



SAFETY MANUAL  
**SM-00-01**  
January - 2008

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## SAFETY LITERATURE HANDBOOK

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### ELECTROSTATIC SAFETY INFORMATION FROM ITW RANSBURG

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**IMPORTANT:** Before using any ITW Ransburg equipment, carefully read all instructions, precautions, hazards, warnings and sections of this manual. Keep this Safety Manual for future reference.

Safety Manual Price: €25.00 (Euro)  
\$30.00 (U.S.)

**NOTE:** This manual was published to supercede the following list of Safety Bulletins:  
SL-77-01.6, SL-79-01.1, SL-80-08, SL-80-09, SL-81-08.2, IL-247-A, and IL-304-B.  
Reasons for this change are noted under "Manual Change Summary" inside the back cover  
of this manual.

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**ITW Ransburg**

# SAFETY

## SAFETY PRECAUTIONS

Before operating, maintaining or servicing any ITW Ransburg electrostatic coating system, read and understand all of the technical and safety literature for your ITW Ransburg products. This manual contains information that is important for you to know and understand. This information relates to **USER SAFETY** and **PREVENTING EQUIPMENT PROBLEMS**. To help you recognize this information, we use the following symbols. Please pay particular attention to these sections.

**A WARNING!** states information to alert you to a situation that might cause serious injury if instructions are not followed.

**A CAUTION!** states information that tells how to prevent damage to equipment or how to avoid a situation that might cause minor injury.

**A NOTE** is information relevant to the procedure in progress.

While this manual lists standard specifications and service procedures, some minor deviations may be found between this literature and your equipment. Differences in local codes and plant requirements, material delivery requirements, etc., make such variations inevitable. Compare this manual with your system installation drawings and appropriate ITW Ransburg service manuals to reconcile such differences.

Careful study and continued use of this manual will provide a better understanding of the equipment and process, resulting in more efficient operation, longer trouble-free service and faster, easier troubleshooting. If you do not have the manuals and safety literature for your Ransburg system, contact your local ITW Ransburg representative or ITW Ransburg.



### WARNING

- The user **MUST** read and be familiar with the Safety Sections in this manual therein identified.
- This manual **MUST** be read and thoroughly understood by **ALL** personnel who operate, clean or maintain this equipment! Special care should be taken to ensure that the **WARNINGS** and safety requirements for operating and servicing the equipment are followed. The user should be aware of and adhere to **ALL** local building and fire codes and ordinances as well as **NFPA-33 SAFETY STANDARD**, prior to installing, operating, and/or servicing this equipment.



### WARNING

- The hazards shown on the following pages may occur during the normal use of corresponding ITW Ransburg equipment. Please read the hazard charts beginning on page 2.

**ITEM #1 - FOR ALL EQUIPMENT**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Spray Area</b>  	<p>Fire Hazard</p> <p>Improper or inadequate operation and maintenance procedures will cause a fire hazard.</p> <p>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent power supply shutdown indicates a problem in the system requiring correction.</p>	<p>Fire extinguishing equipment must be present in the spray area and tested periodically.</p> <p>Spray areas must be kept clean to prevent the accumulation of combustible residues.</p> <p>Smoking must never be allowed in the spray area.</p> <p>The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing or maintenance.</p> <p>When using solvents for cleaning:</p> <p>Those used for equipment flushing should have flash points equal to or higher than those of the coating material.</p> <p>Those used for general cleaning must have flash points above 100°F (37.8°C).</p> <p>Spray booth ventilation must be kept at the rates required by NFPA-33, OSHA, and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents.</p> <p>Electrostatic arcing must be prevented.</p> <p>Test only in areas free of combustible material.</p> <p>Testing may require high voltage to be on, but only as instructed.</p> <p>Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury.</p> <p>If used, the key switch bypass is intended for use only during set-up operations. Production should never be done with safety interlocks disabled.</p> <p>Never use equipment intended for use in waterborne installations to spray solvent based materials.</p> <p>The paint process and equipment should be set up and operated in accordance with NFPA-33, NEC, and OSHA requirements.</p>

**ITEM #2 - FOR ALL EQUIPMENT**

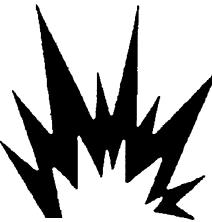
<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>General Use and Maintenance</b>  	Improper operation or maintenance may create a hazard.  Personnel must be properly trained in the use of this equipment.	Personnel must be given training in accordance with the requirements of NFPA-33.  Instructions and safety precautions must be read and understood prior to using this equipment.  Comply with appropriate local, state, and national codes governing ventilation, fire protection, operation maintenance, and housekeeping. Reference OSHA, NFPA-33, and your insurance company requirements.

**ITEM #3 - FOR ALL EQUIPMENT**

(Except applicators listed under section 5 of the FM test standard)

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Electrical Equipment</b>  	High voltage equipment is utilized. Arcing in areas of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance.  Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation.  Frequent power supply shut-down indicates a problem in the system which requires correction.  An electrical arc can ignite coating materials and cause a fire or explosion.	The power supply, optional remote control cabinet, and all other electrical equipment must be located outside Class I or II, Division 1 and 2 hazardous areas. Refer to NFPA-33.  Turn the power supply OFF before working on the equipment.  Test only in areas free of flammable or combustible material.  Testing may require high voltage to be on, but only as instructed.  Production should never be done with the safety circuits disabled.  Before turning the high voltage on, make sure no objects are within the sparking distance.

**ITEM #4 - FOR ALL EQUIPMENT**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Explosion Hazard/ Incompatible Materials</b>  	Halogenated hydrocarbon solvents for example: methylene chloride and 1,1,1,- Trichloroethane are not chemically compatible with the aluminum that might be used in many system components. The chemical reaction caused by these solvents reacting with aluminum can become violent and lead to an equipment explosion.	Aluminum is widely used in other spray application equipment - such as material pumps, regulators, triggering valves, etc. Halogenated hydrocarbon solvents must never be used with aluminum equipment during spraying, flushing, or cleaning. Read the label or data sheet for the material you intend to spray. If in doubt as to whether or not a coating or cleaning material is compatible, contact your material supplier. Any other type of solvent may be used with aluminum equipment.

**ITEM #5 - FOR ALL MANUAL EQUIPMENT**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>General Use and Maintenance</b>	<p>Use of hand tools may cause cumulative trauma disorders (CTD's). CTD's or musculoskeletal disorders, involve damage to the hands, wrists, elbows, shoulders, neck and back. Carpal tunnel syndrome and tendinitis (such as tennis elbow or rotator cuff syndrome) are examples of CTD's.</p> <p>CTD's when using hand tools, tend to affect the upper extremities. Factors which may increase the risk of developing a CTD include:</p> <ol style="list-style-type: none"> <li>1. High frequency of the activity</li> <li>2. Excessive force, such as gripping, pinching or pressing with the hands and fingers</li> <li>3. Extreme or awkward finger, wrist or arm positions</li> <li>4. Excessive duration of the activity</li> <li>5. Tool vibration</li> <li>6. Repeated pressure on a body part</li> <li>7. Working in cold temperatures</li> </ol>	<p>Risk is reduced by avoiding or lessening the listed hazards.</p> <p>CTD's can also be caused by such activities as sewing, golf, tennis and bowling, to name a few.</p> <p>Pain, tingling, or numbness in the shoulder, forearm, wrists, hands, or fingers, especially during the night, may be early symptoms of a CTD. Do not ignore them. Should you experience any such symptoms, see a physician immediately. Other early symptoms may include vague discomfort in the hand, loss of manual dexterity, and non-specific pain in the arm. Ignoring early symptoms and continued repetitive use of the arm, wrist and hand can lead to serious disability.</p>

**ITEM #6 - FOR ALL EQUIPMENT**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Toxic Substances</b> 	Certain material may be harmful if inhaled, or if there is contact with the skin.	<p>Follow the requirements of the Material Safety Data Sheet supplied by coating material manufacturer.</p> <p>Adequate exhaust must be provided to keep the air free of accumulations of toxic materials.</p> <p>Use a mask or respirator whenever there is a chance of inhaling sprayed materials. The mask must be compatible with the material being sprayed and its concentration. Equipment must be as prescribed by an industrial hygienist or safety experts, and be NIOSH approved.</p>

**ITEM #7 - FOR "STIFF" AUTOMATIC EQUIPMENT**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Spray Area / High Voltage Equipment</b> 	This is a high voltage device that can produce electrical arcs capable of igniting coating materials.	<p>Parts being sprayed must be supported on conveyors or hangers and be grounded. The resistance between the part and ground must not exceed 1 megohm. (Reference NFPA-33.)</p> <p>At sea level, a safe distance must be maintained between the parts being coated and the atomizer bell. A distance of at least 1 inch for each 10 kV of power supply output voltage is required at all times.</p> <p>Parts must be supported so that they will not swing and reduce the clearance specified above.</p> <p>All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded.</p> <p>Unless specifically approved for use in hazardous locations, the power supply and other electrical equipment must not be used in Class I, Division 1 or 2 locations.</p>

**ITEM #8 - UNIQUE TO LEPS5001  
POWER SUPPLY AND**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Spray Area</b>  	Fire and/or explosion.	<p>Electrostatic arcing MUST be prevented.</p> <p>The LECU5003 control panel, LEPS5001 power supply and all other electrical equipment must be located outside Class I or II, Division or 2 hazardous areas, in accordance with NFPA-33.</p> <p>Test only in areas free of flammable or combustible materials.</p> <p>The current overload sensitivity MUST be set as described in the SAFETY OVERLOAD ADJUSTMENT section of the LECU5003 Control Panel manual. Protection against inadvertent arcing that is capable of causing fire or explosion is lost if the current overload sensitivity is not properly set. Frequent power supply shutdown indicates a problem in the system which requires correction.</p> <p>Always turn the control panel off prior to flushing, cleaning, or working on spray system equipment.</p> <p>Ensure that the control panel is interlocked with the ventilation system and conveyor in accordance with NFPA-33.</p> <p>Have fire extinguishing equipment readily available and tested periodically.</p>

## ITEM #9 - ALL BELL MANUALS

AREA	HAZARD	SAFEGUARDS
Tells where hazards may occur.	Tells what the hazard is.	Tells how to avoid the hazard.

**Personnel Safety/Mechanical Hazards**



The bell atomizer can rotate at speeds up to 55,000 rpm. At these speeds, the edge of the applicator can easily cut into skin. Loose articles of clothing can also be caught by the rotating bell.

Personnel must stay clear of the bell whenever it is rotating.

Before touching the bell, the turbine air must be shut off.

If the bell has been rotating, allow at least two minutes for it to come to a complete stop before touching it.

## ITEM #10 - FOR FM LISTED AUTOMATIC EQUIPMENT

AREA	HAZARD	SAFEGUARDS
Tells where hazards may occur.	Tells what the hazard is.	Tells how to avoid the hazard.

**Spray Area / High Voltage Equipment**



There is a high voltage device that can induce an electrical charge on objects which is capable of igniting coating materials.

Inadequate grounding will cause a spark hazard. A spark can ignite many coating materials and cause a fire or explosion.

Parts being sprayed must be supported on conveyors or hangers and be grounded. The resistance between the part and ground must not exceed 1 megohm.

All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded.

Any person working in the spray area must be grounded.

Unless specifically approved for use in hazardous locations, the power supply and other electrical control equipment must not be used in Class 1, Division 1 or 2 locations.

**ITEM #11 - AEROBELL 33**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Personnel Safety / Electrical Hazard</b> (Outside of Spray Area)	The high voltage power supply and junction tank used in this application creates a hazard for personnel. The high voltage can cause injury. A spark from the equipment is capable of igniting flammable or combustible materials.  	High voltage equipment must be isolated from personnel. The high voltage equipment must be deenergized prior to allowing personnel to perform maintenance procedures.

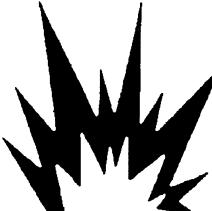
**ITEM #12 - AEROBELL 33 ROBOT BELL MANUAL AND**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Robot Work Area - General Use and Maintenance</b>	Improper use or maintenance can lead to hazardous conditions, particularly from unexpected robot manipulator movement.	Applicator adjustments or maintenance should be done after the robot is taken out of service. Do not adjust or repair the applicator if the robot is operating or standing ready to start.  Refer to robot operating instructions for the procedures to take the robot out of service.

**ITEM #13 - HAND APPLICATORS ONLY**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Spray Area</b>  	Electrostatic Arcing	<p>Never operate the spray applicator without properly grounding the following.</p> <p>A. Operators</p> <p>Operators must be grounded. Rubber soled insulating shoes should not be worn. Grounding leg straps may be used.</p> <p>Operators must maintain contact with the handle of the applicator. If work gloves are used, the palm section should be cut out.</p> <p>Operators must remove from themselves all metal objects that are not grounded.</p> <p><b>NOTE:</b> REFER TO NFPA-33 REGARDING OPERATOR GROUNDING.</p> <p>B. Parts being sprayed. Resistance between the part and a grounded conveyor must not exceed 1 megohm.</p> <p>C. Every metal and conductive object in the spray area. This includes the booth, parts hangers, fire extinguishers, conductive flooring, etc.</p> <p>Grounded conductive flooring must be provided in the spray area.</p> <p>Turn off voltage at the power supply before flushing out, cleaning, or removing any parts from the applicator.</p> <p>Provide proper protection for waterborne supply systems.</p> <p>Never install a spray applicator into a fluid system using an isolated solvent supply.</p> <p>Always discharge Waterborne system capacitance prior to servicing.</p> <p>Do not touch applicator electrode while applicator is energized.</p>

**ITEM #14 - REA-90, REA-90L, AND VECTOR APPLICATORS**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Explosion Hazard / Incompatible Materials</b>  	Halogenated hydrocarbon solvents, for example: methylene chloride and 1,1,1,-Trichloroethane, are not chemically compatible with the aluminum that might be used in many system components. The chemical reaction caused by these solvents reacting with aluminum can become violent and lead to an equipment explosion.	The REA-90, REA-90L, and Vector applicators require that aluminum inlet fittings be replaced with stainless steel. (See accessories list) Aluminum is widely used in other spray application equipment - such as material pumps, regulators, valves, etc. Check all other equipment items before use and make sure they can also be used safely with these solvents. Read the label or data sheet for the material you intend to spray. If in doubt as to whether or not a coating or cleaning material is compatible, contact your material supplier. Any other type of solvent may be used with aluminum equipment.

**ITEM #15 - MANUAL AND AUTO APPLICATORS AND AEROBELL COPES**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Personnel Safety</b>	Skin puncturing by sharp electrode.	Take precautions to see that flesh is not punctured by sharp electrode.

**ITEM #16 - EMF WATERBASE APPLICATOR, AEROBELL AND DISK SYSTEM MANUALS**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Intended Use</b>	Using coating materials and/or cleaning and flushing solvents which have flash points below 100°F (37.8°C) may cause a fire hazard.	This system is intended for use with waterborne coating formulations only.

**ITEM #17 - ALL DISK MANUALS**

<b>AREA</b>	<b>HAZARD</b>	<b>SAFEGUARDS</b>
Tells where hazards may occur.	Tells what the hazard is.	Tells how to avoid the hazard.

**Personnel Safety/  
Mechanical Hazards**



The disk atomizer can rotate at speeds up to 40,000 rpm. At these speeds, the edge of the disk can easily cut into skin. Loose articles can also be caught by the rotating disk.

Personnel must stay clear of the disk whenever it is rotating.

Before touching the disk, the turbine air must be shut off.

If the disk has been rotating, allow at least three minutes for it to come to a complete stop before touching it.

**ITEM #18 - FOR ALL HIGH**

<b>AREA</b>	<b>HAZARD</b>	<b>SAFEGUARDS</b>
Tells where hazards may occur.	Tells what the hazard is.	Tells how to avoid the hazard.

**Personnel Safety  
(High Pressure Equipment)**



Fluid Injection Injury

Never let any part of the body come in direct contact with the fluid stream exiting from the nozzle. If fluid leaks occur in the applicator or in the fluid delivery components, depressurize fluid system before servicing.

Never aim the applicator at any part of the body under any circumstances.

If you are injured by High Pressure Fluid injection, then immediate medical treatment MUST be sought.

**ITEM #19 - FOR WATERBORNE**

<b>AREA</b>	<b>HAZARD</b>	<b>SAFEGUARDS</b>
Tells where hazards may occur.	Tells what the hazard is.	Tells how to avoid the hazard.

**Intended Use  
(Waterborne Only)**

Using coating materials and/or cleaning and flushing solvents which have flash points below 100°F (37.8°C) may cause a fire hazard.

This system is intended for use with waterborne coating formulations only.

Waterborne, waterbase and water reducible coatings are considered the same. Although they may not be highly flammable, their residues are considered combustible.

**ITEM #20 - FOR ALL MANUAL EQUIPMENT**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>General Use and Maintenance</b>	<p>Improper operation or maintenance may create a hazard.</p> <p>Personnel must be properly trained in the use of this equipment.</p>	<p>Personnel must be given training in accordance with the requirements of NFPA-33.</p> <p>Instructions and safety precautions must be read and understood prior to using this equipment.</p> <p>Comply with appropriate local, state, and national codes governing ventilation, fire protection, operation maintenance, and housekeeping. Reference OSHA, NFPA-33, and your insurance company requirements.</p> <p>Always turn power to the power supply OFF, unplug the electrical cord from its outlet, and remove the front panel fuse, before opening the power supply door. If necessary, lock the power supply out so that it cannot be turned ON until the work is finished.</p> <p>Whenever removing high voltage cables from equipment, ground the contact end of the cable by holding the cable such that the contact touches earth ground for several seconds. Do not touch the contact until it has been grounded. This will reduce the possibility of residual charge causing electrical shock.</p> <p>The High Voltage Multiplier Assembly contains energy storage components that can cause serious shock injury, and therefore is not field repairable. Warranty will be voided if the High Voltage Multiplier seal is broken. If the High Voltage Multiplier is defective, contact your authorized ITW Ransburg representative for exchange or repair.</p> <p>The High Voltage Multiplier and high voltage cable contain significant capacitance that will store charge. Allow approximately 10 seconds for this charge to bleed off before</p>

**ITEM #21 - #2 PROCESS HAND APPLICATOR ONLY**

<b>AREA</b> Tells where hazards may occur.	<b>HAZARD</b> Tells what the hazard is.	<b>SAFEGUARDS</b> Tells how to avoid the hazard.
<b>Spray Area</b>  	Electrostatic Arcing	<p>Never operate the spray applicator without properly grounding the following.</p> <p>A. Operators: Operators must be grounded. Rubber soled insulating shoes should not be worn. Grounding leg straps may be used.</p> <p>Operators must maintain contact with the handle of the applicator. If work gloves are used, the palm section should be cut out.</p> <p>Operators must remove from themselves all metal objects that are not grounded.</p> <p><b>NOTE: REFER TO NFPA-33 REGARDING OPERATOR GROUNDING.</b></p> <p>B. Parts being sprayed: Resistance between the part and a grounded conveyor must not exceed 1 megohm.</p> <p>C. Every metal and conductive object in the spray area: This includes the booth, parts hangers, fire extinguishers, conductive flooring, etc.</p> <p>D. Unless specifically approved for use in hazardous locations, the power supply and other electrical equipment must not be used in Class I, Division 1 or 2 locations.</p> <p>Grounded conductive flooring must be provided in the spray area.</p> <p>Turn off voltage at the power supply before flushing out, cleaning, or removing any parts from the applicator.</p> <p>Never install a spray applicator into a fluid system using an isolated solvent supply.</p> <p>Do not touch applicator electrode while applicator is energized.</p> <p>Ensure the Ground Wire Assembly is connected from the power supply ground stud to a true earth ground.</p> <p>Ensure that the power supply is plugged in to a properly grounded outlet.</p>

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# OPERATING ELECTROSTATIC COATING SYSTEMS SAFELY

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## INTRODUCTION

### Principles of Electrostatic Finishing

Electrostatic spray finishing combines the mechanical process of atomization with the distributive effects of electrical attraction and repulsion to achieve a highly efficient product finishing operation.

Atomization is achieved in liquid systems by air, airless, air-assisted, and rotary apparatus. In powder systems, the powder is maintained in air suspension in fluidized-bed hoppers and brought to applicators via a suction venturi and conveying air stream.

In either type of system, the coating material is brought into contact with or through the immediate vicinity of highly charged electrodes. As this occurs, a considerable level of electrical charge is transferred either by direct contact or by passage through a highly ionized zone near the applicator tip (which can be used up to 150 kV), to the particles or droplets of coating material. Since all the particles or droplets are similarly charged and since like charges repel one another, the spray pattern in an electrostatic spray process tends to be larger and more evenly distributed than that of a non-electrostatic process. This increases the ease and efficiency of the operation.

When a metallic object which is electrically neutral or grounded is present, the electric field is established between the charging electrodes of the applicator and the grounded object which, in this case, is the item we wish to coat. The electrically charged particles or droplets of coating material are attracted via the electric field toward the grounded object in much the same way that iron filings are attracted to a magnet. As the particles or droplets come in contact with the grounded object, they begin to dissipate their electrical charges with the metal of the object.

However, since the object is grounded through its hanger and conveyor back to electrically neutral earth, the charge does not accumulate in the metal of the object, allowing it to continue to accept more charges from newly arriving particles or droplets of coating material. Since the particles or droplets do not shed all of their charge immediately, and since like charges repel each other, newly driving charged particles or droplets will tend to be repelled from spots that are already coated and attracted to the remaining areas of bare metal. Similarly, particles and droplets that were propelled beyond the grounded object will tend to curve in around behind it, thus giving the "wrap-around" and recess penetration effects associated with electrostatic spray finishing. The net results of these effects are high quality, evenly distributed finishes, and increased efficiency of coating material use.

If, however, a metallic or otherwise electrically conductive object is in the vicinity which is NOT properly electrically grounded, an entirely different process can occur. Initially, because it is an electrically neutral condition, it will attract the charged particles or droplets of coating material. However, as more and more coating material arrives and shares its charge with the object, the electrical charge will build up in the object because there is no pathway to ground, turning the object into a static electricity "battery". Eventually, and in many cases, this can mean just a few seconds, enough electrical charge can accumulate in the object that a spark can be generated between it and the nearest grounded surface. Or, similarly, an ungrounded metallic object can simply retain its electrical charge for an indefinite time until a grounded surface is brought near enough for a spark to occur. This grounded surface can be a swinging conveyor hook or an operator reaching out to touch the charged object. Likewise, a spark can occur between the electrostatic device and itself and a grounded object if the electrodes or other high voltage portion of the device are placed or brought too close to ground.

It is these sparks being generated in a wet paint and solvent vapors environment or within a possibly explosive concentration of powder dust that represent the greatest, although by no means only, fire and explosion hazard in electrostatic spray finishing operations. It is for that reason that it is absolutely necessary to establish and maintain proper electrical grounding to metallic objects in an electrostatic spray area.

**NOTE**

- Proper electrical grounding is defined as an electrical pathway to neutral earth with a resistance of less than 1.0 megaohm.

## Hazards in Electrostatic Finishing

There are three main types of hazards to be found in electrostatic spraying. These are the fire or explosion hazards, mechanical hazards which may be directly harmful to operators, and toxic hazards which may represent immediate or long-term harm to operators or others in the vicinity.

### **Fire or Explosion Hazards**

Three elements are necessary to initiate and sustain a fire or explosion:

- Oxygen
- Flammable or combustible materials
- A source of ignition

The presence of oxygen in finishing processes is, of course, unavoidable.

### **Flammable or Combustible Materials**

The presence of flammable or combustible materials is inherent in the nature of the processes. Powder coating materials, if present above certain levels, can support a fire and even allow dust explosions similar to those that occasionally occur

in grain storage elevators. This hazard is enhanced since the material, when applied, is dispersed in air as a "fluidized" material or is sprayed onto the item being coated.

**NOTE**

- Measurements have shown that the minimum explosive concentration (MEC) of the powders generally used is in the range of 30 oz./1000 ft<sup>3</sup> of air (or 30 gm/m<sup>3</sup>).

When the MEC value is exceeded, an explosion may occur. Explosions have occurred in powder systems where the powder content in the recirculated air has not been reduced to an acceptable safety level. This can occur due to the breakdown of the air filtration system and a failure by the filtration monitoring system to detect it.

Another potential source of explosive concentrations of powder dust in the air is the practice of cleaning booths and/or spray areas with compressed air applicators, which tend to put large amounts of dust into air suspension. Additionally, the powder contained in powder collection and separation devices can represent a hazardous source of explosive material if a flame or spark reaches it through the ductwork.

With few exceptions, such as water-based paints, liquid coating materials are highly flammable. They include in their compositions methanol, acetone, mineral spirits, styrene, methyl ethyl ketone, turpentine, toluene, xylene, and chlorinated hydrocarbons, among other materials. With the exception of a few chlorinated hydrocarbons, these substances have low flash points and will burn or explode within certain limits of concentrations by volume in air. Additionally, the solvents used in cleaning paint systems and equipment consist of some of the previously listed substances and others, (refer to "Technical Supplement for All Products"), that represent similar fire and explosion hazard levels.

Another source of flammable or combustible materials to feed a fire or explosion is solvent (liquid and powder) buildup in the spray areas, in paint hoods, on dry filters, and within the ventilation and recovery systems and the surrounding areas. This is due to overspray or spillage of materials.

In the event of a spark from electrostatic spray operations, or other sources of ignition, a fire can rapidly flash through these areas causing extensive damage. Spontaneous ignition may occur in these areas if the system is not kept free of solvents and clear of organic materials such as rags or clothing. Spontaneous ignition may also occur if residues from two or more incompatible types of coatings are permitted to accumulate one on top of the other in the spray area, ventilation system or filters.

Additionally, flexible hosing can become frayed and leak, or be accidentally cut during the spray operations, releasing volatile and explosive vapors or liquids. In contact with a source of ignition, they can ignite and explode.

Further sources of flammable and combustible materials are the cleaning solvents and other maintenance connected items brought into the spray area for cleaning or repair functions.

### ***Ignition Sources***

The problem of eliminating or controlling sources of ignition in electrostatic finishing systems is increased over other types of systems because of the presence of high voltage within the spray area. The most common ignitions sources are:

- Electrical discharge spark from failure to maintain correct minimum sparking distance between non-resistive electrostatic applicator and grounded surface
- Electrical discharge spark from ungrounded object in the vicinity of spray operation
- Electrical discharge spark from improperly grounded personnel
- Spark from faulty or improperly installed electrical equipment
- Spark caused by the use of improper cleaning procedures or the wrong tools
- Flame or spark from some other manufacturing process in the vicinity
- The use of pre-heating or cure oven temperatures which exceed the ignition temperature of the coating material.
- Spontaneous combustion of organic materials.
- Smoking

### **CAUTION**

- Always be certain that all electrostatic equipment is completely stopped and de-energized **BEFORE** beginning any maintenance work.



### **CAUTION**

- For non-resistive atomizers: Proper minimum distance between the applicator tip and the object part is one inch for every 10,000 volts of electrostatic charge at standard (sea level) altitude. This distance may need to be increased at altitudes higher than seal level due to reduced air density.

- Electrical discharge spark from an improperly grounded target object

## **GENERAL SAFETY**

### **Overview**

Any tool if used improperly can be dangerous. Safety is ultimately the responsibility of those using a tool. In like manner, safe operation of electrostatic coating processes is the responsibility of those who use such processes and those who operate electrostatic coating equipment. This Safety Manual outlines procedures to be followed in conducting electrostatic coating operations safely.

All personnel connected with coating operations should read and understand this Safety Manual. It is most important that equipment operators and supervisory personnel understand the requirements for safe operation.

This manual cannot answer every circumstance. Each user should examine their own coating operation, develop their own safety program, and insure that their workers follow correct procedures. Most of the precautions listed are applicable whether liquid or powdered coatings are used, and apply equally to non-electrostatic as well as, electrostatic spraying operations. ITW Ransburg hopes that this Safety Manual is helpful to the user and recommends that the precautions in this be included in any such program.

In addition to this manual, the user should consult other standards and recognized safety authorities. NFPA-33, Spray Application, is a standard for spray finishing with flammable materials that is applicable to all spray painting operations. Three chapters, Chapters 11, 12, and 15 (2007 Edition), are specifically applicable to electrostatic coating.

Copies of NFPA bulletins are available at a nominal cost from:

National Fire Protection Association  
Batterymarch Park  
Quincy, MA 02269  
[www.NFPA.org](http://www.NFPA.org)

The National Fire Protection Association also publishes standards other than NFPA-33 relating to the control of fire hazards. NFPA-33 specifically refers to the following bulletins of the National Fire Protection Association as applicable to coating operations:

NFPA-63, Dust Explosion - Industrial Plants  
NFPA-70, National Electrical Code  
NFPA-86A, Ovens and Furnaces  
NFPA-91, Blower and Exhaust Systems  
NFPA-654, Dust Explosion - Plastics Industry  
NFPA-30, Flammable Liquids Code  
NFPA-34, Dipping & Coating  
NFPA-77, Static Electricity

## OPERATING SAFELY

In operating electrostatic coating systems safely, users should make every effort to:

- Avoid sparks
- Avoid accumulations of combustible coating materials
- Avoid accumulations of combustible vapors
- Avoid operating equipment which has given any indication of malfunctioning

The extent to which the user is successful in accomplishing these ends determines largely the safety that is present in his coating operation. Recommended operating procedures follow. These procedures are applicable in the "spraying area" and make frequent references to "grounding". Understanding of these terms is important.

### The Spraying Area Defined

The spraying area is any area in which flammable vapors or coating material deposits are present due to the operation of spraying processes. It includes the interior of spray booths, the interior of ducts exhausting from spraying processes, and any area in the direct paths of spray or any area containing quantities of air-suspended combustible coating materials, or of vapor as a result of spraying operations. Where the user is uncertain of its extent, he should consider the spraying area as that area within 20 feet from every point at which the spraying equipment can be operated.

### Grounding (Overview)

Grounding an object means providing an adequate path for the flow of electrical charge from the object to ground. An adequate path is one that permits charge to flow from the object fast enough that it will not accumulate to the extent that a spark can be formed. It is not possible to define exactly what will be an adequate path under all conditions since it depends on many variables.

**NOTE**

- NFPA-77 states that the electrical resistance of such a leakage path may be as low as 1 megohm ( $10^6$  ohms) but that resistances as high as 10,000 megohms will provide an adequate leakage path in some cases.

In any event, the grounding means should have the lowest possible electrical resistance. Grounding straps should be installed on all loose objects in the spraying area. ITW Ransburg recommends that grounding straps be made of AWG No. 18 bare, stranded wire as a minimum and that larger wire be used where possible. Using bare wire permits the user easily to detect any break in the wire visually. Stranded wire is less likely to break than solid wire.

***Why is Grounding Necessary?***

Electrostatic coating processes depend upon the production of a spray of paint particles that carry an electric charge to obtain a reduction in coating material waste. The electric charge is applied to the paint particles in the operation of the electrostatic coating equipment. Because the paint particles are charged, they are attracted to a grounded object, much like small metal objects are attracted to a magnet. The attraction between charged spray particles and the object being coated gives electrostatic coating its characteristic wrap-around tendency - the deposition of spray that would otherwise be wasted.

Upon reaching an object, however, the electric charge on the spray particles is transferred to the object. Unless the object is grounded (provided with an escape path for this electric charge), the charge will build up on the object. This can have bad results. The charge can build up to such a level that it will jump through the air in the form of an electric spark. Everyone who has felt the small electric shock upon reaching for a door knob or light switch after walking on carpeting has experienced such sparks. An electric spark, if it contains enough energy, can ignite coating material

and solvent vapors. Obviously sparks must be prevented. This brings us to the first rule of safe operation.

***Ground All Objects in the Spraying Area***

Every object in the spraying area must be grounded. This includes the spray booth, conveyor, workholders, hooks, paint tanks, solvent safety containers, tools, the equipment operator and other personnel and any other object which may come within the spraying area. If an object is left ungrounded in the spraying area, electrically charged particles can strike the object and will transfer their electrical charge to the object. If the object is not grounded, the charge will remain on it. As more and more charged particles arrive at the object, the charge on it may build up to such a point that a spark will be formed. Sparks from such ungrounded objects in the spraying area may contain enough energy to ignite any flammable coating material deposit or flammable vapor in the area of the spark. All objects in the spraying area must be grounded to avoid such sparks.

***All Operators and Other Personnel Working in the Spraying Area Must be Grounded***

A human being, if not grounded, can accumulate a charge, which can be released in the form of a spark having enough energy to ignite flammable materials. The following precautions should be taken to ground personnel working in the spraying area.

- Grounded conductive flooring MUST be provided in the spraying area.
- Personnel working in the spraying area should have conductive footwear.
- Grounding leg straps can also be used to ground the operator to conductive flooring in the spraying area.
- Grounding wrist straps may be used to ground the operator to the grounded, conductive applicator handle.

Where the operator is a spray person using an ITW Ransburg electrostatic hand applicator, they will be grounded by contact between their hand and the applicator handle. We recommend that insulating gloves not be used by the spray person. If, however, the spray person must use gloves, a hole must be cut in the palm of both gloves to establish contact between either of the spray person's hands and the applicator handle. Wrist straps or conductive gloves may be used in place of cutting gloves. Hand applicator operators, like all other personnel working in the spraying area, of course, must be grounded by wearing conductive footwear, otherwise they will be ungrounded when not holding the applicator. (See "Personnel Grounding" section of this manual for more information).

Ungrounded metal objects, such as wrenches, knives, pens, cigarette packs, coins, etc., should be removed from pockets to prevent them from becoming charged.

### ***Ground the Object Being Coated While in the Spraying Area***

The object (target) being coated must also be grounded while in the spraying area and while it is being coated. The charged coating material particles are directed at the object being coated and will impair their charge to that object. If the object being coated is not grounded, this charge will build up to such a point that it will produce a spark. The spark produced may have sufficient energy that it will ignite any flammable materials or vapors in the area of the spark.

Since the workholder and the conveyor hooks are adjacent to the objects being coated, coating material may accumulate on these objects. The object or target is normally grounded by contact with the workholder and by contact between the workholder and the conveyor hook. The conveyor must, of course, be grounded. These two points of contact must be inspected frequently for accumulations of coating material which may prevent sufficient contact to provide a ground for the object being coated.

Such accumulations of coating material can prevent the electrostatic charge on the object being coated from flowing to the ground. Accumulated coating material can thus result in sparks either between the object being coated and the workholder, or between the workholder and the conveyor. These sparks can contain sufficient energy to ignite flammable vapors or coating material in the path of the spark. In addition, if the object being coated accumulates a charge because it is not grounded, the charged coating material spray will tend to be repelled from the target and the efficiency of electrostatic coating will be reduced.

### ***Inspect Workholders and Conveyor Hooks Frequently***

Keep workholders and hooks as free of paint as possible. In an electrostatic coating operation this requires a regular workholder and hook cleaning program. Many users find it advantageous to maintain two sets of workholders and hooks. While one set is in use, the other set is being cleaned.

If sparking between the object being coated and the workholder, or between the workholder and the conveyor hook is evident, coating operations should cease immediately, and not be resumed until cause of sparking is detected and corrected. Such sparking may indicate an excessive accumulation of coating materials separating either the object being coated and the workholder, or the workholder and the conveyor hook at their points of contact. Coating materials should never be permitted to accumulate on workholders or conveyor hooks to such a degree that the grounding contact between the object being coated and the workholder or between the workholder and the conveyor hook is lost.

Workholders and conveyor hooks should be inspected frequently to determine if they need cleaning. Workholders should be kept as free of paint as possible over their entire area, not just the points of contact.

**! W A R N I N G**

► Dried coating material that has accumulated on the parts of the workholder other than the points of contact **MAY CAUSE** dangerous operating conditions. Such coating material may cause **UNEXPECTED SPARKING** conditions and may act as a source of fuel to an unexpected flame.

***Insure Any Coating Material Container is Grounded*****! W A R N I N G**

► Be sure that **ALL** coating material containers in the electrostatic spray system are grounded (and therefore discharged) before any work is done around them, such as: adding coating material or solvent, removing coating material, or stirring the contents.

A grounding wire should be fastened to the coating material container at all times. The container should be examined daily to insure that it is grounded.

Some coating materials in use are so conductive that the coating material container must be put on an insulated stand and left ungrounded in order for the system to operate. Users should attempt to use coating materials which are not so conductive, where possible.

**! C A U T I O N**

► Care should be taken in operating systems with such insulated stands. The high voltage to the electrostatic spraying equipment **MUST** be turned **OFF** and the coating material container **GROUNDED BEFORE** any work is done around the coating material container in such operations.

**! C A U T I O N**

► Waterbase applications require different grounding protocol. When using an isolation stand, cage protection with suitable interlocks are **REQUIRED** since the material is isolated from ground. When using the AquaTank, insure the ground stud of the tank is connected to true, earth ground to insure the tank voltage will be properly bled off. When using an AquaBlock, insure **ALL** voltage has been bled to ground **PRIOR** to servicing.

All coating material containers should be treated as if they can become charged. Metallic (electrically conductive) containers must be used as coating material containers or solvent containers, and all portions of such containers should be grounded during use. (Plastic insulating buckets should not be used for flamables.)

A grounding device should be kept adjacent to the container for such use. Care should be taken in grounding such containers. No attempt to ground the container should be made until sufficient time has elapsed after the high voltage is turned off that any electrical charge on the container has dissipated. The grounding device should be fastened to the container near its base away from the opening of the container. Fastening the grounding device away from the opening will reduce the likelihood that it will be dislodged during work with the coating material in the container, and will locate any spark that may occur as the grounding device is fastened to the container away from the opening of the container where the solvent vapors are most dense. In addition, the coating material container or any pump or coating material supply equipment associated with the use of such conductive coating materials should be located in an area that is well ventilated and where personnel cannot inadvertently approach them. The erection of suitable physical barriers to prevent such inadvertent approach is recommended and is the responsibility of the user. Appropriate warning signs should be posted in the vicinity of coating material containers and supply equipment associated with the use of such coating materials.

***Turn the Voltage Off Unless Electrostatic Coating is Being Performed***

The voltage should be turned on only when actually performing coating operations. When coating is discontinued for any period of time, such as on breaks, lunch period, repair work, examination and cleaning, the voltage should be turned off. This is particularly true if the electrostatic coating equipment is to be left unattended for any length of time.

Testing of electrostatic coating equipment sometimes requires the use of high voltage. Such testing must be done carefully and by trained personnel only, and only after ensuring that no flammable vapors or materials are present. Such warning signs should include instructions as the procedures set forth above.

**Rules Of Electrostatic Safety*****First Rule***

Ground all conductive objects within the near field (10 foot radius) of any charged electrode!

***Second Rule***

Excepting those being properly utilized in the application system, **KEEP ALL FLAMMABLE MATERIAL OUTSIDE** of the electrical field (20 foot radius) of any charged electrode.

**Good Housekeeping**

All use of high voltage systems **MUST** be in compliance with the National Electrical Code. Additional precautions are contained in NFPA-33 (Spray Applications) and NFPA-77 (Static Electricity). Frequent inspections should be made to determine if accumulations of combustible materials are occurring in any part of the spraying area. Whenever such accumulations are found, spraying should cease, the voltage should be turned off, and the accumulations should be removed.

The frequency of such cleaning depends largely upon the housekeeping habits of the equipment operators and upon the efficiency of the spraying system. Spray operators should be careful not to spill combustible coating materials or to allow them to be misdirected in spraying onto surfaces,

other than those of the object being coated. Coating material deposits that accumulate within the spraying area may permit the spread of a flame that is otherwise controllable into an uncontrollable fire. Good housekeeping is mandatory if any coating system is to be operated safely.

**PRECAUTIONS FOR SAFE CLEANING**

Users should recognize that the cleaning itself presents a hazard. Tools used for cleaning purposes must be of non-sparking material. Residues, scrapings and debris contaminated with residue should be immediately removed from the premises and properly disposed of. Firesafe waste cans **MUST** be provided for rags or waste materials impregnated with finishing materials. Such cans should have the approval of the appropriate competent authority, such as ***Underwriters Laboratory or Factory Mutual Engineering Corporation***. All such rags and waste should be deposited immediately after their use in these approved waste cans. The contents of the waste cans should be properly disposed of at least once daily at the end of each shift. Spray finishing employee's clothing should not be left on the premises overnight unless kept in metal lockers. Rags, clothing, towels, paper and such materials contaminated with flammable materials present a source of spontaneous combustion and should be handled accordingly.

Solvents used for cleaning purposes should, where practical, be of a type that will not burn. Cleaning solvents should not emit vapors which are dangerous if inhaled by the personnel performing the cleaning operation. Ventilating equipment must be operated while the spraying area is being cleaned.

### **Keep Flammable or Combustible Liquids out of the Spraying Area**

The quantity of flammable and combustible liquids kept in the vicinity of spraying operations must be the minimum required for operation. As noted earlier, all containers for such materials must be grounded and MUST be of an approved type for flammable or combustible liquids (see the Flammable and Combustible Liquid Code, NFPA-30 and Chapter 6 of NFPA-33). Such containers should be kept closed to prevent the spread of flammable vapors beyond the container.

### **Fire Extinguishing Equipment Made Available**

Common sense dictates that automatic or manual fire extinguishing equipment be kept available in any industrial operation involving flammable material. Painting and other coating operations are no different. Since most coating materials are flammable, means to extinguish a flame must be quickly available. If good housekeeping is observed, flames will not spread beyond control, and prompt action with fire extinguishing equipment will prevent significant damage.

Fire extinguishing equipment should be protected to prevent collection of coating material from interfering with its operation. Such equipment should be inspected frequently to insure that it is in proper working order.

#### **NOTE**

- Like all other objects in the spraying area, fire extinguishing equipment must be grounded. Also, refer to NFPA-33 for more extensive issues of fire protection.

### **Understanding How to Operate Electrostatic Coating Equipment Safely**

Personnel who operate electrostatic coating equipment and their supervisors must be trained in the procedures used in operating electrostatic coating equipment safely. Such personnel should read and understand this manual, the service

manuals, NFPA-33, and the codes of local authorities. Periodic retraining of such personnel is important to emphasize the importance that they not become careless in following these procedures. Special care should be taken to see that the personnel newly assigned to work within the spraying area are trained in safe operating procedures. In addition to such training, safety instructions should be posted in the spraying area so that personnel working there may refer to them easily. Such instructions should be prominently displayed so that they may serve as a constant reminder of the importance of not being careless.

### **Ventilate the Spraying Area**

All spraying areas must be provided with mechanical ventilation adequate to remove flammable vapors, mists or powders to a safe location and to confine or control combustible residues. The spraying area should be ventilated at all times while spraying operations are being performed and for a sufficient time after spraying has stopped to allow vapors from deposited coating materials (in the process of drying) to be exhausted. The ventilation and exhaust systems should comply with NFPA-91, Standard for Blower and Exhaust Systems for Vapor Removal, and Chapter 5 of NFPA-33. Local codes should be observed, however.

### **Maintenance and Cleaning - Liquid Electrostatic Coating Equipment**

DO NOT attempt to clean any electrostatic coating equipment UNLESS the voltage has been turned OFF and electrically charged equipment components have been grounded. Electrostatic hand applicators should be carefully cleaned. No conductive residues should be permitted to accumulate on an electrostatic hand applicator. Solvents used to clean such applicators should themselves be clean and of a type which will not leave a conductive film. (See the appropriate Service Manuals for the "Recommended Cleaning Solvents and Procedures".)

**WARNING**

- **NEVER** soak or submerge the electrical components of ITW Ransburg hand applicators (i.e. barrel, transformer, cable) in any liquid for **ANY** reason. Damage and failure may occur!

A soft brush and solvent can be used to clean electrostatic hand applicators.

**CAUTION**

- Metal tools and wire brushes must **NEVER** be used. **NEVER** use a cleaning tool that is harder than the plastic parts. If a deposit cannot be removed with solvent and a rag or soft brush, soak the part in the solvent **ONLY** until the deposit can be removed! **NEVER SOAK THE APPLICATOR BODY, BARREL, OR TRANSFORMER!**

Some parts of ITW Ransburg electrostatic hand applicators can be removed and soaked, such as the **air and paint nozzles of the air spray applicator and spray tip and forward nut** of the hydraulic applicators.

**CAUTION**

- To avoid damage to the fluid nozzle, needle/electrode, the paint pressure **MUST** be released by triggering the applicator prior to removing the tip.
- The applicator **MUST** be tilted front down to remove the air cap and/or fluid nozzle. Failure to do so may allow paint to enter the air passages, thereby reducing air flow and damaging the applicator barrel/cascade. Applicators may be flushed in lieu of removing nozzles. However, they must be either flushed prior to, or tilted down during nozzle removal!
- The control unit power **MUST** always be off when removing the nozzles or any other service to the applicator.
- Using any tool other than the ITW Ransburg 19749-00 wrench to remove or reinstall the fluid nozzle may distort or damage it.

**WARNING**

- Any damage to the applicator may result in **UNSAFE** operating.

**Maintenance and Cleaning - Powder Electrostatic Coating Equipment**

Powder coating application equipment should be carefully cleaned on a regular basis. The electrostatic voltage should be turned OFF when any work is performed on the applicators, controls, or the booth.

**WARNING**

- **NEVER** soak or submerge the powder applicator or muzzle in any liquid for **ANY** reason. Damage and failure may occur!

A special brush is supplied for cleaning out the applicator. Some parts of the applicator assembly may be cleaned in a mild solvent, such as:

- the muzzle union nut
- deflector tips
- deflector rod



### WARNING

- ▶ **NEVER** use Acetone.
- ▶ **DO NOT** allow parts to soak overnight!
- ▶ Guide pin integrity should be MAINTAINED for proper electrostatic contact.
- ▶ **NEVER** use any fluids to clean the control cabinets.

Use only a dry, lint free cloth, or compressed air to blow off the components.



### WARNING

- ▶ **NEVER** wrap the equipment in plastic to keep it clean. A surface charge may build-up on the plastic surface and discharge to the nearest grounded object. Efficiency of the applicator will also be reduced and damage or failure of the applicator components may occur. **WRAPPING THE EQUIPMENT IN PLASTIC WILL VOID ALL WARRANTIES!**

### Powder Containment

A powder applicator **MUST NEVER** be discharged outside of the powder booth! Whenever powder is being sprayed, blown, wiped down, or transferred, the booth recovery air should be on so that the powder will be contained in the booth.

### Do Not Permit Horseplay

Horseplay is out of place in any industrial operation and this includes electrostatic spraying operations. Spraying personnel should NOT be permitted to charge themselves or other objects up so that they may "spark" over to other people or objects. Such sparks may have sufficient energy to ignite combustible vapors. They are a hazard.

## **NOTES**

# PERSONNEL GROUNDING

## GENERAL

### ! WARNING

- The integrity of the system ground **MUST** be inspected regularly and maintained. (See "Equipment Grounding" section of this Safety Manual).

It is simple, but vital matter to be sure that all objects in an electrostatic coating area are grounded (reference NFPA-33).

1. Inspect all ground wires daily. Look for good, firm joints at all points of connection (paint pots, flow regulators, booth wall, power supply, etc.). Look for breaks in the ground wire. Repair any defect **IMMEDIATELY!**
2. Inspect all conveyor apparatus (hooks, hangers, etc.) daily. If there is any accumulation of dried coating material on any of these objects, remove it before using them!
3. Inspect the floor daily for excessive accumulation of dried coating material (or other residue). If there is any, remove it!

Safe grounding is a matter of proper equipment maintenance, proper spray technique, and good housekeeping.

There are hazards to good equipment maintenance in any industry (cleaning crews, shop trucks, etc.). Daily inspection of grounding apparatus and conditions, however, will help prevent hazards that are caused by normal, daily operations.

## PERSONNEL GROUNDING

Personnel grounding is the most difficult area of electrical hazard control. Most people do not realize what excellent capacitors they are. In a very short time, without proper grounding, the human body can build enough static charge to cause dangerous spark discharge. Therefore, ALL persons in an electrostatic coating area **MUST** be grounded at **ALL** times!

Manual equipment operators will be grounded through the equipment as long as it is being held in contact with the bare skin. As soon as the equipment is released from direct (skin) contact with the operator, other grounding methods become necessary.

The operator **SHOULD NOT** wear insulating gloves! Special conductive gloves may be used and are recommended.

### ! WARNING

- If insulating (cloth or rubber) gloves are worn, both palms **MUST** be cut out to allow bare skin contact with the equipment! This allows the operator to change the equipment from one hand to the other.
- If gloves are worn for chemical safety, grounding wrist straps may be connected from the operator's wrist to the applicator assembly.

All persons in the spray area must be grounded at **ALL** times!

This may be accomplished safely by the use of conductive soled shoes, disposable conductive boots, or personnel grounding straps.

## Grounding Straps

A wide variety of anti-static, personnel grounding devices are available. These devices take many different forms with as many different methods of attaching them to the user. Obviously, selection of a specific type would be purely a matter of choice.

Grounding straps and conductive gloves are available as follows from ITW Ransburg:

70289-01	Adjust-A-Stat Ground Straps
70289-02	Ankle-Stat Ground Straps
70289-03	Leg-Stat Ground Straps
70269-04	Wrist Straps
76633-00	Conductive Gloves

### NOTE

- ITW Ransburg recommends that ground straps be made of #18 bare (minimum), standard wire. Where possible, use larger wire.

## Disposable Boots

Conductive boots are available that are worn over the shoe and fastened by either rubber bands or string ties, at the ankles.

## Conductive Soled Shoes

Leather-soled shoes are generally adequate to provide proper personnel grounding. However, it can be difficult with the wide variety of materials available, to know whether or not the soles of a pair of shoes are actually leather. A cursory examination could lead to the belief that soles are made of leather, when actually the material is of a substance that may or may not be conductive.

## ADDITIONAL TIPS

### Housekeeping

Good housekeeping is essential if this equipment is to be operated safely and efficiently. For example, workholders must provide electrical grounding of the articles, thus, workholders require periodic stripping. Clean-up and maintenance schedules for the applicators, booth, and general area should be established by the user, based on recommendations of the ITW Ransburg representative and observation of initial production operation.

### Fire Protection

Normal fire protection measures are required. These include proper storage of paints, solvents and waste, plus adequate fire extinguishing equipment. For details, consult NFPA-33 which recommends automatic sprinkler systems and portable fire extinguishers. Check with your local fire code, local facility equipment standards, and your insurance provider's recommendations. Also see "Operating Your Electrostatic Coating System Safely" section of this Safety Manual.

### ! WARNING

- All users of electrostatic coating equipment must be familiar with the safety requirements prescribed under the OSHA Act of 1970 and in NFPA-33.

Be sure to display all of the appropriate ITW Ransburg furnished DANGER and CAUTION signage in and around the spray area.

### ENSURE THAT:

1. All objects in the spray area are grounded.
2. Operators and all other persons in the spray area are properly grounded.
3. The object being coated is properly grounded (less than 1 megohm resistance to ground).

4. Workholders and conveyor hooks are free of coating accumulation.
5. High voltage is **OFF** and coating material container is grounded **BEFORE** adding, removing or mixing coating materials.
10. The operator thoroughly understands the equipment, has read and fully understands the operations manual.



### WARNING

- Ground **MUST** be maintained during the addition or transfer of fluid to any supply container!
- Whenever transferring flammable fluid from one container to another, both containers **MUST** be properly connected to a proven true earth ground first and then to each other. Personnel executing such a transfer **MUST** also be grounded to true earth ground.

### ! WARNING

- Proper fire protection equipment must be in place and operable before **ANY** finishing equipment is operated.
- The user **MUST** read and be familiar with the appropriate ITW Ransburg equipment manuals and literature.

6. High voltage is **OFF** at all times when not actually conducting coating operations.
7. The spray area is kept free of accumulated coating deposits.
8. Combustible liquids in the spraying area are kept to a minimum, the containers are of the approved types (see NFPA-30 and 33) and properly grounded.
9. Proper ventilation is provided.



### WARNING

- **VENTILLATING EQUIPMENT MUST BE INTERLOCKED** with the spraying equipment to insure proper ventilation when equipment is in operation (see NFPA-33).

## **NOTES**

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# EQUIPMENT GROUNDING

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## GENERAL

In electrostatic coating systems, the flow of high voltage power from the power supply to the atomizing head of the applicator is insulated from ground and isolated from all other functions and equipment. When the voltage reaches the atomizer, it is transferred to the coating material where, by introducing a (normally) negative charge, it causes the atomized fluid to seek the nearest (normally) positive ground. In a properly constructed and operated system, that ground will be the target object.

The directed conduction of the electric charge through its array of wires, cables, and equipment is accompanied by a variety of stray electrical charges passing through the air by various means such as *air ionization*; charged particles in the air and radiated energy. Such stray charges may be attracted to any conductive material in the spray area. If the conductive material does not provide a safe drain to electrical ground which will allow the charge to dissipate as fast as it accumulates, it may store the charge. When its electrical storage limit is reached, or when it is breached by external circumstances (such as the approach of a grounded object or person, or one at lower potential), it may discharge its stored charge to the nearest ground. If there is no safe path to ground (such as a ground wire) it may discharge through the air as a spark. A spark may ignite the flammable atmosphere of a spray area. The hazard area extends from the point of origin up to as much as a twenty foot radius. See the NFPA-33 for definition and limitations of "hazard area".

## EQUIPMENT GROUNDING

It is a simple, but vital matter to be sure that **ALL** conductive objects within the spray area are grounded. This will include such items as, but are not limited to:

- Cabinets
- Benches
- Housings
- Ladders
- Bases
- Containers
- Stands
- People
- Product

**ALL** of which are not by design, insulated from ground **MUST** be connected directly and **INDIVIDUALLY** to true earth ground. Resting on a concrete floor or being attached to a building column may not always be sufficient ground. In order to provide the best ground connection possible, always attach a ground wire to the terminal indicated by the ground symbol and then to a proven, true earth ground. Always check ground connections for integrity. Some items, such as rotators and paint stands, may be supported on insulators, but all components of the system up to the insulator **MUST** be grounded.

### NOTE

- ▶ ITW Ransburg recommends that ground wires be made of No.18, bare, stranded wire (minimum). Where possible, use larger wire.

Where items are mounted directly on structural components such as building columns, the ground connection **MUST** still be made. In many cases the structural component may be painted or coated with an insulating material, and in all cases the ITW Ransburg equipment will be painted. These coatings are insulating. The ground connection must be as perfect as possible. The indicated ground terminal on the ITW Ransburg equipment

will provide the necessary connection at one end, but the user must be sure that the other end is secured to a structural, true earth ground. This may be achieved by the use of a standard ground clamp (properly secured), by brazing or by piercing the structural component enough to assure connection. All ground connections should be made to the most conductive metallic structural ground available.

## ADDITIONAL STEPS

### Daily Inspection

To ensure that everything is properly grounded, the following steps should be undertaken at least daily:

1. Inspect all ground wires. Look for good firm joints at all points of connection. Look for breaks in the ground wire. Repair any defects **IMMEDIATELY!**
2. Inspect all conveyor apparatus (hooks, hangers, etc.). If there is any accumulation of dried coating material on any of these objects, remove it **BEFORE** using them!
3. Inspect the floor for excessive accumulation of dried coating material or other residue. If there are any, **REMOVE** it!

**SAFE GROUNDING IS A MATTER OF PROPER EQUIPMENT MAINTENANCE AND INSTALLATION, CORRECT OPERATION AND GOOD HOUSEKEEPING.**

### Hazard Precautions Checklist

There are hazards to safe equipment maintenance in any industry (personnel, shop trucks, etc.). Daily inspection of grounding apparatus and conditions, however, will help prevent hazards that are caused by normal operations.

- **ALL** objects in the spray area **ARE** grounded.
- Personnel in the spray area are properly grounded. (See "Personal Grounding" section of this Safety Manual).

- The target object is properly grounded and free of solvent accumulation.
- Workholders and conveyor hooks are free of solvent accumulation.
- The high voltage is **OFF** except during normal application.
- The high voltage is **OFF** and applicators are grounded during maintenance operations (see "Maintenance" section of this Safety Manual).
- The spray area is kept free of accumulated coating deposits.
- ALL combustible liquids in the spray area (outside of automatic delivery systems) are kept to a minimum and are kept in fire safe, grounded containers.

### CAUTION

- Plastic containers due to their insulated nature should NOT be used with any and all spray operations. A charge can build up resulting in a fire. (See NFPA-33).

- Proper ventilation is provided.

- Personnel thoroughly understand the equipment, its operation and maintenance, and all safety precautions.

### WARNING

- ALL users of electrostatic coating equipment **MUST** be familiar with the safety requirements prescribed under the OSHA Act of 1970!

## Booth Floor Covering (Spark Gard)

Since the beginning of industrial spray painting there has been a question as to the proper covering for spray booth floors. Any of the answers to this question have left much to be desired regarding safety, cost and/or convenience.

One type of paper called *Spark Gard* (Grade BWA-100) is available and **MAY** be a good solution to the problem. Ostensible, this paper **WILL NOT** support combustion, is highly absorbent and has high wet strength.

It is somewhat more expensive than *Kraft* paper, for example, but its advantages may very well justify this difference.

Another type of product called *Spark Arrest*, which may be used in welding operations, is a more dense paper than *Spark Gard*.

This type of covering **DOES NOT** support combustion either.

A third product is simply called *Masking Tape*. It actually is an exceptionally "tight" sheet paper which is manufactured exclusively for masking in electrostatic applications.



### CAUTION

- Some Electronic Components can be damaged by static electricity. Components such as integrated circuits (I.C.'s) are sensitive to static electricity and can fail if subjected to a static charge.
- Proper handling procedures **MUST** be observed while repairing electronic equipment to avoid static damage.

## Static Electricity

### Electronic Component Damage

Static electricity can easily be formed, such as by shoes rubbing on carpeting, or synthetic clothing rubbing on the skin. Any static charge which builds up can spell disaster to certain electronic components, such as integrated circuits (I.C.'s). If printed circuit boards containing I.C.'s (such as PC boards used in some of ITW Ransburg's Electrostatic Power Supplies) are subjected to a static charge, it is possible that the I.C.'s will fail.

Therefore, it is very important that precautions be taken during repair of electrostatic equipment to prevent static electricity from forming in the area where the repair is being done.

Static guard kits are available on the market to use during electronic repair. These kits include a conductive place mat that the equipment is placed on and ground wires which ground out the place mat and repair person. A typical static guard kit is the "3M" Model 8012 Veolostat Portable Field Service Kit. If a static guard it is not available for use during repair, other common sense safeguards should be observed:

- Connect a ground wire to the power supply ground lug.
- If the workbench can be grounded, ground it also.
- The repair person should roll-up their sleeves and avoid contacting electronic components with clothing.
- The repair person should be bodily grounded by:
  1. **NOT** wearing rubber-soled shoes
  2. **MAINTAINING** contact with ground (such as with wrist ground straps).

## NO. 2 HAND APPLICATOR ON-SITE PAINTING (Near Computers or Other Electronic Devices)

For over 35 years the No. 2 Process hand applicator has been the most widely used tool by the on-site painting industry for the refinishing of office furniture, office panels, lockers, school furniture, and dozens of other items.

Quite often we are asked about the dangers and possible damage to computers, phone systems, word processors, or electronically keyed security systems when electrostatic painting is done nearby.

Concerning those types of applications, the following facts should be noted:

1. The No. 2 Process hand applicator is not electromagnetic. It is electrostatic (much like the static from carpets or wool and synthetic clothing), and works at an output of 100 kilovolts at 30-50 microamperes current draw (100 microamperes maximum short circuit current).

### NOTE

- Grounding of all conductive objects near an electrostatic spray applicator is of utmost importance.

2. Unlike x-rays, electrostatic does not go "through" objects.

3. Some computers, phone systems or word processors are now shielded by the manufacturer against outside static.

4. If the static shielding of the unit is unknown, the keyboard, CPU (central processing unit) and its cable preferably should be removed from the immediate painting area for protection of the device.

If this is not feasible they should be completely wrapped in aluminum foil that is grounded to an earth ground. This will create a "Faraday cage" around the computerized device.

5. Electrical sparks of all types create an R.F. energy (radio frequency) that may radiate through the air and enter into electronic circuits. The resulting damage is unpredictable.

6. Computer software such as tapes, disks, diskettes, etc., should be removed from inside of and the immediate surrounding area of any enclosures that are to be painted.

7. Lightning or electrostatic voltage sparking into an A.C. circuit can create "spikes" or electromagnetic pulse (EMP) that can cause unpredictable damage to electronic hardware.

8. Surge suppressors are available that may help protect appliances from "spikes" of current if the suppressor is in the A.C. line supplying the appliance.

9. When painting any type of electrical control panel or console it is generally not known if all pushbuttons, switches, meters or pilot lights are properly grounded. In view of this, it is desirable to cover all of these items with aluminum foil which is grounded to the panel or another earth ground.

10. All on-site painting companies should have adequate liability insurance to protect them in the event of any real or perceived damage as a result of their operations.

In view of the above unknown and possible uncontrolled conditions, ITW Ransburg does not recommend the electrostatic painting of computer cabinets, consoles or painting in close proximity to these devices.

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# APPLICATOR GROUNDING

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## GENERAL

### WARNING

- The high voltage **MUST** be **OFF** and **GROUNDED** before any direct personal contact is made with the equipment.

Procedures to be followed for safely conducting electrostatic coating operations are outlined in "Operating Your Electrostatic Coating System Safely" section in this Service Manual.

ITW Ransburg Electrostatic Systems depend on high voltage to atomize coating material and deposit it on the target object. During operation, the system is at high voltage. **Personnel must NEVER** attempt any direct contact with the equipment **UNTIL** the high voltage is **OFF**, the atomizer has **STOPPED** rotating and the ground hook has been attached to the applicator or paint supply as indicated. The ground hook cable **MUST** be secured to a proven, true earth ground and readily accessible to the applicator or paint supply.

The ITW Ransburg ground hook is designed to be used with disk or bell atomizers or with insulated fluid supplies. In addition to the aluminum hook, the standard assembly has 15 feet of aircraft cable and a solderless connector for mounting. One assembly should be conveniently located at each station. After the high voltage is off and the atomizer has stopped, the hook should be touched to the atomizer hub or applicator housing momentarily to dissipate any residual charge. It should then be hooked to the applicator housing.

**DO NOT** allow the hook or its cable to touch the working edge of a disk or bell atomizer. This edge is critical to good atomization and should **ALWAYS** be protected from any contact that might cause even the slightest damage. For overhead applicators it may be necessary to suspend the cable with a spring or other elastic material in order to prevent edge contact. ITW Ransburg Waterborne Fluid Supply Enclosures include an insulated paint stand plus a grounded chain link enclosure, and a gate that is equipped with a limit switch, switch trip, warning light and control box. The enclosure is also equipped with a standard ITW Ransburg ground hook assembly to ground the paint supply when personnel are inside of the enclosure.

Personnel entering an insulated fluid supply enclosure **MUST FIRST** be sure that the system is **NOT** operating and that the Warning Light is **OFF!** After entering the enclosure, the ground hook must be attached to the paint supply **BEFORE** any personal contact is made. The ground hook **MUST** be attached during all service and above all, during the addition of fluid to the supply container! When leaving the enclosure, remove the ground hook and close and secure the gate. The warning light **MUST** be **ON** whenever the system is operating.

Ground **MUST** be maintained during the addition of fluid to any supply container! Whenever transferring flammable fluid from one container to another, both containers **MUST** be properly connected to a proven ground first and then to each other. Personnel executing such a transfer **MUST** also be grounded. ITW Ransburg includes an appropriate number of ground hook assemblies with those systems that require them. If your installation is no longer equipped with the device, replacements may be purchased (15946) or fabricated according to.

## NO. 2 PROCESS HAND APPLICATOR GROUNDING (ON-SITE)

Proper grounding between the work piece, the high voltage power supply and the surrounding building is essential for correct operation of the ITW Ransburg No. 2 Process Hand Applicator System.

### ! WARNING

- Failure to observe the following rules for grounding may result in inferior finishes, equipment failures, static shocks to the operator and **FIRE HAZARD!**

### 1. Connect the Power Supply to the Building Electrical Ground.

The 3-prong grounding plug supplied with the power supply is acceptable if the wall receptacle has a proper connection to the ground pin.

### NOTE

- ITW Ransburg suggests that each operating crew be supplied with a three-wire circuit analyzer which may be used to quickly check the ground continuity of the building electrical system. These analyzers are available from many suppliers such as *Sears*, *Hubbell*, or *Wookhead*, at a cost of no more than a few dollars.

### 2. Ground the Power Supply to a Building (Structural) Ground.

If a 3-prong to 2-prong adapter is used or if the ground in the AC receptacle is not connected, then a separate ground wire must be run to a metal building member (electrical conduit, water line, steel building support, etc.). The power supply is equipped with a grounding cable for this purpose.

### NOTE

- Because the building electrical system may not always be properly grounded, using the alternate building ground connection is a good practice in all situations.

### 3. Ground the Work Piece to a building (Structural) Ground.

Secure wire from the work piece to the building ground with a spring clip or a grounding clamp. If a good earth ground is not available, a second ground wire on power supply is available to ground the part.

### ! CAUTION

- DO NOT ground the work piece directly to the power supply. It must be grounded with a separate grounding wire to earth ground. Grounding directly to the power supply could damage the equipment.

### NOTE

- A magnet is acceptable if the magnet is kept free of paint accumulation. Remember that most paints are insulators! A magnet will hold fast over many layers of paint but may not provide good ground and thus cause sparking.

### 4. Ground Any Supporting Conveyance for the Power Supply.

If the power supply is on a cart for portability, ground the cart to the power supply and to building ground. If using a generator, ensure generator frame is also connected to true earth ground. If a true earth ground is not available, one may be established by driving a ground rod (see electrical supplier) into the earth, assuming the soil has adequate moisture content.

**5. Ground the Operator to the Power Supply.**

The operator will be grounded by grasping the metal handle of the No. 2 Process Hand Applicator with their bare hand. The hand applicator is grounded to the power supply through the metal braid in the high voltage cable.

- a. Paint accumulation on the handle must not be allowed.
- b. Gloves cannot be worn unless an alternate operator ground is used.
- c. The applicator handle MUST NOT be covered. Tape is an insulator!

**! W A R N I N G**

- ALL personnel who operate, clean, or maintain this equipment MUST read and thoroughly understand the appropriate service and safety literature! Special care should be taken to ensure that the WARNINGS and requirements for operating and servicing safety are followed.

**C A U T I O N**

- This cable should be inspected frequently for voltage leaks and checked for electrical continuity of both the conductive wire and the grounding braid.

6. Operation of any high voltage electrostatic system requires an awareness of the phenomenon of **INDUCTIVE CHARGING**. Specifically, this phenomenon occurs whenever an ungrounded object (i.e., a metal can on a plastic tile floor) is within the electrostatic field generated by an electrode charged to a high voltage. The ungrounded object will try to acquire a charge equal in voltage to that of the electrode.

Therefore, the **first rule of electrostatic safety** is: Ground all conductive objects within the near field (10 ft. radius) of any charged electrode!

The **second rule** is: Except those being properly utilized in the application system, **KEEP ALL FLAMMABLE** material outside of the far field (20 ft. radius) of any charged electrode.

All use of high voltage systems **MUST** be in compliance with the National Electrical Code. Additional precautions are contained in NFPA-33 and NFPA-77. Also see ITW Ransburg literature "No. 2 Hand Applicator Spray Techniques and No. 2 Hand Applicator" service manual. See "Operating Your Electrostatic Coating System Safely" in this service manual

**! W A R N I N G**

- FIRE HAZARD!

**Pump Head**

This unit is equipped with a grounding cable [70992] that connects the pump head to the grounded base section and prevents the head from becoming charged during operation. This cable **SHOULD** be connected as shown, whenever the paint conductivity is low enough to permit satisfactory operation with the head grounded. Some paints, however, may be too conductive to use with a grounded pump head, so it will be necessary to disconnect the cable.

**! W A R N I N G**

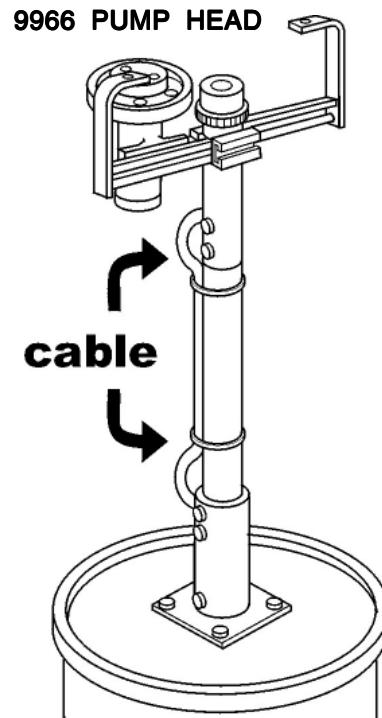
- If this cable is **NOT** connected during operation, it must be assumed that the pump head will be charged and therefore, able to produce an **IGNITION CAPABLE SPARK**. If the grounding cable is disconnected during operation, the pump head **MUST** be equipped with appropriate barriers which will prevent any spark producing contact.

## Paint Supply

If ungrounded operation is necessary to produce satisfactory results, the paint supply **SHOULD** also be insulated. The ITW Ransburg 5875-00 Paint Stand should be used. It incorporates a circuit which quickly bleeds any accumulated charge to ground when the high voltage is interrupted. This stand must be treated the same way as the pump head. A grounding cable **SHOULD** be connected to it whenever the paint conductivity is low enough to permit satisfactory operation with the fluid system grounded. If a grounding cable is **NOT** connected during operation, it must be assumed that the paint supply will be charged and therefore, able to produce an **IGNITION CAPABLE SPARK**. If the grounding cable is not connected during operation, the paint supply **MUST** be equipped with appropriate barriers which will prevent any spark producing contact.

## Conductivity Changes

Whenever fluid conductivity is changed, the overload sensitivity setting **MUST** be adjusted according to the instructions in the appropriate high voltage power supply manual. If the adjustment is **NOT** made, the level of system safety will be reduced thereby increasing the possibility of an ignition capable spark.



Conductivity Adjustments

## Component Contact

In **ALL** cases, **NO** contact should be made with **ANY** ungrounded component of the system (atomizer, pump head or paint supply) without **FIRST** grounding the subject item. It is particularly **IMPORTANT** that **NO** paint or solvent be transferred from one container to another without grounding **BOTH** containers.

# TARGET GROUNDING

## ADDITIONAL STEPS

### Inspections and Precautions Checklist

In order to coat products safely and effectively, the following conditions **MUST** be maintained:

- The target object **MUST** be in electrical contact with its properly grounded support, conveyor etc.
- Hooks, racks, supports, etc., used to hold the target object **MUST** be maintained clean and demonstrate a ground resistance of one megohm or less (see NFPA-33).
- Points of contact between the support device and the target object should be as small as possible (knife edged or sharp pointed).
- Contact points between target objects and support devices **MUST** be as protected as possible from random spray.
- The point of conveyor attachment **MUST** be kept free of accumulated solvents.

### Ground Resistance Testing

To test for ground resistance, use a Megohm Meter (high resistance). This meter is commonly referred to as a **MEGGER**. (There are many manufacturers of such meters and local sources can be easily found to purchase one.) It generates sufficient voltage to penetrate small insulating accumulations and obtain a proper reading. The penetrating voltage is generally 500V DC to 1000V DC.

Because of the low voltage applied by a volt ohm meter (VOM), accurate readings may not be possible and may lead to thinking parts are not grounded sufficiently when they actually are.

## NOTES

# MAXIMUM SAFE OPERATING SPEEDS

## BELL AND DISK ATOMIZERS

Rotating Atomizer	Part Number	Maximum Speed**	Pressure Limit PSI*	For use with Turbine No.
<b>DISKS:</b>				
Deep Well (12 inch)	16775-11	9,000	100	19840-70880
Uni-Disk (6 inch)	19830-06	27,000	50	19840-70880
Uni-Disk (8 inch)	19830-08	23,000	100	19840-70880
Uni-Disk (10 inch)	19830-10	15,000	100	19840-70880
Uni-Disk (12 inch)	19830-12	15,000	100	19840-70880
Conical (6 inch)	20485-6X	40,000	100	19840-70880
Conical (9 inch)	20485-9X	20,000	100	19840-70880
Conical (12 inch)	20485-12X	20,000	100	19840-70880
Conical (6 inch with flip)	20880-6X	20,000	80	19840-70880
Conical (9 inch with flip)	20880-9X	15,000	80	19840-70880
Conical (12 inch with flip)	20880-12X	8,000	85	19840-70880
<b>BELLS:</b>				
Standard	20074	40,000	80	20172
Standard	20074	40,000	28	20865
Honda	70003-00	60,000	52	20865
Standard	70122-XX	60,000	52	20865
Standard	70351-XX	60,000	52	70798-20865
Standard	70571-XX	60,000	52	70586-71985
Standard	70256-XX	60,000	52	70253-70386
Standard	70461-XX	60,000	52	70446
Standard	70900-XX	60,000	45	70798-20865
				70253-70386

\* Measured at the turbine.

\*\* All speeds are with equipment operating at ITW Ransburg specified standards.



## WARNING

- **DO NOT** operate any ITW Ransburg Turbine Atomizer (disk or Bell) in **EXCESS** of its "K" number rpm limit!!

- All atomizers manufactured after April 6, 1982 bear a "K" number. That number indicates the maximum safe rotation speed for that series in tens of thousands.

**For Example: 40K = 40,000 rpm maximum safe speed**

- If you have an atomizer that does not have a "K" number, contact your ITW Ransburg representative for its maximum safe operating speed.



## WARNING

- A maximum limit of 52 psi, measured at the turbine, will produce the maximum safe operating speed of 60,000 rpm (60K) when using the 70256, 70461, or 70571 atomizers. Typically, if the turbine air is supplied through 30 feet of 3/8 inch ID hose, a regulator pressure of 63 psi will result in a pressure of 50 psi at the turbine



## CAUTION

- Always be certain that ALL electrostatic equipment is completely **STOPPED** and de-energized **BEFORE** beginning any maintenance work.

# FLUID DELIVERY EQUIPMENT AND SYSTEMS

## GENERAL

### **! WARNING**

- The simple safety measures outlined in this and your other ITW Ransburg System and Component Manuals are vital. Failure to observe them may cause or contribute to one or more of the hazards outlined in this safety section.
- ITW Ransburg fluid delivery equipment and systems are pressurized. Read the instructions before operating and observe all safety advisories.

Copies of NIOSH publications are available from your regional NIOSH office or the U.S. Government Printing Office. NIOSH and OSHA regional offices can also provide information on the OCCUPATIONAL SAFETY AND HEALTH ACT, including questions on standards interpretations, voluntary compliance information, as well as provide copies of the *OSHA Standards, OSHA Act, Employee Rights Posting Notice and Publications*.

The available materials will be helpful in arriving at a program for safe operation. Local codes and authorities also have standards to be followed in the installation and operation of your equipment. Also, your insurance provider will be helpful in answering questions that arise in the development of your operating procedures.

Because any tool, if used improperly, can be dangerous, safety is ultimately the responsibility of the user. Safe use of ITW Ransburg equipment, therefore, is the responsibility of those who use it. Each user should examine their own operation, develop an appropriate safety program and ensure that the correct procedures are followed. ITW Ransburg hopes that the information it provides is helpful to the user in establishing such a program.

It is most important that operating, maintenance, and supervisory personnel understand the safety requirements. Appropriate ITW Ransburg safety and technical literature and signage is available upon request. Most ITW Ransburg safety signage is available in Spanish and French. In addition to the available cards, labels, brochures, and service manuals, the user should consult other standards and recognized safety authorities such as the NFPA, OSHA, and NIOSH.

Copies of NFPA bulletins are available at a nominal cost from:

National Fire Protection Association  
Batterymarch Park  
Quincy, MA 02269

## FIRE PROTECTION

Where flammable or combustible materials are handled, normal fire protection measures are required. These include proper storage of flammables and the proper disposal of waste, plus ready access to appropriate fire extinguishing equipment. For details, consult the recommended NFPA Bulletins, your local fire codes, local equipment standards and the OSHA Act of 1970 as well as, your insurance provider's recommendations.

Many application for ITW Ransburg products, such as airless spraying systems, may generate static voltage which can produce an ignition capable spark. In such applications, all components of the fluid delivery system, as well as the target object, must be properly connected to a proven, true earth ground.

## PERSONNEL

All personnel should read and understand local codes, appropriate NFPA Bulletins, OSHA Act of 1970, and this Safety Manual.

## TRANSFERRING FLAMMABLE FLUID

Ground **MUST** be maintained during the transfer of flammable fluid from any source to any receiver! Whenever transferring flammable fluid, both source and receiving containers **MUST** be properly connected to a proven, true earth ground first and then to each other.

Ground **MUST** be maintained when inserting equipment (such as a pump assembly) into or removing it from a supply container of flammable fluid! Both container and equipment **MUST** be properly connected to a proven, true earth ground first and then to each other. Personnel executing such transfers **MUST** also be grounded.

### **CAUTION**

- Plastic containers due to their insulated nature should NOT be used with any and all spray operations. A charge can build up resulting in a fire (see NFPA-33, and NFPA-30).

## HIGH PRESSURE AIR

High pressure air can be dangerous and should **NEVER** be used against the body. It can blind, deafen and may even penetrate. If used for cleaning equipment, the user should wear safety glasses and other appropriate protection.

## COMPONENT RUPTURE

Pressurized systems require special concern because of the inherent explosion hazard. To minimize such hazard:

- The user should be familiar with *OSHA Standard 1910.169, Air Receivers and Eye and Face Protection 1910.133*.

- Never apply pressure greater than that recommended for the weakest component of the system.
- Never exceed the recommended temperature limit. To do so may weaken temperature sensitive elements of the device or the system and contribute to the hazard.

Each ITW Ransburg product is subject to the maximum pressure indicated in its product specifications (see the appropriate Service Manual or product label). To avoid rupture and injury, all components of the system, including but not limited to spray applicators, hose, hose connections, heaters and pumps, must have a maximum working pressure not less than the highest indicated component pressure limit.

## FLUIDS

The fluids (coating materials, chemicals, sealants, lubricants and/or solvents) used in the operation of ITW Ransburg equipment and/or systems employing ITW Ransburg equipment are neither manufactured nor marketed by ITW Ransburg, its Divisions or affiliates, and therefore ITW Ransburg, its Divisions and affiliates are excluded from any responsibility and/or responsibility and/or liability for any and all deleterious effects to persons and/or property that may result from the use of, or contact (direct or indirect, immediate or delayed) with these fluids.

Users of ITW Ransburg equipment and/or systems are, therefore most urgently recommended to extend every effort to obtain (from their fluid supplier) all pertinent and useful data about all fluids used in their ITW Ransburg equipment and/or system. Such information as: hazards to human, animal and plant life from ingestion, absorption, or inhalation of toxins; fire or explosion; and levels of hazard, both immediate and delayed; should be obtained by the user and disseminated to, and learned by all persons using such fluids. The user should be aware of all fluid characteristics, including compatibility with other fluids used and the system component materials, as well as

containment and handling requirements and should compile, reproduce and distribute such information to all appropriate personnel. ITW Ransburg further recommends that regular training sessions be conducted to acquaint personnel with the system and its use and to keep them up-to-date on new fluid and equipment characteristics and procedures.

## **HYDRAULIC INJECTION HAZARD**



### **CAUTION**

► All hydraulically fed applicators will cause serious injury if the sprayed or leaking fluid penetrates the skin! If you are injected, **SEEK EMERGENCY MEDICAL TREATMENT IMMEDIATELY** and advise medical personnel of the nature of the injury!

- **DO NOT** place any part of the body in the path of the spray!
- **DO NOT** point the applicator at any person!
- **NEVER** look at the applicator from the nozzle end!
- **Treat this applicator as you would a loaded weapon!**
- Hydraulic spray systems are capable of enough fluid pressure **TO PRODUCE A LETHAL INJECTION!**

### **Airless and Air Assisted Airless Spray Equipment Safety**

ALL personnel who operate, clean or maintain this equipment **MUST** read and thoroughly understand the appropriate ITW Ransburg service and safety manuals. Special care should be taken to insure that the **WARNINGS** and requirements for operating and servicing safely are followed. The user should be aware of and adhere to **ALL** local building and fire codes and ordinances and the

Occupational Safety and Health Act of 1970 (OSHA) prior to installing, operating and/or servicing this equipment.

**BEFORE applying pressure to the system, ALWAYS:**

- Follow the manufacturer's operating instructions and maximum pressure recommendations.
- Secure the trigger in the **OFF** position and check all pressure connections.
- Use grounded, high pressure fluid lines.
- Check that the pump is properly grounded.

**BEFORE disassembly of ANY part of the pressure system (including the applicator or its nozzle) ALWAYS:**

- Shut the pump **OFF**.
- Discharge the residual fluid and pressure from the applicator.
- Secure the trigger in the **OFF** position.

Follow these same three procedures anytime that operation is discontinued.

**DO NOT undertake any of the following UNTIL pressure is relieved from the ENTIRE system:**

- Loosen or remove the nozzle.
- Disassemble any part of the applicator.
- Loosen or disconnect any fluid line fittings.
- Disassemble any part of the pump.

Be sure that the power to the pump is **OFF** and the system is depressurized before undertaking **ANY** repair, maintenance, or adjustment.

If it is necessary to adjust or clean the nozzle on site, be sure that it is aimed away from all personnel

so that it may discharge safely if there is residual pressure in the system.

**DO NOT** use any replacement part that does not meet and is not authorized to manufacturer's specifications.

Correct packing or valve seal leaks **IMMEDIATELY**.

Frequently check the condition of all pressurized components, especially fluid lines. Replace worn hoses and parts before they fail.

If nozzle clogging occurs frequently, use a fluid filter.

Contact your ITW Ransburg representative if you have any questions about safety or procedures.

## INSULATED FLUID SUPPLY

Where the product is part of the fluid supply system for a waterborne electrostatic system, personnel entering an insulated fluid supply enclosure **MUST FIRST** be sure that the system is **NOT** operating and that the Warning Light is **OFF!** After entering the enclosure, the grounding hood must be attached to the paint supply **BEFORE** any personnel contact is made. The grounding hook **MUST** be attached during all service and above all, during the addition of fluid to the supply container! When leaving the enclosure, the gate must be closed and secured. The warning light **MUST** be on whenever the system is operating. The integrity of the system ground **MUST** be inspected regularly and maintained.

## SAFE INSTALLATION

See that all elements of the system are correctly located, connected, and grounded. Position all auxiliary non-approved electrical apparatus, including but not limited to: High voltage power

supplies, fluid pumps, and air compressors, outside of hazardous locations. See the appropriate NFPA and/or OSHA guidelines for your application and equipment.

## SAFE OPERATION

If ANY symptom of improper operation occurs, suspend use of the unit until the problem has been diagnosed and corrected. See the appropriate Troubleshooting Guide of the product's service manual, or contact your ITW Ransburg representative.

Ground **MUST** be maintained when inserting a pump assembly into or removing it from a supply container of hazardous material! Both container and pump **MUST** be properly connected to a proven ground first and then to each other. Personnel executing such a transfer **MUST** also be grounded.

## SAFE MAINTENANCE AND SERVICE

Good housekeeping is essential to safe operation, see that it is maintained at all times. Cleanup and maintenance schedules should be established by the user, based on observations of the initial production operations. Maintenance and safety cards should be posted in clear view of the operator. Good housekeeping is also necessary to ensure quality work, eliminate rejects, and reduce service requirements.

Employ fire protection measures, including proper storage of flammables, cleaning solvents, and waste.

Never operate any equipment without the required or provided protective covers, screens, shields, or devices.

Never alter a system or its components without noting such changes on the appropriate documents, labels, and tags.

Before cleaning or servicing the equipment, turn the electrical power and the air and fluid pressures **OFF**. See that air and fluid pressures are appropriately relieved **BEFORE** opening or removing any part or component.

Flush the system on an appropriate schedule determined by the fluid being used. **ALWAYS** flush the system when changing from one fluid brand or formula to another. **ALWAYS** use the lowest pressure possible to flush the system (no more than 20 psi.).

## Cleaning Safety Requirements

Special care **MUST** be taken in cleaning electrostatic and coating installations. To clean your equipment and installation safely, you **MUST** follow these requirements:

1. **BEFORE** attempting to clean any equipment, ensure that the voltage to the electrostatic coating equipment is turned OFF and **CANNOT** be turned ON. A sign should be posted at the push-button switches to warn against turning the power on.
2. Make sure you know the location of fire extinguishing equipment and how it is operated **PRIOR** to commencing any cleaning operations. Such equipment should be inspected regularly to ensure it is in proper working order.
3. Attach a grounding cable to any high voltage atomizer or electrode during cleaning to protect against inadvertent energization of the coating equipment.
4. **ALL** personnel involved in cleaning the electrostatic installation **MUST NOT** wear shoes that insulate them from the grounded conductive floor of the spraying area. **ALL** personnel involved in cleaning operations **MUST** be grounded at all times.
5. **ALL** containers carried into the spray booth for use in cleaning the installation **MUST** be grounded at **ALL** times. Maintain solvents at the minimum amount required for the cleaning operation and only in approved type safety containers (see Item 11.).
6. Use only cleaning solvents that have a flash point above 100°F.
7. Use cleaning solvents that have no toxicity, whenever possible. Wear respiration devices whenever cleaning requires the use of toxic solvents.
8. Adequate ventilation **MUST** be provided in area where cleaning operations are being conducted. Spraying area ventilation equipment must be operated during cleaning operation to carry away solvent vapors that may be generated in cleaning.
9. Use only non-sparking tools for cleaning purposes.
10. Remove residue (scrapings and debris contaminated with the scrapings) from the premises **IMMEDIATELY**.
11. Place **ALL** rags or waste material impregnated with coating materials or solvents in fire-safe waste cans **IMMEDIATELY** after use. Such cans should have the approval of appropriate competent authorities, such as *Underwriters Laboratories* or *Factory Mutual Engineering Corporation*.
12. **DO NOT** immerse any portion of ITW Ransburg hand applicators in **ANY** liquid for **ANY** reason. Clean electrostatic hand applicators with a soft bristled brush and solvent. **SOME** parts of ITW Ransburg electrostatic hand applicators, such as *air caps* and *paint nozzles*, can be **REMOVED** from the applicators and soaked.
13. Wipe up or dry with air, **IMMEDIATELY**, any solvent that may be spilled during the course of cleaning operations.
14. **DO NOT** reconnect electrostatic coating equipment until after the cleaning operation has been completed and vapors generated in cleaning the spraying area have been removed by ventilation.

15. If any defect in the equipment is noted in cleaning operations, report the defect to supervisory or maintenance personnel **PRIOR** to the commencement of coating operations. **DO NOT** operate equipment suspected of being defective **UNTIL** equipment has been checked completely.

## PROTECTIVE COVERINGS FOR NYLON FLUID LINES

When the coating materials are heated it is necessary to use a fluid tubing such as nylon which has a higher melting point than the polyethylene tubing which is normally provided with TURBODISK®, TURBOBELL® and R-E-A® Automatic Systems. Since the nylon tubing has less electrical strength than a polyethylene tubing the nylon tube may pinhole when conductive coatings are used.



### WARNING

- Pinholing in fluid tubing **CREATES A HAZARDOUS CONDITION.**

To prevent this problem from occurring it is recommended that a polyethylene outer tubing be placed over the nylon tubing to provide added electrical protection. Other safety precautions regarding fluid tubing are outlined in the "Fluid Line Routing for Automatic Installations" section of this Safety Manual.

If nylon tubing is being used for any of the fluid lines please consult your local ITW Ransburg distributor or the ITW Ransburg Technical Support for information on the proper size of polyethylene tubing that must be placed over the nylon tubing to provide additional electrical protection.

## FLUID LINE ROUTING FOR AUTOMATIC INSTALLATIONS

The polyethylene fluid line tubing used in ITW Ransburg installations is sample tested by ITW Ransburg Manufacturing at 125 kV for five minutes. Laboratory tests have been run on samples of this polyethylene tubing which have been abraded or kinked. They were tested at 140 kV for as long as eight hours without failure. However, damaged tubing used for fluid lines will eventually fail.

### ! WARNING

- Pinholing in fluid tubing **CREATES A HAZARDOUS CONDITION.**

The hazard can be avoided, however by a few simple precautions. As damage may occur during either installation or use, the user should exercise care that all fluid tubing, when installed, is held free from all sharp edges or rough surfaces. If stationary tubing is allowed to remain in contact with a sharp edge or a rough surface, the normal structural vibration and movement will eventually damage it. If the edge or surface is grounded, the hazard is compounded. If edges or rough surfaces are unavoidable, they should be padded or the tubing should be sheathed with ITW Ransburg approved, non-conductive sheathing or an insulation stand-off device should be used.

The fluid tube lengths should be more than is needed to allow for expansion and contraction, but should not be long enough to allow kinking or looping. Suspending from above is better than support from below as a method of routing.

When installing tubing, it should be laid in place. It should NEVER be pulled or dragged across surfaces or edges which might cause damage.

Where the tubing is subject to constant movement, as at a reciprocating unit, the slack should be the minimum needed and should be properly suspended from an insulating support. Reciprocating tubing is, of course, at such greater risk than stationary tubing.

### **! W A R N I N G**

- Tubing must **NEVER** be kinked, folded, scratched, pierced, perforated, abraded, mashed, smashed, or otherwise abused!
- Should a tube fail or show signs of potential failure, the **ONLY** ITW Ransburg approved repair is total replacement of that complete length of tubing. Slicing, taping, etc., is **PROHIBITED** and **NOT** ITW Ransburg approved.

### **! C A U T I O N**

- When attaching fittings to fluid lines, exercise great care that the nut is **NOT** **OVERTIGHTENED**. Excessive torque on the nut will cause the ferrule to cut into the tube causing an electrical stress point which will cause premature failure of the tube. The nut should be snug and secure, but not over tight.

### **! W A R N I N G**

- The following table is for maximum rated pressures at the given temperature regarding Teflon tubing:

TUBING SIZE	RATED PRESSURE	TEMPERATURE
1/2" OD X .375" ID PFA Teflon	165 psig	75° F (24° C)
	150 psig	100° F (38° C)
	115 psig	150° F (66° C)
	85 psig	200° F (93° C)
3/82" OD X .250" ID PFA Teflon	230 psig	75° F (24° C)
	210 psig	100° F (38° C)
	165 psig	150° F (66° C)
	120 psig	200° F (93° C)
1/4" OD X .156" ID PFA Teflon	270 psig	75° F (24° C)
	245 psig	100° F (38° C)
	190 psig	150° F (66° C)
	140 psig	200° F (93° C)

A regular schedule of inspection should be established by the user to check the condition, routing and connections of all tubing, with special attention to pinholing at points where the tubing is in close proximity to an electrically grounded component.

**ALL ROUTING TECHNIQUES SHOULD  
BE APPROVED BY AN ITW RANSBURG  
REPRESENTATIVE!**

## **NOTES**

# SOLVENT HAZARDS

## GENERAL

### ! WARNING

#### ► EXPLOSION HAZARD

- A hazardous situation may be present in your coating system! Halogenated Hydrocarbon solvents can cause an explosion when used with aluminum components in closed (pressurized) fluid system (pump, heaters, filters, valves, spray applicators, tanks, etc.).
- THE EXPLOSION COULD CAUSE SERIOUS INJURY, DEATH, AND/OR SUBSTANTIAL PROPERTY DAMAGE.
- Cleaning agents, coatings, paints, etc., may contain Halogenated Hydrocarbon solvents. Some ITW Ransburg equipment includes aluminum components and will be affected by Halogenated Hydrocarbon solvents.

- Equipment Capable of Withstanding Pressure:

When HHC solvents contact aluminum or galvanized parts inside a closed container, such as a pump, spray applicator, or fluid handling system, the chemical reaction can, over time, result in a build-up of heat and pressure, which can reach explosive proportion.

When all three elements are present, the result can be an extremely violent explosion. The reaction can be sustained with very little aluminum or galvanized metal; any amount of aluminum is too much.

The reaction is unpredictable. Prior use of an HHC solvent without incident (corrosion or explosion) does not mean that such use is safe. These solvents can be dangerous along (as clean-up or flushing agents) or when used as a component of coating material.

There is no known inhibitor that is effective under all circumstances. Furthermore, the mixing of HHC solvents with other materials or solvents, such as MEK, alcohol and toluene, may render the inhibitors ineffective.

The use of reclaimed solvents is particularly hazardous. Reclaimers may not add any inhibitors, or may add incorrect amounts of inhibitors. Also, the possible presence of water in reclaimed solvents could feed the reaction.

Anodized or other oxide coatings cannot be relied upon to prevent the explosive reaction. Such coatings can be worn, cracked, scratched or too thin to prevent contact. There is no known way to make oxide coatings, or to employ aluminum alloys, which will safely prevent the chemical reaction under all circumstances.

## HAZARD EXPLANATIONS

There are three elements of the Halogenated Hydrocarbon (HHC) solvent hazard. These elements are:

- The Presence of HHC Solvents:  
1-1-1 Trichloroethane and Methylene Chloride are the most common of these solvents. However, other HHC solvents are suspect if used; either as part of paint or adhesives formulation, or for clean-up flushing.
- Aluminum or Galvanized Parts:  
Most handling equipment contains these elements. In contact with these metals, HHC solvents could generate a corrosive reaction of catalytic nature.

Some solvent suppliers promote HHC solvents for use in coating systems. The increasing use of HHC solvents is increasing the risk. Because of their exemption from many State Implementation Plans as Volatile Organic Compounds (VOC's) their low flammability hazard and their not being classified as a toxic or carcinogenic substances, HHC solvents are very desirable in many respects.

## ! W A R N I N G

- **TAKE IMMEDIATE ACTION!** Halogenated Hydrocarbon solvents are dangerous when used with aluminum components in a closed fluid system.

## ! W A R N I N G

- If you are now using a Halogenated Hydrocarbon solvent in pressurized fluid system having aluminum or galvanized wetted parts, **IMMEDIATELY TAKE THE FOLLOWING STEPS:**
  - Empty system, shut off, completely de-pressure in accordance with equipment instructions.
  - Remove equipment from service, disassemble in accordance with equipment servicing instructions.
  - Inspect all parts for corrosion and/or wear. Replace any damaged parts.
  - Thoroughly clean all parts of the equipment with a non-halogenated solvent and reassemble in accordance with equipment servicing instructions.
  - Flush equipment with non-halogenated solvent.
  - **DO NOT** reuse equipment with HHC solvents or with materials containing such solvents.
  - Material suppliers and/or container labels should be consulted to ensure that the solvents used are compatible with your equipment.

We are aware of no stabilizers available to prevent Halogenate Hydrocarbon solvents from reacting under all conditions with aluminum components in a closed fluid system.

**PLEASE DIRECT THIS IMPORTANT SAFETY INFORMATION** to the appropriate people in your organization such as general and production managers, paint line supervisors, and operators, as well as, purchasing agents, maintenance personnel, and others who may be concerned.

## HALOGENATED SOLVENTS DEFINED

*Any hydrocarbon solvent containing any of the following elements:*

Flourine (f) "-flour-"  
Bromine (Br) "-bromo-"  
Chlorine (C1) "-chloro-"  
Iodine (I) "-iodo-"

Examples (*not all-inclusive*):

### CHLORINATED SOLVENTS:

Carbon tetrachloride  
Orthodichlorobenzene  
Chloroform  
Perchloroethylene  
Ethylene dichloride  
**TRICHLOROETHANE**  
**METHYLENE CHLORIDE** -or-Trichloroethylene  
**DICHLOROMETHANE**  
Monochlorotoluene  
Monochlorobenzene

### FLOUROCARBON SOLVENTS:

Dichlorofluoromethane  
Trichlorofluoromethane

### BROMINATED SOLVENTS:

Ethylene dibromide  
Methyl bromine  
Methylene chlorobromide

### IODINATED SOLVENTS:

N-butyl iodide  
Ethyl iodide  
Methyl iodide  
Propyl iodide

Consult your material supplier to determine whether your solvent or coating contains Halogenated Hydrocarbon Solvents.

Contact ITW Ransburg or your ITW Ransburg representative for the following safety literature:

**DANGER - Explosion Hazard (HHC) LABEL** (for posting to warn of hazard.)

# HIGH PERFORMANCE THERMOPLASTIC BELL CUP PREVENTIVE MAINTENANCE

It is the user's responsibility to ensure proper maintenance of the atomizer bell at all times. Bell cup failure due to inadequate cleaning or handling will not be covered under warranty. The "Do Not" bullets listed are some examples of improper handling which could adversely affect performance or personnel safety and should not be attempted for any reason.

## Bell Cup Cleaning

Always verify that high voltage is turned OFF and that the atomizer bell is spinning before performing any type of color change or bell flush cleaning cycle.

To reduce the risk of fire or explosion, the solvents used for exterior cleaning must have flash points above 100°F (37.8°C). Since electrostatic equipment is involved, these solvents should also be non-polar.

Solvents used for equipment flushing should have flash points equal to or higher than those of the coating material being sprayed.

1. The atomizer bell will normally be fully cleaned during a bell flush cycle. Flushing should be done before any down time or break in production. A bell flush cycle may also be required while spraying batch parts of the same color. Verify that high voltage is OFF and that the atomizer bell is spinning before flushing through the bell.

2. If there are any remaining paint build up on any areas of the bell after flushing, the bell should be removed for hand cleaning (reference "Bell Cup Handling" in this section). The bell's leading edge, paint feed holes or slots, and serration cuts are some examples of areas for special attention.

3. Visually inspect the bell cup edge for signs of abrasion. If the edge is excessively worn or badly chipped as the result of a collision with a part, replace the cup immediately.

4. Soaking the bell cup in solvent will not aid in loosening or removing paint build up! The bell should be dipped in an appropriate solvent or the solution may be allowed to flow over and into the bell while cleaning.

5. Use a soft bristle brush dipped in solvent to remove paint build up from the serration cuts, paint feed holes or slots, and external and internal surfaces of the bell. With a light source shinning into the rear of the bell, any contamination in the paint feed holes will be easily seen when viewed from the front face.

6. A soft, lint free rag dampened with solvent may be used to remove any paint residue from the external and internal surfaces of the bell.

7. After removing all paint build up or residue, rinse the bell in clean solvent and blow dry.

8. Before reinstalling the bell onto the shaft, check the mating surfaces of the thread and taper for any paint build up or residue. Also, check the shaft plug, fluid tube outside diameter, and the shaft bore for any further paint build up. These surfaces should be cleaned before installing the bell.

9. Be sure to install the provided shaft plug, Part Number: RPM-76-1 or 77790-00, into the shaft prior to installing the bell cup.

Install and tighten the bell according to the Atomizer service manual.

## Bell Cup Testing (Non-Rotating)

Check bell cup voltage using ITW Ransburg Test Meter Kit, Part Number: 76652-01 or 76652-04. Verify that the output voltages have not varied much from the setup standard. A drastic change in voltage can be an early indicator of a component or system problem.

The following data was collected under ideal lab conditions using a clean atomizer and an unloaded fluid delivery system.

The following data is for use with the RMA-101 Aerobell 33R Atomizers:

The output voltage measured at the bell will normally range between 91% and 97% of the kV setpoint displayed at the control unit.

The following data is for use with the Aerobell 33 Atomizers:

The output voltage measured at the bell will normally range between 85% and 91% of the kV setpoint displayed at the control unit.

## NOTES

## Bell Cup Handling

Always verify that high voltage is turned OFF and the atomizer bell has stopped spinning before performing any type of handling maintenance.

# OPERATOR / MAINTENANCE

## \*\*\*WARNINGS\*\*\*



**Do not** attempt to hold a rag or a gloved hand against the bell edge to stop or slow down a rotating bell.



**Do not** use ultrasonic devices to clean the atomizer bell cup.



**Do not** attempt to clean the bell edge while the bell is rotating.



**Do not** use ammonia solutions or reclaim solvent containing d-Limonene to clean the bell cups.



**Do not** use sharp or abrasive materials to clean the bell, which will scratch or damage the plastic bell.



**Do not** use the bell cup to spray coatings containing N-methyl pyrrolidone.



**Do not** use sharp or abrasive materials to clean the bell, which will scratch the semi-conductive coating on the surface of the bell.



**Do not** use N-methyl pyrrolidone to clean the bell cup.



**Do not** attempt to place a high voltage probe on the bell edge unless rotation is fully stopped.



**Do not** reuse an atomizer bell that shows signs of damage such as nicks, heavy scratches, dents, or excessive wear (defined under "Bell Cup Cleaning").

**SAFETY TRAINING CHECK LIST**

Customer: \_\_\_\_\_ Job#: \_\_\_\_\_

Location: \_\_\_\_\_

**DATE COMPLETED**

1. Safety Signs Posted \_\_\_\_\_
2. Safety Manual Given to Customer Operations and Safety Personnel \_\_\_\_\_
3. System Safety
  - A. Grounding
    1. Parts \_\_\_\_\_
    2. Personnel \_\_\_\_\_
    3. Objects in Spray Area \_\_\_\_\_
    4. Coating Material / Powder Feed System \_\_\_\_\_
    5. Grounding Hook \_\_\_\_\_
    6. Isolated system (explain requirements) \_\_\_\_\_
  - B. Fire Extinguishing / Fire Detection Equipment
    1. Manual \_\_\_\_\_
    2. Automatic \_\_\_\_\_
    3. UV Detection System \_\_\_\_\_
  - C. Mechanical Hazards
    1. Rotating Atomizers \_\_\_\_\_
    2. Pump Gears \_\_\_\_\_
    3. Reciprocators / Motion Machine \_\_\_\_\_
    4. Rolling Booth (Powder ONLY) \_\_\_\_\_
  - D. Housekeeping
    1. Spray Area \_\_\_\_\_
    2. Equipment \_\_\_\_\_

Customer Personnel Trained:

---

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Installation Supervisor: \_\_\_\_\_

Customer Safety Director: \_\_\_\_\_

**SAFETY ADVISORY CHECK LIST**

Attention: \_\_\_\_\_

Date: \_\_\_\_\_

Company: \_\_\_\_\_

Street Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

The following unsafe conditions were noticed during my visit to your facility and need to be corrected immediately.

Solvents stored in ungrounded containers \_\_\_\_\_

Solvents stored in non-safety container \_\_\_\_\_

Equipment being flushed with high voltage "ON" \_\_\_\_\_

Parts too close to atomizer \_\_\_\_\_

Parts sparking due to poor grounding \_\_\_\_\_

Personnel being shocked due to (please check):

a. Insulated shoes \_\_\_\_\_

b. Wearing gloves \_\_\_\_\_

c. Ungrounded Objects \_\_\_\_\_

Using dirty work holder \_\_\_\_\_

Personnel handling electrostatically charged (isolated) system \_\_\_\_\_

Improper interlocks \_\_\_\_\_

Spraying flammable paints in waterborne (isolated) system \_\_\_\_\_

Power supplies / control equipment located in hazardous area \_\_\_\_\_

Misusing electrostatic equipment \_\_\_\_\_

Insufficient fire protection \_\_\_\_\_

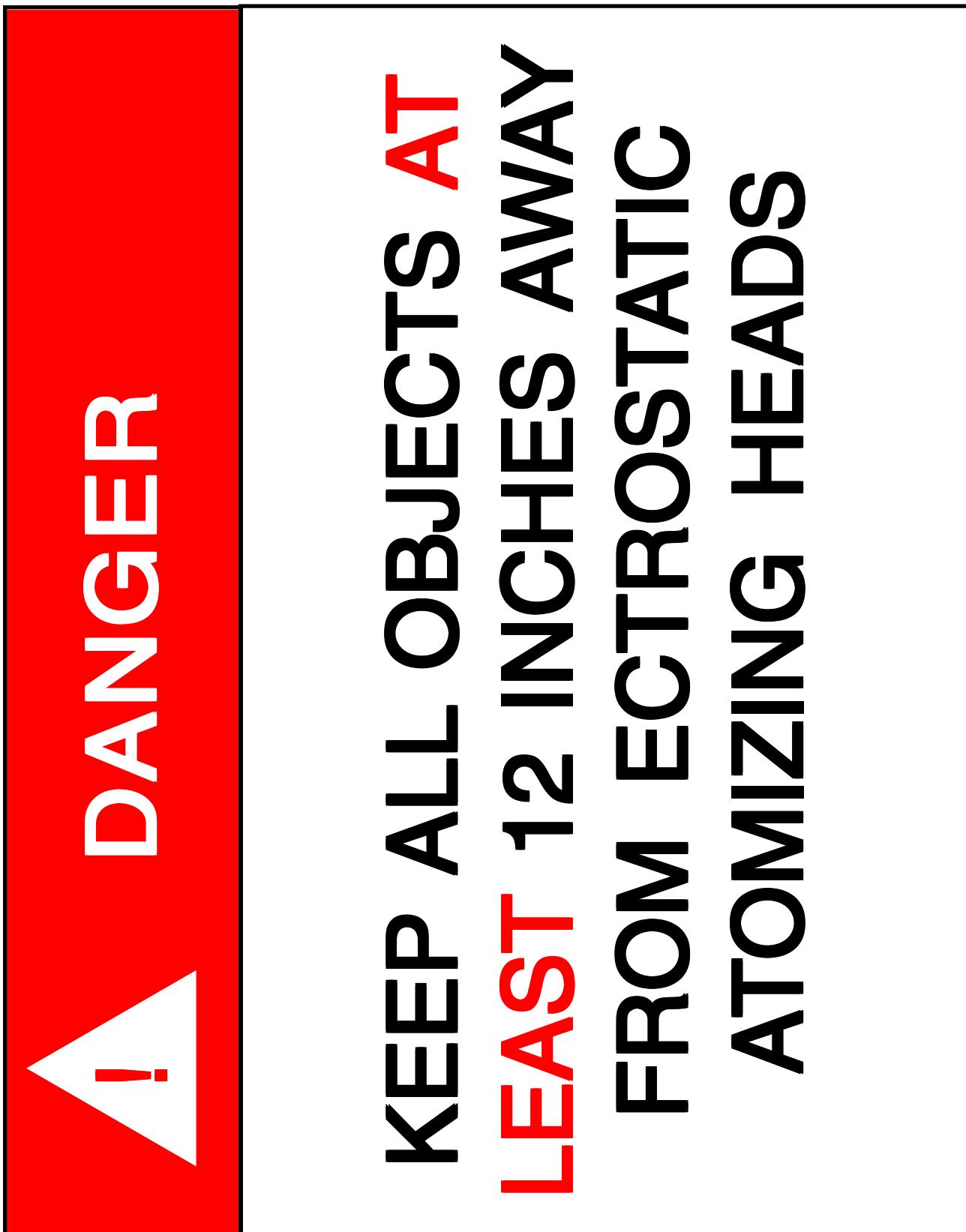
Other, explain: \_\_\_\_\_

ITW Automotive Finishing

Representative's Name (Printed): \_\_\_\_\_

Representative's Signature: \_\_\_\_\_

## SAFETY SIGNS/POSTERS/LABELS



ITW Ransburg Industrial Technical Service: 800/ 233-3366  
ITW Automotive Technical Service: 800/ 626-3565  
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# DANGER

## FIRE HAZARD!



### IN SPRAYING AREA



#### NO SMOKING

#### NO MATCHES



#### NO OPEN LIGHTS



# DANGER

**SHOCK**



**HAZARD!**

**HIGH**

**VOLTAGE**



# CAUTION

## CLEANING SAFETY REQUIREMENTS

**Special care must be taken in cleaning electrostatic equipment and coating installations. To clean your equipment and installation safely, you must follow these requirements:**

1. **BEFORE** attempting to clean any equipment, ensure that the voltage to the electrostatic coating equipment is turned "OFF" and **CANNOT** be turned "ON". A sign should be posted at the push-button switches to warn against turning the power on.
2. Make sure you know the location of fire extinguishing equipment and how it is operated prior to commencing any cleaning operations. Such equipment should be inspected regularly to ensure it is in proper working order.
3. Attach a grounding cable to any high voltage atomizer or electrode during cleaning to protect against inadvertent energization of the coating equipment.
4. All personnel involved in cleaning the electrostatic installation must **NOT** wear shoes that insulate them from the grounded conductive floor of the spraying area. All personnel involved in cleaning operations must be grounded at all times.
5. All containers carried into the spray booth for use in cleaning the installation must be grounded at all times. Maintain solvents at the minimum amount required for the cleaning operation and only in approved type safety containers (see Item 11 below).
6. Use only cleaning solvents that have a flash point above 100°F.
7. Use cleaning solvents that have no toxicity, whenever possible. Wear respiration devices whenever cleaning requires the use of toxic solvents. Avoid skin to solvent contact.
8. Adequate ventilation must be provided in areas where cleaning operations are being conducted. Spraying area ventilation equipment must be operated during cleaning operations to carry away solvent vapors that may be generated in cleaning.
9. Use only non-sparking tools for cleaning purposes.
10. Remove residue (contaminated scrapings and debris) from the premises immediately.
11. Place all rags or waste materials impregnated with coating materials or solvents in fire-safe waste cans immediately after use. Such cans should have the approval of appropriate competent authorities, such as Underwriters Laboratories or Factory Mutual Engineering Corporation.
12. **DO NOT** immerse any portion of ITW Ransburg applicators in any liquid for any reason. Clean electrostatic applicators with a soft bristled brush and solvent. Some parts of ITW Ransburg electrostatic applicators, such as air caps and paint nozzles, can be removed from the applicators and soaked.
13. Wipe up or dry with air, immediately, any solvent that may be spilled during the course of cleaning operations.
14. **DO NOT** reconnect electrostatic coating equipment until after the cleaning operation has been completed and vapors generated in cleaning the spraying area have been removed by ventilation.
15. If any defect in the equipment is noted in cleaning operations, report the defect to supervisory or maintenance personnel prior to the commencement of coating operations. **DO NOT** operate equipment suspected of being defective until equipment has been checked completely.



# CAUTION

## HANDLING COATING MATERIALS SAFELY! Automatic Systems

### **WARNING!**

Be sure that all coating material containers in the electrostatic spray system are grounded (and therefore discharged) before any work is done around them, such as: adding coating material or solvent, removing coating material, or stirring the contents.

1. All coating material containers should be treated as if they can become charged. Metallic (electrically conductive) containers must be used as coating material containers, and all portions of such containers should be grounded during use. A grounding wire should be examined daily to ensure that it is grounded.
2. Some coating materials in use are so conductive that the coating material container must be put on an insulated stand and left ungrounded in order for the system to operate. User should attempt to use coating materials which are not so conductive, where possible.

### **WARNING!**

Special care should be taken in operating insulated systems. The high voltage to the electrostatic equipment must be turned OFF and the coating material container grounded before any work is done around the coating material container in such a system.

1. A grounding device should be kept adjacent the container for such use. Care should be made until sufficient time has elapsed after the high voltage is turned off that any electrical charge on the container has dissipated. The grounding device should be fastened to the container near its base, away from the opening of the container. Fastening the grounding device away from the opening will reduce the likelihood that it will be dislodged during work with the coating material in the container, and will locate any spark that may occur as the grounding device is fastened to the container away from the opening of the container where the solvent vapors are most dense. In addition, the coating material container or any pump or coating material supply equipment associated with the use of such conductive coating materials should be located in an area that is well ventilated and where personnel cannot inadvertently approach them.
2. The erection of suitable physical barriers to prevent such inadvertent approach is recommended and is the responsibility of the user.
3. Warning signs (such as this Caution sign) should be posted in close proximity to the coating materials container, the pump and coating material supply equipment.



## CAUTION

### SAFETY REQUIREMENTS!

#### On-The-Job Safety Requires that YOU Follow These Simple Requirements!

##### **GROUNDING:**

ALL conductive objects in the spray area **MUST** be grounded, including (but not limited to) the following:

- |  |                             |                 |
|--|-----------------------------|-----------------|
| • spray booth  | • booth floor               | • conveyor      |
| • workholder(s)/hook(s)  | • solvent containers        | • workpieces    |
| • applicator handles / supports  | • loose, conductive objects | • ALL personnel |
| • power supply / control panel (these <b>MUST</b> be located OUTSIDE the spray area) |                             |                 |

##### **WARNING!**

1. **DO NOT** cover the floor with **ANY** insulating material.
2. **DO NOT** wear insulating gloves (**UNLESS** the palms have been cut out to allow bare skin contact with the equipment). Gloves containing conductive fibers are acceptable. If gloves are worn for chemical safety, grounding wrist straps may be connected from the operator's wrist to the applicator assembly.
3. **DO NOT** wear insulating shoes.
4. ALL containers **MUST** be properly grounded during the transfer of flammable material.
5. Where operating conditions require the coating material container to be placed on an insulated stand, the high voltage **MUST** be OFF and the container **MUST** be grounded while **ANY** person is near it. (Also see ITW Ransburg Caution Sign, **HANDLING COATING MATERIALS SAFELY**.)

##### **FLAME, FLAMMABLES, AND SPARKS:**

1. Flames and sparks must **NEVER** be allowed in the spray area.
2. **ONLY** the **MINIMUM** necessary flammable liquid may be allowed in the spray area and **ONLY** in approved, grounded containers. (A maximum of one gallon of solvent per container).
3. Functioning, correctly maintained fire extinguishing equipment **MUST** be available in the spray area.
4. The high voltage **MUST** be OFF during the transfer (or stirring) of flammable liquids.

##### **DISTANCE FROM GROUND:**

1. When using listed resistive solvent base atomizers, the applicator target distance may be as close as 0" to 12" to grounded objects. When using non-resistive or waterborne atomizers, the applicator to ground distance **MUST** be no closer than the stated minimum safe distance for that atomizer. (See the applicator service manual.)

##### **HOUSEKEEPING:**

1. Good housekeeping **MUST** be maintained at **ALL** times.
2. Keep **ALL** hooks and work holders free of accumulated coating material. (Strip and clean them frequently.)
3. As often as it is needed, clean **ALL** coating material accumulation **OFF** of the applicator barrel and/or insulator using a non-polar solvent. (Refer to the literature, "**Technical Supplement for All Products - Paint & Solvent Specifications and Viscosity Conversion Charts**" section.)
4. Flush fluid lines into a grounded container or evacuation system, **NOT** onto the floor or walls.
5. The spray area **MUST** be clean and free of accumulated coating material.

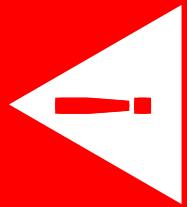
##### **EQUIPMENT:**

1. **ALL** equipment should be checked regularly for defects or malfunctions which might effect efficiency or safety. Safety problems **MUST** be corrected immediately.
2. Short circuit output currents **MUST** be within the manufacturers specified limits.
3. **NEVER** immerse assembled applicators in **ANY** liquid.
4. **ALWAYS** use equivalent (to original specifications) part and hose replacements. (Refer to the literature "**Technical Supplement for All Products - Volumetric Content of Hose or Tube**" chart.)

##### **PERSONNEL:**

1. Adequate ventilation **MUST** be provided during **ALL** coating, cleaning, maintenance, and/or service operations.
2. **ALL** power to and through the equipment **MUST** be OFF prior to cleaning, maintaining, or servicing it (within the spray area).
3. A functioning grounding cable and hook **MUST** be attached to the atomizing head of automatic applicators prior to touching, cleaning, maintaining, or servicing them. *NOTE: Automatic equipment booths **MUST** be equipped with a readily available grounding cable with hook.*
4. Keep **ALL** untrained and/or unauthorized personnel out of the spray area.
5. ALL operating (and associated) personnel **MUST** read and understand the appropriate operating, service, and safety instructions and the Occupational Safety and Health (OSHA) Standard, Section 1910.107.
6. The high voltage should be **OFF** except during actual coating operations.
7. **DO NOT** permit horseplay.

# DANGER

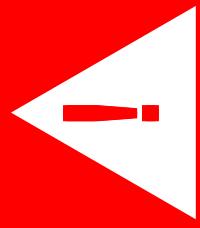


**NEVER DISCHARGE ANY FLUID  
FROM AN APPLICATOR INTO AN  
UNGROUNDED CONTAINER!**

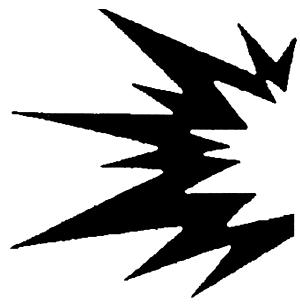
**Always turn off high voltage to applicator before  
collecting material in a grounded container.**

**To reduce vapor explosion hazard, all fluid containers  
in the spray area must be grounded, approved, safety  
containers and their capacity should be minimal.**

**DANGER**



## EXPLOSION HAZARD!



**DO NOT USE**  
1,1,1 - Trichlorethane, Methylene Chloride,  
or any other



**HALOGENATED HYDROCARBON (HHC)**  
Solvents in Pressurizable Fluid Systems  
Having Aluminum or Galvanized Wetted Parts.



# CAUTION

## AIRLESS AND AIR ASSISTED AIRLESS SPRAY EQUIPMENT SAFETY

ALL personnel who operate, clean or maintain this equipment **MUST** read and thoroughly understand the appropriate ITW Ransburg equipment manuals and safety literature. Special care should be taken to ensure that the **WARNINGS** and requirements for operating and servicing the equipment are followed. The user should be aware of and adhere to **ALL** local building and fire codes and ordinances and the Occupational Safety and Health Act of 1970 (OSHA) prior to installing, operating and/or servicing this equipment. If the appropriate literature is not available it may be obtained by contacting ITW Ransburg Electrostatic Systems.



### WARNING: INJECTION HAZARD

- ▶ BECAUSE OF THE INJECTION HAZARD INHERENT WITH ALL HIGH PRESSURE AIRLESS AND AIR ASSISTED AIRLESS (hydraulically fed) APPLICATORS, SPECIAL ATTENTION MUST BE PAID TO THE SAFETY CARDS, WARNING SIGNS AND SERVICE MANUAL NOTICES REGARDING THIS SUBJECT!
- ▶ DO NOT POINT THE APPLICATOR AT ANY PERSON.
- ▶ NEVER LOOK INTO THE BARREL OF THE APPLICATOR FROM THE FRONT (NOZZLE END)!
- ▶ NEVER trigger an airless or air assisted airless gun while it is aimed at a person. The hydraulic pressure may inject fluid into the flesh causing injury or death. If the fluid penetrates the skin, it **WILL** cause serious injury. Clothing, such as gloves will **NOT** provide protection! The system is capable of fluid pressure high enough to cause a LETHAL INJECTION! TREAT THE APPLICATOR AS YOU WOULD A LOADED WEAPON!

Before applying pressure to the system, **ALWAYS**:

- ▶ Follow the manufacturer's operating instructions and maximum pressure recommendations
- ▶ Secure the trigger in the **OFF** position and check all pressure connections
- ▶ Use grounded, high pressure fluid lines
- ▶ Check that the pump is properly grounded

Anytime that operation is discontinued **ALWAYS**:

- ▶ Shut the pump **OFF**
- ▶ Discharge the residual fluid and pressure from the applicator
- ▶ Secure the trigger in the **OFF** position

Follow these same three procedures before disassembly of **ANY** part of the pressure system (including the applicator or its nozzle).

**DO NOT** undertake any of the following until pressure is relieved from the entire system:

- ▶ Loosen or remove the nozzle
- ▶ Disassemble any part of the applicator
- ▶ Loosen or disconnect any fluid line fittings
- ▶ Disassemble any part of the pump

Be sure that the power to the pump is **OFF** and the system is depressurized before undertaking **ANY** repair, maintenance, or adjustment.

If it is necessary to adjust or clean the nozzle on site, be sure that it is aimed away from all personnel so that it may discharge safely if there is residual pressure in the system.

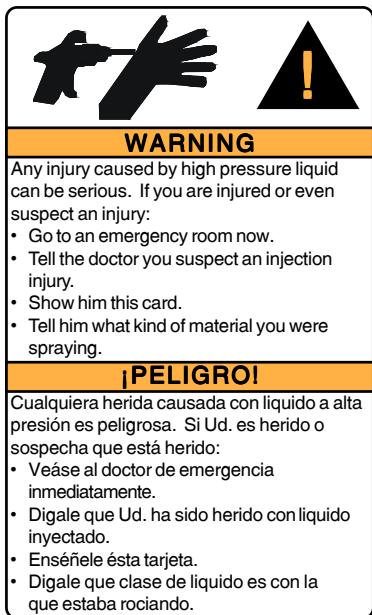
Only use genuine ITW Ransburg replacement parts.

Correct packing or valve seal leaks **IMMEDIATELY**.

Frequently check the condition of all pressurized components, especially fluid lines. Replace worn hoses and parts before they fail.

If nozzle clogging occurs frequently, use a fluid filter.

If you have any questions about safety or procedures, contact your ITW Ransburg Representative.



The seriousness of the wound depends on where the injury is on the body, whether the substance hit something on its way in and deflected causing more damage, and many other variables including skin microflora residing in the paint or applicator which are blasted into the wound. If the injected paint contains acrylic latex and titanium dioxide that damage the tissue's resistance to infection, bacterial growth will flourish. The treatment that doctors recommend for an injection injury to the hand includes immediate decompression of the closed vascular compartments of the hand to release the underlying tissue distended by the injected paint, judicious wound debridement, and immediate antibiotic treatment.

NATIONAL SPRAY EQUIPMENT MANUFACTURERS ASSOCIATION

ITW Ransburg

Form SL-83-01.1 09/07

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# WARRANTY POLICIES

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## LIMITED WARRANTY

**ITW Ransburg** will replace or repair without charge any part and/or equipment that fails within the specified time (see below) because of faulty workmanship or material, provided that the equipment has been used and maintained in accordance with ITW Ransburg's written safety and operating instructions, and has been used under normal operating conditions. Normal wear items are excluded.

### THE USE OF OTHER THAN ITW RANSBURG APPROVED PARTS VOIDS ALL WARRANTIES.

**SPARE PARTS:** One hundred and eighty (180) days from date of purchase, except for rebuilt parts (any part number ending in "R") for which the warranty period is ninety (90) days.

**EQUIPMENT:** When purchased as a complete unit, (example: guns, power supplies, control units, etc.), is one (1) year from date of purchase.

**WRAPPING THE EQUIPMENT IN PLASTIC, SHRINK-WRAP, ETC., WILL VOID THIS WARRANTY.**

ITW RANSBURG'S ONLY OBLIGATION UNDER THIS WARRANTY IS TO REPLACE PARTS THAT HAVE FAILED BECAUSE OF FAULTY WORKMANSHIP OR MATERIALS. THERE ARE NO IMPLIED WARRANTIES NOR WARRANTIES OF EITHER MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ITW RANSBURG ASSUMES NO LIABILITY FOR INJURY, DAMAGE TO PROPERTY OR FOR CONSEQUENTIAL DAMAGES FOR LOSS OF GOODWILL OR PRODUCTION OR INCOME, WHICH RESULT FROM USE OR MISUSE OF THE EQUIPMENT BY PURCHASER OR OTHERS.

### EXCLUSIONS:

If, in ITW Ransburg's opinion the warranty item in question, or other items damaged by this part was improperly installed, operated or maintained, ITW Ransburg will assume no responsibility for repair or replacement of the item or items. The purchaser, therefore will assume all responsibility for any cost of repair or replacement and service related costs if applicable.

## **MANUAL CHANGE SUMMARY**

This manual was published to supercede the following list of Safety Bulletins (making them obsolete): SL-77-01.5, SL-79-01.1, SL-80-08.2, SL-81-08.2, SL-84-02, IL-247-A, and IL-304-B to make the following changes/updates:

1. To publish into one Safety Manual, that list all present and updated safety information, safety signs, posters (All Manual Sections). This is to be used as a reference guideline of general safety and issues pertaining to this subject matter, used in conjunction with all ITW Ransburg products and their corresponding Service Manuals.

**Service Manual Price: €25.00 (Euro)**  
**\$30.00 (U.S.)**

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## **Manufacturing**

1910 North Wayne Street  
Angola, Indiana 46703-9100  
Telephone: 260/665-8800  
Fax: 260/665-8516

## **Technical/Service Assistance**

Automotive Assembly and Tier I  
Industrial Systems  
Ransburg Guns  
[www.itwransburg.com](http://www.itwransburg.com)

Telephone: 800/ 626-3565 Fax: 419/ 470-2040  
Telephone: 800/ 233-3366 Fax: 419/ 470-2071  
Telephone: 800/ 233-3366 Fax: 419/ 470-2071

**Technical Support Representative will direct you to the appropriate telephone number for ordering Spare Parts.**