

## ***General Guidelines For Factories Conducting Electronic Assembly***



The following sections detail some of the basic requirements for a production area to be used for a surface mount production line. Each section provides basic guidelines for production areas, they should be read in conjunction with equipment specifications and associated health and safety requirements.

If suitable controls are not to be used in the operating environment then the equipment and materials performance should be verified under the prevailing conditions.

### **Flooring:**

The flooring used in any area connected with the production of modern electronic equipment should not allow static charges to be produced. The materials should be selected to be compatible with materials and chemicals used in the production process. The flooring should not be affected if spillage occurs.

To prevent static generation when walking on flooring the surface of the floor should be maintained with a surface resistivity  $>10^5$  and  $<10^{14}$  ohms per square. The material used for flooring may be treated to provide these levels of resistivity or using appropriate bulk resistance material. Regular checks should be performed on the flooring surface.

If the floor is to be used for grounding personnel in manufacture then the surface resistivity should be between  $10^5$  and  $>10^9$  ohms per square. If the floor is to be used for grounding operators will require a means of direct grounding through shoe straps or the use of conductive footwear. The resistance for this connection should be 1-5 Meg ohms; monitoring should also be undertaken to check effectiveness.

If the flooring is to be used as a method of operator grounding then consideration needs to be given to earth leakage protection where mains equipment is to be used in the area.

The flooring coating material should be easily cleaned with mild cleaning agents and should not generate dust particles.

### **Environment:**

An enclosed manufacturing area, if it is not to be air conditioned, should be controlled at a positive pressure to maintain cleanliness levels. Where air conditioning is employed excessive air flow around printing equipment, cleaning stations and reflow systems is to be avoided.

Excessive air flow can lead to solder paste drying out on the stencil, solvent being dragged out of cleaning equipment and changes in reflow profiles.

Due to the consumable materials used in the electronics industry and the general reduction in size with the requirement for higher levels of cleanliness smoking should not be permitted.

Appropriate extraction needs to be provided for equipment conducting soldering operations reference should be made to the equipment manufacturers documentation. Consideration should be given to the need for soldering iron fume extraction

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### **Temperature/Humidity:**

The temperature should be maintained in the production area between 18oC and 25oC with no more than a 3oC change per hour. The relative humidity should not exceed 65% RH, levels below 30% RH can lead to increased levels of static generation and are to be avoided. Relative humidity above 65% RH can lead to corrosion of some metallic surfaces. The relative humidity should be maintained at the desired setting with a maximum tolerance of 10% swing.

Although equipment can generally operate in the conditions outlined the tighter the controls the greater the accuracy of component placement. Close control of the operating environment provides for less fluctuation in operating characteristics of the solder paste and adhesive. This is the case during equipment operation and during any hold period between processing. It is probably more cost effective to obtain temperature and humidity control in the machine enclosure if required than in the whole factory space.

### **Power Requirements:**

The individual power requirements will vary from equipment to equipment and needs to be considered in detail. Although it is not possible to specify a standard it is important to control any fluctuation of power inputs to equipment. The most important consideration is changes of voltage during operation due to electrical noise. This can affect the operation of computer equipment and may lead to data loss.

### **Compressed Air:**

Compressed air is used on a number of installations in a factory, it must be provided in a dry and oil free state. As most factory air lines cannot be guaranteed, suitable water traps and desiccated units should be employed. A range of pressures are required for equipment and they should be controlled with suitable valves adjacent to the equipment. Any variation in the supply lines may affect equipment operation.

### **Ambient Lighting:**

As with any manufacturing area the level of lighting must be suitable for its intended purpose. The lighting levels should be maintained at a consistent level throughout the manufacturing area. Due to the use of optical systems in many placement machines, direct sun light or fluctuations during machine operation are to be avoided.

A level of 100 foot candles (1077 Lm/m<sup>2</sup>) illumination is recommended for operator working surfaces and where inspection is to be conducted.

Bob Willis is a process engineer providing engineering support in conventional and surface mount assembly processes. He runs production lines for suppliers at exhibitions and also provides seminar and workshops world wide. Bob has one of the largest collection of training videos, interactive CD-ROMs and training material in the industry. Bob will be presenting four Master Classes at APEX in California, he will also be presenting classes at SMT Nuremberg in Germany for those engineers visiting the show. For further information on how Bob may be able to support your staff contact him via his web site [www.bobwillis.co.uk](http://www.bobwillis.co.uk)

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