CLEAN surface

Designers & Manufacturers of Dry Ice Blasting Equipment

TRAINING MANUAL

CLEAN SURFACE

DRY ICE BLASTER SYSTEM CSL2000 (SMC Version)

System 2000 Operating Procedure

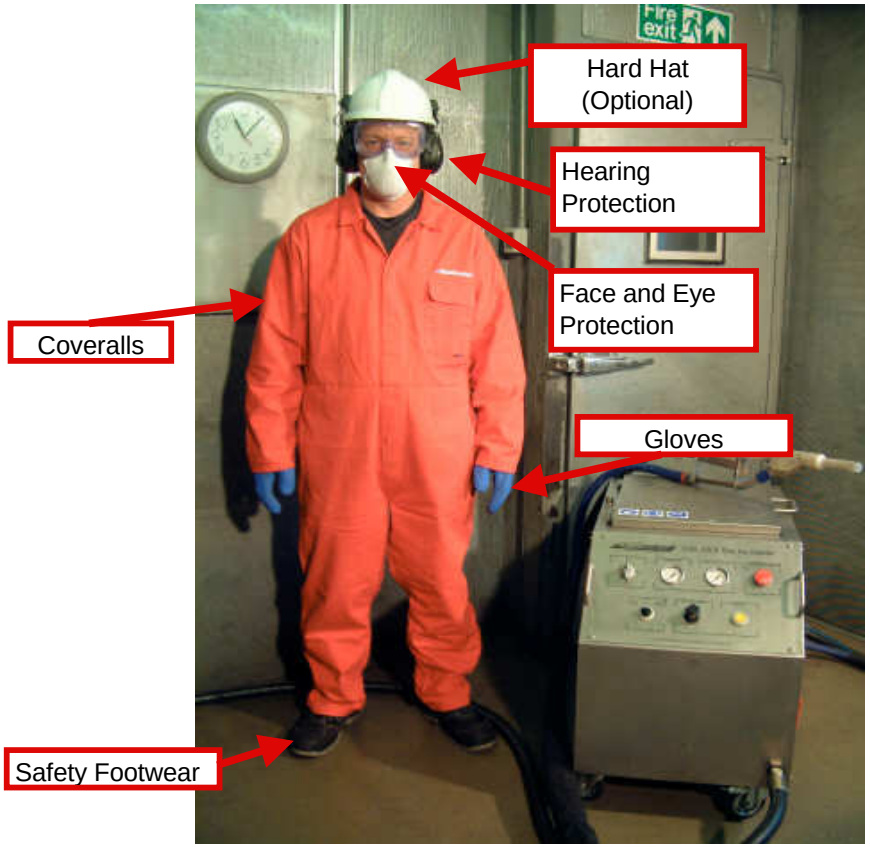
Element Name	**Important Information.**		Page 1 of 15

	Step N°	Main step	Key Point	Reason

The following pages are meant as a GUIDE only and the main Operating Manual MUST be referred to at all times.

System 2000 Operating Procedure

Element Name **PPE**



Step N°	Main step	Key Point	Reason
1	The minimum level of PPE to be worn whilst operating this machine and handling the dry ice are as follows:		
	Gloves	Non-absorbant and insulated.	
	Hearing Protection	Foam ear plugs to min. SNR 31 dB AND ear muffs to min.SNR 32 dB.	
	Eye Protection	Safety glasses / goggles Use a full face mask if solid debris is released during blasting.	
	Coveralls	Ensure sleeves are over glove cuffs	
	Safety Footware	Ensure trouser cuffs cover boot tops	
	Dust Mask	Use at all times	
	Additions (Hard Hat, High Vis Vest etc)	Additional PPE may be required subject to site conditions.	Consult the site managers for advice.

System 2000 Operating Procedure

Element Name **Pre Use Checks**

Key Switch = OFF

Emergency Stop = IN

Selector = ICE ONLY

Air Isolator Valve = OFF

	Step N°	Main step	Key Point	Reason
	1	Ensure that: Key Switch = OFF Selector = ICE ONLY Emergency Stop = IN Air Isolator Valve = OFF Air Supply Hose is NOT connected to the Compressed Air Main	Safety Handle Vertical	To ensure that the machine is in a safe condition prior to connecting and switching on the air supply.

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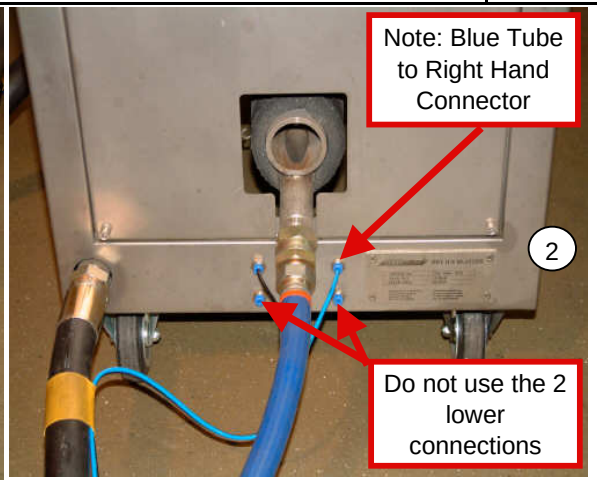
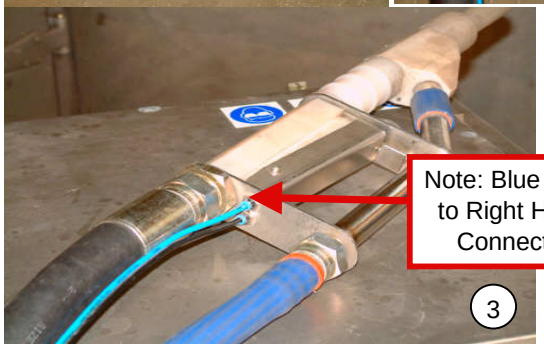
Element Name **Assembly**





Step N°	Main step	Key Point	Reason
1	Connect the air supply hose to the front connection on the machine. Fully tighten.	1" BSP Connection	To establish an air suppy to the machine.
2	Connect the blast hose assembly, as shown, to the rear of the machine. Fully tighten.	1" & 3/4" BSP Connection 2 x 4mm Push Fit Trigger Tubes	Connecting the blast hose assembly
	Note: Later models have colour coded bulkhead connectors on both the Blast Unit and the Nozzle. The left hand bulkhead is black.		
3	Connect the anti-static electrical connector at blaster and nozzle ends	Push and turn clockwise to lock in place	To eliminate static build up at nozzle and workpiece
4	Connect the blast hose assembly to the nozzle, as shown. Fully tighten.	1" & 3/4" BSP Connection 2 x 4mm Push Fit Trigger Tubes	Connecting the nozzle
	Examine all hoses prior to connection. Any damage could result in air or ic leakage and/or injury to personnel due to hose failure. Repair or replace any damaged hoses prior to use.		

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Element Name **Air Supply**

	Step N°	Main step	Key Point	Reason
	1	Ensure that an isolating ball valve is fitted upstream of outlet connection point and that the valve is in the OFF postion prior to connecting the air supply hose.	The air supply could come in the form of either a mobile compressor or site air. It should have a connection point of at least 1" bsp and the pipe size should be a minimum of 1" bore.	
	2	Connect the air supply hose to the outlet connection and fully tighten.		
	3	Open the isolating valve and check for leaks along the full length of hose.		

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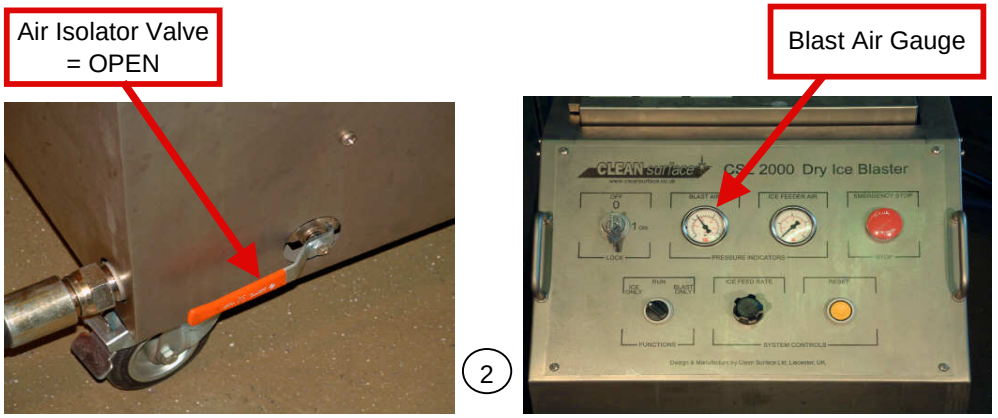
Element Name **Air On**



	Step N°	Main step	Key Point	Reason
	1	Open the supply air valve and check for leaks along the hose length and at the connectors.	Safety	This supplies pressure up to the air isolator valve on the machine.
	2	Open the air isolator valve on the machine and ensure that the blast air gauge reads roughly the same as the supply air output.	Safety Handle Horizontal When moving the air isolator valve handle from closed to open there will be a release of air when the handle is in the halfway position. This is not a fault.	If this gauge does not read the same, contact CSL for assistance. The halfway position is a vent position to allow safe shut down of the blaster. See "Shut Down".

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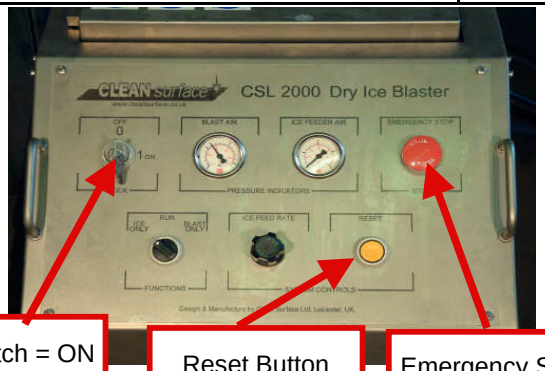
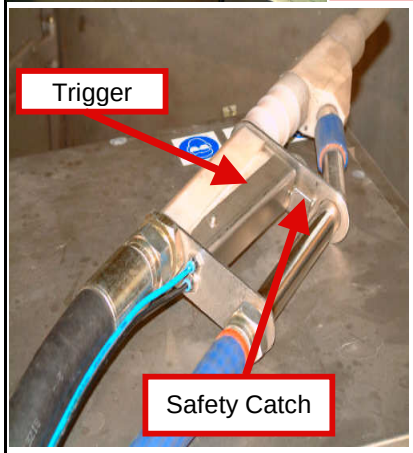
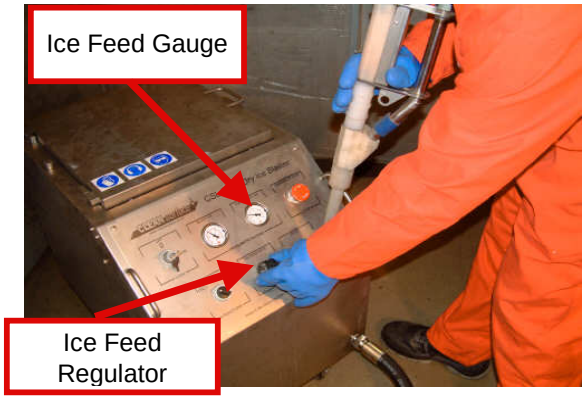
Element Name **Ice Feed Adjust**







Step N°	Main step	Key Point	Reason
1	Pick up the nozzle and blast hose assembly. Drape the hose over the right shoulder so that the nozzle can be held in the right hand with the nozzle pointing towards the ground.		Ensure you are as comfortable as possible before proceeding further. If you are left handed you may prefer to use the left shoulder with the left hand holding the nozzle.
2	Move the key switch to the ON position, reset the emergency stop button Press the Reset button. Release the safety catch on the nozzle and squeeze the trigger. Ensure auger rotates as indicated by a knocking sound from the percussion arm. Adjust the ice feed as required using regulator on the front panel. Release the trigger and push the emergency stop.	Double check that the selector switch is still in the "Ice Only" position. 1bar to 1.2 bar.	Pushing the emergency stop disarms the trigger on the nozzle.

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Element Name **Hopper Moisture Check**

	Step N°	Main step	Key Point	Reason
	1	Check the dry ice hopper	Ensure the hopper, the auger and auger tube are dry before loading dry ice. If moisture is detected it can be removed by blasting dry with compressed air.	If there is moisture in the system it will freeze on contact with the dry ice and block the dry ice flow.
	2	Drying the hopper. Set the selector to RUN, release the emergency stop, press the reset and activate the trigger with the nozzle directed into the hopper. Blast until all traces of moisture are gone.	Be prepared for a reaction force on the nozzle and for wet air blow back from inside the hopper.	

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Element Name **Loading with Dry Ice**

Step N°	Main step	Key Point	Reason
1	When removing dry ice from the container only take the amount needed to do the job, up to a maximum of 20 kg at any one time. Only use the ice that is contained in the bag	Use a plastic scoop and bucket to transfer dry ice from the container. Do not handle or use wet utensils. One full bucket is about 10 kg.	Maximum hopper capacity = 20 kg. Other ice outside of the bag could contain water ice and lead to machine blockage or damage to the area being cleaned.
2	When leaning over the open dry ice container DO NOT BREATH IN	Safety	High concentrations of carbon dioxide gas are contained within the container which could cause asphyxiation.
3	Open the lid and pour in required amount of ice. Close the lid immediately.	Observe the ice as it falls into the hopper. Paying particular attention not to introduce any water ice into the system.	

System 2000 Operating Procedure

Element Name **Blasting**

Step N°	Main step	Key Point	Reason
1	With the blast hose and nozzle assembly draped over the shoulder, move the selector switch to the "Run" position, reset the emergency stop button and press the reset button.	Preparing to blast	This configures the machine so that the trigger is armed and the machine is ready to start blasting.
2	Take up a stance, adjacent to the area to be cleaned, with the left foot forward and right foot rearward.	Always blast in an open well ventilated area. Use a CO2 detector when ever in doubt.	
	Lift up the nozzle and hold in a comfortable position.		Dependent upon how delicate the surface being cleaned is will determine the blasting distance. Start from about 150mm away and move closer to avoid any damage to the surface.
	Point the nozzle at the area to be cleaned at a distance of approximately 60mm from the surface	NEVER blast in a closed area without forced ventilation and a CO2 detector.	
3	Brace yourself, release the safety catch and pull the trigger. After a few seconds ice will start to flow and the cleaning process will begin.	NEVER blast in a closed vessel without using a full flow breathing air face mask.	

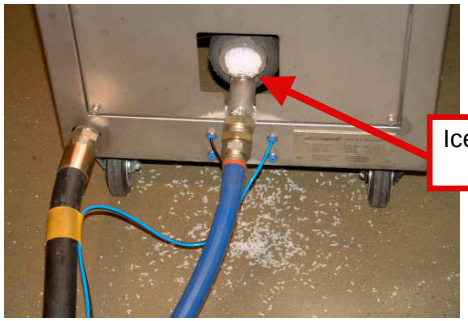
System 2000 Operating Procedure

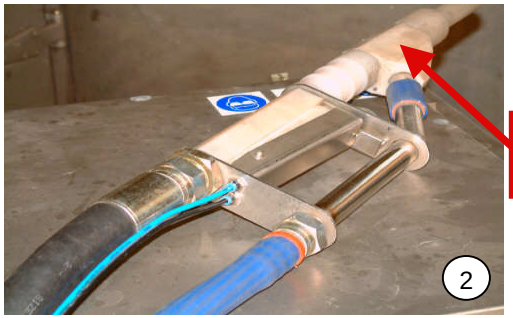
Element Name **Blasting. Continued.**

	Step N°	Main step	Key Point	Reason
	1	If at any point during the blasting operation the nozzle has to be put down, eg Hopper refill, hand over to additional operator etc, the emergency stop button **MUST** be depressed.		This prevents inadvertant operation of the blaster when the nozzle is picked up.
	2	To resume blasting, reset the emergency stop and press the reset button.		
	3	If the blaster is to be left unattended it **MUST** be made safe in accordance with "Shut Down"		This prevents operation of the blaster by untrained personnel.

System 2000 Operating Procedure

Element Name **Clearing a Blockage. Step 1.**





Step N°	Main step	Key Point	Reason
1	Upon discovering a blockage stop blasting immediately. Press the emergency stop button to disarm the trigger.	Blockage indicators are usually a lack of ice flow from the nozzle and an overflow of ice from the back of the machine.	90% of blockages occur inside the nozzle due to either a high moisture content in the supply air or high humidity levels in the working enviroment.
2	Investigate the cause of the blockage. If the block-age is in the nozzle, tap the nozzle, where shown, with a blunt instrument, shake out the obstruction.	Do not assume that a lack of ice flow is always due to a blockage. Check the hopper first, you may have used all the ice.	Some blockages can occur as a result of introducing water ice or other foreign objects into the hopper or by kinking the ice feed hose during blasting, which causes dry ice to compact within the hose.
3	If the blockage is compacted ice in the feed hose, break up the ice by repeatedly bending the hose. If the blockage is a foreign object in the feed hose, the hose will have to be removed and the foreign object removed before continueing.		ALWAYS shut down and make safe PRIOR to disconnecting ANY hoses. See "Shut Down"

System 2000 Operating Procedure

Element Name **Clearing a Blockage. Step 2.**

	Step N°	Main step	Key Point	Reason
	1	If the blockage has been caused by a kinked ice feed hose, straighten out the hose to remove the kink and clear out the ice from the tube at the back of the machine using a screwdriver or other suitable instrument.		
	2	If a blockage cannot be cleared to a level where blasting can continue, (using the methods stated previously) this can be aided by following the procedure on the next page		

System 2000 Operating Procedure

Element Name **Clearing a Blockage. Step 3.**

	Step N°	Main step	Key Point	Reason
	1	Ensure that the area around the back of the machine (Min 3m²) is clear of all personnel and equipment likely to be damaged by dry ice or foreign object.		
	2	Move the selector switch to the Blast Only position. Pick up the nozzle, reset the emergency stop and push the reset button.		
	3	Adopt the standard blasting stance and point the nozzle at a flat surface (floor or flat panel etc) at a distance of no more than 1mm.	It may be necessary to adopt a kneeling stance to carry out this operaton.	
	4	Brace yourself, release the safety catch and pull the trigger. Continue blasting in this mode until you are happy that the blockage is clear.	Ice pellets and/or the foreign object will be ejected from the rear of the machine.	This has the effect of diverting the blast air in the opposite direction down the ice feed hose, subsequently clearing the blockage.

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	Step N°	Main step	Key Point	Reason
	1	When the cleaning job is complete, shut down the machine and make-safe as follows: Emergency Stop = IN Selector = ICE ONLY Key Switch = OFF Main Air Supply = OFF Air Isolator = VENT Air Isolator = OFF	BEFORE NEXT STEP	To vent compressed air trapped in supply hose
	2	Remove keys and store as required.		