

CHAPTER 7

ICE THICKNESS MEASUREMENTS AND REPORTS

- Weekly Ice Thickness Reports
- Ice Thickness Monthly Report
- Examples of Ice Thickness Reports

This chapter deals with the measurement and reporting of ice thickness and snow depth. The depth of snow is important to know because it has a direct bearing on the ice thickness due to its insulating qualities. These measurements are important operationally since they provide a means to estimate the general thickness of the ice cover around the area. They are also important climatological records that users need for ice modeling, building infrastructures and, most recently, studies in climate change. Annual data summaries are produced from these measurements.

The observer shall ensure that the site selected has a depth of water greater than the maximum ice thickness expected for the year. The ice thickness and snow depth shall be measured, as near as practicable, at the same location throughout the ice season, and from one season to the next. The site should be on undeformed (level) and undisturbed ice. When the auger is used, a new hole shall be drilled for each measurement made in order to obtain the thickness of the entire ice layer. If a tidal crack is a permanent feature at the station, the site selected should be slightly seaward of the crack.



Photo 7.1: Snow measurement.

Katherine Wilson (CIS)



7.1 Weekly Ice Thickness Reports

Weekly reports are used in near real-time as validation of fast ice growth and to estimate the rate of growth of drifting sea ice. The reports are to be forwarded to a designated collection station on the meteorological communication system, where they are to be entered on the circuit in bulletins under the heading “**ITCN1**” with the collection station’s identifier. MANTRANS (cf. 3) gives a listing of **ITCN** bulletin headings, including the stations contained in the bulletins and prescribes the relays which provide the desired distribution.

The weekly ice thickness and snow depth measurements are coded as follows:

ITCN1 CXXX YYGGgg
(CXXX)YYI_tI_tI_t S_tS_tTW_fd

Table 7.1: Weekly Ice Thickness Message Heading

SYMBOL	DESCRIPTION
ITCN1	Message identifier
CXXX	Transmission station identifier
YY	Day of month of message transmission
GG	Hour of message transmission
gg	Minute of message transmission

Table 7.2: Weekly Ice Thickness Message Body

SYMBOL	DESCRIPTION	CODE TABLE
CXXX	Observation station identifier (if different than transmission station)	
YY	Day of month of measurement	
I_tI_tI_t	Ice thickness in whole centimetres	
S_tS_t	Average depth of snow in whole centimetres at measurement site	
T	Surface topography	7.3
W_f	Cracks and leads	7.4
d	Measurement method used	7.5



Table 7.3: Surface Topography (T)

SYMBOL	CONCENTRATION	CODE
Smooth		0
Rafted	0 - 1/10	1
	2/10 - 3/10	2
	4/10 - 10/10	3
Ridged	0 - 1/10	4
	2/10 - 3/10	5
	4/10 - 10/10	6
Hummocked	0 - 1/10	7
	2/10 - 3/10	8
	4/10 - 10/10	9

Table 7.4: Cracks and Leads (W_f)

DESCRIPTION	CODE
No cracks or leads	0
Few cracks	1
Numerous Cracks	2
Few leads	3
Numerous leads	4

Table 7.5: Measurement Method Used (d)

DESCRIPTION	CODE
Visually	0
Ice Auger Kit	1
Hot Wire	2
Other Means	3



7.2 Ice Thickness Monthly Report

Weekly ice thickness measurements are recorded on Form 0063-2317. Figure 7.1 (“Ice Thickness Form 0063-2317”, p. 7-7) shows an example of a completed form. The completed forms constitute the official record of ice thickness and snow depth reports from network stations. The Officer-In-Charge (OIC) is responsible for ensuring that each form has been carefully checked and signed by himself or his/her deputy. This signature is a certification of the accuracy and completeness of the record.

The form shall be forwarded by mail to the Canadian Ice Service at the end of each month. One copy should be retained for station files. One form should be used for each month’s observations.

The station name in full, the month and year shall be entered neatly on each sheet in the appropriate spaces provided at the top of the form.

The form has four (4) categories of information to be entered:

- measurement site
- measurements
- leads
- remarks

Table 7.6 describes the guidelines for filling the form.



Table 7.6: Ice Thickness Monthly Report

ITEM #	ITEM	DESCRIPTION
1	Measurement Site	The bearing and distance from a significant landmark and report any change of the site, should a change become necessary
2a	Date of Measurement	The date (a two-figure number) when the ice measurement is taken
2b	Ice Thickness	Measured ice thickness to the nearest whole centimetre
2c	Depth of Snow	Average snow depth to the nearest whole centimetre
2d	Surface Topography	Surface features at the measurement site and seaward (Table 7.3)
2e	Cracks/Leads	The presence and orientation of cracks and leads (Table 7.4)
2f	Method Used	The method used to measure or estimate the ice thickness (Table 7.5)
2g	Transmitted by Message	Y (yes) or N (no) whether or not the weekly report was transmitted
3	Leads	The presence and when possible the location orientation, length and width (in metres or kilometres) of leads shall be noted
4	Remarks	Additional information (include the date ice first appears and the date the ice is unsafe for measurement)



7.3 Examples of Ice Thickness Reports

Example 1

ITCN1 CYFB 072200
07112 15611

Heading

ITCN1 CYFB 072200

ITCN1 message identifier
CYFB station identifier (Iqaluit)
072200 time of filing report for transmission was 7th day of the month at 2200UTC

Body

07112 15611

07 date of measurement was 7th day of the month
112 ice thickness is 112 centimetres
15 average depth of snow is 15 centimetres at measurement site
6 surface topography = 4/10 - 10/10 ridging
1 few cracks
1 measurement made with ice auger kit

Example 2

ITCN1 CYVN 072100\
07095 08401

Heading

ITCN1 CYVN 072100

ITCN1 message identifier
CYVN station identifier (Cape Dyer)
072100 time of filing report for transmission was 7th day of the month at 2100UTC

Body



07095 08401

07 date of measurement was 7th day of the month
095 ice thickness is 95 centimetres
08 average depth of snow is 8 centimetres at measurement site
4 surface topography = 0 - 1/10 ridging
0 no cracks or leads
1 measurement made with ice auger kit

The above examples would be assembled into a bulletin by YFB, the designated collection station, in the following form:

ITCN1 CYFB 072230
YFB 07112 15611
YVN 07095 08401

Figure 7.1: Ice Thickness Form 0063-2317

 Environment Canada / Environnement Canada						
ICE THICKNESS MONTHLY REPORT			Station Bagotville (A) Quebec Month December 2001			
1. Measurement Site: Approximately 200 metres eastward from the wharf and some 250 metres off shore on baie de Ha Ha.						
2.						
Date of Measurement (a)	Ice Thickness (centimetres) (b)	Depth of Snow (centimetres) (c)	Surface Topography (d)	Cracks/Leads (e)	Method Used (f)	Transmitted by Message (Y/N) (g)
03	nil	nil	n/a	n/a	0	N
10	3	1	0	0	0	Y
17	15	7	1	0	1	Y
23	22	10	1	1	1	Y
31	22	6	2	1	1	Y
3. Leads: A few shore leads were seen until approximately December 12. Icebreakers keep a 25 metre channel (approximately) open to navigation on the bay and along the Saguenay River throughout most of the winter season.						
4. Remarks: Observations on December 03 and 10 were visual. After December 15, the ice was piling on shore due to tides and ice ridging from shore to approximately 100 metres off shore. The bay was completely covered with ice on December 17. Several fishing huts were seen on the bay beginning approx. December 20. Relatively warmer temperatures kept the ice thickness fairly unchanged December 23-31.						
Observer(s) <u>Staff</u>						
Reporting Instructions (reference: MANICE, ninth edition, chapter 7)						
1. For "Measurement Site" note bearing and distance from a significant landmark, and report any significant change of the site. The ice thickness should be measured, as near as practicable, at the same spot throughout the ice season and from season to season.						
2. "Surface Topography", "Cracks/Leads" and "Method Used" are coded according to tables 7.3, 7.4, and 7.5 in MANICE.						
3. Indicate by Y/N in the final column whether or not the weekly report was transmitted.						
4. In "3. Leads", when possible, include: location, length and width (metres or kilometres).						
5. In "4. Remarks", indicate if this is the first/last monthly report of the season and please include complementary information such as: the date new ice first appears, date ice is unsafe for measurement, method used when (f) is coded as "Other Means", etc.						
6. The original of this form should be forwarded by mail at the end of each month to: Client Services, Canadian Ice Service, Environment Canada, 373 Sussex Drive, Ottawa ON K1A 0H3 and a copy should be retained on station files.						
0063-2317						



LIST OF REFERENCES

- 1 World Meteorological Organization, *WMO SEA-ICE NOMENCLATURE*, Supplement No. 4, WMO - No. 259. Tp. 145, 1985.
- 2 Meteorological Service of Canada (previously known as Atmospheric Environment Service), *MANMAR, Manual of Marine Weather Observing*, Seventh Edition, Environment Canada, December 1996.
- 3 Meteorological Service of Canada (previously known as Atmospheric Environment Service), *MANTRANS, Meteorological Teletype Traffic*, Volume 1, First Edition, Environment Canada, Nov. 1983.
- 4 Meteorological Service of Canada (previously known as Atmospheric Environment Service), *SAR ICE INTERPRETATION GUIDE*, Environment Canada, 1990.
- 5 Meteorological Service of Canada (previously known as Atmospheric Environment Service), *SLAR USERS MANUAL*, First Edition, Environment Canada, 1991.
- 6 Canadian Coast Guard - Marine Communications and Traffic Services, *RADIO AIDS TO MARINE NAVIGATION*, Fisheries and Oceans Canada, 2001 (issued annually).