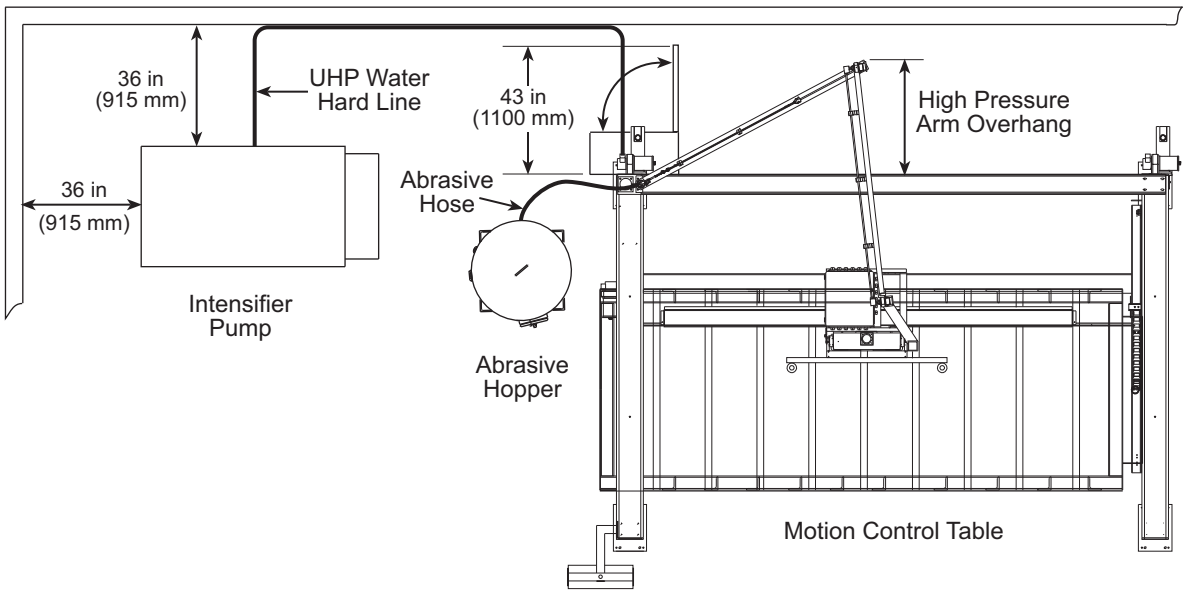
Planning Document

Site Preparation Guide

UHP Motion Control System



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Site Preparation Guide

This document provides information about preparing your facility for the installation of a Jet Edge motion control system. The facility must have adequate air, water, sewer drain, and electrical service as described in this document prior to the installation of Jet Edge equipment.

Contents

Physical Requirements

The work site must accommodate the dimensions and weight of the system components. Floor material must be of concrete capable of supporting the weight of the machine, and thick enough to provide resistance to vibration.

Environmental

Relative humidity must be non condensing: maximum of 95% humidity at 95°F (35°C), otherwise additional cooling may be required for the hydraulic fluid. Altitude should be below 3000 feet (10,000 m).

- For the standard open loop cooling (cooling water flows to drain), the ambient temperature must be within 50°–95° F (10°–35° C).
- Optional closed loop chillers provide supplemental cooling (cooling water chilled and recirculated), if the ambient temperature ranges between 95°–110° F (35°–43° C) the chiller capacity is reduced 1% per 1° F; ranges between 110°–120° F (43°–49° C) the capacity is reduced 2% per 1° F.

Certain locations may be hazardous if the atmosphere contains gas, vapors, or dust in explosive concentrations. Refer to the National Electric Code (NEC), OSHA requirements, and local codes for detailed information about environmental criteria.

Noise

The motion control system produces noise when the UHP water travels through air to the cutting surface. There are cutting techniques and options to reduce the amount of noise generated by a waterjet.

- A waterjet can produce 80–110 db depending on options and cutting techniques.
- The intensifier pump generates approximately 80–85 db.

Hearing protection is required for operators and others who spend time in the room with the motion control system.

The following affect the amount of noise produced by a waterjet:

- When the water level is below the cutting surface, noise is increased.
- When the water level is at the cutting surface, noise is reduced.
- When the water level is above the cutting surface and the waterjet tip is submerged, noise is greatly reduced.
- A water curtain surrounding the waterjet nozzle reduces noise.

Cooling guidelines

The heat exchanger uses regular tap water for cooling hydraulic fluid. A consistent water flow of 3–12 gpm (19 lpm) is required, at an inlet temperature not exceeding 70° F/21° C. Water flow depends on the pump model, larger pumps require more water. The water temperature also affects the flow, warmer water requires more water to cool the pump.

Public utility water is usually acceptable for cooling purposes. In situations where the water contains heavy mineral deposits, the exchanger tubes may eventually become restricted by particle buildup which reduces the cooling efficiency. If this is a chronic problem filtration and/or softening may be needed.

Depending on plant setup, ambient temperature can also be a factor in cooling. Where the equipment is confined to a small high-temperature space, additional cooling may be required. Recycling-type supplemental cooling units can also be installed where the volume of fresh water used is a consideration.

Heat load

The intensifier pump generates heat. Depending on the heat load from other equipment in the work area you might need to consider cooling the work area. See "Heat Load (BTU/hour)" on page 21.

Ultra high pressure tubing

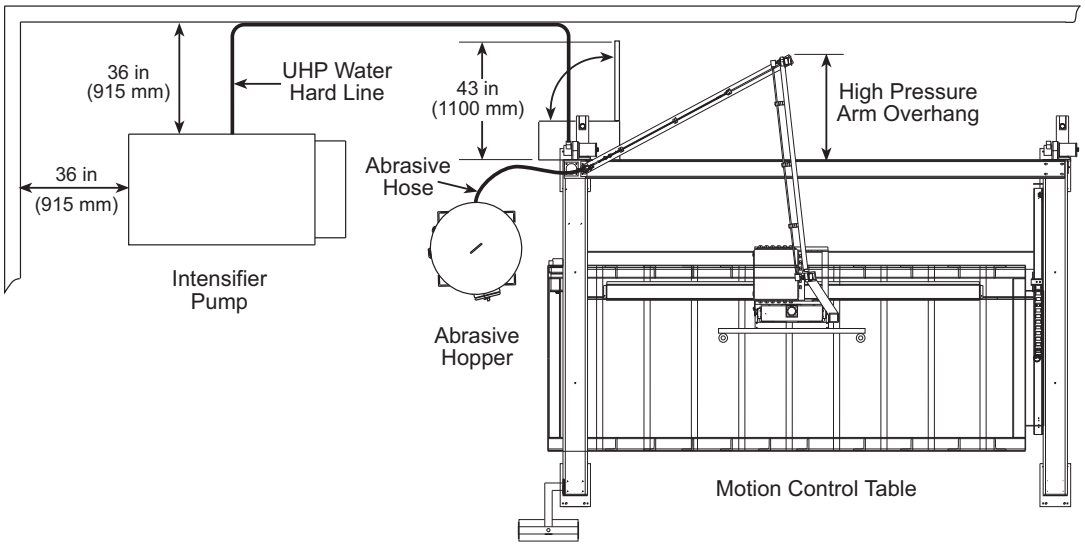
The ultra high pressure (UHP) tubing must be anchored to a stable structure to prevent flexing which can crack the UHP tubing. The UHP tubing should be secured to prevent the tubing from sagging.

The UHP tubing is routed from the intensifier pump, down to the floor, and to the nearest wall. The tubing is routed along the wall towards the motion control table, across the floor and up the leg supporting the high pressure arm assembly. Tubing can be routed overhead but must be supported.

Equipment locations

The dimensions of the work site and the Jet Edge equipment often dictates where equipment can be located. See "Equipment Dimensions" on page 13 for specific dimensions and "Hardware Considerations" on page 24 for more information.

- All connections to the motion control table are at the rear of the machine.
- The abrasive hopper should be as close as possible to the motion control table connections location to keep the length of abrasive hose to a minimum.
- Equipment should be placed at least 36 inches (915 mm) from any walls or structures to allow access to the equipment for maintenance or service.
- The high pressure arm overhang of the high rail must be considered for the placement of the high rail motion control table.
- Access to the electrical assembly must be clear and the door must be able to open 90°.



Typical Equipment Locations

Electrical Requirements

For complete information about electrical service requirements refer to local building codes, NEC and OSHA provisions. Electrical requirements may vary depending on the motor type chosen.

Note *Local electrical code and regulations must be followed. If local codes conflict with Jet Edge requirements contact Jet Edge for additional information.*

When connecting the source power be aware that the full load amperage (FLA) listed on the intensifier pump motor does not reflect the total requirement for the entire setup. Any accessories running off the same power source increase the minimum necessary supply amperage.

- The intensifier pump and the motion control table should have a dedicated electrical box with a disconnect.
- The intensifier pump and the motion control table are ordered with a voltage/frequency option to accommodate the local electrical power.
- Electrical connections to the motion control table are wired to an electrical box located below the electrical assembly on the left rear leg of the table.
- Electrical connections to the intensifier pump are wired at the rear of the electrical assembly on the right side of the pump.
- The basic models of the abrasive hoppers have an electrical cord that plugs into a 115 V(ac) 60 Hz single phase wall outlet.

Pneumatic Requirements

A compressed air supply is needed for pneumatic devices. Air operates the following components:

- Each OmniJet waterjet and Permalign abrasivejet uses air to turn the UHP water on and off.
- The catch tank bladder option uses air to fill an air bladder that raises the water level in the catch tank by 3 inches. The pneumatic requirement for an air bladder is to be able to provide enough air to quickly fill the air bladder volume (see “Catch Tank Considerations” on page 26).
- The Dense Phase Hopper uses air to pressurize the abrasive holding tank and the abrasive feed hose to the mini hopper.
- The mini hopper uses air to operate a slide gate that turns the abrasive flow on and off.

Shop air

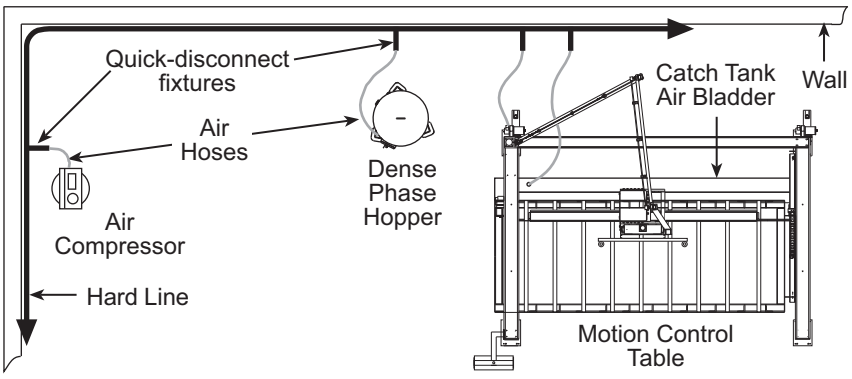
The site requires an air compressor that is capable of providing an adequate volume of air to operate the various components in your system.

- 80–90 psi (5.6–6.2 bar)
- Refer to “Specifications” on page 21 for specific equipment air flow requirements.
- Filtered dry air is required; moisture issues require an air dryer.

Air distribution

Air is usually distributed with hard lines that are anchored along the building walls or roof structure. Trunk lines are located near the equipment that requires an air supply. Trunk lines are terminated with a standard, female, pneumatic quick-disconnect fixture. Air hoses with mating quick-disconnect fixtures connect the equipment to the air distribution system. The connections at Jet Edge equipment have male quick-disconnect fixtures.

Note *The size of the lines in the air distribution system affects how quickly the Dense Phase Hopper and catch tank air bladder can fill the required volume (affecting the performance of the equipment).*



Filtration

Filter/regulators are located on the Dense Phase Hopper and the motion control system. The air supply connection is made at the filter/regulator.

Water Requirements

Two water sources are required for the intensifier pump:

- The water source to supply the intensifier pump that produces the ultra high pressure (UHP) water ***must*** be pretreated for either the removal of hardness, reduction in total dissolved solids, or regulation of the pH level.
- The water source to supply the heat exchanger ***should*** be treated to remove any impurities that might react with the copper in the heat exchanger. The temperature of the cooling water is an important factor to keep the hydraulic fluid at the proper operating temperature.

The water supplied to the intensifier is a crucial factor in waterjet cutting because of its direct influence on the service life of equipment components such as check valves, seals, and the orifices that shape the water stream. A high concentration of Total Dissolved Solids (TDS) causes accelerated wear of these components.

As part of pre installation planning, have a water quality analysis performed by a commercial company that specializes in water conditioning equipment. Water quality available for the installation is unique for each application and geographic location. Consult a water purification supplier to determine the most suitable equipment for specific local conditions. The minimum information that should be furnished is:

- TDS
- Silica content
- pH value

Inlet water should be pretreated for either the removal of hardness or reduction in total dissolved solids. Water softening is an ion exchange process that removes scale forming minerals such as calcium. TDS reduction can be accomplished with either deionizing (DI) or reverse osmosis (RO) equipment. DI or RO will usually provide better component life than water softening processes.

The best pretreatment process for a specific application is based on the original water quality and the desired service life of affected components. Water treatment resulting in TDS content of less than 0.5 ppm is not recommended.

Cooling water

The heat exchanger uses regular tap water to cool the hydraulic fluid. The hydraulic fluid temperature must be maintained below 120° F (49° C). A constant water flow of 3–12 gpm (11–45 lpm), depending on the pump model, is required at an inlet temperature not to exceed 70° F (21° C). Public water is usually acceptable for cooling purposes. The ambient temperature can also be a factor in cooling. Additional cooling might be required if the pump is confined in a small, high temperature space.

Sewer Requirements

Two independent lines to the sewer drain are required. Leakage water and coolant water exiting must be separate or the collector manifold may overflow. The drain should be as close to the machine as possible. Venting of water from the exit ports is gravity-induced and must have a sufficient vertical drop to prevent backup.

Water treatment guidelines

- Low TDS (less than 100 ppm): Considered good water quality and can be treated by softening.
- Moderate TDS (100 to 200 ppm): Can be treated either with softening or TDS reduction (RO reverse osmosis) or (DI deionizing).
- High TDS (greater than 200 ppm): Considered poor water quality and should be treated with RO (reverse osmosis) or DI (deionizing).
- High silica content (greater than 15 ppm): Can only be removed with RO (reverse osmosis) or DI (deionizing) systems.
- Carbon filtration can remove objectionable odors. This is often a consideration in food processing applications.
- The treated water must have a pH value of 6.5 to 8.5, and should be filtered to 0.5 microns absolute to remove suspended particulates such as dirt, silt, and algae.

The physical process of pressurizing the water within the intensifier cylinder causes a rapid rise in water temperature. The temperature of the water supplied to the intensifier assemblies should be kept as low as possible (70° F/21° C maximum).

Excessive inlet water temperatures can cause accelerated wear and reduce component service life, especially the high pressure seals. In installations where initial supply water temperature is above the maximum recommended, additional pre-cooling may be required.

Water Impurities

Scale forming constituents, besides the material build-up, cause erosion; dissolved solids come out of solution and act as abrasive. Primary components affected are: orifices, high pressure seals.

Waterjet components are subject to stress levels which are sensitive to the effect of compounds in water that can lead to localized damage, like corrosion; this can lead to crack initiation failure of metallic pressurized components.

Hardness, iron, and manganese

These three components can form deposits, and/or cause erosion; specially at the nozzle which affects cutting efficiency and unscheduled downtime. High pressure seals are also affected.

Considering if other elements are within acceptable levels, in most cases a water softener will satisfy both, flow rate and capacity requirements.

Observe the usual hardness, iron and manganese application criteria. Use appropriate accessories when the hardness to iron ratio is less than 8 : 1. When iron or manganese is the only problem, use properly sized filtering elements with surface active agents for retention.

Dissolved solids, chloride, silica

High TDS and chloride can promote corrosion on wetted metal parts. TDS and silica can contribute to scaling and erosion. When raw water TDS exceeds 200 mg/L, or chloride exceeds 100 mg/L, or silica exceeds 15 mg/L, RO (reverse osmosis) or DI (deionized) water treatment is recommended. At or below 'Maximum Allowable" amounts, TDS can not be reduced by softening.

Common Impurities Found In Water

Constituent	Chemical Formula	Notes
Calcium	Ca	When dissolved make the water hard. Contributes to the formation of scale.
Chloride	Cl	Adds to solid content and increases corrosive character of water; in relative percentage presence with oxygen induces stress corrosion cracking
Iron	Fe+ + (ferrous) Fe+ + +(ferric)	Discolors water or precipitation. Source of scale and erosion.
Manganese	Mn+ +	Discolors water or precipitation. Source of scale and erosion
Magnesium	Mg	When dissolved makes the water hard. Contributes to the formation of scale.
Nitrate	NO_3	Adds to solid content, but its effect is not usually significant industrially.
PH		Varies according acidic or alkaline solids in water.
Silica	SiO_2	Causes scale.
Sodium	Na	Found naturally; and introduced to water in the ion exchange water softening process.
Sulfate	SO_4	Adds to solid content of water; combines with calcium to form calcium sulfate scale.

Water Analysis

A water analysis report provides data for a variety of impurities, the impurities listed in the following table are the most significant for ultra high pressure (UHP) equipment.

Water Quality Impurity Limits

Impurity	Acceptable Range*
Calcium	N/D to 25 mg/L
Chloride (Cl)	N/D to 15 mg/L
Iron (Fe)	N/D to 0.2 mg/L
Manganese (Mn)	N/D to 0.5 mg/L
Magnesium (Mg)	N/D to 0.1 mg/L
Nitrate (N)	N/D to 25 mg/L
pH	6.5–8.5
Silica (SiO_2)	N/D to 14 mg/L
Sodium (Na)	N/D to 50 mg/L
Sulfate (SO_4)	N/D to 25 mg/L
TDS	5–200 mg/L
Total hardness ($CaCO_3$)	1–25 mg/L
Turbidity	1–5 NTU

* ND = Non Detectable

Terminology

Anions—ions (atoms or molecules with an electrical charge) with a negative (-) electrical charge, so named because they go toward the anode in an electric field. The main anions in water are hydroxide (OH^-), carbonate (CO_3^{-2}), bicarbonate (HCO_3^-) which together comprise "alkalinity", sulfate (SO_4^{-2}), nitrate (NO_3), and chloride (Cl^-)

Cations—ions (atoms or molecules with an electrical charge) with a positive (+) electrical charge, so named because they go toward the cathode in an electric field. Besides the hardness ions, the main cations in water are sodium, Na^+, and potassium, K^+.

Chloride, Cl —a common mineral component, can be found in elevated levels near seawater and other salt supplies, which can cause taste problems and can contribute to corrosion resulting in stress corrosion cracking. Recommended U.S. limit is 0.3 mg/L.

Iron, Fe—causes rust stains and premature failure of high pressure components. The recommended U.S. limit is 0.3 mg/L.

Manganese, Mn—causes scale when dissolved. Often occurs in combination with iron. The recommended U.S. limit is 0.05 mg/L Mn or a total of 0.3 mg/L of Fe + Mn.

Nitrate/Nitrite, NO_3 /NO_2—important because of toxicity to infants, nitrate comes from fertilizers and animal wastes. Water supplies with high nitrate levels should also be screened for agricultural pesticides and bacterial contamination. The mandatory limit under U.S. regulations is 10 mg/L This is usually not a concern in high pressure equipment.

pH—the acid strength of water on a scale of 0 to 14 (neutral = pH 7.0). Values from 0 to 7 are increasingly more acidic; values from 7 to 14 are increasingly more alkaline. The recommended range for drinking water under the U.S. regulations is 6.5 to 8.5. If the pH level is too low, component life can be affected.

Silica, SiO_2—a naturally occurring dissolved mineral, which produces a glassy scale.

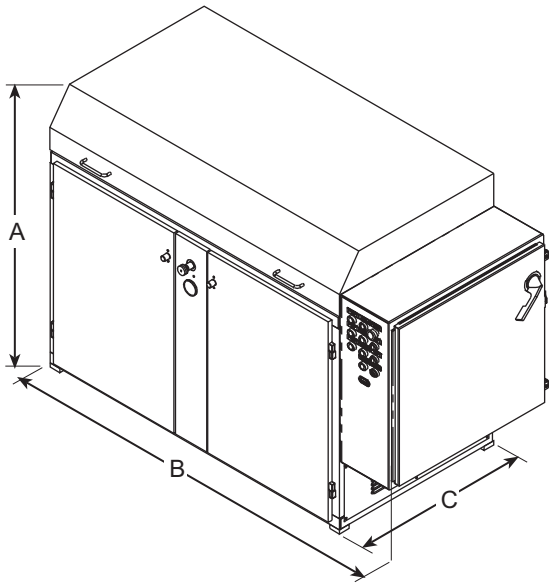
Sulfate, SO_4^{-2}—a common mineral component, only rarely grousing at excessive levels, which can cause calcium sulfate scale when combined with calcium. Recommended U.S. limit is 250 mg/L.

Total Hardness—the sum of all metal ions, mostly Calcium and Magnesium. When heated or evaporated, hard water can cause lime scale that can deposit on components which results in loss in efficiency.

Turbidity—cloudiness in water caused by the dispersion of light by extremely tiny particles. Measured on an arbitrary scale of Nephelometric Turbidity Units (NTUs). The mandatory maximum under U.S. regulations is 0.5 NTU.

Equipment Dimensions

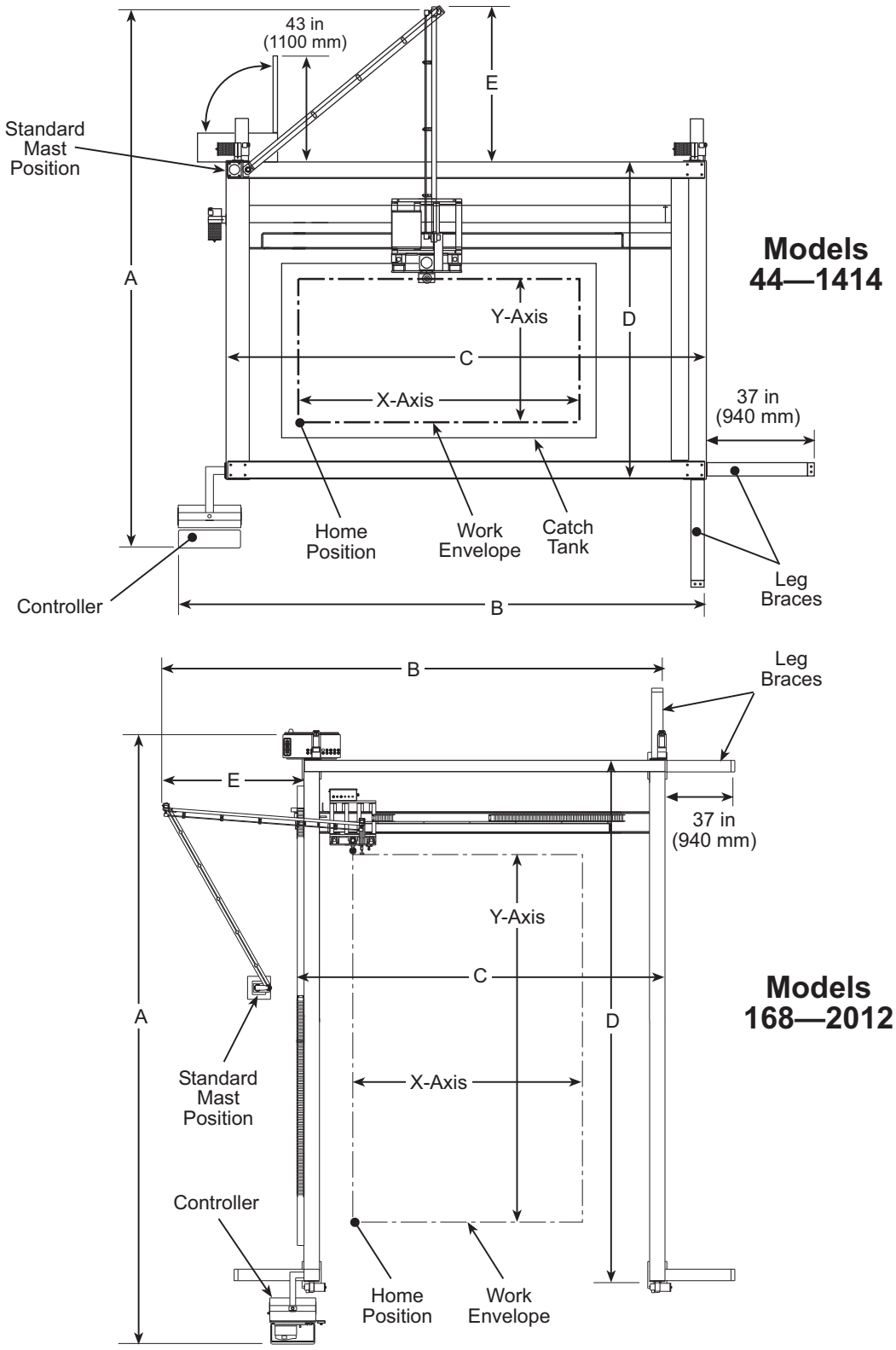
Intensifier Pump Dimensions



Intensifier Pump Dimensions

Model	Height (A)	Width (B)	Depth (C)
iP36-50	52 in (1325 mm)	80 in (2040 mm)	37 in (940 mm)
iP36-100	60 in (1525 mm)	96 in (2440 mm)	37 in (940 mm)
iP36-200	60 in (1525 mm)	95 in (2420 mm)	60 in (1530 mm)
iP55-30	53 in (1350 mm)	64 in (1630 mm)	33 in (840 mm)
iP55-50	53 in (1350 mm)	71 in (1810 mm)	36 in (920 mm)
iP55-50R	55 in (1400 mm)	55 in (1400 mm)	54 in (1380 mm)
iP55-75	55 in (1400 mm)	86 in (2190 mm)	40 in (1120 mm)
iP55-100	55 in (1400 mm)	86 in (2190 mm)	40 in (1120 mm)
iP55-150	55 in (1400 mm)	86 in (2190 mm)	52 in (1320 mm)
iP55-200	60 in (1550 mm)	95 in (2420 mm)	60 in (1530 mm)
iP60-50	53 in (1350 mm)	74 in (1880 mm)	37 in (940 mm)
iP60-100	56 in (1430 mm)	83 in (2110 mm)	40 in (1020 mm)
iP60-150	56 in (1430 mm)	83 in (2110 mm)	56 in (1430 mm)
xP90-50	53 in (1350 mm)	72 in (1810 mm)	36 in (915 mm)
xP90-100	55 in (1400 mm)	86 in (2190 mm)	40 in (1020 mm)

High Rail Dimensions



High Rail Dimensions* in inches (millimeters)

Model†	A	B	C	D	E	Work Envelope (Y-axis x X-axis)
44	167 (4242)	136 (3454)	117 (2972)	110 (2794)	26 (660)	48 x 48 (1220 x 1220)
48	191 (4851)	160 (4064)	165 (4191)	110 (2794)	50 (1270)	48 x 96 (1220 x 2440)
410	203 (5156)	208 (5283)	189 (4800)	110 (2794)	65 (1651)	48 x 120 (1220 x 3050)
64	203 (5156)	136 (3454)	117 (2972)	146 (3708)	26 (660)	72 x 96 (1830 x 2440)
68	237 (6020)	184 (4674)	165 (4191)	146 (3708)	50 (1270)	72 x 96 (1830 x 2440)
610	239 (6071)	208 (5283)	189 (4800)	146 (3708)	62 (1575)	72 x 120 (1830 x 3050)
612	239 (6070)	232 (5895)	213 (5410)	146 (3708)	65 (1575)	72 x 144 (1830 x 3660)
84	261 (6629)	136 (3454)	117 (2972)	164 (4165)	66 (1676)	96 x 48 (2440 x 1220)
812	285 (7239)	232 (5893)	213 (5410)	164 (4165)	90 (2286)	96 x 144 (2440 x 3660)
1010	309 (7849)	208 (5283)	189 (4800)	180 (4572)	98 (2489)	120 x 120 (3050 x 3050)
1014	333 (8458)	256 (6731)	237 (6020)	180 (4572)	122 (3099)	120 x 168 (3050 x 4270)
126	351 (8915)	160 (4064)	141 (3581)	204 (5182)	116 (2946)	144 x 72 (3660 x 1830)
1212	357 (9068)	232 (5893)	213 (5410)	204 (5182)	122 (3099)	144 x 144 (3660 x 3660)
148	381 (9677)	321 (8153)	165 (4191)	228 (5791)	122 (3099)	168 x 96 (4670 x 2440)
1414	393 (9982)	256 (6502)	237 (2222)	228 (5791)	134 (2222)	168 x 168 (4670 x 4670)
168	310 (7874)	233 (5918)	165 (4191)	274 (6960)	70 (1778)	192 x 96 (4880 x 4670)
1610	310 (7874)	262 (6655)	189 (4801)	274 (6960)	76 (1930)	192 x 120 (4880 x 3050)
1812	348 (8839)	315 (8001)	213 (5410)	302 (7671)	102 (2591)	216 x 144 (5490 x 3660)
2010	371 (9423)	279 (9627)	189 (4801)	326 (8280)	90 (2286)	240 x 120 (6100 x 3050)
2012	371 (9423)	303 (7996)	213 (5410)	326 (8280)	107 (2718)	240 x 144 (6100 x 3660)

* Dimensions are calculated and should be considered close approximations.

† Model numbers are based on the size of the work envelope in feet; for example, Model 168 has a y-axis of 16 feet and an x-axis of 8 feet; contact Jet Edge for custom table sizes up to 24 feet x 14 feet.

Note *Work envelopes with the y-axis 168 inches (4670 mm) and longer have a different mast location.*

Note *Leg braces are placed as needed for the model size, they add to the overall footprint.*

Height dimensions The height dimensions are the same for all models:

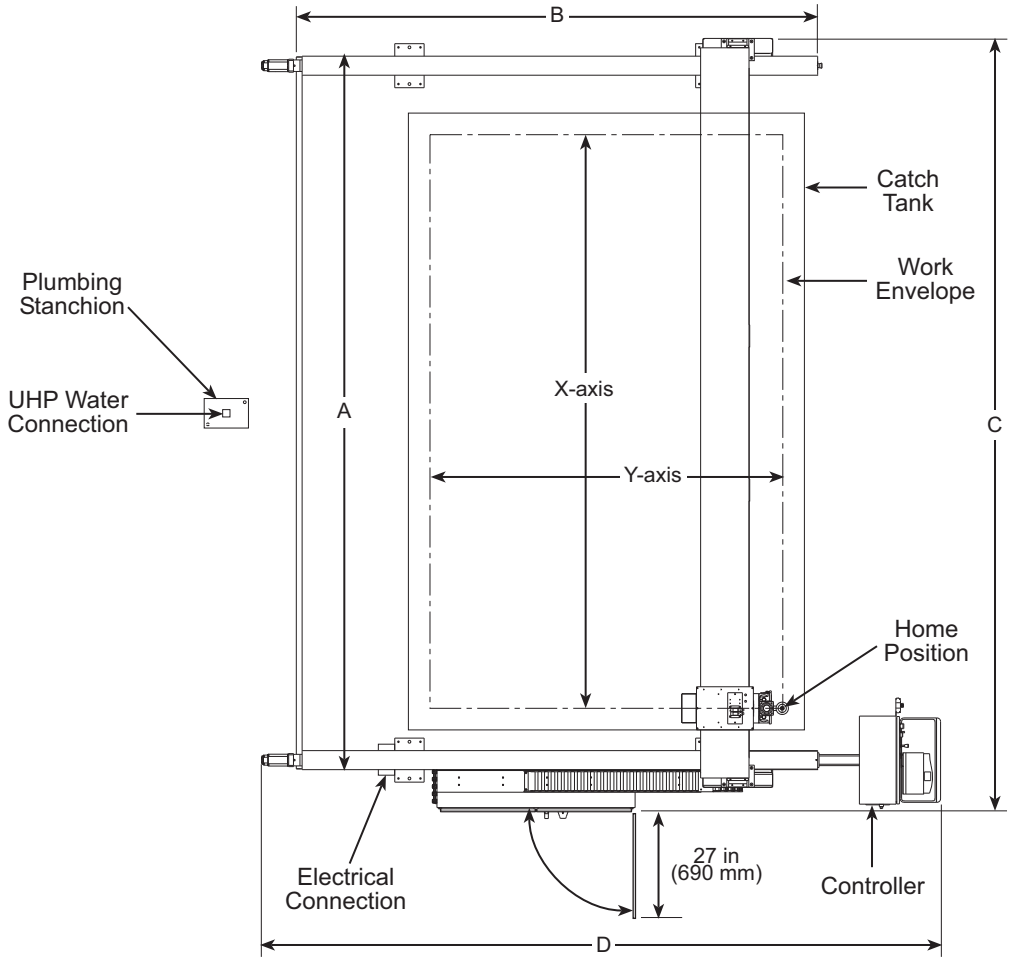
E—height to top of UHP whips = 137 in (3480 mm)

F—height to top of mast = 123 in (3130 mm)

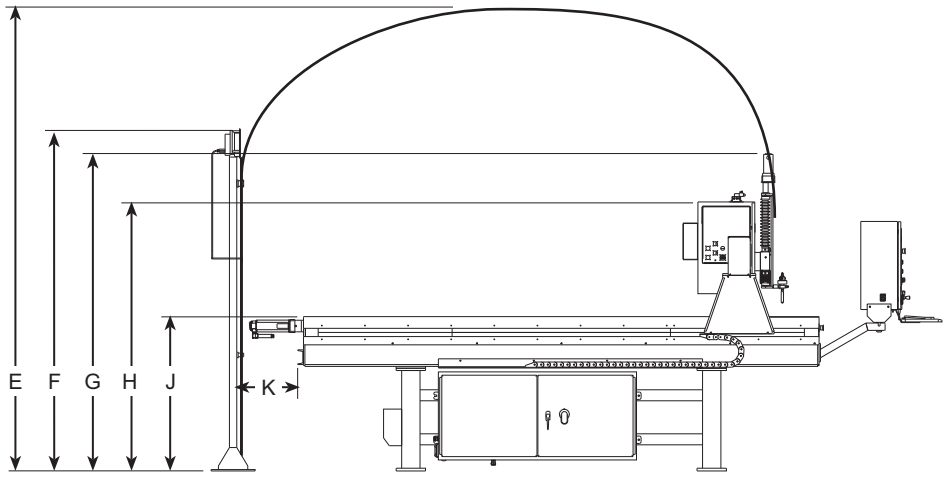
G—height to top of support beam = 95 in (2390 mm)

Mid Rail Dimensions

Top View



Side View



Mid Rail Dimensions* in inches (millimeters)

Model†	A	B	C	D	Work Envelope (Y-axis x X-axis)‡
55	99 (2970)	105 (2670)	117 (2980)	139 (3540)	60 x 60 (1530 x 1530)
58	135 (3430)	105 (2670)	153 (3890)	139 (3540)	60 x 96 (1530 x 2440)
513	195 (4960)	105 (2670)	213 (5410)	139 (3540)	60 x 156 (1530 x 3970)
85	99 (2970)	141 (3580)	117 (2980)	175 (4450)	96 x 60 (2440 x 1530)
813	195 (4960)	141 (3580)	213 (5410)	175 (4450)	96 x 156 (2440 x 3970)
1313	195 (4960)	220 (5590)	213 (5410)	265 (6740)	156 x 156 (6400 x 6400)
215	99 (2970)	316 (8030)	117 (2980)	361 (9170)	60 x 156 (1530 x 6400)
2113	195 (4960)	316 (8030)	213 (5410)	361 (9170)	156 x 252 (6400 x 3970)
2413	195 (4960)	144 (3660)	213 (5410)	397 (1085)	156 x 288 (6400 x 7320)

* Dimensions are calculated and should be considered close approximations.

† Model numbers are based on the size of the work envelope in feet; for example, Model 215 has a y-axis of 21 feet and an x-axis of 5 feet.

‡ Catch tank is 12 inches (300 mm) larger than the work envelope.

Note *The plumbing stanchion is located at the rear of the motion control table and uses a flexible whip to route the ultra high pressure (UHP) water to the cutting head. Tables with side rails 13 feet and longer have the plumbing stanchion located to the side of the of the motion control table and use scissor arms to route the ultra high pressure (UHP) water to the cutting head.*

Common dimensions

The following dimensions are the same for all models:

E—height to top of UHP whips = 192 in (4880 mm):

F—height to top of plumbing stanchion = 84 in (2140 mm)
MR 2113 = 123 in (3130 mm)
MR 2413 = 144 in (3660 mm)

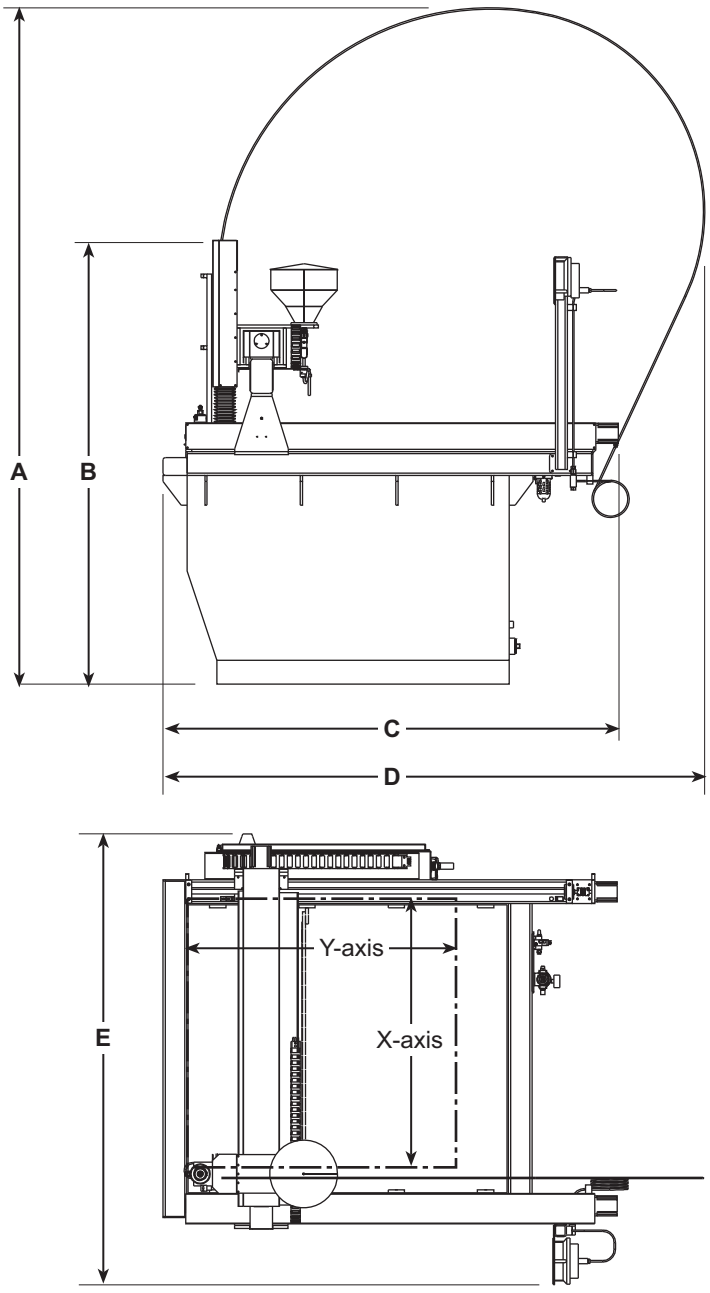
G—height to top of z-axis motor = 88 in (2240 mm)

H—height to top of cross beam = 74 in (1880 mm)

J—height to top of side beam = 43 in (1100 mm)

K—plumbing stanchion post to rear brace = 15 in (380 mm)
MR 2113 and MR 2413 to side of the table = 135 in (3430 mm)

BOSS-CUTTER Dimensions

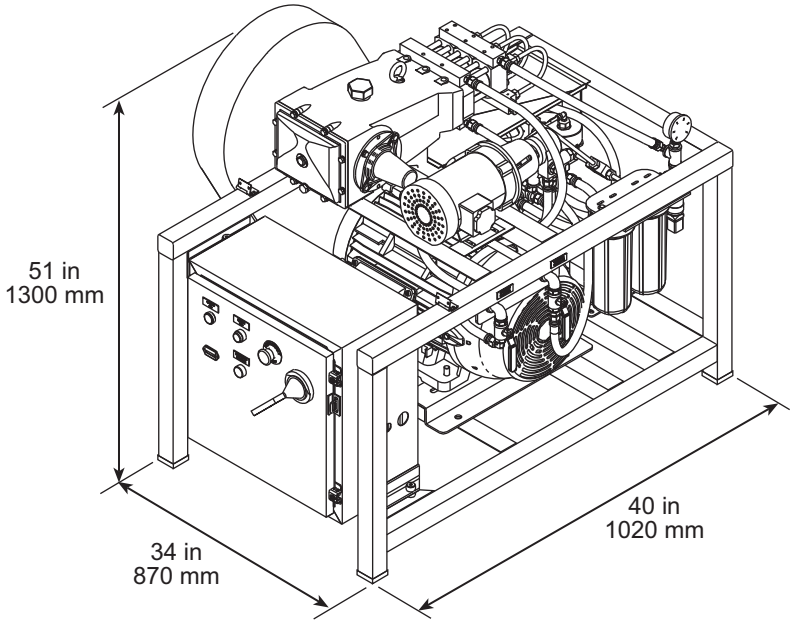


BOSS-CUTTER Dimensions in inches (millimeters)

Model*	A	B	C	D	E	Work Envelope (Y-axis x X-axis)
1000	113 (2870)	74 (1880	77 (1955)	91 (2315)	75 (1905)	39 x 39 (1000 x 1000)
1500	113 (2870)	74 (1880	91 (2315)	106 (2695)	96 (2440)	59 x 59 (1500 x 1500)

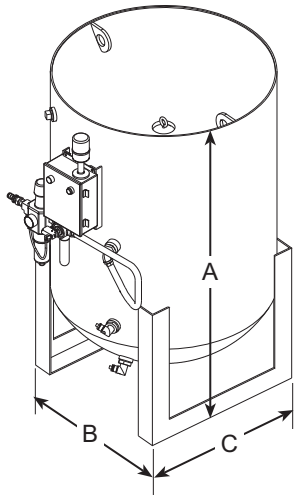
* Model numbers are based on the size of the work envelope in millimeters.

ECO-JET Dimensions



Dense Phase Hopper Dimensions

The dense phase hopper is located near the motion control table. The mini hopper is located on the Z-axis assembly of the motion control table.



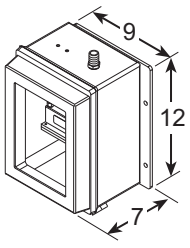
Dense Phase Hopper Dimensions

Model*	A	B	C
3.5	42 in (1070 mm)	24 in (610 mm)	24 in (610 mm)
6.5	48 in (1220 mm)	30 in (765 mm)	34 in (865 mm)
20	60 in (1525 mm)	36 in (915 mm)	46 in (1170 mm)
35	85 in (2160 mm)	38 in (965 mm)	46 in (1170 mm)

* The model number is the capacity of the hopper in cubic feet.

The mini hopper enclosure is:

9 inches (230 mm) wide,
7 inches (180 mm) deep,
12 inches (305 mm) tall;



Allow extra height for the abrasive feed tube connection on the top of the enclosure and an 8 inch (205 mm) minimum radius for the abrasive feet tube.

Specifications

Intensifier Pump General Specifications

Parameter	Specification
Low pressure water	See "Water Requirements" on page 8.
Input pressure	Minimum pressure 40 psi (3 bar); 60 psi (4 bar) for models 55-50A and 55-50R
Input temperature	Maximum temperature 70°F (21°C)
Filtration	On-board filtration to 0.45 micron
High pressure water	Continuous output, peak about 10% higher
	Series 36 = 36,000 psi (2500 bar); Series 55 and 60 = 55,000 psi (3800 bar); Series 90 = 75,000 psi (5170 bar).
Cooling water	See "Water Requirements" on page 8.
Input pressure	Minimum pressure 40 psi (3 bar)
Input temperature	Maximum temperature 70°F (21°C)
Hydraulic fluid	See the "Hydraulic Fluid Selection Chart" on page 33.

Intensifier Pump Model Specific Specifications

Model	Electric Motor Power	Heat Load (BTU/hour)	Hydraulic Fluid Capacity	Water Output Flow Rate	Weight*
iP36-50	50 hp (37 kw)	37,000 BTU	40 gal (150 L)	2 gpm (7.6 Lpm)	3000 lb (1360 kg)
iP36-100	100 hp (75 kw)	80,000 BTU	80 gal (305 L)	3.8 gpm (14.4 Lpm)	4600 lb (2090 kg)
iP36-200	200 hp (149 kw)	125,000BTU	105 gal (400 L)	6.0 gpm (22.7 Lpm)	6200 lb (2810 kg)
iP55-30	30 hp (22 kw)	21,000 BTU	20 gal (80 L)	0.6 gpm (2.3 Lpm)	2000 lb (910 kg)
iP55-50	50 hp (37 kw)	25,000 BTU	25 gal (100 L)	1.0 gpm (3.8 Lpm)	2500 lb (1140 kg)
iP55-50C	50 hp (37 kw)	25,000 BTU	35 gal (130 L)	1.0 gpm (3.8 Lpm)	2500 lb (1140 kg)
iP55-50R	50 hp (37 kw)	39,000 BTU	45 gal (170 L)	1.0 gpm (3.8 Lpm)	3650 lb (1660kg)
iP55-75	75 hp (56 kw)	55,000 BTU	55 gal (210 L)	1.5 gpm (5.7 Lpm)	4100 lb (1970 kg)
iP55-100	100 hp (75 kw)	97,000 BTU	55 gal (210 L)	2.3 gpm (8.7 Lpm)	4600 lb (2090 kg)
iP55-150	150 hp (112 kw)	125,000 BTU	105 gal (400 L)	3.0 gpm (11.4 Lpm)	6100 lb (2770 kg)
iP55-200	200 hp (149 kw)	125,000 BTU	105 gal (400 L)	4.0 gpm (15.2 Lpm)	6200 lb (2820 kg)
iP60-50	50 hp (37 kw)	25,000 BTU	35 gal (135 L)	1.0 gpm (3.8 Lpm)	2500 lb (1140 kg)
iP60-100	100 hp (75 kw)	97,000 BTU	55 gal (210 L)	2.3 gpm (8.7 Lpm)	4600 lb (2090 kg)
iP60-150	150 hp (112 kw)	125,000 BTU	105 gal (400 L)	3.0 gpm (11.4 Lpm)	4600 lb (2090 kg)
xP60-50	50 hp (37 kw)	25,000 BTU	45 gal (170 L)	0.7 gpm (2.6 Lpm)	2700 lb (1230 kg)
xP90-100	100 hp (75 kw)	97,000 BTU	60 gal (230 L)	1.45 gpm (5.5 Lpm)	4900 lb (2230 kg)

* Dry weight; units shipped by air have no hydraulic fluid; units shipped by ground have hydraulic fluid in the tank.

Motion Control Table Specifications

Parameter	Specification
UHP water connection	3/8 inch Autoclave-style high pressure coupling
Air supply	Filtered and dry air supply
Input	80–90 psi (5.5–6.2 bar)
Flow*	6 cfm (0.17 m^3/m) minimum
Catch tank	
Drain	1 in (25 mm) hose connection
Weight (empty)	See "Catch Tank Considerations" on page 26
Electrical power	Specific to local requirements

* Higher flow is needed for the catch tank bladder option, see "Catch Tank Considerations" on page 26.

Dense Phase Hopper Specifications

Parameter	Specification	
Air supply	Filtered and dry air supply	
Input	80–90 psi (5.5–6.2 bar)	
Flow	11 cfm (0.31 m^3/m) minimum	
Abrasive		
Delivery rate		
main hopper*	0.25–30 lb/m (0.11–13.6 kg/m)	
mini hopper	0.25–1.8 lb/m (0.11–0.8 kg/m) nominal 3.5 lb/m (1.6 kg/m) maximum†	
Media size	30–200 mesh	
Capacity and weight (approximate)	3.5 Cubic Foot	400 lb (180 kg)
	6.5 Cubic Foot	800 lb (360 kg)
	20 Cubic Foot	2500 lb (1130 kg)
	35 Cubic Foot	4000 lb (1900 kg)
Electrical power		
Basic controls	115 V(ac)	
Advanced controls	24 V(dc)	
Weight	approximate, empty	
3.5 Cubic Foot	235 lb (110 kg)	
6.5 Cubic Foot	340 lb (155 kg)	
20 Cubic Foot	785 lb (360 kg)	
35 Cubic Foot	1020 lb (465 kg)	

* Main hopper can supply up to four mini hoppers.

† Requires high flow equipment.

ECO-JET Direct Drive Specifications

Parameter	Specification
Air Supply	60 psi (4 bar)
High Pressure Water	
Output pressure	55,000 psi (3800 bar) continuous
Flow rate	1 gpm (3.8 L/min)
Low Pressure Water	See "Water Requirements" on page 22
Input pressure	Minimum pressure 60 psi (4.2 bar)
Input temperature	Maximum temperature 70°F (21°C)
Filtration	On-board filtration to 0.45 micron
Water flow	Cooling circuit: 4 gpm (15 L/min) High pressure circuit: 4.5–5 gpm (17–19 L/min)
Motor	High efficiency TEFE electric motor
Current	35 A at full load
Output	30 hp (22.4 kw)
Weight	1500 lb. (680 kg); approximate

BOSS-CUTTER Specifications

Parameter	Specification
Air supply	Filtered and dry air supply
Input	80–90 psi (5.5–6.2 bar)
Flow	6 cfm (170 L/m) minimum
Electrical Power	115 Vac, 60 Hz
Feed Rate	200 inches/min (5000 mm/min) maximum traverse speed
Positioning Accuracy	0.006 inches (0.15 mm)
Weight (approximate)	1800 lbs (815 kg) dry 4600 lbs (2050 kg) with water in the catch tank
Material load	205 lbs/ft^2 (1000 kg/m^2)
Working Pressure	60,000 psi (4200 bar)

Environmental (all products)	Ambient temperature	50°–95° F (10°–35° C)
	Relative humidity	Non condensing, maximum 95% at 95°F (35°C)
	Altitude	Up to 3000 feet (1000 m)

Specifications All specifications are subject to change without notice. Contact Jet Edge to verify specifications that are critical to your application

Hardware Considerations

Review the following installation information for each machine.

UHP Pump Considerations

The ultra high pressure (UHP) water pumps supply the motion control system table. Several water connections are required for the intensifier pump.

Water Connections

Connection	Type
Leakage Water Out	1/2 inch NPT
High Pressure Water Out*	3/8 inch high pressure coupling
Coolant Water Out†	1/2 inch NPT
Coolant Water In†	1/2 inch NPT
Filtered Water In‡	1/2 inch NPT

* Model iP55-200 has a 9/16 inch high pressure coupling.

† Models iP36-200, iP55-150, and iP55-200 have a 3/4 inch NPT connection. The ECO-JET does not have a coolant water out connection.

‡ Models iP36-200, and iP55-200 have a 3/4 inch NPT connection.

- All tap water supply ports are U.S. standard NPT thread.
- The UHP pump can be located anywhere in the plant. The pump comes with 25 feet (7500 mm) of ultra high tubing. The way the tubing should be routed will require the pump to be within about 10 feet (3000 mm) of the motion control table. For any other location additional (optional) UHP tubing is required (there is a pressure drop for each foot between the pump and table).
- The UHP stainless steel tubing must be rated for 60,000 psi (4100 bar) for most pumps; Series 90 intensifier pumps require UHP stainless steel tubing rated for 100,000 psi (5170 bar).
- Cover the tubing with flexible sheathing to protect personnel in case of a line break. A gauge (60–80 ksi capacity) is required in the UHP line from the machine to the cutting equipment to monitor output water pressure.
- Clamp the UHP tubing to a nearby wall or overhead bracing for stability. Vibration caused by water pulsations can induce failure, especially at connection points, unless the tubing is securely supported.
- UHP autoclave style connections are required at the intensifier pump output and the motion control system table input.
- Water supply and drain lines should be Parker 801-8 or equivalent, PVC, or stainless steel. Do not use copper, galvanized, or iron pipe.
- The ECO-JET pump requires a signal connection from the motion control system to bleed off UHP water when the cutting head is turned off.

High Rail Considerations

⚠ CAUTION

Do not position the rear of the high rail table too close to any structures. The high pressure arm on top of the high rail will articulate out and over the rear of the machine. If the arm movement is restricted, the arm will become damaged.

Ensure the high pressure arm can operate though the entire work envelope without interference at the rear of the machine.

Controller location

The controller is located on the left front leg of the high rail. This is the location where the operator runs the machine; it is near the home position of the motion control system. For custom applications the controller can be located to another location such as the right front leg or a stand alone console.

Leg braces

Leg braces provide support for the high rail legs. Four or more legs are used; the number of braces is system specific and factor in the size of the foot print, tool movement speed, and the mass of the Z-package. The leg braces can be placed on any side of a leg. Leg braces add 37 inches (940 mm) to the high rail foot print when they are attached to the inboard or outboard side of the legs.

Note *When determining the foot print of the high rail table remember to account for any leg extensions that might be included.*

Catch tank

The catch tank is 12 inches (305 mm) larger than the high rail work envelope. The x-axis of the work envelope can be increased with the use of a spreader bar. If a spreader bar exceeds four feet (1220 mm) the catch tank might affect the footprint dimension.

See “Catch Tank Considerations” on page 26 for information about the weight of the catch tank and the pneumatic requirements for the air bladder option.

Mast location

The mast that supports the high pressure arms is located on the left rear leg. For custom installations it can be mounted on other legs. The location of the mast determines which side of the high rail the high pressure arms extend when they are retracted. The mast location affects where the UHP water connection is located, and where the abrasive feed tubing and pneumatic tubing is routed to the z-axis assembly.

Water connections

The high rail motion control system requires an ultra high pressure (UHP) water connection from an intensifier pump. The connection is made to the swivel located at the top of the leg with the mast. The UHP plumbing is typically routed from the floor up the leg. The UHP can be routed from other locations with proper support for the UHP water line.

Electrical connection

Incoming electrical power is connected at the junction box located on the left rear leg of the machine, below the electrical assembly. For custom applications the electrical assembly can be mounted to another leg of the motion control system. The door of the electrical assembly must be able to fully open.

Material loading/ unloading

Material is typically loaded from the front of the machine. Custom applications can have shuttles to load/unload material from any side or additional leg braces when cross braces are removed to accommodate over head lifting systems.

Catch Tank Considerations

The catch tank is one of the heaviest pieces of equipment and with the air bladder option it has the highest demand from the air supply system.

Weight

The following lists the size and approximate weight of a selection of catch tanks, use the table as a guide to estimate specific equipment.

Note *Use a forklift at one end of the catch tank to push it and a pallet jack at the other end to steer the catch tank under the motion control table.*

Size (in feet)	Empty Weight	Full Weight*
5 x 5	2240 lb (840 kg)	5820 lb (2640 kg)
5 x 9	3750 lb (1400 kg)	10,190 lb (4620 kg)
7 x 13	8750 lb (3270 kg)	19,950 lb (9050 kg)
9 x 17	10,420 lb (3890 kg)	33,140 lb (15,030 kg)

* Filled with water; when half filled with abrasive the weight is about a third more. Jet Edge has an Excel spreadsheet that estimates catch tank weights for any size tank (empty, full of water, half full with abrasive).

Dimensions

The catch tank is 12 inches (305 mm) larger than the motion control system work envelope. A standard catch tank is 35 inches (890 mm) tall and the work surface is 33 inches (840 mm) with a 2 inch (50 mm) lip.

Ports

The catch tank includes abrasive recovery ports and an overflow drain. The locations can be custom ordered. The following are the standard locations (as viewed from the front of the machine):

- High Rail catch tanks have the abrasive recovery ports on the left side of the tank; the overflow drain is on the right side of the tank.
- Mid catch tanks have the abrasive recovery ports on the both sides of the tank; the overflow drain is on the left rear of the tank.

Bladder tank option

A bladder tank can raise and lower the catch tank water level 3 inches (75 mm) making the height of the catch tank 38 inches (965 mm) tall. Large catch tanks raise the water level 2 inches (50 mm) making the height of the catch tank 37 inches (940 mm) tall.

The volume of air needed to raise the water level in the catch tank 3 inches can be calculated as follows:

$$(\text{catch tank length} \times \text{catch tank width}) / 4$$

- The size of the lines from the air compressor to the catch tank bladder affects how quickly air the air bladder fills.
- The size of the air compressor tank should be the same size or larger than the volume needed by the air bladder.

Mid Rail Considerations

Water connections

The mid rail motion control system requires an ultra high pressure (UHP) water connection from an intensifier pump. The connection is made to the base of a plumbing stanchion at the center-rear of the table. The UHP plumbing is a whip from the stanchion to the Z-axis. Tables with 21 foot side beams and longer have scissor arms at the side of the table instead of a UHP whip.

The catch tank has a one inch (25 mm) water overflow hose that must be routed to a drain.

Electrical connection

Incoming electrical power is connected at the junction box located on the left side of the machine, on the rear leg next to the electrical assembly. The door of the electrical assembly must be able to fully open

Pneumatic connection

Air is connected to a regulator located on the left-front of the machine with a quick connect coupling.

Abrasive tubing

Abrasive is routed to the z-axis assembly along the UHP whip from the plumbing stanchion.

Catch tank

The catch tank is 12 inches (305 mm) larger than the work envelope. See “Catch Tank Considerations” on page 26 for information about the weight of the catch tank and the pneumatic requirements for the air bladder option. For 5-axis systems, the catch tank is 22 inches (560 mm) wider and 36 inches (920 mm) longer than the work envelope.

BOSS-CUTTER Considerations

Water connections

The BOSS-CUTTER motion control system requires an ultra high pressure (UHP) water connection from an intensifier pump. The connection is made to the base of a plumbing stanchion at the right-rear of the table. The UHP plumbing is a whip from the stanchion to the Z-axis.

The catch tank has a one inch (25 mm) water overflow hose that must be routed to a drain.

Electrical connection

Incoming electrical power is through a power cord from the rear of the electrical assembly on the left side of the machine.

Pneumatic connection

Air is connected to a regulator located on the rear of the machine with a quick connect coupling.

Abrasive

If the machine is equipped with the mini hopper abrasive supply option, the abrasive is routed to the z-axis assembly along the UHP whip from the plumbing stanchion.

Dense Phase Hopper Considerations

The Dense Phase Hopper supplies abrasive to the mini hopper(s) which in turn regulates the abrasive supply to the Permalign abrasivejet. The mini hopper is mounted on the Z-axis assembly of the motion control table.

- The abrasive hose run from the dense phase hopper to the motion control table should be as short as possible.
- The abrasive hose is routed along the route of the UHP tubing to the Z-axis assembly.

  High Rail—route the abrasive tubing from the left rear leg of the high rail motion control table, along the high pressure arm assembly to the mini hopper on the Z-axis.

  Mid Rail—route the abrasive tubing from the plumbing stanchion at the of the mid rail motion control table, along the UHP whip to the mini hopper on the Z-axis.

The Dense Phase Hopper should be located as close as possible to the motion control table as practical to ease the flow of abrasive to the motion control table. Access to the hopper for abrasive refills should also be considered.

Pneumatic connection

Air is connected to a regulator located on the front of the hopper with a quick connect coupling.

Installation

Jet Edge can provide a qualified service engineer to assist with the installation, start-up, and training of the system following the customer's completion of the pre-installation requirements as outlined by Jet Edge.

Installation start-up & training

Jet Edge's installation/start-up services include the following:

- Jet Edge will provide a qualified service engineer for up to four consecutive working days during the normal working days of Monday through Friday. Working days are eight hours each during normal business hours unless other arrangements have been agreed upon with Jet Edge. Jet Edge may at its option include the services of an additional service engineer to assist with the installation/start-up for part of the service period.
- The Jet Edge service engineer will review the customer's installation responsibilities to ensure they have been completed in accordance with Jet Edge's recommendations. The Jet Edge service engineer will assemble, level, and align the motion control system with the assistance of the customer. The Jet Edge service engineer will custom form all high pressure tubing from the intensifier pump to the motion control system with the assistance of the customer who is to provide and mount any support bracketing that may be required. The Jet Edge service engineer will perform initial start-up of the system.

Note *If an Abrasive Recycling system is purchased, it is the customers responsibility to have enough abrasive (new or used) to fill the cutting tank to a minimum depth of 12" to start-up the recycling system and make the necessary adjustments. Failure to have the necessary abrasive to test the unit will result in only an overview of the unit. If the customer requires a return trip to start-up the abrasive recycling system, it will be billed at our standard rate and will not affect the final payment due date.*

Customer's Responsibilities

The customer's installation responsibilities include the following:

- Uncrating and placement of all equipment with the exception of the motion control system and catch tank.
- The ultra-high pressure pump must be located within ten feet of the motion control system unless special provisions have been made for remote locations.
- The area in which the motion control system will be installed must be left open. The leg orientation is to be chalked out on the floor by the Jet Edge service engineer.
- The customer will uncrate and provide the means for positioning the motion control system and catch tank in its final location with the supervision of a Jet Edge service engineer.
- The customer will supply any special equipment and/or tooling that may be necessary for installation/start-up of the system. See "Required Equipment" on page 31.
- The customer will perform all electrical, low-pressure water, cooling, drain, and air connections, including interconnects between system components with the supplied Jet Edge documentation listing all connection points to all codes that apply to customer's site.
- The customer will supply and mount any necessary bracketing that may be needed to support the high pressure tubing.
- The customer should schedule Jet Edge's installation/start-up services to coincide with the completion of the customer's responsibilities at least three weeks prior to the desired date by calling the Jet Edge project coordinator.
- The customer must supply at least one qualified technician to assist with the installation/start-up of the system.
- Electrical / Water / Air / Drains ready prior to arrival (a floor drain should be in the vicinity of the catch tank)

Note *It is the customer's responsibility to set-up all network connections when communications with the Jet Edge AquaVision controller is needed.*

The Jet Edge service engineer will demonstrate that the controller works on a network by communicating with the service engineer's laptop computer.

Note *If SigmaNest software is purchased, the customer is responsible for loading the software on their computer prior to the training session.*

Required Equipment

The following items must be available for the installation.

- Leveling Transit (non laser type)
- 1/2 gallon Acetone
- Hammer drill with 1/2” cement bit, 12” long
- Wet/Dry vacuum
- 1/2 inch hand drill (Heavy duty 3/8 inch drill will work)
- Step stool or small ladder (3 foot)
- Six foot ground rod installed near control box location (or equivalent ground)
- #10 gage ground wire and clamp to ground the controller
- Air pressure with hose and nozzle
- Lifting equipment (over head crane, forklift, pallet jack), equipment weight and shape varies between models. Contact Jet Edge for information about moving heavy equipment (such as a catch tank).
- Access to a bench vice

Motion control systems only

- Network communication Link
- Clean coffee can
- Sixteen weights for Chockfast forms (i.e. 2-3 lbs steel scraps)

Required Service Tools

- Torque wrench; 30–150 in•lb
- Torque wrench; 50–275 ft•lb
- Extension for torque wrench; 3 or 4 inches long
- Deep socket for the torque wrench; 1-1/8 inch (iP60-50), 1-5/16 inch (iP55-30 – iP55-75A), 1-1/2 inch (all other pumps)
- Hex key sockets for torque wrench; 3/32–3/8 inch
- Hex keys (Allen wrenches) metric & standard
- Pick set
- Pliers set
- Screwdriver set
- Socket set
- Combination wrench set; 5/16–1-1/8 inch
- Adjustable wrenches; 6 inch, 12 inch, 15 inch, and 18 inch
- Volt/Ohm meter
- Spud Wrench 0–2 1/2 inch capacity
  (similar to a pipe wrench but with smooth jaws)
- Crowfoot Wrench; 1-1/4 inch open end
- Rubber or plastic mallet
- Heavy duty bench vise
- Transfer pump with 10 micron filter for transferring hydraulic fluid

Note *A tool kit (part number 105157) is available for the model iP60-50 intensifier pump. The tool kit includes the following tools to service the intensifier assembly.*

Torque Wrench, 30–150 in•lb	*Socket, 1-1/18 inch*
Torque Wrench, 25–250 ft•ft	*Socket, 1/2 inch hex bit*
Combination Wrench, 1-1/8 inch	*Socket, 5/32 inch*
Crowfoot Wrench, 1-1/4 open end	*Socket Extension, 2-1/2 inch*
Retaining Ring Pliers, 90 degree tips	*Tool Box*

Hydraulic Fluid Selection Chart

The intensifier pump uses hydraulic fluid to power the intensifier. The hydraulic fluid is filtered to 10 micron full flow.

- Intensifier pumps shipped by ground have hydraulic fluid in the hydraulic fluid tank (Pennzoil AW). Intensifier pumps shipped by air do not have hydraulic fluid in the hydraulic fluid tank.
- The following table does not list all compatible hydraulic oil. Use hydraulic oil with these characteristics; ISO Viscosity Grade 46, anti-wear, and non-detergent.

Company	Brand Name	Viscosity*		
		cSt @ 40ºC	cSt @ 100ºC	Index
Ashland	Valvoline AW	46	6.6	
BP	Bartran HV	46.5	8.22	152
	Castrol Hyspin AWS 46	46	6.65	102
Chevron	Rykon AW	46	6.7	97
	Rykon Premium	46	8.3	157
	Texaco AW	43.7	6.5	98
Citco	Mystick AW	46	6.8	100
	Mystick AW/AL	46	6.8	98
	Mystick AW/AL HVI-46	46.8	8.3	154
	Mystick Premium AW	46.5	6.8	100
Conoco	Super Hydraulic Oil	46	6.8	100
	Syncon R&O	44	7.4	130
ExxonMobil	Mobil DTE 15M	46	7.86	141
	Mobil DTE 25	44.2	6.65	98
	Nuto H 46	46	6.7	104
	Univis N 46	46	8.19	152
Gulf	Harmony AW	46	6.9	105
Houghton	Hydro-Drive HP	46	6.8	100
Lubrication Engineers	Monolec 6110	46.77	6.84	95
Lubriplate	HO-1	42	7	120
Pennzoil	Pennzbell AW	46	6.9	101

* cSt = Centistoke (a viscosity standard); Viscosity Index is a petroleum industry term (it is a lubricating oil quality indicator, an arbitrary measure for the change of kinematic viscosity with temperature).

Training

Training is provided while the Jet Edge service engineer is on site during the motion control system installation. Additional training can be scheduled.

On site training

Jet Edge will provide up to four hours of on-site operator training on the motion control system. This will familiarize the operator(s) which should have a CNC background with the motion control system controller. If programming software has been provided by Jet Edge, the service engineer will provide up to four hours training to familiarize the programmer with the basic operation of the software.

Jet Edge will provide up to six hours of on-site maintenance training to familiarize the operator(s) and maintenance personnel with the overall waterjet system functions and maintenance.

Note *Any additional time needed for installation and training will be billed at the standard rate.*

Off site training

Jet Edge offers additional training classes in Minneapolis, MN throughout the year. There is a nominal charge for these classes. Additional classes can also be arranged at the customer's site. These classes are billed at the standard training rate in addition to any travel and living expenses incurred by the service engineer. For information on available training classes and costs please contact the Jet Edge service coordinator.