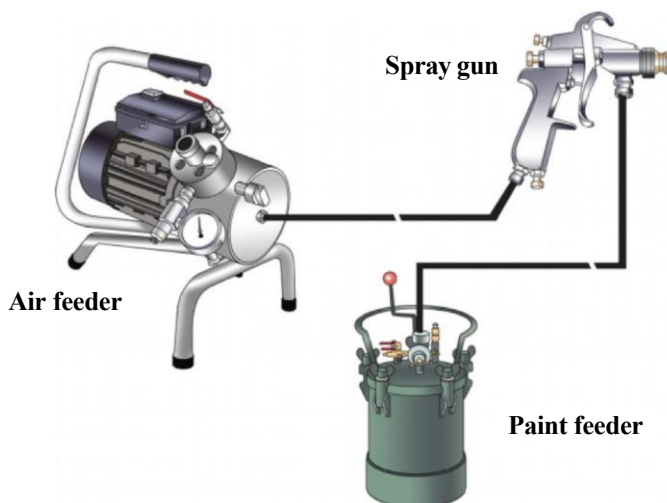




What is an airless spray pump?

Instead of spraying paint by discharging compressed air, paint spraying using an airless spray pump boosts the air pressure from the air compressor dozens of times, applies pressure directly to the paint, and discharges it through a narrow nozzle, thereby spraying the paint particles into fine particles. Unlike the air spray method, paint and air are not mixed; it can prevent defects in the paint film or paint blowing due to moisture or grease generated from compressed air. A paint film 2 to 3 times thicker can be obtained. In addition, the quality of the painting is excellent, even in corners, and it is widely used for painting ships with large or thick painting areas.



[Principle of spray painting]



[Pneumatic airless spray pump]



Work Procedure and Major Hazards (examples)

Guide for Safe Work
with Airless Spray
Pumps



Major hazards

Fire/Explosion

- Risk of fire or explosion due to electrical sparks while using non-explosion-proof electrical machinery (general flashlights, lights, etc.)
- Risk of fire or explosion due to static sparks during spray painting work in an enclosed space inside a block
- Risk of suffocation or poisoning by organic solvents while working without wearing a gas mask
- Risk of fire and explosion due to simultaneous performance of hot work around the spray workshop

Fall

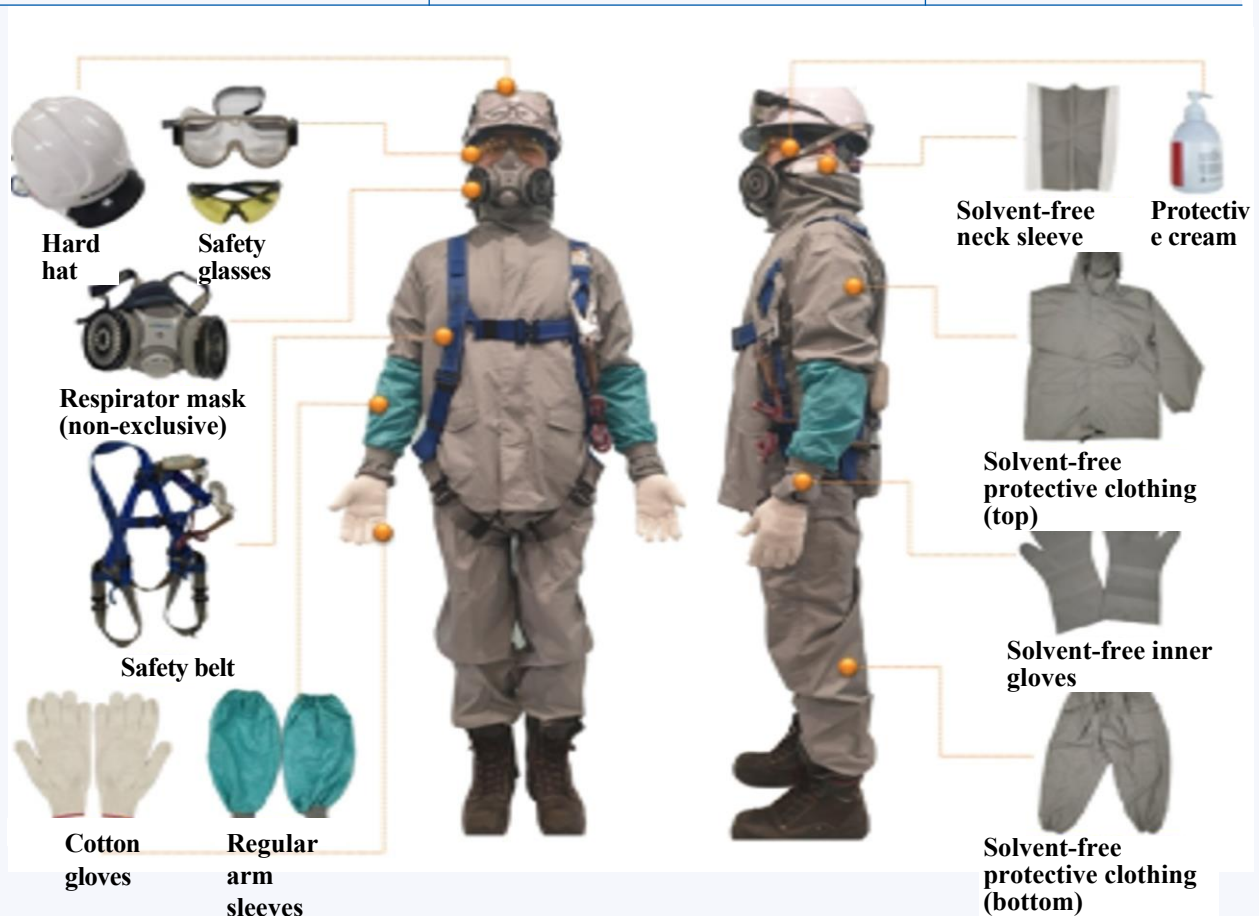
- Risk of falling while moving blocks up or down for painting

Work procedure

① Preparation → ② Locate and inspect the airless pump → ③ Paint → ④ Finish and organize

① Preparation

Harms/Hazards	Improvement measures	Relevant codes
Risk of disasters such as falls and poisoning due to wearing defective protective equipment	- Inspect protective equipment, replace it if defective, and check the wearing condition. - Hard hat, safety glasses, respirator mask, safety belt, protective clothing (top and bottom), sleeves, gloves, etc.	Articles 32 to 34 of the Rules on Occupational Safety and Health Standards (Provision of Protective Equipment, etc.)



Standard attire for solvent-free workers

② Transport and inspect an airless pump

Harms/Hazards	Improvement measures	Relevant codes
Risk of collision between the pump and workers due to the pump getting caught on the floor while being transported	- Remove obstacles from the path to transport the pump. - Work as a team of two when moving the pump.	Article 22 of the Rules on Occupational Safety and Health Standards (Installation of Passages)
- Risk of collision between surrounding workers and the pump derailed from a simple lift during loading or unloading - Risk of the pump falling due to bolt disconnection while being towed with a hook	- Control access to the surrounding area when loading and unloading or lifting the pump from the simple lift. - Tow after checking the tightness of the bolts securing the pump and hook. - Prepare and observe work plans for handling heavy objects.	Article 38-1 (11) (Work Plan for Handling Heavy Objects), Article 39 (Work Leader), Article 40 (Signal) of the Rules on Occupational Safety and Health Standards
Risk of fingers pinched between parts during assembling or disassembling the pump	Check worker's hand position during pump assembly and disassembly and provide periodic on-site training.	-
Risk of workers being struck by the hose due to rupture of the air hose	- Before work, check the condition of the hose, including whether it is ruptured. - Be careful not to snag or bend the hose.	-
- Risk of collision with the nipple bouncing due to high pressure when connecting the air hose - Risk of contact with eyes due to leakage from connection hoses and nipples during testing	- Hold with both hands when connecting the air nipple. - Before testing, check the hose and nipple connections and wear safety glasses.	Articles 32 to 34 of the Rules on Occupational Safety and Health Standards (Provision of Protective Equipment, etc.)
Risk of accidents due to pump failure	- Check operating status before and periodically and replace if abnormal. - Do not use the machine until maintenance is complete.	Article 91 (Maintenance of Broken Machines, etc.) of the Rules on Occupational Safety and Health Standards
Risk of electric shock due to failure to ground the airless pump	Ensure the pump is grounded using a portable grounding pins, etc., and check the grounding condition before working.	Article 302 of the Rules on Occupational Safety and Health Standards (Grounding)



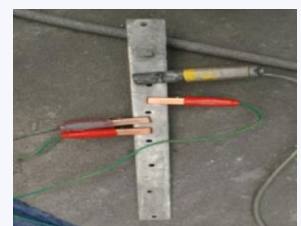
Transport an airless pump pins



Check the paint hose



Check for grounding



Using portable grounding



Work Procedure and Major Hazards (examples)

Guide for Safe Work
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Pumps



3

Painting

Harms/Hazards	Improvement measures	Relevant codes
• Risk of small airless pumps being tipped over	• Small airless pumps are lighter than large and medium-sized airless pumps; be careful of falling when moving.	Article 3 of the Rules on Occupational Safety and Health Standards (Prevention of Overturn)
• Risk of vehicle accidents when exceeding in-house speed limit	• When driving a vehicle, comply with in-house speed regulations (e.g., 30 km/h or less).	Article 98 of the Rules on Occupational Safety and Health Standards (Designation of Speed Limits, etc.)
• Risk of falling/crushing/collision due to malfunction of aerial work platforms	• Check equipment before work. • Do not arbitrarily disarm safety railings, overload prevention devices, or over-rise prevention devices.	Article 186 of the Rules on Occupational Safety and Health Standards (Measures such as Installation of Aerial Work Platforms)
• Risk of exposure to organic compounds during spraying and touch-up	• Wear respiratory protective equipment and protective clothing appropriate for the task, such as a respirator or ventilation mask.	Article 450 (Provision of Respiratory Protective Equipment, etc.), Article 451 (Provision of Protective Clothing, etc.) of the Rules on Occupational Safety and Health Standards
• Risk of suffocation due to non-operation of ventilation fan in confined space	• Check confined spaces and control access. • Establish a permit procedure for work in confined spaces and permit work only when safe conditions are confirmed, such as measuring oxygen and harmful gas concentrations. • Measure oxygen and harmful gas concentrations before work, before restarting after a temporary break, and frequently during work. • Operate ventilation fans before and during work as needed. • If harmful gases may enter the workspace, continue to ventilate while working.	Article 619 (Establishment and Implementation of Confined Space Work Program), Article 619-2 (Measurement of Oxygen and Harmful Gas Concentration), Article 620 (Ventilation, etc.), Article 622 (Access Control) of the Rules on Occupational Safety and Health Standards
• Risk of fire and explosion due to hot work around painting workshops	• Distribute a painting plan schedule and prohibit concurrent hot work near painting work. • If hot work is required after painting, prevent fire through ventilation, such as exhausting flammable gas. • In explosion-proof areas, use explosion-proof lighting, electrical machinery, and equipment.	Articles 239 to 243 (Prohibition of Use of Fire, etc., around Dangerous Substances, etc. - Fire Extinguishing Equipment), Article 231 (Places for Frequently Handling Flammable Liquids) of the Rules on Occupational Safety and Health Standards

③ Paint (cont'd)

Harms/Hazards	Improvement measures	Relevant codes
• Risk of falling or tipping due to poor illumination and visibility under insufficient lighting.	• Install lighting systems to comply with the illuminance standard of 150 lux or more for regular work and 300 lux or more for precision work.	Article 8 of the Rules on Occupational Safety and Health Standards (Illuminance)
• Risk of falling due to unsafe actions on scaffoldings without fastening safety belts.	• Before work, check whether workers are correctly wearing safety belts. • When moving or working, connect the safety belt to other stable structures.	Article 42 (Prevention of Falls), Article 44 (Equipment with Safety Belt) of the Rules on Occupational Safety and Health Standards



Working on an aerial work platform



Painting 1



Painting 2

Outline

Explosion due to flammable vapor during internal spray painting of the stern curved block mounted on the top of the trestle in the paint shop in the shipyard



Cause of the accident

- Electric sparks from non-explosion-proof lanterns act as the ignition source.
 - A spark was generated due to damage while operating a non-explosion-proof (general) lantern switch.
- Failure to install ventilation equipment in areas at risk of flammable vapor retention due to painting

Preventive measures

- Use explosion-proof electrical machinery in explosion-proof areas.
- Use explosion-proof electric machinery, work lanterns, portable lights, etc., for confined spaces.
- When painting the inside of a block, install a local ventilation system that can sufficiently remove flammable vapors.