INTRODUCTION
PROPS – TELESCOPIC BEAMS

- Reinforced concrete construction of all types requires moulds in which to place the concrete. These moulds or shuttering or formwork are therefore a very essential part of the concrete contractor s work.

- Strength, stiffness, smoothness and good shape at the concrete face are the primary necessities; its cost to construct and erect should also be carefully considered. Even on a well organized job the cost of the formwork may be as much as one third of the structural cost of the contract , it is therefore essential that we must keep these costs to a minimum by avoiding wastage of materials and labour .

- Insufficient knowledge of how to build the form correctly and unskilled work may lead to lack of sufficient bracing and shoring, the use of timber not sufficiently strong to carry the loads and removing too soon , are some factors which have caused failures . Even if there is no failure, the work will look bad ; sagging floors ; wavy line in beams and columns .

- The tubular steel scaffolding is today used almost entirely in place of timber. It is more economic compared with timber , this economy is depending on the advantage of these scaffolding which would be carefully considered .

The advantages includes the following :

Simplicity:

Only tubes of two diameters & three or four types of fittings are all that have to be considered, compared with the several sizes and kind of timber.

Interchangeability:

Steel scaffolding are well adapted to be reused for any plant of different heights, leads without wastage of any components.

Definite costs:

Estimates can be obtained for the complete material required, thus removing some of the hazard of estimating the cost of timber support.

Ease of erection:

Erection is more or less standardised and simple compared with the various methods that can be used with timber supports.

Speed:

It is erected by traind men, its erection is rapid & requires no temporary bracing as the bracing is build in as it is erected.

Salvage:

Most of the steel scaffolding & fittings are good at the end of the works , whereas timber may be partly or wholly lost .

Strength:

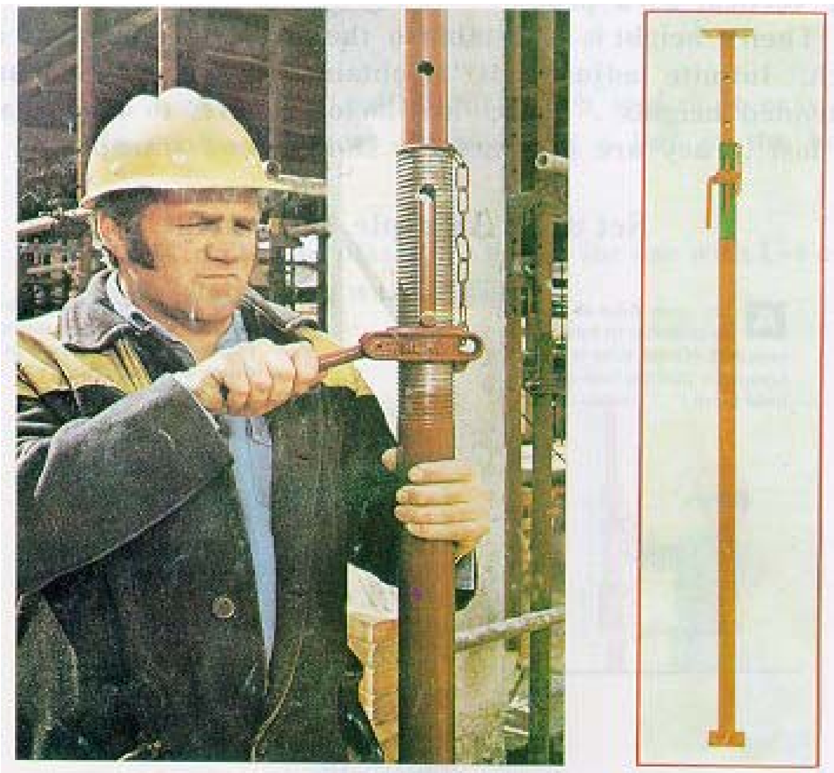
Steel scaffolding has a standard and constant strength, while every piece of timber is subject to flaws, perhaps hidden , that may seriously impair its strength .

Resistance to fire:

This is often an important consideration, especially where a large sum of money is tied up in the erection of large plant.

- The suitability and economy of steel scaffolding is very clear when it is rapidly circulated in the plant and when used for greater heights which requires large timber posts which is not economically, because it needs expensive long lengths or splices, and a considerable amount of bracing which lead to slower erection, whereas steel scaffolding can be carried up to great height with little or no change in component.

1 - STANDARD PROPS



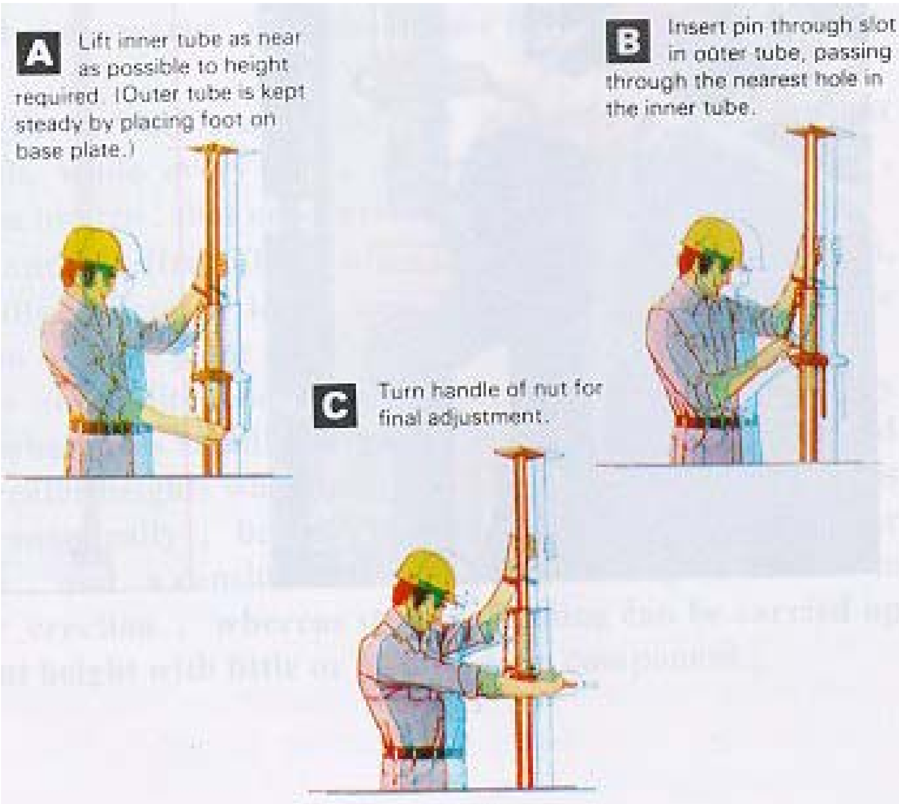
1- Standard Props

- Props eliminate the costly labour and time consumed in cutting timber to length, wedging and nailing, when used in the vertical as a prop .

- Their height is adjustable to the smallest fraction of an inch. Infinite adjustment is obtained between closed and extended heights. There are no loose parts to be mislaid or lost.

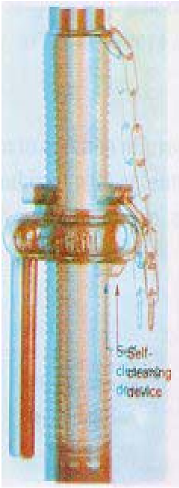
They are compact for storage and transport.

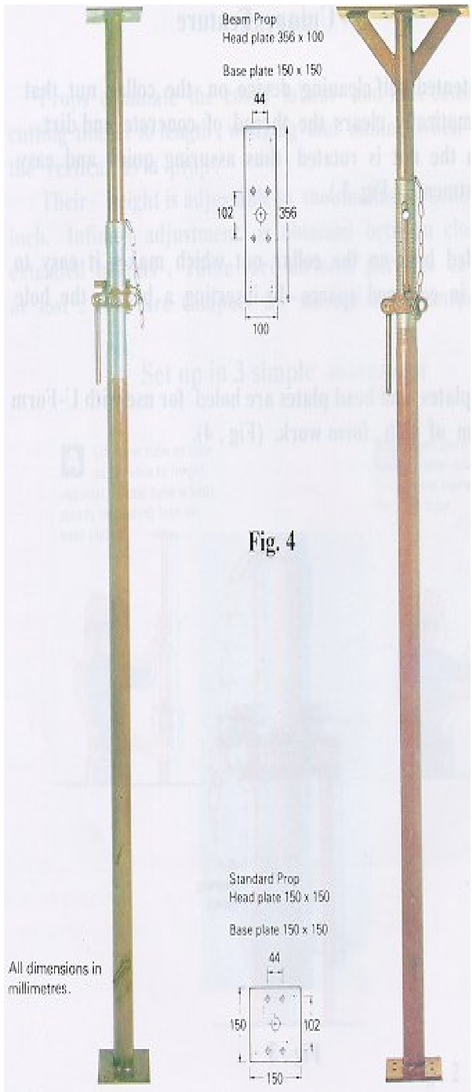
Set up in 3 simple movement



3 - Unique Feature

[1] A patented selfcleaning device on the collar nut which automatically clears the thread of concrete and dirt when the nut is rotated, thus assuring quick and easy adjustment. (Fig. 3).





[2] A holed boss on the collar nut which makes it easy to turn in confined spaces - by insering a bar in the hole.

[3] Base plates and head plates are holed for use with U-Form system of slab formwork (Fig –4)

Site Application

[1] Lack of attention to erection of props resulting in their not being vertical will result in a reduction of carrying capacity.

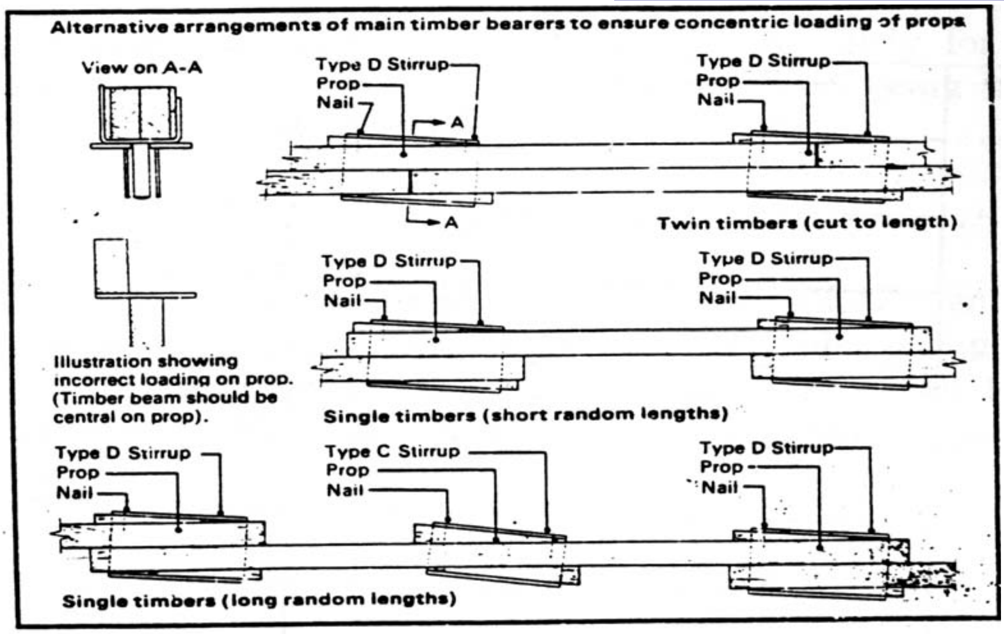
For example, props erected 1.5 degree out of vertical can result in a reduction of carrying capacity of up to 25 %.

[2] Lack of attention to correct seating of base plates can result in prop failure.

[3] Lack of attention to concentric loading to head plates (through timber bearers,etc) will result in a reduction of carrying capacity or prop failure .(Fig . 5).?

[4] Lack of attention to erection of props resulting in their not being vertical combined with eccentric loading conditions, could cause such a reduction in carrying capacity that failure could be possible.

[5] Alternative arrangement of main timber bearers to ensure concentric loading of props

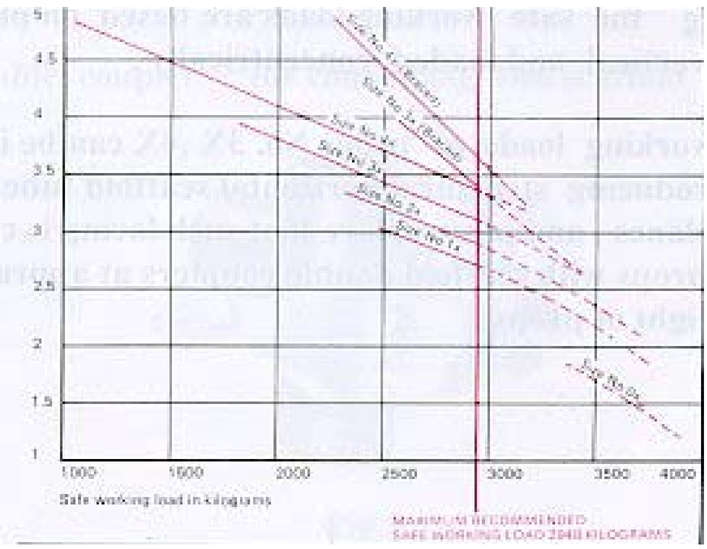


Props sizes, dimension & weights

Sizes	Height Closed	Height Extended	Weight K.G
0X	1.04	1.83	12.7
1X	1.75	3.12	21.1
2X	1.98	3.35	22.0
3X	2.59	3.96	24.6
4X	3.20	4.88	29.3

Safe working load for props

height	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75
1X,2X	3.2	3.1	2.5	2.2						
3X		3.1	2.5	2.2	2.0	1.8	1.6			
4X				3.0	2.4	2	1.7	1.5	1.3	1.2



Recomended Advices For Users Of Props

[1] Ensure that all props are fitted with correct standard prop pin which are manufactured from special high tensile steel. Failure of props can result if reinforced rods, tie rods or materials which may be inferior in quality or smaller in diameter are used instead of high tensile prop pins.

[2] Ensure that inner and outer prop tubes are straight and telescope freely . Bent props should not be used .

[3] Ensure that prop head and base plates are flat and perpendicular to tube to offer correct seating at top & bottom of prop .

[4] Prop loading is limited up to 294 kg solely for case of striking the safe working loads are based on prop being truly vertical and loaded concentrically .

[5] Safe working loads of props No. 3X ,4X can be increased by introducing structural horizontal scaffold tube lacing in both planes , and must ensure that such lacing is connected to all props with scaffold double couplers at approximately half height of props .

Types Of Elements Creating the Scaffold Tube System & Fittings

TUBE:	Outside diameter	= 48,4 m
	Wall thickness	= 4 mm
	Utimate tensile strenght	= 34,6 kg/ mm^2
	Area	= 567 mm^2

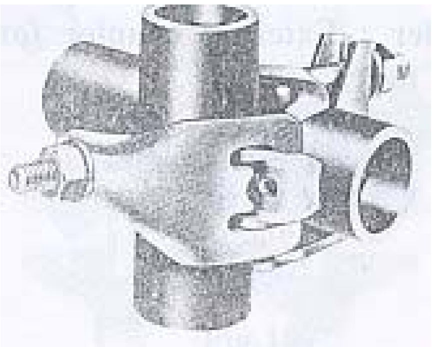
Couplers: There are mainly two kinds of couplers;

a) The right-angle coupler.
b) The swivel coupler.
c) The sleeve coupler.

The right-angle coupler is the key element in the tube/ coupler system and is the most requiested .

[a] The right-angle coupler:

a-1) Double coupler : for connecting two scaffold tubes.



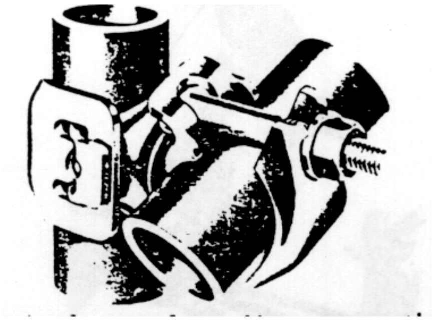
a-2) Prop double coupler : For connecting two scaffold tubes to the outer tube of -a prop .

b) The swivel coupler:

b-1) Swivel double coupler : For connecting two scaffold tubes at any angles (as required for diagonal bracing) .

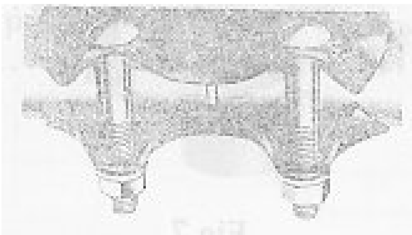
b-2) Prop swivel coupler :For connecting scaffold tube to the outer tube of a prop

when the angle is other than 90 degree.

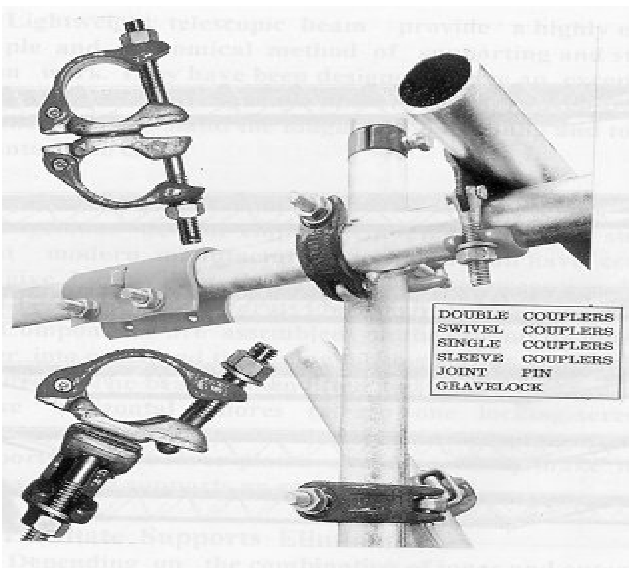


c) Sleeve coupler :

External coupler forthe end to end connection of tube.



Different kinds of fittings



EX. (1)

D. L. = 0.15 X 2.5 = 0.375 t / m 2

L. L = 0.3 t / m 2

T. L. = 0.675 t / m 2

P = 0.675 x 3.8 x 0.6 = 1.539 t < 1.8 t

Calculation of timber:

W = 0.675 x 3.8 = 2.565 t / m

$$M = \frac{2.6 \times (\overline{0.6})^2}{10} = 0.094 \text{ m. t}$$

$$P_{sh} = \frac{2.6 \times 0.6}{2} = 0.78 \text{ t}$$

Choose 2 " x 6 "

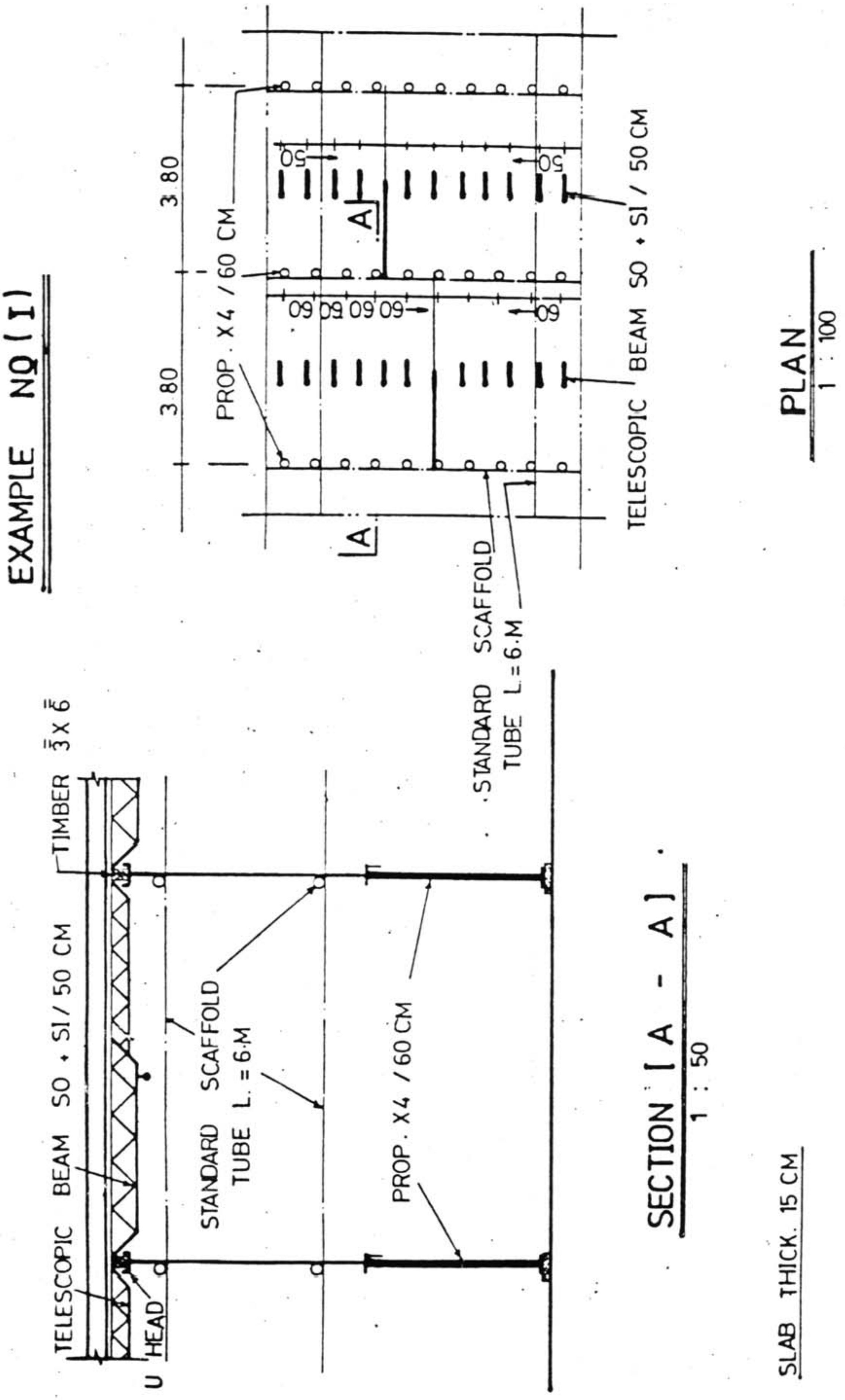
$$F_m = \frac{M}{Z} = \frac{0.094 \times (\overline{10})^5}{187} = 50 \text{ kg / cm}^2$$

$$F_{sh} = \frac{P}{A} = \frac{0.78 \times (\overline{10})^3}{75} = 10.4 \text{ kg / cm}^2$$

$$S = \frac{5}{484} \times \frac{WL}{EI}$$

$$S = \frac{5 \times 0.675 \times 10 \times (\overline{60})^4}{384 \times 1406 \times 80\,000} = 0.01 \text{ cm.} = 1 \text{ mm Safe}$$

Choose 3 '' x 6 "


EXAMPLE NO (I)
3.80
3.80
PROP. X4 / 60 CM
A
A
50
50
60 60 60 60 60
60
TELESCOPIC BEAM 50 + SI / 50 CM
STANDARD SCAFFOLD TUBE L = 6.M
PLAN
1 : 100
TIMBER 3 X 6
TELESCOPIC BEAM 50 + SI / 50 CM
U HEAD
STANDARD SCAFFOLD TUBE L. = 6.M
PROP. X4 / 60 CM
SECTION [A - A]
1 : 50
SLAB THICK. 15 CM

Example (2)

D.L. = 0.15 x 2.5 x 4.5 + 0.25 X 0.55 X 2.5 = 2.03 t / m ‘
L. L. = 0.3 x 4.5 = 1.35 t / m ‘
T. L = 3.38 x 1.0 / 2 = 1.68 t safe

Check of timber:

$W_1 = 3.38 \times 0.5 = 1.69$ t / m ‘

$M = \frac{2.69 \times \overline{(1.0)}^2}{10} = 0.169$ m. t

$P_{sh} = 1.69 \times 0.5 = 0.845$ t choose 3” x 6 “

$F_m = \frac{M}{Z} = \frac{0.169 \times \overline{(10)}^5}{281} = 60.1$ kg/ cm^2 safe

$F_{sh} = \frac{P}{A} = \frac{0.854 \times \overline{(10)}^3}{112.5} = 7.50$ kg / cm^2 safe

$S = \frac{5}{484} \times \frac{WL}{EI}$

$S = \frac{5 \times 1.69 \times 10 \times \overline{(100)}^4}{384 \times 2107 \times 80\ 000} = 0.13$ cm. = 13 mm. Safe

Cheek of sec. Timber: assume 2 “ x 6 “ / 30 cm

$W_2 = 3.38 \times 0.3 = 1.014$ t / 25 cm = 4.1 t / m’
M = 0.12 m.t. P (shear) = 0.507 t

$F_m = \frac{M}{Z} = \frac{0.12 \times \overline{(10)}^5}{187} = 64$ kg / cm^2 safe

$F_{sh} = \frac{P}{A} = \frac{0.51 \times \overline{(10)}^3}{75} = 6.80$ kg / cm^2 safe

$S = \frac{5 \times 4.1 \times 10 \times \overline{(60)}^4}{384 \times 1402 \times 80\ 000} = 0.06$ cm, = 0.6 mm. Safe

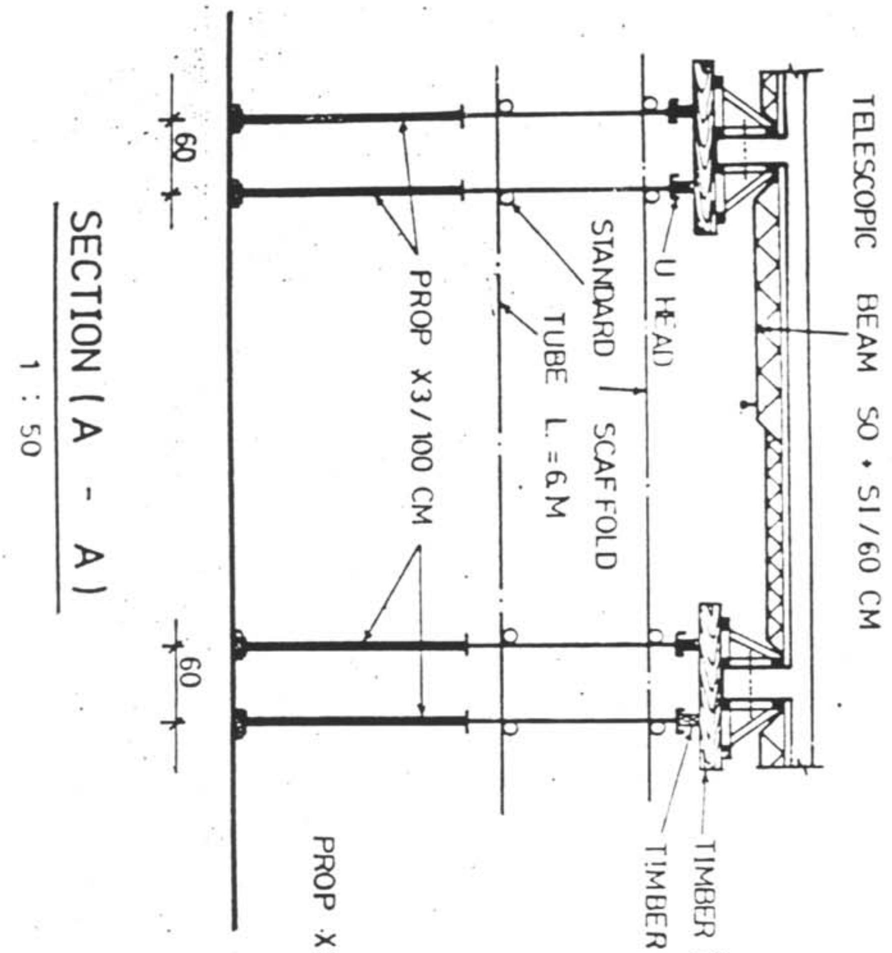
$W_3 = 3.38 \times 0.1 = 0.338$ t / m ‘

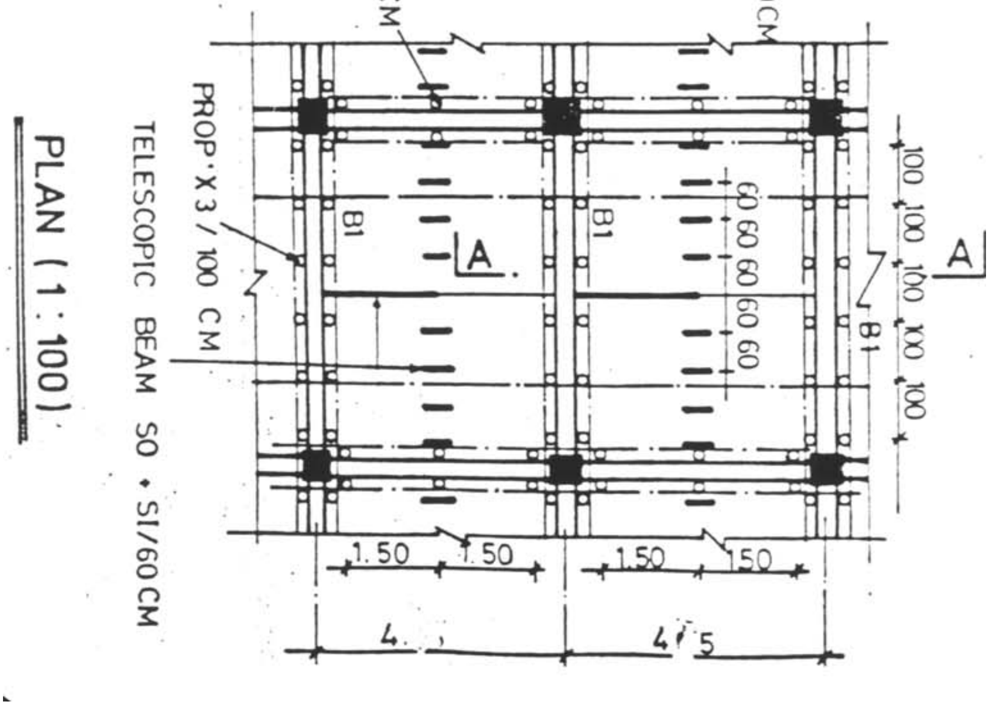
M = 0.0038 m. t. P (shesr) = 0.051 t

$F_m = \frac{M}{Z} = \frac{0.0038 \times \overline{(10)}^5}{10.414} = 36.48$kg / cm^2 safe

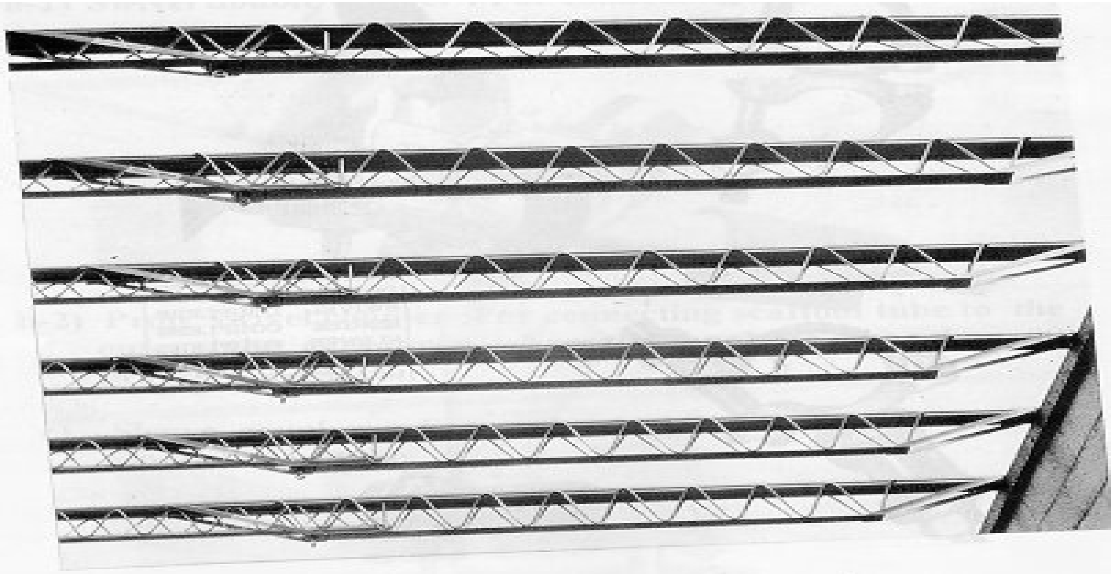
$F_{sh} = \frac{P}{A} = \frac{0.051 \times \overline{(10)}^3}{25} = 2.04$ kg / cm^2 safe

$S = \frac{5 \times 0.338 \times 10 \times \overline{(30)}^4}{384 \times 13.02 \times 80\ 000} = 0.034$ cm. = 0.34 mm. safe


TELESCOPIC BEAM SO • SI/60 CM
U HEAD
STANDARD SCAFFOLD
TUBE L.=6.M
PROP X3/100 CM
60
60
TIMBER 2X6/30CM
TIMBER 3X6
SECTION (A - A)
1 : 50


PROP X3/150CM
PROP X 3/100 CM
TELESCOPIC BEAM SO • SI/60CM
B1
B1
B1
A
A
100 100 100 100 100
60 60 60 60 60 60
1.50 1.50 1.50 1.50
PLAN (1:100)

2- Light Weight Telescopic Beam



Introduction:

- Lightweight telescopic beam provide a highly efficient, simple and economical method of supporting and stripping formwork. they have been designed to give an exceptionally high load-bearing capacity and are manufactured from high tensile steel to stand the toughest site handling and to reduce maintenance costs.

Simple and quick to erect

- Ingenious design, employment of high tensile steel, the most modern manufacturing techniques-all have combined to give Lightweight telescopic beam an exceptionally high load-bearing capacity for its low weight.
- Components are assembled on the ground by telescoping inner into outer and tightening locking screws to give the span required. The beam is then lifted and placed into position. To strike horizontal shores release one locking-screw and telescope inner into outer to clear bearer-plates from their supports. All bearer-plates are tapered to make to their removal from supports an easy operation.

Intermediate Supports Eliminated

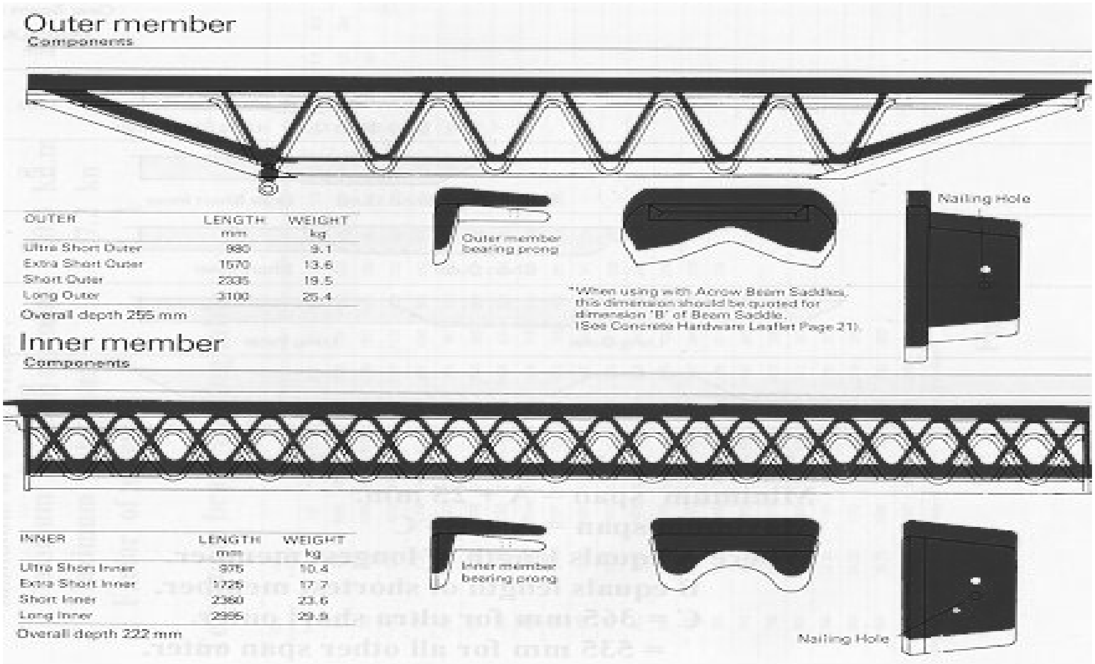
- Depending on the combination of inner and outer, spans from 1m. up to 8m. can be obtained without any intermediate support .

Two Basic Components

- A lightweight telescopic beam comprises an inner in four lenghts and an outer also available in four lenghts. The inner and outer can be combined in a variety of combinations.There are no loose parts to be lost.

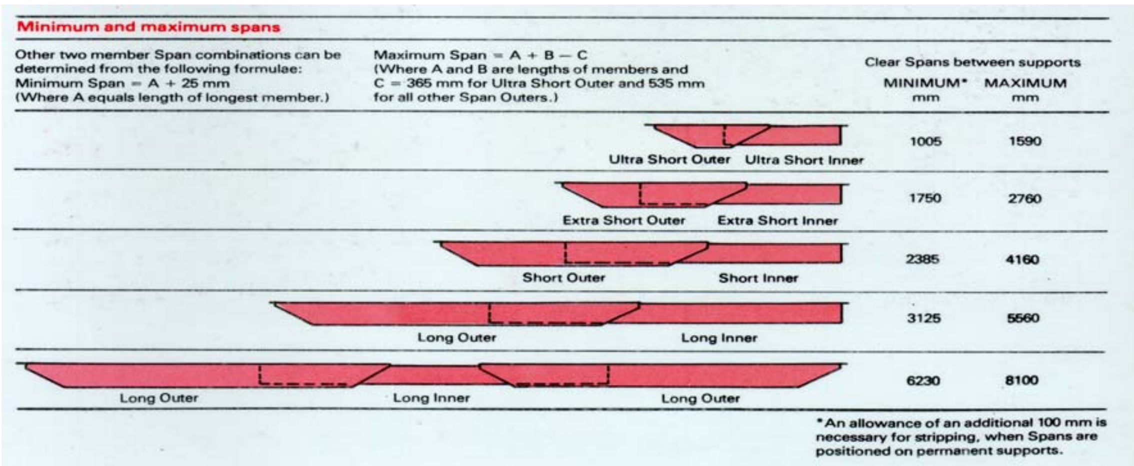
Simple adjustment for camber

- Both components, in both sizes, are fabricated with an upward camber to constant radius. This ensures a continuous camber automatically when the components are jointed together.
- Uniformity of camber is thus automatically achieved without depending in any way on the human element . When stripping ,release of locking-screws creates a sag between adjacent components, relieving them of all stress and making striking simple, safe and speedy .



Minimum and maximum spans

Minimum span = A + 25 mm
Maximum span = A + B – C
Where A equals length of longest member
B equals length of shortest member
C = 365 mm for ultra short outer
= 535 mm for all other span outer



Easily Carried By One Man

- Lightweight telescopic beam are of lattice construction and are easy to handle, transport, store and clean.

Eliminates Costly Cutting and Wastage Of Timber

- Lightweight telescopic beam are easily adjusted to cater for any span within its designed clear span .

Maximum Strength and Safety

Manufactured from high tensile steel Lightweight telescopic beam give the maximum of safety with the minimum of supervision.

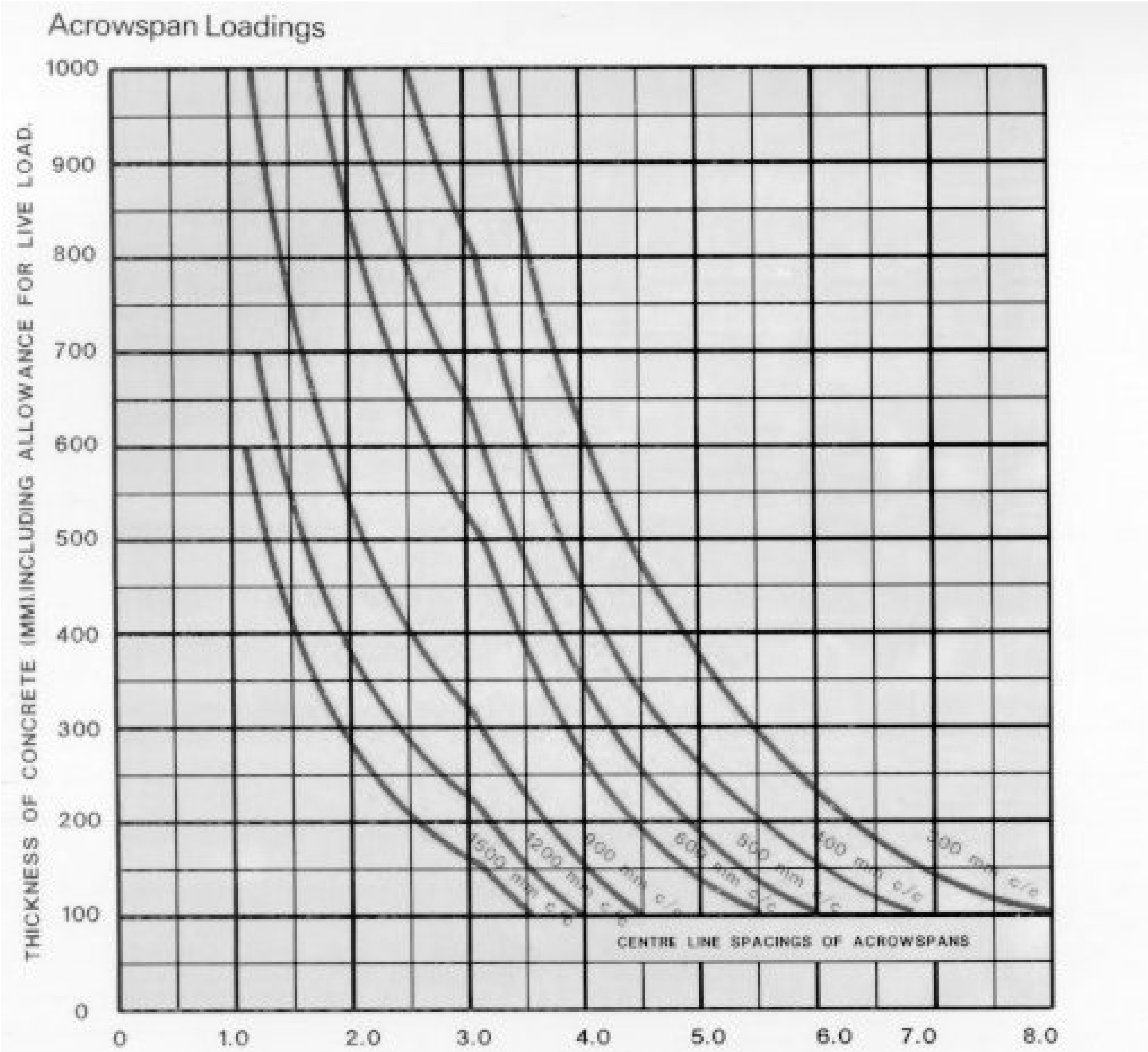
Maximum bending moment 10.3 kn.m
Maximum total load 27.2 kn
Factor of safety 2 : 1

Telescopic beam loadings table

Slab thickness mm	Load KN / m^2															
100	4.5	6046	4031	3023	2418	2015	1504	1152	910	737	609	512	436	376	327	288
125	5.13	5309	6539	2654	2123	1769	1321	1011	799	647	535	449	383	330	287	
150	5.75	4732	3154	2366	1892	1577	1177	901	712	577	476	400	341	294		
175	6.38	4268	2845	2134	1707	1422	1062	813	642	520	430	361	308	265		
200	7.00	3887	2591	1943	1554	1295	967	640	585	474	391	329	280			
225	7.63	3568	2379	1784	1427	1189	888	680	537	435	359	302	257			
250	8.25	3298	2198	1649	1319	1099	820	628	496	402	332	279				
300	9.50	2864	1909	1432	1145	954	712	545	431	349	288					
350	10.75	2531	1687	1265	1012	843	629	482	381	308	255					
400	12.00	2267	1511	1133	907	755	546	432	341	276						
450	13.25	2053	1369	1026	821	684	511	391	309	250						
500	14.50	1876	1251	938	750	625	467	357	282							
550	15.75	1727	1151	863	691	575	924	329	260							
600	17.00	1600	1067	800	640	633	398	305	240							
650	18.25	1490	993	745	596	496	371	284	224							
700	19.50	1395	930	697	558	465	374	265								
750	20.75	1311	874	655	524	437	326	249								
800	20.00	1236	824	618	494	412	307	235								
850	23.25	1170	780	585	468	390	291									
900	24.50	1110	740	555	444	370	276									
950	25.75	1056	704	528	422	352	263									
1000	27.55	1007	671	503	403	335	250									

Telescopic beam loadings curve (Fig.15)

The precedent loading table is represented in a curve shape.



Example (1)

For a given slab thickness can either fix the spacing of telescopic and determine their maximum clear span.
Or fix their maximum clear span and determine their spacing.

Example (1 – a)

Slab thickness = 10 cm.
Required spacing = 91 cm.
Permissible clear span = 4.50 m.

Example (1 – b)

Slab thickness = 15 cm.
Required spacing = 3.50 cm.
Max spacing = 117 m.

Example (2)

Assume thickness of slab = 15 cm.
L. L. = 180 Kg / m^2
Span of slab = 5.54 m.
Max M = 1.037 m. t.
D. L. = 0.15 x 2.5 = 0.375 t/ m^2
L. L. = 0.18 T / m^2
T. L. = 0.18 + 0.375 = 0.555 t/ m^2

$$M = \frac{W\,L^2}{8} = \frac{0.555 \times (\overline{5.54})^2}{8} = 1.037 \text{ m. t.}$$

Then S = 48 cm. From sch. S= 50 cm.

Check of moment for timber

W = 0.555 x 0.1 = 0.056 t/ m’

$$M = \frac{0.056 \times (\overline{0.50})^2}{10} = 0.0014 \text{ m. t.}$$

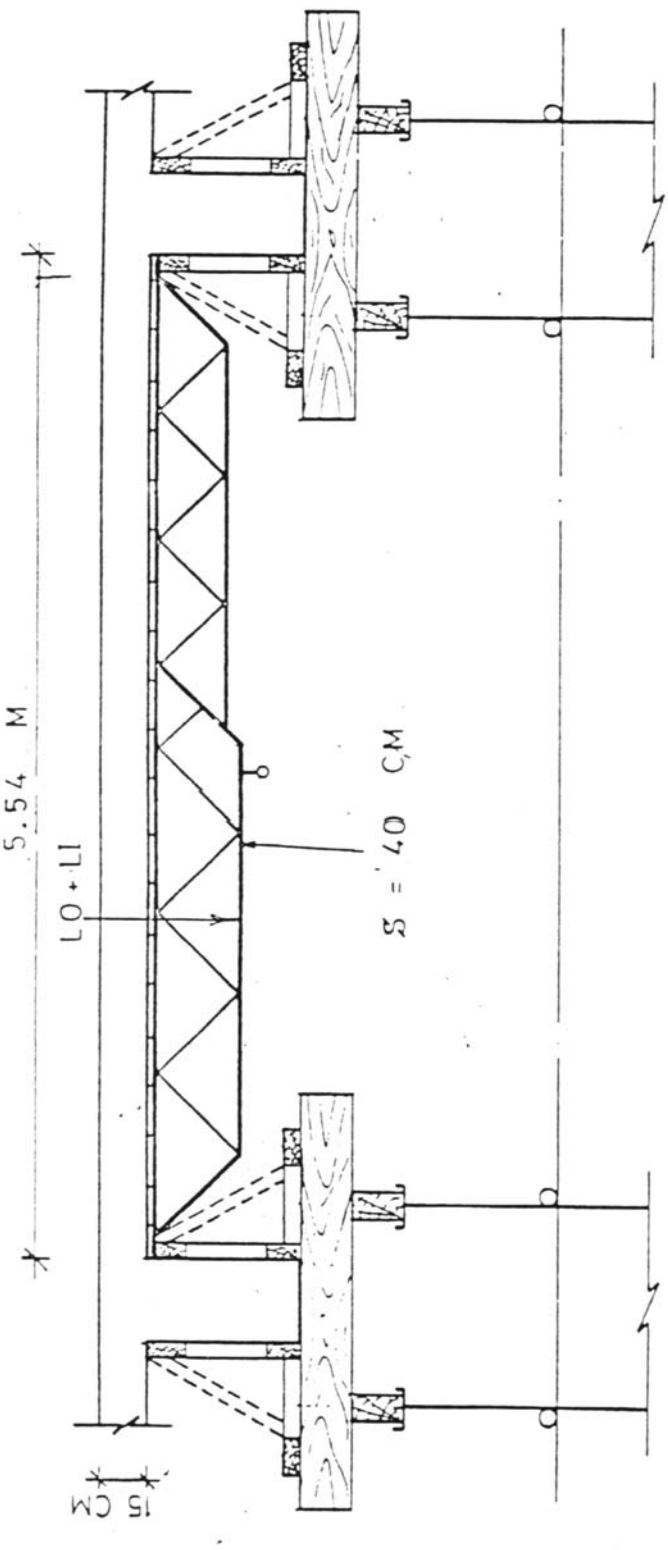
$$F = \frac{0.0014 \times (\overline{10})^5}{10.417} = 13.044 \text{ Kg / cm}^2 < 80 \text{ Kg / cm}$$

P_{sh} = 0.056 x 0.25 = 0.014 t

$$F_{sh} = \frac{0.0014 \times (10)^3}{2.5 \times 10} = 0.56 \text{ Kg / cm} < 6 \text{ Kg / cm}^2$$

$$S = \frac{5}{384} \times \frac{W\,L}{E\,I}$$

$$S = \frac{5 \times 0.056 \times 10 \times (\overline{50})^4}{384 \times 13.021 \times 80\,000} = 0.04 \text{ cm.} = 0.4 \text{ mm.}$$


5.54 M
LO + LI
S = 40 CM
15 CM

Example (3)

Assume thickness of slab = 60 cm.

L. L. = 180 kg/ m^2 **Span of slab = 3.58 m**.

D. L. = 0.6 x 2.5 = 1.50 = tm^2

T. L. = 0.18 + 1.50 = 1.68 t / m^2

Max M = 1.037 m.t

Load for telescopic beam = w = 1.68 where S C.L. To C.L.

$M = \frac{WL^2}{8}$ Then $1.037 = \frac{W \times (3.58)^2}{8}$

Then w = 0.647 t/m2 W= 1.68 x s

S = 0.647 / 1.68 = 0.38 m. = 38 cm. Take 40 cm.

Check of moment for timber (2)

W = 1.68 t / m2 W' = 1.68 x 0.1 = 0.168 t /m'

$$M = \frac{0.168 \times (0.40)^2}{10} = 0.0026 \text{ m.t.}$$

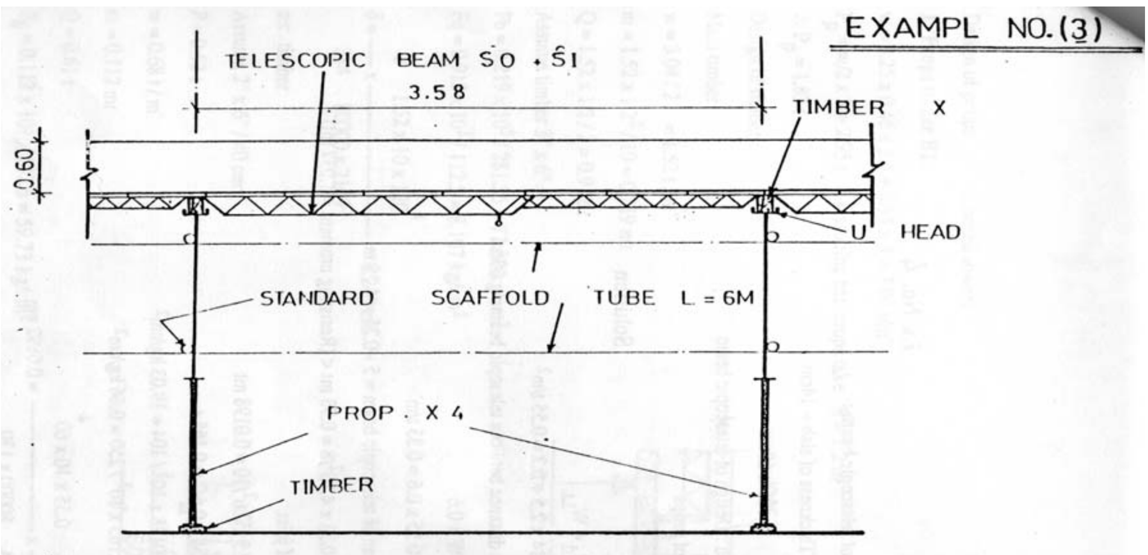
$$F = \frac{0.0026 \times (10)^5}{10.417} = 25.8 \text{ Kg / cm2} < 80 \text{ kg /cm}^2$$

P_{sh} = 0.168 x 0.2 = 0.0336 t

$$F_{sh} = \frac{0.0336 \times (10)^3}{2.5 \times 10} = 1.34 \text{ kg / cm}^2 < 6 \text{ kg / cm}^2$$

$$S = \frac{5}{384} \times \frac{W L}{E I}$$

$$S = \frac{5 \times 0.168 \times 10 \times (40)^4}{384 \times 13.021 \times 80\,000} = 0.053 \text{ cm.} = 0.53 \text{ mm. Safe}$$



EX No. 4

Design of telescopic beam:

Given: Thickness of slab = 14 cm
Beams 25 x 60 cm
Required: Design of telescopic beam
Design of props

Solution

$W_t = W_d + W_{LL}$
$= 0.14 \times 2.5 + 0.2 = 0.5\ 5$ t / m2
Assume distance between telesopic beams = 60cm
$W_{tot} = W \times 0.6$
$= 0.55 \times 0.6 = 0.33$ t / m'
Clear span of telescopic beam = 5 - 0.25 = 4.75 m
M = 0..33 x 4.75 2 / 8 = 0.93 mt < (Resisting moment =1.037 mt)

Check of joist.

$M = 0.55 \times 0.6^2/10 = 0.0198$ mt
$Q = 0.55 \times 0.6 / 2 = 0.165$ t
$Fm = 0.0198 \times (10)^5 / 104 = 19.03\ kg / cm^2$
$Fq = 0.165 \times (10)^3 / 250 = 0.66\ kg / cm^2$

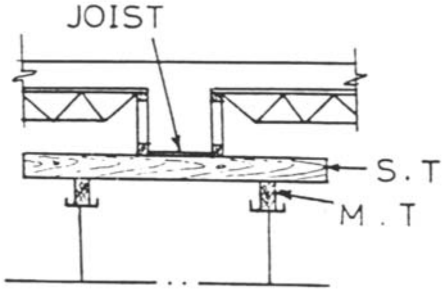
$$\delta = \frac{5}{384} \times \frac{0.55 \times 10 \times 60^4}{8000 \times 130} = 0.0892 \text{ cm}$$

Design of props (Loaded tower)

1. ***Props under Bl :***

W = 0.25 x 0.46 x 2.5 + 0.55 x 5 = 3.04 t / m
$P_p = w/2 \times S > 2.95$ t S = spacing bet. Props take S = 1.2 m
$\therefore p_p = 1.83$ t

Design of timber: Main timber



W =3.04 / 2 =1.52t/m'
$M = 1.52 \times 1.2^2 / 10 = 0.219$ mt
Q=1.52xl.2 / 2 =0.912t

Assume timber 3" x 6"

$Fb = 0.219 \times 10^5 / 281.25 = 77.87\ kg / cm^2$
$Fq = 0.912 \times 10^3 / 112.5 = 8.107\ kg / cm^2$

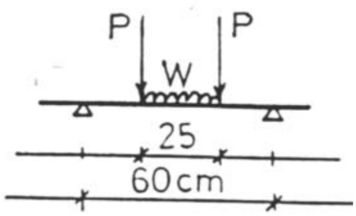
$$\frac{5}{384} \quad \frac{1.52 \times 10 \times 120^4}{80000 \times 2109}$$

δ = x = 0.243 cm

Sec. Timber

Assume 2 " x 6 " / 40 cm

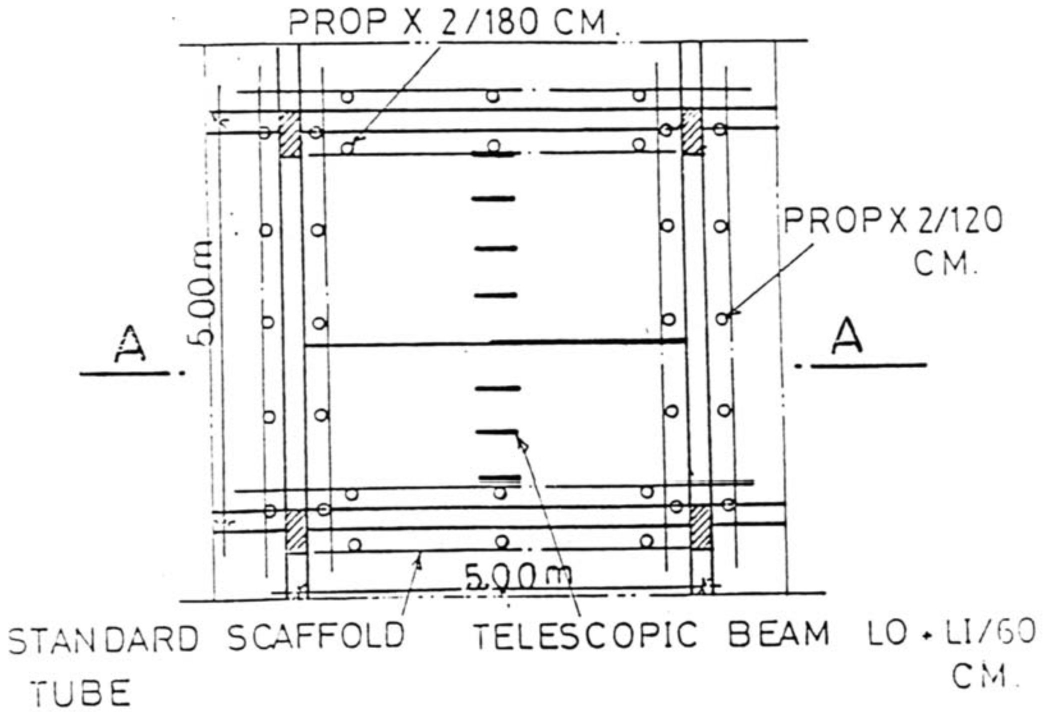
P = 0.52 t
w = 0.68 t / m
m = 0.112 mt
Q = 0.61 t
$F_b = 0.112 \times 10^5 / 187.5 = 59.73$ kg / cm^2
$F_q = 0.61 \times 10^3 / 75 = 8.13$ kg / cm^2

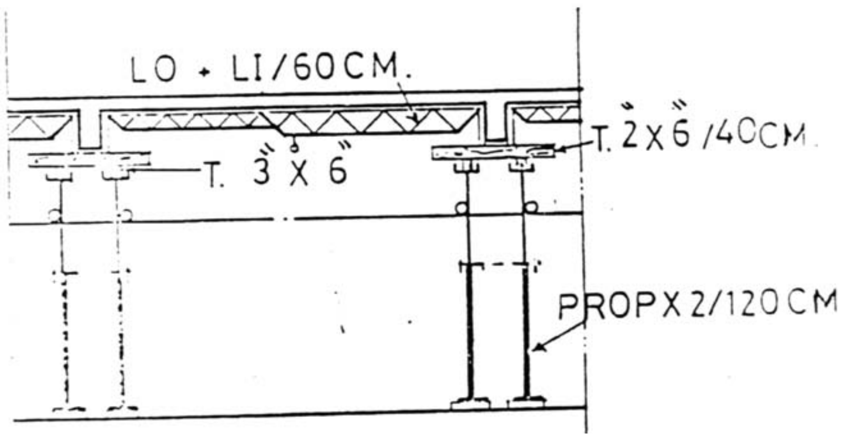


<u>Design of joist (bottom of beam)</u>

W = 0.6 x 2.5 + 0.2 = 1.72 / m2
$M = 1.72 \times 0.4^2 / 10 = 0.027$ mt
Q = 1.7 x 0.4 / 2 = 0.34 t
$F_b = 0.027 \times 10^5 / 104 = 26$ kg / cm^2
$F_q = 0.34 \times 10^3 / 250 = 1.36$ kg / cm^2

$$\delta = \frac{5}{384} \times \frac{1.7 \times 10 \times 40^3}{80000 \times 130} = 0.05 \text{ cm}$$


PROP X 2/180 CM.
PROP X 2/120 CM.
5.00 m
A
A
5.00 m
STANDARD SCAFFOLD TUBE
TELESCOPIC BEAM
LO + LI/60 CM.


LO + LI/60 CM.
T. 2" X 6" /40 CM.
T. 3" X 6"
PROP X 2/120 CM

Design sheet of props & Telescopic Beams?

Telescopic Beam & props: -

O.W of slab = 0.25 x 2.5 = 0.625 t / m^2

Liveload $= \dfrac{0.3}{0925} = t / m^2$

Calculation of Telescopic beam: -

W = 0.925 x 0.50 = 0.4625 t / m

$$M = \frac{0.4625 \times (3.60)^2}{8} = 0.749 \text{ m.t}$$

Calculation of Props: -

P = 0.925 x 3.60 x 3.60 = 0.998 t / m^2

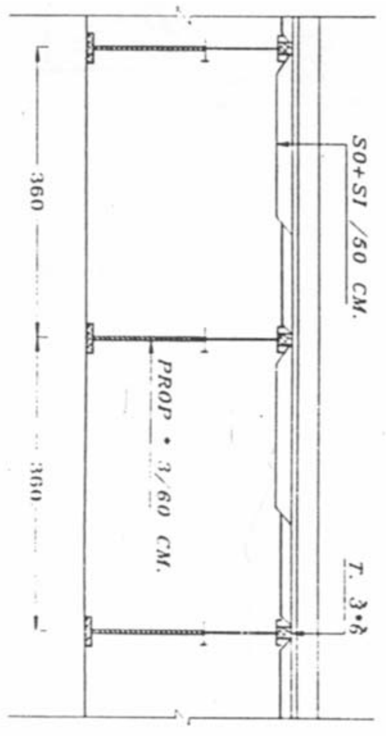
Check of Timber 3" x 6"

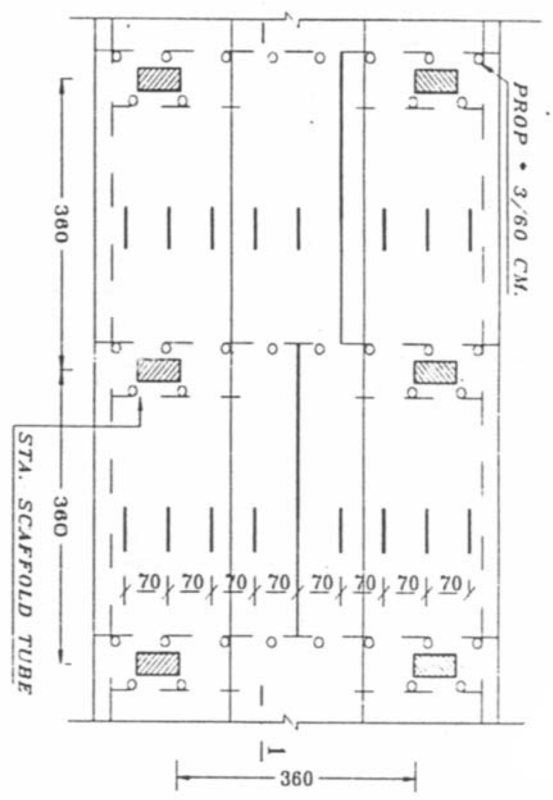
M = 0.12 m.t
Q = 0.999 t

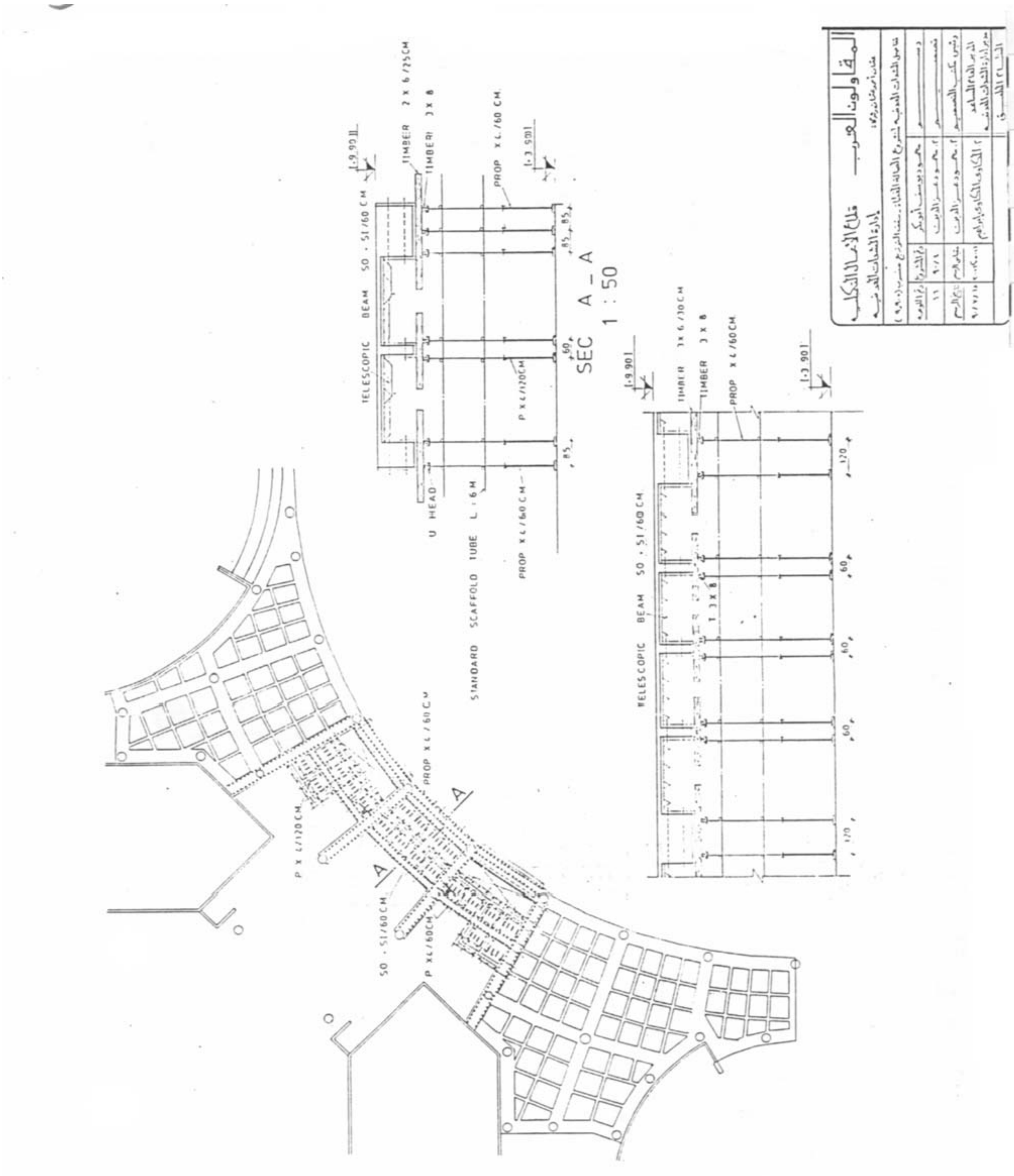
A = 112.5 cm^2
Z = 281.25 cm^3 1 = 2109 cm^4

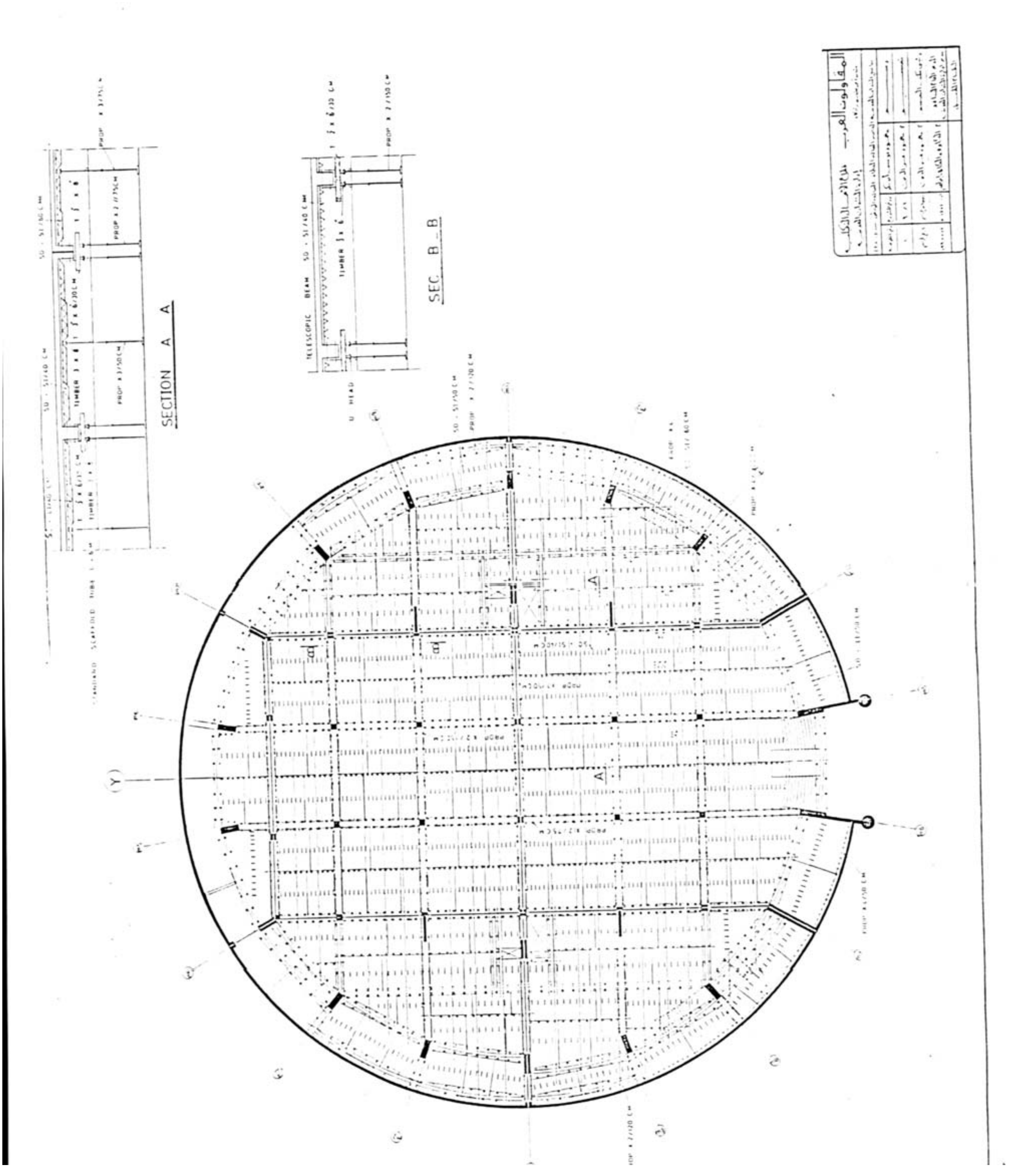
$$F_m = \frac{0.12 \times 10^5}{281.26} = 42.67 \text{ Kg / cm}^2$$

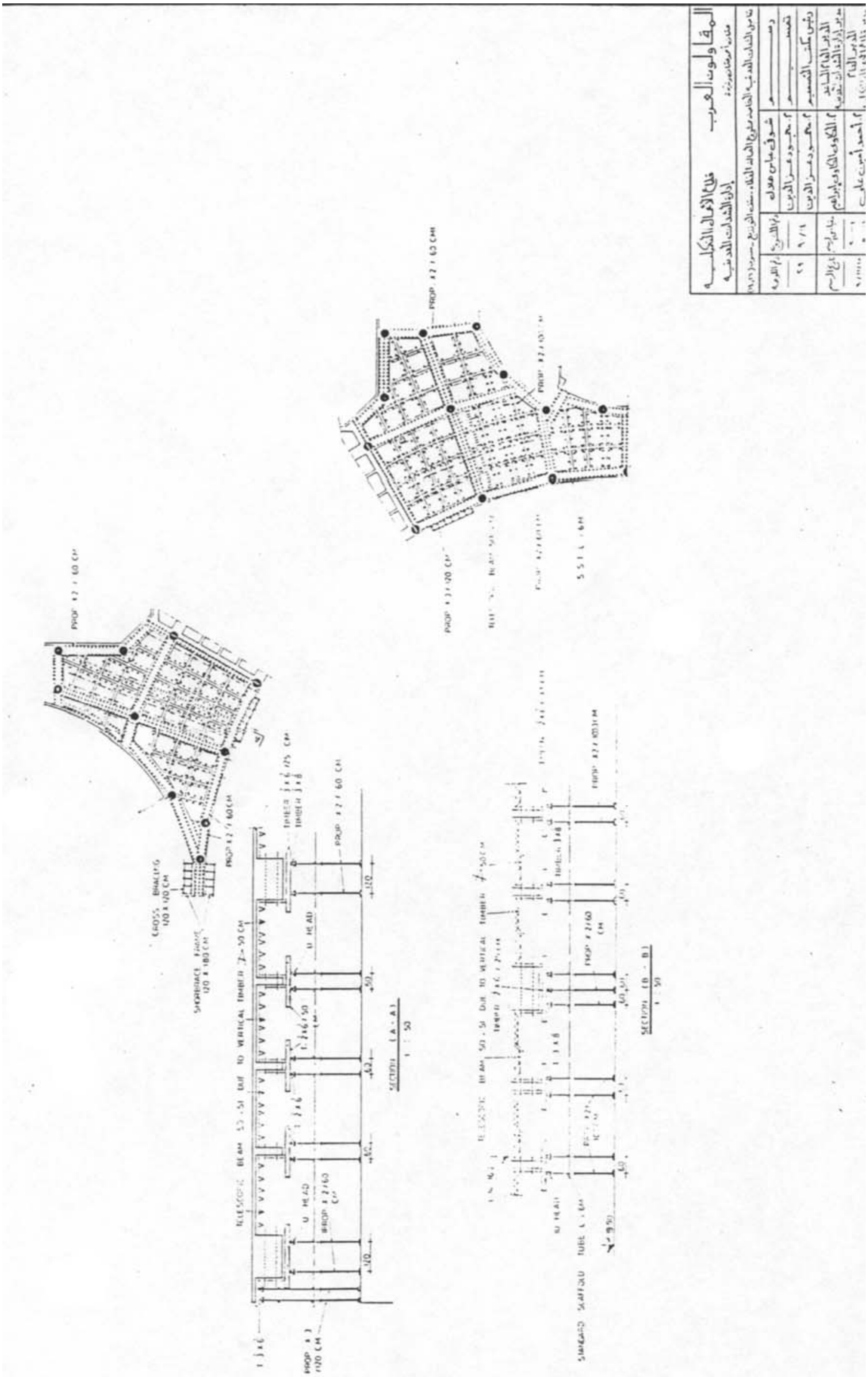
$$A = \frac{5}{384} \times \frac{3.33 \times 10 \times (60)^4}{80000 \times 2109} = 0.03 \text{ cm}$$

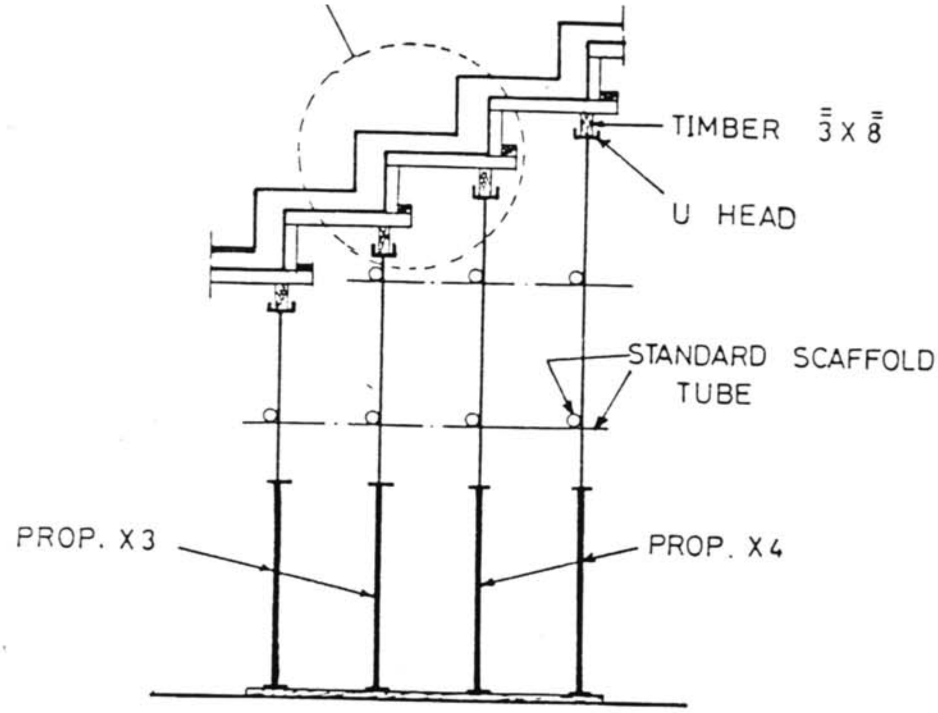


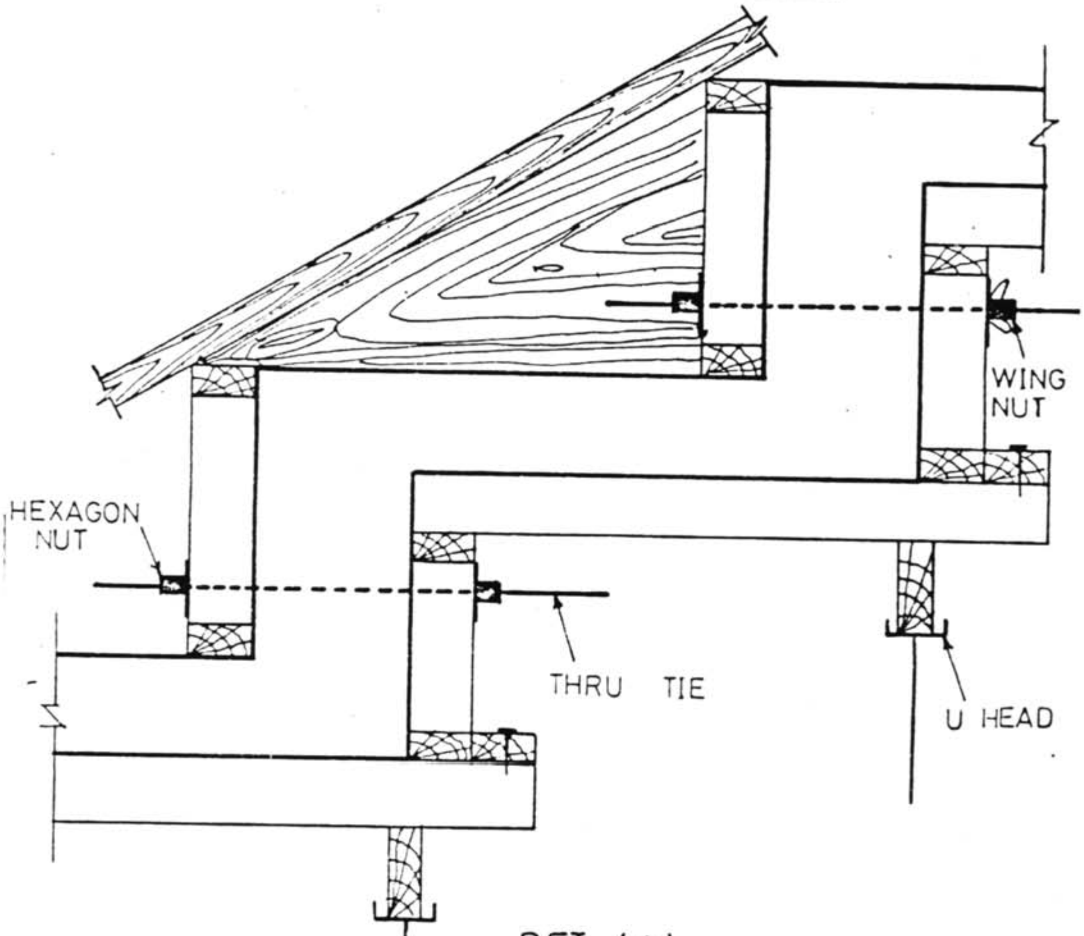



SEC A – A
1 : 50
TELESCOPIC BEAM SO . 51/60 CM
STANDARD SCAFFOLD TUBE L : 6 M
U HEAD
PROP X L /60 CM
P X L/120CM
TIMBER 3 X 8


SECTION A A
SEC. B_B




TIMBER 3 X 8
U HEAD
STANDARD SCAFFOLD TUBE
PROP. X3
PROP. X4


WING NUT
HEXAGON NUT
THRU TIE
U HEAD

DET. (A)