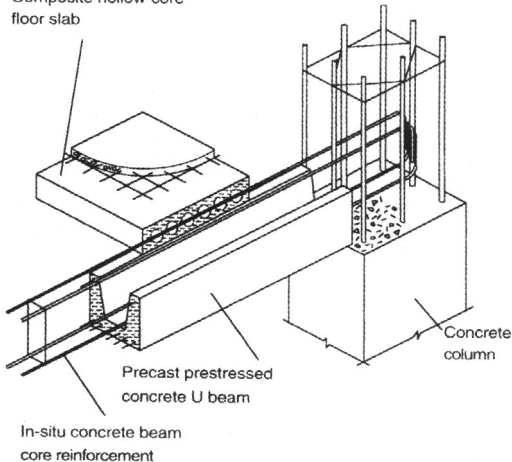


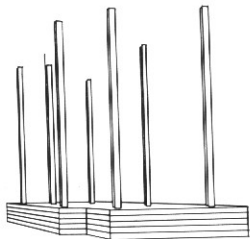
APPENDIX B
ADDITIONAL INFORMATION



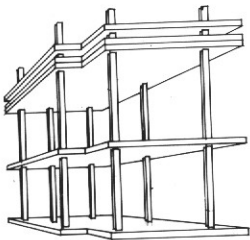
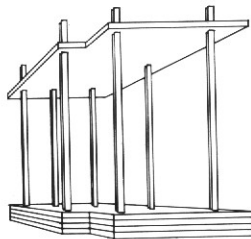
Composite hollow-core
floor slab



1. Structural columns are erected and slabs are cast at ground level.

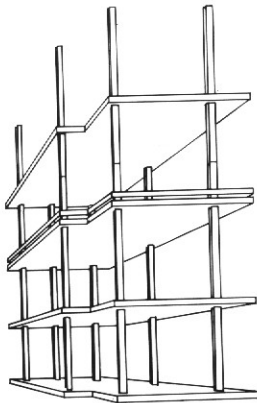


2. The lifting process begins with the top slab.

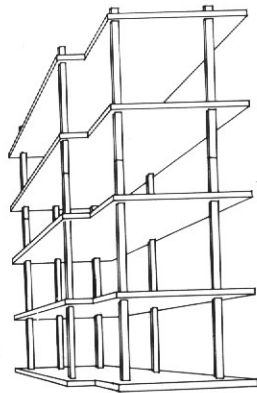


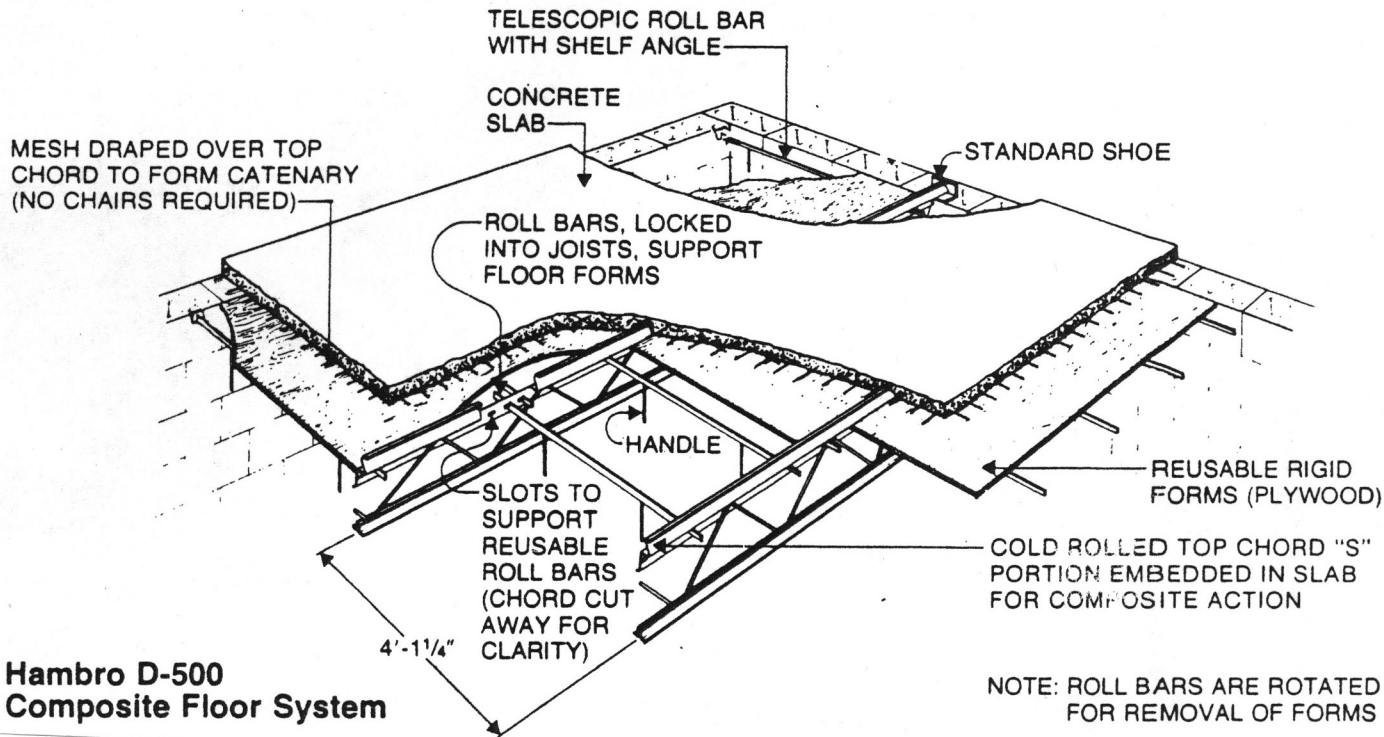
3. Cast slabs are lifted.

4. Column extensions are erected and the lifting continues.



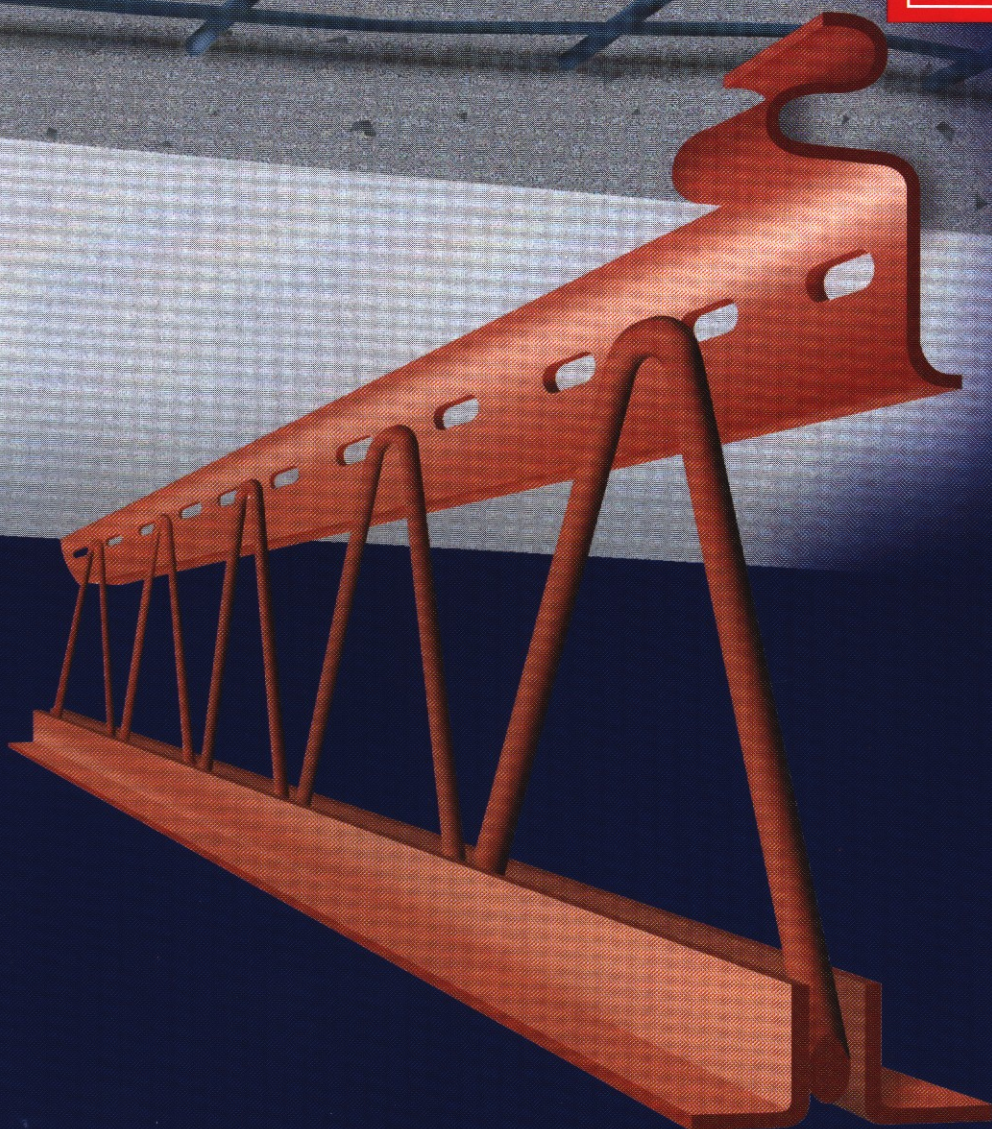
5. Slabs are lifted to final positions and secured permanently.







D500TM



Engineered Solutions

Engineered Service

The Secret Behind Fast and Economical Installation

1. Spreading Joists



Joists are placed on the wall or beam and spread to approximately 1250 mm (4'-1 1/4") o.c. Check your load conditions and fire ratings for permissible options.

2. Placing ROLLBARS®



ROLLBARS are designed to support the plywood forms, the slab dead weight and a 1.92 kPa (40 psf) construction load. When rotated and locked into notches in the top chord, the ROLLBARS® guarantee joist spacing while providing lateral and torsional stability.

3. Installing Plywood Forms



Together, the plywood and ROLLBARS® form a rigid diaphragm during construction, providing a platform for your workforce. The Hambro® system accommodates standard 1220 mm x 2440 mm (4' x 8') plywood sheets. (10 or 13 mm [3/8" or 1/2"] may be used.)

4. Mesh in Place



Standard 2.4 m x 6.1 m (8' x 20') sheets of mesh are easily placed over the top chord "S" of the Hambro® joists. With the top chord "S" acting as a high chair, the mesh forms a natural catenary to reinforce and support the concrete slab.

5. Using Spanners



Temporary spanners are installed to support 13 mm (1/2") plywood sheets. Spanners are not required when using overlapped 10 mm (3/8") plywood sheets.

6. View from Below



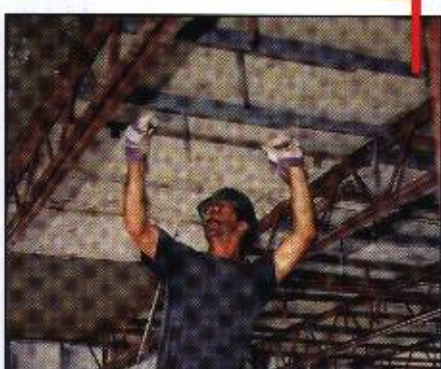
No permanent bottom chord bridging is required. Bottom chords are fabricated with clips generally at third points to accommodate ROLLBARS® for temporary bracing during the concreting stage. No shoring is required unless noted.

7. Pouring Concrete



Minimum design is a 65 mm - 20 MPa (2 1/2" - 3000 psi) slab. The monolithic pour develops diaphragm action and forms an acoustical seal where the slab passes over walls. The patented top chord "S" embeds in the pour of the slab for composite action.

8. Stripping Formwork



ROLLBARS® and plywood forms are usually stripped the day after the pour or as soon as the concrete reaches 3.5 MPa (500 psi). The deck is ready for other trades when the concrete reaches a strength of 7 MPa (1000 psi), usually within 48 hours of the pour. The formwork is easily removed for future reuse.

9. ULC / CUL Fire Rated

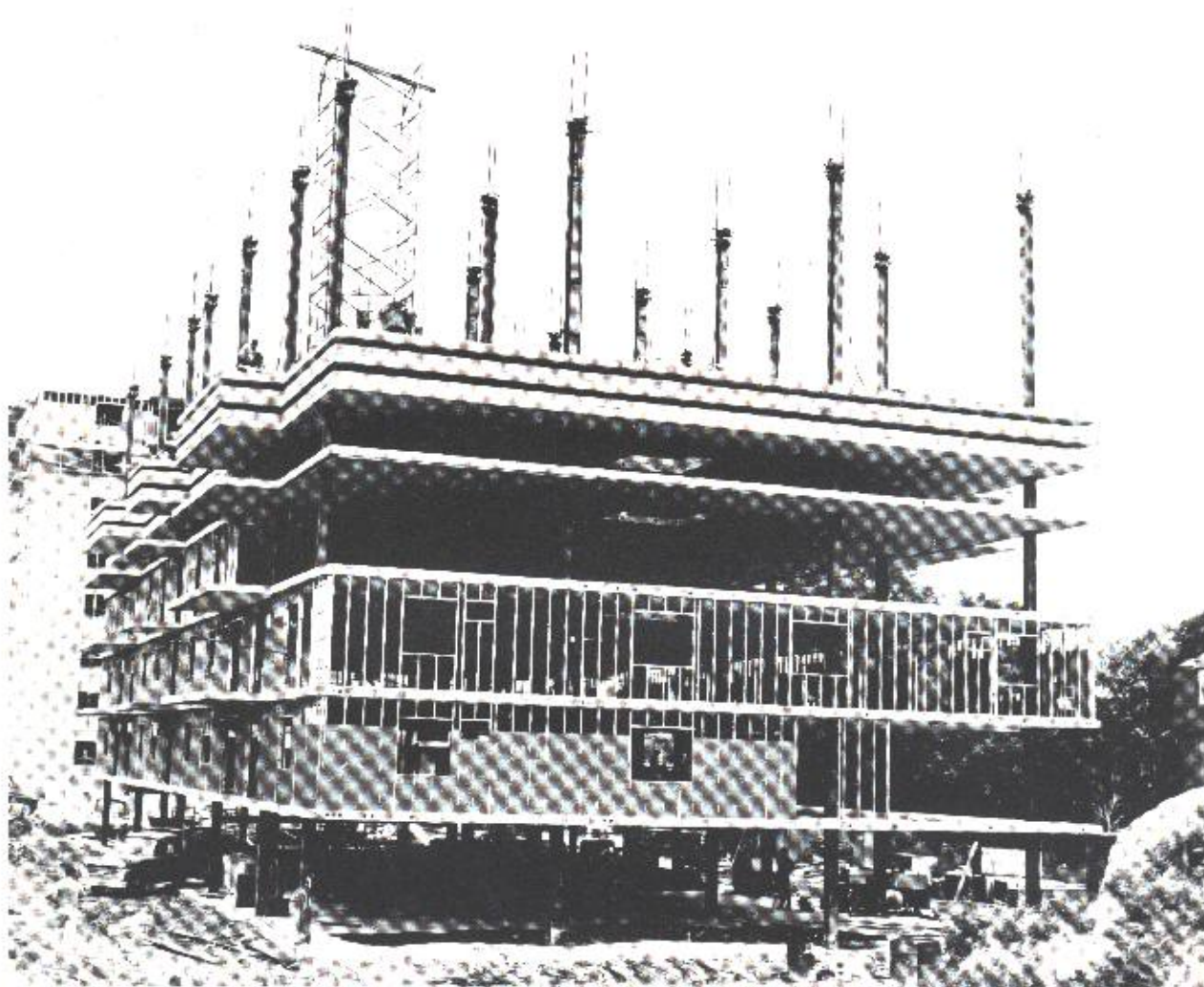


Furring channels are tied to the bottom chord of the Hambro® joists. Fire rated gypsum board completes the assembly, providing an attractive continuous ceiling. See page 4 for UL ratings.





CONSTRUCTION MANUAL



LIFT SLAB

LIFT SLAB BUILDING SYSTEMS

Texstar Construction Corporation

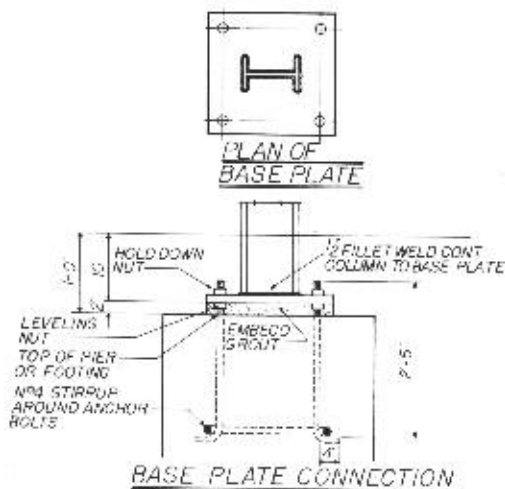


FIGURE 1

METHOD OF SUSPENDING
LIFTING COLLAR

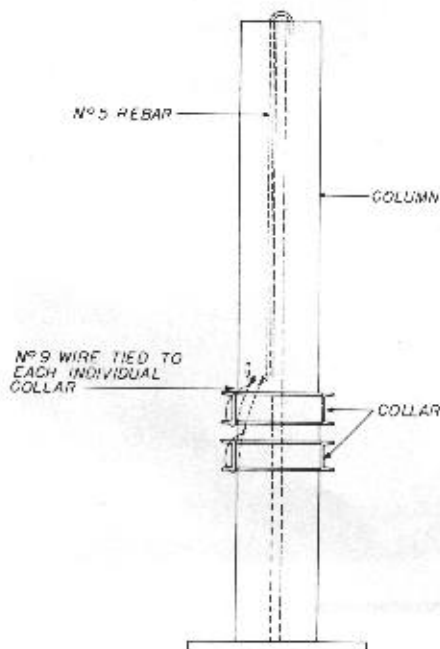


FIGURE 2

The Lift Slab method of construction basically consists of casting concrete floor and roof slabs at or near ground level and lifting them vertically by hydraulic jacks to their final location. This method permits most of the structural work and large portions of the electrical and mechanical rough-in to be done at ground level, and facilitates placing material and reduces labor required.

The Lift Slab frame is installed in the following sequence:

1. Place foundations;
2. Erect structural columns;
3. Pour slab on grade (base slab) which surrounds columns;
4. Apply separating material (two coats);
5. Cast one or more concrete slabs directly on top of grade slab, with separating material applied to the top of each slab;
6. After curing, lift the slabs to their final location, using lifting sequence and necessary column extensions as indicated on the structural drawings.

Lift Slab Building Systems will normally supply the following materials and services:

1. Separating material;
2. Lifting collars;
3. Lift and weld the Lift Slabs;
4. Labor for erecting and splicing the column extensions.

The general contractor shall furnish all material and labor not furnished by Lift Slab Building Systems to construct the Lift Slab frame. The following explanation of procedures is to assist the general contractor to understand the operation and requirements so the project may be constructed in the most efficient manner.

1. **Plans:** The general contractor will supply Lift Slab Building Systems with two complete sets of plans for their use. Lift Slab Building Systems will supply shop drawings as required for material furnished under our proposal.
2. **Anchor Bolts:** These bolts are cast in the foundation and used to set the first stage columns. One method for fast economical erection of the columns is the use of leveling nuts beneath the column base plate. This requires two nuts per anchor bolt (Figure 1). The anchor bolts must be set at proper elevation and center-to-center dimensions in accordance with approved drawings so that they will accommodate the column and base plate called for at each location.

3. **Lifting Collars:** Collars are provided by Lift Slab Building Systems. These collars are cast in the lift slabs and serve two purposes. As a lifting collar it provides a connection point between the jack and rod so that the slab may be lifted. It is also designed as a shearhead and is connected to the column in the temporary and final locations of the lifted slab. The general contractor is responsible for coordinating delivery, unloading, storing and setting of collars. Delivery should be scheduled on or before the setting of first stage columns. Under normal conditions the most efficient manner of setting of collars is:

- A. The collars should be threaded on the proper column in the order and position that they will be used in the casting of slabs. Each column and collar is designed for a specific location. Collars should be located and columns set as indicated by approved drawings. Collars should be placed on the column before setting of column. They should be held temporarily on the column with sufficient headroom so that they do not interfere with work being done on the deck. Figures 2 and 3 indicate methods of holding collars in temporary position.
 - B. Prior to the placing of reinforcement, the collars for the slab to be cast are dropped to the deck. It is the responsibility of the general contractor to drop the collar, center the collar on the column and block out the lifting keyholes and area around the column to prevent entry of concrete during pouring. Collars may be centered by wooden wedges. A typical block-out is illustrated in Figure 4. The block-out prevents concrete and debris from entering the openings around the column. The block-outs must be removed and the keyholes cleaned prior to pouring the next slab.
4. **Columns:** Structural columns are provided to the general contractor by the steel fabricator. They should be fabricated with base plates, temporary and permanent weld blocks. Wedges for the final connection should be supplied loose. Column tops should be milled or cut square to receive the lifting equipment and column splices. Lower ends of column splices are fabricated with erection plates as indicated on the drawings. Columns are generally received in two shipments.
- A. **First Stage Columns:** These columns should be scheduled for erection immediately after foundation and setting of anchor bolts. The general con-

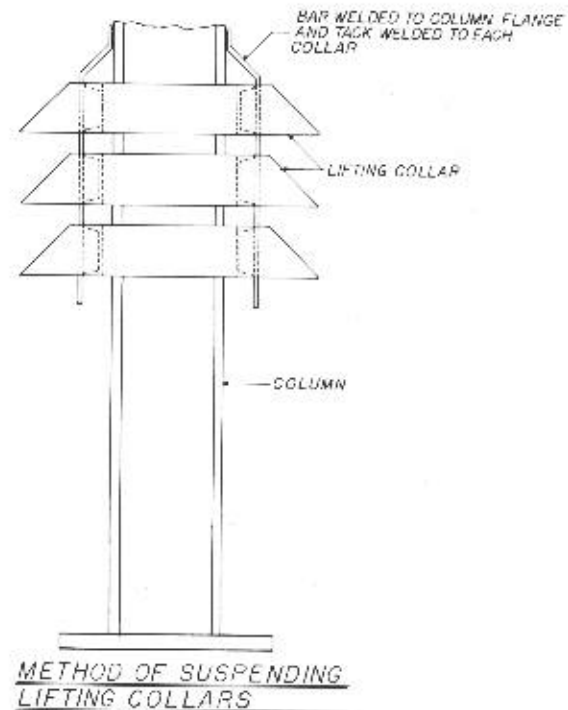


FIGURE 3

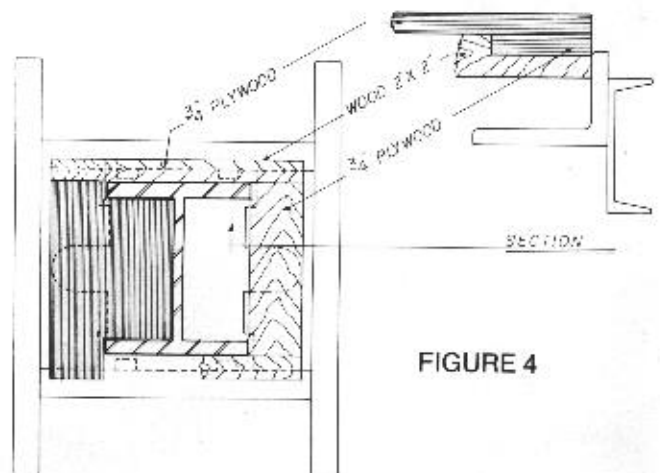
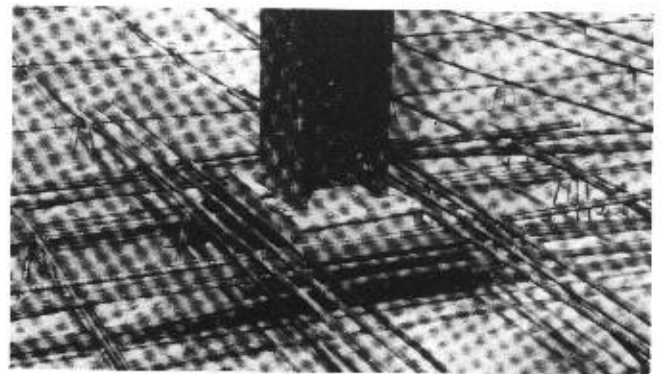


FIGURE 4

LIFTING COLLAR BLOCKOUT

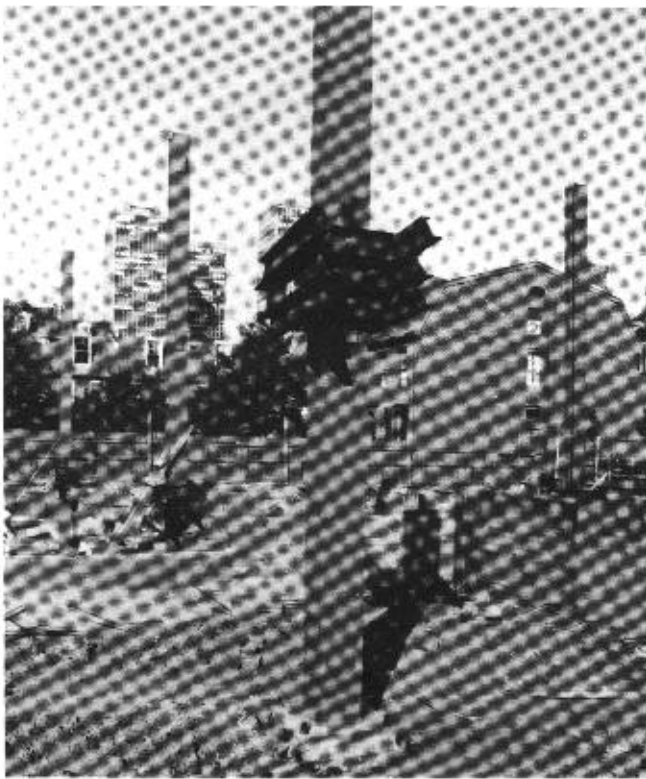
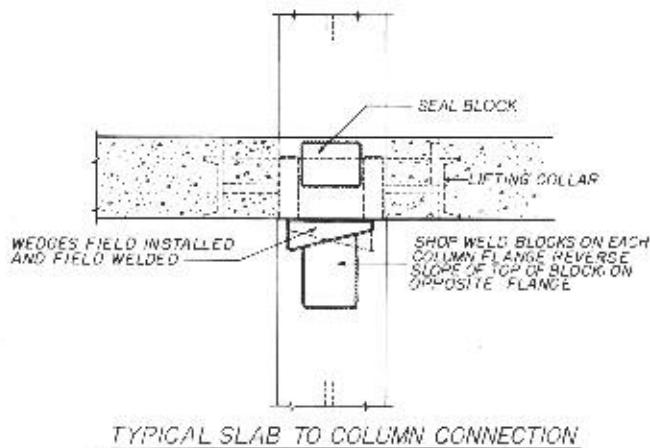


FIGURE 5

tractor is responsible for installing the collars, setting and plumbing the first stage columns, and grouting the base plates. The leveling nuts should be pre-set to the proper elevation to insure the columns are set to the correct elevation. After setting the columns they should be plumbed by making minor adjustments to the leveling and anchor nuts. After plumbing the columns the base plates are grouted with "Embeco" or equivalent non-shrink grout (Figures 1 & 5).

- B. **Upper Stage Columns:** These columns should be scheduled to arrive on the jobsite with the arrival of the lifting equipment. These columns are to be placed on the roof slab or immediately adjacent to the slabs if all slabs are not poured. The general contractor is responsible for unloading the columns. Lift Slab Building Systems will erect and splice the upper stage columns. They will be placed on the roof slab prior to lifting to facilitate the splicing operation.
5. **Edge Forms:** As all slabs are stacked one on top of the other, edge forms are basically the only forms required. At the option of the contractor these forms may be built to receive all the lift slabs (Figure 6) or each slab may be formed individually. Edge forms for post-tensioned slabs should be constructed to remain straight and true with lateral pull due to weight of tendons. The general contractor is responsible for all form work and drilling of holes to receive post-tensioning tendons. Slab depressions may be handled by forming with plywood or by filling with grout. Separating material should be applied to the depression surface before grouting. The grout should receive a hard trowel finish and separating material applied before pouring of next slab.
6. **Separating Material:** The compound used for separating is "Thompson's Curing & Bond Breaking." Thompson's C&B is a clear solution of polymerized organic and inorganic solids carried in a solvent blend. It penetrates the surface carrying the solids into the pores where expansion takes place. This prohibits the penetration of water base materials. An estimate of the amount required will be made by Lift Slab Building Systems and this amount will be included in the proposal. Thompson's C&B is also a curing compound. It is applied in two coats at the rate of 350 sq. ft. per gallon each coat. The first coat should be applied immediately after finishing is completed and the slab is hard enough to walk on. The second coat may be applied any time

before work begins on the next slab. It may be applied by spraying. To insure good coverage the second coat should be applied in the direction 90° from the first coat application. Two coats and complete coverage is mandatory to achieve proper separation.

7. Post-Tensioning: The installation and stressing of post-tensioning tendons should be performed by a qualified installer. Should the general contractor perform the work with his labor force, the contract with the supplier should include adequate jobsite instruction for placing and stressing the tendons. Tendon profiles must have the correct high and low points and a smooth parabolic curve between the points. There should be no intermediate humps or droops between the column line (high point) and mid-span (low point). Particular attention should be paid to the profiles in cantilivers. The tendons should proceed gradually down from the column line to the center of slab at the anchor point, with no sags or low points in between. The top steel should be placed close to the columns as shown in the drawings. Care should be taken during the pouring of concrete to assure the tendons remain at their prescribed profile. The anchor ends and collars should be vibrated to prevent voids in these areas. During stressing the tendons should be marked at a set distance from the edge of slab so that the elongation can be easily measured after stressing. Tendon ends are burned off after approval by the engineer. Unless included in the post-tensioning subcontract, the general contractor will be responsible for:

- A. Unloading and storage of post-tensioning materials;
- B. Drilling of holes to receive post-tensioning tendons;
- C. Furnishing electric power (110 volt) for stressing;
- D. Painting and grouting the tendon ends after stressing to prevent rust and corrosion in the final condition. This may be done at ground level before lifting.

8. Electrical and Mechanical Embedded Items and Sleeves:

- A. Chase openings and sleeves:
 - 1. Openings for chases large enough for the forms to be removed before lifting may be constructed the total height of the slabs to be poured or individual heights for each slab. Figure 7.

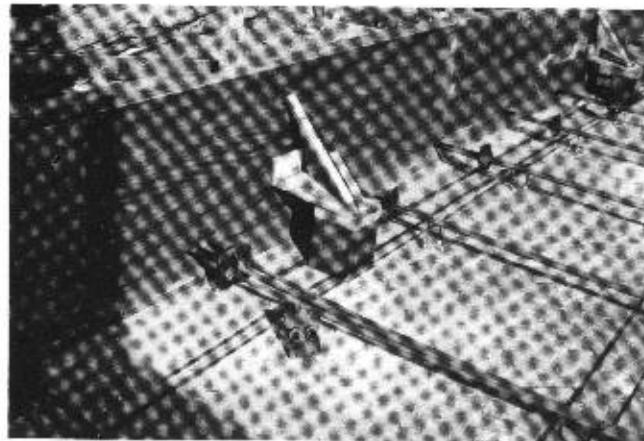


FIGURE 6

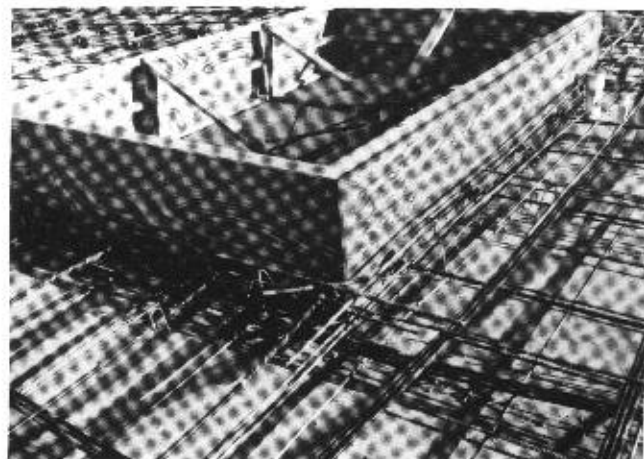
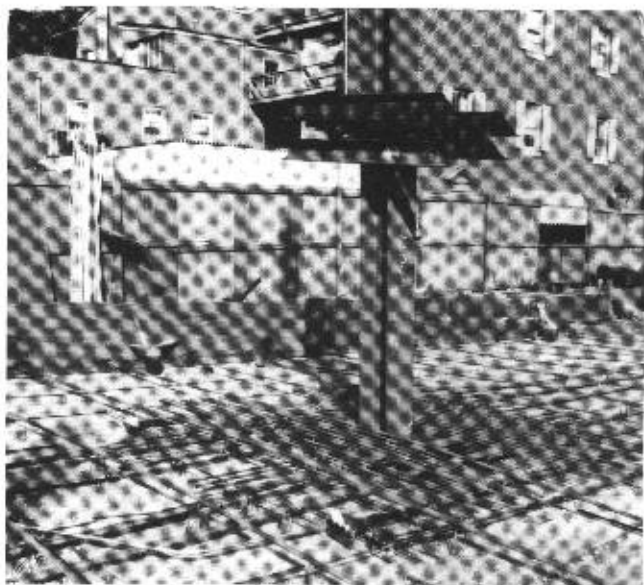




FIGURE 7

These areas are formed by shoring plywood panels tightly against the soffits of the lifted slabs. Long cantilivered conditions at the pour strip should be shored slightly higher than level. Reinforcement required in these areas is shown in detail on the structural drawings. The general contractor is responsible for all labor and material required for pour strips.

11. **Construction Joints:** Construction joint locations should be determined by the structural engineer. He should also specify any special requirements such as shear keys and added rebar.
12. **Slab Depression:** Slab depressions into which the next slab is to be cast should not be formed at right angles (), but at a bevel () so as to prevent spawling at the edges during separation.
13. **Procedures for Plumbing the Structure:** The general contractor is responsible for verification of plumb of the building. He will provide slab attachments and dead men necessary for cable and turnbuckles to plumb the structure. Lift Slab Building Systems will provide the general contractor with details of slab attachments and dead men necessary. Lift Slab Building Systems will provide necessary labor and material to guy and plumb the structure. The general contractor will provide plumb marks on the slab edges at all corners and be responsible for verification of plumb. Plumb marks on the slabs after lifting shall be aligned such that maximum deviation of marks from vertical plumb is no greater than one inch per 600 inches of height.
14. **Lifting and Welding the Lifted Slabs:** Lift Slab Building Systems shall provide necessary labor and equipment to lift the slab, splice the column extensions (if required) and weld the slabs in permanent position. Unless specifically included in Lift Slab Building System's proposal the following items are the responsibility of the general contractor or his suppliers:
 - A. Weld block and wedges;
 - B. Chipping, grinding, and painting of welds, if required;
 - C. Electrical power for lifting equipment (220 volt—3 phase 200 amps/110 volt—30 amps);
 - D. Water for heat exchanger on the power unit;
 - E. Temporary bracing of columns while lifting, if required by structural design;
 - F. Cutting off column tops after lifting;
 - G. Required grades or elevations and verifications of vertical plumb of the building.

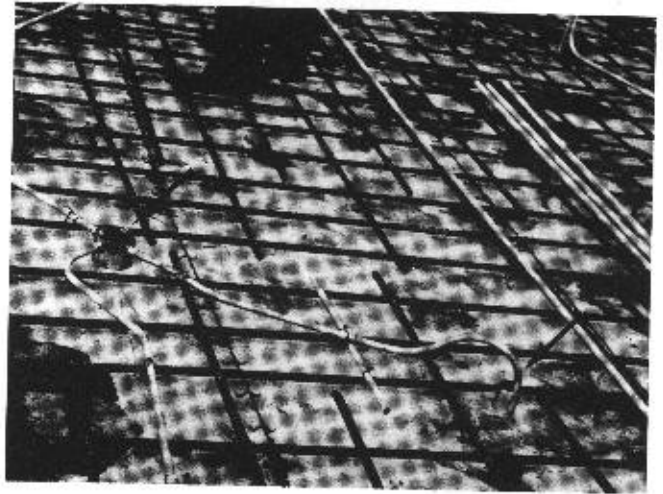


FIGURE 10

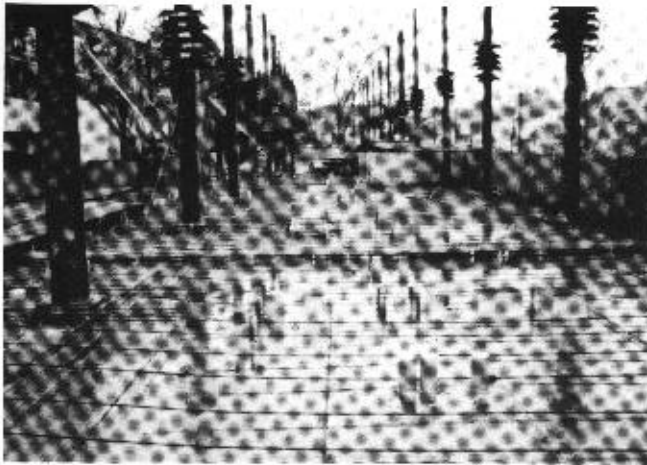


FIGURE 8

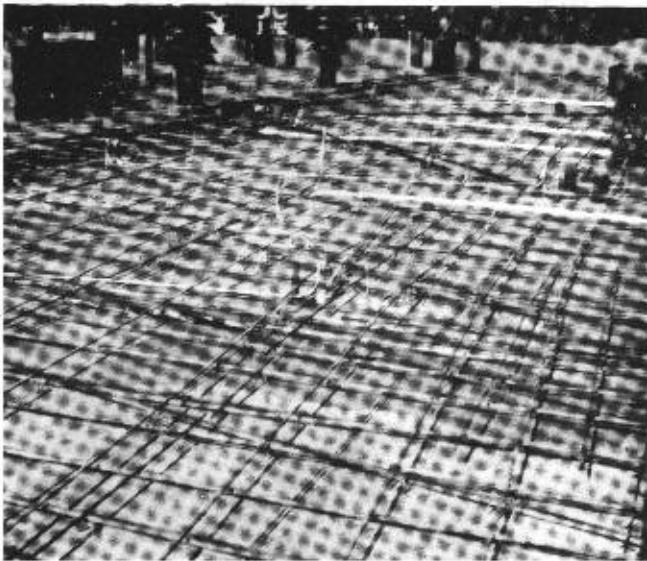


FIGURE 9

2. Sleeves or small chases should be constructed in one slab heights to prevent bonding of concrete to sleeves which prevents separation of slabs. Sleeves may be metal, cardboard tubes or plastic "Hole-outs". Sleeves and chases may be fastened to the base slab by cut nails as the small spawling which results usually falls within the partitions. Figure 8.

B. Electrical Conduits:

1. Efficient prefabrication is feasible for horizontal runs. They may be made directly to outlet and junction boxes and tied to the reinforcement to prevent movement during pouring.
 2. Turn-ups: Turn-ups are handled by extending the conduit one to two inches into the slab to be poured above. The extending conduit should be near vertical and sleeved or wrapped sufficiently to prevent interlocking or adhesion when the slab above is poured. Figure 9.
 3. Turn-downs: Turn-downs are installed easily by means of a bend with cap or plugged coupling on the end. The end may be placed in a sleeve and the sleeve filled with sand before concreting. It may also be accomplished by drilling a shallow hole in the slab below. The turn-down is placed in the hole and the hole caulked or filled with sand to prevent adhesion. To aid in location of outlet boxes in the event of concrete cover, a crayon outline around the box on the slab below will transfer to the slab above when lifted. Figure 10.
- 9. Concrete:** All concrete used in the Lift Slabs should be inspected by a testing laboratory approved by the architect. This laboratory will design the mix of the concrete, inspect the placing and make all necessary tests. No slab will be lifted until the concrete has reached the designed minimum compressive strength. Post-tensioned slabs may be lifted after the concrete has reached the minimum compressive strength for tensioning (usually 3000 p.s.i.) and the tensioning is completed. Rebar reinforced slabs should have a minimum curing of 14 days and a compression strength of 2700 p.s.i. All concrete work is the responsibility of the general contractor.
- 10. Pour Strips:** In large areas it is necessary to provide joining strips between the sections of slabs after lifting into permanent position. The pour strips are generally 3 ft. to 6 ft. wide depending on the height of the building and type of slab reinforcement used.

GENERAL

The general contractor shall also provide access to the slabs in permanent position by ladder or stairs. He shall also provide railings and hole coverings for the roof slab and other slabs as they are placed in permanent position.

During the lifting operation it may be advantageous to use the slabs to lift some of the materials used to finish the structure. These items can be lifted on the slabs provided they do not exceed the slab design load, the capacity of the lifting equipment or interfere

with the lifting and welding operations. Check with your Lift Slab representative before loading of slabs.

As a service, your Lift Slab representative is available for consultation during the construction of the structural frame. Should questions arise pertaining to Lift Slab, contact the local representative.

NOTICE

The information provided by Lift Slab Building Systems is given as an aid to the builder and does not legally bind Lift Slab Building Systems in any way.



LIFT SLAB BUILDING SYSTEMS

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