

	Relevant ANSI/ESD S20.20, EIA-625, or industry standard requirement
ESD Protected Area Clearly Identified using signs & aisle tape.	ANSI/ESD S20.20 Paragraph 6.2.3.1. Protected Areas Requirement "Caution signs indicating the existence of the Protected Area shall be posted and clearly visible to personnel prior to entry to the Protected Area."
ESD Susceptible Items Clearly Identified and handled only in an ESD Protected Area.	ANSI/ESD S20.20 Paragraph 6.2.5.1. ESDS Assemblies and Equipment "ESDS assemblies and equipment containing ESDS parts and assemblies should be marked with an ESD caution symbol located on equipment in a position readily visible to personnel. In addition, the symbol should be located in a position readily visible when an ESDS assembly is incorporated into its next higher assembly." [Note: Per EOS/ESD S8. paragraph 3.1 ESD Susceptibility Symbol Application states 1 "The ESD susceptibility symbol should be used on assemblies and devices that have a sensitivity to ESD events." And, "The symbol may be incorporated on a sticker used to close or seal ESD protective packaging to indicate that materials inside the package are ESD susceptible."] ANSI/ESD S20.20 Paragraph 6.2.3.1. Protected Areas Requirement "Handling of ESDS parts, assemblies and equipment without ESD protective covering or packaging shall be performed in a Protected Area."
Access to ESD Protected Area controlled.	ANSI/ESD S20.20 Paragraph 6.2.3.1. Protected Areas Requirement "Access to the Protected Area shall be limited to personnel who have completed appropriate ESD training. Trained personnel shall escort untrained individuals while in a Protected Area."
Continuous Monitors used or daily Touch Testing flexing wrist strap resistor area. Results logged.	ANSI/ESD S20.20 Paragraph 6.2.2.2 Personnel Grounding Guidance "A log should be maintained which verifies that personnel have tested their personal grounding devices. Personnel should check constant monitoring devices (when used) to ensure that they are functional and operating before ESDS products are handled. In addition, constant monitoring devices should be functionally checked periodically to ensure that they are operating as designed." Per ESD-S1.1 paragraph 6.1.3 Frequency of Functional Testing "The wrist strap system should be tested daily to ensure proper electrical value. Nominally, the upper resistance reading should be <10 Megohms or a user defined value. Daily testing may be omitted if constant monitoring is used."
ESD Protected Area Worksurfaces 10 ⁶ – 10 ⁸ ohm RTG and less than 200 volts. ESD Mat Cleaner used.	EIA-625 Table 1, Item 1, ESD Protective Work Surface "Where unprotected ESDS devices are handled, a grounded static dissipative work surface shall be used unless the manufacturing process necessitates a grounded conductive/highly conductive work surface." Per EIA-625 Table 2, "equal or greater than 10 ⁵ to less than 10 ¹⁰ ohms RTG." ANSI/ESD S20.20 Table 1 Technical Requirements "less than 1 X 10 ⁹ ohms measured per ESD S 4.1" [however, specifies no lower limit], and "less than 200 volts measured per ESD STM4.2." Per ESD S4.1 paragraph 8. Resistance Guidelines "Resistance-to-groundable point 1 x 10 ⁶ to 1 x 10 ⁹ ohms. Resistance from point-to-point greater than 1 megohm. These guidelines represent a range of resistance that has generally been proven to provide protection in the manufacturing environment." Conductive materials conduct electricity too rapidly and a discharge may occur. Dissipative materials will drain the charges off an ESDS device at a slow enough rate to minimize the occurrence of discharges. Dirt & cleaners containing silicone are insulative and a dissipative ESD worksurface cannot fulfil its function if covered by insulative material
ESD Protected Area Clear of Insulators such as regular bags, document holders, & tape.	ANSI/ESD S20.20 Paragraph 6.2.3.1. Protected Areas Requirement "All nonessential insulators, such as those made of plastics and paper (e.g. coffee cups, food wrappers and personal items) must be removed from the workstation. Ionization or other charge mitigating techniques shall be used at the workstation to neutralize electrostatic fields on all process essential insulators if the electrostatic field is considered a threat."

<p>Work instructions in static dissipative <u>Document Holders.</u></p>	<p>Per S20.20 Fundamental Principle “All conductors in the environment, including personnel, must be bonded or electrically connected and attached to a known ground” Insulative paper, placed upon ESD protected worksurface, can easily interrupt path-to-ground.</p>
<p>Process essential insulators neutralized with <u>Ionizers</u> or kept 12” from ESDS.</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.3.1. Protected Areas Requirement “Ionization or other charge mitigating techniques shall be used at the workstation to neutralize electrostatic fields on all process essential insulators if the electrostatic field is considered a threat.” ANSI/ESD S20.20 Paragraph 6.2.3.2. Protected Areas Guidance “All process essential insulators that have electrostatic fields that exceed 2,000 volts should be kept at a minimum distance of 12 inches from ESDS items.”</p>
<p>ESD Protective Smocks used to cover worker’s synthetic clothing or kept 12” from ESDS. RTT 10⁵ to 10¹⁰ ohms. Smock should be grounded via cord or ESD footwear/floor.</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.3.2. Protected Areas Guidance “All process essential insulators that have electrostatic fields that exceed 2,000 volts should be kept at a minimum distance of 12 inches from ESDS items.” Although ESD Smocks are not a S20.20 requirement, it’s a very effective means to comply with paragraph 6.2.3.2’s recommendation. Garment standard ESD-STM2.1-1997 paragraph 7. “Recommended Electrical Resistance Range, The recommended electrical resistance range is 1 x 10⁵ ohms to 1 x 10¹¹ ohms.” Additionally, ANSI/ESD S20.20 Paragraph 6.2.1.1. Grounding / Bonding Systems Requirements, “Grounding shall be used to ensure that ESDS items, personnel and any other conductors (e.g. mobile equipment) are at the same electrical potential.” Smocks are a conductor and therefore, must be grounded. This is best assured when they are designed to make intimate contact with the skin of a grounded operator.</p>
<p>Hand Tools ESD compliant. Tip to ground less than 20 ohms</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.6.1. AC Powered Tools The working part of AC powered tools should be capable of providing a conductive path to ground. New powered hand tools such as soldering irons typically should have a tip to ground resistance of less than 1.0 ohm. Note - This resistance may increase with use but should be less than 20.0 ohms for verification purposes. ANSI/ESD S20.20 Paragraph 6.2.6.2. Battery Powered and Pneumatic Hand Tools Tools Battery powered and pneumatic hand tools while being held should have a resistance to ground of less than 1 X 10¹² ohms.</p>
<p>ESD bags or Packaging Grounded prior to opening. ESDS items opened or removed only at ESD workstation.</p>	<p>ESD Shielding Bag keeps charge on outside of Bag protecting ESDS contents. To open the Bag without first removing the charge grounded via wearing wrist strap or by placing on grounded ESD protected worksurface is poor practice. ANSI/ESD S20.20 Paragraph 6.2.3.1, Protected Areas Requirement, “Handling of ESDS parts, assemblies and equipment without ESD protective covering or packaging shall be performed in a Protected Area.”</p>
<p>Worksurface & Floor Mats Properly Grounded with firm connecting devices</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.1.1. Grounding / Bonding Systems Requirements, “Grounding shall be used to ensure that ESDS items, personnel and any other conductors (e.g. mobile equipment) are at the same electrical potential.” EIA 625 paragraph 7.6 ESD Ground Connections, “Firm fitting connecting devices such as metallic crimps, snaps and banana plugs shall be connected to designated ground points. Use of alligator clips is not recommended.”</p>
<p>Check Ground.</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.1.2. Grounding / Bonding Systems Guidance “In most cases, the third wire (green) AC equipment ground is the preferred choice for ground.” Wiring is easily checked using 41333 AC Outlet Analyzer.</p>
<p>Wrist Straps worn and grounded when seated.</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.2.1. Personnel Grounding Requirements, “All personnel shall be bonded or electrically connected to ground or contrived ground when handling ESD sensitive items. When personnel are seated at ESD protective workstations, they shall be connected to the common point ground via a wrist strap system.”</p>

<p>Floor ESD Protected & clean. Floor less than 10^9 ohms RTT and/or less than 100 volt charge generation..</p>	<p>Per ANSI/ESD S20.20 Table 1 Technical Requirements Protected Flooring “less than 1×10^9 ohms measured per ESD STM 97.1” or “less than 100 Volts measured per ESD STM 97.2.” ANSI/ESD S7.1 paragraph 5.3.1.6 “Perform a minimum of five tests per contiguous floor surface material or a minimum of five tests per 5,000 square feet (464.5 m2) of floor material, whichever is greater. A minimum of three of the five tests should be conducted in those areas that are subject to wear or that have chemical or water spillage or that are visibly dirty.” Dirt is typically insulative and a dissipative ESD protected floor cannot fulfil its function if covered by insulative material.</p>
<p>Foot Wear: Standing and/or mobile personnel should use two Foot Grounders in conjunction with ESD Protective Flooring. When used as primary ground for personnel, the resistance of operator, footwear, floor circuit should measure less than 35×10^6 ohms or charge generation should be less than 100 volts</p>	<p>ANSI/ESD S20.20 Foreword “All conductors in the environment, including personnel, must be bonded or electrically connected and attached to a known ground.” ANSI/ESD S20.20 Paragraph 6.2.2.1. Personnel Grounding Requirements “All personnel shall be bonded or electrically connected to ground or contrived ground when handling ESD sensitive items.” ANSI/ESD S20.20 Paragraph 6.2.2.2 Personnel Grounding Guidance, “ESD protective flooring, used with approved footwear, may be used as an alternative to the wrist strap system for standing operations.” ANSI/ESD S20.20 Paragraph 6.2.2.2 Personnel Grounding Guidance “A log should be maintained which verifies that personnel have tested their personal grounding devices. ANSI/ESD S20.20 Table 1 Flooring-Footwear Systems Technical Requirements “less than 35×10^6 ohms measured per ESD STM 97.1”, and “less than 100 volts measured per ESD STM 97.2.” EIA-625 Table 1 Minimum Requirements, Item 3 Personnel Grounding b) “ESD protective footwear that shall be worn on both feet and be limit current to less than 0.5 mA at the highest power supply voltage that may be encountered.”</p>
<p>Carts grounded. RTG less than 1×10^9 ohms.</p>	<p>ANSI/ESD S20.20 paragraph 6.2.1.1. Grounding / Bonding Systems Requirements, “Grounding/Bonding Systems shall be used to ensure that ESDS items, personnel and any other conductors (e.g. mobile equipment) are at the same electrical potential. As a minimum, ESDS items, personnel and other related conductors shall be bonded or electrically interconnected.” Per S20.20 Table 1 Technical Requirements, Mobile Equipment Recommended Range $< 1 \times 10^9$ ohms.</p>
<p>Shelves electrically connected RTG 10^6 to 10^8 ohms to be considered ESD Protective.</p>	<p>ANSI/ESD S20.20 Fundamental Principle “All conductors in the environment, including personnel, must be bonded or electrically connected and attached to a known ground”. .” ANSI/ESD S20.20 Table 1 Protected Area Technical Requirements, Shelving “less than 1×10^9 ohms measured per ESD STM 53.1”. ESD Protected Workstations ESD-ADV53.1 Electrical Requirements, “Workstation elements shall be connected to, and maintain electrical continuity to, the common point ground as follows: Surfaces of shelves and drawers intended to be used for unprotected ESD sensitive devices - Resistance: Between 1×10^6 ohms and 1×10^9 ohms.”</p>
<p>Use Shielding Bags outside ESD protected area.</p>	<p>ANSI/ESD S20.20 fundamental ESD control principle: “Transportation of ESDS items outside an Electrostatic Protected Area requires enclosure in static protective materials; low charging and static discharge shielding materials are recommended.” ANSI/ESD S20.20 Paragraph 6.2.4.2. Packaging Guidance, “If the user does not know the sensitivity of the items being used, static shielding packaging should be used. The objective of ESD protective packaging is to prevent a direct electrostatic discharge to the ESDS item contained within and allow for dissipation of charge from the exterior surface. In addition, the packaging should minimize charging of the ESDS item in response to an external electrostatic field and triboelectrification. Packaging materials may outgas, contaminate or shed particles that may cause production-related problems. It is important that the Organization evaluate ESDS protective packaging materials for process, storage and environmental compatibility.”</p>
<p>Are Re-Used Bags in good condition?</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.4.2. Packaging Guidance, “Users should be aware that some packaging materials may be humidity dependent and may have limited shelf life. They may also lose static shielding properties by crumpling, puncturing and folding.”</p>

<p>Labels used to Identify ESDS items</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.5.1. ESDS Assemblies and Equipment, “ESDS assemblies and equipment containing ESDS parts and assemblies should be marked with an ESD caution symbol located on equipment in a position readily visible to personnel. In addition, the symbol should be located in a position readily visible when an ESDS assembly is incorporated into its next higher assembly.” EOS/ESD S8. paragraph 3.1 ESD Susceptibility Symbol Application states 1 “The ESD susceptibility symbol should be used on assemblies and devices that have a sensitivity to ESD events.” And, “The symbol may be incorporated on a sticker used to close or seal ESD protective packaging to indicate that materials inside the package are ESD susceptible.”</p>
<p>ESD Packaging Properly Marked with ESD Protective symbol, manufacturer’s name and date code.</p>	<p>ANSI/ESD S20.20 Paragraph 6.2.5.2. Packaging, “ESD protective packaging should be marked in accordance with EOS/ESD S8.1 or MIL-STD-2073-1 for Military applications.” EOS/ESD S8.1 paragraph 4.1 Application, “The ESD protective symbol should be used to identify items that are specifically designed to provide ESD protection for ESDS assemblies and devices. Examples of these are packaging, ESD protective clothing and personnel grounding equipment. The ESD protective symbol should also be used on items designed to replace static generative materials. Examples of these items are ESD protective workstation equipment, trash can liners, and chairs. The item is to be ESD protective or non-static generative by design.” EOS/ESD S8.1 paragraph 4.2 Format “The ESD protective symbol may be printed, embossed, hot stamped, silk screened or incorporated through other mechanisms. In addition to the symbol, the manufacturer’s name, date of manufacture or lot date code should be included where applicable.”</p>