

RACE WORKER TRAINING MANUAL

Alpine Canada
With thanks to SLOC

DISCLAMER

**This “Course Workers Maintenance Manual” is based upon materials designed for the specific
Training and educational needs of the staff and volunteer workers for the
2002 Winter Olympic Games.
It is a guide only to assist volunteers and race organisers**

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WORLD CUP CHAIN OF COMMAND AND JOB DESCRIPTION

F.I.S. World Cup Race Directors (Jury)

These are working professionals, employed by the International Ski Federation (F.I.S.), that are in charge of the World Cup tour. Along with the Jury they are responsible for the overall aspects of the race. Ultimately, they will decide what needs to be done on a daily basis concerning everything from the quality of the food, to hill preparation and safety. If they request anything, our job is to see that it is done promptly, professionally, and efficiently with a smile and good humor.



Jury members inspect the course set prior to training

Technical Delegate (Jury)

The Technical Delegate (T.D.) is assigned by the F.I.S. The T.D. is responsible for the technical aspects of the race. The T.D.'s duties are slightly less at a World Cup as compared to a Nor-Am/Super Series or other lower level races.

Connection Coaches (Eyes of Jury)

These coaches are assigned by the F.I.S. Race Directors to serve as eyes of the jury and to provide input as representatives of the athletes. They will from time to time request specific work to be done, usually through the Chief of Race or the Chief of Course.

Chief of Race (Jury)

The Chief of Race is a member of the Local Organizing Committee with the overall responsibility for all aspects of the race inside the fences, training, and ski testing venues. (See the flow chart for the big picture)

Chief of Course

The primary responsibility of the Chief of Course is the preparation of the course, both snow and protection installations. The Chief of Course will direct and supervise the various crews to accomplish all hill preparation efforts.

Dispatcher(s)

Dispatchers are often a key component in the overall success of efficient course work. They are responsible for the orderly disbursement of crews and tools to specific job sites along the course as requested by the Chief of Race, Chief of Course, and Section Leaders.

All crew leaders must go through Dispatch for work assignments prior to heading out on the course!



Course Worker wait "on deck" at ready to be dispatched.

Equipment Management & Control

The primary responsibility of this position is to insure that the proper tools and equipment are where they need to be, in the appropriate numbers, when they are needed. This includes everything from B-Net parts to the Pine Bough buckets.

The Equipment Management & Control team will work closely with the Chief of Course and the Dispatchers to insure that all equipment is accounted for and in the proper place at the proper times.

Section Leaders

Section Leaders are assigned specific geographic locations along the course and will be assisted by five (plus) crewmembers. The primary job here is to maintain all aspects of their location to insure that it is race ready to the highest standards.

On snow removal days the Section Leader, in conjunction with the Chief of Course, will determine the specific work to be done along with the number of people and type of tools needed to accomplish the task. The Section Leader, along with the crew, will do the initial preparation and setup prior to the arrival of the assigned course crews.

During training and racing the Section Leaders and their crews will remain in place to assist with course maintenance and gate or fencing repair work.

Course Crew Leaders

The Course Crew Leaders will be assigned a crew of ten (10). Their primary responsibility is to assist the Section Leaders in the preparation of the course. Their initial direction to the job location will come from the Chief of Course via the Dispatcher. Once assigned a section or other specific job to report to, the Crew Leaders will assist the Section Leader in organizing the efficient work efforts of the crew.

It is imperative the Course Crew Leaders keep the crew together and report via radio or the Section Leader to Dispatch for the next assignment or routing.

Slip Crew Leaders

The Slip Crew Leaders will be assigned crews of ten (10) members. Their primary responsibility will be to familiarize their members to the proper slipping procedures as well as to insure they know the location and protocol at each slip station.

On snow removal days they will assist the Section and Course Crews in course preparation. Initial direction to job locations will be from the Chief of Course via Dispatch.

There will be a Slip Crew Leader that will control the movement and direction of slippers via direction of the Chief of Race or the Chief of Course. There is a limited number of slippers.

Runners

The Runners are a crew of the strongest skiers that will be utilized to shuttle tools and other miscellaneous equipment during preparation. They will take direction from the Chief of Course via Dispatch. During training and the race, the Chief of Course will provide direction for all runners.

A-Net Crew

The A-Net Crew will supervise the maintenance of all A-Nets on a daily basis. They will coordinate with the Chief of Course and Section Leaders for specific work that needs to be done. On snow removal days they will assist the Section workers to set up snow chutes and organize work crews. They will assist Section Leaders during training and racing. A-Net crews will be responsible for repair of damaged A-Net and Slipskirt during the race.



B Net Crew replacing poles after an impact.

B-Net Crew

The B-Net Crew will supervise the maintenance of all B-Nets on a daily basis. They will coordinate with the Chief of Course and Section Leaders for specific work that needs to be done. They will assist Section Leaders during training and racing.

NOTE: The A-Net and B-Net Crews will in most cases be the Race Department staff. They will assist the Chief of Course and Chief of Race in assuring that there is continuity and consistency in preparation efforts. They will also maintain pads and air fences.

Bough Crew

The Bough Crew will consist of 4-6 people that will be responsible for the final Pine Bough application prior to training and racing. In addition they will add additional boughs during training and racing at the request of the jury. The Pine Bough Crew will be recruited from the Runners.

Test Track

The Test Track Crew will be responsible for the scheduling and general management of the test track venue. This will include the daily scheduling of lanes, venue preparation, and the assistance in the shuttling of skis to and from the venue.

Training Venues

The Training Venue Crew will be responsible for the scheduling and general management of the training venues. This will include the daily morning warm-up, scheduling of training lanes, and venue preparation.

Finish Stadium

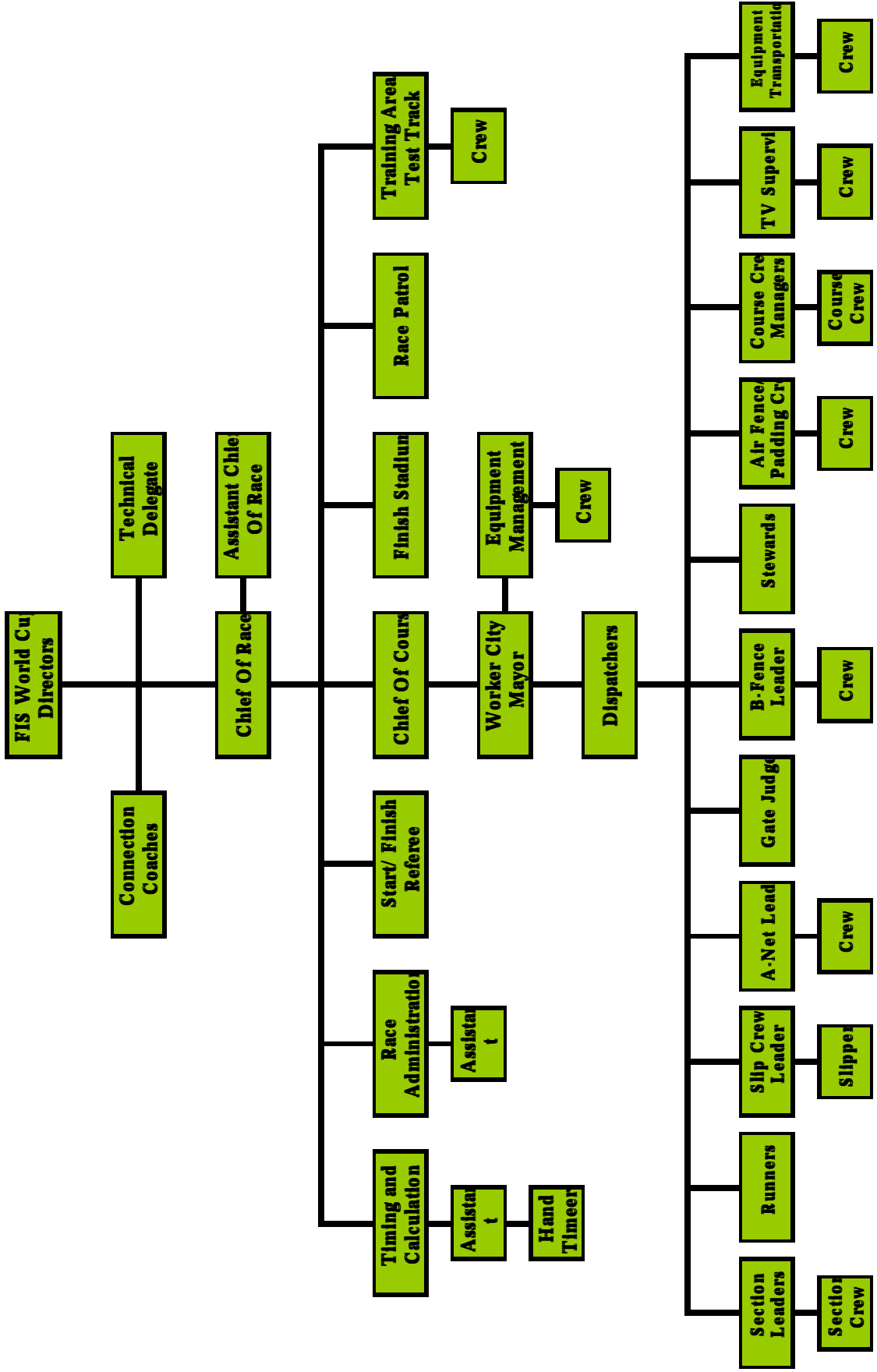
The Finish Stadium Crew will work with the SLOC venue crew in the set-up and maintenance of the finish stadium.

Race Patrol

The Race Patrol's primary responsibility will be to provide medical assistance and evacuation of injured athletes. They will be made up of Snowbasin and visiting ski patrol.

In addition to medical services the Race Patrol will assist in the initial course set-up and daily preparation during training and racing.

World Cup Chain Of Command



RACE JURY

The primary role of the Race Jury is the execution and control of the race in a safe and fair manner. Their duties include but are not limited to:



- Checking the race-course and the course set
 - Checking snow conditions
 - Checking the preparation of the course
 - Approving the use of snow compactors and other chemicals
 - Checking the crowd control systems
 - Check the start, the finish, and the run-out from the finish
 - Checking the first aid service
 - Appointing the course setters
 - Fixing the time of course setting
 - Overseeing the work of the course setters
 - Checking the gate flags
 - Opening or closing the race course for training in consideration of the technical preparations and the prevailing weather conditions
 - Determine the manner of the course inspection
 - Inspection of the course before the race
 - Determining the number of forerunners for each run and setting the start order of the forerunners
 - Debriefing the forerunners as necessary
 - Changing the start order in consideration of course conditions and in extraordinary conditions
 - Changing start intervals
 - Giving instructions to and obtaining information from the gate judges
- Jury Members Discuss options early in the morning

For Downhill

- Arrangement of an additional inspection in unusual weather conditions.
- Shortening the official training
- Positioning of yellow zones
- Checking on the setting of gates
- Changing the position and distance of the gates or adding extra gates as indicated by the experience gained in the training runs. Following significant changes, the competitors must be allowed at least one more training run on the course.

While the jury is the eyes, ears and brain of the event, the course crew and volunteers are the arms and hands.

The Race Director shows his credential to
gain access to the timing building.



During the race the jury members control the event. Course crew and volunteers will receive the jury's instructions from the Chief of Race (himself a jury member) and execute them promptly. It should be made perfectly clear that the jury's instructions must be adhered to for everyone's safety. Information can be passed back to the jury through the Chief of Course or the Chief of Race.

At all times the course crew and volunteers via the direction of the Chief of Race remain under the control of the jury. Because of this protocol a large number of course workers and volunteers are able to conduct race operations in a safe and efficient manner.

The Chief of Race checks on the condition of the race line during a break in the action.

Dispatch is a key component of the race organization. It helps distribute workers out onto the course (at the direction of the Chief of Course) and provides support to those workers.

Dispatch requests, information, and instructions are relayed to it from the Chief of Race, Chief of Course, and Section Leaders. It acts as a clearinghouse, filling these requests and helping to distribute information. Its overall role is to provide logistical support for the ongoing activities of the course workers.

Dispatch is also utilized as the primary dispatch point for all course crews, slippers, and runners. Without controlling worker access, many difficulties would occur implementing the work plan for the day.

Base

Often with large numbers of course workers and with two downhill courses to prepare, satellites are established.

This can be tasked with:

- Marshalling course workers as they arrive at the base of the lift. Both during the first “wave” early in the morning and also later in the day as crews cycle back to the top of the course. In effect they are the traffic cops of the base area.
- Collection of all tools arriving with volunteers from the two courses and transportation of those tools back to .
- Coordination with the tent managers to expedite course worker movement from the Volunteer tent to the base lift and on up the hill.

Another base can be at the top of the lift accessing the race course. It is tasked with:

- Access control for all course workers entering the race arena.
- Logistical support of ongoing race operations on both courses.
- Equipment tracking and it is also the primary repository of all tools for both courses.
- Staging all course workers prior to repositioning to their assigned areas.
- Providing an information cache detailing current operational plans, personal location, and hazards.

To successfully fulfill its assigned tasks, these bases will consist of a number of workers and an enclosed compound. Included in this area are storage tents, volunteer warm up tents, corrals (to organize course crew teams), and staging areas. Lanes through ensure quick access to the course for key workers. As many as ten workers will be permanently assigned to it to ensure all its tasks are quickly carried out. They will include:

- The “Mayor” of base, responsible for overseeing its smooth operation.
- Dispatchers, who will receive requests from the course and ensure that the requests are filled.
- Assistant Dispatchers and Personal Coordinators, who will act on the requests and organize the crews and equipment matching them to the requirement of the dispatcher. They will also be responsible for recording all requests on a White Board tracking the progress of the request and the location of all personal and tools.
- Workers who will receive returning Crew and tools, in effect restocking.



Course Crews assemble at on a beautiful morning, ready for assignments.

Daily dispatch will be responsible for:

1. Basic clean up, trash, snow removal and preparation of to be ready for the day's activities.
2. Assisting to expedite the movement of Section Crews to their assigned sections.
3. Reception and recording of requests from the Section Leaders for pre-assigned Course Crews, tools, or any other items.
4. Dispatch of Course Crews, Runners, or other workers with correct tools matching the requests of the Section Leaders.
5. Continuing logistical support of both courses after the initial deployment of Course Crews.
6. Dispatch of Runners, tools and race equipment during the event.
7. Restocking and Course Sections at the completion of the day's event.

In addition to the above tasks Base will be responsible for:

1. Assembly and Dispatch of the Section Crews, Course Crews, Runners, and Slippers from the base of John Paul. This is a function of Base and it is one of the most crucial aspects of the daily work plan. If the Section and Course Crews are delayed at the base of John Paul the whole schedule could be disrupted.
2. Collection and transportation of tools (at the end of the day) back to . This will occur as Course Crews exit the race arena after completing their assigned tasks.
3. Marshalling of Course Crews for re-deployment to . This may be during the event to assist the other course, or after the event to "touch up" the course to be ready for the following day. This will entail working closely with the Volunteer Tent Manager to locate and dispatch crews.

SECTION LEADER DAILY DUTIES

- Check-in / pick up radios/ pick up lunches.
- Gather crew / pick up section backup with all necessary small tools and crampons.
- Load the lift and check in with dispatch upon arrival, pick up any shovels, rakes, spare poles, etc. and proceed to your section. Be sure to check the best route to your section.
- Check in with the chief of course.



Top of "Three Toe's", the whole section crew waits in a safe area as the race progresses.

Good Days

- Secure area
- Check gates
- Check fences in your area – tidy and clean any snow from bottom of fence.
- Respond to any special requests from the F.I.S. Race Directors and/or the chief of course
- Have the section ready for racer inspection
- Clean up and secure section following racer inspection – shovel
- Report to the chief of course and dispatch that you are ready to go

Bad Days

- Report to your section and consult with the chief of course
- Determine the work to be done and order course crews from
- Get the section crew organized prior to the arrival of assigned course crews
- Check that your equipment is in proper working order i.e. snow blowers, etc.
- In most cases there will be a predetermined snow removal plan
- SUPERVISE the organization of your crew and the course crews assigned
- Coordinate with the chief of course/ on progress or special needs
- Notify dispatch when you release crews
- Plan the work so the racers can inspect the course
- Watch the clock!
- As work progresses begin to secure and clean up the area
- Report to the chief of course and when you are ready to go or how long it will take to be finished.

Other Duties

Equipment management

Each section crew will be assigned the necessary tools to do their work. It will be their responsibility to see that this equipment remains in good repair and in their possession. Replacement of or additional equipment needs should go through the equipment manager at .

Slip stations

If a slip station is located in your section, your Assistant Section Leader must be assigned to manage that slip station during training and racing. This will include keeping the slip station free of obstructions and unnecessary people. It must also be clearly visible to incoming slippers. Instructions regarding where to slip in the area below must be passed across quickly and clearly. Section leaders will coordinate slippers and any special slipping needs during training and the races.



A Slip Team Approaches the "Buffalo Jump" Slip station, manned by the assistant section leader (waiving pole).

Post training and racing

Following a training or race run the section leader will consult with the chief of course on work needing to be accomplished and how it will be done. At the conclusion of work in your section check with for work in other sections you and your crew can assist with. If there is no work, exit at the closest point.

SECTION LEADER CHECKLIST

Included in this section are checklists and guidelines for work that must be completed. As every day brings a fresh challenge, you should only look upon these checklists as a starting point.

Section Tools

Listed below are most of the tools you will need to complete your tasks as section crews. All tools must be in your possession prior to departing base. Some are available only at the equipment check out trailer or the radio trailer. Others you must collect from base or satellite. You may have stored some tools overnight in your section. Upon arrival in your section check all stored tools and re-supply as necessary.

Radio x2, one for the section leader, one for the assistant

18V Drill and Bit.

2 spare drill batteries

1 Gate Key

10 wedges

1 Hammer for wedges

1 Tool Belt

Spare Gate Flags

4 Replacement gates, 2 flex, 2 rigid

30 Replacement B Fence poles (Naked)

10 B Fence clips

Grain scoops for each worker in your section and two rakes for finish work.

Pine Bough 3-4 sacks required each day (if your section is a stop for boughers).

Slip skirt repair sections with bungees (in A Net sections).

Crampons- if required in your section, collect and inventory daily, store in back pack.

Back pack- to transport drill, gate key, crampons, spare flag etc

Pre-race work

Between arrival at your section and the course freeze, certain projects must be completed. Depending on the weather and snow accumulation this may be a simple task or a major operation.

1. General inventory, tools, personal, materials
2. Location scrutiny, i.e. what tasks need to be completed.
3. Check all gates are in their correct position, assist to install gate flags, check all gates are straight, parallel and screwed in properly. Replace if damaged. Straighten gate flags and pull tight.
4. Snow Removal. Complete all snow removal tasks. If a major job, call dispatch for your assigned course workers and tools. If a minor job, complete snow removal and begin “fluff and buff” work to improve appearance of section. Try to use the minimum number of assigned course workers for minor jobs to reduce worker movement on the course. Begin any tasks left over from previous day. The whole course should be perfect in appearance on race days.
5. Check, B Fence, replace any damaged parts (collect and remove to base at end of day). Pack, or remove any accumulated snow at the base of the B Fence. Reset B fence if required.
6. Check all A-Net, remove any excess snow from front and back of the A-Net.
7. Check all timing positions, airfence and willy bags. Remove any accumulated snow. Reposition padding if it has moved due to wind, etc
8. Check all the Spec Fence in your section. This must be unburied and reset each day.
9. Collect all unused tools and personal equipment and store laying down in a safe area. These tools must be stored out of the spill zone.
10. During inspection move all workers away from the race line to allow the athletes a clear and uninterrupted view of the course.
11. After inspection clear any built up snow away from the gates. Both the inside and outside gate. Remove any berms that may have built up.
12. Check that all slip station signs are in place and are clearly visible.
13. Dispatch all course workers to base. If the workers want to watch the race, move them outside the fences. In most cases they must be behind the Spec fence. They must not re-enter the race arena until after the race has finished.
14. Re-check that all tools and personal equipment have been removed from the race arena.
15. Communicate to chief of course your section is ready when all tasks have been completed.
16. Keep all tools needed during the race in your hands (or in a work belt) e.g. drill, gate key, wedges, hammer, gate flag, etc. Keep spare B Fence poles nearby.
17. Check along all A-Nets for ANY items and remove. e.g. water bottles, lunch boxes, bamboo, extra gates, etc.
18. Check all section personal. All the runners and slippers must be in place.
19. Move pine bough stash to where the boughers can quickly and easily access it.
20. Course Freeze

Course Freeze to last Forerunner

1. Re-check schedule for forerunners and course holds.
2. Check B Fence around TV towers. The cameramen often disturb the B Fence as they move to their cameras, repair as necessary.
3. Check that you, your crew, and any others are not in a TV or Photographers shot. Speak to cameramen when they arrive to determine their shot.
4. Insure all Coaches, service men, and photographers equipment is in a safe area.
5. Remind all personal to remain quiet and focus on the race.

During the Race

1. Remain attentive of any gate repair required. Be ready to dispatch a Runner to repair the gate immediately.
2. Insure slipping is progressing as planned. Slippers must be moving on time, getting to the next station, and slipping the race line.
3. Remember to call DNF's in your section. Do not use the radio unnecessarily.
4. Be ready if an athlete falls. B Fence poles and Section crew must be ready to move ONCE the course is clear.
5. Make sure that if you respond to a crash in your section that you give an estimate of the time required to finish all work and clear the area. Remove all damaged materials and re-set fencing or gates. Insure all workers are clear before calling the chief of course to report a course clear.
6. Be ready to perform course work during the scheduled course holds. Quickly move on the course and do only the work that is necessary. Be off the course with plenty of time to spare before the course clear.
7. Keep all Section workers in their safe areas until after the last athlete. Remember no one should be on the course unless there is a course hold.
8. At the end of the race, put up all pop fence and rope lines. Open worker exits as required in each section.
9. Be aware of the sudden rush of coaches and ski service men at the end of the race.

After the Race

1. Collect all Gate flags and inventory them. Bring all gate flags to base to be ready to be reinstalled tomorrow.
2. Collect all section workers and any teams of course workers (who watched as spectators), for instructions on after race projects.
3. Wait for the chief of course to tour the race arena. Instructions will be given as he passes through each section.
4. If snow is expected, roll B Fence up where it covers winch cat pick points. Pull up the bottom of the B Fence. If wind is expected pull down the top of the netting.
5. Do any course “Fluff and Buff” in the afternoon to enhance to appearance of your section. Work done now does not have to be completed in a rush tomorrow morning.
6. Check around A Nets for any snow to be removed. It is almost always required at the end of the day.
7. Inventory all equipment. Call for replacements to re-stock, store all equipment in a safe, well marked area. **DO NOT LEAVE ANYTHING LYING ON THE SNOW.** Even the smallest snowfall will bury equipment and it will be lost.
8. Be prepared for any water patching work in your section. This will require extra rope and fencing to keep people off the patch. Call for materials.
9. Place any barrier rope or pop fence as directed by the chief of course.
10. Call when the chief of course is satisfied and ask if other sections need assistance. Move your section crew and workers as required. If no other sections need help move your crew off the course at the first worker exit.
11. If sections above you are still working, wait until they have moved off the course, or through your section before departing.
12. Review tomorrows schedule before departing the ski area.
13. Ensure your section crew is ready for the morning.

COURSE CREW LEADERS

Daily Duties

- Check in / Pick up lunches
- Gather crew
- Confirm your pre-assigned location for the day. This will be noted on the notice board in the morning meeting.
- Load lift and report to .
- **KEEP THE CREW TOGETHER.**
- will dispatch crews to specific sections with the necessary tools.
- Crews should go directly to the assigned sections as quickly as possible and in a group.
- Once at the assigned section report to the section leader for direction.
- Assist the section leader in the organization of the crew.
- When the work is completed, notify section leader for additional instruction.
- Upon return to base the crew leader should check in with dispatch.
- Crew members should return tools to equipment management at the bottom of JP Lift.
- **STAY TOGETHER.**
- There will be times that crews are held at the bottom of the JP lift by Base.
- A dispatcher will be located at the lift to provide information.
- To insure readiness for the next day many tasks will need to be completed after the day's run. Be sure to check in with Base at the bottom of JP Lift for after the run jobs.
- At times, work assignments on the mid or lower course may require moving down outside of the arena and re-entering the course at a lower section. This allows teams working above to finish tasks undisturbed or sections with completed assignments to be left undisturbed by unnecessary movement on the hill.



Course Crews working in teams, Bear Trap and Hibernation Hole.

SLIPPERS

This season a number of volunteers will be selected (depending upon ability) to be Slippers. Each Slipper will be assigned to a Slip Crew and Leader. All slip teams will be, at times, assigned to other duties in addition to their slipper duties. These may include moving material to various sections, assisting course crews, or spectating!

Assignments

When you are dispatched from base at the top of John Paul lift, you will be given specific instructions and directions regarding how to proceed to your work area. Seek out the Section Chief of the section above your section of work so they can contact the Section Chief below to ask for instructions. Once you are in your section work area, you are too low to do any slipping work.

Movement

- All slip crews must move as a team to their assigned place of work.
- At times work assignments on the mid or lower course may require moving down outside of the arena and re-entering the course at a lower section. This allows teams working above to finish tasks undisturbed or sections with completed assignments to be left undisturbed by unnecessary movement on the hill.
- Slip leaders must make contact with the Section Chiefs before entering sections, as work may need to be done in the upper portions of each section.
- Slippers should pay attention to worker exits. When instructed, Slippers must depart the course at these exits, even if they are at midcourse. Move down to the John Paul lift and check in with .
- Do not slip into the finish unless specifically told to do so. Your security clearance may make it very difficult to return to slipping duty.
- The last slipper exit will be skier's right just above the finish area.
- Check in as a team to the Base at the bottom of John Paul immediately upon arrival. You may be required back at the top of the course.
- Check in at and your slip leader at the top of John Paul when you reach the top.

Slipping

When actual slipping takes place, Slip Leaders must keep control of their Slip Team. All slipping must Absolutely Positively be conducted as a Team to be effective. Slipping requires strength (to move snow) and knowledge (of where and when) to efficiently move snow. Team members must stay a maximum of six feet from one another when slipping.

Prior to event

Good Morning – On good days (no snowfall) Slippers will need to be ready to work. During inspection snow is built up outside the racing line and around the gate. This snow must be removed before the race. Snow moved in previous days may need to be moved again. Be ready to assist.

Bad Morning – Should we have a snow day, Slip teams will need to work closely with Section Leaders to assist with the snow removal efforts.

- Snow must be moved 4 feet away from A-Nets and B-Fences first. It is very difficult to remove large berms of snow from right on the net, and this first movement stops additional snow from sliding onto the nets.
- We must then clean areas away from the racing line before we can work the snow off the race line. E.g. We may divide the course into quarters and first move the snow on the outside 2 quarters to make room to move the snow on the inside 2 quarters.
- There may be times when it is not possible to move all the snow completely off the course. In this instance we may move snow into areas away from the race line and “thousand step” (many very small side steps) the snow to pack it down.

High Speed Slip Team

A team of slippers (numbering between 10-15) will be selected and should assemble at the start 30 minutes before the start. Approximately 15 minutes before the race start this group will conduct a group slip of the racing line. The goal is to “Blow” any remaining loose snow off the racing line. Although this is a high-speed slip, it should not be conducted at race speeds. Rather it must be a continuous start to finish line slip at controlled speeds.

Slipping during the event

- A smaller number of slippers will be required during the event. They will work in teams of two. Teams will be pre-positioned at each slip station on the course prior to the course freeze. After each athlete, 1 team (2 slippers) leaves and each slip station sends a slip team to the next slip station. Thus the whole course is slipped after each racer.
- It is crucial that each slip team moves quickly along the “racing line” unless otherwise instructed to slip the wide line, low line, etc. Look for the tracks the last athlete has just left – this is the racing line.
- Teams should enter the course quickly as a racer passes and pull off quickly at the next slip station. Never slip more than one section, DO NOT pass a slip station.
- If you hear “Course” immediately move off the course. This means that a racer is on course and close by!
- Keep quiet and listen for directions.
- Remember, slip where the racer has left tracks, this is the racing line. It may not be the shortest distance between two gates.



Part of a slip team works Tip to Tail to move snow away from the low line on Glacier Bowl

Terminology

Tip to Tail/Tip to Boot – When slipping as a group you may be asked to slip “Tip to Tail” or “Tip to Boot”. Tip to tail slipping has the group lined out across the hill with the tips of the uphill Slipper at the tails of the Slipper in front and below him.

- Tip to Boot slipping requires the group lined out across the hill with the tips of the uphill Slipper at the boots of the Slipper in front and below him.

- Tip to Tail slipping is for a final hill buffing while Tip to Boot is for working to actually move snow.

Slipping the Flats – During the race, Slippers will not slip the racing line on the flat section of the course, as this will actually slow the next racer. You should move to the side of the course and continue through that section. However, during pre-race work we will need to move the snow off the flats as well.

High Speed Slip – At the end of course work and immediately before the first forerunners, a slip team will conduct a high-speed slip of the race line literally blowing away any residual snow.

Slip Station – The point in each section that Slippers will slip to and then pull off the course, wait for the next athlete and continue.



This image is of the descriptions listed below.

Race Line – The actual line the racer takes as he/she race down the course. Also known as “The Track”.

High Line – The area uphill of the Race Line, both above and below the gate.

Low/ Late Line – The area downhill of the Race Line, both above and below the gate.

Outside/ Wide Line – The area to the outside of the Race Line.

Inside/Outside the Gate – The area “outside the gate” is between the turning pole and the outside gate. The area “inside the gate” is opposite. It is the area from the turning pole away from the outside gate.

RUNNERS

Runner Crew Leader

- Check in/ Pick up Radios
- Gather Crew/ Pick up Lunches
- Load Lift and Report to
- Crew to Meet in Designated Area; Look for Signs

Good Days

Runners will be stationed at base awaiting calls for equipment and materials.

- At the completion of assigned task, runners should call before moving further down the course for other tasks.
- Remaining runners will be dispatched from to needed areas on the course.
- Following a training run or Race, Runners will check in at the bottom of the John Paul Lift to see if they are needed for course preparation.

Bad Days

- Same morning Procedure.

Lead up to Race to and During the Race

- Designated Runners will become Bough Crew, Chemical Crew, and Gate Flag Crew.
- Bough Crew will split into two groups and move to assigned areas 30 min's before scheduled start time (4 people).
- Bough Crew should check their assigned stations, for enough Boughs to last the whole race.
- 15-20 min's before forerunner start, bough crews should begin boughing.
- The top Bough Crew should bough to the first bough station and wait for additional boughing duties during the race.
- The bottom Bough crew should bough from the first Bough station at mid course, to the bottom and return to the start for additional Boughing duties.
- Other runners will assume their assigned positions on the course with all equipment they need (drills, gate panels, wrenches, etc).
- Runners must stay in their skis ready to go.
- Runners must remain alert. At any time, you may have to fix broken gates or missing flags.
- Between racers, time is extremely limited to repair gates. In most cases only 20-45 seconds is available to finish the work and return to a safe area.
- All remaining Runners must remain with skis on at ready to leave at a moments notice.
- Runners should return Immediately to for further assignments.

Communication

- All runners must maintain the highest levels of radio etiquette and be listening for radio calls at all time.

B FENCE CREW

The B Fence crews will consist of 3 workers and a team leader. Each team must be able to ski to any point on the course under any conditions, good or bad. Each must transport all the equipment and spare materials required for B Fence repair. Each team must be able to work together and react quickly during the race.

B Fence Crew Leader

- Check-in, pick up radio, drill, and other tools.
- Collect crew and pick up crew lunches.
- Load lift and report to .

Good Days

- B Fence crews will work under the direction of the Chief of Course.
- Crews should assist sections to install B-Fence and remove during Teardown.
- Crews must be ready to re-install B-Fence removed for Snow Cat Access.
- Preceding the course freeze the crew should be ready to assist transporting outsized items down the course.
- Teams must remain together and contact dispatch upon completion of an assigned task.

Bad Days

- Same morning procedure as good days.

Lead up to course freeze

- Each team should insure that extra B-Fence repair material has been stored at each repair station.
- Teams should spend time checking B-Fence's to ensure it is still installed correctly.
- Check with the Chief of Course for additional B-Fence that must be installed prior to the race.
- If B Fence was rolled up for snow removal, assist with re-installation.
- Insure that the whole team is in its designated position prior to the course freeze.
- One team must remain at top to be ready to bump.



A B-Fence Crew works to replace broken B Fence Poles with the assistance of Section Crew Workers.

During the race

- All team members should remain in their skis at all times during the race.
- Keep your radio volume turned up to be sure to hear all race announcements.
- Teams should not respond to fallen athletes, wait for a call to fix B-Fence after the course is called clear.
- If a course hold is called, be alert for a B-Fence repair call.
- If the section leader is unable to repair any damaged B Fence in his section he will call for B-Fence Repair.
- When called move quickly and as a team.
- When you leave your repair station make sure you have all the materials necessary to complete any B-Fence repair
- The team should carry
 - 40 Naked B-Fence poles
 - 20 B Fence clips
 - 1 Pre-built roll of B-Fence
 - 1 Bag to remove broken B-Fence bases
 - 1 Roll Duct tape to tape broken B-Fence Poles into Bundle
- Call dispatch when you move so they can bump teams to replace you.
- Upon arrival inform the section leader how long it will take to complete the repair.
- Remove all broken material.
- When the team leaves the repair site, exit the course at the closest worker exit and move directly to the bottom of the lift.
- Drop all broken materials at lower , and ride the lift to the top.
- When you arrive at (top) check in with the dispatcher and re-stock with repair materials.
- Be ready to move at any time to repeat the process.

At the end of the race

- Re-stock all B Fence repair stations.
- Help with any B Fence roll up around winch cat pick points and snow cat entry areas.
- Check in with dispatch for further tasks.

Communication

- All B-Fence crews must maintain the highest levels of radio protocol.
- Be listening at all times for radio transmissions regarding B-Fence repair.

SAMPLE DAILY SCHEDULE

Sample

5:00	Arrival of volunteers and race crew
5:30	Morning meeting, collecting team members
5:45	Collect radios, tools, etc.
6:00	Load Lifts Jury loads lift
6:20	Check in @
6:25	Move to sections - Bottom sections first – replace gates, gate flags, bluing, and numbers
7:00	Jury Inspection
7:00 – 9:00	Work in sections
7:30 – 8:00	Coach Inspection
8:00 – 9:00	Inspection for Athletes – Entry to course closes at 8:30
9:00	Complete work in sections, send extra workers to lower and check in with Chief of Course. Gatekeepers begin moving to positions
9:00	Inspection over for athletes
9:10	Press freeze Jury in place Gate keepers in place Runners, slippers and gatekeepers to be in place
9:30	Course freeze – all course crews, slippers, workers, volunteers
9:35	Pine boughs
9:40	High-speed slip begins
9:45	TV Forerunners
9:50	Forerunners
10:00	Race start – After racer #30 a 3 minute course hold for course maintenance.
12:00(approx)	Race ends
12:05	Coaches / techs move
12:20	Fences up – pop fence
12:30 – 2:30	Afternoon course maintenance
2:30	Workers movement off hill (controlled)
3:30	Afternoon meetings
4:00	Depart

SNOW CATS

Winch Cats

The Men's Grizzly Downhill plunges 2,913 feet over a length of 1.9 miles. This equals an average drop of 1,541 feet per mile, and some sections have a slope equal to 71% grade. Due to the incredible gradients encountered on both the men and women's courses, specially equipped snow cats must be used when preparing the course. These cats carry a large hydraulic winch on their back deck with over 2,200 feet of cable. Each of these cats can attach themselves to specially prepared "pick points" which enable them to be lowered into position via steel cables. While in the set up phase these winch cats can work alone, or in groups on the racecourse while the run is closed to skiers. However during a race series if too much snow falls, and it is unable to be removed by side slipping, the winch cats are called on to assist. This can lead to situations where a 6-ton snow cat is suspended while working on the racecourse, by a steel cable! This of course can potentially be very dangerous. As the winch cat moves its cable can "snap" across the hill or into the air. The snow the winch cat is pushing can slide downhill, almost like a mini avalanche.



A winch cat grooming the end of John Paul Traverse after a heavy snow fall

With many course workers on the racecourse at the same time as the winch cats, special precautions must be observed.

- **Never cross a winch cable.** Do not try to pass over or under the cable. A change in tension could cause the cable to jump into the air or slap to the ground.
- When moving to or through an area where winch cats are operating, either call or have someone call the cat operator. Be patient, it may take several minutes for the operator to respond and several more minutes for the cat to move to an area where it is appropriate to stop and safe for you to pass. All calls to winch cats for cable crossings should be made by Snowbasin personal.
- Never position yourself below a winch cat. Should the machine encounter mechanical difficulties you may be in a position where the cat could slide toward you.
- Never approach a moving winch cat. Always wait until the machine has stopped and the driver has indicated that it is safe to approach.

Be aware that with up to 2,200 feet of winch cable, a cat that is attached to a "pick point" can still be a significant distance away, yet you must still observe all safety precautions.

A race worker approaches a Blower Cat suspended by a winch cable. The worker will have to wait until the Blower Cat stops working, then pass below the machine.

Blower Cats

If a blower cat is to be used, snow must be moved into large piles or berms where it is easily accessible by the blower cat. Sometimes this will mean moving snow a considerable distance or to unusual areas.

- Care should be taken to remain well clear of the blower cat at all times.
- Stay clear of the uphill side of the cat so there is no chance of falling and sliding towards the cat.
- While operating the blowers, visibility from the cat is *extremely limited* due to the blowing snow.
- Be aware that the operator may not see you even when you can see him.

Blower cats frequently work attached to a winch cat, if this is the case never attempt to cross the cable and stay well clear of both cats and the winch cable.



Snow scraped of the race line with shovels, is thrown over A Nets by a Blower Cat.

SNOW REMOVAL

Removing snow from the race arena is not rocket science. It can however, seem like rocket science if some key principles are not observed. Over a period of years, key strategies have been developed to streamline the whole snow removal process.

Strategy

Depending on the snow accumulation, there is a fair amount of strategic planning involved in snow removal operations. A small 1-inch snowfall accumulation can usually just be slipped off the course. A heavier 2-inch snowfall calls for some strategy. A 12-inch snowfall requires serious strategy. The figures below will give some idea of the physical reality.

The average width of a downhill course is 40 yards. The figures below are based on a section of the course 40 yards wide by 100 yards long.

- Snowfall of 1 inch (.03 yards) $100\text{yds} \times 40\text{yds} \times .03\text{yds} = 120\text{yds}^3$ that is 120 cubic yards of snow. If that were in a berm 100 yards long and 1 yard wide the snow would pile 1.2 yards high.
- Snowfall of 2 inches (.06 yards) $100\text{yds} \times 40\text{yds} \times .06\text{yds} = 240\text{yds}^3$. That is 240 cubic yards of snow in a berm 100yards long and 1 yard wide the snow would pile 2.4 yards high.
- Snowfall of 12 inches (.33 yards) $100\text{yds} \times 40\text{yds} \times .33\text{yds} = 1320\text{yds}^3$ that is 1320 cubic yards of snow. In a berm 100 yards long and 1 yard wide the snow would pile 6.6 yards high!

The following points are valid

- 1 Remove snow in the area where you wish to put the snow from the race line.
This is always the first objective. If you slip and shovel snow from the race line first, you have a huge berm just outside the line that cannot be moved. Therefore you must completely clear the areas outside the race line *first*. This gives a clear and open space where you can move the snow on the racing line to.
- 2 Remove snow on the low line/bottom of the slope first.
On any slope or traverse snow must first be removed from the lower areas of the slope. As above, this is required to allow space for snow from further up the slope to be pushed down. When clearing the low line always add 30-50% more area to clear. You will need to clear a greater area than you think.
- 3 A major goal of snow removal is to limit the formation of unwanted snow berms.
Points 1 and 2 help to limit the formation of berms. Once developed snow berms are very difficult to move with slippers and usually require machines or shoveling. Collecting snow in berms near the fences so blower cats can deal with them is part of the removal plan. A berm in the middle of the race arena is not desirable.
- 4 Move snow away from the racing line and into small spill zones, or use snow storage areas.
The spill zones can be a good area to store small amounts of snow. These are areas where athletes normally will never get into unless they have fallen and slid into them. It is possible if time is short, to move excess snow into these areas and pack it down, by either sidestepping or with a snow groomer. Likewise, these are areas where large amounts of snow can be moved to and dealt with by blower cats. There are also designated areas where snow can be stored. Check on your section map to locate these areas. After snow has been collected in these areas, it must be packed and smoothed down. No clumps, piles, or bumps should be left protruding from the surrounding snow.
- 5 Move only the snow you need to.
During the morning rush to move snow it is important to identify the areas where snow *does not* have to be removed. These areas can be dealt with in the period after the day's race. Encourage workers to remain clear of these areas.

Other Principles

People moving, means moving snow

No matter how many or how few, every person who moves on the course, to some extent, moves snow. More personnel and softer snow means more snow movement; harder snow means less snow movement. A practical example of this is the formation of moguls on a ski run.

For this reason all worker movement inside the race arena must be carefully controlled. Worker routes and exits should be used as often as possible. Any movement inside the race arena should be coordinated to assist the section leaders in completing their pre-race tasks, rather than disrupting their efforts.



A small number of course workers have already moved snow into a berm that must be removed later.

Snow being moved by hand or ski will react differently depending on the location

Sections with long steep slopes tend to move more easily, moderate slopes less so, and on flat areas snow removal becomes quite a task.

Long steep slopes allow slippers to build up speed and push large quantities of snow ahead of them. Several passes may be required to strip all the unwanted snow. However, as the slope flattens out large piles build up, likewise steep side hills (where the race line traverses the slope) allow slippers to push snow perpendicular to the race line and strip all the snow.

Flat areas require hand work. It is not possible to push the snow away from the race line with slipping. The race line then must be shoveled or raked clean. 15 feet either side of the line should be cleared by hand, and then machines can remove all the remaining accumulated snow.

Moderate slopes are the most challenging for snow removal. Slippers starting at the top of a slope and pushing snow downhill will quickly bog down and build large snow piles. Usually moderate slopes are not steep enough to build up much speed.

Icy slopes allow accumulated snow to be moved with greater ease but slippers must be proficient. As snow is removed, the slick underlying surface is uncovered, and it is more difficult to remain in control on the icy snow.

Double Effort

In all snow removal operations, care should be taken to optimize labor. It is soul destroying for a group of workers to work industriously on a project only to have their work destroyed by poor planning or poor execution of the plan.

Always insure that work progresses in a logical fashion. Keep the overall plan in mind. Keep the work flow efficient. Avoid removing snow from one area then having another group or section dump their snow in that spot. Communicate between sections to ensure efficiency.

Clear Snow for all Events

Frequently during snow removal operations only the race line of the today's event is cleared. However, consideration must be given to all the events to be run in the race arena. There is no point in clearing only the race line of a downhill when the following day a Super G will be held. The key is to clear as wide a swath as possible. Certainly focus on insuring that the current days race is held, but keep in mind events in subsequent days.

Berms and Piles

Snow moves in a non-uniform fashion. Berms and piles quickly develop as worker movement occurs. Any worker movement (whether moving from section to section or as part of a plan to slip) will build berms and piles. Any piles and berms left in the race arena are very dangerous. Any athlete or worker who is moving quickly down the slope and hits one, could be upended and crash heavily. One of the goals in snow removal is to limit the formation of and completely remove any berms and piles of snow.

If you are slipping and you encounter a snow berm or pile that limits your ability to move snow there are several things to do:

1. Do not continue to push snow onto the berm unless the berm is to be removed by a snow blower cat.
2. If you slip into a berm and are unable to move it, jump to the other side of the berm and continue to move the snow behind the berm. It is much better to return later to take care of the berm than to struggle and achieve nothing.
3. When moving a berm it is often better to shovel the berm spreading it downhill and allowing slippers to then move the snow away.

Danger Areas

Particular attention is given to sections of the race line around the landing of jumps and through turns. Soft snow that accumulates here can be very dangerous. As athletes pressure their skis in a turns they can break through this soft layer creating a hole or rut. When jumping and landing on soft snow they can "divot" soft snow and pitch forward, possibly tumbling head over heels.

Extra care must be taken to check these areas to be certain all snow has been stripped away down to the hard surface. Confusion can occur as soft snow is "packed" down. This packed snow can appear hard enough to race on yet must still be completely removed. It is common for snow to be pushed and packed by worker movement resulting in significant accumulation. The back side of small bumps, hollows, depression, and flat areas accumulate the most snow.

Machine Work

Every effort is made to use snow cats to strip snow. In most cases it is much more efficient to remove snow by machine than by hand.

Some limitations do exist. Areas that are inaccessible, or that expose workers, TV platforms and A-nets are unsuitable for machine work. Often the FIS Race Director prefers snow cats not even work on or even cross the race line. These snow cats can fracture the race surface and accelerate its degradation.

Slipping and handwork is often required on the racing line. Machines can then push this snow and remove it completely. In flat section this limitation is relaxed. Machines will generally clear the finish area. If there is a relatively flat section of the race line, it may also be possible to use machines.

Should a heavy snowfall blanket the race arena preventing efficient handwork, snow cats will be initially employed. Subsequent work will include extensive handwork, followed by more cat work to remove the snow stripped by hand.

After a heavy snow fall, a winch cat strips snow out of the race arena.

SHOVELING

Modern ski racing requires an incredible level of precision. One element that allows top class ski racers to perform precisely is the rock hard snow surface. Hurling down the racing slope at speeds up to 80 mph requires a perfect snow surface with few bumps or ripples and absolutely NO soft snow on the surface. Imagine racing a NASCAR car around an oval and getting to turn 3 with 1 to 2 inches of loose gravel on the track, not good! The same idea is applicable to ski racing, loose soft snow on the racing line presents a safety concern. Because of the FIS race director's stringent requirements with regards to snow surface conditions, the race organization frequently requires many workers who assist to clear the racing track with shovels.

There are several key points to insure maximum efficiency and quality when performing shoveling work.



Course Crew teams working in a coordinated fashion, shoveling in two large groups.

1. Teams

It is vital for course crew teams to work in a coordinated fashion. Crew leaders must follow directions from the section leader.

- Team members should work shoulder to shoulder to clear a swath of snow rather than shoveling individually.
- A team should start high and work downhill. Work with gravity, it is your friend.
- The team should work at a steady pace – as fast as the slowest team member, to insure no one lags behind, fragmenting the team.
- Remember when shoveling snow not to throw it onto one of your team members or back on the area you have just cleared – wind drift, etc.

2. Tools

Be sure to use the correct tools for the job. When shoveling there are normally 3 kinds of shovels used:

- Grain Scoops – plastic and aluminum – Best on A-nets and steeper terrain when lifting snow from one place to another.
- Driveway shovels – best for teamwork projects i.e.: shovel brigades, shoulder to shoulder/shovel to shovel. They are also effective when scraping loose snow off the racing surface. Best used on flat to moderate terrain.
- Small steel shovels. For course work on a hard or icy surface in the removal of small chatter marks. Use with caution! It is easy to remove too much material with steel shovels.

- Rakes – For pushing small amounts of snow off the course, removing loose snow from the racing surface and general course maintenance to keep chatter marks and grooves from forming.

From left to right, Aluminum and Plastic Grain Scoops, Driveway Shovels, More Plastic Grain Scoops (behind the fence), Rakes, Yellow Handled Small Steel Shovels (upside down behind the rakes), a second stack of Driveway shovels and more rakes.

The key when shoveling is to remove snow all the way down to the previously prepared hard layer or race surface. Digging into or through this hard layer is unwanted and can in fact be counter productive by creating a hole that must then be fixed. By using only grain scoops and driveway shovels it is very easy to remove the unwanted soft top layers of snow without damaging the hard layers. You will know when you have reached the hard layer by the sound your shovel makes. It is a “rat-tat-tat” sound similar to that heard when clearing a driveway. Final clearing of soft snow can be accomplished by dragging the shovel across the snow blade tip down as if you were using a broom to draw the last of the snow toward you.

3. Around Gates

It is important to remember to also shovel around the gates. Frequently top racers ski close enough to hit them and their skis can be only inches away from the gates. Even if you have cleared loose snow from the gate before athlete inspection it can quickly build up again during inspection. Therefore, it is important to send workers to clear snow away from the gates at the completion of inspection. The gate hinge should be at snow level so removing loose snow down to the hard layer is important. Remember not to dig into the hard layer.

4. Inspection

Most snow clearing work will be completed prior to athlete inspection. However, some work may need to continue while athletes are inspecting. Should this happen, you must make every effort to move clear of the race line so that athletes have a clear view of the course. As the athletes clear the course, shovel teams may move back onto the course to remove any remaining loose snow. With large numbers of coaches and athletes slipping the racing line during inspection, piles of snow will build up and these must be removed.

5. A-Nets

A-nets are installed to protect areas where there is insufficient space for B-Fence. Often A-Net is installed at the bottom of steep slopes. These slopes collect snow and during snow clearing operations the snow is pushed downhill. This excess snow collects at the bottom of the slope in front of the A-Net. All this excess snow must be removed. There are several options to consider when removing this snow.

- Set up snow chutes and escapes under the nets. The most favored option for quick snow removal. (More on this later)
- Use the smaller Honda snow blowers to remove the snow. This is only an option for small snowfalls or when moving snow away from the A-Net. (More on this later)
- Utilize a snow cat with an attached snow blower to blow the snow over the net. Sometimes this is not an option as the snow cat may not be able to cross the race line without damaging the hard snow surface.

No matter which option is chosen the snow must be completely removed from against the net and the surrounding areas.

When finished the snow level on both sides of the A-Net should be at the same level. The snow behind the net should never be higher than the level in front and vice a versa.

A Course Crew team using snow chutes and rakes to remove snow from next to an A Net.

SNOW BLOWERS

Currently two types of snow blowers are employed for snow clearing duties. Larger Blowers attached to snow cats for heavy-duty work (these machine combos are call Blower Cats) and smaller walk behind Honda Snow blowers.

Snow cat mounted snow blowers create large clouds of snow and a lot of noise when they are running. It is important to remain clear of blower cats when they are in operation.

A Blower Cat works in the finish area

Honda Blowers

The smaller Honda blowers are used most often around A-Nets to clear snow away from the A-Net or to move small berms of snow. Follow correct operating procedures at all times.

- Do not stress the snow blower.
- Make sure people, equipment and loose items are well clear of the blowers while operating.
- If blower does not seem to be working properly, shut down motor and check shear bolts and replace if necessary.
- Fill the fuel tank when finished. Check engine oil.



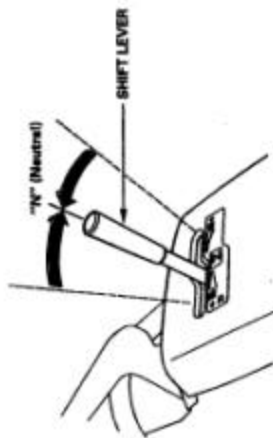
A Honda Tracked Blower is used at Beaver Creek.

STARTING THE ENGINE

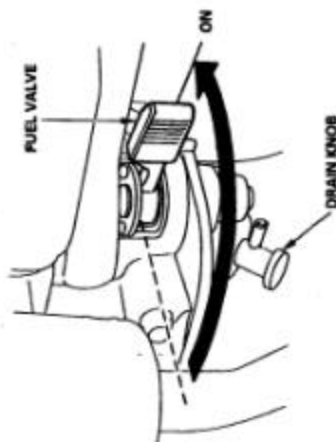
WARNING

Never run the engine in an enclosed or confined area. Exhaust contains poisonous carbon monoxide gas; exposure can cause loss of consciousness and may lead to death.

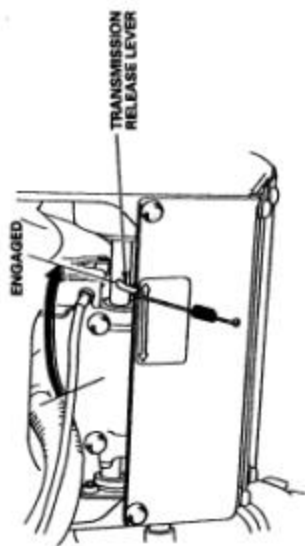
1. Move the shift lever to "N" (Neutral) position.



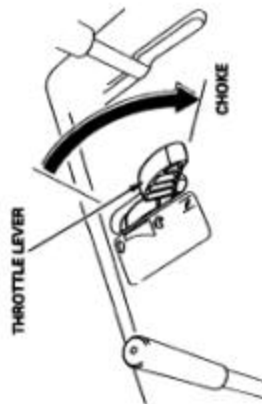
2. Turn the fuel valve to the ON position.
Be sure that the drain knob is tightened securely.



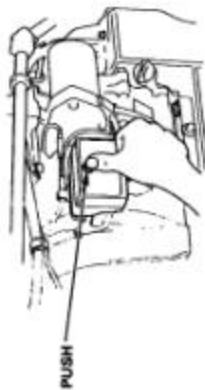
3. Set the transmission release lever in the ENGAGED position.



4. In cold weather and when the engine is cold, move the throttle lever to CHOKE position.



7. Push the starter button until the engine starts. After the engine starts, disconnect the power cord from the electrical outlet first, and then from the switch box.



NOTICE

Do not operate the starter for more than 1 minute. If the engine fails to start, release the button and allow the starter to cool for 15 minutes before operating it again.

[MANUAL STARTING ONLY]

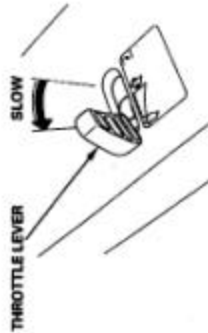
8. Pull the starter grip lightly until you feel resistance, then pull briskly.

NOTICE

- Do not allow the starter grip to snap back against the engine. Return it gently to prevent damage to the starter.
- Damage may result if the starter grip is pulled while the engine is running.

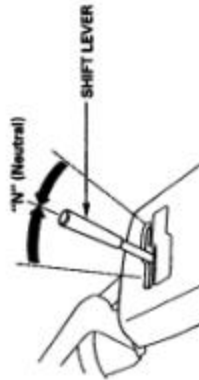


9. Let the engine warm up for several minutes. If the throttle lever has been moved to the CLOSE position, gradually move the throttle lever to the SLOW position as the engine warms up.

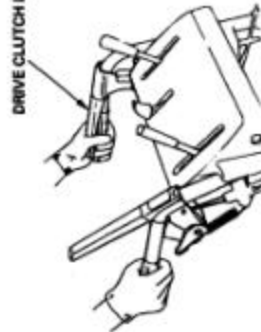


10. While warming the engine up, also warm the transmission as follows:

(1) Check that the shift lever is in the "N" (Neutral) position.



(2) Squeeze the drive clutch lever for about 30 seconds.

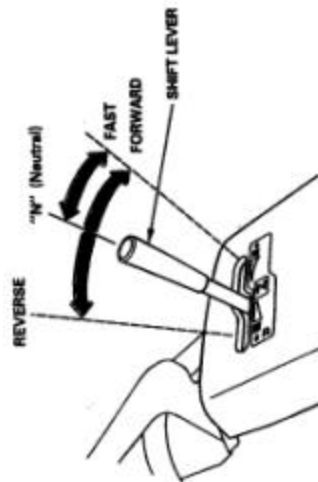


SNOWBLOWER OPERATION

1. Start the engine according to the procedures described on page 25

Before operating this equipment, you should read and understand the Safety information on pages 5 thru 7

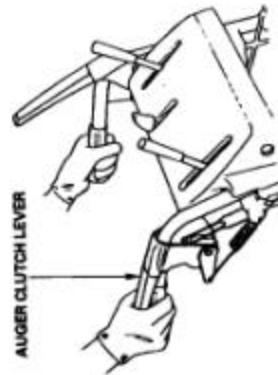
2. Move the throttle lever to the FAST position for normal operation.
3. Release the auger clutch lever, and move the shift lever to select the desired drive speed.



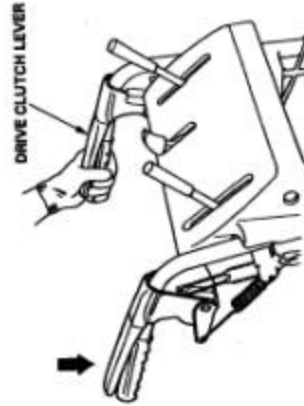
Low speed is recommended for removing deep or hard-packed snow.

4. Set the foot pedal to the "HIGH" position. (See page 16; track type only).
5. Adjust the throwing direction by using the chute crank and the chute guide (see pages 11 and 13).

6. Squeeze the auger clutch lever. The machine will clear snow when you squeeze the auger clutch lever.

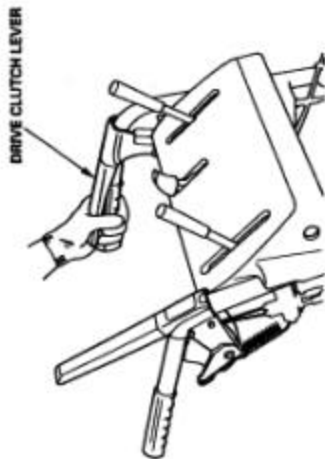


7. Squeeze the drive clutch lever. If the transmission release lever (page 26) is in the ENGAGED position, and the shift lever (page 30) is in the FORWARD (F) position, the hydrostatic drive will propel the snowblower forward when you squeeze the drive clutch lever.

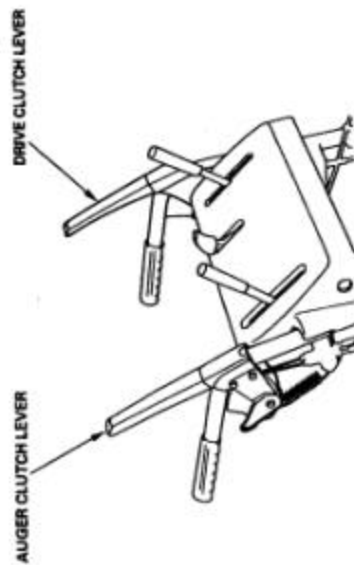


When both levers are squeezed, the drive clutch lever locks the auger clutch lever down. This frees your right hand to operate the other snowblower controls. Releasing the drive clutch lever unlocks and releases the auger clutch lever.

To move from one place to another, or to change direction, use the drive clutch lever only. Release both the drive clutch lever and auger clutch lever, then squeeze the drive clutch lever.



8. Release the clutch levers to stop clearing or moving.

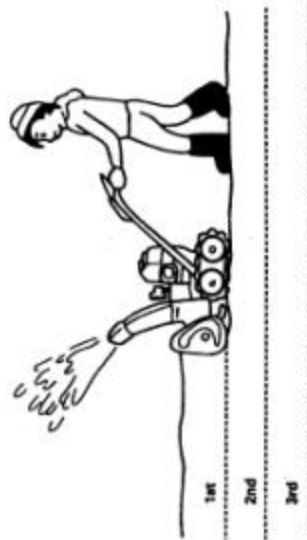


Clearing Snow

For best efficiency, clear snow before it melts, refreezes and hardens. Do not reduce engine speed while clearing snow.

Operating tips for clearing hard or deep snow:

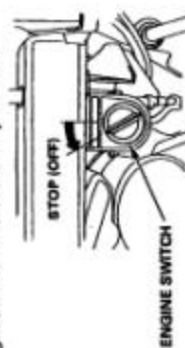
- Reduce forward speed. If that is not sufficient, use the shift lever to clear snow with a back and forth motion.
- Clear a narrower swath. Make several passes with the auger overlapping the cleared areas.
- If the snow is deeper than the height of the auger, remove it in several steps, as shown below.



STOPPING THE ENGINE

- In an emergency:

Turn the engine switch to the OFF position.



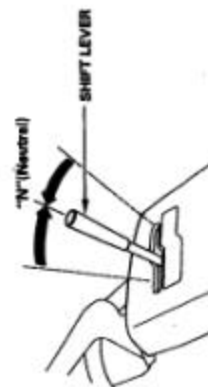
To restart the engine, move the shift lever back to the "N" (Neutral) position.

- In normal use:

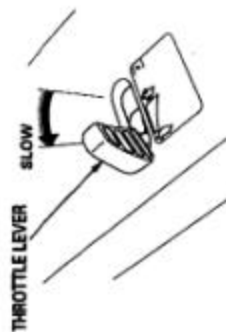
1. Release the auger and drive clutch levers.
The drive and snow throwing mechanism will stop operation.



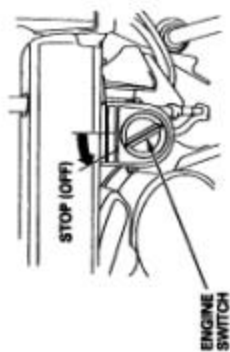
2. Move the shift lever to "N" (Neutral) position.



3. Turn the throttle lever to the SLOW position.



4. Turn the engine switch to the OFF position.

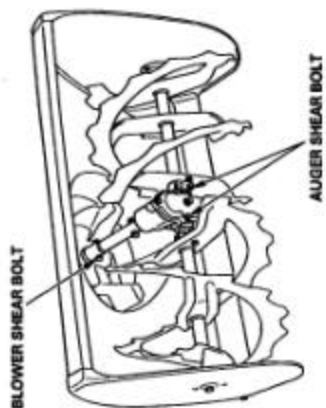


5. Turn the fuel valve to the OFF position.



Auger and Blower Bolts

Check the auger and blower for loose or broken bolts. If broken, replace them with new ones (page 48).



Other Checks

1. Check all bolts, nuts and other fasteners for security.
2. Check each part for operation.
3. Check the entire machine for any damage that might have occurred in previous operation.

SNOW CHUTES

With large amounts of snow needing to be moved quickly, one of the best methods is by using snow chutes. Snow chutes are normally used around A-Nets, but can also be used to move snow from other areas on the course when accumulation becomes so great that other forms of removal become inefficient. There are two main types of snow chutes.

- Curved - to change the direction under an A-Net or the other side of the slope.
 - Straight –sections used to form long lines to move snow over long distances.
- Each section can be overlapped to extend the chutes.

Under the direction of the section leaders or A-Net supervisors, sections of snow chutes will be deployed extending up the slope from the snow chute escapes to the area to be cleared. Each chute section should overlap 6 inches over the one below it. Each section will have two small anchors that are drilled into the snow. These anchors hold the chute in place while in use. Be sure to scrape frozen ice off the chutes before use. This reduces the chance of snow sticking in the chute.



Snow shoveled into the chutes slides down the chute away from the work area to a dumping area. Several people are required at the bottom of the chute. These people manage the last sections moving them from side to side to prevent snow from backing up.

Snow chute “escapes” are placed under A-Nets. These escapes allow snow sliding through longer straight chutes to exit under the A-Nets. Additional chute sections behind the A-Nets then carry the snow away from the A-Nets. Adding curved sections allow chutes parallel to the A-Nets to “bend” towards the escapes.

Escapes remain in place and are buried when snow removal is completed. During the next snow removal operation they are quickly exposed, ready for use.

Most known snow chute areas will be stocked with a sufficient number of chutes. These chutes will be used and then returned to a storage area located nearby. It may be necessary to move additional chutes to problematic areas.

When transporting chutes exercise caution, avoid dragging, or dropping chutes. Be aware of the large surface area of chutes in windy conditions. During strong wind gusts, snow chutes can act like a sail.

COURSE WORK

Modern ski racing technique is incredible dynamic and powerful. Strong pressuring movements are transferred to the skis and thus to the snow. Each day, damage is inflicted upon the racing line by this pressuring, and the passage of the racers skis along the race line. Most of this is normal wear and tear occurring during the race run. As course workers you will be required to assist with maintenance and repair of the racing course and its snow surface.

The speeds involved in Downhill and Super G races normally dictate that course work will be conducted only during course “holds”. This is a time during which racers are not on course. Work is completed and workers return to safe areas before the course is declared “clear” and the race resumes. It is very unusual for course work to be conducted while athletes are on course during Downhill races.

Due to the lower speeds of Slalom and Giant Slalom races, it is common to work on the course between athletes. In this case work must be completed and workers exited the course before the athlete comes into view.

The most important aspect of all course work is safety, both for the course worker and the athlete.



Race Line – The line the racer takes while racing down the course. Also known as “The Track”. This is the actual path that the racers take. Identified by the racers ski tracks left in the snow. This is not necessarily the shortest distance between two gates.

High Line – The area directly uphill of the Race Line, both above and below the gate. This area is between 6” and 24” above the racing line. The line the racer would be taking if he were “above” the racing line, hence “High Line”.

Low Line/ Late Line – The area directly below the Race Line, both above and below the gate. This is the opposite of the high line. This area is between 6” or more below the racing line. The line the racer would be forced into if he were off balance and making turns late, hence “Low Line”.

Outside/ Wide Line – The area just to the outside of the Race Line. This area normally accumulates excess snow as slippers work the race line.

Inside/Outside the Gate – The area “outside the gate” is between the turning pole and the outside gate. The area “inside the gate” is opposite. It is the area from the turning pole away from the outside gate.

Below the gate – The area just below the turning gate.

Several unique types of snow disturbances will be encountered while maintaining a racecourse. It is quite common to encounter a combination of several of these at any given gate. Below is a partial list of course damage.

Hole:

What: A weak point in the snow that forms a hole, similar to a pothole. Very dangerous to ski racers.

Cause: Racers pressuring skis in same place, breaking through weak layers or wear area in snow.

Where: Normally, just below gate on racing line

Effect: Probable binding pre-release, possible injury to leg if bad enough. Normally disrupts racers line for several gates.

Tools: Steel shovel.

Repair: First, shovel downhill edge of the hole, enlarging length wise in direction of racing line. Blend depth to equal surround snow area over several feet. Never dig deeper.

Second, lengthen in direction of racing line uphill. Blend depth to equal surrounding snow over several feet.

Third, dig to the inside towards the gate to blend surrounding level.

Chatters:

What: Small ripples on snow, that makes a chatter sound. Similar to a washboard.

Cause: Racers sliding sideways, edges gripping and releasing makes chatter mark.

Where: Above and below the gate.

Effect: Could possibly cause binding to pre release, normally, not much effect.

Tools: Rakes.

Repair: Use toothed side of rake. Smooth whole area scraping chatters away. (Work with the grain) Raking parallel to the chatter mark is working with the grain.

Ruts:

What: A long groove in the snow in the race line

How: Soft snow yielding to racers ski pressure.

Where: On racing line above and below, next to gate.

Effect: If the bottom end of rut is steep it can act like a ski jump launching the racer into the air causing them to ski a late line in following gates.

Tools: Steel shovel.

Repair: If not getting any worse, leave alone. Otherwise fix in the same manner as holes. Do not allow the bottom of a rut to become a launching ramp by blending steeply into surrounding area. If this looks to be a problem, lengthen the blended area.

Double Rut:

What: Two short parallel ruts in the snow usually at a cross angles to the racing line.

How: Racers double pumping to get pressure on the ski to turn.

Where: Normally, beside and below gate.

Effect: Possible pre-release, has a tendency to throw racer off balance.

Tools: Steel shovel.

Repair: Lengthen bottom of bottom rut and the top of top rut. Remove the bump between the two ruts. Join both together, this can take some time. Otherwise fix as for ruts.

Berm:

What: Snow slipped from racing line to just outside racing is left as a berm.
How: Slippers not continuing to slip wider and wider and blend the berm into the surrounding snow. This usually occurs in the spring as snow softens or from recent snowfall on course.
Where: Normally this occurs beginning opposite gate and below gate outside low line.
Effect: If racer is low and late they could get their ski caught in the soft berm causing a tumbling crash – very dangerous.
Tools: Steel shovel and rake.
Repair: Must be completely shoveled or raked out for the entire length of berm and excess snow either packed down or spread and blended into surrounding snow.

Snow Piles Around Gates

What: Piles of snow surrounding base of turning poles. This snow forms a dangerous ramp. Can be anywhere from ½ inch to 10 inches of snow.
How: Snow slipped from racing line onto turning gate. Accumulates during inspection.
Where: Base and surrounding area of turning and sometimes outside gate.
Effect: Should a racer fall and slide into the gate, snow ramp can launch them in the air. Very dangerous.
Tools: Grain scoops.
Repair: Must completely shovel away entire surrounding area down to hard layer, including area immediately underneath the gate. Must be done after athlete inspection.

WATER PREPARATION

Modern ski racing events require a uniform racing surface. It must be both dense and hard. Creating this surface can be quite a challenge. One of the most successful preparation methods involves water. During the event build out, large quantities of water are sprayed onto the racing line. As this water permeates through the snow pack, some is trapped between snow crystals. This trapped water increases the density of the snow pack. In addition this water will freeze, further bonding the snow pack together and creating the hard racing surface.

There are several different methods to add water to the snow pack.

- Patches – Areas of softer, less dense snow may be watered or patched. Buckets or jugs are used to precisely apply water.
- Whole Course (fence to fence) – May be watered using snowmaking hoses, dousing the course with several inches of water.
- Water Injections Bars may be employed, either over the whole racing line or in select turns only.

Each of these different methods will work with varying success depending on conditions and amount of water added.

Snow Patch

Initially it may not have been necessary to harden the racecourse, however after several days use the race line may require some repair. Around the gate where the athletes pressure their skis the most, holes may develop. These holes must be repaired and this may require small amounts of water or a snow patch.

1. Remove all loose snow and unattached chunks of snow from the hole. Leave chunks that still connected to the surrounding snow. These connected chunks help strengthen the patch. This must be done by hand.
2. Collect several buckets of soft dry snow and several filled water jugs.
3. In a bucket mix dry snow together with water until saturated.
4. Pack saturated snow in bottom of hole with hands. Force into all cracks and hollows. Fill no more than 1/3 depth of hole.
5. Add fresh dry snow and pack by hand. As you do this the water from the saturated snow in the bottom of the hole will wick into the dry snow. Continue until only very small patches (1/2 inch diameter) of wet snow is visible. At this point the hole should be at most 1/2 full.
6. Mix a dryer batch of wet snow and shovel into hole. Pack down. Fill the hole no more than 2/3 full.
7. Again, add dry snow to fill hole out and wick water up.
8. Side step with skis, to smooth the patch surface and blend into surrounding area.

Care should be taken not to add too little or too much water. If the patch is saturated over the whole area it will be too slick when it freezes. If there is insufficient water the patch will be too dry and will chunk out again. The patched surface should be mostly dry, no more than 40% of the surface area should be saturated snow. As the patch freezes more moisture will wick into the dry snow. Rope or mark off the patched area until it freezes. It is susceptible to damage if skied over.

A Course Worker waters a section of the course while Winch Cats wait.

Whole Course

Watering the whole course is a time consuming process. Winch cats, water hose, snowmaking guns and large numbers of personnel are needed. The process is very involved and requires plenty of experience. Timing is critical to insure a good grippy racing surface. It is very easy to “over do it” and produce a surface that is too slick. This process normally takes several days. Watering the whole course would be completed as part of the event build out. It would never be attempted during an event.

Injection Bar

The water injection bar has gained popularity over the last few years on the World Cup circuit. This system is unique. Water is piped to a 16-foot aluminum pipe (the water bar) and under high pressure forced through nozzles. Each nozzle (approximately 40 per bar) shoots a needle of water. When the bar is resting on the snow surface, water is injected into the snow pack. Depending on water pressure, nozzle size and snow pack characteristics, penetration may be as much as 2 feet or as little as 8 inches. Thousand of holes will be left each surrounded by saturated snow. This snow freezes producing the hard racing surface. The holes allow heat from the snow pack to bleed off (or cold air to enter) speeding freezing.

This system when used correctly and under optimum conditions can produce an excellent race surface. There is however a tradeoff. The injection system is very time and labor intensive.

Materials List:

- Water Injection Bar
- 800 – 1500 feet snowmaking hose
- Connection fittings – hose to bar and hose to hydrant
- Water injection bar tool kit

Personnel List:

- 1 Director / Organizer
- 2 injection bar operators
- 2 close in water hose assistants
- 1 hydrant operator
- 5-8 water hose assistants

The director must have complete knowledge of the system and process for optimal results.

Water Injection can be conducted at night, dress warm!

Process

1. Transport all materials to top of area to be treated, the starting point.
2. Beginning at the starting point roll out all the water hose. Roll downhill until the hose supply is extinguished. Connect hoses. Flush closest hydrant to end of hose until clear water flows.
Connect hose to hydrant. The key here is to have adequate hose to inject several long passes rather than many short passes, i.e. 1000 feet of hose rolled 900 feet downhill and connected to hydrant will allow approximately 1800 feet injecting before moving to another hydrant. 1000 feet of hose connected near the start will allow only 1000 feet of injecting.
3. Assemble bar, handles etc. Turn bar upside down, install nozzles. Be careful not to allow nozzles to touch snow before water flows, as they will become plugged with snow. Assembly should take place 20 to 30 feet from the beginning of the slope to be injected. Clean all nozzles before starting.
4. Assemble workers to carry hose, operate the hydrant, and operate injection bar. The director needs to coordinate all the workers actions.
5. Turn injection bar right side up and hold away from snow. Turn water on.
6. The director must maintain constant communication with the hydrant operator to insure correct water pressure and flow. Spread all workers out along the length of the water hose. As the hose fills with water the workers must support it and control its movement as the operation moves downhill.
7. When water flows through to the bar and reaches the desired operating pressure, walk the injection bar and connected hose to beginning of the slope. Pace nozzle down on the snow surface. Two workers must control the hose near the bar. At no time should the hose inhibit the movement of the injection bar.
8. Allow approximately 3 seconds for water to be injected. Carefully listen as water can be heard first “drilling” a hole then fill that hole with water. This process takes between 2 to 5 seconds, depending on snow type. The key is to wait until the hole can be heard filling with water, almost to the snow surface. This is similar to the sound of a water bottle being filled.
9. Drag - don’t lift, the bar across the snow surface, move approximately 6-10 inches downhill. Ensure that both ends of the bar are moved an equal amount.

10. Depending on the desired density of snow, distance between injections may be increased or decreased.
11. Repeat process. Inject for 3 seconds, drag 10 inches, inject, drag etc. Use a zigzag pattern moving the bar 6 to 8 inches laterally when dragged downhill. The director must advise as to lateral movement. The bar must remain perpendicular to the racing line. Continue the process until the injection pass reaches the end of the hose. Turn the hydrant off and carry the bar away from the racing line. Hold the bar away from the snow surface.
12. Reconnect water hose at a lower hydrant and begin again. Remember to let pressure build up before moving back to injecting.
13. Repeat until the area to be treated is finished. If a wider path is needed, two bars can be connected together with a short hose.
14. Allow no one to ski over the treated snow. This will close the injection holes and the water may not freeze.

The end result of the injection work, the dark areas is where the water was injected with man-made snow in between. Note the binding for scale in the lower left corner.

Be sure to explain the whole process to all workers before you begin. If the slope is steep, crampons may be required. Take care not to step on water hose while wearing crampons. If gates are in the way either slide bar over flex gates and continue injecting or remove and replace gates after the bar has passed over the gate hole. If possible, drain any excess water outside the race arena when injecting halts. This work is wet and cold, be sure to wear waterproof clothes and carry extra gloves.

GATE WORK

The flags that racers ski through are called “gates”. Each gate consists of an inside or turning gate and an outside gate. Downhill, gates consist of 4 red poles, 2 for the inside gates and 2 for the outside gate. Both have a 1m by .75m red flag attached to them. Super G and Giant Slalom gates consist of the same number of poles but every other gate is blue and the flag size is .75m by .5m. i.e. one red gate, next one blue gate, then red, blue, etc.

1. Types of poles.

There are several types of poles: rigid, flex, and downhill.

- Rigid poles are used for outside gates and for the outside pole of a turning gate. Comprised of a 2.2m polycarbonate pole 30mm in diameter.
- Flex poles are used for turning poles, often with a threaded base to fasten them to the snow by screwing them down. These gates include a flex hinge between the bottom of the shaft and the top of the threaded base. There are two sizes of flex poles, 30mm slalom poles and 35mm downhill poles. Threaded Screw in gates requires a gate key to screw and unscrew base into snow.
- Most flex poles are referred to by their trade names, Snow grip, Break-a-way, Rapid gate.
- Downhill poles are longer (Approx 2.5m) and larger in diameter (35mm) red in color and normally rigid. Recently some flex poles have been used as the turning pole in downhill races.

2. Installation

Installation of gates is critical. Since they are part of the Competition Arena, appearance and correct installation is vital.

- Gates should be perpendicular to the snow and not leaning to one side up or downhill.
- They must extend at least 1.8m out of the snow.
- If using screw in bases, the top of the base must be at, or slightly below snow level, never above it.
- When using gate flags, poles must be parallel and the correct distance apart – DH .75m, SG & GS .75m. The flag should be perpendicular to the race line.
- Flags must be neat and pulled tight with all attachments (Velcro etc.) fastened. Sponsor logos should be attached right side up and face downhill when possible. Some flags include special tear away strips or bungee cords, which must be installed on the turning pole.
- Distances between turning and outside gates should be uniform gate to gate and adhere to FIS norms.

3. Installation Instructions

I. Snow Grip Threaded Bases

- a. Using an 18V drill and bit, bore a hole into the snow surface. The depth of the hole should equal the length of the bit. The hole must be vertical. Do not ream the hole larger unless in solid ice.
- b. Set drill aside. By hand, insert base of gate into hole and screw in until base will no longer turn.
- c. Slip gate key over gate, handles up teeth down. Insert teeth into slots in base of gate. Continue to screw gate in using gate key. Downwards pressure while turning will help the base to screw in.
- d. Continue until the top of the base is at or just below snow level, no more than ½ inch below snow level.
- e. Remove gate key by sliding over top of gate.
- f. When drilling into fresh fallen snow it is helpful to scrape away new snow exposing the hard layer first, before drilling.
- g. To remove threaded base, attach gate key to gate and insert teeth into slots in base. Unscrew base out of snow. If slots are filled with snow, jab teeth into slots several times to clear snow out

II. Rigid / Downhill Poles

- b. Using 18-volt drill bore a hole into snow surface. The depth of the hole should equal the length of the bit. The hole must be vertical. Ream hole slightly larger.
- c. Set drill aside, with both hands hold gate and jab into the hole. The base of the gate must extend at least 12 inches into the hole.
- d. If the gate is equipped with smaller threaded base, twist to screw further into snow. One or two turns are sufficient.
- e. To remove, grasp gate with both hands and forcibly pull it out.



A Downhill gate.

With time and practice installing a gate, snow grip or rigid pole will become an easy, quick exercise. This is important as during a race when gates are damaged they must be repaired or replaced quickly, without delaying the race.

4. Repair

During a race, athletes will hit gates, sometimes knocking them from the snow. Occasionally hitting gates hard enough will break the shaft. The shaft may break at ground level, leaving the base hidden in the snow. In any case there is a number of points to observe regarding gate repair.

- a) Whatever is left of the gate must be removed and replaced with a gate of the same type and color.
- b) The flag must also be returned to its original attached state.
- c) Broken parts must be transported to the bottom of the lift to be fixed.
- d) The repair must be accomplished in a prompt manner with a minimum number of people. This is particularly important during race days, as the race **will not** be stopped for a broken gate.
- e) The snow surrounding the bottom of the gate will eventually fracture and break if the gate is repeatedly hit. This will “strip” the hole and the gate will be knocked out. In this case the gate should be retrieved, the old hole re-drilled and the gate screwed back in.
- f) Never change the position of the gate by drilling a new hole. If the gate is repeatedly knocked out even after re-drilling, replace the gate in the existing hole and wedge it in place.
- g) Wedges are 6 inches long and made from 2x4. Wedges should be inserted into the hole between the base and the edge of the hole on the downhill side of the gate. Never place a wedge on the uphill side or to either side of the gate. Use a hammer or your ski boot to drive the wedge in. Do not use your skis.
- h) If the hole has been enlarged it may require more than one wedge, however be sure to only insert on the downhill side of the gate.
- i) To remove, use the tooth side of a hammer or the end of a ski to dig each wedge out.
- j) **Always** collect all the pieces of a wedge no matter how small they are.

5. Gate Panels

Gate panels, also known as gate flags, serve a dual purpose. First and most importantly they are a highly visible indicator of where the actual turning gate is. This insures that athletes are able to negotiate through the racecourse at high speeds with good visual cues. Secondly they serve as a billboard for sponsors and race organizers. For both reasons gate flags must be kept neat, attached and pulled tight between the poles of the gate. There are two sizes of gate panels. Downhill panels are solid red only and measure 1m by .75m. Super G and GS panels are comprised of two colors, solid red and solid blue and each color alternated. For example, one red gate is followed by one blue gate. Super G and GS gates measure .75m by .50m.

Gate panels need to be attached each day prior to jury inspection. This is a **priority** job that must be done for every gate on the course. This must be accomplished in less than 30 minutes. Gate panels must be attached in the same way that they would be during a race.

- Elastic straps with Velcro attachments are the most common attachment method. Wrap the elastic around the gate twice and Velcro it to itself. Repeat for all four corners.
- Gate clips with bungee cords are also used. They have a small clip attached to the bungee cord that clips directly to the gate, usually only on the top corners.

When racing, athletes who hit gates may knock the panels off the poles. These panels **must** be replaced quickly. The race **will not** stop for flag repair. During the race, be prepared with spare panels in case the whole panel is torn off and carried down hill out of reach. Be sure to promptly collect panels that are torn off, as they may become an obstacle for the next racer on course. Red panels must be attached to red poles and blue panels on blue poles.

If the weather changes and the wind begins to blow strongly it will affect the gates and panels. If the gates flap in the wind they can blow into the racers path. Should this occur you might be instructed to “butterfly” the panels.

- a) The outside pole is pulled out of the snow with the panel still on.
- b) The pole is rotated end over end once and placed back in the snow.
- c) This leaves the panel twisted with less surface area presented to the wind.

At the completion of the run a decision will be made as to the status of the panels.

- a) Remove all panels from the poles and return to .
- b) Roll the two poles together with the panel still on. Place both poles together in two side-by-side holes.
- c) Leave the panels on overnight.

The choice is based on weather (panels blowing away) or theft (panels are often stolen as souvenirs). With up to 110 flags used on a race course, the expense of the flags dictates removing them from the course most days.

BLUING

To insure that each gate is correctly placed at all times, it is marked with a colored dye called bluing. Bluing is poured around the base of the gate. This leaves a dye spot. Should the gate for some reason be removed or knocked out during a race you simply have to locate the dye and reset the gate in the middle of it.

- Approximately 8 gallons of water mixed with three packs of dye will “blue” the entire course. During regional events only the actual turning pole is marked. During larger, world-class events both the inside poles and outside poles are marked.
- The bluing mark must be circular, centered on the gate, and approximately six inches across.
- Care must be taken not to spill any bluing as this may cause confusion as to the correct placement of the gates.
- The Finish Line and the Red Zone line in the finish area must also be marked. These two lines should only be marked with the aid of a section of rope to insure a straight line.



A downhill panel. Note the bluing mark in the snow at the base of the left pole.

Bluing is a daily task. Every morning the course must be checked and re-blued. At least two people are required for this task. One person is needed to carry extra bluing, the other to blue each gate. Bluing must be completed before the beginning of athlete inspection.

As with other aspects of course preparation, clearing snow around each pole is required prior to bluing the pole. Using a grain scoop, remove all the snow surrounding each pole down to the hard layer. Once the area around the gate is clear, mark each pole.

At the completion of inspection, most of the dye marks will have buried by snow during the inspection. All this snow must be removed. Shovel back down to the hard layer exposing the bluing mark. Be sure to match the level of the snow around the gate with that of the racing line. Do not dig into the hard layer or dig out the bluing mark.

GATE NUMBERS

Each gate on the course must be carefully identified. This is accomplished by sequentially numbering each gate. Gate numbers are required by FIS. The numbers allow the gate judges to correctly identify each gate should an infraction occur.

Numbers are assigned beginning with the top gate as number 1 (first one below start) and ending with the last gate before the finish line.

A weatherproof stick on label is attached to each gate. Each sticker carries a number 1, 2, 3, 4 etc. Numbers should be attached to the outside gate, in a visible location. Be sure to number each gate only once. If a number from a previous race is visible it must be removed to avoid confusion. The best location to place the sticker, is 1-2 inches from the top of the pole, above the gate flag.

Gate numbers must be sequential and on every gate. One must exercise care when numbering gates on slalom courses. Flushes and hairpins (combinations of 2 to 5 gates closely spaced) can cause confusion. Remember number only *one* pole, not both the inside and outside poles in combination gates.

Each day one person should take a fresh set of gate numbers and check every pole. Replace numbers if they are out of sequence or missing. During snow days it is common to remove gates to assist with snow removal. As gates are replaced they may no longer be in order. These gates must be renumbered.

EVENTS DURING THE RACE

Alpine ski racing competitions are conducted under strictly controlled rules to insure safety and continuity. During the course of a race there will be many different events that must be dealt with quickly and safely. The most common events are listed below.

COURSE STOPPAGES

Scheduled

It is typical to schedule several “race holds” during a race to enable course work to be conducted. These stops may be after the 30th athlete, 60th athlete, 90th etc. Scheduled stops may last for as many as 5 minutes or be as short as one minute. They are a period where workers can safely venture onto the course to attend to ruts, bumps, gates, gate panels, etc. It is important the work be conducted quickly and completed prior to the jury clearing the course for the resumption of the race. Do not begin a project that cannot be completed in the short time available. Plan ahead for known stoppages for effective use of time. The actual schedule will be noted on the daily schedule.

Unscheduled

During large televised events every effort is made to limit or eliminate unscheduled stops. Normally, an athlete who falls is the only reason for an unscheduled stoppage. However, a fallen athlete will not automatically dictate a course stop. If the athlete is out of the spill zone or picks himself up quickly and moves out of the way, the jury may decide not to stop the race. Never assume that a fallen athlete will result in a stoppage. If there is a course hold work can be conducted on other areas of the course. Never begin a project during an unscheduled stoppage unless directed to do so by the Chief of Race or the Chief of Course. If there is a stoppage remain alert for notification of the impending restart of the race. Always inform the Chief of Course of the completion of a project.

GATE REPAIR

When racing, athletes who hit gates may knock the panels off the poles. These panels must be replaced quickly. The race will not stop for gate repair. It is the Runner’s responsibility to promptly arrive at the gate, fix or replace the gate panel, retrieve it if it has been knocked off, and return to a place of safety.

This must be done in the short time between athletes. Usually this is between 45 and 60 seconds. For this reason, runners must at all times keep their focus directed at the race. This is also the case if a gate is knocked out. The runner is responsible for its repair or replacement in the limited amount of time available. Time is at a premium, and to be able to return to a safe area before the next athlete passes, work must be conducted quickly and efficiently.

YELLOW FLAGS

During a ski race, safety is the paramount concern. Course workers and athletes must have the greatest respect for safety protocols. When a racer falls while competing, course workers are responsible for repairing any damage to the safety fences and assisting to remove the athlete (in coordination with Race Patrol).

Because of the danger of a collision between course workers responding to a fall and the following racer, no course workers, volunteers, or race patroller should move from their position until cleared to do so by the Chief of Race. The only exception is if the athlete is in a life-threatening situation. This protocol exists to limit the exposure to both course workers and athletes.

If the fallen athlete is unharmed, the appropriate course of action is to wait for a “course clear and hold”. This will limit danger to both parties. The chance of a collision between workers and the following racer will be greatly reduced or eliminated.

Never assume that a course hold or yellow flag in one area has stopped all athletes. Always wait for a “course clear and hold”.

Procedures

1. During the course inspection, yellow flag zones will be identified by yellow flags 2 feet by 2 feet. These flags will be displayed in obvious locations with good stopping areas. Typically the flag handle is stuck in the snow just off the race line next to the location the flagger will occupy during the race. This location is determined prior to inspection and cannot be changed. It is referred to as the “Yellow Zone”.
2. The race workers assigned to yellow zones (normally 2-3 zones) must collect jury radios in the morning and make themselves known to the jury members controlling their yellow zone prior to the course freeze.
3. Workers assigned to yellow zones have only one task, and that is to wave the yellow flag when instructed by the jury member in control of that yellow zone.
4. When a racer falls, the leader of that section should call over the Race channel “racer #(fallen athletes bib number) is down”. Upon hearing this all radio transmission must cease. The only personnel who may use the RACE channel are the Chief of Race, Chief of Course and the section leader responding to the fallen athlete. This situation takes precedent over all other transmissions.
5. In the event of a fall the jury may decide to “yellow flag” the next racer on course. This would occur only if the jury member who witnesses the fall determines the fallen athlete poses a risk to the following athlete. The jury having determined an unsafe situation will call “start stop, flag stop”. This broadcast will occur over the jury channel. The Chief of Race then repeats this over the RACE channel.
6. The jury member controlling the yellow zone will quickly instruct the assigned race worker to “yellow flag” the next athlete. Typically the flagger is 30 to 60 feet uphill of the jury member. He must at all times during the race be in direct contact with the jury member. Immediately the flagger must in the most visible manner possible wave the “yellow flag” while moving towards the race line. However, under no circumstance should the flagger move onto the race line. He must allow plenty of time and space for the flagged racer to stop.
7. While this yellow flagging occurs, the Start Referee will hold the next athlete in the start gate, stopping the race. His radio call over the jury channel will be “racer #(athlete in the start gate bib number) held in start”. Caution – all race workers should be aware that there could still be racers on course.
8. The jury members controlling the flagging position will report, “Racer # (athlete on course bib number) has been flagged and stopped at location “x”. All other racers on course will be located. For example, Race #10 fell, racer #11 Yellow flagged, so the report is “racer #12 is held in the start, racer # 9 is in the finish, racer #11 has been flagged at yellow flag x”.

9. Once this confirmation of the location and status of all racers on course has occurred, the Chief of Race will direct (on the RACE channel) race workers to assist the fallen racer and repair any damage done to the course or fencing. No race workers, race patrol, or volunteer workers should move until directed by Chief of Race.
10. Race workers should first concentrate on repair and restoration of any fencing and course materials damaged during the fall. Race patrol should concentrate on assisting the athlete. If the racer is entangled in fencing, first assist race patrol in removing the athlete then complete course repair. If the athlete is injured, priority must be given to assisting race patrol and athlete. Limit the number of responding workers to the minimum required.
11. The race worker in charge of the repair should upon arrival at the site call the Chief of Course (on RACE channel) and make a fair estimation of the time required to complete removal of athlete and repair of fencing etc. All extra material, broken equipment, and any of the racer's equipment must be removed when departing the scene.
12. As work is completed all workers must evacuate to a safe area. The last worker leaving must call the Chief of Course (on RACE channel) and report that the area is clear. That report is then conveyed to the Chief of Race who informs the jury the section is clear.
13. The jury clears the whole course in preparation for the race to continue.
14. The race director will approve the continuation of the race, and typically 1 or 2 forerunners will precede the next racer.
15. The flagged racer will always start before the last racer, even if the last racer must wait until the flagged racer returns to the start.
16. As the race begins again, return to normal course crew procedures and radio operations.

A Race Worker with a yellow flag watches ready for the next athlete. The jury member for the section stands behind him.

MOVEMENT ON COURSE

Worker Movement

With ever-increasing worker numbers required at world-class skiing events, adhering to a movement worker plan becomes of paramount importance. To move upwards of 800 people down a race venue will result in severe damage to the race arena unless tight controls are placed on worker movement.

1. Initially, in morning work assignments only those workers required will be dispatched to their sections.
2. Dispatching where possible will be accomplished beginning with the bottom sections and continuing to the upper sections.
3. Immediately below a Tunnel under the course will be used to move personnel across the course without having to move over the racing line.
4. Several “worker trails” will be utilized. These trails access the course from “outside” the fences. When practical, use these trails.
5. Stick together in your teams. Don't ever split up.
6. As you move on the hill be sure to “assist” the sections you move through rather than destroying their work.
7. Don't leave unless you have been assigned a task.
8. Always side slip or wedge to move down the course, never turn.
9. Stick together in your teams. Don't ever split up.
10. Move quickly to your assigned section and make sure to go to the correct one.
11. Leave with the tools you need for the job.
12. When leaving your assigned task be sure to exit at the closest worker exit.
13. If you are a section crew worker be sure to be in your position with plenty of time for the course freeze.
14. Stick together in your teams. Don't ever split up.
15. For all other course crews, be sure to have exited the course or be behind the spec fence prior to course freeze. Once the course is frozen the only movement down the hill is outside the race venue.
16. Check with for routes down to your assigned section.
17. Finally, stick together in your teams and do not split up!

Early morning dispatches will be quite confusing as many different teams are dispatched close together and many workers are moving towards their assigned work sections. If conditions are good overnight, few teams will be dispatched. If conditions are bad overnight, all teams will be utilized. During this time be sure to stay in a group and move quickly to your assigned section.

When you arrive at your section, check in with the section leader to get your specific task. You may be in the same area for several hours leading up to the course freeze.

During the event only section crews, runners, slippers, and race crew will be allowed “between the fences”. All other course workers must exit the course. If you wish to watch the race, you may move behind the spec fence. If you want to return to , you must do so before the course freeze.

During The Race

After the course freeze the only workers who remain “between the fences” are section leaders and crews, runners, race slippers, B-fence crew, and race crew. All other personnel must remain for the duration of the race behind the spec fence.

Section crews should never venture onto the course unless a “Course Hold” has been issued. If a racer falls, no one should move until the Chief of Race has called the “course clear” and “on hold”. Section workers may then begin repair of the B-fence and assist race patrol. During a scheduled stop, section workers may conduct normal course maintenance work. Section workers must quickly return to their station at the completion of such work.

Runners

Runners must remain at their stations until “bumped” by a runner from the station above or until a gate flag or pole requires attention. Do not move because nothing is happening in your section. Do not move if a racer falls until cleared by the Chief of Race. Be ready at any time to spring into action to fix damaged poles and flags. During the race this is your primary task. If you need to fix a gate or panel, do so quickly and move directly to the next runner station. Remember you have only seconds to do your work and move to safety.

Be sure to have all the necessary tools to do your job. This includes but is not limited to: Drill, Gate key, Wedges, Extra gate flags, Hammer for wedges, Replacement gates etc. These tools should be on your person at all times during the race.

When you bump to the next station, inform that you have moved so they can bump the runners above and below you. If you have been bumped, as you move to the next station check gates and flags and repair as necessary. Remember, you have only seconds to do your work and move to safety.

Normally runners should not respond to athlete falls. That is the task of the section crews and B-fence repair crews.

Race Slippers

Race slippers will be moving the most during the race and thus must maintain the highest focus. Slippers will move in teams of two immediately behind the racer. You should leave the slip station a maximum of 5 seconds after the racer has passed. Move quickly and together, slipping the race line to the next slip station. You must slip at high speed (15 –20 mph) or the next racer will catch you. Do not delay in reaching the safety of the next slip station. You will need the time to compose yourself for the next slip.

Never wait at a slip station; this will cause a backup and a traffic jam with other slippers. Keep your intervals. When you reach the bottom of the course, return immediately to the top of the lift and check in at . Do not assist with gate repair or B-fence repair. Keep quiet at each slip station to listen for directions. You must have a good sense of timing to ensure you are safely at the next slip station prior to the next racer.

B-Fence Repair

The B-fence repair crew is responsible for (as the name suggests) B-fence repair. There will be 4 crews spaced out on the mountain with materials. You should only move in the event of a fall that requires B-fence repair. Do not assist with slipping or gate work. When called for, move quickly to the repair area, and replace any damaged poles. Remove any broken poles, tidy the fence, and move quickly to the next B-fence repair station. Bump the crew there and be sure to call for a replacement to the station you just left from. As this team must be ready to leave at a moments notice you should be ready with skis on and equipment at hand.

Race Crew

Race Crew duties during the race will be to advise and assist the section leaders with his duties. You should not bump down the course but remain in your assigned sections.

Remember for all workers between the fences, never venture onto the course unless it is to complete a task assigned to you under the circumstances listed above.

Coaches / Techs

The professional coaches and ski technicians that work for the various National teams are experienced ski race veterans. It is quite common for coaches and tech's to inspect the course in the morning prior to athlete inspection. Often these coaches will remain in place until the end of the athlete inspection before moving off the hill.

In the lead up to the course freeze, most of the coaches will move into place. There may even be a burst of activity right at the course freeze as they hurry to move into position. This is quite confusing and can be dangerous as the coaches are often skiing together in groups and moving very fast.

During the event it is not normal to allow the coaching staff or ski technicians to move down the course. However as the last racer completes the course there is another burst of activity as all the coaches and techs move at once. This is the most dangerous time of the race. Remain in place, off the course at your station. It will normally only take 5 minutes for all the movement to stop. After this time you may begin afternoon race course maintenance.

SAFETY

FIS Rules require the World Cup tour director and race director to conduct a pre-season safety inspection of World Cup venues during the summer. During this inspection, the directors compile a FIS “Safety Report”. This report details the various materials that are required by the race director to be installed prior to the beginning of the event.

When “building” the race arena the Safety Report dictates where to position the various materials – fencing, padding, etc. Listed below are some of the materials used.

1. Name: “A-Net” – Suspension Netting.
 Type: Woven Net.
 Composition: 5mm polyethylene twine, 70 mm mesh size with surrounding 12mm rope. 4 meters tall, when sections are woven together can exceed 200 meters in length. Hung by static ropes from steel cables suspended by towers and anchored to snow on bottom edge.

 Operating Principle: A barrier net containing a skier if they fall.
 Daily Maintenance: Snow depth on both sides of the A-Net must be equal. If extra snow accumulates it must be removed to original levels.

 Storage/Removal: Daily – left in place.
 Seasonal – De-rigged and rolled up for storage.

 Other: A permeable safety sheeting “slip skirt” is attached to the front of the A-Net.



A Net with Blue Slip Skirt attached.

B-Fence Set Along John Paul Traverse.

2.

Name:	"B-Fence".
Type:	Woven Net.
Composition	3mm polyethylene cord 50mm mesh size, 2 meters tall and 20 meters long. Supported by 2.25meter tall and 33 mm diameter polycarbonate pole with clips.
Operating Principle:	A barrier net slowing the skier if they fall.
Daily Maintenance:	Insure they are standing upright, with no broken poles, and joined together securely. The bottom of the net <u>must</u> be touching snow and the top pulled up, removing sagging.
Storage/Removal:	Daily – If windy, slide top and bottom of net towards middle of pole. Seasonal – Roll up for transport and storage, poles to the <u>inside</u> of the roll.

3.

Name:	"C-Fence", crowd control, spec fence.
Type:	Woven net.
Composition:	2.5mm twine, 120mm mesh size, 1.3m tall by 50m long. Attached to 1.5m tall, 33mm diameter polycarbonate poles hung by clips.
Operating Principle:	Barrier to keep spectators outside race arena.
Daily Maintenance:	Insure it is standing upright. If buried in snow, pull out of snow and reset.
Storage / Removal:	Daily – none. Seasonal – Roll up for transport and storage.

4. Name: Air-fence.
 Type: Inflatable wall.
 Composition: PVC Material with fabric core, formed into air filled chambers.
 Inflates into a wall.
- | | | |
|-------|------------------|--------------------|
| Sizes | TV | 5m x 1.8m x 1.2m |
| | Ski Air Fence | 5m x 1.2m x 1.2m |
| | Finish Air Fence | 8.5m x 1.2m x 1.2m |
- Operating Principle: An inflatable wall slowing skiers if they fall.
 Daily Maintenance: Remove any excess snow collected in front of air-fence. Re-inflate air-fence.
 Storage/Removal: Daily – left in place.
 Seasonal – Deflate, fold up and transport in air-fence packing sheet.



Air Fence used to protect steel towers.

5. Name: Willy Bag.
 Type: Foam-peanut filled bag.
 Composition: PVC outer bag filled with Styrofoam peanuts.
 2m x 1.3m.
- Operating Principle: A padded bag slowing skiers if they fall.
 Daily Maintenance: None.
 Storage/Removal: Daily – left in place.
 Seasonal – remove to storage.
6. Name: Flat Stock, Finish area pads.
 Type: Foam filled, PVC covered flat pad.
 Composition: PVC outside, foam inside.
 2m x 1.2m x 2m. Supported by 1.5m polycarbonate poles.
- Operating Principle: A foam pad slowing skiers if they fall.
 Daily Maintenance: Remove excess snow from front of pad.
 Storage/Removal: Daily – leave in place.
 Seasonal – Remove to storage.



ALPINA SAFETY FENCING (B/2 NETS) – HANDLING

ALPINA B/2 Nets	Material:	PE
	Dimensions:	20 x 2 m
	Twine thickness:	3 mm
	Mesh size:	50 mm
ALPINA Safety fence pole	Material:	PC with tip, thread, breaking point, cap, 3 pc. safety fence clips
	Dimensions:	Height 2500 mm Ø 33 mm

Placing of the safety fence poles: In snow, ice, or earth, using a Ø 35 mm drill

Insertion depth: SNOW SURFACE = BREAKING POINT

WARNING: The breaking point may be inserted up to 15 cm below the snow surface (for instance, in case of new snow) – but never above the surface! Never cover the lower edge of the net by adding snow, since this may impair the proper functioning of the construction (breaking point, tipping)!

INSTALLATION INSTRUCTIONS

The net must begin at least 10 m above the danger zone (1/2 net length).

The following principle applies: the more poles you use for the net
the higher the braking effect
the greater the break force !!!

DISTANCE BETWEEN THE NET'S LOWER EDGE AND THE SNOW SURFACE = 0 !!!

WARNING: Leave enough space behind the B/2 nets for skiers to fall. Access to the safety zone must be forbidden and the safety zone must always be kept clear of persons or objects.

INSTALLING THE NET: Attach the net on the slope side so that all 3 fence clips have the same vertical mesh distance on both sides of the pole.

WARNING: Do not step against the breaking point – The pole may break!!
Note: Safety fence poles which have been broken at the breaking point can be used again as fence poles for race slope barrier nets (the tip is fastened at the lower rim using rivets!)

SAFETY PRECAUTIONS:

Very strong wind (over 100 km/h) or frozen nets may pose an excessive strain for the safety fence poles. To protect from damage, the fence should be pulled together – WHEN NOT IN USE (e.g. during the night) -, that is, the top and bottom clips are pushed toward the middle of the safety fence pole (toward the centre clip).

MEDICAL

Race Patrol

The Ski Patrol assigns a group of patrollers to work during the event. These patrollers are called the Race Patrol. Typically the Race Patrol works in groups of two and are stationed along the course. Several patrollers are also held in reserve at the top of the lift. At each of their stations the Race Patrol have a complete pack of medical equipment in addition to their toboggans. During the race there will also be a Doctor on station.

In addition to providing medical response during the race, the Race Patrol is available to assist any volunteers before, during, or after the race run. Should enough snow fall to produce avalanche conditions, the race patrol will also assist Snow Safety to mitigate the hazard.

Medical Helicopter

In an effort to cover all contingencies, for WC,OWG and WCS FIS requires a medical helicopter to be on site for the duration of the actual race. This helicopter is available should an athlete suffer a serious injury. The medical helicopter is generally stationed near the bottom of the racecourse in a secured landing zone. In most instances the injured athlete would be stabilized at the accident site, then transported by toboggan to the helicopter.

In addition, on-hill landing zones will be established. These zones will be clearly marked and fenced off. In very rare instances the injured party may be evacuated from the accident site via a winch. This would entail the helicopter hovering over the accident site, lowering a crewman via the winch, hooking the toboggan and crewman on and hoisting them both into the helicopter.

There are some key rules to follow if you are included in or near a medical helicopter evacuation.

- The race patrol leader on scene is in charge. Listen to and comply with any directions he gives.
- As volunteer workers, you will have no involvement with the actual helicopter evacuation.
- Do not view this as a spectator event. This is a medical emergency and any unnecessary movement to get a better look is detrimental to the evacuation.
- The helicopter can cause strong down drafts. Normally the area underneath and downhill from the helicopter is affected most. Be aware, brace yourself, and insure that all loose clothing, hats, backpacks and tools do not blow around.
- You may be required to pull B-fence down to the ground to lessen the wind effects from the helicopter. This must be returned quickly to its original condition after the evacuation.
- We are still running a race, as soon as the evacuation has been completed; quickly return the race arena to its original condition.



Medevac Helicopter prepares to land.

TIMING

One of the most overlooked aspects of a ski-racing event is the task of the Timing workers and their timing system. A secure timing system, with well-trained personal is vital to the success of the event. Protocols exist to ensure information is collected correctly and handled appropriately. Redundant systems are in place to ensure the most accurate timing possible.

Multiple timing locations along the course collect start, finish and intermediate interval times. Numerous volunteer workers are required to ensure the smooth operation of all the timing stations. This information is transmitted to the timing room to be collated and distributed.

The on hill timing locations (other than the start and finish) are often not noticed by most race workers, yet each is vital to the success of the event. Every effort should be made to assist the timing workers and to ensure the continuity of the timing system.

At each timing location, 2x2 wood posts support a pair of infrared photocells. These posts are located opposite one another on either side of the course. Each post is buried solidly in the snow. The base of the post at snow level **Must** be cut at least 2/3rds of the way through.



The 2x2 posts must be positioned outside the back layer of B-fence. Each post should be covered on the uphill side with a piece of flat stock padding. If snow falls or wind blown snow collects around the timing positions it must be removed prior to the start of the days race run. The timing wires that lead to each position must be clearly marked and well supported to insure there is no chance of damaging them during daily operations.

In addition to the Start and Finish timing stations, timing workers will man each of the intermediate locations. At each of the intermediate locations the workers operate a “switch”, activating the photocells at that station. During the race, as an

athlete approaches the timing station, the worker switches the photocells on to allow them to register a time as the athlete passes. After the athlete passes he switches off the photocells. This insures that unwanted times are not registered as race workers pass through the cells between athletes. For this reason you should never move through a timing station while an athlete is passing.

After each athlete passes, slippers and runners are safe to continue their tasks. Some timing stations are located near worker safe areas or slip stations. Should timing worker request that you move during the race, you must comply. The “switch” operators must have a clear view of the course to identify approaching racers. Be sure to move only to a safe location.

During the race course workers should never approach or cross the finish line. If you pass the worker exit be sure to exit the race arena just above the finish line.

CRAMPONS

In order to complete their assigned tasks, some race workers will be required to use crampons. Crampons are rigid metal spikes that are attached to ski boots. They provide increased traction on steep ice slopes.

In order to use crampons safely there are several points that must be observed.

- Always inspect crampons prior to use. All straps, bails, clips, and screws must be in working order. The spikes should not be bent, broken, or dull.
- The crampon must be adjusted to correctly fit your ski boot. To adjust, remove the screw connecting the front plate to the heel section. Adjust as needed and replace screw. Tighten screw. The crampon should stay on the boot with out the lever engaged when set to the correct length.
- Check crampons for left or right. Most crampons are designed to fit one foot only.
- Slide toe bail over ski boot toe. Lift heel lever and clip to heel of boot. Adjust screw on lever to tighten. The lever should snap home when adjusted correctly.
- If still loose, re-adjust the crampon.
- Fasten safety strap around instep.

When walking with crampons on take extreme care. Use common sense and follow these guidelines.

- Walk with feet apart (bow legged) to insure the crampons spikes do not catch on your opposite pant leg.
- Never run while wearing crampons.
- When walking side-hill insure spikes engage snow before fully transferring weight to foot.
- Never walk on anything that may be damaged by the crampons spikes. E.g. TV cable, water hose, etc.
- If you fall NEVER put your feet down. If you do so you could be injured. Instead allow yourself to slide to a stop.

If you are issued crampons do not lend them to others. They are easily misplaced, and it is important that we have them available.

TWO-WAY RADIO'S

One of the vital elements of a well-executed event is the ability to communicate clearly. Snowbasin is an outdoor venue, and as such, telephones (ground lines) are unsuitable. Two-way radios are used to enable communication between workers. Radios can be a powerful tool when used correctly, or a frustrating liability when used incorrectly. We use “Trunked” Radios at our venue. This system is comprised of a hand held radio and a trunked repeater. This repeater is generally located high up on the mountain and allows for the best transmitting and receiving possible.

Equipment

Each hand held comprises of a radio, a battery and an antenna. You may also be issued a remote Microphone that is connected to the radio with a cable. A chest Harness is also issued to carry the radio. The battery will generally last all day with normal use. Batteries will last longer if kept warm. Keeping your radio inside a jacket will help to keep the battery warm. At the end of the day, batteries must be charged. Never charge a cold battery. It must warm to room temperature before charging. If you expect to talk a lot, carry an extra charged battery.

Channels

Snowbasin will be using two main radio channels for worker communication. The channel number will be determined in the days leading up to worker arrival. Other channels exist for the jury, timing, and stadium crews. These channels will not be accessible to course workers.

One channel will be used as a Race Channel. It will be used during the running of the race primarily as a “listen only” channel. Information about the status of the race, course holds, and other vital information will be broadcasted over this channel. Calling or holding conversations on this channel is not permitted.

The Second channel is the “Talk around” channel. This is the channel that most of the business of setting the race up is conducted on. In the morning most communication will occur on this channel. Should you need to contact , this is the channel you will use. During the running of the race, this channel will be used by assistant section leaders and the slipper coordinator-sparingly.

The jury conducts the race. They have their own channel, the “jury” channel. You will not be able to receive this channel, so all jury decisions will be passed on by the Chief of Race over the Race Channel.

Normal race day operations will begin with all crews utilizing the Talk around channel. As all course work is completed and the course is frozen, all section leaders, race crew, runners, and dispatchers will switch to the Race channel. The 40 minute from course freeze to the first TV forerunner will allow all course workers to settle into Race time radio procedures (listen only).

At the completion of the day’s race, all course workers will return to the Talk around channel to complete the days work.

Using the Radio

Leave your radio turned on at all times. Keep the volume turned up enough that you can hear it without disturbing others. When transmitting, press the “PTT” button on the side of the radio. Wait 1-2 seconds before talking. Hold the button down continually while talking, release after you have finished talking. Hold the mic 2-3 inch’s away from your mouth and speak clearly into it.

Radio Procedure

If you need to make a radio call you should

1. Wait until no one else is talking on the radio. Be sure that you are not interrupting a conversation. Wait at least 20 seconds to be sure the channel is clear.
2. Transmit your call identifying who you are and whom you are calling.
3. Wait for a response from the party you have called. If they do not answer, wait at least 10 seconds before calling again.
4. When they have responded, talk clearly and calmly. Speak your message.
5. Allow time for them to respond.
6. At the end of your conversation remember to clear the channel by saying “Out”

The race channel is our only source of information during the race. For this reason no one should transmit on this channel unless there is a valid reason.

From the course freeze onwards the Race Channel must go quiet except for the Race Announcer. The race announcer is stationed at the start. He positions himself near the Start Referee to be able to listen to the jury channel.

The race announcer will announce vital time checks. Including:

Course freeze
10 min to forerunners
5 min to forerunners
Forerunners on course

The race announcer will broadcast any other information relating to the race over the race channel. The only other allowable transmissions on the race channel will be those directly related to the running of the race.

Allowable Transmissions

During the morning set up there will be a considerable amount of radio traffic. This is to be expected as section leaders call for extra equipment and personal. However, all transmissions must be kept to a minimum. Only conversations vital to the race should be transmitted. At no time should superfluous information be broadcast.

By the time the course freeze has occurred, all transmissions should cease. At this point in time all work should be completed and materials required for the race should be at each section. There must be no talk on the race channel unless it is directly related to clearing the course.

During the actual running of the race, the Race channel must ONLY be used for course information listed below (Announcement types). All other transmissions should occur on the Talkaround channel, and these should be limited to vital race related information. This will include assistant section leaders communicating slipper information.

Transmissions regarding race slippers and the line they should slip, should be kept short and to the point. Assistant section leaders controlling their slip stations should call only the slip station above them.

The only Race workers who should transmit on the race channel during the race are:

Race Announcer- Athlete starts, Start Stops, Course Clears, All Race announcements.

Chief of Course- Transmissions related to race operation.

Chief of Race- Transmissions related to race operation.

Section Leaders- Course clears, DNF's, Racer Down calls.

B fence crew- Clearing B fence repair.

Runners- Reporting work completed.

Should a transmission include reference to a “Yellow Flag” or “Racer Down” all radio transmissions must halt to allow the parties dealing with these occurrences to have full and complete control of the channel.

Yellow Flag

- When an athlete falls, the jury member in the area he crashed in will decide if a yellow flag is required. If it is decided only to stop the race, the jury (on the jury Channel) will inform the start to “start stop”, that is stop the next athlete from starting. The section leader in the area that the athlete fell will call on race channel “racer down, racer “X” down” The race announcer on the race channel will broadcast “Start stop racer “X” down, Start stop, racer “Y” Held at Start”. This will mean all athletes currently on course will continue, but the next athlete will be held at the start.
- If the jury decides the athlete has fallen in a dangerous area they may decide to yellow flag the next racer on course. The jury will (on the jury channel) call “Start Stop Yellow Flag Stop”. The jury will also call the jury member controlling the Yellow flag in question and instruct him to flag the approaching racer. Be aware that this will not stop all athletes on course. The athletes below the fallen athlete will still continue.
- The race announcer will call over the race channel “start stop, yellow flag stop. Racer # (athlete at the start number) held at the start, racer # (athlete on course number) to be flagged at yellow flag “X”. This allows all race personal to build a picture of where the fallen athlete is, where the flagging will take place and where all the remaining athletes are on course.
- At this time all radio transmissions must halt to allow the parties dealing with these occurrences to have full and complete control of the channel.

If we have all done our jobs correctly, the race will go off without any radio calls at all. We must all be aware of our radio use and learn to limit it.

Type of Announcement	Who Announces	Jury Channel	Race Channel	Talkaround Channel
Athlete Start	Race Announcer		Race X, 30 seconds to start. Racer X, John Smith on course, racer X on course. Racer Y on Deck Racer Y, 30 seconds to start	
DNF	Section leader		Racer X DNF, Racer X DNF in (Section Name Here)	
Racer down	Section Leader		Racer X down, Racer X is down in (section name here)	
Start Stop	Only the Jury will decide when a start stop should be called it will then be Announced over Race Channel.	Start stop, start stop. <i>reply from start:</i> Start is stopped, Start is stopped racer Y is held at the start, racer X is on course.	<i>Broadcast over race channel after hearing over Jury channel:</i> Start stop, Start stop. racer Y is held at the start, racer X is on course.	
Course Clear	Section leader calls chief of course, who relays information to jury. Jury clears course and resumes race.		<i>Section leader to Chief of course:</i> Section X is clear, Section X is clear. <i>Chief of course relays this to the jury. After jury has cleared course it resumes race. Race announcer calls:</i> Course Clear, Racer X in the gate, 30 Seconds to Racer X.	
Calls to during race				Use this channel only to contact during the race, or to talk to other sections during the race.
Instructions to slippers				Use this channel only to pass instructions between sections for slipper information.

NUTRITIONAL REQUIREMENTS

(for work in the cold and at altitude)

Prepared for SLOC by Nanna L. Meyer, Sports Nutrition, The Institute for Sport Science and Medicine, TOSH, August 9, 2001
Guidelines for volunteers working in the venues for the 2002 Olympic Winter Games in Salt Lake City

Common physiological effects and their consequences when working in the cold:

- Increased metabolic rate
 - 2-4 x greater caloric need compared to work in normal environment)
- Increased shivering to maintain core temperature
 - Increased carbohydrate oxidation
 - Decreased fat oxidation
- Increased cold-induced diuresis (greater need to urinate)
 - Dehydration
- Increased voluntary dehydration (less desire to drink)
 - Dehydration

Common physiological effects and their consequences when working at altitude:

- Increased ventilation, increased cardiovascular load
 - Decreased work capacity
- Increased altitude-induced diuresis
 - Dehydration
- Increased voluntary dehydration
 - Dehydration

Recommendations

Energy (calories)

Because of the higher caloric requirement of work in the cold and at altitude, caloric intake of men and women working as volunteers at the venues are between 3500+ and 2500+ calories, respectively (this depends greatly on the activity). As a comparison, the MRDA (Military Recommended Dietary Allowances) for moderately active personnel ages 17 – 50 years old operating in cold weather are set to 4500 and 3500 calories for men and women, respectively. This caloric requirement should be divided into frequent smaller meals, including several warm/hot meals and energy-containing liquids (such as honey-sweetened herbal teas, broth-based soups, and hot sports drinks).

Macro-nutrients (carbohydrate, protein, fat)

Shivering increases carbohydrate oxidation, thus, increasing the need for adequate carbohydrate supply throughout the day. If carbohydrate intake is low and glycogen stores are depleted, thermoregulation is impaired increasing the risk for cold injury. A carbohydrate-rich diet is easily accomplished with a high carbohydrate breakfast and lunch, as well as frequent high-carbohydrate snacks and drinks at the venues.

A good balance between carbohydrate, fat, and protein for work in the cold and at altitude is 60%, 25%, and 15%, respectively. A rule of thumb is to provide meals that supply 2/3 of the total food in the form of carbohydrate. With the increased energy requirement (as discussed above), the typical three meals are insufficient, and thus, more frequent meal (4 meals/snacks excluding dinner) and drink rations (water stations at breakfast/lunch, portable thermos for each volunteer in backpack, refill individuals, and occasional black tea/coffee/chocolate service) should be provided.

Fluid:

Dehydration is a major problem for working in the cold and at altitude. Although perceived much less than in a hot environment, fluid loss in the cold and at altitude under working conditions is high. If a high amount of physical work is performed more fluid is lost through sweat, further increasing the need for adequate fluid replacement. In addition, cold and altitude-induced diuresis and voluntary dehydration add to the problem of maintaining fluid balance when working in the cold and at altitude. Dehydration increases cardiovascular load, decreases work capacity, decreases the ability to thermo-regulate adequately, and increases the risk for cold injury. Fluid intake in the cold and at altitude should be increased by approximately 1-2 L (~ 32 – 64 fl.oz) per day in addition to basic fluid requirements of 3 (98fl.oz) and 2 L (64 fl.oz) for men and women, respectively. Decreasing the risk of dehydration in volunteers can be achieved by providing frequent fluid availability (at meals and in the field) and should be accomplished by water stations, fluids at meals, thermos (carried by each individual), and refill services throughout the morning and afternoon. Black tea/coffee/chocolate refills only will increase diuresis and add to the problem of dehydration. Such beverages should only be served occasionally. Serving hot beverages will help in maintaining core temperature in the cold.

Micro-nutrients (vitamins and minerals)

Nutrient-dense foods should be served for breakfast, lunch, and snacks. These are the that are high in vitamins and minerals. Because carbohydrate is an important fuel in the cold, complex carbohydrates such as rice, pasta, potatoes, whole grain bread, hot grains, and granola bars should be emphasized. Fruit, juices, dairy products, and sports foods/drinks are also great sources of carbohydrates. Protein sources should come from lean red meat and poultry, as well as from fish, beans, soy-products such as tofu, and low-fat dairy products. Vegetables and fruit should be provided at meals and for snacks. Lunch should include steamed vegetables (root vegetables, carrots, broccoli, peppers etc.) or salads (salads may not be as palatable after a day in the cold) while breakfast should provide fresh fruit and/or juice while snacks could be in the form of fresh fruit (bananas) dried fruit and nuts or fruit breads and granola bars with dried fruit.

Example for meals/snacks/fluids:

Breakfast:

Oatmeal, grits, or hot grain cereal with honey, dried fruit, and nuts
Banana
Peanut Butter/Jelly
Butter
Water station

Milk (1-2%)
Cheese/deli meat
Whole grain bread
Hot tea/coffee/chocolate

Morning Snack

Options to pack as a morning snack (grain bread or crackers w/ cheese, deli meat, turkey jerky, PB/Jelly, granola bars, sports bars, dried fruit/nuts with bread, banana bread etc.)

Thermos (16-32fl.oz): hot beverage (hot herbal teas with honey or hot sports drink or vegetable broth) (no black tea/coffee/chocolate due to diuresis)

One refill during a 4-hour morning

Lunch:

Hot broth – based soups with veggies, rice, potatoes etc. with grain bread and butter
1-2 cups of carbohydrates (rice, pasta, potatoes) (women = 1 cup/men = 2 cups)
4-6 oz serving of meat, chicken, turkey, fish (women = 4 oz/men = 6oz)
1 cup steamed vegetables
Dessert (example: cookies with tea/coffee/chocolate)
Water station

Afternoon Snack

Options to pack as afternoon snack (Grain bread with cream cheese or cheese, sweet breads, granola bars, nuts/dried fruit, chocolate-covered sports bars, sports bars, bananas etc.)

Thermos (16-32fl.oz): hot beverage (hot herbal teas with honey or hot sports drink or hot vegetable broth) (no black tea/coffee/chocolate due to diuresis)

One refill during a 4-hour afternoon

Water stations

Occasional black tea/coffee/chocolate service

Dinner should be along the lines of lunch (ie. carbohydrate rich with balanced protein and fat content).

GLOSSARY

A-Net/Suspension netting

Safety netting 4 meters high. Hung from an overhead wire supported by steel towers.

Above the Gate

The Area immediately above the turning gate.

Behind the fences

The area behind the B-Fence. Can also include behind A Net and Spec fence. E.g. “you must move behind the fences.” Do not allow anyone to stand behind the fences in a spill zone!

Below the Gate

The area immediately below the turning gate.

Berm

Snow pushed by slippers into a wind row or berm. Long pile of snow.

Between the Fences

The area in the race arena between the safety fencing. Another term for being inside the race arena.

B-Fence/B Net

Safety fencing 2meters high. Supported by poles spaced every 2 meters.

Blower Cat

A snow cat with a snow blower attached to its blade. May be a winch cat or a free groomer.

Bluing

Dye used to mark the position of the gates. Poured on the snow at the base of the gate.

Bucket gates/Tubs

Rubber tubs that fit over the bases of screw in gates when they explode out of their holes. The hole is drilled to the size of the tub and the tub is forced into the hole, and gate is inserted into the tub. Bucket gates already include the tub attached to the gate (the bucket).

Chatter Marks

Small ripples on snow, that cause skis to make a chatter sound. Similar to a washboard.

“Course”

If you hear “Course” yelled, immediately move off the course. This means that a racer is on course near by and the course should be cleared of any and all obstructions. I.e. personal, equipment, etc.

Course Clear

The jury will call its members stationed along the course checking each section is “clear”. That means all work has been completed and the course is free of obstructions. Once the course is clear, the race will resume.

Course Freeze

The point in time when all personnel will be in place and all work is finished. Thus all movement on the course will have “frozen”. Will be announced as the course freeze over the radio.

Course Hold

The point during the race that the racers are held at the start, stopping competition temporarily. The course is said to be “on hold” when all athlete movement in the race arena has stopped.

Don't Slip the Flats

During the race, Slippers must not slip the racing line on flat sections of the course, as this will actually slow the next racer. Move to the side of the course and continue through that section.

Double Rut

Two short parallel ruts in the snow usually at a cross angles to the racing line.

Drills

18volt drill used to bore holes in the snow surface. Required when setting Gates, B-Fence and spec fence.

Drill Bits

Special fluted bit for drilling into snow.

Finish Banners/Finish Verticals

Banners that define the finish line. Banner hung horizontal above the finish line. Verticals drop down from the horizontal and are affixed to the snow surface.

Finish Corral/Finish Arena

The area formed by the flat stock finish pad. An enclosed area where athletes, after passing through the finish line, can come to a stop. A entry controlled area.

Flat stock/Finish pads

Large 3.5'x6.5' pads, Connected together in the finish area to form a padded corral. Supported by polycarbonate poles. Also commonly use for padding timing lights.

Flex gate/Break-a-way/Hinged gate

A gate that includes a flexible hinge between the upper shaft and the base. Red or Blue in color.

Forerunner

Tests the course prior to each day's race. If a course stoppage occurs they may be sent again before the next athlete. Usually 5-8 forerunners are sent down the course before the first athlete.

Free Groomer

A standard snow cat with no special equipment.

Gate

The combination of inside poles and outside poles that comprise a gate. Racers ski between the inside and outside poles, through the Gate.

Also slang for individual poles. Pole=gate.

Gate Flags/Gate Panels

Flags hung between two gates to provide a more visible indicator of the position of the gate.

Grain Scoop

A shovel designed to move large quantities of light material. Great for moving snow. Constructed of alloy or plastic (snow will not stick to plastic).

High Line

The area directly uphill of the Race Line, both above and below the gate. This area is between 6" and 24" above the racing line. The line the racer would be taking if he were "above" the racing line, hence "High Line".

High Speed Slip

At the end of course work and immediately before the first forerunners, a slip team will conduct a high-speed slip of the race line literally blowing away any residual snow.

Hole

A weak point in the snow that develops into a hole, similar to a pothole. Very dangerous to ski racers. Normally right in the race line.

Intermediate times/Intermediate timing

Points on the course where intermediate times are collected. Usually 3 intermediate timing locations exist.

Interval

The time period between each athlete as they leave the start. Commonly the first 30 athletes will depart the start at one interval (between 1min30secs and 2mins) and the remaining athletes, 31 to the last athlete will run on a shorter interval (as little as 45sec).

Inside the Gate

Inside the gate is the area from the turning pole away from the outside gate.

Jury

Officials who control the operation of the race.

Jury Channel

The radio channel dedicated to the jury members. The jury uses this channel to control the race.

Low Line/ Late line

The area directly below the Race Line, both above and below the gate. This is the opposite of the high line. This area is between 6" and 24" below the racing line. The line the racer would be forced into if he were off balance and making turns late, hence "Low Line".

Naked B-Fence Pole

A B-Fence pole with no clips on it. Used to quickly replace broken B-Fence poles.

Outside the Gate

The area outside the gate is between the turning pole and the outside gate.

Pick Point/Anchor

The attachment point for the winch cat's cable.

Race Arena

The area contained by Spec Fence. Includes safety fencing, the race course, the start and finish areas.

Race Channel

The radio channel dedicated to receiving information about the status of the race.

Race Line/ Track

The line the racer takes while racing down the course. Also known as "The Track". This is the actual path that the racers take. Identified by the racers ski tracks left in the snow. This is not necessarily the shortest distance between two gates.

Race worker

Several different classes of workers exist.

Race Crew:	Paid employees of the race department
Race Patrol:	Paid employees of the ski patrol
Section Crew:	Are stationed in each section for the duration of the day
Course Crew:	Teams of ten that assist section crews as needed
Slippers:	Teams of ten that assist section crews as needed and slip the race line during the race
B Fence Crew:	Conduct all B Fence repair, assist with section B Fence.
Runner:	Moves Equipment and materials at the direction of
Timing Crew:	Assists the professional timing crew
Gate Keeper/Judge:	Watches the gates during the race, notes incorrect passage of the athletes through the gates.

Rake

Large 30" head. Used for clearing the remaining snow of the course. Works well to smooth chatter marks.

Repair Station

The area where all the materials needed to conduct repair on B-Fence, A-Net, and Slip skirt is stored. Also the area where section tools are stored. A repair station will be in a safe area out of the spill zone.

Ruts

A long deep groove in the snow in the race line.

Screw in Gate/Snow grip

A gate that has a threaded base that screws in the snow. Helps to keep the gate from being knocked out.

Slip Skirt

Attached to the front of A-Net with bungees. Allows an athlete to slide along an A-Net without becoming entangled in the nets mesh. Usually extends 2 meters above the snow surface.

Slip Station

The point in each section that Slippers will slip to and then pull off the course, wait for the next athlete and continue. The safe waiting area for slippers. Will be away from the race line and out of the TV Shot. Is marked with a black disk with a yellow square inside it.

Snow Blower

A gas powered, walk behind snow blower. Equipped with small caterpillar tracks.

Snow Chute

Plastic chute 8' long. When connected it together forms a slide to carry snow downhill and off the course.

Snow Chute Escapes

A curved section of snow chute buried under an A Net. It is unburied to allow snow from snow chutes to be exited out under the A-Net.

Snow Piles Around Gates

Piles of snow surrounding base of turning poles. This snow forms a dangerous ramp. Can be anywhere from ½ inch to 10 inches of snow.

Spec Fence/Crowd Control/C Fence

3' high fencing to control movement of spectators and skiers. Defines edges of arena.

Spill Zone

The area where if an athlete crashed, he would slide into. An unsafe place to stand or store equipment. Generally regarded as anywhere in front of an A-Net or B-Fence. Anywhere an athlete could slide to.

Start House

The building that the athletes start the race from.

Static Gate/ Jab in/Rigid gate

A pole with no hinge or flex point. One piece usually includes a textured base with smaller threads.

Steel Shovel

Flat blade, steel head. For working on hard snow in the race line. Used by Race/Section Crew only.

Thousand Step/Side stepping

Side stepping down the hill taking very small steps. Between 2" and 4" per step. Used to pack down and smooth out snow berms and snow piles.

Timing Lights/Photo Cells/ Light beams

Infrared lights that create a thru beam. When the beam is broken as an athlete passes, it creates a timing impulse. Used at intermediate timing stations and the finish line.

Tip to Tail/Tip to Boot

When slipping as a group you may be asked to slip "Tip to Tail" or "Tip to Boot" During Tip to tail slipping, a group spreads out across the hill with the tips of the uphill Slipper at the tails of the Slipper in front and below him. During Tip to Boot slipping, a group spreads out across the hill with the tips of the uphill Slipper at the boots of the Slipper in front and below him.

TV Forerunner

A forerunner who carries a small TV camera. Provides the "Athletes view of the course". Usually is sent up to 10 minutes before the first forerunners. May be several.

TV Interval

After racer 10 leaves the start there can be a 3-5 minute interval for TV to hold commercials, etc. After racer 30 has passed, there is time for race workers to conduct course maintenance. Will be scheduled, may also be held after racer 20. Check the daily schedule for actual times.

Water Injection Bar

Alloy Tube with nozzles inserted on the lower side. Connected to a snowmaking hydrant, water is injected into the snow pack.

Wedges

Wooden wedge 6"x4"x2". Used to secure a gate when the hole the base is in becomes enlarged.

Wide Line/ Outside line

The area just to the outside of the Race Line.

Wide Slip

A slip down the outside, wide line. Removes any berms and piles of snow.

Willy bag

Large 5'x8' PVC bag. Filled with foam peanuts. Used to pad objects.

Winch Cable

The steel wire that supports the weight of the winch cat.

Winch Cat

A snow cat equipped with a winch, used to haul itself up a slope.

The area at the top of the lift where all work teams will check in. Controls all work in the race arena. Controls entry to the race arena for all workers.

Base

Collection point for all tools and workers who have just arrived from the race arena. Provides an area close to the lift for workers to wait before they are called back to work. All volunteer workers must check in at base after leaving the race arena and remain close in case you are needed.

Channel

The radio channel dedicated to communications with . Used to call for workers, equipment, talk between sections, etc

Worker Exit

A gap in the B-Fencing where race workers can exit the race arena.

Worker Station

The area where race workers who must remain in the arena during the race may safely stand. Worker stations are out of the spill zones.