

2017-2018

ICE TECHNICIANS REFERENCE MANUAL



1400 Bayly St., Unit 10, Pickering, ON, L1W3R2

ICE TECHNICIAN'S REFERENCE MANUAL

TABLE OF CONTENTS

| | | | |
|-----------|--|-----------|----|
| 1) | INTRODUCTION | 4 | |
| | Introduction | | 4 |
| | OCA Ice Team | | 5 |
| 2) | ICE TECHNICIAN/CLUB RELATIONSHIP | 6 | |
| | Hiring | | 6 |
| | Remuneration | | 7 |
| | Supervision | | 8 |
| | Performance Review | | 10 |
| | Termination | | 11 |
| | Sample Hiring Package | | 12 |
| | Method | | |
| | Questions | | |
| | Interview Sheet | | |
| | Sample Job Description | | |
| | Ice Technician Performance Review | | |
| 3) | SAFETY | 16 | |
| | Safety Practices | | 16 |
| | Emergency Telephone Numbers | | 17 |
| | Ammonia Mask | | 17 |
| | Ammonia Detector System | | 17 |
| | Fire Extinguishers | | 17 |
| | New Employee Safety Training | | 17 |
| | First Aid Kits | | 18 |
| | Gassing | | 18 |
| | Liquid Splashed or Concentrated Vapour in the Eyes | | 18 |
| | Skin Burns from Splashes or Concentrated Vapours | | 18 |
| | WHMIS Training | | 19 |
| | Transportation of Dangerous Goods | | 19 |
| | Ammonia Safety Data | | 20 |
| | Emergency Plan | | 20 |
| | Exposure Hazards & First Aid For Ammonia | | 21 |
| 4) | START-UP | 22 | |
| | Start-up | | 22 |
| | Start-up Checklist | | 24 |

| | | | |
|------------|--|-----------|----|
| 5) | ICE INSTALLATION | 25 | |
| | Recording Floods in the Log Book | | 25 |
| | Initial Floods | | 26 |
| | Painting | | 27 |
| | Finishing Floods | | 28 |
| | Thickness of Ice | | 28 |
| | Curling Sheet Specifications | | 29 |
| | Equipment/Supplies Inventory Checklist | | 31 |
| 6) | TEMPERATURE AND AIR CONTROL | 33 | |
| | Fans | | 33 |
| | Heaters | | 33 |
| | Dehumidifiers | | 33 |
| | Ceiling Insulation | | 34 |
| 7) | SHUT-DOWN | 35 | |
| | Shut-down | | 35 |
| 8) | ICE MAINTENANCE | 36 | |
| | Daily | | 36 |
| | Weekly | | 37 |
| | Mid-Season | | 38 |
| 9) | SCRAPING | 39 | |
| | Pass Patterns | | 40 |
| 10) | PEBBLE HEADS | 41 | |
| 11) | PEBBLING | 42 | |
| | Throwing Distance | | 42 |
| | Time per Sheet | | 42 |
| | Temperatures and Humidity | | 42 |
| | Pebbling Water Temperature | | 42 |
| | Condition of the Ice | | 43 |
| | Sizes of Pebble Head | | 43 |
| | Rock Running Surface | | 43 |
| 12) | PEBBLING TO FIX ICE PROBLEMS | 43 | |
| | Deep scrape and Light scrape | | 43 |
| | Feeding Low Sides | | 44 |
| | Dish or Gull Wing | | 44 |
| 13) | ROCKS | 45 | |
| | Moving & Cooling of Rocks | | 45 |
| | Identification of Rocks | | 45 |
| | Handles | | 45 |
| | Matching of Rocks | | 45 |

| | |
|--|-----------|
| Storage of Rocks | 46 |
| To Resurface or Not? | 46 |
| Rock Types and Characteristics | 47 |
| Inserts | 47 |
| Texturing the Running Surface | 47 |
| Prior to Texturing rocks | 48 |
| Finding Running Surface width | 48 |
| Measuring/printing running surface width | 48 |
| Methods of Texturing Rocks | 49 |
| Aggressive Method | 49 |
| Quarter Turn Method | 50 |
| Pros and Cons of Textured rocks | 51 |
| 14) PREVENTATIVE MAINTENANCE | 52 |
| Advise Your Board | 52 |
| Daily | 52 |
| Periodic | 53 |
| Summer | 53 |
| Refrigeration Contractor | 54 |

INTRODUCTION

The Ontario Curling Association Ice Team has an ongoing commitment to provide assistance to member clubs and has prepared this OCA Ice Technician Reference Manual for use by those individuals responsible for the ice and plant operations in curling clubs.

This manual is intended to address the immediate needs of the curling club ice technician in a general way. It provides a basic checklist of items of concern to the club and the ice technician no matter what size of club you have or what experience you have.

As all curlers should be provided with, and appreciate, keen, consistent ice, we have structured this manual to help you in building a working relationship with the club that will produce the desired results. In many cases curling clubs have wasted their resources on schemes or trends rather than building a plan that best utilizes the facilities and personnel available. Too often little thought and attention is given to developing a program that will ensure the best ice possible.

We feel that the items discussed in the manual are of the utmost importance and we encourage you to seek out more details which are available by consulting existing Curling Canada technical manuals and the OCA Ice Team, as well as manufacturers and suppliers, or by attending ice schools.

Updates to this manual will be made to the master manual on the OCA website when new and important information becomes available. The manual is intended for your use while you are responsible for the ice and plant and should be kept available so that the materials contained in it, as well as those gathered by you, are readily available.

OCA ICE TEAM

| | |
|------------------------------------|---|
| Jon Wall (Zones 1, 2, 3, 4) | 613-816-2956 Cell wall2wallice@gmail.com |
| Mark West (Zones 4, 5, 6) | 705-328-5402 m.e.west@xplornet.com |
| Don Powell (Zones 7, 8, 9) | 647-402-4259 Cell Iceworks30@gmail.com |
| Scott Muir (Zones 7, 8, 9) | 905-339-9858 Cell scttym@yahoo.com |
| Bryan Wilson (Zones 10, 11) | 705-543-0340 Cell bryanwilson@sympatico.ca |
| Joe Hahn (Zones 12, 13) | 905-945-2688 Bus jahahn@rogers.com |
| Darrin Sinclair (Zones 14, 15, 16) | 519-681-8223 Bus 519-835-1110 Cell darrin.sinclair@hotmail.com |

ICE TECHNICIAN/CLUB RELATIONSHIP

The following topics are designed to assist the ice chairman or club manager in building a mutually beneficial working relationship with the ice technician from the start so that the club can benefit from the best possible ice and a happy, productive employee.

Hiring

Without exception, the most important action taken by the ice chairman is the hiring of the club's ice technician. Not every club can afford to hire a full-time ice technician and instead may have to operate with a part-time ice technician, contract icemakers, or even volunteers. In all cases, the selection and supervision of the work force requires the same care and attention.

The following are some of the many ways to locate a good ice technician:

- **Recruit locally.**
Often the best candidate for the position is a club member or associate. This person may not have as much experience or technical expertise as you would like, but he or she may have the ability and willingness to do the job. An added bonus is that you know their work habits and can easily check references.
- **Rehire former employees.**
Consider re-hiring employees who left your club on good terms.
- **Advertising.**
By drawing responses from a broad cross-section of candidates, advertising will give you a good idea of the current market. Be selective and use well targeted advertising as part of your overall hiring strategy. Newspapers such as The Curling News can provide excellent exposure.
- **Contact the OCA Ice Team.**
The individual members of the OCA Ice Team know a number of qualified ice technicians and individuals who may have shown interest. They are well placed to assess individuals who may be well suited to your situation.

It is more time consuming to train the wrong person than it is to hire the right person.

Some guidelines to follow are:

- **Know what you are looking for.** Take the time, before you begin interviewing, to decide exactly what technician abilities and personal attributes a person will need to handle a particular job and to do it well.
- **Play it straight.** Overstating the conditions and the opportunities of a particular job may convince a desirable candidate to accept it, but the employee isn't likely to last very long. The best policy is honesty, honesty about the club, honesty about the job, and honesty about the opportunities.
- **Look beyond appearances.** Naturally, the way a candidate looks dresses and behaves during an interview will affect your hiring decision, but don't let yourself be so influenced by looks and personality that you forget to consider the two most important factors in hiring; whether the person *can actually do the job*, and whether the person *is willing to do it*.
- **Get off on the right foot.** Make sure that all newly hired employees are fully aware of their duties, organizational status and benefits. Take a good look at your orientation policy and ensure that it is adequate.

A sample of a hiring package used by one OCA club (Method, Curling Questions and Interview Sheet) is included in this section to provide a model you can use as is or alter to suit the needs of your club.

Remuneration

Obviously the resources available to the club to compensate the ice technician and his/her staff will vary greatly from club to club.

The high turnover of personnel can be closely related to the club's ability to fairly compensate the ice technician.

The cost of re-training or hiring qualified outside servicemen is considerable. The club should take into consideration the following when assessing value:

- Job description
- Ice technician's training
- Ice technician's experience
- Specific mechanical skills

A sample of a job description is included in this section and may be used as is or modified to suit the needs of your club.

Supervision

Most ice technicians would claim that they have several hundred supervisors. As the chairman of the ice committee, it is important that you solicit from the members, feedback on the performance of the ice committee and the ice technician.

Some suggestions to foster and strengthen the committee's role could include.

- **Use a team approach.** Creating a team feeling isn't all that difficult. It is mainly a matter of showing that different viewpoints, when constructively presented, are welcome.
- **Be receptive to suggestions.** Don't just wait for suggestions, encourage them. It is important that certain procedures be followed to ensure that the ice technician has some direction.
- **Reward initiative as well as results.** Show the ice technician that you value initiative and that you understand that, on occasion, it results in mistakes. Give him/her enough latitude to achieve his/her full potential.
- **Publish an in-house newsletter.** A newsletter is an excellent and inexpensive way to keep the members advised of the ice committee's news and policy changes. You can also use it to recognize outstanding performance and prepare the members for any changes that may be deemed necessary.
- **Make meetings meaningful.** Many committees hold regularly scheduled management/employee meetings as often as once a week. Such a policy can be productive, but only when the meetings hold a specific purpose. To hold a meeting simply for the sake of holding a meeting is a waste of everybody's time.

After you have chosen an ice technician, try some "people oriented" strategies that build morale. Praise is as good as a raise.

- **Do something special for special people.** The best way to encourage good performance is to acknowledge it. When you find that the ice technician is performing exceptionally well, show him/her by rewarding him/her. Never lose sight of the fact that it is hard to find well-motivated, hardworking employees and praise is an effective way of recognizing a job well done.
- **Keep the lines of communication open.** All employee complaints justified or not, deserve your prompt attention as well as a prompt reply. When you do report back to the employee, be sure to tell him/her what action, if any, you took or are about to take. Take time to have informal one-on-one meetings with employees as such discussions keep them involved and motivated.
- **Don't forget the little courtesies.** Workplace surveys indicate that criticizing an employee in front of others is the worst breach of etiquette. A "good morning", a "thank you", and a note of appreciation when the situation calls for it, can go a long way in keeping your best people.
- **Be fair.** Most employees don't mind a reasonably tight ship as long as the basic rules and regulations apply to everybody, and as long as the discipline is tempered with compassion. Be firm, but be human as well. And before you fire someone, make sure that the reasons are valid and your decision is sound.

Performance Review

The evaluation process is intended to support appraisals of the situation in certain areas of development, with a view to making the best possible decisions about future progress.

There are three principal processes in program evaluation:

1. **Measurement**
To collect the information needed for decision making.
2. **Evaluation**
To make judgments based on the information collected through various means of measurement.
3. **Decision Making**
To make administrative decisions in light of the information provided by measurement and evaluation.

In measuring the development and performance of the ice technician, a co-operative approach utilizing two-way communication can provide useful insights to both the technician and the administrator.

The checklist on page 13 has been developed to jointly measure performance. The comments for each category should be listed as E-Excellent, G-Good, S-Satisfactory, U-Unsatisfactory, N-Needs Improvement, C-Cannot Be Improved

When jointly discussing the completed form, the ice technician and the administrator now have a basis for constructive criticism.

If both agree that performance on an activity is excellent or cannot be improved, then there is little need for further discussion. Likewise, if both agree that performance is unsatisfactory or needs improvement, then the item goes on a priority list. When different results appear, the basis for discussion develops.

Termination

The only thing harder than hiring is firing. It is never easy to fire an employee and often the termination is not entirely of the employee's making. A few suggestions for making an unpleasant situation a little less painful include:

- **Have adequate cause.** Before you fire someone, be sure that you have a good reason. Get whatever expert advice is necessary to be sure that you have a legal basis for the termination. More importantly, out of fairness consider giving the employee a second chance to correct any deficiency in performance.
- **Analyze what went wrong.** Surveys indicate that most top executives place the blame on management when an employee has to be fired. So the question you have to ask yourself is what led you to hire the person in the first place, and what you can do to prevent the same mistake from happening again.
- **Have all necessary separation information on hand.** The employee you terminate has the right to know immediately whatever benefits or entitlements are due. If there is accrued vacation pay, separation pay or a final cheque, have it with you at the meeting as well as the Unemployment Insurance Record of Employment.
- **Don't drag it out.** If the purpose of the meeting is to let an employee go, don't hem and haw. The longer you wait to spring the news, the tougher it gets.
- **Be extra tactful.** Do your best to give the employee that you are firing an explanation that he or she can live with, but by all means be truthful.

SAMPLE HIRING PACKAGE

Method

The following questions were asked after having reviewed the Ice Technician's Manual in complete detail. In that way, the interviewers would know if the person being interviewed knows what they are talking about.

As the person was interviewed, the interviewers took down the applicants answers in detail. The Interview Sheet was then completed after each interview by each of the interviewers and the scores compared. The applicant who received the most number of high scores was then offered the job.

Questions

1. Recent Experience (3-5 years)
Tell us of your experience in general.
2. Ice Plant
Explain the operation of the ice plant.
Comment on the following - compressors - daily log
 - controls
 - brine table
 - pumps
 - other
3. Ice Making
Briefly explain the procedure for ice making from start to finish.
4. Maintenance
How would you maintain the ice and equipment?
5. Communications
How and what do you communicate to the ice chairman?
 - Daily?
 - Weekly?
 - Problems?
6. Housekeeping
How do you keep the area clean? - Routine?
7. Hours of work
What would be your normal hours of work?
8. Education
Are you familiar with the Curling Canada Ice Technician Manuals?
What certification level are you?
9. Responsibility
Do you take full responsibility for making sure that the ice is in top condition?

INTERVIEW SHEET

Date _____

Applicant's Name _____

- 5 – Excellent
- 4 – Above Average
- 3 – Average
- 2 – Below Average
- 1 – Low

| <u>QUESTIONS</u> | <u>SCORE</u> |
|---------------------|--------------|
| Recent Experience | _____ |
| Ice Plant Knowledge | _____ |
| Ice Making | _____ |
| Maintenance | _____ |
| Communication | _____ |
| Housekeeping | _____ |
| Hours of Work | _____ |
| Education | _____ |
| Responsibility | _____ |
| TOTAL | _____ |

SAMPLE JOB DESCRIPTION

Ice Technician

Scope of work

The ice technician is accountable to the curling club ice chairman and is to perform the functions prescribed to him/her by the ice chairman. He/she is to perform the technical duties that will play a significant role in achieving, maintaining and improving the quality of curling ice.

The overall goal/objective is to ensure that the ice function is operated efficiently and effectively with special emphasis on consistency and communication.

Job Responsibilities/Qualifications

1. Initiate start-up procedures
2. Install the ice
3. Maintain the ice
4. Shut-down the facility
5. Perform summer maintenance and repairs
6. Maintain daily log
7. Communicate regularly with ice chairman
8. Budget preparation for ice requirements
9. Fire prevention and safety
10. Other duties as assigned by the ice chairman

Accountability

This position is accountable to the curling club ice chairman for the interpretation, application and fulfillment of his/her duties and responsibilities.

Relationship Responsibilities

He/she will keep informed on changing techniques relating to the fulfillment of the job description.

He/she will establish and maintain an excellent climate of working relations both inside and outside the club consistent with encouraging improved performance at all levels.

He/she will keep the ice chairman informed of the operations and of any unusual matters that may affect budgets.

ICE TECHNICIAN'S PERFORMANCE REVIEW

| | E | G | S | U | N | C |
|---|-----------------|----------|----------|----------|----------|----------|
| START-UP PROCEDURES The start-up procedures were timely and well organized. | | | | | | |
| Materials were properly prepared well in advance. | | | | | | |
| ICE INSTALLATION All measurements were accurate. | | | | | | |
| The paint and lines were well applied. | | | | | | |
| ICE MAINTENANCE All daily maintenance procedures were adhered to. | | | | | | |
| A mid-season ice maintenance program returned the ice to the original condition. | | | | | | |
| A daily log was maintained. | | | | | | |
| SHUT DOWN Rocks were properly and safely stored. | | | | | | |
| The facility was returned to a condition ready for next season's start-up. | | | | | | |
| PREVENTATIVE MAINTENANCE Daily maintenance procedures were followed and logged. | | | | | | |
| A summer maintenance program, as outlined in the manual, was followed. | | | | | | |
| COMMUNICATION Communications with the Ice Chairman occurred on a regular basis throughout the year. | | | | | | |
| BUDGET All functions of the ice program of the club were executed within budget. Any deviation was noted. | | | | | | |
| ATTITUDES AND GENERAL ATTRIBUTES The ice technician has strong personal motivation. | | | | | | |
| The ice technician is good at planning & organizing work. | | | | | | |
| The ice technician learns new tasks and takes on new responsibilities quickly. | | | | | | |
| The ice technician is open minded and willing to consider ideas and solutions. | | | | | | |
| The ice technician is willing to take time to train others and to delegate responsibilities. | | | | | | |
| The ice technician is constantly looking for ways to work or manage more effectively. | | | | | | |
| DATE _____ | SIGNATURE _____ | | | | | |

E = EXCELLENT
G = GOOD

S = SATISFACTORY
U = UNSATISFACTORY

N = NEEDS IMPROVEMENT
C = CANNOT BE IMPROVED

SAFETY

To ensure your safety and that of your club members and visitors, certain precautions must be observed and certain safety devices must be maintained in the club. The following section will be added to on a regular basis and will detail these safety issues.

Safety Practices

1. Make certain that exhaust ventilation equipment is adequate and maintained in operating condition.
2. Provide a long rope for tying to a person entering a room likely to be filled with any refrigerant - to serve as a guide for his/her exit and for use in attempting to follow and locate the person in that room. Never go into a room with heavy concentrations of any refrigerant without another person nearby.
3. Provide emergency lighting, proper exits, gas masks and spare gas mask canisters.
4. Monitor the compressor discharge temperature and the lubricating oil temperature. Maintain within manufacturers prescribed top limit. Stop the compressor and determine the cause if it is noted that the top limit has been exceeded.
5. Avoid standing on piping. Eliminate excessive piping vibration immediately.
6. Maintain guards on belt-drive and direct-driven equipment.
7. Maintain relief valve piping to a diffuser located outside.
8. Never valve off a vessel filled with liquid refrigerant, unless it is protected with a properly sized relief valve. Never expose refrigerant vessels, drums or bottles to excessive heat.
9. Liquid refrigerant pumps should have properly sized relief valves whether positive or centrifugal type to protect against excessive pressure.
10. Use a "buddy system" for personnel making repairs in refrigerated rooms and engine rooms.
11. Develop an "emergency procedures plan" and arrange for rehearsals and training of personnel and club members in this plan. Know the location of: main liquid line shut-off valve, compressor shut-off switch, water hose.
12. Always wear a gas mask when making repairs in an area where a leak might occur.

Emergency Telephone Numbers

A sheet detailing emergency telephone numbers should be attached to the wall beside or above each telephone in the club. When an emergency occurs, stay calm and call the numbers listed in the following order:

- 911
- or
1. Fire Department
 2. Police Department
 3. Ambulance
 4. Ministry of the Environment
 5. Ice Chairman or Club Manager

If you have a fire or an ammonia leak, you should have someone assist you to evacuate the club immediately, in a calm and orderly manner.

Ammonia Mask

An up-to-date "CSA Approved" ammonia mask must be kept in a proper storage cabinet next to any doors leading to the compressor room.

Filters must be checked regularly and changed when required.

Ammonia Detector System

Where ammonia is present in any part of the refrigeration system, an ammonia detector system is required by law.

Please consult your refrigeration contractor for the appropriate ammonia detector system.

Fire Extinguishers

The proper number of the appropriate type and size of fire extinguishers must be properly located throughout the club.

Please consult your local fire department for the regulations concerning fire extinguishers.

New Employee Safety Training

Each time a new employee is hired, it is the responsibility of the club to acquaint that employee with all safety considerations, i.e. procedures and equipment.

First Aid Kits

Complete, well stocked first aid kits should be kept in a place that is easily accessible. In addition, it is recommended that one person with basic first aid training be available in the club at any given time.

KEEP AN IRRIGATION BOTTLE READILY AVAILABLE CONTAINING 2½% EACH OF BORAX AND BORIC ACID IN DISTILLED WATER.

Gassing

1. Remove affected person to fresh air immediately
2. Summon a doctor.
3. Remove clothing if splashed with liquid or impregnated with concentrated vapour.
4. Do not remove clothing frozen to the skin.
5. Keep the patient still and warmly wrapped with blankets.
6. If conscious and the mouth is not burnt, give hot sweet tea or coffee.
7. Oxygen may be administered by a person authorized by a doctor.
8. If breathing fails, apply artificial respiration.

Liquid Splashed or Concentrated Vapour in the Eyes

1. Irrigate eyes immediately with a solution of 2½% each of borax and boric acid in distilled water and continue for at least thirty (30) minutes.
2. Summon a doctor.

Skin Burns from Splashes or Concentrated Vapour

1. Wash immediately with large quantities of water and continue for at least fifteen (15) minutes, removing all clothing while washing.
2. Summon a doctor.
3. After washing, apply wet compresses (solution of 2½% of borax and boric acid in distilled water) to affected parts until medical advice is available.

WHMIS Training

The Workplace Hazardous Materials Information System (WHMIS) is a Canada-wide effort to ensure that employers and employees are familiar with the safe handling, storage and use of any hazardous or potentially hazardous materials, both new and old in the workplace.

The Workplace Safety & Insurance Board (WSIB) hold information seminars periodically. For individuals wishing to attend this free seminar you can contact WSIB at

Toll-free 1-800-387-0750
Website: www.wsib.on.ca

To meet the law's requirements, employers must provide training and education for workers who work with or are likely to handle, or be exposed to, hazardous materials in the workplace. They need to understand the significance of hazard information, labels, material safety data sheets and hazard symbols. Information is to be provided to the worker in a way that will ensure that the worker is able to understand the hazards and knows how to deal with any emergencies.

Penalties For Non-Compliance

Penalties for non-compliance under the Canada Labour Code can be as high as \$100,000.00 or six (6) months imprisonment. As well, each province or territory has its' own regulations containing penalties ranging from assessment under the Worker's Compensation Board (WCB) to specific fines.

As the refrigeration system in a curling club contains hazardous materials, you are advised to seek out WHMIS training using the phone number and website information above.

Transportation of Dangerous Goods

The federal government has legislation regarding the transportation and handling of dangerous goods that may affect any ice technicians that do their own refrigeration service and/or painting. Proper training and certification of such training is required for anyone handling or transporting a variety of products, including ammonia and Freon. Under the act, acetylene, ammonia and propane cannot be transported in a passenger vehicle and limits are placed on the quantities of other substances such as paints that can be carried in a passenger vehicle.

The Dangerous Goods Act was not enacted to deter employers from carrying on their normal type of business but rather to promote public safety and we recommend that you contact Transport Canada regarding the Safety Education Program and for further information on where to get training.

Ammonia Safety Data

Emergency Plan

Spill or Leak Procedures

Steps to be Taken in Case Material is Released

1. Initiate emergency response plan.
2. Stop leak if possible.
3. Evacuate personnel not involved in response activities.
4. Notify 911 emergency response officials.
Be prepared to give information such as:
 - Your name and position
 - Location and phone number at the emergency site
 - Some details of the emergency such as:
 - any chemicals involved or in the affected area
 - any injuries involved
 - any chance of hazard i.e. Fire, explosion etc.
5. Assess need to evacuate surrounding population.
6. Evaluate explosion potential in confined spaces.
7. Evacuate response personnel if explosion risk exists.

Waste Disposal Method

Contain run-off of liquid ammonia or water containing ammonia. Allow to evaporate or neutralize and arrange for disposal by approved disposal firm. For hazardous waste regulations, go to www.hwin.ca and look under the Quick link for Hazardous waste Resources.

If a spill occurs call the Spills Action Centre (open 24/7) at 1-800-268-6060

Exposure Hazards & First Aid For Ammonia

Inhalation

The gas is extremely odorous and is readily detectable at levels well below those which cause lasting effects. It is extremely irritating to the mucous membranes and lung tissues. A sore throat, coughing, shortness of breath and laboured breathing can develop. Repeated or prolonged exposure to concentrations higher than the IDLH of 500 ppm should be avoided without respiratory protection. Brief exposures to concentrations of 5,000 ppm or above must be avoided as permanent injury or death can result.

First-Aid:

1. Remove from exposure.
2. Administer artificial respiration or oxygen if breathing has stopped.
3. Seek medical aid.

Skin Contact

Contact with vapour concentrations higher than 500 ppm can result in irritation to moist areas of the body. Concentrations of 5,000 ppm or higher can result in burns to the skin. Contact with liquid ammonia causes frostbite and burns.

First-Aid:

1. Immediately flush with large quantities of water and continue for 15 minutes.
2. Do not remove clothing if frozen to skin.
3. Seek medical aid.

Eye Contact

Contact with gases at concentrations below 500 ppm can result in eye irritation and tearing. Above 500 ppm there will be extreme eye irritation with involuntary closure of the eyes and visual impairment.

Liquid ammonia will rapidly cause serious burns to the eye which results in permanent blindness.

First-Aid:

1. Flash with large quantities of water for 15 minutes.
2. Seek medical aid.

Ingestion

Swallowing liquid ammonia will result in immediate pain and burns to the mouth and esophagus.

First-Aid:

1. Do not induce vomiting. Give 1 - 2 glasses of milk or water.
2. Seek medical aid.

START-UP

The following is a list of tasks to be completed annually prior to the ice installation. These tasks are to be done by the ice technician and/or an outside contractor. The date to begin start-up is approximately 6 weeks prior to the start of curling at your club and this date will vary from club to club.

A Start-up Checklist is included at the end of this section to ensure all tasks are completed.

Refrigeration Contractor

Book an appointment with a refrigeration contractor to re-check and start-up the compressor. It is important that the start up is done right, have your contractor do the initial start up.

At the same time, book an appointment with the refrigeration contractor for shutdown (date required - immediately following last day of curling).

Daily Log Book

Now is the time to start your daily log.

Photocopies of the daily log book are no longer valid. The log books must be pre-printed and pre-numbered so that pages cannot be removed.

A legal log book can be ordered from ORFA at 416-426-7062 (www.orfa.com)

Painting Supplies

Make sure that all installation supplies are on hand or have been ordered. e.g. ice paint, yarn, painting supplies, drywall tape etc.

If an outside contractor is used to paint the ice, now is the time to book the appointment if one was not made the previous year.

Cleaning

Clean all surfaces within the ice area. e.g. Walls, beams, light fixtures, floors, walkways, etc.

A solution of vinegar and water is suggested.

Equipment

Inspect sideboards and backboards for rot and repair and replace, if necessary.

Inspect bumpers for damage and repair or replace, if necessary. Bumpers may have collected dirt that should be vacuumed out so it does not fall on the ice when a rock hits it.

Check all equipment within the ice area.
e.g. dehumidifier, fans, heaters, lighting, etc.

Arrange for immediate repairs if you discover a need during your equipment inspection.

Inspect all ice installation and maintenance equipment and repair or replace where necessary.
e.g. hoses, brushes, scrapers, mops, pebbling cans, pebbling heads, etc.

Sand Based Floors

Check, level and secure the pipes.

Add sand where necessary, making sure that it is level.

Check the header pipes.

Check clamps to ensure that they are tight.

It is recommended that you use stainless steel clamps as they will not rust.

Close all doors seal the building and start up the refrigeration system and dehumidifier.

When the pipes cool they will contract, reseal any high pipes.

| Start-up Check List | | |
|--|--------------------|--------------|
| TARGET DATE: | START DATE: | |
| Task | Date | Notes |
| Book Refrigeration Contractor | | |
| Start Daily Log | | |
| Inventory Installation Supplies | | |
| Order Installation Supplies | | |
| Book Painting Contractor | | |
| Clean Ice Area Surfaces | | |
| Walls | | |
| Beams | | |
| Light Fixtures | | |
| Floors | | |
| Walkways | | |
| Other | | |
| Inspect Sideboards & Backboards | | |
| Repair/Replace Sideboards & Backboards | | |
| Inspect Bumpers | | |
| Repair/Replace Bumpers | | |
| Check Plant Equipment | | |
| Dehumidifier | | |
| Fans | | |
| Heaters | | |
| Lighting | | |
| Other | | |
| Repair of Plant Equipment | | |
| Inspect Installation/Maintenance Equipment | | |
| Repair Installation/Maintenance Equipment | | |
| Order Installation/Maintenance Equipment | | |
| Check Pipes | | |
| Level Pipes | | |
| Secure Pipes | | |
| Add Sand | | |
| Level Sand | | |
| Check Header Pipes | | |
| Check Clamps | | |
| | | |
| | | |
| | | |
| | | |

ICE INSTALLATION

The following is a list of tasks to be completed during the installation of curling ice.

Recording Floods in the Log Book.

It is important to record such data as:

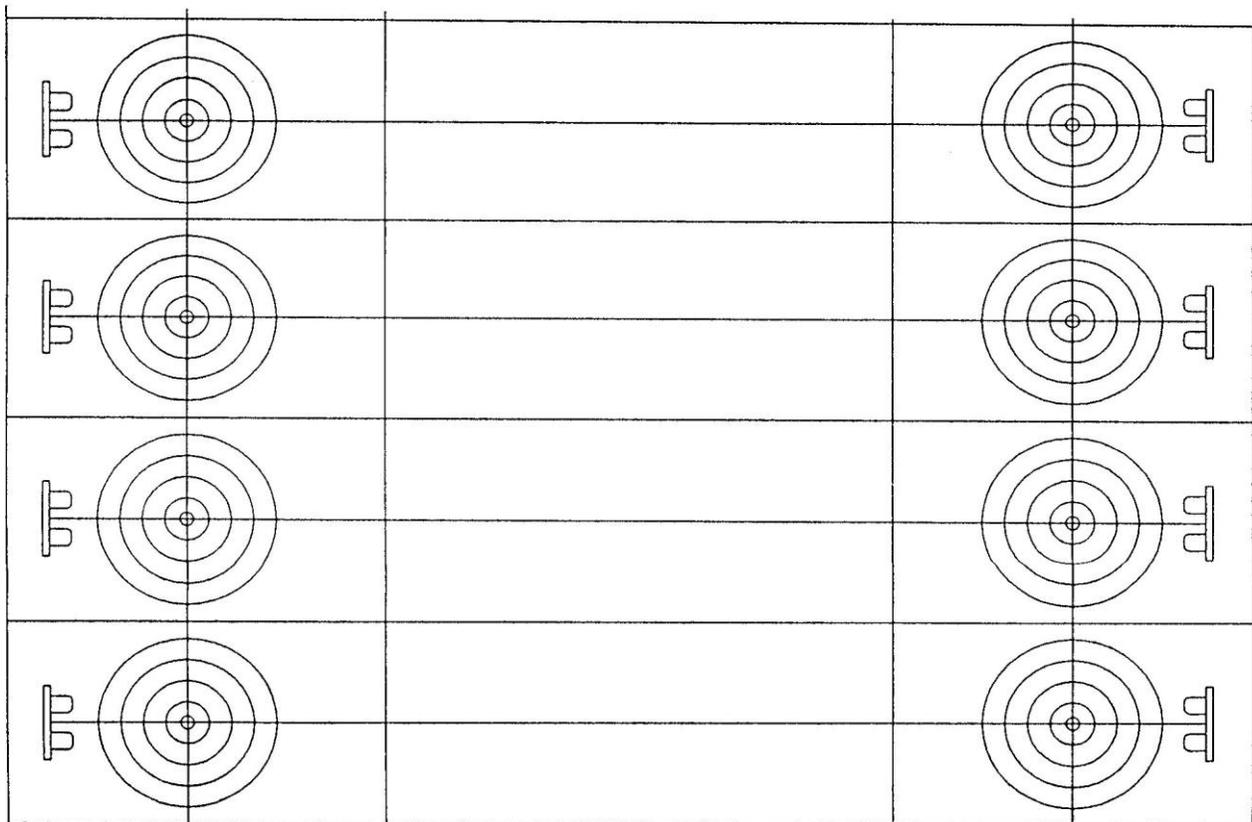
Time start and finish,
Ice temp start and finish,
Flood or spray number,
Gal/min,
Total gal.

Most of these can be recorded in your logbook if you do a record before and after a flood. The flood number, gal/min and total gallons used can be recorded in the comments section of the log. This way all the pertinent data will be easily accessible for future reference.

- Bring the brine temperature down. The suggested temperature is 20 - 22° F.
- As the temperature of the brine is coming down, check the temperature of the building and ice surface and record on your daily log. When the brine reaches the desired temperature, you are ready to begin installing the ice.
- If you do not have sophisticated probes, a simple method of determining when the desired temperature has been reached is to place 1" of water in a plastic glass and put it on the floor - when it freezes, the desired temperature has been reached and you may begin.
- Bring rocks out of storage and place on the backboards so they begin to cool down. Cover the rocks with plastic and check periodically for moisture.
- If you are on a sand base soak the sand using a garden watering nozzle. Soak only to the bottom of the sand do not allow the water to soak under the insulation.
- Use light sprays with a fine nozzle and apply water in layers until an even crust of ice has formed. Sand-based floors may require 10 - 20 applications. Concrete-based floors may require 3-5 applications.

Initial Floods

- Make sure that the perimeter is sealed.
This step is critical for good curling ice.
Slushing or drywall tape may be used and may have to be repeated to ensure a level ice surface.
- Apply 4 light even floods walking at a steady pace.
Time the first light flood and ensure that subsequent floods take an equivalent amount of time.
Never put on more water unless the total ice surface is frozen and the brine temperature is at least 26°F or lower.
- Install hacks (hack base if removable hacks are used) and centre pins at this time.
- Apply heavier even floods walking at a steady pace until the surface is level enough for painting and dries uniformly. A heavy flood will consume 80 - 100 gallons of water per sheet.



Painting

- Prepare the ice surface for painting by setting the temperature of the ice down to 19 or 20 degrees.
- Scrape to remove some impurities and to create a smoother surface.
- Be prepared to start painting immediately after scraping!
If you delay painting at this point, the impurities will rise to the surface, frost may settle and you will have to scrape again.
- Paint the entire white surface following the directions supplied by the manufacturer of the white paint. 3 fine coats, or even 4, are suggested. Make sure the surface dries between coats.
- Seal the surface with 8-10 light sprays of water using hose.
It is suggested that you begin the 1st spray from the backboards, stepping forward only when each sprayed section has frozen.

Remember to wear clean, cold footwear and to keep hoses moving from this point on.

- Outline the circles according to the specifications outlined in the General Rules of Curling using a template or a scribe and fill in with desired paint colours using brushes or rollers.

Remember to mix colours making sure you have sufficient quantities to complete the job as dye lots may vary.

- Lay tape or yarn to define the sheets according to the specifications outlined in the General Rules of Curling.
- Install the hog line according to the specifications outlined in the General Rules of Curling. It is recommended that the hog line be painted as bubbles may appear with the wide tape.
- Seal the circles, tapes and hotlines with 8-10 light sprays of water using a clean pressure weed sprayer. Making sure that you don't step on tapes or coloured paint.
- Seal the entire surface with 8-10 light sprays of water using a hose.

Finishing Floods

- Apply 1 light, even flood to the entire surface within 1½ - 2 hours after the final sealing.
- Apply heavier even floods until the desired level is reached (at least 2).
- Monitor each flood for uniformity of freezing to determine how many floods above 2 may be required.
- The final flood should be done with the brine set point turned up to 28 or 29 degrees or with the compressor and brine turned off until the flood is completed.

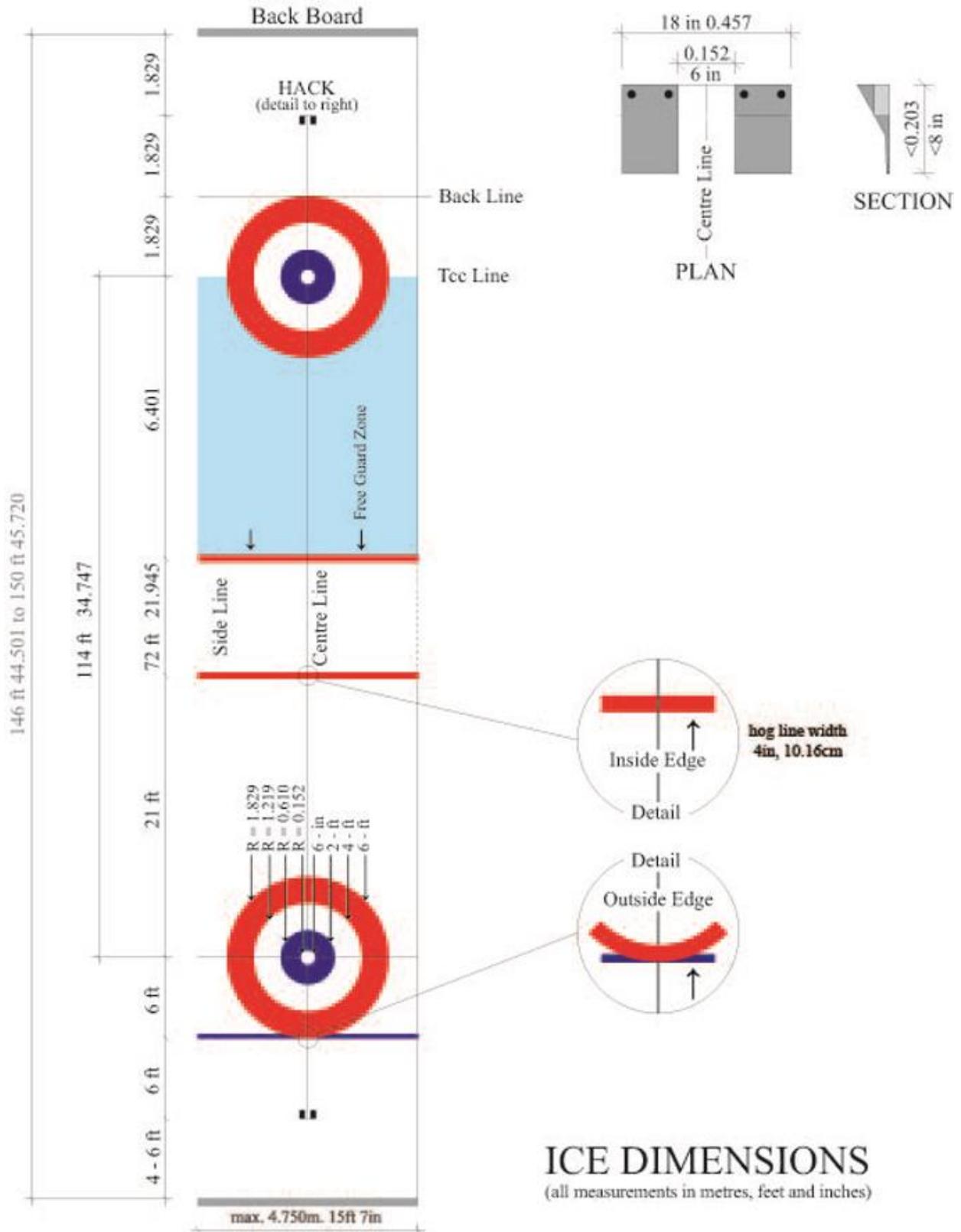
Thickness of Ice

- In order to keep control of the ice sheet it is vital to not let your ice get too thick. The maximum thickness that most curling club equipment is designed to handle is 1½" - 2" but the desired thickness is less than 1" over the paint.
- Too much ice requires lower refrigerant temperature. This requires equipment to run longer and harder, thus increasing electrical and water costs as well as wear and tear on the equipment.
- Each club will require a different thickness but care should be taken to install the same thickness year after year once you have determined what works for your club.
- Clean out centres and hacks. Hand scrape the ends. Pebble behind the hacks.
- Wipe the rocks with a dry cloth and tighten all loose handles
- Place rocks on the ice surface on 2 layers of 6 mil plastic or on plastic mesh (dish drying sheets available from kitchen supply outlets). Remember to allow 24 hrs. for the rocks to freeze!
- Pebble and scrape the entire surface to remove as many impurities as possible. This pebbling and scraping process should be done 4-6 times to minimize the effect of "green" ice.
- Clean the total surface and pebble each sheet up and back.
- Break or nip the pebble

Congratulations THE ICE IS READY FOR CURLING!

Curling Sheet Specifications

- 1) The length of the sheet from backboard to backboard shall be 146 ft. (44.501 m). The width of the sheet from sideline to sideline shall be a minimum of 14 ft. 2 in. (4.318 m). This area shall be delineated by lines drawn or boards placed on the perimeter.
- 2) At each end of the sheet there shall be three (3) distinct lines drawn from sideline to sideline as follows:
 - a) the tee line, 1/2 in. in width, shall be placed 16 ft. (4.877 m) from the backboard to the centre of the tee line and there shall be 114ft. (34.747 m) from the centre of one tee line to the other tee line. The intersection of the tee line and the centre line shall be called the tee.
 - b) the backline, 1/2 in. in width shall be placed with the outer edge 6 ft. (1.829) from the centre of the tee line so that the outer edge will just touch the outer edge of a circle 6 ft. from the tee.
 - c) the hog line, 4 in. (10.16 cm) in width, shall be placed with the inner (circle side) edge 21 ft. (6.401 m) from the centre of the tee line.
- 3) With each tee as centre, there shall be drawn four (4) circles at each end with the outer edge of the outer circle having a radius of 6 ft. (1.829 m), the next circle 4 ft. (1.219 m), the next circle 2 ft. (60.96 cm) and the inner circle a minimum of 6 in. (15.24 cm).
- 4) The centre line, 1/2 in. in width, shall be placed the length of the sheet through the centre of the tees to a point 12 ft. (3.658 m) behind each tee. At this point, lines of 1 ft. 6 in. (45.72 cm) in length shall be placed at right angles to the centre line and shall be known as the hack line. The inside (circle side) edge of the hack boards shall be placed on this hack line.
- 5) The intersection of each tee line and each centre line shall be identified by an adjustable tee centre; with the base portion being securely anchored at the exact intersection of the tee line and centre line of each house; and the top portion being capable of vertical adjustment to suit varying ice levels. The design of the tee centre shall be accepted by the Curling Canada.
- 6) The hack(s) shall be of a style and size accepted by the Curling Canada. The hack(s) shall not exceed 8 inches (20.32 centimetres) in length.
 - (a) If two hacks are used, the back edge of each hack shall be placed on the hack lines and that the inside edge of each hack shall be no further than 3 inches (7.62 centimetres) from the centre line.
 - (b) If one moveable hack is used, it shall be placed with the back edge of the hack on the hack line and be either centered on the centre line or with the inside edge no further than 3 inches (7.62 centimetres) from the centre line (left or right).
 - (c) If one fixed hack is used, it shall be placed with the back edge of the hack on the hack line and centered on the centre line.



EQUIPMENT/SUPPLIES INVENTORY CHECKLIST

| Qty. | Item |
|-------------|---|
| 1 | set Hacks (4 per set) for each sheet of ice |
| 1 | 6' biters |
| 1-2 | Measures Hack covers for each sheet of ice |
| 2 | hand scrapers |
| 1 | Power scraper (4' or 5' blade) |
| 1 | Spare blade for power scraper |
| 1 | Ice nipper or rock pebble breaker (11 rock) |
| 1 | Mini burner |
| 1 | Hand-held propane torch |
| 1 | 8' broom |
| 2 | Spare 8' mop heads |
| 3-4 | Corn brooms |
| 1 | 2' - 3' hair brush |
| 1 | Plastic shovel or plastic dust pan |
| 1-2 | 20 gal. plastic garbage pail |
| 1 | Wet/dry vac c/w 20' hose |
| 1 | 200' x 1" flooding hose c/w shut-off ball valve (preferable rubber inside & green reinforced plastic outside – not red or black) |
| 1 | Flooding tube |
| 1 | Adjustable fine spray nozzle |
| 1 | Pressurized weed sprayer (back-pack style) |
| 2 (min.) | Pebbling cans, plastic or stainless steel c/w 3/4" output hole (ID - no less than 5/8") |
| 2 | Non-collapsible hoses for pebbling can |
| 1 | Floor mop |
| 1 | Spare floor mop head |
| 1 | Squeegee pail on plastic wheels |
| 1 | Air temperature thermometer |
| 1 | Ice surface temperature gauge |
| 1 | Humidity tester |

EQUIPMENT/SUPPLIES INVENTORY CHECKLIST (cont.)

| Qty. | Item |
|-------------|--|
| 1 | Circle scribe |
| 1 | 12' template |
| 1 | 4' template |
| 1 | Roll of line string |
| | Assorted brushes for painting |
| | Assorted Plastic pails |
| 4 | Plastic paint trays |
| 6 | Horse hair brushes for circle painting |
| 3 | 2" paint scrapers |
| 2 | Sponges for cleaning hacks |
| | Assorted wiping rags |

Optional

| | |
|---|--------------------------|
| 1 | 14' ice melter |
| 1 | Ice cutter |
| | Spray painting apparatus |

TEMPERATURE AND AIR CONTROL

Fans

Inexpensive 18 or 20 inch house fans can be bought at most hardware stores to move and mix the air in the building. Warm air will rise and the fans will help to mix this warmer air from the ceiling out into the pad. The fans should be mounted 10 or more feet from the corners of the building with one on each wall and slightly away from the walls to give them room to pull and push the air. The fans should be set at a small angle into the centre and face a direction to move the air in a circle in the pad.

Heaters

Heaters and dehumidifiers are both important. Heaters will be used more in the dead of winter to take the chill out of the air. They are also important in the spring to help dry the air.

A 180K BTU heater has plenty of capacity to do the job in a four sheet club. It may be enough keep a six sheet pad comfortable especially if the building has a low E ceiling.

The heater should be located in a corner of the building 15 feet or more from the end wall and 10 feet or more from the side wall. The deflectors for the heater should point straight out or slightly up to avoid warm air hitting the ice. The fans on the walls of the pad used to move the air should face in the same direction as the heater fan.

The heaters should be set to keep the air at eye level between 35 and 40 degrees F. This temperature will be relatively inexpensive to maintain. The ice techs will find they have more control over the ice conditions and the curlers will be more comfortable. New curlers will be more inclined to take up the game if they are not freezing.

Dehumidifiers

Dehumidifiers will help in the fall during start up and at painting time to allow for an easier install. In spring it will control the moisture to keep condensation down. During the season, if there is no heater, it may help the comfort level by taking the damp chill out of the air. The humidity should be kept between 60 and 70 % if possible.

The dehumidifiers can be located at the end wall or in a corner at the opposite end of the building from the heater. If it is located in the corner it should be in the opposite corner from the heater. This will help the air in the pad to move in a circle. The deflectors should direct the dry air slightly up and never at the ice

surface. In some cases a long sock or duct work has been used to diffuse the dry air.

Ceiling Insulation

Low E ceilings were developed to deflect the radiant heat from the ceiling back up to the ceiling. It will also provide a barrier between that warm air and the cooler air in the ice pad. This does not mean there will be no condensation on the Low E insulation but it will help. The Low E ceiling is usually installed a few inches from the roof suspended with thin steel cables.

SHUT DOWN

Rock Removal

Immediately following the last draw of the season, remove the rocks and store them properly. (refer to Rocks pg. 3)

Refrigeration Contractor

A qualified refrigeration contractor should be on hand to properly shut down and check for possible problems.

Concrete Floors

Mechanical dehumidifiers are not designed to work in warm areas so it must be shut down as soon as the season is finished. Fans can be kept running and doors opened if the temperature outside is warmer than inside.

Turn the heaters up to 50 degrees and allow up to 48 hours for the ice to melt.

Remove, clean and store all centres and hacks.

Remove and dispose of all ribbons and yarn when the ice has melted enough.

Use a squeegee to move the paint, before it dries, to an area where it can be removed and disposed of in compliance with environmental regulations for your area.

Properly wash the floors and vent the building to prevent mildew.

Sand Based Floors

Vent the building to prevent mildew. Heavy duty screen doors will allow the building to dry but still keep the club secure.

Remove, clean and store all centres and hacks.

Remove and dispose of all ribbons and yarn when the ice has melted enough.

When the paint has dried it can be scratched, squeegeed and disposed of according to local environmental regulations.

Ensure that no pipes are exposed to sunlight

ICE MAINTENANCE - DAILY

The following is a list of tasks to be completed daily in order to maintain good, playable curling ice.

- Fill in slide areas in front of hacks as well as chips, hand marks and knee marks throughout entire surface.
- Empty garbage.
- Put out new boxes of tissues, if required.
- Sweep or vacuum the end walkways.
- Hand scrape in front and beside the hacks. If there is daytime and evening curling it should be done twice.
- Scrape entire ice surface using different patterns such as 5-4-3 patterns, one pattern for each time you scrape.
- Sweep entire ice surface using 8' ice mop.
- Check ice temperature and air temperature and humidity periodically and adjust if necessary.
- Pebble all sheets with the required temperature. Keep in mind that lower humidity (under 55%) will require a lower pebble temperature even if it is very cold. The amount of pebble will vary with the humidity, temperature and number of curlers using the ice.
- Nip or break the pebble.
- Take down numbers from scoreboards.

ICE MAINTENANCE - WEEKLY

The following is a list of tasks to be completed weekly in order to maintain good, playable curling ice.

- Put clean 8' mop heads on as needed.
- Vacuum or sweep the sideboards.
- Move or lift the rocks and remove the hacks if you have the removable type and scrape the ends.
- Drill the centres.
- Scrape, pebble with cool water and scrape again to refresh the sheets.

ICE MAINTENANCE - MID SEASON

The following is a list of tasks to be completed mid-season in order to maintain good, playable curling ice.

- Remove rocks and place on backboards close to ice surface.
It is recommended that rocks be placed on cleaned carpet.
- Remove the hacks if you have the removable type.
- Scrape or burn the ice deep enough to remove some dirt.
- Hand scrape areas where the scraper and burner can't reach, e.g. corners and around hacks.
- Mop entire ice surface and remove snow.
- Complete a heavy flood or controlled melt.
 - ◆ Flood:
 - Turn the brine set point up to 29 or 30 degrees.
 - Apply a heavy flood.
 - Return the set point to playing temperature.
 - ◆ Controlled Melt:
 - Warm the air by turning the heaters up to 48 to 50 degrees or higher if possible.
 - Turn OFF THE BRINE PUMP and compressor to allow the ice to melt from the top. If the compressor is turned off but the brine pump is left running the ice will melt from the bottom.
 - After the top of the ice has melted and the entire pad is covered with water turn the brine pump and compressor on and reset the air temperature. The brine temperature can be left at playing temperature or raised to allow for slower more level freezing.
- When the ice has frozen scrape and pebble the ends.
- Set the rocks on the plastic mesh to freeze. Allow sufficient time before placing the rocks on the ice.
- Drill the centres. Clean out the hacks.
- Pebble and scrape till the ice is flat and clean.
It may take 3 times or more to achieve the desired results.
- Replace the removable hacks if removed.
- Pebble with the proper temperature and amount for the climate and caliber of curling.
- Nip or break the pebble for play.

SCRAPING

Scraping patterns seem to be complicated but they are not. The diagram on the next page shows the 3 pass, 4 pass and the 5 pass patterns. The 3 pass and 4 pass patterns, as in all others, can be varied to create more patterns but reversing direction or going inside out as opposed to outside in will not yield the differences in these patterns that can be achieved with higher pass patterns.

The only limits to the number of passes are your imagination and the time you are willing to spend on the ice. These patterns can also be varied by starting on or near the centre line and working your way to the outside or starting at or near the outside and working to the centre.

Starting from the outside and working in will help to control the dish or gull wing that will be created by pebbling. Going from outside to centre will put the middle of the blade on the crest of the dish and help to chop it down.

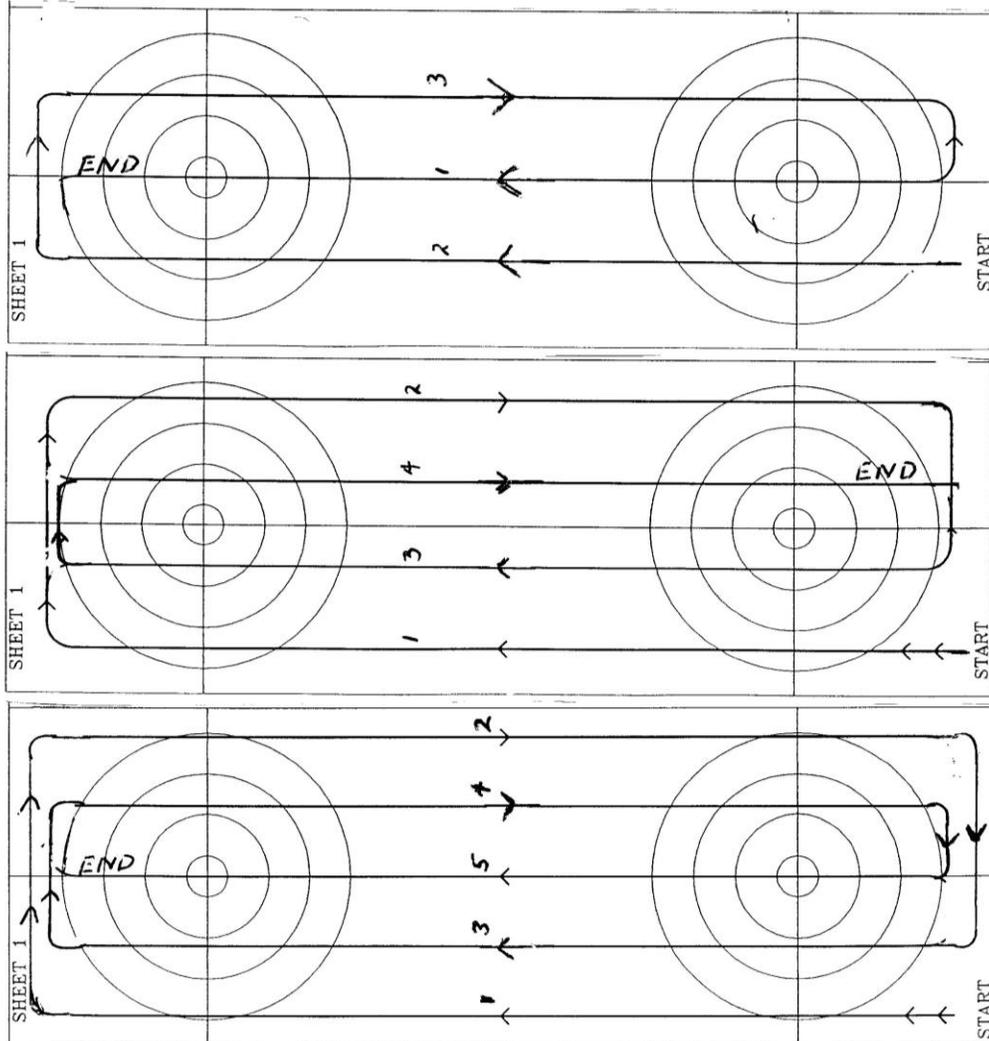
Starting near or on the centre will help keep the centre level.

If the problem of the dish or the centre becomes severe use a 3 pass scrape, pebble from eight foot to eight foot, then a full pebble and scrape again using a higher pass scrape.

Scraping should be done at least one time daily even if the ice is not used. This will keep the ice from becoming frosty or stale. If the ice is used in the daytime and the evening it should be scraped before each.

A heavy scrape, pebble and lighter scrape should be done at least one time per week.

Pass Patterns



PEBBLE HEADS

The "*Beaver Tail*" pebble head was one of the first popular heads. It has a low profile with a round face drilled with approximately 50 holes. The holes can be large, medium, small, extra small or any combination.

The next generation is the "*Dome Head Beaver Tail*". It is similar to the beaver tail but has a longer body and higher domed face.

These are the best tools to use to distribute pebble over the ice surface.

To look at the pebble on the ice it seems that both lay down an excellent even pebble but over time the differences in their pebble distribution becomes obvious.

The beaver tail tends to concentrate more pebble in the centre area from the 8-foot to the 8-foot. This may result in the rocks having trouble going from the outside to the centre line but having a lot of curl from the centre to the outside. An inverted dish is a good description for this ice shaped like this.

The domed beaver tail has a tendency to lay an even pebble on the 4- foot area but concentrate extra pebble, on both sides, in the outer 8-foot. This may result in the rocks curling nicely from the 8-foot to the centre line but struggling to go from the inside to the outside as they will have trouble crossing the 8-foot to get to the outer edge. If the 8-foot area is high enough it will cause the end of the scraper blade to take more ice off the centre line. Do not confuse this with a high centre line it is actually the 8-foot area that is high. This ice shape was dubbed a gull wing by Shorty Jenkins.

To alleviate or delay the problem the ice technician could alternate using the two types of pebble heads.

If the scraper is used to take out an inverted dish concentrate more on the centre and use more inside to outside patterns. It is a good practice to speed up the process by feeding the low areas before a scrape. When feeding the low outside area do a pebble that hits from the side line to the middle 8-foot. On the second pass reverse direction and concentrate on the area from the side line to the 4-foot. For the third pass reverse direction again and cover half the sheet from the side line to just over the centre line. Do the same to the other side of the sheet then finish with a full pebble to blend it all in. This same system can be used to build up the low side of an outside sheet. Be sure to do the whole sheet on the last pebble.

If the gull wing is the problem feed the side lines and feed the centre from 8-foot to 8-foot. Always finish with a full blending pebble. When scraping the sheet do an extra pass or two on the middle of the 8-foot path.

The best way to decide if there is a problem is to watch or throw rocks on the sheet. The scraper will only show the problem if it is severe. Even though the scraper blade seems very rigid it will slightly conform to the shape of the ice. To prove this lift the blade off the ice and set the tensioner so it is snug, now lower the blade onto the ice and the tensioner will now be loose.

PEBBLING

Throwing distance

The pebble head must travel as flat as possible and be horizontal at all times, avoid tipping the head down.

The pebble should be thrown so at least a foot or more goes onto the adjacent sheets. A good rule is to watch the pebble head as you go through the house. In your line of sight the pebble head should go past the four foot circle an equal distance on both sides. Another thing to watch is the height of the pebble on both sides. The pebble should go at least eye height or more and be the same on both sides. If it is difficult to see on the ice surface mark the width of the sheet and the four foot on a cement floor and pebble it. Don't worry about how the pebble looks on the cement it will even out better as you move on the ice.

Time per sheet

Start with one minute from back line to back line this should give a good population of pebble. The size of the pebble head used will affect the distance between pebbles. For an extra fine pebble head the time may need to be higher and for coarse you may have to go slightly faster.

Temperatures and humidity

Laying down a good pebble to suit your building and rocks will take some effort. You will need a good grasp of the temperatures that will affect the rocks performance, the humidity and some trial and error work.

A good starting point is to set:

- the brine temperature going back into the chiller at 23°F. This will put the ice temperature around 25°F
- the air temperature between 35° and 40°F
- the humidity between 60 and 70%

These numbers will give ice that is quick and pebble that will last. If they do not don't change them right away, there are many other factors to consider that are easier to change and will probably give the desired results.

Pebbling Water Temperature

The temperature of the water used to pebble is very important. If the ice that is being pebbled is made from pure water like deionized or reverse osmosis the temperature can be over 100 ° F. If the ice is made from city water a good place to start is around 80 ° F even if the pebble water is purified. After a layer of purified water has been pebbled over the city water ice you may have to raise the temperature of the pebble water.

Condition of the ice

At the beginning of the season the ice after being cured (scraped and pebbled till the impurities have been removed) will be as clean as it will ever get. This will make the pebble harder and stand higher. The pebble temperature can be raised so the rocks do not crush them and the rocks will curl more.

Sizes of Pebble head

The different types of pebble head were covered earlier in this manual (Page 38). The sizes of the holes in the pebble head have a greater influence on the rocks performance. Most rocks in Ontario have a running surface between 5.6 and 6 mm. This size running surface usually prefers a smaller pebble with plenty of population, a good rule is to start with a fine or an extra fine-fine combination. Note how the rocks react with regard to speed and curl and check to be sure the pebble lasts during the game. If something is still not right start by changing the pebble temperature and population first.

The first few rocks of the game should start a little slower and by skips rocks it should be at the game speed you want and it should stay there till the end.

Rock Running Surface Size and Texture

As mentioned most rocks in Ontario have a running surface between 5.6 and 6 mm. If the rocks being used have a narrow running surface the pebble used may have to be larger and cooler so they will last the whole game. Smaller running surfaces put more pounds per square inch on the pebbles; this usually results in good curl but slow ice. If the speed of the rocks is consistent through the game and the pebble is strong till the end but the rocks will not curl you can try varying the pebble size and temperature. If this does not work then the texture of the rocks will have to be addressed. This is covered later in this manual (page 43).

PEBBLING TO FIX ICE PROBLEMS

Deep scrape and Light scrape

Scraping the ice deep every time will cause pockets to form. The ice should be scraped hard at least once or twice a week, then after the scrape give it a good sixty second pebble with a fine or medium pebble head, back the scraper blade off so when you cut it leaves a good base. The ice will be as good as it can be made.

Feeding Low Sides

Any sheet can develop a low side that scraping alone will not fix. If a sheet has an area with thicker ice the scraper will cut deeper there and make the problem worse. To fix

this start by layering extra pebble on the low sides. Start by pebbling from the sideline to the near eight foot, then come back the other way pebbling from the same sideline and going to the centre of the sheet. Do the same thing going back the other way but putting the pebble from the low sideline to the eight foot on the high side. This may need to be done more than once. Every time it is done you should vary the distance of the pebble, don't always land it in the same place. After feeding you can blend the pebble in by doing a full pebble and do a normal scrape.

Dish or Gull Wing

Pebbling every day will cause a dish or gull wing. Feed the centre with an eight foot pebble and the divider with a quick pebble then scrape using an outside in pattern that spends an extra rounds on the outer eight foot path.

ROCKS

The rocks are one of the most important assets in any club and care should be taken to look after them in order to ensure their long life.

It is recommended that the insurance on your rocks is up-to-date and is for "replacement value".

Moving and Cooling Rocks

- When moving rocks do not allow the bottoms of the rocks to hit or rest on any hard or abrasive material. Care must be taken not to damage the running surface.
- At the beginning of the season, follow instructions in the "START-UP" section to properly cool rocks as well as instructions for placing on ice.

Identification of Rocks

- It is recommended that rocks be engraved in the cup area on the bottom of the rock with an identifying number and that the numbers be recorded and placed in safekeeping.

Handles

- Plastic handles are recommended. These plastic handles should be engraved with the sheet number and a number from 1 to 8 for easier matching.

Matching Rocks

- It is advised that rocks be matched in pairs as well as by sheets, if possible. This is a short outline of how to match rocks.
 - Prepare the ice similar to the way you prepare for a game but use warmer pebble and nip or break more aggressively so the rocks do not have to break pebble.
 - Use a stop watch or a photo electric sensor to time the rocks from backline or tee line to the hog line. If the rocks time the same from these points they should travel the same distance and curl the same amount.
 - Good, consistent curlers should be used to throw the rocks and there must be volunteers there to record times and results for each rock.

Storage of Rocks

- Care should be taken when storing rocks for the summer in order to protect the running surface.
- It is recommended that the rocks be stored on their side in a cradle with space between the running surface of each rock.
- The cradles should be placed in a location where people won't be bumping them but one that is close to a fire exit.
- Each cradle should be loosely covered with carpeting to prevent damage from something being dropped on them.

To Resurface or not?

- Making the decision to have your rocks resurfaced is something that will take a great deal of careful consideration.
If your rocks exhibit the following signs and symptoms, you might have to consider resurfacing:
 - excessive pitting (refer to Trefers on next page)
 - running surface too wide (if polished they may fall)
 - running surface too narrow (they may be heavy)
 - inconsistency (some curl others are straight)
 - no curl (may just need to be scratched, see next page)
 - too much curl
 - too heavy
 - picking

Once you have noticed one or more of the above signs on a regular basis, you should follow the plan shown below to make your decision.

- Set up a committee to investigate and make the decision.
- Use other stones which are free of symptoms to verify that the ice is not causing the problem.
- Attempt to match the rocks.
- Contact the OCA Ice Team for assistance.
- Contact an independent contractor to meet with your committee and the OCA

Rock Types and Characteristics

There are a few different types of granite common to curling clubs in Ontario.

- **Blue Hone**

These rocks have the tightest grain and are very resistant to absorbing moisture but they are susceptible to chipping on the striking band. Some of these rocks with poor striking bands have been sacrificed to make inserts for other types of rocks.

- **Common Blue Hone**

These rocks share the qualities of the blue hones but are a little more porous.

- **Blue and Red Trefers**

These rocks are more porous which causes the running surface to pit naturally but because they are softer the striking band will last longer.

- **Keynees**

These rocks are also porous and are less frequently found.

Inserts

Inserts are made of blue hone granite and as the name implies are inserted into other rocks to make the best rocks that can be made.

Texturing the Running Surface (Formerly referred to as Scratching Rocks)

Scratching rocks is a harsh term so we will refer to the practice as texturing the rocks. In earlier days ice was not scraped as often as it is now and players were less careful when it came to ice conditions. Some social curlers would come to the club with their curling shoes on carrying their old straw or unclean hair broom. The running surfaces of the rocks were sharper then so they had to be thrown harder consequently they were less susceptible to the negative effects of the debris on the ice.

Since the early nineties rocks have undergone an overhaul. Experiments with different size cups and running surfaces have led to quicker and more predictable rocks. But these wider running surfaces are more inclined to point out flaws in the ice surface and in the condition of the ice with respect to cleanliness.

Dedicated ice technicians and all Curling Associations recognize the need for better ice conditions to go with the new rocks. Ice technicians need to regularly attend courses, clinics and symposiums to update their skills and learn the latest ice maintenance procedures to ensure cleaner, truer ice.

The cleaner ice required by the wider running surface has a tendency to polish the running surface, resulting in rocks that will go straighter the more they are used. The simple solution to this is to make the running surface more abrasive.

- **How to Tell If the Rocks Need Texturing**

If the ice technician watches rocks during games and he notices that the rocks hesitate to curl in an area this could be a pipe line that is a little cooler than the rest of the ice or it could be a run. Check the ice with the scraper blade. If it seems to be level then the rocks have given you the first sign that they are becoming polished.

- **Where to Get Help**

The first time a technician textures the rocks it is unnerving. The club should elect to call in a member of the OCA ice team for assistance.

- **Prior to texturing rocks**

Before any consideration is given to texturing rocks, some key information must be obtained.

Start by watching this video: <https://www.youtube.com/watch?v=5eZy5RULzKE>

The running surface width is important to know before texturing. Ideal widths are between 5.5 – 6.5 mm with softened edges that does not grab and carry snow.

Rocks that are out of this range; i.e. thinner than 5 mm, wider than 7 mm may require a different process and this should be investigated prior to texturing. Using an incorrect process may be detrimental to your objectives. Contact the OCA Ice team or your curling stone supplier if you have further questions.

Finding Running Surface width

The simplest and most effective method is by making blueprints of the running surface. By making Blue prints an exact record is kept. The blue prints themselves are measurable and proper decisions can be made based on these measurements.

What you need:

- Carbonless transfer paper which is available at Staples, Office Depot, Grand and Toy or any office supply store. The paper is two pieces together with perforated tabs.
- Masking tape
- Stainless Steel (or Marble) rolling pin. Look for “pastry pin” at kitchen supply store.
- Digital Micrometer.
- Magnifying glass – bench mounted.

Method:

Build a box as a frame or use an empty Jet Ice colour paint bucket to hold the rock. The bucket works well as you do not have to remove the handle from the rock.

Flip the rock upside down and wipe running surface clean with camp fuel.

Place carbonless transfer paper over rock and tape in place so it cannot move.

With the rolling pin, press and roll on the carbonless transfer paper. Be careful not to scuff or slide the pin across the paper, or off the edge of the rock. Should this happen (and it will), throw it out and start again with a new piece of carbonless transfer paper.

Rotate the rock 1/3 and blueprint again.

Rotate the rock 1/3 and blueprint again. By doing this 3 ways you should have the complete circle of the running surface.

This requires lots of practice to be consistent at blueprinting. The same person should do all the blueprinting. Helpers can bring and clean the rocks.

Remove the carbonless transfer paper and carefully separate the papers by removing the perforated tabs. You will now have a paper copy of the exact running surface showing any nicks or pits. Mark the rock number on the paper.

Using the digital micrometer and magnifying glass, measure several locations across the running surface to find the exact width. Record this on the paper. Measuring is difficult and requires lots of practice. One person should do all the measuring. Once the running surface width of each rock is known, you can make educated decisions on how to proceed.

Ideal widths are between 5.5 – 6.5 mm. Rocks that are out of this range require extra advice. Call the OCA Ice Team or your curling stone supplier if your measuring results are outside of the 5.5 to 6.5 mm range. The advice is easy. Correcting is not.

- **Methods of Texturing Rocks**

Traditionally texturing the rocks was done by aggressively attacking the running surface of the rock with silica carbide sandpaper. This method is now used more at the start of the season when the ice is green and hard. The combination of green ice and keeping the ice at a lower than normal temperature will control the amount of curl. During the season a little extra curl can be put into the rocks by giving them just one quarter turn on the silica carbide sandpaper. Both methods are described below.

- A) Aggressive Method:**

- Materials needed:

- One sheet of 80 grit silica carbide wet dry sandpaper (scwd sandpaper) for each rock that is to be done.
 - A piece of granite at least one inch thick and slightly larger than a sheet of scwd sandpaper, or a kit made especially for this job.

- A piece of half inch felt or a towel folded to a half inch.

The small piece of granite can usually be obtained, for free, from counter top installers that use granite. Tape or glue scwd sandpaper (business side up) to the face of the granite. This will be used as an anchor for the sheets of scwd sandpaper that will be doing the work. Lay the working scwd sandpaper on the anchor. The first step is to rotate the rock one full turn in one direction on the scwd sandpaper.

Next with the handle of the rock at the twelve o'clock position place it down covering the bottom half of the sheet. With both hands and with only very little downward pressure push the rock to cover the top half of the scwd sandpaper then pull it back to the bottom half. Lift the rock and place it down with the handle of the rock at the two o'clock position. With the same amount of pressure push and pull rock as previously done. The last step is to lift the rock and set it down with the handle at the ten o'clock position and repeat the push and pull. The working emery must now be replaced before the next rock can be done.

After being done a few times on the hard surface especially in this aggressive manner the running surface will expand and the edge will become crisp. To counter this, the rocks should be given one full turn on scwd sandpaper on the soft felt or towel. This will keep the running surface from expanding and soften the edges so they will slide over the pebble easier.

Clean off the little bit of dust that will be on the bottom of the rock by rotating it on a soft cloth.

With help to carry and clean the rocks the whole procedure should take less than 15 minutes per sheet. All the rocks should be done on the scwd sandpaper by one person to ensure consistency.

B) Quarter Turn Method:

Materials needed are the same as for the aggressive method with the exception that less scwd sandpaper is required.

The setup for this job is the same as for the aggressive method.

If the rocks are being done during the season it is important to slide them a short distance on the ice to knock off any ice particles that are stuck to the running surface.

Two or four rocks can be done per sheet of scwd sandpaper. If two rocks are being done, line the first up to use the right-hand side of the paper and the second to use the left-hand side of the paper. If four are being done each rock should use a different corner of the paper. The pattern left on the paper will show that the running surfaces have overlapped. This amount of overlap does not cause any problems. With the rock in its place on the scwd sandpaper use both hands on the sides of the rock and with a very little downward pressure rotate the handle one quarter turn.

If the rocks have become extremely straight they can be given more than one quarter but each rock must be done the same.

As in the aggressive method the rocks should be wiped clean.

This less aggressive method will take longer to change the width of the running surface so they will not need to be done on soft material till after four or five times. With some help the quarter turn method should take less than five minutes per sheet.

The quarter turn method will only yield a small change in the curl of a rock and most of the curlers will not realize they have been done. The abrasions are not deep and plentiful so the rocks will need more work during the season. The rocks should be textured as often as needed. This could be as many as three times per season.

- **Pros and Cons of Textured Rocks**

After texturing the rocks they will all be running on surfaces that are almost identical so they will be matched as good as they can be, only after they start to polish again will their individual personalities start to show. They will also hide small imperfections in the ice or in the pad.

Newly textured rocks will have to be delivered with a positive handle or the handle will be dragged off.

PREVENTATIVE MAINTENANCE

If equipment is neglected you run the risk of breakdowns that could jeopardize curling either during the season or over the long run. Major repairs take time and could cost more money than the club has available. Continuing preventative maintenance will prolong the life of any equipment and it is suggested that the following checklists be adhered to in order to avoid problems.

Advise Your Board

Advise your Board of Directors of the life expectancy of the equipment so that funds can be budgeted for their eventual replacement as well as for their regular maintenance.

The refrigeration contractor will advise you of the anticipated life expectancy of your equipment but it is up to you to chart equipment and major components starting from installation and showing when it was overhauled and/or repaired. It is a good idea to have your own preventative maintenance program and keep your own records.

Preventative Maintenance - Daily

▪ Daily Log Book

Using a daily log sheet to document and keep track of your findings, make the following checks, at least once, but preferably twice a day.

- Check oil level in compressors.
- Check for leaks in water, oil and refrigerant.
- Check brine level.
- If the brine level is too low, it could signal leaks. If the brine level is too high, it could signal air in the system.
- Check operating pressures.
- Check compressor high pressure (discharge).
- Check compressor low pressure (suction).
- Check compressor oil pressure.
- Check brine pump pressure.
- Check water pump pressure.
- Listen to the noise level made by the machinery as a change in the level of noise could indicate a problem.
- Check the refrigerant level.
- Check water tank for level, dirt and the build up of solids.
- Check water temperature gauges on compressors.
- Ensure that there is a reasonable off cycle on machinery, compressors, pumps and fans.
- Short cycling can signal a problem, especially in compressors.

Preventative Maintenance - Periodic

- Drain oil from chillers and compare the logged consumption with the amount drained out.
- If the amount drained does not equal the logged consumption, there may be a leakage problem.
- Check water sprays on condenser and remove and clean, if plugged.
- Clean strainers as necessary.
- Check belt tensions, making sure machinery is shut off.
- Check couplings for wear, making sure machinery is shut off.

Preventative Maintenance - Summer

- As discussed in "SHUT-DOWN", dry the ice area out by opening screen doors (or vents).
- Turning fans on will keep air circulating and prevent mildew and the dry rotting of wood.
- Lift the header boards so that the headers can dry off.
- Check clamps, nipples and pipes for excessive rust and brine leaks.
- Spray or brush oil all over header pipes and nipples to extend their life.
- Continue to check the brine level at least once a week in the summer. If a leak develops, have it repaired immediately.
- Check the compressor room at least once a week in the summer watching for leaks in refrigerant, water and oil, and spin shifts on pumps and motors.
- Any problems noted should be repaired immediately.

Refrigeration Contractor

- Once a year, the head should be removed from the compressor and the heads should be examined and overhauled or repaired, if necessary.
- Every two years, the compressor and brine pumps should be looked at for wear, etc. The condition of the compressor should be checked specifically at the following locations:
 - cylinder walls
 - pistons and rings
 - discharge valves
 - suction valves
 - crank shaft
 - shaft seal or packing
 - oil pumps and filter
 - safety heads
 - connecting rods and wrist pins
 - main bearings
 - crankcase
 - manifold valves
 - forced feed lubricators