

Chester Bowl Snowmaking 101

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Introduction

Thank you for volunteering or working as a staff member to make snow at Chester Bowl. It's an exciting way to complete your family's volunteer hours or earn some money, help get the hill ready for the season, and pretend to be mother nature. The following document will provide the basic information necessary to be successful while making snow at Chester Bowl. Please spend time reviewing this information prior to your volunteer shift. If you have questions please email Joel Tiburzi, joel@chesterbowl.org

Volunteering & Working as Snowmakers

Snowmakers are responsible for having a basic understanding of how the snowmakers work, monitoring the snowmakers, and if there is an issue pass that info onto the Chester Bowl overnight staff or calling the Chester Bowl manager that is on call.

The following describes how to get signed up to volunteer (or get scheduled as staff) and what you should expect during a typical snowmaking shift.

1. Snowmaking volunteers must sign up using Google Forms in order to become snowmaking volunteers. Staff will sign up using a Signup Genius page and will claim shifts that work for their schedule. In addition to providing their contact info they also provide emergency contact info and sign the waivers needed to volunteer. Once we are ready to make snow, a link to a Signup Genius page will be sent out to both volunteers and staff members. There will be two slots available on the signup. The first will be for "Snowmaking Staff" and is for our paid staff members only. The second slot will be for "Snowmaking Volunteers" and this is where parent volunteers will sign-up.

Here is an example of what the signup could look like:

Dates shown as mm/dd/yyyy CDT

Date	Location	Time	Snowmaking Volunteer
01/05/2022 Wednesday		7:45am-12:00pm	Snowmaking Volunteer Full All slots filled Henry Eichman HE Snowmaking Staff Sign Up 1 slot available

2. Snowmakers will arrive on time for their volunteer shift. This is crucial as there is a built in 15-minute window during which the outgoing staff or volunteer has to pass any

information onto the incoming volunteer. **If you are late, you are impacting someone else's schedule.** Please show respect to your fellow snowmakers and arrive on time. Park near the Thom Storm Chalet and enter the front door. The upstairs space is available for snowmakers during snowmaking shifts.

3. The incoming volunteer will check in with the Chester Bowl staff and outgoing volunteer. The staff & outgoing volunteer will pass on the following info:
 - a. Snowmaker locations
 - b. Any issues or challenges with snowmaking
 - c. How to use the radio & when to check in
 - d. Where the PPE is and what to watch out for
 - e. Share the phone number to reach management in the case of an emergency
4. The outgoing volunteer will complete their volunteer card before leaving. The staff member will complete their timecard. Then the Chester staff member and incoming volunteer will walk up the hill to go over how each machine works and what needs to be done during the volunteer shift.
5. **The snowmakers will do the following during their shift:**
 - a. Use the radio to check in with each other before hiking up the hill on the hour each hour. The staff member and volunteer can take turns hiking up the hill.
 - i. Inspect for ice build up
 - ii. Inspect for water leaks
 - iii. Inspect snow quality
 - b. Remove snow buildup from power cords, hoses or equipment. Do not pry or drag hoses or power cords. Do not attempt to remove snow or ice buildup from overhead objects.
 - c. Keep sliders, skiers, and snowboarders away from the snowmaking equipment.
 - d. Visually monitor snowmakers from inside the chalet when not on the hill.
 - e. If there are any issues they will check in with the Chester Bowl staff.
 - f. If the issue cannot be solved by the Chester staff and volunteers they will call the management staff that is on call.
 - i. Delaney Kreager, Sam Luoma, and Joel Tiburzi are sharing the on-call responsibilities. Their phone number will be posted on the Signup Genius Page, written in the office, or posted in upstairs space where snowmaking volunteers will be spending their time.
 - g. When the next snowmakers arrive, clearly explain how to use the snowmakers and what they should be doing during their shift. Be sure to pass on any information that was given to you during the start of your shift.
 - h. Snowmakers will follow all safety protocols covered in the Snowmaking Safety section of this document.
6. Keep the radio with you so that way you can communicate with staff members and/or volunteers.

7. Keep your cell phone on you so that you can call for help if needed.
8. If the volunteer who is scheduled to relieve you is late, call the volunteer. The snowmaking schedule will be posted. The volunteer phone numbers are listed on the schedule. If the volunteer does not answer, leave a message. If 15 minutes have passed, you have called the volunteer, you can't get a hold of them and they have not yet arrived, call the staff member that is on-call and they will come in to relieve you.
9. Fill out volunteer cards in order to keep track of hours. If not completed there is no documentation that the volunteer time had been completed.

Snowmaking Basics

In nature, snowflakes start with a particle of dust. Water vapor collects around dust particles in the atmosphere creating an ice crystal which will continue to collect water vapor, build mass, become heavier, and fall to the ground collecting more vapor along the way. When using machinery to make snow the process is forced in order to create an icier version of natural snow.

The ingredients for making snow are water and air. At Chester Bowl we use City of Duluth water and ARECO snow makers to mix in air and create enough loft so that the mixture can freeze before landing on the ground.

Chester Bowl's Snowmaking Equipment

Snowmakers

Chester Bowl's snowmakers are relatively simple in comparison to larger more automated machines but understanding the components of the machines is necessary in order to make quality snow and to ensure safety. Water will enter the snow machine, be cleaned by the filters, compressed air is mixed in, the water is sprayed from nozzles, and the fan blows the water and air mixture into the air so that as it falls to the ground it can freeze. Please review the following list of components:

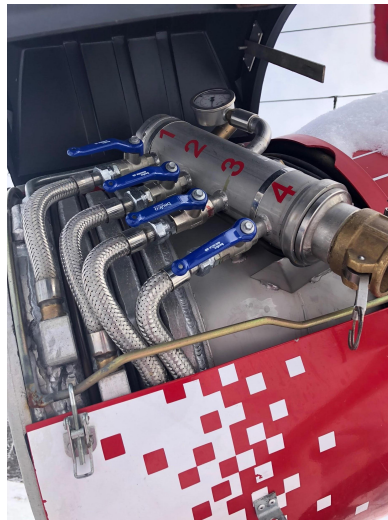
1. Filters- The water supply, carried by fire hoses, connects to a filter which cleans the water before it reaches the machine.
2. Compressor- The water then has compressed air mixed into it by a compressor.
3. Nozzles- Water is sprayed from the machine through several tiny nozzles. These nozzles are prone to freezing. To prevent icing the nozzles are heated. The heater is controlled with a toggle switch that is located on the control panel. The switch must be turned to the right in order to have power.
4. Fan- The water is then pushed from the machine by a fan which is housed within the main housing of the machine.
5. Oscillator- Both of our snowmakers have the ability to oscillate side to side in order to cover a larger area with snow.

6. Control Panel- The compressor, fan, heater for the nozzles, and oscillator are operated from a control panel.



Control panel. Top row, left to right: heater (toggle switch), compressor, fan, oscillator.
Bottom, search light (toggle switch)

7. Valve Controls- There are a series of valves housed under the black hood that can be used to decrease the volume of water that is sprayed from the nozzles.



Valve controls.

8. Position Adjustments- Each snowmaker can be “aimed” left or right via a pivot point. In addition to left or right movement the machines can be “aimed” up or down via a hand crank located on the side of the fan housing



Picture of hand crank with snowmaker aimed towards the ground



Water Supply

Chester Bowl gets its water supply from a pump house located adjacent to Kenwood Avenue, in the gravel pit located in the park. In the pump house there is a fire hydrant which is connected to a water pump which is powered by an electric motor. From the pump house the water is transported uphill via a 4" water pipe which is buried along-side the access road leading from Kenwood Avenue to the top of the hill's Raspberry Run. It terminates in a standpipe which is located at the top of the service road near the edge of Raspberry Run. This standpipe is where the fire hoses are attached. There are drain valves located along the 4" water pipe. One located at the stand pipe, the other two located in the ditch along the access road. Fire hoses are attached to the standpipe and carry water to the snowmakers. Valves may be added to allow for diversion of water.



(Left to right) Chester Bowl pump house, power to pump house, and drain valves located near Kenwood Avenue, along service road.

Electricity

220 watt power is required for operation of the snowmaking equipment. There are 4 power boxes located on the hill. The first is located near the stand pipe. The second located at the top lift house, third located under the chairlift at tower 5, the fourth located under the chairlift at tower 3. This circuit is controlled from the power breaker panel located in the upper lift house. At each power source there is an outlet available to plug in the snowmakers.

In addition to the power required to operate the snowmakers, electricity is required to run the motor that operates the water pump. The electric motor also requires 220 w power which can be turned on or off from the power box located near the pump house.



(Left to right) Outlets at top lift house, at tower #5, and at tower #3.



Outlet at near stand pipe.

Equipment Operation

Prerequisites For Snowmaking

Prior to making snow the following prerequisites must be met:

1. The temperature must be at or below 20°F
2. The snowmakers, power outlets, and pump must be tested to ensure safe operation.
3. Volunteers must be secured in order to ensure that the equipment is being watched at all times.

Once the above prerequisites have been met then setup and operation of the snowmakers can happen.

Setup

When volunteers come in to make snow the snow machines will already be set up and making snow. The following info is for staff members.

A minimum of two people is required for setup. One to operate the standpipe and snowmaker, the other to operate the pump. Volunteers will not be asked to complete setup on their own but may be asked to assist during the setup process.

1. Positions Snowmakers- Using a truck, PistonBully, or ATV with a pintle hitch, position the snowmaker. When positioning, consider the following: wind speed and direction, overhead lines, chairlift lines, utility poles, and any other object that may be covered in snow as a result of snowmaking.
2. Lower Leveling Arms- There are two crank operated leveling arms that must be lowered to level the machine. This prevents pooling of oil in the compressor and must be done before operating.
3. Power- As soon as the snowmaker is positioned plug it into the nearest power source and turn the heater on to prevent icing. Before plugging the snowmaker into the plug be sure that the outlet has no power going to it. If you do not know if the outlet is live DO NOT PLUG IT IN. If the power is off to the outlet, then the snowmaker can be plugged in. After the snowmaker is plugged in, turn the power on to that outlet. When plugging the machine in, wrap the power cord once around the power source so that the plug has less of a chance to be unplugged.
4. Water- Connect the necessary water hoses and valves from the snowmaker to the standpipe.
5. Aim- Aim the snowmaker in the desired direction.
6. Power Fan and Compressor.
7. Turn on Water and Pump.
8. Monitor- Monitor the equipment for leaks and to ensure that snow is landing in the desired location. Check at a minimum of once every hour.

Making Snow

When making snow the following conditions need to be monitored.

1. Temperature- Monitor the temperature hourly. If the temp rises above 20° reduce the volume of water moving through the machine by closing valves on the snowmaker.
2. Location of Snow- Be sure that snow is not building up on overhead lines or the chairlift. If the outside temperature is above 20° the snow tends to stick to whatever it lands on. The weight of snow building up on objects is enough to pull overhead lines down, pull trees down, and create damage.
3. Quality of the Snow- Environmental factors like humidity, wind speed, temperature, and amount of sunshine will change the quality of the snow being made. When the temp is climbing, reduce the volume of snow by closing the control valves on the snowmakers, aim the machines higher so that the snow has a longer time to freeze before landing on the ground.
4. Coverage- Giant piles of snow may look cool but they are difficult to move. Attempt to make many small piles of snow rather than one or two giant piles.

5. Wind- Monitor the wind speed and direction. Wind can cause snow to be blown back into the snowmaker which will cause ice buildup. Wind can blow snow into unwanted areas or onto objects that will be damaged.
6. Ice Buildup- Ice frequently will build up on the metal grates that are on the rear of the snowmakers. The metal grates are there as a safety precaution preventing objects from entering the fan. To remove ice, use a hammer to hit or scrape the ice from the grate. When doing this turn your face away so that ice does not get in your eyes.
7. Leaks- Monitor all hose junctions for leaks. Sometimes dripping will occur, that's normal but water spurting from junctions is not. If this happens, call Sam Luoma immediately.
8. Power outages- If electricity is cut to the snowmakers they will cease to make snow. Instead, water will continue to flow through the machine and onto the hill and will likely cause severe ice buildup on the snowmakers. This is an emergency. Call Sam Luoma immediately in order to receive instructions.
 - a. If the power comes back on after 2 minutes or less, attempt to turn the snowmakers back on if there is not substantial ice buildup.
 - b. If the power does not come back on WAIT FOR INSTRUCTIONS FROM SAM LUOMA. If Sam does not answer his phone or if Sam instructs you to do so follow the steps below:
 - i. Aim the snowmakers directly down so that the water does not have to fight gravity to flow out the machine. This will reduce ice buildup.
 - ii. Open the drain valve at the standpipe to divert water away from the snowmakers.
 - iii. Hike to the pump house.
 - iv. Open the drain valves located near the pump house. Water will exit the drain valves at extreme force. Do not stand in front of the valves.
 - v. Enter the pump house.
 - vi. Turn the pump off with the toggle switch.
 - vii. Use the pipe wrench to turn off the water hydrant.
 - viii. Wait for further instruction from Sam Luoma.

Additional Snowmaking Tasks

1. Occasionally, the wind will carry snow over the snowmakers' power cords, and fire hoses. When this happens, volunteers will be asked to move the cords and hoses hourly so that they are not buried.
2. During wind events, snow can be blown back towards the snowmakers which will cause the snowmakers to draw the snow through the fan which will cause ice to build up on the metal safety grate which is located at the rear of the machine. If this happens aim the snowmakers so that the wind is no longer blowing snow towards the machine. If not monitored ice can build up on the fan blades which can cause damage to the snowmakers. Follow the steps below to remedy these issues:
 - a. Removing ice from safety grates
 - i. Using the orange dead-blow hammer located in the conference room breaks the ice free from the grate. When doing so, turn away and wear safety gear.

- b. Removing ice from fan blades. (Check in with Sam Luoma before doing this)
 - i. When wind is a concern a propane tank with a torch attachment will be placed on the hill near the standpipe.
 - ii. Volunteers will need to bring a smaller torch provided by CBIC which will be located in the conference room to the top of the hill.
 - iii. To turn the propane torch on:
 1. Open the valve at the top of the propane tank.
 2. Open the valve on the wand of the torch.
 3. Using the smaller torch lit the larger torch.
 4. Once lit, turn off the smaller propane torch.
 - iv. Once the propane torch is lit, use the torch to melt the ice on the grate and apply heat to the rear of the snowmaker so that the heat is drawn through the fan housing.
 - v. Once ice is melted, turn the torch off and place it back at the standpipe.
 - vi. Show caution when using the propane torch. Never turn the propane tank upside down. Never point the torch towards yourself. Never heat up a hose, valve, or electrical cable. The torch will be hot, do not touch the end of the torch.

Tear Down

This is to be done only with the supervision of a CBIC staff member or City employee.

A minimum of two people is needed for tearing down the snowmakers. One to operate the standpipe and snowmakers, the other to operate the pump. Volunteers will not be asked to complete this task on their own but may assist in this process.

1. Position one person at the snowmaker.
2. Position the other person at the pump house.
3. When both parties are ready, the person located at the pump house will:
 - a. Turn off the water pump using the toggle switch.
 - b. Open the drain valves located outside of the pump house.
 - c. Close the water hydrant.
 - d. Open the pipet valve located at the bottom of the pump.
 - e. Leave the light and heat on in the pump house. Place orange cones inside the pump house and lock the door with chain and lock.
 - f. Join the other person at the snowmaker.
4. After the water is shut off the volunteer positioned at the snowmaker will:
 - a. Monitor the snowmaker until there is little to no snow exiting the machine.
 - b. Aim the snowmaker so that it's pointed directly at the ground.
 - c. Turn off the fan and compressor.
5. Open all valves located on the standpipe. If they are iced up do not attempt to open. Notify Sam Luoma.
6. Remove all hoses and drag downhill to store in the garage located behind the Thom Storm Chalet. Once thawed, roll up.
7. Remove all "T-Valves" and open valves. Store in the garage located behind the Thom Storm Chalet with valves open.
8. Turn off the power to the outlet.

9. Unplug the snowmaker.
10. Close the breaker box located next to the snowmaker and lock it.
11. Wind up the snowmaker cord.
12. Hook the snowmaker trailer to the vehicle that is being used to transport.
13. Raise leveling arms.
14. Transport snowmaker to new location or to the garage located behind the Thom Storm Chalet.

Snowmaking Safety

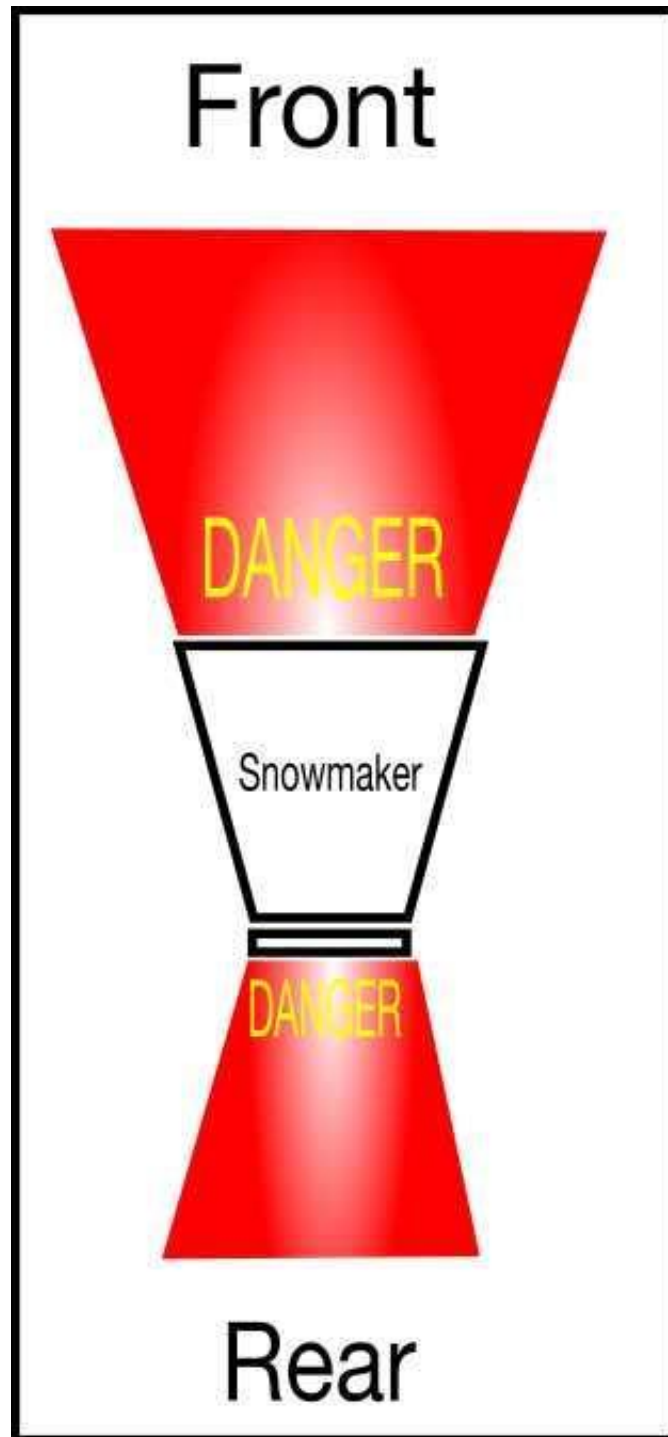
Water pressure, high voltage, fan blades, ice, slipping, and falling are all things that could pose a threat to volunteers or staff who are using snowmaking equipment. However, if the proper attention is paid to surroundings and volunteers are doing things safely the danger can be reduced greatly.

Communication

Carry a cell phone or have the means to communicate to EMS in the event that a slip occurs and assistance is needed. When volunteering, there will either be another volunteer or a Chester Bowl staff member at Chester with you. Volunteers and staff are required to carry a two way radio used to communicate with each other. Before hiking up the hill each hour, use the two way radio to let the other person know that you are heading up the hill. Once you are back, use the radio to check in with the second person.

Zone of Danger

The front and rear of the snowmakers both have a cone where one should spend as little time as possible when operating the snowmaker. The reason for the danger is due to the machine and due to projectiles being ejected from the snowmaker.



Operating Snowmakers Safely

Avoid spending unnecessary time near the front of the machine where the snow is exiting the fan housing. Never attempt to place anything inside the front of the machine while it's operating. Never place an object or a part of your body into the path of the snow that's coming out of the machines. Avoid spending time near the rear of the machine where the metal grate

protecting the fan is. When in operation air is drawn through the grate of the machine and through the fan blades. This creates a current of air that will draw light objects into the machine. Never attempt to insert objects or body parts through the metal grate into the machine.

Falling Objects

Be aware that making snow does create the opportunity for snow and ice buildup on overhead objects. This ice and snow buildup has the potential to fall. Do not stand beneath or attempt to remove ice and snow buildup. Injury can occur as a result of snow and ice falling from overhead objects.

Preventing Slips and Falls

Snowmaking typically takes place in November when the ground begins to freeze. Depending on the weather there could be significant ice on the ground. When making snow one should wear boots that are supportive and stable. The use of Yak-Tracks or similar traction devices can prevent slips on ice. Consider using Yak-Tracks if available.

Hearing Protection

Wear hearing protection when making snow. The snowmakers are loud and can cause hearing damage. Hearing protection is provided for all volunteers and is located in the conference room of the chalet. Volunteers must wear hearing protection such as earplugs or earmuffs. Earplugs are provided. If other hearing protection is preferred, volunteers must bring it from home.

Eye Protection

Volunteers must wear eye protection when working with the snowmakers. Eye protection such as safety glasses or goggles must be worn.

Electrical Shock

When plugging or unplugging snowmakers from outlets the power to said outlet must be turned off using the breaker switch located at the outlet. Always look away from switches and use a non-dominant hand to flip switches. **Only trained staff should be unplugging the machines.**

Water Pressure

The hoses, pipes, and valves contain pressurized water at 220 lbs per square inch. Never stand over or straddle hoses, valves, or pipes. Never lean over a valve that is being turned off or on. Do not attempt to drag hoses under pressure beyond minor adjustments. Never use sharp objects to move, pry, or puncture hoses, valves, or pipes. Never attempt to shovel around pressurized hoses.

Weather Appropriate Clothing

Temperatures may be between -20° F and 20° F and volunteers will be exposed to water. Dress accordingly. Wear layers that include; a base-layer of wool or synthetic; a mid-layer of wool, fleece or down; and an outer-layer of wool, down or synthetic material designed to repel water

and snow. Hand-warmers will be provided by Chester Bowl but clothing is the responsibility of volunteers.

Emergency Action Plan

[Chester Bowl has an emergency action plan document that can be viewed here.](#)

It is the responsibility of all Chester Bowl staff to know the emergency action plans and how to respond to emergency situations. This document will be printed and available during staff orientations, in staff break rooms, and during snowmaking shifts.

Emergency Contacts

Life threatening accidents or injuries call 911 immediately.

Equipment malfunctions, questions, concerns call **the staff member that is on call.**

Delaney	Kreager	218-260-8992
Sam	Luoma	218-340-4678
Joel	Tiburzi	218-260-7200

Other Considerations

Wifi Password: The public wifi at Chester is named MySpectrumWiFi1b-5g, the password is islandreview690

Safety of Minors: Under no circumstances are any staff members or volunteers to be in a closed room or private place with a child/minor that they aren't related to. Minors are not allowed to be on the hill or in the chalet during snow making as they cannot operate snowmaking equipment. For more clarification please contact Sam Luoma, sam@chesterbowl.org