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FEDERAL METEOROLOGICAL HANDBOOK No. 2

Synoptic Code

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U.S. DEPARTMENT OF COMMERCE
U.S. DEPARTMENT OF DEFENSE
U.S. DEPARTMENT OF TRANSPORTATION

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FEDERAL METEOROLOGICAL HANDBOOK No. 2

Synoptic Code

(Standards and Procedures for the
Coding of Synoptic Reports)

Effective January 1, 1969



**U.S. DEPARTMENT OF COMMERCE
U.S. DEPARTMENT OF DEFENSE
U.S. DEPARTMENT OF TRANSPORTATION
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Federal Meteorological Handbook No. 2

SYNOPTIC CODE

RECORD OF AMENDMENTS

Amendment		Effective date	Pages
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PREFACE

i. HISTORICAL. At its Fourth Session in Wiesbaden, Germany, March 1966 the Commission for Synoptic Meteorology (CSM) of the World Meteorological Organization adopted a few minor changes in the form of message and the tables of specifications in the synoptic reports from land and ship stations (FM 11.D and FM 21.D, respectively). These changes were subsequently approved by the Organization which specified 0000 GMT January 1, 1969 as the implementation date. The WMO resolutions and recommendations are designed to include certain basic procedures and specifications required for use on a world-wide basis and at the same time provide as much latitude as practicable to the individual services so that their national requirements can be met. As a member of the WMO the United States has certain commitments with regard to the coding procedures adopted by the organization which must be fulfilled. United States meteorological agencies (both civil and military) discharge these obligations by complying with WMO regulations regarding the data exchanged internationally, and providing for additional United States national requirements within the WMO framework.

ii. PURPOSE. The synoptic code has been issued as a Federal Meteorological Handbook to meet the requirement that all United States agencies having meteorological establishments use the same instructions for coding their surface synoptic reports. This action is in consonance with the established procedure of incorporating all instructions pertaining to the coding of meteorological data used by the several agencies into the series of Federal Meteorological Handbooks, insofar as feasible. This Handbook provides information on the variations and additions to the synoptic code used in the United States and elsewhere.

iii. AUTHORITY. This Handbook has been approved by appropriate officials of the Departments of Commerce, Defense and Transportation for use within these organizations. Therefore, the instructions contained herein are equally directive on all meteorological personnel of these three organizations. Inquiries by field personnel regarding the contents of this Handbook shall be forwarded to the headquarters of their organization through established administrative channels.

iv. FORMAT OF THE HANDBOOK. This Handbook has been arranged to provide all concerned with the information required with as few cross references as practicable. In physical make-up the handbook consists of eleven parts. Part A contains information of a general nature, such as procedures, definitions of terms, etc. Part B deals in detail with the coding of synoptic reports by land stations on United States territory in North and Central America (WMO Region IV) and the Pacific Area (WMO Region V). Part C contains the code tables required in coding reports in the area covered by Part B. Part D contains the surface synoptic codes, and their variants, for use by both land and ship stations, adopted by the WMO plus the operating notes and code tables (additional to those given in Parts B and C) required for their use. Parts E to K, inclusive, contain information on the various WMO Regions with respect

to the adopted Regional Code practices and national variations, if any, that are being used. Each of these seven Parts is complete with respect to a Region and it is in no way dependent on another Regional Part for an understanding of its contents; however, some reference to Parts B, C and D is necessary in order to obtain complete information on the coding arrangements used by a particular WMO Region. In order to meet both civil and military requirements, it is necessary to provide all United States stations, both interior and overseas, with the information needed to code and decode reports from all areas of the world. As the majority of United States facilities are located in North and Central America and the Northern Pacific, the instructions for these areas have been presented as a unit in Parts B and C of this Handbook. This arrangement of dividing the Handbook into Parts is considered to be the best arrangement practicable for meeting all United States requirements in one publication.

v. **NUMBERING SYSTEM.** As mentioned in the preceding paragraph, the major subdivision of the Handbook is the Part which is identified by a capital letter (i.e., A, B, C, etc.). The Part is subdivided into Chapters which are numbered by Arabic numbers in consecutive order; however, each Chapter is always uniquely identified by both the Part letter and the Chapter number. For example: If Part A had three Chapters and Part B five Chapters, the numbers A1, A2, A3, B1, B2, B3, B4 and B5 would always be used to identify the Chapters so that each would have a unique number.

Each Chapter is subdivided into paragraphs and subparagraphs, which are identified by Arabic numbers according to the decimal system which is read from left to right in descending order of importance. For example: The paragraph number 1.2.3.6 means that the figure 1 on the extreme left indicates the first major subdivision for the chapter, the figure 2 means the second subdivision under the first major subdivision. The figure 3 means the third subdivision under figure 2, and the figure 6 means the sixth subdivision under figure 3. If additional subdivision is required, lower case letters, enclosed in parentheses, in alphabetical order, are used.

Normally, the paragraph or subparagraph is uniquely numbered by using the PART letter, the Chapter number and the paragraph, or subparagraph number. For example: Using the subparagraph number given above (i.e., 1.2.3.6), that subparagraph in Chapter B5 would be written B5-1.2.3.6 which is unique as no other paragraph in the Handbook would have that number. Please note that a dash is always used to separate the Chapter from the paragraph or subparagraph number. In almost all instances, cross references to paragraphs are made by means of the full unique number. Occasionally, when reference is made to a paragraph within the same Chapter the reference will read "paragraph 2.2 in the Chapter", or "paragraph 2.2, preceding", or "paragraph 2.2, following". This secondary method of reference is made for the convenience of the reader so that he will know the referenced paragraph is in the immediate vicinity and can be quickly found without checking for PART and Chapter number.

Pages of the Handbook are numbered consecutively for each Chapter starting with the figure one. The complete page number consists of the PART letter, the Chapter number and the consecutive page number. For example: If there are 3 pages in Chapter A2, they are numbered A2-1, A2-2 and A2-3; if there are 4 pages in Chapter A3 they are numbered A3-1, A3-2, A3-3 and A3-4; etc.

vi. AMENDMENTS. Amendments to this Handbook will be issued, when required, in the form of write-in corrections or revised pages, as appropriate. They will be inserted in the Handbook in accordance with the instructions accompanying them. The entry in the Handbook of all items in the amendment will be acknowledged by making the appropriate entries in the "Record of Amendments" form given in the reverse of the Title Page. This Handbook may be supplemented by addenda issued separately by the various agencies concerned. The directives in an addendum apply only to the stations of the issuing service.

vii. IMPLEMENTATION. All United States operated surface synoptic observing stations will begin using the synoptic code contained in this Handbook **January 1, 1969 at 0000 GMT.**

viii. WMO REGIONS. A map showing the boundaries of the various WMO Regions is given in the Appendix to this publication.

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(To be issued later)

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(To be issued later)

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REGION IV (NORTH AND CENTRAL AMERICA)**

(To be issued later)

**PART I. REGIONAL PROCEDURES AND NATIONAL PRACTICES WITHIN WMO
REGION V (SOUTH-WEST (PACIFIC))**

(To be issued later)

**PART J. REGIONAL PROCEDURES AND NATIONAL PRACTICES WITHIN WMO
REGION VI (EUROPE)**

(To be issued later)

**PART K. REGIONAL PROCEDURES AND NATIONAL PRACTICES WITHIN
ANTARCTICA**

(To be issued later)

APPENDIX—MAP OF WMO REGIONS

PART A
INTRODUCTION

C

PART A—INTRODUCTION

CHAPTER A1. GENERAL INSTRUCTIONS

1 General

1.1 This Handbook contains the Standards and Procedures established by the WMO and the United States for the coding of Synoptic Reports. These instructions are intended for use **only** in the **coding and decoding** of Surface Synoptic Reports. Hence, reference to observing procedures, recording of the observations, communications, etc., will be made only when necessary to explain coding procedures. It is recommended that all concerned consult the appropriate publication for instructions on observing procedures, communications, the recording of data on forms, etc., when detailed information on those operations are required.

2 Arrangement

2.1 In order to facilitate reference to instructions contained herein all paragraphs have been numbered throughout the entire manual. In addition, instructions have been cross referenced so that related instructions can be located quickly.

2.2 The information given in the Table of Contents plus the numerous cross references should lead quickly to any instruction required.

2.3 It will be noted that Parts B and C of the Handbook contain all the information required by United States stations in North and Central America and the Pacific area to code their surface synoptic reports. Further, that these two parts (i.e., B and C) of the Handbook conform to the WMO Standards, Procedures and Specifications with the exception of the units used for reporting some temperatures and amounts of precipitation.

They are in effect an amplification and simplification of the WMO instructions and specifications set forth in Part D of this Handbook. Therefore, the information required to code the individual elements common to Part B and other parts of the Handbook are given **only** in

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Part B. Also, that the code tables required for Part B (and in some instances, other parts of the Handbook) are given **only** in Part C. Coding instructions and code tables required for elements appearing in Part D, and which are not included in Parts B and C, are given in Part D. Information required for coding elements given in other parts of the Handbook (i.e., Parts E to K, inclusive) which are common to Part D or Parts B and C are not repeated in these other parts. Information required for coding elements which are unique for a part will be given in that part **only**. Appropriate cross references are given in Parts D to K, inclusive, so that any information required can be obtained quickly from Parts B, C, or D, as appropriate.

3 Application

3.1 United States reporting stations (both civil and military) shall code their reports for transmission according to the instructions given in this Handbook as follows:

3.1.1 **Part A**—This part applies to all United States stations, regardless of their location.

3.1.2 **Parts B and C**—These parts apply to all United States land stations in North and Central America (WMO Region IV) and Hawaii and the Pacific Area (WMO Region V), except that Chapter B17 shall be used **only** by Weather Bureau stations.

3.1.3 **Parts D, E, F, G, H, I, J and K**—These parts apply to all United States land stations, as appropriate, other than those specified in paragraph 3.1.2.

(NOTE: The substance of Parts H and I has been incorporated into the text of parts B and C. Parts H and I have been included in the Handbook so that the actual text of the adopted Coding Practices of WMO Regions IV and V will be available to all concerned, if required.)

3.1.4 Military Stations—The WMO Regional procedures of the Region in which the station is located shall be followed unless otherwise authorized.

3.1.4.1 Air Force—At Air Force installations the Air Weather Service Wing and Group Commanders will determine whether or not all the regional and national procedures within the command areas are satisfactory for operational requirements (see paragraph A1-3.1.2 for exception). If the specified regional and national procedures are incompatible with operational requirements so as to necessitate instituting deviating procedures action will be taken in accordance with Air Weather Service Addendum No. 1 to this Handbook.

3.1.4.2 Navy—At Navy installations, if Commanding Officers or Officers-in-Charge consider the specified regional and national procedures to be incompatible with operational requirements, authorization to deviate from such procedures will be sought from the Director, U.S. Naval Weather Service.

4 Separation of the Handbook

4.1 Civil Stations—In some cases Civil stations will not have a requirement for the entire Handbook. These stations may simplify it by removing those portions not required in daily operations. For example: A station in the interior of the United States not plotting reports from outside of North America would require only Parts A, B, and C of the Handbook. In these instances the meteorologist in charge is authorized to make such separation of the station copy on a temporary basis as may be indicated to promote its efficient use (OPTIONAL). The separated portions will be placed in a binder which must be filed so as to be readily available to all personnel. All amendments will be entered in the separated material.

4.2 Military Stations—Military stations will keep their Handbook intact; i.e., no separation will be made.

5 Composition of the Report

5.1 The surface synoptic report from land stations consists of figure groups, each group

having five figures. However, in some instances plain language words or contractions are used to report the occurrence of certain meteorological phenomena, for which there is no appropriate code figure group. Each figure in each group has significance according to its position in the group and according to the position of the group in the report.

5.2 When observed datum is not available for an element the appropriate code figure or missing indicator will be reported to preserve the continuity of the group.

5.3 The groups in the report are sometimes referred to as the "first", "second", etc. When this is done, Iiii is always counted as the first group, Nddff as the second, etc. The self-identified groups are usually referred to by the indicator figure of the group, for example, group 7RRR,s is called the "7-group", 8N_{Ch,h} is called the "8-group", etc.

5.4 The first six groups could be called the **universal** groups as they are **mandatory** groups and are used by all services. Synoptic reports included in collectives used for international exchange purposes via radio and other means normally contain, as a minimum, the first six groups.

5.5 The remaining groups in the message are known as **supplementary** groups and are reported in accordance with WMO or national procedures and specifications, as appropriate.

5.6 The **supplementary** groups are included or omitted from the message in accordance with (a) instructions, or (b) if data are not observed due to nonoccurrence of the phenomenon. The first figure of each **supplementary** group is the group identifier; therefore, the omission of one or more of these groups from the message does not prevent identification of the succeeding groups. When any of the **supplementary** groups are included in the message, they will appear in numerical order (i.e., 7, 8, 9, 1, 2, etc.)

6 WMO Instructions

6.1 The symbolic forms of messages for all surface reports (both land and ship) and the general instructions for their use adopted by the World Meteorological Organization are

given in Part D of this Handbook. The forms of messages included are: the three specified for use by land stations (i.e., SYNOP, METAR and SPECI) and the four specified for use by ship stations (i.e., SHIP (both complete and abbreviated), SHRED and SPESH). This

WMO material has been included primarily to provide all concerned with the basic information needed to decode these reports, if required. Parts B and C are used in conjunction with Part D to obtain all of the detailed information required to decode these reports.

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CHAPTER A2. TERMS AND DEFINITIONS

1 General

1.1 The WMO uses a number of terms in connection with the coding of meteorological data that require precise definitions. In some instances these terms are used in the general sense, in others a precise definition of the term is required. The list of terms given here contains some of each of these types of definitions and is included so that all concerned will have a clear understanding of the meaning of the terms used throughout this manual.

2 Standard Hours of Observation

2.1 The WMO standard hours of primary surface synoptic observations are 0000, 0600, 1200 and 1800 GMT. These primary reports are sometimes referred to as **6-hourlies**. (Par. A2-4.2)

2.2 The WMO standard hours of intermediate surface synoptic observations are 0300, 0900, 1500, and 2100 GMT. These intermediate reports are sometimes referred to as **3-hourlies**. (Par. A2-4.2)

2.3 all United States stations shall use the WMO standard hours of observation (i.e., 0000, 0300, 0600, 0900, 1200, 1500, 1800, and 2100 GMT) as given in paragraphs A2-2.1 and A2-2.2. The one exception to this rule is given in paragraph A2-3.1.

2.3.1 United States stations located in territories or countries having a national meteorological service shall take their **primary and intermediate** surface synoptic observations at the times designated by the National Meteorological Service of the place in which they are located, even though such designated times may vary from the WMO standard hours of observation.

2.3.2 United States stations wishing to deviate from the instructions given in paragraphs A2-2.3 and A2-2.3.1 must obtain **prior approval** from their headquarters before implementing such deviations.

3 Universal Time

3.1 The WMO has noted that the terms "Greenwich Mean Time" (GMT), "Greenwich Civil Time" (GCT), and "Universal Time" (UT), all refer to mean solar time reckoned from midnight on the Greenwich meridian. However, the WMO has **adopted** Greenwich Mean Time as the standard designator to be used in all its references to time. The United States will follow the WMO practice and use **GMT** to designate the standard of time used for all synoptic purposes.

3.2 **Conversion of Time**—The basic procedure for converting Greenwich Mean Time (GMT) to local time is:

3.2.1 **West of Greenwich**—GMT is obtained by adding 1 hour to the local standard time of the area for each 15° the area lies west of Greenwich. For example: Eastern Standard time (i.e., 75th meridian west) is 5 hours **slower** than Greenwich time, therefore, the GMT equivalent of 2000 EST of March 1 is 0100 GMT of March 2 (i.e., $2000 + 500 = 2500$ hours or 1 day and 1 hour).

3.2.2 **East of Greenwich**—GMT is obtained by subtracting 1 hour from the local standard time of the area for each 15° the area lies east of Greenwich. For example: Japanese local standard time (i.e., 135th meridian east) is 9 hours **faster** than Greenwich time, therefore, the GMT equivalent of 0600 Japanese Standard time of June 20 is 2100 GMT of June 19 (i.e., $0600 - 0900 = -0300$ or 2100 hours of the previous day).

3.2.3 In addition to the basic conversion factors mentioned in paragraphs A2-3.2.1 and A2-3.2.2 there may be other factors to take into consideration in determining the exact difference between the standard of time in local use and Greenwich time such as daylight saving, variations in time zone boundaries, etc.

4 WMO Definitions of Times of Observations

4.1 Actual Time—In the case of a surface synoptic observation, the **actual** time of observation will be the time at which the barometer is read. In the case of METAR observations, the **actual** time of observation is the time when the observing of all elements required is completed (each national Service may decide the sequence of observing the elements appropriate to particular situations).

4.1.1 The foregoing does not preclude the use of the term **actual time of observation** with specific reference to an individual meteorological element but in such cases the individual meteorological element involved must be specifically named, e.g., **actual** time of observation of maximum temperature.

4.2 Standard Time—The **standard** time of observation is the internationally agreed time as given in WMO Technical Regulations. (Par. A2-2.2)

4.3 Filing Time—Once the observation is completed it is put in a form for transmission, at which time it becomes a **meteorological report**. The report may be in the form of figure-groups, plain language, or any other form approved for transmission. The **filing** time of the meteorological report is the time it is **delivered** to the communicator.

4.4 Scheduled Time of Transmission—The **scheduled** time is the time the meteorological report is scheduled to be transmitted on a communications system.

4.5 Actual Time of Transmission—This is the time that the meteorological report is actually **transmitted** over a communications system.

4.6 As a general principle, the estimation or measurement of the elements comprising a surface synoptic observation (i.e., SYNOP or SHIP) should be made in as short a period of time as possible. Any detailed calculations or observational routines associated with but not required to complete the SYNOP, SHIP, or METAR report should be carried out subsequently or previously.

5 WMO Definitions of Height, etc.

5.1 The WMO has adopted definitions of height, altitude, and elevation as follows:

5.1.1 Height—The following definitions apply:

5.1.1.1 The vertical distance of a level, point, or an object considered as a point, measured from a specified datum plane.

5.1.1.2 The vertical dimension of an object. (The term height may also be used in a figurative sense for a dimension other than vertical, e.g., the height of a letter or a figure painted on a runway.)

5.1.2 Altitude—The vertical distance of a level, a point or an object considered as a point measured from mean sea level.

5.1.3 Elevation—The vertical distance of a point or level on or affixed to the surface of the earth, measured from mean sea level.

6 Units of Wind Speed

6.1 The **knot** is the unit of speed equivalent to one international nautical mile (6,076.1 feet) per hour. The nautical mile is defined as the length of one minute of arc of a great circle of the earth. (1 international nautical mile = 1.15078 statute miles)

6.1.1 The **knot** is the unit of wind speed established by the WMO for use throughout the world.

6.2 A **meter per second** is approximately equivalent to two knots (1 m/s = 1.94258 knots \cong 2 knots).

7 WMO Identification System

7.1 The WMO system of **INDEX** numbers for identifying observing stations consists of two parts, i.e., **BLOCK** number (II) and the **STATION** number (iii). When these two numbers are combined, the resulting group provides a unique number for each station and is referred to as the **INDEX** number (IIiii). Synoptic reports are identified by the **INDEX** number (IIiii).

7.2 **BLOCK** numbers (II) are allocated to countries or geographic areas. Each of these **BLOCK** numbers identifies 1000 **STATION**

numbers (iii) which are assigned to individual stations in the specified country or area.

7.3 Individual synoptic reports from United States stations are **invariably identified** by the INDEX number (IIiii). This applies to all United States synoptic reports when sent as individual reports and when included in any collective.

7.4 International BLOCK and STATION number assignments are listed in:

WMO Publication No. 9, Volume A, Nomenclature of Stations; United States Naval Oceanographic Office publication Radio Weather Aids (H.O. Pub. No. 119); and the Weather Bureau's publication International Station Numbers for North and Central America.

8 Disposal of Insignificant Figures

8.1 The WMO has not formally adopted a procedure regarding the disposal of insignificant figures, therefore, United States stations will use the procedure given in Pars. A2-8.1.1 and A2-8.1.2 whenever computations require that a number be rounded.

8.1.1 If the fractional part to be disposed of is one-half or greater, the preceding digit will be increased by one.

8.1.2 If the fractional part to be disposed of is less than one-half, the preceding digit will remain unchanged, e.g., 29.248 rounded to the nearest tenth is 29.2.

8.1.3 The algebraic sign of the number will be disregarded; e.g., 1.5=2; -1.5=-2, etc.

9 Layer of Cloud

9.1 The WMO has adopted the following definition of layer of cloud: A layer of cloud exists when N, N_h, etc.=1 or more (i.e., Code figure 1 or higher in Code Table 1). In other words, any amount of cloud **greater than zero** is considered to be a layer.

10 Celestial Dome

10.1 Until the WMO defines this term United States observers will use the following definition: The celestial dome is that portion of the sky which would be visible provided

there was an unobstructed view, due to the absence of both lithometeors and hydrometeors, of the horizon in all directions from the point of observation. For surface synoptic purposes, the point of observation is on the surface of the earth.

(NOTE: The size of the celestial dome is fixed by definition and its size does not vary with respect to the areal coverage or density of any obscuring phenomenon that might be present.)

11 Maximum Wind Speed

11.1 For synoptic coding purposes the United States has defined a maximum wind speed at the surface of the earth as the highest average speed observed during any one minute interval (i.e., during 60 consecutive seconds).

12 Visibility

12.1 To date the WMO has been unable to devise one procedure for reporting visibility values which would adequately cover the requirements of all branches of applied meteorology. This question is under continuing and intensive study by the appropriate technical commissions; however, the WMO has stated that it seems highly improbable that in the near future international agreement will be reached on either the **minimum concept** or the **visibility index concept** as being completely satisfactory for all purposes.

12.1.1 The WMO did agree that until international agreement can be reached on a single method, the reporting of **minimum** visibility be maintained as the only recognized standard. In order to meet aeronautical requirements the WMO has agreed that when the horizontal visibility is different in different directions, and it is desired to report these variations, appropriate Q-code or plain language may be added at the end of the message.

12.1.2 The WMO has defined **visibility index** as the greatest visibility which is attained or surpassed throughout half of the horizon circle not necessarily continuous.

12.2 The United States uses the WMO definition for visibility index given in paragraph A2-12.1.2.

13 Parentheses and Brackets

13.1 The parentheses and brackets used to enclose symbols and words in the symbolic forms of message have the following meanings:

13.1.1 Parentheses—Elements or groups enclosed by parentheses are drop-out items and may or may not be included in the report depending on specified conditions, or the availability of data.

13.1.2 Brackets—Identification material enclosed by brackets is **not** included in the coded reports. Occasionally it is convenient to include words, numbers, or phrases for identification or other purposes in the symbolic forms of messages given in this publication. This material is enclosed in brackets so that its nature will be evident.

14 Celsius

14.1 The Ninth General Conference on Weights and Measures (1948) decided to adopt the term **Celsius** as a replacement for the word **centigrade**. Since that time many international organizations concerned with thermometry have also adopted the term. The United States (as a member of these various organizations and the Conference) has accepted this term for national use.

14.1.1 The only change involved was the replacement of the word **centigrade** by the word **Celsius**. The old centigrade thermometric scale of 0° for the freezing point and 100° for the boiling point of pure water was not changed.

CHAPTER A3. DISTRIBUTION OF REPORTS

1 General

1.1 Coded synoptic reports are distributed throughout the world over modern communication systems, both government and privately owned.

1.2 The WMO and its constituent bodies have adopted a number of standards and procedures to be followed regarding both the preparation and transmission of exchanges of these reports on an international basis. In general, most of these standards and procedures deal with the contents of the meteorological broadcasts, the time at which they are made, the headings, etc., so that a high degree of uniformity can be achieved. In general, these broadcasts provide for the transmission of meteorological reports, weather forecasts, and storm warnings, used by other meteorological services, ships, aircraft, etc.

1.3 The WMO has issued two publications containing information on these broadcasts which are "Transmissions" and "Information for Shipping" (Volumes C and D, respectively, of Publication No. 9, Weather Reports). This information is also given in the United States Naval Oceanographic Office publication Radio Weather Aids (H.O. Pub 118A-Atlantic and

Mediterranean Area; H.O. Pub 118B-Pacific and Indian Oceans Area).

1.4 The meteorological reports included in international broadcasts are given in the international form of message. United States Communications Editing Units preparing collectives of synoptic reports for inclusion in the continental broadcasts are issued separate instructions regarding the preparation of these collectives.

1.5 Within the United States the principal method of distributing coded synoptic reports is by teleprinter circuits. In areas not served by these circuits, other methods of communications are employed as available and in accordance with the station's current communications instructions.

1.6 In the United States, collections of coded synoptic reports are made on a national scale via the teleprinter circuits. In general, the transmissions begin as soon as practicable after the time of observation. The precise times of collection on civil circuits are given in the Federal Aviation Agency's ATS Handbook "Service C Weather Schedules" and the times of transmission on Air Force Circuits are given in Air Force Communications Service Manual 105-2, Volume II, "Weather Communications."

PART B
SYNOPTIC CODES USED BY UNITED STATES STATIONS
IN NORTH AND CENTRAL AMERICA
(WMO REGION IV)
AND THE
PACIFIC (WMO REGION V)

PART B—SYNOPTIC CODES USED BY UNITED STATES STATIONS IN NORTH AND CENTRAL AMERICA (WMO REGION IV) AND THE PACIFIC (WMO REGION V)

CHAPTER B1. SYMBOLIC FORMS OF MESSAGES AND DEFINITIONS OF SYMBOLS

1 General

1.1 In order to satisfy domestic and international requirements it is necessary to use three forms of messages for the **primary** surface synoptic reports from land stations within the United States and its possessions. (Pars. B1-2.2, B1-2.3 and B1-2.4) Each of these forms of messages is used within a specified geographical areas These areas are (a) the Northern Portion of WMO Region IV (i.e., the 49 continental States), (b) the Southern Portion of WMO Region IV (i.e., the Caribbean Islands, Central America, Mexico and the Bahamas) and (c) the Northern Portion of WMO Region V (i.e., Hawaii and the Northern Pacific Area). The forms of messages are presented here according to the geographical areas in which they are used.

1.2 Although there are only slight differences in the three forms of messages, it is obligatory that the United States use all three forms as it is a Member of both the WMO Regions and it maintains a reporting network in each of them. Each WMO Region has adopted coding procedures consistent with its synoptic requirements.

2 Symbolic Forms of Messages (SYNOP)

2.1 **General**—There are two basic forms of surface synoptic reports, one of which is the complete form and the other is the shortened form. The complete form is referred to as the **primary** synoptic, the **6-hourly** report or **SYNOP**. The **primary** synoptic is reported at the **standard** hours of observation which are 0000, 0600, 1200 and 1800 GMT. The shortened

form is referred to as the **intermediate** synoptic or the **3-hourly** report. The **intermediate** synoptic is reported at the **standard** hours for the intermediate observation which are 0300, 0900, 1500 and 2100 GMT.

2.1.1 The **primary** synoptic can be divided into two parts as follows:

2.1.1.1 **Universal groups**—The first seven (or eight) groups of the form of message (i.e., IIIii through 6P_oP_oP_o) are **mandatory** or **universal** groups as they are invariably included in the report. If datum is not available for an element in these groups, the appropriate missing datum indicator is included in lieu of the coded datum. Synoptic reports included in collectives used for international exchange purposes normally contain as a minimum these first seven (or eight) groups. The 99ppp group has both **universal** and **supplementary** status depending upon a specified condition, i.e., the amount of the pressure tendency. When the pressure tendency **equals** or **exceeds 9.9** mbs it becomes a **universal** group and it must be **included** in the message, for both domestic and international purposes. When this criterium is not satisfied the group assumes **supplementary** status as it is **not** included in the report.

2.1.1.2 **Supplementary groups**—The remaining groups of the complete report (i.e., from and including the 7RRR_s group to the end) are the **optional**, or **supplementary**, groups in accord with Regional and/or National decision, as appropriate. In the symbolic form these groups are enclosed in parentheses to indicate that they are drop-out items and they may or may not be included in the report, depending on specified conditions. The **supplementary** groups are in-

cluded or omitted from the message in accordance with (a) instructions, or (b) if data are not observed due to nonoccurrence of the phenomenon or for any other reason. The first figure(s) of each **supplementary** group is the group identifier; therefore, the omission of one or more of these groups from the message does not prevent identification of the succeeding groups. When any of the **supplementary** groups are included in the message, they will appear in the order given in the symbolic form.

2.2 Northern Portion of WMO Region IV—The complete symbolic form of message used by United States stations in the 49 continental States for the **primary** synoptic report is:

IIIII Nddff VVwww PPPTT
 N₁C_LhC_MCH T₁T₂app (99ppp)
 6P.P.P.P. (7RRR₁) (8N₁Ch₁)
 (9S_rS_ra_r) (2R₂R₂R₂R₂)
 (3P_vP_vH_vH_v) (d_vd_vP_vH_vH_v)
 (4T₁T₁T₁T₁) (Additional Plain
 Language Data)⊙

2.2.1. The symbolic form of the **intermediate** synoptic report made by United States stations in the 49 continental States is:

IIIII Nddff VVwww PPPTT
 N₁C_LhC_MCH T₁T₂app (99ppp)
 6P.P.P.P.⊙

2.3. Southern Portion of WMO Region IV—The complete symbolic form of message used by United States stations in the Southern Portion of WMO Region IV (i.e., the areas covered by the Caribbean, Central America, Mexico and the Bahamas) for the **primary** synoptic report is:

IIIII Nddff VVwww PPPTT
 N₁C_LhC_MCH T₁T₂9p₂₄p₂₄ 6P.P.P.P.
 (7RRR₁) (8N₁Ch₁) (9S_rS_ra_r)
 (2R₂R₂R₂R₂) (3P_vP_vH_vH_v)
 (d_vd_vP_vH_vH_v) (4T₁T₁T₁T₁)
 (Additional Plain Language Data)⊙

2.3.1. The symbolic form of the **intermediate**

synoptic report made by United States stations in the Southern Portion of WMO Region IV is:

IIIII Nddff VVwww PPPTT

N₁C_LhC_MCH T₁T₂9p₂₄p₂₄ 6P.P.P.P.⊙

2.3.2 It will be noted that this form of message (Par. B1-2.3) is identical to the first 10 groups of the form of message used in the Northern Portion of Region IV (Par. B1-2.2) with the exception of the T₁T₂9p₂₄p₂₄ group where 9 is the indicator specifying that the **24-hour pressure change** is being reported for p₂₄p₂₄. The instructions given in PART B of this Handbook for the coding of all elements and groups and the dimensional units used for these elements shall be followed. Please note that U.S. stations in this area report **6-hourly amounts** of precipitation in **hundredths of an inch** for RR rather than by code figures representing millimeters (WMO Code Table 3577) as reported by other national meteorological services in the area.

2.4 Hawaii and the Pacific (WMO Region V)—The complete symbolic form of the message used for the **primary** synoptic report by United States stations in Hawaii and the Pacific is:

IIIII Nddff VVwww PPPTT

N₁C_LhC_MCH T₁T₂app (99ppp)

6P.P.P.P. (7RRD_LD_M) (8N₁Ch₁)

(9S_rS_ra_r) (Additional Plain Language Data)⊙

2.4.1 It will be noted that this form of message is identical to the first 11 groups of the form of message used in the Northern Portion of WMO Region IV (Par. B1-2.2) except for the 7-group which becomes 7RRD_LD_M where D_L and D_M are the directions of the clouds reported for C_L and C_M. (Pars. B2-9.5 and B2-9.6). The instructions given in Part B of this Handbook for coding all elements and groups, and the dimensional units used for these elements shall be followed. Please note that U.S. stations in the Pacific area report **6-hourly amounts** of precipitation in **hundredths of an inch** for RR rather than by code figures representing millimeters (WMO Code Table 3577) as done by other services in WMO Region

V. Also, it will be noted that instead of reporting the $T_d T_a \text{app}$ group some of the national meteorological services in the tropical areas of Region V report the group $T_d T_a 9RR$, where 9 is the indicator and RR is the amount of precipitation accumulated since the 0000 GMT observation.

2.4.2 If required for special purposes the groups $(9S_p S_r s_p s_r)$, $2R_{24} R_{24} R_{24} R_{24}$, $3P_w P_w H_w H_w$ ($d_w d_w P_w H_w H_w$), and $4T_1 T_1 T_1 T_1$ of the primary form of message used by U.S. stations in the Northern Portion of Region IV (Par. B1-2.2) may be reported in accordance with the instructions given in Part B provided stations have been authorized to report them. Except in the case of emergency, the area supervising offices will obtain prior approval from their respective Central Headquarters before authorizing stations to include any of these groups in their SYNOP messages on a continuing basis.

2.4.3 The symbolic form of the intermediate synoptic report made by United States stations in Hawaii and the Pacific area is:

IIIII Nddff VVwwW PPPTT
 $N_h C_L h C_M C_H T_d T_a \text{app} (99\text{ppp})$
 6P.P.P.P.①

2.5 General Coding Instructions—The instructions for coding the individual elements apply equally to both the primary and intermediate forms of messages unless otherwise indicated elsewhere in the text.

2.5.1 Plain language words to indicate the number of whole inches of precipitation are inserted following the $7RRR_s$ and the $7RRD_L D_M$ group; and combinations of plain language words (or contractions) and figures are added to the end of the message after the coded groups to report occurrence of record temperatures, city office data, weekly and monthly mean data and tide data. Specific instructions for the use of the additional figure groups and plain language words are given in Chapters B11 through B15 and B17.

3 Definitions of Symbols

3.1 Symbolic letters (or groups of letters) and words (or letter groups) are listed below in alphabetical order. Symbolic figures (or figure groups) are given in numerical order. Detailed explanations and coding procedures for each element and group are given in Chapter B2. "Coding of Individual Elements and Groups".

3.1.1 Definitions of the symbolic letters are:

- a=Characteristic of pressure tendency during the 3 hours preceding the time of observation. (Par. B7-2 and Code Table 12)
- C=Genus of cloud. (Par. B11-3 and Code Table 19)
- C_H =Clouds of genera Ci, Cc, Cs. (Par. B6-5 and Code Table 11)
- C_L =Clouds of genera Sc, St, Cu, Cb. (Par. B6-2 and Code Table 8)
- C_M =Clouds of genera Ac, As, Ns. (Par. B6-4 and Code Table 10)
- D_H =Direction from which C_H clouds are moving. (Par. B12-4.3.4 and Code Table 22i)
- (NOTE: Paragraph B12-4.3.4 and Code Table 22i apply also to the reporting of the direction from which C_L and C_M clouds are moving by means of the $9S_p S_r s_p s_r$ group.)
- D_L =Direction from which C_L clouds are moving. (Par. B10-5 and Code Table 18)
- D_M =Direction from which C_M clouds are moving. (Par. B10-6 and Code Table 18)
- dd=True direction, in tens of degrees, from which wind is blowing (00-36). (Par. B3-2 and Code Table 2)
- $d_w d_w$ =True direction, in tens of degrees, from which the waves are coming (00-36). (Par. B14-4 and Code Table 23)
- ff=Wind speed in knots. (Par. B3-3)

- $H_w H_v$ = Height of the waves in increments of $1\frac{1}{2}$ feet (i.e., $\frac{1}{2}$ yard). (Par. B14-3)
- h = Height, above ground, of the base of the lowest cloud seen. (Par. B6-3 and Code Table 9)
- $h_c h_s$ = Height, above ground, of the base of the cloud layer whose genus is indicated by C or CC. (Par. B11-4 and Code Table 20)
- IIiii = Index number. (Par. B2-2)
- N = Fraction of the celestial dome covered by cloud. (Par. B3-1 and Code Table 1)
- N_a = Fraction of the celestial dome covered by all the C_L cloud(s) present, and if no C_L cloud is present, that fraction covered by all the C_M cloud(s) present. (Par. B6-1 and Code Table 1)
- N_s = Fraction of the celestial dome covered by the individual cloud layer of genus C or CC. (Par. B11-2 and Code Table 1)
- P_w = Period of the waves. (Par. B14-5 and Code Table 24)
- $P_w P_w$ = Period of the waves in seconds. (Par. B14-2)
- PPP = Atmospheric pressure reduced to mean sea level, in tens, units, and tenths of millibars. (Par. B5-1 and Code Table 6)
- $P_o P_o P_o P_o$ = Station pressure to tenths of a millibar. (Par. B9-2)
- pp = Amount of pressure tendency (net change at the station level), during the past 3 hours in units and tenths of millibars. (Par. B7-3 and Code Table 13)
- $p_{24} p_{24}$ = Amount of pressure change at the station level during the past 24 hours. (Par. B7-5 and Code Table 14)
- ppp = Total amount of pressure tendency (net change) in tens, units and tenths of millibars when pp equals or exceeds 9.9 mbs. (Par. B8-2)
- R_t = Time precipitation began or ended. (Par. B10-3 and Code Table 16)
- RR = Amount of precipitation for the past 6 hours in hundredths of an inch. (Par. B10-2 and Code Table 15)
- $R_{24} R_{24} R_{24} R_{24}$ = Total amount of precipitation during the preceding 24-hour period in hundredths of an inch. (Par. B13-2)
- $S_p S_p$ = Special Phenomena, general description. (Par. B12-2 and Code Table 21)
- s = Total depth of snow on ground, to the nearest whole inch. (Par. B10-4 and Code Table 17)
- $s_p s_p$ = Special Phenomena, detailed description. (Par. B12-3 and Code Table 22)
- TT = Temperature of the air to the nearest whole degree Celsius. (Par. B5-2 and Code Table 7)
- $T_d T_d$ = Temperature of the dew point to the nearest whole degree Celsius. (Par. B7-1 and Code Table 7)
- $T_n T_n$ = Minimum temperature to the nearest whole degree Fahrenheit. (Par. B15-3 and Code Table 7)
- $T_x T_x$ = Maximum temperature to the nearest whole degree Fahrenheit. (Par. B15-2 and Code Table 7)
- VV = Horizontal visibility at surface. (Par. B4-1 and Code Table 3)
- W = Past weather. (Par. B4-3 and Code Table 5)
- ww = Present weather. (Par. B4-2 and Code Table 4)
- 3.1.2** Definitions of the symbolic words are:
- SYNOP = Code name. Refers to a surface synoptic report from a land station. The code word SYNOP is used in headings of international collectives to identify the type of report being transmitted. (Par. B1-2.1)
- 3.1.3** Definitions of the symbolic figures (or figure groups) are:
- / = Solidus. Indicates missing data,

- represents a specific value, or is used as a filler to complete a 5-figure group.
- ⊙ = Message separation signal. (Par. B16-1)
- 2 = Indicator figure for the $2R_{21}R_{22}R_{23}R_{24}$ group. (Par. B13-1)
- 3 = Indicator figure for the $3P_{\nu}P_{\nu}H_{\nu}H_{\nu}$ group. (Par. B14-1)
- 4 = Indicator figure for the $4T_{\tau}T_{\tau}T_{\tau}T_{\tau}$ group. (Par. B15-1)
- 6 = Indicator figure for the $6P_{\circ}P_{\circ}P_{\circ}P_{\circ}$ group. (Par. B9-1)
- 7 = Indicator figure for the $7RRD_L D_M$ group. (Par. B10-1)
- 7 = Indicator figure for the $7RRR_s$ group. (Par. B10-1)
- 8 = Indicator figure for the $8N_cCh_h$ group. (Par. B11-1)
- 9 = Indicator figure for the $9S_rS_rS_rS_r$ group. (Par. B12-1)
- 9 = Indicator figure specifying that $p_{21}p_{21}$ follows in the $T_dT_d9p_{21}p_{21}$ group. (Par. B7-4)
- 99 = Indicator figures specifying that ppp follows in the $99ppp$ group. (Par. B8-1)

CHAPTER B2. GENERAL INSTRUCTIONS AND CODING OF IDENTIFICATION GROUP

1 General

1.1 The order of listing the groups and elements in Chapters B2 through B17 is the same order in which the groups appear in the symbolic form of message given in paragraph B1-2.2. The form of message given in paragraph B1-2.2 contains more groups than either of the other two forms of messages used by the United States (i.e., than those forms of messages given in paragraphs B1-2.3 and B1-2.4).

1.2 The individual groups in all three forms of messages are the same with the exception that several of the groups have variant forms with the variant forms being applied for specified geographical areas.

1.3 All instructions for coding a group are given in the Chapter for that group. Therefore, Chapters for some of the groups contain two sets of coding instructions when a variant form is involved. Observers are cautioned to exercise care in coding these groups to make sure that they use the group form required for their area.

1.4 The elements and groups will appear in the message in the positions specified in the symbolic forms of messages given in paragraphs B1-2.2, B1-2.3 and B1-2.4, as appropriate.

2 Group Iiii

2.1 Index number Iiii

2.1.1 The Index Number assigned to the station shall be reported for Iiii.

2.1.2 When the station has not been assigned an Index Number, code figure 00000 shall be reported for Iiii and the message shall be preceded by the Letter Identification assigned to the station, or the station name if no Letter Identification has been assigned.

2.1.3 See paragraph A2-7 for explanation of the Index Numbering system.

2.2 Group

2.2.1 The Iiii group shall always be included in the message by all United States stations regardless of their location.

CHAPTER B3. CODING OF SKY COVER—WIND GROUP

Group N d d f f

1 Fraction of the celestial dome covered by cloud N

1.1 The total fraction of the celestial dome covered by cloud, irrespective of their genus, shall be reported for N. (Code Table 1 and Par. 2.10)

1.2 The fraction of the celestial dome covered by cloud is observed in tenths and reported in accordance with the specifications of Code Table 1.

1.2.1 When no obscuring phenomenon is present only those portions of the various cloud layers present that are actually visible from the ground shall be included in the value reported for N. (Pars. B3-1.7 and B3-1.9)

1.3 When no clouds are present, code figure 0 shall be reported.

1.4 When any particles of cloud exist up to and including one-tenth cloud cover, code figure 1 shall be reported.

1.5 When nine-tenths of cloud cover or an overcast with openings exists, code figure 7 shall be reported.

(NOTE: A mackerel sky (Alto cumulus or Strato cumulus translucidus) shall be reported by using code figure 7 or a lower code figure, as appropriate, since breaks are always present in this cloud form even if it extends over the whole celestial dome.)

1.6 When the celestial dome is completely overcast (i.e., no openings), code figure 8 shall be reported.

1.7 When the celestial dome is obscured by rain, snow, fog, ice fog, duststorm, sandstorm, smoke, or any phenomena other than clouds, so that the cloud amount cannot be evaluated, code figure 9 shall be reported.

1.8 **Condensation Trails**—The fraction of the celestial dome covered by condensation trails, and cloud masses which have obviously developed from condensation trails, shall be included in the value reported for N as follows:

1.8.1 Rapidly dissipating condensation trails shall **not** be included in the value reported for N or those clouds reported for C_M and C_H .

1.8.2 Persistent condensation trails, and cloud masses which have obviously developed from condensation trails, shall be considered in determining the appropriate specification to be reported for C_H or C_M and included in the value reported for N. The inclusion of that phenomenon (i.e., persistent condensation trails and associated cloud masses) in the report shall be indicated by adding the contraction COTRA at the end of the message.

1.9 For synoptic purposes, a sky **not discernible** condition due to an obscuring phenomenon shall be reported as follows:

1.9.1 When blue sky or stars can **not** be seen due to an obscuration and no clouds are visible, the elements relating to clouds shall be coded to indicate an obscured sky (i.e., $N=9$, $N_h=9$, $C_L=/$, $h=/$, $C_M=/$ and $C_H=/$).

1.9.2 When blue sky or stars can **not** be seen due to an obscuration aloft, and clouds are visible below the obscuration, the elements relating to clouds are coded: $N=9$, h and N_h as observed; C_L , C_M and C_H , as observed, or zero, or /, as appropriate. For example: If an opaque obscuring layer of smoke occurs at 7,000 feet with 2/10 Sc occurring at 3,000 feet, the elements relating to clouds are coded: $N=9$, $N_h=2$, $C_L=5$, $h=5$, $C_M=/$ and $C_H=/$.

1.10 For synoptic purposes a sky **discernible** with an obscuring phenomenon present condition shall be reported as follows:

1.10.1 When blue sky, stars or clouds are **seen**, either through openings in the obscuration or through the obscuration itself, the existing sky condition shall be evaluated as though the obscuring phenomenon were not present. For example:

- (a) If 6/10 of the celestial dome is actually obscured by snow and there are 4/10 clouds visible at 2,000 feet, the sky

condition is evaluated as being 10/10 Sc at 2,000 feet (i.e., the obscuration of snow is ignored and the Sc clouds are considered to extend solidly to the horizon). Therefore, the elements relating to clouds are coded as follows: $N=8$, $N_h=8$, $C_L=5$, $h=5$, $C_M=/$ and $C_B=/$.

- (b) If a thin layer of smoke is present through which about 5/10 of the celestial dome can be seen and of that visible 5/10 about 3/10 is blue sky and 2/10 Ac at 12,000 feet, the sky condition is evaluated as being 6/10 blue sky and 4/10 Ac (i.e., the thin layer of smoke is ignored and the conditions existing in the 5/10 of the celestial dome visible through the smoke are projected to the horizon). Therefore, the elements relating to clouds are coded as follows: $N=3$, $N_h=3$, $C_L=0$, $h=9$, $C_M=4$ and $C_B=0$.

1.10.2 When blue sky or stars are seen, either through openings in the obscuration or through the obscuration itself, and no traces of clouds are observed through the obscuration or openings, the obscuration shall be ignored and the elements relating to cloud shall be coded to indicate a cloudless sky.

1.10.3 When the sky is discernible with an obscuring phenomenon present, as specified in paragraphs 1.10.1 and 1.10.2 above, a Special Phenomena group(s) shall be used to report pertinent information on the obscuration, provided the required information regarding the nature of the obscuration (e.g., smoke aloft, etc.) is not given elsewhere in the message.

NOTES:

- (i) The obscuration may consist of rain, snow, fog, ice fog, duststorm, sandstorm, smoke, etc., and may either be on the surface or aloft.
- (ii) A sky not discernible condition usually exists when more than 0.9 of the celestial dome is covered by an obscuration of such density that the blue sky or stars can not be seen through it.
- (iii) A sky discernible condition usually exists when 0.9 or less of the celestial dome is covered by an obscuration through which blue sky or stars can be seen (i.e., either through openings or through the obscuration itself).

2 Direction of surface Wind . . . dd

2.1 The true (not magnetic) direction from which the surface wind is blowing shall be reported for **dd**.

2.2 The direction is reported to the nearest tens of degrees on the 00-36 scale (Code Table 2). For example: A wind blowing from the north (360 degrees) toward the south (180 degrees) is called a north wind and code figure **36** is reported.

2.3 When the air has no perceptible motion (i.e., calm), code figure **00** shall be reported.

2.4 When the wind speed ranges from 100 to 199 knots, inclusive, special provision is made for reporting **dd**. (See paragraph B2-3.3.5)

2.5 When for any reason an instrumental direction cannot be obtained, the estimated direction shall be reported. If neither an instrumental nor estimated direction can be obtained, solidi (//) shall be reported for **dd** to indicate missing.

3 Wind speed . . . ff

3.1 The wind speed in knots shall be reported for **ff**.

3.2 True speeds (i.e., corrected for instrumental error) shall be reported.

3.3 When the air is calm, code figure **00** shall be reported.

3.4 In the range 0 to 99 knots, inclusive, the speed is coded direct for **ff**. For example: 60 knots is coded 60; 99 knots is coded 99; etc.

3.5 In the range 100 to 199 knots, inclusive, 50 is added to the code figure normally reported for **dd** and the speed minus 100 is reported for **ff**. For example: For a wind speed of 110 knots from the west, **dd** is coded **77** (i.e., $27+50=77$) and **ff** is coded 10 (i.e., $110-100=10$).

3.6 When for any reason an instrumental speed can not be obtained, the estimated speed shall be reported. If neither an instrumental nor estimated speed can be obtained, solidi (//) shall be reported for **ff** to indicate missing.

4 Group

4.1 The **Nddff** group shall always be included in the message by all United States stations regardless of their location.

CHAPTER B4. CODING OF VISIBILITY—WEATHER GROUP

Group VVwwW

1 Horizontal visibility VV

1.1 The horizontal visibility at the surface shall be reported for VV. (Code Table 3)

1.1.1 If the observed visibility distance lies between two of the values given in the code table, the code figure representing the lower code table value shall be reported for VV. Code figures from the 90–99 decade of Code Table 3 are never used in reporting VV for land stations.

1.2 Visibility values reported for VV shall be obtained from the same observation point that is used for observing ww: e.g., control tower visibilities shall not be reported in the synoptic message unless the control tower is also used as the observation point for ww.

1.3 If for any reason a reportable visibility value cannot be obtained, solidi (//) shall be reported.

1.4 Instructions for observing visibility and obtaining reportable values are given in the Federal Meteorological Handbook No. 1—Surface Observations.

2 Present weather ww

2.1 The present weather shall be reported for ww. (Code Table 4)

2.2 Symbol ww represents the weather occurring at the time of observation except under certain circumstances when it may represent the weather during the hour preceding the time of observation.

2.3 The time of observation with reference to ww means the actual time present weather is observed and the term in the last hour refers to the full hour preceding the actual time of observation.

2.4 General rules for coding ww are:

2.4.1 If more than one of the specifications in the ww table is applicable to the weather at the time of observation, the specification having

the highest code number shall be reported, except that code figure 17 will have preference over code figures 20–49, inclusive.

2.4.2 When the phenomena is not predominantly droplets, the appropriate code figure shall be selected without regard to VV.

2.4.3 With respect to precipitation, the phrase at the station in the ww table means at the point where the observation is normally taken.

2.4.4 The precipitation will be characterized as intermittent, if it has been discontinuous during the preceding hour, without presenting the character of a shower.

2.4.5 For synoptic coding purposes a thunderstorm is regarded as being at the station from the time thunder is first heard, whether or not lightning is seen or precipitation is occurring at the station. A thunderstorm is reported in present weather if thunder is heard within the normal observational period preceding the time of the report. A thunderstorm is regarded as having ceased at the time of the last audible thunder and the cessation is confirmed if thunder is not heard for 10–15 minutes after this time.

2.4.6 The word HAIL shall be added at the end of the message when a shower or a thunderstorm, accompanied by hail, occurs in the period covered by ww.

2.5 Explanatory material for use in connection with selecting the correct ww specification to be reported is:

2.5.1 Code figures 00–49, inclusive—When precipitation is not occurring at the station at the time of observation, a code figure from the first half of the ww table shall be reported.

2.5.1.1 Code figures 00–03, inclusive—These specifications shall be used to describe the general trend of the state of the sky during the hour preceding the time of observation. The development (increase in vertical development or thickening) or dissolution (decrease in verti-

cal extent or thinning) are the primary factors to be considered in determining the appropriate code figure to be reported. There is no limitation on the magnitude of the change of the cloud amount.

(Norm: When one of these code figures is reported for *ww*, the code figure which best represents the total amount of the celestial dome that is covered by cloud will be reported for *N*; i.e., the selection of one of these code figures for *ww* has no relationship to the value reported for *N*.)

2.5.1.1.1 Code figure **00**—This code figure shall be reported, when for any reason, the state of sky has not been observed during the preceding hour. In this case any amount of cloud (i.e., from zero to solid overcast) can be present at the time of observation.

2.5.1.1.2 Code figure **01**—This code figure shall be reported when the clouds have shown a definite tendency to decrease in vertical development. If it is not practicable to observe changes in the vertical development but the clouds have shown a definite decrease in horizontal extent, code figure 01 shall be applicable. (For example: Code figure 01 is applicable to the decrease of fine weather cumulus late in the day. A cloudless sky at the time of observation could be reported by code figure 01 provided the clouds present at the beginning of the preceding hour have been completely dissolved by the time of observation).

2.5.1.1.3 Code figure **02**—This code figure shall be reported when there has been no appreciable change in the state of the sky during the past hour. (For example: A cloudless sky at the time of observation could be reported by code figure 02 provided the sky had been cloudless during the entire hour preceding the time of observation).

2.5.1.1.4 Code figure **03**—This code figure shall be reported when the clouds have shown a definite tendency to form or develop during the hour preceding the time of observation. (For example: This figure is applicable when cumulus clouds are forming and also when fine weather cumulus is developing into heavy cumulus).

2.5.1.2 Code figure **04**—International visibility limits have not been established for this

specification. National reporting procedures are as follows:

- (a) When smoke is present that has apparently originated from a distant source and it is very evenly diffused at all levels in the free atmosphere, no visibility limits are involved.
- (b) When smoke that has apparently originated from a relatively nearby source (e.g., forest fire, industrial area, city, etc.) is present in predominately stratified form in the lower levels, the surface visibility must be restricted to 6 miles or less in order to report this specification.

4.2.5.1.3 Code figure **05**—This specification shall be reported when the obstruction to vision is predominantly of lithometers. No visibility limits are involved.

4.2.5.1.4 Code figure **06**—No visibility limits are involved in this specification.

4.2.5.1.5 Code figure **07**—International visibility limits have not been established for this specification. The national requirement is that visibility be restricted to not more than 6 miles or not less than 1,100 yards ($\frac{1}{2}$ mile).

4.2.5.1.6 Code figure **09**—International visibility limits have not been established for this specification. The national requirement is that visibility be restricted to less than 1,100 yards ($\frac{1}{2}$ mile).

4.2.5.1.7 Code figure **10**—This specification requires the light fog to be 6 feet or more in depth above the land surface (33 feet above sea surface) with visibility at the 6 foot level to be not less than 1,100 yards ($\frac{1}{2}$ mile) and not more than 6 miles. The specification refers only to water droplets and ice crystals.

4.2.5.1.8 Code figures **11** and **12**—These specifications require that visibility shall not be restricted at eye level (i.e., not deeper than 6 feet on land and 33 feet at sea). The fog must be heavy enough to restrict the apparent visibility in the fog to less than 1,100 yards ($\frac{1}{2}$ mile). When the shallow fog is observed to cover more than half of the ground normally visible, code figure 12 shall be reported in preference to code figure 11.

4.2.5.1.9 Code figure 13—This specification shall be reported when lightning is seen at the time of observation, or within 15 minutes preceding the time of observation, but no thunder is heard.

4.2.5.1.10 Code figure 17—This specification shall be reported when thunder is heard, either at the time of observation or within the 15 minutes preceding the time of observation. The reporting of code figure 17 has preference over code figures 20-49, inclusive. (Par. B4-2.4.1)

2.5.1.11 Code figure 18—This specification requires that no precipitation accompanied the squall. If precipitation (i.e., a rainshower) occurs with the squall, the specification best describing the precipitation shall be reported instead of code figure 18. The criteria for determining a squall are given in the Federal Meteorological Handbook No. 1—Surface Observations.

2.5.1.12 Code figure 19—The WMO term funnel cloud as used in this specification covers the following three situations:

- (a) when the funnel cloud does not touch the surface of the earth (i.e., either land or water);
- (b) when the funnel cloud touches a land surface (i.e., a tornado occurs); and
- (c) when the funnel cloud touches a water surface (i.e., a waterspout occurs).

This code figure is reported when any one of the above three situations is observed either at the station or within sight of the station, provided the funnel cloud is present at the time of observation, or has occurred during the hour preceding the time of observation. In addition, the plain language word TORNADO is added at the end of the message when the funnel cloud touches a land surface. Likewise, the plain language word WATERSPOUT is added at the end of the message when the funnel cloud touches a water surface.

2.5.1.13 Code figures 20-29, inclusive—These code figures are never used when precipitation, fog, ice fog, or thunderstorm is observed at the time of observation.

(NOTE: The fog and ice fog require that visibility be reduced to less than 1,100 yards.)

2.5.1.14 Code figure 28—This specification

requires the visibility to have been reduced to less than 1,100 yards ($\frac{1}{2}$ mile) by fog during the past hour. The specification refers only to visibility restrictions which occurred as a result of water droplets or ice crystals.

2.5.1.15 Code figures 30, 31 and 32—These specifications require that the visibility be reduced to less than 1,100 yards ($\frac{1}{2}$ mile) but not less than 550 yards ($\frac{1}{4}$ mile).

2.5.1.16 Code figures 33, 34 and 35—These specifications require that the visibility be reduced to less than 550 yards ($\frac{1}{4}$ mile).

2.5.1.17 Code figures 36 and 37—The term **generally low** refers to a height of less than 6 feet above surface. No visibility restrictions are involved as the visibility is not perceptibly diminished at eye level.

2.5.1.18 Code figure 38 and 39—The term **generally high** refers to a height of 6 feet or more above surface. The horizontal visibility at eye level is usually poor. Code figure 39 is reported when the visibility is less than $\frac{1}{2}$ mile at eye level.

2.5.1.19 Code figure 40—This specification requires that the fog be 6 feet or more in height. The apparent visibility in the fog, or ice fog, patch or bank will be less than 1,100 yards ($\frac{1}{2}$ mile). The obstruction to vision is predominantly water droplets or ice crystals.

2.5.1.20 Code figures 41-49, inclusive—The fog is 6 feet or more in height with visibility restricted to less than 1,100 yards ($\frac{1}{2}$ mile).

2.5.1.20.1 Code figures 41-47, inclusive—These specifications require that the obstruction to vision consist predominantly of water droplets or ice crystals.

2.5.1.20.2 Code figures 48 and 49—These specifications require that the obstruction to vision consists predominantly of water droplets.

2.5.2 Code figures 50-99, inclusive—When precipitation is occurring at the station at the time of observation, a code figure from the second half of the ww table shall be reported.

2.5.2.1 Code figures 50-59, inclusive—A mixture of freezing rain and freezing drizzle is not reported in this decade. The precipitation reported by code figures 56-59, inclusive, may be either intermittent or continuous.

2.5.2.2 Code figures 66-69, inclusive—The precipitation reported by these code figures may be either intermittent or continuous. Combinations of freezing rain and freezing drizzle are reported by code figures 66 and 67.

2.5.2.3 Code figure 76—The occurrence of ice prisms shall be reported by code figure 76 regardless as to whether or not fog or ice fog is also present.

2.5.2.4 Code figure 79—The U.S. term sleet is synonymous with the international term ice pellets (type a). This type of precipitation consists of transparent or translucent pellets of ice which can range up to 0.2 inch in diameter. These pellets are formed by the freezing of raindrops, or the refreezing of largely melted snowflakes, during their passage through a below-freezing layer of air near the earth's surface. The pellets may be spherical or irregular, or (rarely) conical in shape.

2.5.2.5 Code figures 80-90, inclusive—Showers reported by these code figures are not associated with thunder. These code figures are to be used only when the precipitation is of the shower type and takes place at the time of observation. Clouds producing showers are isolated clouds and, in consequence, the showers are usually of short duration. Between the showers, openings are observed, except if stratiform clouds fill the intervals between the clouds from which the showers are falling.

2.5.2.5.1 Code figure 82—Exceptionally heavy or torrential rain showers are reported by code figure 82. These showers usually occur in tropical and subtropical regions, however, they do occasionally occur in temperate regions. The observer is permitted considerable latitude in deciding whether the showers are of sufficient intensity to justify the reporting of code figure 82.

2.5.2.5.2 Code figures 87 and 88—The ice pellets (type b) referred to in these specifications consist of transparent or translucent pellets of ice made up of snow encased in a thin layer of ice. They are spherical or irregular (rarely conical), in shape and have a diameter of 0.2 inch or less.

2.5.2.5.3 Code figures 89 and 90—These specifications provide for reporting hail alone and not in combination with other types of

solid pellets. Hail is defined as small balls or pieces of ice (i.e., hailstones) with diameters ranging up to 2.0 inches, or more, falling either separately or agglomerated into irregular lumps. Code figure 89 requires that all types of the precipitation occurring be of light intensity. Code figure 90 requires that at least one type of the precipitation occurring be of moderate or heavy intensity.

2.5.2.6 Code figures 91-94, inclusive—Specifications for these code figures require the last thunder to have been heard in the period between 1 hour and 15 minutes, and 15 minutes before the time of observation. The specifications for code figures 93 and 94 include the term hail which for coding purposes has been expanded in these specifications to include ice pellets (type b) and snow pellets as well as hail.

2.5.2.7 Code figures 95-99, inclusive—Specifications for these code figures require that thunder be heard within the 15-minute period preceding the time of observation. The specifications for code figures 95, 96, 97 and 99 include the term hail which for coding purposes has been expanded in these specifications to include ice pellets (type b) and snow pellets as well as hail.

2.5.2.7.1 Code figure 98—In reporting code figure 98 considerable latitude is allowed the observer in presuming that precipitation is, or is not, occurring if it is not actually visible at the station.

3 Past weather W

3.1 The general character of the weather during the preceding period shall be reported for W. (Code Table 5)

3.2 The following periods of time shall be used in reporting past weather (W):

3.2.1 At 0000, 0600, 1200, and 1800 GMT, W covers the 6 hours preceding the actual time of observation. (Par. A2-2.1)

3.2.2 At 0300, 0900, 1500, and 2100 GMT, W covers the 3 hours preceding the actual time of observation. (Par. A2-2.3)

3.2.3 The code figure for W shall be selected in such a way that the data given for W and ww together give as complete a description as possi-

ble of the weather in the time interval concerned. For example: If **ww** indicates a type of weather that has occurred during the last hour, the period of time used for **W** in the 6-hourly (or 3-hourly) report shall be the full 5 (or full 2) hours preceding the hour covered by **ww**.

3.3 When precipitation is occurring at the time of observation or has occurred in the hour preceding the time of observation, the specification in Code Table 5 which **best represents** the general character of the weather that has occurred throughout the 5 (or 2) hour period ending one hour previous to the actual time of observation shall be reported for **W**.

3.4 When two or more of the specifications for **W** are appropriate, the specification having the **highest** code figure shall always be reported. Exceptions to this general rule permit the reporting of a **lower** code figure when:

- (a) precipitation, fog or ice fog has occurred in the hour preceding the time of observation, or
- (b) precipitation, fog, ice fog, duststorm, sandstorm, or storm of blowing snow is occurring at the time of observation.

3.4.1 When precipitation, fog, ice fog, duststorm, sandstorm, or storm of blowing snow is reported for **ww** the same phenomena will also be reported for **W** only when it **best represents** the general character of the weather which occurred throughout the 5 (or 2) hour period ending one hour prior to the time of observation.

3.5 Visibility or intensity criteria applicable to the specifications for **W** are:

3.5.1 Code figure **3**—A restriction of the prevailing visibility to less than 1,100 yards ($\frac{1}{2}$ mile) by a sandstorm, duststorm or blowing snow is required for the reporting of code figure **3**.

3.5.2 Code figure **4**—A restriction of the prevailing visibility to less than 1,100 yards ($\frac{1}{2}$ mile) by fog, ice fog, thick haze or thick smoke is required for the reporting of code figure **4**.

3.5.3 Code figures **5** to **9**—Visibility or intensity criteria have not been established for

these specifications; therefore, the occurrence of one of these phenomena is sufficient for reporting it, when appropriate.

3.6 When precipitation **has occurred** during the 6 (or 3) hours preceding the time of observation and **it is not occurring** at the time of observation or **has not occurred** during the hour preceding the time of observation, code figure **5, 6, 7, 8, or 9**, as appropriate, shall be reported.

3.7 When thunder has been heard at the station in the 6 (or 3) hour period ending with the time of observation and the specification reported for **ww** does not indicate the occurrence of thunder during the past hour or at the time of observation, code figure **9** shall always be reported for **W** **regardless** of the general character of the weather which has occurred throughout the 6 (or 3) hour period.

3.8 Plain language words are used in connection with past weather as follows:

3.8.1 When code figure **3** is reported to indicate a sandstorm and the temperature is below freezing, the plain language word **SANDSTORM** shall be added to the end of the message.

3.8.2 When code figure **8** or **9** is reported and the shower(s) or thunderstorm was accompanied by hail, the plain language words **PAST HAIL** shall be added to the end of the message.

3.8.3 When code figure **8** is used to indicate showers of snow, rain and snow mixed, snow pellets or ice pellets with the temperature above the freezing point, the plain language word(s) **SNOW, RAIN AND SNOW MIXED, SNOW PELLETS** or **ICE PELLETS**, as appropriate, shall be added to the end of the message.

3.9 When, for any reason, information regarding past weather is not available, a solidus (/) shall be reported.

4 Group

4.1 The **VVwwW** group shall always be included in the message by **all** United States stations regardless of their location.

CHAPTER B5. CODING OF PRESSURE—TEMPERATURE GROUP

Group PPPTT

1 Atmospheric pressure PPP

1.1 The atmospheric pressure in millibars (tens, units and tenths digits) shall be coded direct for **PPP**. (Code Table 6)

1.1.1 The hundreds digit(s) is not reported (i.e., the 9 or 10 hundreds figures are dropped). For example: 1025.7 mb is coded 257; 981.4 mb is coded 814; etc.

1.2 The sea level pressure is reported; i.e., the pressure is corrected for instrumental error, temperature, and gravity, and reduced to the mean sea level reference plane before coding.

1.3 When for any reason, the pressure can not be obtained, solidi (///) shall be reported.

2 Temperature of the air TT

2.1 The temperature of the air to the nearest whole degree Celsius shall be coded direct

for **TT**. (Code Table 7 and Conversion Tables G, H and I)

2.2 When the temperature is below zero, 50 is added to the absolute value of the temperature (i.e., $TT+50$) and the tens and units digits of the sum are reported for **TT**. For example: If the temperature is -8°C , 58 is coded for **TT** (i.e., $8+50=58$). If the temperature is -50°C , 00 is coded for **TT** (i.e., $50+50=100$). If the temperature is -53°C , 03 is coded for **TT** (i.e., $53+50=103$).

2.3 When for any reason the temperature can not be obtained, solidi (///) shall be coded for **TT** to indicate missing.

3 Group

3.1 The **PPPTT** group shall always be included in the message by all United States stations regardless of their location.

CHAPTER B6. CODING OF CLOUD GROUP

Group $N_h C_L h C_M C_H$

1 Fraction of the celestial dome covered by all the C_L (or C_M) clouds present N_h

1.1 Fraction of the celestial dome covered by cloud of either C_L or C_M type shall be reported for N_h (Code Table 1) as follows:

1.1.1 When C_L cloud(s) is present, the value reported for N_h represents the total amount of all C_L cloud present regardless as to the number of C_L types that may coexist at the time of observation.

1.1.2 When no C_L cloud is present and cloud of C_M type is present, the value reported for N_h represents the total amount of all C_M cloud present regardless as to the number of C_M types that may coexist at the time of observation. The fraction of the celestial dome covered by persistent condensation trails and cloud masses obviously developed from condensation trails is included in the value reported for N_h , provided N_h represents C_M cloud and the persistent condensation trails and/or derived cloud masses can be classified as C_M type cloud. (Par. B3-1.8)

1.1.3 There are no restrictions on reporting cloud of C_L or C_M types for N_h because of height.

1.2 Cloud of C_H type is never reported for N_h .

1.3 Code figure 0 is reported for N_h when there are no clouds of C_L or C_M types and the celestial dome is not obscured.

1.4 Code figure 1 is reported when there are a few clouds (i.e., any particle of cloud, no matter how small) up to and including 1/10 present.

1.5 Code figure 7 is reported when an overcast with openings exists.

1.6 Code figure 8 is reported when a solid overcast (i.e., without openings) exists.

1.7 Code figure 9 is reported (a) when the celestial dome is obscured by fog, ice fog, dust-

storm, sandstorm, rain, snow, smoke, or other phenomena so that cloud (if any) can not be evaluated, or (b) when the cloud amount cannot be evaluated for reasons other than given in (a) preceding. (Par. B3-1.7)

1.8 When all clouds covering the celestial dome are reported by one of the code figures for either C_L or C_M , the value reported for N_h is the same as that reported for N . The fraction of the celestial dome covered by cloud which is reported for N_h may equal but can never exceed the value reported for N .

2 Clouds of genera Sc, St, Cu, Cb C_L

2.1 The code figure to be reported for symbol C_L is determined on the basis of the detailed description of the low clouds and the illustrations of them in the International Cloud Atlas in conjunction with the specifications given in Code Table 8.

2.2 A brief resume of the order, with respect to decreasing importance, in which the code figure shall be selected to report the C_L cloud(s) present is as follows:

2.2.1 If cumulonimbus are present, with or without other C_L clouds, code figure 9 or 3 is always reported depending on the state of development of the Cb.

2.2.1.1 If the upper part of at least one of the Cb clouds present is clearly fibrous or striated, code figure 9 shall be reported.

2.2.1.2 If the upper part of none of the Cb clouds present is clearly fibrous or striated, code figure 3 shall be reported.

2.2.2 If no Cb are present, code figure 4, 8 or 2 has second priority, in the following order:

2.2.2.1 If Sc formed by the spreading out of Cu is present, code figure 4 shall be reported.

2.2.2.2 If code figure 4 is not applicable and if Cu and Sc with bases at different levels are present, code figure 8 shall be reported.

2.2.2.3 If code figures 4 and 8 are not applicable and if Cu of moderate or strong vertical extent are present, code figure 2 shall be reported.

2.2.3 If code figure 9, 3, 4, 8 or 2 is not applicable code figure 1, 5, 6 or 7 may be applicable. All of the specifications for these code figures have equal priority except for the question of predominance and they are the **only** cloud specifications involved in that question.

2.2.3.1 If the C_L cloud(s) present is predominantly Cu with little vertical extent and seemly flattened, or ragged Cu other than of bad weather, or both, code figure 1 shall be reported.

2.2.3.2 If among the C_L cloud(s) present, Sc other than that formed by the spreading out of Cu is predominant, code figure 5 shall be reported.

2.2.3.3 If the C_L cloud(s) present is predominantly St in a more or less continuous sheet or layer, or in ragged shreds (other than ragged shreds of bad weather), or both, code figure 6 shall be reported.

2.2.3.4 If the C_L cloud(s) present is predominantly pannus (i.e., ragged shreds of St of bad weather or ragged Cu of bad weather, or both), code figure 7 shall be reported.

2.2.3.5 Clouds of any one of these four specifications (i.e., code figures 1, 5, 6 and 7) are said to be predominant when their sky cover is **greater** than that of the clouds of any of the three other specifications. When two or more of the types of C_L clouds represented by these specifications are present and the more prevalent types cover exactly equal portions of the celestial dome, the cloud at the **highest** level (with respect to the height above ground of the cloud base) shall be reported for C_L .

2.2.3.6 The term "Bad Weather" refers to conditions generally existing during precipitation and a short time before and after.

2.3 When no C_L cloud(s) is present, code figure 0 shall be reported.

2.4 When the celestial dome is obscured by rain, snow, fog, ice fog, blowing snow, dust-storm, sandstorm, smoke, or other phenomena so that C_L cloud(s), if any, can not be observed, a solidus (/) shall be reported. (Par. B3-1.7)

FMH No. 2

2.5 Cloud observing procedures, etc., are given in the Federal Meteorological Handbook No. 1—Surface Observations.

3 Height, above ground, of the base of the lowest cloud seen **h**

3.1 The height above ground of the base of the **lowest** cloud seen shall be reported for **h**. (Code Table 9)

3.2 Only the heights of C_L and C_M clouds are reported for **h**. There are no restrictions regarding the heights of either of these cloud types when being reported for **h**.

3.3 If no C_L or C_M cloud(s) is present, code figure 9 shall be reported for **h** regardless of the presence or absence of C_H type clouds.

3.4 If there are C_L clouds present, the value reported for **h** refers to them as follows:

3.4.1 If the bases of the existing C_L clouds are all at one level, the height of that level shall be reported for **h**.

3.4.2 If the bases of the existing C_L clouds are at more than one level the height of the **lowest** cloud (i.e., the lowest visible fragment) shall be reported for **h**.

3.5 When no C_L cloud exists and C_M cloud is present the instructions in paragraphs B6-3.4.1 and B6-3.4.2 shall be followed in reporting the height of the existing C_M cloud.

3.6 When the celestial dome is obscured by rain, snow, fog, ice fog, blowing snow, dust-storm, sandstorm, smoke or other phenomena so that cloud (if any) can not be observed, a solidus (/) shall be reported for **h**. (Par. B3-1.7)

3.7 When a reportable height can not be obtained for any reason not covered in paragraphs B3-1.9 and B3-1.10, a solidus (/) shall be reported for **h**.

4 Clouds of genera Ac, As, Ns C_M

4.1 The code figure to be reported for symbol C_M is determined on the basis of the detailed description of the medium clouds and the illustrations of them in the International Cloud Atlas in conjunction with the specifications given in Code Table 10.

4.2 A brief résumé of the order, with respect to **decreasing** importance, in which code figures

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shall be selected to report the C_M cloud(s) present is as follows:

4.2.1 If *Alto*cumulus are present, one of the code figures 9 to 3, inclusive, may be applicable.

4.2.1.1 If *Ac* is present, either with or without the presence of *As* or *Ns*, code figure 9, 8 or 7 may be applicable.

4.2.1.1.1 If the sky is chaotic, code figure 9 shall be reported.

4.2.1.1.2 If code figure 9 is not applicable, and if *Ac* with sproutings in the form of turrets or battlements, or *Ac* having the appearance of small cumuliform tufts is present, code figure 8 shall be reported.

4.2.1.1.3 If code figure 9 or 8 is not applicable and if *As* or *Ns* is present together with *Ac*, code figure 7 shall be reported.

4.2.1.2 If *Ac* is present and no *As* and no *Ns* is present, code figure 6, 5, 4, 7 or 3 may be applicable.

4.2.1.2.1 If code figure 9, 8 or 7 is not applicable and if *Ac* formed by the spreading out of *Cu* or *Cb* is present, code figure 6 shall be reported.

4.2.1.2.2 If code figure 9, 8, 7 or 6 is not applicable and if the *Ac* present is progressively invading the sky, code figure 5 shall be reported.

4.2.1.2.3 If code figure 9, 8, 7, 6 or 5 is not applicable and if the *Ac* present is continually changing in appearance, code figure 4 shall be reported.

4.2.1.2.4 If code figure 9, 8, 6, 5 or 4 is not applicable and if the *Ac* present occurs at two or more levels not progressively invading the sky and no *As* and/or no *Ns*, code figure 7 shall be reported.

4.2.1.2.5 If code figure 9, 8, 6, 5 or 4 is not applicable, and if the *Ac* present occurs at one level, code figure 7 or 3 shall be reported depending on whether the *Ac* is opaque or semi-transparent, respectively.

4.2.1.3 If no *Ac* is present, code figure 2 or 1 may be applicable.

4.2.1.3.1 If *Ns* is present or if the greater part of the *As* present is opaque, code figure 2 shall be reported.

4.2.1.3.2 If there is no *Ns* present and if the greater part of the *As* present is semitransparent, code figure 1 shall be reported.

4.3 When no C_M cloud(s) is present, code figure 0 shall be reported for C_M .

4.4 A solidus (/) shall be reported for C_M under the following conditions:

4.4.1 When clouds of the C_M type (if any) can not be observed due to an intervening cover (usually more than %) of C_L cloud(s); or

4.4.2 When the celestial dome is obscured by rain, snow, fog, ice fog, blowing snow, dust-storm, sandstorm, smoke, or other phenomena so that C_M cloud(s) (if any) can not be observed. (Par. B3-1.9)

4.5 An exception to paragraph B6-4.4.1 is: When a relatively stable layer is present for a period of time prior to the observation and it is obscured (either gradually or suddenly) by an intervening cover of cloud at a lower height during the hour preceding the time of observation, the type of cloud in the obscured layer may be reported, if applicable, provided the observer is reasonably sure the obscured layer is still present. For example: If a layer of $C_M=3$ cloud is present for several hours prior to the observation and it is obscured during the past hour by the layer of $C_L=5$ cloud, the obscured $C_M=3$ cloud may be reported provided no other C_M code figure is applicable.

4.6 Condensation trails and related cloud masses shall be reported as follows:

4.6.1 Rapidly dissipating condensation trails shall not be reported or considered in determining the presence of C_M type cloud.

4.6.2 Persistent condensation trails and cloud masses resembling C_M type cloud, which have obviously developed from condensation trails, shall be considered in determining the appropriate specification to be reported for C_M . The existence of persistent condensation trails, or related cloud masses, or both, are indicated by adding the contraction **COTRA** at the end of the message.

5 Clouds of genera C_i , C_c , C_s C_H

5.1 The code figure to be reported for symbol C_H is determined on the basis of the detailed description of the high clouds and the illustrations of them in the International Cloud Atlas in conjunction with the specifications given in Code Table 11.

5.2 A brief résumé of the order, with respect to decreasing importance, in which code figures shall be selected to report the C_H cloud present is as follows:

5.2.1 If C_c is present alone, or if the amount of the C_c present is more than the combined amount of any C_i and/or C_s that might be present, code figure 9 shall be reported.

5.2.2 If code figure 9 is not applicable and C_s is present, with or without the presence of C_i or C_c , code figure 7, 8, 6, or 5 may be applicable.

5.2.2.1 If the C_s covers the whole sky, code figure 7 shall be reported.

5.2.2.2 If code figure 7 is not applicable and if the C_s does not cover the whole sky and is not invading the celestial dome, code figure 8 shall be reported.

5.2.2.3 If code figure 7 or 8 is not applicable and if the C_s is progressively invading the sky and the continuous veil of C_s extends more than 45° above the horizon but does not cover the whole sky, code figure 6 shall be reported.

5.2.2.4 If code figure 7, 8 or 6 is not applicable and if the C_s is progressively invading the sky and the continuous veil of C_s does not reach 45° above the horizon, code figure 5 shall be reported.

5.2.3 If code figure 9 is not applicable and no C_s is present, code figure 4, 3, 2 or 1 may be applicable.

5.2.3.1 If the C_i is progressively invading the sky, code figure 4 shall be reported.

5.2.3.2 If code figure 4 is not applicable and if dense C_i , which originated from C_b , is present, code figure 3 shall be reported.

5.2.3.3 If code figure 4 or 3 is not applicable and the combined sky cover of dense C_i , of C_i with sproutings in the form of small turrets or battlements and of C_i in tufts is greater than the combined sky cover of C_i in the form of

filaments, strands or hooks, code figure 2 shall be reported.

5.2.3.4 If code figure 4 or 3 is not applicable and the combined sky cover of C_i in the form of filaments, strands, or hooks is greater than the combined sky cover of dense C_i , of C_i with sproutings in the form of small turrets or battlements, and of C_i in tufts, code figure 1 shall be reported.

5.3 When no C_H cloud(s) is present, code figure 0 shall be reported.

5.4 A solidus (/) shall be reported for C_H under the following conditions:

5.4.1 When clouds of the C_H type cannot be observed due to intervening cover (usually more than 9/10) of C_L and/or C_M types of clouds; or

5.4.2 When the celestial dome is obscured by rain, snow, fog, ice fog, duststorm, sandstorm, smoke or other phenomena so that clouds of the C_H type (if any) cannot be observed. (Par. B3-1.9)

5.5 Condensation trails and related cloud masses shall be reported as follows:

5.5.1 Rapidly dissipating condensation trails shall not be reported or considered in determining the presence of C_H type cloud.

5.5.2 Persistent condensation trails and cloud masses resembling C_H type cloud, which have obviously developed from condensation trails, shall be considered in determining the appropriate specification to be reported for C_H . The existence of persistent condensation trails or related cloud masses, or both, are indicated by adding the contraction COTRA at the end of the message.

6 Group

6.1 The $N_C C_L C_M C_H$ group shall always be included in the message, even though no clouds are present, by all United States stations regardless of their location.

CHAPTER B7. CODING OF DEW POINT—PRESSURE TENDENCY GROUP

Group $T_d T_d a p p$ or $T_d T_d 9 p_{24} p_{24}$

1 Dew point $T_d T_d$

1.1 The dew point temperature to the nearest whole degree Celsius shall be reported for $T_d T_d$. (Code Table 7)

1.2 When the dew point temperature is below zero, the coding procedure given in paragraph B5-2.2 shall be followed.

1.3 When the dew point temperature is missing, solidi (//) shall be reported.

2 Characteristic of pressure tendency . . . a

2.1 The characteristic of the pressure tendency during the 3-hour period ending at the actual time of observation shall be reported for a. (Code Table 12)

2.2 In determining the characteristic of the pressure tendency, no allowance is made for diurnal change.

2.3 When, for any reason, the characteristic of the pressure tendency cannot be obtained from the barograph, a solidus (/) shall be reported for a.

2.4 The 3-hour period used in determining the characteristic is the full 3 hours preceding the actual time of observation; e.g., if the characteristic is observed at 1145 GMT, the 3-hour period is from 0845 to 1145 GMT.

3 Amount of 3-hour pressure tendency pp

3.1 The amount of the pressure tendency (net change in the atmospheric pressure at the station level) during the past 3 hours shall be reported for pp.

3.2 The amount of the pressure tendency, in units and tenths of millibars is coded direct for pp. (Code Table 13)

3.2.1 In determining the amount of the tendency, no allowance is made for diurnal change.

3.3 The 3-hour period used in computing the tendency is the full 3 hours preceding the actual time of observation. (Par. B7-2.4)

3.4 When the amount of tendency can not be determined, solidi (//) shall be reported for pp.

3.5 When the amount of the pressure tendency equals or exceeds 9.9 mbs, 99 shall be reported for pp and the total amount of the pressure tendency shall be reported by group 99ppp. (Chapter B8)

4 Indicator figure 9

4.1 The indicator figure 9 specifies that the two code figures following represent the total amount of pressure change at the station level during the past 24 hours (i.e., $p_{24} p_{24}$).

4.2 The indicator figure 9 must be included in the group ($T_d T_d 9 p_{24} p_{24}$) whenever $p_{24} p_{24}$ is reported.

5 Amount of 24-hour pressure change $p_{24} p_{24}$

5.1 The net amount of the pressure change at the station level during the past 24 hours shall be reported for $p_{24} p_{24}$. (Code Table 14)

5.2 It will be noted that Code Table 14 is divided into two portions with code figures 01 to 49, inclusive, representing a net increase in pressure during the 24 hour period and code figures 51 to 99, inclusive, representing a net decrease in pressure during the period. The amount of change in the pressure is reported in increments of 0.1 to a mb up to and including 4.0 mbs and in increments of 1 mb from 4 mbs up to and including 13 mbs.

5.3 The 24-hour period used in computing the amount of the change is the full 24 hours preceding the actual time of observation.

5.4 When the amount of the change can not be determined, solidi (//) shall be reported for $p_{24} p_{24}$.

6 Group

6.1 Either the $T_d T_{app}$ or the $T_d T_d 9p_{21} p_{21}$ group is included in the coded message by U.S. stations depending on their geographical location.

6.2 Group $T_d T_{app}$ —All United States Stations in the 49 continental States (i.e., the Northern Portion of WMO Region IV) and in

Hawaii and the Pacific (i.e., WMO Region V) shall **always include** the $T_d T_{app}$ group in the coded message.

6.3 Group $T_d T_d 9p_{21} p_{21}$ —All United States Stations in the Southern Portion of WMO Region IV (i.e., in the area covered by the Caribbean, Central America, Mexico and the Bahamas) shall **always include** the $T_d T_d 9p_{21} p_{21}$ group in the coded message.

CHAPTER B8. CODING OF EXCESSIVE PRESSURE TENDENCY GROUP

Group (99ppp)

1 Indicator figures 99

2 Amount of pressure tendency ppp

2.1 The total amount of the pressure tendency (net change in the atmospheric pressure at the station level) during the past 3 hours shall be reported for ppp. The actual value of the tendency in tens, units and tenths of millibars is coded direct for ppp.

2.2 The 3-hour period used in computing the amount of tendency is the full 3 hours preceding the actual time of observation. (Par. B7-2.4)

3 Group

3.1 The group is enclosed in parentheses

to indicate that it shall be **included in** or **omitted from** the message in accord with specified conditions. These conditions are:

(a) The group is **never included** in the message if the amount of the tendency is 9.8 mbs or less,

(b) The group is **always included** in the message if the amount of the tendency is 9.9 mbs or more.

For example: If the total amount of the tendency is 23.4 mbs, the groups are coded T_aT_aa99 99234. If the amount is 9.9 mbs, the groups are coded T_aT_aa99 99099.

3.2 Only those United States stations which report the T_aT_appp group shall include the 99ppp group in their coded messages, when the conditions given in paragraph B7-3.5 are satisfied.

CHAPTER B9. CODING OF STATION PRESSURE GROUP

Group **6P.P.P.P.**

1 Indicator figure **6**

2 Station pressure **P.P.P.P.**

2.1 The station pressure to tenths of a millibar (i.e., the hundreds, tens, units and tenths digits) shall be coded direct for **P.P.P.P.** (Code Table 6)

2.1.1 There is one **exception** in coding the actual value of the station pressure and that occurs when the pressure is 1000.0 mbs or greater. When the pressure is 1000.0 mbs or greater, code figure **3** shall be reported for the hundreds digit. For example: 1000.0 mbs is coded 3000; 1025.7 mbs is coded 3257; etc.

2.1.2 When the station pressure is 999.9 mbs or less, the actual value is coded direct for **P.P.P.P.** For example: 999.9 mbs is coded 9999; 975.1 mbs is coded 9751; 889.1 mbs is coded 8891; etc.

2.2 Only corrected station pressure is reported for **P.P.P.P.** (i.e., the pressure is corrected for instrumental error, temperature and gravity before coding).

2.3 When for any reason the station pressure can not be obtained, solidi (////) shall be coded for **P.P.P.P.**

3 Group

3.1 The **6P.P.P.P.** group shall always be **included** in the message by all United States stations regardless of their location.

CHAPTER B10. CODING OF PRECIPITATION GROUP

Group (7RRR_s) or (7RRD_LD_M)

1 Indicator figure 7

2 Amount of precipitation RR

2.1 The total amount of precipitation which has occurred in the 6 hours preceding the **actual** time of observation is coded direct in hundredths of an inch for **RR**. (Code Table 15)

2.1.1 The term total amount of precipitation refers to the amount of rain and/or the water equivalent of snow and other solid forms of precipitation.

2.1.2 The time of observation refers to the **actual** time of observation and **not** the **standard** time of observation; e.g., 2347 GMT and not 0000 GMT. There is **one exception** to this rule and it occurs when the **only** precipitation for the preceding 6-hour period occurs between the time the message is filed for transmission and the time the precipitation would have normally been measured. When this occurs, the 7-group shall be inserted in the coded message and a trace shall be reported for **RR** regardless of the amount of precipitation that occurs during these few minutes. The other elements in the message affected shall be changed (even though they have already been coded) to agree with the 7-group.

2.2 When the total amount of precipitation is a **TRACE**, code figure 00 shall be reported for **RR**.

2.3 When the amount of precipitation is 1.00 inch or more, a plain language word to indicate the number of whole inches shall be inserted in the message immediately following the 7-group and the hundredths of an inch are reported for **RR**. For example: If the amount of precipitation is 2.67 inches, the groups are coded 767R_s TWO; if 3.00 inches, 700R_s THREE; if 1.99 inches, 799R_s ONE, etc.

2.4 If precipitation has occurred during the 6 hours preceding the time of observation and,

for any reason, the measured amount can not be obtained, solidi (/) shall be reported for **RR**.

(NOTE: The instructions given here that **hundredths** of an inch be reported for **RR** applies to all United States stations in WMO Regions IV and V (i.e., the specified areas of North and Central America and the Pacific area). Two units of measurement are being used for reporting **RR** in these two WMO Regions. These units are **hundredths of an inch** and **millimeters** (WMO Code Table 3577) with **millimeters** being the unit established by the WMO for this purpose. Insofar as information is available at this time, it is expected that there will be little change with respect to the unit of measurement being reported for **RR** as most services will probably continue their present practice.)

3 Time precipitation began or ended R_t

3.1 The time precipitation began or ended shall be reported for **R_t**. (Code Table 16)

3.2 When precipitation is occurring at the time of observation, or **has ended** during the hour preceding the observation, the time reported is the time precipitation began.

3.3 When precipitation is **not occurring** at the time of observation, and **has not occurred** in the hour preceding the observation, the time reported is the time precipitation ended.

3.4 When two or more periods of precipitation occur during the 6-hour period, the time (beginning or ending, as appropriate) of the last period of precipitation shall be reported.

3.5 When the time of beginning or ending of the precipitation is unknown, code figure 9 shall be reported.

3.6 For **R_t**, the time of observation means the **standard** time of observation (i.e., at 0000, 0600, 1200, or 1800 GMT).

4 Depth of snow s

4.1 The total accumulated depth, to the nearest whole inch, of snow on the ground at

the time of observation shall be reported for **s**. (Code Table 17)

4.1.1 The term snow as used here includes ice and all solid forms of precipitation; i.e., snow, hail, ice pellets (sleet), etc.

4.1.2 When the depth of snow is not uniform, the average depth shall be reported.

4.2 When there is no snow on the ground at the time of observation, and the **7RRR,s** group is included in the message, code figure **0** shall be reported for **s**.

4.3 When the total accumulated depth of snow on the ground is a trace, code figure **9** shall be reported.

4.4 When the total accumulated depth of snow on the ground is **8 inches or more** and the **7RRR,s** group is included in the message, code figure **8** is reported for **s** and a **9S_rS_rs_rs_r** group is used to report the total depth. (Par. B12-4.5.1.1)

4.5 When there is more than a trace of snow on the ground at the 1200 GMT observation and the **7RRR,s** group is not included in the message, a **9S_rS_rs_rs_r** group shall be used to report the total depth. (Par. B12-4.5.1.2)

4.6 When there is more than a trace of snow on the ground and a measurement or a reasonably accurate estimate cannot be made, a (/) shall be reported for **s**.

4.7 The time of observation refers to the actual time of observation and not the standard time of observation. (Par. B10-2.1.2)

5 Direction from which **C_L** clouds are moving . . . **D_L**

5.1 The direction (true) from which the cloud(s) reported for **C_L** are moving is reported for **D_L**. (Code Table 18)

5.2 When no cloud(s) of **C_L** type exist, code figure **0** shall be coded for **D_L**. Code figure **0** will have, therefore, two meanings with one being that **C_L** cloud(s) is present and stationary and the other being that no **C_L** cloud is present. The actual meaning being reported by **D_L** can

be determined by reference to the datum being reported for **C_L**.

6 Direction from which **C_M** clouds are moving . . . **D_M**

6.1 The direction (true) from which the cloud(s) reported for **C_M** are moving is reported for **D_M**. (Code Table 18)

6.2 When no cloud(s) of **C_M** type exists, code figure **0** shall be coded for **D_M**. Code figure **0** will have, therefore, two meanings with one being that **C_M** cloud(s) is present and the other being that no **C_M** cloud is present. The actual meaning being reported by **D_M** can be determined by reference to the datum being reported for **C_M**.

7 Group

7.1 Either the **7RRR,s** or the **7RRD_LD_M** group is included in the coded message by United States stations, depending on their geographical locations, and whether or not the requirements for the inclusion of either group have been satisfied. The groups are enclosed in parentheses to indicate that they shall be included in, or omitted from, the coded message in accord with specified conditions. These conditions are:

7.1 Group 7RRR,s—All United States Stations in North and Central America (i.e., both the Northern and Southern Portions) shall include the **7RRR,s** group in the coded message only when precipitation has occurred in the 6-hour period preceding the actual time of observation. (See paragraph B10-2.1.2 for the one exception to the time period.)

7.1.2 Group 7RRD_LD_M—All United States stations in Hawaii and the Pacific (WMO Region V) shall include the **7RRD_LD_M** group in the coded message only when datum for any one of the three elements is available (i.e., when precipitation has occurred in the past 6 hours, or when **C_L** and/or **C_M** type cloud(s) are reported in the **N_LC_LhC_MC_H** group).

CHAPTER B11. CODING OF CLOUD LAYER GROUP

Group (8N_oCh_oh_o)

1 Indicator figure 8

2 Fraction of the celestial dome covered by the individual cloud layer of genus C N_o

2.1 The fraction of the celestial dome covered by the individual cloud layer (or mass) reported by C shall be reported for N_o. (Code Table 1)

2.2 The selection of cloud layers to be reported by this group shall be made according to the following rules:

2.2.1 The **lowest** individual layer (or mass) of cloud of any amount greater than zero.

2.2.2 The **next higher** individual layer (or mass) of cloud which covers 0.4 or more of the celestial dome.

2.2.3 The **next higher** individual layer (or mass) of cloud which covers 0.6 or more of the celestial dome.

2.2.4 Cumulonimbus clouds, whenever observed and not reported under paragraphs 2.2.1, 2.2.2 and 2.2.3, preceding. This group will **only** contain information on the Cb.

2.3 In determining the cloud amounts to be reported for the individual layers or masses in the 8-groups an evaluation is made of each layer of cloud at the different levels as if no other cloud were present. The evolution of the cloud layers shall be taken into consideration so that the best scientific evaluation practicable can be made of the amount in the layer. Observers are reminded that the **layer concept** and **not** the **summation concept** is used in determining the value to be reported for N_o. (Par. A2-9)

2.4 When the celestial dome is obscured by rain, snow, fog, ice fog, duststorm, sandstorm, smoke, or other phenomena so that cloud, if any, cannot be observed, code figure 9 shall be reported for N_o.

3 Genus of cloud C

3.1 The genus of cloud, whose amount is reported by N_o, shall be reported for C. (Code Table 19)

3.2 When the sky is obscured by rain, snow, fog, ice fog, duststorm, sandstorm, smoke, or other phenomena so that cloud, if any, can not be observed, a solidus (/) shall be reported for C.

4 Height of base of cloud layer whose genus is indicated by C h_oh_o

4.1 The height above ground of the base of the layer of cloud reported for C shall be reported for h_oh_o. (Code Table 20)

4.2 When the celestial dome is obscured by rain, snow, fog, ice fog, duststorm, sandstorm, smoke or other phenomena so that the cloud, if any, can not be observed, the vertical visibility shall be reported for h_oh_o.

4.3 If the observed height value lies between two of the values given in the code table, the code figure representing the **lower** code table value shall be reported for h_oh_o.

4.4 When a reportable height can not be obtained for any reason not covered in paragraph B11-4.2, solidi (/) shall be reported for h_oh_o.

5 Group

5.1 The 8N_oCh_oh_o group is enclosed in parentheses to indicate that its **inclusion in**, or **omission from**, the coded message depends on cloud conditions or instructions to the station. All United States Stations located in the specified areas of WMO Regions IV and V shall **omit** this group from the coded message unless separate instructions to include it have been received. (Pars. B1-2.2, B1-2.3 and B1-2.4)

5.2 When reported, the 8-group shall be included in the coded message as many times as

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CODING OF CLOUD LAYER GROUP

may be required to report the layers of cloud that exist in accordance with the specifications of paragraph B11-2.2. The 8-groups shall appear in the message in **ascending order**; i.e., the group reporting the lowest layer (with respect

to height above ground) shall appear first followed by the group representing the next higher layer, etc.

5.3 When no clouds exist (i.e., $N=0$), the 8-group is omitted from the message.

CHAPTER B12. CODING OF SPECIAL PHENOMENA GROUP

Group (9S_rS_rSS_p)

- 1 Indicator figure 9
- 2 Special Phenomena, general description
. . . . S_rS_r

2.1 Special Phenomena (general description) are reported for S_rS_r. (Code Table 21)

2.2 Each S_rS_r specification requires further description which is provided by the appropriate selection of a code figure to be reported for s_ps_p (Special Phenomena, detailed description).

2.3 With regard to Code Table 21 it will be noted that:

2.3.1 Each specification is followed by one or more symbols (enclosed in parentheses) which indicate the type of information to be reported for s_ps_p (detailed description).

2.3.2 Some of the S_rS_r code figures have a single specification which is amplified by use of only one s_ps_p code table (e.g., S_rS_r=20 where only dd is reported for s_ps_p).

2.3.3 Some of the S_rS_r code figures have two specifications separated by the word or in which case the s_ps_p symbols are separated by the word or, also. When this occurs the S_rS_r specification given at the left of the word or is used in combination with the s_ps_p symbol given at the left of the word or. Similarly, the S_rS_r specification and the s_ps_p symbol to the right of the word or are used in combination. For example: In S_rS_r=08, the State of Sea and S_pS_p are reported in combination, and Period of Sea Swell and K_pK_p are reported in combination.

2.3.4 Some of the S_rS_r code figures have one specification followed by two s_ps_p symbols which are separated by a comma. In these cases, either of the s_ps_p symbols may be used to provide detailed information on the specification. For example: In S_rS_r=06 either tt or zz may be reported, as appropriate.

2.4 The assignment of more than one specification for an S_rS_r code figure should cause no

difficulty in decoding the group as the detailed information reported for s_ps_p and other information given in the synoptic message will indicate the appropriate S_rS_r specification.

- 3 Special Phenomena, detailed description
. . . . s_ps_p

3.1 The code figure which appropriately describes the phenomenon reported for S_rS_r shall be reported for s_ps_p. (Code Table 22)

3.2 The symbols in parentheses at the end of the specification for S_rS_r indicates the s_ps_p code table(s) to be used.

3.3 If more than one s_ps_p code figure (either from one or two s_ps_p code tables) could appropriately be reported for an S_rS_r specification, the s_ps_p code figure representing the more important information will be reported.

3.4 The list given below indicates the possible code figures that may be reported to describe a particular S_rS_r code figure. The following table is given for convenience and does not imply that the indicated code figure is to be reported each time the phenomenon occurs at the station:

S _r S _r Code Figure	s _p s _p Symbols	Number of Code Table Specified	Possible s _p s _p Code Figures
00	nn	22a	00-99
01	nn	22a	00-99
02	nn	22a	00-99
03	nn	22a	00-99
04	nn	22a	00-99
05	EE	22b	00-99
06	tt, zz	22c, 22d	00-99, 76-78, 83, 84, 95-99
07	nn	22a	00-99
08	S _p S _p or K _p K _p	22e or 22f	00-99 or 11-99
09	nn	22a	00-99
10	D _p D _p or ss	22g or 22d	02-39 or 70-75, 77-84, 87-93, 95-99
14	tt	22c	00-75

S _p S _p Code Figure	s _p s _p Symbols	Number of Code Table Specified	Possible s _p s _p Code Figures
15	tt	22c	00-75
16	nn	22a	00-99
17	tt or ss	22c or 22d	00-99 or 73, 90-93
18	tt or ss	22c or 22d	00-99 or 70-72, 74-76, 80-85, 91, 92, 95-99
20	dd	2	00-36
21	ff	22h	00-99
22	ff	22h	00-99
23	ff	22h	00-99
24	dd	2	00-36
25	ss or dd	22d, or 2	73, 78, 90-93 or 00-36
26	ss	22d	73, 90-93
27	tt	22c	00-75
28	tt, ss	22c, 22d	00-75, 76, 84, 85, 86, 89
29	tt, ss	22c, 22d	00-75, 76, 84, 85, 86, 89
30	D, D, or ss	22g or 22d	02-39 or 75-99
31	tt	22c	00-75
32	tt	22c	00-75
33	D, D, or ss	22g or 22d	02-39 or 70-75, 78-99
34	D, D, or ss	22g or 22d	02-39 or 70-99
35	tt, ss	22c, 22d	00-75, 76-99
37	tt, ss	22c, 22d	00-75, 76-99
38	tt or ss	22c or 22d	00-75 or 76-99
39	tt or ss	22c or 22d	00-75 or 76-99
40	tt or ss	22c or 22d	00-74 or 76-99
41	VV	3	00-89
42	VV	3	00-89
43	VV	3	00-89
44	VV	3	00-89
45	VV	3	00-89
46	VV	3	00-89
47	VV	3	00-89
48	VV	3	00-89
49	DL, D _M , D _H	22i	0-9, 0-9, 0-9

4 Group

4.1 The Special Phenomena group (9S_pS_ps_ps_p) is included in the message when the occurrence of the phenomenon must be reported on a **mandatory** basis or when **both** of the following conditions are fulfilled:

4.1.1 When a phenomenon occurs for which essential information **cannot** be reported elsewhere in the message;

4.1.2 When such information regarding the phenomenon would be of value in forecasting or in general weather service activities.

4.2 Because of the great variety of information that can be reported by the Special Phenomena group it is not practicable to give detailed instructions to each station as to when and under what circumstances each item should be reported. Hence, unless specific instructions are issued regarding the reporting of an item it will be left to the observer's judgment to determine which items are to be reported, and when, provided of course the decision is in accordance with the instructions given in paragraph 4.1, preceding.

4.2.1 In deciding whether or not an item is to be reported the observer should consider:

4.2.1.1 Specific instructions (if any) regarding the item; Relative frequency of occurrence of the phenomenon at the station; Season of the year; Time of day; Type and location of station; Frequency of reporting observations; Local topography; Distance to adjacent reporting stations; etc.

4.2.2 As many Special Phenomena groups as are required to describe the observed meteorological conditions may be included in the message: however, it is not intended that the length of the message be increased unduly by the reporting of relatively unimportant phenomena. In general, the average station will seldom find it necessary to report more than one Special Phenomena group and in most instances none will be required. Only under the most unusual circumstances (e.g., hurricane, severe winter storm, severe thunderstorm, etc.) would more than one Special Phenomena group be included in a single message.

4.3 The Special Phenomena Code Tables are designed to provide for reporting a variety of phenomena that can not otherwise be included in the synoptic message. Special Phenomena generally considered of value are:

4.3.1 Direction and speed of maximum wind during the preceding 6 hours provided the wind speed equals or exceeds 33 knots, or is in accordance with special instructions that have been issued to the station. (Par. A2-11)

4.3.2 Detailed information on phenomena associated with blizzards, hurricanes, and severe local storms (including tornadoes).

4.3.3 Pronounced variations in wind direction, wind speed, visibility, barometric pressure, and the occurrences of frost, and frontal passages.

4.3.4 Direction of C_L , C_M , and C_H clouds when a hurricane is in progress in the area (i.e., within approximately a 500 mile radius of the station).

4.4 Code Figure 01—Depth of Newly Fallen Snow

4.4.1 A Special Phenomena group to report the depth of newly fallen snow ($S_P S_P=01$) shall **always be included** in the message whenever one inch or more has accumulated on the ground during the past 6 hours.

4.4.1.1 For synoptic coding purposes, the term newly fallen snow means the sum of all the snow that has accumulated on the ground during the past 6 hours before melting, if any, takes place. In the case of snow showers, it will be the sum of the individual accumulated amounts deposited by each shower. Therefore, it will be necessary to obtain the accumulated depth left by each shower before melting occurs in order to obtain the 6-hour sum. For example: If two showers occur during the 6-hour period, the first of which leaves an accumulated depth of two inches and the second 3 inches, the value reported will be 5 inches even though one inch of the first shower's accumulated 2 inches may have melted before the second shower occurred.

4.5 Code Figure 04—Total Depth of Snow on Ground

4.5.1 A Special Phenomena group to report the total accumulated depth of snow and/or ice on ground ($S_P S_P=04$) shall **always be included** in the message:

4.5.1.1 When the $7RRR,s$ group is included in the message and the total depth of snow on the ground is 8 inches or more, the $904s,s$ group is **included** in the message. The total

depth (in inches) is reported for s,s . For example: If there is 8 inches of snow on the ground the groups are coded $7RRR,8$ and 90408 ; if 14 inches, $7RRR,8$ and 90414 ; etc.

4.5.1.2 If the $7RRR,s$ group is **not included** in the 1200 GMT report and there is **more** than a trace of snow present on the ground, the $904s,s$ group is **included** in the message. The total depth (in inches) is reported for s,s .

4.5.1.3 If a measurement or a reasonably accurate estimate of the amount of snow on the ground cannot be made, the $904s,s$ group shall be included in the message and solidi (//) shall be reported for s,s .

4.6 Code Figure 07—Glaze

4.6.1 A Special Phenomena group to report the average rate of accrual per hour of glaze ($S_P S_P=07$) shall **always be included** in the message whenever the phenomenon is **occurring** at the time of observation or **has occurred** during the past 6 hours.

4.6.2 The units used in determining the rate are a tenth of an inch and a time period of one hour. The difficulties involved in making accurate observations of this phenomenon are fully understood and in many instances, therefore, the value reported will be a considered estimate rather than a precise measurement. Only the number of hours the glazing actually occurred is used in determining the average rate of accrual per hour. For example: If during the preceding 6 hours, glazing actually occurred for 3 hours and deposited 0.6 of an inch, the average rate of accrual per hour would be 0.2 inch ($s_P s_P=02$). In this instance the coded group would be 90702.

4.6.3 If the phenomenon is occurring, or has occurred, and for any reason a reportable value cannot be obtained, solidi (//) shall be reported for s,s , to indicate the datum is missing.

4.7 Group

4.7.1 The $9S_P S_P s,s$ group is enclosed in parentheses to indicate that its **inclusion** in, or **omission** from, the coded message depends on the occurrence of the phenomenon or instruc-

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CODING OF SPECIAL PHENOMENA GROUP

tions. All United State stations in North and Central America (WMO Region IV) shall include the **9S_pS_pS_pS_p** group in the coded message according to the instructions given elsewhere

in this Chapter. United States stations in Hawaii and the Pacific (WMO Region V) shall follow the instructions given in Paragraph B1-2.4.2 regarding the **9S_pS_pS_pS_p** group.

CHAPTER B13. CODING OF 24-HOUR PRECIPITATION GROUP

Group (2R₂₄R₂₄R₂₄R₂₄)

- 1 Indicator figure 2
- 2 24-hour precipitation R₂₄R₂₄R₂₄R₂₄

2.1 The total amount of precipitation (including water equivalent of solid forms of precipitation) which has occurred during the 24-hour period preceding the 6-hourly observation shall be reported for R₂₄R₂₄R₂₄R₂₄.

2.2 The 24-hour amount shall be coded direct in tens, units, tenths, and hundredths of inches. Amounts of less than 0.01 inch are not reported.

2.3 When precipitation (0.01 inch or more) has occurred during the preceding 24 hours and, for any reason, the amount can not be determined, solidi (////) shall be reported for R₂₄R₂₄R₂₄R₂₄.

2.4 The actual time of observation is used in determining the 24-hour amount of precipitation; e.g., 1141 GMT, if appropriate, etc.

3 Group

3.1 The 2R₂₄R₂₄R₂₄R₂₄ group is enclosed in parentheses to indicate that its inclusion in, or

omission from, the coded message depends on the occurrence of the phenomenon or individual station instructions.

3.2 All United States Stations in the Northern Portion of WMO Region IV (i.e., in the 49 continental States), which are equipped with precipitation measuring devices, shall include the 2R₂₄R₂₄R₂₄R₂₄ group in the message when precipitation of 0.01 inch or more has occurred in the 24 hours preceding the 0000, 0600, 1200, or 1800 GMT observation.

3.3 United States Stations in the Southern Portion of WMO Region IV shall include this group in the coded message under the same conditions as specified in paragraph 3.2, preceding.

3.4 United States Stations in Hawaii and the Pacific (i.e., WMO Region V) shall follow the instructions given in paragraph B1-2.4.2 regarding the reporting of this group.

3.5 When precipitation has not occurred, or less than 0.01 inch has occurred, during the preceding 24 hours, the group shall be omitted from the message.

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CHAPTER B14. CODING OF WAVE GROUPS

Groups (3P_wP_wH_wH_w) (d_wd_wP_wH_wH_w)

1 Indicator figure 3

1.1 The indicator figure 3 identifies the wave groups 3P_wP_wH_wH_w d_wd_wP_wH_wH_w.

2 Period of the wind waves P_wP_w

2.1 The period of the wind waves in seconds shall be reported direct for symbol P_wP_w.

2.2 The period of the wind waves is the time between the passage of two successive crests past a fixed point (i.e., it is equal to the wave length divided by the wave speed).

2.3 When no wind waves are observed due to a calm sea, code figure 00 shall be reported for P_wP_w.

2.4 When an estimate of the period of the wind waves can not be made due to a confused sea, code figure 99 shall be reported for P_wP_w.

2.5 When the period of the wind waves can not be observed for any reason other than a confused sea, solidi (//) shall be reported for P_wP_w.

3 Height of the waves H_wH_w

3.1 Height of the waves (both wind and swell) shall be reported in increments of 1½ feet. The total number of increments of height shall be reported for symbol H_wH_w. For example: Code figure 01=1 increment (i.e., 1 x 1½=1½ feet); code figure 02=2 increments (i.e., 2 x 1½=3 feet); code figure 03=3 increments (i.e., 3 x 1½=4½ feet); etc.

3.2 When no waves are observed due to a calm sea, code figure 00 shall be reported for H_wH_w.

3.3 When the height (trough to crest) of the waves was not observed for any reason, solidi (//) shall be reported for H_wH_w.

4 Direction from which the swell waves come d_wd_w

4.1 The true (not magnetic) direction in tens of degrees from which the swell waves are

coming shall be reported direct for symbol d_wd_w. (Code Table 23)

4.2 When the direction of the swell waves can not be observed due to a confused sea, code figure 99 shall be reported for d_wd_w.

4.3 When the direction of the swell waves can not be observed for reasons other than a confused sea, solidi (//) shall be reported for d_wd_w.

5 Period of the swell waves P_w

5.1 The period of the swell waves shall be reported for symbol P_w as specified in Code Table 24.

5.2 The period of the swell waves is the time between the passage of two successive crests past a fixed point (i.e., it is equal to the wave length divided by the wave speed).

5.3 The average value of the wave period is reported, as obtained from the larger well-formed waves of the wave system being reported.

6 Groups

6.1 The 3P_wP_wH_wH_w d_wd_wP_wH_wH_w groups are enclosed in parentheses to indicate that their inclusion in, or omission from, the coded message depends on the occurrence of the phenomenon or the instructions issued to individual stations regarding the reporting of waves.

6.2 Only authorized stations (coastal, lightships, lighthouses, etc.) will include the wave groups in their coded messages.

6.3 Depending on location, equipment, etc., the authorizations issued to the individual stations for reporting wave information may vary from station to station. Hence, this group may appear in the message irregularly according to the authorizations. For example, stations may include the group under varying circumstances:

6.3.1 When waves reach specified heights or come from specified directions; at certain seasons of the year or times of day; when a storm center is within a specified distance from the station; on call; etc.

6.3.2 When the water surface is calm (i.e., waves, if present are less than 1½ feet) the wave group(s) is not reported unless the inclusion of the group(s) has been requested by the forecast center for a specified period of time.

6.4 Group 3P_wP_wH_wH_w—The 3P_wP_wH_wH_w group contains the period and the height of the wind waves. The direction from which wind waves come is the same as the surface wind; therefore, it is not necessary to report the direction. It will be noted that the 3P_wP_wH_wH_w group contains the indicator figure 3 which uniquely identifies it as the wind wave group; therefore, it can be used alone. When only wind waves are being reported, the d_wd_wP_wH_wH_w group is not included in the message. If there

are no wind waves and a swell wave is observed, 30000 shall be reported for 3P_wP_wH_wH_w.

6.5 Group d_wd_wP_wH_wH_w—The d_wd_wP_wH_wH_w group contains the direction, period and height of the swell waves. It will be noted that the d_wd_wP_wH_wH_w group is not uniquely identified by an indicator figure; hence, it can never be used alone as there would be no way of positively identifying it as the swell wave group. Therefore, the 3P_wP_wH_wH_w group must always immediately precede the d_wd_wP_wH_wH_w group in the coded message so that the latter group can be identified. The 3P_wP_wH_wH_w shall be coded as specified in paragraphs 2 and 3 of this Chapter, which provide for coding observed and missing data. The d_wd_wP_wH_wH_w group shall be repeated as required to report additional swell wave systems (e.g., 3P_wP_wH_wH_w d_wd_wP_wH_wH_w d_wd_wP_wH_wH_w).

CHAPTER B15. CODING OF EXTREME TEMPERATURE GROUP

Group (4T₁T₂T₃T₄)

1 Indicator figure 4

2 Maximum temperature T₁T₂

2.1 The maximum temperature of the air to the nearest **whole degree Fahrenheit** shall be reported for T₁T₂. (Code Table 7)

2.2 Maximum temperature shall be reported as follows:

2.2.1 The maximum temperature for the **previous 24 hours** is reported at 0600 GMT.

2.2.2. The maximum temperature for the **previous calendar day** (midnight to midnight local standard time) is reported at 1200 GMT. (If the midnight to midnight maximum temperature cannot be obtained due to station not operating on a 24-hour basis, lack of a temperature recording device, etc., the maximum temperature for the 24-hour period ending at 0600 GMT may be reported.)

2.2.3 The maximum for the **previous 12 hours** is reported at 1800 and 0000 GMT.

2.3 The following procedures shall be used in coding temperatures 100°F or higher and 0°F or lower:

2.3.1 When the temperature is 100°F or higher, 100 is subtracted from the absolute value of the temperature and the remainder is coded; e.g., 107°F is coded 07 (i.e., 107-100=07); 114°F is coded 14; 100°F is coded 00; etc.

2.3.2 When the temperature is 0°F or lower, the absolute value of the temperature is subtracted from 100 and the remainder is coded; e.g., -15°F is coded 85 (i.e., 100-15=85); -1°F is coded 99; 0°F is coded 00; etc.

2.4 When for any reason the appropriate maximum temperature cannot be determined, solidi (//) shall be reported for T₁T₂ to indicate missing.

2.5 The **actual** time of observation is used in determining the maximum temperature.

3 Minimum temperature T₃T₄

3.1 The minimum temperature of the air to the nearest **whole degree Fahrenheit** shall be reported for T₃T₄. (Code Table 7)

3.2 Minimum temperature shall be reported as follows:

3.2.1 The minimum temperature for the **previous 24 hours** is reported at 0600 and 1800 GMT.

3.2.2 The minimum temperature for the **previous 12 hours** is reported at 1200 GMT.

3.2.3 The minimum temperature for the **previous 18 hours** is reported at 0000 GMT.

3.3 When the minimum temperature is 100° or higher, or 0° or lower, it shall be coded in accordance with the instructions given in paragraph 2.3, preceding.

3.4 When for any reason the appropriate minimum temperature can not be determined, solidi (//) shall be reported for T₃T₄.

3.5 The **actual** time of observation is used in determining the minimum temperature.

4 Group

4.1 The 4T₁T₂T₃T₄ group is enclosed in parentheses to indicate that its **inclusion** in, or **omission** from, the coded message depends on the reporting instructions issued to stations and whether or not the station is equipped with suitable temperature recording devices.

4.2 All United States Stations in the Northern Portion of WMO Region IV (i.e., in the 49 continental States), which are **equipped** with appropriate temperature recording devices, shall **include** the 4T₁T₂T₃T₄ group in the coded message.

4.3 United States Stations in the Southern Portion of WMO Region IV shall include this group in the coded message under the same conditions as specified in paragraph 4.2, preceding.

4.4 United States Stations in Hawaii and the Pacific (i.e., WMO Region V) shall follow the instructions given in paragraph B1-2.4.2 regarding the reporting of this group.

CHAPTER B16. CODING OF MESSAGE SEPARATION SIGNAL

Message separation signal ⊙

1 The message separation signal ⊙ is always added at the end of every surface synoptic coded report from a United States land station.

1.1 If the report ends in a figure group the separation signal is added, without a space intervening, to the last group so that in most instances the last group will become a six-figure group. If the 4T₁T₂T₃T₄ group is the last group of the report it becomes 4T₁T₂T₃T₄⊙. If the last data group of the report is the Monthly Mean Data it becomes TTR₁R₁R₁T₄₄T₄₄T₄₄⊙.

1.2 If the report ends in a plain language

word, the separation signal is added to the word as though it were a letter, i.e., without intervening space. Some examples are: HAIL⊙, SNOW⊙, PELLETS⊙, COTRA⊙, HIEAT⊙, LOEFM⊙, etc.

2 By international agreement the message separation signal is signal No. 22 (figure case position) of the International Telegraph Alphabet No. 2, which on the meteorological keyboard used by the United States prints out the symbol normally used for a scattered cloud condition of the sky (i.e., ⊙). In other countries, signal No. 22 may print out some other character, figure or symbol, however, this is a matter of local convention and it is immaterial to the fact that signal No. 22 is transmitted.

CHAPTER B17. CODING OF ADDITIONAL PLAIN LANGUAGE DATA¹

1 Record Temperatures

1.1 The occurrence of high or low temperatures in degrees Fahrenheit which equal or exceed the station records shall be reported for synoptic purposes by using contractions of plain language words. This information will be reported in accordance with the following rules:

1.1.1 Only first order Weather Bureau stations in the 49 continental states having a length of record equaling fifteen (15) years shall report this information.

1.1.2 Only records obtained during the time the station is classed as the synoptic reporting station for the city (or locality) shall be considered in determining whether current extreme temperatures equal or exceed record temperatures for synoptic purposes.

1.1.3 When the total synoptic record consists of several segments taken consecutively at two or more different exposures of the temperature sensor within a city (or locality), the guidelines given below shall be followed in determining the length of record to be used in deriving this information for synoptic purposes.

1.1.3.1 When the present site has been in use for fifteen years or more, **only** the temperature records obtained at the present site of the temperature sensor shall be used when determining whether the current temperatures have equaled or exceeded past records for synoptic purposes.

1.1.3.2 When the present site has been in use less than fifteen years, its length of record may be combined with those from previous sites **provided** the temperature records for all sites included are clearly compatible. If the temperature records from the various sites (considered in consecutive order) are **not** compatible, the station shall **not** begin to report

record temperatures until fifteen years of consecutive compatible record has been obtained.

1.1.4 Records from cooperative climatological or other types of substations shall **not** be used for this purpose.

1.2 When a contraction is appropriate for inclusion in the message, it shall be added immediately following the 4T₁T₂T₃T₄ group. These contractions are:

HIXAT=HIGhest eXceeded for All Time
LOXAT=LOWest eXceeded for All Time
HIEAT=HIGhest Equaled for All Time
LOEAT=LOWest Equaled for All Time
HIXFM=HIGhest eXceeded For the Month
LOXFM=LOWest eXceeded For the Month
HIEFM=HIGhest Equaled For the Month
LOEFM=LOWest Equaled For the Month
HIXSE=HIGhest eXceeded So Early
LOXSL=LOWest eXceeded So Late
HIESE=HIGhest Equaled So Early
LOESL=LOWest Equaled So Late
HIXSL=HIGhest eXceeded So Late
LOXSE=LOWest eXceeded So Early
HIESL=HIGhest Equaled So Late
LOESE=LOWest Equaled So Early

1.2.1 Contractions shall be added to any one of the four primary (6-hourly) synoptic messages in which the maximum (T₁T₂) or minimum (T₃T₄) temperature being reported is the record temperature to which the word refers. For example: If a maximum temperature, which requires the inclusion of the contraction HIXAT is reported for the first time in the 0000 GMT message, the contraction HIXAT shall be included in the 0000, 0600, and 1200 GMT messages as these are the messages in which this particular maximum temperature is reported under normal circumstances.

1.3 All-time Temperatures

1.3.1 Whenever all-time temperature records have been **exceeded or equaled**, appropriate contractions are included in the message to

¹NOTE.—The instructions in Chapter B17 apply only to Weather Bureau stations, therefore, Military stations will not report the "Additional Plain Language Data" provided for in this chapter.

report this information. Temperatures are considered to whole degrees for this purpose. The words and rules for reporting them are:

1.3.1.1 HIXAT or LOXAT—Whenever the previous all-time record for either the maximum or the minimum temperature (regardless of its date of occurrence) has been exceeded either the contraction HIXAT or LOXAT, respectively, shall be included in the message.

1.3.1.2 HIEAT or LOEAT—Whenever the previous all-time record for either the maximum or the minimum temperature (regardless of its date of occurrence) has been equaled, either of the contractions HIEAT or LOEAT, respectively, shall be included in the message.

1.4 Winter and Summer temperatures

1.4.1 Whenever temperature records for the winter (i.e., December, January, and February) or summer (i.e., June, July, and August) months have been exceeded or equaled, appropriate contractions are included in the message. Temperatures are considered to whole degrees for this purpose. The contractions and rules for including them are:

1.4.1.1 HIXFM—Whenever a maximum temperature occurs which is higher than any temperature that has ever been recorded for the same month (e.g., January), the contraction HIXFM shall be included in the message.

1.4.1.2 LOXFM—Whenever a minimum temperature occurs which is lower than any temperature that has ever been recorded for the same month (e.g., January), the contraction LOXFM shall be included in the message.

1.4.1.3 HIEFM—Whenever a maximum temperature occurs which equals the highest temperature that has ever been recorded for the same month (e.g., January), the contraction HIEFM shall be included in the message.

1.4.1.4 LOEFM—Whenever a minimum temperature occurs which equals the lowest temperature that has ever been recorded for the same month (e.g., January), the contraction LOEFM shall be included in the message.

1.5 Spring temperatures

1.5.1 Whenever temperature records for the spring months (i.e., March, April, and May)

have been exceeded or equaled, appropriate contractions are included in the message to report this information. For this purpose temperatures are considered to whole degrees. The words and rules for including them are:

1.5.1.1 HIXSE—Whenever a maximum temperature occurs which is higher than any temperature that has ever been recorded so early in the spring, the contraction HIXSE shall be included in the message.

1.5.1.2 LOXSL—Whenever a minimum temperature occurs which is lower than any temperature that has ever been recorded so late in the spring, the contraction LOXSL shall be included in the message.

1.5.1.3 HIESE—Whenever a maximum temperature occurs which equals the highest temperature that has ever been recorded so early in the spring, the contraction HIESE shall be included in the message.

1.5.1.4 LOESL—Whenever a minimum temperature occurs which equals the lowest temperature that has ever been recorded so late in the spring, the contraction LOESL shall be included in the message.

1.6 Autumn temperatures

1.6.1 Whenever temperature records for the autumn months (i.e., September, October, and November) have been exceeded or equaled, appropriate contractions are included in the message to report this information. Temperatures are considered to whole degrees for this purpose. The words and rules for reporting them are:

1.6.1.1 HIXSL—Whenever a maximum temperature occurs which is higher than any temperature that has ever been recorded so late in the autumn, the contraction HIXSL shall be included in the message.

1.6.1.2 LOXSE—Whenever a minimum temperature occurs which is lower than any temperature that has ever been recorded so early in the autumn, the contraction LOXSE shall be included in the message.

1.6.1.3 HIESL—Whenever a maximum temperature occurs which equals the highest temperature that has ever been recorded so

late in the autumn, the contraction **HIESL** shall be included in the message.

1.6.1.4 **LOESE**—Whenever a minimum temperature occurs which equals the lowest temperature that has ever been recorded so early in the autumn, the contraction **LOESE** shall be included in the message.

2 City Data

2.1 In several instances Weather Bureau airport stations have been authorized to add special coded groups of **CITY OFFICE** or **DOWNTOWN** data to their 0000 and 1200 GMT synoptic reports. These added data consist of maximum, minimum, and current temperatures in degrees Fahrenheit and 24-hour amounts of precipitation recorded at the designated observation station in the city.

2.2 Prior approval of the Central Headquarters is required before **CITY OFFICE** or **DOWNTOWN** data can be added to the airport's synoptic message.

2.3 **CITY** data groups shall be added to the message after **RECORD TEMPERATURE** plain language words (par. 6.1), if these words are included in the message. If **RECORD TEMPERATURE** words are not included in the message, the **CITY** data groups will follow the **4T₁T₂T₃T₄** group, etc., as appropriate.

2.4 The symbolic form of the **CITY** data is as follows:

CITY T₁T₂ T₃T₄ TT R₂₄R₂₄R₂₄R₂₄

2.4.1 City data shall be coded in accordance with paragraphs B15-2 (**T₁T₂**), B15-3 (**T₃T₄**), B15-2.3 (**TT**, current temperature in degrees Fahrenheit) and B13-2 (**R₂₄R₂₄R₂₄R₂₄**).

2.5 If the **CITY** temperature data are such that plain language **RECORD TEMPERATURE** words are appropriate for inclusion in the message, the word(s) shall be added following the **CITY** data. The words shall be determined in accordance with the instructions given in paragraph 1, preceding. However, in this instance only the available city office temperature records shall be used.

3 Weekly Means Data

3.1 Each Monday first order Weather Bureau stations, except those that have received special instructions to the contrary, shall report weekly values of mean temperature and the total amount of precipitation. These data shall be coded in a 6-figure group of the form **T_wT_wR_wR_wR_wR_w**. This group is added to the 1200 GMT synoptic message on Monday. If Monday falls on a holiday the weekly mean data are added to the 1200 GMT synoptic message of the next working day.

3.1.1 Some stations have been authorized to add information on the thickness of the ice layer in an adjacent river, lake or harbor to their weekly mean data group. These stations will use a 9-figure group of the form **T_wT_wR_wR_wR_wR_wIII**. Ice information shall always be included in each weekly message by these stations during the months specified as the ice season.

3.2 Group **T_wT_wR_wR_wR_wR_wIII**

3.2.1 Weekly mean temperature **T_wT_w**

3.2.1.1 The mean temperature (to the nearest whole degree Fahrenheit) for the week shall be reported for **T_wT_w**.

3.2.1.2 The weekly mean temperature is computed in accord with the instructions given in the Weather Bureau Manual (III-C-0506).

3.2.1.3 When the weekly mean temperature is 100° or higher, or 0° or lower the coding procedures given in paragraph B15-2.3 shall be followed.

3.2.1.4 When, for any reason, the weekly mean temperature can not be obtained, solidi (//) shall be reported.

3.2.2 Total weekly precipitation **R_wR_wR_wR_w**

3.2.2.1 The total precipitation (in tens, units, tenths, and hundredths of an inch) for the week shall be reported for **R_wR_wR_wR_w**.

3.2.2.2 The weekly precipitation shall be computed in accord with the instructions given in the Weather Bureau Manual (III-C-0506).

3.2.2.3 If no precipitation has occurred

during the week, 0000 shall be reported for R_wR_wR_wR_w.

3.2.2.4 If less than 0.01 inch occurred during the week, 9999 shall be reported for R_wR_wR_wR_w.

3.2.2.5 If for any reason the weekly amount can not be obtained, solidi (////) shall be reported for R_wR_wR_wR_w.

3.2.3 Ice III.

3.2.3.1 The thickness of the ice at a selected locality in a river, lake, or harbor in tens, units, and tenths of inches is coded direct for III. Occasionally special ice conditions instead of thickness shall be reported for III. When special conditions are reported they shall be reported according to the following specifications:

Code Figure	Ice Condition
555	Ice gorge.
666	Floating ice.
777	Shore ice.
888	Frozen but measurement impracticable.

3.2.3.2 When no ice exists, code figure 000 shall be reported.

3.2.3.3 When a trace of ice is present, code figure 999 shall be reported.

3.2.3.4 When, for any reason, the ice measurement or ice information can not be obtained, solidi (////) shall be reported.

3.3 Examples of Coded Weekly Means Data Groups:

Mean Temperature	Total Precipitation	Ice Thickness	Coded Group
55	1. 01	Not authorized.....	550101
47	12. 69	" "	471269
30	Trace	" "	309999
-12	0. 06	" "	880006
34	1. 18	Missing.....	340118///
-4	0. 20	9.5.....	96002095
0	Trace	Floating ice.....	009999666
8	12. 10	0.....	081210000
22	1. 15	19.5.....	220115195

4 Monthly Means Data

4.1 Monthly means data shall be reported by first order Weather Bureau stations, except those that have received special instructions to the contrary. These data will be added to the 1800 GMT synoptic report on the first working week day of the month (i.e., not on Saturday, Sunday, or holiday). The data consists of the mean temperature for the month, the total precipitation, and the total heating degree days for the month. The group may contain 9 or more figures depending on the number of degree days to be reported.

4.2 Group TTR₁R₁R₁R₁T_{dd}T_{dd}T_{dd}

4.2.1 Monthly mean temperature TT

4.2.1.1 The monthly mean temperature in degrees Fahrenheit (to the nearest whole degree) shall be reported for TT.

4.2.1.2 When the monthly mean temperature is 100° or higher, or 0° or lower, the coding procedure given in paragraph B.15-2.3 shall be followed.

4.2.1.3 When, for any reason, the monthly mean temperature can not be obtained, solidi (//) shall be reported.

4.2.2 Total monthly precipitation R₁R₁R₁R₁

4.2.2.1 The total monthly precipitation (in tens, units, tenths, and hundredths of an inch) shall be reported for R₁R₁R₁R₁.

4.2.2.2 If no precipitation has occurred during the month, 0000 shall be reported for R₁R₁R₁R₁.

4.2.2.3 If less than 0.01 inch occurred during the month, 9999 shall be reported for R₁R₁R₁R₁.

4.2.2.4 If for any reason the monthly total can not be obtained, solidi (////) shall be reported for R₁R₁R₁R₁.

4.2.3 Total heating degree days T_{dd}T_{dd}T_{dd}

4.2.3.1 The total number of heating degree days for the month shall be reported for T_{dd}T_{dd}T_{dd}.

4.2.3.2 The hundreds, tens, and units digits of the total heating degree days are always reported; hence, at least 3 digits are always reported. If the total degree days is 1,000 or more, the thousands figure is reported and 4 figures are reported for this element.

4.2.3.3 If no degree days are recorded during the month, 000 shall be reported for T₄₄T₄₄T₄₄.

4.2.3.4 If for any reason the total degree days can not be obtained, solidi (///) shall be reported for T₄₄T₄₄T₄₄.

4.3 Examples of coded monthly means data groups:

Mean Temperature	Total Precipitation	Total Heating Degree Days	Coded Group
51.....	12.18	416	511218416
12.....	1.14	1,567	1201141567
70.....	0.53	0	700053000

5 Tide

5.1 A number of Weather Bureau stations have been authorized to include in their synoptic reports information on the departure of the observed tide from the computed normal tide. This information shall be reported in a separate section of the message consisting of a combination of plain language words, abbreviations and numbers.

5.2 The TIDE section shall be included in all the 6-hourly synoptic reports (i.e., at 0000, 0600, 1200 and 1800 GMT) of the stations authorized to report it.

5.3 The TIDE section shall be added to the synoptic report immediately following Monthly Mean Data, or the Weekly Means Data, or the City Data, etc., as appropriate.

5.4 The tide observation shall be made one hour prior to the synoptic observation time (i.e., at 0500 GMT for the 0600 GMT synoptic observation) except that the observation shall be made at the time the normal HIGH or LOW tide is predicted to occur if either of these times occurs during the hour prior to the standard

time of the synoptic observation. If the TIDE observation is made at the time of occurrence of the normal high tide the abbreviation HW is inserted in the message immediately following the word TIDE. If the tide observation is made at the time of occurrence of the normal low tide the abbreviation LW is inserted.

5.5 The complete form of the TIDE section is:

TIDE HW (or LW) PLUS (or MINUS) t_Dt_Dt_D where—

TIDE=Word indicator signifying that the following groups contain tide information. This word is always included in the message.

HW (or LW)=Contraction to indicate that the departure observation was taken at the predicted time of occurrence of the normal high (or low) tide with HW indicating High Tide and LW indicating Low Tide. These contractions shall not be included unless the conditions specified in Par. 5.4, preceding, are met.

PLUS (or MINUS)=PLUS indicates that the observed tide is above the normal hourly tide curve; hence, the reported departure must be added to the normal height to obtain the actual height of the tide. MINUS indicates that the reported departure is below the normal hourly tide curve. If the departure value is zero, neither of the words will be reported.

t_Dt_Dt_D=The amount of departure in tens, units and tenths of feet of the observed tide from the predicted normal height of the tide. Code figure 000 is reported for zero departure.

5.6 If for any reason, a departure value is not available, the word MISSING shall be reported and this portion of the message will take the form: TIDE MISSING.

5.7 The instructions given in paragraphs 5.1 through 5.6, preceding, provide **only** for including tide departure values in the synoptic report on a routine basis and in **NO way affect**

other instructions, present or future, regarding the reporting and transmitting of these or similar data in connection with the occurrence of severe storms, etc.

CHAPTER B18. EXAMPLES OF CODED SYNOPTIC MESSAGES

1 Example of a coded 0000 GMT synoptic message.

1.1 Symbolic form of the groups and data to be reported:

Symbol	Data to be Reported	Code Figures	Coded Groups
IIIII.....	Key West, Fla.....	72201	72201
N.....	10 tenths.....	8	
dd.....	290°.....	29	
ff.....	71 knots.....	71	82971
VV.....	3 miles.....	48	
ww.....	Rain in last hr. but not at time of ob.	21	
W.....	Rain.....	6	48216
PPP.....	948.9 mbs.....	489	
TT.....	23° C.....	23	48923
N ₁	10 tenths.....	8	
C _L	F _B and/or F _C of bad weather.	7	
h.....	700 feet.....	3	
C _M	Obscured by C _L	/	
C _H	Obscured by C _L	/	873//
T _d T _d	21° C.....	21	
a.....	Decreasing then increasing.	3	
pp.....	+20.2 mbs.....	99	21399
99.....	Group indicator.....	99	
ppp.....	+20.2 mbs.....	202	99202
6.....	Group indicator.....	6	
P.P.P.P.....	948.2 mbs.....	9482	69482
7.....	Group indicator.....	7	
RR.....	0.35 in. (Total amount 2.35 in.).	35	
R _t	Began 6 to 12 hrs ago.	7	
s.....	None.....	0	73570

Symbol	Data to be Reported	Code Figures	Coded Groups
-----	2.00 in. of precip. ((Total 2.35 in).	TWO	TWO
9.....	Group indicator.....	9	
S _r S _r	Dir. of max. wind.....	20	
s _r s _r	320°.....	32	92032
9.....	Group indicator.....	9	
S _r S _r	Speed of max. wind.....	21	
s _r s _r	84 knots.....	84	92184
9.....	Group indicator.....	9	
S _r S _r	Lowest press. in past 6 hrs.	16	
s _r s _r	923 mb.....	23	91623
9.....	Group indicator.....	9	
S _r S _r	Time of lowest press. 1 hr. 54 min. before ob.	17	
s _r s _r		19	91719
2.....	Group indicator.....	2	
R ₁₁ R ₁₁ R ₁₁ R ₁₁	3.64 inches.....	0364	20364
4.....	Group indicator.....	4	
T ₁ T ₁	77° F.....	77	
T ₂ T ₂	66° F.....	66	
⊙	Message Separator.....	⊙	47766 ⊙

1.2 The coded message:

```
72201 82971 48216 48923 873//
21399 99202 69482 73570 TWO
92032 92184 91623 91719 20364
47766⊙
```

2 Example of a coded 1200 GMT synoptic message.

2.1 Symbolic form of the groups and data to be reported:

Symbol	Data to be Reported	Code Figures	Coded Groups
IIII.....	Lander, Wyo.....	72576	72576
N.....	9 tenths.....	7	
dd.....	180°.....	18	
ff.....	17 knots.....	17	71817
VV.....	11 miles.....	67	
ww.....	Sky unchanged.....	02	
W.....	Cloudy.....	2	67022
PPP.....	1019.3 mbs.....	193	
TT.....	18° C.....	18	19318
N ₁	6 tenths.....	5	
C ₁	Sc.....	4	
h.....	800 ft.....	3	
C ₂	None.....	0	

Symbol	Data to be Reported	Code Figures	Coded Groups
C _H	Cirrus.....	1	54301
T ₁ T ₂	16° C.....	16	
a.....	Increasing then decreasing.....	0	
pp.....	+ 1.0 mbs.....	10	16010
⊙.....	Group indicator.....	6	
P.P.P.P.....	834.8 mbs.....	8348	68348
4.....	Group indicator.....	4	
T ₁ T ₂	78° F.....	78	
T ₁ T ₂	58° F.....	58	
⊙.....	Message separator.....	⊙	47858⊙

7.2.2 The coded message:
 72576 71817 67022 19318 54301
 16010 68348 47858⊙

Code Table 1

[WMO Code 2700]

Symbol N = Fraction of the Celestial Dome Covered by Cloud
 Symbol N_a = Fraction of the Celestial Dome Covered by All the C_L (or C_M) Cloud present
 Symbol N_o = Fraction of the Celestial Dome Covered by an Individual Cloud Layer or Mass

Code Figure	Fraction Covered in Tenths	Fraction Covered in Oktas
0	Zero.....	Zero
1	1 or less but not zero...	1 Okta or less but not zero
2	2 and 3.....	2
3	4.....	3
4	5.....	4
5	6.....	5
6	7 and 8.....	6
7	9 or more, but not 10...	7 or more, but not 8
8	10.....	8
9	Celestial dome obscured, or cloud amount can not be estimated.	

Code Table 2

[WMO Code 0577]

Symbol dd = Direction from Which Wind is Blowing

Code Figure	True Direction	Code Figure	True Direction
00	Calm	19	185°-194°
01	5°- 14°	20	195°-204°
02	15°- 24°	21	205°-214°
03	25°- 34°	22	215°-224°
04	35°- 44°	23	225°-234°
05	45°- 54°	24	235°-244°
06	55°- 64°	25	245°-254°
07	65°- 74°	26	255°-264°
08	75°- 84°	27	265°-274°
09	85°- 94°	28	275°-284°
10	95°-104°	29	285°-294°
11	105°-114°	30	295°-304°
12	115°-124°	31	305°-314°
13	125°-134°	32	315°-324°
14	135°-144°	33	325°-334°
15	145°-154°	34	335°-344°
16	155°-164°	35	345°-354°
17	165°-174°	36	355°- 4°
18	175°-184°		

NOTE.—Wind speeds from 100 to 199 knots, inclusive, are reported by adding 50 to the code figure for dd and coding the observed speed minus 100 for ft.

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Code Table 3

[WMO Code 4577]

Symbol VV = Horizontal Visibility

Code Figure	Statute Miles	Yards	Kilometers
00	Less than 1/10...	Less than 110.	Less than 0.1.
01	1/10.....	110.....	0.1
02	2/10.....	220.....	0.2
03	3/10.....	330.....	0.3
04	4/10.....	440.....	0.4
05	5/10.....	550.....	0.5
06	6/10.....	660.....	0.6
07	7/10.....	770.....	0.7
08	8/10.....	880.....	0.8
09	9/10.....	990.....	0.9
10	1.....	1,100.....	1.0
11	1 1/10.....	1,210.....	1.1
12	2/10.....	1,320.....	1.2
13	3/10.....	1,430.....	1.3
14	4/10.....	1,540.....	1.4
15	5/10.....	1,650.....	1.5
16	1.....	1,760.....	1.6
17	1 1/10.....	1,870.....	1.7
18	1 2/10.....	1,980.....	1.8
19	1 3/10.....	2,090.....	1.9
20	2/10.....	2,200.....	2.0
21	2 1/10.....	2,310.....	2.1
22	2 2/10.....	2,420.....	2.2
23	2 3/10.....	2,530.....	2.3
24	2 4/10.....	2,640.....	2.4
25	2 5/10.....	2,750.....	2.5
26	2 6/10.....	2,860.....	2.6
27	2 7/10.....	2,970.....	2.7
28	2 8/10.....	3,080.....	2.8
29	2 9/10.....	3,190.....	2.9
30	3/10.....	3,300.....	3.0
31	3 1/10.....	3,410.....	3.1
32	3.....	3,520.....	3.2
33	3 2/10.....	3,630.....	3.3
34	3 3/10.....	3,740.....	3.4
35	3 4/10.....	3,850.....	3.5
36	3 5/10.....	3,960.....	3.6
37	3 6/10.....	4,070.....	3.7
38	3 7/10.....	4,180.....	3.8
39	3 8/10.....	4,290.....	3.9
40	4/10.....	4,400.....	4.0
41	4 1/10.....	4,510.....	4.1
42	4 2/10.....	4,620.....	4.2
43	4 3/10.....	4,730.....	4.3
44	4 4/10.....	4,840.....	4.4
45	4 5/10.....	4,950.....	4.5
46	4 6/10.....	5,060.....	4.6
47	4 7/10.....	5,170.....	4.7
48	5.....	5,280.....	4.8
49	5 1/10.....	5,390.....	4.9
50	5 2/10.....	5,500.....	5.0
51	Not specified.		
52	Not specified.		
53	Not specified.		

C-1

FMH No. 2

Code Table 3—Continued

Code Figure	Statute Miles	Yards	Kilometers
54	Not specified.		
55	Not specified.		
56	3 $\frac{3}{4}$ -----	6, 600-----	6
57	4 $\frac{3}{4}$ -----	7, 700-----	7
58	5-----	etc-----	8
59	5 $\frac{1}{2}$ -----		9
60	6 $\frac{1}{4}$ -----		10
61	6 $\frac{1}{2}$ -----		11
62	7 $\frac{1}{4}$ -----		12
63	8 $\frac{1}{4}$ -----		13
64	8 $\frac{3}{4}$ -----		14
65	9 $\frac{1}{4}$ -----		15
66	10-----		16
67	10 $\frac{1}{2}$ -----		17
68	11 $\frac{1}{4}$ -----		18
69	11 $\frac{3}{4}$ -----		19
70	12 $\frac{1}{2}$ -----		20
71	13 $\frac{1}{4}$ -----		21
72	13 $\frac{3}{4}$ -----		22
73	14 $\frac{1}{2}$ -----		23
74	15-----		24
75	15 $\frac{1}{2}$ -----		25
76	16 $\frac{1}{4}$ -----		26
77	16 $\frac{3}{4}$ -----		27
78	17 $\frac{1}{2}$ -----		28
79	18 $\frac{1}{4}$ -----		29
80	18 $\frac{3}{4}$ -----		30
81	21 $\frac{1}{2}$ -----		35
82	25-----		40
83	28 $\frac{1}{2}$ -----		45
84	31 $\frac{1}{4}$ -----		50
85	34 $\frac{1}{2}$ -----		55
86	37 $\frac{1}{2}$ -----		60
87	40%-----		65
88	43%-----		70
89	Greater than 43%-----		Greater than 70.
90		Less than 55.	Less than 50 m.
91		55-----	50 m.
92	$\frac{1}{2}$ -----	220-----	200 m.
93	$\frac{5}{8}$ -----	550-----	500 m.
94	$\frac{3}{4}$ -----	1, 100-----	1 km.
95	1 $\frac{1}{4}$ -----	2, 200-----	2
96	2 $\frac{1}{4}$ -----	4, 400-----	4
97	6 $\frac{3}{4}$ -----		10
98	12 $\frac{1}{2}$ -----		20
99	31 $\frac{1}{4}$ or more-----		50 or more.

NOTES:

(1) The values given are discrete values (i.e., not ranges). If the observed visibility is between two of the reportable distances as given in the table, the code figure of the lower reportable distance shall be reported.

(2) Only the code figures 00-89 shall be used in reports from land stations.

(3) In reporting visibility at sea the decade 90-99 shall be used.

Code Table 4

[WMO Code 4677]

Symbol **ww**=Present Weather

00-49: No precipitation at the station at the time of observation.

00-19: No precipitation, fog, ice fog (except for 11 and 12), duststorm, drifting or blowing snow at the station at the time of observation or, except for 09 and 17, during the preceding hour.

- | | | | | |
|--------------------------------|--|----|--|---|
| No meteors except photometeors | { | 00 | Cloud development not observed or not observable. | } Characteristic change of the state of sky during past hour. |
| | | 01 | Clouds generally dissolving or becoming less developed. | |
| | | 02 | State of sky on the whole unchanged. | |
| | | 03 | Clouds generally forming or developing. | |
| Haze, dust, sand or smoke | { | 04 | Visibility reduced by smoke, e.g., veldt or forest fires, industrial smoke or volcanic ashes. | } |
| | | 05 | Haze. | |
| | | 06 | Widespread dust in suspension in the air, not raised by wind at or near the station at the time of observation. | |
| | | 07 | Dust or sand raised by wind at or near the station at the time of observation, but no well developed dust whirl(s) or sand whirl(s), and no duststorm or sandstorm seen: or, in the case of ships, blowing spray at the station. | |
| | | 08 | Well developed dust whirl(s) or sand whirl(s) seen at or near the station during the preceding hour, or at the time of observation, but no duststorm or sandstorm. | |
| | | 09 | Duststorm or sandstorm within sight at the time of observation or at station during the preceding hour. | |
| | | 10 | Light fog. ¹ (Vis. 1,100 yds. or more.) | |
| | | 11 | Patches of shallow fog or ice fog at the station, whether on land or sea, not deeper than about 6 feet on land or 33 feet at sea. (Apparent vis. less than 1,100 yds.) | |
| | | 12 | More or less continuous | |
| | | 13 | Lightning visible, no thunder heard. | |
| 14 | Precipitation within sight, but not reaching the ground or the surface of the sea. | | | |
| 15 | Precipitation within sight, reaching the ground or the surface of the sea, but distant (i.e., estimated to be more than 3.1 miles) from the station. | | | |
| 16 | Precipitation within sight, reaching the ground or the surface of the sea near to but not at the station. | | | |
| 17 | Thunderstorm, but no precipitation at the time of observation. | | | |
| 18 | Squalls at or within sight of the station during the preceding hour or at the time of observation. | | | |
| 19 | Funnel cloud(s) (i.e., tornado cloud or waterspout) at or within sight of the station during the preceding hour or at the time of observation. | | | |

Code Table 4—Continued

20—29: Precipitation, fog, ice fog or thunderstorm at the station during the preceding hour but not at the time of observation.

- 20 Drizzle (not freezing) or snow grains
- 21 Rain (not freezing)
- 22 Snow
- 23 Rain and snow or ice pellets (type a)
- 24 Freezing drizzle or freezing rain
- 25 Shower(s) of rain.
- 26 Shower(s) of snow, or of rain and snow.
- 27 Shower(s) of hail,³ or of rain and hail.³
- 28 Fog or ice fog. (Vis. less than 1,100 yds.).
- 29 Thunderstorm (with or without precipitation).

} Not falling as shower(s).

30—39: Duststorm, sandstorm, drifting or blowing snow.

- 30 } Slight or moderate duststorm or sandstorm
- 31 } { Has decreased during the preceding hour.
- 32 } { No appreciable change during the preceding hour.
- 33 } { Has begun or has increased during the preceding hour.
- 34 } Severe duststorm or sandstorm
- 35 } { Has decreased during the preceding hour.
- 36 } { No appreciable change during the preceding hour.
- 37 } { Has begun or has increased during the preceding hour.

- 36 Slight or moderate drifting snow, generally low. (Less than 6 ft.)
- 37 Heavy drifting snow, generally low. (Less than 6 ft.)
- 38 Slight or moderate blowing snow, generally high. (6 ft. or more)
- 39 Heavy blowing snow, generally high. (6 ft. or more)

40—49: Fog or ice fog at the time of observation. (Vis. less than 1,100 yds.)

- 40 Fog or ice fog at a distance at the time of observation, but not at the station during the preceding hour, the fog or ice fog extending to a level above that of the observer.
- 41 Fog or ice fog in patches
- 42 Fog or ice fog, sky discernible
- 43 Fog or ice fog, sky not discernible
- 44 Fog or ice fog, sky discernible
- 45 Fog or ice fog, sky not discernible

} Has become thinner during the preceding hour.

} No appreciable change during the preceding hour.

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Code Table 4—Continued

- 46 Fog or ice fog, sky discernible
- 47 Fog or ice fog, sky not discernible
- 48 Fog, depositing rime, sky discernible.
- 49 Fog, depositing rime, sky not discernible.

} Has begun or has become thicker during the preceding hour.

50—99: Precipitation at the station at the time of observation

50—59: Drizzle.

- 50 Drizzle, not freezing, intermittent
- 51 Drizzle, not freezing, continuous
- 52 Drizzle, not freezing, intermittent
- 53 Drizzle, not freezing, continuous
- 54 Drizzle, not freezing, intermittent
- 55 Drizzle, not freezing, continuous
- 56 Drizzle, freezing, slight.
- 57 Drizzle, freezing, moderate or heavy (dense).
- 58 Drizzle and rain, slight.
- 59 Drizzle and rain, moderate or heavy.

} Slight at time of observation.

} Moderate at time of observation.

} Heavy (dense) at time of observation.

60—69: Rain.

- 60 Rain, not freezing, intermittent
- 61 Rain, not freezing, continuous
- 62 Rain, not freezing, intermittent
- 63 Rain, not freezing, continuous
- 64 Rain, not freezing, intermittent
- 65 Rain, not freezing, continuous
- 66 Rain, freezing, slight.
- 67 Rain, freezing, moderate or heavy.
- 68 Rain or drizzle and snow, slight.
- 69 Rain or drizzle and snow, moderate or heavy.

} Slight at time of observation.

} Moderate at time of observation.

} Heavy at time of observation.

70—79: Solid precipitation not in showers

- 70 Intermittent fall of snow flakes
- 71 Continuous fall of snow flakes
- 72 Intermittent fall of snow flakes
- 73 Continuous fall of snow flakes
- 74 Intermittent fall of snow flakes
- 75 Continuous fall of snow flakes
- 76 Ice prisms (with or without fog).
- 77 Snow grains (with or without fog).

} Slight at time of observation.

} Moderate at time of observation.

} Heavy at time of observation.

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Code Table 4—Continued

- 78 Isolated starlike snow crystals (with or without fog).
- 79 Ice pellets (type a) (sleet, U.S. definition).

80—99: Showery precipitation, or precipitation with current or recent thunderstorm

- 80 Rain shower(s), slight.
- 81 Rain shower(s), moderate or heavy.
- 82 Rain shower(s), violent.
- 83 Shower(s) of rain and snow mixed, slight.
- 84 Shower(s) of rain and snow mixed, moderate or heavy.
- 85 Snow shower(s), slight.
- 86 Snow shower(s), moderate or heavy.
- 87 } Shower(s) of snow pellets, or
88 } ice pellets (type b) with or
without rain or rain and
snow mixed. { Slight.
Moderate or
heavy.
- 89 } Shower(s) of hail,² with or
90 } without rain or rain and
snow mixed, not associated
with thunder. { Slight.
Moderate or
heavy.
- 91 Slight rain at time of observa-
tion.
- 92 Moderate or heavy rain at
time of observation.
- 93 Slight snow or rain and snow
mixed or hail³ at time of
observation.
- 94 Moderate or heavy snow, or
rain and snow mixed or
hail³ at time of observation.
- 95 Thunderstorm, slight or mod-
erate, without hail³ but
with rain and/or snow at
time of observation.
- 96 Thunderstorm, slight or mod-
erate, with hail³ at time of
observation.
- 97 Thunderstorm, heavy, with-
out hail,³ but with rain
and/or snow at time of
observation.
- 98 Thunderstorm combined with
duststorm or sandstorm at
time of observation.
- 99 Thunderstorm, heavy with
hail³ at time of observation.

Thunderstorm during the preceding hour but not at time of observation.

Thunderstorm at time of observation.

Thunderstorm at time of observation.

¹ The U.S. term, "light fog" is synonymous with the European term "mist."

² Refers to "hail" only.

³ Refers to snow pellets, ice pellets (type b), and hail.

NOTE.—With respect to precipitation, "at the station" means "at the point where the observation is normally taken."

Code Table 5

[WMO Code 4500]

Symbol **W**=Past Weather

Code Figure	Weather
0	Cloud covering 1/2 or less of the celestial dome throughout the appropriate period.
1	Cloud covering more than 1/2 of the celestial dome during part of the appropriate period and covering 1/2 or less during part of the period.
2	Cloud covering more than 1/2 of the celestial dome throughout the appropriate period.
3	Sandstorm, duststorm, or blowing snow.
4	Fog, ice fog, thick haze or thick smoke.
5	Drizzle.
6	Rain.
7	Snow, rain and snow mixed, or ice pellets.
8	Showers(s).
9	Thunderstorm, with or without precipitation.

NOTE.—The term "ice pellets" is synonymous with the U.S. term "sleet."

Code Table 6

Symbol **PPP**=Atmospheric Pressure Reduced to Sea Level

Symbol **P.P.P.P.**=Station Pressure

(One inch=33.86389 Millibars)
(One millibar=0.02952998 inch)

in.		mb.		in.		mb.	
27.50	931.3	27.68	937.4	27.86	943.4		
27.51	931.6	27.69	937.7	27.87	943.8		
27.52	931.9	27.70	938.0	27.88	944.1		
27.53	932.3	27.71	938.4	27.89	944.5		
27.54	932.6	27.72	938.7	27.90	944.8		
27.55	933.0	27.73	939.0	27.91	945.1		
27.56	933.3	27.74	939.4	27.92	945.5		
27.57	933.6	27.75	939.7	27.93	945.8		
27.58	934.0	27.76	940.1	27.94	946.2		
27.59	934.3	27.77	940.4	27.95	946.5		
27.60	934.6	27.78	940.7	27.96	946.8		
27.61	935.0	27.79	941.1	27.97	947.2		
27.62	935.3	27.80	941.4	27.98	947.5		
27.63	935.7	27.81	941.8	27.99	947.9		
27.64	936.0	27.82	942.1	28.00	948.2		
27.65	936.3	27.83	942.4	28.01	948.5		
27.66	936.7	27.84	942.8	28.02	948.9		
27.67	937.0	27.85	943.1	28.03	949.2		

Code Table 6—Continued

Code Table 6—Continued

in.	mb.	in.	mb.	in.	mb.	in.	mb.	in.	mb.	in.	mb.
28.04	949.5	28.58	967.8	29.12	986.1	29.66	1,004.4	30.20	1,022.7	30.74	1,041.0
28.05	949.9	28.59	968.2	29.13	986.5	29.67	1,004.7	30.21	1,023.0	30.75	1,041.3
28.06	950.2	28.60	968.5	29.14	986.8	29.68	1,005.1	30.22	1,023.4	30.76	1,041.7
28.07	950.6	28.61	968.8	29.15	987.1	29.69	1,005.4	30.23	1,023.7	30.77	1,042.0
28.08	950.9	28.62	969.2	29.16	987.5	29.70	1,005.8	30.24	1,024.0	30.78	1,042.3
28.09	951.2	28.63	969.5	29.17	987.8	29.71	1,006.1	30.25	1,024.4	30.79	1,042.7
28.10	951.6	28.64	969.9	29.18	988.1	29.72	1,006.4	30.26	1,024.7	30.80	1,043.0
28.11	951.9	28.65	970.2	29.19	988.5	29.73	1,006.8	30.27	1,025.1	30.81	1,043.3
28.12	952.3	28.66	970.5	29.20	988.8	29.74	1,007.1	30.28	1,025.4	30.82	1,043.7
28.13	952.6	28.67	970.9	29.21	989.2	29.75	1,007.5	30.29	1,025.7	30.83	1,044.0
28.14	952.9	28.68	971.2	29.22	989.5	29.76	1,007.8	30.30	1,026.1	30.84	1,044.4
28.15	953.3	28.69	971.6	29.23	989.8	29.77	1,008.1	30.31	1,026.4	30.85	1,044.7
28.16	953.6	28.70	971.9	29.24	990.2	29.78	1,008.5	30.32	1,026.8	30.86	1,045.0
28.17	953.9	28.71	972.2	29.25	990.5	29.79	1,008.8	30.33	1,027.1	30.87	1,045.4
28.18	954.3	28.72	972.6	29.26	990.9	29.80	1,009.1	30.34	1,027.4	30.88	1,045.7
28.19	954.6	28.73	972.9	29.27	991.2	29.81	1,009.5	30.35	1,027.8	30.89	1,046.1
28.20	955.0	28.74	973.2	29.28	991.5	29.82	1,009.8	30.36	1,028.1	30.90	1,046.4
28.21	955.3	28.75	973.6	29.29	991.9	29.83	1,010.2	30.37	1,028.4	30.91	1,046.7
28.22	955.6	28.76	973.9	29.30	992.2	29.84	1,010.5	30.38	1,028.8	30.92	1,047.1
28.23	956.0	28.77	974.3	29.31	992.6	29.85	1,010.8	30.39	1,029.1	30.93	1,047.4
28.24	956.3	28.78	974.6	29.32	992.9	29.86	1,011.2	30.40	1,029.5	30.94	1,047.7
28.25	956.7	28.79	974.9	29.33	993.2	29.87	1,011.5	30.41	1,029.8	30.95	1,048.1
28.26	957.0	28.80	975.3	29.34	993.6	29.88	1,011.9	30.42	1,030.1	30.96	1,048.4
28.27	957.3	28.81	975.6	29.35	993.9	29.89	1,012.2	30.43	1,030.5	30.97	1,048.8
28.28	957.7	28.82	976.0	29.36	994.2	29.90	1,012.5	30.44	1,030.8	30.98	1,049.1
28.29	958.0	28.83	976.3	29.37	994.6	29.91	1,012.9	30.45	1,031.2	30.99	1,049.4
28.30	958.3	28.84	976.6	29.38	994.9	29.92	1,013.2	30.46	1,031.5	31.00	1,049.8
28.31	958.7	28.85	977.0	29.39	995.3	29.93	1,013.5	30.47	1,031.8	31.01	1,050.1
28.32	959.0	28.86	977.3	29.40	995.6	29.94	1,013.9	30.48	1,032.2	31.02	1,050.5
28.33	959.4	28.87	977.7	29.41	995.9	29.95	1,014.2	30.49	1,032.5	31.03	1,050.8
28.34	959.7	28.88	978.0	29.42	996.3	29.96	1,014.6	30.50	1,032.8	31.04	1,051.1
28.35	960.0	28.89	978.3	29.43	996.6	29.97	1,014.9	30.51	1,033.2	31.05	1,051.5
28.36	960.4	28.90	978.7	29.44	997.0	29.98	1,015.2	30.52	1,033.5	31.06	1,051.8
28.37	960.7	28.91	979.0	29.45	997.3	29.99	1,015.6	30.53	1,033.9	31.07	1,052.2
28.38	961.1	28.92	979.3	29.46	997.6	30.00	1,015.9	30.54	1,034.2	31.08	1,052.5
28.39	961.4	28.93	979.7	29.47	998.0	30.01	1,016.3	30.55	1,034.5	31.09	1,052.8
28.40	961.7	28.94	980.0	29.48	998.3	30.02	1,016.6	30.56	1,034.9	31.10	1,053.2
28.41	962.1	28.95	980.4	29.49	998.6	30.03	1,016.9	30.57	1,035.2	31.11	1,053.5
28.42	962.4	28.96	980.7	29.50	999.0	30.04	1,017.3	30.58	1,035.6	31.12	1,053.8
28.43	962.8	28.97	981.0	29.51	999.3	30.05	1,017.6	30.59	1,035.9	31.13	1,054.2
28.44	963.1	28.98	981.4	29.52	999.7	30.06	1,017.9	30.60	1,036.2	31.14	1,054.5
28.45	963.4	28.99	981.7	29.53	1,000.0	30.07	1,018.3	30.61	1,036.6	31.15	1,054.9
28.46	963.8	29.00	982.1	29.54	1,000.3	30.08	1,018.6	30.62	1,036.9	31.16	1,055.2
28.47	964.1	29.01	982.4	29.55	1,000.7	30.09	1,019.0	30.63	1,037.3	31.17	1,055.5
28.48	964.4	29.02	982.7	29.56	1,001.0	30.10	1,019.3	30.64	1,037.6	31.18	1,055.9
28.49	964.8	29.03	983.1	29.57	1,001.4	30.11	1,019.6	30.65	1,037.9	31.19	1,056.2
28.50	965.1	29.04	983.4	29.58	1,001.7	30.12	1,020.0	30.66	1,038.3	31.20	1,056.6
28.51	965.5	29.05	983.7	29.59	1,002.0	30.13	1,020.3	30.67	1,038.6	31.21	1,056.9
28.52	965.8	29.06	984.1	29.60	1,002.4	30.14	1,020.7	30.68	1,038.9	31.22	1,057.2
28.53	966.1	29.07	984.4	29.61	1,002.7	30.15	1,021.0	30.69	1,039.3	31.23	1,057.6
28.54	966.5	29.08	984.8	29.62	1,003.0	30.16	1,021.3	30.70	1,039.6	31.24	1,057.9
28.55	966.8	29.09	985.1	29.63	1,003.4	30.17	1,021.7	30.71	1,040.0	31.25	1,058.2
28.56	967.2	29.10	985.4	29.64	1,003.7	30.18	1,022.0	30.72	1,040.3	31.26	1,058.6
28.57	967.5	29.11	985.8	29.65	1,004.1	30.19	1,022.4	30.73	1,040.6	31.27	1,058.9

Code Table 6—Continued

in.	mb.	in.	mb.	in.	mb.
31.28	1,059.3	31.36	1,062.0	31.44	1,064.7
31.29	1,059.6	31.37	1,062.3	31.45	1,065.0
31.30	1,059.9	31.38	1,062.6	31.46	1,065.4
31.31	1,060.3	31.39	1,063.0	31.47	1,065.7
31.32	1,060.6	31.40	1,063.3	31.48	1,066.0
31.33	1,061.0	31.41	1,063.7	31.49	1,066.4
31.34	1,061.3	31.42	1,064.0		
31.35	1,061.6	31.43	1,064.3		

Code Table 7

Symbol **TT** = Air Temperature
 Symbol **T_dT_d** = Dew Point Temperature
 Symbol **T_rT_r** = Maximum Temperature
 Symbol **T_nT_n** = Minimum Temperature

Air and dew point surface temperatures (i.e., symbols **TT** and **T_dT_d**, respectively) are coded in degrees Celsius. Maximum, minimum and all other temperatures in the Synoptic report are coded in degrees Fahrenheit. (Note: Procedures for coding below zero temperatures in degrees Celsius are given in paragraph B5-2.2. Procedures for coding temperatures of 100° Fahrenheit or higher, and 0° Fahrenheit or lower, are given in paragraph B15-2.3. (See Conversion Tables G, H and I)

Code Table 8

(WMO Code 0612)

Symbol **C_L** = Clouds of Genera Sc, St, Cu, Cb

Code Figure	Technical Specifications	Nontechnical Specifications
0	No C _L clouds.....	No Stratocumulus, Stratus, Cumulus, or Cumulonimbus.
1	Cumulus humilis or Cumulus fractus other than of bad weather, ¹ or both.	Cumulus with little vertical extent and seemingly flattened, or ragged Cumulus other than of bad weather, ¹ or both.
2	Cumulus mediocris or congestus, with or without Cumulus of species fractus or humilis, or Stratocumulus, all	Cumulus of moderate or strong vertical extent generally with protuberances in the form of domes or towers, either accompanied or not by

Code Table 8—Continued

(WMO Code 0612)

Code Figure	Technical Specifications	Nontechnical Specifications
2	having their bases at the same level.	other Cumulus or by Stratocumulus; all having their bases at the same level.
3	Cumulonimbus calvus, with or without Cumulus, Stratocumulus or Stratus.	Cumulonimbus, the summits of which, at least partially, lack sharp outlines, but are neither clearly fibrous (cirriform) nor in the form of an anvil; Cumulus, Stratocumulus or Stratus may also be present.
4	Stratocumulus cumulogenitus.	Stratocumulus formed by the spreading out of Cumulus; Cumulus may also be present.
5	Stratocumulus other than Stratocumulus cumulogenitus.	Stratocumulus not resulting from the spreading out of Cumulus.
6	Stratus nebulosus or Stratus fractus other than of bad weather, ¹ or both.	Stratus in a more or less continuous sheet or layer, or in ragged shreds, or both, but no Stratus fractus of bad weather. ¹
7	Stratus fractus or Cumulus fractus of bad weather, ¹ or both (pannus), usually below Altostratus or Nimbostratus.	Stratus fractus of bad weather ¹ or Cumulus fractus of bad weather, ¹ or both (pannus), usually below Altostratus or Nimbostratus.
8	Cumulus and Stratocumulus other than Stratocumulus cumulogenitus, with bases at different levels.	Cumulus and Stratocumulus other than that formed from the spreading out of Cumulus; the base of the Cumulus is at a different level from that of the Stratocumulus.

Code Table 8—Continued

Code Figure	Technical Specifications	Nontechnical Specifications
9	Cumulonimbus capillatus (often with an anvil), with or without Cumulonimbus calvus, Cumulus, Stratocumulus, Stratus or pannus.	Cumulonimbus, the upper part of which is clearly fibrous (cirriform), often in the form of an anvil, either accompanied or not by Cumulonimbus without anvil or fibrous upper part, by Cumulus, Stratocumulus, Stratus or pannus.
/	C _L clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena.	Stratocumulus, Stratus, Cumulus, or Cumulonimbus invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena.

¹ "Bad weather" denotes the conditions which generally exist during precipitation and a short time before and after.

Code Table 9

[WMO Code 1600]

Symbol **h**=Height above Ground of the Base of the Cloud

Code Figure	Height in Feet	Height in Meters
0	0- 149.....	0- 49
1	150- 299.....	50- 99
2	300- 599.....	100- 199
3	600- 999.....	200- 299
4	1, 000-1, 999.....	300- 599
5	2, 000-3, 499.....	600- 999
6	3, 500-4, 999.....	1, 000-1, 499
7	5, 000-6, 499.....	1, 500-1, 999
8	6, 500-7, 999.....	2, 000-2, 499
9	8, 000 or higher, or no clouds.	2, 500 or higher, or no clouds.

Notes: (1) The heights (in feet) given in this code table approximately correspond to those given in WMO Code 1600 and to those given in the ninth decade (i.e., code figures 90-99) of WMO Code 1577.

(2) The term "height above ground" is considered as being the height above the official aerodrome elevation or above station level at a non-aerodrome station.

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Code Table 10

[WMO Code 0515]

Symbol **C_M**=Clouds of Genera Ac, As, Ns

Code Figure	Technical Specifications	Nontechnical Specifications
0	No C _M clouds.....	No Alto cumulus, Altostratus or Nimbostratus.
1	Altostratus translucidus.	Altostratus, the greater part of which is semitransparent; through this part the sun or moon may be weakly visible as through ground glass.
2	Altostratus opacus or Nimbostratus.	Altostratus, the greater part of which is sufficiently dense to hide the sun or moon, or Nimbostratus.
3	Alto cumulus translucidus at a single level.	Alto cumulus, the greater part of which is semitransparent, the various elements of the cloud change only slowly and are all at a single level.
4	Patches (often lenticular) of Alto cumulus translucidus, continually changing and occurring at one or more levels.	Patches (often in the form of almonds or fishes) of Alto cumulus, the greater part of which is semitransparent; the clouds occur at one or more levels and the elements are continually changing in appearance.
5	Alto cumulus translucidus in bands, or one or more layers of Alto cumulus translucidus or opacus, progressively invading the sky; these Alto cumulus clouds generally thicken as a whole.	Semitransparent Alto cumulus in bands, or Alto cumulus in one or more fairly continuous layers (semitransparent or opaque), progressively invading the sky; these Alto cumulus clouds generally thicken as a whole.

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Code Table 10—Continued

Code Figure	Technical Specifications	Nontechnical Specifications
6	Altocumulus cumulogenitus (or cumulonimbogenitus).	Altocumulus resulting from the spreading out of Cumulus (or Cumulonimbus).
7	Altocumulus translucidus or opacus in two or more layers, or Alto-cumulus opacus in a single layer not progressively invading the sky, or Alto-cumulus with Altostratus or Nimbostratus.	Alto-cumulus in two or more layers, usually opaque in places, and not progressively invading the sky; or opaque layer of Alto-cumulus, not progressively invading the sky; or Alto-cumulus together with Altostratus or Nimbostratus.
8	Alto-cumulus castellanus or floccus.	Alto-cumulus with sproutings in the form of small towers or battlements, or Alto-cumulus having the appearance of cumuliform tufts.
9	Alto-cumulus of a chaotic sky, generally at several levels.	Alto-cumulus of a chaotic sky, generally at several levels.
1	C_M clouds invisible owing to darkness, fog, blowing dust or sand, or other similar phenomena, or because of a continuous layer of lower clouds.	Alto-cumulus, Altostratus and Nimbostratus invisible owing to darkness, fog, blowing dust or sand or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds.

Code Table 11

[WMO Code 0808]

Symbol C_M = Clouds of Genera Ci, Cc, Cs

Code Figure	Technical Specifications	Nontechnical Specifications
0	No C_M clouds...	No Cirrus, Cirrocumulus, or Cirrostratus.
1	Cirrus fibratus, sometimes uncinus, not progressively invading the sky.	Cirrus in the form of filaments, strands or hooks, not progressively invading the sky.
2	Cirrus spissatus, in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a Cumulonimbus; or Cirrus castellanus or floccus.	Dense Cirrus in patches or entangled sheaves, which usually do not increase and sometimes seem to be the remains of the upper part of a Cumulonimbus; or Cirrus with sproutings in the form of small turrets or battlements, or Cirrus having the appearance of cumuliform tufts.
3	Cirrus spissatus cumulonimbogenitus.	Dense Cirrus, often in the form of an anvil, being the remains of the upper parts of Cumulonimbus.
4	Cirrus uncinus or fibratus, or both, progressively invading the sky; they generally thicken as a whole.	Cirrus in the form of hooks or of filaments or both, progressively invading the sky; they generally become denser as a whole.
5	Cirrus (often in bands) and Cirrostratus, or Cirrostratus alone, progressively invading the sky; they generally thicken as a whole, but the continuous veil does not	Cirrus (often in bands converging towards one or two opposite points of the horizon) and Cirrostratus, or Cirrostratus alone; in either case, they are progressively invading the sky, and generally

Code Table 11—Continued

Code Figure	Technical Specifications	Nontechnical Specifications
5	reach 45° above the horizon.	growing denser as a whole, but the continuous veil does not reach 45° above the horizon.
6	Cirrus (often in bands) and Cirrostratus, or Cirrostratus alone, progressively invading the sky; they generally thicken as a whole; the continuous veil extends more than 45° above the horizon, without the sky being totally covered.	Cirrus (often in bands converging towards one or two opposite points of the horizon) and Cirrostratus, or Cirrostratus alone; in either case, they are progressively invading the sky, and generally growing denser as a whole; the continuous veil extends more than 45° above the horizon, without the sky being totally covered.
7	Cirrostratus covering the whole sky.	Veil of Cirrostratus covering the celestial dome.
8	Cirrostratus not progressively invading the sky and not entirely covering it.	Cirrostratus not progressively invading the sky and not completely covering the celestial dome.
9	Cirrocumulus alone, or Cirrocumulus predominant among the C _H clouds.	Cirrocumulus alone, or Cirrocumulus accompanied by Cirrus or Cirrostratus, or both, but Cirrocumulus is predominant.
/	C _H clouds invisible owing to darkness, fog, blowing dust or sand or other similar phenomena, or because of a continuous layer of lower clouds.	Cirrus, Cirrocumulus, and Cirrostratus invisible owing to darkness, fog, blowing dust or sand or other similar phenomena, or more often because of the presence of a continuous layer of lower clouds.

Code Table 12

[WMO Code 0800]

Symbol α = Characteristic of Pressure Tendency During the 3 Hours Preceding the Time of Observation

Code Figure	Description	
0	Increasing, then decreasing; atmospheric pressure the same or higher than 3 hrs. ago.	
1	Increasing, then steady; or increasing, then increasing more slowly	} Atmospheric pressure now higher than 3 hours ago.
2	Increasing (steadily or unsteadily)	
3	Decreasing or steady, then increasing; or increasing, then increasing more rapidly	
4	Steady, atmospheric pressure the same as 3 hrs. ago.	
5	Decreasing, then increasing; atmospheric pressure the same or lower than 3 hrs. ago.	
6	Decreasing, then steady; or decreasing then decreasing more slowly	} Atmospheric pressure now lower than 3 hours ago.
7	Decreasing (steadily or unsteadily)	
8	Steady or increasing, then decreasing; or decreasing then decreasing more rapidly	
9	Indicator figure	

NOTE: Code figure 9 is used as an indicator to signify that the 2 code figures immediately following it in the group contain information on elements other than α . The other elements to be reported are determined by Regional agreement. United States stations in specified areas report the code figure 9 immediately followed by the amount of the 24-hour pressure change ($P_2 - P_0$). (Par. B7-4)

Code Table 13

Symbol **pp**—Amount of 3-Hour Pressure Tendency

Code Figure	Inches of Mercury	Milli-bars	Code Figure	Inches of Mercury	Milli-bars
00	0.000	0.0			
02	0.005	0.2	52	0.155	5.2
03	0.010	0.3	54	0.160	5.4
05	0.015	0.5	56	0.165	5.6
07	0.020	0.7	58	0.170	5.8
08	0.025	0.8	59	0.175	5.9
10	0.030	1.0	61	0.180	6.1
12	0.035	1.2	63	0.185	6.3
14	0.040	1.4	64	0.190	6.4
15	0.045	1.5	66	0.195	6.6
17	0.050	1.7	68	0.200	6.8
19	0.055	1.9	69	0.205	6.9
20	0.060	2.0	71	0.210	7.1
22	0.065	2.2	73	0.215	7.3
24	0.070	2.4	75	0.220	7.5
25	0.075	2.5	76	0.225	7.6
27	0.080	2.7	78	0.230	7.8
29	0.085	2.9	80	0.235	8.0
30	0.090	3.0	81	0.240	8.1
32	0.095	3.2	83	0.245	8.3
34	0.100	3.4	85	0.250	8.5
36	0.105	3.6	86	0.255	8.6
37	0.110	3.7	88	0.260	8.8
39	0.115	3.9	90	0.265	9.0
41	0.120	4.1	91	0.270	9.1
42	0.125	4.2	93	0.275	9.3
44	0.130	4.4	95	0.280	9.5
46	0.135	4.6	97	0.285	9.7
47	0.140	4.7	98	0.290	9.8
49	0.145	4.9			
51	0.150	5.1			

Notes:

(A) The three-hour period used in computing the tendency is the full three hours preceding the actual time of observation.

(B) When the amount of the pressure tendency equals or exceeds 0.9 mb., the group **pppp** will be inserted in the message following the **TdTemp** group.

Code Table 14

[WMO Code 470]

Symbol **ppp₂₄**—Amount of Pressure Change at the Station Level During Past 24 Hours

Code Figure	Amount of Pressure Change
00	No change; pressure same as 24 hours ago
01	Pressure has risen 0.1 mb
02	" " " 0.2 mb
03	" " " 0.3 mb
04	" " " 0.4 mb
05	" " " 0.5 mb
06	" " " 0.6 mb
07	" " " 0.7 mb
08	" " " 0.8 mb
09	" " " 0.9 mb
10	" " " 1.0 mb
11	" " " 1.1 mb
12	" " " 1.2 mb
etc.	etc.
38	" " " 3.8 mb
39	" " " 3.9 mb
40	" " " 4 mb
41	" " " 5 mb
42	" " " 6 mb
43	" " " 7 mb
44	" " " 8 mb
45	" " " 9 mb
46	" " " 10 mb
47	" " " 11 mb
48	" " " 12 mb
59	" " " 13 mb or more
50	Not used
51	Pressure has fallen 0.1 mb
52	" " " 0.2 mb
53	" " " 0.3 mb
54	" " " 0.4 mb
55	" " " 0.5 mb
56	" " " 0.6 mb
57	" " " 0.7 mb
58	" " " 0.8 mb
59	" " " 0.9 mb
60	" " " 1.0 mb
61	" " " 1.1 mb
62	" " " 1.2 mb
etc.	etc.
88	" " " 3.8 mb
89	" " " 3.9 mb
90	" " " 4 mb
91	" " " 5 mb
92	" " " 6 mb
93	" " " 7 mb
94	" " " 8 mb
95	" " " 9 mb

Code Table 14—Continued

Code Figure	Amount of Pressure Change
96	Pressure has fallen 10 mb
97	" " " 11 mb
98	" " " 12 mb
99	" " " 13 mb or more

Code Table 15

Symbol RR = Amount of Precipitation

(In 6-hour period preceding the actual time of observation)

Code Figure	Amount	Code Figure	Amount	Code Figure	Amount
00	Trace ¹	07	.07 inch.	97	.97 inch.
01	.01 inch.	08	.08 inch.	98	.98 inch.
02	.02 inch.	09	.09 inch.	99	.99 inch.
03	.03 inch.	10	.10 inch.	00	1.00. ²
04	.04 inch.	11	.11 inch.	01	1.01. ²
05	.05 inch.	etc.	etc.	02	1.02. ²
06	.06 inch.	96	.96 inch.	etc.	etc.

¹ A trace of precipitation is an amount generally considered too small to measure; i.e., less than 0.005 inch.

² When the amount of precipitation is 1.00 inch or more, the number of whole inches is reported by a plain language word inserted in the message immediately following the 7RRR group.

Code Table 16

Symbol R_t = Time Precipitation Began or Ended ¹

Code Figure	Time Began or Ended	Code Figure	Time Began or Ended
0	No precipitation.	6	5 to 6 hours ago.
1	Less than 1 hr. ago	7	6 to 12 hours ago.
2	1 to 2 hours ago.	8	More than 12 hours ago.
3	2 to 3 hours ago.	9	Unknown.
4	3 to 4 hours ago.		
5	4 to 5 hours ago.		

¹ In relation to the "official time of observation."
(NOTE: This Code Table is used by the United States and Canada.)

Code Table 17

(WMO Code 08)

Symbol s = Total Accumulated Depth of Snow
(On ground at the actual time of observation)

Code Figure	Depth of Snow on Ground	Code Figure	Depth of Snow on Ground
0	None.	5	5 inches.
1	1 inch.	6	6 inches.
2	2 inches.	7	7 inches.
3	3 inches.	8	8 inches or more.
4	4 inches.	9	Less than 0.5 inch.

*NOTE: <0.5 inch of snow and/or ice on ground is considered a TRACE for synoptic coding purposes.

Code Table 18

(WMO Code 84)

Symbol D_L = Direction From Which C_L Clouds Are Moving

Symbol D_M = Direction From Which C_M Clouds Are Moving

Code Figure	Direction
0	Stationary
1	Cloud coming from NE
2	" " " E
3	" " " SE
4	" " " S
5	" " " SW
6	" " " W
7	" " " NW
8	" " " N
9	No definite direction, or unknown

Code Table 19

(WMO Code 060)

Symbol C = Genus (Type) of Cloud

Code Figure	Type of Cloud
0	Cirrus..... Ci
1	Cirrocumulus..... Cc
2	Cirrostratus..... Cs
3	Alto cumulus..... Ac
4	Altostratus..... As
5	Nimbostratus..... Ns
6	Stratocumulus..... Sc
7	Stratus..... St
8	Cumulus..... Cu
9	Cumulonimbus..... Cb
/	Cloud not visible owing to darkness, fog, duststorm, sandstorm, or other analogous phenomena.

Code Table 20

(WMO Code 1977)

Symbol h_b —Height of Base of Cloud Layer
Whose Type is Indicated by C

Code Figure	Height in Feet	Height in Meters
00	Less than 100.....	Less than 30.
01	100.....	30.
02	200.....	60.
03	300.....	90.
04	400.....	120.
05	500.....	150.
06	600.....	180.
07	700.....	210.
08	800.....	240.
09	900.....	270.
10	1,000.....	300.
11	1,100.....	330.
12	1,200.....	360.
13	1,300.....	390.
14	1,400.....	420.
15	1,500.....	450.
16	1,600.....	480.
17	1,700.....	510.
18	1,800.....	540.
19	1,900.....	570.
20	2,000.....	600.
21	2,100.....	630.
22	2,200.....	660.
23	2,300.....	690.
24	2,400.....	720.
25	2,500.....	750.
26	2,600.....	780.
27	2,700.....	810.
28	2,800.....	840.
29	2,900.....	870.
30	3,000.....	900.
31	3,100.....	930.
32	3,200.....	960.
33	3,300.....	990.
34	3,400.....	1,020.
35	3,500.....	1,050.
36	3,600.....	1,080.
37	3,700.....	1,110.
38	3,800.....	1,140.
39	3,900.....	1,170.
40	4,000.....	1,200.
41	4,100.....	1,230.
42	4,200.....	1,260.
43	4,300.....	1,290.
44	4,400.....	1,320.

Code Table 20—Continued

Code Figure	Height in Feet	Height in Meters
45	4,500.....	1,350.
46	4,600.....	1,380.
47	4,700.....	1,410.
48	4,800.....	1,440.
49	4,900.....	1,470.
50	5,000.....	1,500.
51	Not specified.....	
52	Not specified.....	
53	Not specified.....	
54	Not specified.....	
55	Not specified.....	
56	6,000.....	1,800.
57	7,000.....	2,100.
58	8,000.....	2,400.
59	9,000.....	2,700.
60	10,000.....	3,000.
61	11,000.....	3,300.
62	12,000.....	3,600.
63	13,000.....	3,900.
64	14,000.....	4,200.
65	15,000.....	4,500.
66	16,000.....	4,800.
67	17,000.....	5,100.
68	18,000.....	5,400.
69	19,000.....	5,700.
70	20,000.....	6,000.
71	21,000.....	6,300.
72	22,000.....	6,600.
73	23,000.....	6,900.
74	24,000.....	7,200.
75	25,000.....	7,500.
76	26,000.....	7,800.
77	27,000.....	8,100.
78	28,000.....	8,400.
79	29,000.....	8,700.
80	30,000.....	9,000.
81	35,000.....	10,500.
82	40,000.....	12,000.
83	45,000.....	13,500.
84	50,000.....	15,000.
85	55,000.....	16,500.
86	60,000.....	18,000.
87	65,000.....	19,500.
88	70,000.....	21,000.
89	Higher than 70,000....	Higher than 21,000.
90	0-149.....	0-49.
91	150-299.....	50-99.
92	300-599.....	100-199.
93	600-999.....	200-299.

Code Table 20—Continued

Code Figure	Height in Feet	Height in Meters
94	1,000-1,999.....	300-599.
95	2,000-3,499.....	600-999.
96	3,500-4,999.....	1,000-1,499.
97	5,000-6,499.....	1,500-1,999.
98	6,500-7,999.....	2,000-2,499.
99	8,000 or higher, or no clouds.	2,500 or higher, or no clouds.

NOTE.—(A) If the observed height is between two of the reportable heights as given in the table, the code figure for the lower reportable height will be reported when code figures 60 to 99, inclusive, are involved.
 (B) The 90-99 decade should never be used for aeronautical purposes or in special weather reports from ships.

Code Table 21

(WMO Code 468)

Symbol $S_P S_F$ = Special Phenomena Code, General Description

Code Figure	"General" description with "detailed" code used (Symbol of detailed code shown in parentheses)
00-09: Ground and Miscellaneous Phenomena	
00	Average depth of deepest snowdrifts (in feet). (nn)
01	Depth of newly fallen snow during past 6 hours (in whole inches). (nn)
02	Water equivalent of snow and/or ice on ground (tenths of an inch). (nn)
03	Water equivalent of snow and/or ice on ground (in whole inches). (nn)
04	Total amount of snow and/or ice on ground (in whole inches). (nn)
05	State of ground. (EE)
06	Frost. (tt, ss)
07	Glaze, average rate of accrual per hour (in tenths of an inch). (nn)
08	State of sea, or Period of sea swell. (S _s , or K _s , K _e)
09	Water temperature in whole degrees (Fahrenheit or Celsius). (nn)
10-15: Clouds	
10	Direction of clouds from station, or clouds. ((D _s D _e , or ss)
11	
12	
13	
14	Nonpersistent contrails; time first observed. (tt)
15	Persistent contrails; time first observed. (tt)

Code Table 21—Continued

Code Figure	"General" description with "detailed" code used (Symbol of detailed code shown in parentheses)
16-19: Atmospheric Pressure and Fronts	
16	Atmospheric pressure reduced to mean sea level, lowest in past 6 hours (in "tens" and "units" of mbs.). (nn)
17	Time of lowest pressure, or Barometric stability. (tt or ss)
18	Time front passed station, or Front. (tt or ss)
19	
20-29: Wind Data	
20	Direction of maximum wind in tens of degrees (dd)
21	Speed of maximum wind. (ff)
22	Speed of peak gusts. (ff)
23	Average speed of prevailing wind during past 6 hours. (ff)
24	Prevailing wind direction during past 6 hours. (dd)
25	Wind direction during past hour, or Wind direction 1 hour ago. (ss or dd)
26	Wind speed during past hour. (ss)
27	Time of highest wind. (tt)
28	Pronounced clockwise (veering) shift in wind direction. (tt, ss)
29	Pronounced counterclockwise (backing) shift in wind direction. (tt, ss)
30-34: Fog and smoke	
30	Fog; direction or variability. (D _s D _e , or ss)
31	Fog began. (tt)
32	Fog ended. (tt)
33	Fog bank in distance; direction or variability (D _s D _e , or ss)
34	Smoke; direction or variability. (D _s D _e , or ss)
35-39: Blowing Phenomena	
35	Blowing dust (or sand), blowing snow. (tt, ss)
36	
37	Drifting dust (or sand), drifting snow. (tt, ss)
38	Dust whirls; time began or variability. (tt or ss)
39	Dust whirls; time ended or variability. (tt or ss)
40-49: Visibility	
40	Visibility; time of change, or variability. (tt or ss)
41	Visibility to NE. (VV)
42	Visibility to E. (VV)

Code Table 21—Continued

Code Figure	"General" description with "detailed" code used (Symbol of detailed code shown in parentheses)
40-49: Visibility—Continued	
43	Visibility to SE. (VV)
44	Visibility to S. (VV)
45	Visibility to SW. (VV)
46	Visibility to W. (VV)
47	Visibility to NW. (VV)
48	Visibility to N. (VV)
49	
50-79: Unassigned	
80-89: Reserved for National Use	
90-99: Clouds	
9	Direction from which C_L , C_M , C_H clouds are moving (D_L , D_M , D_H). To report cloud directions, the Special Phenomena group becomes 99 $D_L D_M D_H$.

Code Table 22

Symbol $s_p s_p$ = Special Phenomena Table, Detailed Description

Several individual code tables are required to report data for $s_p s_p$. For ease of identification the individual $s_p s_p$ code tables are considered to be parts of one general $s_p s_p$ code table (No. 22) and they are designated by letter (e.g., 22a, 22b, 22c, etc.). The individual $s_p s_p$ code tables are:

Code Table		Symbol
22a	Units of Specific Value.....	nn
22b	State of Ground.....	EE
22c	Time.....	tt
22d	Variation in Phenomena.....	ss
22e	State of Sea.....	$S_p S_p$
22f	Period of Sea Swell.....	$K_p K_p$
22g	Direction from Station.....	$D_p D_p$
22h	Wind Speed.....	ff
22i	Direction of Cloud Movement.	$D_L D_M$, and D_H .

Code Table 22a

(WMO Code 400)

Symbol nn = Units of Specific Value (00-99)

Code Figure	Value (depending on "general" code figure used)
00	Zero or less than 1 unit.
01	1; 10; 100; or 1,000.
02	2; 20; 200; or 2,000.
Etc.	Etc.
12	12; 120; 1,200; or 12,000.
13	13; 130; 1,300; or 13,000.
Etc.	Etc.
98	98; 980; 9,800; or 98,000.
99	99 or more; 990 or more; 9,900 or more; 99,000 or more.

¹When the value to be coded for symbol "nn" is "more than 99, etc." the appropriate number of 98, 99, nn groups will be used; i.e., in the first group (or groups) 99 will be reported for "nn" and the amount in excess of 100 (or 200, etc., as appropriate) will be reported for "nn" in the last group of the series. For example: 100 inches of snow on ground would be coded 90499 90400; 105 inches, 90499 90405; 210 inches, 90499 90499 90410, etc.

(NOTE: In the example given in footnote 1, immediately above, WMO Region IV has specified that the depth of snow be given in centimeters rather than inches. In this case the United States will continue national custom and report the depth of snow on ground in inches. However, those using reports from other countries should be alert to the possibility that depths of snow on ground may be reported in centimeters.)

Code Table 22b

(WMO Code 0900)

Symbol E = State of Ground (0 to 9)
Symbol EE = State of Ground (00 to 09)

Code Figure	State of Ground
00	Surface of ground dry (no appreciable amount of dust or loose sand).
01	Surface of ground moist.
02	Surface of ground wet (standing water in small or large pools on surface).
03	Surface of ground frozen.
04	Glaze or ice on ground, but no snow or melting snow.
05	Snow or melting snow (with or without ice) covering less than one-half of ground.
06	Snow or melting snow (with or without ice) covering more than one-half of ground but ground not completely covered.
07	Snow or melting snow (with or without ice) covering ground completely.
08	Loose dry snow, dust or sand, covering more than one-half of ground (but not completely).
09	Loose dry snow, dust or sand covering ground completely.

NOTES

(a) Where dust or sand is reported and the temperature is below 0° C., the word DUST or SAND is added at the end of the message.

(b) The definitions in the code for E for numbers 0 to 3 apply to representative bare ground and numbers 4 to 9 to an open representative area.

(c) In all instances the highest code figures applicable will be reported.

Code Table 22c

[WMO Code 487]

Symbol **tt**=Units and Tenths of Hours Before Observation (00-75)

Code Figure	Hours and minutes before observation	Code Figure	Hours and minutes before observation
00	At observation.	43	4 hours 18 minutes.
01	0 hour 6 minutes.	44	4 " 24 "
02	0 " 12 "	45	4 " 30 "
03	0 " 18 "	46	4 " 36 "
04	0 " 24 "	47	4 " 42 "
05	0 " 30 "	48	4 " 48 "
06	0 " 36 "	49	4 " 54 "
07	0 " 42 "	50	5 hours 0 "
08	0 " 48 "	51	5 " 6 "
09	0 " 54 "	52	5 " 12 "
10	1 hour 0 "	53	5 " 18 "
11	1 " 6 "	54	5 " 24 "
12	1 " 12 "	55	5 " 30 "
13	1 " 18 "	56	5 " 36 "
14	1 " 24 "	57	5 " 42 "
15	1 " 30 "	58	5 " 48 "
16	1 " 36 "	59	5 " 54 "
17	1 " 42 "	60	6 hours 0 "
18	1 " 48 "	61	6 to 7 hours.
19	1 " 54 "	62	7 to 8 "
20	2 hours 0 "	63	8 to 9 "
21	2 " 6 "	64	9 to 10 "
22	2 " 12 "	65	10 to 11 "
23	2 " 18 "	66	11 to 12 "
24	2 " 24 "	67	12 to 18 "
25	2 " 30 "	68	More than 18 hours.
26	2 " 36 "		
27	2 " 42 "	69	Time unknown.
28	2 " 48 "	70	Began during observation.
29	2 " 54 "		
30	3 hours 0 "	71	Ended during observation.
31	3 " 6 "		
32	3 " 12 "	72	Began and ended during observation.
33	3 " 18 "		
34	3 " 24 "		
35	3 " 30 "	73	Changed considerably during observation.
36	3 " 36 "		
37	3 " 42 "		
38	3 " 48 "	74	Began after observation.
39	3 " 54 "		
40	4 hours 0 "	75	Ended after observation.
41	4 " 6 "		
42	4 " 12 "		

NOTE.—Code figures 00 to 69, inclusive, refer to the STANDARD time of observation. Code figures 70 to 75, inclusive, refer to the ACTUAL time the element is observed.

Code Table 22d

[WMO Code 488]

Symbol **zz**=Variation in Phenomena

Code Figure	Description
70	Began while observation was being taken. ¹
71	Ended while observation was being taken. ¹
72	Began and ended while observation was being taken. ¹
73	Changed considerably while observation was being taken. ¹
74	Began after observation was taken. ¹
75	Ended after observation was taken. ¹
76	At station.
77	At station, but not in distance.
78	In all directions.
79	In all directions, but not at station.
80	Approaching station.
81	Receding from station.
82	Passing station in distance.
83	Seen in distance.
84	Reported in neighborhood, but not at station.
85	Altoft, but not near ground.
86	Near ground, but not altoft.
87	Occasional; occasionally.
88	Intermittent; intermittently.
89	Frequent; frequently; at frequent intervals.
90	Steady; steady in intensity; steadily; no appreciable change.
91	Increasing; increasing in intensity; has increased.
92	Decreasing; decreasing in intensity; has decreased.
93	Fluctuating; variable.
94	Continuous; continuously.
95	Very light; very weak; greatly below normal; very thin; very poor.
96	Light; weak; below normal; thin; poor.
97	Moderate; normal; average thickness; fair; gradually.
98	Heavy; severe; thick; above normal; good; suddenly.
99	Very heavy; killing; very severe; dense; greatly above normal; very thick; very good.

¹ Code figures 70 to 75 refer to the ACTUAL time the element is observed.

Code Table 22e

[WMO Code 3700]

Symbol **S**=State of Sea (0 to 9)
Symbol **S₁S₂**=State of Sea (00 to 09)

Code Figure	Description of sea	Height of waves in feet	Height of waves in meters
00	Calm (glassy).....	0.....	0.
01	Calm (rippled).....	0-1/4.....	0-0.1.
02	Smooth (wavelets).....	1/4-1 1/4.....	0.1-0.5.
03	Slight.....	1 1/4-4.....	0.5-1.25.
04	Moderate.....	4-8.....	1.25-2.5.
05	Rough.....	8-13.....	2.5-4.
06	Very rough.....	13-20.....	4-6.
07	High.....	20-30.....	6-9.
08	Very high.....	30-45.....	9-14.
09	Phenomenal.....	Over 45.....	Over 14.

NOTES

- (1) The average wave height as obtained from the larger well-formed waves of the wave system being observed is reported.
- (2) If an exact boundary height could be reported by two code figures the lower code figure will be reported; e.g., a height of 13 feet would be reported by code figure 5 or 06.

Code Table 22f

[WMO Code 461]

Symbol **K₁K₂**=Period of Sea Swell (in seconds)

Code Figure	Period	Code Figure	Period
11	1 second.	14	4 seconds.
12	2 seconds.	Etc.	Etc.
13	3 seconds.		

¹ The code figure gives the actual number of seconds plus ten.

Code Table 22g

[WMO Code 442]

Symbol **D₁D₂**=Direction From Station (00-39)

Code Figure	Direction
00	At station.
02	NNE.
04	NE.
06	ENE.
08	E.
10	ESE.
12	SE.
14	SSE.
16	S.
18	SSW.
20	SW.
22	WSW.
24	W.
26	WNW.
28	NW.

Code Table 22g—Continued

Code Figure	Description
30	NNW.
32	N.
33	Variable.
34	Unknown.
35	In several directions.
36	In several directions, but not at station.
37	Over nearby water area.
38	Over nearby valleys.
39	Over nearby hills or mountains.

Code Table 22h

Symbol **ff**=Wind Speed in Knots

Code Figure	Wind Speed	Code Figure	Wind Speed
00	Calm; or unknown.	97	97 knots.
01	1 knot.	98	98 knots.
02	2 knots.	99	99 knots; or 100 knots.
03	3 knots.	01	101 knots. ¹
04	4 knots.	02	102 knots. ¹
Etc.	Etc.	03	103 knots. ¹
95	95 knots.	04	104 knots. ¹
96	96 knots.	Etc.	Etc.

¹ When the wind speed is greater than 100 knots TWO Special Phenomena groups are included in the message and the same code figure is reported for "S₁S₂" in both groups. In the first group "99" is reported for "S₁S₂" and in the second group the speed in EXCESS of 100 knots is reported for "S₁S₂". For example: In reporting a maximum wind of 124 knots, the groups are coded "92199 92124."

Code Table 22i

[WMO Code 431]

Symbol **D_H**=Direction From Which C_H Type Clouds Are Moving

Symbol **D_L**=Direction From Which C_L Type Clouds Are Moving

Symbol **D_M**=Direction From Which C_M Type Clouds Are Moving

Code Figure	Direction	Code Figure	Direction
0	Calm.	5	Southwest.
1	Northeast.	6	West.
2	East.	7	Northwest.
3	Southeast.	8	North.
4	South.	9	Unknown.

Code Table 23

[WMO Code 0885]

Symbol $d_w d_v$ = True Direction from which Swell Waves Come, in Tens of Degrees

Code Figure	Direction	Code Figure	Direction
00	Calm (no waves).	20	195°-204°.
01	5°-14°.	21	205°-214°.
02	15°-24°.	22	215°-224°.
03	25°-34°.	23	225°-234°.
04	35°-44°.	24	235°-244°.
05	45°-54°.	25	245°-254°.
06	55°-64°.	26	255°-264°.
07	65°-74°.	27	265°-274°.
08	75°-84°.	28	275°-284°.
09	85°-94°.	29	285°-294°.
10	95°-104°.	30	295°-304°.
11	105°-114°.	31	305°-314°.
12	115°-124°.	32	315°-324°.
13	125°-134°.	33	325°-334°.
14	135°-144°.	34	335°-344°.
15	145°-154°.	35	345°-354°.
16	155°-164°.	36	355°-4°.
17	165°-174°.	99	Waves confused, direction indeterminate.
18	175°-184°.		
19	185°-194°.		

Code Table 24

[WMO Code 3165]

Symbol P_w = Period of the Swell Waves

Code Figure	Period
0	10 seconds.
1	11 seconds.
2	12 seconds.
3	13 seconds.
4	14 seconds or more.
5	5 seconds or less.
6	6 seconds.
7	7 seconds.
8	8 seconds.
9	9 seconds.
/	Calm or period not determined.

Conversion Table A

[WMO Code 1100]

Symbol F = Force of Surface Wind

(Beaufort Scale of Wind)

Beaufort No.	Knots	Statute miles per hour	Meters per second	Kilometers hour	Explanatory terms
0	Less than 1.	Less than 1.	0-0.2	<1	Calm.
1	1-3	1-3	0.3-1.5	1-5	Light air.
2	4-6	4-7	1.6-3.3	6-11	Light breeze.
3	7-10	8-12	3.4-5.4	12-19	Gentle breeze.
4	11-16	13-18	5.5-7.9	20-28	Moderate breeze.
5	17-21	19-24	8.0-10.7	29-38	Fresh breeze.
6	22-27	25-31	10.8-13.8	39-49	Strong breeze.
7	28-33	32-38	13.9-17.1	50-61	Near gale.
8	34-40	39-46	17.2-20.7	62-74	Gale.
9	41-47	47-54	20.8-24.4	75-88	Strong gale.
10	48-55	55-63	24.5-28.4	89-102	Storm.
11	56-63	64-72	28.5-32.6	103-117	Violent storm.
12	64 and over.	73 and over.	32.7 and over.	118 and over.	Hurricane.*

*The United States uses 74 statute mph as the speed criteria for hurricane.

CODE AND CONVERSION TABLES

Conversion Table B

Wind Direction

[Degrees to 16 Compass Points]

Degrees	Compass Point	Degrees	Compass Point
349°- 11°	N	169°-191°	S
12°- 33°	NNE	192°-213°	SSW
34°- 56°	NE	214°-236°	SW
57°- 78°	ENE	237°-258°	WSW
79°-101°	E	259°-281°	W
102°-123°	ESE	282°-303°	WNW
124°-146°	SE	304°-326°	NW
147°-168°	SSE	327°-348°	NNW

Conversion Table C

Meters Per Second to Knots

Mps	0	1	2	3	4	5	6	7	8	9
	<i>Knots</i>									
0	-----	1.9	3.9	5.8	7.8	9.7	11.7	13.6	15.5	17.5
10	19.4	21.4	23.3	25.3	27.2	29.1	31.1	33.0	35.0	36.9
20	38.9	40.8	42.7	44.7	46.6	48.6	50.5	52.4	54.4	56.3
30	58.3	60.2	62.2	64.1	66.0	68.0	69.9	71.9	73.8	75.8
40	77.7	79.6	81.6	83.5	85.5	87.4	89.4	91.3	93.2	95.2
50	97.1	99.1	101.0	103.0	104.9	106.8	108.8	110.7	112.7	114.6
60	116.6	118.5	120.4	122.4	124.3	126.3	128.2	130.1	132.1	134.0
70	136.0	137.9	139.9	141.8	143.7	145.7	147.6	149.6	151.5	153.5
80	155.4	157.3	159.3	161.2	163.2	165.1	167.1	169.0	170.9	172.9
90	174.8	176.8	178.7	180.7	182.6	184.5	186.5	188.4	190.4	192.3
100	194.3	-----	-----	-----	-----	-----	-----	-----	-----	-----

Conversion Table D

Knots to Meters per Second

Knots	0	1	2	3	4	5	6	7	8	9
	<i>Mps</i>									
0	-----	0.5	1.0	1.5	2.1	2.6	3.1	3.6	4.1	4.6
10	5.1	5.7	6.2	6.7	7.2	7.7	8.2	8.8	9.3	9.8
20	10.3	10.8	11.3	11.8	12.4	12.9	13.4	13.9	14.4	14.9
30	15.4	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.6	20.1
40	20.6	21.1	21.6	22.1	22.7	23.2	23.7	24.2	24.7	25.2
50	25.7	26.3	26.8	27.3	27.8	28.3	28.8	29.3	29.9	30.4
60	30.9	31.4	31.9	32.4	32.9	33.5	34.0	34.5	35.0	35.5
70	36.0	36.6	37.1	37.6	38.1	38.6	39.1	39.6	40.2	40.7
80	41.2	41.7	42.2	42.7	43.2	43.8	44.3	44.8	45.3	45.8
90	46.3	46.8	47.4	47.9	48.4	48.9	49.4	49.9	50.4	51.0
100	51.5	52.0	52.5	53.0	53.5	54.1	54.6	55.1	55.6	56.1

Conversion Table E

Nautical Miles to Statute Miles

Nautical Miles	Statute Miles	Nautical Miles	Statute Miles
1	1.1508	6	6.9047
2	2.3016	7	8.0555
3	3.4523	8	9.2062
4	4.6031	9	10.3570
5	5.7539	10	11.5078

Conversion Table F

Statute Miles to Nautical Miles

Statute Miles	Nautical Miles	Statute Miles	Nautical Miles
1	0.8690	6	5.2139
2	1.7380	7	6.0828
3	2.6069	8	6.9518
4	3.4759	9	7.8208
5	4.3449	10	8.6898

International Nautical Miles.

Conversion Table G

Temperature

(Degrees Fahrenheit to Code Figures in Degrees Celsius)

Temperature °F	Code Figure °C	Temperature °F	Code Figure °C
-79	12	-64	03
-78	11	-63	03
-77	11	-62	02
-76	10	-61	02
-75	09	-60	01
-74	09	-59	01
-73	08	-58	00
-72	08	-57	99
-71	07	-56	99
-70	07	-55	98
-69	06	-54	98
-68	06	-53	97
-67	05	-52	97
-66	04	-51	96
-65	04	-50	96

Conversion Table G—Continued

Temperature °F	Code Figure °C	Temperature °F	Code Figure °C
-49	95	-4	70
-48	94	-3	69
-47	94	-2	69
-46	93	-1	68
-45	93	0	68
-44	92	+1	67
-43	92	2	67
-42	91	3	66
-41	91	4	66
-40	90	5	65
-39	89	+6	64
-38	89	7	64
-37	88	8	63
-36	88	9	63
-35	87	10	62
-34	87	+11	62
-33	86	12	61
-32	86	13	61
-31	85	14	60
-30	84	15	59
-29	84	+16	59
-28	83	17	58
-27	83	18	58
-26	82	19	57
-25	82	20	57
-24	81	+21	56
-23	81	22	56
-22	80	23	55
-21	79	24	54
-20	79	25	54
-19	78	+26	53
-18	78	27	53
-17	77	28	52
-16	77	29	52
-15	76	30	51
-14	76	+31	51
-13	75	32	00
-12	74	33	01
-11	74	34	01
-10	73	35	02
-9	73	+36	02
-8	72	37	03
-7	72	38	03
-6	71	39	04
-5	71	40	04

Conversion Table G—Continued

Temperature °F	Code Figure °C	Temperature °F	Code Figure °C
+41	05	+86	30
42	06	87	31
43	06	88	31
44	07	89	32
45	07	90	32
+46	08	+91	33
47	08	92	33
48	09	93	34
49	09	94	34
50	10	95	35
+51	11	+96	36
52	11	97	36
53	12	98	37
54	12	99	37
55	13	100	38
+56	13	+101	38
57	14	102	39
58	14	103	39
59	15	104	40
60	16	105	41
+61	16	+106	41
62	17	107	42
63	17	108	42
64	18	109	43
65	18	110	43
+66	19	+111	44
67	19	112	44
68	20	113	45
69	21	114	46
70	21	115	46
+71	22	+116	47
72	22	117	47
73	23	118	48
74	23	119	48
75	24	120	49
+76	24	+121	49
77	25	122	50
78	26	123	51
79	26	124	51
80	27	125	52
+81	27	+126	52
82	28	127	53
83	28	128	53
84	29	129	54
85	29	130	54

Conversion Table H

Temperature
(Code Figures in Degrees Celsius to Degrees Fahrenheit)

Code Figure °C	Temperature °F	Code Figure °C	Temperature °C
15	-85	75	-13
14	-83	74	-11
13	-81	73	-9
12	-80	72	-8
11	-78	71	-6
10	-76	70	-4
09	-74	69	-2
08	-72	68	0
07	-71	67	+1
06	-69	66	+3
05	-67	65	+5
04	-65	64	7
03	-63	63	9
02	-62	62	10
01	-60	61	12
00	-58	60	+14
99	-56	59	16
98	-54	58	18
97	-53	57	19
96	-51	56	21
95	-49	55	+23
94	-47	54	25
93	-45	53	27
92	-44	52	28
91	-42	51	30
90	-40	00	+32
89	-38	01	34
88	-36	02	36
87	-35	03	37
86	-33	04	39
85	-31	05	+41
84	-29	06	43
83	-27	07	45
82	-26	08	46
81	-24	09	48
80	-22	10	+50
79	-20	11	52
78	-18	12	54
77	-17	13	55
76	-15	14	57

Conversion Table H—Continued

Code Figure °C	Temperature °F	Code Figure °C	Temperature °C
15	+59	38	100
16	61	39	102
17	63		
18	64	40	+104
19	66	41	106
		42	108
20	+68	43	109
21	70	44	111
22	72		
23	73	45	+113
24	75	46	115
		47	117
25	+77	48	118
26	79	49	120
27	81		
28	82	50	+122
29	84	51	124
		52	126
30	+86	53	127
31	88	54	129
32	90		
33	91	55	+131
34	93	56	133
		57	135
35	+95	58	136
36	97	59	138
37	99		

Conversion Table I—Continued

Temperature °F	Temperature °C	Temperature °F	Temperature °C		
-75.0 to	-73.3	-59	+6.0 to +7.7	-14	
-73.2	-71.5	-58	+7.8	+9.5	-13
-71.4	-69.7	-57	+9.6	+11.3	-12
-69.6	-67.9	-56	+11.4	+13.1	-11
-67.8	-66.1	-55	+13.2	+14.9	-10
-66.0 to	-64.3	-54	+15.0 to	+16.7	-9
-64.2	-62.5	-53	16.8	18.5	-8
-62.4	-60.7	-52	18.6	20.3	-7
-60.6	-58.9	-51	20.4	22.1	-6
-58.8	-57.1	-50	22.2	23.9	-5
-57.0 to	-55.3	-49	+24.0 to	+25.7	-4
-55.2	-53.5	-48	25.8	27.5	-3
-53.4	-51.7	-47	27.6	29.3	-2
-51.6	-49.9	-46	29.4	31.1	-1
-49.8	-48.1	-45	31.2	32.8	0
-48.0 to	-46.3	-44	+32.9 to	+34.6	+1
-46.2	-44.5	-43	34.7	36.4	2
-44.4	-42.7	-42	36.5	38.2	3
-42.6	-40.9	-41	38.3	40.0	4
-40.8	-39.1	-40	40.1	41.8	5
-39.0 to	-37.3	-39	+41.9 to	+43.6	+6
-37.2	-35.5	-38	43.7	45.4	7
-35.4	-33.7	-37	45.5	47.2	8
-33.6	-31.9	-36	47.3	49.0	9
-31.8	-30.1	-35	49.1	50.8	10
-30.0 to	-28.3	-34	+50.9 to	+52.6	+11
-28.2	-26.5	-33	52.7	54.4	12
-26.4	-24.7	-32	54.5	56.2	13
-24.6	-22.9	-31	56.3	58.0	14
-22.8	-21.1	-30	58.1	59.8	15
-21.0 to	-19.3	-29	+59.9 to	+61.6	+16
-19.2	-17.5	-28	61.7	63.4	17
-17.4	-15.7	-27	63.5	65.2	18
-15.6	-13.9	-26	65.3	67.0	19
-13.8	-12.1	-25	67.1	68.8	20
-12.0 to	-10.3	-24	+68.9 to	+70.6	+21
-10.2	-8.5	-23	70.7	72.4	22
-8.4	-6.7	-22	72.5	74.2	23
-6.6	-4.9	-21	74.3	76.0	24
-4.8	-3.1	-20	76.1	77.8	25
-3.0 to	-1.3	-19	+77.9 to	+79.6	+26
-1.2	+0.5	-18	79.7	81.4	27
+0.6	+2.3	-17	81.5	83.2	28
+2.4	+4.1	-16	83.3	85.0	29
+4.2	+5.9	-15	85.1	86.8	30

Conversion Table I

Temperature

(Degrees Fahrenheit to Degrees Celsius)

Temperature °F	Temperature °C	Temperature °F	Temperature °C
-111.0 to	-109.3	-79	
-109.2	-107.5	-78	
-107.4	-105.7	-77	
-105.6	-103.9	-76	
-103.8	-102.1	-75	
-102.0 to	-100.3	-74	
-100.2	-98.5	-73	
-98.4	-96.7	-72	
-96.6	-94.9	-71	
-94.8	-93.1	-70	
-93.0 to	-91.3	-69	
-91.2	-89.5	-68	
-89.4	-87.7	-67	
-87.6	-85.9	-66	
-85.8	-84.1	-65	
-84.0 to	-82.3	-64	
-82.2	-80.5	-63	
-80.4	-78.7	-62	
-78.6	-76.9	-61	
-76.8	-75.1	-60	

CODE AND CONVERSION TABLES

Conversion Table I—Continued

Temperature °F	Temperature °C	Temperature °F	Temperature °C
+86.9 to +88.6	+31	+113.9 to +115.6	+46
88.7 90.4	32	115.7 117.4	47
90.5 92.2	33	117.5 119.2	48
92.3 94.0	34	119.3 121.0	49
94.1 95.8	35	121.1 122.8	50
+95.9 to +97.6	+36	+122.9 to +124.6	+51
97.7 99.4	37	124.7 126.4	52
99.5 101.2	38	126.5 128.2	53
101.3 103.0	39	128.3 130.0	54
103.1 104.8	40	130.1 131.8	55
+104.9 to +106.6	+41	+131.9 to +133.6	+56
106.7 108.4	42	133.7 135.4	57
108.5 110.2	43	135.5 137.2	58
110.3 112.0	44	137.3 139.0	59
112.1 113.8	45	139.1 140.8	60

PART D
COMPLETE WMO SURFACE SYNOPTIC CODES

—LAND, SHIP AND AVIATION WEATHER REPORTS—

(SYNOP—FM 11.D)

(METAR—FM 15.D)

(SPECI—FM 16.D)

(SHIP—FM 21.D)

(SHIP—FM 22.D)

(SHRED—FM 23.D)

(SPESH—FM 26.D)

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PART D—COMPLETE WMO SURFACE SYNOPTIC CODES—LAND, SHIP AND AVIATION WEATHER REPORTS

CHAPTER D1—SURFACE SYNOPTIC REPORTS FROM LAND STATIONS

1 Introduction

1.1 General—It will be noted that Part A of this Handbook contains introductory material which is applicable to the entire Handbook. Parts B and C contain all the code forms, instructions and code tables required by United States stations in North and Central America (WMO Region IV) and in Hawaii and the Pacific Ocean Area (WMO Region V) for coding surface synoptic reports. Therefore, Part D of the Handbook will not be required for coding purposes by United States stations in North and Central America and in Hawaii and the Pacific Area.

1.2 Purpose—The complete WMO surface codes for land stations (i.e., Part D) has been included in this Handbook so that all concerned will be informed regarding the mandatory portions and the various optional features of the basic surface synoptic reporting codes which have been adopted by the WMO for worldwide use and which may be employed by other meteorological services throughout the world. Information on the complete WMO surface land codes may be required by United States stations in the decoding of reports received from other meteorological services and by those United States stations which are located in other parts of the world.

1.3 Contents—Part D of the Handbook contains the complete WMO symbolic surface synoptic forms of messages for land stations and all of the WMO coding instructions. Those definitions of symbolic letters, instructions and code tables required in the complete WMO codes that are given in Parts B and C of the Handbook have not been repeated in Part D. It will be necessary, therefore, to refer to Parts B and C for those definitions, code tables

and coding procedures omitted from Part D, if required.

1.4 Form of Message—There is one form of message specified by the WMO for reporting surface data from land stations for synoptic purposes, which is SYNOP (FM 11.D).

2 SYNOP—FM 11.D

2.1 Symbolic Form of Message—The symbolic form of message used by land stations for synoptic reports (SYNOP, FM 11.D) is:

(SYNOP)

IIIII Nddff VVwwW PPPTT

N₁C_LhC_MC_H T₁T₂J₁J₂ (99ppp)

(6P₁P₂P₃P₄) (7RRjj) (8N₁Ch₁h₂)

(9S₁S₂s₁s₂) (1jjj) (2jjj)

(3d₁d₂H₁H₂ (d₁d₂P₁H₁H₂)) (4jjj)

(5jjj) (6a₁hhh)

2.2 WMO General Instructions—General instructions for the use of SYNOP (FM 11.D) are:

2.2.1 The code name SYNOP may prefix the report, indicating that it is a surface report from a land station, but in the case of a group of such reports, it may only be used in the heading of the collective.

2.2.2 Those national services which consider light-vessels in the same category as land stations make use of land code forms with index numbers. The reports are included in land report collectives.

2.3 Use of parenthesized groups—Elements or groups enclosed in parentheses are dropout items and may, or may not, be included in the report depending on specified conditions.

2.3.1 IIIII—In each individual message, either isolated or included in a bulletin, the

position group shall always contain the block number **II** and the international station number **III**.

2.3.2 (7RRj)—The use of this group is fixed regionally.

2.3.3 (8N,Ch,h₃)—The inclusion of this group is fixed, regionally or nationally. When the 8-group is included in a SYNOP report, the rules for the use the 8-group are given in Chapter B-11 and specify minimum requirements.

2.3.4 (9S,S₃,a₃)—The use of this group is fixed regionally.

2.3.4.1 The groups with indicators may be repeated as necessary.

2.3.5 Additional groups or supplementary information—The following additional groups, comprising an indicator figure and/or the following information, may be added to the SYNOP form:

2.3.5.1 Coastal stations and light-vessels may add in their reports the wave groups (**3P_vP_vH_vH_v** (**d_vd_vP_vH_vH_v**)) in accordance with national or regional instructions. Coastal stations desiring to report "tendency" of the waves replace these wave groups by the groups **WATEN O_vd_vd_vH_vH_v**.

2.3.5.2 Additional or supplementary groups with the indicator figures 1, 2, 4 and 5 may be added to the SYNOP form. The form and use to these groups are fixed regionally.

2.3.5.3 High-level stations may use the group **6a,hhh** to indicate the geopotential of an agreed standard isobaric surface.

- (a) All stations for which pressure at mean sea level can be computed with reasonable accuracy report this pressure in the **PPPTT** group.
- (b) A station which cannot report mean sea level pressure with reasonable accuracy reports, by regional agreement, either the geopotential of an agreed standard "isobaric surface" or the pressure reduced to an "agreed datum level" for that station. The level chosen for each station is indicated in Volume A of WMO Publication No. 9.
- (c) High level stations which can do both, report pressure reduced to mean sea

level in the group **PPPTT** and may use the group **6a,hhh**, where **hhh** indicates the geopotential meters of the "standard isobaric surface" specified by **a₃**.

- (d) When this group is used in the SYNOP code form, it appears as the last group in the report.

2.3.5.4 Under special conditions, a group of the form **99ppp** is inserted in the report after the **T_vT_vJ_vJ_v** group.

2.3.5.5 One or more of the following words should be added at the end of the report, when the weather conditions specified for each of them justify their inclusion:

HAIL—when a shower or a thunderstorm, accompanied by hail, occurs in the period covered by **ww**.

PAST HAIL—when a shower or a thunderstorm, accompanied by hail, occurred in the period covered by **W**.

SNOW or SLEET—when a snow shower or a shower of rain and snow mixed, with a temperature above 0° C, has been observed during the period covered by **W**.

SANDSTORM—when a sandstorm, with a temperature below 0° C, has occurred in the period covered by **W**.

COTRA—when the cloud reported consists in whole or in part of condensation trails.

2.3.5.6 In the reports from aeronautical stations using FM 11.D, appropriate **Q** signals or plain language may be added at the end of the report when the horizontal visibility differs in different directions and when it is desired to report this.

2.4 Definitions of Symbols—Definitions of those symbolic letters (or groups of letters) and words which are common to both the U.S. and the WMO versions of SYNOP (FM 11.D are given in Chapter B1. Therefore, they are not repeated below.

2.4.1 The definitions of those symbols pertaining **only** to the WMO version of SYNOP in alphabetical order are:

a₃=Indicator giving the standard isobaric surface for which the altitude is reported. (Par. D1-2.5.1 and WMO Code Table 0264)

hhh=Altitude in geopotential meters of the standard isobaric surface indicated by a_3 . (Par. D1-2.5.2)

j_a =Indicator of the characteristic of pressure tendency or of other elements. (Par. D1-2.5.3)

jj=Elements to be included by Regional agreement. (Par. D1-2.5.4)

$j_p j_p$ =Indicator of **pp**, pressure tendency, or other elements. (Par. D1-2.5.5)

O_w =Tendency of height of the waves since the last observation. (Pars. D1-2.5.6 and D1-2.6 and WMO Code Table 2955)

RR=Amount of precipitation. (WMO Code Table 3577)

2.4.2 Definitions of the symbolic words are:
WATEN=Prefix of the wave group, when tendency is reported. (Par. D1-2.5.4)

2.4.3 Definitions of the symbolic figures (or figure groups) are:

6=Indicator figure for the $6a_3 hhh$ group. (Pars. D1-2.5.1 and D1-2.5.2)

2.5 Coding of Individual Elements and Groups—Instructions for the coding of elements and groups which are common to both the U.S. and WMO versions of SYNOP (FM 11.D) are given in Chapter B2 through B16. Therefore, they are **not repeated** below. Instructions for coding those elements or groups pertaining only to the WMO version are:

2.5.1 Indicator giving the standard isobaric surface for which the altitude is being reported a_3

2.5.1.1 The standard isobaric surface for which the altitude is being reported is specified by the code figure reported for symbol a_3 . The surfaces for which altitude may be reported are specified in WMO Code Table 0264.

2.5.2 Altitude of the standard isobaric surface specified by a_3 **hhh**

2.5.2.1 The altitude of the standard isobaric surface specified by symbol a_3 shall be reported for **hhh**. The altitude is reported in geopotential

meters (i.e., the hundreds, tens and units digits of the computed altitude are reported for hhh).

2.5.3 Indicator of the characteristic of pressure tendency or other element j_a

2.5.3.1 The code figure reported for j_a indicates the element(s) being reported for symbols j_a and $j_p j_p$. Code figures 0 through 8 for j_a designate that the characteristic of the pressure tendency during the three hours preceding the time of observations (symbol a) is being reported and that the amount of the pressure changes during the past 3 hours (symbol **pp**) is being reported for $j_p j_p$. Code figure 9 designates that the data given for $j_p j_p$ following refers to elements included by regional agreements.

2.5.4 Elements to be included by Regional Agreement **jj**

2.5.4.1 The elements to be reported for symbol **jj** are determined by Regional agreement. Various definitions may be established for these symbols to meet the Regional requirements.

2.5.5 Indicator of **pp**, pressure tendency or other elements $j_p j_p$

2.5.5.1 Pressure tendency (**pp**) or some other element may be reported for $j_p j_p$ as determined by Regional agreement.

2.5.6 Tendency of height of the waves since last observation O_w

2.5.6.1 The tendency of the height of the waves since the last observation is reported for symbol O_w . (WMO Code Table 2955)

2.5.6.2 Coastal stations **not** equipped with suitable instruments for recording the characteristics of waves, but desiring to report tendency in addition, send the group $O_w d_w d_w P_w H_w$ preceded by the code word **WATEN**. In this instance the $O_w d_w d_w H_w H_w$ group replaces the $3P_w P_w H_w H_w$ ($d_w d_w P_w H_w H_w$) groups. The instructions for coding $P_w P_w$, $H_w H_w$, $d_w d_w$ and $H_w H_w$ given in Chapter B14 apply.

2.6 Tables of Specifications—The code tables not given in Part C and which are required in the WMO version of SYNOP (FM 11.D) are given in Chapter D4.

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CHAPTER D2. SURFACE SYNOPTIC REPORTS FROM SHIP STATIONS

1 Introduction

1.1 Purpose—Information on the WMO SHIP forms of messages have been included in this Handbook for **decoding** purposes only; therefore, those concerned with reporting surface observations taken aboard ship should not use these instructions for observing or coding purposes but should use the appropriate handbook issued for those purposes. Only the symbolic forms of messages, definitions of symbols, general WMO instructions and code tables required in **decoding** surface ship reports have been included in this Handbook.

1.1.1 There are four forms of messages specified by the WMO for reporting surface data from ship stations. These forms of messages are (a) the full form of SHIP (FM 21.D), (b) the abbreviated form of SHIP (FM 22.D), (c) the reduced form SHRED (FM 23.D) and (d) the special report SPESH (FM 26.D).

2 SHIP—FM 21.D

2.1 The symbolic form of message used by ship stations (SHIP, FM 21.D) in full form is:

SHIP 99L₁L₂L₃ Q_cL₄L₅L₆L₇ YYGGi_v
Nddff VVwww PPPTT
N₁C₁hC_MC_H D_vv_{app} (7RRjj)
(8N_cCh_h) (9S_pS_ps_ps_p)
(OT_vT_vT_dT_d) (1T_vT_vT_vt_v)
(2L_eE_eR_e) (3P_vP_vH_vH_v)
(d_vd_vP_vH_vH_v) ICE followed by
plain language or by (c₂KD_{re})

2.2 WMO General Instructions—General instructions for the use of SHIP (FM 21.D) are:

2.2.1 The code name SHIP is used as a prefix to the report, indicating that it is a surface report from a ship, but in the case of a group of

such reports, it should only be used in the heading of the collective.

2.2.2. The form FM 21.D is considered suitable not only for selected ships, but also for ocean weather stations.

2.2.3. Those national services which consider light-vessels in the category of ships, use ship code forms and include the reports in ship collectives.

2.2.4 If the group D_vv_{app} is not reported, 30 is added to the time of observation in whole hours GMT (example: actual time of observation 0550 GMT; GG=06+30=36).

2.2.5 If the groups N₁C₁hC_MC_H and D_vv_{app} are not reported, 60 is added to the time of observation in whole hours GMT (example: actual time of observation 1145 GMT; GG=12+60=72).

2.2.6 However, ships which, in accordance with their national instructions or because of failure of instruments, do not report the group D_vv_{app}, include a group D_vv_{///} in the ship report when in an area where the ship report collecting center, in order to meet a requirement of a search and rescue center, has requested this inclusion as a routine procedure.

2.2.7 Use of parenthesized groups—Groups in parentheses are drop-out items and they may or may not be included in the report depending on specified conditions. These groups, being provided with an indicator figure, may be repeated as necessary.

2.2.7.1 (7RRjj)—For lightships reporting in the SHIP code form and for ocean weather stations, the use of this group is fixed regionally or nationally. In the case of mobile ship stations, which make precipitation observations, the group 7RRjj is added to each SHIP report under the form 7RRt_{pr}.

2.2.7.2 (8N_cCh_h)—This cloud group is optional for merchant ships but mandatory for ocean weather stations. When the 8-group is included in a SHIP report, the rules for the use

of the (8N,Ch,h₀) group in METAR apply and specify minimum requirements. (Par. D3-2.2.9)

2.2.7.3 (9S_rS_ra₀a₀)—This group is normally not included in ship reports, other than ocean weather stations. Cases may occur, where reports of special phenomena would justify inclusion in the report from ships, other than ocean weather stations. As these cases are very rare, these reports should be sent in plain language.

2.2.7.4 (0T₀T₀T₀T₀)—This group may or may not be included in the report, in accordance with national instructions. It is mandatory for ocean weather stations

2.2.7.5 (1T₀T₀T₀T₀)—This group is optional for merchant ships but mandatory for ocean weather ships.

2.2.7.6 (3P_wP_wH_wH_w (d_wd_wP_wH_wH_w))—These groups should be included in the report. They are mandatory for ocean weather stations. The group **3P_wP_wH_wH_w** is used to report wind waves. When swell can be distinguished from wind waves, the swell should be reported by the group **d_wd_wP_wH_wH_w**, and this group should be repeated to report a second swell system if such can be distinguished. If there is a swell with no wind waves the first group is to be reported as **30000**.

2.2.7.7 When the ice accretion on ships is reported in plain language it shall be preceded by the word **ICING**.

2.2.7.8 (ICE c₂KD_rre)—Reporting ships from which ice and/or icebergs are visible or have been observed at a point or points within a distance of 50 to 60 km from the ship's position at the actual time of observation, should add to the SHIP report the word **ICE** followed by the group **c₂KD_rre** or by **plain language**. Ice information for other special purposes may be given by means of the special ice codes. Reporting of sea ice in **SHIP** reports is **not** to supersede the reporting of sea ice and icebergs in accordance with the International Convention for the Safety of Life at Sea.

2.2.9 Additional groups or supplementary information—The following additional groups, comprising an indicator figure and/or the following information, may be added to the **SHIP** form:

2.2.9.1 Under special conditions, a group of the form **99ppp** is inserted in the report after the **D_vv_{app}** group. (Chapter B8)

2.2.9.2 Reporting ships from which icebergs are visible should add to their **SHIP** report, in plain language, the number of icebergs seen at the actual time of observation (e.g., "3 BERGS"), unless these bergs have been reported with the group (**ICE c₂KD_rre**).

2.2.9.3 One or more of the following words should be added at the end of the report, when the weather conditions specified for each of them justify their inclusion:

HAIL—when a shower or a thunderstorm, accompanied by hail, occurs in the period covered by **ww**.

PAST HAIL—when a shower or a thunderstorm, accompanied by hail, occurred in the period covered by **W**.

SNOW or SLEET—when a snow shower or a shower of rain and snow mixed, with a temperature above 0°C, has been observed during the period covered by **W**.

SANDSTORM—when a sandstorm, with a temperature below 0°C, has occurred in the period covered by **W**.

COTRA—when the cloud reported consists in whole or in part of condensation trails.

2.3 Definitions of Symbols—Definitions of those symbolic letters (or groups of letters) and words which are common to both the U.S. and the WMO versions of **SYNOP (FM11.D)t** and **SHIP (FM 21.D)** are given in paragraphs B1-3 and D1-2.4, respectively. Therefore, they are not repeated here.

2.3.1 The definitions of those symbolic letters pertaining **only** to **SHIP** in alphabetical order are:

c₂=Description of kind of ice. (Par. D2-4.16 and WMO Code Table 0663)

D₁=Bearing of ice edge. (Par. D2-4.18 and WMO Code Table 0739)

D_v=Ship's course (true) made good during the three hours preceding the time of observation. (Par. D2-4.7 and WMO Code Table 0700)

- E_sE_s**=Thickness of ice accretion on ships in centimeters. (Par. D2-4.14)
- e**=Orientation of ice edge. (Par. D2-4.20 and WMO Code Table 1000)
- GG**=Actual time of observation to the nearest whole hour in GMT. (Par. D2-4.5)
- I_s**=Ice accretion on ships. (Par. D2-4.13) and WMO Code Table 1751)
- i_w**=Wind indicator. (Par. D2-4.6 and WMO Code Table 1855)
- K**=Effect of the ice on navigation. (Par. D2-4.17 and WMO Code Table 2100)
- L_sL_sL_s**=Latitude in tenths of degrees. (Par. D2-4.1)
- L_oL_oL_oL_o**=Longitude in tenths of degrees. (Par. D2-4.3)
- Q_e**=Quarter of the globe. (Par. D2-4.2 and WMO Code Table 3333)
- R_s**=Rate of ice accretion on ships. (Par. D2-2.4.15 and WMO Code Table 3551)
- r**=Distance to ice edge from reporting ship. (Par. D2-4.19 and WMO Code Table 3600)
- T_sT_s**=Difference between air temperature and sea temperature in half-degrees Celsius. (Par. D2-4.10)
- T_wT_wT_w**=Sea surface temperature in tenths of degrees Celsius. (Par. D2-4.11)
- t_T**=Tenths figure of the air temperature. (Par. D2-4.12)
- t_{RT}**=Duration of precipitation. (Par. D2-4.9 and WMO Code Table 4080)
- v_s**=Ship's average speed made good during the three hours preceding the time of observation. (Par. D2-4.8 and WMO Code Table 4451)
- YY**=Day of the month. (Par. D2-4.4)

2.3.2 Definitions of the symbolic words are:

SHIP=Code name. Refers to a surface synoptic report from a ship station. (Par. D2-2.1)

2.3.3 Definitions of the symbolic figures (or figure groups) are.

0=Indicator figure for the 0T_sT_sT_sT_s group. (Par. D2-2.7.4)

1=Indicator figure for the 1T_wT_wT_wt_T group.

2=Indicator figure for the 2I_sE_sR_s group.

3=Indicator figure for the 3P_wP_wH_wH_w group.

99=Indicator figures for the 99L_sL_sL_s group.

2.4 Coding of Individual Elements and Groups—Instructions for the coding of elements and groups which are common to the U.S. and WMO versions of SYNOP (FM 11.D) are given in Chapters B3 through B16 and paragraph D1-2.5. Therefore, they are not repeated below. The coding instructions for elements and groups pertaining only to SHIP, in the order in which they appear in the message, are:

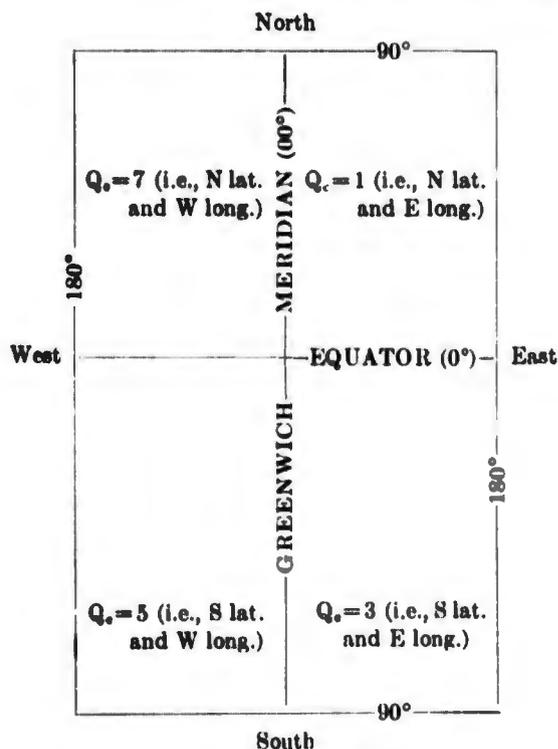
2.4.1 Latitude L_sL_sL_s

2.4.1.1. The latitude of the point of observation in tens, units and tenths of degrees shall be reported for symbol L_sL_sL_s. The tenths of degrees are obtained by dividing the number of minutes by 6, disregarding the remainder.

2.4.2 Quadrant of the globe Q_e

2.4.2.1 The quadrant of the globe shall be reported for symbol Q_e. (WMO Code Table 3333)

2.4.2.2 For this purpose the earth is divided into four quarters by the Greenwich Meridian and the Equator where positions having north latitudes and east longitudes are represented by code figure 1 (i.e., Q_e=1); positions having south latitudes and east longitudes are represented by code figure 3 (i.e., Q_e=3); etc. The following nomograph illustrates the system used in dividing the earth into quarters:



2.4.2.3 There are two cases which raise a question regarding the code figure to be reported for Q_c . A procedure has not been established, nor does one appear necessary, to cover these two cases. These two cases occur:

- (a) When the ship is precisely on the Greenwich Meridian (i.e., $L_1L_2L_3L_4 = 0000$) either code figure 1 or 7 (Northern Hemisphere) or code figure 3 or 5 (Southern Hemisphere) may be reported, as appropriate with respect to latitude.
- (b) When the ship is precisely on the Equator (i.e., $L_1L_2L_3 = 000$) either code figure 1 or 3 (Eastern Hemisphere) or code figure 5 or 7 (Western Hemisphere) may be reported, as appropriate with respect to longitude.

2.4.3 Longitude $L_1L_2L_3L_4$

2.4.3.1 The longitude of the point of observation in hundreds, tens, units and tenths of degrees shall be reported for symbol $L_1L_2L_3L_4$. The tenths are obtained by dividing the number of minutes by 6, disregarding the remainder.

2.4.4 Day of the month YY

2.4.4.1 The day of the month (according to GMT) on which the observation is taken shall be reported for symbol YY.

2.4.4.2 The first day of the month is coded 01, the second day 02, the third day 03, etc.

2.4.5 Time of observation GG

2.4.5.1 The actual time of observation to the nearest whole hour GMT shall be reported for symbol GG.

2.4.5.2 In the case of surface observations, the actual time of observation is the time at which the barometer is read.

2.4.6 Wind indicator i_w

2.4.6.1 The unit of wind speed (i.e., knots or meters per second) being used is reported for symbol i_w . This element is also used to indicate whether the speed was obtained by means of an anemometer or estimated. (WMO Code Table 1855)

2.4.7 Ship's course D_s

2.4.7.1 The ship's course (true) made good during the three hours preceding the time of observation shall be reported for symbol D_s . (WMO Code Table 0700)

2.4.8 Ship's average speed v_s

2.4.8.1 The ship's average speed made good during the three hours preceding the time of observation shall be reported for symbol v_s . (WMO Code Table 4451)

2.4.9 Observational period for RR and duration of precipitation t_{RR}

2.4.9.1 The number of hours (i.e., 6, 12, 18 or 24 hours) over which the amount of precipitation reported for RR has been accumulated and the duration, in hours and minutes, of the precipitation are reported for symbol t_{RR} . (WMO Code Table 4080)

2.4.9.2 Code figures 00 to 19, inclusive, are reported when the accumulated amount for the 6 hours prior to the time of observation is being reported for RR; code figures 20 to 49, inclusive, for the previous 12 hour period; code figures 50 to 69, inclusive, for the previous 18

hour period; and code figures 70 to 99, inclusive, for the previous 24 hour period.

2.4.10 Difference in air and sea temperatures **T_aT_s**

2.4.10.1 The difference between air temperature and sea temperature in half-degrees Celsius shall be reported for symbol **T_aT_s**.

2.4.10.2 If the air temperature is 4.5° C above the sea temperature, code figure **09** is reported for **T_aT_s** (i.e., 4.5°×2=9.0° which is coded **09**).

2.4.10.3 If the air temperature is below the sea temperature, **50** is added to the numerical value of the difference for coding purposes (e.g. if the air temperature is 17.5° C below the sea temperature, code figure **85** is reported for **T_aT_s** [i.e., 17.5°×2=35.0+50=85]).

2.4.11 Sea surface temperature **T_wT_wT_w**

2.4.11.1 The sea surface temperature in tenths of a degree Celsius is reported for symbol **T_wT_wT_w**.

2.4.11.2 For negative temperatures, **500** is added to the absolute value of the observed sea surface temperature. Thus, a minus sea surface temperature (i.e., -T_wT_wT_w) is reported by the sum of T_wT_wT_w + 500.

2.4.12 Tenths digit of the air temperature **t_r**

2.4.12.1 The tenths digit of the air temperature is reported for symbol **t_r**

(NOTE: When a ship report contains the **1T_wT_wT_wt_r** group, the air temperature reported for **TT** is the tens and units digits of the actual observed temperature (i.e., the value reported for **TT** is **not rounded** to the nearest whole degree). When the ship report does not contain the **1T_wT_wT_wt_r** group, the air temperature reported for **TT** is **rounded** to the nearest whole degree.)

2.4.13 Ice accretion on ships **I_s**

2.4.13.1 The ice accretion on the ship shall be reported for symbol **I_s**. (WMO Code Table 1751)

2.4.13.2 It will be noted that the specifications given in WMO Code 1751 provide

information on the source of the moisture supply that is causing the ice to accrue on the ship. In the event there is any doubt that the moisture is being supplied from more than one source, the code figure representing the two sources shall be reported. For example: If it is obvious that the major portion of the ice is being formed by the freezing of rain but some ice may be forming from the spray, code figure 5 shall be reported.

2.4.14 Thickness of ice accretion **E_sE_s**

2.4.14.1 The thickness of the ice accretion on the ship in centimeters shall be reported for symbol **E_sE_s**.

2.4.15 Rate of ice accretion **R_s**

2.4.15.1 The rate of the ice accretion on the ship shall be reported for symbol **R_s**. (WMO Code Table 3551)

2.4.15.2 The specifications reported for **R_s** indicate the tendency of the accretion rather than specific amounts.

2.4.16 Description of kind of ice **c_s**

2.4.16.1 The description of the kind of ice observed on the sea surface at the shore line shall be reported for symbol **c_s**. (WMO Code Table 0663)

2.4.17 Effect of ice on navigation **K**

2.4.17.1 The effect of the sea ice on surface navigation shall be reported for symbol **K**. (WMO Code Table 2100)

2.4.18 Bearing of ice edge **D_i**

2.4.18.1 The bearing of the ice edge from the point of observation shall be reported for **D_i**. (WMO Code Table 0739)

2.4.18.2 The direction reported for **D_i** refers to the true north and **not** the magnetic north. If more than one ice edge is observed, the nearest or most important should be reported.

2.4.19 Distance to ice edge **r**

2.4.19.1 The distance from the observing point to the ice edge is reported for symbol **r**. (WMO Code Table 3600)

2.4.20 Orientation of ice edge e

2.4.20.1 The orientation of the ice edge with respect to the point of observation shall be reported for symbol e. (WMO Code Table 1000)

2.5 Tables of Specifications—The code tables not given in Part C and which are required in SHIP are given in Chapter D4.

3 SHIP—FM 22.D

3.1 The symbolic form of message used by ship stations (SHIP, FM 22.D) in abbreviated form is:

SHIP 99L₁L₂L₃ Q₁L₁L₂L₃ YYGGI₁
 Nddff VVwwW PPPTT
 N₁C₁hC_MC_H (D₁v₁///) (2L₁E₁E₂R₁)
 ICE followed by plain language
 or by (c₂KD₁re)

3.2 WMO General Instructions—General instructions for the use of SHIP (FM 22.D) are:

3.2.1 This code form is considered suitable for supplementary ships, i.e., ships supplied, not with full sets (as the selected ships and ships at ocean weather stations), but with modified sets of tested instruments. These ships are requested to report at the main standard time of observation, whenever practicable, in areas where shipping is relatively sparse, or on request and especially when storm conditions threaten or prevail.

3.2.2 Use of parenthesized groups—Some of the elements or groups have been enclosed in parentheses to indicate that the use of them is OPTIONAL, that their inclusion depends on the availability of data, or specified conditions.

3.2.2.1 (D₁v₁///)—This group is included in ships' reports from an area only when the ship report collecting center for that area, in order to meet a requirement of a search and rescue center, has requested its inclusion, as a routine procedure, by all ships in the area.

3.2.3 The WMO general instructions given under SHIP FM 21.D (paragraph D2-2.2) covering those groups which are common to both the full (FM 21.D) and abbreviated (FM

22.D) forms of SHIP apply equally to the abbreviated form.

3.3 Definitions of Symbols—Definitions of those symbolic letters (or groups of letters), words and figures required in the abbreviated form of SHIP (FM 22.D) which are common to both the U.S. and the WMO versions of SYNOP (FM 11.D) and SHIP (FM 21.D) and are given in paragraphs B1-3, D1-2.4 and D2-2.3, respectively. Therefore, they are not repeated here.

3.4 Coding of Individual Elements and Groups—Instructions for the coding of elements and groups included in the abbreviated form (FM 22.D) are common to both the U.S. and WMO versions of SYNOP (FM 11.D) and SHIP (FM 21.D) and are given in Chapters B2 through B16 and paragraph D2-2.4, respectively. Therefore, they are not repeated here.

3.5 Tables of Specifications—The code tables not given in Part C and which are required in the abbreviated SHIP are given in Chapter D4.

4 SHRED—FM 23.D

4.1 The symbolic form of message used by ship stations (SHRED, FM 23.D) in reduced form is:

SHRED 99L₁L₂L₃ Q₁L₁L₂L₃ YYGGI₁
 Nddff VVwwW PP/TT (D₁v₁///)
 (2L₁E₁E₂R₁) ICE followed by plain
 language or by (c₂KD₁re)

4.2 WMO General Instructions—General instructions for the use of SHRED (FM 23.D) are:

4.2.1 The code name SHRED is used as a prefix to the report, indicating that it is a reduced type of ship report. The prefix SHRED should always be included in the message.

4.2.2 This code form is considered suitable for any ship, other than a selected ship, a ship at an ocean weather station or a supplementary ship, which is not supplied with tested instruments and may be requested to report in areas where shipping is relatively sparse, or on request and especially when storm conditions threaten or prevail. These ships can report in plain

language, if the use of code is impracticable. They are encouraged to make their reports at the main standard times of observation, but reports at other hours, more convenient to themselves, are acceptable, the actual time of observation being reported in the report to the nearest hour GMT.

4.2.3 The solidus (/) in the group **PP/TT** signifies that the information in the tenths of mb is not available owing to lack of accuracy or closeness of scale of the ship's barometer.

4.2.4 If the group **PP/TT** is **not** reported, 30 is **added** to the time of observation in whole hours GMT (example: actual time of observation 0550 GMT; GG=06 plus 30=36).

4.2.5 Use of parenthesized groups—Some of the elements or groups have been enclosed in parentheses to indicate that the use of them is **OPTIONAL**, that their inclusion depends on the availability of data, or specified conditions.

4.2.5.1 (D.v.//)—This group is included in ship's reports from an area only when the ship report collecting center for that area, in order to meet a requirement of a search and rescue center, has requested its inclusion, as a routine procedure, by all ships in the area.

4.3 Definitions of Symbols—Definitions of those symbolic letters (or groups of letters) required in SHRED (FM 23.D) which are common to both the U.S. and WMO versions of SYNOP (FM 11.D) and SHIP (FM 21.D) are given in paragraphs D1-2.4 and D2-2.3, respectively. Therefore, they are not repeated here.

4.4 Coding of Individual Elements and Groups—Instructions for the coding of elements and groups included in SHRED which are common to the U.S. and WMO versions of SYNOP (FM 11.D) and SHIP (FM 21.D) are given in Chapters B3 through B16 and paragraph D2-2.4, respectively. Therefore, they are not repeated here.

4.5 Tables of Specifications—The code tables required for SHRED are given in Part C and in Chapter D4.

5 SPESH—FM 26.

5.1 The symbolic form of message used by ship stations (SPESH, FM 26) for reporting special weather conditions is:

**SPESH 99L₁L₂L₃ Q₁L₄L₅L₆ YYG'G'w₂
Nddff VVwwW 8N.Ch.b. (OTTT₁T₂)**

5.2 WMO General Instructions—General instructions for the use of SPESH (FM 26) are:

5.2.1 SPESH is the symbolic prefix identifying a special report from a ship.

5.2.2 The criteria for the taking of a special report follow hereunder. They should be applied regionally with a view to transmitting messages of interest to synopticians in order to avoid the transmission of a large number of reports. The criteria are:

5.2.2.1 Wind Speed—When a marked and sustained change in the mean wind speed has occurred (i.e., the order of 20 knots or more and has been sustained for 10 minutes prior to commencement of the observation). In this instance code figure 1 would be reported for **w₂**.

5.2.2.2 Wind Direction—When a marked and sustained change in the mean wind direction has occurred (i.e., of the order of 30° or more, sustained for 10 minutes prior to the commencement of the observation), the mean wind speed having been 15 knots or more before or after the change. In this instance code figure 1 would be reported for **w₂**.

5.2.2.3 Fog—When fog has begun or ended. In this instance code figure 2 would be reported for **w₂**.

5.2.2.4 Precipitation—When precipitation has begun or ended (except individual showers if shower type precipitation is occurring). In this instance code figure 4 would be reported for **w₂**.

5.2.2.5 Pressure—When the pressure has risen or fallen in the amount of 2 or more millibars in the preceding hour. The sign of the pressure change will be reported by adding the word **PLUS** or **MINUS** at the end of the report to indicate whether the pressure is rising or falling, respectively. In this instance code figure 5 would be reported for **w₂**.

5.2.2.6 State of Sea—Code figure 6 is reported for **w₂** when: At the time of observation the average wave height is 15 feet (4½ meters) or more and the average wave height has increased or decreased by 5 feet (1½ meters)

or more since last reported, or at the time of observation, the average wave height is 15 feet (4½ meters) or more and the direction of the wave system has changed 60° or more since last reported. (Note: The state of sea criteria is a U.S. requirement.)

5.2.2.7 Phenomena—When one or more of the following phenomena is occurring or has occurred:

Hail; Heavy snow; Freezing precipitation.

In this instance code figure 4 would be reported for w_2 .

Thunderstorm. In this instance code figure 8 would be reported for w_2 .

Squall; Waterspout. In this instance code figure 8 would be reported for w_2 .

5.2.3 When more than one criterion exists simultaneously, the highest applicable code figure is reported for w_2 .

5.2.4 Plain Language—Plain language to give more detailed description of existing conditions may be added to the report when in the opinion of the observer such supplementary information might be helpful to forecasters or maritime interests.

5.2.4.1 The following situations are always reported:

(a) When a combination of the above criteria occurs in such a manner as to indicate the likelihood of a frontal passage, it is indicated by appending to the end of the message words **FRONT, COLD FRONT, WARM FRONT, etc.**, as appropriate.

(b) The occurrence of icing on ships' superstructures is always reported in plain language added at the end of the coded message. The word **ICING**, followed by such words as may be necessary to give a concise description of the icing, is used. The thickness in inches and the general trend of the accumulation is given whenever practicable, for example, **ICING 2 INCHES INCREASING**. If thickness observations cannot be made for any reason (e.g., obstruction to vision, darkness, etc.), the condition will be reported as **ICING SLIGHT, MODERATE** or **SEVERE**, as the case may be.

5.2.5 The WMO general instructions given under SHIP FM 21.D (paragraph D2-2.2) covering those groups which are common to both SHIP and SPESH apply equally to SPESH.

5.3 Definitions of Symbols—The definitions of those symbolic letters (or groups of letters), words and figures which are common to the U.S. and WMO versions of SYNOP (FM 11.D) and SHIP (FM 21.D) are given in paragraphs B1-3, D1-2.4 and D2-2.3, respectively. Therefore, they are not repeated here.

5.3.1 The definitions of those symbols pertaining only to SPESH are:

w_2 —Indication of the element forming the principal object for the taking of a special weather report from a SHIP. (Par. D2-2.4.1 and WMO Code Table 4663)

5.3.2 Definitions of the symbolic words are:

SPESH—Code name. Refers to a special weather report of surface conditions taken by a ship. (Par. D2-5.2.1)

5.4 Coding of Individual Elements and Groups—Instructions for the coding of elements and groups included in SPESH which are common to the U.S. and WMO versions of SYNOP (FM 11.) and SHIP (FM 21.C) are given in Chapters B3 through B16 and paragraph D2-2.4, respectively. Therefore, they are not repeated here. The coding instructions pertaining only to SPESH are:

5.4.1 Indication of principal object of report . . . w_2

5.4.1.1 The element forming the principal object for taking the special weather report from the ship shall be reported for symbol w_2 . The various elements for which SPECIALS are required are listed in WMO Code Table 4663 which is given in Chapter D4.

5.5 Tables of Specifications—The code tables required for SPESH are given in Part C and in Chapter D4.

CHAPTER D3. AVIATION WEATHER REPORTS

1 Introduction

1.1 General—The WMO has adopted two new forms of messages for transmitting routine and special meteorological reports in ground-to-ground exchanges for aeronautical purposes. These forms of messages are **METAR** (FM 15.D) which is used to report routine weather observations and **SPECI** (FM 16.D) which is used to report selected special weather reports at aerodromes. These forms of messages have been developed in accord with the statement of aeronautical operational requirements formulated by ICAO.

1.1.1 This chapter contains the symbolic forms of messages, definitions of letter symbols, and WMO general instructions required to decode these reports. The code tables required are given in either Part C or Chapter D4 of this Handbook as indicated by the reference notations.

2 METAR—FM 15.D

2.1 The symbolic form of message used by aerodrome stations for Aviation Routine Weather Reports (METAR, FM 15.D) is:

METAR GGgg CCCC dddff/f_mf_m

$$\left\{ \begin{array}{l} \text{VVVV RV}_R\text{V}_R\text{V}_R\text{V}_R/\text{D}_R\text{D}_R \\ \text{w'w' N.CCh.h.} \\ \text{or} \\ \text{CAVOK} \\ (\text{T'T'/T'dT'd}) (\text{P}_H\text{P}_H\text{P}_H\text{P}_H) \end{array} \right.$$

2.2 WMO General Instructions—General instructions for the use of **METAR** (FM 15.D) are:

2.2.1 The code name **METAR** designates an aviation routine weather report. **METAR** shall appear as a prefix to individual reports but in the case of a group of such reports it shall appear in the heading of the collective only.

2.2.2 The elements or groups enclosed in parentheses are included in the code form in

accordance with regional agreements unless otherwise specified in the following notes.

2.2.3 Groups may have to be repeated in accordance with the detailed instructions for each group.

2.2.4 Instructions for the group **GGgg**:

- (i) The group **GGgg** is always placed in the heading of a collective, indicating the time of observation of the report placed first in the collective. If the time of observation of any following report in the collective differs **not more** than ten minutes from the time given by **GGgg** in the heading it is not necessary to use **GGgg** in any such report. If the time of observation of any following report in the collective differs **more** than ten minutes from the time given by **GGgg** in the heading, it is necessary to use **GGgg** in any such report.

2.2.5 Instructions for the group **dddff/f_mf_m**:

- (i) The mean direction and speed of the wind over the ten minute period immediately preceding the observation shall be reported under **dddff**. However, when the ten minute period includes a discontinuity in the wind characteristics, **only** data occurring since the discontinuity shall be used for obtaining mean values, hence the time interval in these circumstances will be correspondingly reduced. The direction of wind shall be reported in tens of degrees, thus the third figure of **ddd** will always be 0.
- (ii) If during the ten minute period preceding the observation the maximum wind speed exceeds the mean speed by 10 knots or more, this maximum speed shall be reported as /f_mf_m immediately after **dddff**. Otherwise the element /f_mf_m shall **not be** included in the report.
- (iii) Calm shall be reported **00000**. Variable direction shall be reported **999** followed by the speed.

2.2.6 Instructions for the group **VVVV**:

- (i) The visibility **VVVV** is given in meters in increments of one hundred meters up to 5 kilometers and in increments of one kilometer up to and including 9 kilometers. **9999** indicates a visibility of 10 kilometers and above.
- (ii) See the instructions given in paragraph D3-2.2.10 following.

2.2.7 Instructions for the group **RV_RV_RV_RV_R/D_RD_R**:

- (i) When runway visual range is being observed during a period of reduced visibility, one or more group(s) **RV_RV_RV_RV_R/D_RD_R** shall be included in the report in the following manner:
 - (a) if runway visual range is observed over one runway the value shall be reported as **V_RV_RV_RV_R** preceded by the letter indicator **R**, the drop-out element **D_RD_R** being omitted;
 - (b) if runway visual range is observed over two or more runways simultaneously and there are no significant differences in runway visual range between runways its value shall be reported as indicated in (a) above;
 - (c) if runway visual range is observed over two or more runways simultaneously and there are significant differences in runway visual range between runways the value obtained for each runway shall be reported if required, as many **RV_RV_RV_RV_R/D_RⁿD_R** groups being included in the report as necessary, the number of each runway being indicated by **D_RD_R**;
- (ii) Observed Runway Visual Range is given in meters; the values up to 500 meters should be reported in steps not greater than 50 meters; those from 500 to 1000 meters in steps not greater than 100 meters, and those above 1000 meters in steps not greater than 200 meters.
- (iii) See the instructions given in paragraph D3-2.2.10 following.

2.2.8 Instructions for the group **w'w'**:

- (i) This group contains the reporting of present weather as specified in WMO Code 4678.
- (ii) See the instructions given in paragraph D3-2.2.10 following.

2.2.9 Instructions for the group **N_cCCh_ch_c**:

- (i) This group may be repeated to report a number of layers or masses of cloud. The normal number of groups should not exceed three; it may, however, be four in cases when Cumulonimbus clouds are observed. The selection of layers (masses) to be reported shall be made in accordance with the following requirements:
 - (a) The lowest individual layer (mass) of any amount (i.e., N_c equals 1 or more);
 - (b) The next higher individual layer (mass) the amount of which is greater than $N_c=2$ (i.e., N_c equals 3 or more);
 - (c) The next higher layer (mass) the amount of which is greater than $N_c=4$ (i.e., N_c equals 5 or more);
 - (d) Cumulonimbus clouds, whenever observed and not reported under (a), (b) and (c) above by means of a group referring exclusively to Cb.

NOTES:

- (i) The order of reporting of the groups is always from low to high levels;
- (ii) In determining the cloud amounts to be reported for individual layers or masses in the cloud group, the observer estimates by taking into consideration the evolution of the sky, the cloud amounts of each layer or mass at the different levels as if no other clouds were existing. Caution should be taken, however, to avoid unconsidered guessing (this requires elaboration in national instructions).
- (ii) When the sky is clear, the cloud group is not used;
- (iii) When the sky is obscured (i.e., $N_c=9$), the cloud group shall read **9//h_vh_v** where **h_vh_v** is the vertical visibility;

(iv) See the instructions given in paragraph D3-2.2.10 following.

2.2.10 Instructions for the group CAVOC:

(i) The code word **CAVOK** shall be included in the report in place of the groups **VVVV**, **RV_RV_RV_RV_R/D_RD_R**, **w'w'** and **N_cCC_hh_s**, whenever the following conditions occur simultaneously at the time of observation:

- (a) visibility—10 kilometers or more,
- (b) cloud—amount of the lowest layer 4/8 or less and height of base 3000 meters or more, and no cumulonimbus present,
- (c) weather—no precipitation and no thunderstorm.

2.2.11 Instructions for the group (T'T'/T'dT'd):

- (i) The air temperature and dew point temperature is given in whole degrees Celsius. Values less than 10 degrees have to be preceded by 0 (e.g., +9° C is to be reported 09).
- (ii) Temperatures **below** 0° C are indicated by **M** (i.e. minus), for example -9° C is to be reported by **M09**.

2.2.12 Instructions for the group (P_HP_HP_HP_H):

- (i) **QNH** is always rounded off to the nearest millibar (0.5 is always rounded downwards);
- (ii) If the value of **QNH** is less than 1000 millibars, it shall be given in three figures only.

2.2.13 Supplementary information:

- (i) Other significant information (e.g., regarding turbulence, aircraft icing, other significant phenomena in sight not occurring at the station, or wind shear) in the lower layers should be added in plain language in accordance with regional agreements;
- (ii) When there are significant directional variations in visibility, additional values should be given at the end of the report with indications of the direction of

observation in plain language using recognized abbreviations.

(NOTE: The examples of supplementary information given above are not intended to be restrictive. Any meteorological information that appears to be of importance to aeronautical operations shall be reported.)

2.3 Definitions of Symbols—Definitions of all the symbolic letters (or groups of letters) which are used in the METAR symbolic form of message in alphabetical order are:

CC=Genus of cloud in two letters according to the abbreviations in WMO Code 0500. (Chapter D4)

CCCC=International four letter location indicator.

(i) ICAO indicators should be used whenever possible.

D_RD_R=Number of the runway to which the runway visual range given by **V_RV_RV_RV_R** refers.

ddd=Direction in degrees from which wind is blowing, rounded to the nearest tens of degrees.

(i) The direction is to be referred to the true and not to the magnetic north.

ff=Wind speed in knots.

f_mf_m=Maximum wind speed in knots, at the surface.

(i) Speeds of 100 knots or more are given in three figures.

GGgg=Time of observation in hours and minutes GMT.

P_HP_HP_HP_H=**QNH** value in whole millibars.

(NOTE: **QNH** is the abbreviation for "altimeter setting" based on 29.92 inches (1013.2 mbs).)

R=Letter indicator specifying that the value given immediately following is the runway visual range.

T'T'=Air temperature in whole degrees Celsius. For negative value **T'T'** is immediately preceded by the letter **M**.

$T'_{d}T'_{d}$ = Temperature of the dewpoint in whole degrees Celsius. For negative values $T'_{d}T'_{d}$ is immediately preceded by the letter M.

VVVV = Horizontal visibility at surface in meters up to 9000 meters.

$V_{R}V_{R}V_{R}V_{R}$ = Runway visual range in meters.

w'w' = Present weather in code figures and optional abbreviations as given in WMO Code 4678. (Chapter D4)

(NOTE: In accordance with regional air navigation agreements, the corresponding equivalents, in the form of letter abbreviations, may be added, following immediately the w'w' code figures as shown in parentheses in WMO Code Table 4678.)

2.4 Coding of Individual Elements and Groups—Instructions for coding individual elements and groups are given in the WMO Instructions (Par. D3-2.2) and in the definitions of the Symbolic Letters (Par. D3-2.3).

2.5 Tables of Specifications—The Tables of Specifications required in coding METAR are given in Chapter D4 as indicated by the reference notations in paragraph D3-2.3.

3 SPECI—FM 16.D

3.1 The symbolic form of message used by aerodrome stations for aviation selected special weather reports (SPECI—FM 16.D) is:

SPECI GGgg CCCC dddff/f_mf_m

VVVV RV_RV_RV_RV_R/D_RD_R

w'w' N_cCC_hh_h

or

CAVOK

3.2 WMO General Instructions—General instructions for the use of SPECI (FM 16.D) are:

3.2.1 The code name SPECI designates an aviation selected special report.

3.2.2 When a deterioration of one weather element is accompanied by an improvement in another element (e.g., lowering of clouds and an improvement in visibility), a single SPECI report shall be issued.

3.2.3 The instructions given in paragraphs D3-2.2.2 and D3-2.2.3 under METAR apply equally to SPECI.

3.2.4 The group GGgg is always included in the individual report.

3.2.5 The instructions given in paragraphs D3-2.2.5, D3-2.2.7, D3-2.2.9 and D3-2.2.10 under METAR apply equally to SPECI.

3.2.6 Additional groups or supplementary information are added to SPECI, when appropriate, as indicated in paragraph D3-2.2.13 under METAR.

3.2.7 The governing criteria for issuing SPECI reports are specified in WMO Publication No. 49, BD.3—Meteorological Service for International Air Navigation (paragraph [12.2] 2.2.3). The criteria are:

Element	Special report to be made	Special report to be disseminated as a selected special report																										
<p>(a) Height above official aerodrome elevation of base of lowest cloud of an amount greater than 4 oktas</p>	<p>When the height</p> <p>(i) decreases to a value equal to or less than, <i>or</i></p> <p>(ii) increases to a value equal to or greater than,</p> <p>any one of a list of values to be selected from one of the following lists:</p> <table border="0" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;"><i>Meters</i></th> <th style="text-align: left;"><i>Feet</i></th> </tr> </thead> <tbody> <tr><td>30</td><td>100</td></tr> <tr><td>*60</td><td>*200</td></tr> <tr><td>90</td><td>300</td></tr> <tr><td>120</td><td>400</td></tr> <tr><td>*150</td><td>*500</td></tr> <tr><td>180</td><td>600</td></tr> <tr><td>240</td><td>800</td></tr> <tr><td>*300</td><td>*1,000</td></tr> <tr><td>450</td><td>1,500</td></tr> <tr><td>600</td><td>2,000</td></tr> <tr><td>750</td><td>2,500</td></tr> <tr><td>900</td><td>3,000</td></tr> </tbody> </table>	<i>Meters</i>	<i>Feet</i>	30	100	*60	*200	90	300	120	400	*150	*500	180	600	240	800	*300	*1,000	450	1,500	600	2,000	750	2,500	900	3,000	<p>When the special report relates to</p> <p>(i) one of the values marked with an asterisk in column (2) <i>or</i></p> <p>(ii) any other values determined by regional air navigation agreement as additional criteria for a selected special report.</p>
<i>Meters</i>	<i>Feet</i>																											
30	100																											
*60	*200																											
90	300																											
120	400																											
*150	*500																											
180	600																											
240	800																											
*300	*1,000																											
450	1,500																											
600	2,000																											
750	2,500																											
900	3,000																											
<p>(b) Amount of lowest cloud</p>	<p>When the amount changes</p> <p>(i) from 4 oktas or less to more than 4 oktas, <i>or</i></p> <p>(ii) from more than 4 oktas to 4 oktas or less,</p> <p>and the height of the base corresponds with one of the values given above.</p>																											
<p>(c) Horizontal visibility</p>	<p>When the horizontal visibility</p> <p>(i) decreases to a value equal to or less than, <i>or</i></p> <p>(ii) increases to a value equal to or greater than:</p> <p>(a) 800 m 1600 m 5000 m</p> <p>(b) any additional values agreed, provided they are values used in meteorological reporting practices.</p>	<p>When the special report relates to one of the values:</p> <p>800 m 1600 m 5000 m</p>																										

See footnotes at end of table.

AVIATION WEATHER REPORTS

Element	Special report to be made	Special report to be disseminated as a selected special report
(d) Runway visual range	<p>When the runway visual range for a point about 300 m (100-ft) from the threshold:</p> <ul style="list-style-type: none"> (i) decreases to a value equal to or less than, or (ii) increases to a value equal to or greater than: <ul style="list-style-type: none"> (a) 200 m 400 m 800 m (b) any additional values agreed. <p>NOTE: Values intermediate between those given in a)—possibly separated by intervals as small as those in use for reporting runway visual range in accordance with par. D3-2.2.7(ii), preceding, may be necessary for certain operations, e.g. those for which the relevant runway visual range minima are within the range 200 to 800 m.</p>	<p>When the special report relates to one of a set of not more than three values selected from the following, if so determined by regional air navigation agreement:</p> <ul style="list-style-type: none"> (i) 200 m 400 m 800 m (ii) any higher values determined by regional air navigation agreement for a special report, in accordance with (ii)(b) of column (2).
(e) Surface wind	<ol style="list-style-type: none"> 1. When the mean direction has changed by 30 degrees or more since the time of the latest of the routine and special reports already issued, the mean speed before and/or after the change being 15 knots or more; 2. When the mean speed has changed by 10 knots or more since the time of the latest of the routine and special reports already issued, the mean speed before and/or after the change being 25 knots or more; 	<p>When the mean wind speed before and/or after the change was 20 knots or more.</p> <p>When the mean wind speed before and/or after the change was 30 knots or more.</p>

See footnotes at end of table.

Element	Special report to be made	Special report to be disseminated as a selected special report
(e) Surface wind	3. When the speed variation has increased by 10 knots or more over the value of speed variation (including no report of speed variation) given in the latest of the routine and special reports already issued, the mean speed being 10 knots or more.	When the mean wind speed before and/or after the change was 15 knots or more.
(f) Present weather	When any one of the following begins, ends or changes in intensity: Tornado or waterspout Thunderstorm Hail Snow and rain mixed Freezing precipitation Drifting snow Duststorm or sandstorm Squall	All

A selected special report representing a deterioration in conditions shall be disseminated immediately after the observation.

A selected special report representing an improvement in conditions should be disseminated only after the improvement has been maintained for ten minutes; it should

be amended before dissemination, if necessary, to indicate the conditions obtaining at the end of this ten-minute period.

When deterioration of one weather element is accompanied by an improvement in another element, a single special report should be issued indicating the deterioration.

3.3 Definitions of symbols—The definitions of the symbolic letters (or groups of letters) used in METAR **apply equally** to SPECI; therefore, they are not repeated here. The definitions are given in paragraph D3-2.3, preceding.

3.4 Coding of Individual Elements and Groups—Instructions for coding individual ele-

ments and groups of SPECI are given in paragraphs D3-2.2, D3-2.3 and D3-3.2 preceding.

3.5 Tables of Specifications—The tables of specifications required in SPECI are given in Chapter D4 as indicated in the reference notations in paragraph D3-2.3.

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CHAPTER D4. WMO CODE TABLES

1 General

1.1 The tables of specifications required by the forms of messages given in PART B of this Handbook are given in PART C where they are numbered consecutively in the order in which they appear in the forms of messages given in PART B. PART C contains all of the Code Tables required by United States stations in WMO Regions IV and V.

1.2 Chapter D4 contains additional tables of specifications required to decode reports that might be received from other countries. The tables of specifications in this Chapter are identified by their WMO numbers and are referred to as WMO Code Tables. The WMO Code Tables appear in their numerical order.

1.3 The Code Tables given in PART C are **not repeated** in Chapter D4; therefore, in order to decode reports given in the forms of messages in PART D it will be necessary to refer to **both** PART C and Chapter D4.

WMO Code Table 0264

Symbol a_4 = Indicator Giving the Standard Isobaric Surface for which the Altitude is Reported.

Code Figure	Standard Isobaric Surface
0	1000 mb surface.
1	850 mb surface.
2	700 mb surface.

WMO Code Table 0500

Symbol CC = Genus of Cloud

Code Letters	Type of Cloud	Code Figures
CI	Cirrus.....	0
CC	Cirrocumulus.....	1
CS	Cirrostratus.....	2
AC	Alto cumulus.....	3
AS	Altostratus.....	4
NS	Nimbostratus.....	5
SC	Stratocumulus.....	6
ST	Stratus.....	7
CU	Cumulus.....	8
CB	Cumulonimbus.....	9
//	Cloud not visible owing to darkness, fog, duststorm, sandstorm, or other analogous phenomena.	/

WMO Code Table 0663

Symbol c_3 = Description of Kind of Ice

Code Figure	Specifications
0	No ice (0 may be used to report ice blink and then a direction must be reported).
1	New ice.
2	Fast ice.
3	Pack ice/drift ice.
4	Packed (compact) slush or sludge.
5	Shore lead.
6	Heavy fast ice.
7	Heavy pack ice/drift ice.
8	Hummocked ice.
9	Icebergs.*

*Icebergs can also be reported in plain language.

WMO Code Table 0700

Symbol D_0 = Ship's Course (true) Made Good
During the 3 Hours Preceding the
Time of Observation

Code Figure	Direction	Code Figure	Direction
0	Stationary.	5	Southwest.
1	Northeast.	6	West.
2	East.	7	Northwest.
3	Southeast.	8	North.
4	South.	9	Unknown.

WMO Code Table 0739

Symbol D_1 = Bearing of the Ice Edge

Code Figure	Specifications
0	No ice edge can be stated.
1	Ice edge towards NE.
2	Ice edge towards E.
3	Ice edge towards SE.
4	Ice edge towards S.
5	Ice edge towards SW.
6	Ice edge towards W.
7	Ice edge towards NW.
8	Ice edge towards N.
9	Ice edge in several directions.

WMO Code Table 1000

Symbol e = Orientation of the Ice Edge

Code Figure	Orientation
0	Orientation of ice edge impossible to estimate—ship outside the ice.
1	Ice edge lying in a direction NE to SW with ice situated to the NW.
2	Ice edge lying in a direction E to W with ice situated to the N.
3	Ice edge lying in a direction SE to NW with ice situated to the NE.
4	Ice edge lying in a direction S to N with ice situated to the E.
5	Ice edge lying in a direction SW to NE with ice situated to the SE.
6	Ice edge lying in a direction W to E with ice situated to the S.
7	Ice edge lying in a direction NW to SE with ice situated to the SW.
8	Ice edge lying in a direction N to S with ice situated to the W.
9	Orientation of ice edge impossible to estimate—ship inside the ice.

WMO Code Table 1751

Symbol I_s = Ice Accretion on the Ship

Code Figure	Specifications
1	Icing from ocean spray.
2	Icing from fog.
3	Icing from spray and fog.
4	Icing from rain.
5	Icing from spray and rain.

WMO Code Table 1855

Symbol I_w = Wind Indicator

Code Figure	Specifications
0	Wind speed estimated
1	Wind speed obtained from anemometer.
2	Wind speed estimated
3	
4	Wind speed obtained from anemometer.
5	
6	
7	
8	
9	

WMO Code Table 2955

Symbol O_w = Tendency of Height of Waves Since Last Observation

Code Figure	Specifications
0	Increasing, then decreasing.
1	Increasing, then constant
2	Height constant
3	Increasing steadily
4	Decreasing or constant, then increasing.
5	Decreasing, then increasing.
6	Decreasing, then constant.
7	Indeterminate
8	Decreasing steadily
9	Increasing or constant, then decreasing.

WMO Code Table 2100

Symbol K = Effect of the Ice on Navigation

Code Figure	Navigation Conditions
0	Navigation unobstructed.
1	Navigation unobstructed for steamers, difficult for sailing ships.
2	Navigation difficult for low-powered steamers, closed to sailing ships.
3	Navigation possible only for powerful steamers.
4	Navigation possible only for steamers constructed to withstand ice pressure.
5	Navigation possible with the assistance of icebreakers.
6	Channel open in solid ice.
7	Navigation temporarily closed.
8	Navigation closed.
9	Navigation conditions unknown (e.g., owing to bad weather).

WMO Code Table 3333

Symbol Q_c = Quadrant of the Globe

Code Figure	Latitude	Longitude
1	North	East
3	South	East
5	South	West
7	North	West

WMO Code Table 3551

Symbol R_c = Rate of Ice Accretion on the Ship

Code Figure	Specifications
0	Ice not building up.
1	Ice building up slowly.
2	Ice building up rapidly.
3	Ice melting or breaking up slowly.
4	Ice melting or breaking up rapidly.

WMO Code Table 3577

Symbol RR = Amount of Precipitation

Code Figure	Millimeters	Code Figure	Millimeters
00	0.	39	39.
01	1.	40	40.
02	2.	41	41.
03	3.	42	42.
04	4.	43	43.
05	5.	44	44.
06	6.	45	45.
07	7.	46	46.
08	8.	47	47.
09	9.	48	48.
10	10.	49	49.
11	11.	50	50.
12	12.	51	51.
13	13.	52	52.
14	14.	53	53.
15	15.	54	54.
16	16.	55	55.
17	17.	56	60.
18	18.	57	70.
19	19.	58	80.
20	20.	59	90.
21	21.	60	100.
22	22.	61	110.
23	23.	62	120.
24	24.	63	130.
25	25.	64	140.
26	26.	65	150.
27	27.	66	160.
28	28.	67	170.
29	29.	68	180.
30	30.	69	190.
31	31.	70	200.
32	32.	71	210.
33	33.	72	220.
34	34.	73	230.
35	35.	74	240.
36	36.	75	250.
37	37.	76	260.
38	38.	77	270.

Code Figure	Millimeters	Code Figure	Millimeters
78	280.	92	0. 2
79	290.	93	0. 3
80	300.	94	0. 4
81	310.	95	0. 5
82	320.	96	0. 6
83	330.	97	A little precipitation, non-measurable.
84	340.		
85	350.		
86	360.	98	More than 400 mm.
87	370.		
88	380.	99	Measurement impossible or inaccurate.
89	390.		
90	400.		
91	0. 1		

WMO Code Table 3600

Symbol r = Distance of Ice Edge from Reporting Ship

Code Figure	Miles	Kilometers
0	Up to 1 mile.....	Up to 2 kilometers.
1	1-2 miles.....	2-4 kilometers.
2	2-4 miles.....	4-7 kilometers.
3	4-6 miles.....	7-11 kilometers.
4	6-8 miles.....	11-15 kilometers.
5	8-12 miles.....	15-22 kilometers.
6	12-16 miles.....	22-30 kilometers.
7	16-20 miles.....	30-37 kilometers.
8	More than 20 miles.	More than 37 kilometers.
9	Unspecified, or no observation.	Unspecified, or no observation.

NOTE: The exact bounding distance is to be assigned to the lower code figure in each case; e.g., a distance of 8 miles or 15 kilometers is code 1 as 4.

WMO Code Table 4080

Symbol t_{RR} = Observational Period for RR and Duration of Precipitation

Observational Period of 6 hours		Observational Period of 12 hours		Observational Period of 18 hours		Observational Period of 24 hours	
Code Figure	Total Duration of Precipitation	Code Figure	Total Duration of Precipitation	Code Figure	Total Duration of Precipitation	Code Figure	Total Duration of Precipitation
00	None.	20	None.	50	None.	70	None.
01	Less than 15 min.	21	Less than 15 min.	51	Less than 1 hr.	71	Less than 1 hr.
02	15 to 30 min.	22	15 to 30 min.	52	1 to 2 hours.	72	1 to 2 hr.
03	30 to 45 min.	23	30 to 45 min.	53	2 to 3 hours.	73	2 to 3 hr.
04	45 min. to 1 hr.	24	45 min. to 1 hr.	54	3 to 4 hours.	74	3 to 4 hr.
05	1 hr. to 1 hr. 15.	25	1 hr. to 1 hr. 15.	55	4 to 5 hours.	75	4 to 5 hr.
06	1 hr. 15 to 1 hr. 30.	26	1 hr. 15 to 1 hr. 30.	56	5 to 6 hours.	76	5 to 6 hr.
07	1 hr. 30 to 1 hr. 45.	27	1 hr. 30 to 1 hr. 45.	57	6 to 7 hours.	77	6 to 7 hr.
08	1 hr. 45 to 2 hr.	28	1 hr. 45 to 2 hr.	58	7 to 8 hours.	78	7 to 8 hr.
09	2 hr. to 2 hr. 15.	29	2 hr. to 2 hr. 15.	59	8 to 9 hours.	79	8 to 9 hr.
10	2 hr. 15 to 2 hr. 30.	30	2 hr. 15 to 2 hr. 30.	60	9 to 10 hours.	80	9 to 10 hr.
11	2 hr. 30 to 2 hr. 45.	31	2 hr. 30 to 2 hr. 45.	61	10 to 11 hours.	81	10 to 11 hr.
12	2 hr. 45 to 3 hr.	32	2 hr. 45 to 3 hr.	62	11 to 12 hours.	82	11 to 12 hr.
13	3 hr. to 3 hr. 30.	33	3 hr. to 3 hr. 30.	63	12 to 13 hours.	83	12 to 13 hr.
14	3 hr. 30 to 4 hr.	34	3 hr. 30 to 4 hr.	64	13 to 14 hours.	84	13 to 14 hr.
15	4 hr. to 4 hr. 30.	35	4 hr. to 4 hr. 30.	65	14 to 15 hours.	85	14 to 15 hr.
16	4 hr. 30 to 5 hr.	36	4 hr. 30 to 5 hr.	66	15 to 16 hours.	86	15 to 16 hr.
17	5 hr. to 5 hr. 30.	37	5 hr. to 5 hr. 30.	67	16 to 17 hours.	87	16 to 17 hr.
18	5 hr. 30 to 6 hr.	38	5 hr. 30 to 6 hr.	68	17 to 18 hours.	88	17 to 18 hr.
19	Duration not specified.	39		69	Duration not specified.	89	18 to 19 hr.
		40				90	19 to 20 hr.
		41	6 hr. to 7 hr.			91	20 to 21 hr.
		42	7 hr. to 8 hr.			92	21 to 22 hr.
		43	8 hr. to 9 hr.			93	22 to 23 hr.
		44	9 hr. to 10 hr.			94	23 to 24 hr.
		45	10 hr. to 11 hr.			95	
		46	11 hr. to 12 hr.			96	
		47				97	
		48				98	
		49	Duration not specified.			99	Duration not specified.

WMO Code Table 4451

Symbol v_s = Ship's Average Speed Made Good During the Three Hours Preceding the Time of Observation

Code Figure	Nautical Miles Per Hour	Kilometers Per Hour
0	0 nm/hr.....	0 km/hr.
1	1-5 nm/hr.....	1-10 km/hr.
2	6-10 nm/hr.....	11-19 km/hr.
3	11-15 nm/hr.....	20-28 km/hr.
4	16-20 nm/hr.....	29-37 km/hr.
5	21-25 nm/hr.....	38-47 km/hr.
6	26-30 nm/hr.....	48-56 km/hr.
7	31-35 nm/hr.....	57-65 km/hr.
8	36-40 nm/hr.....	66-75 km/hr.
9	Over 40 nm/hr.....	Over 75 km/hr.

WMO Code Table 4663

Symbol w_3 = Indication of the element forming the principal object of a report of deterioration or improvement of the weather or for the taking of a special weather report from ship

Code Figure	Specifications
0	Gusts.
1	Wind (either wind direction or speed, or both).
2	Visibility.
3	Cloud (amount or height).
4	Precipitation.
5	Pressure.
6	State of sea or of swell; i.e., waves.
7	Duststorm, sandstorm or blowing snow.
8	Thunderstorm (with or without precipitation).
9	Squall or tornado.

WMO Code Table 4678

Symt ol $w'w'$ = Present Weather in Code Figures and Optional Abbreviations

Code Figure and Abbreviation	Present Weather
04(FU)	Smoke.
06(HZ)	Dust haze.
08(PO)	Dust devils.
11(MIFG)	Shallow fog.
12(MIFG)	
17(TS)	Thunderstorm.
18(SQ)	Squall.
19(FL)	Funnel cloud.
20(REDZ)	Recent drizzle.**
21(RERA)	Recent rain.**
22(FESN)	Recent snow.**
23(RESN)	Recent rain and snow.**
24(REFR)	Recent freezing rain and snow.**
25(RESH)	Recent showers.**
26(RESH)	Recent snow showers.**
27(REGR)	Recent hail.**
29(SETS)	Recent thunderstorms.**
30(SA)	Duststorm or sandstorm.
31(SA)	
32(SA)	
33(XXSA)	Heavy duststorm or sandstorm.
34(XXSA)	
35(XXSA)	
38(BLSN)	Blowing snow.
39(BLSN)	
40(BCFG)	Fog patches.
41(BCFG)	
42(FG)	Fog.
43(FG)	
44(FG)	
45(FG)	
46(FG)	
47(FG)	Freezing fog.
48(FZFG)	
49(FZFG)	Drizzle.
50(DZ)	
51(DZ)	
52(DZ)	Heavy drizzle.
53(DZ)	
54(XXDZ)	Freezing drizzle.
55(XXDZ)	
56(FZDZ)	
57(FZDZ)	

WMO Code Table 4678—Continued

Code Figure and Abbreviation	Present Weather
58(RA)	} Rain.
59(RA)	
60(RA)	
61(RA)	
62(RA)	
63(RA)	
64(XXRA)	} Heavy rain.
65(XXRA)	
66(FZRA)	Freezing rain.
67(FZRA)	Heavy freezing rain.
68(RASN)	Rain and snow.
69(RASN)	Heavy rain and snow.
70(SN)	} Snow.
71(SN)	
72(SN)	
73(SN)	
74(XXSN)	} Heavy snow.
75(XXSN)	
77(SN)	Snow.
79(PE)	Ice pellets.
80(RASH)	Showers.

WMO Code Table 4678—Continued

Code Figure and Abbreviation	Present Weather
81(XXSH)	} Heavy showers.
82(XXSH)	
83(RASN)	Showers of rain and snow.
84(RASN)	Heavy showers of rain and snow.
85(SNSH)	Snow showers.
86(XXSN)	Heavy snow showers.
87(GR)	} Soft hail.
88(GR)	
89(GR)	Hail.
90(XXGR)	Heavy hail.
91(RA)	Rain.
92(XXRA)	Heavy rain.
93(GR)	Hail.
94(XXGR)	Heavy hail.
95(TS)	Thunderstorm.
96(TSGR)	Thunderstorm with hail.
97(XXTS)	Heavy thunderstorm.
98(TSSA)	Thunderstorm with duststorm or sandstorm.
99(XXTS)	Heavy thunderstorm with hail.

**Recent applies if the phenomena was observed during the hour preceding the time of observation.

APPENDIX
MAP OF WMO REGIONS

