# D&G Group Limited

VOLUME 2:

LATTICE REINFORCED SLAB

INSTALLATION MANUAL

D&G Group Limited manufacturers and supplies a range of precast concrete structural building products ranging from foundations to flooring systems that utilizes Lattice Reinforced Joists.
The Lattice Reinforced Joists-Slab System is one of the most modern construction technique in Tanzania, although it has been widely used in Europe and South America. The factory at D&G Group Limited has the capacity to produce up to 10,000 m of specifically designed Lattice Reinforced Joists, which are supplied throughout Dar es Salaam. Our design team has revolutionised the manufacturing of reinforced concrete slabs in Tanzania.

*In addition to the requirements set forth in the Code of Practice for Safe Erection of Precast Concrete and Associated Components (Precast Flooring Federation. 2001), the following sequence of activities should be considered in the realization of a Lattice Reinforced Slab.*

## STEP ONE: WORKING TO SEQUENCE

Prior to the arrival of the installation team, a sequence for on-site installation must have been agreed, with records kept on site and a copy handed to the Foreman. It is the responsibility of the Foreman to ensure adherence to the agreed sequence. In circumstances where a deviation from the sequence is unavoidable, the Foreman must seek advice and approval before altering the sequence, either by referring back to the Company Construction Manager, or to the Company Representative responsible for that project.

## STEP TWO: SUPPORT SYSTEM

The installation of Lattice Reinforced Slab requires the use of temporary supports. In most cases, the support system will be in form of propping. The propping centres are normally stipulated by D&G Group Limited design team. The number of props required can be determined by the load / span criteria. Moreover, in consultation with the D&G Group Limited design team a choice can be made on the optimum propping layout, which will give an overall cost saving on the installation.

**A: False work – Special Considerations**

The first step in the installation of a slab is the placement and locking of False work (***Photo 1***). Before this is done, *the floor must be properly aligned and leveled*. The supporting base for the false work must be firm and strong to ensure it does not give way under the weight of the concrete that will be laid. The ideal support is a floor slab. When the supporting base is the ground itself, it should be well compacted to ensure that it will not give way under the weight of the load.
*It is incorrect to place false work directly on the ground*; instead, each leg of the false work should be placed on a wooden board (***Photo 2***).

Photo 1: False work system

Photo 2: False work bars supported on boards

**NOTE 1:** *The critical condition of lattice-reinforced slabs is not when they are already completely loaded and the concrete has hardened, but when the concrete is being laid on the rib-filler element set. In this situation there is already a considerable load (about 50% of the total), which is borne only by the rib, whose height is limited. It is therefore crucial that the scaffolding be sufficiently stiff to prevent the occurrence of bending in this phase, because if it does occur, the system will already be produced with deflections that will be perpetuated during the entire life of the structure*.

**B: The use of ladders and factors to be considered**

The Foreman must visually inspect all ladders provided for use during the installation process, and any defects noted must be brought to the attention of Construction Manager, or where appropriate, the Company's Representative for that project, so that the particular item can be replaced or repaired before it is used.

Ladders should be used only as access or for light work of short duration, lasting no more than 30 to 60 minutes where other safer means, such as scaffold towers or Mobile Elevated Work Platforms (MEWPs) have been considered and found not to be reasonably practicable. When ladders are used, they need to be of the correct type, and should be in good condition and effectively secured to prevent movement (**Figure. 1**)

The length of the ladder required. Very long ladders are heavy to handle and may need staying to reduce flexing in use. Correct angle of ladder – for every four up go one out (**Figure 2**).

Where applicable, there must be an extension of at least 1 m above landing point to provide a secure handhold.

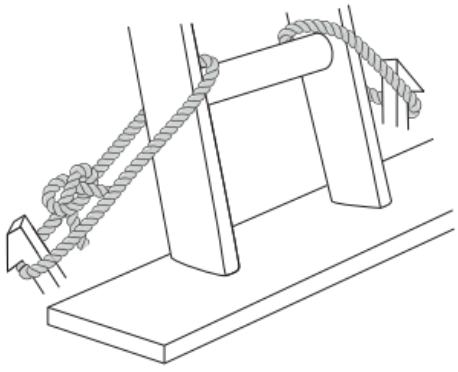

**Figure 1:** Secure ladder as appropriate

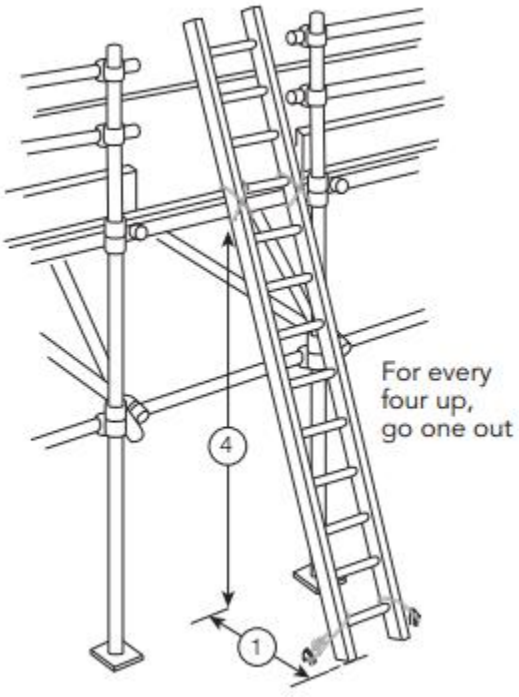


**Figure 2:** Correct ladder angle

## STEP THREE: SHUTTERING AND STEEL FIXING OF MAIN/PRIMARY BEAMS

Shuttering and steel fixing of main/primary beams should be done in accordance to the relevant procedures established for construction works. (*Construction of columns precedes this stage*).

In the absence of established procedure, the following should be considered:

Props and ledgers for the beams should be correctly levelled/aligned as pointed in step two above. (Surveyor and surveying techniques to be deployed at this stage)

As a rule of thumb, beam bracing should be spaced at 300 mm centers.

Photo: Shuttering and steel fixing of main/primary beams

### Tracking

Start and Finish times for this exercise should be recorded in order to establish the estimated duration that will assist in future planning and sequencing of similar activities.

## STEP FOUR: PLACEMENT OF LATTICE JOISTS

### A: Pre start checks

Ensure correct elements and support system are in place before hoisting, (Make use of identification tags and color codes)

### B: Setting out:

Establish the positions of lattice joists by marking along the formwork of main/primary beams to establish the number and correct spacing of lattice joists.

### C: Hoisting

There are two basic approaches to hoisting and placement of joists into their rightful positions. One way involves the use of hoisting machinery such as cranes (whose respective procedure is guided by *Code of Practice for Safe Erection of Precast Concrete and Associated Components (Precast Flooring Federation. 2001)*

*As a rule of thumb:* The weight of the largest individual precast concrete member to be handled on a project will dictate the size of the crane and hauling equipment or methodology required

Another means is by manual handling of lattice joists, where a set of five personnel and two ladders can accomplish the task within 45 minutes for a slab panel requiring up to ten lattice joists.

**Photos below illustrates the sequence of manual hoisting of lattice reinforced joists**

Photo 1: Three personnel handles lattice joists with the climber carefully climbing up the ladder.

Photo 2: Two personnel receives lattice joists to be supported on main/primary beams, one end of the joist has been received, the other was temporarily supported on the second ladder before the climber could get it to the other personnel.

Photo 3: The climber make use of the second ladder to deliver the second end of the joist. At this stage ladder stability is of paramount.

Photo 4: Upon receipt of both ends, the two personnel moves the joists to its predetermined positioned established with chalk marking on the sides of formwork of main beams.

Photo 5: Lattice joists positioned ready to receive filler blocks.

Photo 6: Start up filler blocks positioned on both ends to ensure uniformity upon completion

**D: Elements of control**

Alignment, for joists: - departure from intended horizontal/vertical position should not exceed +/- 2 mm

**E: Connections**

The joists should penetrate the set of primary/ main beams by at least 50 mm or at most half the width of the beam.

**F: Tracking**

Start and Finish times for this exercise should be recorded in order to establish the estimated duration that will assist in future planning and sequencing of similar activities.

## STEP FIVE: PLACEMENT OF FILLER BLOCKS

After the placement of the joists, the filler blocks are installed. Filler blocks are fabricated in shapes and sizes especially to fulfill certain constructive requirements and to avoid cutting on site and wastage of material.

This activity may proceed by making use of support system established during placement of lattice joists or as directed by site Engineer in charge.

**Tracking**

Start and Finish times for this exercise should be recorded in order to establish the estimated duration that will assist in future planning and sequencing of similar activities.

## STEP SIX: SERVICES INSTALLATIONS

Services installations shall proceed in accordance to the relevant drawings and procedures established for electrical works.

*As a general rule:*

The electrical conduits and other service pipes should be embedded in the slab without reducing its load-bearing capacity. The placement of conduits depends on the distribution of points for ceiling lights, light switches, electrical outlets, fuse box, water outlets and foul drains.

**Tracking**

Start and Finish times for this exercise to be recorded in order to establish the estimated duration that will assist in future planning and sequencing of similar activities.

## STEP SEVEN: WIRE MESH REINFORCEMENT, CONCRETE TOPPING, CURING AND REMOVAL OF PROPS

Wire mesh reinforcement in slab topping should be placed according to the slab design specifications

Before the concrete topping is laid, it is essential to clean the elements that make up the slab, especially at the interface between the ribs and the concrete to be laid, removing dust, dirt, grease, soil, oil or any other substance that may impair the transfer of shear by the contact surface. The engineer in charge should make an inspection of the work before authorizing the concreting.

**Tracking**

Start and Finish times for this exercise should be recorded in order to establish the estimated duration that will assist in future planning and sequencing of similar activities.

## STEP EIGHT: POST INSTALLATION

Post installation checks should be performed by making use of post-pour inspection checklist established for site works.

## COMMON CONSTRAINSTS AND RECOMMENDED SOLUTIONS

### A: ACCESS

| CONTRAINTS | RECOMMENDED SOLUTIONS |
|---|---|
| Crane and trailer are unable to negotiate small turning radius at junctions of small roads. | Study the locality and look for available space for turning. Have one worker direct traffic while crane and trailer is turning. |

### B: COORDINATION

| CONTRAINTS | RECOMMENDED SOLUTIONS |
|---|---|
| Wrong components delivered to site | Provide clear labels on components and drawings to avoid confusion |
| Wrong sequence of delivery | Person ordering must maintain good communication with person delivering. |

### C: INSTALLATION

| CONTRAINTS | RECOMMENDED SOLUTIONS |
|---|---|
| Lifting over neighbor's roof may cause anxiety over safety and damage to existing properties. | Crane and trailer can be parked strategically to avoid such lifting. Crane operator can make use of boom angle to keep lifting within site boundary. |

### D: HANDLING

| CONTRAINTS | RECOMMENDED SOLUTIONS |
|---|---|
| Damage such as cracks and corners chipped-off occurred due to knocking during handling. | If damage is minor, cracked components can be repaired using approved epoxy resin. Non-shrink grout can be used for chipped-off corners. |