Quality Assurance
Supplier Reference Guide

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1.0 INTRODUCTION

The purpose of this manual is to communicate the requirements for products purchased by SV Microwave from suppliers. It is the desire of SV Microwave to minimize or eliminate rejected or reworked parts so that SV Microwave may meet their own delivery schedules and so that the suppliers may also eliminate costly rework in their own facilities.

1.1 Additional Purchase Order requirements are flowed down from SV to our Supplier via General Terms and Conditions and Quality Notes (QNotes). These will be itemized at the end of every PO. The specific requirements are located on our Website at www.svmicro.com

1.1.1 Contact your buyer if you have questions on any of these since they are part of the contract to you and non-conforming parts could result in product being returned to you.

1.2 If at any time SV receives Non-conforming product from you we reserve the option to:

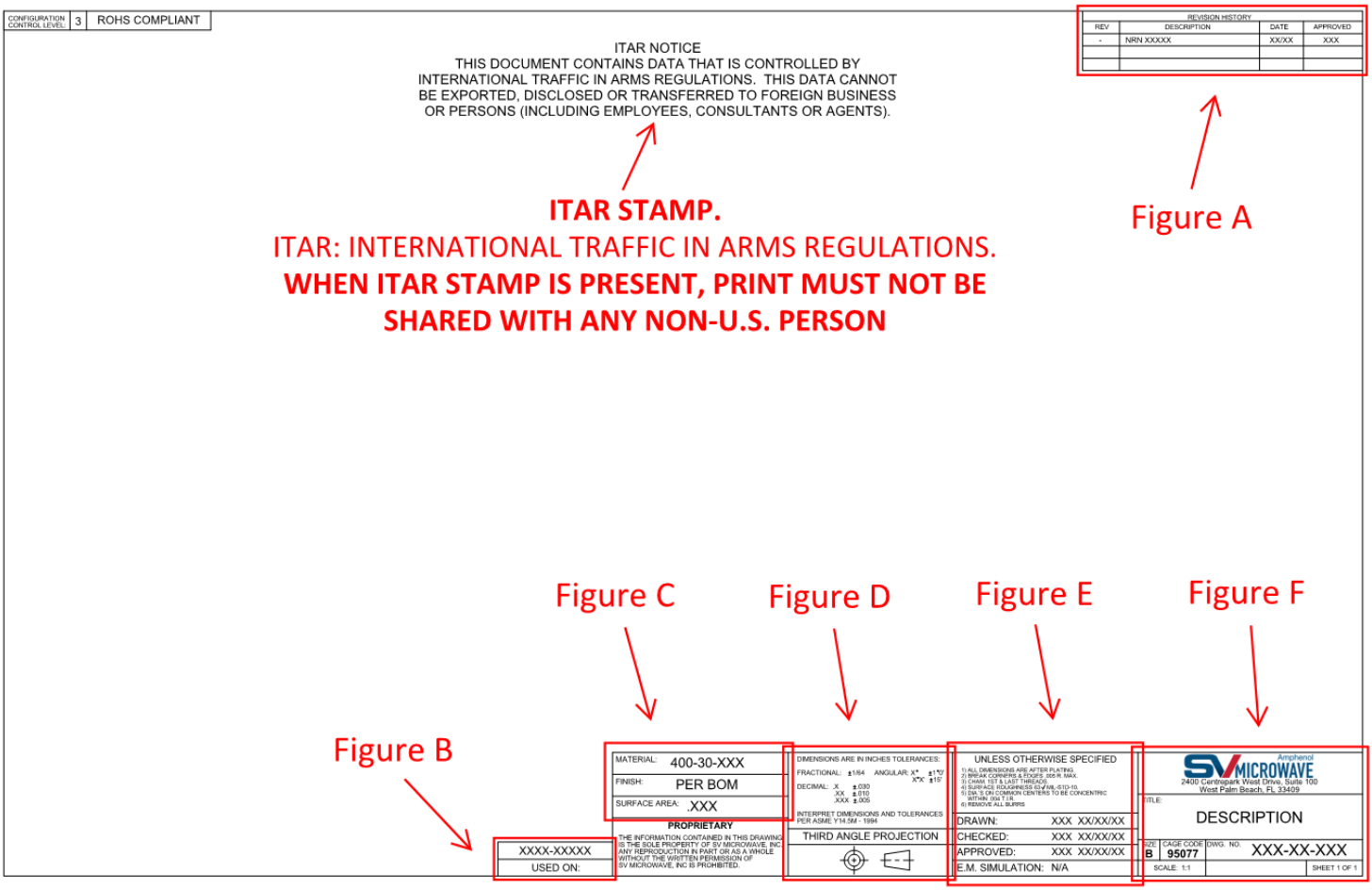
1.2.1 Return the parts to the supplier for correction or require that the parts be remade at no cost to SV.
1.2.2 Return the parts to the supplier without payment, and cancel the contract.
1.2.3 Rework the parts within the factory and deduct labor plus overhead costs from the supplier's billing. Parts to be reworked at SV will be discussed in detail with the supplier prior to starting the rework.
1.2.4 SV can reject and return part to the supplier at any time during the SV assembly process (line rejects).

1.3 All drawings sent to SV Suppliers are considered to be Proprietary and may be controlled by ITAR or SV Customer.

1.3.1 In order to ensure that you are always working to the correct revision and that there is no inadvertent dissemination of our drawing to outside interests, we require that all hard copies be discarded.

1.3.1.1 SV Purchasing Dept. is required to send new drawings for review with every Quote/Purchase Order. If you do not get a new copy you need to contact your Buyer. DO NOT use old versions or revisions.

2.0 SV DRAWING FORMAT INTERPRETATION



SV Microwave Standard Drawing Format

DESCRIPTION:
1. "NRN": NEW RELEASE NOTICE (REVISION "-")
2. "DCN": DRAWING CHANGE NOTICE (REVISION "A" AND ABOVE)
3. "XXXXX": SEQUENTIAL DCN OR NRN NUMBER

INITIALS OF APPROVING ENGINEER

DRAWING REVISION:
1. INITIAL RELEASE DENOTED BY A DASH: "-"
2. SUBSEQUENT REVISIONS: "A", "B", "C", ETC.

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED
-	NRN XXXXX	XX/XX	XXX

EFECTIVE DATE OF REVISION

Figure A

NEXT HIGHER ASSEMBLY
WHERE THIS PART IS USED

XXXX-XXXXX
USED ON:

Figure B

MATERIAL OF PART.
THIS BLOCK REFERS TO SV MICROWAVE SPEC. # "400-30-XXX," WHERE "XXX" IS THE UNIQUE 3-DIGIT NUMBER OF THE MATERIAL IN QUESTION

PLATING FINISH OF PART.
PART PLATING FINISH IS USUALLY LISTED ON THE FINAL ASSEMBLY DRAWING, BUT IS SOMETIMES LISTED ON THE PART DRAWING. IF FINISH BLOCK READS "PER BOM" OR "SEE P/L," THEN PART SUPPLIER IS NOT RESPONSIBLE FOR PLATING FINISH, UNLESS OTHERWISE INSTRUCTED BY SV MICROWAVE.
IF PLATING IS REQUIRED, THEN SUPPLIER WILL BE GIVEN AN SV MICROWAVE PLATING SPEC. # "400-01-XXX," WHERE "XXX" IS THE UNIQUE 3-DIGIT NUMBER OF THE PLATING SPEC. IN QUESTION

MATERIAL:	400-30-XXX
FINISH:	PER BOM
SURFACE AREA:	.XXX

TOTAL SURFACE AREA OF PART IN SQUARE INCHES

Figure C

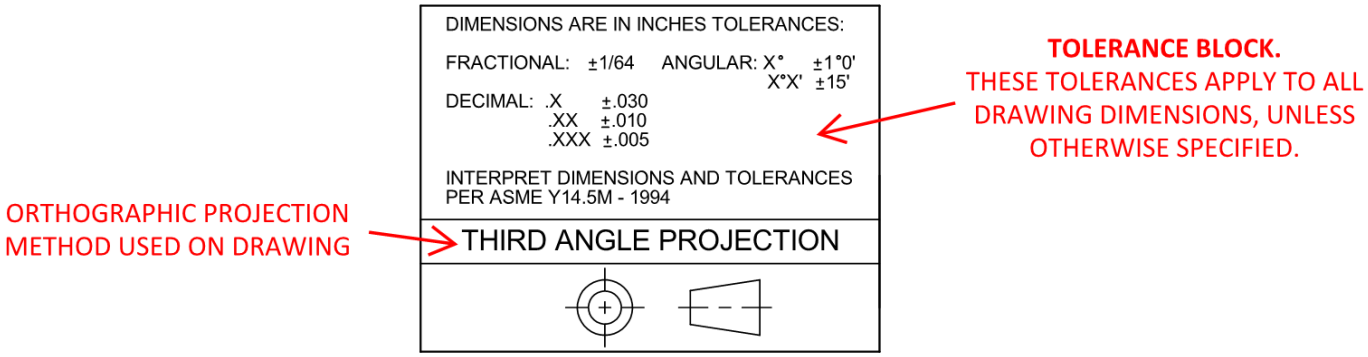


Figure D

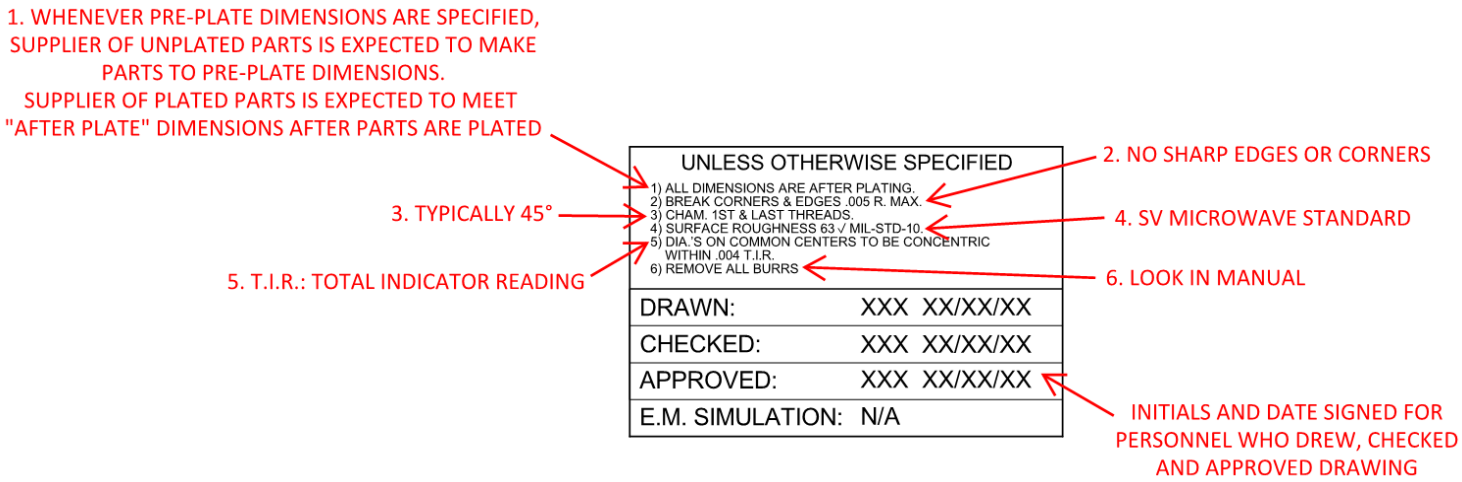


Figure E

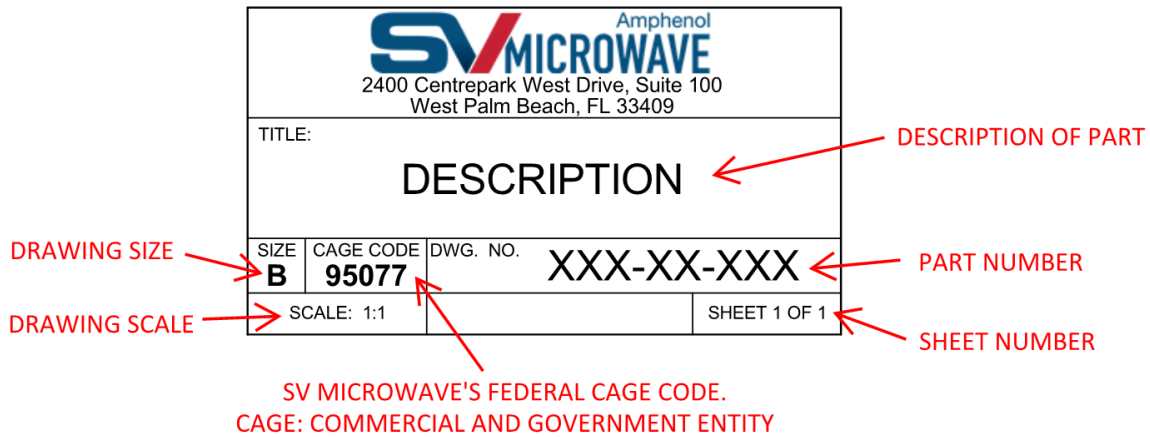


Figure F

3.0 INSPECTION CRITERIA

SV Microwave uses the following criteria as a guideline for visual and mechanical inspection:

- When visually inspecting the product, an illuminated microscope with at least 7X magnification is used. SV reserves the right to increase magnification to verify a suspect condition.

- The sample size for inspection is in accordance with ANSI/ASQC Z1.4-1993, Level II, (a=0), unless otherwise specified by a Customer or drawing requirement. All inspections are performed on parts randomly selected from the lot.

- In the event a conflict arises between this document and the drawing, the drawing shall prevail. Parts are inspected for all drawing dimensions and "Notes", if applicable, during the inspection.

- All parts must be clean and free of all contaminants including any oils, dirt and debris left from the machining operations.

- SV reserves the right to perform any testing to ensure product received meets all necessary requirements.

4.0 MEASUREMENT TECHNIQUES

The following recommended shop practices should be used for reference and as a guideline for using standard measuring tools and techniques for inspecting SV product:

External Measurement

- Use vernier tools (calipers) for tolerances of .005 or greater.
- Use one inch micrometer for tolerances of .0005 to .005.
- Use a bench micrometer or dial snap gauge for tolerances of .0003 to .0005.
- Use electronic calipers, comparators and gauge heads for tolerances of . 0005 to .0001.

Internal Measurements

- Use plus gauge pins for tolerances of .0005 or greater.
- Use a dial bore gauge for tolerance of .0003 to .0005.

Measurements for counter bore depths

- Use a height gauge with .001 graduations for tolerances of .005 or greater.
- Use a height gauge with .0001 graduations for tolerances of .0003 to .005.
- Use an electronic gauge with height check for tolerances of .0003 or less.

5.0 BURRS, ROLL-OVERS AND SHARP EDGES- PIECE PARTS

Visually examine parts with an illuminated microscope using a minimum 7X magnification for burrs, roll-overs or sharp edges that may cause interference, an out-of-tolerance condition, arcing, corrosion or a malfunction during operation. Burrs that are firmly attached should not exceed .002 in size and may not exceed dimensional tolerances. Firmly attached burrs are those that cannot be detached by picking, brushing or scraping.

Examples of burr-induced defects:

- interference between mating parts
- the potential of being broken off, exposing the base surface and leading to deterioration of the base material
- causing parts to seize, gall or function in an erratic manner
- electrical and/or mechanical failures
- corrosion caused by trapped plating solutions
- interference with the plating process that may cause “shadows” or voids in the plating

6.0 CHIPS AND OIL

All parts must be clean and free of all oil and chips.

Special Note: No ozone-depleting chemical shall be used to clean parts.

7.0 SURFACE FINISH

SV inspects surface finish using visual surface finish standards. The following are descriptions of surface finishes used at SV:

- The 125 surface finish is a coarse production surface for interior clearance and clean-up operations. This finish is produced by turning, milling, drilling, boring, etc., and is permitted wherever definite tool marks are not objectionable. This finish is used on interior surfaces where a better finish is not needed, such as in areas that are designed to accept insulators.

- The 63 surface finish, an industry standard, is a medium, commercial finish, which is produced by using relatively high speeds and fine feeds. This is the minimum required finish for all non-critical, exterior surfaces produced by lathes, milling machines and controlled drilling and counter-bore operations. Tool marks in excess of this surface finish requirement are causes for rejection. This surface finish is generally used on all other diameters, thread reliefs and mating lead diameters. Also, this surface finish is used on inner diameters visible on finished connectors, cable crimps, IDs and flats on clamp nuts. This finish also is used on shoulders and cut off areas, exposed shoulders and flats on center conductors.

- The 32 surface finish is a good machine finish produced by the use of high-speed cutting operations combined with fine feeds and well sharpened cutting tools. This finish is produced (except when otherwise specified) on mating parts and on surfaces where close fits are required. This type of finish is used on "O" ring grooves, mating counter-bores, contact areas of outer conductors, center contacts, mating areas and screw threads.

- The 16 surface finish is a fine machine finish produced by the use of high speed cutting operations combined with fine feeds, well sharpened cutting tools and buffing. This finish is typically produced (except when otherwise specified) on mating parts and on surfaces where another moving metal surface will interface. This type of finish is used on contact areas of outer conductors for switch connectors.

- Tool marks are irregularities in the surface finish whose height (or depth) and width are in excess of the adjacent surface allowable limits. Tool marks are always objectionable and, in most cases, are unacceptable. Tool marks may be accepted at the discretion of the SV Material Review Board (MRB).

- In cases where the surface finish cannot be confirmed via visual standards, SV reserves the right to verify and reject based on testing via Profilometer.

8.0 SCREW THREADS

SV inspects screw threads using the following criteria:

- Inspection of screw threads is performed by using "before plate Go" and "after-plate No-go" thread plug and thread ring gauges.

- The "before plate Go" and "after-plate No-go" thread plug gauges check the limits of the size of the major and pitch diameters of the product's internal threads. The "before plate Go" plug gauge must completely enter the product's internal thread to assure that the major and pitch diameters do not exceed the maximum material limit. The "after plate No-go" thread plug gauge must not enter the product's internal thread by more than 2-1/2 turns, to provide adequate assurance that the major and pitch diameters do not exceed the minimum material limit.

- The "before plate Go" and "after plate No-go" thread ring gauges are used to check all thread elements except the major diameter of the product's external threads. The "before plate Go" gauge must completely receive or pass over the product's external thread to assure that the minor and pitch diameters do not exceed the maximum material limit. The "after plate No-go" gauge must not pass over the major diameter of the product's external thread by more than 2-1/2 turns to assure that the minor and pitch diameters are not less than the minimum material limit.

- The threads should be smooth and free of surface defects. Examples of surface defects are nicks, burrs, chatter marks and finish not meeting the surface finish requirement on the drawing.

- All threads are manufactured and inspected in accordance with FED-STD-H28.

9.0 BRAZING

SV inspects brazing using the following criteria:

- All silver alloy, brazed joints are inspected to SV Microwave drawing and MIL-B-7883.

  NOTE: MIL-B-7883 has been cancelled and currently has no replacement as of this date, it can still be referenced per DLA.

- All nickel alloy, brazed joints are inspected to SV Microwave drawing and the current revision of AMS-2675.

- All stainless steel component piece parts will have been passivated per the specifications of SV Microwave drawing 400-01-020 prior to brazing.

- Visually inspect sample for evidence of a braze fillet at 7X minimum magnification. If any parts do not exhibit a fillet the entire lot will be rejected. A fillet is defined as "A radius (curvature) that joins two surfaces essentially at right angles to each other".

- Torque test samples and data must accompany all shipments. See the appropriate piece part drawing(s) for the minimum torque requirements.

10.0 PLATING ALLOWANCE ON THREADS

When a Brass or BeCu part is purchased by SV, the pitch diameters for the BEFORE PLATE "Go" gauges in accordance with the following chart are required on parts manufactured for SV. A standard "Nogo" gauge is in accordance with FED-STD-H28 for both before and after plate conditions. Contact the SV buyer for any not on this list.

"GO" BEFORE PLATE PLUG GAUGES		"GO" BEFORE PLATE RING GAUGES	
THREAD SIZE	PITCH DIA.	THREAD SIZE	PITCH DIA.
0-80 UNF-2B	.0529"	0-80 UNF-2A	.0504"
1-72 UNF-2B	.0652"	1-72 UNF-2A	.0622"
2-56 UNC-2B	.0756"	2-56 UNC-2A	.0728"
3-56 UNF-2B	.0884"	4-40 UNF-2B	.0940"
4-40 UNC-2B	.0970"	6-32 UNC-2A	.1159"
6-32 UNF-2B	.1187"	6-40 UNF-2A	.1200"
6-40 UNF-2B	.1228"	8-36 UNF-2A	.1440"
8-32 UNC-2B	.1447"	10-32 UNF-2A	.1676"
8-36 UNF-2B	.1472"	10-36 UNS-2A	.1700"
10-32 UNF-2B	.1709"	10-48 UNS-2A	.1746"
10-36 UNF-2B	.1732"	12-32 UNEF-2A	.1936"
10-48 UNS-2B	.1777"	12-40 UNS-2A	.1978"
12-40 UNS-2B	.2010"	¼-28 UNF-2A	.2246"
¼-28 UNF-2B	.2282"	¼-32 UNEF-2A	.2275"
¼-32 UNEF-2B	.2309"	¼-36 UNS-2A	.2301"
¼-36 UNS-2B	.2330"	9/32-40 UNS-2A	.2629"
9/32-40 UNS-2B	.2662"	5/16-32 UNEF-2A	.2900"
5/16-32 UNEF-2B	.2934"	3/8-32 UNEF-2A	.3525"
3/8-24 UNF-2B	.3490"	3/8-40 UNS-2A	.3567"
3/8-32 UNEF-2B	.3559	7/16-28 UNEF-2A	.4120"
3/8-40 UNS-2B	.3598"	15/32-32 UNS-2A	.4474"
7/16-28 UNEF-2B	.4155"	½-28 UNEF-2A	.4745"
7/16-32 UN-2B	.4182"	½-32 UNEF-2A	.4777"
½-20 UNF-2B	.4687"	½-40 UNS-2A	.4816"
½-28 UNEF-2B	.4780"	9/16-24 UNEF-2A	.5330"
½-32 UN-2B	.4810"	9/16-32 UNS-2A	.5400"
½-40 UNS-2B	.4850"	5/8-24 UNEF-2A	.5955"
9/16-24 UNEF-2B	.5366"	11/16-24 UNEF-2A	.6580"
9/16-28 UN-2B	.5405"	¾-20 UNEF-2A	.7150"
9/16-32 UN-2B	.5432		
5/8-24 UNEF-2B	.5991"		
11/16-24 UNEF-2B	.6616"		
¾-20 UNEF-2B	.7189"		

11.0 PLATING INSPECTION

A random sample will be pulled from the lot and examined for the following:

- Correct plating type.
- Plating omitted.
- Plating coverage that meets all requirements of SV plating specification (400-01-XXX).
- Critical dimensions after plating. Example: contact ODs and body IDs.
- Threaded areas are checked with an after plate "Go" and "Nogo" gauge.

Visual examination at 10X magnification:

- Evidence of chipping, peeling, nodules, pits or blistered plating.
- Evidence of scratches, nicks, or gouges on any part where the base metal has been exposed.
- A complete removal of plating salts.
- The color shade of the plating is as specified in the contract, as well as the type of finish (mat or polish). No evidence of discoloration or contamination.
- Parts are inspected for any evidence of bleeding. This is where trapped plating solutions bleed through the outside plating layer.
- There is no evidence of corrosion on the plated parts.
- Evidence of tarnish that detracts from the appearance of the finished part.

The plater is responsible for all quality assurance provisions and inspections specified in the military documents. SV Microwave has the option to perform all or some of the tests in the plating military specification.

Adhesion Test

- A minimum of one sample is subjected to a crush test for adhesion. The bend test is used on some contacts, but the crush test is used on all other products to break the base metal. The sample is crushed in a hand vise or suitable type of equipment, only until the base metal fractures.

- The adhesion of the plating and all underplatings is examined at a magnification not to exceed 10X. Neither the plating, nor any underplating, may show blistering, peeling, lifting or flaking. Cracks in the base metal, or any plating, are not considered failures unless accompanied by flaking, peeling, or blistering. When crushing the connector contacts, the solder pot of the contact under test is crushed just enough to fail the base metal. A sharp, pointed tool is used to determine if any area of plating can be separated from the base metal.

Bake Test- when required on contact drawing

- A Level II, 1.0 AQL sample (per ANSI/AsQC Z1.4) will be pulled and subjected to a bake test per MIL-DTL-45204.

- The sample will be placed in an oven at 145°C to 155ºC, (295ºF to 311ºF), for one hour minimum.

- After removal and cooling, the surface of the sample will be examined at 10X for any evidence of flaking, peeling, blistering, or discoloration.

Plating Thickness

- The five-piece sample is measured for plating thickness via a non-destructive method unless otherwise specified by the customer. The data is supplied with the C of C from the plating facility. When the parts are received, SV Microwave's plating inspection verifies these readings on a sample lot basis.

- Hi-Rel customers require cross-sections be performed for plating thickness of the underplate and surface plating. A two-piece sample is used for cross-section, unless otherwise specified SV Purchase Order.

Hardness Test Per MIL-DTL-45204

- The plater is responsible for checking the hardness of the gold plating per paragraph 3.6.3 and 4.5.3 of MIL-DTL-45204. Certificates of Compliance are required.

Salt Spray

- The Salt Spray test is the responsibility of the outside plating facility.

Adhesion on Zone Plated Parts

- On all zone plated glass seals, a crush test is performed on the internal pin and body. Nickel plating on the glass seal body is inspected for adhesion.

Form-over Parts

- Prior to acceptance at Incoming Inspection, parts requiring a form-over in the assembly process must have one piece sent to production in order to test the plating integrity at the form-over location.

Glass Seal Parts

- All glass seal assemblies must have plating thickness documentation supplied and verified if plating is required on the pins. The glass seal assemblies will be tested for thermal shock capability, leakage, insulation resistance and dielectric withstanding voltage.

12.0 PACKAGING AND HANDLING

The following appears on all purchase orders:

“PACKAGE TO ENSURE MO DAMAGE OCCURS DURING SHIPMENT”

All parts will be properly handled and packaged to prevent dings, dents, damage, gouges, scratches, etc. See figures XX – XX for examples of improper packaging and handling damage.

13.0 SUPPLIER CORRECTIVE ACTION

Suppliers, who consistently perform at an unsatisfactory level, will be reviewed quarterly during the Key Supplier meetings and actions taken accordingly.

Whenever defective product is found during Incoming Inspection, the magnitude of the problem is appraised against established product or process capability history. From this appraisal, if a corrective action on product or process is required, a Corrective Action Request (CAR) is generated and sent to the supplier.

The supplier is required to determine the root cause of the discrepancy, method to contain any current product that may have the discrepancy and method to correct existing condition (corrective action) and actions taken instituted to prevent discrepancy from occurring on any future shipments.

The supplier is required to reply by the documented due date, so as not to affect their vendor status with SV Microwave. The Quality Manager may allow a reasonable extension if warranted.