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Consolidation of Concrete in CONFORM®

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1. **Consolidation is the process of compacting fresh concrete and of eliminating honeycomb and entrapped air, within the forms and around embedded items and reinforcing steel.**
2. Consolidation is accomplished through vibration either by hand or by mechanical means. The method chosen in CONFORM® is dependent on many factors such as, the consistency of the concrete, the thickness of the walls, the amount and spacing of reinforcing steel placed in the walls, the ambient temperature and the wall temperature.
3. The consistency of the concrete is affected by the type of cement, the type of aggregate and the size of aggregate. Typically, the cement is type 10 Portland Cement and the water/cement ratio is 0.55 maximum. The size of aggregate is 10 mm (3/8") maximum. Also, rounded or pea gravel aggregate is recommended.
4. The slump is a major factor affecting the consistency of the concrete. The slump at point of discharge should be 115 to 130 mm (4 1/2" to 5"). This may require an initial slump of 150 to 175 mm (6" to 7") at the truck. The slump should be measured at the truck and at the end of the pump hose for the first concrete truck. Slump should be measured for all other trucks as appropriate to ensure the proper slump is provided. A higher than normal cement content may be required to provide the desired slump and workability. The use of plasticizers or super-plasticizers is not recommended.
5. The wall thickness and the type of CONFORM® components will affect the flow of the concrete. For example, the concrete flow is less in a CF4 wall with numerous small components than in a CF8 wall with standard box and panel components.
6. The quantity and size of vertical and horizontal reinforcing steel will affect the flow of the concrete. Congested areas of reinforcing steel, such as hooked bars at corners, will reduce the flow of the concrete. Therefore, additional external vibration is required in these areas.
7. In hot climates, the temperature of the walls can be high and the flow of the concrete may be greatly reduced. Immediately prior to placing concrete, it is recommended that the interior of the CONFORM® be sprayed with water to prevent adhesion of the cement paste to the interior surface of the forms, especially if the wall temperatures are above 35°C. Also, refer to Nuform Construction Bulletin #6, Hot Weather Requirements.
8. **Only external surface vibration or hand rodding is recommended for CONFORM®.**
9. Surface vibration of CONFORM®, that contain a minimal amount of reinforcing steel, usually consists of a rubber mallet tapped, repeatedly, on the wall to ensure that there are no voids and that the concrete has settled.
10. Surface vibration of CONFORM® at items that are cast in the wall such as anchor bolts and steel lintels consists of a rubber mallet tapped vigorously on the wall around the cast-in item to ensure that there are no voids. Also, additional vibration may be required by rodding the concrete immediately adjacent to the cast-in items.
11. Hand rodding, that is, thrusting a tamping rod or other suitable tool into the concrete and lifting it repeatedly, can be effective in consolidating the concrete. The tool must be long enough to extend to the bottom of the form and thin enough to pass between the reinforcing steel and the form.
12. Surface vibration of CONFORM® with horizontal reinforcement needs to be more vigorous than tapping with a rubber mallet and therefore a mechanical vibrator or the guard of an operating quick-cut saw can be held on the exterior face of the walls. The thickness of the wall and the quantity of vertical and horizontal reinforcement will determine the amount of vibration necessary to consolidate the concrete.
13. **Internal mechanical vibration with immersion-type or pencil vibrators is not recommended for CONFORM®.**
14. It must be noted that internal mechanical vibration usually causes over vibration that can result in serious problems such as blow-outs of the wall face, bulges in the wall face from broken webs, bowing of the wall faces between webs and curving of the walls at ends and intersections.
15. All CONFORM® must be monitored during placement of concrete for bowing of the wall faces which indicates that the concrete pressure is becoming excessive and vibration is too great.
16. **Consolidation of concrete is essential in CONFORM® to maintain the moisture barrier, vapour barrier and air barrier properties of the CONFORM®. Failure to do so may result in voids that could cause moisture and air leaks at the joints. All CONFORM® must be checked for voids by tapping on the face of the wall.**

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