

Liquid Water Equivalent (LWE) – A New Deicing Standard

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Current US Snow Intensity

- NWS reports Snow Intensity based on visibility
 - Visibility $> \frac{1}{2}$ SM is Light
 - Visibility $> \frac{1}{4}$ SM and $\leq \frac{1}{2}$ SM is Moderate
 - Visibility $\leq \frac{1}{4}$ SM is Heavy

All other precipitation types have intensity based on precipitation rate.

Aviation Deicing Operations

Holdover Charts are based on LWE

TABLE 4K. FAA GUIDELINES FOR HOLDOVER TIMES KILFROST ABC-S PLUS TYPE IV FLUID MIXTURES AS A FUNCTION OF WEATHER CONDITIONS AND OUTSIDE AIR TEMPERATURE

CAUTION: THIS TABLE IS FOR DEPARTURE PLANNING ONLY AND SHOULD BE USED IN CONJUNCTION WITH PRETAKEOFF CHECK PROCEDURES.

Outside Air Temperature		Manufacturer Specific Type IV Fluid Concentration Neat-Fluid/Water (Volume %/Volume %)	Approximate Holdover Times Under Various Weather Conditions (hours: minutes)					
Degrees Celsius	Degrees Fahrenheit		Freezing Fog	Snow/ Snow Grains	Freezing Drizzle*	Light Freezing Rain†	Rain on Cold Soaked Wing**	Other‡
-3 and above	27 and above	100/0	2:10-4:00	1:15-2:00	1:50-2:00	1:05-2:00	0:25-2:00	CAUTION: No holdover time guidelines exist
		75/25	1:25-2:40	0:45-1:15	1:00-1:20	0:30-0:50	0:10-1:20	
		50/50	0:30-0:55	0:15-0:30	0:15-0:40	0:15-0:20		
below -3 to -14	below 27 to 7	100/0	0:55-3:30	1:00-1:45	***0:25-1:35	***0:20-0:30		
		75/25	0:45-1:50	0:35-1:00	***0:20-1:10	***0:15-0:25		
below -14 to -25 or LOUT	below 7 to -13 or LOUT	100/0	0:40-1:00	0:15-0:30				

FAA Snow Holdover Testing

- Light Snow 0-1.0 mm/hour (0-0.04")
- Moderate Snow 1-2.5 mm/hour (0.04-0.10")
- Heavy Snow >2.5 mm/hour (>0.10")

At 10:1 Ratio, 2.5 mm/hour = 1" snow/hour

WMO Snow Intensity

- Light Snow 0-1.0 mm/hour (0-0.04")
- Moderate Snow 1-5.0 mm/hour (0.04-0.20")
- Heavy Snow >5.0 mm/hour (>0.10")
 At 10:1 Ratio, 5.0 mm/hour = 2" snow/hour

This is not consistent with current practices. SNOINCR
Remark used when snow accumulates 1" in an hour

Snow Visibility Not Reliable for Holdover Times

- Night visibility better than Day in identical Snow (nearly doubles at night)
- Partial melting aloft lowers visibility with same water content (heavy wet snow)

LWE for Snow Intensity

Solution: LWE (Liquid Water Equivalent) for determining snow intensity

- LWE is the standard used to measure Hold Over Times
- LWE is accurate for all types of snow (heavy/wet, dry powdery, etc.)
- LWE is already present at most airports

Enhance METAR/SPECI

- Proposal to allow LWE be used for Snow Intensity instead of visibility where available.
- Proposal to add METAR Remark with LWE for airline deice operations
- Increases accuracy and safety in aviation deicing events.

Snow Intensity

- NWS reports Snow Intensity based on visibility
 - Visibility > ½ SM is Light
 - Visibility > ¼ SM and <= ½ SM is Moderate
 - Visibility <= ¼ SM is Heavy
- FAA Holdover Guidance is Different:

Time of Day	Temp.		Visibility (Statute Mile)							Snowfall Intensity
	Degrees Celsius	Degrees Fahrenheit	≥ 2 1/2	2	1 1/2	1	3/4	1/2	≤ 1/4	
Day	colder/equal -1	colder/equal 30	Very Light	Very Light	Light	Light	Moderate	Moderate	Heavy	Snowfall Intensity
	warmer than -1	warmer than 30	Very Light	Light	Light	Moderate	Moderate	Heavy	Heavy	
Night	colder/equal -1	colder/equal 30	Very Light	Light	Moderate	Moderate	Heavy	Heavy	Heavy	
	warmer than -1	warmer than 30	Very Light	Light	Moderate	Heavy	Heavy	Heavy	Heavy	

NOTE 1: This table is for estimating snowfall intensity. It is based upon the technical report, “The Estimation of Snowfall Rate Using Visibility,” Rasmussen, et al., Journal of Applied Meteorology, October 1999 and additional in situ data.

NOTE 2: This table is to be used with Type I, II, III, and IV fluid guidelines.

HEAVY = Caution—No Holdover Time Guidelines Exist

Questions?