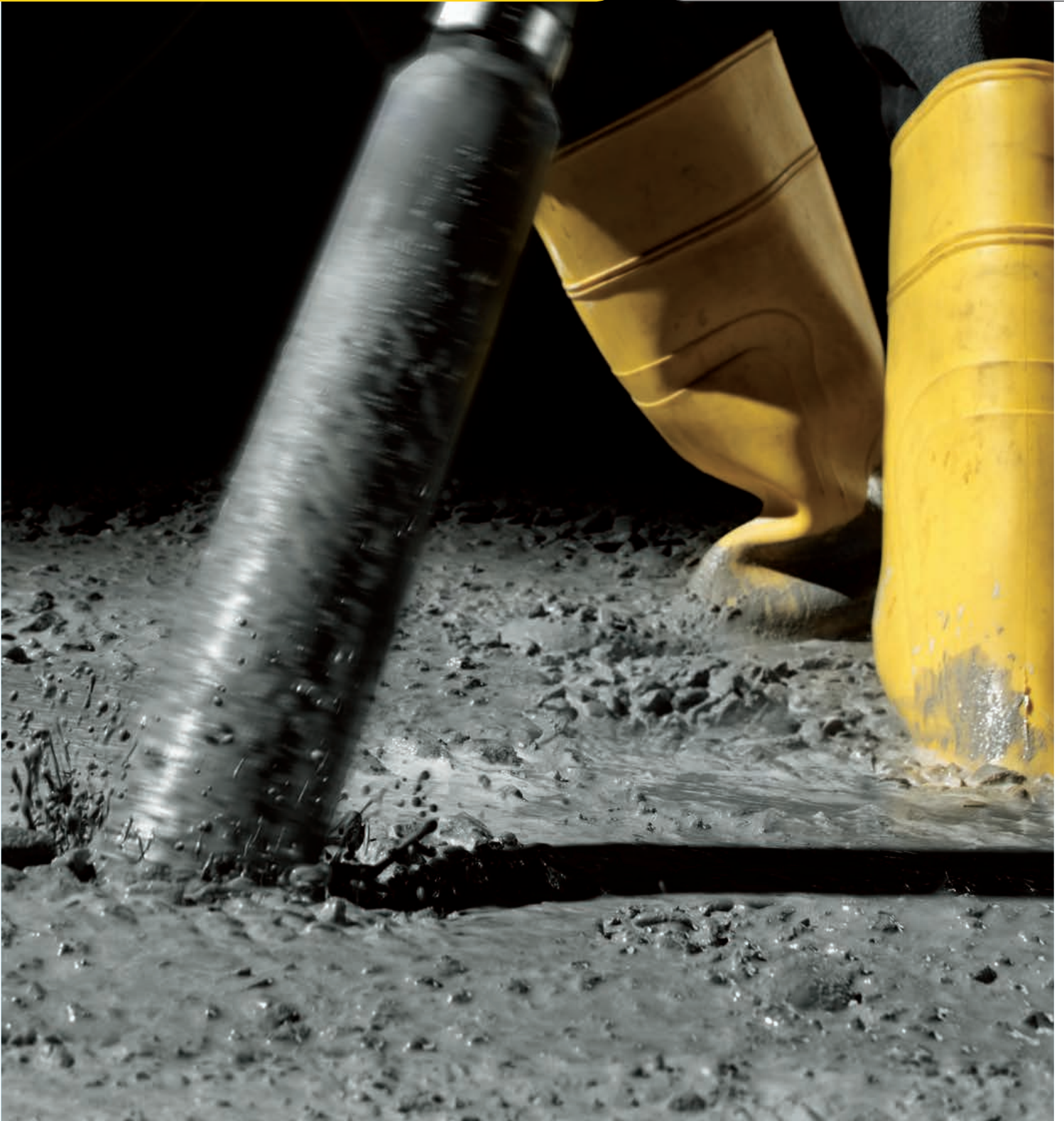


# Quick Guide to Vibrating Concrete



**WACKER  
NEUSON**

*all it takes!*



# Quick Guide to Vibrating Concrete

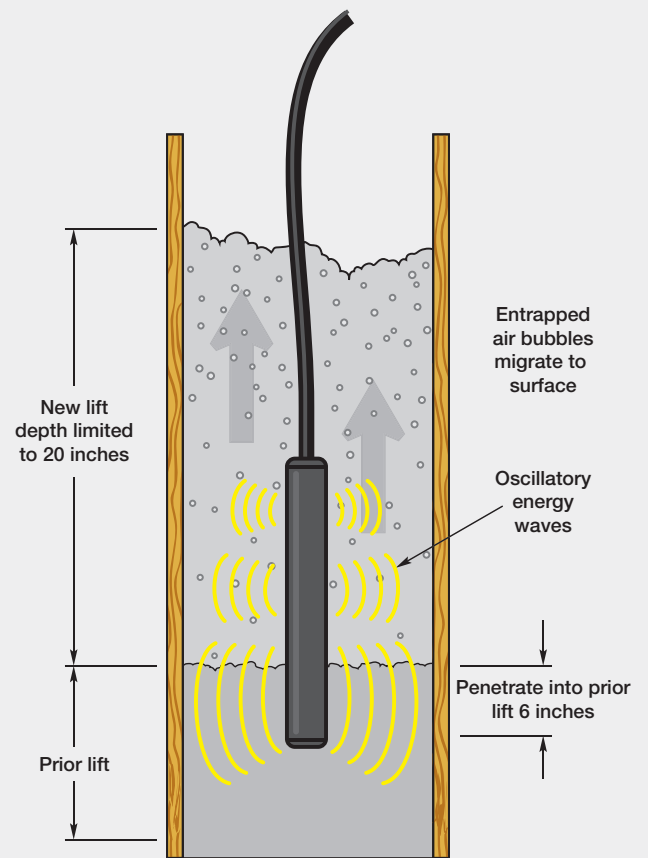
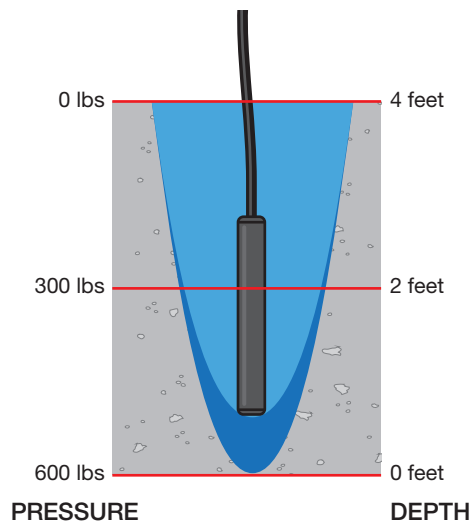
The creation of this quick guide is in part combined experience of experts in the field, proven consolidation products, and ACI 309-Concrete Consolidation guidelines. It covers both internal and external vibration product applications and best recommended practices. **Please note that even with the best situation, product, and technique, a perfect looking end product is typically impossible to obtain.**

## INTERNAL VIBRATORS

### Lift Depth

ACI 309 guidelines state that a 20 inch lift depth will yield the best results for consolidation by vibration. Most contractors have achieved good results however using 4 foot lifts. The diagram below details how form pressure and concrete weight can play a role in reducing optimum results.

**Normal concrete weighs about 150 pounds per cubic foot and produces 150 pounds of pressure for each foot of concrete in the form, regardless of form width. Too deep of a lift can result in excessive load pressure on the head of the vibrator and at the bottom of the form during vibration.**



### Insertion Rate: Internal Vibration

Recommended timing for vibrator insertion into plastic concrete is as follows:

1. Insert the head as quickly as possible.
2. Leave at the bottom of the lift for 5 seconds doing a slight jiggling motion.
3. Withdraw at a rate of 1-2 inches per second. For example a 20 inch lift will take about 10-20 seconds to vibrate properly after jiggling. Remove head quickly out of concrete at top of lift.
4. For each new lift, penetrate 6 inches into the lift below it first, and repeat step 2.

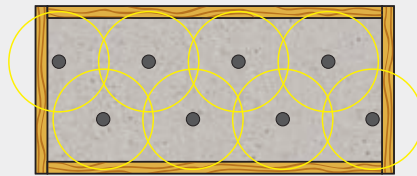
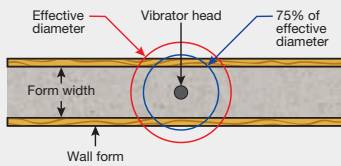
Pre-marking the shaft with tape will help determine how deep the vibrator is going into the concrete.



# INTERNAL VIBRATORS

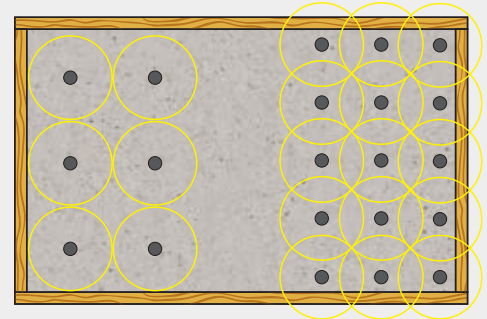
## Insertion Spacing: Internal Vibration

The industry best practice for vibrator insertion spacing is shown below. Each head will give a vibration diameter that can be measured by the operator. This will be different with head size and other factors including concrete slump. The general rule of thumb is inserting the head at 1.5 x's the radius of the affected area or multiply the diameter by 75% or .75. When choosing a head size for walls, it should overlap the wall by 2-3 inches. If the wall is larger than the diameter given off by the head it will be necessary to follow the Wide Wall diagram below. A good starting point for head size to consolidation diameter is: **head size x 10-15 will give you a good idea of what head to choose. For slabs, go with the largest practical yet economical size.**



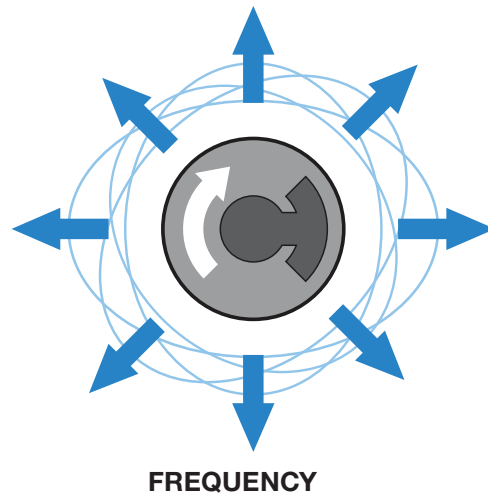
**WRONG**

**CORRECT**

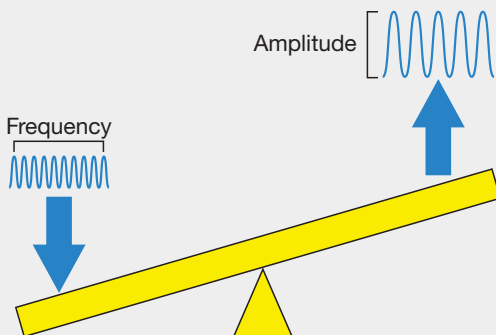


## Frequency and Amplitude

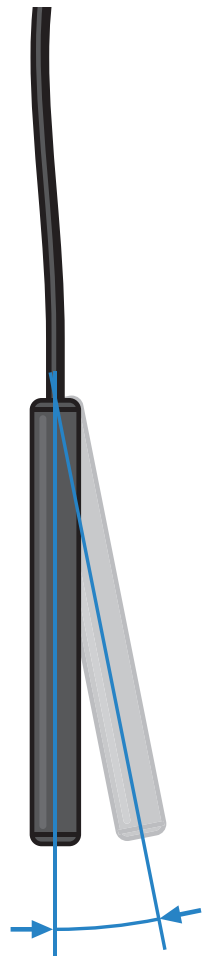
Frequency and amplitude are the 2 key factors when choosing the proper consolidation products for your job. They act in an inverse relationship in that as frequency goes up, amplitude goes down and vice-versa. **All of the products Wacker Neuson makes for concrete consolidation meets the recommended frequencies and amplitudes recommended by ACI 309 for both internal and external vibration.** A later section of this guide covers two simple methods to check your equipment to make sure the products are running at optimum levels for your project. (See recommended frequency ranges)



Frequency is how many times the head moves per minute and amplitude is how far from the center point. The number is different for internal versus external due to the nature of the vibration energy given.



**AMPLITUDE**



# EXTERNAL VIBRATORS



External vibrators are used in several applications where internal vibrators can't. This includes under window openings, cantilevered forms, very tall walls, and where heavy reinforcing steel interferes with head insertion.

Wacker Neuson Corporation offers several form clamps to fasten to almost any form type and material. The clamps and AR26 motors can be mounted horizontally or vertically to the form beams to direct the energy into the forms and concrete inside them. Wood beams will absorb more of the energy and may need to be vibrated longer than metal.

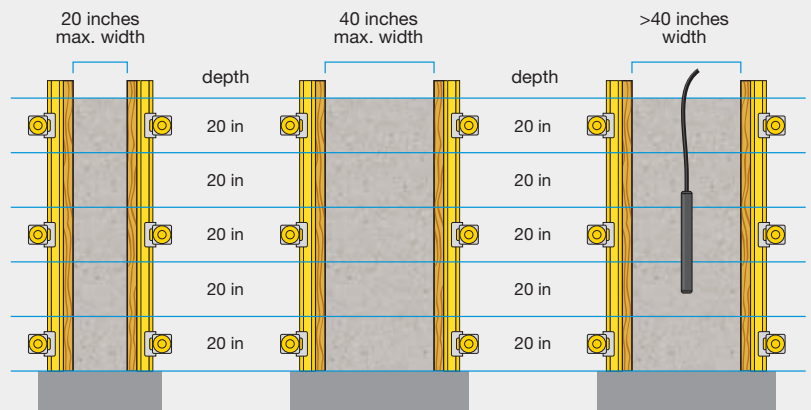


AR26 motor with SV53 clamp. Jaws can be reversed to work with wood or metal beams.



## External Rules

1. Motors should be located 1 foot from bottom and corners and 3-4 feet apart.
2. Take length of wall and divide by 4+1 to get good estimate of motors needed for 1 course.
3. Typically need 2 courses.
4. Start motors at half of lift at half power, increase to full at lift depth height.
5. Run 3-5 minutes.
6. Premark forms for next location as you leap frog motors up the form face.
7. Mock up panel is highly recommended.
8. Follow form depth recommendations at right.








Any form over 40 inches wide should be supplemented internally. Results depend on concrete slump.

# Recommended Frequency Ranges Under Load

Internal Consolidation: 9000-12000 vibrations per minute (vpm)

External Consolidation: 3000-6000 vibrations per minute (vpm)

Choosing the right vibrator for the job - VIBRATOR SELECTION CHART

Type of vibrator		Residential walls and footings	Structural columns/pylons, highway barriers	Bridge structures	Heavy reinforcing vertical structures	Tall structures > 30 feet	Thick slabs with reinforcing > 6 inches	Curb and gutter placement	Slab edges with dowels
	Modular internal vibrators	X	X	X		X	X	X	X
	High cycle internal vibrators	X	X	X		X		X	
	Gas powered backpack vibrators	X					X		X
	External form vibrators	X	X	X	X	X			
	Vibratory surface screeds						X		

The chart above highlights the various vibrators available and their recommended best practices. All of the above products mentioned are designed to run at the optimum levels to achieve the best results for the application. High cycle or high cycle vibrators lose very little power when placed in the concrete or when under load due to the nature of the motor in head design. Wacker Neuson high cycle vibrators are unique in the industry in that they don't need

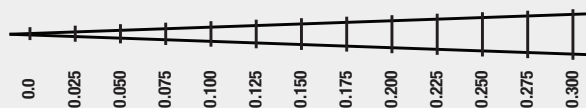
a special inverter to run. Just plug into a common 120V outlet on a generator. Rubber coated heads are available for epoxy coated rebar applications for both modular, backpack, and high cycle vibrators.

Walk behind screeds run at a range of 4000-6000 rpms. This gives the screed a higher amplitude and lower frequency which is beneficial for slab consolidation and leveling of the concrete surface.

## Checking your equipment

Checking the frequency and amplitude prior to starting any job is key to a successful pour. There are several ways for doing this, but the quickest and easiest is shown below

Amplitude of vibration indicator









The optical wedge is a decal you attach to the head with the V pointing down, and the tachometer you hold onto the head or shaft to check frequency.



Amplitude-Indicator Frequency-Reed Tachometer



## Shaft chart

	SM 1-E	SM 2-E	SM 3-E	SM 4-E	SM 5E	SM 7-E		
H25S								
H25HA	M1500		M2500					
	SM 0-S	SM 1-S	SM 2-S	SM 3-S	SM 4-S	SM 5-S	SM 7-S	SM 9-S
H35S								
H35HA	M1500		M2500					
H45S								
H45HA								
H50HA								
H65								
HR48								
HR65								
HR70								
HR70S								
	SM 3-E	SM 4-E	SM 5-E	SM 3-S	SM 4-S	SM 5-S		
H25HA								
H35HA	BV50A-H							
H45HA								
HR48								
H50HA								

T-handle Guide 

Green M1500  Red M2500 

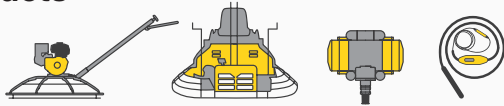
H = Vibrator Head (Number = Head diameter in mm), HA = High Amplitude, S = Short head  
SM = Flexible Shafts (Number = Length in meters, 0 = 0.5 meters), E = Economy, S = Standard  
BV = Backpack Vibrator, 50 = cc engine, A = Honda

# Recommendations:

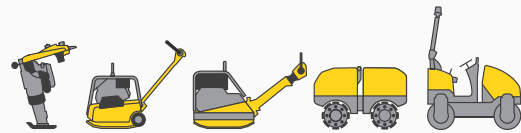
- Recommended shaft length and head for the BV50A-H is a SM3-S (10 foot) shaft and H45HA (1.8 inch) head.
- Vibrate concrete in front of you, not beneath.
- Read the operators manual for recommended maintenance intervals.
- Don't hang or hold internal vibrators by the cord attached to the motor.
- You are more likely to under-vibrate than over-vibrate.
- Make sure external motors are tightly mounted to clamps which are centered and clamped tightly on form member.
- Consider a mock up panel.



## PRODUCTS



Concrete technology



Compaction



Excavators



Wheel loaders



Telehandlers



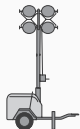
Skid Steer Loaders



Dumpers



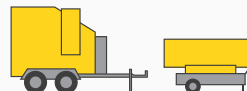
Generators



Lighting



Pumps



Heaters



Certified Used Equipment

## Services



Warranty Program



Flexible Financing



Wacker Neuson University



EquipCare



The concrete specialists

## Spare parts



Spare Parts

Sustaining Member of



American Concrete Institute  
*Always advancing*

[www.wackerneuson.com](http://www.wackerneuson.com)