Scaffold Training Institute

Competent Person Manual

Section 04:
System Type Scaffold

Note: The slides in this presentation will match the pictures in Section Four of the manual.
This photo shows the connector device on the system we will erect. The connector consists of two parts. A rosette with slots is located on the post. A horizontal slot with captive wedge is located on the end of the horizontal. The end of the horizontal slides onto the rosette, then the captive wedge is driven down through the slots, locking the horizontal (or diagonal) into place.
The base plates and screw jacks are one piece. Instead of beginning the scaffold with a 10' post, a special starter collar with one rosette is used (pictured on right).
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.
Runners are used to space the posts horizontally. They may also be used as bearers on short spans (under 5').

Bearers are used to support planks on spans longer than 5'. These will be reinforced like a truss on longer spans.
Diagonal braces fit into the rosette in the same manner, and may be swiveled to accommodate the desired angle.

Side brackets are available.
Ladders with stand off brackets are used.

Locking pins are used to lock the posts together.
Hook-on type planks are available.

Special components may be secured to the rosette which have either a right angle or swivel clamp end. Trusses are available for longer spans.
Now that we have introduced the basic components of this type system scaffolding, let's build a small one section tall scaffold. After that, we will erect a larger multilevel scaffold and include detailed instructions. As with all scaffolds, the pre-job procedures should be done first as covered in earlier sections. This includes site inspection, equipment inspection, design layout for anticipated load, and all other topics discussed.
First, lay out the mudsills at approximate centers and place base jacks on them. With system scaffold, the length and width are determined by the fixed length of the horizontals chosen. Most system scaffolds offer horizontals in 3', 4', 5', 6', 7', 8', & 10'.
Place the starter collars on the jacks. Connect the runners and bearers to the rosette on the starter collar. This is done by sliding the slot on the end of the horizontal onto the rosette, the driving the wedge down through the slot in the rosette.
Level the base. After all four starter collars are attached and leveled, measure the scaffold from inside to inside to be sure the corner angles are at 90 degrees (square). Some manufacturers recommend a horizontal diagonal brace to keep the scaffold square.
Set the main posts into the starter collars.
After insuring the first level or "wrap" is properly spaced, square, plumb and level, you may begin the second level. Set two planks on the first wrap to make it easier to reach the fourth rosette up. Do not exceed more than four rosettes (6' 6") before you place this second wrap. Place and secure the horizontal runners and bearers by driving the wedge as previously described.
Next, attach the diagonals. All four sides should have diagonal bracing attached.
Attach a ladder for access to the second level. Make sure the ladder extends far enough above the deck for safe access.
Next put the planks on the second level bearers.
Note: Some manufacturers require special truss bearers on spans greater than 5', depending upon tube wall thickness or steel strength. These trusses are especially important if boards would be overlapped on top the bearer (e.g. a run of scaffold), or if more than 25 PSF will be placed on the deck. In some cases, the bearer may supported by bracing in the center with a diagonal knee brace as shown. Consult the manufacturer for instructions on bearer spacing.
Install the guardrails, midrails, and toeboards.
Secure the planks to the bearer. A good way to secure the planks to the bearer is by wiring the toeboard to the bearer. The toeboard acts as a compression member holding the planks in place, if all planks are secured to the toeboard by nailing.
Inspect the scaffold. Place a tag on the ladder indicating it has been inspected and is ready for use.
The completed scaffold should be square, rigid, properly diagonally braced, ladders should extend at least to top of handrails, work platforms fully planked with scaffold grade lumber, toeboards installed, wire-mesh where required, guardrails and midrails installed, and all other safety measures met.
Now that we have reviewed the steps for a single bay tower, let's construct a more complex scaffold. Looking from the left to right, this scaffold is three bays long. It has a staircase extending out to the front creating an "L" shape. It is three levels high from the lowest ground level.
The scaffold runs down an elevated walkway. The walkway is 4' wide, the scaffold is 5' wide. Consequently, the back posts of the scaffold are up on the walkway. The front posts are down on the lowest level. The front and rear posts are tied together with diagonal bracing running down to the lower post from the upper. The first post actually begins halfway up the steps.
Looking from right to left, we see the three bays with staircase. There is one working level on top. The bay with the staircase is actually sub-divided in front into two 3' 6" bays to accommodate the stair risers. Now let's begin.
After the pre-job planning is done, lay out the mudsills, base jacks, and starter collars at approximate location. In this picture the "L" shaped staircase bay is being set. It is two parallel 3' 6" by 7' bays. The jacks further down at the base of the walkway will be the front posts of the scaffold. The rear posts are laid out on the upper walkway.
Begin connection of the base horizontals. Drop the wedge into the rosette, but don't hammer it tight yet.
Start at the high end and use the screw jacks to level all base horizontals.
Use a tape measure to ensure each bay is square. The inside to inside dimensions should be the same.
After the bay is square and level, drive the wedges down to lock the horizontals.
Continue setting up bays, squaring and locking as you go, until the base is set up.
Now we can set the posts into the starter collars. Pick up the post carefully, lower it over the screw jack, and drop it into the collar.
Continue this procedure until all posts have been placed.
Install second level runners and bearers no higher than the fourth level of ring sets.
Vertical diagonals must be installed at this point in the erection. Set the top wedge first, then set the bottom. Bracing patterns are discussed later.
Continue until the first and second level horizontals, and the diagonals are placed. Note: Once the erectors are off the ground, they are exposed to fall hazards and must take additional precautions as previously covered.
Note: 1926.451(g)(2) requires the erectors to have fall protection if it is feasible to provide and does not create a greater hazard. Most manufacturers have issued warnings against using the scaffold itself as a anchorage point for personal fall arrest systems. Consult your company safety department for company policy.
If access ladders are used, attach them at this time for access to the second level.
Install additional vertical post in the same manner as the previous post installation to increase scaffold height.
Install guardrails and midrails at each level that will be decked as a working platform.
Install next level of vertical and horizontal diagonals.
Continue to install horizontals. Be sure to lock all the wedges in place as you go.
Install the planking at the working level elevation.
Continue all procedures until the main structure is completed.
Make sure the platform has guardrails, midrails, and toeboards as previously discussed.
If the scaffold base cannot be erected within reach of the vertical surface, side brackets may be installed.
Stand-offs and ties or scaffold guys are required to stabilize the structure. These should be installed when the height equals four times the minimum base, every 30' horizontally, and additionally when side brackets or other overturning effects are introduced.
On this scaffold we erected a stairtower instead of a ladder. Let's discuss some details about it. Most manufacturers make stair towers for their system scaffolding. Consult the manufacturer for specific instructions.
The basic components are usually a stair riser that fits the bay, and stair treads.
Standard diagonal members are used for the handrails.
When you reach the top of a flight of steps, there must be a landing or turnaround installed. In this case, the top of the first flight opened onto a 5' wide bay. Since we did not need a full 5' wide turnaround, we put one aluminum plank down. We then clamped tubing across the system handrails to provide guardrails on the open side. Tube & clamp and system scaffold are both made from 2" tubing and are interchangeable with standard clamps.
The second flight finished at the outside of the scaffold. We used side brackets to build a cantilevered turnaround complete with guardrails. The third flight opened onto the working level and did not require any special procedures.
System scaffolds must be diagonally braced. Most manufacturers recommend attaching in diagonal in the same direction one above the other, rather than "zig-zagging" as in tube & clamp.

Free standing towers must be braced on all four sides.
Circular scaffold structures must be diagonally braced every other bay. These braces should oppose each other. (Follow the manufacturers' instruction, some may differ).
Multiple bay scaffolds require vertical diagonals at the end bays and every fifth bay in between (some require every third, check the manufacturer's instructions). On long runs alternate the bracing direction so that they oppose. Some manufacturers recommend bracing every third bay.
Scaffolds should be tied in the first time at four times their minimum base. Above that, the vertical increment is 26' (20' for scaffolds less than 3' wide).
These ties must be repeated every 30' horizontally and at both ends.
Scaffolds erected around structures may be secured by all push ties.

The important thing to remember is that the scaffold must be braced to prevent movement.
If the scaffold cannot be tied back to a nearby structure, guy wires may be used. All guyed scaffolds must be designed by a qualified engineer.
Some manufacturers recommend horizontal diagonals at the tie point locations. System is different than tube & clamp in one important regard. Most right angle clamps apply the same rigidity laterally. However, system scaffolds vary widely in the lateral strength of the connection. Some are extremely rigid laterally, others are not. That is why it is so important to follow the manufacturer's instructions for bracing, tieing, and guying.
Once all these procedures have been followed, the scaffold should be complete and erected to meet OSHA and the manufacturer's standards. After a final inspection, the scaffold warning tag may be replaced with a green ready to use tag.
Make sure that users have been properly trained in safe use procedures.
After use, the scaffold will be dismantled. First do a complete inspection of the scaffold to make sure it has not been altered and all safety standards are in place.
Dismantling system scaffolding is more or less just the reverse of erection. Start at the top by dismantling the guardrails. Remove and lower each piece as you unsecure it. Do not leave an unsecured piece in place, even for a moment.
Remove the work platforms.
Continue until dismantle is complete. Be very careful at the bottom not to get into a rush and leave an unsecured post standing upright.
Stack the material neatly for banding and shipping.
There are many other types of systems than the one shown. Remember to follow the manufacturer's recommendations for the brand of system you are using.
SELF-CHECK CP/01/04

TITLE: Determine the Specific Safety Rules Associated with the Erection of System Type Scaffolding.

DIRECTIONS

This Self-Check will help you validate your understanding of the information presented in this Information Sheet, CP/01/04, "Determine the Specific Safety Rules Associated with the Erection of System Type Scaffolding." Read each of the following questions carefully. Choose the BEST answer for each one. Place your answer in the space provided. After you have completed the Self-Check, compare your answers with those listed in the Self-Check Answer Key immediately following the Self-Check. If you scored 100%, go to the Learning Steps for Information Sheet CP/01/05, "Identify the Major Items to Consider when Performing a Scaffold Inspection." If you scored less than 100%, review the information on the question(s) you missed before going on to the next Information Sheet.

QUESTIONS

_____ 1. All components used in system scaffolding, regardless of manufacturer, must support at least ___________ times the maximum intended load.
   
   a. six
   b. five
   c. four
   d. three

_____ 2. Diagonals on system scaffolds are placed one above the other:

   a. in a zig-zag formation.
   b. in the same direction
   c. every fifth level vertically
   d. randomly

_____ 3. A qualified professional engineer must be used to design scaffolds that will reach a height in excess of:

   a. 175 feet.
   b. 150 feet.
   c. 125 feet.
   d. 120 feet.
4. The erection and dismantling of system scaffolds must be performed by a:
   a. professional engineer.
   b. competent person.
   c. qualified person.
   d. trained crew.

5. Longitudinally, scaffold ties must be placed at each end of the scaffold at intervals not to exceed:
   a. 25 feet.
   b. 30 feet.
   c. 35 feet.
   d. none of the above

6. The placement of the first tie of the completed scaffold must be no higher than _______ times the smallest base dimension.
   a. three
   b. four
   c. five
   d. six

7. When side brackets are used on system scaffolds to permit workers to reach the structure to perform work activities ___________ must be used for stabilization.
   a. stand-off and ties
   b. additional diagonal bracing
   c. ties and guys
   d. stand-offs, ties, and guys

8. Multiple bay system scaffolds require vertical diagonals at the end bays and every _________ bay in between (at a maximum). This may vary, consult your manufacturer.
   a. third
   b. fourth
   c. fifth
   d. sixth
9. On circular scaffolds vertical diagonal bracing is placed at each alternate bay. These diagonals are ____________ the diagonals placed on the previous bay.

a. in line with  
b. opposed to  
c. tied along with  
d. guyed to stabilize

10. Before a scaffold can be used it must be:

a. guyed.  
b. tied.  
c. inspected.  
d. cleaned.

11. The maximum width of bearer tubes on system scaffolds is:

a. 3' 
b. 4' 
c. 7' 
d. varies from manufacturer to manufacturer
SELF-CHECK CP/01/04

ANSWER KEY

TITLE: Determine the Specific Safety Rules Associated with the Erection of System Type Scaffolding.

ANSWERS

1. c - four
2. b - in the same direction
3. c - 125 feet
4. d - trained crew
5. b - 30 feet
6. b - four
7. a - stand-off and ties
8. c - fifth
9. b - oppose to
10. c - inspected
11. d. - varies....
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End Section 04:
System Type Scaffold

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