Calculating Scaffold Loads

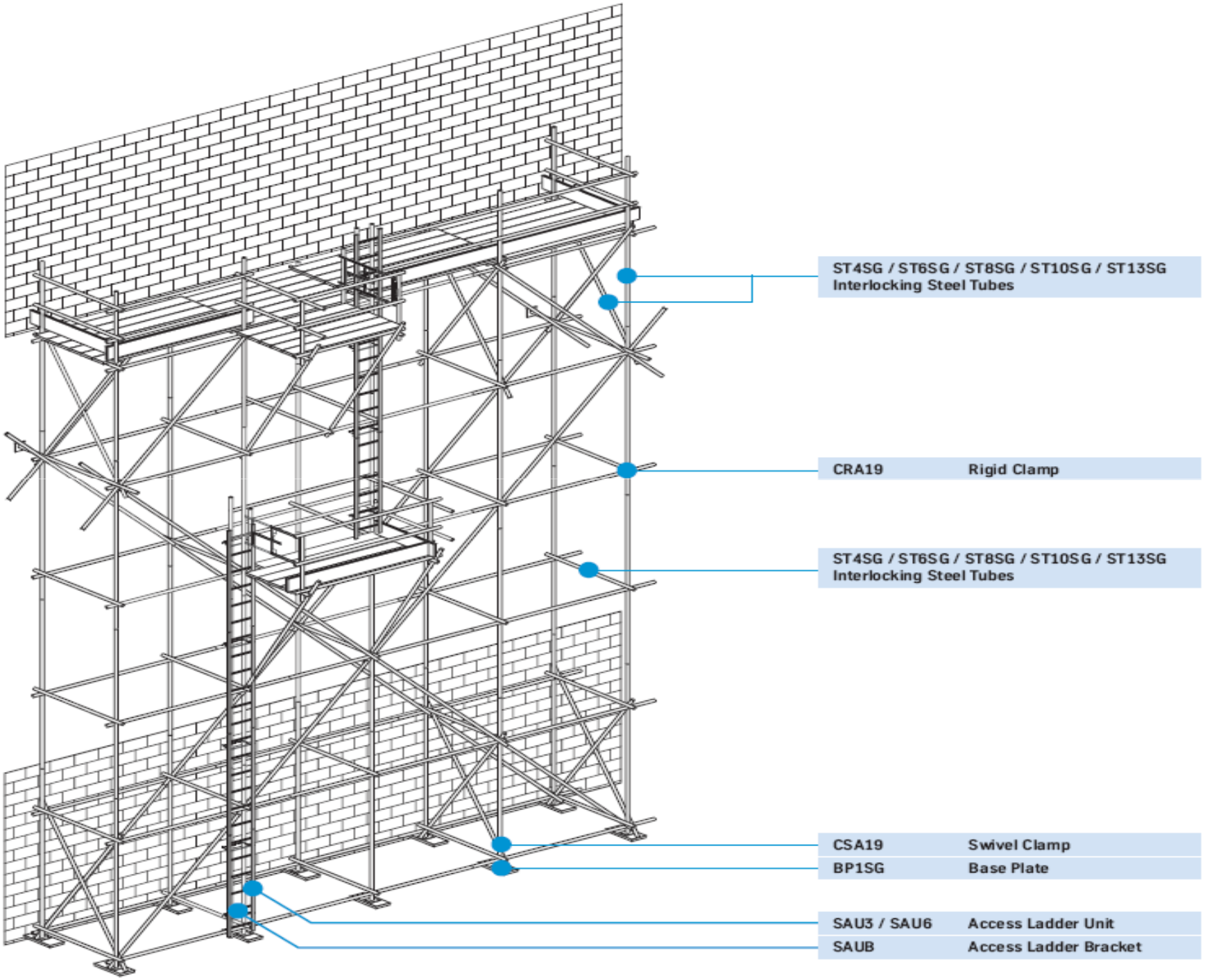
Loads

- OSHA requires that a scaffold be designed with a 4:1 safety factor.
- Light duty: 25 pounds per square foot
- Medium duty: 50 pounds per square foot
- Heavy Duty: 75 pounds per square foot.
- Material loads should be evenly distributed on platform and not concentrated in one small area.

LOADS

Tube and Clamps Scaffolds

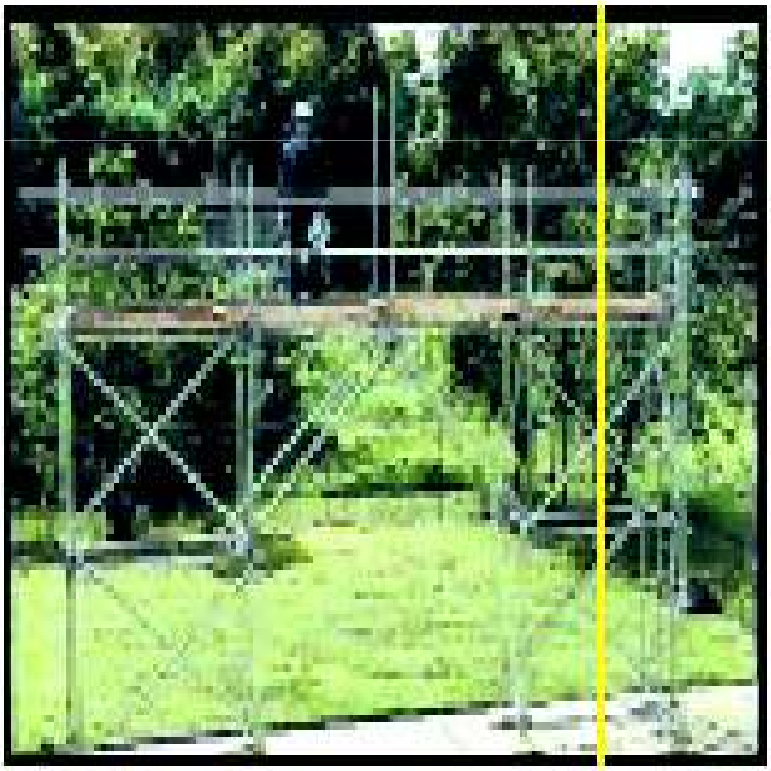
Loads

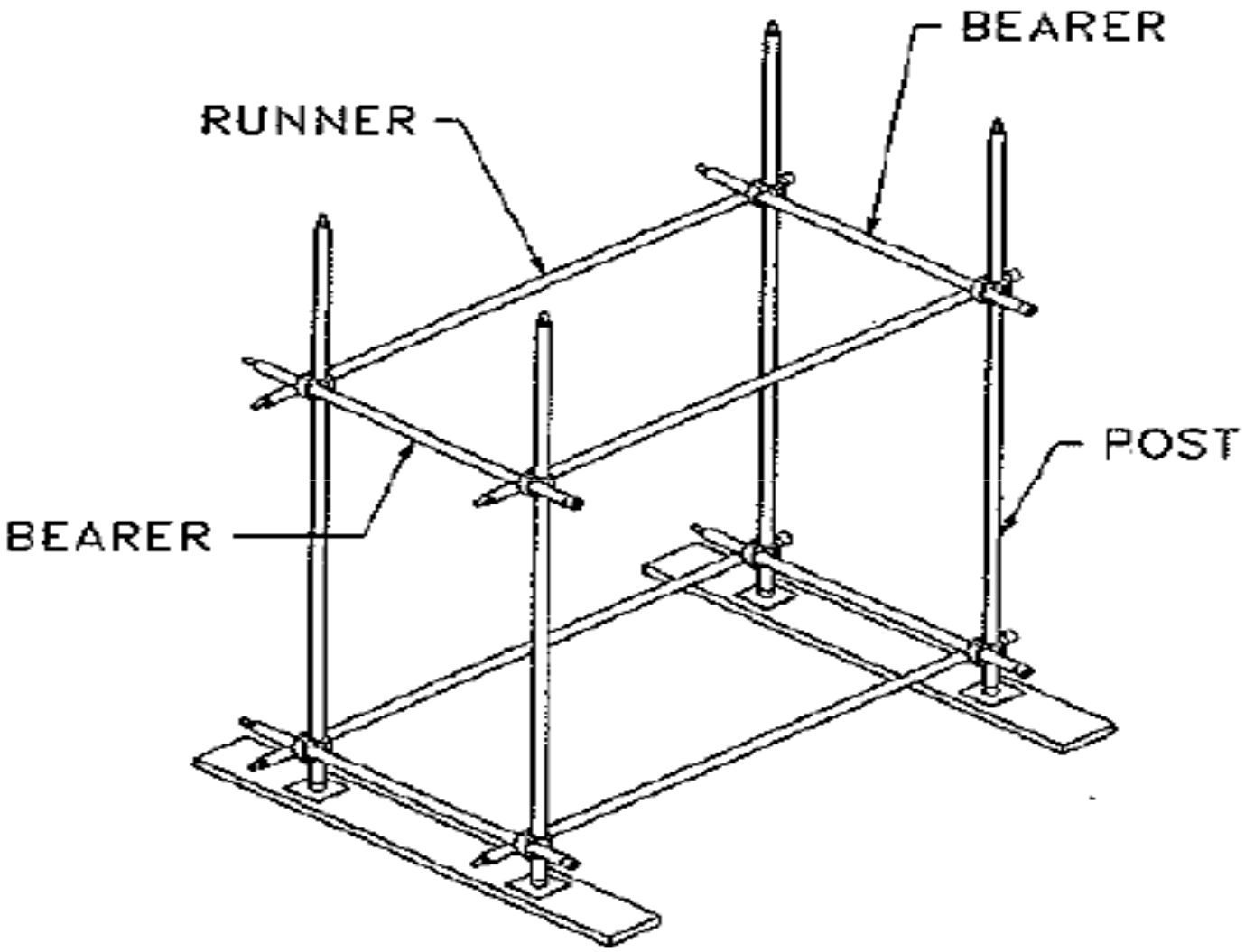

ST4SG / ST6SG / ST8SG / ST10SG / ST13SG
Interlocking Steel Tubes
CRA19 Rigid Clamp
ST4SG / ST6SG / ST8SG / ST10SG / ST13SG
Interlocking Steel Tubes
CSA19 Swivel Clamp
BP1SG Base Plate
SAU3 / SAU6 Access Ladder Unit
SAUB Access Ladder Bracket

The Posts (Standards) Carry the Scaffold Loads

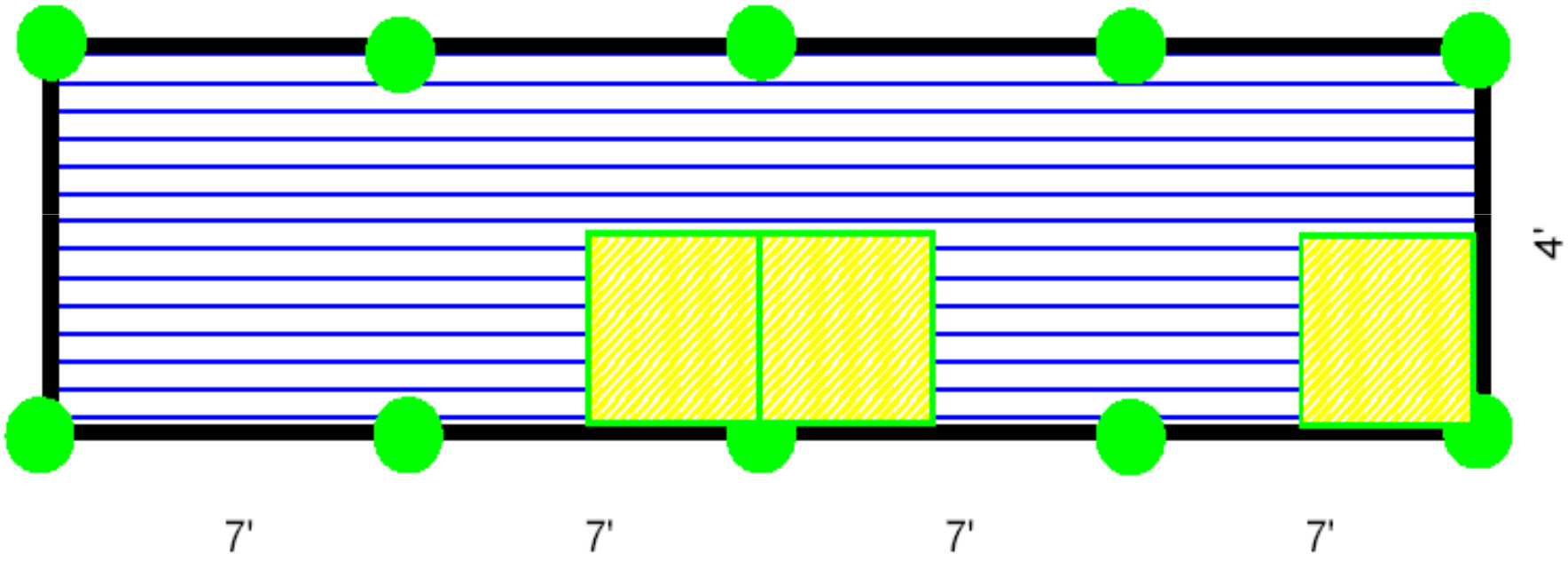
Posts (legs)

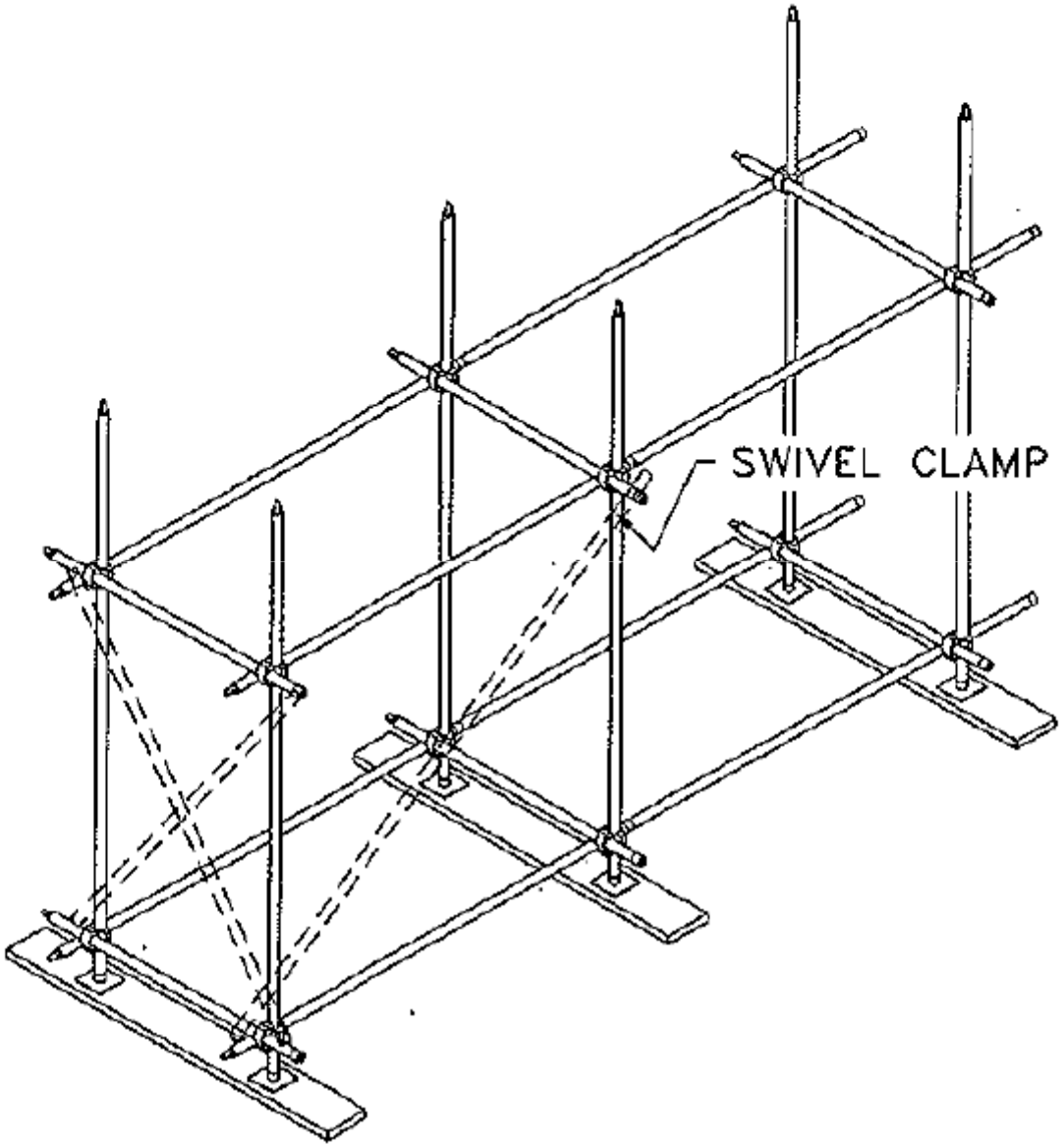
Calculating the post or leg loading can be a little more difficult. Consider the pictures below.



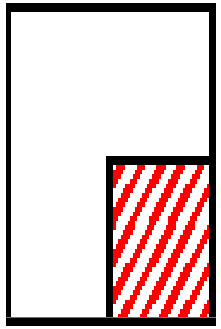

BEARER
RUNNER
POST
BEARER

LOADS

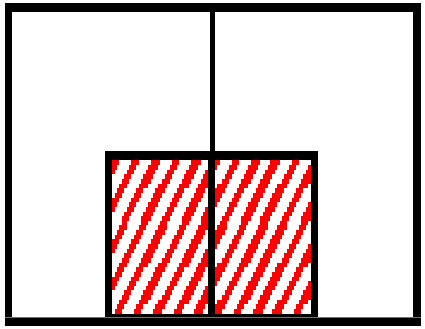



SWIVEL CLAMP

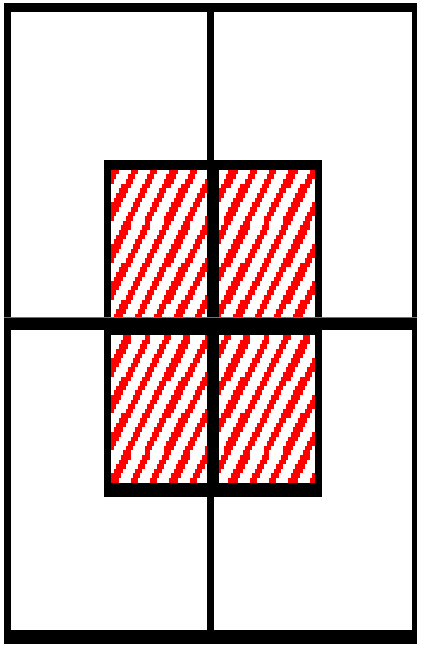
Contributory Area



Four leg scaffold contributory area.

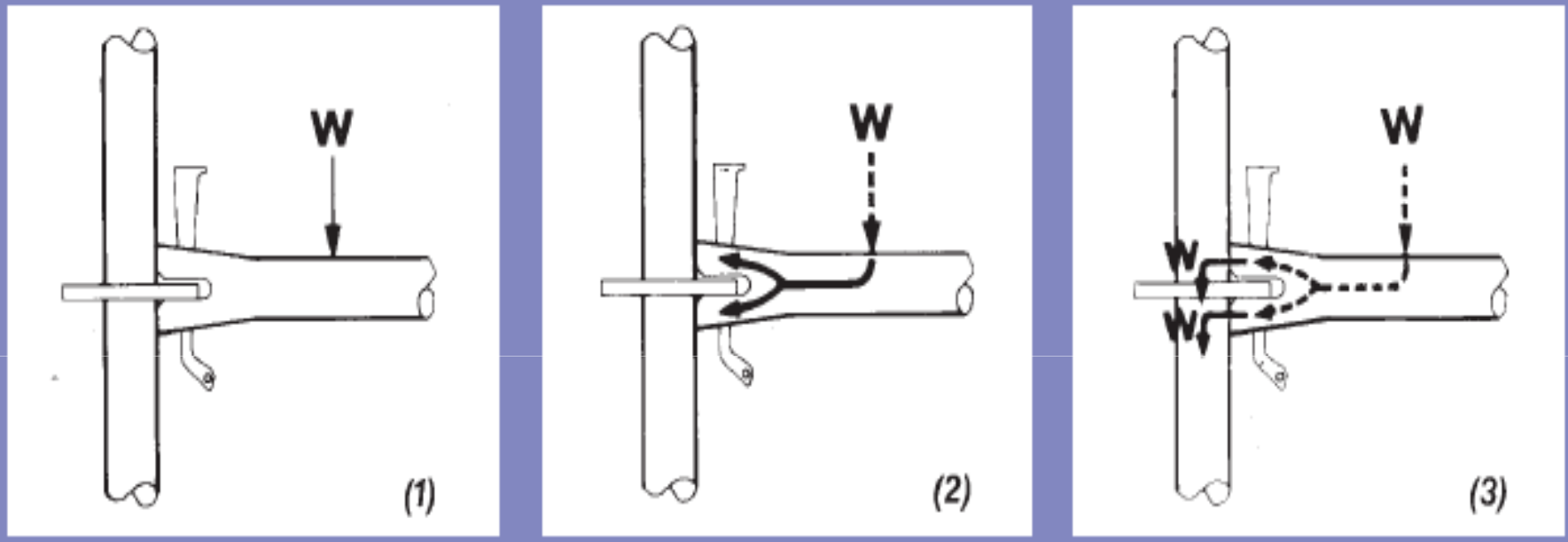


Six leg scaffold contributory area.



Center leg scaffold contributory area.

Safety is built in...



As the load is applied to the horizontal (1), it travels along the horizontal to the integrally formed end (2). There the load is transferred to the post via a friction connection created by securing the wedge. Ends of the horizontals and trusses are shaped to insure the consistency of the connection. The result is a load path around the ring and no stress on the welded connection (3).

These pictures illustrate the contributory area of the legs. Notice that the corner post is carrying one fourth of a platform. The inner leg, however, is carrying one fourth of the two adjacent platforms. The point is that each leg may carry a different load depending upon its' position within the design.

Let's use the corner leg shown in the picture on the bottom of the previous page as an example. To calculate the leg load we need to determine the live and dead load. First, let's figure the dead load. What weight of scaffolding is this leg carrying? Obviously, it is carrying its' own weight. Let's assume the scaffold post consists of one 10' long tube and one 8' long tube stacked on top of each other. The 10' tube weighs 20#, the 8' tube weighs 17#. Start a list with those tubes first.

Next list the horizontal tubes attached to the post. Include one half of the weight of all the horizontal and diagonal tubes attached to it. Why one half? The corner leg we are examining supports one end of the tube, and the other end is clamped to and supported by a different leg. It is like if you and a friend pick up different ends of a barbell; his hand carries half the weight, and your hand carries half the weight. Looking at the front side of the picture on page 45, we see five 8' long horizontal tubes attached to the post. Each 8' tube weighs 17#, and the leg supports one half. Each tube is held on by a right angle clamp weighing 2.75", and the post carries all the weight of that clamp. Also, two diagonals are attached to the post from this direction. The diagonals are 10' tubes @ 20#, and the leg carries half. The diagonals are held on by two swivel clamps. The swivel clamps weigh 3.5#, and the post carries all the clamp weight. So we add those to the list. Note: we are ignoring the attached ladder for this excercise.

Looking at the end of the scaffold (the short way), we see five 4' tubes attached to the post. Each 4' tube weighs 10#, and the leg carries half. The 4' tubes are held on by four right angle clamps, each weighing 2.75#, and the leg carries it all. Two diagonals are attached to the post. The diagonals are 8' tubes and weigh 17#, and this post carries half. The diagonals are held on by two swivel clamps, each weighing 3.5#, and the post carries it all.

On top, there are four 8' long planks @ 32# each. The post supports one fourth of the planks on top. There are also two toeboards, 8' & 4', weighing 15# total. The nails could also be added in but we won't do that here.

Now let's write out our list.

Tube & Clamp List

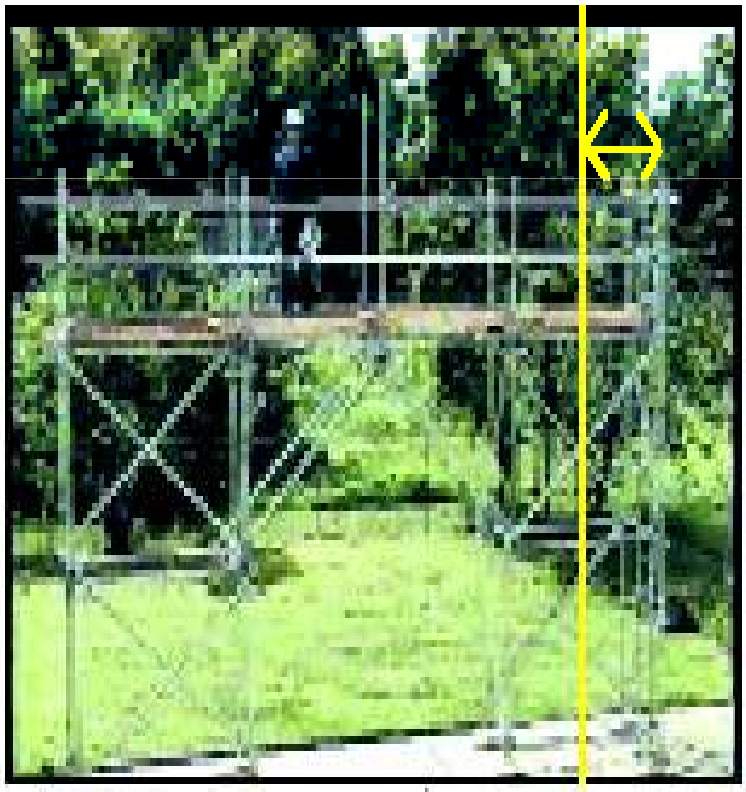
Source	Part	Qty.	Wt.	Share Factor	Total
Posts	10 tube	1	20#	1.0	20#
Posts	8 tube	1	17#	1.0	17#
Front horizontal	8 tube	5	17#	.5	42.5#
Clamps above	RA	5	2.75	1.0	13.75#
Front diag	10 tube	2	20#	.5	20#
Diag clamp	SW	2	3.5#	1.0	07#
End horizontal	4' tube	5	10#	.5	25#
Clamps above	RA	5	2.75	1.0	13.75#
End diag	8' tube	2	17#	.5	17#
Diag clamps	SW	2	3.5#	1.0	07#
Planks	8'	4	32#	.25	32#
Toeboards	TB8	1@8'	10#	.5	05#
Toeboards	TB4	1@4'	5.0#	.5	02.5#

Total Scaffold Weight (Dead Load)_____222.5#

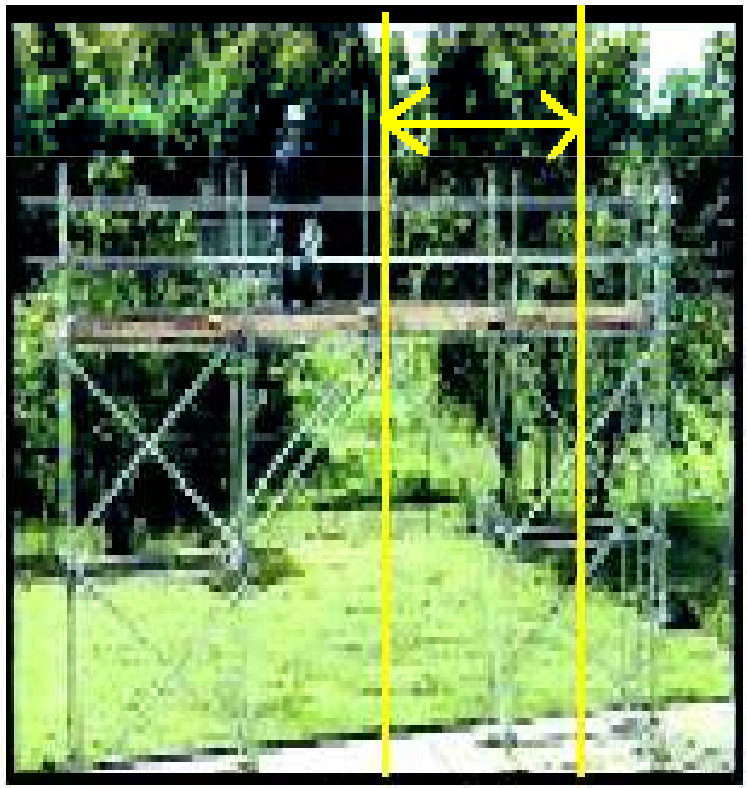
Next we will calculate the live load. Assume a light duty (25PSF) load. Refer to the contributory area diagram on the previous page. This platform is 7' long by 4' wide. This one is simple enough to do the short way: 7 X 4 = 28 X 25PSF = 700#. This leg's share is 1/4th, which equals 175#.

So the total live and dead load in this example is 222.5# plus 175# equals 397.5#. That number is compared to the rated capacity from the manufacturer. In this case the leg is rated for 4000# in this configuration. So we are only using about one tenth of it's capacity. Also, keep in mind that the rated capacity includes the four to one safety factor.

However, while this corner leg is lightly loaded, notice that the leg to the left in the scaffold is in a different configuration. Its' contributory area includes distance to the right and distance to the left. And notice that the post to the left is a dead leg so that half the weight of that leg is transferred back down to the leg we are examining. The other half is transferred down to the leg further left. So in effect the leg being considered carries a larger platform weight to its' left and half a platform to the right. The areas must be calculated separately.



corner leg



next leg to left

Scaffold Loads

Code:	Range of Lengths	Weight(kg/m)	Weight(kg/ft)
Black Tube			
001101	0.3m -6.3m (1ft -21ft)	4.46	1.36
Galvanised Tube			
001201	0.3m -6.3m (1ft -21ft)	4.66	1.42
Aluminium Tube			
001301	0.3m -6.3m (1ft -21ft)	1.67	0.51

Superboards

Conform to BS2482

Code:	Range of Lengths	Weight(kg/m)	Weight(kg/ft)
001400	0.3m - 3.9m (1-13ft)	4.46	1.36

Machine Stress Graded

Code:	Range of Lengths	Weight(kg/m)	Weight(kg/ft)
001400	1.5m - 3.9m (5-13ft)	4.46	1.36

Swivel Coupler

Swivel Couplers connect two scaffold tubes at any angle to provide a ledger brace, façade, or similar bracing. These are also key components in the structure and must be load bearing. The body is firmly riveted to permit rotation but still ensures the minimum of further movement, for maximum rigidity. Again, the T-bolts can be removed for maintenance.

Code:	Weight(kg)	S.W.L.(kN)
006200	1.02	6.25

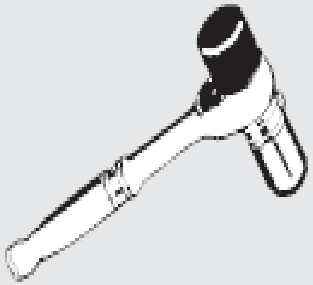
Double Coupler

Double Couplers connect two scaffold tubes at right angles. These are critical components in the scaffold structure and must be load bearing to resist both slip and distortion. The design is based on a strong one piece body with flaps and T-bolts that can be removed for maintenance or replacement.

Code:	Weight(kg)	S.W.L.(kN)
006100	0.91	6.25

Tube & Clamp Wrench

Part No.	Description	Weight
CW78	Ratchet and Socket Wrench with Mallet	2 lbs.



CW78

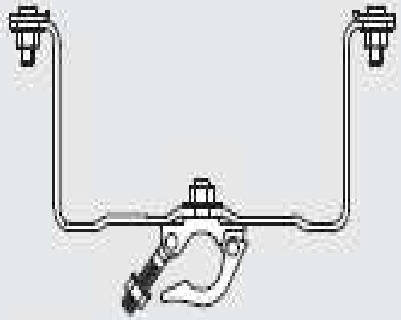
Access Ladder Units and Components

Part No.	Description	Weight	Width	Rung Spacing
SAU3*	Access Ladder Unit, 3'	9.5 lbs.	17¾"	12"
SAU6*	Access Ladder Unit, 6'	18.0 lbs.	17¾"	12"
SAUB	Access Ladder Bracket	5.5 lbs.		

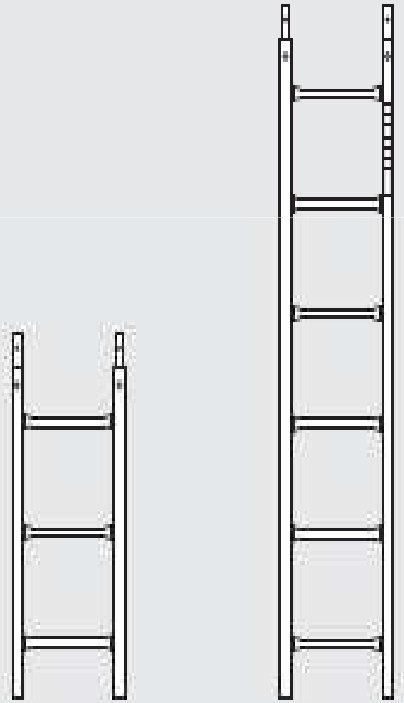
*Must be installed with SAUB brackets. Two brackets are required on base ladder section; one on each additional section.

Climbing ladder and brackets must be used to provide easy access to scaffold. Landing platforms must be provided when required.

Access Ladder Bracket (SAUB) will attach to SAU ladder sections at any elevation and clamp to either a vertical tube or a horizontal bearer. Provides 7" toe clearance.



SAUB



SAU3 SAU6

Materials Weight

2 inches pipes: 5 kg/meter
5 cm x 25 cm boards: 6 kg/meter
2 cm x 10 cm boards: 2 kg/meter
Right Angle Clamp = 1 kg
Swevel Joint Clamp = 1 Kg
2 inches pipes is designed to carry 1500 kg

Example

- A tube and clamp scaffold
- Three (3) levels – each (6.5 ft) 2 meters high
- One bay
- Bay length = 7 ft (2.25 meter)
- Bay Width = 5 ft (1.5 meter)
- One light duty working level (120 kg per square meter). (25 pounds per square feet).
- Calculate the load

S.N.	Description	Dimension	Qt.	Total Length	Unit Wt	Total Wt	Share	Total Wt
1	Post	6 m	1	6 m	5 Kg	30 kg	100%	30 kg
2	Post	2 m	1	2 m	5 kg	10 kg	100%	10 kg
3	Bearer	2 m	6	12 m	5 kg	60 kg	50%	30 kg
4	RA Clamp	-----	12	------	1 kg	12 kg	50%	6 kg
5	T-Bracing	2.5 m	3	7.5 m	5 kg	37.5 kg	50%	19 kg
6	SW Clamp	-----	6	-------	1 kg	6 kg	50%	3 kg
7	Toe-Board	1.5 m	1	1.5 m	2 kg	3 kg	50%	1.5 kg
8	Runner	2.5 m	6	15 m	5 kg	75 kg	50%	37 kg
9	RA Clamp	------	12	----	1 kg	12 kg	50%	6 kg
10	F-Bracing	3 m	3	9 m	5 kg	45 kg	50%	22.5 kg
11	SW Clamp	------	6	-----	1 kg	6 kg	50%	3 kg
12	Scaffold Plank	2.5 m	6	15	5 kg	90 kg	25%	22.5 kg
13	Toe-Board	2.25	1	2.25	5 kg	12 kg	50%	6 kg
Total Dead Weight = 196.5 kg								

Total Weight

Live Weight = 1.5 x 2.25 = 3.375 Square meter x 120 = 405 kg / 4 = 101.25 kg

Total Weight = 195.5 + 101.25 = 296.75 kg

Example

- A tube and clamp scaffold
- Three (3) levels – each (6.5 ft) 2 meters high
- Three bays
- Bay length = 7 ft (2.25 meter)
- Bay Width = 5 ft (1.5 meter)
- One light duty working level (120 kg per square meter). (25 pounds per square feet).
- Calculate the load

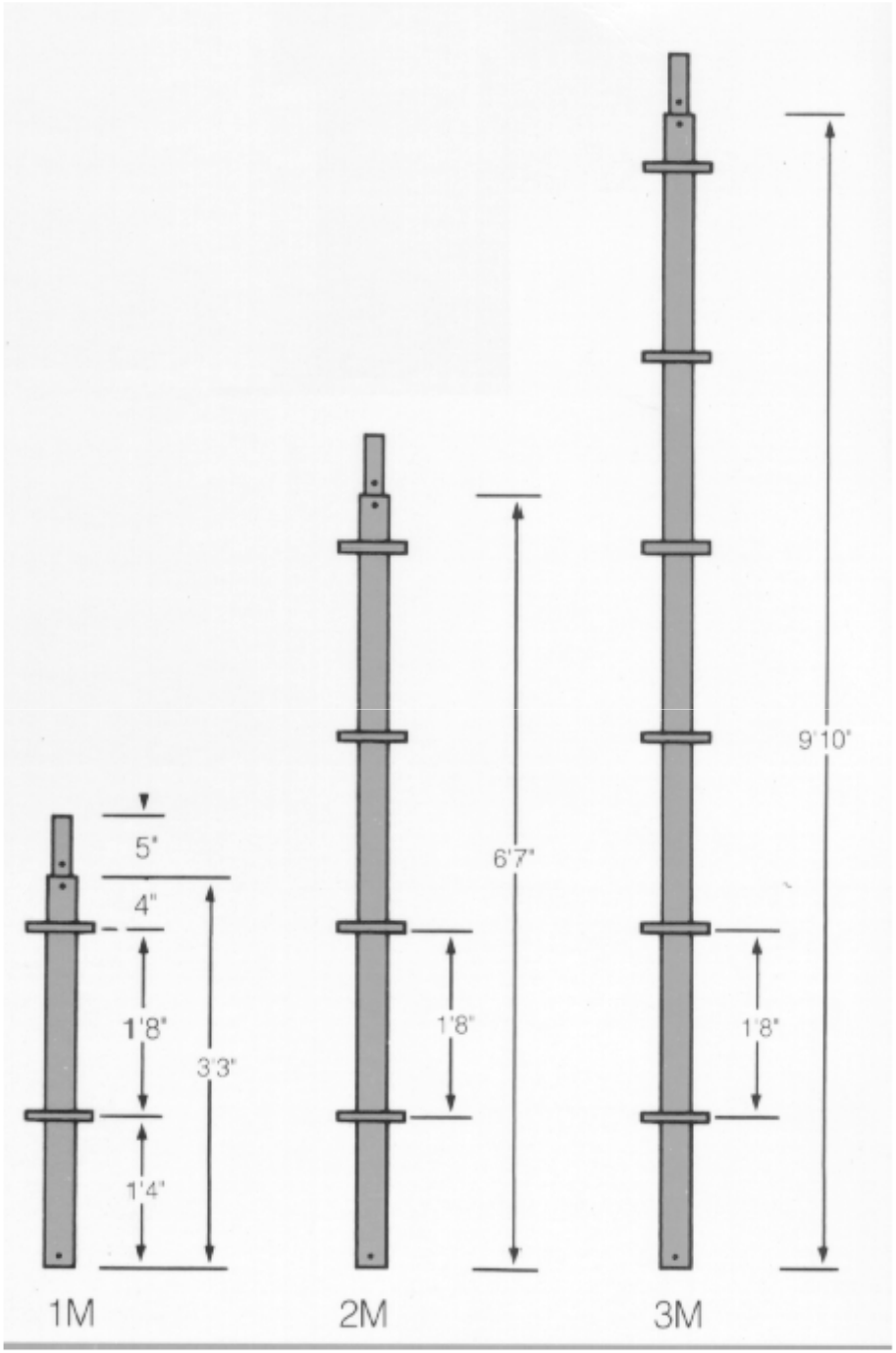
- TO calculate the **dead Weight** Of scaffold we must be aware of all scaffold components as follows :-
- **1- posts** - (vertical Pipe)
- **2- Bearers** - (horizontal pipe perpendicular to the building structure
- **3- Transverse braces** - pipe which take a diagonal shape when used
- **4- Right angle clamps**
- **5- Swivel joint clamps**
- **6- Toe boards**
- **7- Runners**
- **8 - Face bracing**
- And now you can search about the data which you can use it in scaffold building and then you can calculate the live load and add it to the dead load to know the maximum intended load in this scaffold per single leg.

		Total	Share factor	Wight	Quantity	Part	Source	Ser.
		400	1	40	10	10F	post	1
		16	1	16	1	4F	Post	2
		200	0.5	20	20	5F	Bearer	3
		224	0.5	32	14	8F	zigzag	4
		60	1	3	20	------	right angle clamp	5
		56	1	4	13	------	swivel clamp	6
		20	0.5	20	2	4F	Toe board	7
		320	0.5	32	20	8F	Runner for front view	8
		60	1	3	20	------	right angle clamp for front view	9
		35	0.5	35	2	8F	Toe board for front view	10
		56	1	4	13	------	Swivel joint clamp	11
		280	0.5	40	14	10F	Face bracing	12

Scaffold Loads

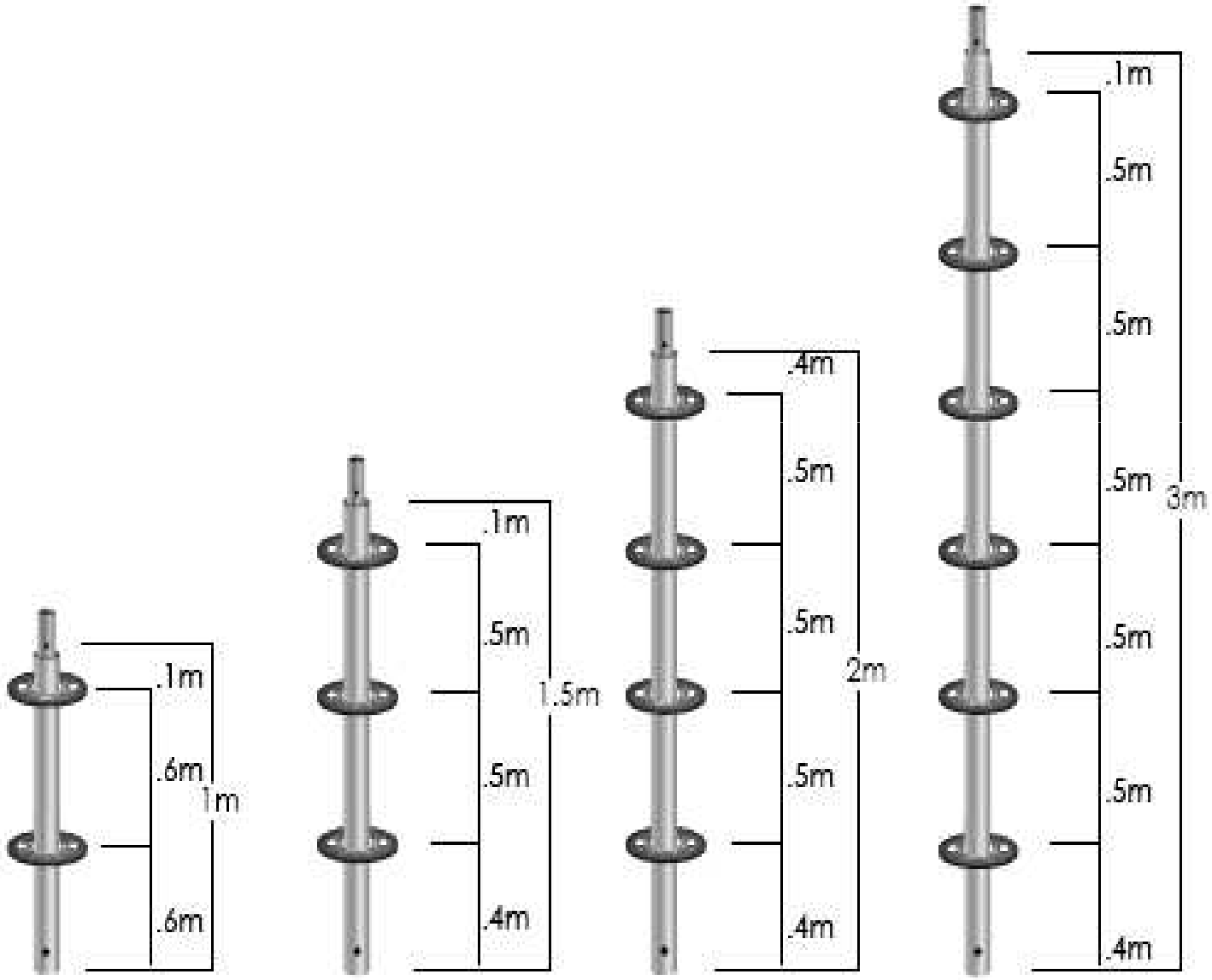
System Scaffolds

OSHA System Scaffolds



Posts are made in three basic sizes, 9' 10", 6' 7", and 3' 3". The rosette is usually located at 19.5" or 20" on center. The fourth rosette up from the platform gives an approximate 6' 6" vertical spacing for the next platform level. The second rosette up would be the guardrail position, and first rosette up would be the midrail position.

Standards / Verticals



DESCRIPTION	SIZE		WEIGHT	
	metric	imperial	metric	imperial
Standard	.5 m	1'8"	2.73 kg	6 lbs
Standard	1 m	3'3"	5.0 kg	11 lbs
Standard	1.5 m	4'11"	7.5 kg	16 lbs
Standard	2 m	6'7"	9.5 kg	21 lbs
Standard	3 m	9'10"	14.3 kg	31.5 lbs

The Ring Scaffold System is manufactured using hi-strength steel mechanically welded and finished with hot dip galvanized finish. This offers the user the highest possible product quality and durability with the least possible maintenance.

Superboards

Conform to BS2482

Code:	Range of Lengths	Weight(kg/m)	Weight(kg/ft)
001400	0.3m - 3.9m (1-13ft)	4.46	1.36

Machine Stress Graded

Code:	Range of Lengths	Weight(kg/m)	Weight(kg/ft)
001400	1.5m - 3.9m (5-13ft)	4.46	1.36

Toe-Board/Scaffold Plank

- **Toe-Board:**
- 2 cm x 10 cm
- Each meter weighing = 2 kg
- **Scaffold Planks:**
- 5 cm x 25 cm
- Each meter in length weighing = 6 kg

Example

- System Scaffold (Light Duty)
- 12 levels
- Each level height = 2 meters
- 2 light duty working levels
- 4 additional planked levels
- Width of Scaffold = 1.5 meters
- Scaffold Bay Length = 2.5 meters
- Scaffold consists of 3 bays
- Each post (Standard) can carry up to 2500 kg
- **Calculate the load**

Materials Weight

2 inches pipes: 5 kg/meter
5 cm x 25 cm boards: 6 kg/meter
2 cm x 10 cm boards: 2 kg/meter

2 inches pipes is designed to carry 1500 kg

S.N.	Descrp.	Dim.	Qt.	Total Length	Unit Weight	Total Weight	Share	Weight On Post
1	Post	4m	6	24m	5kg	120kg	100%	120kg
2	post	2m	1	2m	5kg	10kg	100%	10kg
3	Bearer	1.5m	12	15m	5kg	75kg	50%	37.5kg
4	Runner	2.5m	28	70m	5kg	350kg	50%	175kg
5	Bracing	3m	12	36m	5kg	180kg	50%	90kg
6	Toe-board	2.5m	4	10m	2kg	20kg	50%	10kg
7	Scaffold Planks	3m	72	216m	6kg	1296kg	25%	324kg
Total Dead Load		766.5kg						
Platform Area		1.5 x 2.5 = 3.75 Square Meters						
Area of two working platform		2 x 3.75 = 7.5 Square Meters						
Total Live Load per leg		7.5 x 120 = 900/4 = 225kg (25%)						
Total weight per leg		766.5 + 225 = 991.5 kg						