

RECOMMENDED FRAME SHORING ERECTION PROCEDURE



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INTRODUCTION

Guides to contractors, architects, engineers, dealers, etc., for the proper use of this equipment are deemed necessary, and for this reason the Scaffolding, Shoring & Forming Institute has prepared this bulletin. Consult Safe Practices for Erection and Dismantling of Frame Shoring, Single Post Shore Safety Rules, Flying Deck Form Safety Rules, and Horizontal Shoring Beam Safety Rules prepared by the Institute.

NOMENCLATURE

1. **Adjustment Screw** - device composed of a threaded screw and an adjusting handle used for the vertical adjustment of the shoring and formwork.
2. **Base Plate** - a device used to distribute the leg load.
3. **Coupling Pin** - an insert device used to align lifts or tiers vertically.
4. **Cross-bracing** - system of members connecting frames to make a tower structure.
5. **Extension Device** - any device used to obtain vertical adjustment of shoring towers other than an adjustment screw.
6. **Factor of Safety** - the ratio of ultimate load to the allowable load.
7. **Formwork** - the material used to give the required shape and support of poured concrete, consisting primarily of:

Sheathing - material which is in direct contact with the concrete.

Joists - members which directly support sheathing.

Stringers or ledgers - members which directly support the joists.

8. **Frame** - the principal prefabricated structural unit in a tower.
9. **Lifts or Tiers*** - the number of frames stacked one above each other in a vertical direction.
10. **Locking Device** - a device used to secure the cross brace to the frame.
11. **Safe Leg Load** - that load which can safely be directly imposed on the frame leg.
12. **Shoring Layout** - an engineered drawing prepared prior to erection showing arrangement of equipment for proper shoring.
13. **Sill or Mud Sill** - a footing, usually wood, which distributes the vertical shoring loads to the ground or slab below.
14. **Towers** - a composite structure of frames, braces and accessories.
15. **Ultimate Load** - the maximum load which may be placed on a structure causing failure by buckling of column members or failure of some other component.

* These terms can be used synonymously

INSPECTION OF SHORING EQUIPMENT PRIOR TO ERECTION

The three main areas of inspection are for rust, straightness of members and welds. This applies to all components of a shoring system.

1. **Rust** - Rusted shoring equipment may indicate abuse, neglect, or corrosion and, if severe, should not be used.
2. **Straightness of members** - Mishandling, trucking and storing may cause damage to shoring equipment. All members or parts of all shoring components should be straight and free from bends, kinks or dents.
3. **Welds** - Equipment should be checked before use for damaged welds and any piece of equipment showing damaged welds or rewelding beyond the original factory weld should not be used. The factory weld reference pertains to location and quality of rewelds.

While rust, straightness and welds are of primary concern, other component parts should be checked.

4. Locking devices on frames and braces shall be in good working order, and if not, must be repaired or replaced prior to use.
5. Coupling pins must effectively align the frame legs.
6. Pivoted cross braces must have the center pivot securely in place.

SAFE BEARING LOADS FOR SOILS

Considering that the allowable loads (bearing) on various soils and rock range from less than 1000 p.s.f. (47.9 kN/m²) to more than 50,000 p.s.f. (2393.7 kN/m²) care should be exercised in determining the capacity of the soil for every shoring job, realizing that weather conditions can turn an otherwise suitable ground condition into a hazardous situation. As an example, dry clay with an allowable bearing capacity of 8,000 p.s.f. (383.0 kN/m²) could become very plastic after a rainfall and drop to less than 2,000 p.s.f. (95.8 kN/m²).

Care should also be taken not to excessively disturb the soil. If fill is required in shored areas, a qualified engineer should be consulted as to materials and compaction.

FOUNDATIONS

The purpose of good foundation or mud sill is to distribute the shoring load over a suitable ground area. The size of the footing or sill is determined by the total shoring load carried over a particular ground area, and by the nature of the soil supporting these sills.

The total shoring load should be computed and the sills designed accordingly.

Suitable sills should be used on a pan or grid dome, floor, or any other floor system involving voids, where a frame leg could concentrate an undesirable load on a thin concrete section.

When shoring from earth or fill, the area should be leveled and the sills spaced in a pattern assuring adequate stability for all shoring legs.

ERECTION OF FRAMES

The work of erecting the shoring should be under the supervision of a person with proper experience and aptitude for securing a safe installation.

Shoring layouts made by a qualified shoring designer must be strictly adhered to when locating frame legs. Layouts may be obtained from your shoring supplier in most instances.

Advance planning will help the erection of frames to progress smoothly. The material should be unloaded as close to the area to be shored as possible and should be arranged in the order it is to be used. Adjustment screws should be set to their approximate final adjustment before setting up the shoring units. At this time, a person should check to see that all frames which require coupling pins have them, and that all frames which require accessories at the top do not have coupling pins. Consult safety rules as recommended by the Institute.

To expedite erection of the shoring and to be sure the loading is distributed the way the shoring is designed, the location of each tower should be marked on the floor by use of chalk line or some other simple method. If required, sills should be placed first. After the location of the shoring towers has been marked, the adjustment screws or base plates, whichever is to be used, along with the necessary braces, should be distributed to each set of marks indicating the location of the tower.

After assembling the basic unit it should be leveled so that no matter how high the final tower is to be, the additional frames will be level and plumb as they are installed. When the basic unit is leveled, it is ready to receive the next tier of frames. For higher lifts, a work platform is easily formed for erecting the shoring by using planks on the top horizontal member of the frames. Tie towers of shoring frames together with sufficient bracing to make a rigid, solid unit.

FINAL INSPECTION OF ERECTED SHORING EQUIPMENT

The following is a list of check points to be covered when making a final inspection of shoring equipment prior to the placing of concrete on the form. All points should be carefully checked to insure a safe and accident-free job.

1. Check to see that there is a sound footing, or sill, under every leg of every frame on the job. Check also for possible washout due to rain.
2. Check to make certain that all base plates or adjustment screws are in firm contact with the footing or sill. All adjustment screws should be snug against the legs of the frame.
3. Obtain a copy of the shoring layout that was prepared for this specific job. Make sure that the spacings between towers and the cross brace spacing of the towers do not exceed the spacings shown on the layout. If any deviation is necessary because of field condition consult with the qualified shoring designer who prepared the layout for his approval of the actual field setup.
4. Frames should be checked for plumbness in both directions. The maximum allowable tolerance for a frame which is out of plumb is (1/8 inch in 3 feet). If the frames exceed this tolerance the base should be adjusted until the frames are within the tolerance.
5. If there is a gap between the lower end of one frame and the upper end of another frame, it indicates that one adjustment screw must be adjusted to bring the frames in contact. If this does not help, it indicates the frame is out of square and should be removed.
6. When two or more tiers of frames are used, each shall be braced to at least one adjacent frame.
7. While checking the cross braces also check the locking devices to assure that they are all in their closed position or that they are all tight.
8. Check the upper adjustment screw or shore head to assure that it is in full contact with the formwork. If it is not in contact, it should be adjusted or shimmed until it is.
9. Check to see that the obvious mistakes of omitting joists, using the wrong size ledger or incorrectly orienting members have not been made. Check the print to see that the lumber used is equal to that specified on the shoring layout. Check the general formwork scheme to make sure that it follows good standard practice for formwork.
10. If the shoring layout shows exterior bracing for lateral stability, check to see that this bracing is in place in the locations specified on the drawing. Check to make sure that the devices which attach this bracing to the equipment are securely fastened to the legs of the shoring equipment. If tubing clamps are used, make sure that they have been

properly tightened. If devices for holding timber require nails, check to see that sufficient nails have been used to hold the bracing securely to the frame legs.

DISMANTLING OF SHORING EQUIPMENT

Premature releasing or stripping of shoring can be a cause of failure. A qualified engineer must decide when and how stripping is to proceed. Variables which enter into this phase include load transfer, weather conditions, variations in different parts of the structure and the setting qualities of the concrete.

After approval of a qualified engineer is obtained, follow approved dismantling procedure. Screw jacks should be released only far enough to remove forming member. The dismantling of the equipment can then be performed in the reverse method used in erection and moved to the next location for reuse. It is often more desirable to merely release the adjusting screws to such a point that the forming members can be pulled away from the underside of the concrete and allowed to rest in certain modules on top of the frame shoring equipment and the entire unit moved to the next location. Formwork and shoring of varying sizes are frequently moved from one pour to other pours without dismantling or removing formwork.

Lower shoring components in a safe manner. Do not drop or throw components as this could result in injury to personnel or damage to equipment.

THE RESHORING OPERATION

Reshoring is one of the most critical operations in formwork; consequently, reshoring procedure must be designed by a qualified person and approved by the architect/engineer of record.

Extreme care must be taken to release the adjustment screws to a point where the slab takes its actual permanent deflection. The adjustment screws should then be tightened until contact is again made with the underside of the slab. In this manner, the frame reshoring below will not be carrying the load of the slab that it had previously shored.

Reshoring is usually done to facilitate maximum reuse of framework and may utilize the strength of the completed construction below when such construction is fully cured and capable of supporting the loads to be imposed by the additional construction above.

While reshoring is being placed, no construction loads should be permitted on the new construction.

Extra care should be taken during a reshoring operation where an upper slab being poured is heavier than the slab being reshored.