

ICE MANAGEMENT

WATER | CONDITIONS | TECHNOLOGY



ZAMBONI.

TOROMONT

CIMCO



630 REGISTRATIONS



SCHEDULE

- **INTRODUCTION (5 Minutes)**
- **EVOLUTION OF ICE MAKING - ORFA (5 Minutes)**
- **KNOW YOUR WATER & MONITOR YOUR CONDITIONS - JET ICE (10 Minutes)**
- **INTEGRATED ICE RESURFACING - ZAMBONI (10 Minutes)**
- **INFRARED THERMAL IMAGING CAMERA - CIMCO (10 Minutes)**
- **SUB-ZERO: DIGITAL ICE MANAGEMENT - MARMAK (10 Minutes)**
- **CONCLUSION | Q&A (10 Minutes)**



The Evolution of Skating Ice Maintenance

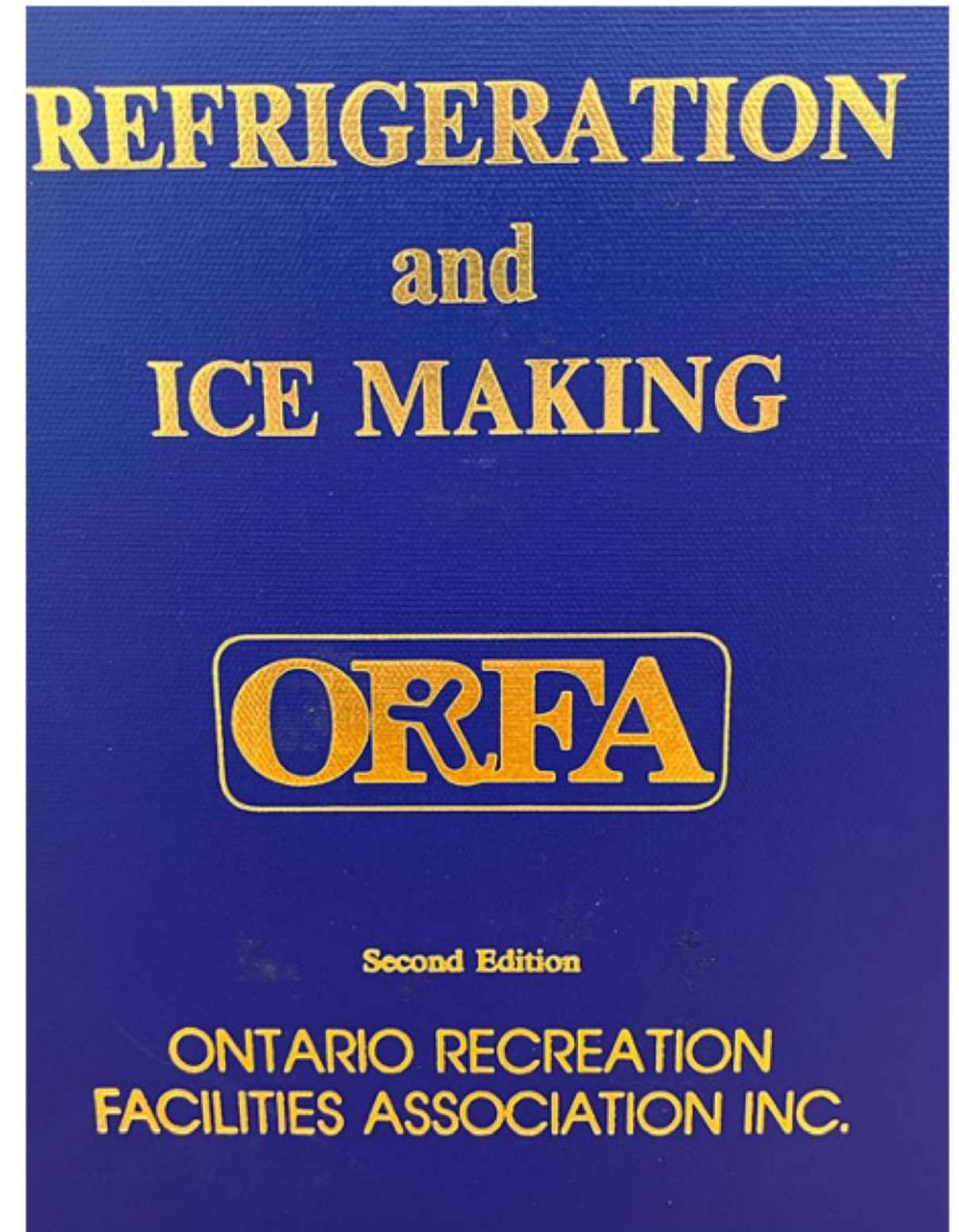
First Media Presentation of Ice Maintenance

- The original VHS tape from the 80's provided by the Zamboni Co. showed an example of the importance of hand drilling an ice sheet at various locations to measure "ice depth"
- A recommended ice depth of $1 \frac{1}{4}$ to $1 \frac{1}{2}$ inches was presented as the sweet spot to be met



ORFA Refrigeration and Ice Making Manual

- Was considered the industry's book of best practices for ice rink operations that was a collection of "industry best practices, tips and innovations of the time – much remains rooted today
- The manual adopted the ice depth of 1 ¼ to 1 ½ inches – BUT had little to do with skater safety – refrigeration plant performance



Today's Ice Maintenance Focus

- Still involves energy management responsibilities
- With the collection of ice depth data remaining rooted in liability protection
- While giving operators facility specific set points for quality ice
- The original 1 ¼ to 1 ½ inches of ice no longer applies as different activities may require additional ice depth to be maintained
- Whatever depth is selected by facility management is to be in place at the end of the rental...not just at the beginning



ICE MANAGEMENT

FACTORS IN PLAY

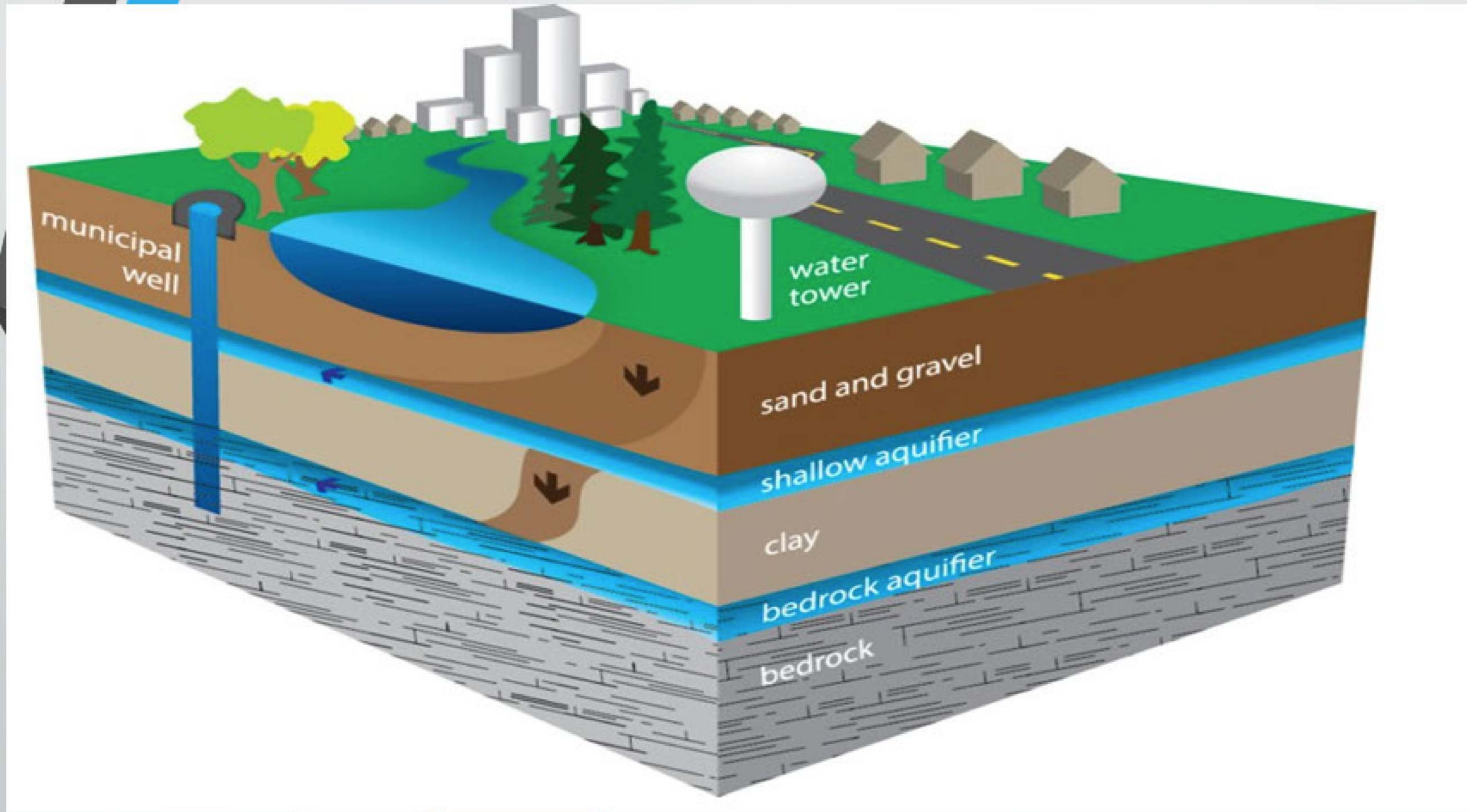
ICE TEMPERATURE, DRIVER, LATENT HEAT

KNOWLEDGE, WATER, SENSIBLE HEAT

ENVELOPE, AIR IN ICE, THICKNESS



WATER QUALITY





WATER TO ICE



WATER TO ICE



WATER TO ICE



THE CONTENTS IN WATER EFFECTS

CLARITY

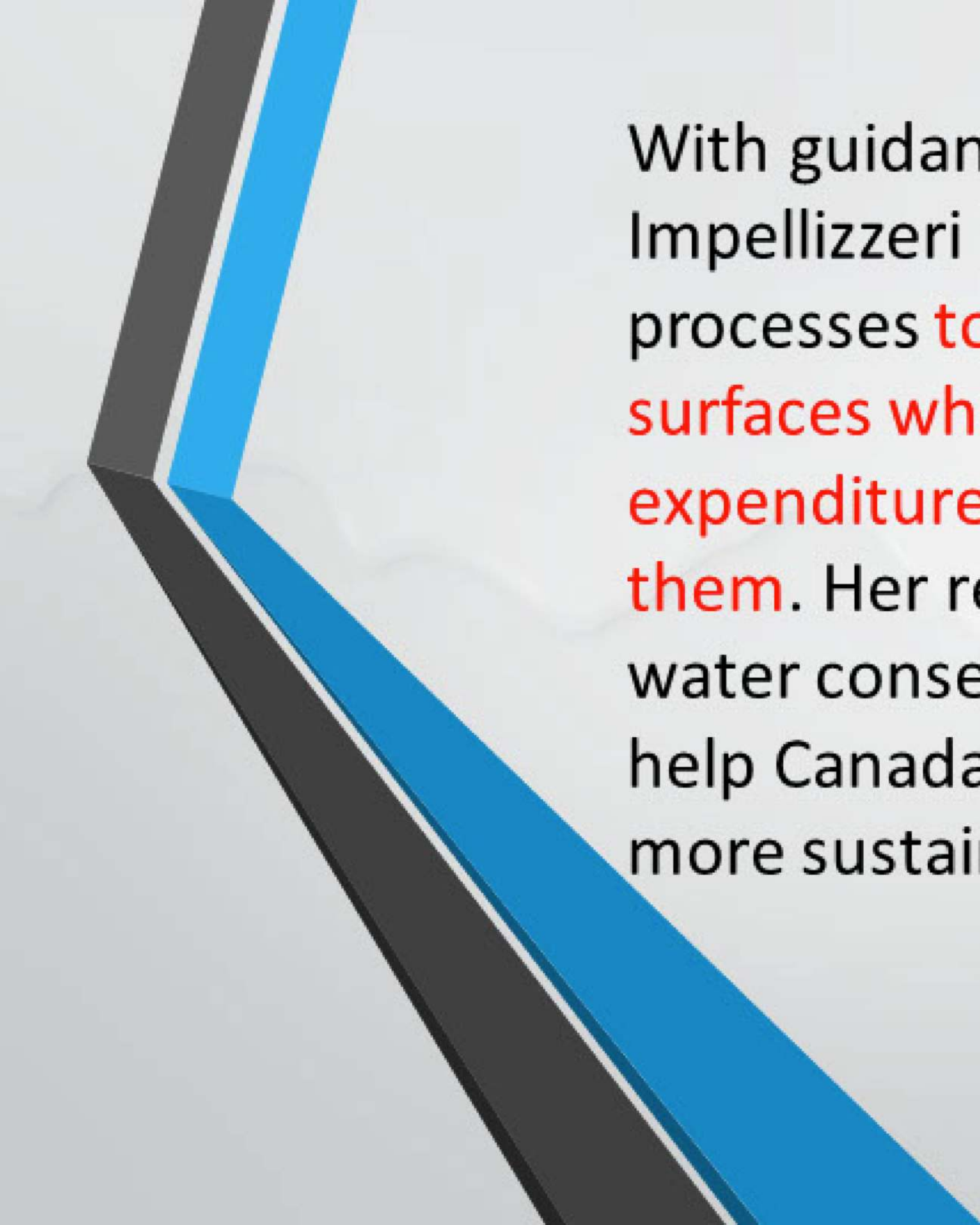
HEAT TRANSFER

ICE TEXTURE

Toronto Metropolitan University



A material chemist researcher in the Department of Chemistry and Biology, Stefania Impellizzeri is exploring how to **optimize the quality of ice used in arenas that host professional and recreational winter sports.** It's an inquiry she's undertaking as the inaugural Jet Ice Research Chair in Sustainable Materials Chemistry, a position that was established in September by Jet Ice, a leader in providing ice-making products and services to arenas.



With guidance from the company's leaders, Impellizzeri is experimenting with different processes **to produce high-quality ice surfaces while reducing the energetic expenditure to assemble and maintain them**. Her research will also yield insights on water conservation in ice-making that could help Canada's thousands of arenas operate more sustainably.



WATER TO ICE





**COLLECT THE DATA
PRESENT THE DATA**



WATER TO ICE



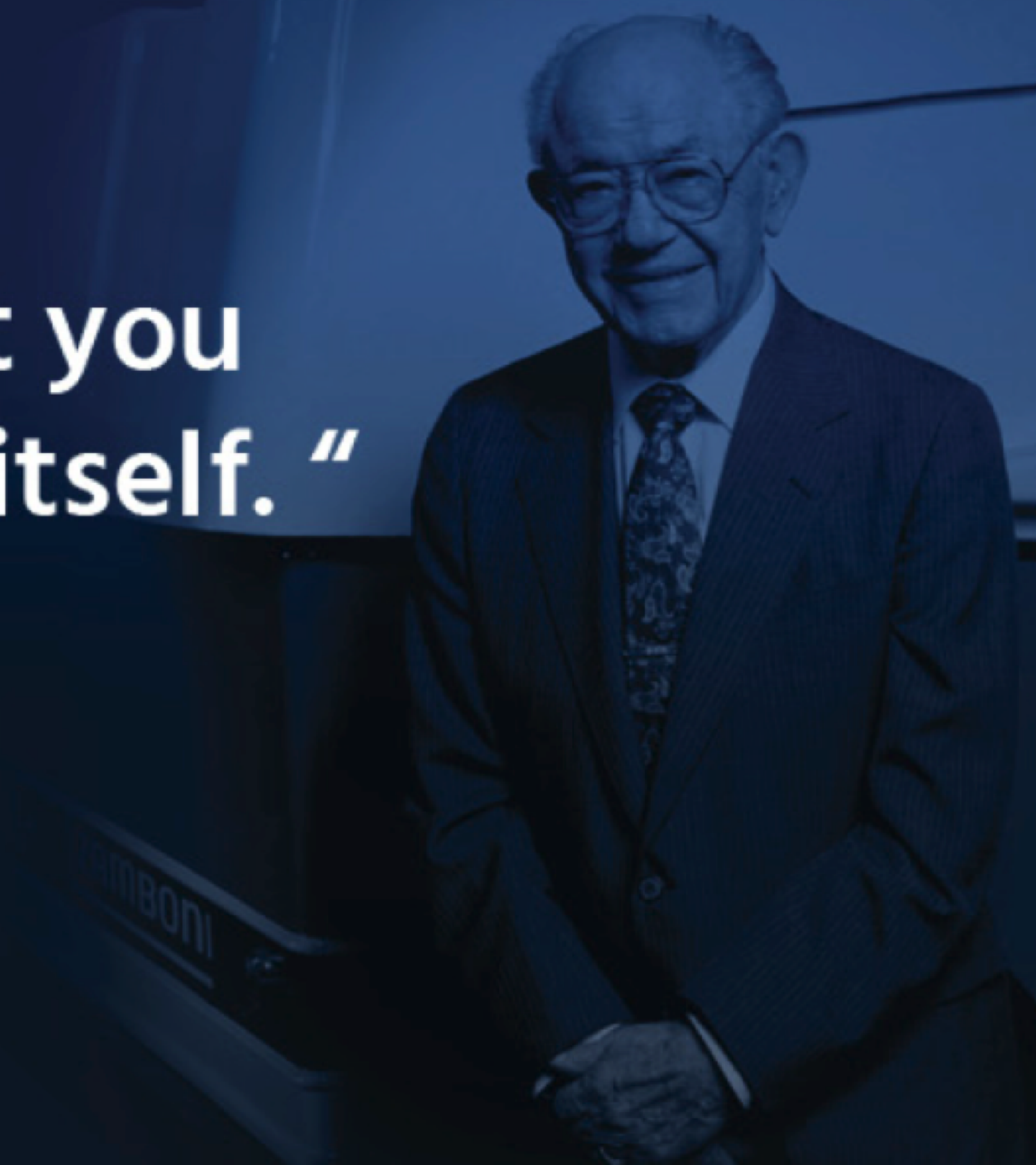
WATER TO ICE

ZAMBONI®

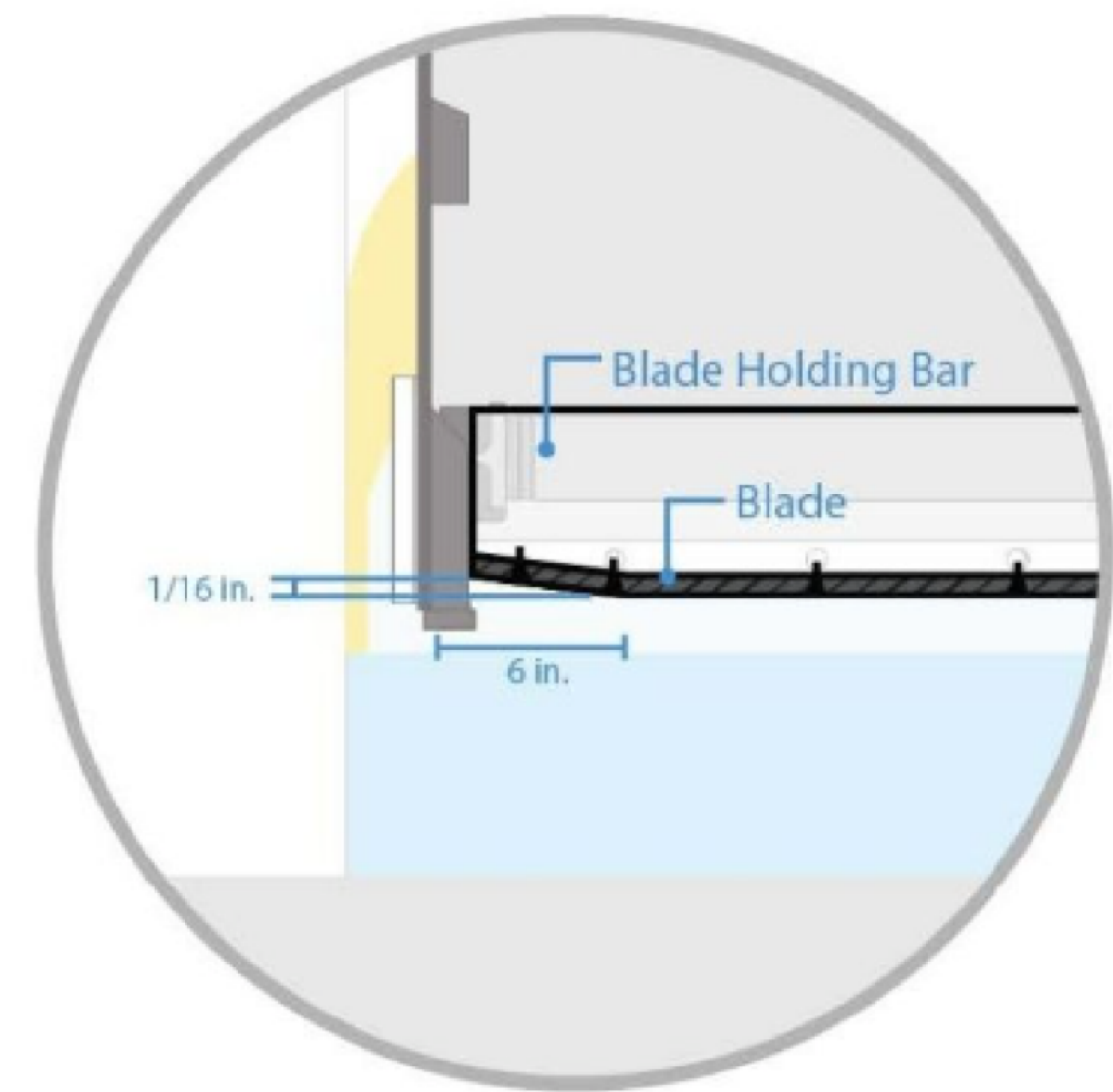
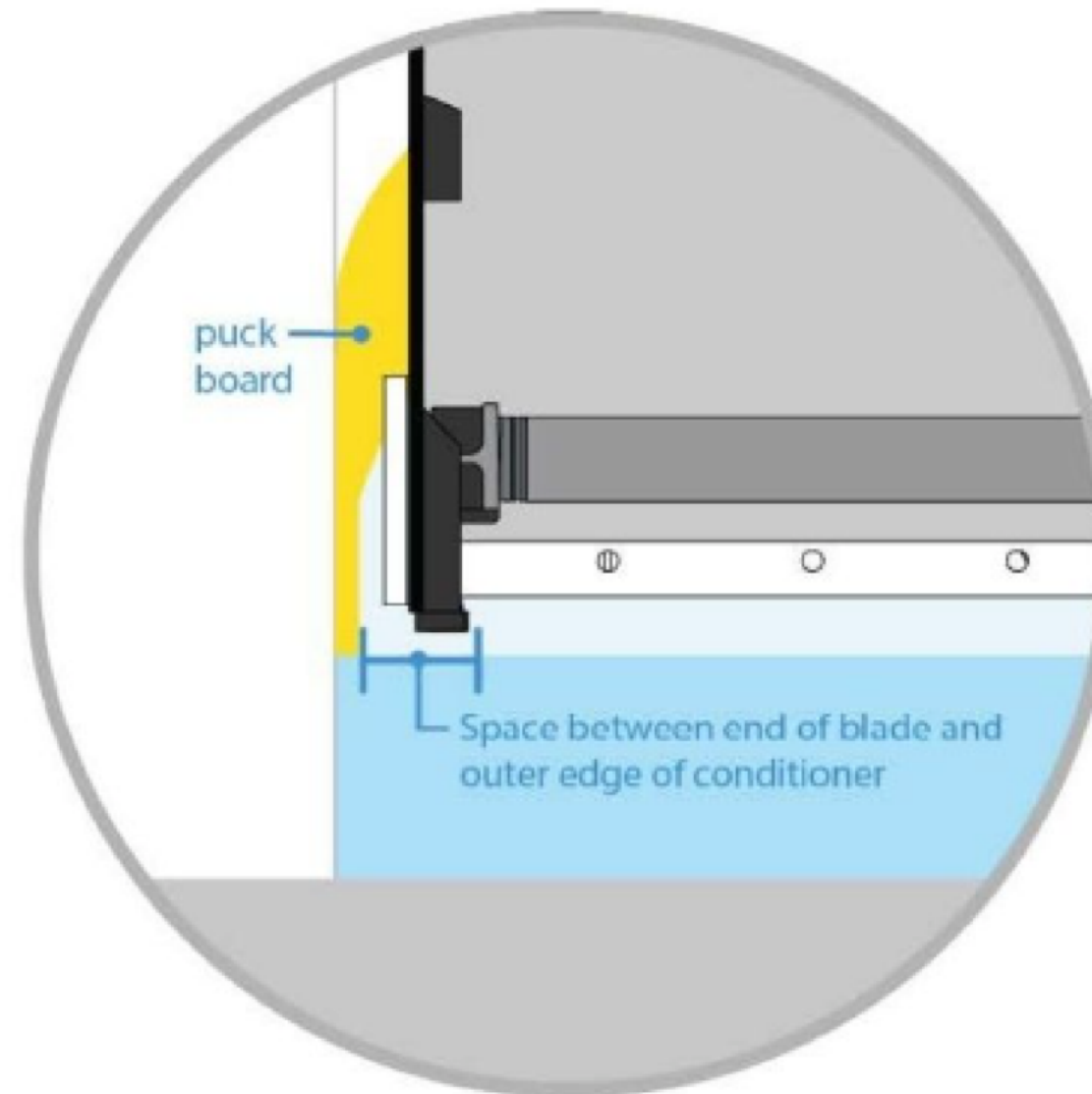
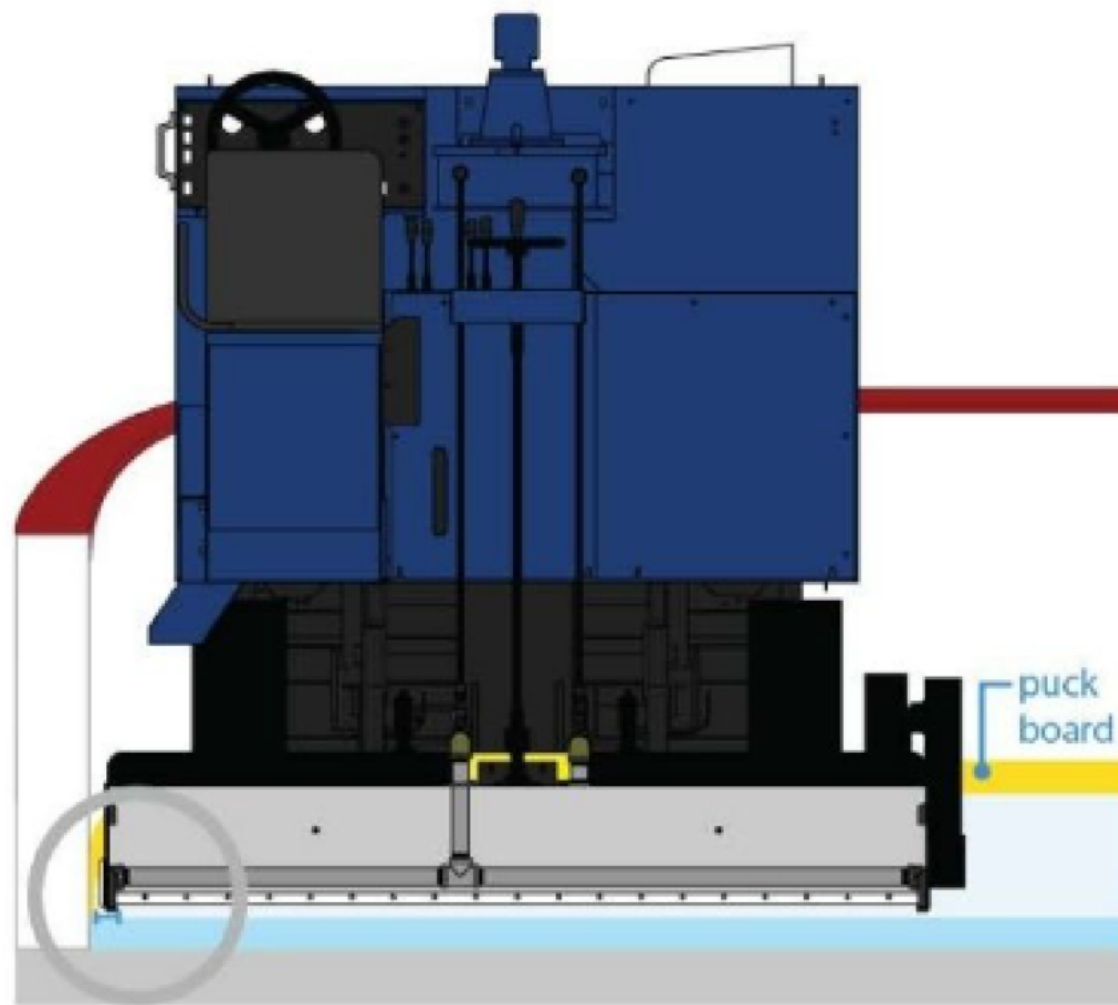
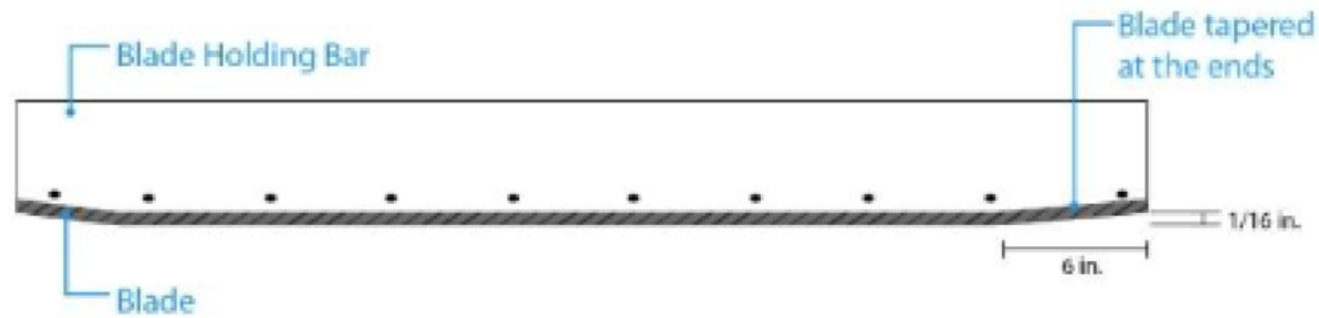


**“ The principal product you
have to sell is the ice itself. ”**

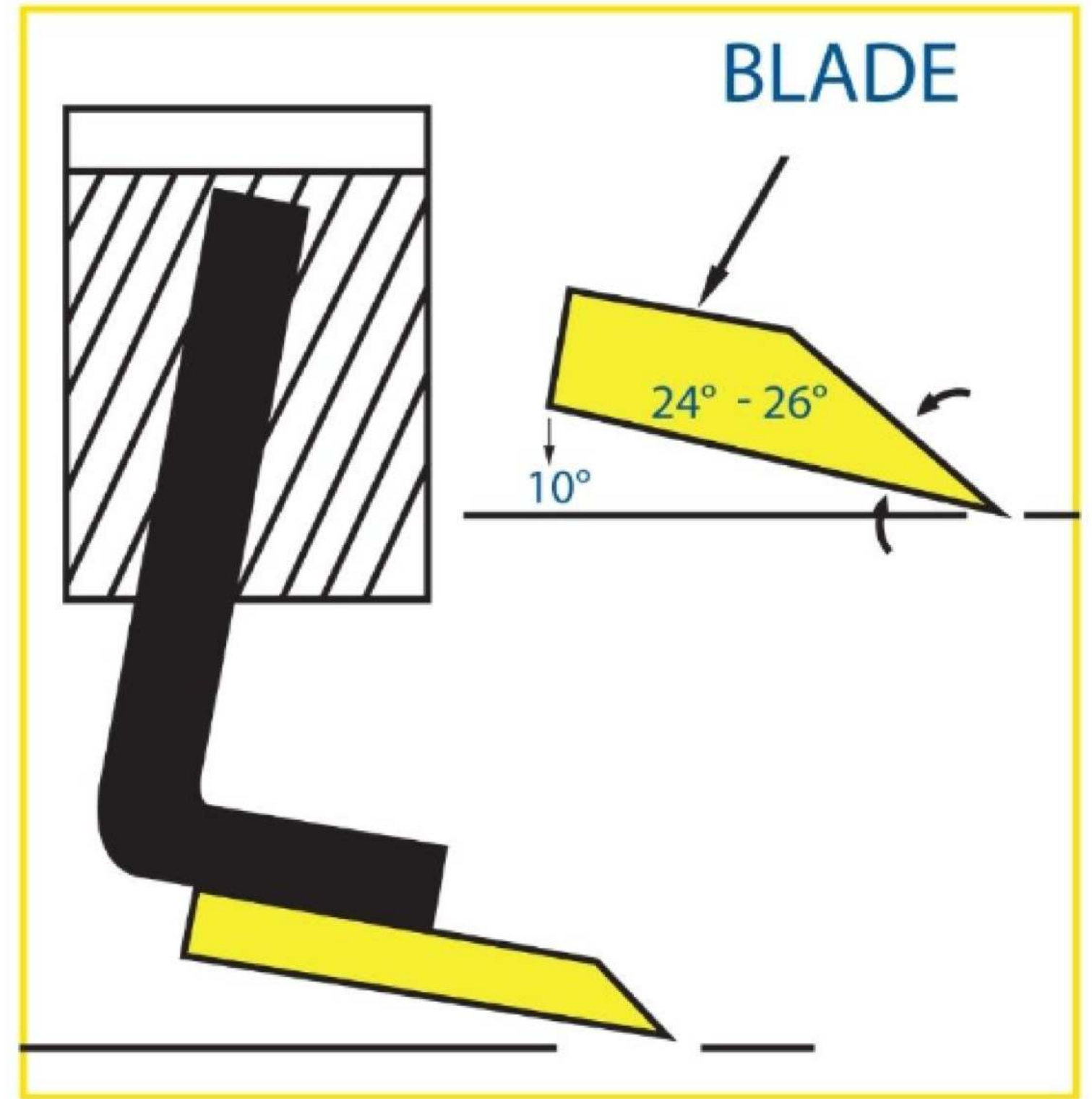
~ Frank J. Zamboni



Why Regular Edging Makes a Difference



Blade Quality and Sharpening







**Reduced
Ice Maintenance**



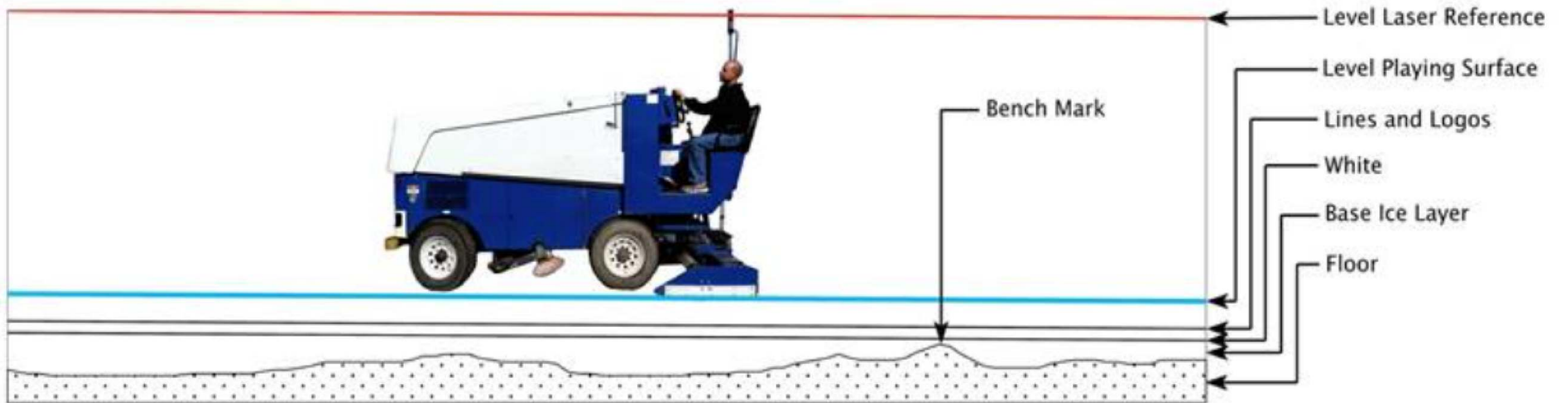
**Reduced
Water Consumption**



**Reduced
Load on Compressors**

Level-Ice







ZAMBONI

A high-angle, blue-tinted photograph of an industrial facility. In the center, several workers in safety gear are standing on a platform, surrounded by a complex network of pipes, ladders, and machinery. The scene is dimly lit, with some light reflecting off the surfaces of the equipment. The overall atmosphere is technical and industrial.

OVER A CENTURY OF TECHNICAL EXPERTISE

TOROMONT

CIMCO

Successfully Installed
Built 50% of Worlds
Ice Rinks

1200+

Employees

550+

Certified Mechanics and Technicians
throughout North America

Who We Are

Recognized as leaders in sustainable refrigeration, CIMCO is North America's largest supplier of thermal solutions catering to industrial, recreational and commercial sectors. Renowned as a forerunner in providing environmentally-friendly ice systems, we take pride in our ability to engineer world-class technology and deliver outstanding service to our customers

What We Do

- Designing systems from conception to final delivery, taking utmost care of all requisite stages
- Engineering capability to handle all the stages of a project-from conceptualization to design to supervision and finally commissioning, thanks to our in-house team of expert engineers
- Automation technologies, providing automatic microprocessor control solutions for refrigeration plants
- Manufacturing expertise in in-house fabrication of customized equipment and support capabilities
- Service and Maintenance, including our National Parts Centre
- Special emphasis on Safety, including pre-start review, right safety gear, and regular inspections

OUR COMPANY

Founded in 1913

TOROMONT

CIMCO

TOROMONT

CIMCO

IQ Series Automation System

 cimcorefrigeration.com/iQ



iQ

CIMCO iQ. DESIGNED BY YOU.

Every facility is as unique as the people using it.
That's why our systems are curated
to give you complete control.



iQ ESSENTIAL

The foundation for exceptional ice.

- Comprehensive refrigeration equipment control, covering pumps, compressors, condensers, heat exchangers, etc.
- Industry-leading controller hardware with BACnet for easy BMS integration
- Temperature control via infrared camera for consistent ice quality
- Web-server-based operator interface for accessibility from any network device
- Robust alarming system to identify precise malfunctions with email and text notification capabilities
- Equipment run hour tracking to support maintenance planning
- Dedicated desktop PC and monitor setup for operator convenience



iQ ENERGY

- Designed to help you keep costs down and reduce emissions to hit net zero targets.
- Floating head pressure for optimized heat rejection and energy use
 - Energy management schedules, including night setback
 - Unlimited minute-by-minute data collection on rink, compressor, and condenser for rapid diagnosis, minimal downtime, and performance measurement



iQ ANALYTICS

- The more you know, the better your ice will be. Stay on top of things with this data-driven bundle.
- Enhances system insight with 45+ additional sensors
 - 25+ algorithms to detect safety, reliability, and efficiency issues
 - Supports downtime reduction with maintenance planning countdown and notifications
 - Stores power monitoring data for in-depth energy analysis



iQ PERFORMANCE

- Includes all available features to deliver optimal performance.
- Custom iQ Elite Mobile App for remote monitoring
 - NHL-required game conditions reporting
 - Wireless air temperature/humidity sensors for easy board installation/removal during non-hockey events
 - NHL Mode for quicker equipment response and manual control
 - Proactively adjusts refrigeration control in sync with the game clock before ice resurfacing
 - Provides comprehensive ice data via the iQ Vision thermal imaging camera
 - Features an ice tempering system



iQ CONNECT

- Your peace of mind, guaranteed.
- Warranty program
 - Adaptable customization



iQ ESSENTIAL



iQ ENERGY



iQ ANALYTICS



iQ PERFORMANCE



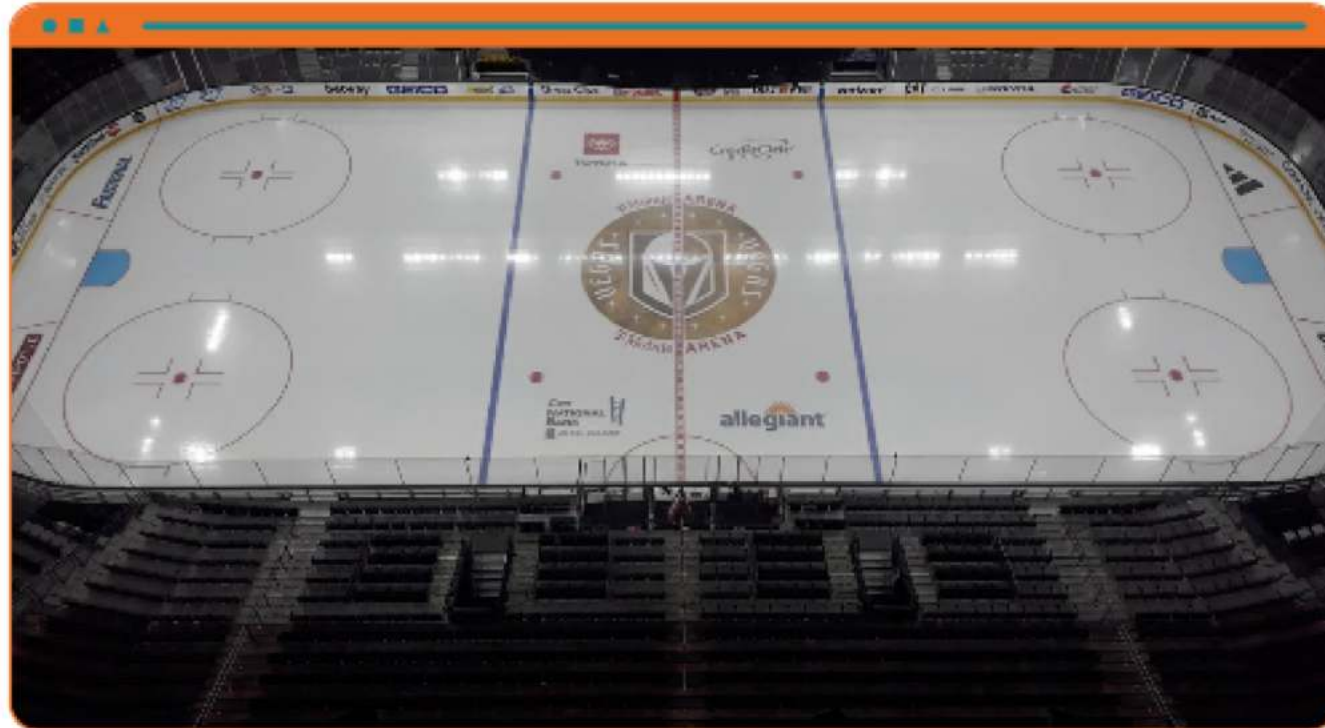
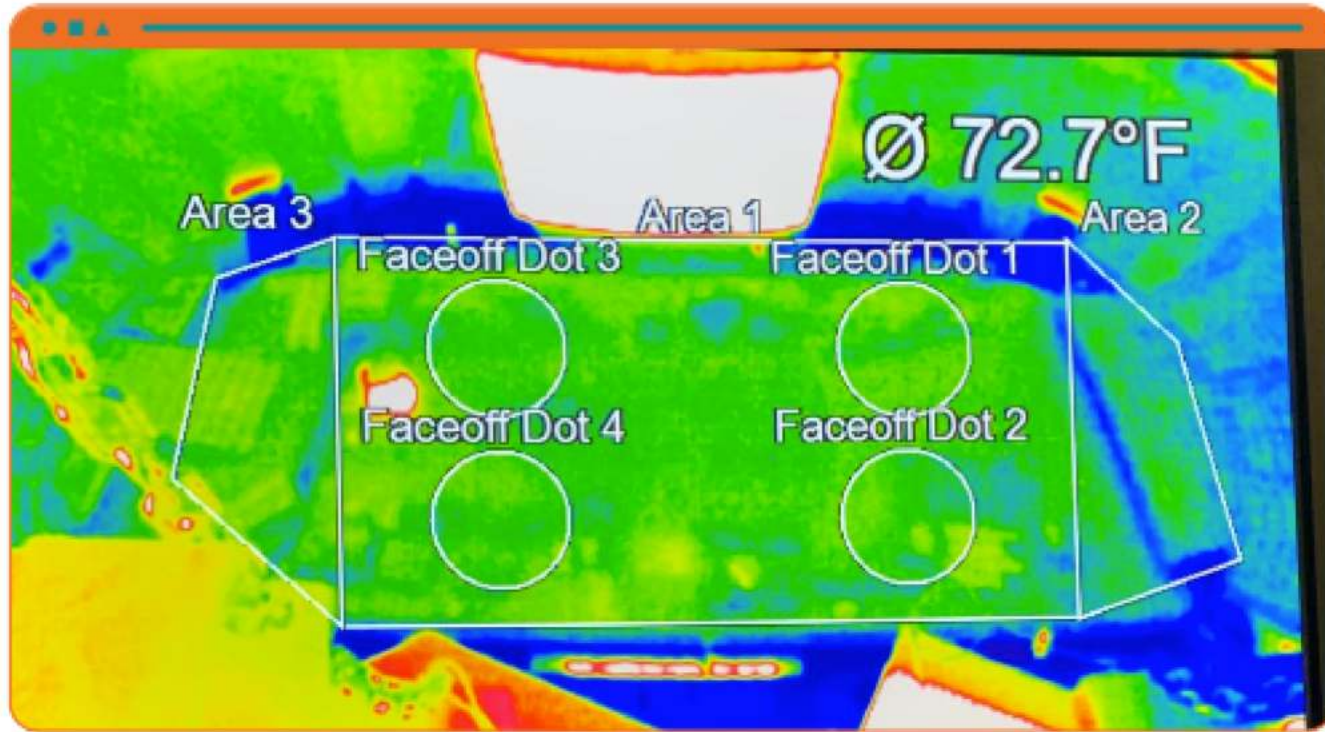
iQ CONNECT

12 months

18 months

24 months

IQ Vision Thermal Imaging Camera



01

91,000 separate temperature points

02

Capacity to read dozens of separate measuring areas as desired

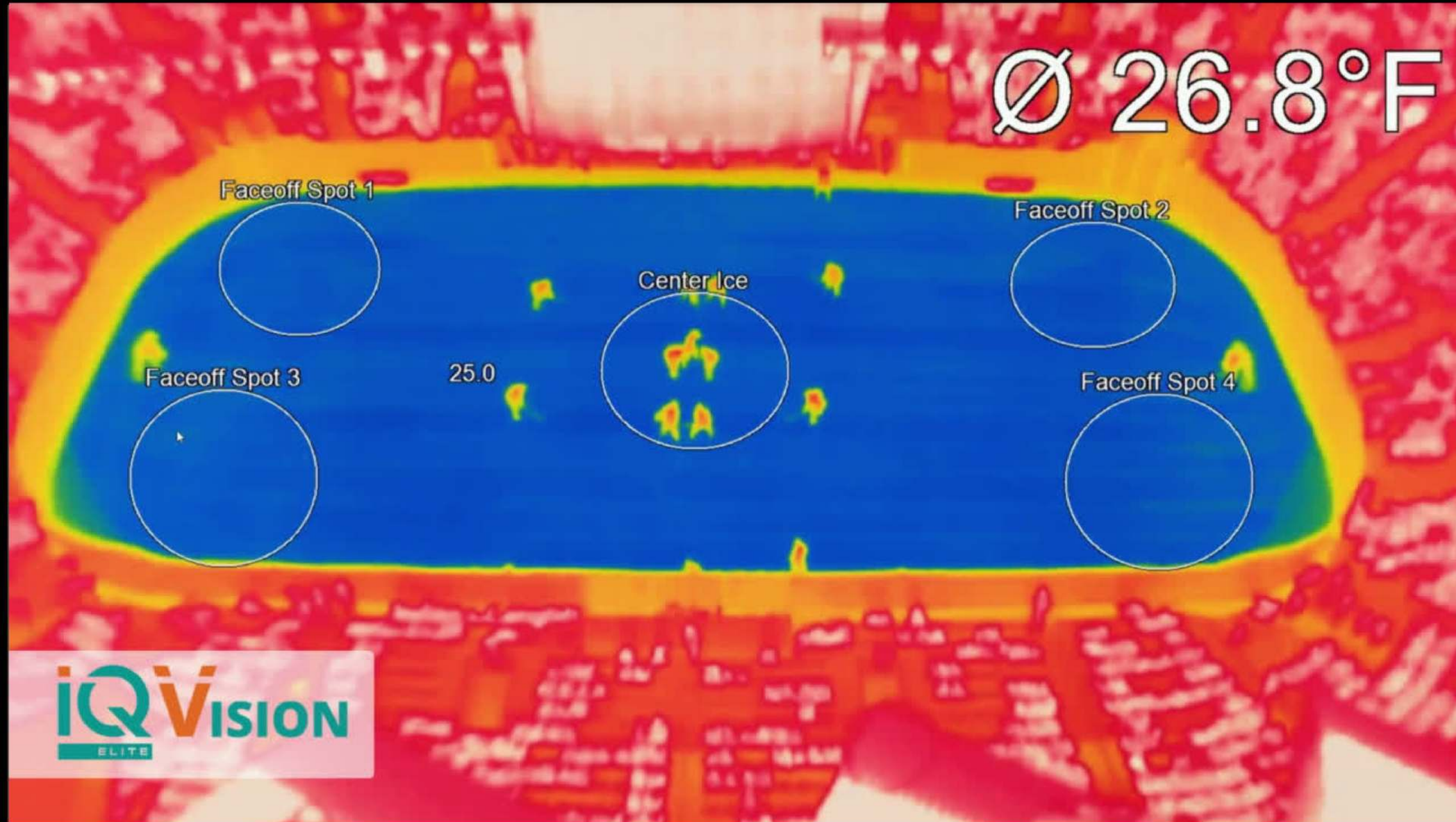
03

Record or take screenshots manually or by programming at specific times (during, before or after games)

04

Shows the differences in ice temperature using a gradient color scale so that you can visualize the quality of your ice surface at any point and how it changes

IQ Vision Cam



IQ Elite Mobile App

- > Setpoints are changeable and will update in tandem with their CIMCO control system
- > Alter setpoints and monitor alarms without having to access the plant computer
- > Reads dozens of points from the control system and imports them directly to your phone
- > View the conditions at the arena from anywhere, as long as you have an internet connection and the correct log in

The image displays three smartphone screens showing the IQ Elite Mobile App interface. The central screen is the 'Home' screen, which features a large digital clock showing 20:00. Below the clock, there are several data points: IRC (0 °F), Slab (0 °F), Bowl AT (72.9 °F), Bowl RH (36.88 %), Dewpoint (45.04 °F), Capacity (0 %), OAT (89.58 °F), and OARH (32.56 %). A 'Report' button is visible at the bottom of the data section. The top of the screen shows 'Alarm Status: CLEAR' and the CIMCO logo. The left screen is the 'Alarms' screen, showing 'ALARM STATUS CLEAR' and a list of alarms with corresponding readings. The right screen is the 'Setpoint' screen, showing 'Return' temperature (66.2 °F) and a table of setpoints for different modes.

Alarms

Home

Setpoint — Game Clock

	IRC	SLB	RTN
Flood	23.1	20	16
Day	25.8	28	19
Cover	22.5	20	19
NHL	21.5	19.9	15.9

NHL Reporting

- Provide a report with metrics recorded over several hours that is up to NHL standards
- Process, save and email itself out to the intended recipients automatically
- Condensed version on the app to give you a snapshot of how the ice quality was throughout a game
- Will provide a scoring system to let you quickly identify your ice quality and set an objective scale to compare against (ie. A+ to D- 12 point scoring system)

Oil_Kings										Reg_Season					
0800															
Supply Air Temp	44.2 °F	Outdoor Conditions		Supply	8.2 °F										
Bowl Temp	59.0 °F	Outdoor Temp	15.4 °F	Return	12.5 °F										
Bowl RH	17.3 %	Outdoor Humidity	77 %	Slab	19.0 °F										
Bowl Dew Point	14.7 °F	Outdoor Dew Point	9.5 °F	Surface	28.5 °F										
Top of Glass Temp	43.8 °F	Comps	4												
Fan Speed	100 %														
1000															
Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F										
Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F										
Bowl Humidity	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F										
Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F										
Top of Glass	0.0 °F	Comps	0												
Fan Speed	0 %														
Warm Up															
Time Started	0	Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F	20:00	15:00	10:00	5:00	0:00			
Time Finished	0	Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Bowl RH	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Top of Glass Temp	0.0 °F	Comps	0	24 Hour Time	0	0	0	0	0	0			
		Fan Speed	0 %												
1200															
Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F										
Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F										
Bowl Humidity	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F										
Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F										
Top of Glass	0.0 °F	Comps	0												
Fan Speed	0 %														
1400															
Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F										
Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F										
Bowl Humidity	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F										
Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F										
Top of Glass	0.0 °F	Comps	0												
Fan Speed	0 %														
1600															
Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F										
Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F										
Bowl Humidity	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F										
Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F										
Top of Glass	0.0 °F	Comps	0												
Fan Speed	0 %														
Doors															
Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F										
Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F										
Bowl Humidity	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F										
Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F										
Top of Glass	0.0 °F	Comps	0												
Fan Speed	0 %														
1800															
Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F										
Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F										
Bowl Humidity	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F										
Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F										
Top of Glass	0.0 °F	Comps	0												
Fan Speed	0 %														
2nd Period															
Time Started	0	Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F	20:00	15:00	10:00	5:00	0:00			
Time Finished	0	Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Bowl RH	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Top of Glass Temp	0.0 °F	Comps	0	24 Hour Time	0	0	0	0	0	0			
		Fan Speed	0 %												
3rd Period															
Time Started	0	Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F	20:00	15:00	10:00	5:00	0:00			
Time Finished	0	Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Bowl RH	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Top of Glass Temp	0.0 °F	Comps	0	24 Hour Time	0	0	0	0	0	0			
		Fan Speed	0 %												
End of Game / Overtime															
Time Started	0	Supply Air Temp	0.0 °F	Outdoor Conditions		Supply	0.0 °F	20:00	15:00	10:00	5:00	0:00			
Time Finished	0	Bowl Temp	0.0 °F	Outdoor Temp	0.0 °F	Return	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Bowl RH	0.0 %	Outdoor Humidity	0 %	Slab	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Bowl Dew Point	0.0 °F	Outdoor Dew Point	0.0 °F	Surface	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F	0.0 °F			
		Top of Glass Temp	0.0 °F	Comps	0	24 Hour Time	0	0	0	0	0	0			
		Fan Speed	0 %												

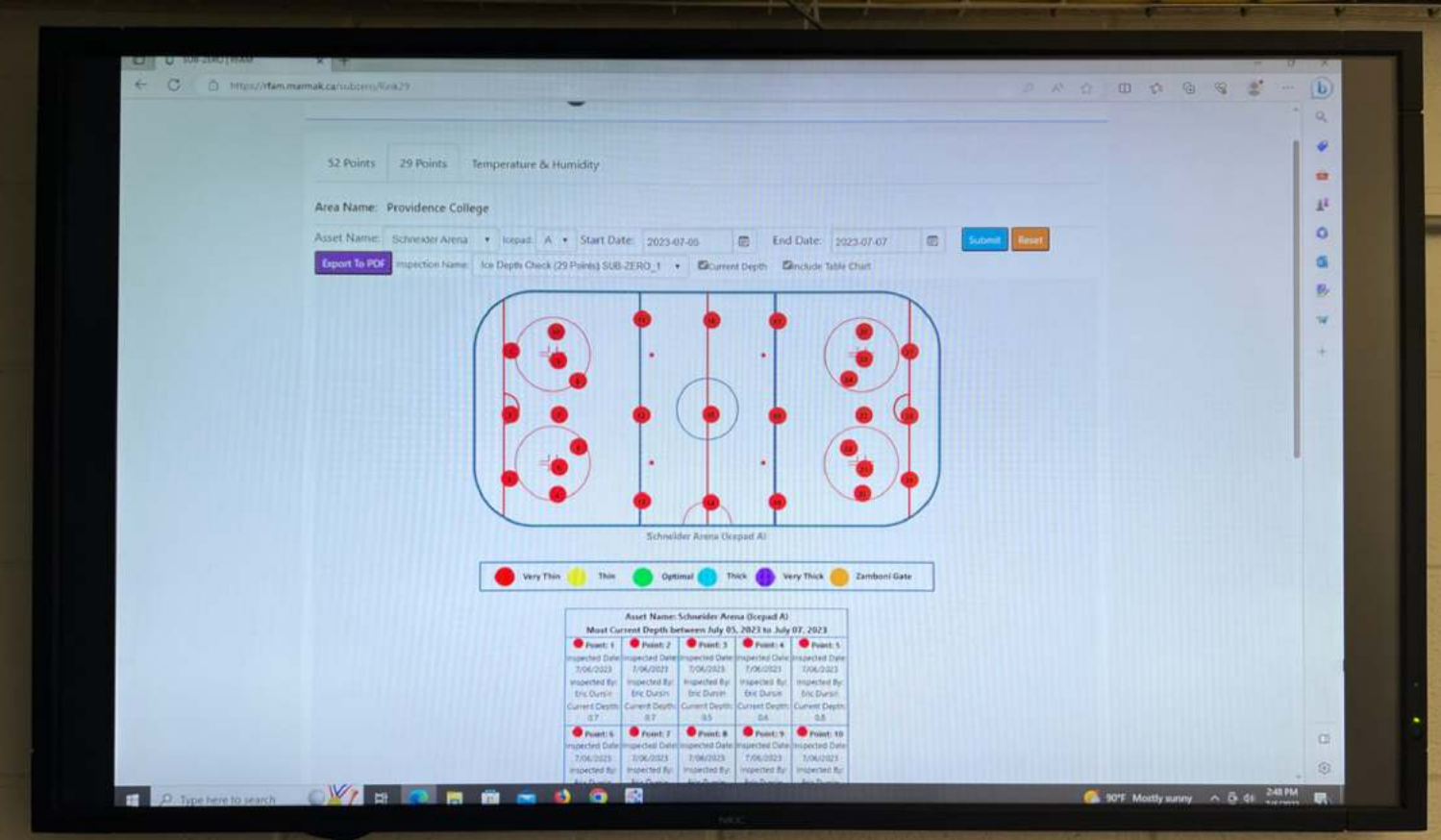
SUB ZERO



ELEVATE YOUR ICE

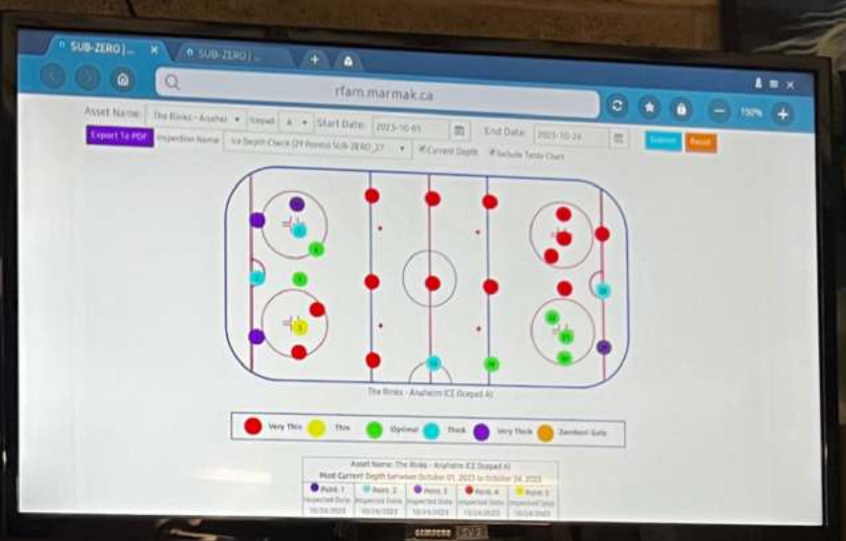


MARMAK
Large City Functionality, Small Town Affordability.



3:24 10.25 16°

Asset Name	Inspected Date	Inspected By	Current Depth
Point 1	7/5/2023	Eric Durkin	87
Point 2	7/5/2023	Eric Durkin	87
Point 3	7/5/2023	Eric Durkin	85
Point 4	7/5/2023	Eric Durkin	84
Point 5	7/5/2023	Eric Durkin	85
Point 6	7/5/2023	Eric Durkin	87
Point 7	7/5/2023	Eric Durkin	87
Point 8	7/5/2023	Eric Durkin	85
Point 9	7/5/2023	Eric Durkin	84
Point 10	7/5/2023	Eric Durkin	85



Screws = < 1"

QUIT Edging So Much Here

1.76, 1.42, 1.25, 1.57, 1.63, 1.75, 1.27, 1.09, 1.44, 1.59, 1.49, 1.25, 1.27, 1.38, 1.55, 1.57

Low real Depths 1.4-1.6 ideal 1.5 perfect

■ = High 11/28/22
 ■ = Good 10:45 am
 ■ = Low JJ

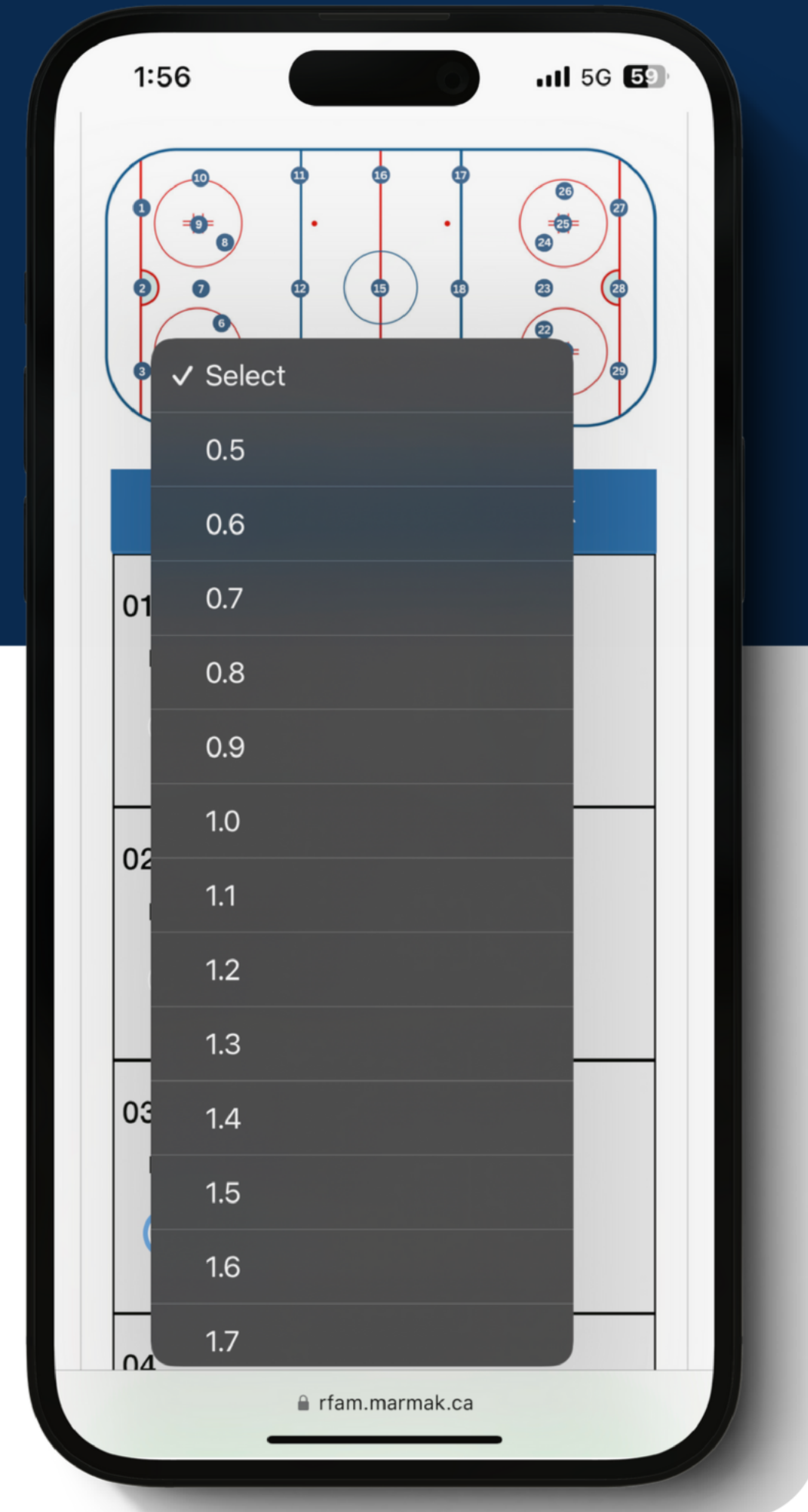
The tortoise won the race
SLOW N STEADY

BECKER ARENA PRODUCTS, INC.
 WWW.BECKERARENA.COM 800-234-5522





- **MOBILE ACCESS**
- **STRUCTURED DROPDOWNS**
- **ABILITY TO ADD CUSTOM RINK DIAGRAM**
- **DIFFERENTIATE BY FACILITY AND ICE PAD.**

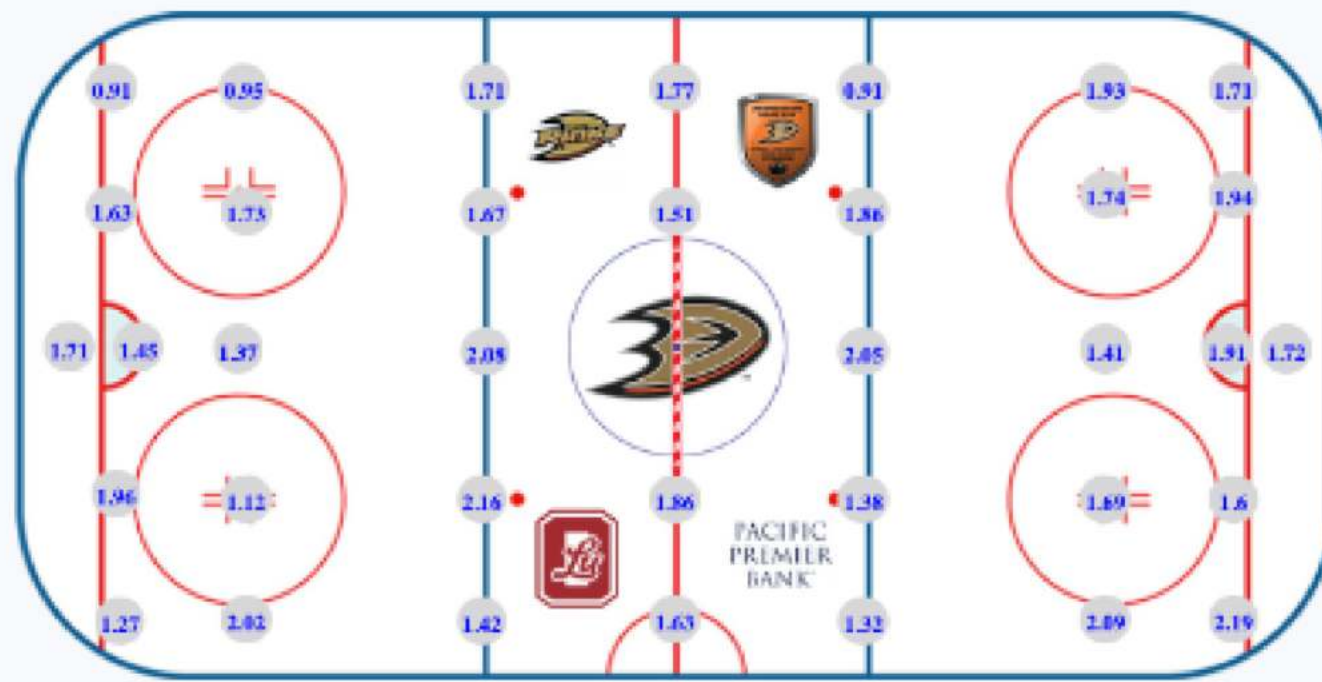




52 Points 29 Points Temperature & Humidity

Area Name: Oilers Ice Center Asset Name: Oilers Ice Center Icepad: A Start Date: 2023-10-01 End Date: 2023-10-19

Inspection Name: Ice Depth Check (29 Points) SUB-ZERO_1 Current Depth Include Table Chart Floor Variance [Submit](#) [Reset](#) [Export To PDF](#)



Fifth Third Arena (Icepad A)

- VALIDATE STAFF TRAINING
- WATER QUALITY
- PLANT EFFICIENCY
- EQUIPMENT PERFORMANCE

#01 Rink Controls

#01 Ice Surface 26.1	#02 Slab Temp 18.2	#03 Rink Temp 58.2
#04 Humidity 46.6	#05 Dewpoint 39.0	#06 Return Temp 12.4

Jet Ice RO System

Salinity Reading .04	Salt Level 1/2	System PSI 83
TDS Reading (0-100ppm) 52	Waste Water GPM (4-6gpm) 4	Water Temp (65-80F) 85

#02 Compressor Hours

Compressor 1 31895	Compressor 2 30456	Compressor 3 31895
Compressor 4 31639	Compressor 5 31811	Compressor 6 30248

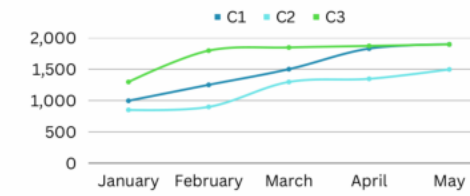
Ice Cut Log

Activity Prior PS	End Battery % 69.5	Olympia # 1
Snow in Dump Tank 1/4	Start Battery % ??	Wet/Dry Wet

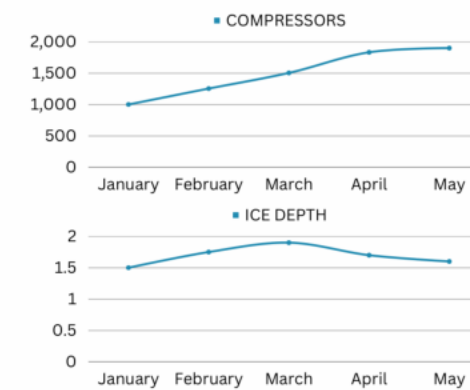
PERFORMANCE

Ice Depth Check (29 Points) SUB-ZERO_1

COMPRESSOR RUNTIMES



AVERAGE RUNTIME VS ICE DEPTH



DETAILS

FUSION

Ice Depth Check (29 Points) SUB-ZERO_1

Outdoor Temperature: 98°F

Surface Temperature: 63.5°F

Relative Humidity: 75%

TDS / PPM: 83

Water Temperature: 90.4°F

DETAILS

DATE RECORDED: 11/03/2023

ICE

Ice Depth Check (29 Points) SUB-ZERO_1

ICE RESURFACER: A

Battery % (Before): 95%

Battery % (After): 85%

SNOW TANK LEVEL: FULL

DETAILS

DATE RECORDED: 11/03/2023



ICE

PERFORMANCE

FUSION

RFAM

SETTINGS

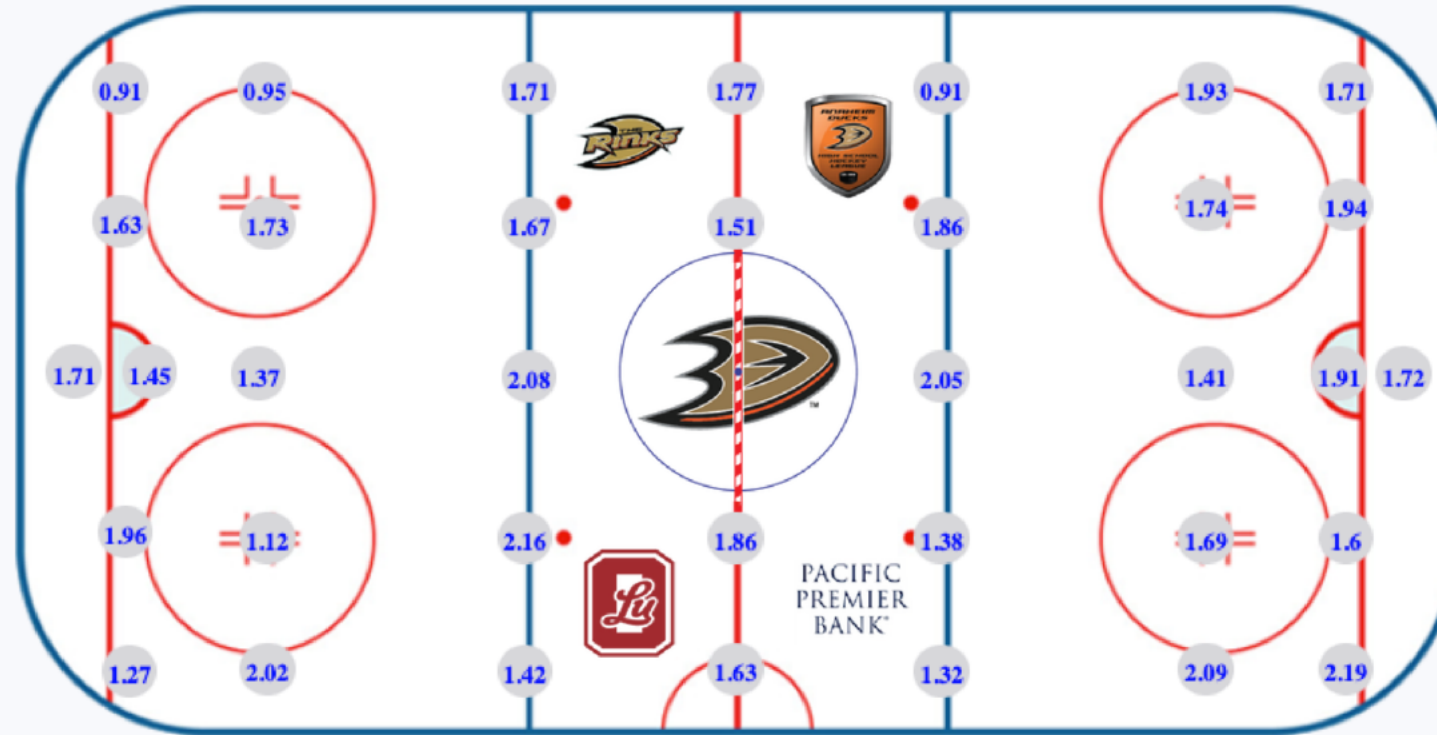
LOG OUT

52 Points 29 Points Temperature & Humidity

Area Name: Oilers Ice Center | Asset Name: Oilers Ice Center | Icepad: A | Start Date: 2023-10-01 | End Date: 2023-10-19

Inspection Name: Ice Depth Check (29 Points) SUB-ZERO_1 | Current Depth | Include Table Chart | Floor Variance

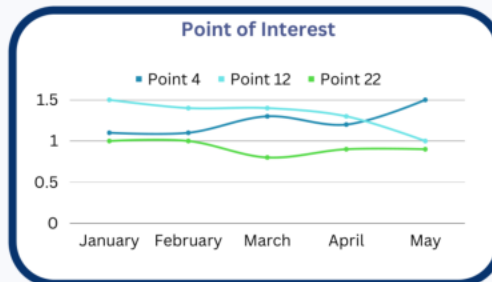
[Submit](#) [Reset](#) [Export To PDF](#)



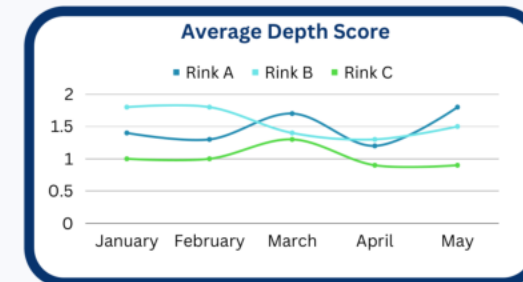
Fifth Third Arena (Icepad A)

● Very Thin
 ● Thin
 ● Optimal
 ● Thick
 ● Very Thick
 ● ICE RESURFACER GATE

Asset Name: Fifth Third Arena (Icepad A)				
Average Depth between June 01, 2023 to August 01, 2023				
<p>● Point: 1 Avg Depth: 1.6 Thinnest Depth: 1.5 Thickest Depth: 1.7</p>	<p>● Point: 2 Avg Depth: 1.27 Thinnest Depth: 1.2 Thickest Depth: 1.4</p>	<p>● Point: 3 Avg Depth: 1.73 Thinnest Depth: 1.7 Thickest Depth: 1.8</p>	<p>● Point: 4 Avg Depth: 1.55 Thinnest Depth: 1.5 Thickest Depth: 1.6</p>	<p>● Point: 5 Avg Depth: 1.55 Thinnest Depth: 1.4 Thickest Depth: 1.7</p>
<p>● Point: 6 Avg Depth: 1.38 Thinnest Depth: 1.2 Thickest Depth: 1.5</p>	<p>● Point: 7 Avg Depth: 1.6 Thinnest Depth: 1.5 Thickest Depth: 1.8</p>	<p>● Point: 8 Avg Depth: 1.35 Thinnest Depth: 1.2 Thickest Depth: 1.4</p>	<p>● Point: 9 Avg Depth: 1.35 Thinnest Depth: 1.3 Thickest Depth: 1.4</p>	<p>● Point: 10 Avg Depth: 1.35 Thinnest Depth: 1.2 Thickest Depth: 1.4</p>



COMING SOON



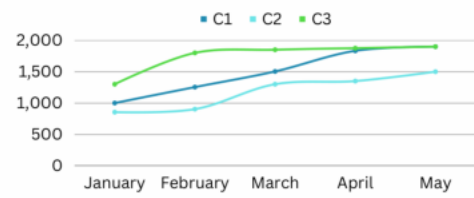
COMING SOON

COMING SOON

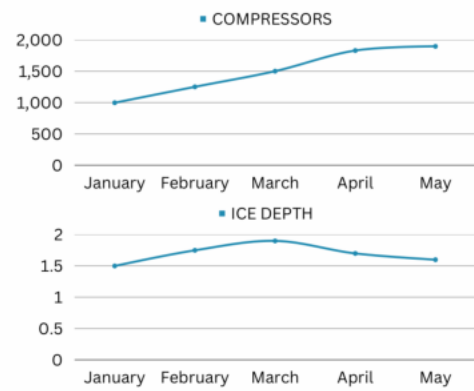
PERFORMANCE

Ice Depth Check (29 Points) SUB-ZERO_1

COMPRESSOR RUNTIMES



AVERAGE RUNTIME VS ICE DEPTH



DETAILS

ICE CUT LOGS

COMING SOON

FUSION

Ice Depth Check (29 Points) SUB-ZERO_1

Outdoor Temperature: 98°F

Surface Temperature: 63.5°F



TDS / PPM: 83



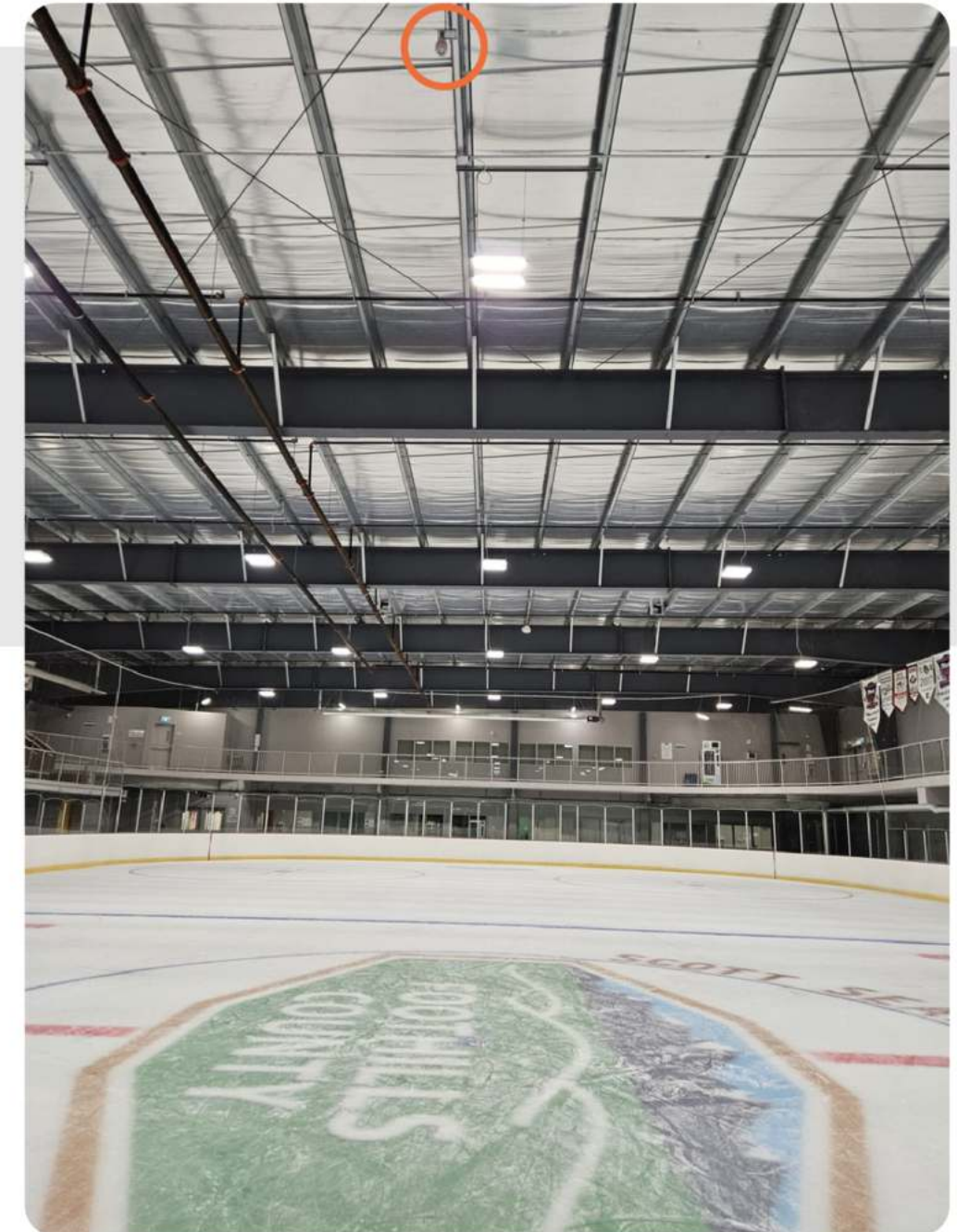
DETAILS

DATE RECORDED: 11/03/2023

“This new program's incredible. A few more years development and we won't even have to dig anymore.”
Volunteer #1 - Jurassic Park



GUEST
AUTOMATION
RINK AUTOMATION SPECIALISTS



Ice Slab	
System	Slab Sensor
Gold Rink Ice Slab Thickness	1.66 in

SUBZERO
ELEVATE YOUR ICE

Q&A

PARTICIPANT OFFER

PARTICIPANT OFFER

3 MONTHS AT NO COST.



TO QUALIFY FILL IN
WEBINAR SURVEY



HAVE UNTIL FRIDAY DECEMBER 8 TO REGISTER.