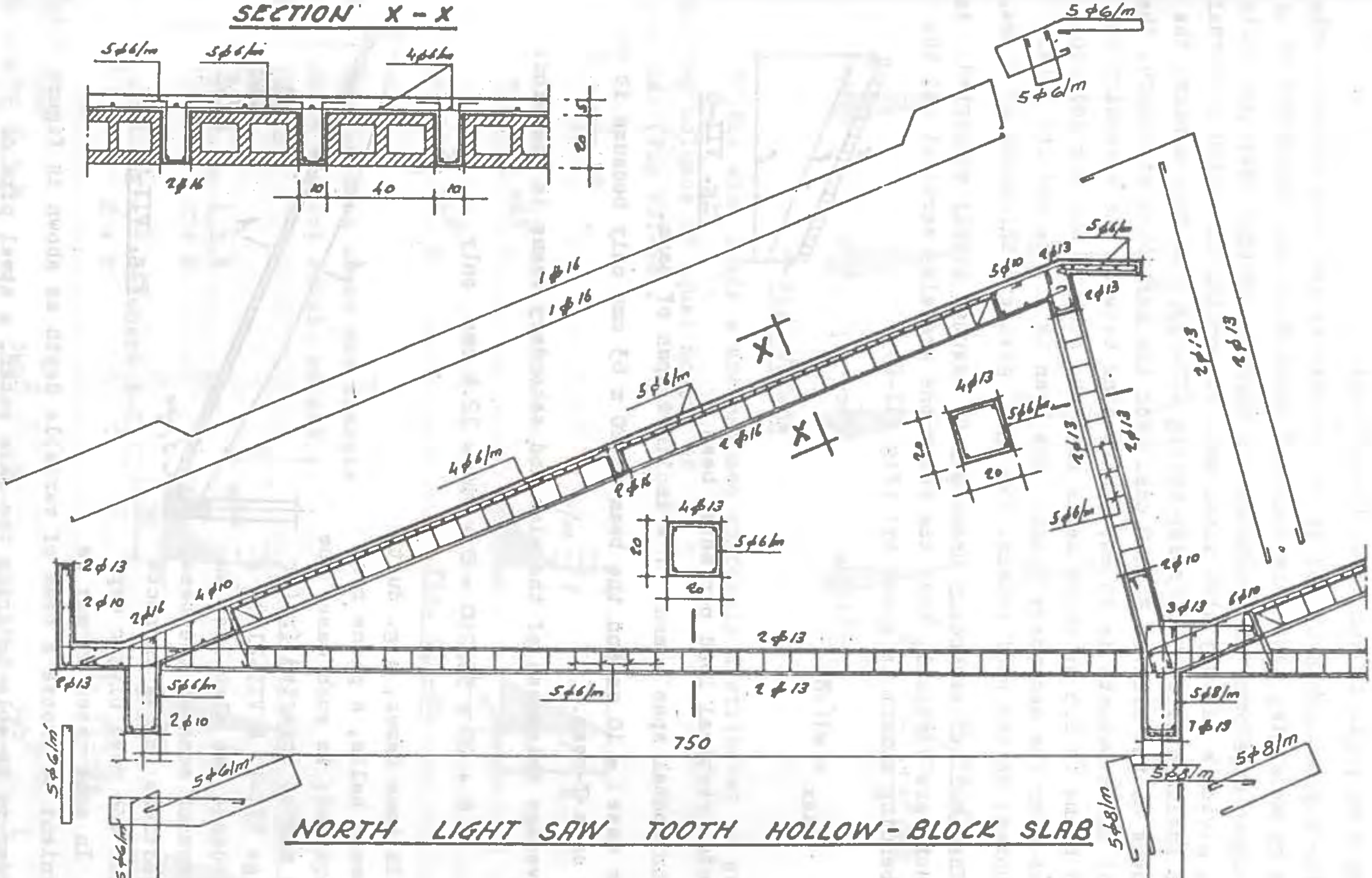
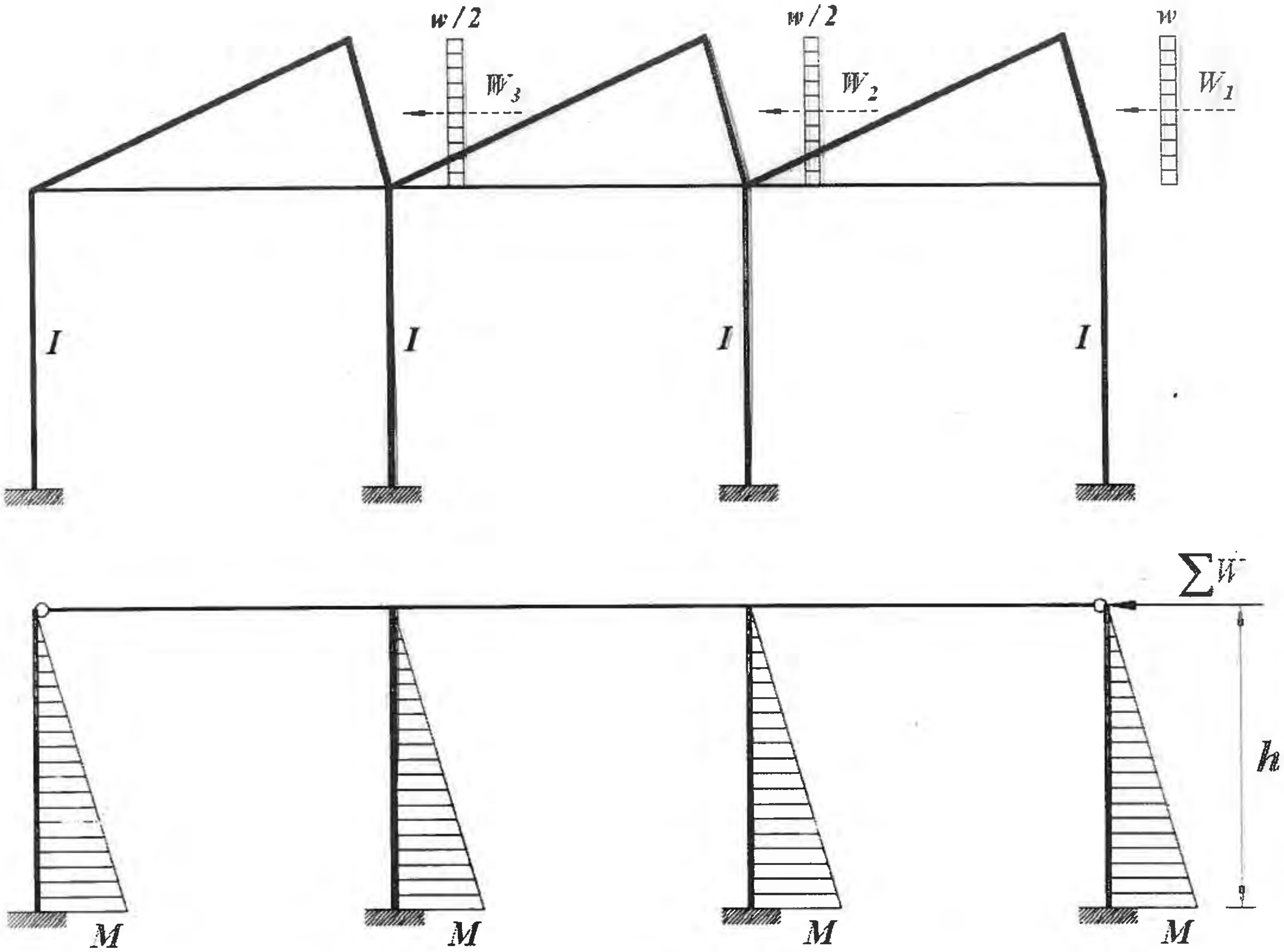
L
L



NORTH LIGHT SAW TOOTH HOLLOW-BLOCK SLAB

Fig. VII-5



$$M = \sum W\,h \,/\, n$$

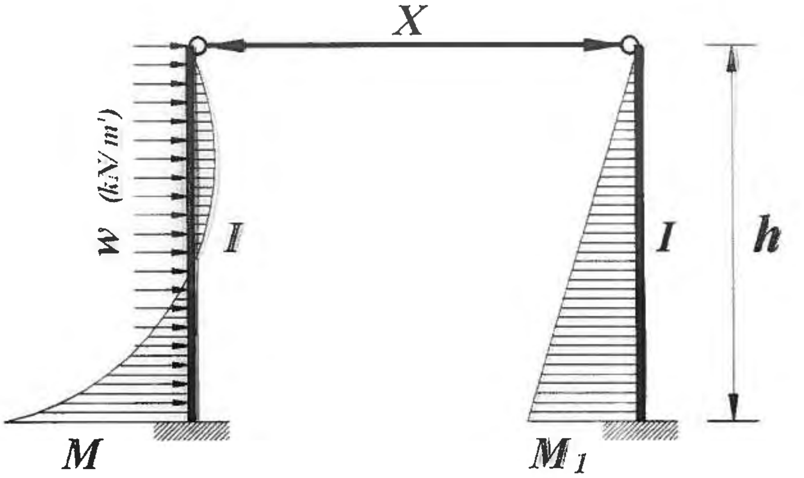
where :

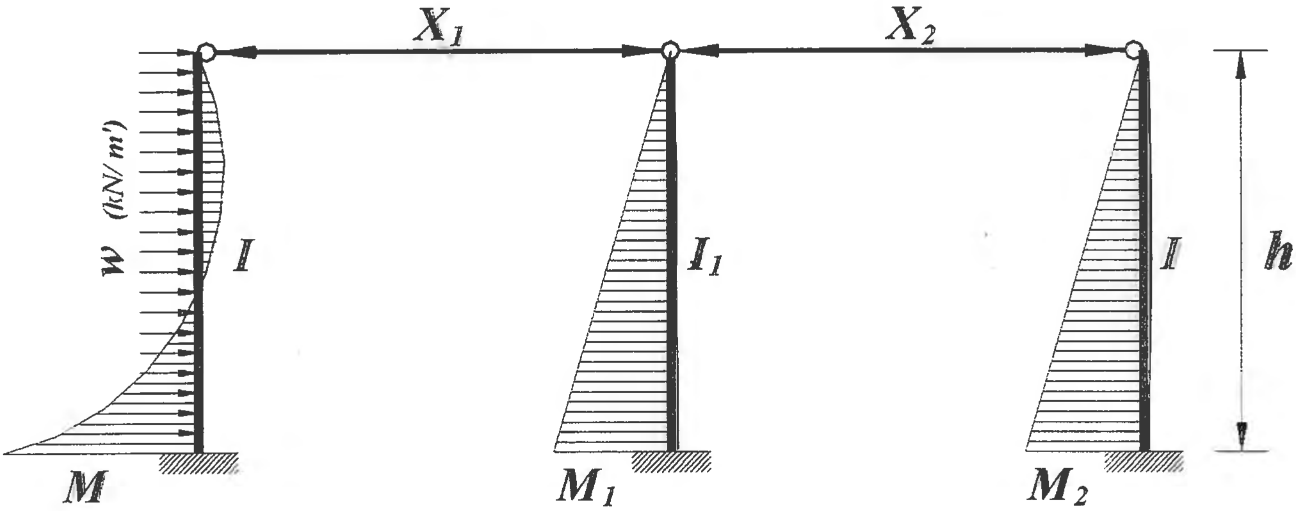
$n = N^{O.}$ *of Cols.*

$$X = \frac{3}{16}\, wh$$

$$M = -\frac{5}{16}\, wh^2$$

$$M_1 = +\frac{3}{16}\, wh^2$$





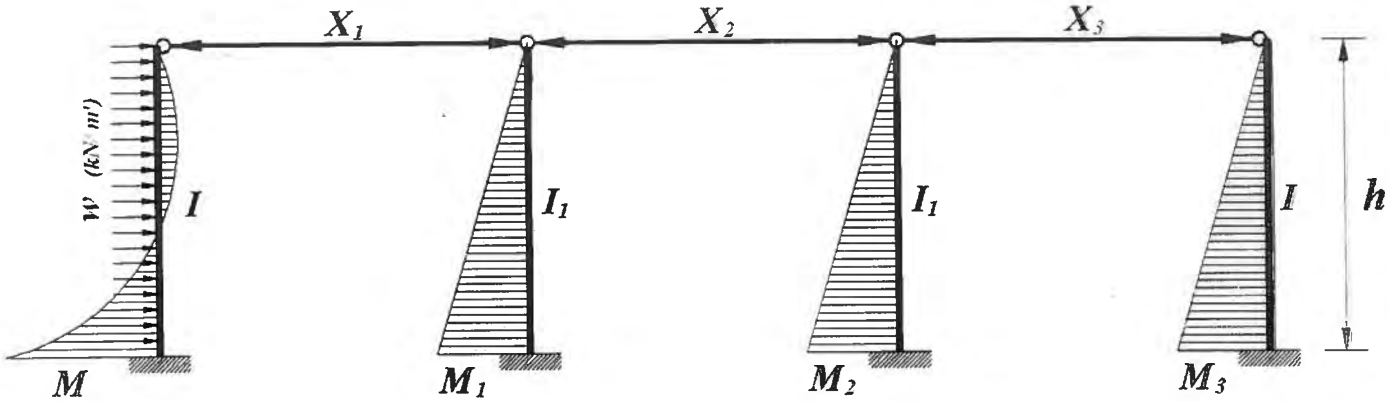
$$X_1 = \frac{3}{8}\, wh \left[\frac{1+k}{2+k}\right] \qquad \text{and}$$

$$X_2 = \frac{3}{8}\, wh \left[\frac{1}{2+k}\right] \qquad \text{where} \quad k = I_1/I$$

$$M = \frac{wh^2}{8} \left[\frac{5+k}{2+k}\right]$$

$$M_1 = \frac{3wh^2}{8} \left[\frac{k}{2+k}\right]$$

$$M_2 = \frac{3wh^2}{8} \left[\frac{1}{2+k}\right]$$



$$X_1 = \frac{3}{16}\, wh \left[\frac{1+2k}{1+k}\right]$$

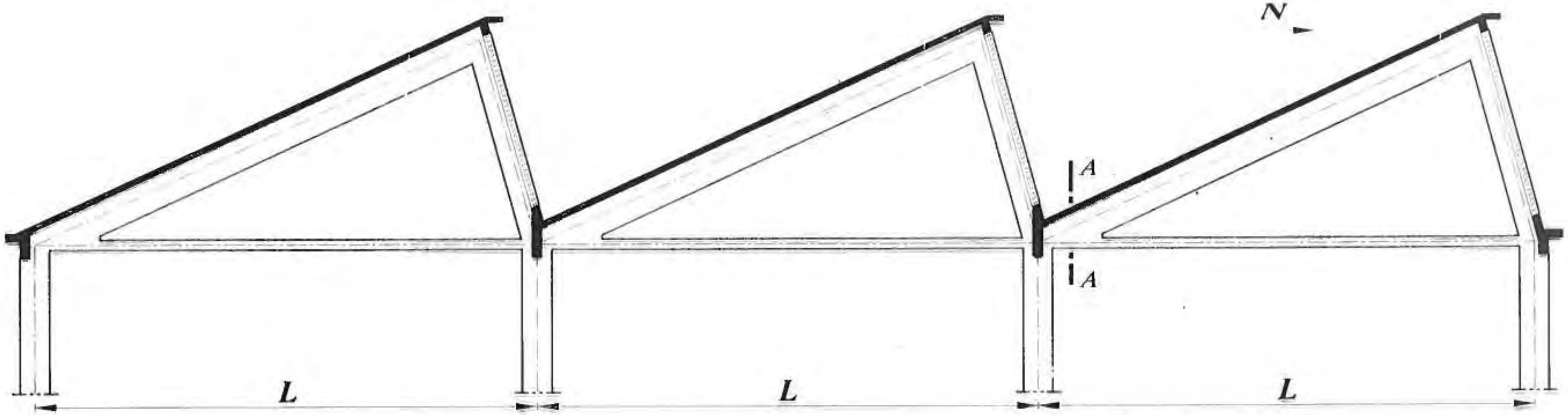
$$X_2 = \frac{3}{16}\, wh$$

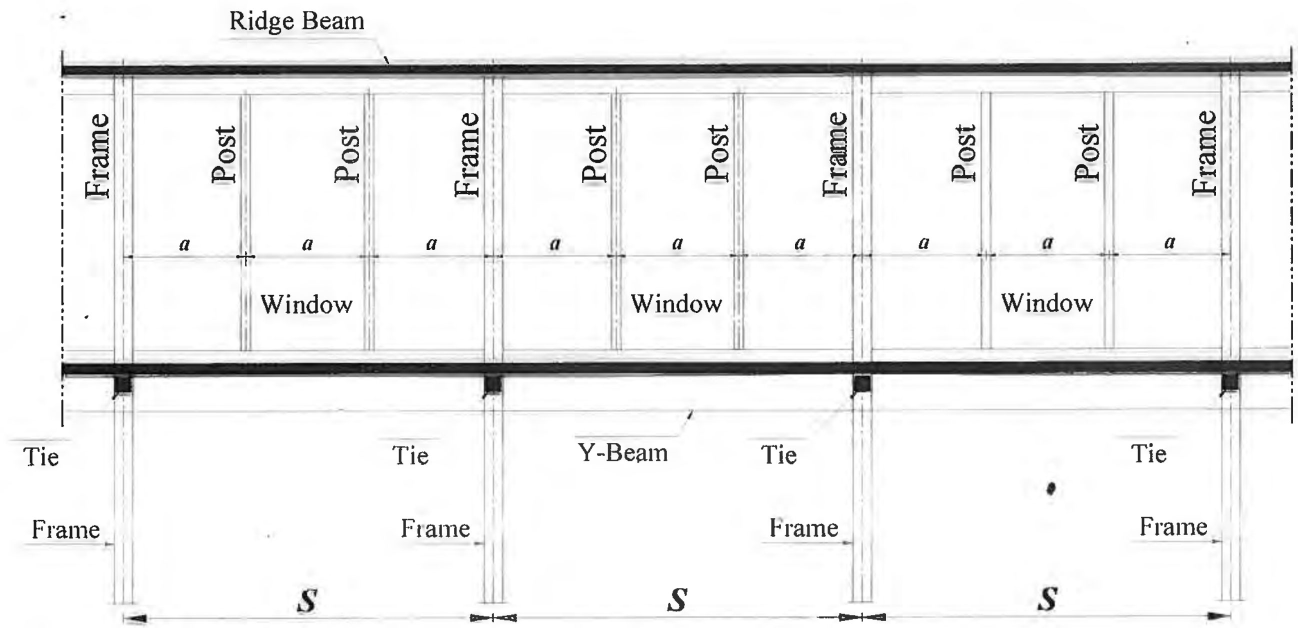
$$X_3 = \frac{3}{16}\, wh \left[\frac{3k}{1+k}\right] \qquad \text{where} \quad k = I_1/I$$

$$M = \frac{wh^2}{16} \left[\frac{5+2k}{1+k}\right]$$

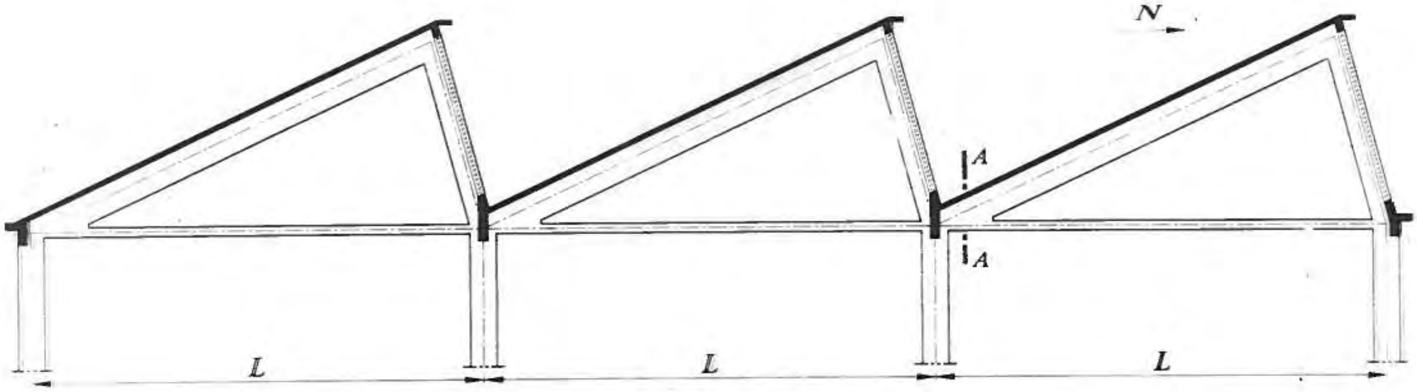
$$M_1 = \frac{wh^2}{16} \left[\frac{3k}{1+k}\right] \quad , \qquad M_1 = M_2$$

$$M_3 = \frac{3wh^2}{16} \left[\frac{1}{1+k}\right]$$

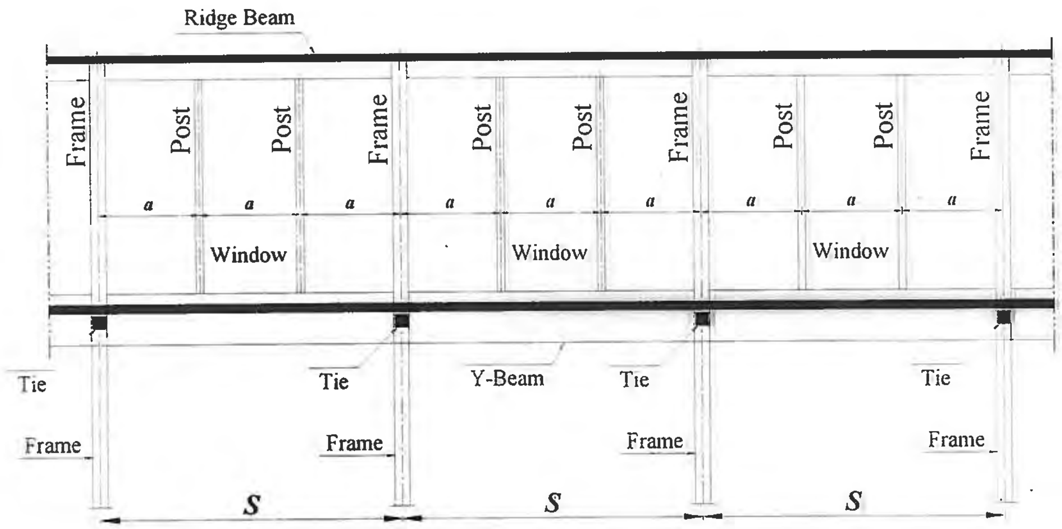

N
A
A
L
L
L


Ridge Beam
Frame
Post
Post
Frame
Post
Post
Frame
Post
Post
Frame
a
a
a
a
a
a
a
a
a
Window
Window
Window
Tie
Tie
Y-Beam
Tie
Tie
Frame
Frame
Frame
Frame
S
S
S

SEC. A - A

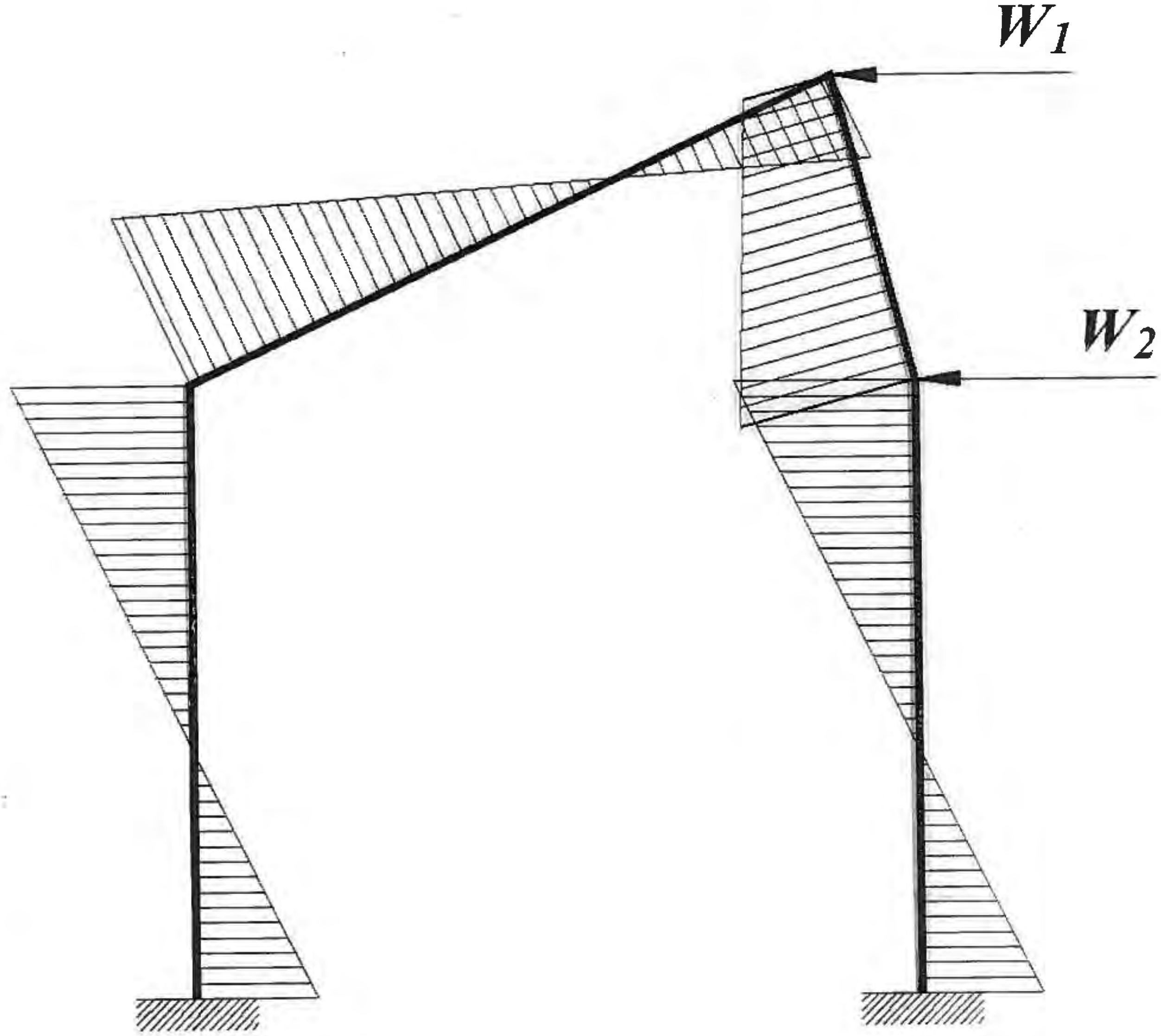


N
A
A
L
L
L

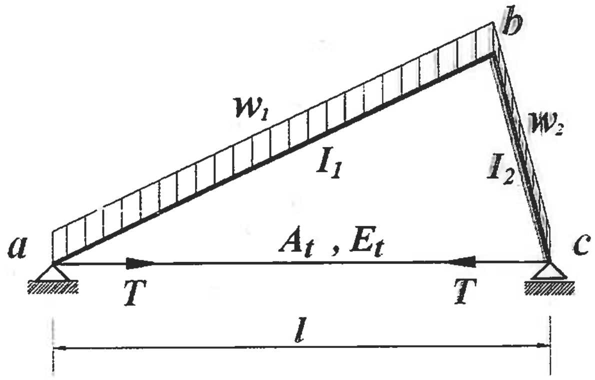


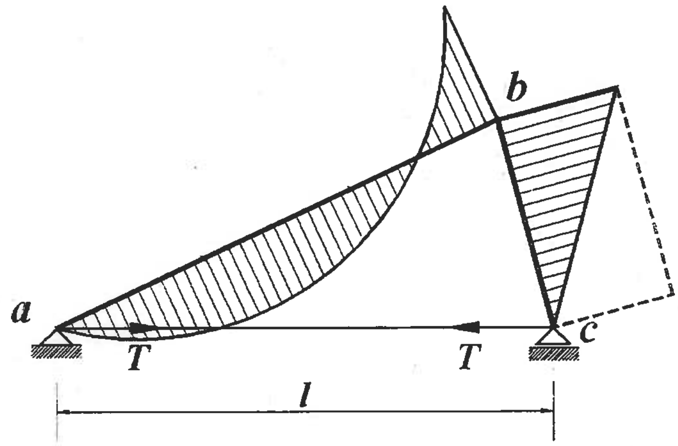
Ridge Beam
Frame
Post
Post
Frame
Post
Post
Frame
Post
Post
Frame
a
a
a
a
a
a
a
a
a
Window
Window
Window
Tie
Tie
Y-Beam
Tie
Tie
Frame
Frame
Frame
Frame
S
S
S

SEC. A - A

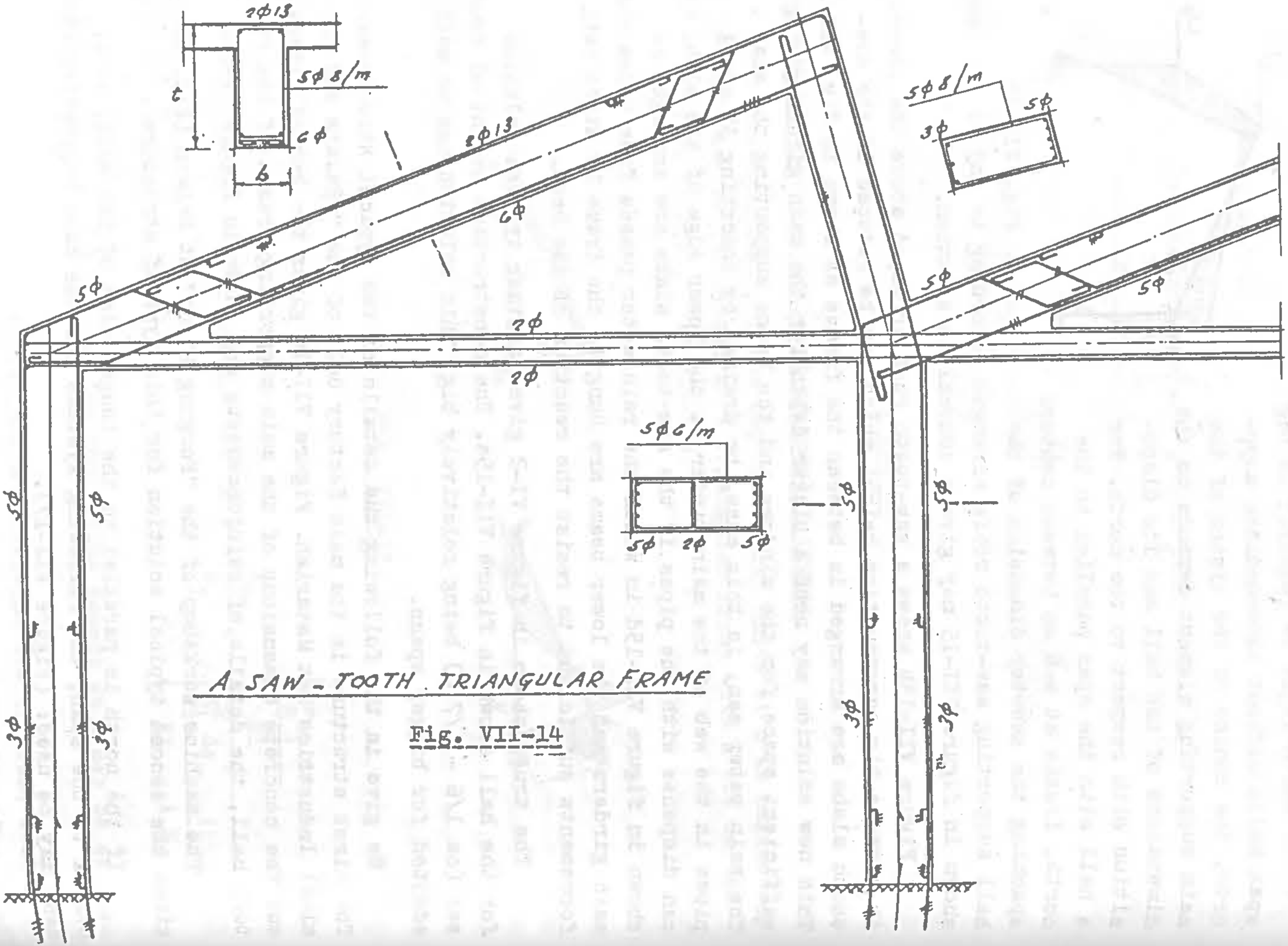


W_1
W_2



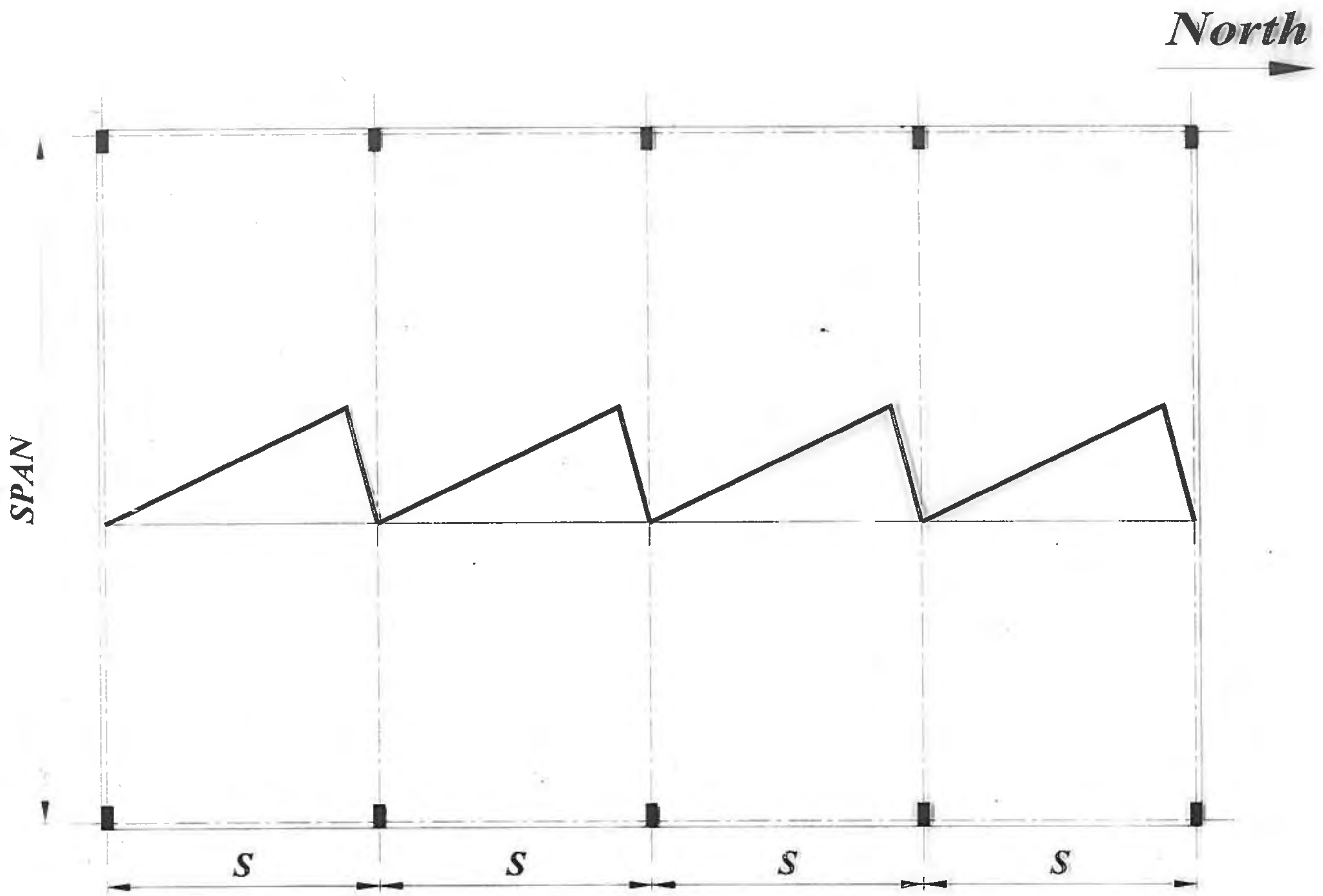


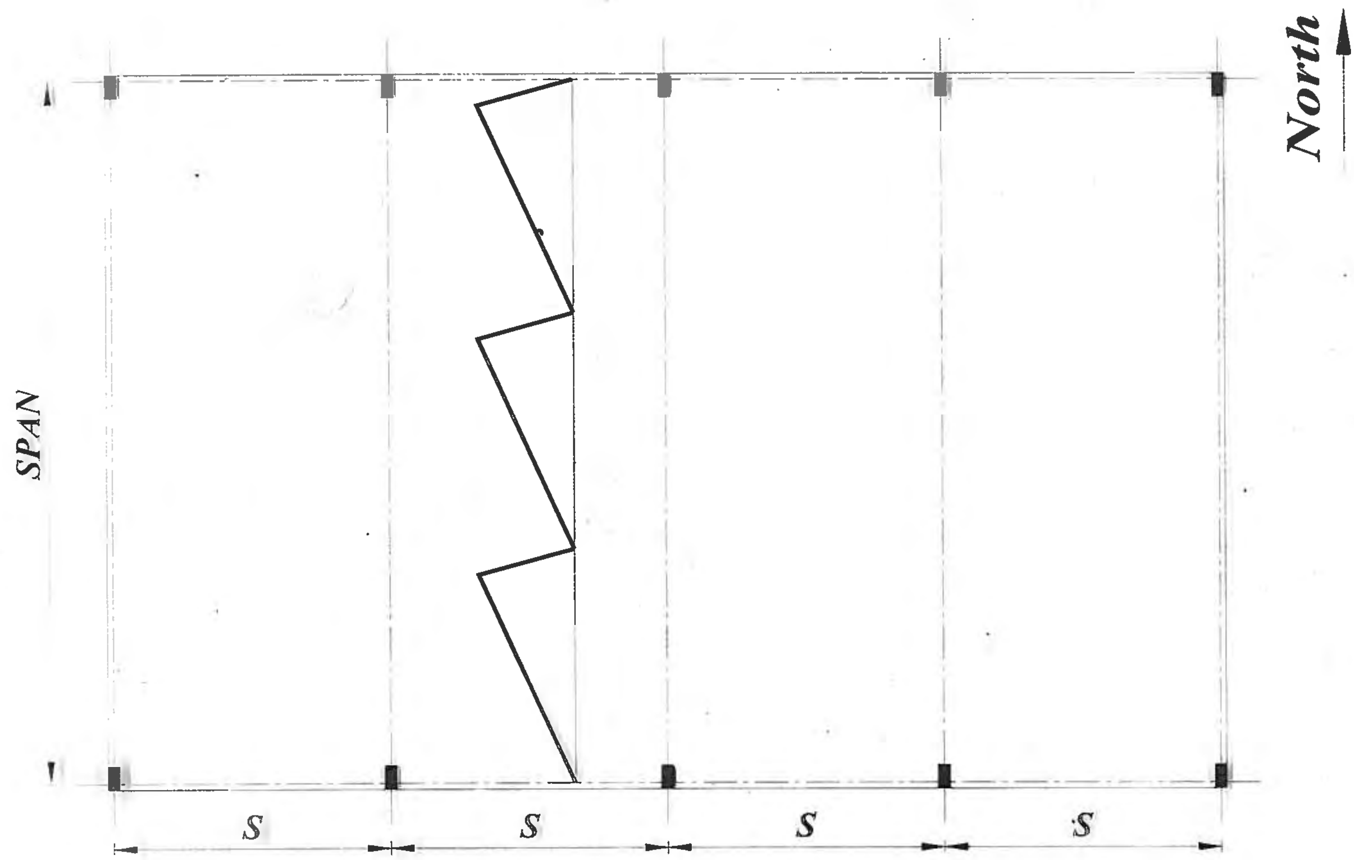
$$T = -\frac{\delta_o}{\delta_1} = -\frac{\int \frac{M_o M_1}{EI}\, \Delta l}{\int \frac{M_1^2}{EI}\, \Delta l + \frac{l}{A_t E_t}}$$

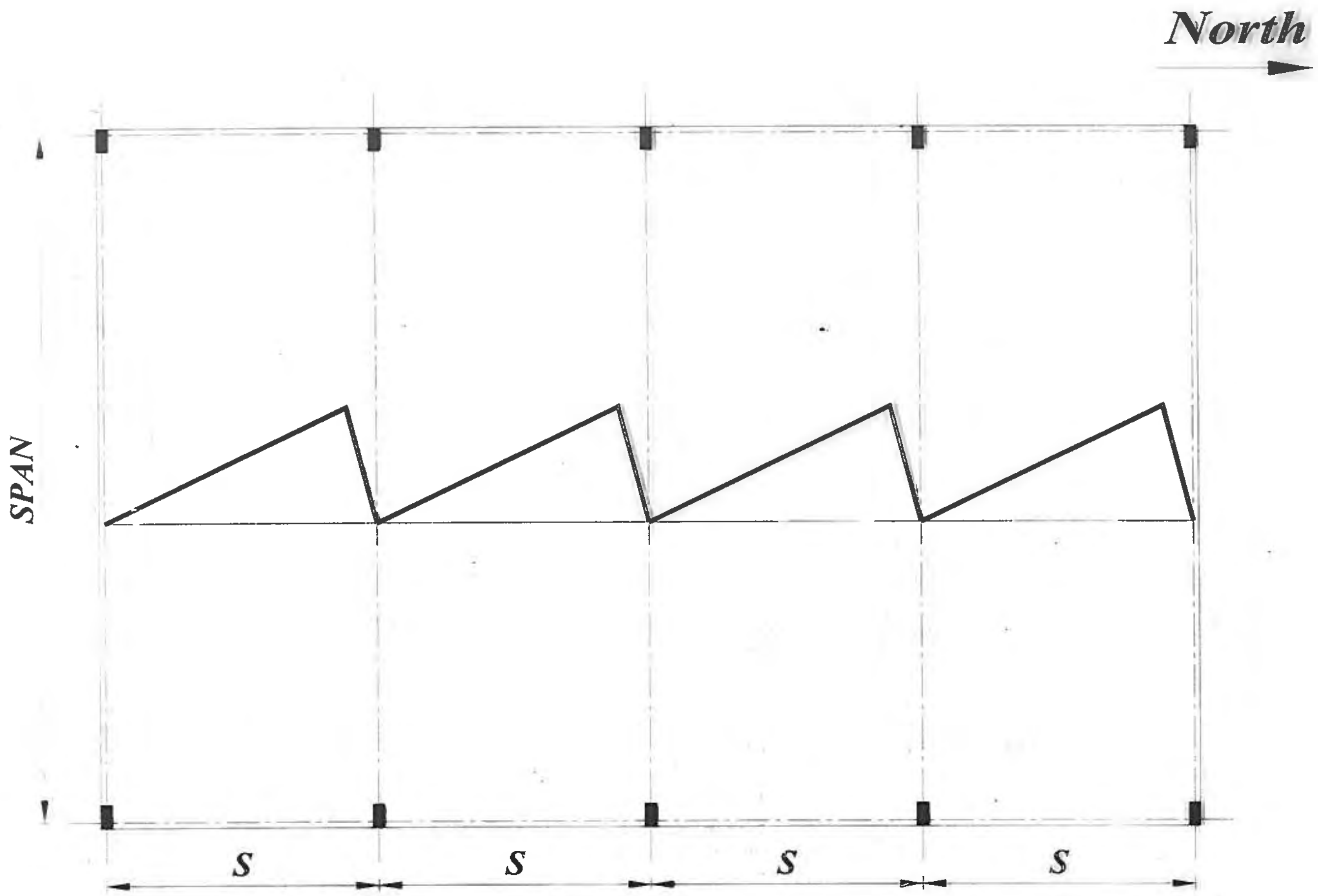


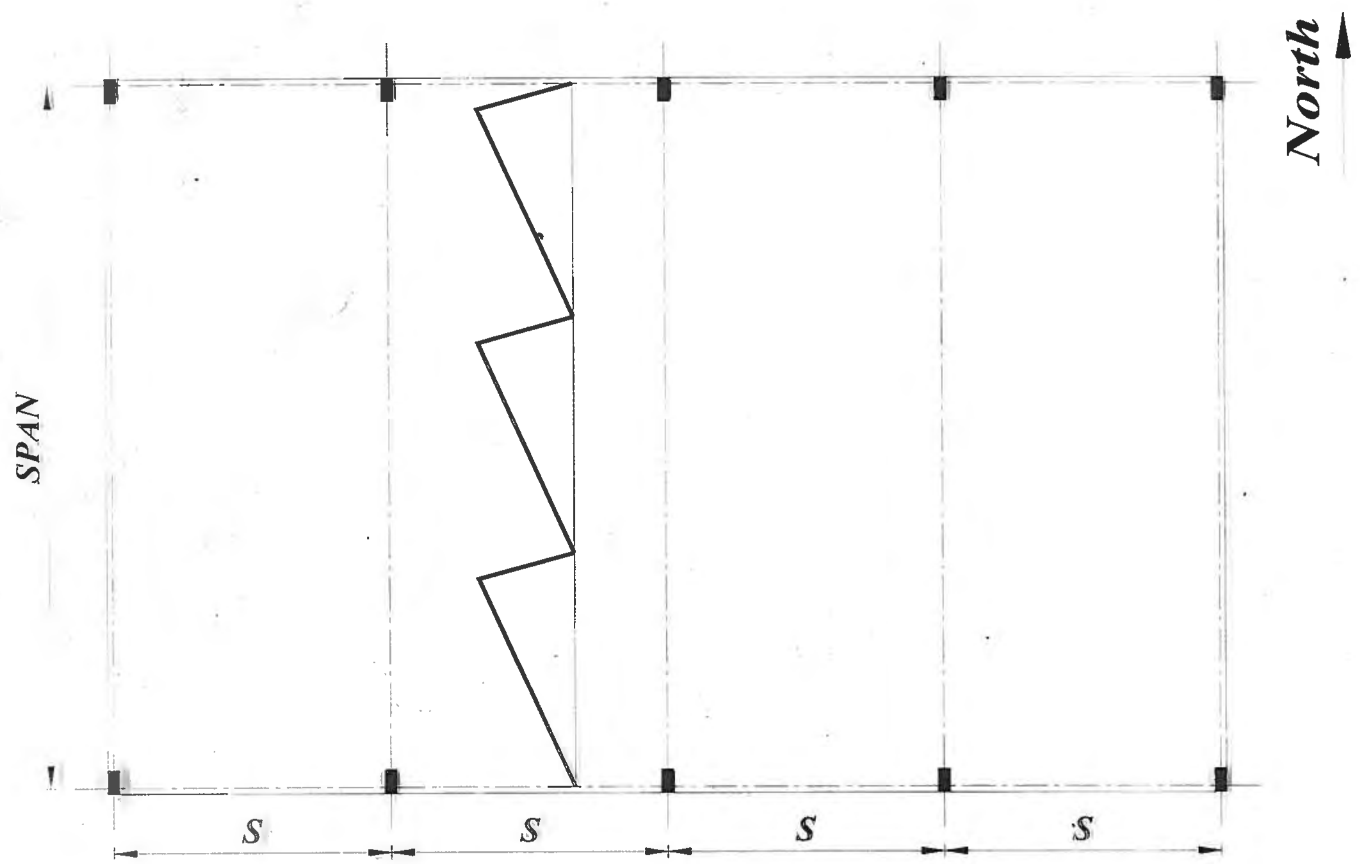
A SAW - TOOTH TRIANGULAR FRAME

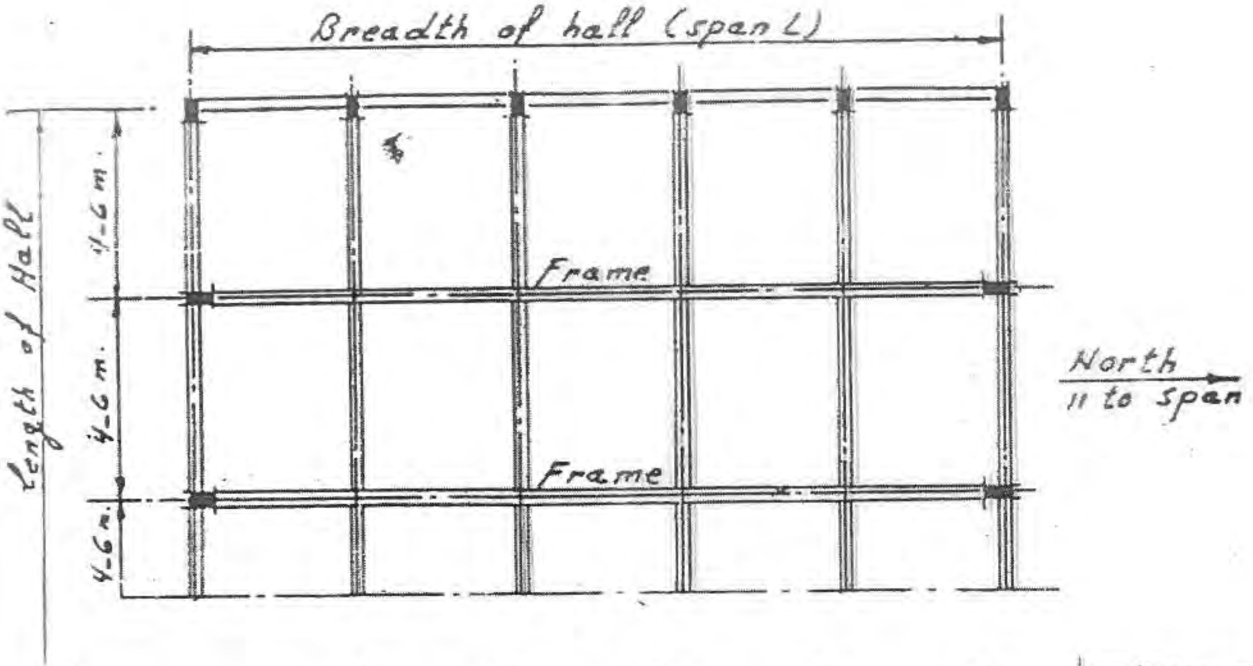
Fig. VII-14


North
SPAN
S
S
S
S

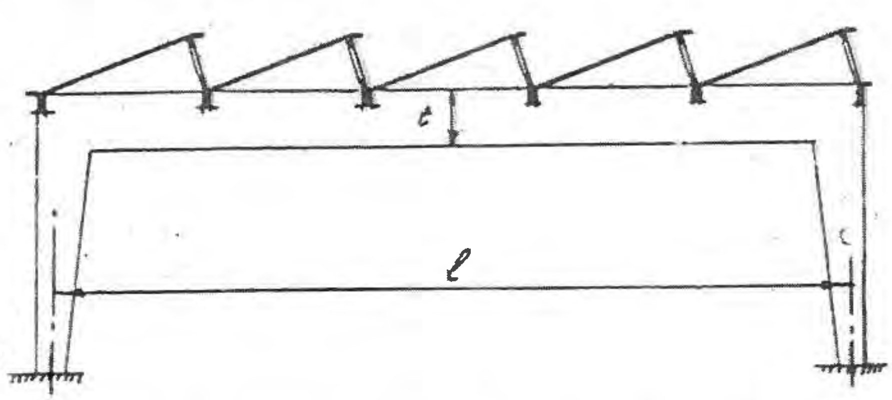

North
SPAN
S
S
S
S

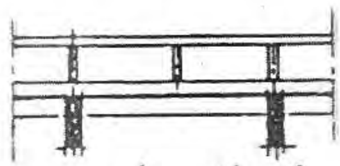

North
SPAN
S
S
S
S


North
SPAN
S
S
S
S



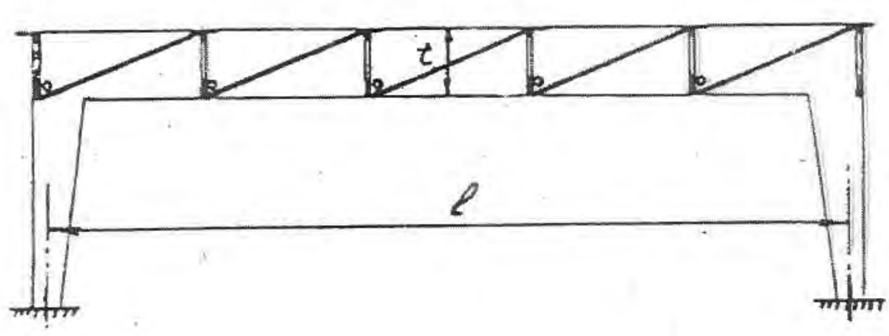
b

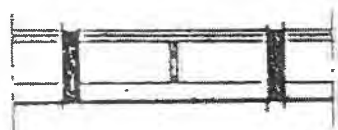




$t = 1/14 - 1/16\ l$

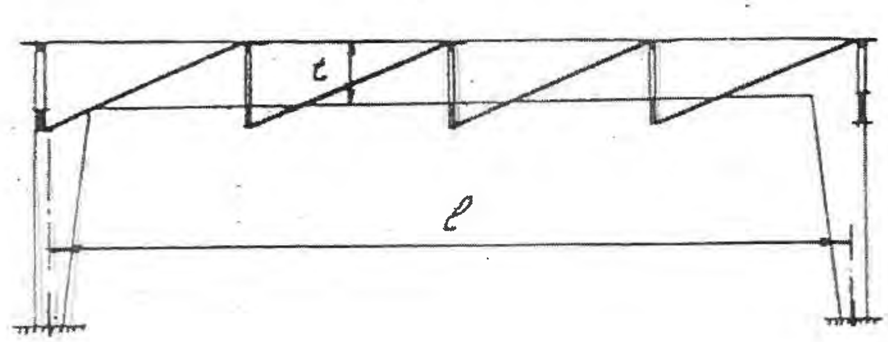
c

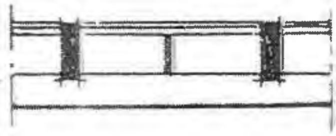




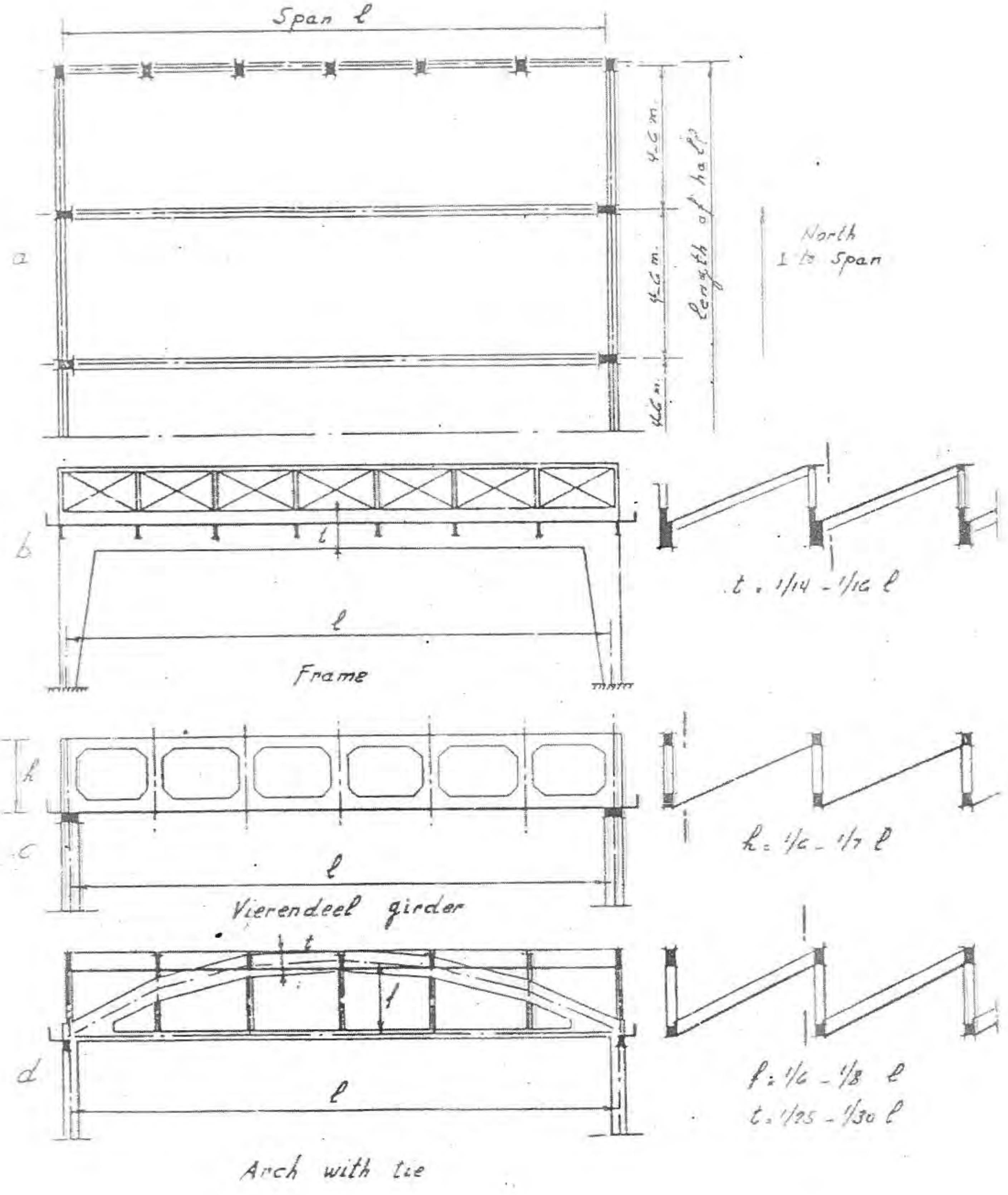
$t = 1/12 - 1/14\ l$

d

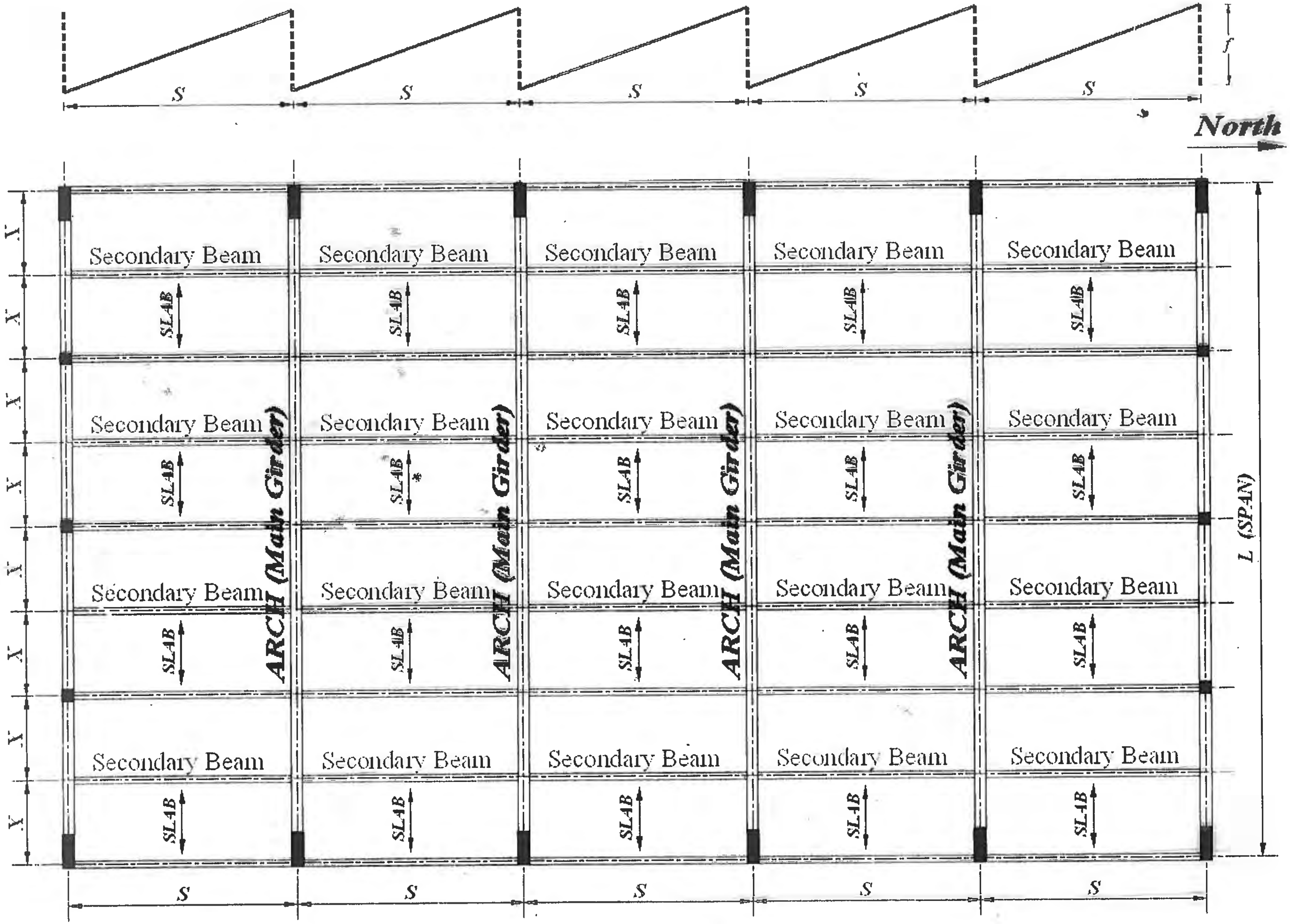


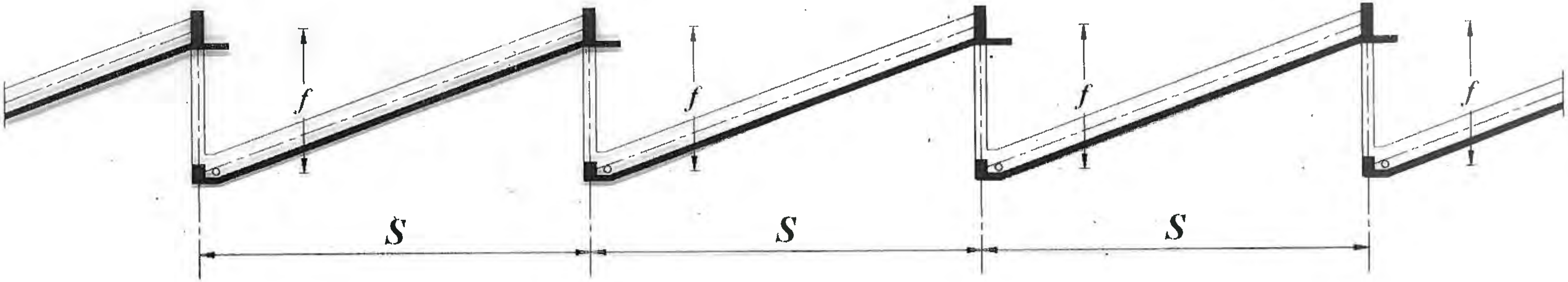


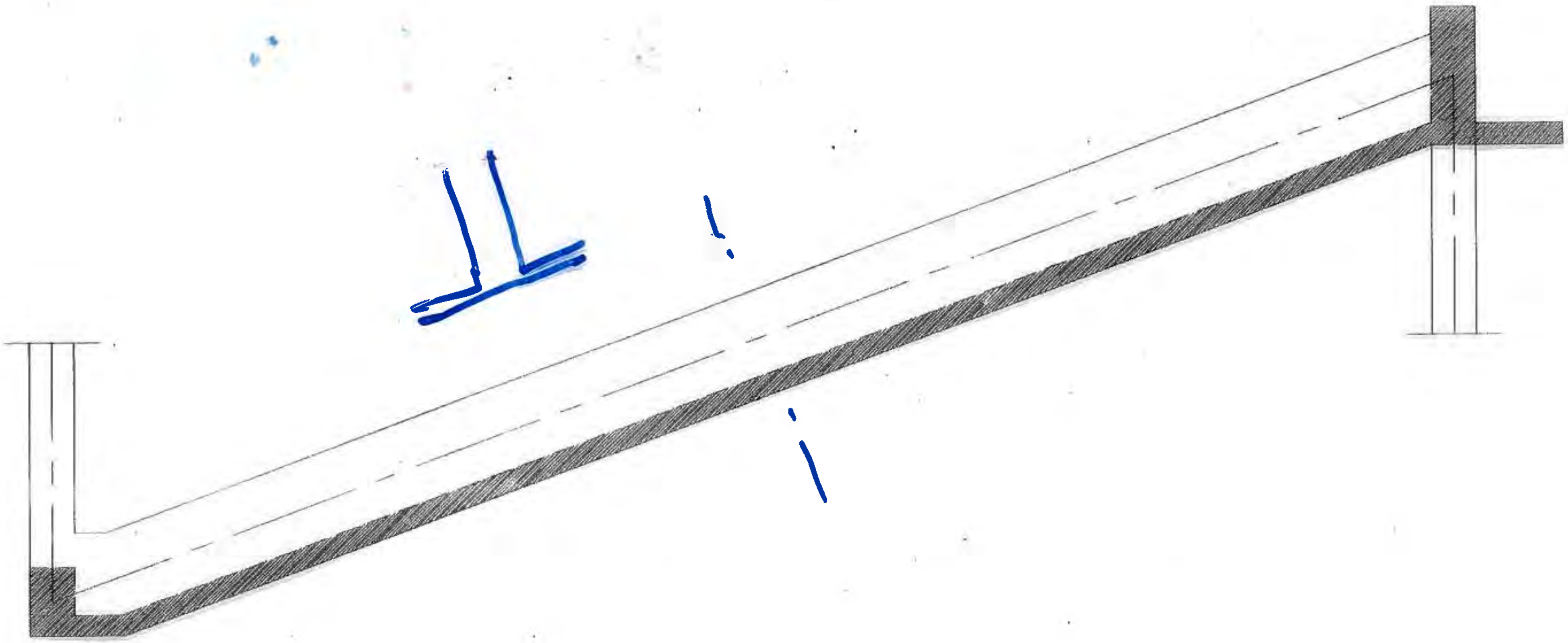
$t = 1/14 - 1/16\ l$

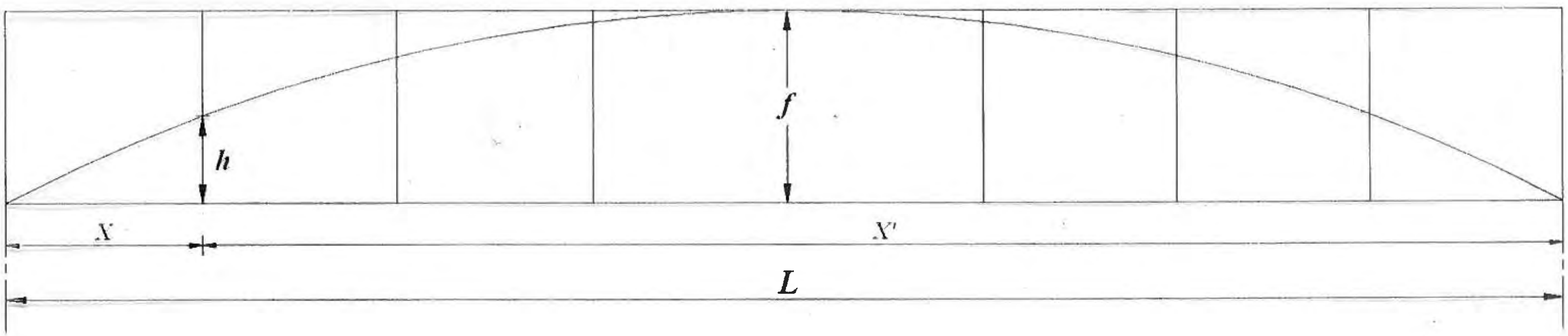


Span l
4.6 m.
4.6 m.
4.6 m.
Length of hall
North
⊥ to Span
a
b
t
l
Frame
t = 1/14 - 1/16 l
h
c
l
Vierendeel girder
h = 1/6 - 1/7 l
d
t
f
l
f = 1/6 - 1/8 l
t = 1/25 - 1/30 l
Arch with tie


S
S
S
S
S
f
North
Secondary Beam
SLAB
ARCH (Main Girder)
X
L (SPAN)

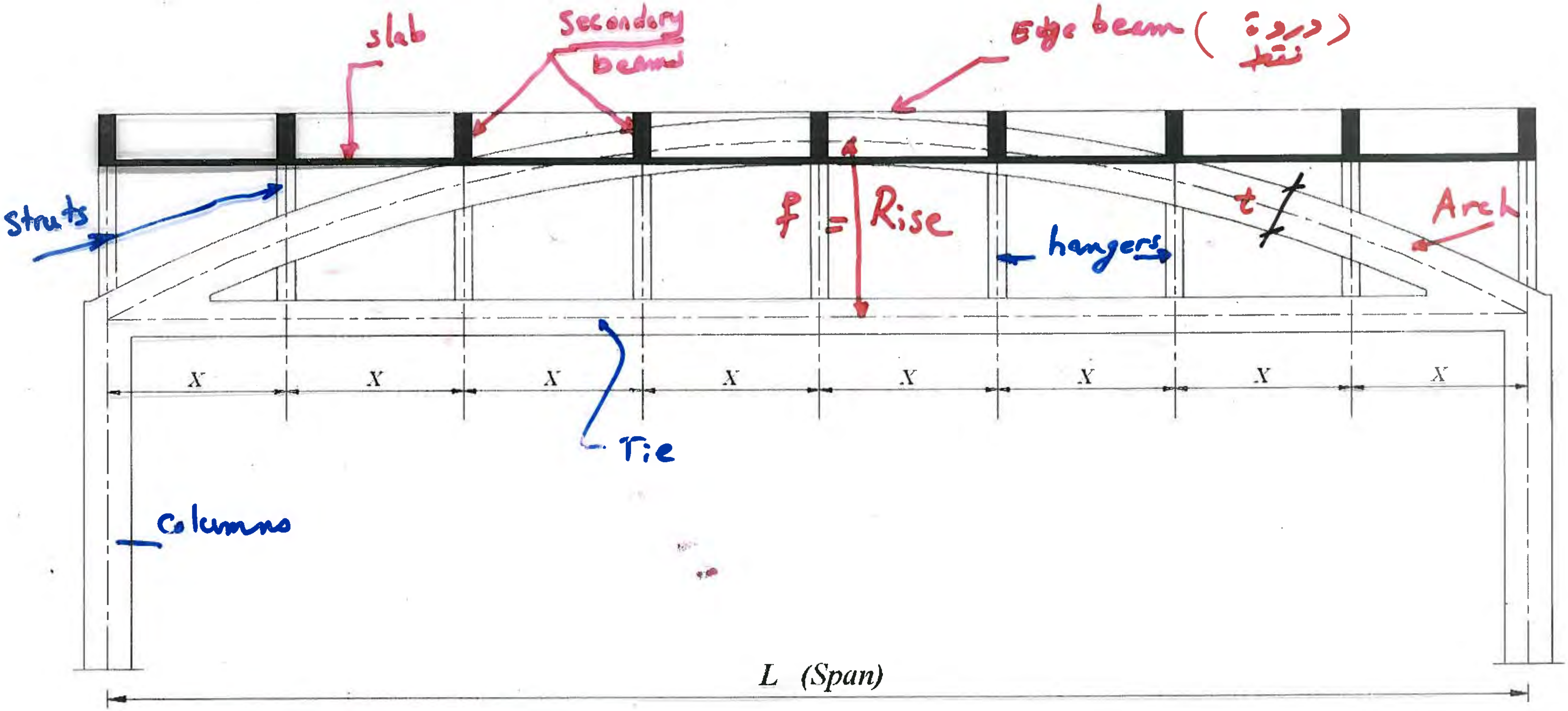

f
f
f
f
S
S
S





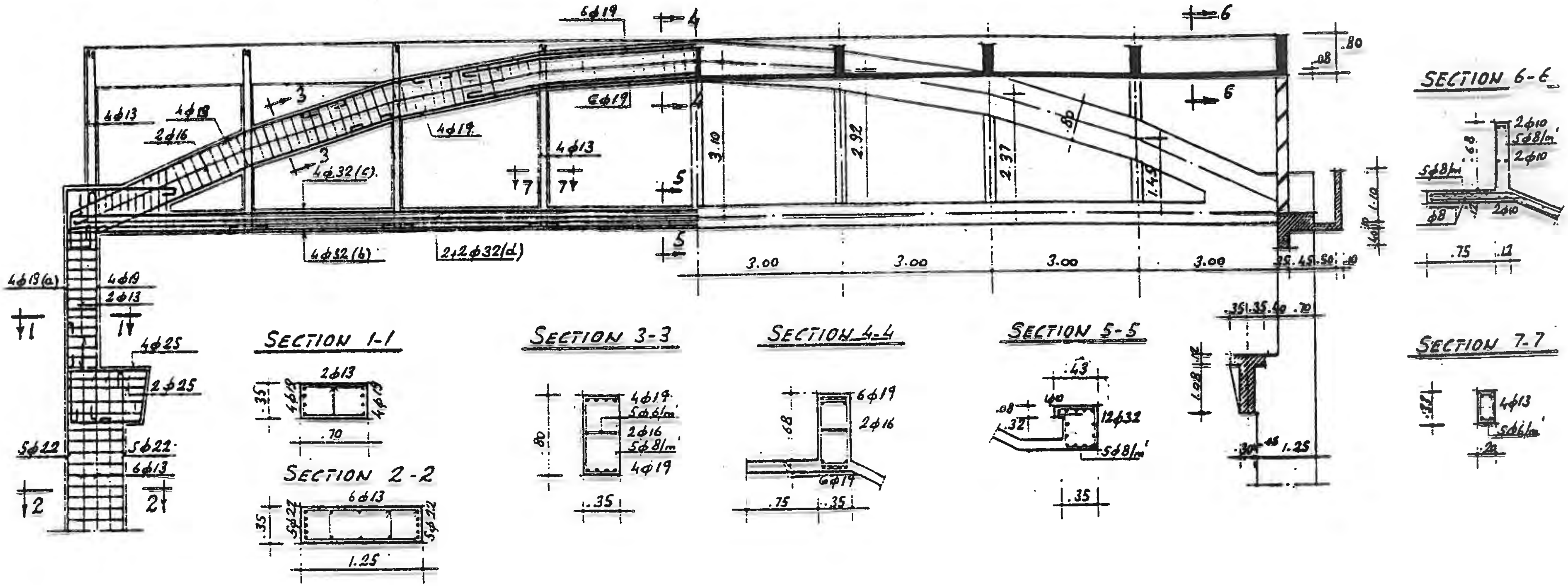
$$f = \left[\frac{1}{6} - \frac{1}{8}\right] L$$

$$h = \frac{4 . f \; x \; x'}{L^2}$$



$$f = \left(\frac{1}{6} - \frac{1}{8}\right) L$$

$$t = \left(\frac{1}{25} - \frac{1}{30}\right) L$$

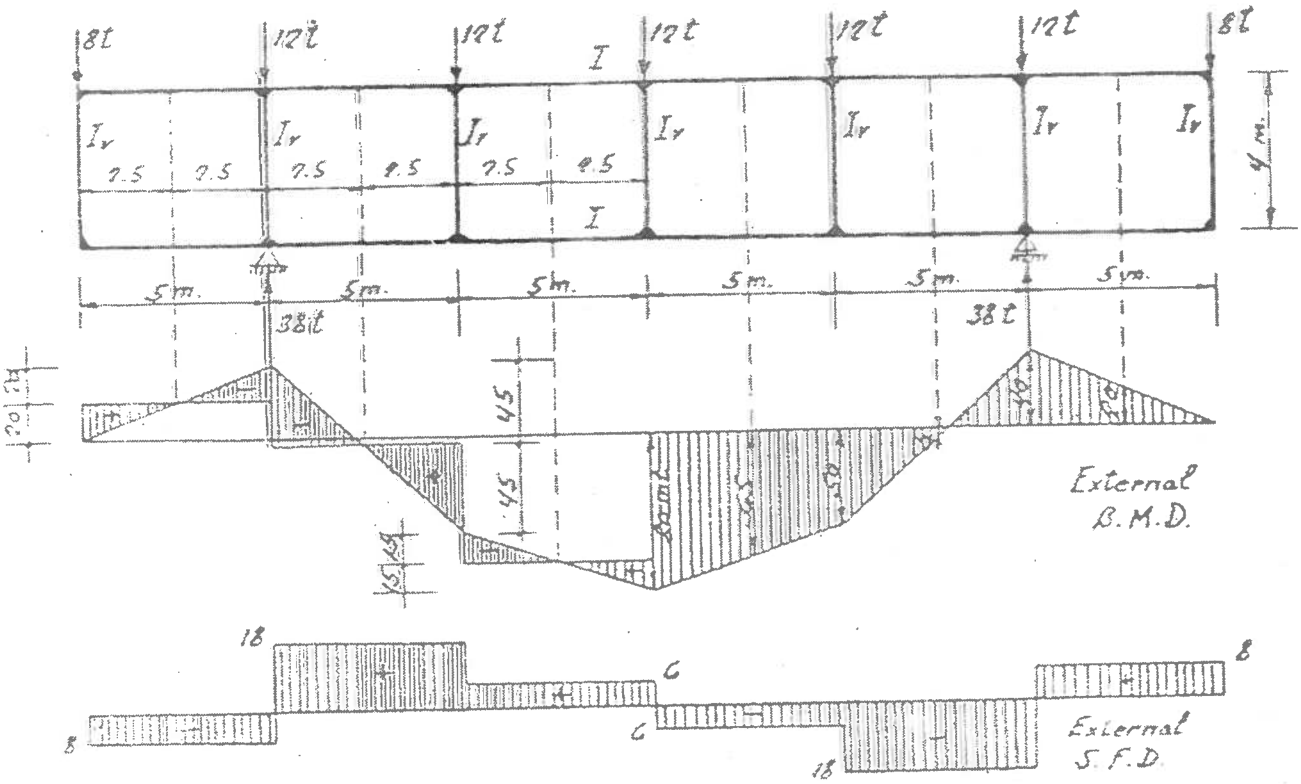

SECTION 1-1
SECTION 2-2
SECTION 3-3
SECTION 4-4
SECTION 5-5
SECTION 6-6
SECTION 7-7
3.00
3.00
3.00
3.00

To determine the internal forces in the Vierendeel girder using approximate solution assume the following assumptions:

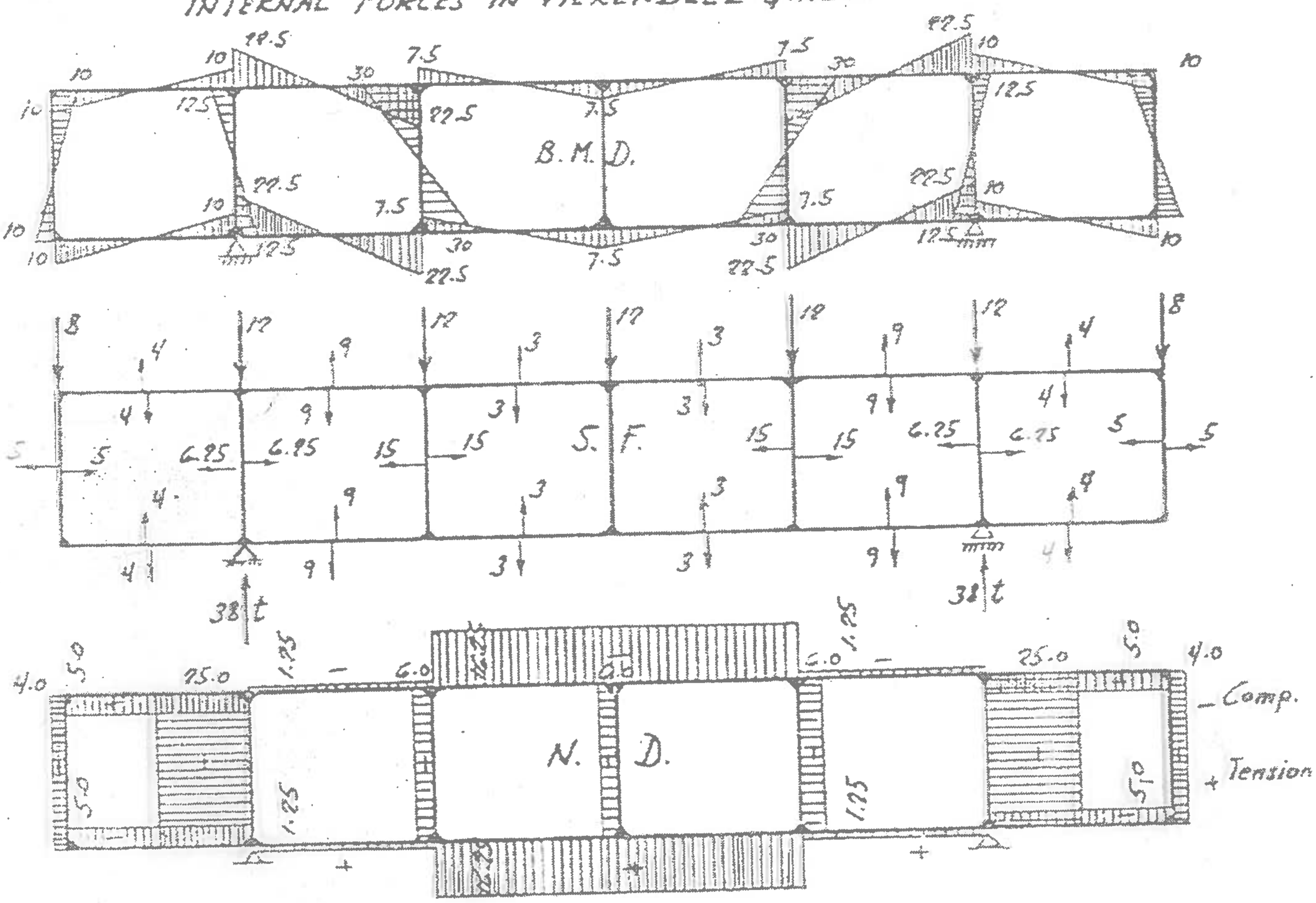
- The moments of inertia of the top and bottom chords are equal (I).
- The moments of inertia of the verticals are equal (I_v). $[I_v \cong (1-1.20)I]$
- Rigid connections between chords and vertical.
- It is better to have the loads are acting at the panel points.
- The points of zero bending moments at the middle of each element.

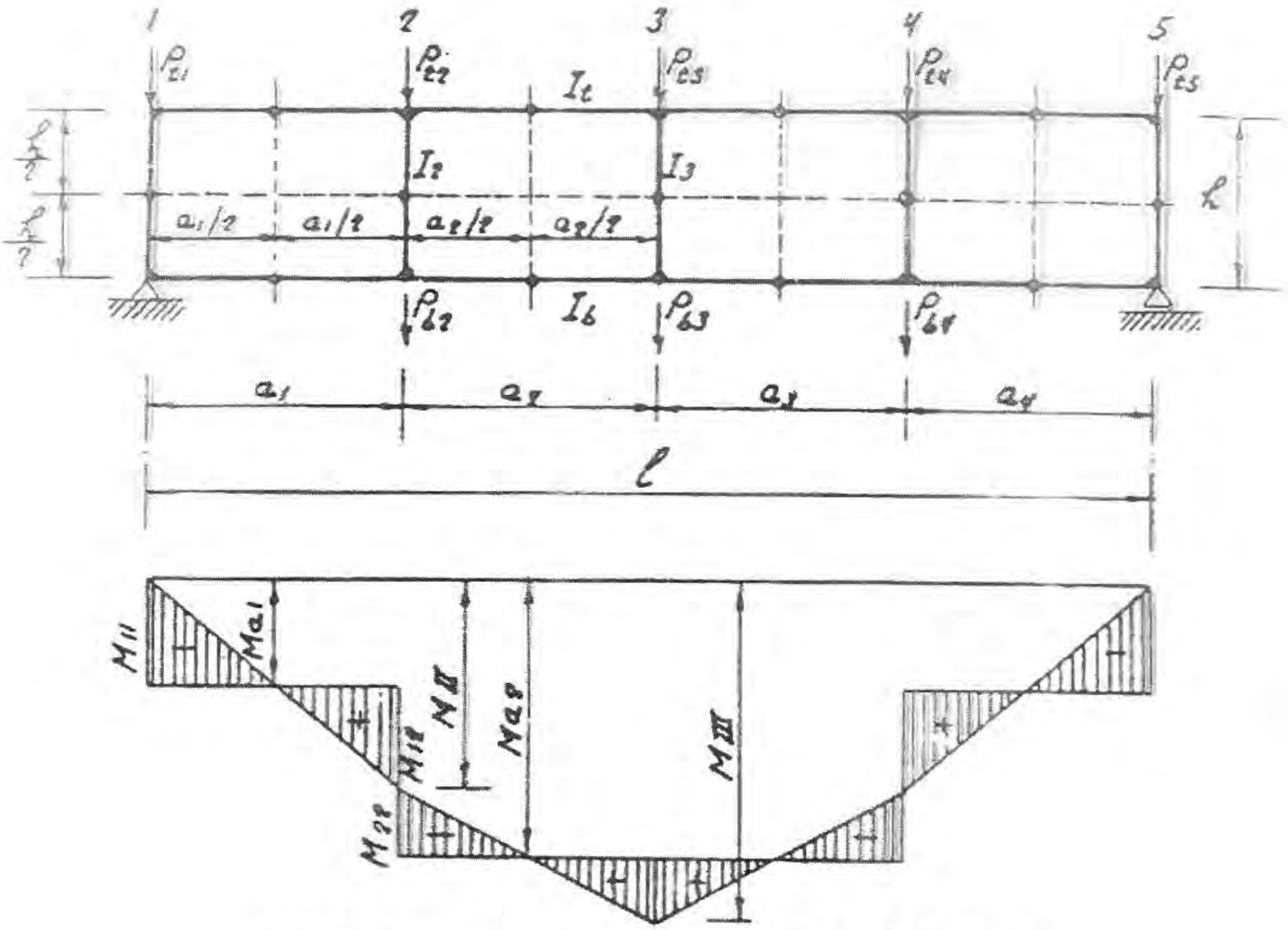
The following steps can be follow in order to determine the internal forces:

1. Draw the external bending moment and shearing force diagrams.
2. Draw vertical lines through the points of zero bending moment in the chords (middle points); extend them to meet the sides of the external B.M.D.
3. Through the points of intersection draw horizontal lines. The hatched diagrams between these horizontals and the sides of the external B.M.D. give the bending moments in the two chords. Each of the chords is subject to half these values.
4. The bending moments at the upper and lower joints of the verticals can be determined from the equilibrium of the joints.
5. The shearing forces in the chords and verticals can be determined by diving the moment at the joint by half the length of the corresponding panel.
6. The normal forces in any of the chords can be determined by dividing the ordinates of the external B.M.D. at the middle of the chord by the height of the Vierendeel.

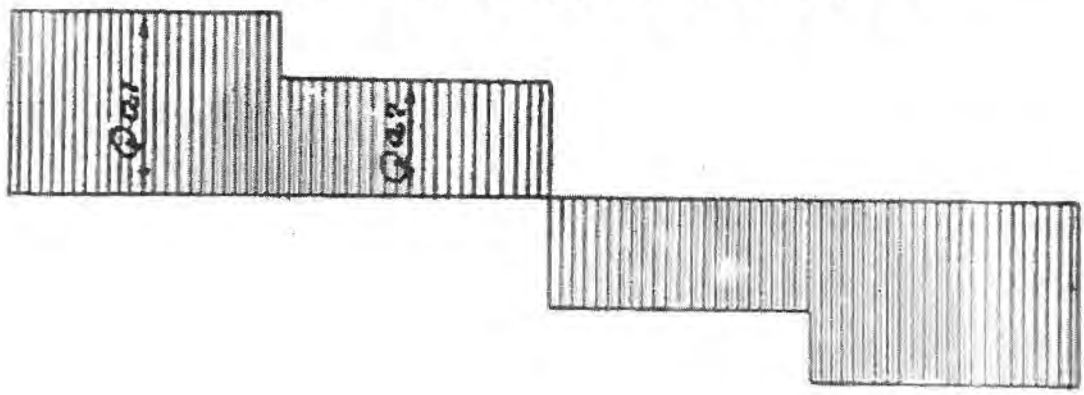


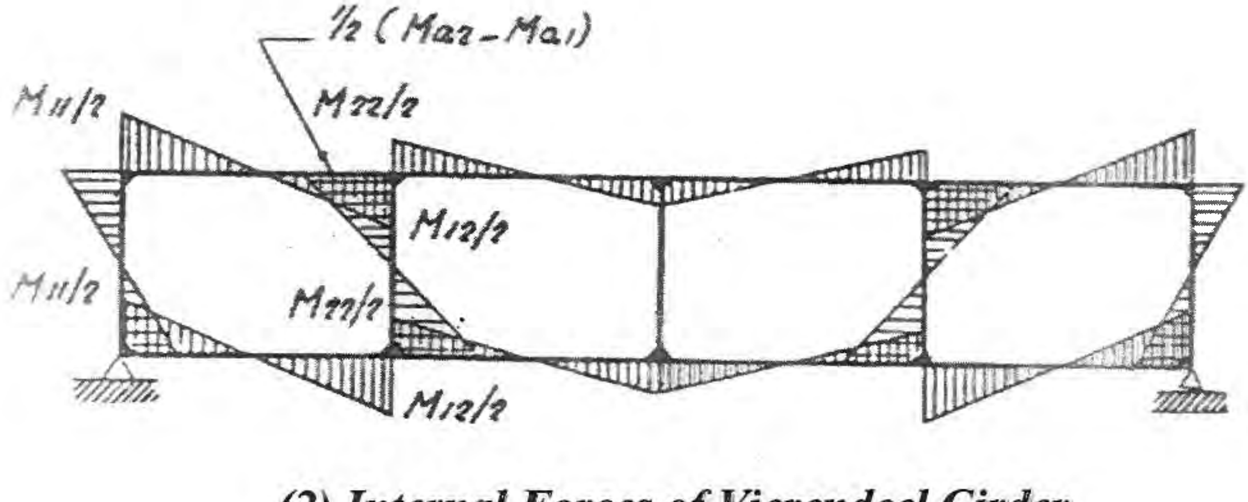
INTERNAL FORCES IN VIERENDEEL GIRDER



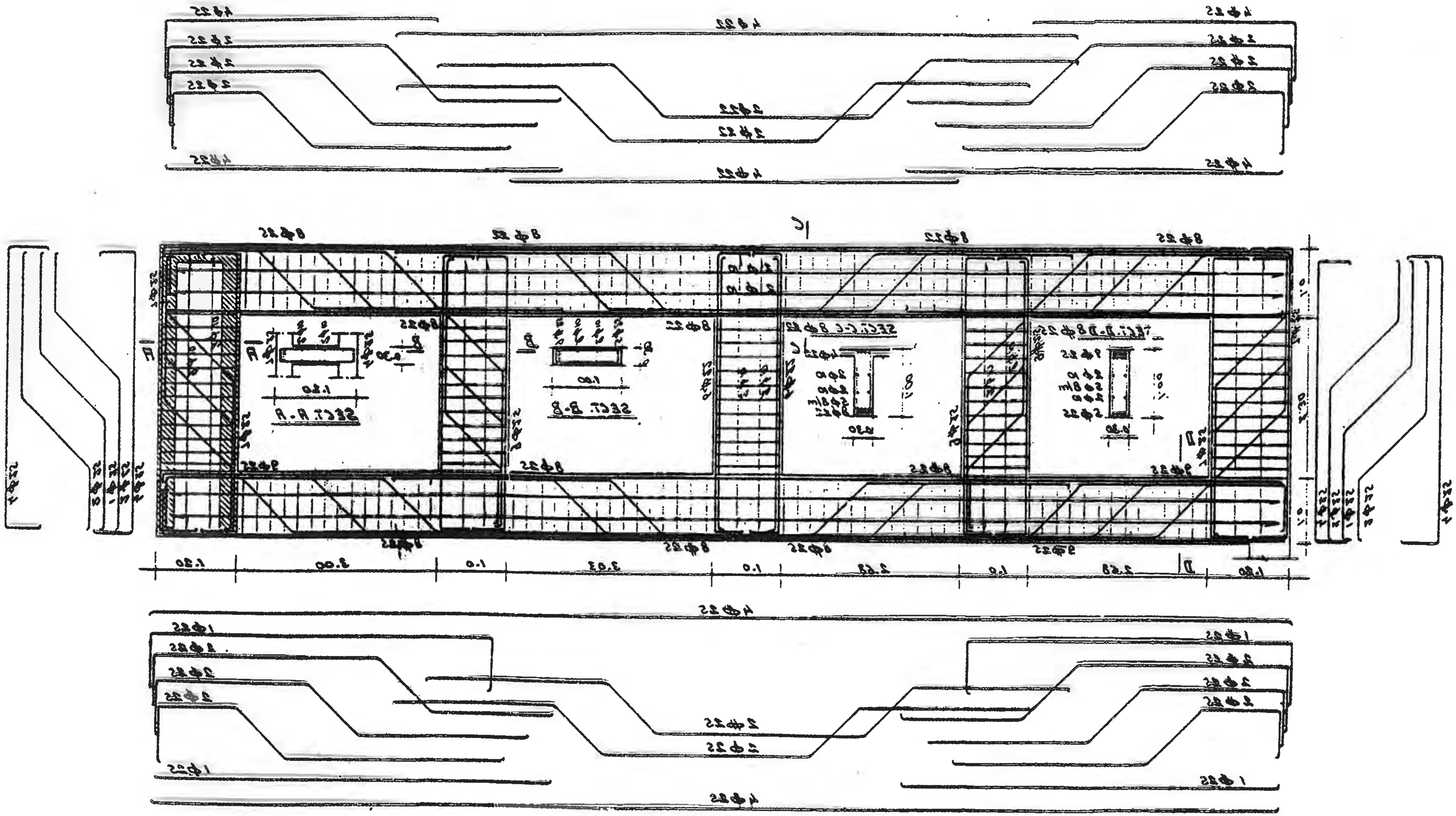


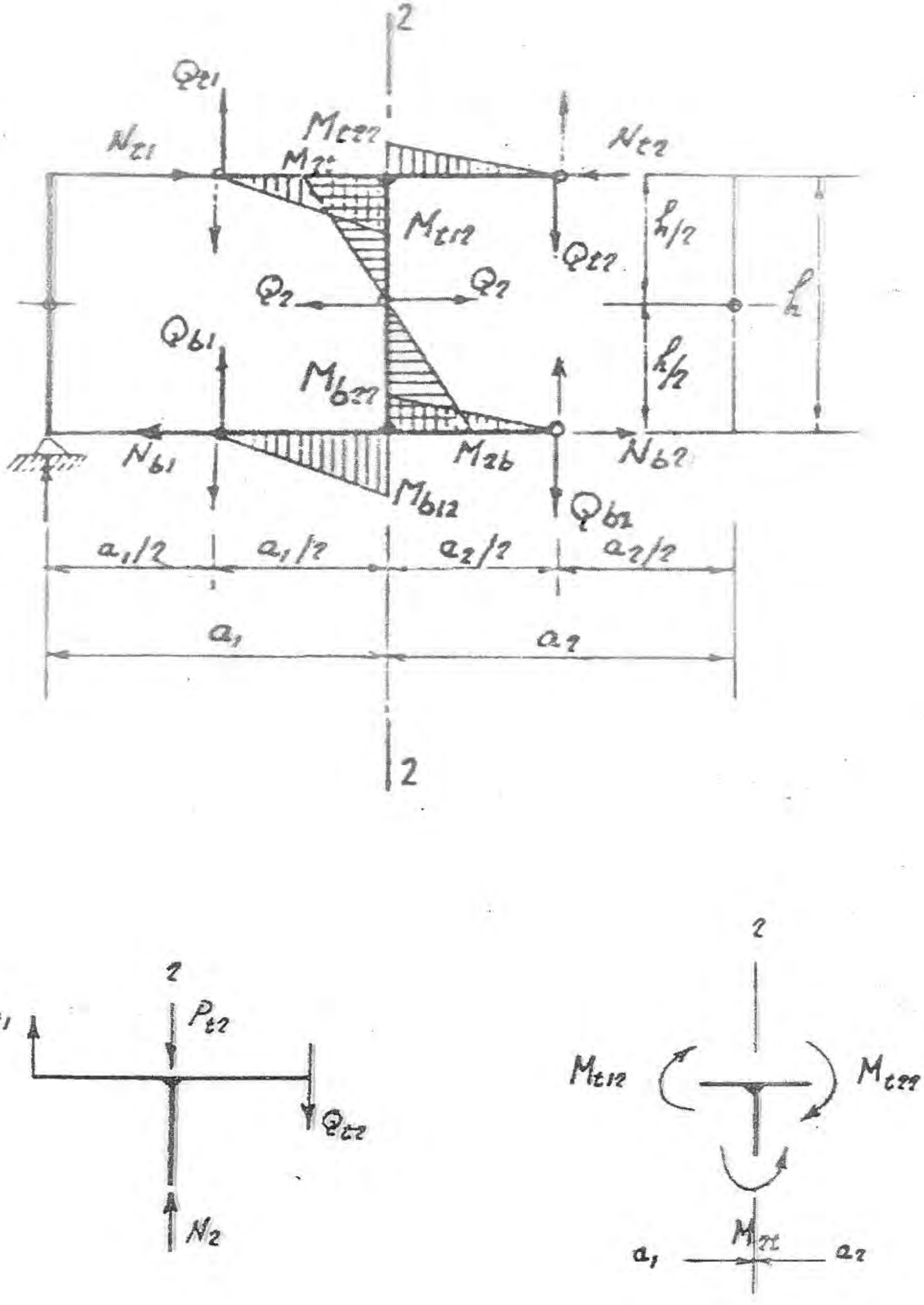
(1) External Forces of Vierendeel Girder





(2) Internal Forces of Vierendeel Girder





Joint No. (2) of the Vierendeel Girder

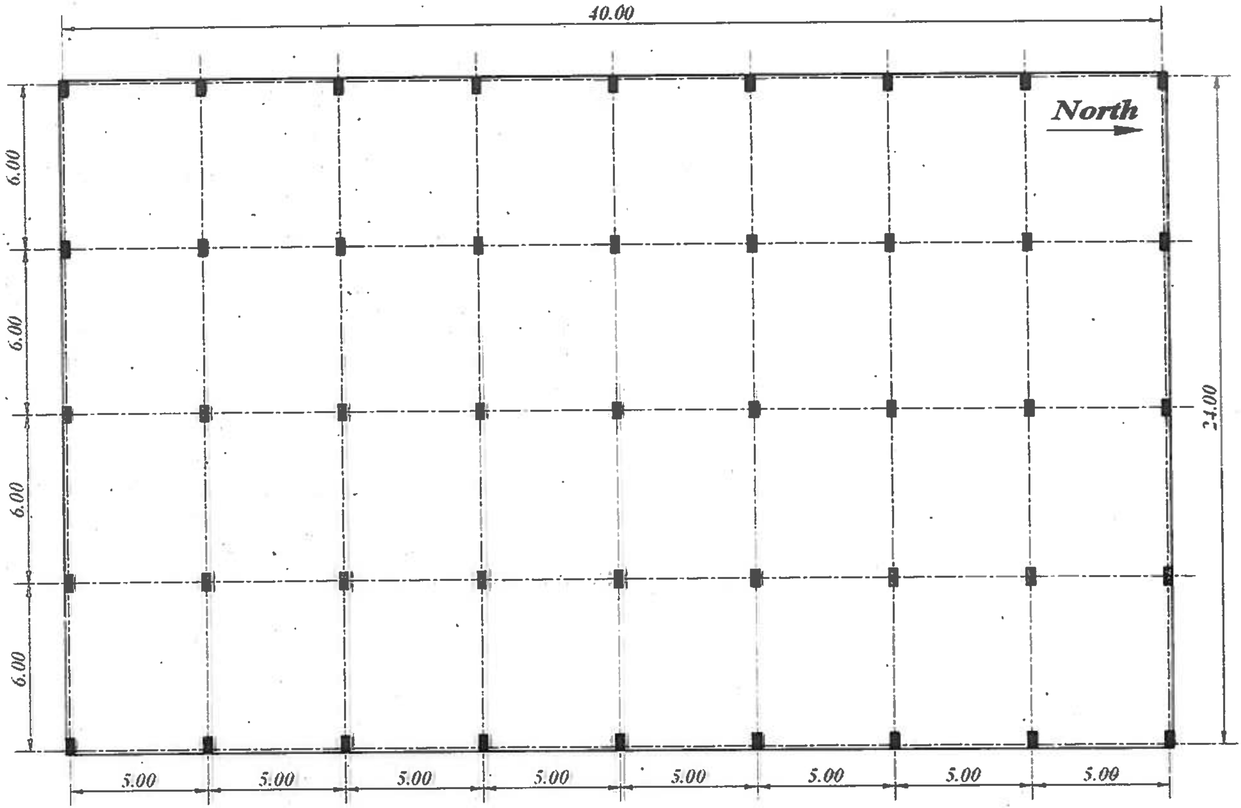


Figure (1)

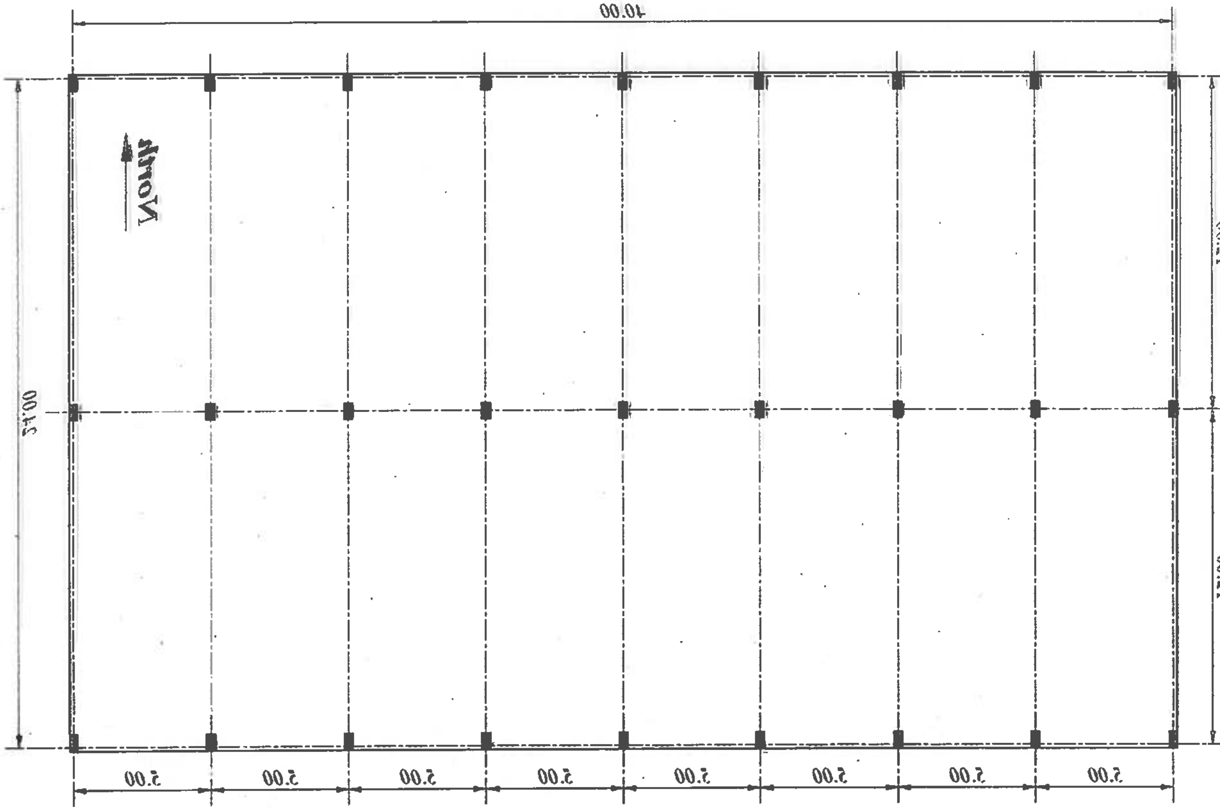


Figure (2)

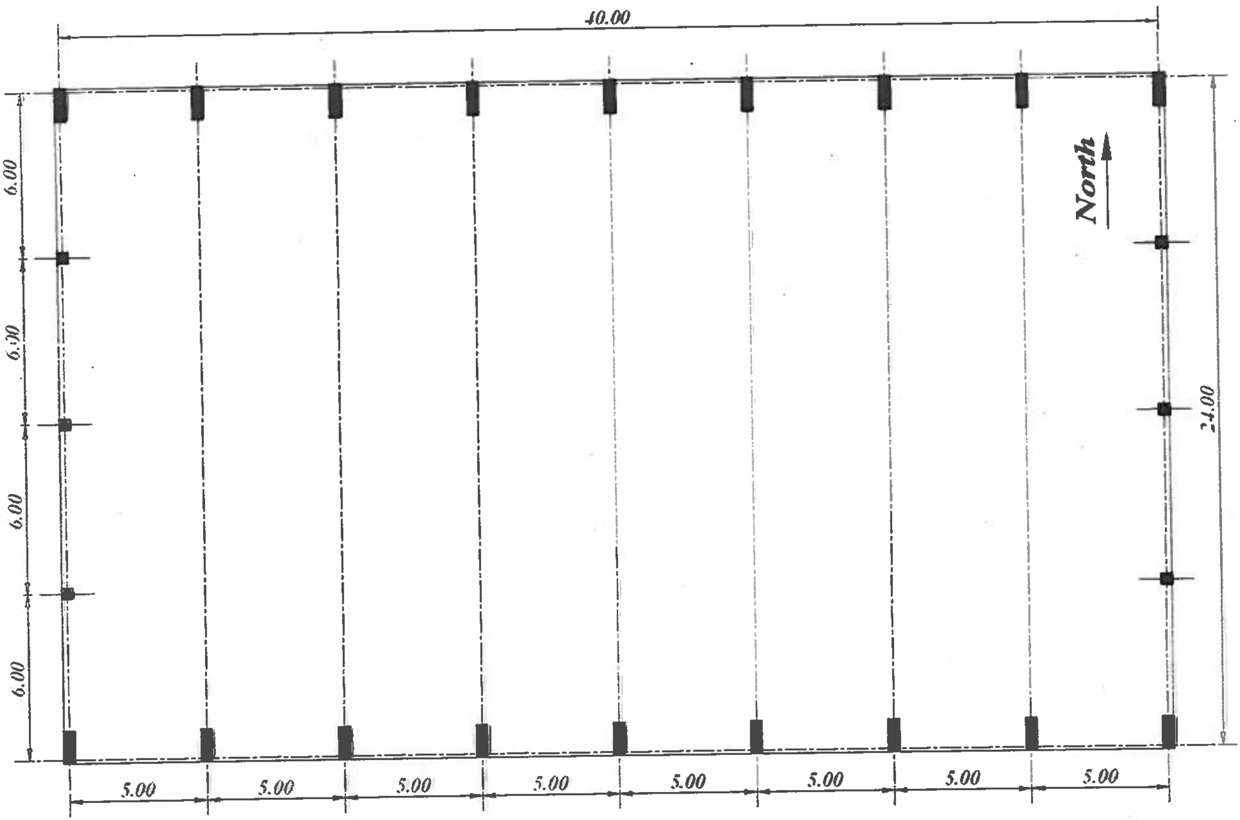


Figure (3)

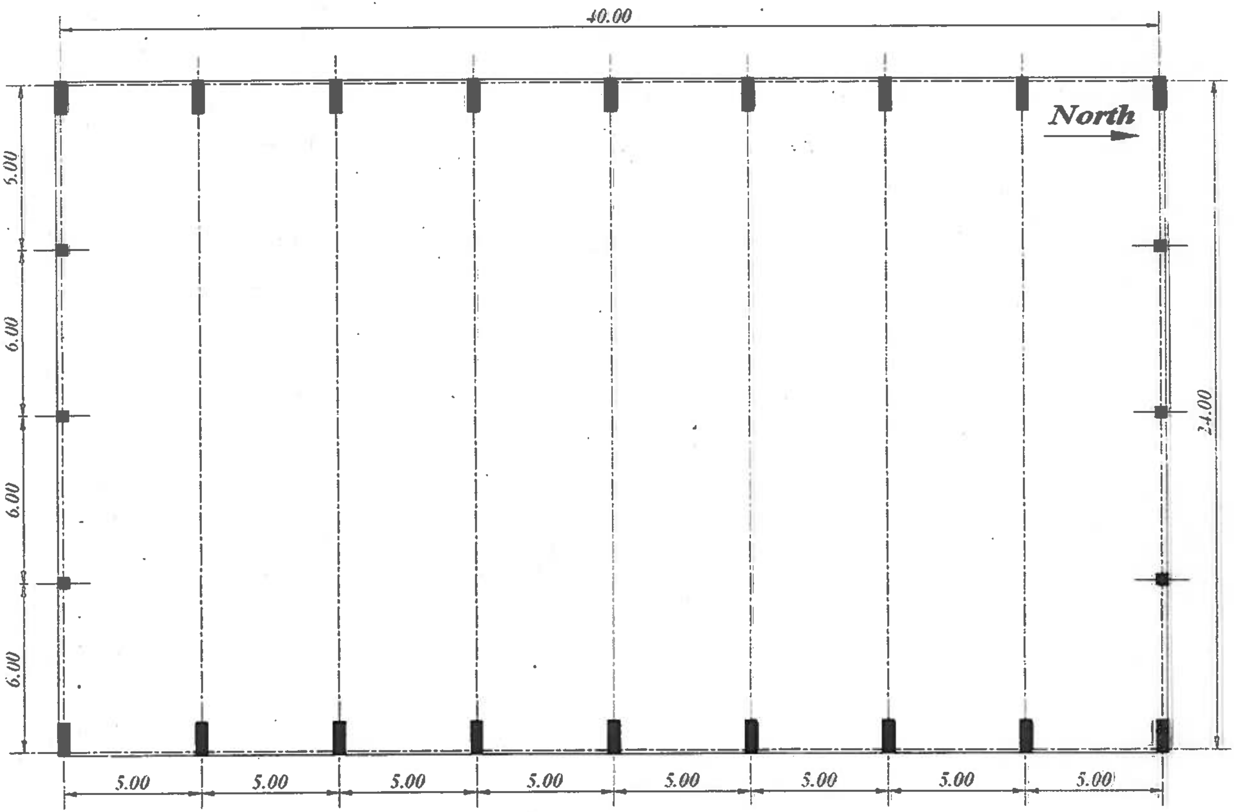


Figure (4)

ding and at 6 ms from them in order to have adequate space between the two rows of columns. Figure IV-71 shows the general layout of the new floor and its supporting circular beams and radial frames.

Due to the loading, the frame ab has the tendency to rotate around the lower hinge b pressing the inner circular ring beam at a ,

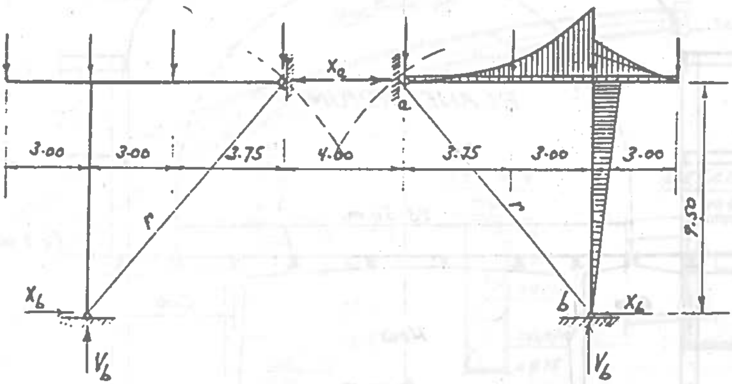


Fig. IV-72

so that each of the frames can be assumed as hinged at b and supported on the circular beam at a as shown in figure IV-72.

The concrete dimensions and details of reinforcements are shown in figure IV-73.

5) Continuous frames with ties as shown in figure IV-74.

The systems shown in figure IV-74 represent economic solutions for halls of moderate spans because the slabs and secondary beams are arranged in such a way that the axis of the polygonal girder coincides approximately on the line of pressure of the loads. If the spans are equal to or smaller than 10 ms, the effect of the elongation of the tie on the columns is small and may be neglected. In this case, the polygonal girder with its tie may be assumed as a shed giving for vertical loads on the girder, vertical reactions on the columns.

The internal forces can be determined for one single span both for vertical loads and wind pressure. However, adequate top reinforcement must be arranged and well anchored at the supports to resist the connecting moments that are liable to take place.

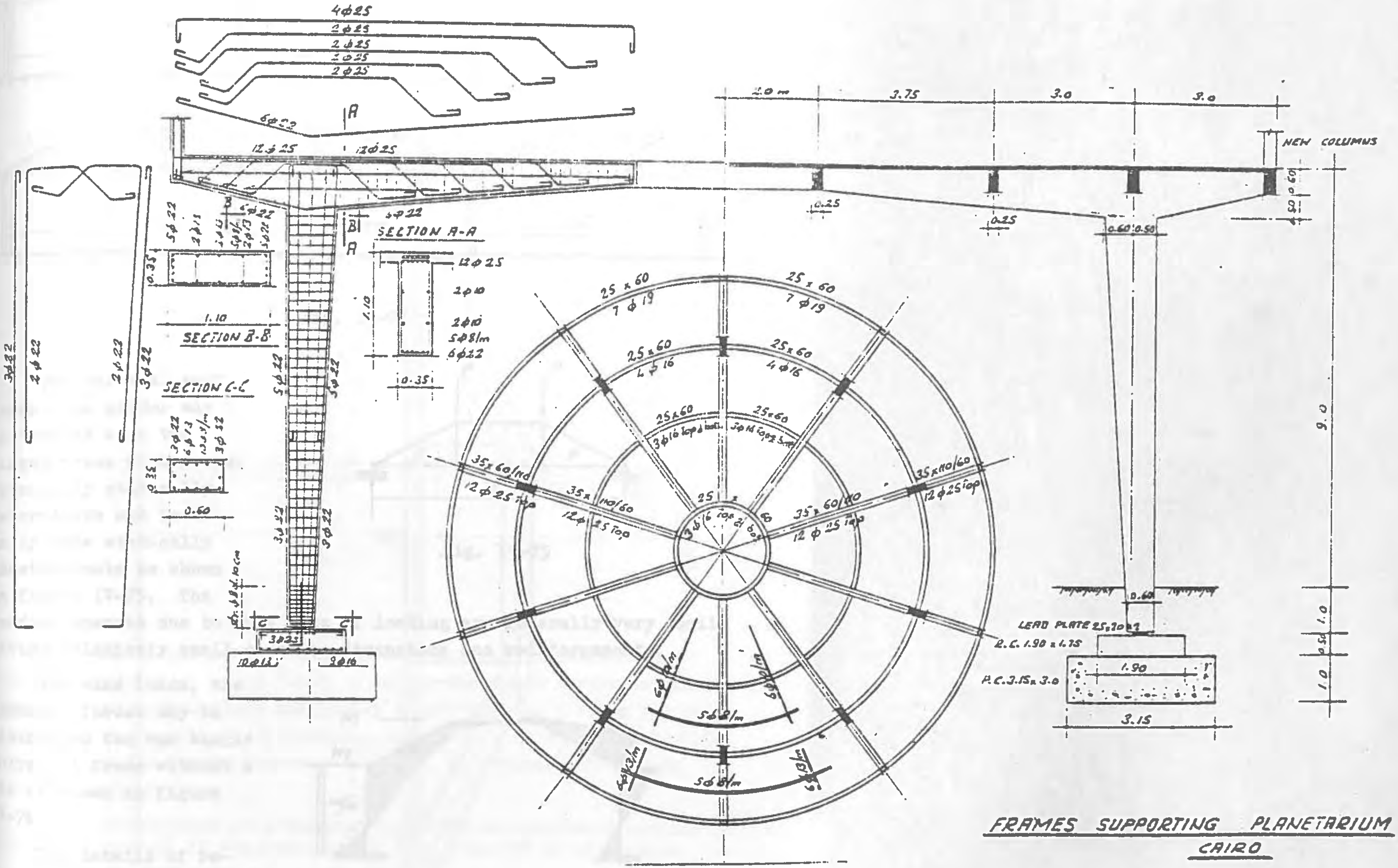

4φ25
2φ25
2φ25
2φ25
2φ25
6φ22
12φ25
12φ25
5φ22
SECTION A-A
12φ25
2φ10
2φ10
5φ8/m
6φ22
1.10
0.35
0.35
1.10
SECTION B-B
SECTION C-C
0.35
0.60
3φ22
2φ22
2φ22
3φ22
3φ22
10φ13
3φ16
25 x 60
7 φ19
25 x 60
7 φ19
25 x 60
4 φ16
25 x 60
4 φ16
25 x 60
25 x 60
35 x 60/110
12 φ 25 Top
35 x 110/60
12 φ 25 Top
35 x 110/60
12 φ 25 Top
35 x 60/110
12 φ 25 Top
5φ8/m
5φ8/m
2.0 m
3.75
3.0
3.0
NEW COLUMNS
0.25
0.25
0.60
0.50
9.0
1.0
0.50
1.0
LEAD PLATE 25 x 20 x 2
R.C. 1.90 x 1.75
P.C. 3.15 x 3.0
1.90
3.15
FRAMES SUPPORTING PLANETARIUM
CAIRO

Fig. IV-73