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KEY TO METEOROLOGICAL RECORDS DOCUMENTATION NO. 3.031

HISTORY OF OBSERVATIONAL
INSTRUCTIONS ON FOG



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INTRODUCTION

The Key to Meteorological Records Documentation Series has been established to provide guidance information to research personnel making use of climatological data.

Frequently users of such data have found it necessary to spend a great deal of time establishing whether the criteria for observing or computing various elements have changed over the period of record.

It is therefore hoped that the presentation of this series may not only conserve valuable time but may have a direct influence in improving the accuracy of research results.

As a part of the above series, it is intended that this documentation show a complete chronological annotation of changes in instructions issued for the observation and recording of fog from 1891-1958.

In reviewing past instructions it was noted that frequent reference was made to the forms in current use. The original outline was to include related changes in forms 1001's, 1130's, etc., but this proved unsuccessful due largely to the frequent evolution of the various forms.

Material used in documenting this particular element was obtained for the most part from Instructions for Preparing Meteorological Forms, Circular N, Circular Letters, Topics and Personnel, and in several instances from correspondence.

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SYNOPSIS
Part One

Fog was recorded from 1891-1931 as either light or dense. Dense fog only was considered as a day with fog.

Instructions to observers issued in 1893 defined a standard for determining a day with fog as one in which fog surrounds the station for one hour or more, and is dense enough to obscure objects at a distance of one thousand feet. This same standard apparently became accepted also as the criteria for distinguishing light from dense fog.

In 1906, a day with fog no longer referred to dense fog. A day with fog was recorded as light or dense dependent upon the condition observed. Light fog was not recorded on days when dense fog occurred, unless there were two distinct occurrences of fog.

In 1908, instructions were issued to commence recording the time of beginning and ending of days with fog. Later instructions, 1909-1938, were made more explicit, however, the criteria remained basically the same throughout the period.

It might be noted that on Form 1083 for the period 1932-38, fog was entered under the designations "light", "moderate", and "dense", while all other forms and publications such as Forms 1001 and 1030 carried headings of light and dense fog.

Until the necessary printing corrections were made, moderate fog was recorded as light fog and entered on climatological records and carried in climatological publications as such.

Prior to July 1, 1944, inconsistencies were noted in recording days with light and heavy fog between the "Climatological Record Book" and current issues of Forms 1001, 1002, and 1003. After July 1, 1944, days with light fog were counted as such for record purposes, regardless of whether heavy fog occurred. A day with heavy fog also counted as a day with light fog. Thus the total of days with light fog included all days when fog occurred, regardless of intensity. The number of days with heavy fog was assumed to be included in this total, although recorded separately.

Dense fog only was recorded in the "Climatological Record Book" through 1930. Days with light and dense fog were recorded from 1931-42; days with light and heavy 1943-50. From 1931-June 19, 1944, if light and dense or (heavy) fog occurred on the same day, it was recorded as a day with dense or (heavy) fog only.

Light, moderate, and thick descriptions were all entered in the light fog column.

With the beginning of Form 1001C in 1949 and continuing in the present publication, "Local Climatological Data", fog has been recorded only on days that it obstructed visibility to 1/4 mile or less. "No distinction is made between fog and ground fog or ice fog."

ANNOTATED CHANGES TO
INSTRUCTIONS FOR THE OBSERVATION OF FOG

PART 1. SYNOPTIC AND CLIMATOLOGICAL

1891 Fog will not be recorded in tenths, but recorded as dense or light except when it occurs in only a portion of the sky, then as 1/10 fog in NW, etc. When fog prevails to such an extent as to fully obscure the sky from the point of observation the weather will be recorded as foggy. When light fog is observed with no clouds, the state of weather will be recorded as cloudless.

Fog will be considered in determining the most frequent kind of clouds, and the direction recorded for fog will be considered in ascertaining the most frequent direction of clouds. The amount of fog will not be considered in the sums or averages.

1892 (change) When dense fog is observed in the region of lower clouds, but the sky is clear overhead, the weather will be recorded as "clear", otherwise it must be recorded "foggy".

Fog with lower clouds in the same region should be recorded as "light".

1893 (change) Enter the word "fog" only on the days on which fog surrounds the station for one hour or more, and is dense enough to obscure objects at a distance of one thousand feet. The number of such days will be recorded.

Note: Above criteria accepted as identifying "dense fog".

1897 (change) Dense fog (unless prevailing with nimbus clouds) will not be recorded when clouds are observed, except when the sky can be seen from an elevation (roof of a building, etc.), then the weather will be determined from the amount of clouds; otherwise, when dense fog is observed the weather will be recorded as "foggy". When light fog is observed, the state of weather will be determined from the amount of clouds.

1906 (change) Enter the word "light" or "dense" on days when these conditions are observed midnight to midnight, standard of time in local use. Light fog will be recorded on days when dense fog occurs, unless there are two distinct occurrences of fog.

Note: Dense fog is one that is dense enough to obscure objects at a distance of one thousand feet.

1908 (change) Enter time of beginning and ending on days when fog, "light" or "dense" are observed at station, midnight to midnight, standard of time in local use.

1920 (change) When dense fog obscures eight-tenths or more of the sky, the state of the weather will be recorded as "foggy".

1938 (change) When ground fog is observed, the state of the weather will be determined by the amount of clouds observed.

1946 (change) Ground fog will be treated separately and will not be considered as a day with fog.

1949 (change) Criteria for light fog will be 5/16 mile to and including 6 miles; for heavy fog, 1/4 mile or less.

May 15 - Entry for "light" or "heavy" fog is discontinued. The symbol "F" will be entered when appropriate to indicate all forms of fog.

SYNOPSIS
Part Two

Published instructions for the purposes of recording and transmitting observations for airways have been issued in various editions of the WB "Circular N".

Commencing with the first edition of this publication issued in 1928, it was noted that fog was recorded for the synoptic and airways observation as either "light" or "dense" with criteria considered for "light fog" being less than 1/2 mile and that for "dense fog", less than 1000 feet, ground fog being considered as fog obscuring objects on the ground but not obscuring sky or stars.

The 1932 edition changed the fractional limits of visibility obstructed by fog to "light fog" 3/4 mile or greater, "dense fog" 1/5 mile or less. This edition also introduced the term "moderate fog" to be used between the new limits 1/5 mile and 3/4 mile.

In 1935, the use of symbols was adopted to indicate the type of obstruction limiting visibility at time of observation. This replaced the written or abbreviated method formerly used. The following symbols applied to fog:

- (F-) light fog
- (F) moderate fog
- (F+) dense fog

Previous specified limits for estimating degree of intensity remained the same.

The 4th edition issued in 1939 created a fourth term "thick" fog along with a further refinement applied to the other terms as to visibility limits. The following classification briefly summarizes the period 1939-42:

- (F-) Light, 5/8 mile or more
- (F) Moderate, 5/16 mile to less than 5/8 mile
- (F+) Thick, 1/5 mile to less than 5/16 mile
- (FF) Dense, less than 1/5 mile to be reported as 1/8 or zero miles

In 1943, significant changes occurred both to the terms thick and dense fog and to the criteria for intensity limits. Intensity terms thick and dense were replaced by the more appropriate term "heavy". The new limits now in use are:

- (F-) light - 6 miles - 3300 ft.
- (F) moderate - 3299 ft. - 1650 ft.
- (F+) heavy - 1649 ft. - 0 ft.

Effective January 1, 1947, the use of intensity symbols (+ and -) for obstruction to vision were discontinued. Intensities thereafter were noted from the reported visibility at time of fog.

Entries for "moderate" fog were discontinued in 1949. Descriptive terms now in use are "light" and "heavy" with the following revised limits:

- light, 5/16 to 6 miles inclusive
- heavy, 1/4 mile or less

A later revision adopted in 1949 and continuing at present, omitted entries of obstructions to vision from observing forms when the visibility was 7 miles or more at the station. If the visibility was less than 7 miles, obstructions were reported. This was designated as either F, GF, or IF.

ANNOTATED CHANGES TO
INSTRUCTIONS FOR THE OBSERVATION OF FOG

PART II. AIRWAYS

1928 Standard for the reporting of -

"Light fog", when a fog with a visibility of only about 1/2 mile is present.

"Dense fog", when a fog of a denser character is observed, and visibility is less than 1000 feet.

"Ground fog", when a fog obscures objects on the ground, but does not materially obscure the sky or stars.

1932 (change)

"Dense fog", when fog is present, the visibility is less than 1/5 mile (1000 feet) and the sky can not be seen overhead.

"Light fog", to be reported when fog is present and the visibility is greater than 3/4 mile.

"Moderate fog", to be reported when fog is present and the visibility is over 1/5 mile, but not more than 3/4 mile.

"Dense fog" (revised), to be reported when fog is present, the visibility is 1/5 mile or less, and the sky can not be seen overhead. When this occurs, it will be reported as a "sky condition as the first words of the report. The ceiling in any observation in which "dense fog" is reported will invariably be reported as zero and the visibility as less than 1/5 mile.

"Dense ground fog", to be reported when fog is present in a layer through which the sky can be seen and the visibility is 1/5 mile or less.

1935 (change) If "dense ground fog" is reported, indicate in remarks whether or not the heavenly bodies are visible, e.g., "stars visible overhead", "sun visible", etc.

A Special Observation is required for:

Beginning or ending of fog, and the beginning or ending of "dense fog" including "dense ground fog" or "dense ice fog".

Revision effective July 1, 1935.

<u>Symbols Used</u>	<u>Reporting Term</u>	<u>Specifications for Estimating Degree of Intensity</u>
(F-)	<u>Light Fog</u>	When fog is present and the visibility is over 3/4 mile.
(F)	<u>Moderate Fog</u>	When fog is present and the visibility is in excess of 1/5 mile but not exceeding 3/4 mile.
(F+)	<u>Dense Fog</u>	When fog is present and the visibility is 1/5 mile or less. (This term will not be reported as an "obstruction to vision" but when occurring will be reported as the "sky condition", the ceiling being reported as "zero" in all cases.)

1939 (change)

(F-)	Light	When fog is present alone and objects are visible at 5/8 mile or more. Visibility to be reported as 3/4, 1, 1 1/4, 1 1/2, etc., miles.
(F)	Moderate	When fog is present alone and objects are visible at 5/16 mile but not at 5/8 mile. Visibility to be reported as 1/2 mile.
(F+)	Thick	When fog is present alone and objects are visible at 1/5 mile but not at 5/16 mile. Visibility to be reported as 1/4 or 1/5 mile.
(FF)	Dense	When fog is present alone and objects are not visible at 1/5 mile. Visibility to be reported as 1/8 or zero miles.

Ice Fog - Light (IF-)	Same as "light fog".
Moderate (IF)	Same as "moderate fog".
Thick (IF+)	Same as "thick fog".
Dense (IFF)	Same as "dense fog".

Note - If "sky is given with "dense ice fog" it will be understood that the condition is similar to "dense ground fog".

Ground Fog - Light (GF-)	Same as "light fog".
Moderate (GF)	Same as "moderate fog".
Thick (GF+)	Same as "thick fog".
Dense (GFF)	Same as "dense fog".

1941 (Addition to requirement for special observation)

1. Beginning or ending of fog, ground fog, or ice fog.
2. Beginning or ending of thick or dense ground fog, thick or dense ice fog, or thick or dense fog. (A change from thick to dense or the reverse of the same type fog need not require a special.)
3. A change from one type of fog to another type of fog, example, ground fog to fog, ice fog to fog, fog to ground fog, etc.

1943 Effective January 1, 1943 - change item 2 above to read - Beginning or ending of heavy fog, heavy ground fog, or heavy ice fog.

1945 Effective July 1, 1945

Symbols in use

F
GF
IF

A plus or minus sign following the symbols for obstructions to vision will indicate heavy and light degrees of intensity, respectively. The absence of any sign will indicate that the intensity is moderate.

1947 Effective January 1, 1947

The use of intensity symbols (+ and -) with obstructions to vision will be discontinued. Note that these symbols will continue to be used with precipitation.

1949 The following changes were made:

Entries for "moderate fog" will be discontinued. Criteria for "light fog" will be for visibilities of 5/16 mile to 6 miles inclusive; for "heavy fog", 1/4 mile or less.

COMPOSITE

<u>Period</u>	<u>Intensity Classification</u>			
1891 - 1892	Light Fog (no definition)		Dense Fog (no definition)	
1893 - 1927	Light Fog (no definition)		Dense Fog (must surround the station for one hour or more, and obscure objects at 1000 ft.)	
1928 - 1931	Light Fog (visibility of only about 1/2 mile)		Dense Fog (visibility less than 1000 ft.)	
1932 - 1938	Light Fog (visibility greater than 3/4 mile)	Moderate Fog (visibility greater than 1/5 mile but not more than 3/4 mile)	Dense Fog (visibility 1/5 mile or less, sky cannot be seen overhead)	
<p>Note: Ground Fog and Ice Fog are governed by the same limits, with the exception of Dense Ground, or Ice Fog, in which case the sky must be visible overhead.</p>				
1939 - 1942	Light Fog (visibility 5/8 mile, 3300 ft. or more)	Moderate Fog (visibility 5/16 mile, 1650 ft. to but not including 5/8 mile, 3300 ft.)	Thick Fog (visibility 1/5 mile, 1000 ft. to but not including 5/16 mile)	Dense Fog (visibility less than 1/5 mile, 1000 ft.)
1943 - 1948	Light Fog (6 miles to 5/8 mile, 3300 ft.)	Moderate Fog (less than 5/8 mile to 5/16 mile, 1650 ft.)	Heavy Fog (less than 5/16 mile to zero ft.)	
1949 -	Light Fog (5/16 mile to 6 miles inclusive)	Heavy Fog (1/4 mile or less)		
<p>Criteria for "moderate" fog discontinued.</p>				
1949 (May) To Date	Fog (7 miles or less)			
<p>Entry for "light" or "heavy" fog discontinued.</p>				