Hot Air and Superheated Steam Worker Safety Guidlines

General guidelines only

Please read the specific equipment manual supplied with the specific model.

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Some Guidelines for Hot Air and Superheated Steam Worker Safety O MHI Inc.



General concepts about hot air and steam

MHI Hand-held devices can deliver Hot Air or steam depending on the Model

Both Air and Superheated steam can penetrate crevices that are difficult to clean using physical cleaning strategies.

VTA750-2GC : The temperature of air at the exit can exceed 800C.





The Equipment

- VTA Models and SaniZap Models
- VTA750-2GC Heavy duty, flameless air heater show can deliver almost 225 liters/min at 800C
- Superheated steam sanitation equipment can be a roll-along, backpack, or side-pack unit. The units contain a water reservoir, and the heat generator is located on the gun.

Potential risks of using this technology

- Hot air and steam-gas are both odorless, colorless gas and can cause skin burns.
- Both Superheated steam and high temperature air from the heater may cause dust or emission of harmful particles or gases if directed at an inappropriate surface.
- Superheated steam and high temperature air from the heater can heat surfaces quickly to high temperatures and the equipment can stay hot for sometime after use.



OSHA Considerations





https://www.osha.gov/laws-regs/regulations/standardnumber/1910



General concepts about the technology

Superheated steam (SHS) is steam that is given additional heat (energy) to become gas above the boiling point at a pressure. Superheated steam does not contain any mist or water droplets.

In contrast to saturated steam, a decrease in temperature will not lead to condensation unless the temperature decreases to the saturation point. Sometimes it is called "dry steam".

Superheated steam can penetrate crevices that are difficult to clean using physical drycleaning strategies.

General strategies to avoid injury



The Equipment

- Superheated steam temperature ranges from 125° to >800C
- Superheated steam sanitation equipment can be roll-along, back-pack, or side-pack unit.
- The units contain a water reservoir, and the heat generator is located on the gun.



Gloves

- Gloves must be worn while operating the hot air or steam equipment.
- Gloves need to be heat resistant AND waterproof to protect from burns.

Gloves



Source: southernlabware.com

X Do NOT wear later or nitrile gloves under the heat resistant gloves or by themselves because they can melt when exposed to superheated steam.

 Consult with the supplier of your heat and waterproof gloves to ensure they are fit to purpose.

Shoes

- Slip resistant footwear is needed to protect the worker from slips and trips.
- Shoes should be waterproof (eg. no cloth tennis shoes).
- Composite-toe or metatarsal shoes are necessary in the event of accidental rolling over or dropping of the equipment.
- Metatarsal guards are preferable to toe guards.

Hair restraint & protective apron or smock

- ✓ Hair should be restrained to avoid contact with the air or superheated steam gun.
- ✓ Ideally, a heat resistant and waterproof apron or smock water is recommended.





Source: Grainger.com



Personal protective equipment Hearing protection



Permissible Noise Exposures

Duration per day, in hours	Sound level dBA in slow response				
8	90				
6	92				
4	95				
3	97 100 102				
2					
11/2					
1	105				
1/2	110				
¹ / ₄ or less	115				

OSHA noise standard; Table G-16 at 29 CFR 1910.95(b)(2).

- \checkmark The hot air or steam equipment is noisy when in use, ear protection must be worn.
- \checkmark There are different options for ear protection: earplugs (foam and rubber) and earmuffs.

Personal protective equipment Hearing protection

Hearing protection equipment must be replaced as necessary.					
Why?	The foam seal on earmuffs flanges on rubber earplugs, and foam earplugs all lose their elasticity over time.				
	The headband on earmuffs can relax so they won't provide a snug fit.				
Other considerations	Foam plugs need to be replaced every day or two.				
	Do not remove hearing protection with dirty hands if they are expected to be re-used.				

Operating guidelines – Steam BACKPACK UNIT ONLY

- The unit should be held at a roughly horizontal level during use. Do not point the gun directly upward. Wands both flexible and rigid are available
- ✓ Optimal position is a 1-5 degree downward angle with an exit nozzle slightly lower than the center of the unit. This ensures water does not collect at the back of the gun.
- ✓ If angled positions are required during sanitation, continuously move the gun up and down to mitigate water collection at the back of the gun.
- ✓ This does not apply to the roll-along units because the heater is not in the gun itself.

Ergonomics

- ✓ The empty superheated steam backpack weighs 17 lbs altogether.
- Roll-along units mitigate stress from wearing the water vessel. The least amount of water necessary should be held in the back-pack unit's reservoir to mitigate this stress.
- \checkmark The roll-along unit gun weighs only 1.6 lbs alone.
- ✓ The gun on the backpack unit weighs 8.7 lbs alone.
- ✓ The VTA750-2GC weighs 10.2 lbs alone.
- The back-pack gun and VTA should be held away from the body as it becomes warm during operation. Workers can find it tedious or tiring to hold away from the body during operation.
- ✓ To mitigate that stress, workers should:
 - ✓ Take frequent breaks to interrupt repetitive tasks
 - ✓ Take breaks to stretch



https://ehs.stanford.edu/topic/ergonomics/safe-lifting

Operating guidelines –Air and **Steam**

There should be no blockage of air or steam Water should be always flowing through the steam device during operation. Failure to achieve this might result in overheating and damage to the unit.

The unit requires very little water per hour in operation.

Ensure at least 1 L of water is in the reservoir at the start of each use. Distilled water or filtered water is recommended. Tap water should not be used.







As a general rule <u>maintain at least</u> <u>3 ft of distance from the operator</u> when the VTA or SHS unit is in use.



Do not stand in front of the nozzle or nozzle extender.

- ✓ The equipment gun will become hot during use
- ✓ The gun requires up to 30 min to cool down after use
- ✓ Do not touch the gun without heat and/or waterproof gloves until at least 30 min after the equipment has been turned off



- ✓ Treated surfaces become hot.
- ✓ Treated surfaces require up to 15 min to cool (depending on material type, thickness, and treatment exposure).
- ✓ Do not touch treated surfaces within 15 min of treatment.





- ✓ Do not point the nozzle or extender tubes at any surface you do not intend to treat with hot air or superheated steam
- ✓ No "horseplay" when operating the VTA or superheated steam unit
- ✓ Do not point at flammable objects or those sensitive to deformation
- ✓ These objects could include:
 - ✓ Paper
 - ✓ Cardboard
 - ✓ Rubber
 - ✓ Chemicals
- ✓ Although objects may not immediately ignite, the risk of fire increases with exposure

Understand specific hazards when using steam or hightemperature air for specific purposes.

For example:

- Extreme care should be taken when stripping paint. The peelings, residue, and vapors may contain lead which is poisonous. Use all appropriate safety methods including adequate ventilation.
- ✓ Be aware that heat may be conducted to behind the work surface and ignite hidden material.
- ✓ Do not use the units near combustible materials, flammable liquids, or gases.
- Always treat high-temperature steam and air equipment with the same respect as any electrical tool, following all user instructions and precautions.
- ✓ Be aware of electrical hazards

High temperature exposure can damage human skin

SHS temperature is >150°C therefore the injuries can be irreversible

Sensation	Skin Color	Tissue Temperature		Process	Injury	
Numbness	White	deg. C	deg. F	Protein Coagulation	Irreversible	 Burns are classified as first, second, or third degree. A first-degree burn causes redness. Blistering is caused by a second-degree
	Mottled Red and White	68 64	72 162 68 64 60 140 56 52 48 44 111	Thermal Inactivation of Tissue Contents	Possibly Reversible	
Maximum Pain Severe Pain Threshold Pain	Bright Red Light Red	- 60 56 52 48			Reversible	
Hot Flushed Warm	Flushed	40 36	93	Normal Metabolism	None	burn. Charred, blackened or blanched skin are signs of a third-
		32	32		1 1055 -03	degree burn.

(2014)

Mitigation strategies if affected by hot air or steam

Seek professional, medical treatment for:

- All third-degree burns (call an ambulance)
- Second-degree burns involving more than one-fifth of the body
- Burns on the face, hands, feet, or genitalia

First aid treatment for burns involves:

- Relief of pain
- Infection prevention and treatment or prevention of shock
- Cooling in cold, still (not running) water or an ice pack

Use common sense in all situations. Maintain a well-stocked first aid kit and be familiar with first aid procedures. Being knowledgeable and prepared may be the smartest first step of all.

https://www.safetymanualosha.com/cuts-and-burns/

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