INSTALLATION MANUAL FOR CANTILEVER RACK - STRUCTURAL

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WARNING

INSTRUCTIONS FOR CANTILEVER RACK ASSEMBLY ARE SET FORTH ON THESE PAGES. PROPER ASSEMBLY OF THE CANTILEVER RACKING SYSTEM IS THE RESPONSIBILITY OF THE PURCHASER AND IS NOT COVERED BY ANY WARRANTY OF THE SELLER. THE BUYER IS CAUTIONED TO NOT SUBSTITUTE PARTS OR HARDWARE. SELLER DISCLAIMS ALL LIABILITY WITH RESPECT TO ANY SUBSTITUTION OF PARTS OR HARDWARE NOT APPROVED IN WRITING BY THE SELLER. THE INSTALLATION DETAIL DRAWINGS BELOW ARE INTENDED TO BE USED AS BASIC GUIDES TO THE INSTALLATION OF STANDARD COMPONENTS. DEPENDING UPON THE SPECIFICS OF THE CANTILEVER RACK SYSTEM, THERE COULD BE LIMITATIONS REGARDING THE USE OF THESE STANDARD COMPONENTS AND/OR A REQUIREMENT FOR SPECIAL INSTALLATION TECHNIQUES.

MATERIAL HANDLING EXCHANGE

1800 CHURCHMAN AVrNUr
1Nt71ANAPOU5 INDIANA
46205

					11-rLf 5-rRUC11LR!'I CAN11LfVfR RACK INSf/'ILA110NMANU/'I			
					DRAWINu NO. 5HRIM- f/'I'U Of CON11'Nf5 / W/IRNINu5			
RfV.	DA11'	DbCRIP110N			5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	DA11' 1/1/2025	'.S!UrNO. I Of IB

BUILDING A CANTILEVER SYSTEM

Step 1 - Determine the Quantity & Spacing of Cantilever Arms
You should always use enough cantilever arms under the product to prevent any deflection. Deflection of the product can cause damage to the product itself and in some cases will cause undesirable side pressure on the cantilever arms. Determining the right amount of cantilever arms needed to support your products without any deflection is easy. Simply take two wooden blocks or maybe 2x4's and place them on your floor. Then place your product on the blocks to test the load for deflection. With this test you are determining if your load can be supported by only two cantilever arms. You can adjust the width between the blocks until you start to see deflection. See figure 1 on sheet 3. It is a good idea to never have the cantilever arms spaced apart more than 1/2 the length of the product you are storing.

If you detect any deflection then you have reached the maximum distance the cantilever arms can be apart in your cantilever rack system. You will want to round this distance down to the nearest whole inch as braces are manufactured in 1" increments. Also, remember the rule of never having the cantilever arms spaced apart more than 1/2 the length of the product you are storing.

If there is any deflection when using two cantilever arms try three. When correctly loading your Cantilever Rack the product should only overhang the cantilever arms by 1/2 of the cantilever upright centerline distance. Loading product without overhang is incorrect and dangerous.

Step 2 - Determine Cantilever Arm Length
Cantilever arm length should always equal or slightly exceed the product load depth. See figure 2 on sheet 3. Arm lengths should always be a whole inch dimension as arms are manufactured in 1" increments.

Step 3 - Determine Tower Height
You will first start by giving consideration to the base height. The height of the base will always be the first number presented in the steel size, for example, a W8x18 base is 8" tall. Next you will look at the number of storage levels you can achieve by reviewing the following: Load Height, Lift Off Space, Arm Height, & Facility Clear Height. See figure 3 on sheet 3. Load Height is the total distance between where the producUload will sit on the cantilever arms and the top of the producUload. Lift Off Space is the space necessary to place the product on, or lift it off of, the cantilever arms. We recommend a minimum of 4" lift off space but more is always better. Arm height is determined determined by your required capacity and will be presented similar to the tower and base sizes. The height of the arm will be the first number in the steel size, for example, a C5x6.7 is 5" tall. Facility Clear height is the distance from the floor to the lowest hanging obstruction in the installation area. Note: Some municipalities require a specific distance between the top of stored product and the sprinkler heads (usually 36"), check with your local Fire Marshal to determine the clear height of your facility.

With the above information we can determine both the tower height and the number of arm levels the tower can support. Example: Load Height 36", Lift Off Space 4", Arm Height 4", Facility clear height 20'-0", Capacity requires a W6x15 Tower and Base. Arm Height+ Load Height+ Lift Off Height= 44" (it is important that this number is divisible by 4 due to Cantilever Towers 4" adjustability), Clear Height - (Base Height+ Load Height+ Lift Off)= 16'-2", 16'-2" / 44" = 4.409... Always round down, that gives us 4 arm levels. 44" * 4 = 176" + 6"(base height)+ 36"(base load height)+ 4"(base lift off space)= 222" or 18'-6". It is not always* important that the tower extend past the top load height but it should always extend 6" or more above the top arm level. In the example above the tower height could be 19'-0" or 18'-0". Tower Heights should whenever possible be in whole feet as they are manufactured in 12" increments, custom heights can be manufactured upon request.
*Note: Any "loose" loads such as unbundled pipes or similar products that can shift position will require the tower to extend past the top of the top load for safety.

Step 4 - Determine the Required Arm Capacities
To determine the required arm capacities you take the load weight and divide it by the number of arms it takes to support the product without any deflection, which we determined way back in Step 1. Note: this is based on uniformly distributed loads, uneven lading reduces arm capacities by 50%. See figure 4 on sheet 3.

Step 5 - Determine the Bracing Lengths
Brace length is the distance between towers in a cantilever system. See figure 5 on sheet 3. Part of the system brace length is determined in Step 1, however for long runs of Cantilever Rack sometimes different brace lengths are required in different locations. As an example, your product is 8'-0" long. In Step 1 you determined that two cantilever arms would support you product at a 4'-0" spacing. This meets all the requirements set forth in Step 1, spacing is 1/2 or less the product length, there is no deflection, and the overhang will be no more than 1/2 of the cantilever upright spacing. What this doesn't account for is if you wanted more than one bay this size in a run, if all of your braces are 4'-0" and you have 2' of overhang between each storage bay then you have to load your product perfectly centered every time and there will be no space between product from one bay to the next. This is not ideal, however if you alternate between 4'-0" braces and 5'-0" braces that gives you 12" of maneuvering space and since these 5'-0" spaces are not carrying any load directly we are still following all the rules detailed above.

BUILDING A CANTILEVER SYSTEM - REFERENCE

FIGURE 1.

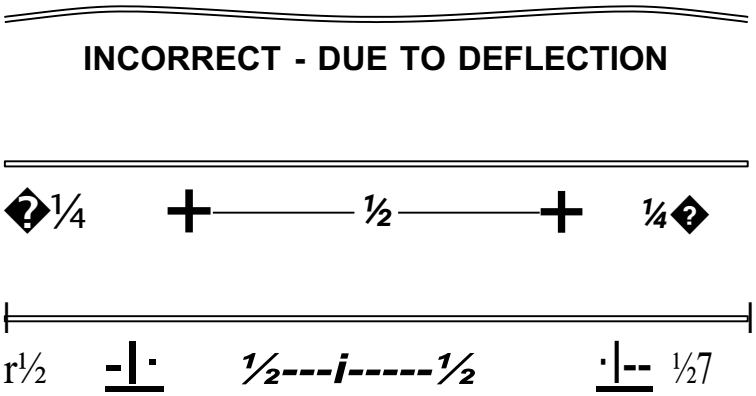


FIGURE 2.

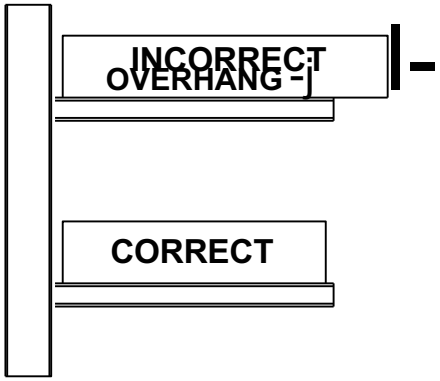


FIGURE 3.

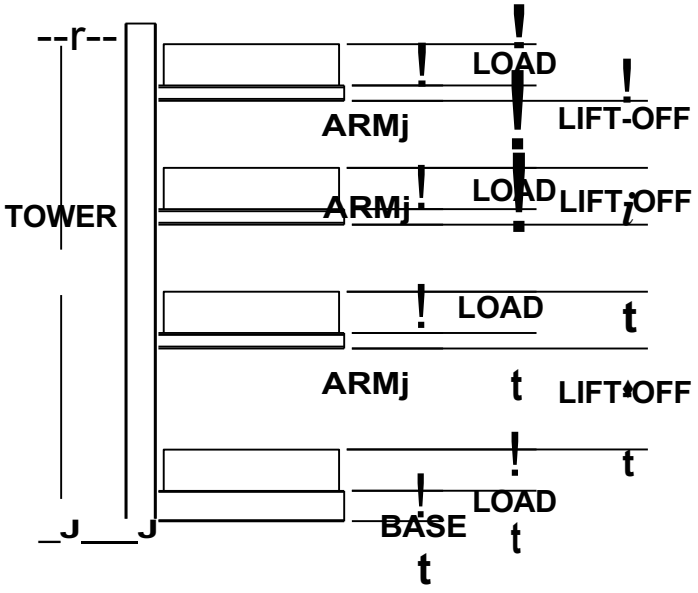


FIGURE 4.

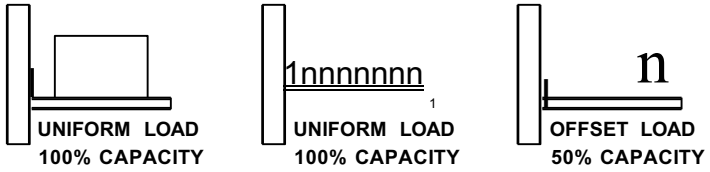
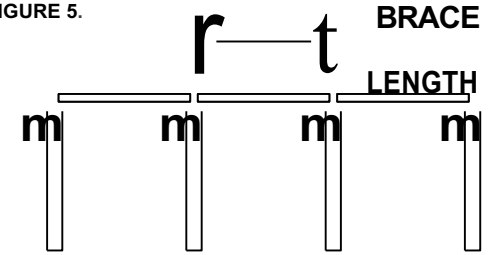


FIGURE 5.



MATERIAL HANDLING EXCHANGE	1800 CHURCHMAN AVrNur INDIANAPOU5 INDIANA 46205	11-115I?RAWINC1:,5CONfiI?fN11/'I ANI? CONfAIN5PROPRU/\RY INfOPMA110N bf MA11'RI/'I HANDIINC:fX, CHANC:,f. 11-115DRAWINC1:,5LOANW ON 1)-jf CONDIfION-rHAf If 15Nor W Bf RfPRODUCW IN WHaf, OP INPf'Rf, WI11-10Uf11-1f WRImN CON:tNWf MA11'RI/'I HANI?LINC:, fXCHAI'U UNffl11-10RIZW COPYINCQ f 11-115I?RAWINC:, 15A VlaA110NOf 11-1f U.5. COPYRIC:,Hf IAW5. AWPfANCf Of 11-115DRAWINC:, 5H/'II Bf CON5-rRUC11'D A5 AN MRffMfNf Of 11-1f:t 11'RM5.				11 f 5-rRUCWR/'I CAN11LfVfR RACK INSf/'IIA110NMANU/'I				
					I?RAWINC:,NO. 51-CRIM- BUWINC:, A CAN11IfVfR5Y511'M				
			RfV.	I?A11'	I?f5CRIP110N	5C/'If N/ A	51Zf A	I?RAWN RYAN MA50N	DA11' 1/1/2025	SHfffNO. 5 Of IB

STRUCTURAL CANTILEVER RACK ASSEMBLY INSTRUCTIONS

Step 1 - Confirm the Receipt and Condition of Material
Confirm that all materials have been received and is free of any damage from shipment. Confirm the material received against the information on the Bill of Lading and packing lists. Notify the shipper immediately of any shortages and/or product damage.

Step 2 - Review of the Installation Area
Determine or confirm the area the cantilever rack will be installed. Review the installation area to determine if there are any obstructions such as building columns, pipes, lights, heat ducts, etc. to ensure a clear area for rack installation.

Step 3 - Laying out your Cantilever Rack System
Determine your specific cantilever layout. To do this you must determine your required aisle dimensions and the positioning of the rack. Using a chalk line, snap lines marking a start point/line. This will mark your first tower location. (See drawing Sheet #5)

Step 4 - Assemble and Stand Your First (and Second) Tower
First, you will want to lay you tower down near the starting area you had marked above with the arm and base mounting holes facing up. Next you will want to mark the locations of the arms on the towers. Install the arms in these locations using the provided hardware while the tower is still on the ground. For double-sided configurations only one side will be able to be installed this way, the second side will be installed after the tower has been stood up and braced to a second tower. The last step before standing the tower is to install the base using the provided hardware. Do all of these steps for all towers in a run, shortening the time between standing the first tower and bracing it to the second tower is the key to a safe cantilever install. (See drawing Sheet #6)

Finally, stand the tower. Raise the second tower and brace it to the first by installing the top most horizontal brace using the provided hardware. Next, install the next brace down, and so on until all horizontal braces have been installed. (See drawing Sheet #7)

WARNING: A single tower of cantilever rack is not designed to stand on it's own, until a second tower is raised and the cross bracing has been attached it is recommended that any standing towers be braced against something.

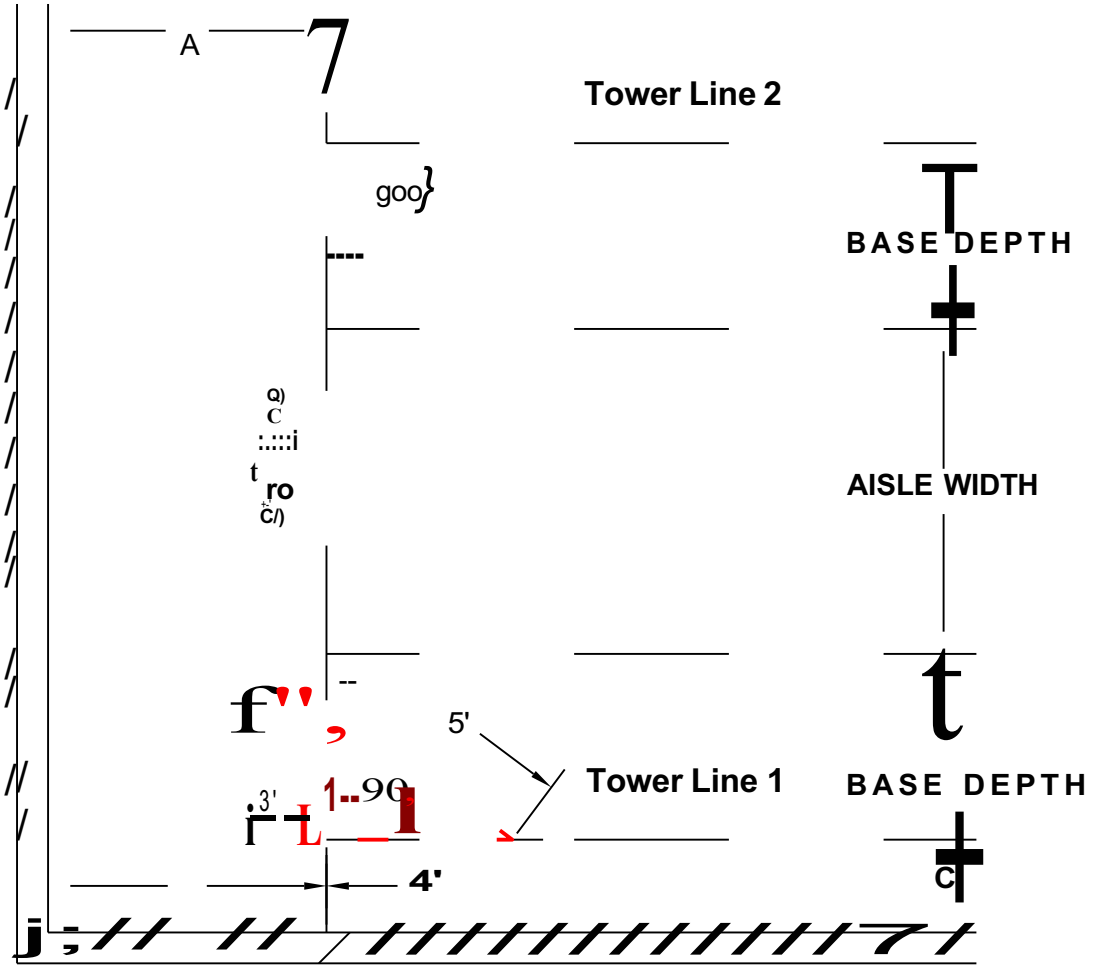
Step 5 - Brace the Towers
Pay close attention to how any horizontal braces being used as X-braces are installed, the X-brace holes need to be in the same plane and face "inward" towards each other. Then, install the flat bar stock that creates the X-braces using the provided hardware. All bracing hardware at this point should only be "finger tight". Your system should now be stable enough to stand on its own, without any additional bracing. At this point if your cantilever system is double sided in configuration you can install the second side base and arms. (See drawing Sheets #8 & #9)

Step 6 - Square, Plumb, Shim, and Anchor
The first tower in a cantilever system must be properly placed, plumbed to the concrete floor, and squared to the second tower to ensure the proper placement of rack in the continuing run. Always confirm the location of the cantilever tower and that it is plumb and square before anchoring. Use shims as necessary to enable you to plumb the system. Cantilever tower and base shims are available in *Ya* inch thickness and are specifically designed to work with the towers and based you purchased. At this step only place one (1) anchor in the tower baseplate. More will be required later but for now we may want to make adjustments to the square of the system as we continue to add towers to the run. (See drawing Sheet #10)

Step 7 - Continuing the Run
With your first two (2) towers standing and anchored you can follow the procedures detailed in steps 4, 5 & 6 with all the remaining towers in the run. When the run is complete do one final check to make sure that the system is square and plumb. (See drawing Sheet #11)

Step 8 - Tighten and Anchor
Tighten all of the brace hardware that was left "finger tight", there are no specific torque requirements for cantilever hardware, it just needs to be a reasonable amount of tight. Finally, install and tighten the remaining anchors, there should be two (2) anchors in every tower and at least one (1) anchor in each base.

STARTING POINT & CHALK LINES



Start first by designating an area to begin erecting your cantilever rack.

Measure out a desired distance from a wall or column line in two (2) locations (A and B) and snap a chalk line (Start Line) this will be the end of your cantilever runs.

Measure out a desired distance perpendicular to the first two from a wall or column (C), mark this distance then check for square using the 3-4-5 method (in red) before snapping the chalk line (Tower Line 1). This will be either the front face or the rear face of your cantilever tower, it doesn't matter which so long as you remain consistent.

From Tower Line 1 measure out the base depth (or overall system depth if aligning to the rear of the system) mark this distance and again check for square before snapping the chalk line. Repeat this process for the aisle width (left) and again for the base depth of the next run to mark your second tower line (Tower Line 2).

Repeat this process until all cantilever run start points have been chalked out.

MATERIAL HANDLING EXCHANGE	IBOO CHURCHMAN AVrNUr INDIANAPOI15 INDIANA 4620:5	11-115DRAWINu 15CONfIDfN11/'I *AND* CONfAIN5PROPRU/\RY INfOPMA110N Of MA11'RI/'I HANDLINu fXCHANuf. fHl5 DRAWINu 15LOANW ON !Hf CONDIfION-rHAf If 15 Nor *W* Bf RfPRODUCW IN WHaf, OP IN PAR-r, w111-1our 11-1f WRlmN CON5fNr Of MA11'Rlf'I HANDLINu fXCHANuf. UNA!I11-10RIZW COPYINu Of 11-115 DRAWINu 15A VlaA110N Of 1)-jf U.5, COPYRluHf LAW5, AWPfANCf Of 11-115DRAWINu 5H/'IL Bf CON5-rRUC11'D A5 AN MRffMfNf Of 11-1f5f 11'RM5.				fl f: 5-rRUCilIR/'I CANfILfVfRRACK IN5f/'ILAfIONMANU/'I				
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				RfV.	DA11'	Df5CRIP110N	5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	DA11' 1/1/2025	'.S!UrNO. 0 Of 18

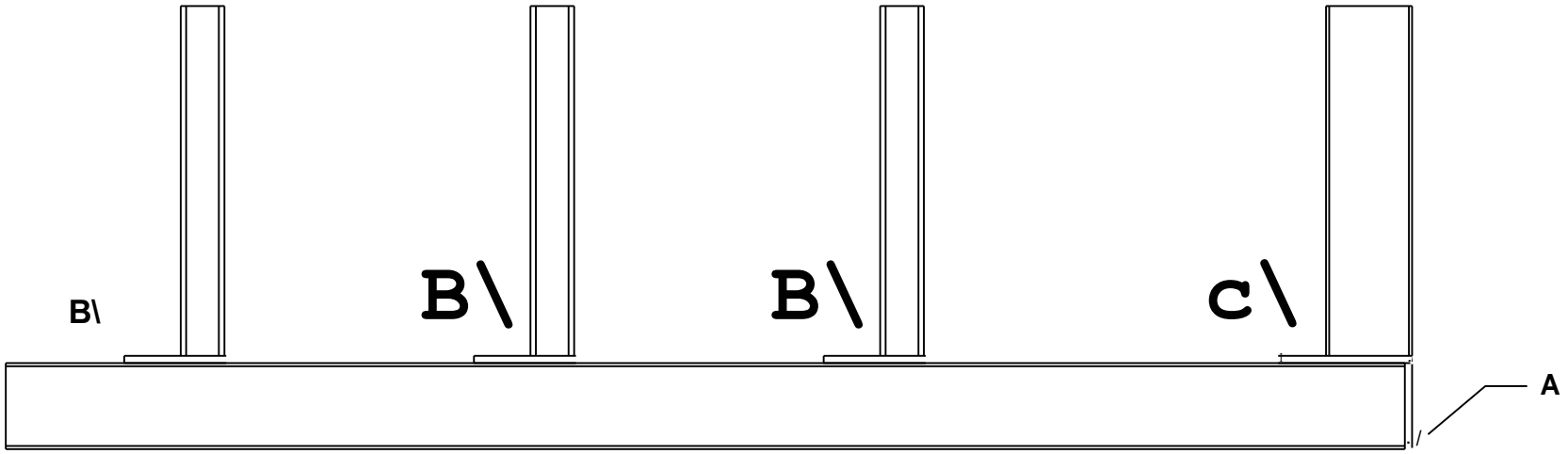
ASSEMBLING YOUR FIRST (AND SECOND} TOWER

To begin have your towers laid down with the arm holes facing upward near your start point (A). Space the towers along the run so that minimal handling is required between standing the towers and bracing them together.

Next, mark the arm locations on the towers (B). Place the arms so that the top of the arm (not the plate) closely aligns with the marks on the tower. Install the arms using the hardware provided.

Install the base at the bottom of each tower using the hardware provided (C).

IMPORTANT: Do not stand any towers until arms and bases have been installed for the run. A single tower of cantilever rack is not designed to stand on its own, until a second tower is raised and the cross bracing has been installed it is recommended that any standing towers be braced against something. For double sided installations the rear arms and bases will need to be installed after the tower is standing and braced.



MATERIAL HANDLING EXCHANGE

1800 CHURCHMAN AVrNUr
INDIANAP0l 15 INDIANA
4620:5

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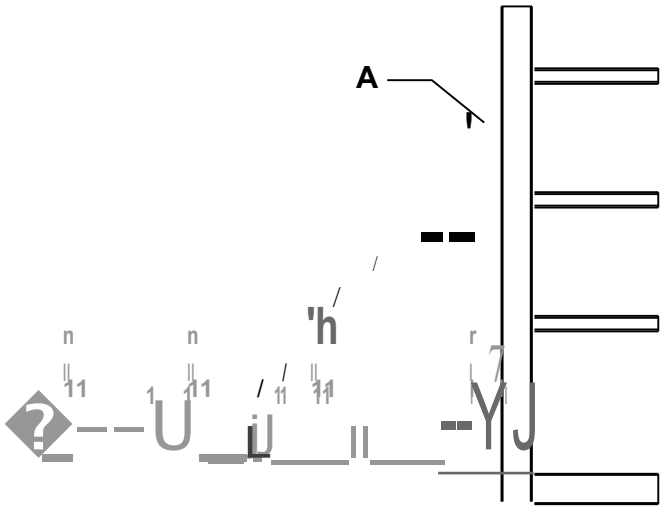
51-CRIM - WWfR A55fMBLY

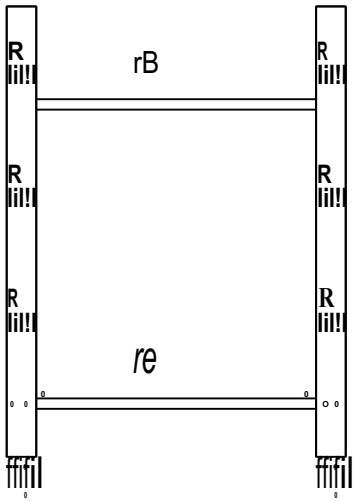
5C/'If	51Zf	*DRAWN*	DA11'	'.S!UrNO.
N/ A	A	RYAN MA50N	1/1/2025	*6* Of 18

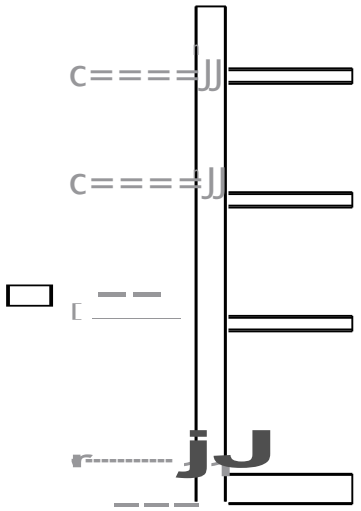
STANDING YOUR FIRST (AND SECOND) TOWER

WARNING: A SINGLE TOWER OF CANTILEVER RACK IS NOT DESIGNED TO STAND ON IT'S OWN, UNTIL A SECOND TOWER IS RAISED AND THE CROSS BRACING HAS BEEN ATTACHED IT IS RECOMMENDED THAT ANY STANDING TOWERS BE BRACED AGAINST SOMETHING.

Raise the first tower and brace it while standing the second tower (A) and bracing it to the first by installing the top most horizontal brace using the provided hardware (B). Next, install the next brace down, and so on until all horizontal braces have been installed (C). Pay close attention to how any horizontal braces being used as x-braces are installed, the x-brace holes need to be in the same plane and face "inward" towards each other. Then, install the flat bar stock that creates the x-braces using the provided hardware (See sheet 8). All bracing hardware at this point should only be "finger tight". Your system should now be stable enough to stand on its own, without any additional bracing. At this point if your cantilever system is double sided in configuration you can install the second side base and arms (D).







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					DRAWINu NO. 51-CRIM- WWfR 5fANI?INu				
			RfV.	I?A11'	I?f5CRIP110N	5C/'If N/ A	51Zf A	I?RAWN RYANMA50N	DA11' 1/1/2025	'.S!UrNO. *1* Of 18

BRACING THE SYSTEM

Pay close attention to how any horizontal braces being used as x-braces are installed, the x-brace holes need to be in the same plane and face "inward" towards each other. Then, install the flat bar stock that creates the x-braces using the provided hardware. all bracing hardware at this point should only be "finger tight".

Figure 1 shows how horizontal braces should be installed as "panels" so every distinct pair of horizontals face "inward" towards each other.
Figure 2 shows how the diagonal straps attach to the horizontal braces to form an x-brace panel.
Figure 3 details a side view of an x-brace installation.

FIGURE 1.

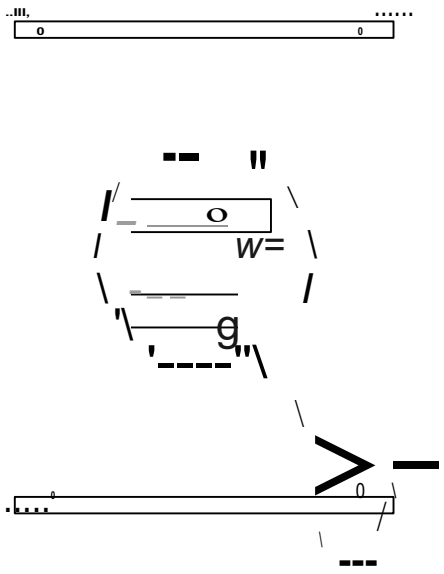


FIGURE 2.

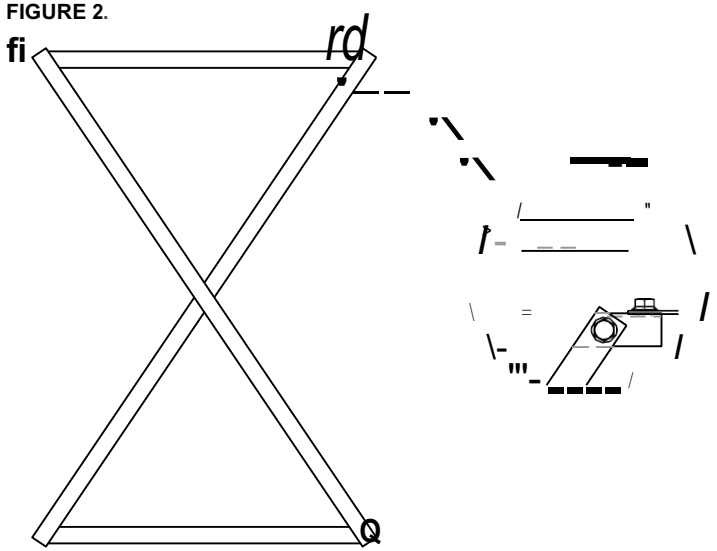
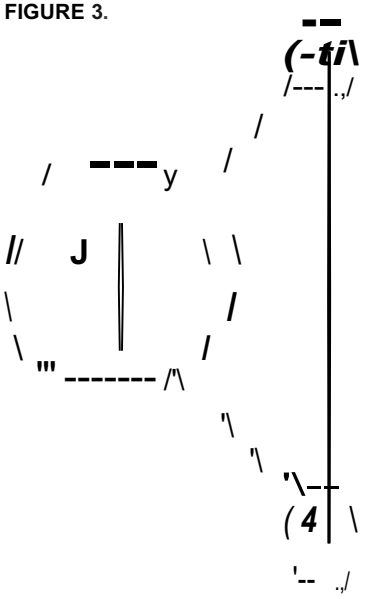


FIGURE 3.



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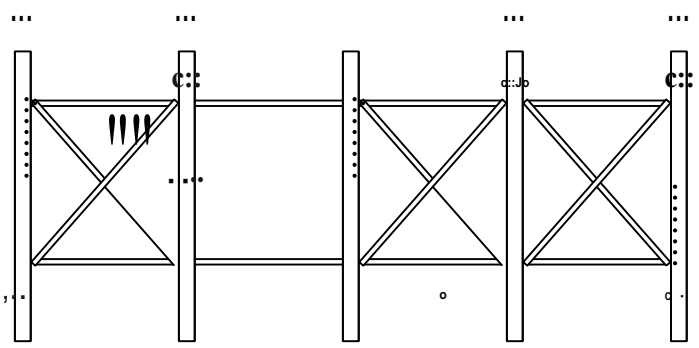
					DRAWINu NO. 51-CRIM- BRACINu 11-If 5Y511'M				
					5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	DA11' 1/1/2025	'.S!UrNO. 8 Of 18
			RfV.	DA11'	Df5CRIP11ON				

SPECIAL BRACING INSTRUCTIONS

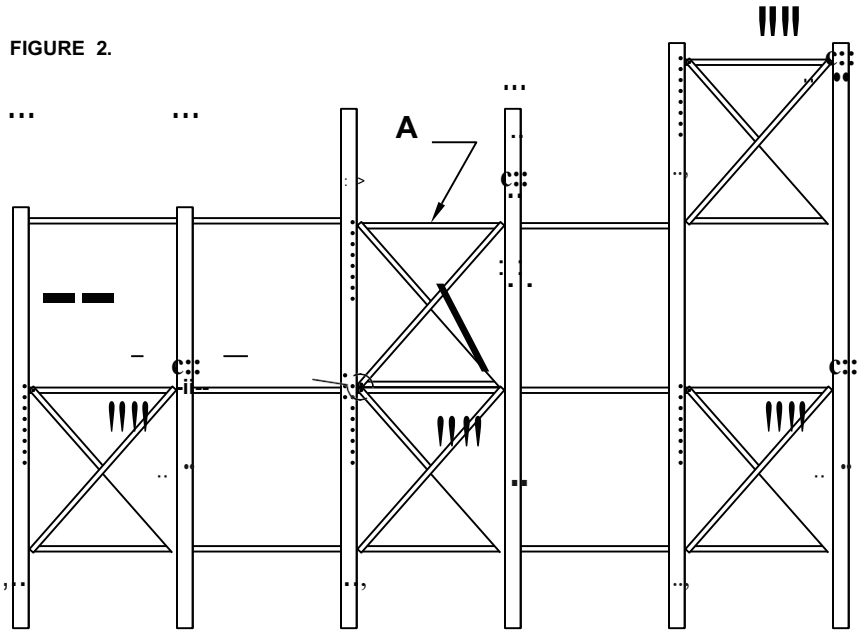
When installing a cantilever set up there are a few specific "rules" for brace installation. one such rule is that runs of cantilever start and end with x-brace panels regardless of length (Figure1). The other consistent rule is that the height of your tower effects both the number of horizontals and x-braces required per panel (Figure 2). The most unique of these circumstances is for towers 17' to 18' in height (A) where two x-brace panels are stacked so that they share a central mounting tab (A.1).

FIGURE 1.



DETAIL A.1

FIGURE 2.



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					DRAWINu NO. 51-CRIM - 5PfCl/'I BRACINu IN5fRUC110N5			
			RfV.	DA11'	Df5CRIP110N	5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	DA11' 1/1/2025	'.S!UrNO. *9* Of 18

SQUARE, PLUMB, SHIM, & ANCHOR

To square the system once at least two towers are standing and braced measure from each tower to the end of the opposite base as shown below (Figure 1). Dimensions A & B should be equal. This will square the system from front to back. Then measure from the top of each tower to the bottom of the opposite as shown below (Figure 2). Dimensions C & D should be equal. This will square the system from top to bottom.

To ensure the system is plumb, use a plumb bob, measure off a dimension (E) from the top of the tower, usually 1" or 2" as shown below (Figure 3). Dimension F should be equal to or no greater than ±½" of dimension E.

You may need to employ the use of shims to properly square and plumb the system (Figure 4). You can shim bases and towers independently of each other to achieve the required results.

Only when the system is squared front to back, top to bottom, and plumbed should you anchor. Towers and bases require two anchors each (Figure 4).

FIGURE 1.
TOP VIEW

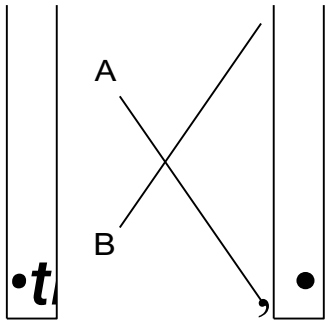


FIGURE 2.
FRONT VIEW

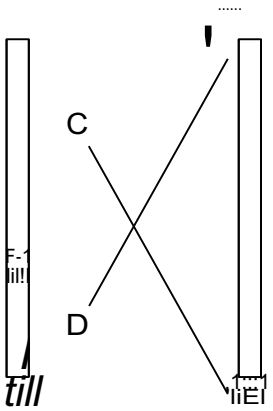


FIGURE 3.
SIDE VIEW

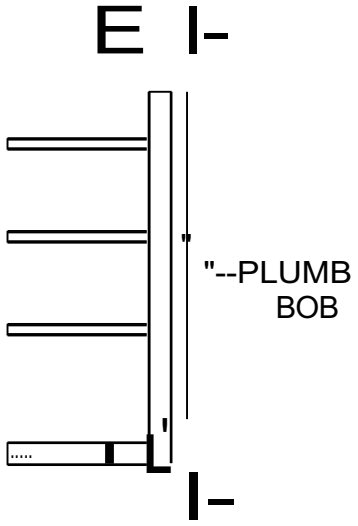
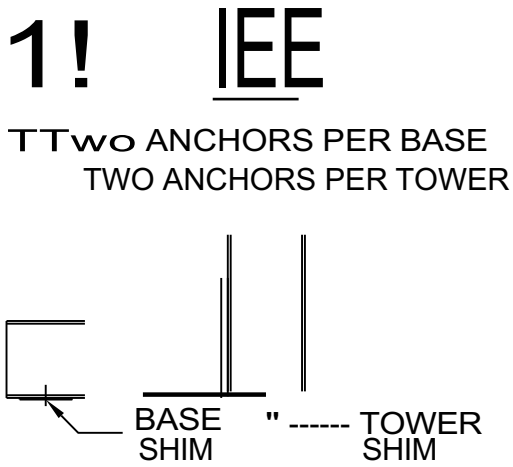


FIGURE 4.
DETAIL VIEWS

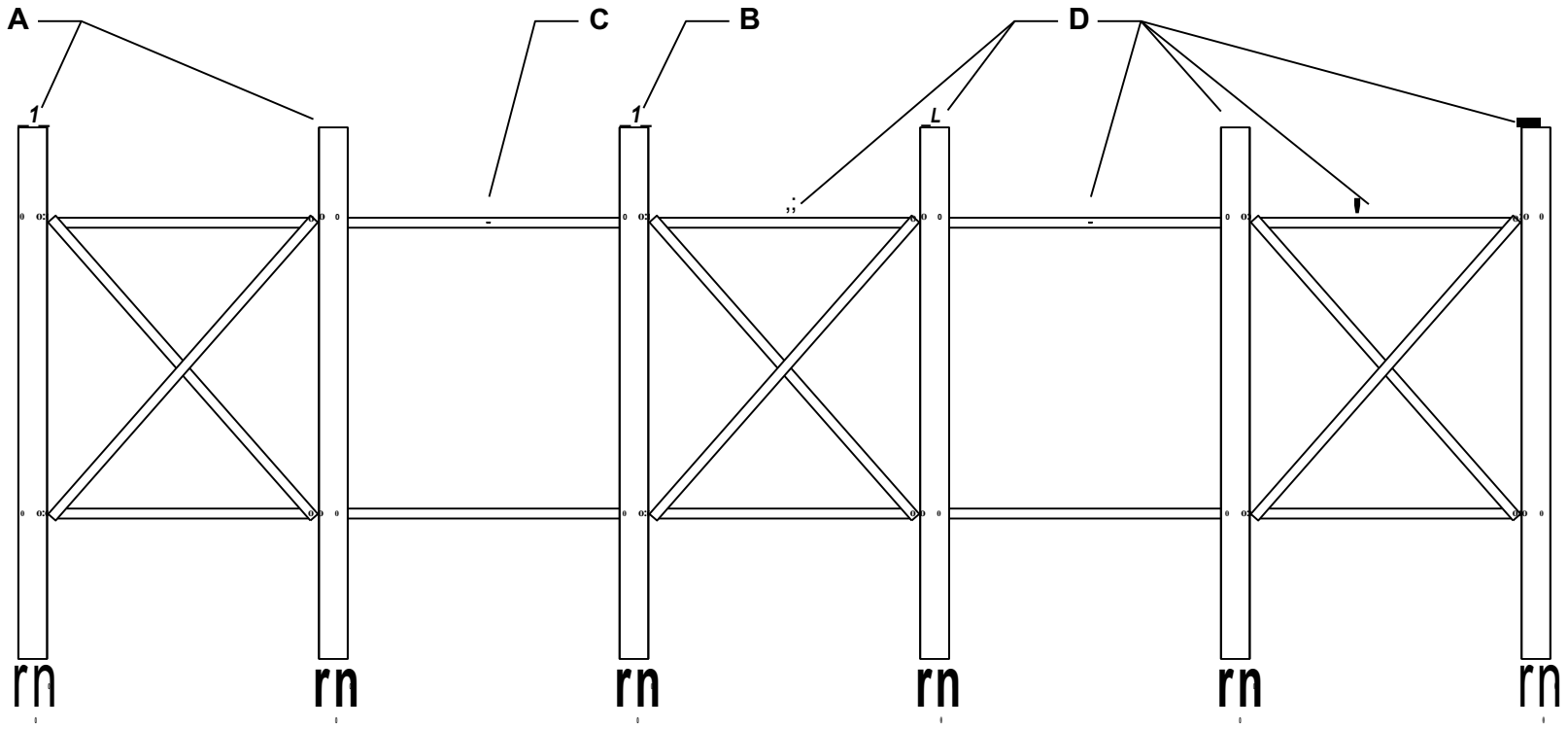


MATERIAL HANDLING EXCHANGE	1800 CHURCHMAN AVrNUr INDIANAP0l 15 INDIANA 4620:5	11-115DRAWINu 15CONfIDfN11/'I *AND* CONfAIN5PROPRU/\RY INfOPMA110N Of MA11'Rl/'I HANDLINu fXCHANuf, 11-115DRAWINu 15LOANW ON 1)-jf CONDIfION-rHAf If 15Nor *W* Bf RfPRODUCW IN WHaf, OP INPfRf, w111-1our 11-1f WRlmN CON5fNr Of MA11'Rlf'I HANDLINu fXCHANuf. UNA!I11-10RIZW COPYINu Of 11-115 DRAWINu 15A VlaA110NOf 1)-jf U.5, COPYRIuHf LAW5, AWPfANCf Of 11-115DRAWINu 5H/'IL Bf CON5-rRUC11'D A5 AN MRffMfNf Of 11-1f5f 11'RM5.				fl f: 5-rRUCilIR/'I CANfILfVfRRACK IN5f/'ILAfIONMANU/'I			
					DRAWINu NO. 51-CRIM - 50UARf PLUMB '.tiIMANCHOR			
			RfV.	DA11'	Df5CRIP110N	5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	DA11' 1/1/2025	'.tifffNO. 10 Of 18

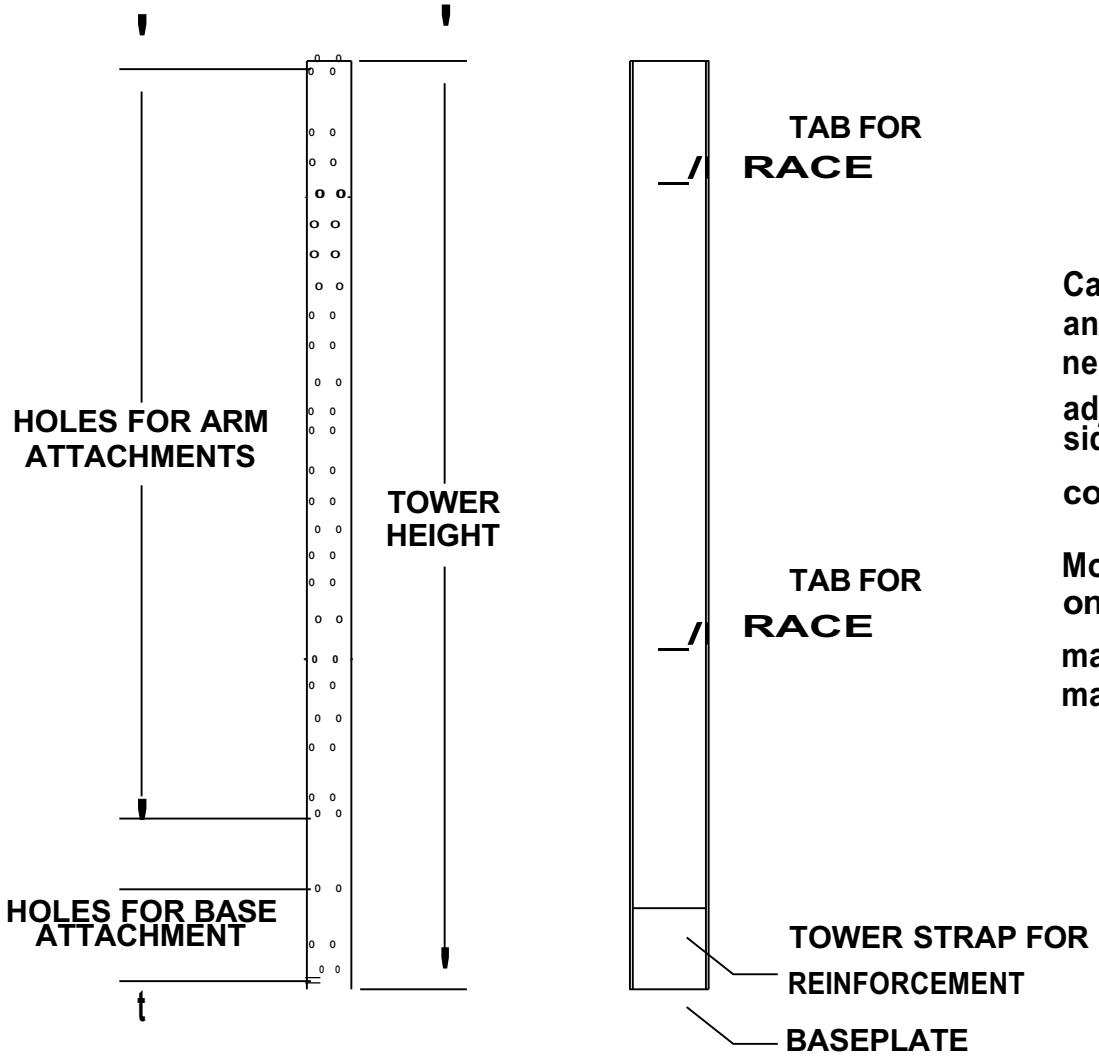
CONTINUING THE RUN

Identify the existing standing bay (A). Stand the next tower (B) in the run using the steps on Sheet 7. Be sure to support the tower until braced (C) to the already standing bay using the steps on Sheets 8 and 9. Check for square and plumb as you stand towers following the steps on Sheet 10. Repeat (D) this process as necessary to complete the run. Aside from the initial bay you should hold off on anchoring the rest of the towers and bases until until the run is complete and each new towers has been checked for plumb and square.

Once the run is complete, square, plumb, and anchored all bolts that were previously finger tight should be tightened to snug tight. No special tightening of bolts is required. Snug tight is the condition that exists when all of the plies in a connection have been pulled into firm contact by the bolts in the join and all bolts in the join have been tightened sufficiently to prevent the removal of the nuts without the use of a wrench.



CANTILEVER TOWERS



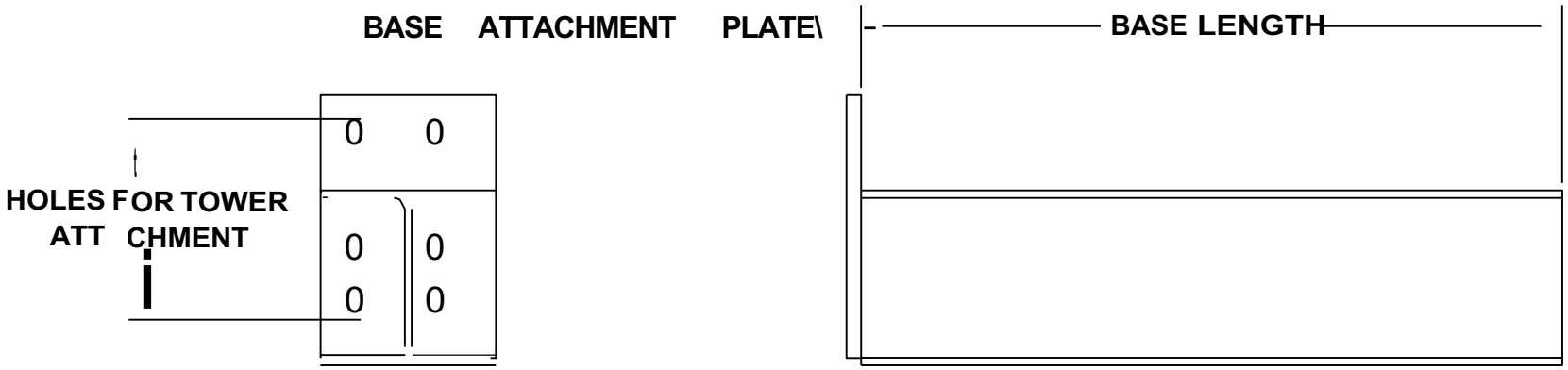
Cantilever towers come in various structural beam sizes and various heights to suit your capacity and loading needs. Arm holes are spaced on four inch (4") intervals for adjustable shelf spacing and are included on one or both sides of the tower for single-sided or double-sided rack configurations.

Most towers are compatible with all arm sizes depending on load needs. Towers are compatible with bases that match their structural beam size at any length (often matching the length of the arms).

CANTILEVER BASES

Cantilever bases come in various structural beam sizes and various lengths to suit your load needs.

Bases are compatible with towers of the same structural beam size and come in any length (often matching the length of the arms).



MATERIAL HANDLING EXCHANGE	1800 CHURCHMAN AVrNUr INDIANAPOl 15 INDIANA 4620:5	11-115DRAWINu 15CONfIDfN11/'I *AND* CONfAIN5PROPRU/\RY INfOPMA110N Of MA11'Rl/'I HANDLINu fXCHANuf, 11-115DRAWINu 15LOANW ON 1)-jf CONDIfION-rHAf If 15 Nor *W* Bf RfPRODUCW IN WHaf, OP IN PAR-r, w111-1our 11-1f WRlmN CON5fNr Of MA11'Rlf'I HANDLINu fXCHANuf. UNA!I11-10RIZW COPYINu Of 11-115 DRAWINu 15A VlaA110N Of 1)-jf U.5, COPYRluHf LAW5, AWPfANCf Of 11-115DRAWINu 5HAIL Bf CON5-rRUC11'D A5 AN MRffMfNf Of 11-1f5f 11'RM5.				fI f: 5-rRUCilIR/'I CANfILfVfRRACK IN5f/'ILAfIONMANU/'I				
					DRAWINu NO. 51-CRIM - BA5f				
		RfV.	DA11'	Df5CRIP110N	5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	DA11' 1/1/2025	'.S!UrNO. 15 Of 18

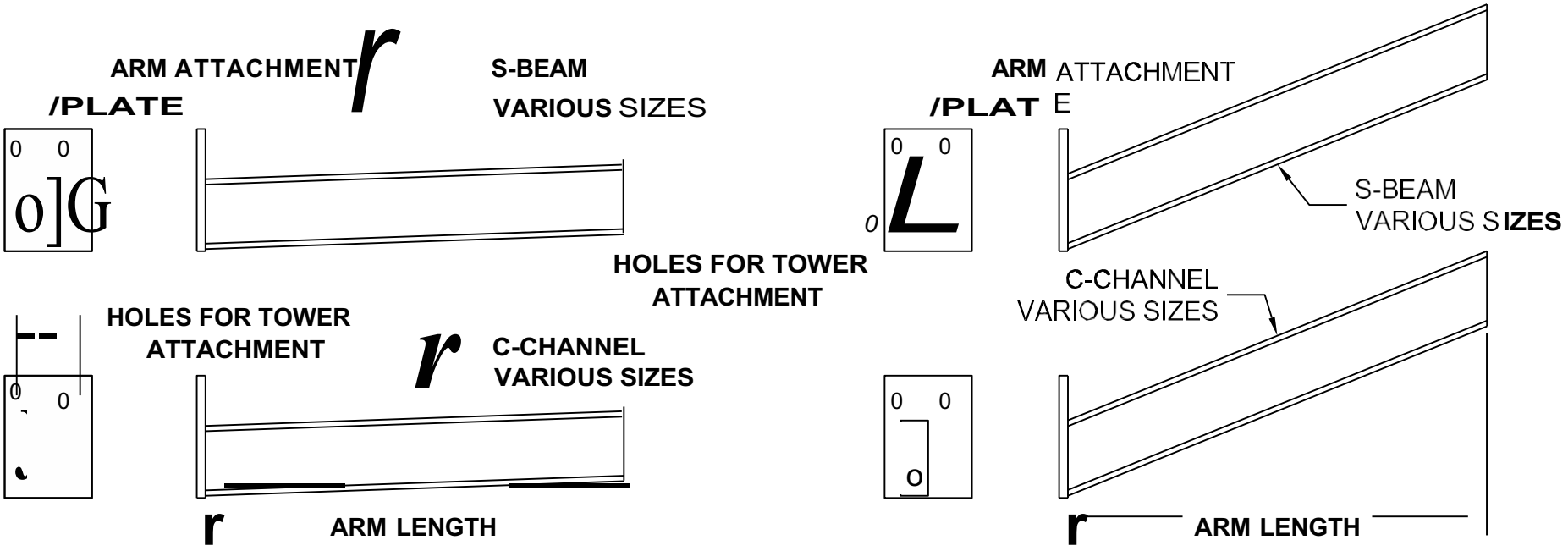
CANTILEVER ARMS

Cantilever straight arms come in various C-channel and S-beam sizes at various lengths to suit your load needs. Straight arms (below) have a 2° to 4 ° incline which sets to about 1° under load.

All arm sizes are compatible with most towers and come in any length (often matching the length of the bases).

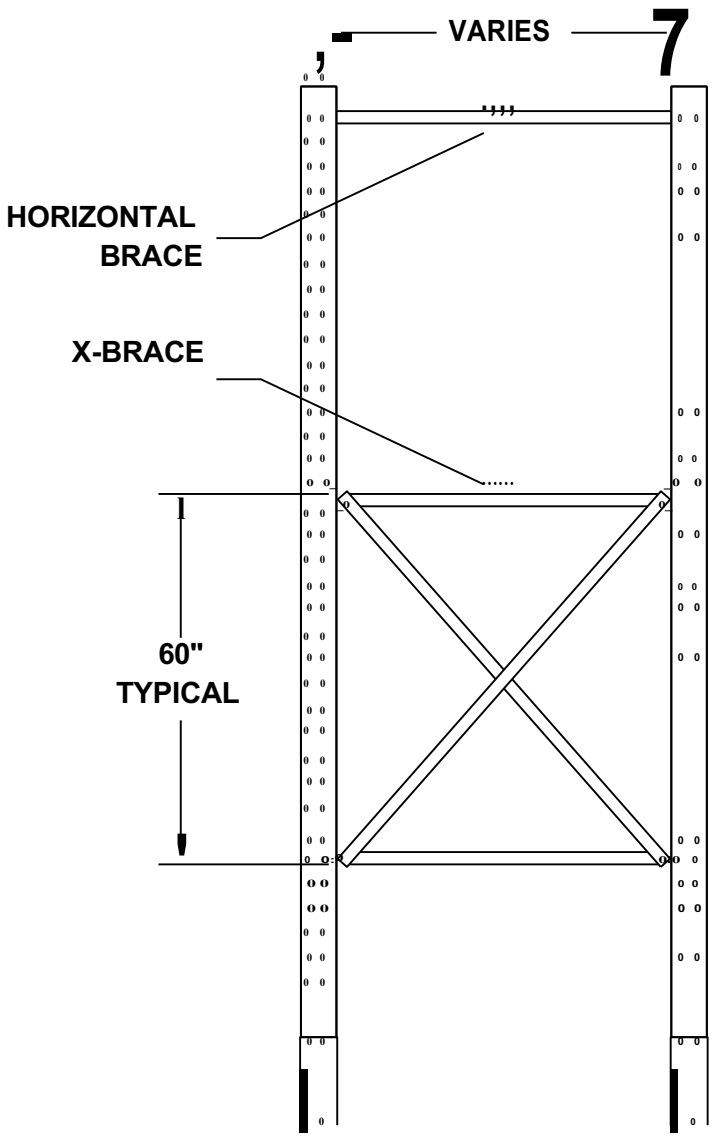
Cantilever incline arms come in various C-channel and S-beam sizes and various lengths to suit your load needs. Incline arms (below) have a 22° incline for loading of loose materials.

All arm sizes are compatible with most towers and come in any length (often matching the length of the bases).



MATERIAL HANDLING EXCHANGE	1800 CHURCHMAN AVrNUr INDIANAPOl 15 INDIANA 4620:5	11-115t?RAWINu 15CONfil?fN11/'I *AND* CONfAIN5PROPRU/\RY INfOPMA110N Of MA11'Rl/'I HANI?LINu fXCHANuf, 11-1151?RAWINu 15LOANW ON 1)-jf CONI?IfION-rHAf If 15 Nor *W* Bf RfPROI?UCW IN WHaf, OP IN PAR-r, w111-1our 11-1f WRlmN CON5fNr Of MA11'Rlf'I HANDLINu fXCHANuf. UNA!I11-10RIZW COPYINu Of 11-115 t?RAWINu 15A VlaA110N Of 1)-jf U.5, COPYRIuHf LAW5, AWPfANCf Of 11-115DRAWINu 5HAIL Bf CON5-rRUC11'D A5 AN MRffMfNf Of 11-1f5f 11'RM5.				fl f: 5-rRUCillR/'I CANfILfVfRRACK IN5f/'ILAfIONMANU/'I				
					t?RAWINu NO. 5HRIM-ARM5				
			RfV.	I?A11'	I?f5CRIP110N	5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	t?A11' 1/1/2025	'.S!UrNO. 14 Of 18

CANTILEVER BRACING



Cantilever braces come in various lengths to suit your load needs. More information on installation of braces can be found on sheets 8 & 9.

Braces are used to tie towers together to add stability to the run. Braces are only required to tie the towers that hold the same load however an entire run of towers can be braced for ease of installation.

Braces are cut to specific lengths so that tower on centers can be maintained. I.E. a 24" brace is cut short so that the tower center to tower center dimension is 24".

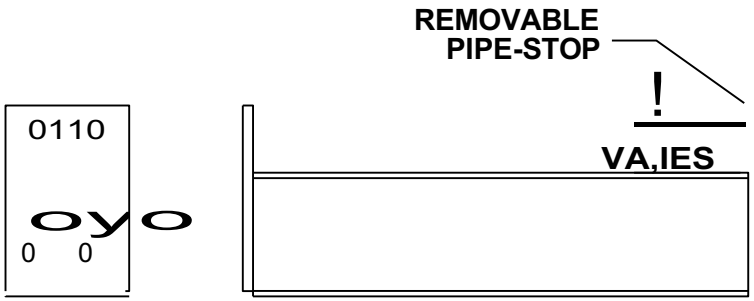
PIPE STOPS

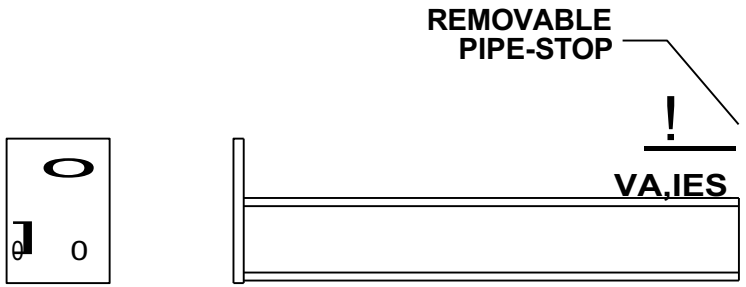
Pipe stops are an optional addition to bases and arms that allow for the storage of loose materials on straight arms or bases. Pipe stops come in a series of options.

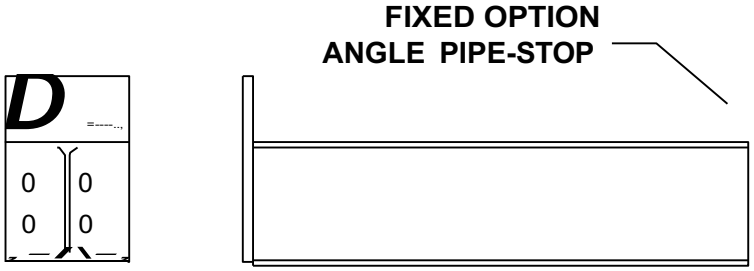
Removable pipe stops feature a bar that fits into a sleeve attached to the end of a base or arm. They can be removed to allow for ease of product removal or to store bundled product that does not require a stop.

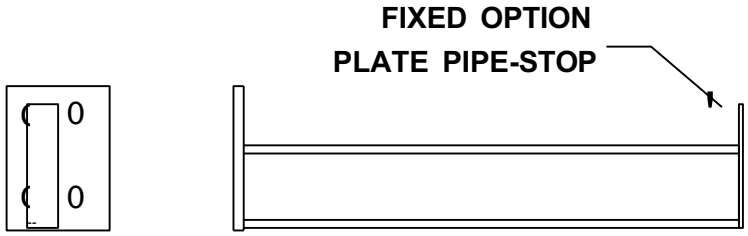
Fixed pipe stops are welded directly to the arm or base. These stops can hold back greater amounts of weight but lack the versatility of removable stops.

All pipe stops come in variable heights to meet the needs of your load.









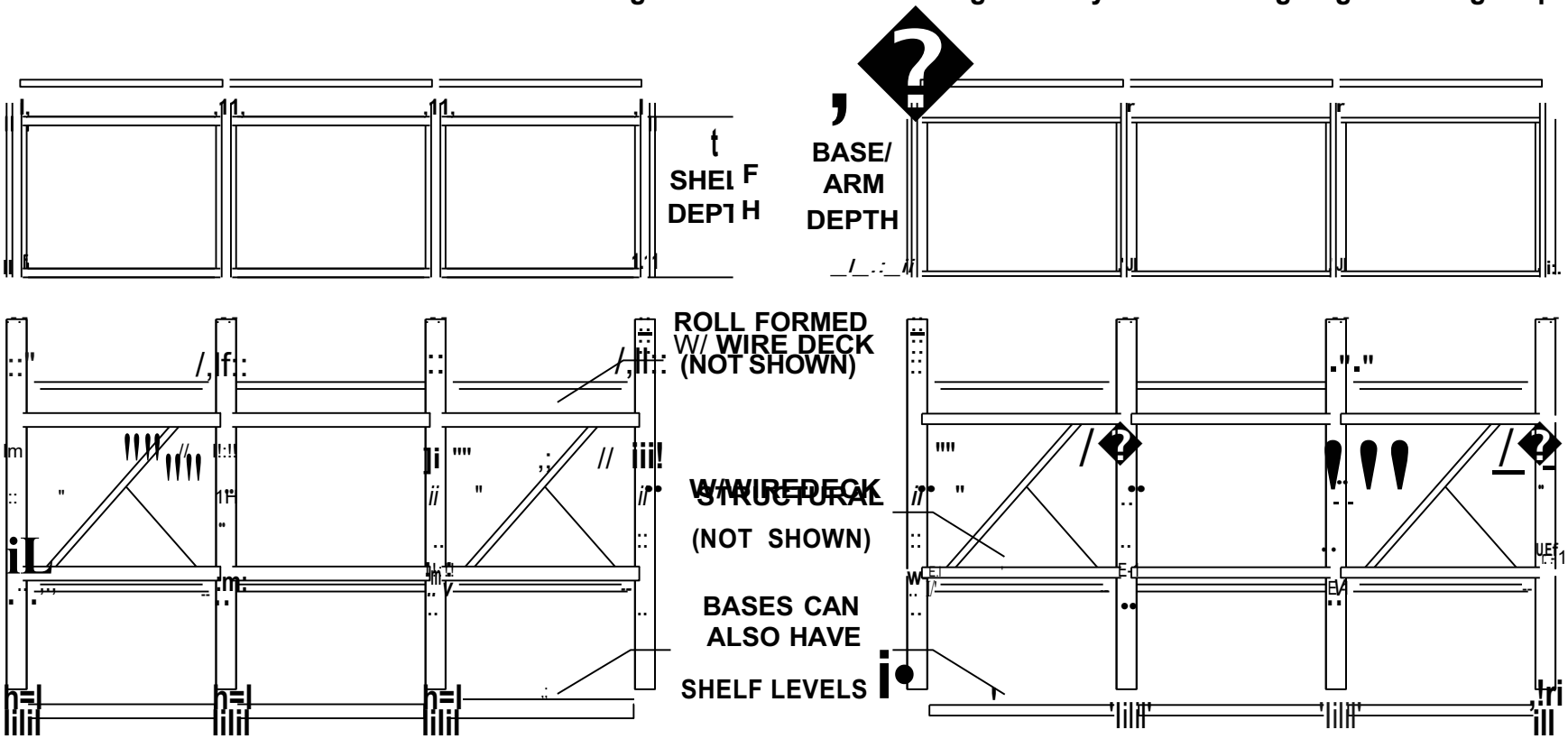
MATERIAL HANDLING EXCHANGE	1800 CHURCHMAN AVrNUr INDIANAP0l 15 INDIANA 4620:5	11-115DRAWINu 15CONfIDfN11/'I *AND* CONfAIN5PROPRU/\RY INfOPMA110N Of MA11'RI/'I HANDLINu fXCHANuf, 11-115DRAWINu 15LOANW ON 1)-jf CONDIfION-rHAf If 15 Nor *W* Bf RfPRODUCW IN WHaf, OP IN PAR-r, w111-1our 11-1f WRlmN CON5fNr Of MA11'Rlf'I HANDLINu fXCHANuf. UNA!I11-10RIZW COPYINu Of 11-115 DRAWINu 15A VlaA110N Of 1)-jf U.5, COPYRIuHf LAW5, AWPfANCf Of 11-115DRAWINu 5H/'IL Bf CON5-rRUC11'D A5 AN MRffMfNf Of 11-1f5f 11'RM5.				fl f: 5-rRUCillR/'I CANfILfVfRRACK IN5f/'ILAfIONMANU/'I				
					DRAWINu NO. 51-CRIM - PIPf 5fOP5				
					5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	DA11' 1/1/2025	'.S!UrNO. 16 Of 18
			RfV.	DA11'	Df5CRIP110N				

FURNITURE CANTILEVER

Furniture cantilever is an optional configuration of rack that connects the arms in a run of cantilever creating a continuous shelf allowing for loads of various sizes in high density while properly distributing load across multiple arms. Furniture cantilever comes in a few options to meet your loading needs.

Roll-formed cross-beam furniture cantilever is typically used for high capacity loads that require stronger arms and more dense tower placement. The roll-formed cross-beams are a reduced cost option that provide the same stability over shorter spans.

Structural cross-beam furniture cantilever is typically used for lower capacity loads that require standard arms and fewer towers over the run. The structural cross-beams allow for longer runs while maintaining stability and reducing sag over longer spans.



MATERIAL HANDLING EXCHANGE	1800 CHURCHMAN AVrNUr INDIANAP0l 15 INDIANA 4620:5	11-115DRAWINu 15CONfIDfN11/'I *AND* CONfAIN5PROPRU/\RY INfOPMA110N Of MA11'Rl/'I HANDLINu fXCHANuf, 11-115DRAWINu 15LOANW ON 1)-jf CONDIfION-rHAf If 15Nor *W* Bf RfPRODLt:W IN WHaf, OP INPAR-r, w111-1our 11-1f WRlmN CON5fNr Of MA11'Rlf'I HANDLINu fXCHANuf. UNA!I11-10RIZW COPYINu Of 11-115DRAWINu 15A VlaA110NOf 1)-jf U.5, COPYRluHf LAW5, KCfPfANCf Of 11-115DRAWINu 5HAIL Bf CON5-rROC11'D A5 AN MRffMfNf Of 11-1f5f 11'RM5.				fI f: 5-rROCillR/'I CANfILfVfRRKK IN5f/'ILAfIONMANU/'I				
					DRAWINu NO. 51-CRIM- fURNIillRf CAN11LfVfR				
		RfV.	DA11'	Df5CRIP110N	SC/'If N/ A	51Zf A	*DRAWN* RYAN MASON	DA11' 1/1/2025	'.S!UrNO. 17 Of 18

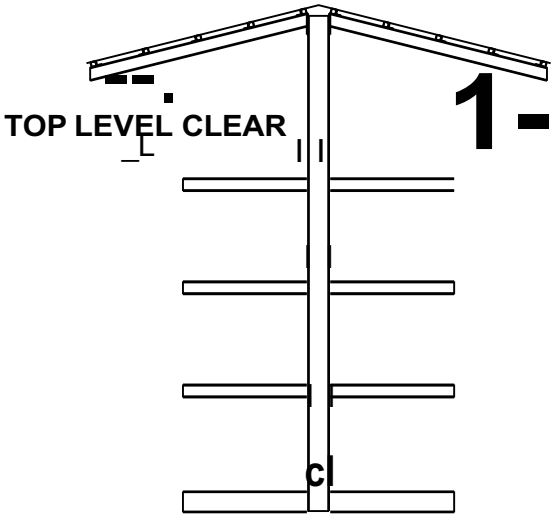
CANTILEVER WITH ROOF

Cantilever with Roof is an optional configuration of rack for installation outdoors while storing materials that should have reduced exposure to the elements. Installation of a roof arm at the top of the tower allows for the attachment of purlins running the length of the system and installation of a roof membrane (by others).

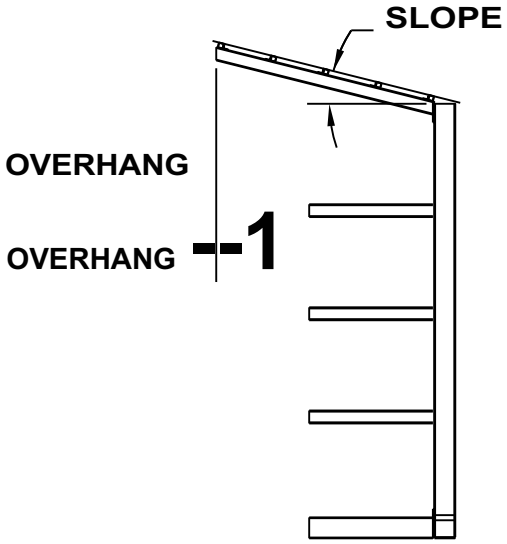
A few things to keep in mind when looking into a cantilever system with roof are the following. When installing a roof with a downward pitch, the tower must be tall enough to keep the top level clear for loading and unloading. The roof arm may need an overhang depending on how little exposure the stored material should be exposed to. The slope or pitch of the roof is often determined by regional wind / snow loads.

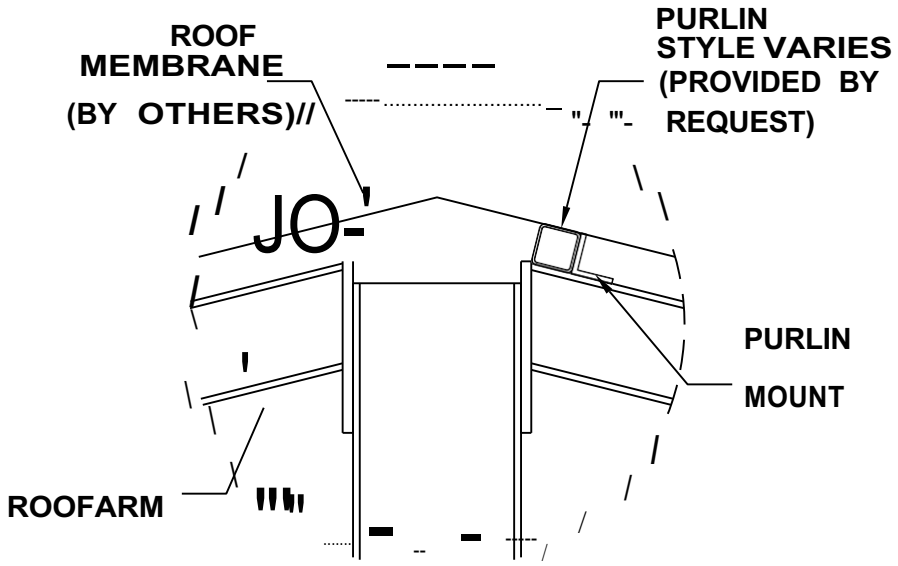
Purlins can be provided by the customer or provided by the manufacturer. Roof membrane will always be provided by the customer.

DOWNWARD PITCH



UPWARD PITCH





MATERIAL HANDLING EXCHANGE	1800 CHURCHMAN AVrNUr INDIANAPOl 15 INDIANA 4620:5	11-115t?RAWINu 15CONfil?fN11/'I *AND* CONfAIN5PROPRU/\RY INfOPMA110N Of MA11'RI/'I HANI?LINu fXCHANuf, 11-1151?RAWINu 15LOANW ON 1)-jf CONI?IfION-rHAf If 15Nor *W* Bf RfPROI?UCW IN WHaf, OP INPAR-r, w111-1our 11-1f WRlmN CON5fNr Of MA11'Rlf'I HANDLINu fXCHANuf. UNA!I11-10RIZW COPYINu Of 11-115 t?RAWINu 15A VlaA110NOf 1)-jf U.5, COPYRluHf LAW5, AWPfANCf Of 11-115DRAWINu 5HAIL Bf CON5-rRUC11'D A5 AN MRffMfNf Of 11-1f5f 11'RM5.				fl f: 5-rRUCillR/'I CANfILfVfRRACK IN5f/'ILAfIONMANU/'I				
					t?RAWINu NO. 51-CRIM- CANfILfVfRWIfH ROOf				
			RfV.	I?A11'	I?f5CRIP110N	5C/'If N/ A	51Zf A	*DRAWN* RYAN MA50N	t?A11' 1/1/2025	'.S!UrNO. 18 Of 18