BACA SYSTEMS

AMERICAN STONE AUTOMATION

Robolution Pro

Pre-Installation Document

Revision P-1.01, 10/6/2021

WATER QUALITY REQUIREMENTS ALERT

Failure to meet the water requirements specified in this document could lead to premature equipment failure.

We highly recommend having your water tested to guarantee it meets the water quality requirements listed on page 6. You can purchase an inexpensive testing kit from a local hardware store or, if necessary, contact a water testing lab to have these tests completed. **Complete this test as soon as possible.** Once completed, please provide your BACA project manager the results of each water test.

BACA Systems recommended water specifications are on page 6 of this pre-install document. All water sources feeding your machines should follow these recommendations in order to have the least corrosive water possible contacting the metal components of the equipment. Ideal water quality is crucial to the performance of your machine, so following our recommendations will minimize any corrosion or other negative impacts due to water quality.

Thank you

BACA SYSTEMS
AMERICAN STONE AUTOMATION

ROBOLUTION PRO FOUNDATION REQUIREMENTS

Failure to meet the requirements specified in this document could lead to the system removing itself from the ground.

The robot is mounted to a fabricated steel pedestal that must be mounted on, AT A MINIMUM, an **8" thick** concrete floor with **available space measuring 86" x 86".** DO NOT CROSS OVER SEAMS OR JOINTS IN CONCRETE. The surface must be flat, and quality of the concrete should meet the requirements of the C20/25 standard. There cannot be any steel reinforcement bars or other obstructions in the material that would prevent drilling into the foundation when using a standard concrete drill bit. (SEE PAGE 9 FOR FURTHER SPECIFICATIONS)

Thank you

BACA SYSTEMS
AMERICAN STONE AUTOMATION

Overview of Installation Requirements		
Topic	**Overview**	**Detailed Information Page**
Robot System Power	480V, 80 AMPS, 3 PHASE, 60HZ. This is a dedicated drop to the panel. We recommend consulting with a licensed electrician. Customer supplied. Customer is required to consult with a licensed electrician to install ground rod. Once building layout is confirmed, customer must verify that there are no power lines located where the robot base will be drilled.	**5**
H2O Pump Power	50 HP MOTOR, 480V, 63 FLA, 60HZ, 3 PHASE, 100 AMP BREAKER SIZE. This is a dedicated drop to the pump. Appropriately Sized Copper Wire MUST Be Used. We recommend consulting with a licensed electrician. Customer supplied.	**5**
Internet Connection	High speed internet connection with access for remote administration using TeamViewer. Customer supplied.	**5**
Filtered Cutting Water	1/2" NPT female fitting (optional #8 BSP 60deg Male). Filtered flow of 4 GPM at 40PSI. Piping/fittings must be PVC, stainless steel or copper. No black pipe or galvanized pipe/fittings allowed. Failure to meet the water requirements specified in this document could lead to premature equipment failure. Customer supplied.	**6-7**
Cooling Water Inlet	1/2" NPT female fitting. Minimum inlet pressure of 40 PSI at 2 - 4 GPM with a maximum temperature of 65° F. If water temperature exceeds this maximum; pump seal life will be reduced. Customer supplied.	**7**
Cooling Water Drain	1/2" NPT female fitting. Large enough capacity to accommodate the inlet cooling pressure with little to no restriction. Valve used to throttle water flow should be placed on the outlet and not the inlet. This is clean process water that can be added to the gray water system. Customer supplied.	**7**
Bleed Down Outlet	1/2" NPT female fitting drain hose to gray water system. Customer supplied.	**7**
Saw Water	3/4" NPT female fitting. Minimum 5 GPM @ 35 PSI. Added benefit can be attained with 12 GPM @ 50 PSI. Water must be filtered to 50 microns.	**8**
Air requirements	Robot = 5 cfm at 85-100 psi. Garnet hopper = 3 cfm at 60 -100 psi. All air supplied must be dry & filtered to minimum of 40 microns. Customer supplied.	**8**
Robot Foundation	The robot is mounted to a fabricated steel pedestal that must be mounted on, at a minimum, an 8" (200mm) thick concrete floor with available space measuring 86" x 86" (2180mm x 2180mm). DO NOT CROSS OVER SEAMS OR JOINTS IN CONCRETE. The surface must be flat, and quality of the concrete should meet the requirements of the C20/25 standard. There cannot be any steel reinforcement bars or other obstructions in the material that would prevent drilling into the foundation when using a concrete drill bit.	**9**
Table Foundation	The table(s) need to be mounted on a flat floor. The slope cannot exceed 1" difference from one end of the work envelope to the other.	**10**
Overhead Clearance	12.5' (3.8m)	**10**
Temperature	The system is designed to operate within a temperature range of 50° F - 113° F	**10**
Hydraulic Oil	55 gallons. Chevron Rando HD Oil ISO 46, Conoco Megaflow AW ISO 46, Mobile DTE-25 Medium, Shell Telus S2 M ISO 46, Agip Arnica ISO 46. Customer is responsible for supply and filling of the pump.	**11**
Tank Water Drain	The waterjet tanks have drain connections. Customer is responsible for routing piping to discharge water into trench or other desired location.	**11**

***The above summary is an overview of the installation requirements. Please see detailed information in remainder of this document. ***

Typical Installation Schedule

Day	Work Preformed	Customer Supplied Resources Required
Monday	• Anchor robot • Place tanks • Place Tool Stand • Erect safety fencing	• Area where system will be located should be completely clear of debris by 8:00 AM • Power disconnect box should be located near machine (See Page 5) • Concrete Foundation (See Page 9)
Tuesday	• Finish installing safety fence if necessary • Place all peripheral equipment • Start routing cables for equipment	• Electrician should be on site by 8:30 A.M. to do final power drops to electrical panels (See Page 5) • 2 Air connections must be provided (See Page 8) • Plumbing must be complete (See Page 6-8) • CAT5 Internet connection to control cabinet by the end of the day (See Page 5) • Water discharge piping should be done today (See Page 7)
Wednesday	• Continue installation • Lay HP tubing • Fill tanks with water	• Hydraulic fluid on site • Garnet should be onsite by the end of the day
Thursday	• Finish installing all cables and high-pressure lines and test system • Start calibration process	
Friday	• Complete calibrations	• Scrap stone for test cuts

1. ELECTRICAL REQUIREMENTS

Figure 1: 480VAC Electric Disconnects

The Robolution Pro requires two (2) different power circuits and an internet connection. It is the customer's responsibility to contract a qualified licensed electrician to run AND connect the electrical power to the machine. BACA Systems installers are prohibited from performing any electrical work from the facility to the machinery.

We recommend consulting with a licensed electrician.

Electrical services available must be routed to the area near the machine location before scheduled installation date. Below are the details on the internet connection and the three (2) types of power the customer is to provide the following services and connections. **Customer is required to consult with a licensed electrician to install ground rod**. Once the building layout is confirmed, the customer must verify that there are no power lines located where the robot base will be drilled.

A. **Power**

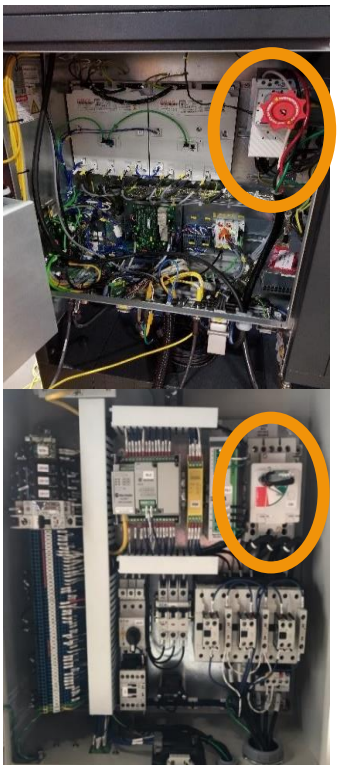


Figure 2: Robot & H2O Panels

Robot: 480VAC, 3 phase, protected by a circuit breaker or fused disconnect for 80 amps. If customer facility has a lower voltage, the customer is responsible for a step-up transformer to supply 480VAC. Consult BACA project manager for more details. **Must Be Copper**. (Terminal lugs are not large enough to handle aluminum.) See picture on right.

H20 Pump: 480VAC, 3 phase, protected by a circuit breaker or fused disconnect for 100 amps. The motor is 50 HP and has a FLA rating of 63 amps. The intensifier can be ordered with a 208VAC motor. There is an additional charge for this modification and delivery timing could also be impacted. Consult your sales engineer for further details. **Must Be Appropriately Sized Copper.** (Terminal lugs are not large enough to handle aluminum.) See picture on right.

B. **Internet Connection**

A high-speed internet connection is needed. The Cat 5 cable will be landed in the Robolution Pro control panel. Access through customer's firewall shall allow for remote administration using Team Viewer. (Team Viewer is supplied by BACA).

2. WATER REQUIREMENTS

The Robolution Pro requires three (3) different water utilities. There is also a drain on the intensifier. It is the customer's responsibility to provide these water sources and connect them to the machine as required. Below are the water requirements for each:

Failure to meet the water requirements specified in this document could lead to premature equipment failure.

A. Intensifier Cutting Water In

This inlet water is pressurized by the intensifier pump and delivered to the cutting nozzle. Proper water quality at this connection point will significantly improve the performance and the life of the high-pressure components. The recommended quality standards for this water supply are as follows:

Water Quality Standards

Constituent (mg/l)	Minimum Requirement	Better	Best
Alkalinity	50	25	10
Calcium	25	5	0.5
Chloride	100	15	1
Free Chlorine	1	.5	0.05
Iron	0.2	0.1	0.01
Magnesium as Mg	0.5	0.1	0.1
Manganese as Mn	0.1	0.1	0.1
Nitrate	25	25	10
Silica	15	10	1
Sodium	50	10	1
Sulfate	25	25	1
TDS*	350	100	50**
Total Hardness	25	10	1
pH	6.5-8.5	6.5-8.5	6.5-8.5
Turbidity (NTU)	5	5	1

* ***Note:*** Total dissolved solids

*****Note:*** Do not reduce the TDS beyond this amount or the water will be too aggressive.

The cutting water supplied should be a minimum of 40 PSI at 4 GPM at **all** times. Failure to satisfy this requirement will lead to multiple shutdown faults. The customer supplied connection of cooling water IN is at the rear of the pump and it is a ½" NPT fitting. **Piping/fittings must be PVC, stainless steel or copper**. No black pipe, garden hoses, or galvanized pipe/fittings allowed. **Run a 1-inch supply line to the pump and only reduce down at the pump connection.** See attached water requirements from pump manufacturer. See Figure 3.

Drain) This is a ½" NPT fitting on the back of the pump. The water here will only be present after the system is depressurized. It will be less than 1 quart of water per discharge. This water is clean and oil free and can be recycled into the gray water system. See Figures 3 & 4.

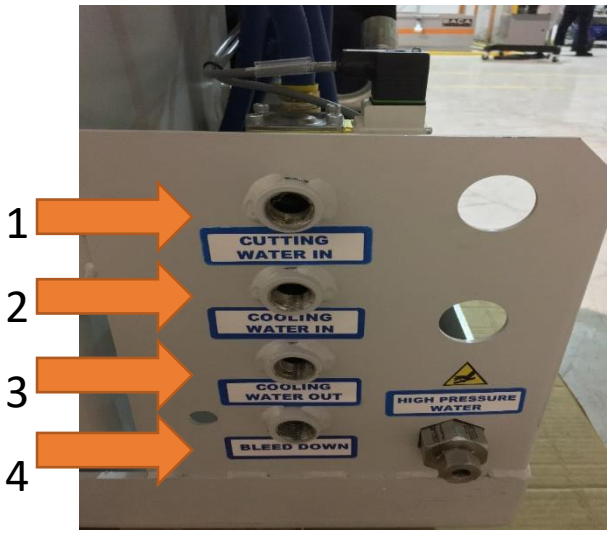


Figure 3 Water Connections

Figure 4 Water Connections Plumbed Example

B. **Cooling Water IN/OUT**

Cooling Water In (2) The cooling requirement for the pump is approximately 35,000 BTU/hr. The unit can be cooled by clean city water or from a chiller. Cooling Water IN needs to be 3-5 GPM at 65 degrees F. The customer supplied connection of Cooling Water In is at the rear of the pump and is a 1/2" NPT fitting. See Figures 3 & 4. **Recycled water is not recommended for use as cooling water.**

Cooling Water Out (3) To control the flow of the cooling water, a ball valve is recommended to be placed on the Cooling Water OUT line. Restricting/controlling flow at this point will ensure the heat exchanger is full of water before exiting. Cooling Water Out should be plumbed back to the chiller, if applicable, or to the gray water or recycling system if using city water. The customer supplied connection of Cooling Water Out is at the rear of the pump and is a 1/2" NPT fitting. See Figures 3 & 4.

C. **Saw Water**

This water is used to cool the saw blade. It can be clean city water or recycled process water (commonly referred to as “gray water”) and must be filtered to 50 microns. Supplemental filtration may be required. A **minimum of 5 GPM** at 35 PSI is required but added benefit can be attained with 12 GPM at 50 PSI. The connection on the robot is a standard 3/4” female garden hose connection and the customer supplied connection is at the rear of the robot mechanical unit.

3. AIR REQUIREMENTS

The Robolution Pro requires two (2) separate air connections.

Dry air is critical to the performance of the system.

A. Robot Air

Robot system requires 5 cfm@ 85-100 PSI. This customer supplied connection is made at the pneumatic regulator mounted on the system perimeter near the utilities. It uses a standard ¼ quick disconnect air fitting. See Figure 5.

B. Bulk Garnet Hopper Air

The bulk garnet hopper requires 3 cfm at 60-100 PSI. This customer supplied connection is made at the side of the garnet hopper. Location of the hopper MUST be within 75’ of the back of the robot. Dry air is critical to the performance of the garnet delivery system. Moist air will impede the garnet from flowing properly. See Figure 5.

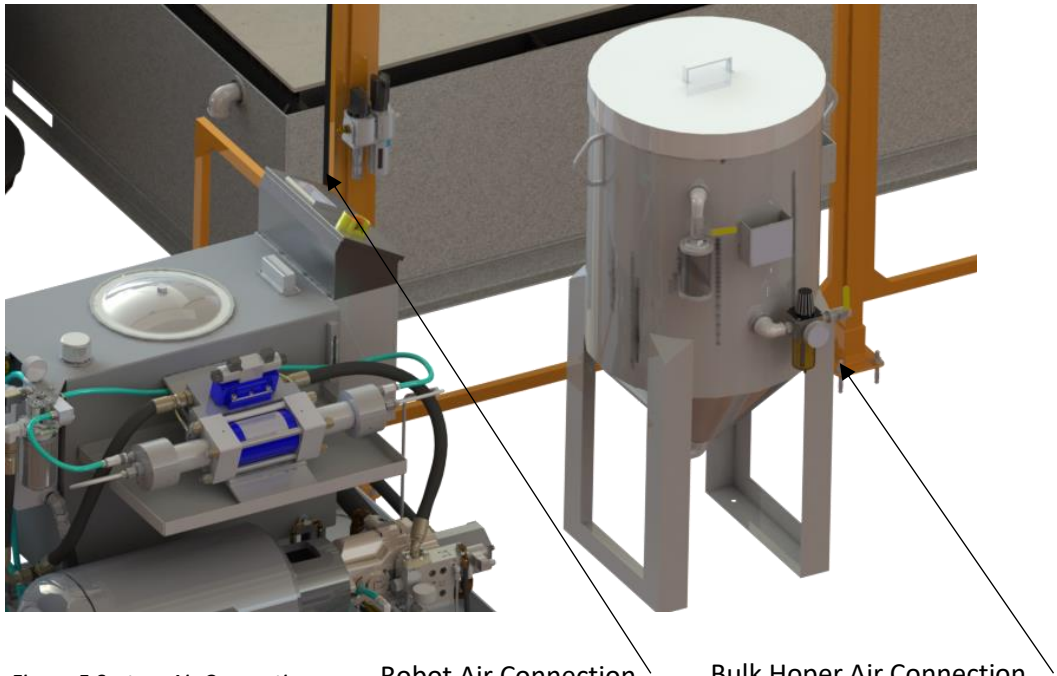


Figure 5 System Air Connections

4. FOUNDATION REQUIREMENTS

The Robolution Pro robot is mounted on a steel pedestal and the base has a 67” x 67” (1700mm x 1700mm) footprint. The robot pedestal shall be lagged to a **FLAT** concrete floor **NEVER raised,** and shall NEVER be placed over a seam/joint in the concrete. Below are the minimum recommended foundation details. See Figure 6 for base footprint details.

A. Minimum concrete floor: 86” x 86” (2180mm x 2180mm) and 8” (200mm) thick
B. The quality of the concrete should meet the requirements of the C20/25 standard (approximately 3,000 – 3,500 PSI).
C. There cannot be any steel reinforcement bars or other obstructions in the concrete that would prevent drilling into the foundation when using a standard concrete drill bit. See robot base detail in figure 6 below.

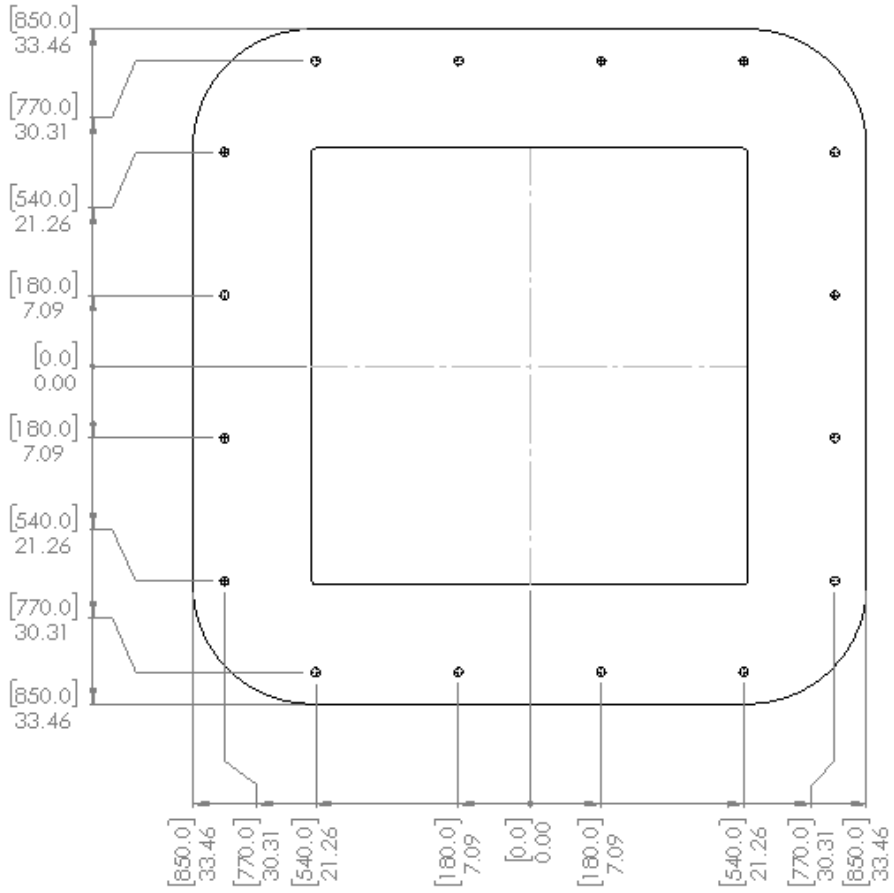


Figure 6 Robot Base Footprint Detail

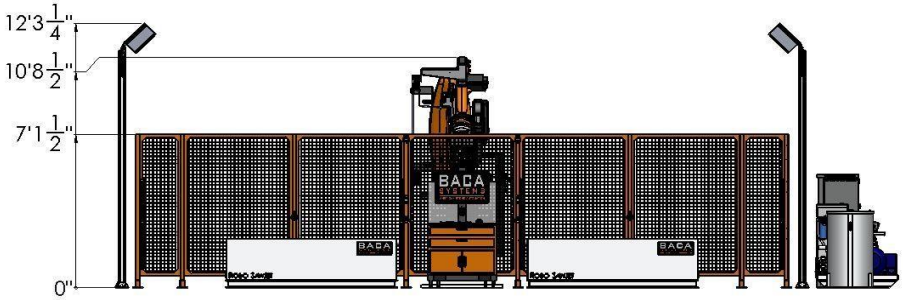
5. SPACE REQUIREMENTS AND EQUIPMENT MOUNTING

The Robolution Pro requires a minimum of 12.5’ of overhead clearance across the entire footprint of the machine. This means that all stationary girders, lights, crane rails, etc. must be above 12.5’ but not obstruct the field of view of the camera(s).

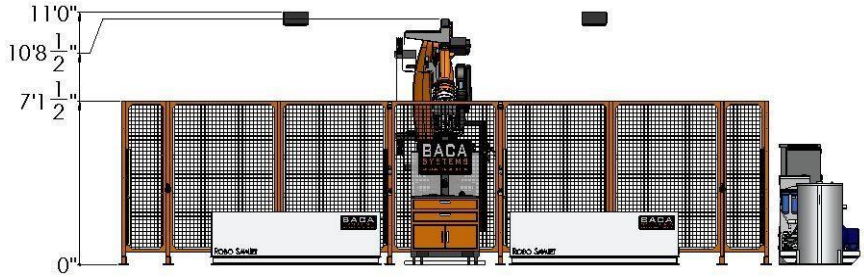
The floor does not have to be level, but it does need to be flat – especially under the robot pedestal. The Robolution Pro has the ability to compensate for a slightly sloped floor and anything in excess a 1” slope across the machine footprint should be discussed with BACA Systems. Customer supplied leveling shims for the tables/robot pedestal may be required. Customer must verify and confirm that there are no utilities (power, water, air, heat, etc.) in the floor under the entire system footprint (BACA installers will be installing concrete lags into the floor).

The location for the Robolution Pro Tool Stand in the cell, between the robot and the front fence panel, must be free of trenching & obstructions.

The Robolution Pro is a wet process and depending on the work being done where, there is always a possibility for water to spill over the sides of the table. Adequate drainage should be provided for accommodating this spillage.



The Robolution does have the option of ceiling mounting cameras. This will accommodate for ceiling heights from 11’ to 25’. Customer MUST supply a lift and proper mounting surface for installation.



6. ENVIRONMENTAL REQUIREMENTS

The Robolution Pro is designed to operate in an environment with a temperature range between 41° F and 113° F. For facilities that have conditions that fall outside of this temperature range, additional climate control equipment may be required.

7. ADDITIONAL CUSTOMER RESPONSIBILITIES

As described above, **the customer shall provide all power, water, drain, and air utilities.** All utilities will be ran to and landed in the Robolution Pro by the customer, under direction from the BACA Systems installer.

Customer shall provide an 8' step ladder.

Customer shall determine where the system will be installed before the arrival of the installers. System layout drawings are provided. **Customer is responsible for placing the pedestal and table(s) as provided in the drawing.** Table overflow drains are only on one side of each table. Customer is to determine which side the drains will be on before setting table in place. **Customer is responsible for plumbing drains away from system.**

Any customer delay in providing and connecting utilities could impact the overall length of time to conclude install. Any delay in install completion could result in another trip by BACA Systems and the additional travel and labor expenses will be the responsibility of the customer. **All utilities shall be ready for the Robolution Pro and the installers on the first day of the installation.**

Approximately 55 gallons of hydraulic oil is required. **Customer is responsible for supply and filling of pump with oil.** Acceptable oil types include Chevron Rando HD Oil ISO 46, Conoco Megaflow AW ISO 46, Mobile DTE-25 Medium, Shell Telus S2 M ISO 46, Agip Arnica ISO 46. Oil from other manufacturers is acceptable as long as it meets or exceeds the specifications of the oils listed above.

Customer shall be prepared for the system to arrive on a 48' curtain side truck/trailer. Customer shall be prepared to unload from both sides of the truck. Robot will be bolted to the pedestal and the robot/pedestal shall be unloaded using the fork pockets provided in the pedestal. **The fork pockets in the robot are NOT to be used for unload/transfer to end location.**

Customer supplied forklift shall be **12,000** lbs. payload minimum. The forklift's forks shall not be larger than 6.5" wide by 2.5" tall and should be a minimum of 6.0' long. The lift forks will need to have a minimum spread of 26" (from inside of the left fork to the inside of the right fork).

Customer shall be prepared to have a 12' wide table enter the building if truck needs to be unloaded outside. Fork pockets on the table(s) are only supplied on one side (the wide side).

There are two female threaded 2-inch bulkheads on each tank to drain dirty water out. BACA does provide one plug and one 90-degree elbow per tank. The customer is responsible for providing piping to discharge the water away from the tank into the trenches or other desired location. It is recommended to do this, although not required.