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**Testing Authority** ▪ Labosport Canada      **Type of Surface** ▪ Artificial Turf

**Testing Officer** ▪ Maxime FAVÉ

**Location of Greens** ▪ 249 24th St E, North Vancouver, BC V7L 4R4 CANADA

**Installation Date** ▪ June 2021

**Date Tested** ▪ Nov 29th & 30th 2021

### Description of Green and product

**Outdoor  
Greengauge Needle Punch**

Weight                    1700g/m<sup>2</sup>  
 Thickness                10mm  
 Width                     4m  
 Length                    Bespoke  
 Type                        Polypropylene 1150g/m<sup>2</sup> top  
                                  Polyester 550g/m<sup>2</sup> bottom  
 Construction            Staple fibres - 2 ply needled together  
 Colour                     Option: Dark Green/Summer Green  
 UV                            600kl

## ORIENTATION OF GREEN

North

	16	15	14	13	12	11	10	9	
16									9
15									10
14									11
13									12
12									13
11									14
10									15
9									16
	9	10	11	12	13	14	15	16	

South

## GREEN, DITCH AND BANK DIMENSIONS

**Date:** December 23<sup>rd</sup>, 2021

### Length

N-S	37.85 m
-----	---------

E-W	37.85 m
-----	---------

	Av. Ditch width	Av. ditch depth	Av. bank height
North	308	179	412
East	313	172	407
South	307	181	412
West	296	169	410

**Note:** Each ditch and bank dimension is the average of three randomly selected positions on each side of the green.

### Comments:

- World Bowls Performance Standards specify that the length of the green in the direction of play shall be between 31 - 40m.
- World Bowls Performance Standard specifies that ditches shall be between 200 - 380mm wide and between 50 - 200mm deep.
- World Bowls Performance Standard specifies that the top of the bank should be a minimum of 230mm above the surface of the green.

**The length of the green, ditch width & depth and bank height meet World Bowls requirements.**

## GREEN SPEED

Condition of Surface: Soaked

Date: December 23<sup>rd</sup>, 2021

Position	Direction	Rink No.	Green speed (m)	Green speed (s)
1	East-West	10	17.14	12.18
2	East-West	12	17.31	12.24
3	West-East	14	16.71	12.03
4	West-East	16	16.44	11.93
5	East-West	14	16.53	11.96
6	East-West	16	17.07	12.16
7	South-North	10	17.68	12.38
8	South-North	12	16.90	12.09
9	North-South	14	16.69	12.02
10	North-South	16	16.32	11.88
11	South-North	14	16.52	11.96
12	South-North	16	16.18	11.83
13	West-East	10	16.97	12.12
14	West-East	12	17.00	12.13
15	North-South	10	16.95	12.11
16	North-South	12	16.77	12.05
		Grand mean	16.8	12.1
		Max. speed	17.7	12.4
		Min. speed	16.2	11.8

### Comments:

- The World Bowls Performance Standard requires green speed to be in the range of 10 to 18 seconds. The green speed obtained in each test location shall be within  $\pm 0.5$  seconds of the mean green speed.
- The mean green speed was 12.1s. All rinks were within  $\pm 0.5$  seconds of the mean green speed.

**The green meets the World Bowls Performance Standards for green speed in both directions of play.**

## SURFACE DRAW AND END POINT VARIANCE

Condition of Surface: Wet      Date: December 23<sup>rd</sup>, 2021

### Draw

Position	Direction	Rink No.	Left hand draw (mm)	Right hand draw (mm)	% uniformity**
1	E-W	15	827	763	8.4
2	E-W	10	757	878	16.0
3	S-N	10	839	888	5.8
4	S-N	15	784	882	12.5
5	W-E	15	812	886	9.1
6	W-E	10	830	760	9.2
7	N-S	10	908	824	10.2
8	N-S	15	886	786	12.7
<b>Grand mean</b>			<b>830</b>	<b>833</b>	<b>10</b>

\*\* Calculated by subtracting the narrower draw from the wider draw and expressing the difference as a percentage of the narrower draw.

### Variance

Position	Direction	End point circumference (of 5 bowls) (m)	
		LH Draw	RH Draw
1	E-W	1.6	2.6
2	W-E	2.9	2.8
3	S-N	2.7	2.4
4	N-S	2.9	2.3
5	E-W	2.3	2.4
6	W-E	2.2	2.7
7	S-N	2.2	2.8
8	N-S	2.4	2.9
9	E-W	1.9	2.3
10	W-E	2.6	2.7
11	S-N	2.4	2.7
12	N-S	2.1	2.7
13	E-W	2.3	2.6
14	W-E	2.9	2.8
15	S-N	2.7	2.4
16	N-S	2.9	2.3

### Comments:

- The maximum difference between pairs of left and right maximum draws shall be less than 40%. Also, draw on surfaces having green speeds in excess of 14.1 seconds shall be greater than 1000mm and draw on surfaces having green speeds in the range 10 to 14 seconds shall be greater than 750mm.

- ❑ Perimeter of spread for greens with a speed of 10.0-12.0 secs shall be no more than 2.5m; 3.0m for greens for a speed of 12.1-14.0 secs and 3.5m for greens for a speed in excess of 14 secs.

**The Green meets the requirements for extent and variance of Draw.**

## **SURFACE EVENNESS (USING STRAIGHT EDGE)**

**Date:**

**Comments:**

- ❑ The World Bowls Performance Standard allows for localised undulations of less than 4mm, when measured using a 3m straight-edge. Undulations of up to 6mm are permissible providing they do not affect the trajectory of a bowl, particularly as it rolls slowly. Undulations greater than 6mm should not occur anywhere on the Green.
- ❑ One undulation was found greater than 3 mm (6 mm, corner South-East; rink 9/10). The inspection established the bowling performance was not affected by the defect. On the rest of the green, there were no undulations found greater than 3 mm.

**The green meets the World Bowls Performance Standard as there were no undulations greater than 6mm was found.**

## DESIGN LEVELS (USING LASER)

Date:

2 x 2m grid survey completed on the finished Green (values in mm).

m	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
0	7	7	5	5	4	4	5	5	6	7	7	5	4	4	3	6	6	7	6
2	7	7	6	5	5	4	5	6	6	5	5	6	6	5	5	4	6	6	7
4	6	6	4	6	5	3	4	5	6	3	4	5	4	5	6	5	5	4	6
6	4	5	6	5	3	2	3	4	4	4	5	6	4	2	4	5	5	6	5
8	4	5	5	5	3	3	4	3	4	5	5	4	5	3	4	6	4	4	5
10	5	5	5	5	4	2	5	4	4	6	5	2	4	4	2	4	5	6	4
12	5	5	4	3	4	2	4	4	3	2	4	1	3	3	3	4	6	7	6
14	6	6	5	4	3	4	5	3	2	2	2	1	1	2	3	4	6	8	6
16	7	8	4	4	4	5	4	3	2	1	1	2	1	2	4	4	5	5	6
18	7	6	6	4	2	3	5	2	1	0	1	3	2	2	3	3	4	7	5
20	8	5	5	6	6	4	4	3	2	1	2	4	4	2	2	2	4	3	5
22	6	6	4	5	6	3	3	2	2	2	4	2	1	3	3	4	6	3	5
24	3	5	6	7	4	4	7	5	5	3	4	1	2	1	2	2	5	4	6
26	3	6	6	5	5	4	5	6	5	3	2	3	2	3	4	3	2	4	4
28	5	3	4	3	3	6	5	4	5	5	3	3	1	2	3	2	3	5	8
30	5	4	6	6	4	5	5	5	6	3	5	3	2	3	4	3	4	4	7
32	6	6	7	6	5	6	6	5	5	4	4	3	4	4	3	4	5	5	5
34	4	4	5	5	5	7	6	5	5	4	5	4	4	4	6	4	5	5	6
36	5	5	4	6	6	8	5	6	5	7	6	6	6	5	5	6	6	6	7
38	5	6	6	8	6	6	6	6	6	6	7	8	6	7	6	6	6	6	7

### Comments:

- The World Bowls Performance Standard is for a height range of no more than +/-7mm and for adjacent spot heights on the 2m grid not to be greater than 3mm. In practice, this standard is very difficult to achieve and certain deviations from the standard are acceptable, subject to appropriate green speed and draw results.
- The overall height range was +/- 4 mm.

### The height range meets the Standard of +/-7mm.

- Adjacent spot height variances of 4mm mm (and 1 spot of 5 mm) were found. See above. Giving consideration to the overall design levels and the variability obtained with a laser surveying device (+/-1mm), we believe the green offers acceptable levelness.



## Infiltration rate

### Comments:

- The World Bowls Performance Standard requires new surfaces to have an infiltration rate of greater than 100mm/hr. Greens over 12 months old need to have an infiltration rate greater than 50mm/hr).
- The average infiltration rate for the green was over 600 mm per hr.
- The green meets the World Bowls Performance Standards for surface infiltration rate.

## CONCLUSIONS

<u>Characteristic</u>	<u>Result</u>
Green speed	Pass
Surface draw	Pass
Surface levelness	Pass
Design levels	Pass
Green dimensions	Pass
Bank height	Pass
Ditch depth	Pass
Ditch width	Pass
Infiltration rate	Pass

**Signed:**

Maxime FAVÉ

**Date:** December 23<sup>rd</sup>, 2021

## APPENDIX I

### Summary of Methods of Test

#### Green Speed

Green speed was measured using test WBB-01. In this test an unbiased bowl is made to roll along the surface under test by being released down a ramp from a specified height onto the surface. The distance the bowl rolls is measured and the green speed calculated from a standard calibration curve.

#### Surface Draw

The maximum draw of the surface was measured using test WBB-02. In this test a standard bowl issued by the World Bowls Board is made to roll along the surface under test by being released down a ramp from a specified height onto the surface. The trajectory of the bowl is observed and both the maximum draw and consistency of the draw are measured.

#### Surface Evenness

Surface evenness was assessed using a 3m straight edge on a 3m grid using WBB-03.

#### Design Levels

Design levels was assessed using a surveyor's optical laser level and staff to measure spot heights on a 3m grid relative to a temporary benchmark. Data are fed into a computer package which generates a contour grid and enhanced 3D surface representation.



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**Testing Authority** ▪ Labosport Canada      **Type of Surface** ▪ Artificial Turf

**Testing Officer** ▪ Maxime FAVÉ

**Location of Greens** ▪ 249 24th St E, North Vancouver, BC V7L 4R4 CANADA

**Installation Date** ▪ June 2021

**Date Tested** ▪ Nov 29th & 30th 2021

### Description of Green and product

**Outdoor  
Greengauge Needle Punch**

Weight                    1700g/m<sup>2</sup>  
 Thickness                10mm  
 Width                     4m  
 Length                    Bespoke  
 Type                        Polypropylene 1150g/m<sup>2</sup> top  
                                  Polyester            550g/m<sup>2</sup> bottom  
 Construction            Staple fibres - 2 ply needled together  
 Colour                     Option: Dark Green/Summer Green  
 UV                           600kl

## ORIENTATION OF GREEN

North

	8	7	6	5	4	3	2	1	
8									1
7									2
6									3
5									4
4									5
3									6
2									7
1									8
	1	2	3	4	5	6	7	8	

South

## GREEN, DITCH AND BANK DIMENSIONS

**Date:** December 23<sup>rd</sup>, 2021

### Length

N-S	37.85 m
-----	---------

E-W	37.85 m
-----	---------

	Av. Ditch width	Av. ditch depth	Av. bank height
North	307	180	410
East	312	174	408
South	308	180	413
West	297	169	412

**Note:** Each ditch and bank dimension is the average of three randomly selected positions on each side of the green.

### Comments:

- World Bowls Performance Standards specify that the length of the green in the direction of play shall be between 31 - 40m.
- World Bowls Performance Standard specifies that ditches shall be between 200 - 380mm wide and between 50 - 200mm deep.
- World Bowls Performance Standard specifies that the top of the bank should be a minimum of 230mm above the surface of the green.
- The length of the green, ditch width & depth and bank height meet World Bowls requirements.

## GREEN SPEED

Condition of Surface: Soaked

Date: December 23<sup>rd</sup>, 2021

Position	Direction	Rink No.	Green speed (m)	Green speed (s)
1	East-West	1	17,0	12,1
2	East-West	3	16,6	12,0
3	West-East	1	17,2	12,2
4	West-East	3	17,0	12,1
5	East-West	5	17,2	12,2
6	East-West	7	17,1	12,2
7	South-North	5	17,9	12,4
8	South-North	7	17,1	12,2
9	North-South	1	17,0	12,1
10	North-South	3	17,1	12,2
11	South-North	1	17,3	12,3
12	South-North	3	17,6	12,3
13	West-East	5	17,2	12,2
14	West-East	7	17,1	12,2
15	North-South	5	16,3	11,9
16	North-South	7	17,1	12,2
		Grand mean	17,1	12,2
		Max. speed	17,9	12,4
		Min. speed	16,3	11,9

### Comments:

- The World Bowls Performance Standard requires green speed to be in the range of 10 to 18 seconds. The green speed obtained in each test location shall be within  $\pm 0.5$  seconds of the mean green speed.
- The mean green speed was 12.2s. All rinks were within  $\pm 0.5$  seconds of the mean green speed.
- The green meets the World Bowls Performance Standards for green speed in both directions of play.



## SURFACE DRAW AND END POINT VARIANCE

Condition of Surface: Wet Date: December 23<sup>rd</sup>, 2021

### Draw

Position	Direction	Rink No.	Left hand draw (mm)	Right hand draw (mm)	% uniformity**
1	E-W	2	832	888	6,7
2	E-W	7	754	883	17,1
3	S-N	2	839	888	5,8
4	S-N	7	812	892	9,9
5	W-E	2	812	886	9,1
6	W-E	7	869	810	7,3
7	N-S	2	909	829	9,7
8	N-S	7	948	812	16,8
<b>Grand mean</b>			<b>847</b>	<b>861</b>	<b>10</b>

\*\* Calculated by subtracting the narrower draw from the wider draw and expressing the difference as a percentage of the narrower draw.

### Variance

Position	Direction	End point circumference (of 5 bowls) (m)	
		LH Draw	RH Draw
1	East-West	2,0	1,9
2	West-East	2,8	2,6
3	South-North	2,1	2,6
4	North-South	2,8	2,7
5	East-West	2,9	2,4
6	West-East	2,8	2,7
7	South-North	2,6	2,9
8	North-South	2,5	2,9
9	East-West	2,7	2,0
10	West-East	2,9	2,7
11	South-North	2,9	2,7
12	North-South	2,8	2,7
13	South-North	2,8	2,6
14	North South	2,4	2,7
15	South-North	2,4	2,6
16	North-South	2,3	2,4

### Comments:

- The maximum difference between pairs of left and right maximum draws shall be less than 40%. Also, draw on surfaces having green speeds in excess of 14.1 seconds shall be greater than 1000mm and draw on surfaces having green speeds in the range 10 to 14 seconds shall be greater than 750mm. The green meets these requirements.

- ❑ Perimeter of spread for greens with a speed of 10.0-12.0 secs shall be no more than 2.5m; 3.0m for greens for a speed of 12.1-14.0 secs and 3.5m for greens for a speed in excess of 14 secs. The Green meets the requirements for Variance of Draw.

## **SURFACE EVENNESS (USING STRAIGHT EDGE)**

**Date:**

**Comments:**

- ❑ The World Bowls Performance Standard allows for localised undulations of less than 4mm, when measured using a 3m straight-edge. Undulations of up to 6mm are permissible providing they do not affect the trajectory of a bowl, particularly as it rolls slowly. Undulations greater than 6mm should not occur anywhere on the Green.
- ❑ Two undulations were found greater than 3 mm (corner South-East and corner North-West). The inspector established the bowling performance was not affected by the defects. On the rest of the green, there were no undulations found greater than 3 mm. There were no undulations found greater than 6 mm.
- ❑ The green meets the World Bowls Performance Standard as there were no undulations greater than 6mm was found.

## DESIGN LEVELS (USING LASER)

### Date:

2 x 2m grid survey completed on the finished Green (values in mm).

m	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
0	7	7	7	6	6	6	5	4	5	5	5	5	6	5	5	7	6	8	8
2	7	6	5	5	5	4	5	4	5	5	5	5	4	4	5	6	6	7	7
4	6	6	5	5	4	6	4	6	3	4	4	4	3	6	6	6	7	7	7
6	6	6	5	4	5	4	4	4	5	5	4	4	4	5	5	5	5	5	7
8	5	5	4	3	3	3	3	6	3	4	4	5	3	5	3	6	6	6	7
10	6	4	3	3	4	4	3	4	4	5	3	3	4	4	4	4	6	5	8
12	6	5	4	5	4	4	4	4	3	2	4	1	3	3	3	4	5	5	7
14	5	4	4	4	3	5	5	3	2	2	2	2	1	2	3	4	5	6	8
16	5	4	5	4	4	4	4	3	2	1	1	2	1	2	4	4	4	5	8
18	6	4	4	4	5	5	5	2	1	0	1	3	2	2	3	3	5	6	8
20	5	4	5	5	4	4	3	3	2	1	3	4	4	2	2	2	4	6	7
22	6	5	4	4	6	4	3	2	2	2	2	2	2	3	3	4	5	6	6
24	6	4	3	3	3	4	5	5	5	3	4	1	3	2	2	2	4	4	7
26	6	5	4	5	3	4	5	6	3	3	2	3	2	3	4	3	4	5	6
28	5	3	4	5	5	6	5	3	5	5	3	3	3	2	3	2	5	5	6
30	5	3	4	4	4	4	5	5	4	3	5	3	2	3	4	3	4	5	6
32	5	4	4	4	3	3	4	4	3	4	4	3	3	4	5	4	4	4	6
34	7	5	4	3	4	4	4	4	3	4	4	4	3	5	6	4	5	6	6
36	6	6	5	5	5	5	5	5	4	5	4	3	4	4	6	5	7	6	6
38	6	6	6	5	5	5	6	5	6	6	5	3	4	4	5	4	6	8	7

### Comments:

- The World Bowls Performance Standard is for a height range of no more than +/-7mm and for adjacent spot heights on the 2m grid not to be greater than 3mm. In practice, this standard is very difficult to achieve and certain deviations from the standard are acceptable, subject to appropriate green speed and draw results.
- The overall height range was 4 mm. As such the height range met the Standard of +/- 7mm.
- Given the consideration mentioned above (cf. Surface evenness) and the fair overall design level, we believe the green offers acceptable levelness.

## Infiltration rate

### Comments:

- The World Bowls Performance Standard requires new surfaces to have an infiltration rate of greater than 100mm/hr. Greens over 12 months old need to have an infiltration rate greater than 50mm/hr).
- The average infiltration rate for the green was over 650 mm per hr.
- The green meets the World Bowls Performance Standards for surface infiltration rate.

## CONCLUSIONS

<u>Characteristic</u>	<u>Result</u>
Green speed	Pass
Surface draw	Pass
Surface levelness	Pass
Design levels	Pass
Green dimensions	Pass
Bank height	Pass
Ditch depth	Pass
Ditch width	Pass
Infiltration rate	Pass

**Signed:**

Maxime FAVÉ

**Date:** December 23<sup>rd</sup>, 2021

## APPENDIX I

### Summary of Methods of Test

#### Green Speed

Green speed was measured using test WBB-01. In this test an unbiased bowl is made to roll along the surface under test by being released down a ramp from a specified height onto the surface. The distance the bowl rolls is measured and the green speed calculated from a standard calibration curve.

#### Surface Draw

The maximum draw of the surface was measured using test WBB-02. In this test a standard bowl issued by the World Bowls Board is made to roll along the surface under test by being released down a ramp from a specified height onto the surface. The trajectory of the bowl is observed and both the maximum draw and consistency of the draw are measured.

#### Surface Evenness

Surface evenness was assessed using a 3m straight edge on a 3m grid using WBB-03.

#### Design Levels

Design levels was assessed using a surveyor's optical laser level and staff to measure spot heights on a 3m grid relative to a temporary benchmark. Data are fed into a computer package which generates a contour grid and enhanced 3D surface representation.