SECTION 10 – PLANT SPECIFIC REQUIREMENTS

-BOSCH BRAKING SYSTEMS, CLARKSVILLE, TN –

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PLANT SPECIFIC REQUIREMENTS

The following document is the specific requirements of the Bosch Braking Systems manufacturing facility located in Clarksville, TN. We believe that it's contents will allow us to function the most efficiently and effectively in our business. Please read this chapter thoroughly, as you will be asked to conform to all of the specifications and build machinery to suit.

10.1. OVERVIEW OF CLARKSVILLE, TN SPECIFIC REQUIREMENTS

10.1.1.SPECIFICATION HIERARCHY

Bosch understands that there will be conflicts between the Bosch General Delivery Specification, Chapters 1-9, Chapter 10, and the request for quotation, or CDR. Please use the following hierarchy to help resolve any conflicts that are found between the documentation:

1.) Purchase Order
2.) Request for Quotation
3.) Chapter 10 of Bosch GDS
4.) Chapters 1-9 of Bosch GDS

10.1.2.REVISION LEVEL

The Clarksville plant specific Chapter 10 document and its appendices are all "living" QS-9000 documents in the Bosch- Clarksville quality system. As technology and equipment changes, this specification will also change, and not necessarily at the same time as Chapters 1-9 of the Bosch GDS. Bosch reserves the right to revise this chapter, without notifying its holders. It is therefore important to note the revision level of this document when declaring conformance to the Bosch General Delivery Specification. The revision level is found in the footer of each page in left side.

10.2. PREFERRED MECHANICAL COMPONENTS

10.2.1.STANDARD HARDWARE / FASTENERS

Springs	Lee Spring
Ball and Roller Bearings	Allied, Star
Shock Absorbers	Ace
O-Rings	Buna

10.2.2.PRIMARY COMPONENTS

Robots	FANUC
Bowl Feeders	Vibromatic / Service Engineering
Torque Guns	Bosch
Hydraulic Equipment	Vickers, Parker
Load / Torque Cells	Sensotec, Tranducer Techniques
Load Cell Monitors	Sensotec, Daytronic, Transducer Tehniques
LVDT	K.J. Law / Valenite / Marposs / RDP, Balluff
Gaging	K.J. Law, Valenite, BTI, Marposs

10.2.3.MISC. COMPONENTS

Processor Cooling Fans	Rotron
Dust Collection Systems	Torit
Mist Collectors	Royal Products Filter Mist, Torit
Fluids – Cutting, Rust Protectant	Quaker Chemical
Fluids – Lubricating, Hydraulic, etc.	Exxon / Esso

10.3. PREFERRED ELECTRICAL COMPONENTS

10.3.1.CONNECTORS, SWITCHES

Interconnecting Cables	Ole Flex, Belden, Alpha
Cable Connectors	Amphenol, Cannon, T&B
Disconnect Switches	Allen-Bradley
Selector Switches	Allen-Bradley
General Relays	Allen-Bradley
Safety Relays	Pilz
Terminal Strips	Allen-Bradley, EMM
Panel Lighting Disconnect	Daykin
Push Buttons	Allen-Bradley
Stacking Indicator Lights	Telemecanique (LED Style Only)
Guard Switches (2 Piece Key Style Only)	Telemecanique
Proximity Multiports	Efector, Brad Harrison
Motor Disconnects	Square D (with LOTO)
HMI	Allen Bradley Panel View (Flash Card Provided For Each), Total Control

10.3.2.SENSORS

Proximity Switches & Brackets	Ifm Efector
Ergonomic Touch Cycle Buttons	Banner
Light Curtains	STI, Keyence
Photo Electrics and Fibers	Keyence (Fibers to be Armored)
Vision Systems & Brackets	Sharp / Keyence

10.3.3.TRANSFORMERS, CONTROL DEVICES

Isolation Transformer	Allen-Bradley, Sola, Heavy Duty, Daykin (With LOTO Disconnect)
Control Transformer	Allen-Bradley, General Electric, Heavy Duty
Fuses	Fusetron, Bussman
Circuit Breakers	Allen-Bradley

10.3.4.MOTORS

AC Motors	Reliance, Baldor, GE
DC Motors	Reliance, Fanuc, GE, Danfoss
DC Motor Controllers	Cycletrol
Motor Starters	Allen-Bradly

10.3.5.ENCLOSURES

Enclosures	Hoffman

10.3.6. POWER SUPPLIES

Power Supplies (24 vdc)	Power One, Condor, Sola
Uninterruptable Power Supplies	APC (With application shutdown software)

10.3.7. FREQUENCY DRIVES

Frequency Drives	Allen Bradley

10.4. PREFERRED PNEUMATIC COMPONENTS

10.4.1. CYLINDERS

Standard pneumatic without reed switches	SMC, Numatics, PHD
Rodless cylinders	Origa Cylinders
Grippers	Robohand
Air over Oil	Pressotechnik

10.4.2.VALVES

Miniature Valves	SMC
All other valves	Numatics

10.4.3.AIR SERVICE UNIT

Filter / Pressure Regulator	Numatics, SMC
Pneumatic Flow Control	SMC

10.5. PREFERRED HYDRAULIC / COOLANT COMPONENTS

10.5.1.PUMPS

Hydraulic Pumps	Vickers
Coolant Pumps	Gusher

10.5.2.VALVES

Hydraulic Valves	Vickers
Solenoid Valves	Vickers
Flow Control Valves	Vickers
Lockout Valves	Vickers
Check Valves	Vickers

10.5.3.ACCESSORIES

Filters	Vickers
Central Lubrication	Vickers
Silencers	Vickers
Regulators	Vickers
Pressure Switches	Vickers

10.5.4.CYLINDERS

Standard Hydraulic	Parker

10.6. PREFERRED CONTROLLERS / COMPUTERS

10.6.1.CONTROLLERS

CNC controllers	Fanuc
Programmable Logic Controllers	Allen-Bradley, Minimum SLC 504 w/DH+ and 13 Slot Rack
PC Based Controllers	TCP, Seimans
Operator Interface	Allen-Bradley PanelView
PC Based Controls	Think and Do
Ladder logic programming software	**Rockwell Software:** RSLogix 5 for PLC 5 Controllers RSLogix 500 for SLC 500 Controllers Vendor Software MUST be compatible with either of the above.
PC Based Operating Systems	Microsoft Windows

10.6.2.COMPUTER COMPONENTS

Hard Drives	Western Digital
Processors (PC)	Intel, Cyrix, Alpha, HP
Ethernet Cards (RJ45 and Co-Axial)	3-Com
Non-Industrial PC's	Gateway, Compaq, Dell
Keyboard / Mouse Connector	PS/2

If industrial PC's must be used, standard, replaceable components (IO Cards, Video Cards, Controllers, etc.) must be used.

10.7. ADDITIONAL SAFETY REQUIREMENTS

10.7.1. HEALTH, SAFETY AND ENVIRONMENTAL STANDARDS

Every Machine shall conform to all applicable local, state, and federal safety standards per the primary references listed in Appendix D.

10.7.2.LOCKOUT – TAGOUT DIAGRAM

A Lockout / Tagout diagram must be posted on every machine describing the method to diffuse and lockout any sources of energy in the machine for safe maintenance. An example of this diagram has been included in appendix A1.

The main diagrams should be posted at every source of electrical energy (i.e. at the Disconnect). This diagram should show a layout of the machine system with labels pointing out the location where any source of energy is to be locked out.

This diagram should state the type of energy used, a step by step method for diffusing the energy (locations marked on diagram), and a method of checking that the energy has been diffused (location marked on diagram).

Color labels corresponding to the diagram must be posted at each lockout location identifying it as the energy source lockout. For example, if a machine uses pneumatic energy, a large "P" for pneumatic (or "E" for electrical, "H" for Hydraulic, etc..) should be posted next to the air source lockout.

Please contact manufacturing engineering for more information if needed.

10.7.3.MARKING OF ANALOG GAGES

All analog gages should be easily accessed and readable. All analog gages used on machines should be marked for designed pressure settings in two places. The first should be a permanent plaque fastened to the machine nearby with the function of the gage and the acceptable setting or range of pressure. In addition, the gage needs to be marked on its face for quick reference from a distance. This can be done either by purchasing gages with this feature, or by marking the face of the gage as shown in figure 10.7.3.1. Using tape or a paint marker, the acceptable range should be marked with two green lines. Mark the unacceptable range with red in a way that the gage values can still be read.

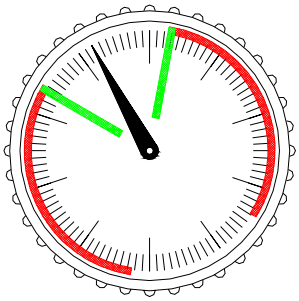

Figure 10.7.3.1 Example of Marked Gage

10.7.4.MARKING OF LEVEL INDICATORS

All level indicators should be easily accessed and readable. All level indicators used on machines should be marked for designed level settings in two places. The first should be a permanent plaque fastened to the machine nearby with the function of the level indicator and the acceptable setting or range of fluid level. In addition, the level indicator needs to be marked on its face for quick reference from a distance. This can be done either by purchasing level indicators with this feature, or by marking the face of the gage as shown in figure 10.7.3.1. Using tape or a paint marker, the acceptable range should be marked with two green lines. Mark the unacceptable range with red in a way that the level indicator values can still be read.

Figure 10.7.4.1 Example of Marked Level Indicator

10.8. GAGE MASTERING / MASTERS

This section is applicable for any equipment or components of equipment that measure a part feature(static or dynamic). Any exceptions or clarifications to these criteria should be documented in the Purchase Order.

10.8.1 GAGE MASTERS

- Any gage that measures static dimensions must come with a minimum, mean, and maximum size master part for calibration of the gage unless otherwise stated by Clarksville manufacturing engineering and included in the purchase order.
- The vendor should propose the design and specifications for these masters and obtain Bosch MFE/QAM documented approval before fabrication.
- Masters should be designed to be loaded and unloaded from the gage with the same method as production parts. (This is a safety consideration-the mastering process should not require bypassing any safety devices or have the operator's hands or body near moving equipment.)
- Special controls should also be put in place for the removal of the master from automatic gaging systems to prevent processing of the master.
- When designing the master, consideration should be given to prevent accidentally shipping the master. Surfaces not being measured should be brightly colored to distinguish master from production parts.
- Prints and certifications must be provided for each master at delivery. Features that need to be verified during calibration to maintain master integrity must be specially designated on the print.
- Two sets of masters should be provided for each gage to prevent any down time associated with masters being lost, damaged, or sent out for calibration. Final decision on how many masters to order will be made by the MFE group and documented on the Purchase Order.
- All part masters must come with a storage container designed to withstand a one meter drop without damage to master.
- Master design should include a location to store the container/master on the machine nearby the location it is to be used. Storage location should remain at ambient temperature when gage is running, not near or above any devices producing heat.

- Master design should consider a 1" x 1" location to place the calibration label. If the master cannot accept a label, the storage container should have a standard calibration label location.
- The gage supplier should etch Gage numbers on the gage and masters. QAM gage lab to supply the gage number.

10.8.2 GAGE MASTERING

- All gages must be designed to be mastered/calibrated in no more than five (5) minutes per instance.
- Where a specific gage program is dependent on the individual known master reading, the gage should require entry of the master serial number prior to processing the mastering program.
- The gage must operate consistently with a mastering frequency of once every nine (9) hours while measuring parts at quoted production rate. For each feature measured, a mean shift of no more than 10% of the part tolerance is allowed. Any exceptions should be documented in the purchase order.
- Vendor and Bosch MFE to document in the purchase order if min/max masters will be used to <u>verify</u> the gage or <u>set</u> the gage. In either case, the correct software and/or mastering instructions must be provided with illustrations.

10.8.3 MEASUREMENT SYSTEM ANALYSIS

- Criteria for Measurement Systems Analysis(MSA) as outlined in QS9000 should be specified in the purchase order. The method to evaluate must also be specified. Below are the general criteria.
- <u>R&R(Repeatability and Reproducibility):</u>

  Criteria:<10%
  Method:Run 10 production parts 3 times each. Repeat for total of 3 operators. Calculate results per QS-9000 MSA.
- <u>Stability:</u>

  Criteria:<10% of tolerance change in the mean of 10 parts run before and after nine(9) hours of production at rate.
  Method:Run an R&R just before and just after a nine(9) hour trial run. Grand average of the means for each feature should change less than 10% of the tolerance.
- <u>Bias:</u>

  Criteria: Less than 5% of the tolerance for that feature
  Method: Certify at least 3 parts(1 nominal, 1 min, 1 max) in an approved gage lab.
  Measure the each part on the gage 10 times and calculate the average.
  Lab reading(actual value) and gage average(measured value) difference should be less than 5% of the part tolerance for each part.
- <u>Linearity:</u>

  Criteria: To be determined by the Bosch MFE.
  Method: Use bias study above to calculate a best-fit line per the QS-9000 MSA method.
- <u>Discrimination:</u>

  Criteria:The gage must be able to distinguish to at least one-tenth of the part tolerance.
  Method: Gage supplier demonstrates that the gage can measure and display readings to

10.9. ADDITIONAL DOCUMENTATION REQUIREMENTS

10.9.1.TROUBLESHOOTING DOCUMENTATION

As part of the documentation package, the supplier must include detailed information on troubleshooting and fixing a problem. The document must include every possible control error, machine fault, or likely problem with operation. For each of these items at least three possible causes should be listed with at least three potential courses of action to repair the problem.

If a Fanuc CNC control is to be used, all inputs and outputs must have labels within the ladder explaining their function. Regardless of the control, a separate list must be included listing all of the inputs and outputs, their address and the location in the machine or system where they may be found.

10.9.2.SPARE WEAR PARTS

As part of the documentation package, the supplier must include detailed information on the spare and wear parts recommended for Bosch to stock to minimize downtime. This must be a list separate from any drawings or other documentation. This list also must comprise spare and wear parts suggested by sub-suppliers. The minimum of information to be included is as follows:

1.) Part Description
2.) General Location on Machine
3.) Manufacturer & Manufacturer's P/N
4.) American Distributor & Distributor's P/N
5.) Qty in System
6.) Qty Recommended for Bosch Stock
7.) Estimated Lead Time
8.) Estimated Cost

10.10. CAD FORMAT

10.10.1.FILE FORMAT

All draft, proposed, and finalized drawings must be submitted on CR-ROM in AutoCAD Release 14 format (.DWG or .DXF format). All drawings and Bills of Materials must use the standard Bosch Braking Systems border. Manufacturing engineering will supply a 3½" disk with standard size Bosch Braking Systems borders for each size of paper currently used in Clarksville, in AutoCAD format.

All machinery system drawing packages MUST include an overhead "plan" view of the equipment. The purpose of this layout is to be integrated into the Bosch plant layout. The units of this drawing must be in "Inch – Engineering" format. It is also important that the amount of detail in this drawing is reduced. For example, if you are providing a large assembly line, it is not necessary to show the individual parts or the buttons on the operator control, etc…

All drawings, designs and their electronic equivalent will become the property of Bosch Braking Systems.

10.10.2. TOOL / DRAWING NUMBERS

Tool, gage, and drawing numbers will be assigned by Bosch and must be placed on finalized drawings. The manufacturer / supplier must contact the appropriate Bosch – Clarksville Manufacturing Engineer with the number of part numbers required and the Engineer will return a range or part numbers for use on the project.

At the time of the first design review, the supplier shall submit a request for tool numbers based on their needs to the engineer.

10.10.3.SETUP

Only AutoCAD default line types (acad.lin) should be used if drawn originally drawn in AutoCAD. Please restrict the character count of 'filename' + 'line type', 'block', or 'layer' to no more than 22 characters (including automatic AutoCAD dividers when inserting external references and blocks).

The drawings must have the following layers with corresponding colors. If additional layers and/or colors are required, Bosch Manufacturing Engineering must approve them in advance.

Layer Description	**Color**	**Line Style**
10 Machine / Outline (Including Maximum Door Swings and Travels)	Green	Solid
11 Mounting Points	Black	Solid
12 Work Piece Centerline	Black	Centerline
13 Minimum Clearance Line (Including Door Swing and Maximum Travels Plus 3 Ft.)	Light Gray	Phantom
15 Operator Platforms and Stairs	Dark Gray	Solid
16 Machine Guards	Yellow	Solid
17 Machine Dimensions	Black	Dimension Lines
20 Electrical Cabinets	Orange (Autocad Color #20)	Solid
21 Main Electrical Power Connection Point	Orange (Autocad Color #20)	Solid
22 Electrical Interconnect Points	Orange (Autocad Color #20)	Solid
30 Main Air Connection Point	Cyan	Solid
31 Air Interconnection Points	Cyan	Solid
40 Main Water Connection Point	Blue	Solid
41 Water Interconnection Points	Blue	Solid
42 Remote Water Chiller	Blue	Solid
50 Main Connection Point, Other Utilities (Gases, Vent Stacks, etc.)	Olive (Autocad Color #54)	Solid
51 Other Utility Interconnection Points (Gases, Vent Stacks, etc.)	Olive (Autocad Color #54)	Solid
60 Remote Hydraulic System	Brown (Autocad Color #14)	Solid
61 Hydraulic Interconnection Points	Brown (Autocad Color #14)	Solid
70 Chip Handling	Violet (Autocad Color #213)	Solid

80 Conveyor Not Integral to Machine	Red	Solid
90 Part Outline	Magenta	Solid
100 Machine Name	Black	Text
101 Machine Number	Black	Text
110 Operator Outline	Dark Gray	Solid

10.11. RUN-OFF REQUIREMENTS

10.11.1. GENERAL

These specifications outline the basic procedures for equipment manufacturers / suppliers to follow when qualifying equipment / systems for Bosch Braking Systems, Clarksville Plant. These qualification measures are a necessary and vital element of the acceptance procedure, and are required for proper compliance to the Purchase Order Agreement. The specifications are the minimum requirements for the equipment / system qualifications. Equipment manufacturers / suppliers are encouraged to exceed these requirements, and make their accomplishments known.

The purpose of the specification is to clearly state the minimum requirements for qualification activities involving new, rebuilt, or modified manufacturing equipment, whether leased or fully purchased from the equipment manufacturer / supplier. Through an open and meaningful communication network between the customer and the supplier, both parties can realize long-term benefits and more efficiently achieve the objective of this Equipment Qualification and Acceptance Procedure. That objective is simply to ensure the intended equipment / system is capable of consistently operating within the equipment / system requirements at the contracted production rates.

The qualification process stated herewith consists of ten steps, all of which must be performed and successfully completed before final equipment / system acceptance and financial settlement can be performed. The qualification steps to be run in the supplier's facility are as follows:

STEP 1: GAGE RELIABILITY STUDY
STEP 2: MINI-CAPABILITY STUDY
STEP 3: TWENTY-FOUR (24) HOUR CONTINUOUS RELIABILITY RUN (DRY)
STEP 4: FOUR (4) HOUR RUN – AT – RATE TEST
STEP 5: DOCUMENTATION REVIEW
STEP 6: PRE-DELIVERY QUALIFICATION REPORT

The qualification steps to be run on the Bosch – Clarksville floor prior to final acceptance of the equipment are as follows:

STEP 7: MINI-CAPABILITY / GAGE RELIABILITY STUDY
STEP 8: TWENTY FOUT (24) HOUR CONTINUOUS RELIABILITY RUN (DRY)
STEP 9: FOUR (4) HOUR RUN – AT – RATE TEST
STEP 10 PRODUCTION QUALIFICATION / ACCEPTANCE REPORT

Upon completion of step nine, the qualification process in concluded. This process ensures to both the customer and the supplier that the equipment / system is of reliable and durable design, capable of conforming to the specified requirements.

During each test, logs shall be kept by the equipment manufacturer / supplier. Equipment / system downtime must be fully documented in loft minutes, technical deficiencies, the corrective action taken and the responsible party for each associated downtime.

The primary manufacturer / supplier will be responsible for providing the resources necessary to run the test and service the equipment for the entire test duration. Additionally the primary manufacturer / supplier will be responsible for all components and equipment during all test runs, including providing the necessary preventative maintenance to the equipment / system (as indicated in the PM maintenance program included with the system / equipment).

All parts required for testing will be provided by Bosch Braking Systems. Each part shall be serialized to corresponding test step and data for each of the specified characteristics in an effort to reduce the time required to verify dimensions in the event of suspect or erroneous data. During the data collection, adjustments to compensate for normal tool wear are allowable, however adjustments due to machine instability are not.

These guidelines apply for the primary production part or parts. If the equipment is required to produce additional parts as a secondary application, the run-off for these parts shall coincide with the steps of the primary part. Unless agreed upon in advance, all components for the secondary production part, including but not limited to chucks, grippers, jaws, stops, locating details and part programs shall be installed and tested in each step of the run-off. However, the volumes and durations for testing the secondary production parts shall be agreed upon by Bosch and the equipment manufacturer / supplier prior to run-off.

All tests shall be run at the production rate set forth by the request for quotation or the Purchase Order Agreement.

It is the responsibility of the Bosch Braking Systems, Clarksville plant to ensure these requirements and specifications for the equipment / system are fulfilled.

STEP 1: GAGE RELIABILITY STUDY

The gage reliability study is primarily for the equipment manufacturer's / supplier's benefit and can be performed without Bosch Braking Systems representation. Its purpose is to verify the capability of the gage so that the gages can be used to determine future capability data for future steps. It also minimizes the number of scrapped parts if the gages are not functioning properly.

Gage repeatability and reliability studies shall be conducted on five (5) parts and ten (10) trials for all variable gages to be delivered with the machine and all gages used to measure part dimensions required for run-off. The gage R&R percentage must meet the requirements identified in the Bosch General Delivery Specifications, Section 6.3. in order to progress to step 2.

From the results of this test, enhancements or modifications to the equipment / system can be made to ensure more complete and precise compliance to the tested characteristics and equipment / system requirements.

Results from all studies in Step 1 must be submitted to Bosch along with action plans if the gage has not met the requirement. The results also must be presented in the Pre-Delivery Qualification Report. Action plans must include resources, timing, and steps required.

STEP 2: MINI-CAPABILITY STUDY

Upon validating that the gages meet the qualification requirements, a mini-capability study shall be run. Like Step 1, it is primarily for the equipment manufacturer / supplier's benefit and does not require Bosch Braking Systems participation. Its purpose is to pre-determine the capability of the equipment / system prior to the reliability run. By running the capability and gaging study prior to Step 3, the need for a second reliability run is negated in the case of large automation changes. Additionally, reliability runs are manual labor intensive and should only be run on equipment that is verified as performing to the specified requirements.

The number of parts to be tested is 125 and shall be subdivided into subgroups of 5. Please see appendix 6.1 in Section 9 for more detail on the frequency of sampling. As a general guideline, process capability shall be calculated for all dimensions affected by the process. The specific dimensions to be examined will be identified by with the agreement of the equipment supplier and Bosch Braking Systems. The process capability indexes (P_p, P_{pk}, C_p, C_{pk}) shall exceed 1.67 (overriding requirement from section 6.3) in order to progress to Step 3.

The process of qualifying a particular characteristic of the equipment / system and verifying its capability is only valid if the data from the characteristic can be represented by a normal distribution. Such is the case of variable data relating to physical measurement of an unbounded dimension. This process, however is not appropriate or applicable if the data is non-normally distributed or an attribute characteristic. For this data (which is the type needed for the second portion of the capability study) the following procedure is observed.

Attribute data is characterized by data non-quantitative in nature, or is collected from an experiment with a limited number of outcomes producing discrete results. Such is the case of "success / failure" experiments typically conducted to verify if the intended equipment / system is capable of meeting its primary objective. Applying the binomial "success" or "failure" for a given characteristic performs the statistical analysis of such data. The analysis, however, is quite complex and will not be presented for the qualification process. Instead, the number of "successes" and "failures" regarding the equipment / system meeting its primary objective shall be recorded and analyzed. The equipment manufacturer / supplier shall record this data (and the reason for the equipment / system non-compliance) and present it to Bosch Braking Systems representatives in the Pre-Delivery Qualification Report. The data for this portion of the short-term Process Capability Study shall be collected during the production run, and the characteristics of concern shall be determined by Bosch Braking Systems and discussed with the equipment manufacturer / supplier.

From the results of this test, enhancements or modifications to the equipment / system can be made to ensure more complete and precise compliance to the tested characteristics and equipment / system requirements.

Results from all studies in Step 2 must be submitted to Bosch along with action plans if the process has not met the requirement. The results also must be presented in

the Pre-Delivery Qualification Report. Action plans must include resources, timing, and steps required.

STEP 3: TWENTY FOUR (24) HOUR CONTINUOUS RELIABILITY RUN (DRY)

The purpose of the first reliability run is to verify the mechanical / electrical integrity of the new, rebuilt, or modified equipment, and to test the quality and reliability of its construction. This test is unsophisticated in nature, but shall be applied to every system or piece of machinery intended on being purchased by the Bosch – Clarksville plant.

The duration of the test is twenty-four (24) hours. This time period will be CONTINUOUS operation with no human or mechanical intervention, or without any system / equipment or controller malfunctions. Any interruption of this test attributed to mechanical and / or electrical failure will require a restart of the test until 24 continuous, uninterrupted, failure free hours are achieved. Unless agreed upon previously, a Bosch Braking Systems representative must be present at the start of the test and every restart thereafter.

The tests may be performed without tooling mounted to the equipment, or any customer parts being handled. However, if the equipment requires parts to cycle properly, a minimum of parts can be supplied and should be re-used if possible. The manufacturer / supplier, however, can choose to run the test with full production hardware, if so desired.

The reliability run may be initiated and attended by Bosch Braking Systems personnel. The entire test shall be continuously monitored by the manufacturer / supplier whether by human observance, an approved video tape system, or an approved electronic data recording / monitoring system.

Equipment stoppages created by conditions external to the equipment during the test such as outside power failures, etc… will not necessitate a restart in the reliability test. However, the amount of time lost during such a delay shall not be applied toward the 24-hour requirement. During this period, maintenance not related to the external conditions will not be permitted or the test will be restarted.

STEP 4: FOUR (4) HOUR RUN – AT – RATE TEST

The purpose of this test is to demonstrate to Bosch Braking Systems representatives the functionality, reliability and the quality of the equipment / system, as specified in the Request for Quotation and Purchase Order agreements. Further, how well the equipment / system meets these requirements. This will require the equipment / system duplicate production conditions and rates as closely as possible.

It is within this production simulation that any equipment / system problems be identified and eliminated prior to integrating the equipment / system within a Bosch Braking Systems manufacturing facility. This equipment is expected not only to function properly upon delivery, but also continue to do so throughout its service at Bosch Braking Systems.

Through the actual four (4) hour simulation and upon its conclusion, the following objectives relating to the equipment / system should have been achieved:

A.)Verification of equipment / system reliability prior to installation
B.)Verification of equipment / system quality and workmanship
C.)Reduction / elimination of start-up delays
D.)Improvement in the quality level of all components, equipment, and systems to that which conforms to Bosch Braking Systems standards
E.)Correction of all software, programming and controller problems prior to installation
F.)Conformation of equipment / system cycle time required to meet Bosch Braking Systems' production requirement
G.)Demonstrate where applicable the equipment / system change-over capability
H.)In-depth exposure to Bosch Braking Systems personnel in the operation, maintenance and construction of the equipment / system.
I.)Calculation of Overall Equipment Effectiveness (OEE). See Section 9, Appendix 6.2.

The duration of this test is four (4) hours. Run-time does not have to be continuous, or a 300 piece minimum run. If the test is not completed within two (2) working days, or requires more than four (4) restarts, Bosch Braking Systems and the equipment manufacturer / supplier shall decide together what corrective action should be implemented and whether the test will continue or be restarted.

If for practicality or logistics reasons, it is not possible to run the equipment / system for a period of four (4) hours, Bosch Braking Systems personnel may authorize a deviation on this portion of the qualification process. If granted, the deviation will either allow a reduction in the total run-time, or base the test on a set number of pieces processed through the equipment / system. A deviation will only be authorized through language in the request for quotation or the purchase order agreement.

The actual intended function of the equipment / system will be performed during this testing procedure. Actual production parts will normally be handled and run through the system. This will require all associated system hardware to be installed on the equipment and fully functional, and the system to operate at the required production rates. The system shall operate with the actual intended workloads in the actual (or near actual) work envelope. All attempts shall be made (within practical limits) to simulate all of the input / output devices interfacing with the equipment / system.

Bosch representatives may include machine operators and / or maintenance personnel from the Clarksville facility. Attendance from these groups will allow better familiarization with the process and equipment.

The functionality and capability of the emergency stop mechanisms shall be demonstrated for all equipment / systems.

STEP 5: DOCUMENTATION REVIEW

Due to past difficulties obtaining proper detailed documentation for purchased machinery, the equipment manufacturer / supplier shall supply all documentation listed below in advance of equipment / system approval. The manufacturer / supplier should be documenting the equipment / system throughout the build rather than after the equipment / system is out of reach for reference. If this is followed throughout the process, the delivery of documentation should not be a problem.

Receipt and review of the documentation will have significant merit in the Pre-delivery acceptance.

Bosch believes that proper documentation including maintenance manuals are critical in the training of operators and maintenance personnel. Personnel will be far more effective and efficient in there work and maintenance if they are trained using and referencing the documentation that they will be forced to rely on after installation.

The following documents will be evaluated in detail for comprehensiveness and usefulness to the operators and maintenance personnel during training. All manuals shall contain detailed drawings or photographs depicting the steps and location of the task to be performed. Failure to provide acceptable documentation will most likely result in failure in the pre-delivery stage.

- Maintenance Manuals (All manuals shall include drawings or photographs depicting maintenance locations and operations)
- Assembly and Detail Drawings (Hard copy and Disk)
- Safety Instructions and Procedures
- Equipment Home Position Instructions
- Power Down Procedures
- Listing Faults and Issues with Likely Causes and Likely Repair
- Machine serial / model / project numbers
- Listing of relevant phone numbers (Service, Engineering, Design, Sales etc..)
- Machine lifting positions
- Specific foundation requirements
- Tooling layouts showing tool paths
- All operating parameters (speeds, feeds, rpm)

The following documents will be checked for presence and will not be reviewed in detail until the training stages. It is necessary to provide these documents at this phase to guarantee that they will be present at installation.

- Hydraulic Drawings
- Electrical Drawings
- Pneumatic Drawings
- PLC Programs (Hard copy and Disk)
- CNC Programs (Hard copy and Disk)
- Maintenance Schedules (Daily, weekly, monthly, etc..)
- Spare Parts List Including Pricing, Lead Time, and Recommended Inventory to be Stocked at Bosch
- List of Consignment Parts (Where Applicable)

To restate, all of the above documentation and any additional documentation previously agreed upon MUST be provided in advance the Pre-Delivery Qualification. In order to avoid delays from improper documentation, the manufacturer / supplier is encouraged to present drafts of manuals and procedures IN ADVANCE for review by Bosch engineering so that there will be no question as to what is expected of documentation composition and detail.

STEP 6: PRE-DELIVERY QUALIFICATION REPORT

The purpose of the report is to summarize the highlights and results of the equipment / system simulation / run-off conducted at the manufacturer's / supplier's facility and to present it to Bosch Braking Systems representatives in a well documented,

formalized manner. The content of the report shall include information on the following qualification steps

A.)Gage Reliability Study
B.)Mini-Capability Study
1.)Quantitative Data Portion
2.)Attribute Data Portion
C.)Twenty-Four (24) Hour Continuous Reliability Run
D.)Four (4) Hour Run-At-Rate Test

The Pre / Final Acceptance Checklist, described in Section 7 of the Bosch GDS along with Addendum A to the Checklist (found in Appendix A.3 of Chapter 10) will also accompany the report as evidence of a thorough examination of the equipment / system. The checklist must be completed in accordance with the guidelines on Section 7 and signed on the final page. If the machinery is not satisfactory to the Checklist or the given specifications, this shall be noted on the checklist and corrective action must be taken to fix any nonconformance. If the Pre / Final Acceptance Checklist is not completed, signed, and approved, the equipment may not be dismantled or shipped.

This report and checklist shall be presented to Bosch Braking Systems prior to dismantling the equipment / system and delivering it to Bosch Braking Systems, Clarksville Plant. The package shall be submitted no later than five (5) working days upon completing the last portion of the run-off at the equipment manufacturer's / supplier's facility. The report shall be signed and dated by:

A.)Project Coordinator / Engineer (Bosch Braking Systems)
B.)Project Coordinator / Engineer (Equipment / system manufacturer / supplier)
C.)Sales Representative (Equipment / system manufacturer / supplier)

The report shall be distributed to the Bosch Braking Systems personnel as follows:

A.)Plant Manger
B.)Quality Assurance Manager
C.)Purchasing / Materials Manager
D.)Manager of Operations and Engineering for Project

Upon mutual agreement of the equipment / system performance / capabilities as presented in the report, and completion of the signing procedures, the equipment / system shall be approved for shipment to the proper Bosch Braking Systems manufacturing facility.

STEP 7: MINI-CAPABILITY / GAGE RELIABILITY STUDY

The Mini-Capability / Gage Reliability Study is identical to Steps 1 and 2 which is performed prior to the delivery of the equipment / system. This study, however, is performed once the equipment / system is installed in Bosch Braking Systems' manufacturing facility. For the quantitative data and attribute data studies shall be performed, but both studies can be conducted with reduced sample sizes. For the quantitative test, data shall be collected from a 30-piece sample at the time of installation. For the attribute portion of the study, data shall be collected continuously for one hour at the required production rate upon completing the equipment / system installation. The results of this study shall be presented in the Production

qualification / Acceptance Report. A supplier's representative shall be present for this reliability test.

STEP 8: TWENTY FOUR (24) HOUR CONTINUOUS RELIABILITY RUN (DRY)

In order to verify the "as-installed" condition of the equipment / system, the twenty-four (24) hour continuous reliability run is to be repeated at the intended Bosch Braking Systems manufacturing facility. As before, the system must cycle at the production speed required in the Purchase Order Agreement continuously for twenty-four (24) hours. The procedure for this test shall be identical to the Twenty-four (24) Hour Continuous Reliability run conducted at the manufacturer's / supplier's facility. A supplier's representative shall be present for this reliability test.

STEP 9: FOUR (4) HOUR RUN – AT – RATE TEST

The purpose of this test is to verify to Bosch Braking Systems representatives the "as-installed" functionality, reliability and the quality of the equipment / system, as specified in the Request for Quotation and Purchase Order agreements. Further, how well the equipment / system meets these requirements. This will require the equipment / system duplicate production conditions and rates as closely as possible. The procedure for this test shall be identical to the Four (4) Hour Run – At – Rate Test conducted at the manufacturer's / supplier's facility. A supplier's representative shall be present for this reliability test.

STEP 10PRODUCTION QUALIFICATION / ACCEPTANCE REPORT

The presentation of this report is the final step in the Equipment Qualification and Acceptance Specifications & Procedures. The purpose of this report is to document the run-off results from the following in-plant qualification steps:

A.)Mini-Capability / Gage Reliability Study
B.)Twenty Four (24) Hour Continuous Reliability Run (Dry)
C.)Four (4) Hour Run – At – Rate Test
1.)Quantitative data portion
2.)Attribute data portion

The Pre / Final Acceptance Checklist, described in Section 7 of the Bosch GDS along with Addendum A to the Checklist (found in Appendix A.3 of Chapter 10) will also accompany the report as evidence of a thorough examination of the equipment / system. The checklist must be completed in accordance with the guidelines on Section 7 and signed on the final page. If the machinery is not satisfactory to the Checklist or the given specifications, this shall be noted on the checklist and corrective action must be taken to fix any nonconformance. If the Pre / Final Acceptance Checklist is not completed, signed, and approved, the "buy-off" of the equipment may not proceed.

The report shall be organized and prepared by Bosch Braking Systems, Clarksville Plant representatives, and approved and signed by the parties indicated in the Pre-Delivery Qualification Report section. The submission of this report shall occur within ten (10) working days of completing the Four (4) Hour Run-At-Rate Test. Upon completion of this qualification step, the equipment / system will have completed the necessary and required steps for the Equipment Qualification and Acceptance

Procedures, and the "buy-off" (equipment / system Purchase Order Balance; typically 10%) can be performed.

10.11.2.RUN – OFF PROBLEMS

Bosch understands that the manufacturer's / supplier's time is invaluable and we hope that the manufacturer / supplier will have the same respect for Bosch representative's time. For this reason we must impose a penalty for each additional run-off that is required. Bosch's customer's impose much larger penalties for late delivery or new program start-up and we feel that this cost shall be shared with the manufacturer / supplier if the manufacturer / supplier is deemed to be at fault. It is important to note that Bosch is penalized for late delivery regardless of the reason and sub-supplier induced delays should also be dealt with in the same manner.

The following is a list of example situations where the equipment / system will be at fault for late delivery or additional run-off's:

1.) Problems with equipment / system manufacturer / supplier produced equipment (First Tier) due to faulty design, engineering, construction, programming etc… by the manufacturer / supplier.
2.) If Bosch representatives arrive for a scheduled run-off and the equipment is not ready. This can be avoided by contacting the Bosch personnel at least 24 hours in advance to cancel the run-off.
3.) Machinery that does not meet the agreed upon specifications of the Purchase Order, including but not limited to Capability and Gage R&R performance.
4.) Proper manufacturer / supplier personnel not available or present at scheduled run-off.
5.) Sub-supplier's delivery problems deemed within manufacturer / supplier control including but not limited to design changes not initiated by Bosch or Bosch's customer's.

The following is a list of example situations where the equipment / system will NOT be at fault for late delivery or additional run-off's:

1.) Acts of God causing power outages, missed work days, delayed deliveries, etc.. Timing chart adjustments shall be made and delivered within 10 working days of the end of the event. If no schedule adjustments are received within this time, it will be assumed that the change will have no impact on timing and therefore will not be considered as a reason for late run-off's or delivery.
2.) Sub-supplier's delivery problems deemed outside manufacturer / supplier control including but not limited to each of the reasons listed for no penalty.
3.) Design changes initiated by Bosch with proper notice of timing impact. Timing chart adjustments shall be made within 10 working days of written notice to the manufacturer / supplier from Bosch of the change. If no schedule adjustments are received within this time, it will be assumed that the change will have no impact on timing and therefore will not be considered as a reason for late run-off's or delivery.
4.) Quantity of parts for run-off provided by Bosch is less than the agreed amount in the Purchase Agreement.

Additional reasons or circumstances will be evaluated upon occurrence.

Penalties for additional run-off's will include airfare or other travel arrangements, hotels, meals, rental cars for the scheduled duration of the additional run-off. This will cover costs incurred by all Bosch representatives scheduled to attend the run-off. Written notice of the costs will be delivered within 15 working days to the manufacturer / supplier and the cost will be deducted from the costs due at acceptance of the equipment and the supplier's facility and then the any later payments.

The penalty for late delivery will be 2% of the full purchase price for each week that the equipment is late as defined above. The maximum penalty for late delivery is 10% of the full purchase price.

10.11.3. PART USAGE DURING RUNOFF

Please state in your quotation the number of parts that will be required to run-off the machine or system. This will allow us to schedule these parts in and have them ready for setup and runoff of the equipment. If a volume is not stated, the maximum number of parts that can be used is equal to two (2) times the requirement of the run-off stated in this section plus 10% of that quantity for setup. If the runoff volume initially stated or the default maximum (if no initial statement of volume is given) is exceeded, the raw material and manufacturing costs of these additional parts will be deducted from the final payment.

For example, for a system that runs a 30s cycle time, the following schedule shows the allowed usage by the default maximum quantity.

STEP 1:	GAGE STUDY	10
STEP 2:	CAPA. STUDY	125
STEP 3:	24HR DRY RUN	0
STEP 4:	4 HR RUN-AT-RATE	480
STEP 5:	DOC. REVIEW	0
STEP 6:	PRE-DELIVERY REPORT	0
STEP 7:	CAPABILITY / GAGE STUDY	135
STEP 8:	24HR DRY RUN	0
STEP 9:	4 HR RUN-AT-RATE	480
STEP 10	ACCEPTANCE REPORT	0.
	TOTAL:	1230
	2x	1230
	10%	246
	MAX PARTS ALLOWED:	**2706**

If the duration of the run at rate is reduced to less than four hours by Clarksville manufacturing engineering, then the default maximum number of parts allowed will be adjusted. However, the suppliers stated requirement will not change.

10.12. ELECTRICAL REQUIREMENTS

10.12.1. GENERAL

All machinery, equipment, conveyors, etc… must follow the following wiring / labeling standard to provide consistency, reduce troubleshooting time and enhance electrical safety for equipment / system used throughout the Clarksville facility. The following

has been taken from the National Electric Code (NEC) and the NEC should be followed in the event on question.

220 / 480 VAC Wiring	Black
120 VAC Wiring	Red
Direct Current Voltages (VDC)	Blue
Wiring connected to an external power source	Yellow
Wiring connected to AC common	White
VDC Common	Blue w/ White Stripe
Wiring connected to System / Chassis Ground	Green

120 VAC control circuits must be grounded (i.e. secondary of transformer).

All discreet components and wires connected to a PLC should be labeled with the I/O number and function. I.E. a sensor detecting a full conveyor connected to the first slot, input #5 should be designated sensor I:1/05 “CONVEYOR FULL” and the connecting wire/terminal block should be labeled I:1/05 “CONVEYOR FULL”. A valve connected to the fifth slot, output #10 should be designated valve O:5/10 and the connecting wire/terminal block should be labeled O:5/10.

All machines shall have a programming port and 115 VAC outlet as well as a collapsible shelf (for laptop) mounted near the main operator panel. Outlet to be labeled “FOR PROGRAMMING DEVICE ONLY”

Remove 115 VAC receptacle from inside main enclosure from Section 5.5.5.C.

10.12.2. NEXT OPERATION FULL

All machinery should include the necessary programming, sensor, and connections to pause the machines operation if this sensor is blocked. This sensor will then be mounted on the conveyor after the machine and should stop the machine should the conveyor back up. The same applies for reject conveyors or chutes.

10.12.3. CONTROLLED CYCLE STOP

All programs are to incorporate a “CYCLE STOP” function which will bring the machine to a controlled stop in which all tooling will be in their home position ready for next cycle.

10.12.4. TOOLING HOME FUNCTION

All programs are to incorporate a “TOOLING HOME” function which will bring all of the machine tooling to their “HOME” position.

10.12.5. WIRING PRACTICES

All wiring practices shall be governed by the National Electrical Code (NEC) and NFPA 79 (Electrical Standard for Industrial Machinery).

All wiring connections are to be Ferruled.

All PLCs to be powered from an isolation transformer which will be sized to accommodate the PLC and a 110 VAC outlet for programming purposes. The isolation transformer primary will be wired to the top of the machine main disconnect. This is to lengthen the life of the PLC battery and allow programming while power is

off. The 480 VAC wires shall be BLACK with a piece of yellow tape at both ends, the 120 VAC wires shall be yellow.

All I/O is to be 24 VDC with PNP style sensors.

All 240 or 480 VAC motors are to have power disconnect located near said motor(s) Disconnect is to have Lock out Tag out capability.

All proxs, photoelectrics and fiberoptics are to be quick disconnect style. These in turn are to wired to "Multi ports" where they again will be quick disconnectable.

Circuit Breakers shall be used in lieu of fuses.

All DC power supplies shall have their DC Common grounded.

All enclosures AND junction boxes shall have slotted style wiring duct.

All wires entering a junction box shall be terminated. NO junction box shall be used as a pull thru box.

All PCs shall have an uninterruptable power supply **with software** to shutdown the PC application in case of a power outage.

All machines shall have Stacking style indicator lights to show status of the machine.
Red = Fault condition Top Position
Amber = Waiting on Material Middle Position
Green = Auto Cycle Bottom Position

All machines shall have counters and timers to indicate:
Good Parts Counter
Reject Parts Counter
Last Cycle Time
Lase 10 Cycles Average

All machines to utilize 2001 technology and components. NO obsolete material shall be used.

10.12.6. PLUMBING PRACTICES

All valves to be mounted vertically. The "A" solenoid shall be on the RIGHT hand side and the "B" on the LEFT hand side. The "A" solenoid shall ADVANCE the cylinder and the "B" shall RETRACT the cylinder.
NOTE: Rule of thumb. A ADVANCE B BACK

10.13. PAINT REQUIREMENTS

10.13.1. GENERAL

All machinery, equipment, conveyors, etc… require painting to Bosch Braking Systems requirements. It will be the manufacturer's / supplier's responsibility to determine the color specifications before quoting by contacting the Bosch Braking Systems Manufacturing Engineering Department for items not specified in the Request for Quotation.

10.13.2.EQUIPMENT COLORS

Machine Parts, Castings, Etc…	Bosch Beige
Machine Doors, Panels - Outside	Same as Machine
Machine Doors, Panels - Inside	Safety Orange
Operator Push-button Station, Outside	Same as Machine
Operator Push-button Station, Inside	White
Motors	Blue
Panel Enclosures, Outside	Same as Machine
Panel Enclosures, Inside	White
Panel Doors, Outside	Same as Machine
Panel Doors, Inside	Safety Orange
Fenced Guards – Border	Safety Yellow
Fenced Guards – Fence	Black
Other Guards	Safety Yellow
Large Visible Moving Parts (Transfers, Lift & Carry, etc…)	Safety Orange
Pedastal Type Robots	Mfg Standard
Hoists and Overhead Cranes	Safety Yellow
Chip Hoppers	Green
Sprinkler Lines	Safety Red
Gas Lines	Safety Yellow
Water Lines	Light Green
Pressurized Air Lines	Light Blue
Special Chemical Piping	Purple
Hydraulic Systems and Piping	Safety Orange
Machine or tool surfaces that come in contact with work Piece or test or coolant fluids	**Black Oxide**
Heat treat equipment subject to high temperatures, such as Furnaces and ovens	**Heat Resistant Aluminum Paint**

10.13.3.PAINT SOURCES

Bosch Beige	RAL 1015 or RAL-9002 if RAL-1015 not available SHERWIN WILLIAMS: 1393, Polane “B” Polyurethane Enamel or Tile Clad II Catalyzed Epoxy Enamel
White	SHERWIN WILLIAMS: Polane “B” Polyurethane Enamel or Tile Clad II Catalyzed Epoxy Enamel
Green	SHERWIN WILLIAMS: Polane “B” Polyurethane Enamel or Tile Clad II Catalyzed Epoxy Enamel
Blue	SHERWIN WILLIAMS: Polane “B” Polyurethane Enamel or Tile Clad II Catalyzed Epoxy Enamel
Safety Orange	SHERWIN WILLIAMS: 4510, Polane “B” Polyurethane Enamel or Tile Clad II Catalyzed Epoxy Enamel
Safety Yellow	SHERWIN WILLIAMS: Polane “B” Polyurethane Enamel or Tile Clad II Catalyzed Epoxy Enamel

10.14. GAGE, PROCESS AND MACHINE CAPABILIITY REFERENCES

The following references are the industry standards and will be followed throughout the process.

1.)Automotive Industry Action Group, **Production Part Approval Process (PPAP).** 2nd Edition, February 1995.
2.)Automotive Industry Action Group, **Measurement Systems Analysis (MSA).** 2nd Edition, February 1995.
3.)Automotive Industry Action Group, **Quality System Requirements (QS-9000).** 2nd Edition, February 1995.
4.)Automotive Industry Action Group, **Statistical Process Control (SPC).** 2nd Edition, February 1995.
5.)Automotive Industry Action Group, **Potential Failure Mode and Effects Analysis (FMEA).** 2nd Edition, February 1995.
6.)Automotive Industry Action Group, **Advanced Product Quality Planning and Control Plan (APQP).** 2nd Edition, February 1995.
7.)Automotive Industry Action Group, **Quality System Assessment (QSA).** 1st Edition, August 1994.
8.)American Society of Mechanical Engineers**, ASME Y145.M-1994 Dimensioning and Tolerancing.** Copyright 1995, AMSE, New York, New York.

10.15. MACHINE TECHNICAL TRAINING SUPPORT

'We Value Our Suppliers'. 'We award business to our suppliers based on their ability to meet our needs and commitments, their reputation for service, their high standards for quality and delivery, and their price structures in short, for the very same reasons our customers award business to us'. The level of customer service, technical support, and training support that we receive following a machine purchase is a major contributor to our success and the job satisfaction of our Associates.

10.15.1.RFQ MEETING-EXPECTATIONS

In addition to other tasks during the RFQ Meeting, the supplier will meet with appropriate Bosch personnel to better understand our training support expectations.

10.15.2.PRESENATION OF BID

During the Presentation of Bid Meeting, the supplier will present a training plan that details support included prior to machine delivery, during machine deliver, and following machine delivery.

We anticipate four components in the training plan.

- Proposal *(Including target dates for training)*
- Syllabus *(Schedule & Content)*
- Materials *(Literature List, course certificates for students, etc.)*
- Machinery Requirements

10.15.3.PRE-AWARD MEETING

Bosch will formerly acknowledge acceptance of the training plan in the Bid Award.

10.16. GDS VENDOR EXPECTATIONS

10.16.1.RFQ

1) Communications: All communications, concerning clarification and/or exception to a RFQ, shall make reference to the RFQ Number issued by Bosch. Must be written and forwarded to the requestor, copied to the Purchasing Buyer, and must be on the Vendor's Letter Head with the Vendors Sales Representative's signature.
2) Timeliness: The Vendor is responsible to make sure that RFQ communication responses are issued to Bosch and received in a timeliness manor in order to assure the quote is issued on time.

10.16.2.QUOTE

1) The quote must be clear and concise and follow the Bosch GDS guidelines, section 1. The quote must show the total price per the RFQ and additional options listed separately.
2) Exceptions: Exceptions to the RFQ must also be listed in a separate section.
3) Quotes must make reference to the RFQ number, Part Names and numbers, Name of Project Engineer requesting the quote, and Vendor's quote number and date.
4) Signature: The quote must be signed by the Vendor's sales representative.
5) Documentation: The quote must contain conceptual drawings, layouts, special equipment provisions, and a basic timeline with critical milestones (i.e. Design Review, Build Review, Run-off at Vendor Location, Run-off at Bosch Location).
6) Quote shall be itemized per the GDS section 1.2.3.

10.16.3.PURCHASE ORDER

The Purchase Order can be received in two forms:

1)Letter of Intent (LOI): At times it is critical to Bosch's customers timing to procure equipment prior to issuing a Purchase order. The LOI has the same power and constraints as a Purchase Order. The LOI is temporary and will be replaced with a Purchase Order. The Vendor is expected to begin work upon receipt of the LOI and will be bound to the RFQ/Quote/LOI agreement.

2)Purchase Order (PO): The PO will be issued to the Vendor via Bosch Purchasing. It is the responsibility of the Vendor to Communicate immediately any exceptions to the PO. These exceptions must be written and forwarded to the requestor, copied to the Purchasing Buyer, and must be on the Vendor's Letter Head with the Vendors Sales Representative's signature.

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3)The acknowledgement copy of purchase order must be signed and received by the Bosch Senior Buyer before any payment is released.

4) Bosch Terms of Payment are Net 30 with invoice schedule as follows:

Purchase order acknowledgement written acceptance: Invoice 10%
Final Design Approval: Invoice 30%
Run-off Acceptance at Supplier: Invoice 40%
Run-off Acceptance at Bosch: Invoice 10%
Receipt of all Drawings: Invoice 10%

10.16.4.PROJECT MANAGEMENT

1) The vendor is responsible to manage the design, build, and installation of equipment as defined in the Bosch PO.
2) The vendor is expected to document and maintain Timing, Cost, and Scope of the Project.
3) The vendor is to include Bosch Purchasing and the Project Engineer in weekly updates of the project status. This status report must include Timing progress, Cost progress, Scope Control, Open issues and Risk, and Action item status.
4) It is the responsibility for the vendor to schedule periodic progress meetings with Bosch and issue minutes with open issues/action items. The meetings shall be at the minimum of, PO issuance by Bosch, First and Second Design Reviews, First and Second Build Reviews, Equipment Verification, and Project Closure. The minutes shall include participants, detail of discussion, list of verbal agreements, open issues, action items with responsible and due dates.
5) It is the responsibility of the Vendor to communicate all Risk and contingency proposals to the Bosch Project Engineer and Bosch Purchasing.
6) Evidence Book: It is the responsibility of the vendor to maintain an Evidence Book for each project. This evidence book shall be made available during each progress meeting to be reviewed by the Bosch representative and a final copy made available upon project closure. This evidence book shall include, but not limited to: RFQ, Quote, LOI/PO, Additional Agreements and Addendum's to the PO, Updated Time Lines, Updated Cost Schedule (Budget vs. Spent), Scope Control (Can be in the form of equipment prints and bill of materials, Open issues and Risk, and action item status.

10.16.5.DESIGN REVIEW

The Vendor must schedule two design reviews with the Bosch Project Engineer to review.

1) First Design Review: Timing, Cost, Scope Control, Concept and Layout.
2) Second Design Review: Timing, Cost, Scope, Control, Build prints, BOM and Spare parts list.

The Vendor must obtain written approval from the Bosch Project Leader of design acceptance and progress payment (dependent on PO payment schedule).

10.16.6.BUILD REVIEW

The Vendor must schedule two build reviews with the Bosch Project Engineer to review.

1) First Build Review: Timing, Cost, Scope Control, Documentation, Material On Hand, and Build progress.
2) Second Build Review: Timing, Cost, Scope Control, Documentation, Spare Parts On Hand, and Build Finalization. Equipment Verification Plan and Timing also to be discussed.

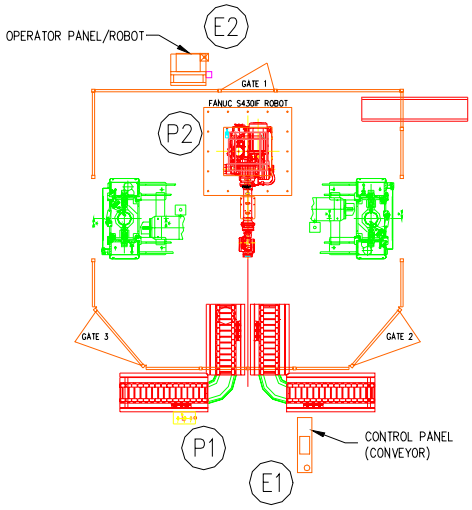
The Vendor must obtain written approval from the Bosch Project Leader of build acceptance and progress payment (dependent on PO payment schedule).

10.16.7.EQUIPMENT VERIFICATION

1) The equipment verification plan shall be agreed upon in the Quoting and PO stage of the project. This plan shall be formalized in nature and have signatures from the Vendor and Bosch Project Engineer.
2) It is the responsibility of the Vendor to support the verification plan-making available all resources to assure the plan is executed, i.e. residual equipment, metrology equipment and personnel, amenities for Bosch personnel, personnel to support verification activities, etc.

APPENDIX A: EXAMPLE OF LOCKOUT – TAGOUT DIAGRAM

SAFETY LOCKOUT / BOSCH BRAKING SYSTEMS



REMEMBER LOCKOUT

- REFER TO COMPANY LOCKOUT POLICY FOR LOCKOUT REQUIREMENTS AND SAFE PRACTICES
- ALWAYS PERFORM CHECK TO VERIFY ENERGY IS CONTROLLED
- ASSURE RELEASE OF ALL STORED ENERGY
- ONLY WORK UNDER YOUR OWN LOCK

	LOCATION	METHOD	CHECK
CONVEYOR CONTROL PANEL	(E1) RIGHT FRONT DOOR	1.) PUSH CYCLE STOP BUTTON 2.) PULL DISCONNECT & LOCKOUT	PUSH MASTER START PB
ROBOT CONTROLLER	(E2) UPPER LEFT CORNER	1.) PUSH POWER OFF BUTTON 2.) TURN DISCONNECT & LOCKOUT	PUSH MASTER START PB
PNEUMATIC 120 PSI	(P1) RIGHT FRONT	TURN OFF AIR VALVE & LOCKOUT	VISUALLY CHECK AIR GUAGES FOR ZERO "0" PRESSURE
PNEUMATIC 120 PSI	(P2) LEFT REAR	TURN OFF AIR VALVE & LOCKOUT	VISUALLY CHECK AIR GUAGE FOR ZERO "0" PRESSURE

SEQUENCED CONTROLLED SHUTDOWN

1.) ELECTRICAL CONSOLE (E1)	2.) PNEUMATIC (P1)	3.) ROBOT CONTROLLER (E2)	4.) PNEUMATIC (P2)

APPENDIX B: RECORD OF PRE-AWARD CONFERENCE FOR PURCHASE OF CAPITAL EQUIPMENT

UPON APPLICTAION OF SIGNATURES TO THIS DOCUMENT, IT BECOMES AN ADDENDUM TO THE BOSCH PURCHASE ORDER LISTED BELOW.

SUPPLIER_____ **RFQ #**_____

DATE_____

ADDRESS_____

P.O.NUMBER_____

_____

_____

_____ **PHONE:** _____

10 EQUIPMENT DESCRIPTION AS WRITTEN ON PURCHASE ORDER

_____

_____

_____

_____

_____

_____

_____

_____

A. QUOTATION

		YES	NO
1.	Quotation due date_____		
2.	Quotation received date _____		
3.	Did supplier receive the Bosch Clarksville GDS?	☐	☐
4.	Did the supplier receive the drawings for the production parts that will be produced on this equipment? List Part No.(s) and Rev._____	☐	☐
5.	Did the supplier complete all areas of the Request For Quotation form?	☐	☐
6.	Does the quotation contain any qualifications to the purchase order, Bosch Clarksville GDS, Equipment Technical Specifications or Request for Quotation? (if so, complete section B)	☐	☐

B. QUALIFICATIONS TO THE SUBMITTED QUOTATION

List all qualifications to any specification, which were submitted as conditions of the supplier's quotation. <u>Qualifications to capacity or delivery date must be listed and resolved prior to issue of a purchase order.</u>

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____

List the resolution for each qualification with appropriate explanation.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

17. _____

18. _____

19. _____

20. _____

21. _____

22. _____

23. _____

24. _____

C. EQUIPMENT REMARKS

	YES	NO
1. Does the quotation include a complete description of all equipment and sequence of operation quoted?	☐	☐
2. Does the quotation include all costs for models, patterns, tool aids, etc.?	☐	☐
3. Does the quotation include a listing of all sub-contracted tooling suppliers?	☐	☐
4. The quoted cycle time is _____ seconds from cycle start to cycle start including estimated load/unload time.		
5. The quoted capacity is _____ pieces per day based on _____ hours per day and 100% operator efficiency.		
6. The quoted uptime is _____ %.		
7. Equipment Progress Worksheets are due every 2 weeks and are to be mailed to:		
_____Manufacturing Engineer		
_____ Purchasing Buyer	☐	☐
8. The supplier understands that in the event the equipment is not ready to meet production tryout at the Clarksville, Tennessee facility by the specified date, the supplier will assume ALL liability for premium transportation costs, premium labor costs, and all other premium costs to assure the capability of the Clarksville, Tennessee facility to meet production continuity, unless negotiated to the contrary by the Buyer.	☐	☐
9. If applicable has the time required for items to pass through customs been addressed?		

D. UNION AFFILIATION

NO

1. Are the employees at the supplier's plant unionized? ☐
2. Union: _____
3. Local: _____
4. Contract expiration date: _____
5. If the contract expiration date is eminent, what action is the supplier taking to ensure continued operations?

   _____

   _____

   _____

6. Does the supplier agree to notify the Buyer and Manufacturing Engineer immediately if the supplier encounters labor situations that jeopardize, or threaten to jeopardize, continuity of equipment completion? ☐

E. ENERGY AVAILABILITY

NO

1. Will the curtailment of natural gas or other energy source adversely affect the supplier's manufacturing operation? ☐
2. If the above is yes, what actions is the supplier taking to ensure continued operations, such as establishing secondary sources of energy, sub-contracting, etc?

   _____

   _____

   _____ ☐

   _____

3. Does the supplier agree to notify the Buyer and Manufacturing Engineer immediately if the supplier encounters energy situations that jeopardize, or threaten to jeopardize, continuity of equipment completion.

F. EQUIPMENT PRE-INSTALLATION AND INSTALLATION REQUIREMENTS

	YES	NO
1. Will the supplier be required to try out equipment for Bosch approval prior to shipment to the Clarksville, Tennessee facility?	☐	☐
2. What is the minimum Ppk, Cpk required at try-out at the supplier's facility? _____	☐	☐
3. Will the supplier be required to assemble and try out equipment at the Clarksville, Tennessee facility?		
4. What is the minimum Ppk, Cpk required at the try-out after the equipment is installed in the Clarksville, Tennessee facility? _____	☐	☐
5. Will parts used to try-out equipment be produced on the production process?		
6. If not, how will parts be supplied?_____ _____ _____	☐	☐
7. Does the supplier have a list of characteristics for which Cpk's must be proven?		
8. What is the date the equipment is required to be installed in the Clarksville, Tennessee facility? _____	☐	☐
9. Has the supplier quoted completion by this date?		

G. METHOD OF PAYMENT

1.

H. ACKNOWLEDGMENT

Supplier comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

CONFERENCE ATTENDEES

SUPPLIER REPRESENTATIVE BOSCH REPRESENTATIVE

_____TITLE _____ _____ TITLE _____

_____TITLE _____ _____ TITLE _____

_____TITLE _____ _____ TITLE _____

_____TITLE _____ _____ TITLE _____

APPENDIX C: ADDENDUM A TO PRE / FINAL DELIVERY ACCEPTANCE CHECKLIST OF BOSCH GDS SECTION 7.2

APPENDIX D: SAFETY REFERENCES

Primary Safety References

American National Standards Institute (ANSI)
For Customer Service and
General Inquiries please call:
212-642-4900
Washington, DC Headquarters
1819 L Street, NW, 6th Fl.
Washington, DC, 20036
202-293-8020
http://www.ansi.org/

Occupational Safety and Health Administration (OSHA)
Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30303
404-562-2300
http://www.osha.gov

Tennessee Department of Labor and Workforce Development
710 James Robertson Parkway, 3rd Floor
Nashville, Tennessee 37243-0659
615-741-7036
http://www.state.tn.us/labor-wfd/tosha.html

National Fire Protection Agency (NFPA) National Electric Code (NEC)
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
617-770-3000
http://www.nfpa.org/Home/index.asp
http://www.nfpa.org/nec/catalog/index.asp

Secondary safety references:

American Conference of Governmental Industrial Hygienists (ACGIH)
1330 Kemper Meadow Drive
Cincinnati, Ohio 45240, USA
Customers/Members Phone: 513-742-2020
Administrative Phone: 513-742-6163
http://www.acgih.org/home.htm

United States Environmental Protection Agency (EPA)
Region 4
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-3104
404-562-9900
800-241-1754
http://www.epa.gov/

Toxic Substances Control Act (TSCA) Inventory
http://msds.pdc.cornell.edu/tscasrch.asp

Insert ADDENDUM A TO PRE / FINAL DELIVERY ACCEPTANCE ☑ CHECKLIST OF BOSCH GDS SECTION 7.2

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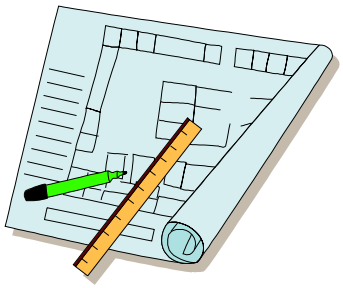

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