 <b>VANGUARD</b> EMS™ <i>Leading Edge Electronics Manufacturing</i>	<h2>Supplier Quality Requirements</h2>
<b>Type: Reference Table</b>	
<b>Document # 12769-015</b>	<b>Page 1 of 7</b>

## 1.0 Purpose

Defines quality requirements and expectations for Vanguard Suppliers.

## 2.0 Scope

Material that affects product or service quality including COTS, MRO, Services, Special Processes and Build-to-Print items including PCB's.

## 3.0 Definitions

<b>COTS</b>	Commercial Off-The-Shelf Products
<b>FOD</b>	Foreign Object Debris
<b>MRO</b>	Maintenance, Repair and Operating
<b>PCB</b>	Printed Circuit Boards
<b>Services</b>	Auditing, Calibration, Consulting – that affect quality
<b>Special Processes</b>	Processes where parameters are directly influenced by component geometry and/or results that cannot be confirmed by inspection

## 4.0 General Requirements for All Suppliers


### Approved Sources

- All materials and components used in the manufacture of supplier's product or supplied directly to Vanguard must be acquired directly from an approved Original Equipment Manufacturer or from an Authorized or Franchised distributor. Authorized or Franchised distributors are those distributors holding a formal distribution agreement with the designated OEM.
- Suppliers are not authorized to use Brokers without permission from Vanguard and/or Vanguard's customer.
- Suppliers must notify Vanguard upon receipt of a purchase order if supplier is not an OEM Authorized reseller / distributor of requested product, unless previously authorized in writing by Vanguard EMS.

### Awareness of Vanguard's Quality Policy & Ethics:

As a supplier to Vanguard, you need to be aware:

- Vanguard's Quality Policy:
  - We build defect-free products and deliver them on time.
  - We are a continually improving organization.
- Vanguard's Code of Ethics:
  - Do the right thing.
  - Be honest and open.
  - Be accountable.
- Your contribution is critical to our success, and the success of our customers.
- By supplying quality components and services on schedule, Vanguard is able to do the same for our customers.
- Many of our products are life or mission critical. The quality of the components are foundational to their success.
- We expect our suppliers to hold to the same quality and ethical values as we hold ourselves.

	<h2>Supplier Quality Requirements</h2>
<b>Type: Reference Table</b>	
<b>Document # 12769-015</b>	<b>Page 2 of 7</b>

### Certificate of Conformance

- Supplier shall provide written certification. The certificate shall contain:
  - Vanguard EMS Purchase Order Number
  - Vanguard EMS Part Number and Revision
  - Lot code and/or Date Code
  - Statement that article(s) delivered under this purchase order have been inspected and are in compliance with requirements, applicable drawing(s), specification(s) and terms and conditions of the Purchase Order.
  - Certificates of Conformance from Distributors shall include the name of the Original Manufacturer and the MFG part number

**Note:** A Certificate of Conformance can be included on the Packing Slip as long as all the CoC requirements above are clearly present and it is legible and copyable/scanable.

### Control of Non-Conforming Material

- Supplier has not been granted MRB Authority. Supplier shall not: Use as Is, Rework or Repair non-conforming material without authorization from Vanguard Engineering and/or Quality.
- Material used in medical products must have an adverse impact/risk review and may require special documented procedures.
- Vanguard may need to obtain authorization from regulatory bodies or its customer prior to Use as Is, Rework or Repair.

### Counterfeit Parts


- Suppliers of electronic components must have a counterfeit parts prevention program. The purpose of this program shall be to prevent the delivery of counterfeit parts and control parts identified as Counterfeit. Further guidance can be found in SAE AS5553.

### Environmental Laws and Regulation Compliance

- In addition to items noted in the Code of Conduct or elsewhere in this document:
- Suppliers will act in accordance with all the applicable laws and regulations.
- Suppliers will comply with the Dodd-Frank Wall Street Reform and Consumer Protection Act and provide supporting information as requested.
- Ozone-Depleting Substance rules and flow-downs.
  - a. Seller shall label products which contain or are manufactured with ozone-depleting substances in the manner and to the extent required by 42 U.S.C. 7671j (b), (c), and (d) and 40 CFR Part 82, Subpart E, as applicable:
    - Warning: Contains \* \_\_\_\_\_, a substance(s) which harm(s) public health and environment by destroying ozone in the upper atmosphere.
    - Warning: Manufactured with \* \_\_\_\_\_, a substance(s) which harm(s) public health and environment by destroying ozone in the upper atmosphere.
    - \* Seller shall insert the name of the substance(s).

### Language Requirements

- All documentation sent to Vanguard as part of compliance with these requirements needs to be in English.

	<h2>Supplier Quality Requirements</h2>
<b>Type: Reference Table</b>	
<b>Document # 12769-015</b>	<b>Page 3 of 7</b>

### **Material with Limited Shelf Life**

- The remaining shelf life at time of delivery to Vanguard shall not be less than 75% of total shelf life.

### **Notice of Changes**

- Supplier is required to notify Vanguard of any product and/or process changes, change of sub-suppliers, manufacturing facility location in writing. Examples of other changes that require notification and may require authorization include:
  - Quality System Changes such as Registration or De-Registration
  - Ownership or Key Personnel
  - Workmanship Standards
  - Outsourcing Processes (especially for “Special Processes”)
- Supplier is required to obtain prior written approval from Vanguard for any changes that may affect fit, form or function

### **Notice of Product Escapes**


- Supplier shall notify Vanguard within 24 hours of discovery that there may be a quality, reliability or safety problem with material that is in transit or has already been delivered to Vanguard

### **Packaging Requirements**

- Packaging shall conform to all requirements specified on drawings, specifications, and purchase order. At all times:
  - Materials shall be packed to protect them from contamination and physical damage including, but not limited to moisture and electrostatic discharge.
- Identification
  - Each shipping container shall be identified with or include a Packing Slip that states:
    - Vanguard Purchase Order Number
    - Vanguard Part Number
    - Quantity
    - Lot Number and/or date code (when applicable)
    - Serial Number (when applicable)
    - Static sensitivity and/or moisture sensitivity requirements, warnings or protocols (when applicable).
    - Statement of RoHS Compliance (when applicable)

### **Quality System Requirements**

- Supplier shall maintain a Quality Management System to assure consistent conformance of their products and services to specified requirements.
- Supplier’s Quality Management Systems must be approved by Vanguard. Approval is automatic if supplier is maintaining certification(s) to any of the following: ISO 9001, ISO 13485, or AS9100.
- If supplier is not certified to a standard (above), Vanguard will ask for a copy of your Quality Manual to review and put on file.
- Primary QMS requirements are stipulated in this document. Additionally requirements may be added in the Purchase Order or other contract flow-downs.

 <b>VANGUARD</b> EMS™ <i>Leading Edge Electronics Manufacturing</i>	<h2>Supplier Quality Requirements</h2>
<b>Type: Reference Table</b>	
<b>Document # 12769-015</b>	<b>Page 4 of 7</b>

### **Record Retention**

- Supplier shall maintain legible, readily identifiable and retrievable records as defined on Vanguard's Purchase Order
- Supplier shall use Good Documentation Practices (GDP) to ensure clear, complete and accurate information is recorded
- Vanguard's standard record retention requirement is 36 months unless otherwise stated on the PO
  - Specific Record retention periods may be defined by Vanguard customer requirements or regulatory requirements and may differ from customer to customer or even product to product.

### **Right of Access and Source Inspection**


- Right of access by Vanguard, its customers and regulatory authorities to the applicable areas of the facilities is required; at any level of the supply chain involved in the order and to all applicable records
  - Vanguard or its customer may perform product verification at Sellers premises. If such verification is performed, Vanguard shall notify the seller in advance and include intended verification arrangement
  - An approved source inspection does not relieve the supplier from their obligation to provide conforming product.

### **Sub-Tier Supplier Flow Downs**

- Supplier shall maintain a system to assure that supplier procured materials and/or services conform to the Purchase Order, current drawings and specifications.
- Seller shall assure that requirements are flowed down to sub-tier suppliers as required and that these requirements are met by sub-supplier.
- Flow down information may include:
  - Vanguard or Vanguard end customer Quality Clauses and Requirements
  - US Government Requirements including:
    - Contract Requirements
    - FAR/DFAR Requirements
    - Export Control Compliance
    - Environmental Compliance

### **Supplier Performance and Corrective Action**

- Vanguard monitors supplier performance. Information reviewed includes incorrect paperwork, non-conforming material, on-time delivery and overall service.
  - If Vanguard determines Supplier performance is inadequate, a Corrective Action will be issued to the Supplier.
- Supplier is responsible for the initiation of prompt and complete replies to Vanguard's request for corrective action and the implementation of required corrective action.
- Suppliers Quality System shall provide a means for:
  - Detection of non-conformances
  - Containment of suspect product
  - Thorough root cause investigation
  - Prompt and effective corrective action
  - Accurate supporting documentation

 <b>VANGUARD</b> EMS™ <i>Leading Edge Electronics Manufacturing</i>	<h2>Supplier Quality Requirements</h2>
<b>Type: Reference Table</b>	
<b>Document # 12769-015</b>	<b>Page 5 of 7</b>

### Supply Chain Code of Conduct

- Vanguard EMS, Inc. is committed to ensuring the long term sustainability of its supply chain. Suppliers shall execute their business in accordance with the Responsible Business Alliance (formerly Electronics Industry Citizenship Coalition) Code of Conduct, including standards supporting Labor, Health and Safety, Ethics and the Environment. Suppliers must conduct business in full compliance with the laws, rules and regulations of the countries in which it operates.
- Responsible Business Alliance Code of Conduct:  
<https://www.responsiblebusiness.org/code-of-conduct/>

### Traceability

- Vanguard assures Traceability by connecting the Supplier Lot Number or Date Code to Vanguard's internal numbering system. This Lot and/or Date Code are indicated on the Packing Slip. Additional traceability requirements may be required and will be specified on Vanguard's PO.

## 5.0 Build-to-Print Suppliers

### First Article Inspections

- A First Article Inspection Report (FAIR) is required for all first time builds with Supplier and for any Rev Changes that affect fit, form or function. Effect on fit, form or function is determined by Vanguard Engineering. Delta FAIRs may be acceptable. Specific FAIR requirements will be called out on Vanguards PO or Supplemental Information including the need for AS9102 level FAIR.


## 6.0 Defense/Aerospace Requirements

### Supplier Employee Awareness

- External provider employees to be aware of:
  - their contribution to product or service conformity;
  - their contribution to product safety;
  - the importance of ethical behavior.

### Texting While Driving

- Vanguard, in compliance with FARs 52.223-18, flows down the following:
  - (c) The Contractor is encouraged to-
    - (1) Adopt and enforce policies that ban text messaging while driving-
      - (i) Company-owned or rented vehicles or Government-owned vehicles; or
      - (ii) Privately-owned vehicles when on official Government business or when performing any work for or on behalf of the Government.
    - (2) Conduct initiatives in a manner commensurate with the size of the business, such as-
      - (i) Establishment of new rules and programs or reevaluation of existing programs to prohibit text messaging while driving; and
      - (ii) Education, awareness, and other outreach to employees about the safety risks associated with texting while driving.

	<h2>Supplier Quality Requirements</h2>
<b>Type: Reference Table</b>	
<b>Document # 12769-015</b>	<b>Page 6 of 7</b>

(d) Subcontracts. The Contractor shall insert the substance of this clause, including this paragraph (d), in all subcontracts that exceed the micro-purchase threshold, as defined in Federal Acquisition Regulation 2.101 on the date of subcontract award.

**NOTE:** Additional terminology regarding “texting” is found within the FAR 52.223-18 text.

## 7.0 Printed Circuit Board Suppliers

### IPC Class 2 and 3 PCB's


- For inspection purposes, Vanguard requires several specific materials be provided with each lot:
  - Microsection Coupon (Mounted Coupon) with 3 objectives per IPC
    - Verified by Vanguard during our inspection process
  - Microsection Report
    - This will be used to complete the Internally Observable Characteristics Report
  - Board Finish Report (also known as a Thickness Report)
    - Verified by Vanguard during our inspection process
  - Electrical Test Report – Isolation and Connectivity
    - Verified by Vanguard during our inspection process
- Other Test Reports such as Dielectric Withstand (Hi-Pot), Impedance (TDR), Solderability and Ionic Cleanliness are required when specified on the PCB Drawing.

### PCB and Array Designs

- Vanguard may determine panel/array design using internally generated array drawings. If a Vanguard Array Dimensional Drawing is provided, create the manufacturing array following the dimensional drawing requirements. Any conflicts or questions shall be escalated via EQ/TQ process.
  - Typical naming convention:
    - ZZ12345-006 VG Array Dimensional Drawing.pdf
- PCB design is determined by our customer's design files (Gerber, ODB++, Drawings, etc.).
  - Customer naming convention varies

### Packaging Requirements

- All panelized PCBs and PCBs with rails shall have a 0.062” radius on the corners of the breakaways (rails) to prevent ripping the moisture barrier bag (commonly referred to as a MBB)
- All PCBs without rails shall have padding on the corners to prevent ripping the moisture barrier bag
- All PCBs or arrays will be packaged with desiccant and a humidity indicator card inside a sealed moisture barrier bag with the PCBs
  - The amount of desiccant shall be calculated for a 12 month shelf life based on section 3.3.2.2 of IPC/JEDEC J-STD-033
  - When the desiccant capacity at 10% RH and 25°C is known the following equation should be used.
    - **U = (0.304\*M\* WVTR \* A)/D**

 <b>VANGUARD</b> EMS™ <i>Leading Edge Electronics Manufacturing</i>	<h2>Supplier Quality Requirements</h2>
<b>Type: Reference Table</b>	
<b>Document # 12769-015</b>	<b>Page 7 of 7</b>

- U = Amount of desiccant in UNITS
- M = Shelf life desired in months
- WVTR = Water vapor transmission rate in grams/m<sup>2</sup> (grams/100 in<sup>2</sup> ) in 24 hrs
- A = Total exposed surface area of the MBB in square meters (square inches)
- D = The amount of water in grams, that a UNIT of desiccant will absorb at 10% RH and 25°C
  - When the desiccant capacity at 10% RH and 25°C is not known the quantity needed can be estimated using the following simplified equation.
    - $U = 5 \times 10^{-3} A$
- Limit packaging of PCBs to stack of 1" (2.54cm) per moisture barrier bag
- Barrier sheets shall be interleaved between PCB's whenever multiple boards are stacked on top of one another and placed in packaging. Reference IPC-1601, section 4.3.1.5.
- PCB's with Immersion Silver finish should be interleaved with sulfur absorbing paper. Reference IPC-1601, section 4.3.1.2.

### **Panelization Array Drawing Approvals**

- All PCB Vendors must submit a final set of Gerbers and a Dimensional Drawing of the array for approval prior to starting fabrication on initial orders or revised PCB's.
  - Additional Vanguard approval of the Dimensional Drawing of the PCB array is not required if directly supplied by Vanguard-EMS.

### **Solder Samples**

- In order to complete a variety of machine and process set-ups, Vanguard requires Solder Samples.
- Solder Samples are ideally boards that are not guaranteed or production ready as they will be used for set-up processes only and are typically damaged in the process.
  - Boards that have been Couponed cannot be used as their damage is too significant for our purposes.
- Two PCB or PCB panel samples are required for a first time order and any time the PCB is revved.
  - A PCB is a single board.
  - A PCB Panel is a set of boards on a single panel
    - The PCB Panel must be complete, it cannot be a partial panel
- Samples must be intact with Final Finish