
# Basic Machinery and Equipment Standards

For

Tooling, Special Machinery and Welding Equipment

Rev 13

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## 1. INTRODUCTION

1.1. Ridgeview's shared goal with suppliers is to establish a standard where-by special machines, tooling and welding equipment produced will be of consistent quality and workmanship to provide our customer with consistent components and assemblies. We understand various criteria, (i.e.) customer print requirements; longevity, type of material, volume, etc. can alter design and construction. Our shared goal is to allow our suppliers to use innovative ideas to design and construct cost effective equipment to be delivered in a reasonable amount of time using, but not limited to, the following standards.

1.2. These are general standards only. They are intended to supplement the specific tooling, special machinery and welding equipment specification. It is the responsibility of the designated Ridgeview engineer to determine the conformance to these standards as a requirement of the project.

1.3. It is the supplier's responsibility to thoroughly review and understand the contents of these standards for tooling, special machinery and welding equipment. If necessary, contact the assigned responsible engineer at Ridgeview Industries for clarification.

## 2. SUPPLIER REQUIREMENTS

2.1. All supplier quotations for tooling, special machinery, and welding equipment must be submitted with the necessary information to clearly describe the proposed equipment.
The following will accompany each quote:

- Design and Build Cost (capital & tooling separation)
- Equipment Descriptions
- Preliminary Sequence of Operations
- Anticipated Cycle Time (including machine and assumed operator time)
- Lead Time (shipping date)
- Estimated Changeover Time

2.2. After the release of a purchase order, the supplier will be responsible to attend a meeting so that all issues related to the project will be reviewed.

- Concept Drawings
- Project Timeline ***by supplier***
- Required Cycle Time (part to part)
- Program Management (single point of contact)

2.3. It is the responsibility of the supplier to obtain the approval of the assigned responsible Ridgeview engineer for all design prints and schematics that establish the primary function of the equipment. Approvals must be obtained prior to the release of the equipment for manufacture and the purchase of any major components through a design review meeting with key Ridgeview personnel. This approval process in ***No Way*** alleviates the vendor from full responsibility for the function, performance, and dependability of the equipment being supplied.

2.4. Timing: The supplier must have adequate resources available to ensure that any minor changes to the system or equipment can be completed without delay to delivery of a fully functional system or piece of equipment.

2.5. At machine runoff on suppliers floor the vendor is responsible to provide one (1) copy of the machine maintenance and operation manual in a 3-ring binder format for review for each piece of equipment furnished. After equipment buyoff by Ridgeview, the supplier is responsible to update all drawings, schematics, and machine documentation to reflect the "**as-built**" condition of the equipment. This manual must contain the following machine documentation:

- The machine electrical wiring schematics, pneumatic and hydraulic schematics must be produced on a reproducible media, and a memory stick or CD (2D data to be DXF, PDF, 3D to be STP and native design – ie Mechanical Desktop, SolidWorks).

- The machine PLC program and documentation must be supplied on a memory stick or CD, in a file format which can be imported to Allen Bradley software. Programs must be "fully documented."

- Bit maps of touch screens.

- JPEG/Bit maps of Medar setup screens-upon delivery.

- One (1) set of machine mechanical drawings on a reproducible media, and a memory stick or CD (2D data to be DXF, PDF, 3D to be STP and Native Design –ie Mechanical Desktop, SolidWorks). This set must include machine layouts, bill of materials, and detail drawings. Detailed dimensioned drawings must be provided for all non-purchased wear items, perishables, and part specific details.

- All manufacturer's data sheets, parts lists, and instruction manuals for all purchased items installed on the equipment. Any modifications made to standard purchased items must be shown in the detailed machine drawings and bill of materials.

- The recommended preventative maintenance procedures for the machine including frequency of inspections, lubrication diagrams, checkpoints, methods of determining wear, and methods for correcting malfunctions.

- The recommended list of spare parts which Ridgeview should stock in their facility

- A clearly documented procedure that outlines the steps required to properly change over the equipment to different product or models with photos if applicable.

- A clearly documented procedure that outlines the steps required to properly set-up and operate the equipment, including any critical sensor adjustments.

- Documentation of weld parameters as-supplied with corresponding weld performance data.

- Documentation/Map of all sensors with description and I/O destination.

2.6 A Fanuc Master Key (flash drive) must be provided with all equipment that utilizes a Fanuc robot.

## 3. GENERAL MACHINE STANDARDS

3.1. All tooling, special machinery, and welding equipment supplied to Ridgeview must meet all safety requirements of the Occupational Safety and Health Act (OSHA/MIOSHA), including all provisions, standards, and amendments applicable at the time of shipment of a machine.

3.2. It is the supplier's responsibility to design and build equipment that conforms to these specifications in their entirety. In the event that a machine design requires the use of non-standard equipment as determined by these specifications or equipment not listed, the supplier is responsible for the following items:

3.2.1. The supplier must submit in writing a request for the use of non-standard equipment along with the purchasing source, expected cost of replacement and projected delivery lead-time. This request must clearly define the equipment by listing the type, manufacturer, and model, as well as providing a brief description of its function on the machine.

3.2.2. If the domestic availability, replacement costs or delivery lead times are deemed unacceptable to Ridgeview, the supplier will be required to deliver one (1) set of immediate wear items or replacement parts with the original equipment, *which must be included in the quote*.

3.3. All welding and assembly equipment must contain part presence sensing devices that comply with Ridgeview's Machine Build Principles. The equipment must detect that all parts are present before beginning the current operation. Whenever the assembly is removed from one assembly fixture and placed in subsequent assembly fixtures, that equipment must detect that all of the previous operations are complete. If multiple operations are being performed by a single operator, the operations must be programmed together to force one piece flow. When the equipment detects that a part is not present or the previous operation is not complete, the equipment will not allow the part to be removed from the assembly fixture until the equipment is key reset. The operator will be notified of all faults through the operator control panel. All equipment must have a routine to perform sensor checks for verifying the sensors on/off condition and must satisfy project PFMEA and Poka Yoke plan as determined by the RVI Manufacturing Engineer.

3.4. Sensors that are used for part presence and/or operation complete should be wired and/or programmed in such a manner as to ensure proper operation of the sensing device during every cycle of the machine, including on a turntable in the load station to be off when the table stops and on when parts are loaded.

3.5. All lockout tagout points must be identified and labeled.

3.6. If a machine is designed to disposition reject parts, the parts must be placed in a location inside the work center that can be accessed without stopping the machine. The access point must have a hinged door that will rotate up when opened to cover the drop area while personnel are removing parts. The door shall have a prox to detect it being open so that the machine will wait to drop a part if the door is open.

3.7. Turn table machines must be capable of automatic part disposition of good and reject parts.

3.8. Indexers on turn tables must be able to operate at the speed listed by the manufacturer.

## 4. MECHANICAL DESIGN

4.1. The equipment must have fork lift pockets 8" X 4" tubing or lifting lugs (rings) if pockets are unfeasible.

4.2. Working height between 36" to 40". (Reach - no greater than 14") Parts should be orientated for easy load and unload.

4.3. All steel guide ways shall have a hardened surface.

4.4. Machine Paint Standards:

4.4.1. The supplier is responsible to make the necessary pre-paint preparations to all surfaces to be prime painted and finish painted. All surfaces must be clean and free of dirt, oils, greases, and steel scale. The vendor is responsible for using proper masking techniques to ensure that all areas and surfaces not intended for finish paint are protected from direct paint spray and over-spray.

4.4.2. All machine equipment must conform to the specific paint color standards of Ridgeview. Final paint touch-ups are to be performed at machine installation.

4.4.3. All barriers, permanent guards, and removable guard frames will be painted **safety yellow,** except for extruded aluminum frame and lexan. This standard applied to all Ridgeview manufacturing facilities. RSW/ASM cells to contain black wire safety barriers with translucent flash protection. GMAW cells to contain black ABS guarding. (ABS to have texture to prevent glare, aka "orange peel").

4.4.4. All machine frames, operator stands, and all other surfaces and components intended for finish paint will be painted. **Manufacturer: Benjamin Moore 219**

4.4.5. Supply water piping shall be **blue,** warm return water shall be **red**, and compressed air shall be **gray / black**.

4.5. All tooling shall, when possible, be manufactured so that the entire piece of tooling associated with one part can be removed from the machine as one assembly. This is for the purpose of modification, certification, or repair of the tooling on a CMM or surface table.

4.5.1. All shim packs or adjustment blocks need be on the same plane that will have to be adjusted.

4.5.2. All fixtures need to be identified with the RVI part number. Characters should be stamped or etched in an easy to see location and ¾" height minimum.

4.6. All clamping should be automatic. Manual clamping ***should not*** be used without Ridgeview's approval. Customized toggle clamps should have the clamping arm bolted to the toggle body – not welded. All clamps (both automatic and manual) should be checked for closed status. All clamping cylinders to have flow controls on both ports mounted at the cylinder unless authorized by Ridgeview.

4.7. All parts will follow the Machine Build Principles with preferred flow to be automatically removed or ejected from the fixture upon completion of the sequence to permit the operator free access for subsequent operations unless otherwise agreed to in writing.

4.7.1. Machines that have auto unload ability must be able to have a minimum of two drop points into the finished goods container. The goal is to fill the container without operator interaction.

4.8. Sensing of any moving parts (cylinders, clamps, slides, etc.) ***must*** be done off the attached detail and not off the motion device (no reed switches unless approved by RVI), including documented procedure/gage for any critical sensor adjustments. No sensors are allowed to be held in place with a setscrew wedged against the body of the sensor. No sensors shall be mounted in slots for adjustability; they must be mounted in a hole with brackets or targets that can be shimmed.

4.9. All bowl feeders, conveyors, air assist lines, lights etc. need to be shut down after the machine sits idle for 10 minutes then automatically restart with the first cycle as long as it doesn't bring up any safety concerns.

4.10. Changeover components that are moved or replaced on fixture plates shall be identified with 1/8" colored drill spots. Each changeover will have its own color and every component that needs to changeover will be marked with the colored drill spot. When mounted in the correct position the drill spot on the changeover component will reside next to the same colored drill spot on the mating tooling.

4.11. Rotary/Swing clamps shall not be used in any fixture design. If there is no other option, RVI approval is required for their use.

4.12. All machines built for RVI Huntsville must have a fan mounted to them. Fans shall be 18" Pro-Source MSC#38838264. Fans must be hard wired in and must be wired to a relay and programmed to shut off after 10 minutes of idle time.

4.13. All components with the potential to leak fluids such as surge tanks or FRL's shall not be mounted over any control boxes.

4.14. Bowl feeders for nut and stud feeder systems must be guarded by an enclosure with transparent plastic panels on all 4 sides and top. The top panel shall have a funnel that directs fasteners into the feeder hopper and must be no higher than 42". One side of the enclosure must have an access door for maintenance.

4.15. Weld tip dressers must have a catch tray or vacuum system to collect chips.

## 5. PNEUMATIC STANDARDS

5.1. All pneumatic components must conform to ANSI (American National Standards Institute) pneumatics standards for industrial equipment or the latest revision thereof.

5.2. A detailed drawing of the pneumatic schematic and bill of materials must be submitted to, and approved by, Ridgeview.

5.3. All equipment provided must be designed to function properly, meet all cycle time requirements, and provide all output force requirements at **60 psi**. A pressure switch shall be installed on the incoming airline capable of providing a signal to the PLC so that the air pressure has not dropped below an acceptable level. If operating pressures required **above 80 psi, appropriate changes will need to be made.**

5.4. All pneumatic supply lines shall contain the necessary airline filters, lubricators, and pressure regulators (FLR) of proper size. A MIOSHA/OSHA approved lockout device shall be installed on any machine using pneumatic equipment.

5.5. Cylinders and main actuators must have adjustable flow controls. Pilot operated checks are recommended on vertical cylinder applications.

5.6. Push lock Air line connectors may be used when fittings are not in contact or protected from Mig Weld Spatter. Exposure to Mig Weld Spatter or other high heat sources will require metal push lock air line connectors, the use of ¼" spatter resistant tubing IN-241-3307B (HH Barnum Company) and 3/8" silicon tubing STID3/8-INCH-30M (Great Lakes Automation) for protecting sensor wires.

5.7. Piping shall have provisions for the installation of quick disconnect air couplings at main air source. Change over tooling connections to use SMC 10 port connectors KDM 10P-07, equipment shall use KDM 10S-07.

5.8. The compressed air exiting a machine pneumatic circuit must pass through an exhaust muffler.

5.9. Piping **ID** should be equal to or greater than port size (¼" npt = ¼" **ID or larger** hose or tubing)

5.10. An accumulator/surge tank with an in-line check valve shall be used with any equipment that requires more air volume that what can be supplied by a 1.0" supply line at 80 psi.

5.10.1. All equipment with turn tables and/or air blown feeding systems shall have a surge tank.

## 6. HYDRAULIC STANDARDS

6.1. All hydraulic components must conform to ANSI (American National Standards Institute) hydraulic standards for industrial equipment or the latest revision thereof.

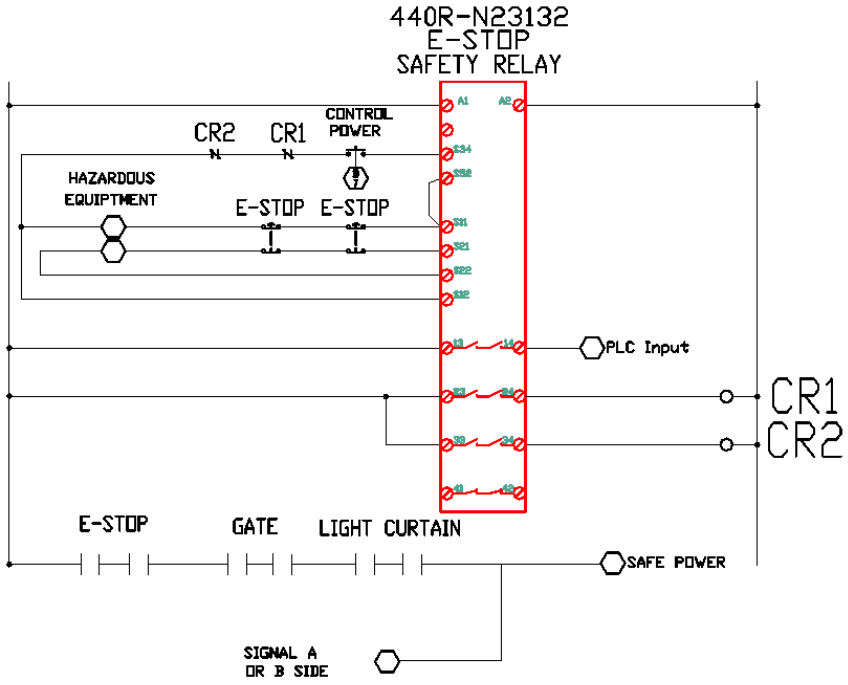
6.2. A detailed drawing of the machine hydraulic schematic and bill of materials must be submitted to, and approved by, Ridgeview.

6.3. No fittings for hydraulic hose connections can be barbed only, must be crimped style fitting.

## 7. OPERATOR AND GENERAL SAFETY GUIDELINES

7.1. All machines with transfers, index tables, or other moving equipment must have adequate protection to prevent injury to operator from moving parts, arc flash, or sparks during normal operation. All safety protection provided must meet the approval of OSHA/MIOSHA. Robotic applications must comply with ANSI/RIA R15.06.99 or current version. Acceptable means of operator protection include the use of light curtains, palm button, and general machine guarding.

7.1.1. Safety circuits shall be setup with one module per circuit with a monitor to the PLC. Each circuit shall have two redundant force guided relays or a controller, depending on the equipment, that will monitor within the circuit and also back to the PLC. Reference the Electrical Standards list for approved components. See following example.




7.2. Light curtains are to be used to ensure operator safety on open style machine accesses, loading stations, indexing conveyors, rotary tables, etc. Wherever a pinch point is present that an operator in the event breaks the light beam can be potentially injured, these motions must stop immediately. No detent valves are allowed where this potential exists. Builder is to follow industry standards for light curtain safety distance calculations and provide calculations at equipment reviews.

7.3. The machine builder will be responsible for supplying all necessary guards, both permanent and removable, to protect the operator, set-up personnel or passerby from points of hazard on the machine or weld equipment.

7.3.1. Permanent guards must be supplied to completely enclose all driven chains, sprockets, couplings, and gears. Guards should also enclose all areas of moving parts and potential pinch points.

7.3.2. Removable guards must be supplied for general guarding of the machine or in areas that the operator or set-up personnel must access for routine inspection or maintenance. This guarding will prevent injury from breakage of any of the component parts.

## 8. ELECTRICAL STANDARDS

8.1. General Requirements: All tooling, special machinery and welding equipment shall comply with the following general requirements for conditions, components and practices.

8.1.1. This standard is not intended as a summary of current safety requirements. All equipment and designs supplied to Ridgeview must comply with the current revision of the National Electric Code (including the version currently accepted by MIOSHA, the American National Standards Institute (also referred to as ANSI), the National Fire protection Agency (also referred to as NFPA), OSHA and any other local, state or national safety codes.

8.1.2. Ridgeview's manufacturing facilities have available a supply of 480 volt, 3 phase, 60 hertz and 120V. All equipment provided must be designed to accept this supply. All machine control circuitry shall be not more than 120 volts with a fuse or circuit breaker on the line side and a grounded neutral line. All operator interfaces with machine should be 24vdc.

8.1.3. All electrical components, whether located in the main control panel or mounted on the machine, must be clearly labeled to identify their function in correspondence to the symbols and abbreviations shown on the machine electrical wiring schematics. If control is by PLC, wire labeling will correspond with input/output PLC address.

8.1.4. All I/O blocks must have light indicators to show the status of each port.

8.1.5. Thermal switches must be monitored on all high current/active components (Weld controls, transformers, index table motors...etc)

8.2. Microprocessors and Programmable Logic Controllers (PLC's): A microprocessor or PLC shall be used whenever possible. PLC equipment shall be Allen Bradley as a general standard and, per the machine requirements. The PLC shall, upon final design and machine delivery, contain 50% spare memory and 25% spare space for future I/O or I/O racks. If a PLC with fixed I/O is selected, 25% spare I/O must be provided.

8.2.1. Control systems using Ethernet communications need to be CompactLogix or higher. Ethernet connectivity is required using (Juniper SRX300 NAT) device. SLC platform is acceptable if Ethernet connectivity is not used. (requires RVI review prior to build) RVI to supply internal machine IP addressing standard.

8.2.2. Nut and stud feeders shall use Allen Bradley processors.

8.2.2.1. Nut and stud feeders must have sensors to detect the in and out positions of the feeder cylinder.

8.3. Control Panels:

8.3.1. The main control panel for each machine shall have an I.D. tag (oil and heat resistant, non-fading) with the following information thereon:

| | | | |
|---|---|---|---|
| Manufacturer | Name and Address | Electrical | Volts (Line and Control) |
| | Telephone Number | | Amperage |
| | Machine Model # | | Phase |
| | Machine Serial # | | Cycles |
| | Mfg. Job # | | PLC Program Name |

8.3.2. Spare terminals shall be provided on all control panels. The number of spare terminals shall be 10% of the total in use on each panel, subject to a minimum of eight (8) spare terminals for control conductors and three (3) for power conductors. Multiple layers of terminal block arrangements will not be allowed.

8.3.3. Operator control stations and devices:

8.3.3.1. Shall be mounted only on the front plate of control panel enclosures or submit specifications at engineering design review. HMI height 57" from bottom of viewing screen.

8.3.3.2. Shall have push buttons that retain their color identification indefinitely.

8.3.3.3. Where Operator shares space with equipment motion (ie, clamps, table rotation, automation), utilization of share space must have indicator light in clear view of operator (location approved by RVI) separate from the cycle start button for operator accessibility into the light curtain.
Red=No entry. Green=Safe entry. Yellow=Armed for next cycle.

8.3.3.4. Shall utilize the following push button color code:

| | |
|---|---|
| Red | - Stop |
| Red (mushroom Head) | - Emergency stop |

| | |
|---|---|
| Green | - Start motors, cycle start |
| Black | - Manual machine motions |
| Yellow | - Cycle stop or top stop |

"Emergency Stop" operators shall be the red, maintained, mushroom type of push button.

8.3.3.5. Key Reset (Allen Bradley Key number D018) required for the following features.

1. Tip change request
2. RSW manual tip dressing (function and schedule)
3. Machine faults that would produce a bad part

8.3.3.6. Stack Lights (Allen Bradley 855T Series) shall be installed to allow visibility.

Red -- Machine or tooling fault
Blue -- Tip change indicator, flash for warning, solid for change reached
Green -- Control power on, auto mode selected

8.3.3.7. K50 (Banner) cycle start button shall be mounted between 36"-42" from the floor and color codes shall be utilized as follows:

| | |
|---|---|
| Red | Machine faulted/Do not enter |
| Green | All components present and ready for cycle |
| Yellow | Load fixture/Machine ready for next cycle |

8.3.3.8. If the machine is not ready to cycle when the cycle start button has been initiated, a clear (easy to understand) message must be displayed on the HMI as to why the machine will not cycle.

8.3.3.8.1. The HMI must have two fault screens available to review. See RVI's Panel View Fault Screens document for requirements.

8.3.3.9. HMI enclosure shall have a convenience outlet mounted on the outside. Mencom DP1-RJ45-16LS. The enclosure must also have a stowaway laptop tray.

8.3.4. Main control panels shall have a convenience outlet mounted on the outside. Mencom DP-RJ45-R-32.

8.3.5. All E-Stops in cell including but not limited to robots, nut feeders and any other auxiliary equipment must be tied in with the main cell E-Stop.

8.3.5.1. E-Stop buttons must be lighted or a message must display on the HMI screen that identifies the E-Stop button that has been pressed.

8.4. Wiring Practices:

8.4.1. Machine Wiring. All wiring and wiring connections to a control panel enclosure shall conform to applicable NEC and ANSI standards in their entirety. Wiring must be enclosed in suitable conduits, metal raceways, or enclosures. 480V AC wiring and control wiring must be in separate wire ways. Flexible connections must be made by liquid tight flexible metal conduit or non-metallic multi-conductor cable with an oil resistant synthetic jacket. The weight of remote push button stations must be supported by means other than the flexible conduit or cables. All machine components must be bonded/grounded. All flexible conduit lines must contain a continuous ground wire. ***Splicing is not allowed***.

8.4.2. Wire Coding and Marking: All wires shall be identified at each termination point, by marking with a number on the wire, which corresponds, with all diagrams. When a PLC is used, all wire termination labels shall correspond to the I/O address point. Wires shall be color-coded as follows:

| | |
|---|---|
| A-Line and load circuits, AC/DC power | Black (except 120V AC-Red) |
| B-AC control circuit | Red |
| C-DC control circuit | Blue |
| D-Circuit neutral conductor | White (when grounded) |
| E-Outside power entering the panel | Yellow |
| F-Machine ground | Green |

*Note: Wire markers shall be used for all wire identification. Deviations from this color code may be permitted on the internal wiring of individual purchased devices that are completely pre-wired.*

8.4.3. Control Wiring: All AC or DC wiring shall be made with color-coded #18 multi-strand machine tool wire with a 600 volt rating as a minimum gauge. All wire shall be insulated with THHN jacket or equivalent.

8.4.4. PLC I/O Wiring: All PLC input and output wiring shall be #18 AWG multi-strand machine tooling wiring with a 600 volt rating as a minimum. Wiring between PLC I/O point and terminal strip shall by THHN. Shielded cable is to be provided when TTL, 0-5V DC, or 0-24V DC is required for instrumentation logic. These cables must be run in separate conduits from machine supply and control voltage lines. Shielded cable runs must be continuous from the specific logic module to the field-mounted device.

8.4.5. Panel Wiring: Panel wiring must be mechanically supported when necessary to keep them in place. Wiring bundles and connecting devices in the panel shall be laid in a wiring channel. Channels shall be of adequate width and depth to allow necessary access for circuit tracing and wiring changes. For each control panel, spare wires equal to 10% of the total in use, with a minimum of two (2), shall be provided. Spare wires shall be numbered consecutively as S1, S2, etc.

8.4.6. Flexible Wire Bundles: control conductors, which terminate at devices mounted on the enclosure doors shall be bundled with tie wraps and made flexible at the hinged side of the enclosure door. Adequate length and flex should be allowed so that the door can swing to the full open position. There shall be 25% spare wires from the panel enclosure to the door. Spares must be bundled and marked appropriately. The wire bundle between the inside of the enclosure and the door shall have a protective wrap around the bundle.

8.4.7. All single-phase transformers shall have a grounded neutral.

8.4.8. One wire from each terminal used on all limit switches, push buttons, and other devices shall be returned to the main control panel and shall be individually terminated at the terminal strips. No series wiring of any devices is allowed.

8.4.9. Ground reactors are to be installed on all resistance welding guns and connected to the secondary side of the transformer.

8.4.10. All wiring must enter/exit through the side or bottom of enclosures. No wiring shall be mounted through the top of enclosures.

8.4.11. Cables on ATI connected fixtures must have field wireable connectors on the I/O block side of the cable.

8.4.12. All power and I/O associated with index table motors must run back to the control panel, no power or I/O for these motors should be ran through an I/O block.

8.4.13. Cables for ATI connections must use 90° connectors into the ATI I/O block in order to reduce the stick out and prevent damage.

8.4.14. Cables for EOAT from the Robot shoulder

## 9. WELDER STANDARDS

9.1. Quality Requirements: When possible, Ridgeview will supply the weld quality requirements for a specific part welding application in the form of a part blueprint or a welding specification sheet. If these requirements are not supplied by Ridgeview, it is the supplier's responsibility to conform to the standards for weld quality as set forth by the American Welding Society (AWS) or the customer specific welding standards (e.g., Chrysler, Ford, GM, Honda, etc).

9.2. Resistance Welding Circuits: It will be the responsibility of the welding equipment supplier to ensure the proper design of the secondary welding circuit. The following Standards must be followed whenever suitable to the specific welding process application.

9.2.1. The secondary circuit voltage and current will be supplied by a properly sized and rated resistance welding transformer.

9.2.2. If it is the supplier's intention to supply rebuilt/reconditioned transformers it must be clearly stated in the vendor's quotation as an option for Ridgeview to select.

9.2.3. Only non-magnetic fixture materials and components will be used in the throat of the welder or secondary field.

9.2.4. Fasteners for current carrying shunt cables and copper electrodes shall be of stainless steel or brass material. The shunts must be sized to protect against premature failure and must not contact moving components in the welder.

9.2.5. All fixture/machine components contacting the part shall be insulated and isolated from ground conductance. The use of a micarta type material for insulation between horizontal plates and nylon-type bushings for insulation of bolts, shafts, and rods are considered acceptable methods for ground conductance isolation. Only micarta grades G5 and G9 are acceptable.

9.2.6. The welding electrodes, holders, shanks, and tips must be of the proper material grade and sizes for the resultant spot or projection weld to meet all weld quality requirements. *Offset electrode shanks will not be allowed*. Copper blocks with tapped holes and adjustable lower back-up electrodes to be no less than RWMA Class 2, RWMA Class 3 being preferred. Where possible make tapped details replaceable. 1 extra set of welding consumables **must** be supplied with equipment.

9.2.6.1. Stud welding electrodes should have a thru hole that is .01" larger than the major diameter of the thread on the stud.

9.2.6.2. Electrodes for stud and nut welding must be plumbed with air to prevent expulsion on threads.

9.3. Electrical Circuit:

9.3.1. Resistance welding machines shall contain WTC MFDC Weld Controller with current monitors.

9.3.1.1. High and low limits must be set for each part number.

9.3.2. The welder electrical circuit design and sequence must provide the capability to initiate, monitor, and adjust each weld point individually. If multiple jobs all must have their own programs and weld settings, no sharing allowed.

9.3.3. Multi-function welders must be supplied with a Programmable Logic Controller (PLC) to perform the necessary machine control functions.

9.3.4. All weld guns to include the use of a separate pressure switch to initiate welding sequence and linear transducers for gun position.

9.3.4.1. Transducer magnets shall be attached with steel ball joints. (Turck SM-Q21)

9.3.4.2. Pressure switches must be programmed to read in psi.

9.3.5. Welding equipment and fixtures should be designed to incorporate the use of limit switches, proximity switches or photo-eye switches for part and position sensing. The sensors should be programmed to be self-monitoring (e.g., the sensor should sense a part only some of the time, not all of the time.) Quick-disconnect type electrical connectors are to be used for switches and sensors when possible to allow for quick replacement.

9.3.6. Limit switches, proximity switches, photo-eyes, and their associated electrical cables must be adequately guarded and shielded to protect against damage from weld sparks. These devices must also be rated as weld field immune.

9.3.7. Weld cylinders/guns shall have full open or returned detection where index of cylinder/gun or fixturing can cause damage if they remain in a closed position. If no damage can happen we will allow movement as long as we know the gun is clear to save cycle time.

9.3.8. The welding machine must be supplied with two (2) production counters ("Total"/"Batch") and (2) Tip change counters for: "Upper"/" Lower" Electrodes. Also a button in the control panel that is for "Test Part" that when pushed it will not count or eject a part. A button for "Tip change continue". This button will allow reset of the welder and continue to run for a set amount of cycles while waiting for Weld Tech. Tip change counter verbiage: "Number of Welds", auto dressing cells verbiage: "Number of Dresses".

9.3.9. Once the weld has been initiated the machine must maintain air, electrical and water supplies until the weld cycle is complete. Only an E-stop condition shall drop these out.

9.3.10. Weld cylinders must have enough stroke to contact the opposing electrode plus a minimum of 1.0" additional travel to account for tip and cap dressing. Special circumstances must be approved by RVI.

9.3.11. Equipment with multiple weld guns and/or multiple stations must have a program to automate the zeroing process for the linear transducers.

9.3.12. Pinch guns must have tip compensation setup for tip dressing.

9.3.12.1. Programming must include a C-Factor check after each tip dress.

9.4. Pneumatic Circuit:

9.4.1. Welding equipment shall have all weld guns supplied with a separate solenoid valve and pressure regulator for each gun **(not in a manifold).** This feature will provide independent control of the weld gun actuation and output force. All weld guns and solenoid valves must be clearly labeled in accordance with pneumatic circuit schematics provided with the machine.

9.4.2. All weld guns shall be clearly labeled with the weld gun number.

9.4.3. Welders are required to have an extra valve available to actuate Verifast electrode pins.

9.5. Cooling Circuit:

9.5.1. Coolant flow rate through weld guns should be those recommended by the gun manufacturer with an average supply differential of 30 PSIG provided at the drops. Guns should not be piped in series.

9.5.2. Coolant flow to be PLC certified. Water lines to be 3/8" minimum. Flow switch to be 6" straight pipe minimum from disperse/collection manifolds.

9.5.3. Coolant systems shall contain individual hand shut off valves for tip changes that are accessible from outside the machine at a height no greater than 7 feet.

9.5.4. All fittings to be brass.

9.5.5. Coolant temperature shall be sensed using a Turck FTCI-3/4D15A4P-2UP8X-H1141 sensor. The equipment shall not cycle if a temperature above 95° Fahrenheit is detected.

9.5.6. RSW fixtures shall have a 2ft long supply and return line attached to the fixture with a quick connect fitting. See Resistance Welding Materials List for required components.

9.6. Welding Fixturing:

9.6.1. Weld fixture designs must incorporate modular construction and assembly techniques. These sub-bases must be accurately doweled and bolted to the machine frame. The part specific fixturing must be accurately doweled and bolted to the sub-bases.

9.6.2. Dowels must locate components and details that are subject to replacement or changeover. Quick-change features must be incorporated when a component or detail must be consistently repositioned within the fixture.

9.6.3. Air lines and coolant lines that are subject to weld spatter should be copper or steel tubing, or have adequate shielding to protect the hoses from the weld spatter. Reference Pneumatic Standards section 5.6 for options to shield air lines and sensor cables.

9.6.4. The weld fixture design should utilize the defined part datum holes for locating the individual components. All critical areas must be protected from weld flash.

9.6.5. All fasteners shall be English and no fasteners smaller than ¼" are allowed in the build of any fixturing. Only exceptions to this are for sensor mounting.

9.6.6. Rough gaging should have lead-in at the top and should be made of stainless steel and must be insulated from the fixture base.

9.7. MIG Welding:

9.7.1. All robotic MIG welding machines must be supplied with the following equipment:
- Fanuc Robot
- Lincoln Power Supply
- CM Industries Weld Torches
- Genesis System Platform

9.7.2. Robotic MIG welding machine cells must be rigidly connected to provide stability or designed to incorporate a common machine base to include the robot, the positioning equipment, and all part fixturing devices.

9.7.3. The fixture designs for MIG welding machines must accommodate common welding practices such as torch angle, maintenance, and current flow. Work holding fixtures must present the work piece seam to the weld torch in an attitude that allows a proper torch angle and wire stick out (1/2") to be maintained throughout the entire weld. The fixtures must provide the means for current flow to ground as close to the work piece as possible. Grounding paths are not permitted through bushings, bearings, toggle clamps, etc.

9.7.4. The work holding, indexing, and positioning devices must be capable of presenting the work piece to the weld torch within a tolerance, which is less than or equal to one half of the diameter of the welding wire being used.

9.7.5. The specified equipment for the welding power supply, electrode filler wire type and shielding gas specified for a MIG welding process must be reviewed and approved by the assigned responsible engineer.

9.7.6. MIG welding equipment shall be supplied with an adequate torch "cleaning" system consisting of a torch lubricator/reaming system. The equipment must also include a nozzle detection sensor and a torch alignment system. See Standard Materials List

9.7.7. Spatter guards that are near the weld zone must be made out of Copper Class 3 material.

9.8. Miscellaneous Welding Issues:

9.8.1. All welding equipment must be provided with adequate provisions for securing and leveling the machine in place. This provision will consist of leveling plates and hold down screws.

9.8.2. All controls for the robots will be placed in a position to allow service personnel to have access to it from the outside of the cell. The teach pendant will be accessible from outside the cell and able to be carried into the cell.

9.8.3. All critical areas must be protected from weld flash as identified by RVI Spatter Free Zone Doc.

9.8.4. Each Robot and related equipment shall be labeled with 4" minimum numeric identification. RVI to supply ID number.

9.8.5. All controls for weld gun position, force, and material stack-ups must be calibrated and setup to output actual readings.

## 10. PROGRAMMING STANDARDS

10.1. Reference program to be provided by RVI with equipment kick off. If additional examples or questions arise please contact RVI Controls Engineer for clarification

10.2. All programming shall be done in a manner that allows for the ability to add additional part numbers at a future date.

10.3. All multi-station operations must have a run in/out function selectable from the HMI for start and end of production and tooling maintenance.

10.4. Weld gun zeroing should be done tip to tip and display as zero once calibrated.

10.5. Turntable equipment must track and transfer part critical data for each nest as the table indexes.

10.6. Red part checks must be forced by a count value that will be provided by RVI (determined by rate and run time). After 7 hours of run time a prompt must display to have the red part program ran. If the program has not been run after 8 hours the machine will not run until the red part program has successfully ran. Need the ability to reset the count value from the HMI.

10.7. All robot programs must be called from the PLC using PNS.

10.7.1. Robots must be setup to read in imperial/english values.

10.8. All self-contained cells must have full diagnostics to aid troubleshooting (part missing, timeout conditions, defective sensor, etc..)

10.9. All ethernet faults must be displayed on an Ethernet Status Screen with fault code and description. Screen must match ethernet electrical print.

10.10. All E-Stops must be PLC monitored and location displayed on HMI.

10.11. All HMI screens must have a way to navigate out of them (no locked screens).

10.12. See HMI reference program for examples of items listed above along with fault display and transducer readings with which settings need to be locked.

## 11. Robot Standards

11.1. All robot applications should use Fanuc Robots. Use of other makes of Robot to be approved by RVI at Quotation.

11.2. Applications requiring ATI's

11.2.1. QC-41 Series ATI to be used for all application requiring exchange of end of arm tool. Any deviation from this series require RVI approval during quote.

11.3. Robot Dress Package

11.3.1. Leoni/BizLink Dress pack systems are to be used on all robotic applications. Use of other dress pack systems must be approved by RVI at quotation.

11.3.2. I/O connection from robot shoulder to ATI should be configured as follows:

11.3.2.1. EE connector should be made with 6 inch pig tail cord set. Then attach a patch cable from EE connector pig tail to ATI master side I/O connection with high flex cable.

11.3.3. All connections from the robot shoulder to EOAT should be protected from weld spatter, abrasion, and pulling or snagging.

11.3.4. Cables on ATI connected fixtures must have field wireable connectors on the I/O block side of the cable.

11.3.5. Cables for ATI connections must use 90° connectors into the ATI I/O block in order to reduce the stick out and prevent damage.

## 12. EQUIPMENT CAPABILITY AND ACCEPTANCE PROCEDURE – ECAP

As applicable, the following procedures and requirements must be met by the machine supplier prior to the equipment being acknowledged as acceptable and eligible for final payment by Ridgeview.

12.1. Machine Run-Off: As determined by Ridgeview and the assigned responsible engineer, the equipment may be subject to the following machine run-off requirements. It is the vendor's responsibility to ensure the equipment's conformance to these run-off requirements.

12.1.1. Two Hour Production Run-off at Vendor Facility: The assigned responsible engineer and representatives of Ridgeview's production facility will be present at the vendor facility for the machine production run-off. During the two (2) hour run the machine should be in full production mode. All machine functions, sensor capability study, set-up requirements, cycle times, and quality requirements will be verified and compared to the specified and design criteria. Cycle times need to meet or exceed quoted rates as to insure that all machine functions are optimized for best utilization of machine/equipment. The machine vendor will provide a completed check off sheet to the assigned responsible engineer, who will then determine if the machine has meet all Acceptable Run-Off Requirements prior to shipment to Ridgeview.

Acceptable Run-Off Requirement Definitions (2-Hour):

a. Scrap: Scrap is defined as a discrepant assembly. Process to yield less than .25% scrap due to process related issues. (Scrap related to out of spec WIP will not contribute to this percentage).

b. Cell Up/Operational Time: During run, no more than 1 cycle stop per non-planned occurrence. Repeat occurrences will be considered unacceptable and will need to be addressed. Planned occurrences are items such as, but not exclusive to: Tip changes, part/container moves, planned cleanings, planned operational stops, etc.

c. Cycle Time: Cycle time definition is based on 50min hour (83% of 60 min hour). Cycle time will be calculated using planned hourly rate divided into 3000secs. (200pcs/hr = 3000sec / 200pcs/hr = 15sec cycle time requirement).

12.1.2. Three Hour or Minimum 33% Daily Requirement, Production Run-Off at Ridgeview's Facility: The machine builder is required to be present at Ridgeview for the machine production run-off. The negotiated production run-off will be performed with the machine in a full production mode. All machine functions, set-up requirements, changeovers, machine cycle times, and quality requirements will be verified and compared to the specified and design criteria for finial equipment signoff through an equipment check off sheet by Ridgeview. Cycle times need to meet or exceed quoted rates as to insure that all machine functions are optimized for best utilization of machine/equipment. Assigned responsible engineer will then determine if the machine has met all Acceptable Run-Off Requirements for Ridgeview.

Acceptable Run-Off Requirement Definitions (3-Hour):

a. Scrap: Scrap is defined as a discrepant assembly. Process to yield less than .25% scrap due to process related issues. (Scrap related to out of spec WIP will not contribute to this percentage).

b. Cell Up/Operational Time: During run, no non-planned occurrence allowed to stop process. Planned occurrences are items such as, but not exclusive to: Tip changes, part/container moves, planned cleanings, planned operational stops, etc.

c. Cycle Time: Cycle time definition is based on 50min hour (83% of 60 min hour). Cycle time will be calculated using planned hourly rate divided into 3000secs. (200pcs/hr = 3000sec / 200pcs/hr = 15sec cycle time requirement).

## 13. RVI STANDARD MATERIALS LIST

**MECHANICAL:**

**Leveling Mounts:**----------*Barry Controls LM-1, LM-2 or* RVI Approved

**Fixtures shall use Douglas shim packs and blocks for X, Y, and Z adjustments of part locators:**

*Douglas #DSCH037-size (2-slot)*
*Douglas #DSCH038-size (3-slot)*
*Douglas #DSCH039-size (4-slot)*
*Douglas #DSCH040-size (5-slot)*

## PNEUMATIC:

**Cylinders with Magnetic Pistons:**----------*SMC-preferred, Bimba*
**Tie Rod Style Cylinders (Pneumatic):**---------- *Parker*
**Tie Rod Style Cylinders (Hydraulic):**----------*Miller, Parker, Milwaukee*
**Hydraulic Shock Absorbers:**----------*Ace*
**Toggle Clamps:**----------*SMC-preferred, Destaco*
**Slides & Ball Screw Packages:**----------*Thompson, SMC, THK, PHD*
**Index Tables:**----------*Weiss*
**Air Filters, Lubricators, Regulators:**----------*SMC with ¾" NPT ports*
**Air Directional Valves:**----------*SMC*
**Air fitting components:**----------*Parker or equivalent*
**Air Tubing (Weld Environment):**----------*Bond Fluidaire (WT47541) HH Barnum (IN-241-3307B)*
**Flow Control Components:**----------*Parker, SMC*

## HYDRAULIC:

**Pumps and Motors:**----------*Vickers, Continental*
**Cylinders:**----------*Parker, Milwaukee, Miller*
**Valves:**----------*Vickers, Continental*
**Hoses and Fittings:**----------*Parker, or RVI Approved*
**Accumulators:**----------*Parker or RVI Approved*

## ELECTRICAL:

**Control Panel Disconnect Switches:** ----------*Allen Bradley / Square-D*
**Magnetic Starters:** ----------*Allen Bradley / Telemecanique*
**Relays:** ----------*Allen Bradley (700-K31Z-ZJ, 100-KFC22, 700-CF310ZJ)*
**Terminal Blocks:** ----------*Allen Bradley (only screw type wire terminals Allowed)*
**PLC Constant Voltage Source:**- ----------*Sola Transformer*
**Programmable Logic Controllers:** ----------*Allen Bradley Family*
**Push Buttons, Selector Switches, Indicating Lights:**-- ----------*Allen Bradley (size 30.5 mm)*
**Cycle Initiate Buttons:**- ----------*Banner Opto-Touch ( K50 Series 3 Color Push Button)*
**Limit Switches:**- ----------*Allen Bradley*
**Proximity Switches:** ----------*Turck (PNP)*
**Photo-eye Switches:**- ----------*Keyence (PNP)*
**Pressure Switches:**-- ----------*SMC (ISE70-N02-L2)*
**Lirght Curtains:** ----------*Keyence (GL-R series)*
**Opeator Interface:**----------*Allen Bradley Family (10")*
**Safety Component Brands : --** ----------*Allen Bradley Guard Master (440C-CR30, 440R-N23132, 440R-N23135, AT-GM-13A, 440N-Z21S1164, 440N-Z2BR51C)*
**Current Breaker:**-- ----------*Eaton or Allen Bradley*
**Cable Shielding:**----------*Great Lakes Automation (STID3/8-INCH-30M)*
**Cable Connector:**----------*HH Barnum (RSC4/7)*

## RESISTANCE WELDING:

**The lower fixturing part contacting electrodes for spot welding are to be the flat type with a hex-shaped body and 3/8 – 16 male threads.**
*RVI stock CLH3-78-37C*

For Nut and Stud welding use Centerline Verifast holders, LVDT or IA must be specified by RVI. For some Nut welding Tipaloy *TDT-25-C or TDT-30-C* holders will be acceptable, Standard **springs (MSC 06811731) are to be added w/air** to hold the weld nut pins up.

**Electrodes, Holders, Shanks and Tips:** ----------*Tuffaloy Tipaloy and Centerline*
**Air Only Weld Cylinders:**----------*Centerline, Advanced Cylinder Products*
**Water/Flow Temp Sensing:**----------*Turck (FTCI-3/4D15A4P-2UP8X-H1141)*
**Weld Guns:**----------*Centerline (Model and type to be reviewed and approved by RVI)*
**Quick Connect Water Fitting:**----------*Bond Fluidaire (PLCD-42004)*
**Flexible Water Line:**----------*Bond Fluidaire (Parker-Push-Lok Plus 801-4-Red and 801-4-Blue)*
**Weld Tip Dressers:**----------*Ram Solutions (Kyokutoh CD-R480-N-N-A5)*

## MIG WELDING:

**Robots:**----------*Fanuc (Model and type to be reviewed and approved by RVI) Full set of manuals if vendor supplies, shall include TorchMate software and block*
**Power Supply:**----------*Lincoln (Unless otherwise specified) Model and type to be reviewed and approved by RVI*
**Weld Torch:**----------*CM Industries (Unless otherwise specified) Model and type to be reviewed and approved by RVI*
**Torch Reamer:**----------*Nasarc reamer with Anti Spatter Mister*
**Nozzle Detection Sensor:**----------*Nasarc*
**Torch Alignment:**----------*Genesis Systems style stand (requires CMI thread insert)*

## 14. Revision Level and Changes

REVLevel 11(01/08/21)

- 2.6-*New*
- 3.3-*Added*- If multiple operations are being performed by a single operator, the operations must be programmed together to force one piece flow.
- 4.8-*Added*- No sensors shall be mounted in slots for adjustability; they must be mounted in a hole with brackets or targets that can be shimmed.
- 4.9-*Added*- lights, for 10 minutes
- 4.11-*New*
- 4.12-*New*
- 4.13-*New*
- 5.7-*Added*- KDM 10P-07, equipment shall use KDM 10S-07
- 5.10.1-*New*
- 5.11-*New*
- 8.2.1-*Added*- RVI to supply internal machine IP addressing standard
- 8.2.2-*New*
- 8.3.3.5.2-*Added*- manual tip dressing
- 8.3.3.6-*Added*- Allen Bradley 855T Series
- 8.3.3.9-*New*
- 8.3.4-*New*
- 8.4.10-*New*
- 9.2.6.2-*New*
- 9.3.4.1-*New*
- 9.3.10-*New*
- 9.3.11-*New*
- 9.5.3-*Added*- that are accessible from outside the machine at a height no greater than 7 feet.
- 9.6.5-*New*
- 11.1.1a- *Modified* - Process to yield less than .25% scrap due to process related issues. (Scrap related to out of spec WIP will not contribute to this percentage).
- 11.1.2a- *Modified* - Process to yield less than .25% scrap due to process related issues. (Scrap related to out of spec WIP will not contribute to this percentage).
- 12 Pneumatic-*Updated*- suppliers for Cylinders, Toggle Clamps & FRL's
- 12 Electrical-*Updated*- Pressure Switch part number to ISE70-N02-L2
- 12 Resistance Welding-*Updated*- Combined Flow Meter & Water Temp Sensing to Water Flow/Temp Sensing *Turck (FTCI-3/4D15A4P-2UP8X-H1141)*

REVLevel 12(08/18/22)

- 3.6-*New*
- 3.7-*New*
- 3.8-*New*
- 4.2-*Added*-Parts should be orientated for easy load and unload.
- 4.5.2-*New*
- 4.7.1-*New*
- 4.14-*New*
- 4.15-*New*
- 4.16-*New*
- 6.3-*New*
- 8.1.4-*New*
- 8.1.5-*New*
- 8.2.2.1-*New*
- 8.3.3.3-*Added*-separate from the cycle start button, into the light curtain
- 8.3.5-*New*
- 8.3.5.1-*New*
- 8.4.11-*New*
- 8.4.12-*New*
- 8.4.13-*New*
- 9.2.5-*Added*-Only micarta graded G5 or G9 are acceptable.
- 9.3.1.1-*New*
- 9.3.12-*New*
- 9.3.12.1-*New*
- 9.3.4.2-*New*
- 9.4.3-*New*
- 9.6.6-*New*
- 10-*New*
- 12.Pneumatic.Tie Rod Style Cylinder (Pneumatic)-*Removed*-Miller
- 12.Electrical. Operator Interface-*Removed*-7"
- 12.Electrical.Cable Connector-*New*

- 12.Resistance-*Updated*- For Nut and Stud welding use Centerline Verifast holders, LVDT or IA must be specified by RVI. For some Nut welding Tipaloy *TDT-25-C or TDT-30-C* holders will be acceptable
- 12.Resistance Welding.Weld Tip Dressers-*New*

REV Level 13 (01-18-23)

- 11.0 – Robot Standards - *New*