

# OPERATING INSTRUCTIONS

**IMPORTANT: PROPER OPERATING TECHNIQUE IS EXTREMELY IMPORTANT AND SPECIAL ATTENTION MUST BE PAID TO THIS SECTION TO UTILIZE THE FULL BENEFITS OF THIS TOOL AND ACHIEVE MAXIMUM CONSOLIDATION OF THE CONCRETE BEING WORKED.**

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1. Vibrator operators must be properly trained and have a full understanding of the basic principles of how an internal vibrator works. Inside the vibrator head, an unbalanced weight called an eccentric is turned at a high RPM by a flex-shaft drive core attached to the motor. This causes the vibrator head to oscillate with an extreme centrifugal force and when immersed into freshly placed concrete creates a field of vibrating action.
2. The purpose of this field of vibration is to consolidate concrete. The vibration causes the concrete to act and be manipulated as a liquid, by forcing out entrapped air, evenly dispersing the aggregate, and filling in the voids of tight spaces. This consolidation increases compressive strength and bond between concrete and rebar after the structure is cured. Concrete consolidation decreases water permeability, honeycombing, and loss of structural integrity due to entrapped air and aggregate segregation.
3. It is important to choose the proper shaft length, head diameter and motor size for the concrete application at hand. The major determining factors include rebar spacing, depth, width or shape of forms and consideration must be given to the consistency of the concrete mix pertaining to concrete slump and aggregate size. Generally speaking, a large aggregate and a dry low slump concrete will require a larger diameter head and a more powerful motor than a high slump, small aggregate concrete mix. Head diameter is one factor that determines the size of the effective diameter of vibration in concrete. Approximate effective diameters per head size are listed on page 7 of this manual.
4. To vibrate properly, it is best to insert a vibrator head vertically and rapidly to the bottom of the form or the last lift of concrete. A vibrator head moving downward will start to liquefy the concrete, but basically creates its own void at this point. The true process of vibration occurs during the lift upwards as the field of action around the vibrator head is pulled up slowly and methodically, forcing entrapped air from underneath aggregate and reinforcement, up the sides of the form and out of the concrete. It is important to make this lift slowly so that the void left behind by the vibrator head has time to refill within the field of action, leaving behind the consolidated concrete of the finished product.
5. Good timing while lifting a vibrator head upward through the concrete is one of the most crucial technique skills required of a vibrator operator and determines the quality of the consolidation in the finished structure. If the timing of the pull is executed too fast, erratically, or inconsistently, zones of unconsolidated voids will be left behind in the concrete. For the vibrator operator, removing the vibrator head must be thought of as slowly chasing entrapped air upward one zone at a time with the lower zone blending into the one above as the vibrating field of action passes through. There are many factors involved with the proper amount of time for a vibrator to consolidate, but an average general rule is to pull up the vibrator head at a rate of 20 seconds for a 5 foot lift. Approximately 3 inches per second.



6. It is important to pay special attention to the spacing between the insertions of the vibrator head. The field of action or the effective diameter around the head must always overlap the effective diameter from the previous insertion. The operator should perform the overlapped insertions in sections, being aware not to skip over any areas. Observe the surface of the concrete to determine the size of the effective diameter. Larger heads, more powerful motors and high-slump concrete will create a larger effective diameter. As a general rule, in most situations, the effective diameter is usually 8 times the vibrator's head diameter.

7. There are clues that help an operator judge when proper consolidation has taken place. The concrete surface will take on a sheen and large air bubbles will no longer escape. Listen to and feel the vibrator motor. The motor will change in pitch and tone, when consolidation has occurred. This change in action can actually be felt by the operator. These signs will indicate the right time to resume a lift in a wall or move the vibrator head to the next overlapped area of unvibrated concrete. Different consistencies of concrete mixes requires different vibrator operating techniques. Generally, a dryer low-slump concrete will have a smaller effective diameter and will take a longer period of time to properly consolidate.

8. If a vibrator head becomes wedged and stuck in reinforcement, turn the vibrator motor and shaft to the left while pulling. This will tighten the vibrator head while rolling and walking it out of the reinforcement. Vibrators are different from other tools because they can only be effective when the concrete is in a very short lived state of workability. Never start a concrete job without a spare vibrator on hand.

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### THREE TECHNIQUE RULES A VIBRATOR OPERATOR MUST OBSERVE:

1. Good timing while lifting a vibrator head.
2. Make sure to properly space head insertions to overlap radius of action.
3. Work the vibrator head vertically not sideways.

### THREE SIGNS THAT CONCRETE HAS ACHIEVED PROPER CONSOLIDATION:

1. Concrete surface has leveled and taken on a sheen.
  2. Large air bubbles no longer escape the concrete.
  3. A change in the pitch, tone, and feel of the vibrator motor.
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