

# Vipros 255 With Fanuc 18P Control User Pre-installation Guide



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## ***Warning***

- ❑ Qualified personnel must complete all work.
- ❑ Do not apply power to the Vipros 255 until an A.E.S.I. (Amada Engineering and Service Incorporated) Engineer is present and has instructed you to do so.
- ❑ Considerable effort has been made to ensure that this manual is free of inaccuracies and omissions. However, as we are constantly improving our product, some of the data contained herein may be out of date. Please check our Internet site, <http://www.amada.com>, for the latest release of this document.

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## Introduction

This manual describes the tasks that the purchaser of a Vipros 255 must complete before calling A.E.S.I. (Amada Engineering and Service Incorporated) to complete the installation and operator training.

An overview of the preparations is as follows:

- Plan the location of the Vipros 255 in the shop, taking into account all of the optional equipment involved and the Safety / Maintenance areas indicated on the floor plan. See page 16, *Planning the Location of the Vipros 255*, for details.
- Prepare the Vipros 255 foundation as required. See page 25, *Foundation Requirements*, for details.
- Uncrate the Vipros 255 and SBC EX3.0 chiller and place them on the floor, do not fill the anchor-bolt holes (if used) until after A.E.S.I. completes the initial installation.
- Install the electrical supply. See page 13, *Electrical Supply Requirements*, for details.
- Install the pneumatic supply. See page 15, *Pneumatic Supply Requirements*, for details.
- Remove the protective coating from the surface of the machine. See page 35, *Removing the Protective Coating*, for details.

Note: It is the purchaser's responsibility to install any safety devices to ensure operator safety.

## Motion Package Specifications

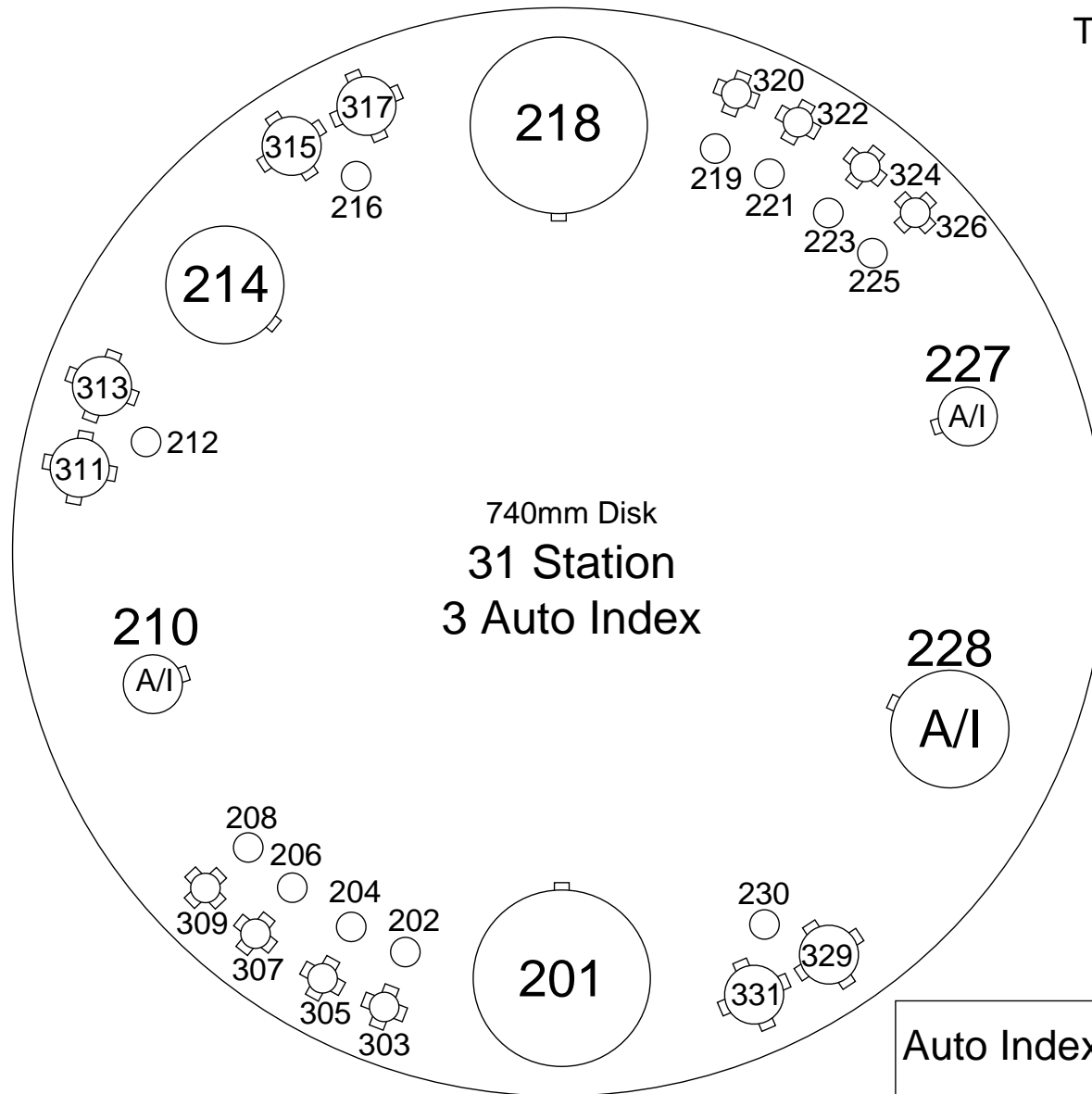
Travel Method	X and Y axes work piece movement
Control Method	X, Y, T & C
Drive Motors	Fanuc AC Servo (X, Y, T, C)
Maximum Sheet Size	50.0" (Y) x 100.0" (X) with one repositioning cycle
Maximum Sheet Thickness	0.250" with Ball Transfer Table 10 gage (0.135") with Brush Transfer Table
Maximum Material Weight	220 lb.(F4), 110 lb. (F1) with Ball Transfer Table 110 lb.(F4), 110 lb. (F1) with Brush Transfer Table
Maximum Axis Travel	50.0" (X) x 50.0" (Y)
Max. Linear Table Speed	2559 IPM (X), 1968 IPM (Y),
Punching Accuracy	±0.0027" (standard), ±0.002" (high accuracy mode)
Positioning Accuracy	±0.0014"
Repeatability	±0.0006"

## Punching System Specifications

Press Capacity	22 Tons		
Press Stroke	1.575"		
Stroke Rate (X/Y)	Pitch	Stroke	Stroke Rate
	0.079"	0.098"	1000 (X only)
	0.079"	0.118"	720/510
	0.079"	0.236"	545/470
	0.315"	0.315"	410/380
	1.000"	0.315"	340/280
Maximum Hole Diameter	3.5"		
Tool Type	Amada Thick Turret		
Turret Rotation Speed	35 RPM		
Turret Capacity	31 Stations (3 auto-index)		
Feed Clearance	0.787"		

### 31 Station - 3 Auto-Index Turret Configuration

Turret used in the following Models  
Vipros 255, Vipros 2510 King



	Maximum Size Round	Number of Stations (keyed)
A	1/2" (12.7mm)	19 (8)
B	1 1/4" (31.7mm)	6 (6)
C	2" (50.8mm)	1 (1)
D	3 1/2" (88.9mm)	2 (2)
Auto Index	B 1 1/4" (31.7mm)	2 (2)
	C 2" (50.8mm)	1 (1)

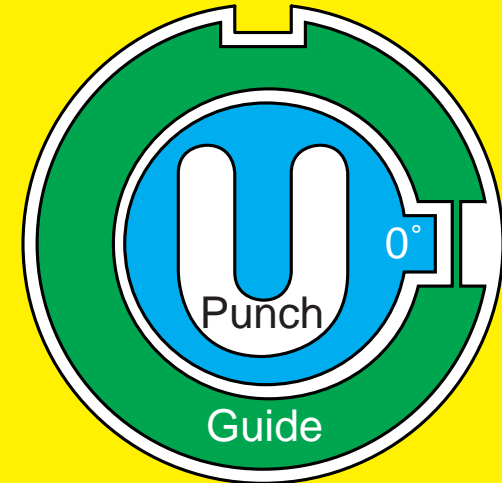


## B-Size Auto-Index

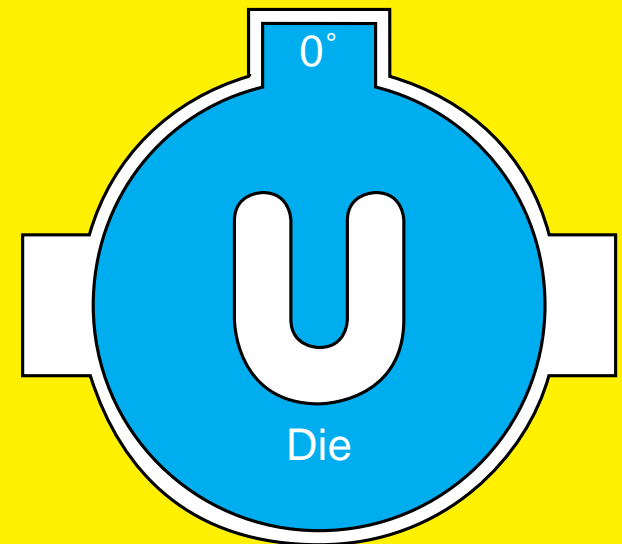
Care must be used when installing or ordering special shape punches and dies for use in the Vipros 255 B-Size Auto-Index station as the station is not keyed in the standard 0° position.

All existing punches and dies not keyed per this drawing must be loaded as the keying permits and compensated for in the G-code program.

New Punch Guides and Dies should be ordered keyed to orient the punch and die properly.



B-Size Auto-Index  
Upper Turret Punch Holder



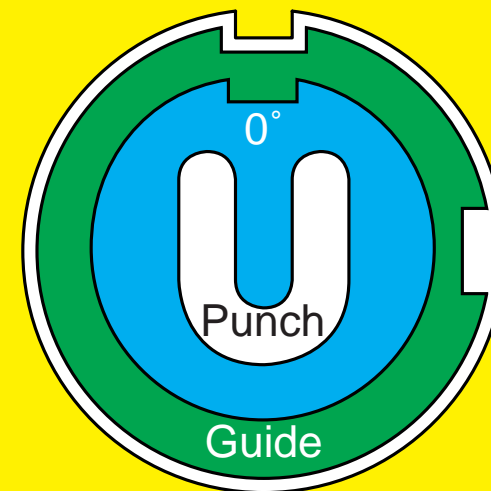
B-Size Auto-Index  
Die Holder Lower Turret

## C Size Auto Index

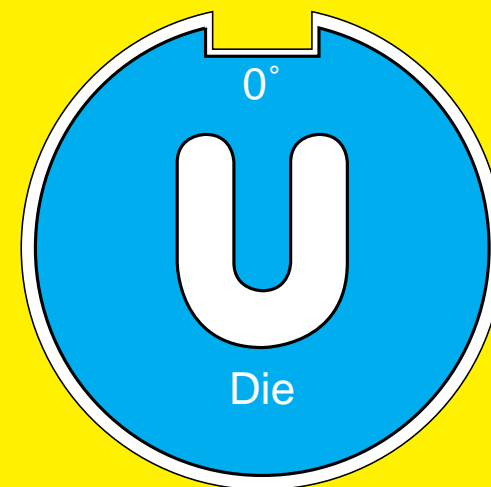
Care must be used when installing or ordering special shape punches and dies for use in the Vipros 255 C-Size Auto-Index station as the station is not keyed in the standard  $0^{\circ}$  position.

All existing punches and dies not keyed per this drawing must be loaded as the keying permits and compensated for in the G-code program.

New Punches, Guides and Dies should be ordered with keying to orient the punch and die properly.



Upper Turret  
C-Size Auto-Index Punch Holder



Lower Turret  
C-Size Auto-Index Die Holder

## CNC Controller

Model	Fanuc 18 (with PHNC)
Control Function	X, Y, T & C
Input Method	MDI, Floppy Disk Drive, DNC
Minimum Command Unit	0.001" (X, Y) .01 <sup>0</sup> (C)
Minimum Travel Unit	0.001" (X, Y) .01 <sup>0</sup> (C)
Operating Modes	Automatic, MDI & Manual
Display Modes	Program Contents, Position Information, Program Check, Parameters, Tool Hit Counter, Self Diagnostics
Interlock Displays	Oil Temperature, Door Open

## Hydraulic Systems Specifications

### Power Hydraulic Numerical Control

Ram Cycle Patterns	277 total Punching 2 Nibbling 1 Forming 250 Marking 10 Knockouts 10 Slitting 4
Minimum Increment	0.01mm

### Hydraulic Power Unit

Model	Yuken
Dual Operating Pressure	100 kgf cm <sup>2</sup> & 195 kgf cm <sup>2</sup>
Oil Type	Mobil DTE <sup>®</sup> Excel 46 (formerly called Mobil Hydraulic Oil NZ 46)
Oil Capacity	40 Gallons

## Electrical Supply Requirements

<p>Electrical Power Supply Vipros 255</p> <p>SBC EX3.0 Chiller</p> <p>The Chiller voltage must be specified when machine is ordered.</p>	<p>230 / 460 3ph ±10%, 22 kVA                      56 amps @ 230 / 3 / 60 VAC*                      28 amps @ 460 / 3 / 60 VAC*</p> <p>230 or 460 3ph ±10%, 15 kVA                      38 amps @ 230 / 3 / 60 VAC*                      19 amps @ 460 / 3 / 60 VAC*</p>
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### Optional Equipment

<p>V255hs Conveyor</p>	<p>208 / 230 / 460 3ph ±10%, kVA                      2.1 amps @ 208 / 3 / 60 VAC*                      2.0 amps @ 230 / 3 / 60 VAC*                      1.0 amps @ 460 / 3 / 60 VAC*</p>
<p>MP1225 Loader</p>	<p>200 / 3 / 60 ±10%, 10 Kva                      29 amps @ 200 / 3 / 60 VAC*</p> <p>To operate at 230 / 460 VAC a step up transformer with the following service is required</p> <p>26 amps @ 230 / 3 / 60 VAC*                      13 amps @ 460 / 3 / 60 VAC*</p>

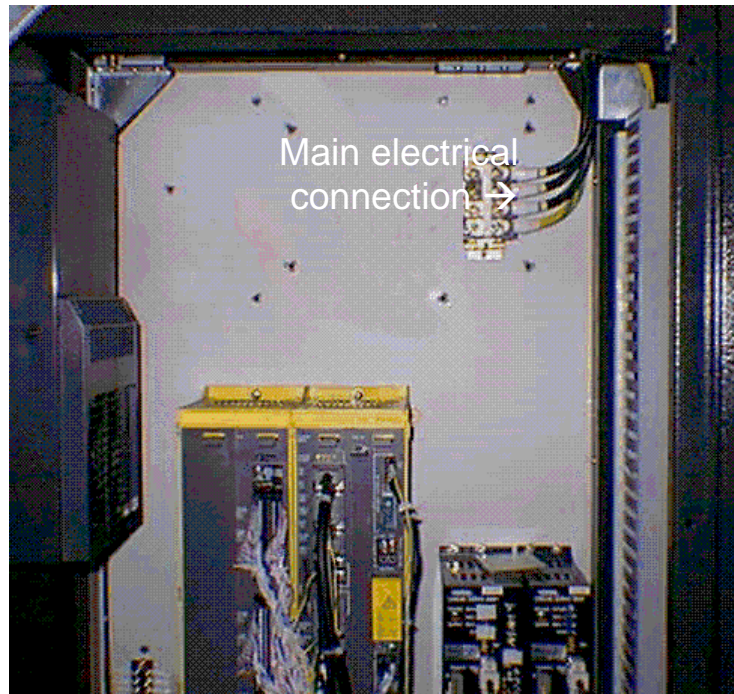
\*The actual supplied electrical service must be sized to allow for starting current of approximately 150% of this value.

## Installing the Electrical Power Supply

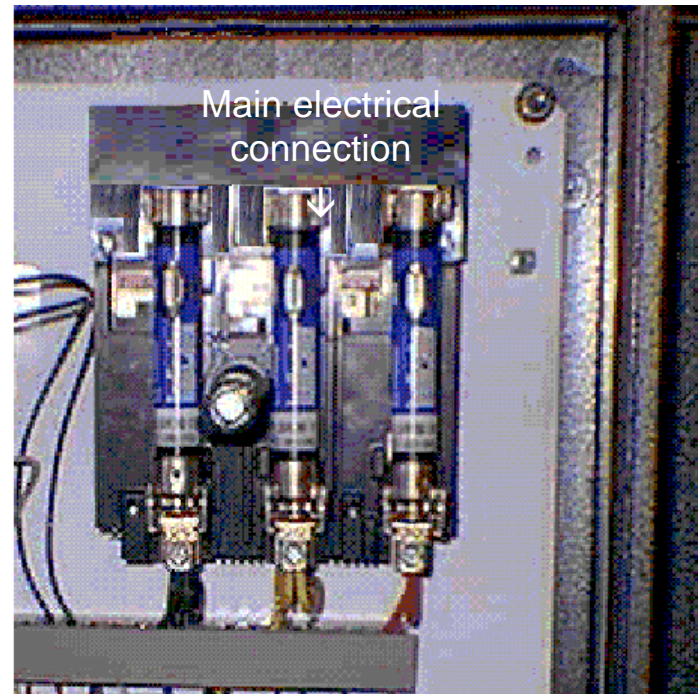
The Vipros 255 requires two separate power sources. The main power source is to the Vipros 255 CNC Unit, the other source goes to the SBC EX3.0 Chiller. The Vipros 255 should be supplied from a power line separate from those for welding machines or other machines that produce electrical noise.

- The Vipros 255 Electrical inlet is 72" above floor level.
- The SBC EX3.0 Chiller Electrical inlet is approximately 53" above floor level.

Vipros CNC unit left side electrical enclosure



Chiller electrical enclosure



## Pneumatic Supply Requirements

Vipros 255	80 psi @ 8.8 ft <sup>3</sup> /min.
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### Optional Equipment

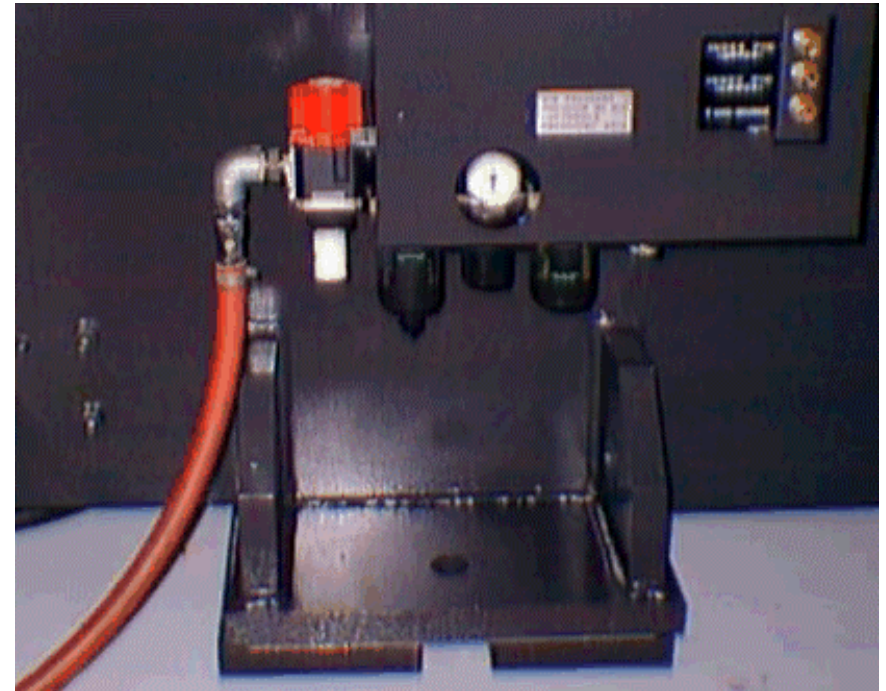
MP1225 Loader	75 psi @ 31.8 ft <sup>3</sup> /min.
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### Installing the Pneumatic Supply

The Vipros 255 must be connected to a compressed air system by hose or pipe. The compressed air must be clean and dry.

Please note the following:

- The minimum inner pipe diameter is ½".
- The air pressure required is 80 psi.
- The air volume required is 8.8<sup>3</sup>ft/min.
- The air inlet is approximately 18" above the floor level.



## Planning the Location of the Vipros 255

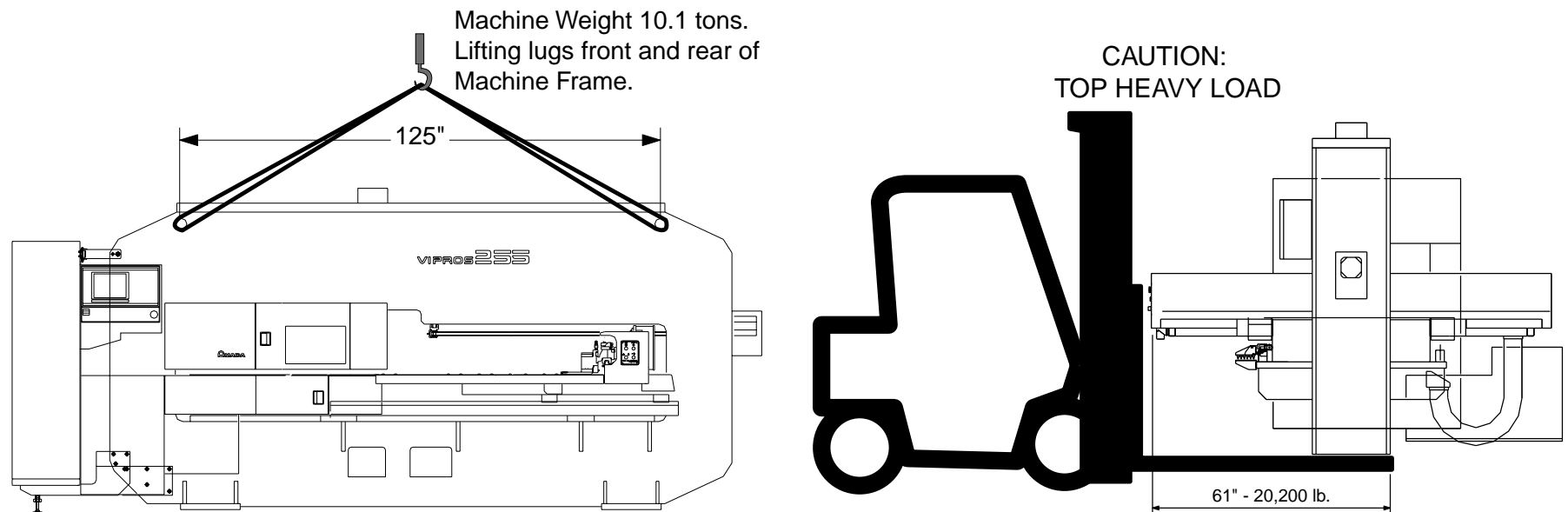
The following diagrams provide the details for positioning the Vipros 255.

- ❑ No obstacles are allowed in the worksheet travel area and the ceiling must be at least 40" above the Vipros 255.
- ❑ All of the recommended maintenance areas should be used, but at a minimum the doors of the NC unit must be able to be opened. Any reduction of the listed maintenance areas may increase time and expense of installation and maintenance.
- ❑ The Vipros 255 machine and control must be protected from direct sunlight or other heat sources. Direct exposure to direct heating sources such as infrared heaters have been shown to affect punch and die alignment.
- ❑ The positioning of the SBC EX3.0 Chiller is very flexible. See page 22, *Chiller*, for details.

### Lifting the Machine


Lifting or moving of the Vipros 255 should be done only by professional rigging companies well versed in the moving of large and heavy industrial machinery. Acceptable moving methods include, lifting by overhead crane as shown, wheeled dollies beneath the machine feet, or adequately sized forklift forks beneath the machine frame.

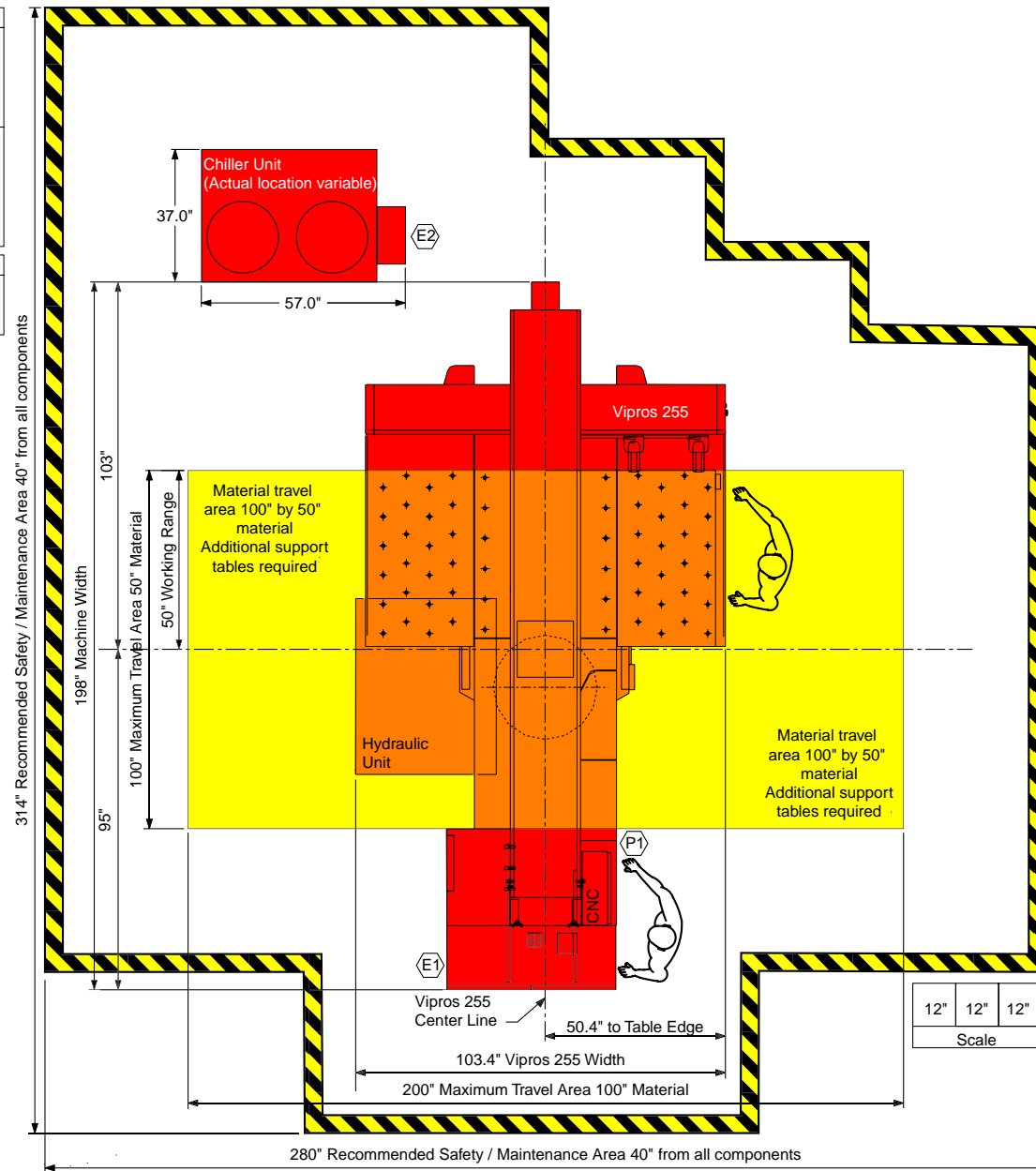
The Vipros 255 has a relatively high center of gravity and narrow footprint, care must be taken to prevent inadvertent tipping of the machine while in motion.





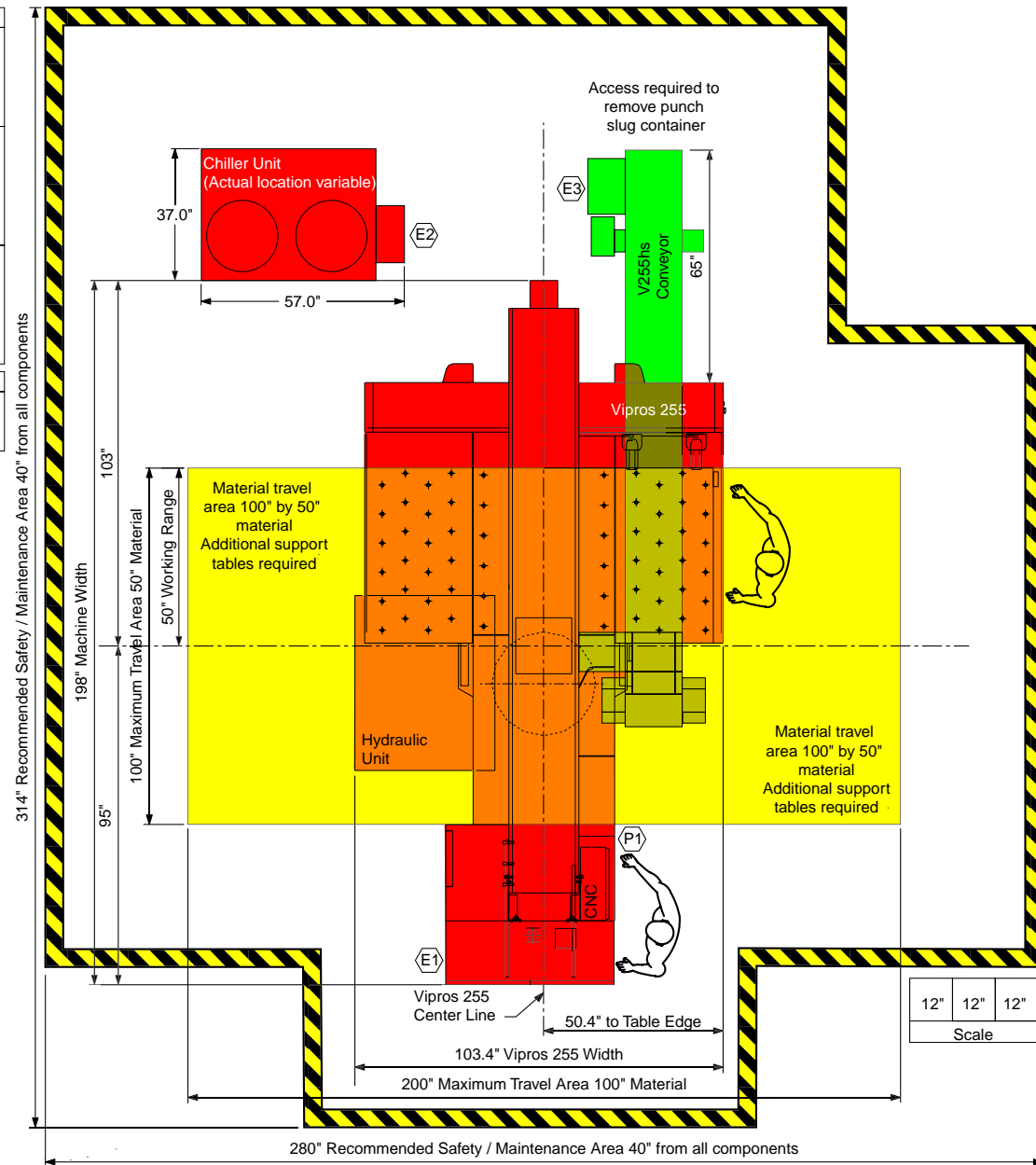
# Plan View - Vipros 255

<b>Electrical Requirements</b>	
<b>E1</b>	Vipros 255 230 / 460 / 3 / 60 ±10%, 22 kVA 68 amps @ 230 / 3 / 60 VAC 34 amps @ 460 / 3 / 60 VAC
<b>E2</b>	SBC EX3.0 Chiller 230 or 460 / 3 / 60 ±10%, 15 kVA 38 amps @ 230 / 3 / 60 VAC 19 amps @ 460 / 3 / 60 VAC
<b>Compressed Air Requirements</b>	
<b>P1</b>	Vipros 255 80 psi @ 8.8 ft3/min.
<b>Operator Control Station</b>	
	




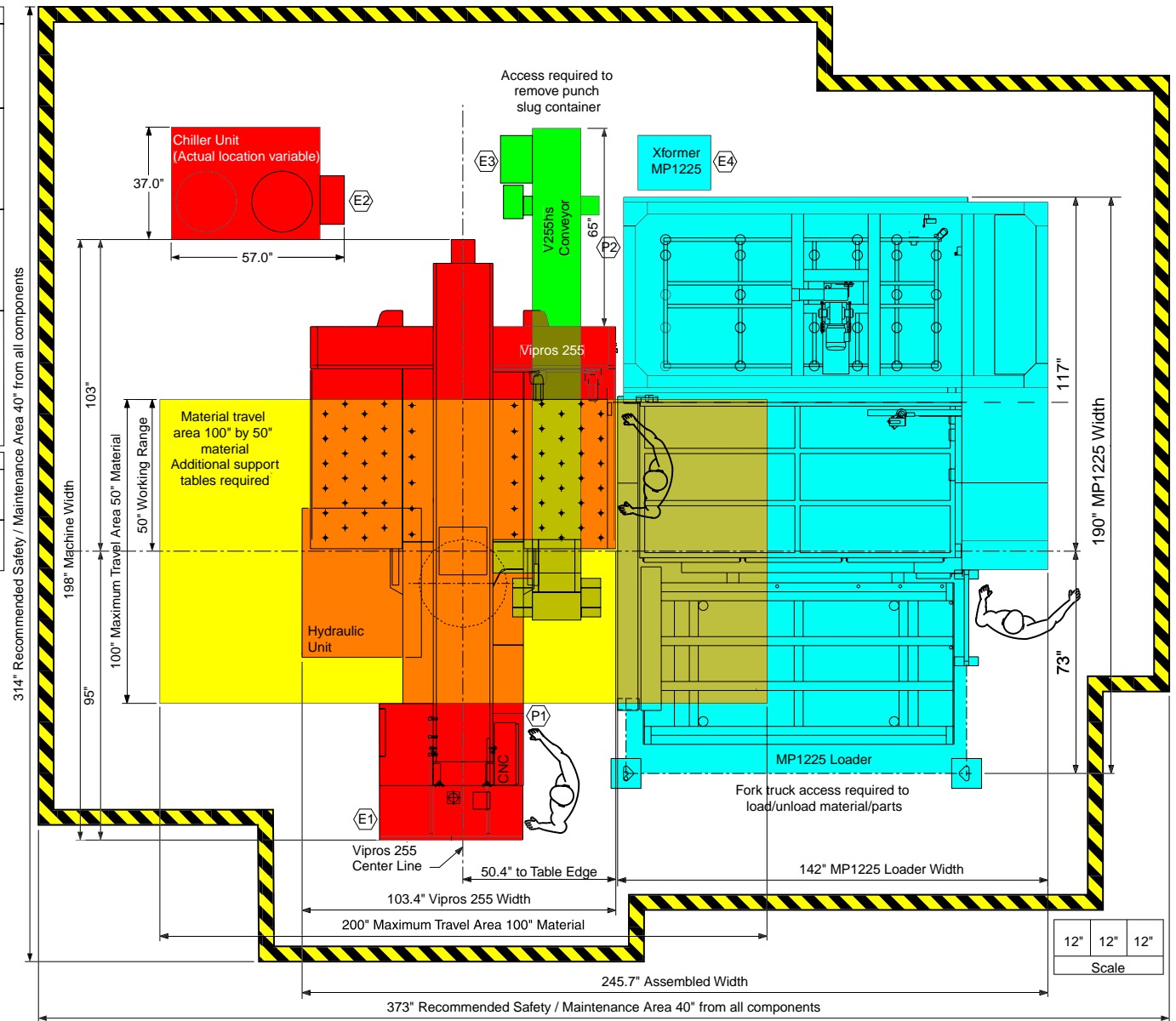
# Plan View - Vipros 255 (shown with optional V255hs Conveyor)

Electrical Requirements	
(E1) Vipros 255	230 / 460 / 3 / 60 ±10%, 22 kVA 68 amps @ 230 / 3 / 60 VAC 34 amps @ 460 / 3 / 60 VAC
(E2) SBC EX3.0 Chiller	230 or 460 / 3 / 60 ±10%, 15 kVA 38 amps @ 230 / 3 / 60 VAC 19 amps @ 460 / 3 / 60 VAC
(E3) V255hs Conveyor	208 - 230 / 460 / 3 / 60 ±10%, .8 kVA 2.1 amps @ 208 / 3 / 60 VAC 2.0 amps @ 230 / 3 / 60 VAC 1.0 amps @ 460 / 3 / 60 VAC
Compressed Air Requirements	
(P1) Vipros 255	80 psi @ 8.8 ft3/min.
Operator Control Station	

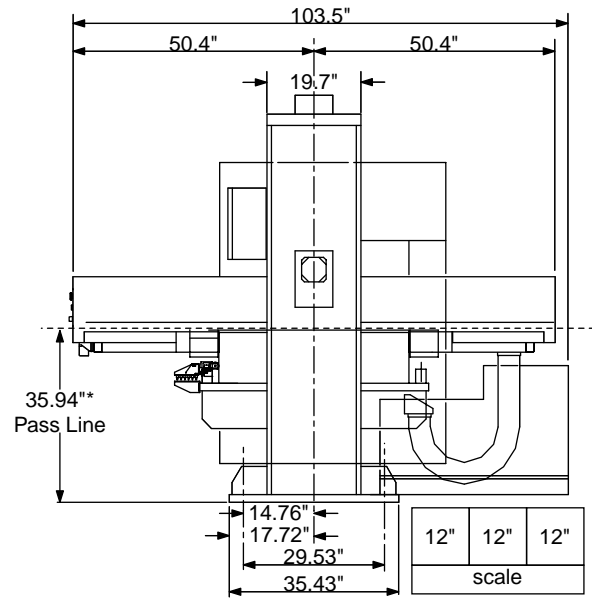


# Plan View - Vipros 255 (shown with optional V255hs Conveyor and MP1225 Loader)

Electrical Requirements	
E1	Vipros 255 230 / 460 / 3 / 60 ±10%, 22 kVA 68 amps @ 230 / 3 / 60 VAC 34 amps @ 460 / 3 / 60 VAC
E2	SBC EX3.0 Chiller 230 or 460 / 3 / 60 ±10%, 15 kVA 38 amps @ 230 / 3 / 60 VAC 19 amps @ 460 / 3 / 60 VAC
E3	V255hs Conveyor 208 - 230 / 460 / 3 / 60 ±10%, .8 kVA 2.1 amps @ 208 / 3 / 60 VAC 2.0 amps @ 230 / 3 / 60 VAC 1.0 amps @ 460 / 3 / 60 VAC
E4	MP1225 Loader 200 / 3 / 60 ±10%, 10 Kva To operate at 230 / 460 VAC a step up transformer is required with the following service is required 29 amps @ 200 / 3 / 60 VAC 26 amps @ 230 / 3 / 60 VAC 13 amps @ 460 / 3 / 60 VAC
Compressed Air Requirements	
P1	Vipros 255 80 psi @ 8.8 ft3/min.
P2	MP1225 Loader 75 psi @ 31.8 ft3/min.
Operator Control Station	
	

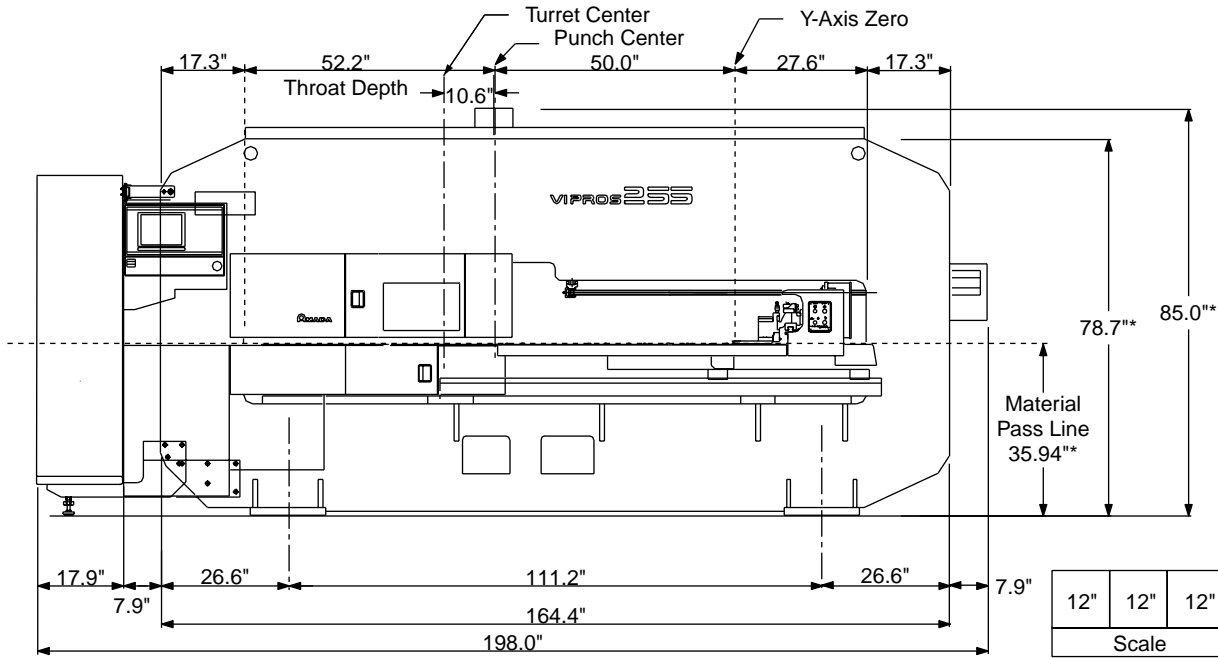


## End View - Vipros 255



\*dimension subject to change with installed optional equipment

# Elevation View - Vipros 255



\*Material Pass Line will vary depending on installed options

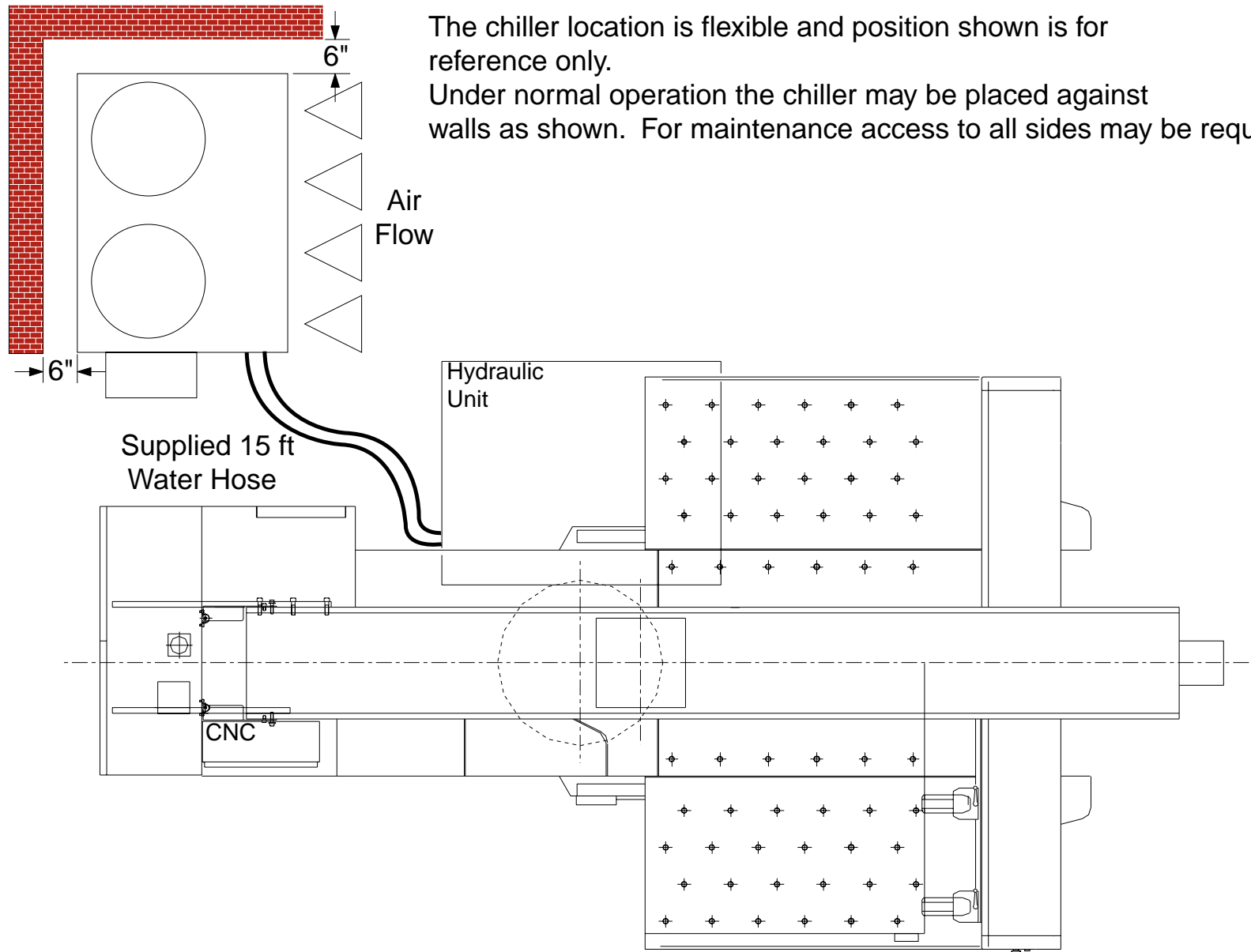
## Chiller

Make / Model	SBC EX3.0
Cooling Capacity	36,000 BTU/hour at 65 <sup>0</sup> ambient air temperature
Water Volume	10-15 GPM at 35 psi.
Reservoir Capacity	30 Gallons distilled water
Pump HP	1 hp single phase

The SBC EX3.0 Chiller is very important to the reliable operation of the Vipros 255.

- The SBC EX3.0 Chiller must be placed so that adequate airflow is maintained.
- The position of the SBC EX3.0 Chiller is flexible. The SBC EX3.0 Chiller is supplied with two (2) fifteen-foot lengths of hose to connect the SBC EX3.0 Chiller to the Vipros 255 Hydraulic Unit. The customer may supply a longer length of hose if required.
- Under normal operating conditions the SBC EX3.0 Chiller may be placed against walls as shown, for maintenance purposes access to all sides may be required.
- The SBC EX3.0 Chiller must have a minimum of 60" of overhead clearance for proper airflow.

## Chiller Placement



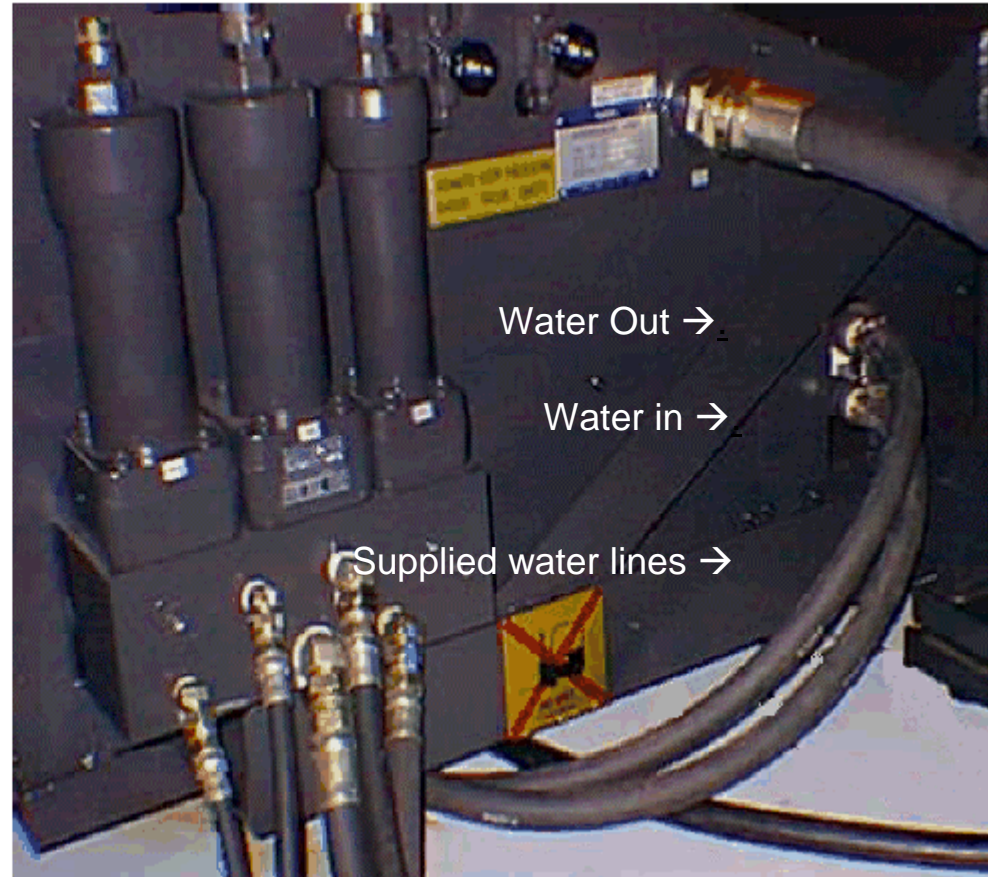
The chiller location is flexible and position shown is for reference only. Under normal operation the chiller may be placed against walls as shown. For maintenance access to all sides may be required.

# Connections

Chiller



Hydraulic Unit





## Foundation Requirements

The Vipros 255 does not require a special foundation to perform as expected, however there are minimum requirements that an existing floor must meet in order to assure machine reliability and tool life. If the existing floor does not meet the following minimum requirements, plans for a recommended foundation are given on page 26, *Foundation Anchoring Procedure*.

The minimum acceptable floor conditions to assure a successful installation are:

- The area of the floor where the Vipros 255 machine frame is to be located must be a single, homogeneous slab in good condition. There must be no cracks or other signs of deterioration of the floor.
- The floor must be 4" to 6" thick.
- The floor must be capable of supporting 3.5 tons/ft<sup>2</sup>.
- The floor must be level to 0.032"/ft.

If the existing floor meets the minimum requirement list above, it must still be inspected carefully when the anchor-bolt holes are cut. Voids under the floor, or wetness (not associated with the hole cutting procedure) should be considered signs of an inadequate floor and a new machine location or new foundation must be considered.

It is the customer's responsibility to determine that the floor meets these minimum requirements. Placing the machine on an inadequate, cracked floor, or straddling seams in a floor may be grounds for voiding the machine warranty!

Amada America, Inc. does not recommend the use of vibration isolating mounts under the machine feet, as these devices have been shown to increase the vibration within the machine frame, increasing the likelihood of vibration related problems. Solid leveling devices are acceptable provided they incorporate a means of anchoring the machine to the floor.

**Special Note:** This document details several methods of anchoring the Vipros 255 to a new foundation or an existing floor. These methods are designed to install the Vipros 255 as a stand-alone machine using the supplied anchor bolts and base plates. Installation or use of additional options such as leveling pads or material handling systems may dictate other methods of anchoring or foundation design not shown in this document. Before committing to a specific method of anchoring the Vipros 255, confirm that the chosen method is compatible with all purchased optional items and future planned expansion.

## Foundation Anchoring Procedure

An ideal foundation is given on the following pages. This foundation must be used if the existing floor cannot meet the minimum requirements to support the machine.

The foundation must consist of a single, homogeneous slab. The foundation must be level to within 0.032" / ft. Anchoring the Vipros 255 to the floor using the anchor-bolts supplied is essential to ensure reliable performance. Amada generally recommends that the foundation have a minimum load bearing capacity of 3.5 ton/ft<sup>2</sup>. It is the purchaser's responsibility to determine that the foundation meets these requirements.

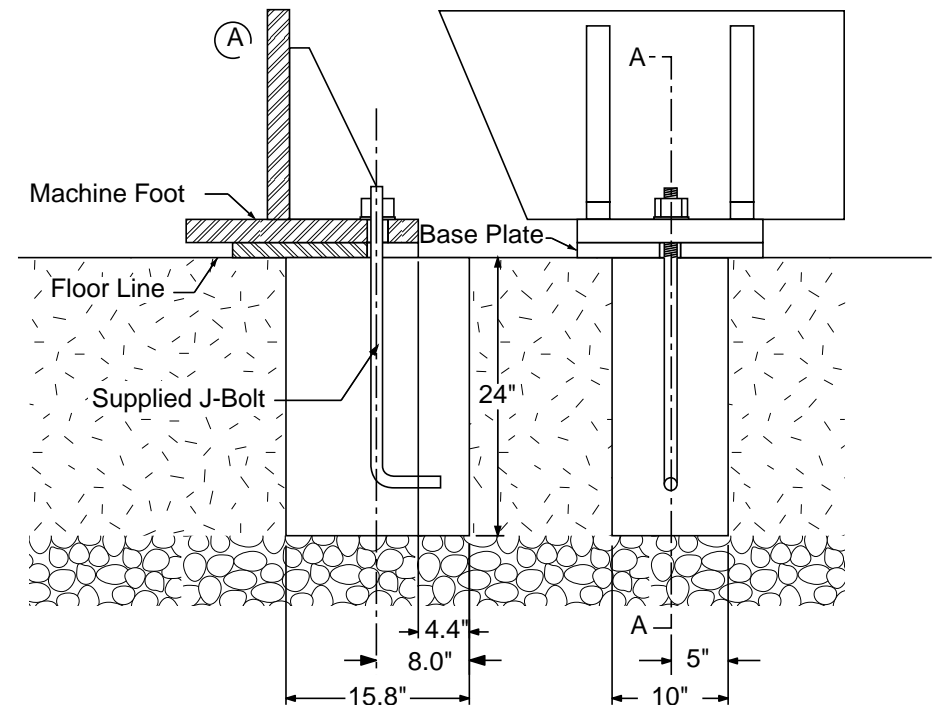
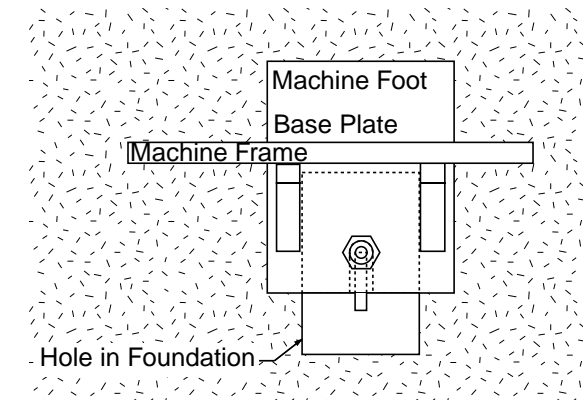
Please see Special Note Page 25.

**Note:** The base plates, shims, anchor bolts, nuts, and washers are shipped Vipros 255.

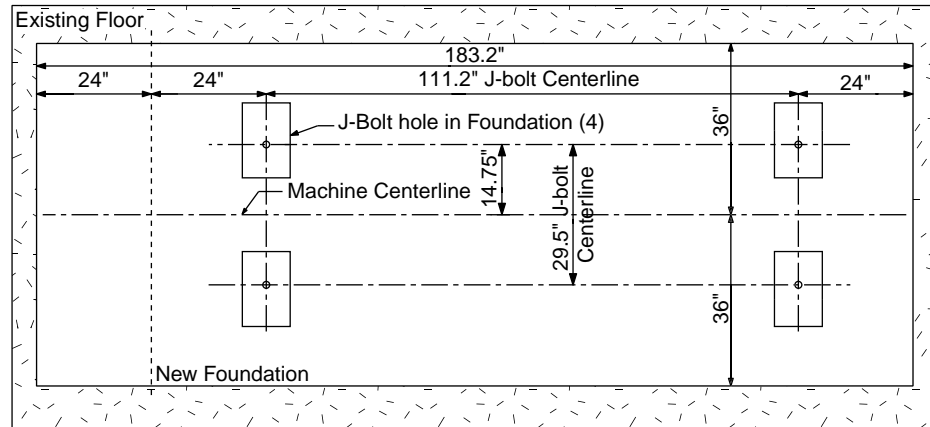
**Note:** The concrete J-bolt pads should be filled after the machine is placed on the foundation.

## Foundation J-bolt Detail

See *Floor J-bolt Mounting Procedure* for proper method of mounting machine on foundation.

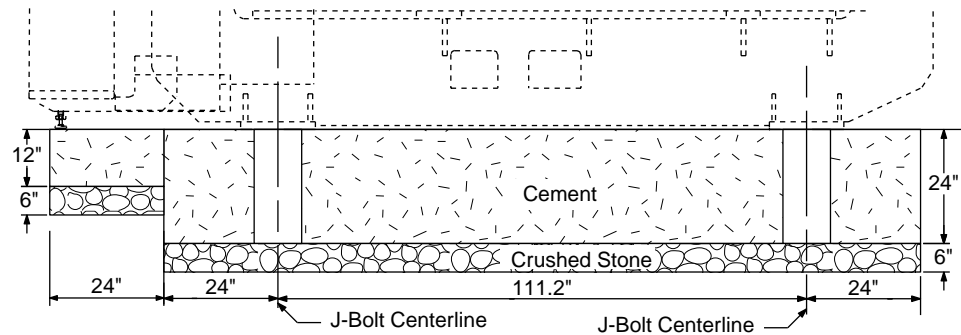


## Plan View - Vipros 255 Foundation



12"	12"	12"
Scale		

## Elevation View - Vipros 255 Foundation



12"	12"	12"
Scale		

# Vipros 255 Anchoring Requirements

To maintain machine reliability, extend tool life, and remain level over an extended period the Vipros 255 must be anchored in place on an adequate floor or foundation.

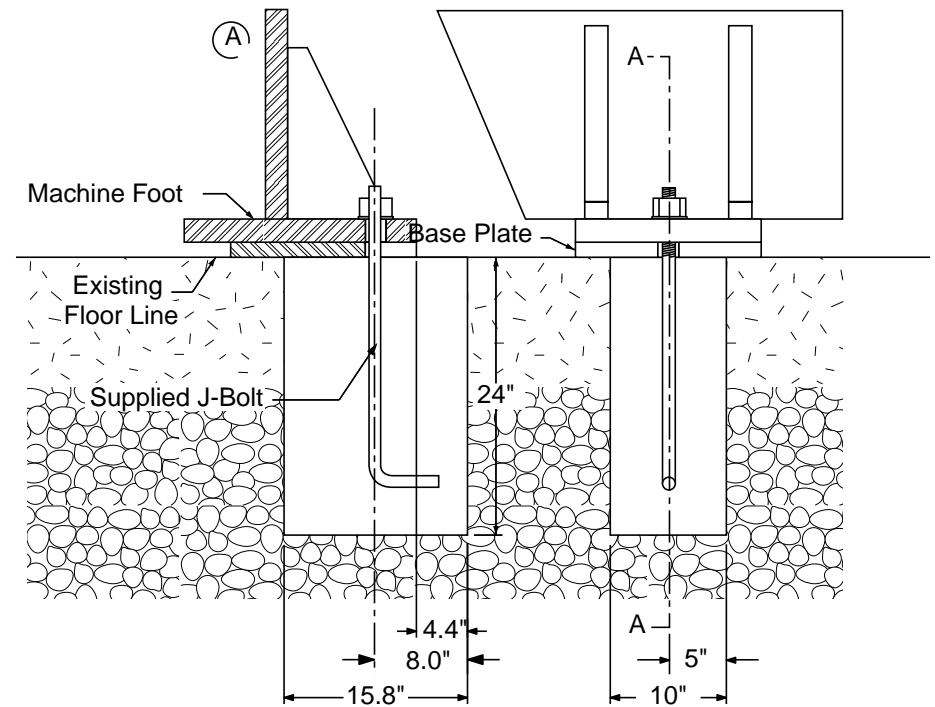
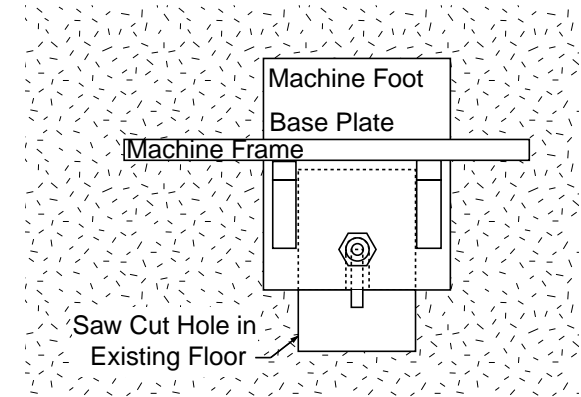
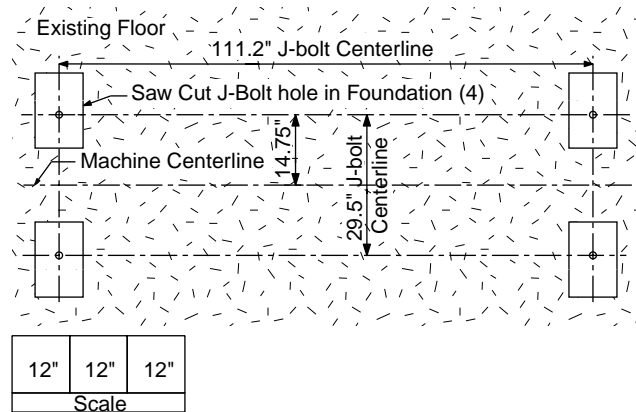
At a minimum the floor must consist of a single, homogeneous slab, level to within 0.032"/ft<sup>2</sup>, and capable of supporting 3.5 tons/ft<sup>2</sup>. It is the purchaser's responsibility to determine that the floor meets these minimum requirements.

## Floor J-bolt Mounting Hole Detail (saw cut hole)

This machine mounting method should be used only if the floor is of such quality that it will support the weight of the Vipros 255 with the anchor J-bolts used only for maintaining the location of the machine.

Please see Special Note Page 25.

## Plan View - Floor J-bolt Mounting Hole (saw cut hole)

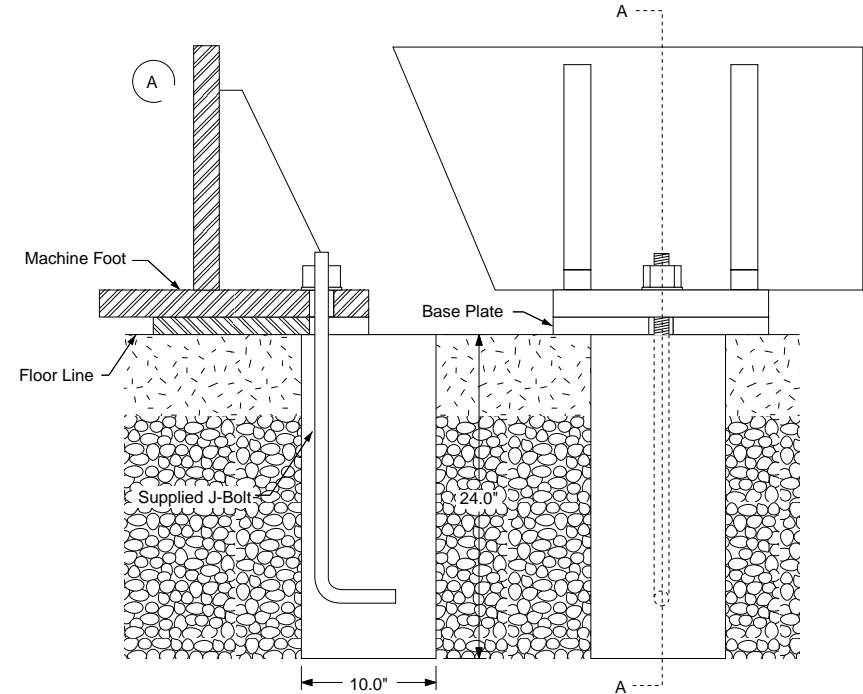
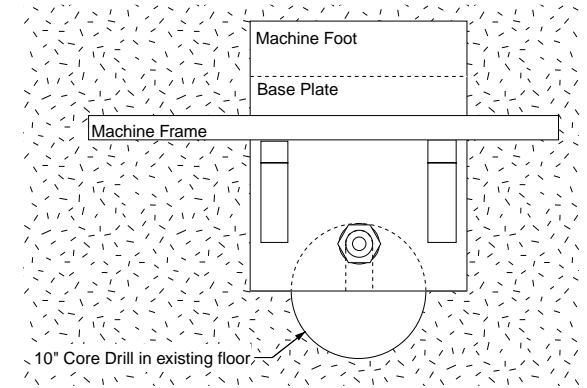
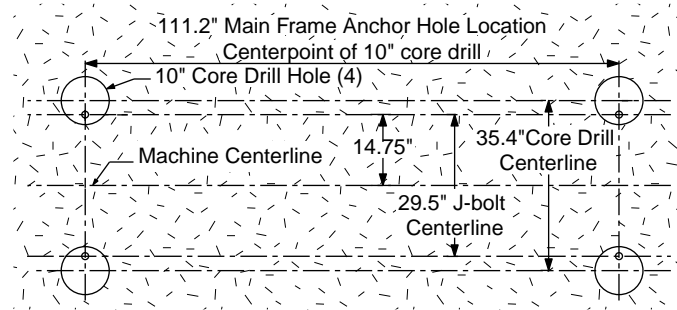


## Alternative Floor J-bolt Mounting Hole Detail (Core Drill)

This machine mounting method should only be used if the floor is of such quality that it will support the weight of the Vipros 255 with the anchor J-bolts used only for maintaining the location of the machine.

Please see Special Note Page 25.

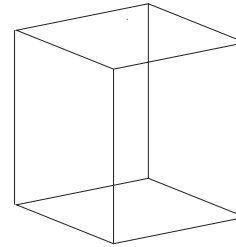
### Plan View - Alternative J-bolt Mounting Method (Core Drill)



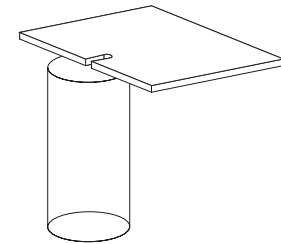
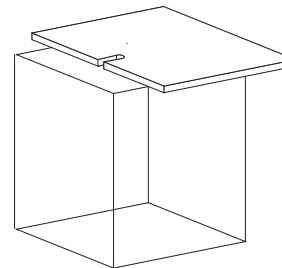
## Floor / Foundation J-bolt Mounting Procedure

- Step 1. Saw cut or Core drill a hole in the existing floor and remove the underlying dirt to the required 24" depth.

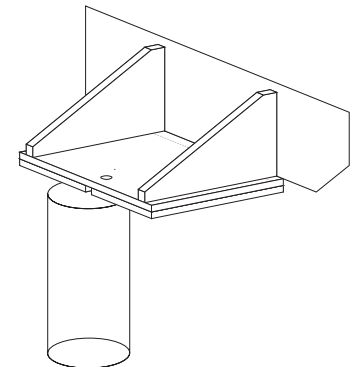
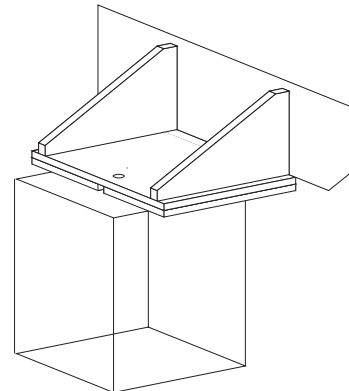
See *Floor J-bolt Mounting Hole Plan View (saw cut hole)* or *Alternative J-bolt Mounting Method Plan View (Core Drill)* for correct layout dimensions of the four anchor holes required.



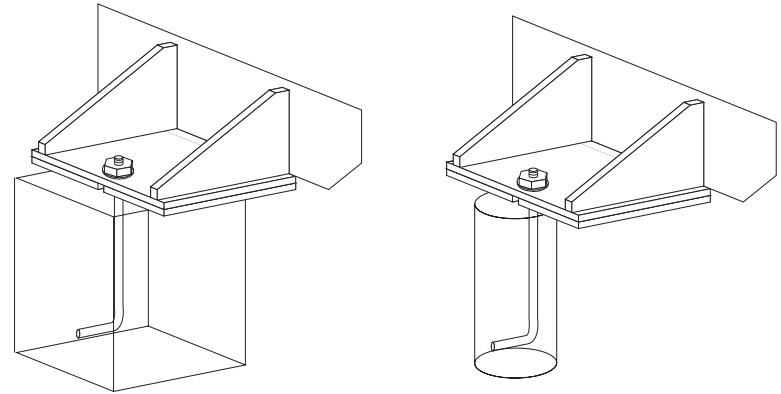
- Step 2. Set base plate over the hole.



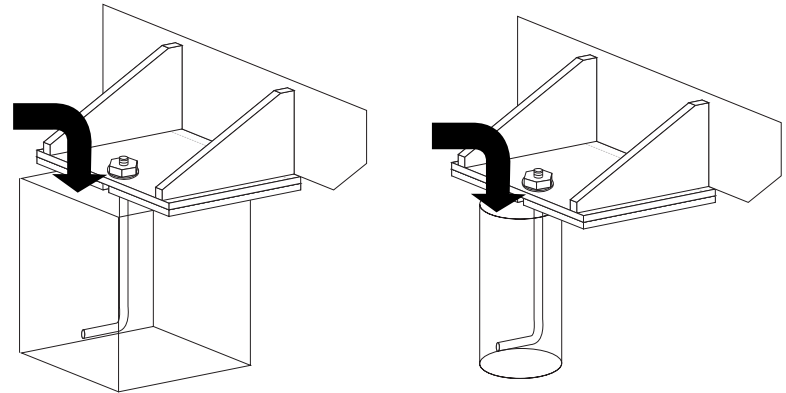
- Step 3. Set the machine on the base plate.



**Step 4.** Set the J-bolt through the hole in machine foot, attach washer and nut to hold J-bolt in place.

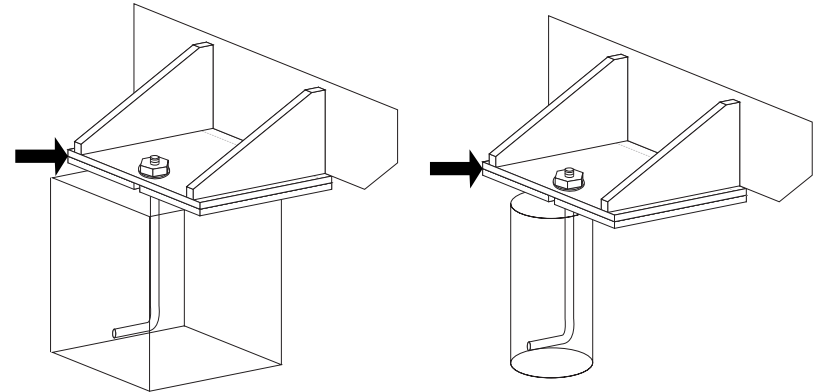


**Step 5** Pour the Concrete.  
Ensure that the J-bolt remains correctly aligned to the machine frame during the pouring and hardening time of the concrete.  
Ensure that the concrete level is equal to the floor level



**Step 6.** To complete the mounting procedure, level the machine frame by inserting leveling shims between the machine foot and base plate.

See page 39, *Leveling Procedure* section for correct procedure.

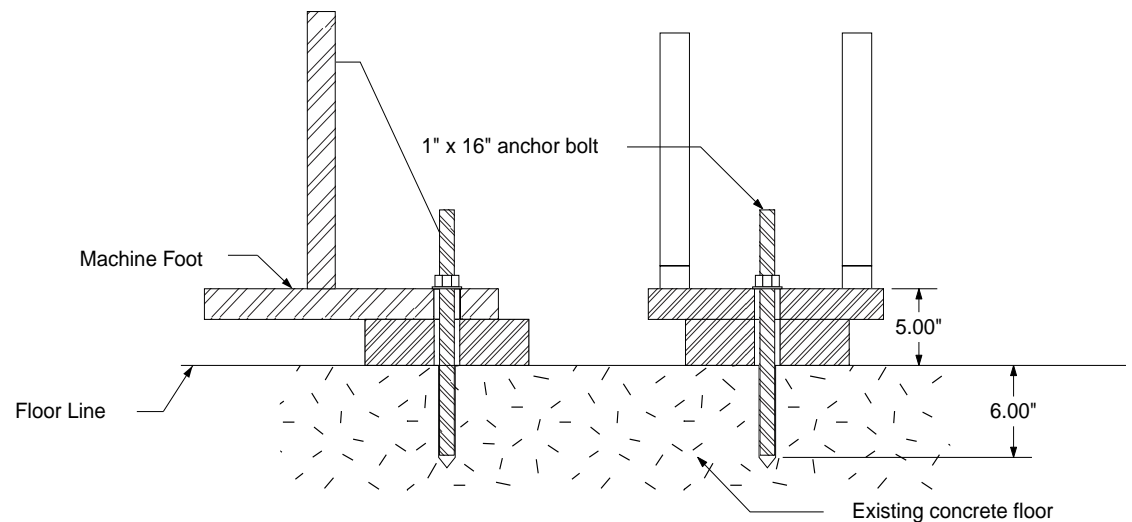
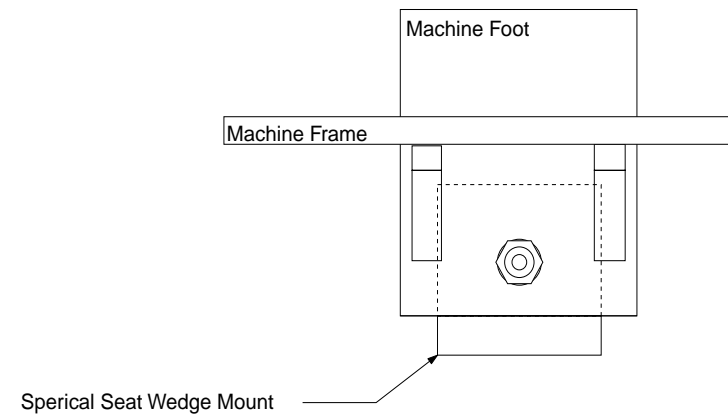
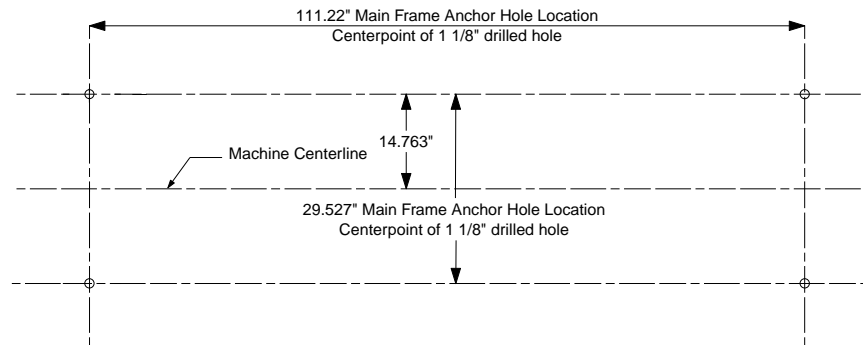


## Alternative Anchoring Method (Drilled Hole with Anchor Rod and Adhesive)

This machine mounting method should only be used if the floor is of such quality that it will support the weight of the Vipros 255 with the Anchor Rod used only for maintaining the location of the machine.

Please see Special Note Page 25.

### Plan View - Alternative Floor Bolt Mounting Method (Drilled Hole with Anchor Rod and Adhesive)



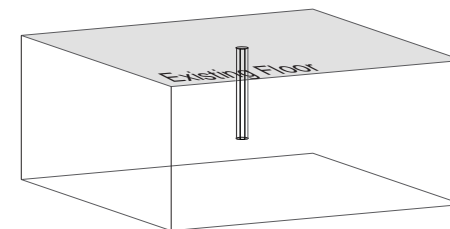


## Drilled Hole with Anchor Rod and Adhesive Mounting Procedure

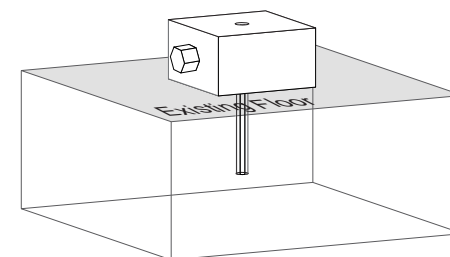
Step 1. Drill the four Anchor Rod holes in the existing floor.

The holes should be drilled approximately 6" deep.

See *Alternative Floor Bolt Mounting Method Plan View (Drilled Hole with Adhesive Anchor Rod)* for correct layout dimensions.



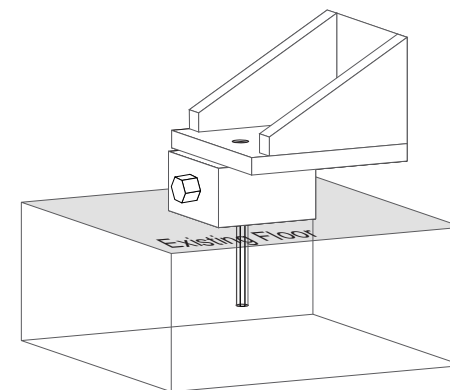
Step 2. Set the Amada Machine Leveling Plates over the drilled holes



Step 3. Set the Vipros 255 on the machine leveling plates.

Step 4. Level the machine frame by adjusting the Amada machine leveling plates.

See page 39, *Leveling Procedure* section for correct procedure.



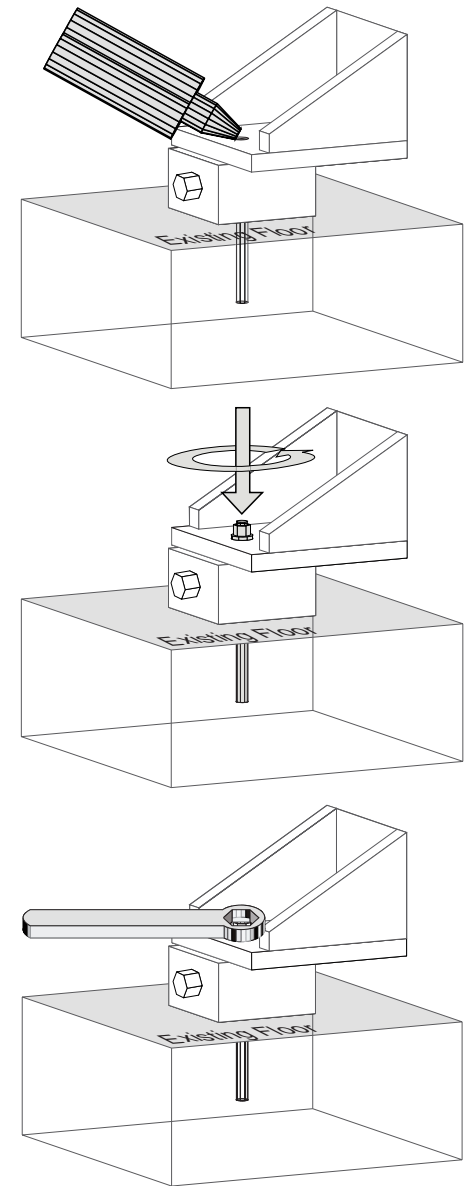
**Step 5** Fill each of the Anchor Rod holes to within 2 inches of the floor surface with the Adhesive compound. Do not overfill.

**Step 6** Attach the hex nut and flat washer on the Anchor Rod and place the Anchor Rod into the drilled hole.

Using a twisting motion to move the Anchor Rod through the epoxy compound, seat the flat washer and hex nut against the top of the machine foot.

**Step 7** Allow the Adhesive to harden for 24 hours.

**Step 8.** Tighten the 4 hex nuts.

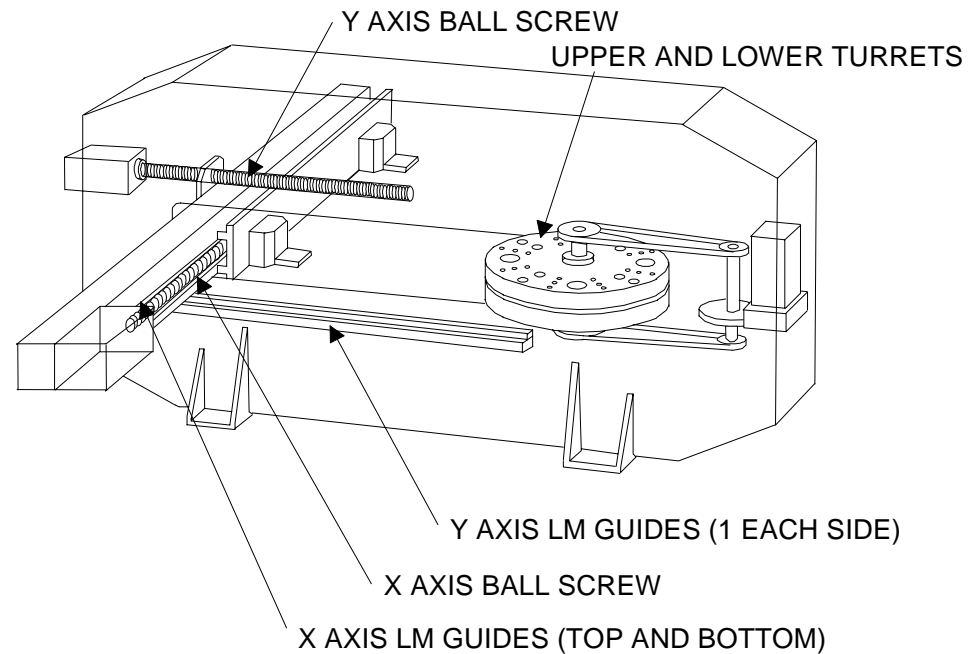


## Removing the Protective Coating

The Vipros 255 must be thoroughly cleaned of protective coating. The sheet metal guards can be removed from around the turret to allow cleaning of the upper and lower turrets, tool bores and die holders.

Please note the following:

- ❑ Remove the wrapping paper from the X and Y-axis ball screws then remove the protective coating.
- ❑ Remove the wrapping paper from the X and Y LM guides then remove the protective coating, make sure that you remove the paper from both sides of the carriage.
- ❑ Clean die holders one at a time. Remove a die holder, clean and replace it before removing the next die holder. If the die holders are mixed up, serious turret alignment problems may occur.
- ❑ A suitable solvent should be used to remove the protective coating.



## Machine Leveling

Proper Machine leveling is critical to the Vipros 255 performing as designed.

Materials and tools required:

Supplied with the machine:

Assorted thickness machine leveling shim stock

Anchor bolts

Supplied by AESI service:

Spirit level capable of reading 0.0005"/ft

One (1) 12 ton hydraulic bottle jack

Not supplied:

Additional shim stock of 0.005" thickness may be required to achieve a properly leveled machine.

## Rocking Test

After the machine frame has been leveled the use of the following G-code is necessary to determine that Vipros 255 is properly leveled and balanced.

Should the Vipros 255 vibrate or move excessively during the rocking test the Vipros 255 must be re-leveled using the procedure in this manual.

Should the proper leveling technique not eliminate the excessive Vipros 255 motion, consideration must be given to relocation of the Vipros 255 or replacement of the existing floor with an adequate foundation.

Set M500 values to Top Position 0.080", Bottom Position, 0.080", Slow Position 0.000"

Repeat test with X-axis movement values of 0.500", 1.000", and 4.000"

G92X47.638Y50.000

G06A.050B0

N1G91X-.25TTTT(Use any valid tool number)

X.25

M97P1

G50

## Floor Condition: Crowned

The flatness of the floor plays an important step in the leveling procedure of the machine. To properly level the machine the weight bearing points must be as far from the centerline of the machine frame as possible.

Should a condition known as crowned exist the weight bearing points of the machine may not be far enough from the machine centerline to ensure a stable machine.

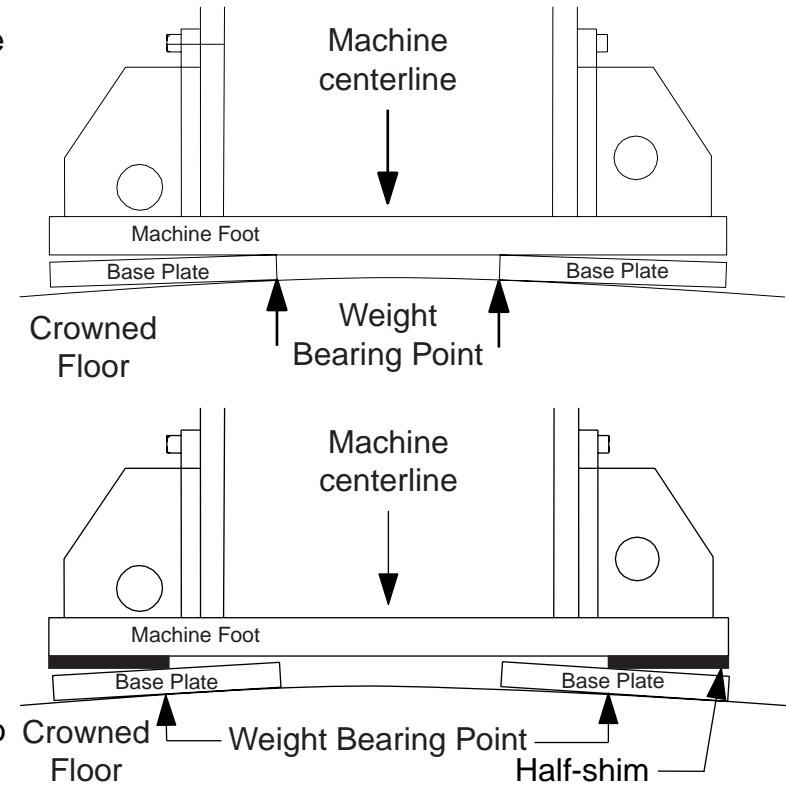
Under these conditions a procedure known as *Half-Shimming* should be used.

To move the weight bearing points further from the machine centerline the use of half-shims of .125" thick on top of the base plate as shown is recommended.

After the half-shims are installed and the machine frame is leveled use the rocking test to determine that the machine frame is stable enough to allow production without damaging the machine.

Under extreme conditions the use of half-shims may not move the machine weight bearing points far enough from the machine centerline to ensure the machine frame is stable.

Under these conditions a more suitable location must be found for the machine, or a new foundation for the machine will be necessary.



## Floor Condition: Slope

The slope of the floor plays an important step in the leveling procedure of the machine. To properly level the machine the weight bearing points must be as far from the centerline of the machine frame as possible.

Should the floor slope excessively the weight bearing points of the machine may not be far enough from the machine centerline to ensure a stable machine.

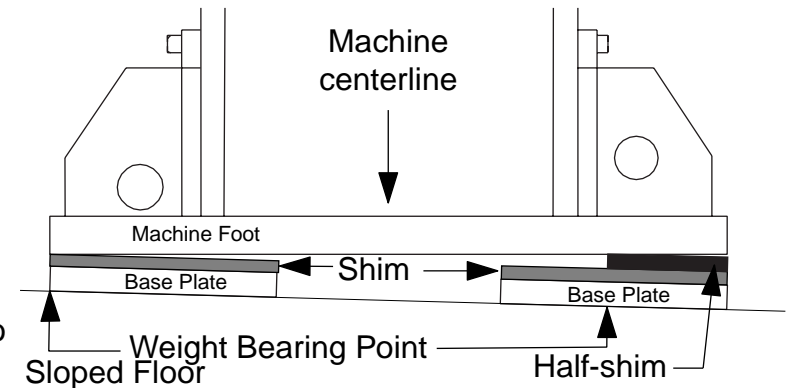
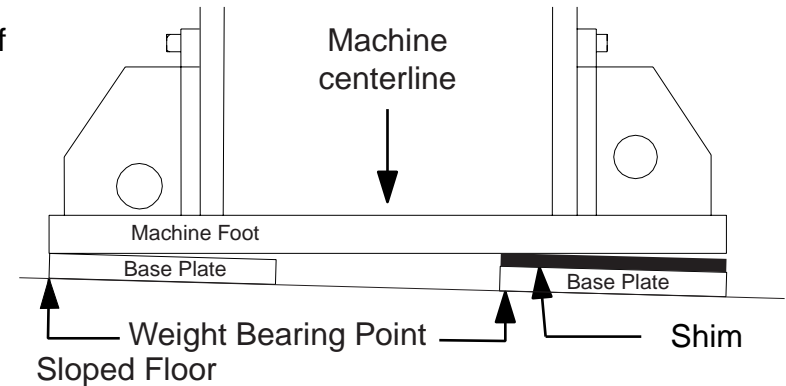
Under these conditions, a procedure known as *Half-Shimming* should be used.

To move the weight bearing points further from the machine centerline the use of half-shims of .125" thick on top of the base plate and leveling shims as shown is recommended.

After the half-shims are installed and the machine frame is leveled, use the rocking test to determine that the machine frame is stable enough to allow production without damaging the machine.

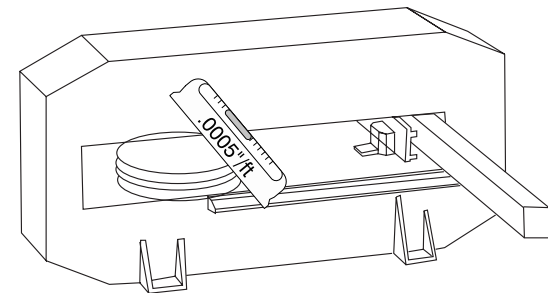
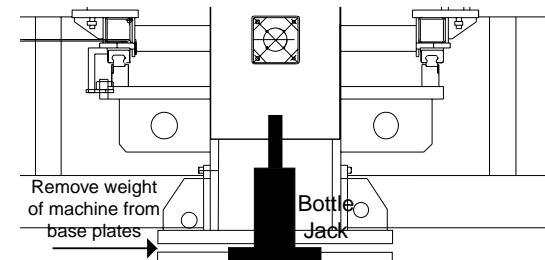
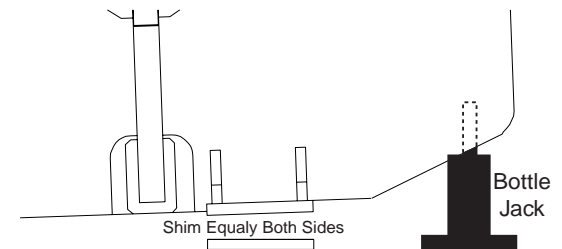
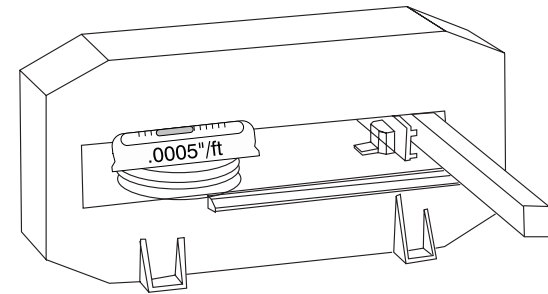
Under extreme conditions the use of half-shims may not move the machine weight bearing points far enough from the machine centerline to ensure the machine frame is stable.

Under these conditions, a more suitable location must be found for the machine, or a new foundation for the machine will be necessary.

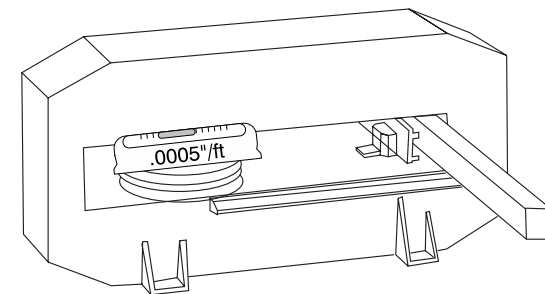
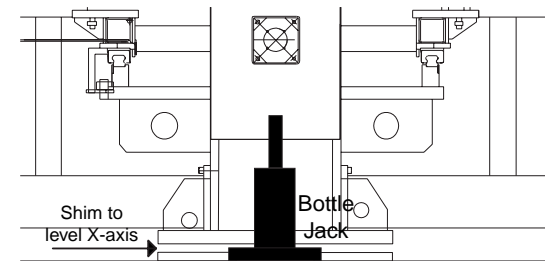
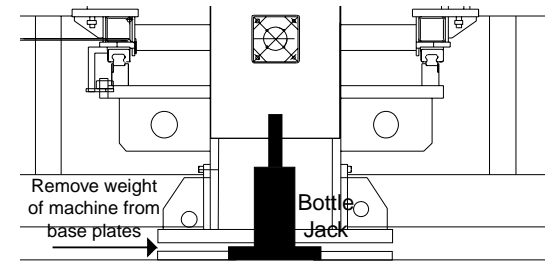
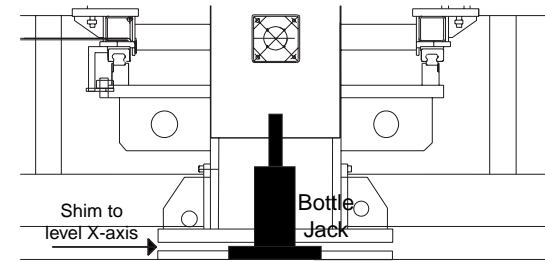


## Leveling Procedure

1. Determine the high end of machine frame by placing the spirit level on the turret to measure the level of the machine frame in the y-axis.
2. Use the bottle jack to lift the low end of the machine frame. Shim equally between both machine feet and the base plates until the machine frame measures near level on the y-axis with the turret end of the machine frame slightly higher than the carriage end.
3. Center the bottle jack under the carriage end of the machine frame. Lift the machine frame until all weight is off the machine feet at the carriage end of the machine frame. Lift the machine frame as little as possible to take the weight off the base plates.
4. With the machine supported on the bottle jack at the carriage end of the machine frame and the machine feet at the turret end of the machine frame, place the spirit level on the turret. Measure and record the level of the turret in the x-axis direction. Lower the machine frame to place all machine feet in contact with the leveling shims and base plates.



5. Lift the turret end of the machine frame to allow shimming between the machine feet and base plates to level the machine frame in the x-axis direction.
6. Repeat steps 3 to 5 until the machine frame measures level to 0.0005"/ft in step 4, then continue.
7. With the bottle jack supporting the weight of the carriage end of the machine monitor the level of the turret in the x-axis as the bottle jack is slowly lowered to place the carriage end machine feet in contact with the base plates. Any change in the level indicates that the carriage end of the machine needs to be leveled.
8. Lift the carriage end of the machine frame to allow shimming between the machine feet and base plates to level the carriage end of the machine frame in the x-axis direction.
9. Repeat steps 6 and 7 until no difference in level is noted when the machine weight is on or off of the base plates and shims, then continue.
10. With all of the machine feet setting on the shims and base plates place the spirit level on the turret to measure and note the level of the machine frame in the y-axis.





11. Using the bottle jack lift the low end of the machine frame and shim equally under both machine feet to level the machine frame in the y-axis.
12. Repeat step 8 to 9 until the machine frame measures level to 0.0005"/ft in the y-axis then continue.
13. Run the machine using the rocking test G-code to determine that the machine frame is leveled adequately. Should excessive movement of the machine frame be noticed check for the conditions discussed in *Floor Condition Crowning* and *Floor Condition Slope*.
14. Tighten the anchor bolt nuts to prevent the machine frame from moving when in use. Monitor the machine level while tightening the anchor bolts to assure the machine level is not changed.

