

20K & 20KA Shoring Systems Safety Rules and User Guide

SS-670R2



Frame Shoring Safety Rules

STEEL FRAME SHORING SAFETY RULES

AS RECOMMENDED BY SCAFFOLDING, SHORING & FORMING INSTITUTE, INC.

(See Separate Scaffolding Safety Rules and Recommended Steel Frame Shoring Erection Procedure)

Following are rules designed to promote safety in the use of steel frame shoring equipment. These rules are illustrative and suggestive only, and are intended to deal only with some of the many practices and conditions encountered in the use of steel frame shoring. The rules do not purport to be all-inclusive or to supplant or replace other additional safety and precautionary measures to cover usual or unusual conditions. They are not intended to conflict with, or supersede, any state, local, or federal statute or regulation; reference to such specific provisions should be made by the user. (See Rule II.)

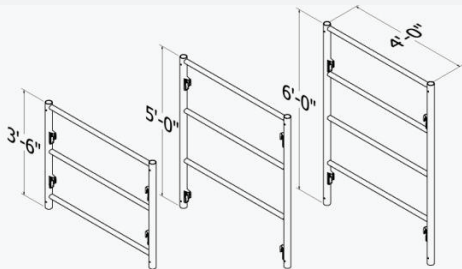
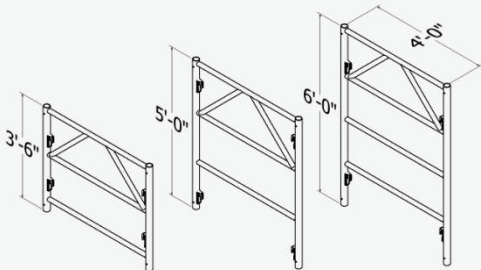
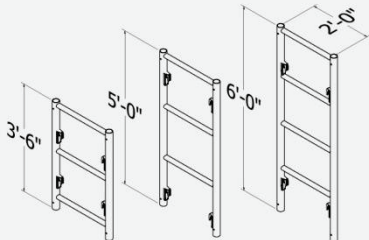
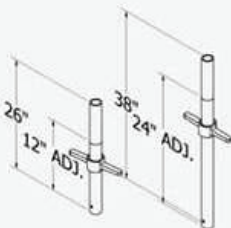
- I. **POST THESE SHORING SAFETY RULES** in a conspicuous place and be sure that all persons who erect, dismantle or use, shoring frames are aware of them.
 - II. **FOLLOW ALL STATE, LOCAL AND FEDERAL CODES, ORDINANCES and REGULATIONS** pertaining to shoring
 - III. **A SHORING LAYOUT** -Shall be available on the jobsite at all times.
 - IV. **INSPECT ERECTED SHORING AND FORMING:**
 - a. Immediately prior to pour - b. During pour - c. After pour until concrete is set.
 - V. **CONSULT YOUR SHORING EQUIPMENT SUPPLIER WHEN IN DOUBT.** Shoring is their business, **NEVER TAKE CHANCES.**
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- | | |
|---|--|
| <ol style="list-style-type: none">A. USE MANUFACTURER'S RECOMMENDED SAFE WORKING LOADS CONSISTENT WITH the type of SHORING FRAME and the height from supporting sill to framework.B. DO NOT EXCEED THE SHORE FRAME SPACINGS OR TOWER HEIGHTS as shown on the layout.C. SHORING LOAD SHOULD BE CARRIED ON LEGS. Consult your shoring supplier for SHORING FRAMES that are designed for taking loads on top horizontal.D. IF MOTORIZED CONCRETE EQUIPMENT is to be used, be sure that the shoring layout has been designed for use with this equipment and such fact is noted on the layout.E. PROVIDE AND MAINTAIN A SOLID FOOTING to distribute maximum loads properly.F. USE ADJUSTMENT SCREWS to adjust to uneven grade conditions.G. USE ADJUSTMENT SCREW to level-off, to accurately position the falsework and for easy stripping.H. KEEP SCREW EXTENSIONS to a minimum for maximum load carrying capacity (follow manufacturer's recommendation on screw extension).I. MAKE CERTAIN THAT ALL ADJUSTMENT SCREWS are firmly in contact with sills, form-work and frame legs. | <ol style="list-style-type: none">J. PLUMB AND LEVEL ALL SHORING FRAMES as the erection proceeds. DO NOT force braces on frames – level the shoring towers until proper fit can be made easily. CHECK PLUMB AND LEVEL OF SHORING TOWERS just prior to pour.K. FASTEN ALL BRACES SECURELY.L. TIE HIGH TOWERS OF SHORING FRAMES TOGETHER with sufficient braces to make a rigid, solid unit (see manufacturer's recommendations).M. EXERCISE CAUTION when erecting or dismantling free standing towers to prevent tipping.N. DO NOT CLIMB CROSS BRACES.O. AVOID ECCENTRIC LOADS ON U-HEADS, top plates and similar members by centering stringers on those members.P. USE SPECIAL PRECAUTIONS when shoring from or to sloped surfaces.Q. USE LUMBER STRESSES as shown on layout and consistent with age, type and condition of the available lumber to be used. Use only the lumber that is in good condition.R. RESHORING PROCEDURE SHOULD BE APPROVED BY A QUALIFIED ENGINEER.S. DO NOT REMOVE BRACES OR BACK-OFF ON ADJUSTMENT SCREWS until proper authority is given. |
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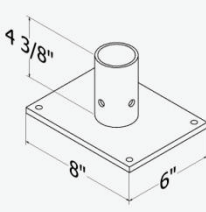
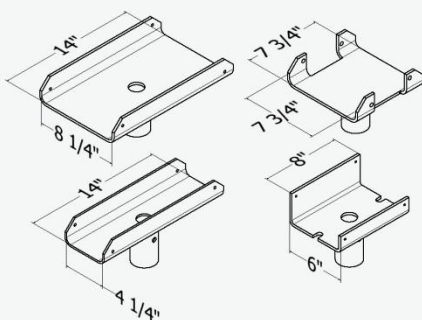
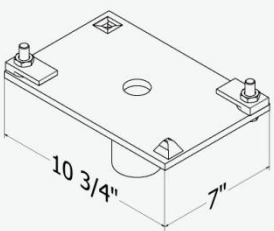
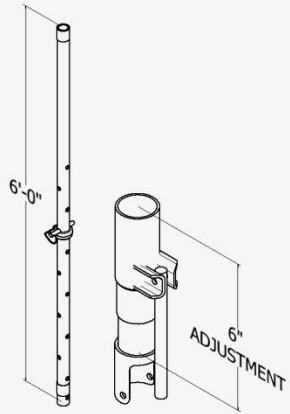
General Frame Shoring Notes

1. Contractor to check and verify all dimensions at job before proceeding with work.
2. Deviation from these layouts may be made only under the direction and supervision of a qualified person who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project and/or with the consultation of Aluma Systems.
3. The shoring installation must comply with safe practice and with the requirements of governmental regulations, codes and ordinances.
4. Contractor shall design and provide suitable sills to properly distribute the imposed shoring loads.
5. When setting elevations, allow for compression of lumber and soil.
6. Design of formwork is the responsibility of Contractor. Lumber formwork shown indicates suggested minimum methods and sizes only, to coordinate with design of horizontal and vertical shores. Final design and engineering of the lumber formwork and its construction is to be done by the contractor.
7. The formwork system must be stabilized to poured columns and walls. The layout as shown is designed with the provision that the formwork system is restrained from lateral movement with respect to the shoring. The contractor shall provide sufficient lateral support as necessary.
8. The shoring layout is not designed for motorized concrete placing equipment unless specifically stated.
9. All reshoring design and procedures are the responsibility of others.
10. All vertical and horizontal shoring should be installed and used in compliance with safety rules and recommendation published by the Scaffolding, Shoring & Forming Institute, Inc. and by Aluma Systems.
11. Do not intermingle or mix HI supplied components with those of other suppliers.
12. Imposed shoring loads are computed as applied concentrically to their vertical support member, whether frame legs or single post shores. Ledgers must be centered laterally and ledger joints butted or lapped centrally over their vertical support members.
13. Lateral stability bracing must be designed and installed by contractor for all single post shoring. For general recommended methods refer to drawing and/or printed information available from Aluma Systems such as SP-102R3.
14. All vertical shoring equipment shall be plumb in two directions unless otherwise specified on the shoring drawings.
15. Ledgers and stringers must be centered, butted or lapped centrally over their vertical support members.
16. Follow all additional information shown on Sheet No. 1 of the shoring layout drawings.

20K Shoring Components

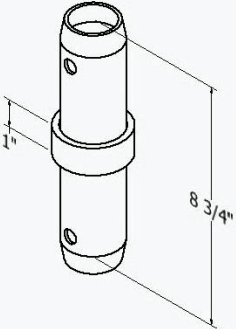
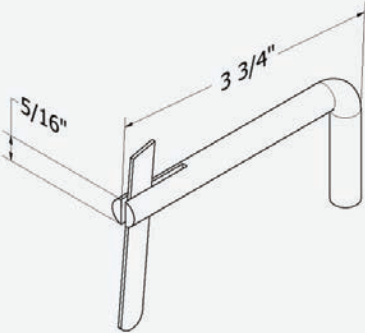
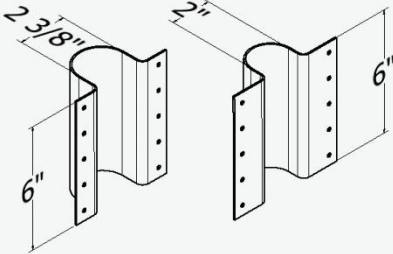
	Description	Part No.	Weight
	4' x 5'-0" 20K Frame	203C	55 lbs.
	4' x 6'-0" 20K Frame	203D	69 lbs.
	4' x 3'-6" 20K Frame Steel frames with maximum leg capacity of 10,000 lbs.	203E	45 lbs.
	4' x 5'-0" 20K Headload Frame	203CH	71.5 lbs.
	4' x 6'-0" 20K Headload Frame	203DH	84.25 lbs.
	4' x 3'-6" 20K Headload Frame Steel frames with maximum leg capacity of 10,000 lbs. (See page 10 for loading conditions)	203EH	50.25 lbs.
	2' x 5'-0" 20K Frame	217C	44.5 lbs.
	2' x 6'-0" 20K Frame	217D	55 lbs.
	2' x 3'-6" 20K Frame Steel frame with maximum leg capacity of 10,000 lbs.	217E	34.5 lbs.
	12" 20K Adjustable Leg	202E	12 lbs.
	24" 20K Adjustable Leg Adjustable screw leg used with both 20K & 20KA. See page 10 for loading data.	202EE	16 lbs.

20K Shoring Components

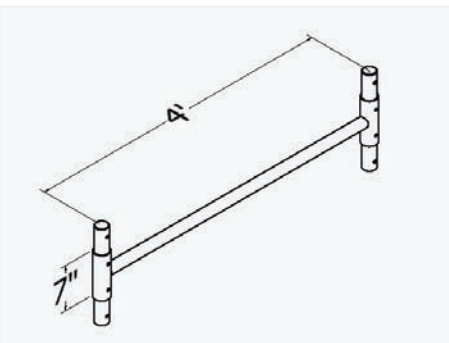
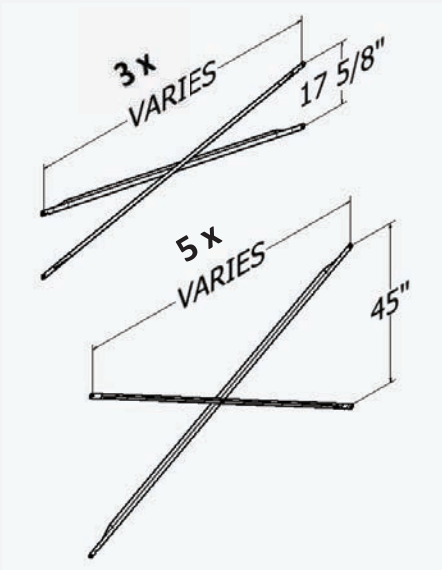
	Description	Part No.	Weight
	20K Base Plate 20K Swivel Base Plate Steel base plates used with either 20K & 20KA shoring frames.	201A 201AS	6.5 lbs. 6.75lbs.
	20K 8.25" x 14" U-Head 20K 4.25" x 14" U-head 20K 2 Way U-head 20K 6" x 8" J-head Steel U-heads used with either 20K & 20KA shoring frames.	201J-14 201JJ-14 201J-2W 201J-68	14 lbs. 7 lbs. 6.5 lbs. 11.4 lbs.
	20K Top Plate Used to secure steel or aluminum ledgers to 20K or 20KA shoring frames.	201P	10 lbs.
	6'-0" Extension Tube & 20K Adjusting Collar Extension tube can be used with either 20K or 20KA Adjusting collar used with 20K steel frames only. (See page 11 for allowable loading)	202-J12 202K	21 lbs. 8 lbs.

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20K Shoring Components

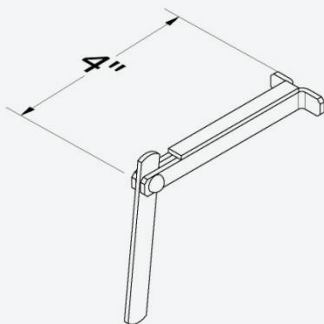
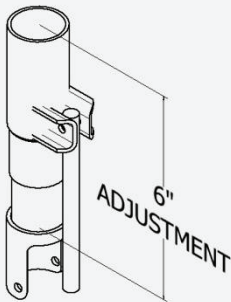
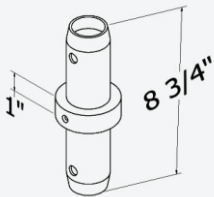
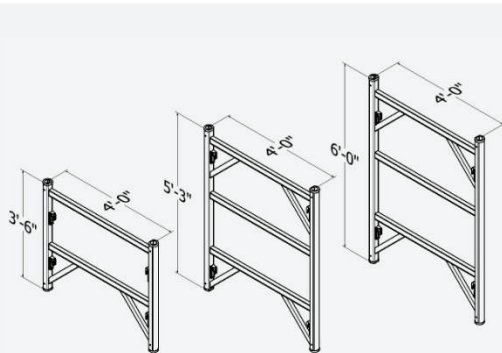
	Description	Part No.	Weight
	Sprocket for 20K Used to stack steel 20K frames.	204A	2.5 lbs.
	Solid Connecting Pin for 20K Used to secure sprockets, base plates and top plates to 20K.	204E	.11 lbs.
	Nailer Plate for 2" Ø Tubes Nailer Plate for 2 3/8" Ø Tubes Used to secure lumber bracing to either 20K adj. screw leg, ext. tube or 20K frame leg.	205A 205C	1.0 lbs. 1.1 lbs.

20K Shoring Components

	Description	Part No.	Weight
	Step Unit for 20K Frames Used when erecting 20K stair towers.	208N	17 lbs.
	Pivoted Cross Braces 3' x 2' 3' x 3' 3' x 4' 3' x 5' 3' x 6' 3' x 7' 3' x 8' 3' x 10' 5' x 2' 5' x 3' 5' x 4' 5' x 5' 5' x 6' 5' x 7' 5' x 8' 5' x 10'	 06T 06S 06R 06C 06B 06A 06Q 06H 06N 06M 06L 06F 06E 06D 06K 06G	 5 lbs. 7 lbs. 8 lbs. 10.75 lbs. 12.75 lbs. 14.75 lbs. 16.75 lbs. 18 lbs. 10.5 lbs. 9 lbs. 11 lbs. 12.75 lbs. 14.5 lbs. 16.25 lbs. 18 lbs. 19.5 lbs.

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20KA Shoring Components



Description	Part No.	Weight
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4' x 5'-3" 20KA Frame
4' x 6'-0" 20KA Frame
4' x 3'-6" 20KA Frame
Aluminum frames with maximum leg capacity of 10,000 lbs.

2403C
2403D
2403E

36.5 lbs.
39.5 lbs.
24.25 lbs.

20KA Sprocket
Used to stack aluminum 20KA frames.

2404A

2 lbs.

20KA Adjusting Collar
Adjusting collar used with 20KA aluminum frames only.

2402K

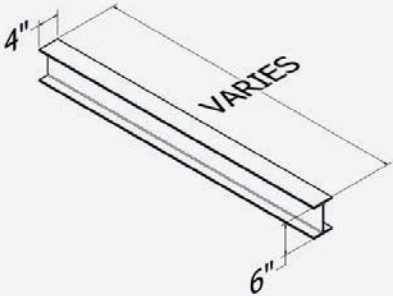
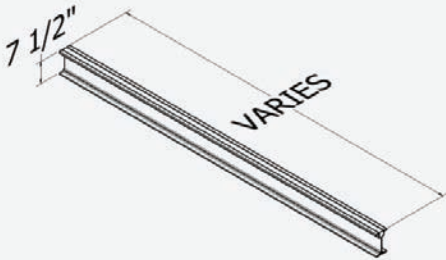
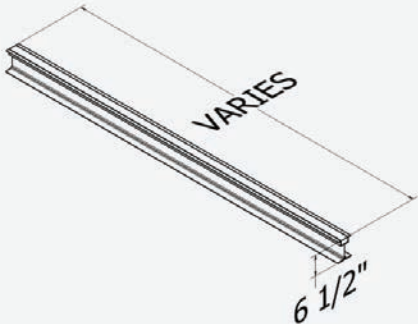
10.0 lbs.

Connecting Pin for 20KA
Used to secure sprockets, base plates and top plates to 20KA.

2404ES

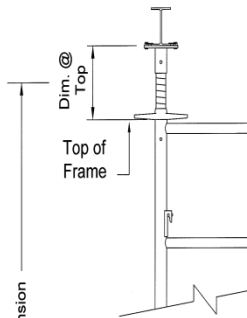
0.10 lbs.

Shoring Components

	Description	Part No.	Weight
	4' W6x12 Steel Stringer 6' W6x12 steel Stringer 8' W6x12 Steel Stringer 10' W6x12 Steel Stringer 12' W6x12 Steel Stringer Used to transfer loading to shoring frame legs. See page 12 for loading capacities.	W6x12-4 W6x12-6 W6x12-8 W6x12-10 W6x12-12	48 lbs. 72 lbs. 96 lbs. 120 lbs. 144 lbs.
	8' - 7½" Aluminum Stringer 10' - 7½" Aluminum Stringer 12' - 7½" Aluminum Stringer 16' - 7½" Aluminum Stringer Used to transfer loading to shoring frame legs. See page 13 for loading capacities.	46001-8 46001-10 46001-12 46001-16	41.6 lbs. 52 lbs. 62.5 lbs. 83.2 lbs.
	6½" Aluminum Joists Used to transfer loading to ledgers or stringers. Available in even foot increments. See page 14 for loading capacities.	45001-xx	4.5 lbs./ft.

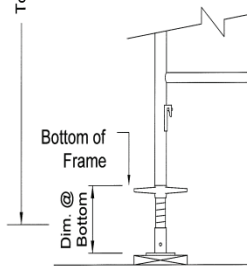
20K/20KA Allowable Leg Loading

Allowable leg load for **20K** Shoring Towers up to 3 Frames High with the total extension equal to the sum of the distance between the frame and bottom of stringer and bottom of frame to top of sill, is as indicated below:



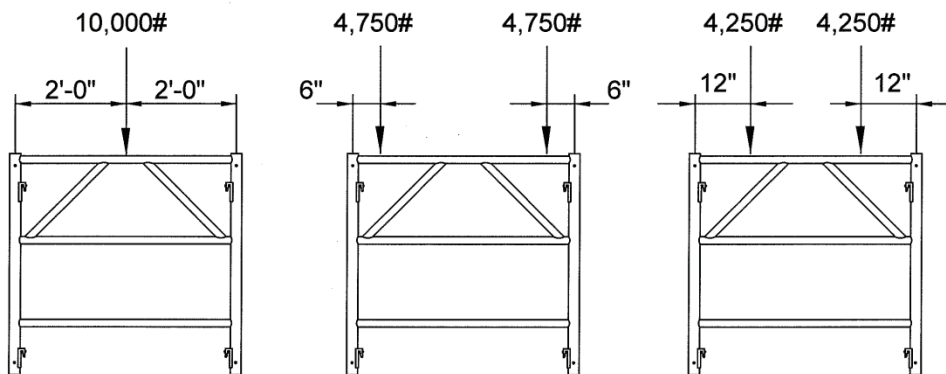
Sum of Distance Top & Bottom	12"	24"	36"	48"	60"
Allowable Leg Load	10,000#	10,000#	10,000#	8,200#	8,200#
Reduce allowable leg load for each additional frame in tower height by	70#	70#	70#	75#	75#

Allowable leg load for **20KA** Shoring Towers up to 3 Frames High with the total extension equal to the sum of the distance between the frame and bottom of stringer and bottom of frame to top of sill, is as indicated below:



Sum of Distance Top & Bottom	12"	24"	36"	48"	60"
Allowable Leg Load	10,000#	10,000#	10,000#	8,200#	8,200#
Reduce allowable leg load for each additional frame in tower height by	40#	40#	40#	45#	45#

Allowable loading for 20K Headload Frames

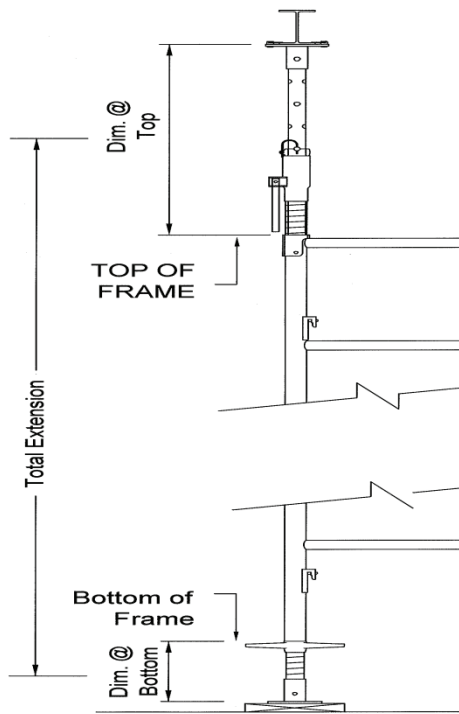


NOTE

Be sure to add any loading being imposed on the frame leg to assure that the total imposed load does not exceed the maximum allowable loading shown above.

Consult Aluma Systems for towers over 60'-0"

20K Extension Tube Allowable Loading



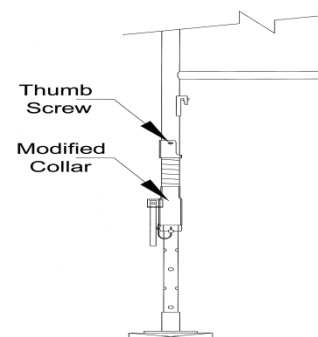
Allowable loading for 20K 6' Extension Tube with Collar

**Amount of extension	Allowable load unbraced (lbs.)	Allowable load braced in two directions (lbs.)
Up to including 24"	10,000	10,000
25" to 36"	8,000	10,000
37" to 48"	7,000	8,200
49" to 60"	6,000	8,200

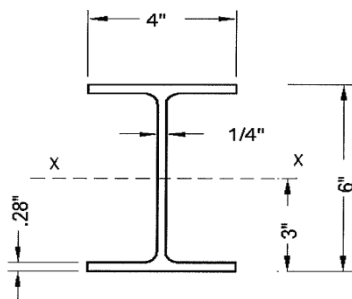
**Amount of extension is measured from top of frame to bottom of stringer plus bottom of frame to top of sill.

NOTES

1. Load values given for direct vertical loading.
2. Load values given for braced extension tubes to be used only when tubes are braced in two directions 90 degrees apart. Braces to be Tubelox or 2x4 lumber (min.) securely attached to the extension tubes and formwork or from extension tube to adjacent frames below or between extension tubes.
3. Extension legs and collars to be used only with Aluma Systems 20K or 20KA shoring equipment.
4. Allowable loads developed through test procedures recommended by "The Scaffolding, Shoring and Forming Institute".
5. For non vertical loading of extension tubes consult Aluma Systems.
6. Extension tubes may be used either in top or bottom of shoring frames. Use of extension tubes in both the top and bottom of shoring frames is **not recommended**.
7. When using extension tubes and collars at bottom of shoring frames, a modified collar must be used.



W6x12 Stringer Load Data



Properties for W6x12 Steel Stringer

Area = 3.54 in²

Weight = 12.0 lbs./ft.

$S_{x-x} = 7.25 \text{ in}^3$

$I_{x-x} = 21.7 \text{ in}^4$

$M_{MAX.} = 13.05 \text{ Kip-ft.}$

End Reaction = 26.4 kips *

Interior reaction = 52.8 kips **

$E = 29,000,000 \text{ psi}$

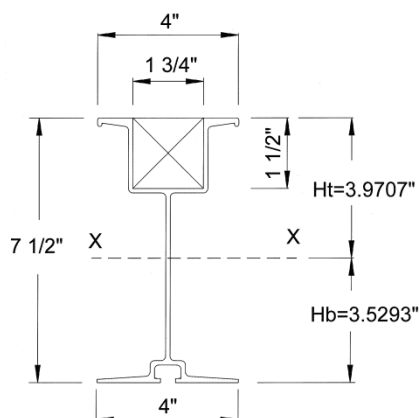
- Check web shear 20 kips max.
- * * Check web shear 17.4 kips max.

Span (ft.)	Uniform loading (lbs./ft.)	
4	6510 #/ft.	Moment governs
5	4165 #/ft.	Moment governs
6	2890 #/ft.	Moment governs
7	2125 #/ft.	Moment governs
8	1625 #/ft.	Moment governs
10	700 #/ft.	Deflection governs

Span (ft.)	Mid-point loading (lbs.)	
4	13,050 #	Moment governs
5	10,440 #	Moment governs
6	8,700 #	Moment governs
7	7,450 #	Moment governs
8	6,525 #	Moment governs
10	4,520 #	Deflection governs

Deflection limited to 1/4"
Verify capacity of support at ends

7½" Aluminum Stringer Load Data



Properties for 7½" Alum. Stringer

Area = 3.538 in²

Weight = 5.2 lbs./ft.

$S_{X-X} = 8.769$ in³

$I_{X-X} = 34.82$ in⁴

$M_{MAX} = 13.154$ Kip-ft.

End Reaction = 7.4 kips

Interior reaction = 14.8 kips

E = 10,000,000 psi

Span (ft.)	Uniform loading (lbs./ft.)	
4	3700 #/ft.	Reaction governs
5	2960 #/ft.	Reaction governs
6	2385 #/ft.	Deflection governs
7	1500 #/ft.	Deflection governs
8	945 #/ft.	Deflection governs *
10	385 #/ft.	Deflection governs *

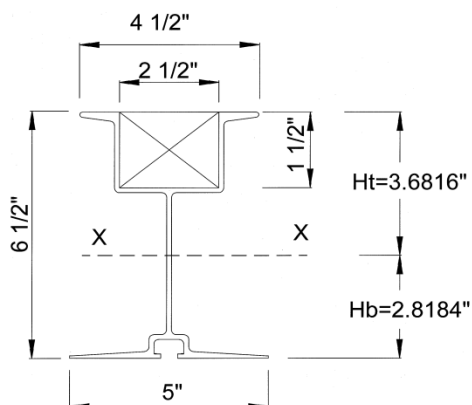
Span (ft.)	Mid-point loading (lbs.)	
4	13,150 #	Moment governs
5	10,525 #	Moment governs
6	8,770 #	Moment governs
7	6,575 #	Deflection governs
8	4,720 #	Deflection governs *
10	2,415 #	Deflection governs *

Deflection limited to L/360

* Deflection limited to ¼"

Verify capacity of support at ends

6½" Aluminum Joist Load Data



Properties for 6½" Alum. J400 Joist

Area = 2.61 in²

Weight = 4.5 lbs./ft.

$S_{x-x} = 4.517 \text{ in}^3$

$I_{x-x} = 16.63 \text{ in}^4$

$M_{MAX.} = 6.771 \text{ Kip-ft.}$

End Reaction = 6.075 kips

Interior reaction = 12.15 kips

$E = 10,000,000 \text{ psi}$

Span (ft.)	Uniform loading (lbs./ft.)	
4	3035 #/ft.	Reaction governs
5	1970 #/ft.	Deflection governs
6	1180 #/ft.	Deflection governs
7	715 #/ft.	Deflection governs
8	450 #/ft.	Deflection governs *
10	185 #/ft.	Deflection governs *

Span (ft.)	Mid-point loading (lbs.)	
4	6,770 #	Moment governs
5	5,415 #	Moment governs
6	4,275 #	Deflection governs
7	3,095 #	Deflection governs
8	2,255 #	Deflection governs *
10	1,155 #	Deflection governs *

Deflection limited to $L/360$

* Deflection limited to $\frac{1}{4}$ "

Verify capacity of support at ends

Recommended Maximum Pressure for Plywood

(lbs./sq. ft.)

Face grain of sheet across supports (Strong direction)

PLYFORM CLASS I FACE GRAIN ACROSS 2 x SUPPORTS

Spacing of Supports	3/4" Plywood		5/8" Plywood	
	1/360	1/270	1/360	1/270
8"	1592 S	1592 S	1267 S	1267 S
10"	1054 B	1054 B	829 B	829 B
12"	732 B	732 B	576 B	576 B
14"	526 D	538 B	388 B	423 B
16"	370 D	412 B	267 D	322 D
19.2"	225 D	286 B	158 D	196 D
24"	119 D	159 D	82D	104 D

Plywood continuous across three or more spans

PLYFORM CLASS I FACE GRAIN ACROSS J400 SUPPORTS

Spacing of Supports	3/4" Plywood		5/8" Plywood	
	1/360	1/270	1/360	1/270
8"	1647 B	1647 B	1296 B	1296 B
10"	1054 B	1054 B	829 B	829 B
12"	732 B	732 B	576 B	576 B
14"	538 B	538 B	423 B	423 B
16"	412 B	412 B	324 B	324 B
19.2"	266 D	286 B	188 D	224 B
24"	137 D	183 D	96 D	119 D

Plywood continuous across three or more spans

PLYFORM CLASS I FACE GRAIN ACROSS 4x SUPPORTS

Spacing of Supports	3/4" Plywood		5/8" Plywood	
	1/360	1/270	1/360	1/270
8"	1647 B	1647 B	1296 B	1296 B
10"	1054 B	1054 B	829 B	829 B
12"	732 B	732 B	576 B	576 B
14"	538 B	538 B	423 B	423 B
16"	412 B	412 B	324 B	324 B
19.2"	286 B	286 B	225 B	225 B
24"	158 D	183 B	109 D	137 D

Plywood continuous across three or more spans

S = Shear Governs
B = Bending Governs
D = Deflection Governs

Recommended Maximum Pressure for Plywood

(lbs./sq. ft.)

Face grain of sheet parallel to supports (Weak direction)

PLYFORM CLASS I FACE GRAIN PARALLEL TO 2x SUPPORTS

Spacing of Supports	3/4" Plywood		5/8" Plywood	
	1/360	1/270	1/360	1/270
8"	900 S	900 S	479 D	633 B
10"	556 D	688 S	277 D	369 D
12"	359 D	478 D	172 D	230 D
14"	243 D	324 D	113 D	151 D
16"	171 D	228 D	78 D	104 D
19.2"	104 D	139 D	46 D	62 D
24"	55 D	74 D	24 D	32D

Plywood continuous across three or more spans

PLYFORM CLASS I FACE GRAIN PARALLEL TO J400 SUPPORTS

Spacing of Supports	3/4" Plywood		5/8" Plywood	
	1/360	1/270	1/360	1/270
8"	1064 S	1064 S	633 B	633 B
10"	709 B	709 B	382 D	405 B
12"	465 D	492 B	226 D	281 B
14"	305 D	362 B	143 D	161 D
16"	209 D	277 B	96 D	128 D
19.2"	123 D	164 D	55 D	73 D
24"	63 D	84 D	28 D	37 D

Plywood continuous across three or more spans

PLYFORM CLASS I FACE GRAIN PARALLEL TO 4x SUPPORTS

Spacing of Supports	3/4" Plywood		5/8" Plywood	
	1/360	1/270	1/360	1/270
8"	1107 B	1107 B	633 B	633 B
10"	709 B	709 B	405 B	405 B
12"	492 B	492 B	281 B	281 B
14"	362 B	362 B	184 D	207 B
16"	258 D	277 B	119 D	158 B
19.2"	147 D	192 B	66 D	88 D
24"	73 D	97 D	32 D	42 D

Plywood continuous across three or more spans

S = Shear Governs
B = Bending Governs
D = Deflection Governs

Sample Design Application

Shoring projects can be designed in one of several ways, all of which are correct. Once the load that the shoring system must support is determined, design may start at several points, since there is no single correct sequence. A designer might calculate the maximum allowable tributary area per leg or post and then determine the span & spacing for stringers/ledgers and joists. Another designer might reverse the order but in both cases all the steps are required.

The keys to a good design are satisfying the customer's needs and minimizing the amount of equipment by loading all the shoring components at or near the safe carrying capacity. Often the initial design may be adjusted to fit the application or structure or to be more efficient use of the equipment.

Let us take a look at a simple project consisting of an 8" concrete flat slab with a floor to floor height of 10'-0"

1. First calculate the dead load of the 8" concrete slab and form work;

$$\frac{8''}{12''/\text{ft.}} \times 150 \text{ \#/ft.}^3 = 100 \text{ \#/ft.}^2 + 10 \text{ \#/ft.}^2 = 110 \text{ \#/ft.}^2$$

(Typically concrete weighs 150 #/ft.³ and the form work 10 #/ft.²)

2. Next we will add the appropriate live load (20 #/ft.² min. to 50 #/ft.² max.)

$$110 \text{ \#/ft.}^2 + 40 \text{ \#/ft.}^2 = 150 \text{ \#/ft.}^2 \text{ This the design load.}$$

(Note: Some projects may have a minimum dead load and live load as specified in the contract documents.)

3. Determine the maximum span for the grade and thickness of plywood being used.
See page 12 for loading capacities for plywood in the strong direction.
(3/4" Class I Plyform is commonly used in construction.)

With a design loading of 150 #/ft.², the maximum span would be 19.2" (19.2" constitutes 5 equal spaces for an 8 ft. sheet of plywood.)

4. Using the spacing of 19.2" o.c., we will determine the max. allowable span for J400 Aluminum Joists.

$$150 \text{ \#/ft.}^2 \times \frac{19.2''}{12''/\text{ft.}} = 240 \text{ \#/ft.}$$

Maximum simple span = 8' (We generally design around a simple span as this is the worst case scenario on any given project.)

Sample Design Application

5. We will now determine the maximum span for our 7 ½" Aluminum Stringer assuming the J400 joists span the maximum of 8'-0".

(Refer to page 13 for loading capacities)

$$240 \text{ \#/ft.} \times 8' \text{ span} = 1920 \text{ \#/ft.}$$

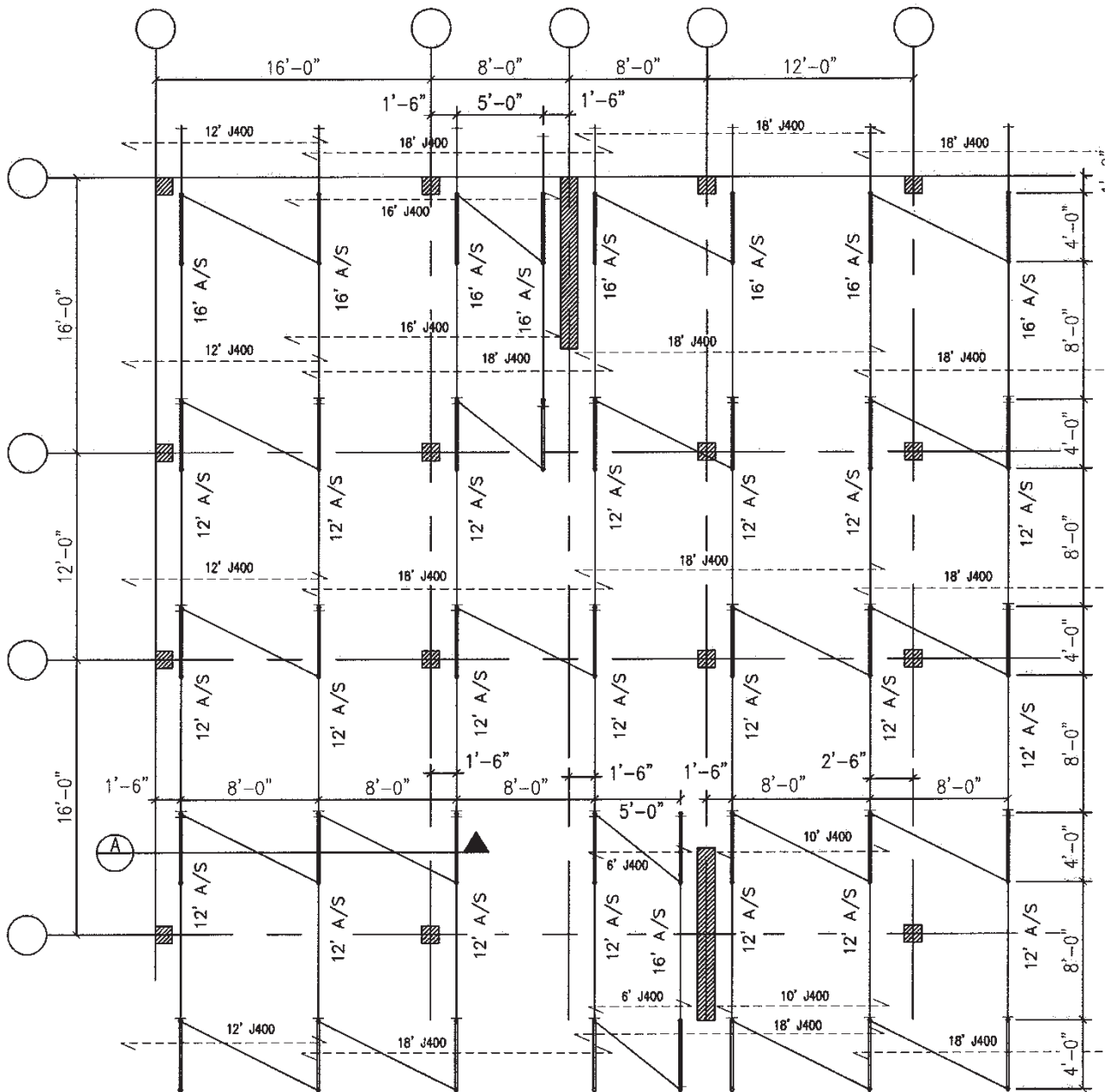
$$\text{Maximum simple span} = \mathbf{6'}$$

6. The maximum calculated tributary area per 20K leg would be 8' x 6' or 48 sq. ft.

$$\text{The calculated leg load is } 48 \text{ ft.}^2 \times 150 \text{ \#/ft.}^2 = 7200 \text{ \#}$$

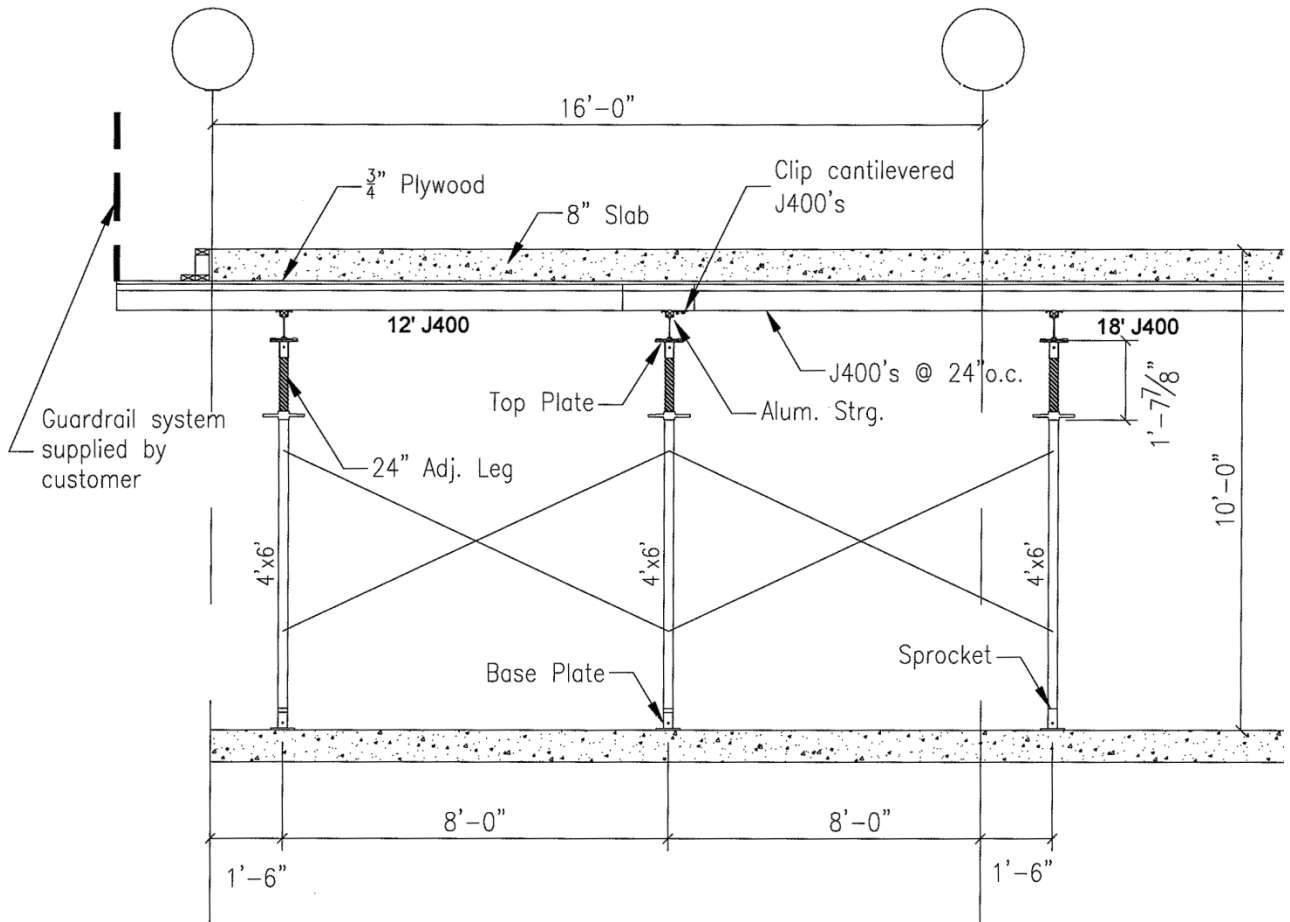
The allowable loading for a 20K/20KA frame with a maximum extension of adjustable screw legs is 10,000 #. (Refer to page 10.)

A proposed shoring system designed around the parameters calculated could look like the layout and section shown on the next pages.



Partial Plan View

Sample Design Application



Section "A"

There are any number of correct 20K stack-ups that could be used for this project. Since the 20K is bearing on a solid surface, not compacted fill, a stack-up without an adjustable screw leg at the bottom was chosen. This method is fine for stack-ups of one or two frames high, but as the stack-up exceeds two or more frames, it is advisable to place an adjustable screw leg at the bottom as well as the top.

An adjustable screw leg is used at the bottom, when the shoring frames are resting on uneven surfaces, or for plumbing the shoring tower, or for achieving greater adjustability in the shoring tower height.

Caution must be exercised when cantilevering joists or stringers, as this creates a tipping hazard, and may require that the joists or stringers be secured at their inner ends.

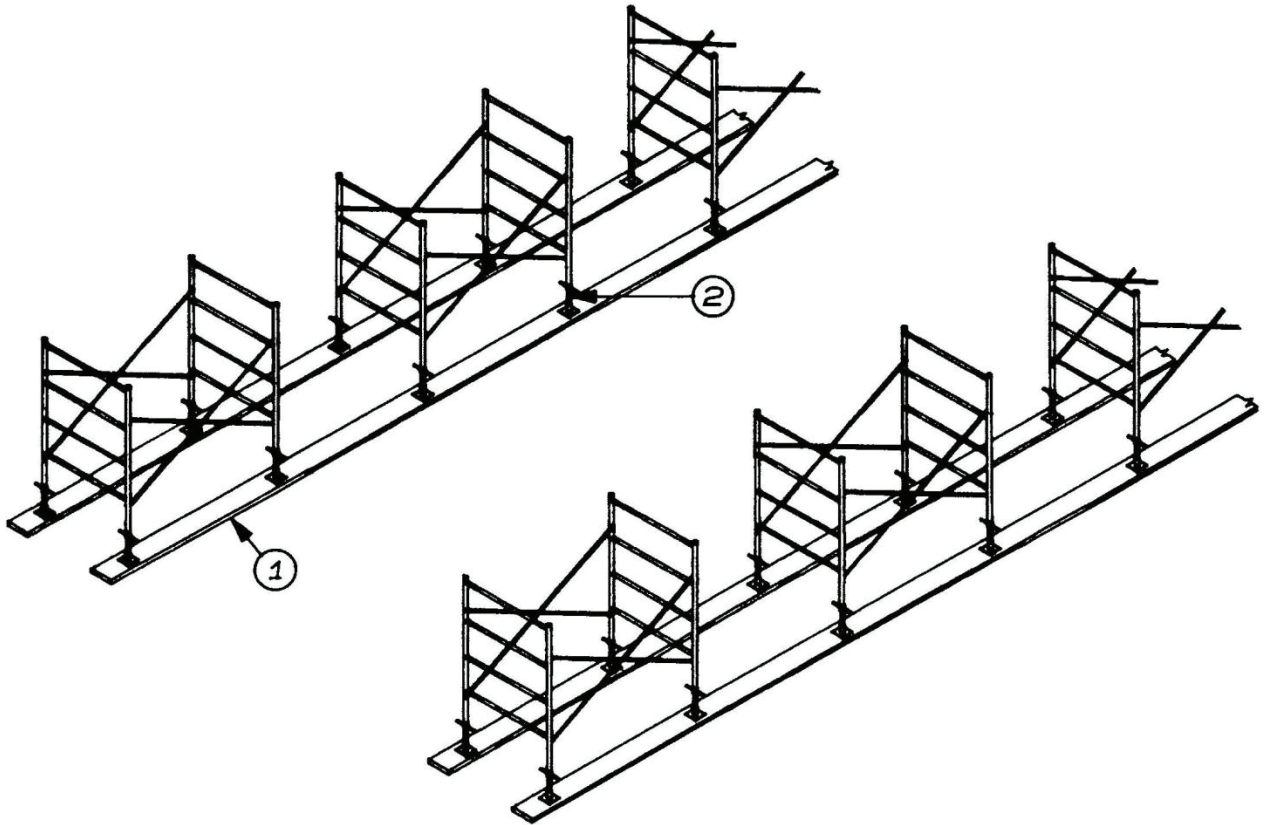
Suggested Methods of Erecting & Dismantling Aluma Frame Shoring

It shall be the responsibility of all users to read and comply with the following common sense rules which are designed to promote safety in the erecting and the dismantling of shoring systems. These rules do not purport to be all inclusive nor to supplant or replace other additional safety and precautionary measures to cover usual or unusual conditions. If these rules conflict in any way with state, local or federal statute or regulation said statute or regulation shall supersede these rules and it shall be the responsibility of the users to comply therewith.

1. Survey shall be made of the jobsite for hazards including but not limited to untamped earth fills, ditches, debris, tension wires, unguarded openings or hazardous conditions created by other trades.
2. Only an experienced and qualified supervisor shall be utilized in the erecting and dismantling of steel frame shoring, joists & stringers.
3. Do **not** climb shoring cross braces.
4. Use caution when erecting free standing towers. Prevent tipping by guying or bracing.
5. Use plywood, planking, walkways, scaffolds or ladders during the erection of shoring equipment. Plank **must** conform to OSHA specifications.
6. Never stock material on open joist or stringers. Stock material on concrete or solid deck surface.
7. Only personnel erecting the deck forms shall be allowed on the uncompleted deck. The deck forming shall be accomplished with an employee trained in this type of construction operation and aware of the hazards connected with placing structural members for the support of poured-in-place concrete.
8. During the transition stage of erecting and removing formwork, the shoring and reshoring work at the leading open unguarded edge shall be supervised by the customer or an authorized representative of the customer to assure operations are accomplished with minimal exposure to the open edge, with due regard for the experience and abilities of the employees.
9. Do not walk on stringers or joists.
10. If working edge is over 8'-0" from poured concrete or solid deck surface, laydown plywood, planking or walkways to install equipment.
11. When completed, open-sided deck form used for the support of poured concrete floors shall be guarded as prescribed by OSHA.
12. At customer's request, Aluma Systems will discuss any accessories not available directly from Aluma Systems .
13. Do not make unauthorized changes or substitutions of equipment; Always consult with Aluma Systems prior to making changes necessitated by jobsite conditions.
14. Do not make unauthorized modifications to any equipment supplied by Aluma Systems.

During erecting, dismantling or use of equipment always follow separate Safety Rules and Instructions as indicated on contract drawings. In the event of a conflict between these general notes & illustrations and the contract engineering drawings, the contract engineering drawings take precedence.

Suggested Methods of Erecting & Dismantling Aluma Frame Shoring

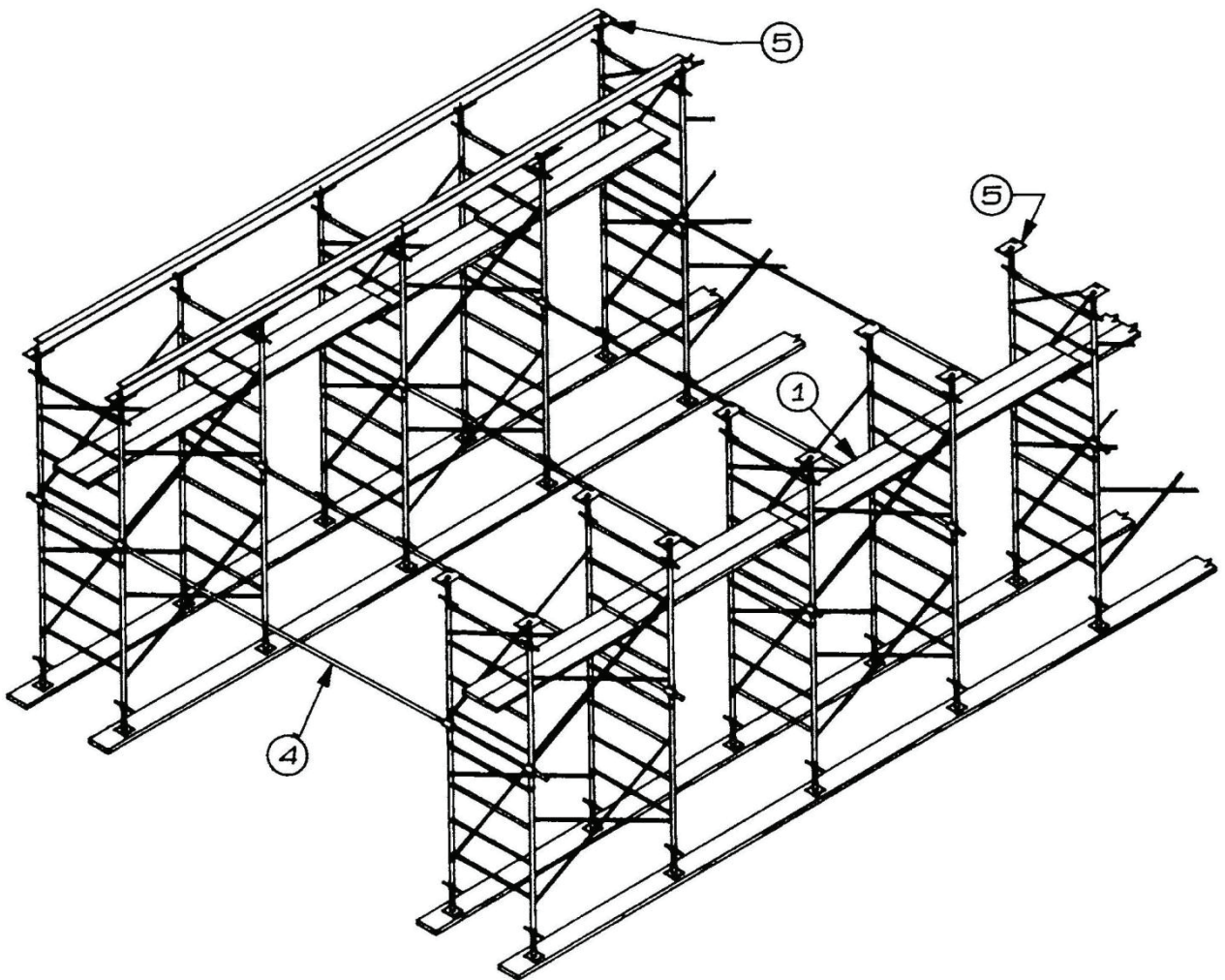


Step 1

Shoring equipment is to be erected by qualified workers knowledgeable in shoring erection:

1. The first tier of frames or single towers shall be erected on properly designed sills or solid surface.
2. Frames are to be plumbed and leveled prior to the erection of the second tier.

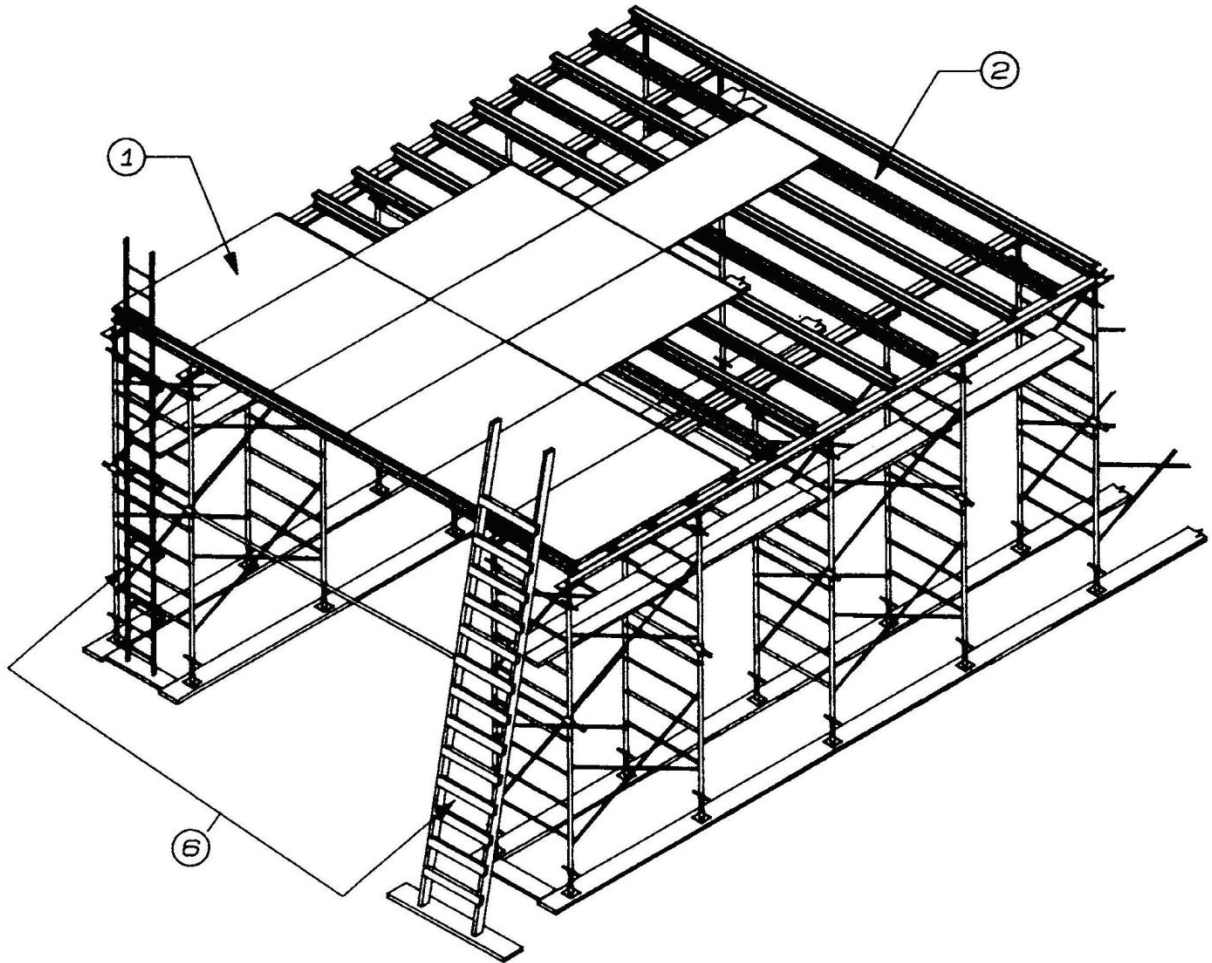
Suggested Methods of Erecting & Dismantling Aluma Frame Shoring



Step 2

1. The customer shall provide adequate work platforms as additional tiers of frames are erected.
2. Work platforms shown are schematic representations and are not to be interpreted as specific locations for any erection sequences.
3. During erection and dismantling, the formwork structure is incomplete. Care must be taken to safeguard against any hidden or obscure sources of danger.
4. Stabilize all towers at intervals no greater than 4 times their minimum base dimensions.
5. When erecting or dismantling adjustable screws, stringers (ledgers), and other accessories, the customer shall provide adequate work platforms.

Suggested Methods of Erecting & Dismantling Aluma Frame Shoring



Step 3

1. Use previously provided work platforms or install plywood on top of joists to provide walkways.
2. Workers should not walk on top of open spaced horizontal joists.
3. Deck forming shall be accomplished by an a user trained in this type of construction operation.
4. During the transition stage of erecting and removing framework, the leading open unguarded edge shall be supervised by the customer.
5. As soon as practical, open edges and openings in the plywood deck shall be guarded using guardrail systems.
6. Climbing ladders should be used for access on shoring system to working locations. Customer shall furnish his own job built or purchased ladder which must be attached at working location. If desired Aluma Systems can furnish an offset ladder which attaches to the shoring system. All access ladders shall extend a minimum of 42" above the working surface.

Dismantling Notes

The work of dismantling shoring should be under the supervision of an individual with proper experience and aptitude. The following should be observed while dismantling..

1. It shall be the responsibility of employees to read and comply with the following guidelines which are designed to promote safety in the dismantling of shoring. These guidelines do not purport to be all inclusive nor supplant or replace other additional safety and precautionary measures that may be necessary to cover usual or unusual conditions.
2. Check to see if shoring has been structurally altered in any way which would make it unsafe; and, if so, reconstruct where necessary before commencing with the dismantling procedures.
3. Dismantle shoring from the top down. Begin by removing all accessories from that lift being dismantled at the time.
4. Always work from a minimum of two planks placed on the frames below the lift being removed. Move planking down as dismantling progresses.
5. Do not remove braces until dismantling has reached the lift to which they are attached.
6. Always stay within the inside of the shoring. Do not climb on the outside for any reason when dismantling. Do not climb on braces or unbraced components. Use only appropriate climbing and access components to move between levels.
7. During dismantling of frames be sure sprockets are not dislodged as they are not always pinned into the frames.
8. Be sure that area below is clear of personnel not involved in the dismantling and is secured against unauthorized access.
9. Lower shoring components in a safe manner as they are dismantled. Avoid dropping or throwing the components as this could result in injury to personnel below, or damage to the equipment.

WARNING

Serious injury may result if you fail to use safe practice in the erecting, dismantling or use of shoring, scaffolding and/or forming equipment. Erectors, dis-mantlers, and users must be familiar with and follow current laws and regulations, safe practice and the Safety Rules and Instructions. Individuals using this equipment must be instructed in these requirements. Safety Rules and Instructions pertaining to the products shown herein are provided upon sale or rental of equipment. Additional copies or further information shall be provided upon your request and are at www.aluma.com

It is important to note that current OSHA regulations require the use of guardrail systems and/or fall protection devices at all working levels, open sides, and at all openings on platforms and work areas above certain heights, as specified by OSHA. In all cases, where a worker is exposed to a fall hazard in the use of this equipment, guardrail systems, where appropriate or other personal fall protective devices, must be utilized. Means of access must be made available by the customer to all locations where people are expected to work. Materials for the provision of such means of access may be job built by the customer, or, at the customer's option, be obtained through Aluma Systems or other suppliers. Aluma Systems will, at customer's request, consult on an



A BRAND COMPANY

Graphics and diagrams are illustrative only. All products and equipment shall be used or offered for sale only where permitted by law or governmental regulations, codes or ordinances and shall be used in strict conformity therewith and for the purpose and in the manner as may be prescribed therein and in conformity with safe practice. Specifications of products and equipment shown herein are subject to change without notice.