

Concrete Placement – Lift and Fall Heights



The placement of concrete in Fox Blocks needs to follow the recommended procedures for flow rates, lifts heights, and consolidation, plus the specifications for concrete design mix, slump and aggregate size. All of these aspects are specific to the design and placement of concrete in an ICF wall, and vary from the specifications for regular concrete forming systems.

Concrete design and placement, fall heights, lift heights, and consolidation are all details that must be considered individually to work together for a successful Fox Blocks build. In reality, these are all independent issues that must each be considered individually for a Fox Blocks build.

CONCRETE PLACEMENT RATE

The speed or flow rate at which concrete is placed has many variables that must be considered prior to placement. For example:

- Linear Length
- Height of Wall
- Temperature
- Concrete Mix
- Placement Method
- Available Manpower
- Overall Time From Start to Finish.

Pre-planning is essential for a successful placement.

Prior to placement to concrete refer to the Fox Blocks Installation Checklist 1.02.01



Installation Checklist

Refer to Technical Bulletin 1.06.01 Concrete Design and Placement

The American Concrete Institute (ACI) does not directly address the height of concrete placement.

Refer to Technical Bulletin 1.06.01 for Concrete Placement Rates



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CONCRETE PLACEMENT LIFT HEIGHTS

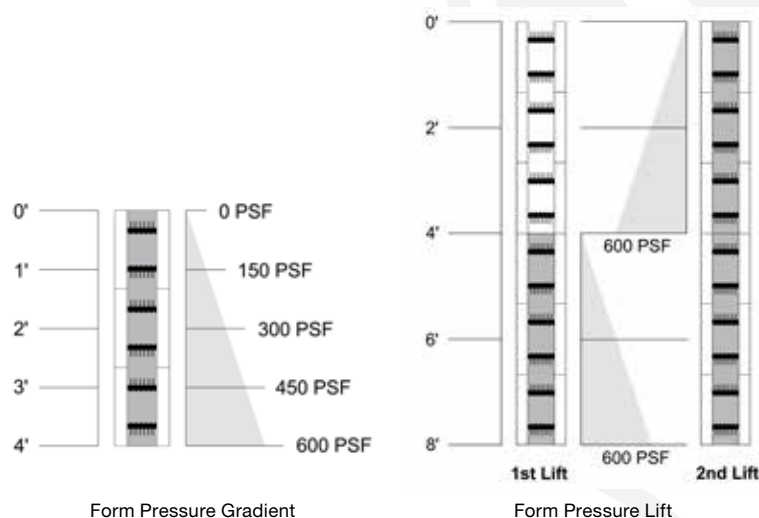
Concrete placement is recommended in 4 feet lift heights. This does not mean that the concrete cannot be placed greater than 4 feet in height. The concrete is typically placed in a continuous operation in multiple lifts - two, three or four lifts, by making continuous passes around the perimeter or section of the wall to achieve the full height required.

In typical residential construction, concrete is commonly placed in a wall to a maximum of 10 to 12 feet in height during one concrete pour. This is done in multiple lifts of around 4 feet or less. In commercial construction walls may be higher -14 to 18 feet. These walls also have the concrete placement in multiple lifts following the same procedure.

This placement method is a standard practice in the ICF industry. The 4 foot lift height is a recommendation, as a guideline, to minimize liquid concrete hydrostatic pressure on the forms and to avoid exceeding the formwork's designed capacity. This method allows the lower lift of concrete to begin setting up, providing support to the next lift as concrete is placed in the full wall.

In the planning of placement lift heights, the top lift should be a minimum of 2 feet or more.

Fox Blocks concrete mix design has a high slump of 5" to 6". Refer to Technical Bulletin 1.06.01



Consolidation is required in every lift to eliminate any honeycombing or voids and blend the lifts to eliminate cold joints in the wall.

Refer to Technical Bulletin 1.06.05
Concrete Consolidation

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CONCRETE FALL HEIGHTS

A structural engineer, a specifier, or an inspector may want to limit the maximum free fall height of concrete placement with the intent to prevent segregation. Concrete placement operations in a Fox Blocks wall are planned to allow for the free fall of concrete from the top of the formwork. The concrete mix design with a high slump of 5" to 6" is advantageous for the specified fall heights in a Fox Blocks wall assembly.

The American Concrete Institute (ACI) does not directly address the height of concrete placement. Neither ACI 301, "Specifications for Structural Concrete," nor ACI 318 "Building Code Requirements for Structural Concrete," limits the maximum distance concrete can free fall. Field studies have shown that free fall from great distances does not reduce concrete quality or compressive strength.

In the specification notes to owner's representative, ACI 336 states that recent research on free-fall concrete has confirmed that free fall does not cause segregation, at least for fall heights up to 60 feet.

The American Society of Concrete Contractors (ASCC) has written a Position Statement #17 addressing the free fall of concrete. At least four field studies have shown that free fall from great distances does not reduce concrete quality. The ASCC position statement goes on to state that although the field studies have been for caissons, the results should also apply to other structural elements such as walls, columns, and mat foundations.

ASCC references a 1994 FHWA study the provided test data leading the investigators to conclude that "the general expectation that concrete striking of the rebar cage will cause segregation or weakened concrete is invalid and they found "no segregation or strength differences between low and high slump concrete mixtures."

Fox Blocks recommends placing concrete, with Fox Blocks specified mix design and slump, following ACI standards and safety factors in lifts as detailed. Typically, the concrete fall height for a Fox Blocks wall would be 9' to 12' + high, in some commercial applications the fall height may 16' +.



Bruce Suprenant, article "Free Fall of Concrete" June 2001, Concrete International Magazine summarizes many of the findings discussed in this technical brief.

Restricting free-fall heights, decreases concrete production rates, which increases owners' costs without increasing concrete quality.