

## Masonry Grouting Methods

### Introduction

All concrete masonry requires either solid or partial filling with grout. The New Zealand Standard NZS 4210 Masonry Construction: Materials and Workmanship sets out four different methods for grout filling.

1. High lift grouting with an expansive admixture.
2. High lift grouting without an expansive admixture.
3. High lift grouting with reduced compaction.
4. Low lift growing.

The choice of method may be dictated by the job specification and reference to this must be made before selecting a method.

In non-specific masonry construction in accordance with NZS 4229 the grouting methods 1, 2 and 4 are options. For specific design in accordance with NZS 4230, all of the methods 1-4 are acceptable, with methods 1 and 2 most regularly specified and occasional special use of method 4. For masonry elements forming part of timber framed structures in accordance with NZS 3604, methods 1, 3 and 4 are permitted options.

### General

The following comments apply to all the grouting methods:

1. Clean out openings are required when using any of the high-lift methods, with their positioning dependent on the geometry of the concrete masonry units being used in construction and whether the wall is to be partial or solid grout filled.
2. Grouting should not commence until the

mortar joints have attained sufficient strength to resist blowouts and grout spaces have been cleaned out. The height of individual lifts in any pour ought to be limited to prevent blowouts.

3. Using the appropriate method outlined in NZS 3604, NZS 4229 and specific engineering design to NZS 4230, grout should completely fill all the cells and cavities containing reinforcement and such other cells as defined in the above standards.
4. The grout should be thoroughly compacted to completely fill all cells and cavities containing reinforcement and other areas required to be solid filled. Where cells are not to be filled then they need to be covered to prevent the entry of grout, provided this is done in a manner such that the mortar bond between courses is not impaired.
5. The top of the wall should be protected to prevent too rapid drying out.
6. Horizontal construction joints in grout should be prepared by thoroughly cleaning the surface of the hardened grout and by removing all laitance, loose and foreign matter.
7. Consider that weather conditions influence the timing and height of pour.

### Grout Requirements

These may be defined by the job specification but the outline requirements from NZS 4210 are as follows:

1. **Fine grout:** Sand complying with NZS 3121, Portland cement and water should be used where any dimension of grout spaces is less than 60 mm.

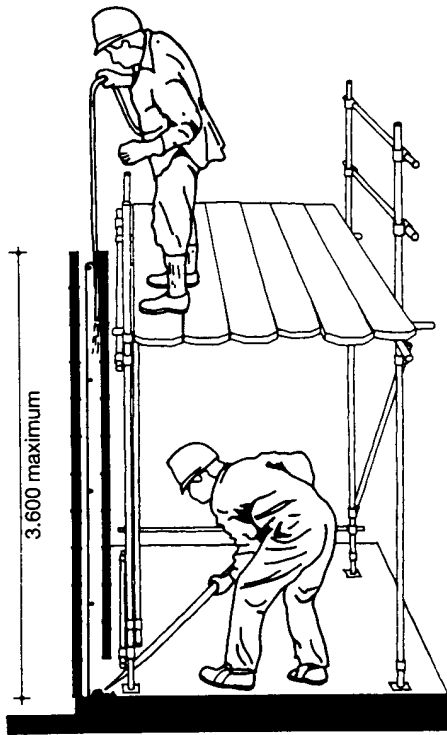
2. **Coarse grout:** Consists of sand complying with NZS 3121, Portland cement, coarse aggregate and water and may contain admixtures. Graded coarse aggregate usual maximum size range is 13.2-4.75 mm.
3. Admixtures are permitted providing they comply with NZS 3113 and AS 1478, or specific approval for use has been given.
4. The strength requirement is 17.5 MPa at 28 days with a spread value of 450 mm – 530 mm, with the exception of seaspray (B2) where

the minimum compressive strength should be 25 MPa, when tested in accordance with Appendix 2.A and the test results are evaluated as required by NZS 3104.

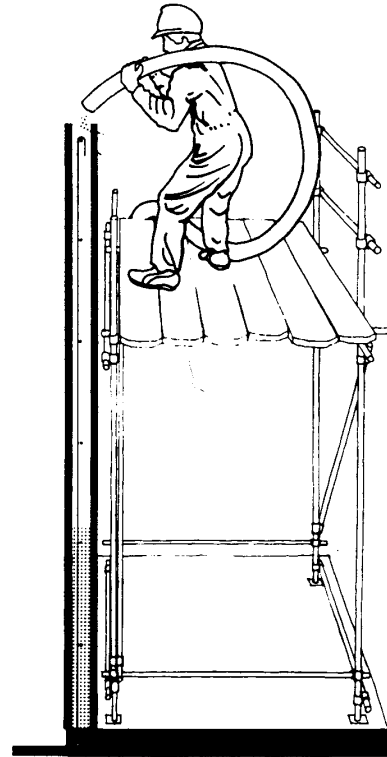
5. Expansive agent when used is to give a volume increase of between 2 to 4% before the initial setting of the grout. Dosage is set by the manufacturer, which does vary with temperature conditions. The material may be rodded into position or by limited use of a vibrator. Extensive vibration can cause loss of gas.

# 1. High lift grouting with expansive admixture

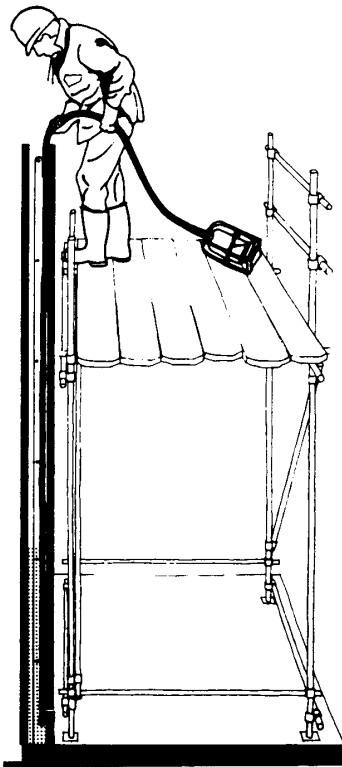
Follow Steps 1-4 as illustrated.



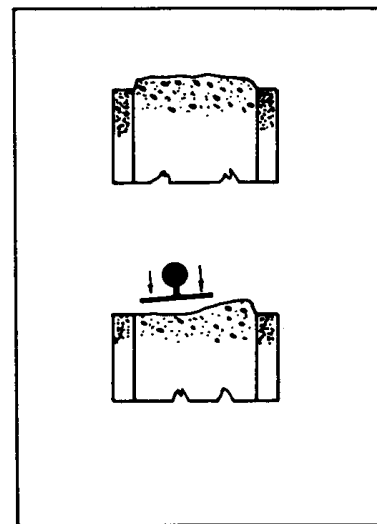
**Step 1.** Clean out grout space and remove all debris and loose material from construction joint.



**Step 2.** Grout the wall in a semi continuous operation to the top.



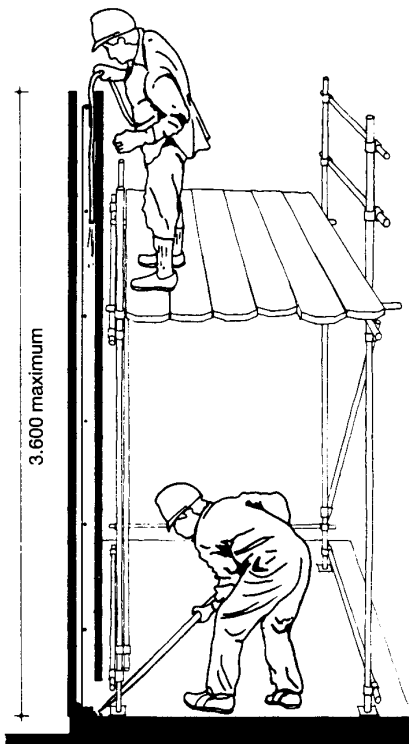
**Step 3.** Consolidate with vibrator or by rodding as work of filling proceeds to the top.



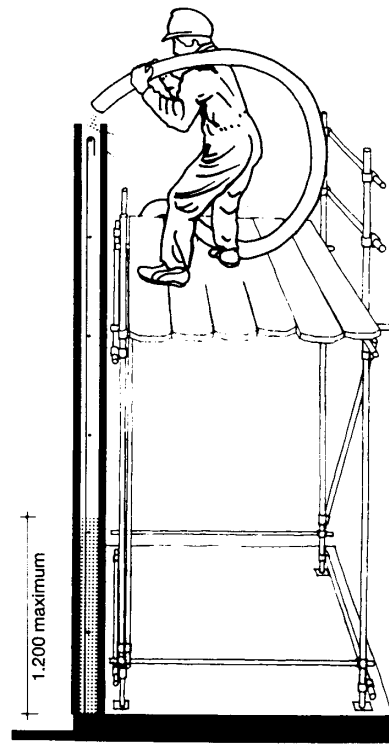
**Step 4.** After waiting for expansion, trowel down and recompact the top surface of the expanded grout. An alternative method is to place a weighted board on top of the wall to contain the expansion.

## 2. High lift grouting without expansive admixture

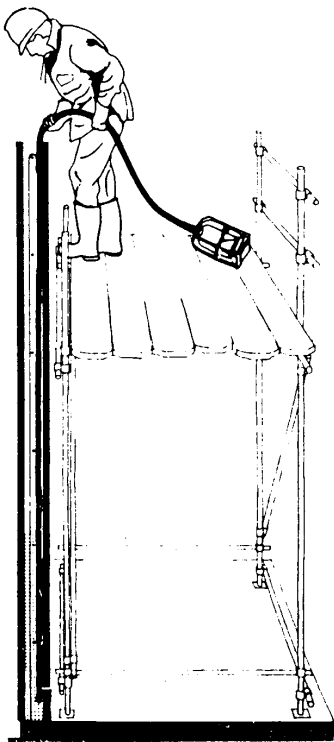
Follow Steps 1-11 as illustrated.



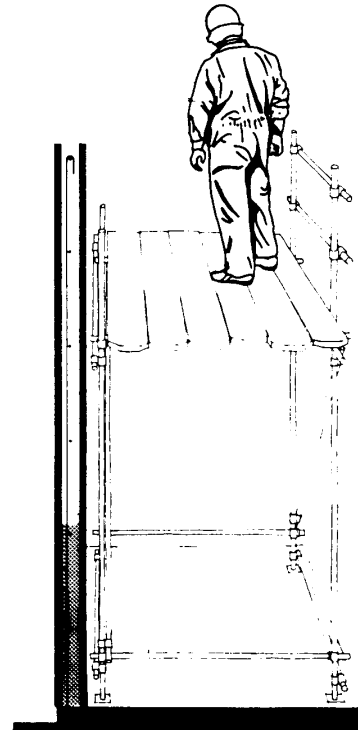
**Step 1.** Clean out grout space and remove all debris and loose material from construction joint.



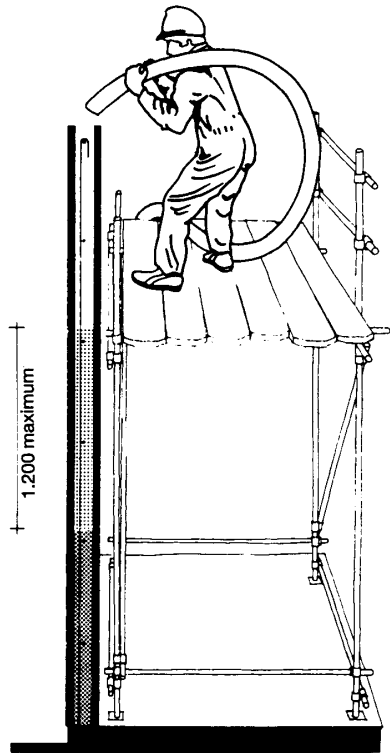
**Step 2.** Grout first lift to maximum depth of 1.200 m.



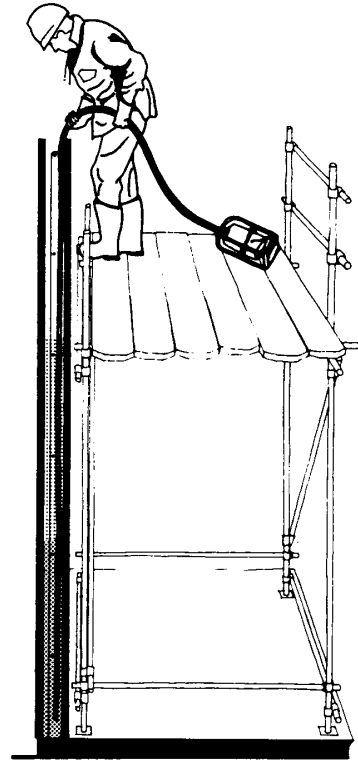
**Step 3.** Consolidate first lift with vibrator.



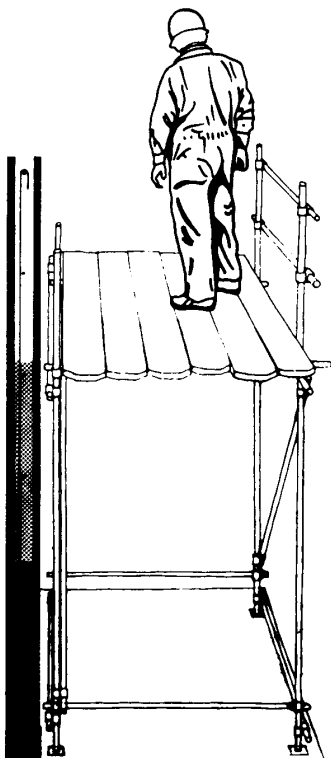
**Step 4.** Move on from this location. Leave for between 15 and 60 minutes to allow grout to become plastic.



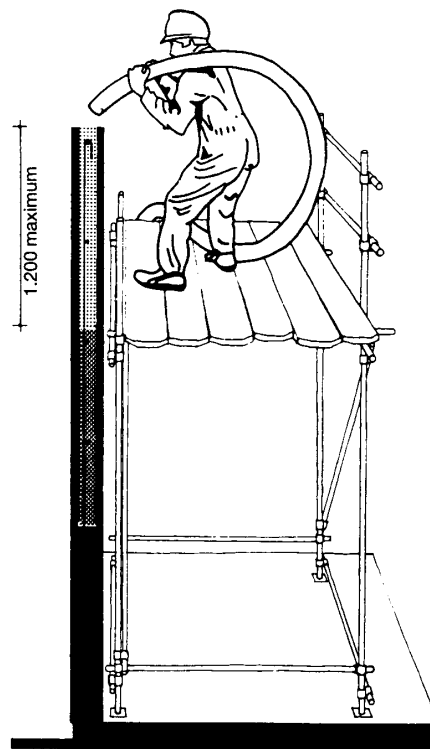
**Step 5.** Return to initial position. Pour next 1.200 m lift of grout.



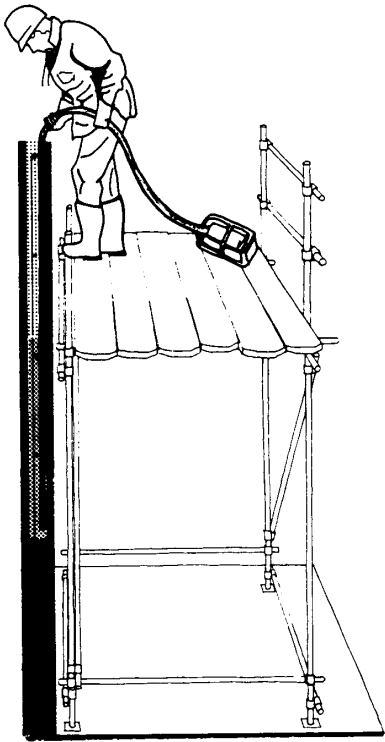
**Step 6.** Consolidate this lift and reconsolidate lower lift with vibrator.



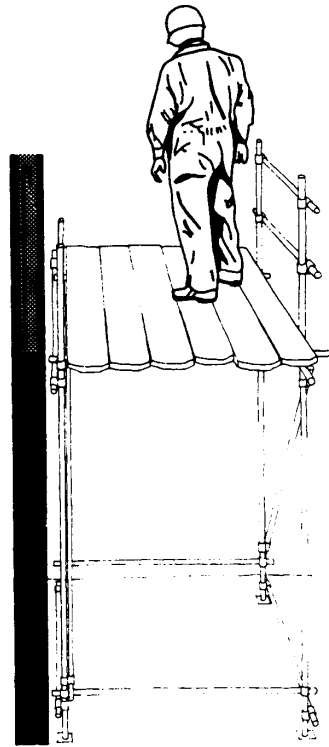
**Step 7.** Move on from this location. Allow between 15-60 minutes for grout to become plastic.



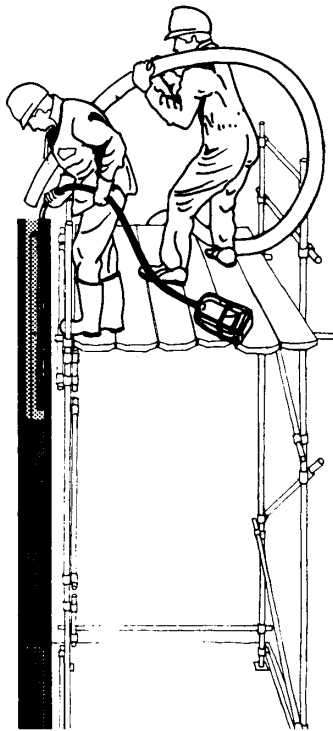
**Step 8.** Return to position. Pour final lift of grout.



**Step 9.** Consolidate this lift and the one immediately below with vibrator.



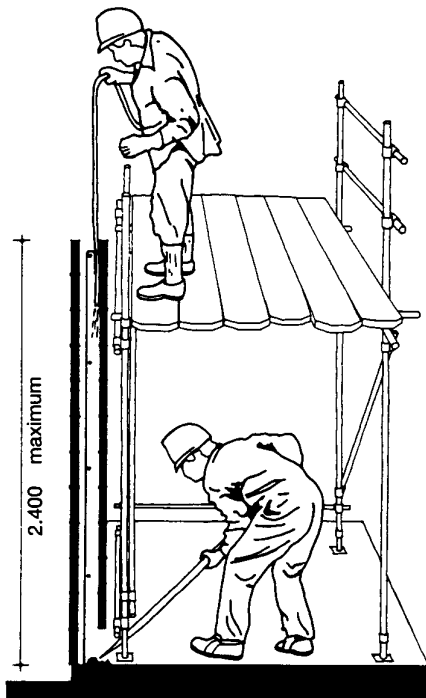
**Step 10.** Move on from this location. Allow between 15-60 minutes for grout to become plastic.



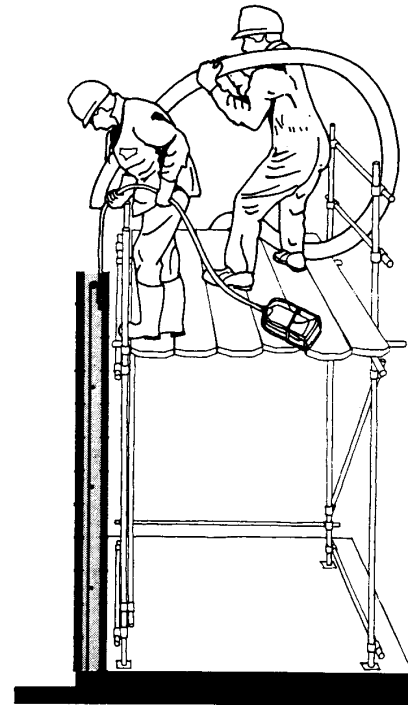
**Step 11.** Return and reconsolidate final lift, topping up as required.

### 3. High lift grouting with reduced compaction

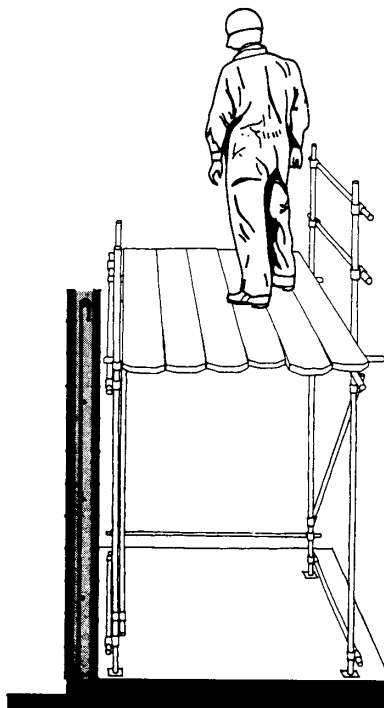
Follow Steps 1-4 as illustrated.



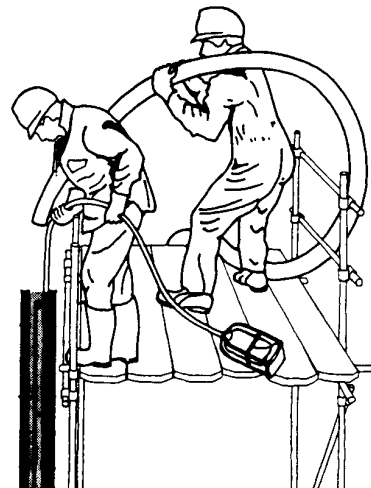
**Step 1.** Clean out grout space and remove all debris and loose material from construction joint.



**Step 2.** Grout wall to full height (2.4 m maximum) with continuous vibration.



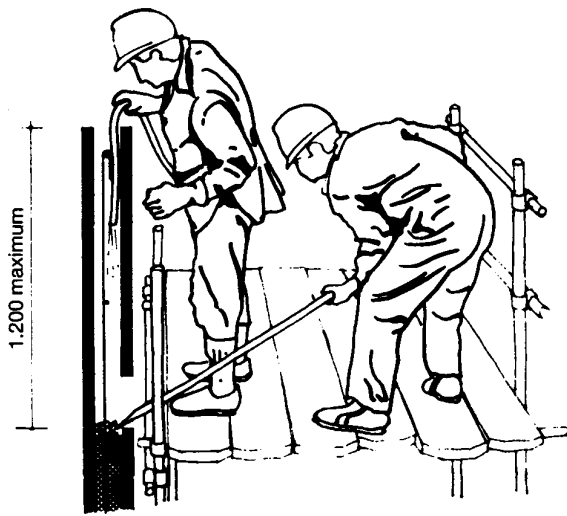
**Step 3.** Move on to another section of wall. Allow between 15-60 minutes for grout to settle and become plastic.



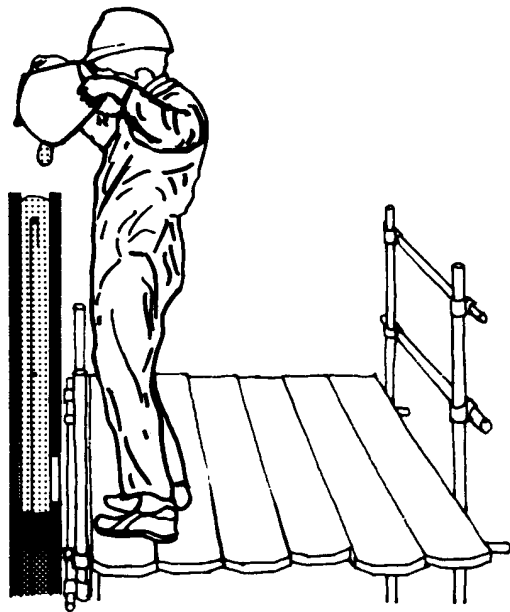
**Step 4.** Return to location and reconsolidate with mechanical vibration, topping up with grout as required.

## 4. Low lift grouting

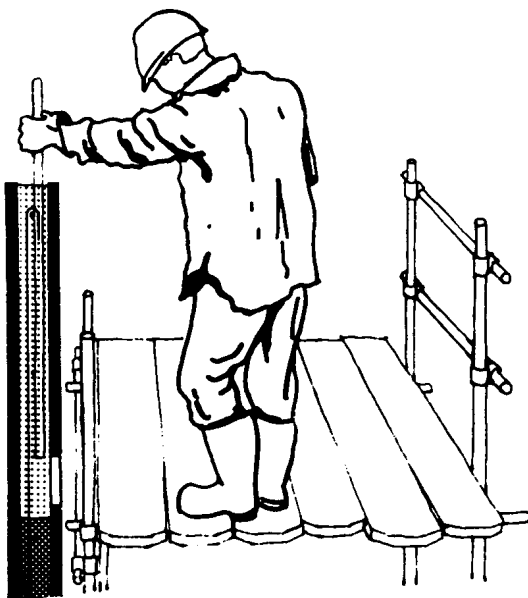
Follow Steps 1-4 as illustrated.



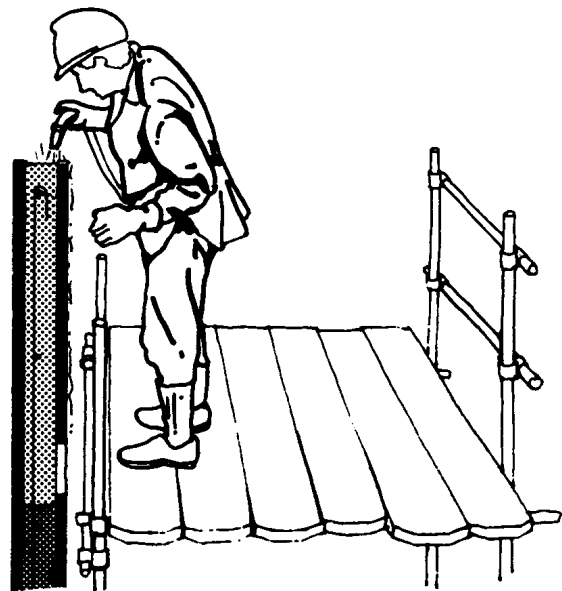
**Step 1.** Clean out grout space and remove debris.  
\*200 mm maximum when grout space is 50 mm or more; 400 mm maximum when grout space is less than 50 mm.



**Step 2.** Block clean-out port and pour in grout.



**Step 3.** Consolidate the grout. Rodding is allowed for low-lift grouting. A broom handle is satisfactory for this function.



**Step 4.** Prepare construction joint by washing off laitance soon after grout has set.

## CHECKLIST BEFORE GROUTING

1. All debris has been removed from the base of the wall.
2. Check the wall for plumb. Tolerance 10 mm in 3 m within a storey.
3. Check the wall for straightness. Tolerance 5 mm in 10 m: 10 mm any length over 10 m. (Overall position of wall in structure presumed checked at first course setting out).
4. Reinforcement steel tied to starter bars.
5. Reinforcement steel within  $\pm 50$  mm or  $\frac{1}{4}$  the length on an individual grouted cell.
6. Minimum 6 mm clearance from a face shell. (Note special project conditions may require 15 mm).
7. Vertical steel within  $\pm 50$  mm or  $\frac{1}{4}$  the length on an individual grouted cell.
8. Vertical steel adequately laterally supported to prevent movement during grouting. Support interval 1.2 m/10 mm; 2.4 m/12 mm; 3.6 m/16 mm.
9. Lap length of 300 grade reinforcement should be checked with drawing. Typical lengths are 400 mm for 10 mm, 480 mm for 12 mm and 640 mm for 16 mm.

10. Adequate formwork to clean out openings.
11. Correct grout ordered: strength, spread, maximum aggregate size.
12. Appropriate grouting methods chosen:  
HLA 1  HL2  HLRC3  LL4
13. Grouting gear available:
  - For methods 1 and 4, 20/25 mm vibrator or rodding bar at least 16 mm diameter with length to suit wall depth.
  - For methods 2 and 3, 20/25 mm vibrator.

## CHECKLIST AFTER GROUTING

1. After filling and waiting:
  - Revibrate and top of methods 2, 3, 4.
  - Trowel down expanded grout top method 1.
2. Construction joint, if required, lightly brush/wash the grout surface after initial set.
3. In hot weather protect wall top from premature drying out.
4. Remove any grout spills on wall surface.

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