CHANGE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Air Traffic Organization Policy

JO 7900.5E
CHG 1

Effective Date:
07/1/2021

SUBJ: Surface Weather Observing

1. Purpose. This change amends practices and procedures in Surface Weather Observing.

2. Who this change affects. This order applies to all FAA and FAA-contract personnel, Limited Aviation Weather Reporting Stations (LAWRS) personnel, Non-Federal Observation (NF-OBS) Program personnel, as well as United States Coast Guard (USCG) personnel, as a component of the Department of Homeland Security and engaged in taking and reporting aviation surface observations.

3. Disposition of Transmittal Paragraph. Retain this transmittal sheet until the directive is replaced by a new directive.

PAGE CHANGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
15 thru 29	01/15/20	15 thru 29	07/01/21
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96	01/15/20	96	07/01/21
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4. Administrative Information.

5. Where I can find this order. This order is available on the FAA Web site at Air Traffic Publications and on the My FAA employee website at Orders and Notices.

6. Explanation of Changes. This change adds new criteria for weather observers including LAWRS to issue a SPECI weather observation to report the beginning, ending, or change in intensity of snow. In 2019, an SRM panel determined that this change to SPECI reporting criteria did not change the existing acceptable level of risk for the system.

This change also adds new criteria to issue a SPECI weather observation when the visibility increases/decreases at or below 1/2 statute mile or 1/4 statute mile. Adding the lower visibility SPECI criteria will assist in automatically generating a SNOW SPECI at controlled/uncontrolled airports.

ASOS/AWOS-C must also have these new SPECI thresholds added to the system local SPECI criteria until ASOS/AWOS-C software is upgraded.

Paragraph 3.10 is revised to clarify that the NWS MF1M-10C is only completed at manual stations. Table 3-1, Chapter 11, 12 and 13 have also been edited to clarify that weather observers do not augment/edit the additive data groups that the automated weather observation system automatically generates.

7. Distribution. This order is distributed to select offices in Washington Headquarters; Air Traffic Organization; Office of Operations Planning; NAS Weather Office; Flight Standards Service; the Mike Monroney Aeronautical Center; the William J. Hughes Technical Center; the USCG Elizabeth City Facility; the Department of Defense (DoD); all air traffic field facilities; all Alaska flight service stations (FSS); FAA-contract weather; and the National Weather Service (NWS).

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U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

ORDER
JO 7900.5E

Air Traffic Organization Policy

Effective Date:
01/15/2020

SUBJ: Surface Weather Observing

The Federal Aviation Administration (FAA) Surface Weather Observer Program is a component of the National Airspace System (NAS). It combines with other elements of the NAS to ensure the overall safety of air transportation services. The FAA is committed to providing the resources necessary to ensure the vibrancy of this critical aviation service. This order provides the practices and procedures for weather observation services that support the important role it plays in the mission of the FAA.

The practices and procedures set forth in this order apply to all FAA personnel, FAA-contract personnel, and non-Federal Observer personnel who provide aviation weather observation services. Weather observer personnel are required to apply the provision of this order as it pertains to their observational responsibilities. Observers are expected to exercise experienced judgment when encountering situations not covered by this order.

Jeffrey U. Vincent
Vice President
Air Traffic Services

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Appendices

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Chapter 1. Introduction

1.1. Purpose of This Order. This order prescribes aviation surface weather observing procedures and practices. This order includes practices and procedures for both manual and automated observation locations. Also included are practices and procedures for augmentation of automated observations and backup information in the event of system failure, erroneous or non-representative data. These procedures and practices are intended to provide a framework for identifying meteorological phenomena of importance to aviation and reporting their occurrence.

1.2. Audience. This order applies to all FAA and FAA-contract personnel, Limited Aviation Weather Reporting Stations (LAWRS) personnel, Non-Federal Observation (NF-OBS) Program personnel, as well as United States Coast Guard (USCG) personnel, as a component of the Department of Homeland Security and engaged in taking and reporting aviation surface observations.

1.3. Where to Find This Order. This order is available on the FAA Web site at http://faa.gov/air_traffic/publications and http://employees.faa.gov/tools_resources/orders_notices/.

1.4. Cancellation. This order cancels FAA Order 7900.5D, Surface Weather Observing, effective December 20, 2016.

1.5. Explanation of Changes. This order has been revised to incorporate the changes implemented with NOTICE JO 7900.11, GS/GR Contraction Change. The organizational change from District Manager to General Manager has been incorporated. Obsolete and redundant paragraphs with information that was provided elsewhere in the order or in another FAA directive have been deleted. (e.g. Types and Content of METAR/SPECI have been removed from Chapter 2 since the information is also in Chapter 3)

Paragraph 4.4 prohibits all weather observers from appending Notice to Airmen (NOTAM) to the AWOS/ASOS broadcast.

Backup procedures for ASOS/AWOS-C OID/OT and communication line failures have been revised in paragraphs 6.3g and 6.4, since both systems have the capability to interface with several other automated systems.

Paragraph 6.13 has been added requiring weather observation stations to develop or include in their existing contingency plan, shutdown procedures of their weather-observing duties.

The Chapter for Runway Visual Range (RVR) reporting has been deleted since RVR reporting is completely automated and when the automated RVR interface fails, the RVR readings are not backed up by weather observers. This information has been added to the Visibility chapter.

The Chapter for Operation of Equipment has been deleted. Equipment used by weather observers is installed and maintained by the National Weather Service (NWS) or FAA Technical Operations. The procedures for observers and the equipment used is contained in other chapters.

The Appendix (Index) has been deleted since the order is only distributed electronically.

Appendix I (Aviation Weather Observation Quality Control), I.3 b. has been deleted. Contacting Regional Operations Center (ROC) is no longer a requirement.

Appendix J (Aviation Weather Observer Certification Process), J.9 Transfers has been revised to assist facilities in transferring certifications from one facility to another.

Appendix B Mike-in-Hand is a supplemental service provided by surface weather observers in Alaska. A new Appendix has been added defining Mike-in-Hand services and requirements.

The old Appendix B, Continuity of Service has been removed. Backup procedures for equipment failures are prescribed in Chapter 6. The need for 24-hour notifications through ROC have not been proven to be necessary.

Weather observers are no longer permitted to disable automated sensors without instructions from maintenance personnel.

SPECI criteria has been updated to inform Air Traffic Control Towers (ATCT) of the ability to add site-specific SPECI criteria. The use of "SKC" versus "CLR" has been clarified.

Standalone Weather Sensor System (SAWS) and Surface Weather System (SWS) have been added to the order and procedures for backing up the automated weather system temperature and dew point data has been updated. The definition of Hygrothermometers has been deleted since the equipment is no longer used.

Non-Federal Weather Observers (NF-OBS) currency requirements have been revised to match those of the former Supplemental Aviation Weather Reporting Stations (SAWRS) since both types of facilities are similar in their duties and responsibilities.

Altimeter equipment and comparison checks are removed from the Appendix C, LAWRS. FAA JO 7210.3, Chapter 2, Section 10 provides guidance on the use of altimeter equipment.

1.6. Abbreviations and Acronyms. Appendix A. Abbreviations and Acronyms, contains abbreviations and acronyms used in this order.

1.7. Relationship to FMH-1 and Other Documents

a. Federal Meteorological Handbook No. 1, Surface Weather Observations and Reports (FMH-1). FMH-1 defines surface weather observing standards for all Federal agencies engaged in taking and reporting surface aviation observations. FMH-1 also defines the standard reporting and coding procedures used in surface aviation observation. Order 7900.5D defines the procedures and practices to be followed by FAA, FAA-contract, and NF-OBS personnel for observing, reporting, and coding surface observations that meet the Federal standards. A description of the NF-OBS Program is provided in FAA JO 7210.77, Non-Federal Weather Observation Program Operation and Administration. This order complements, but does not change the standards contained in FMH-1.

b. Automated Weather Observing Systems Handbooks. Handbooks are produced by automated systems manufacturers. However, all systems must be operated in accordance with

practices and procedures contained in this order. A partial listing of the applicable handbooks necessary to operate the various automated weather observing systems includes:

(1) Federal Aviation Administration, Operator Instructions, Automated Weather Observing System (AWOS), August 1, 1994, U.S. Department of Transportation, Washington, DC.

(2) National Weather Service ASOS Ready Reference Guide (RSM1005-00038).

1.8. Applicability of Procedures and Practices

a. Applicability. The procedures and practices in this order apply to all facilities that have the equipment capability to comply with the stated procedure or practice. Observers are not required to back up an automated sensor if backup equipment is not available. Procedures for coding missing data are contained in Paragraph 6.5 and throughout this order.

b. Conflicting Information. In case of conflicting information, the procedures and practices in this order take precedence. However, any applicable FAA air traffic orders take precedence over any procedures or practices in this order that are in conflict. Such conflicts should be brought to the attention of the originator of this order.

c. Terminology. Throughout this order, the following terminology applies:

(1) Must – indicates a procedure or practice that is mandatory at all applicable facilities.

(2) Should – indicates a procedure or practice that is recommended at all applicable facilities.

(3) May – indicates a procedure or practice that is optional.

(4) Will – indicates futurity; it is not a requirement to be applied to current practices.

d. Unforeseen Requirements. No set of procedures and practices can cover all possibilities in weather observing. The observer must use good judgment, adhering as closely as possible to this order, to describe phenomena not adequately covered by cover such situations may be made through appropriate channels.

1.9. User Responsibilities. Employee participation in directive writing and upkeep activities is encouraged. Any user who finds a subject matter conflict, an error, obsolete information, or who would like to make recommendations or suggestions should notify Air Traffic Services, in writing. FAA Form 1320-19, Directive Feedback Information, is available for this purpose. If clarification or correction is urgently needed, you may call Air Traffic Services for guidance, but you should also use the FAA Form 1320-19 as a follow-up to verbal conversation.

1.10. Distribution. This order is distributed to select offices in Washington Headquarters; Air Traffic Organization; Office of Operations Planning; NAS Weather Office; Flight Standards Service; the Mike Monroney Aeronautical Center; the William J. Hughes Technical Center; the USCG Elizabeth City Facility; the Department of Defense (DoD); all air traffic field facilities; all Alaska flight service stations (FSS); FAA-contract weather; and the National Weather Service (NWS).

1.11. Changing the Order. Changes, additions, deletions, and corrections will be issued as necessary. These changes will be issued by the Director, Air Traffic Services.

1.12. Maintaining the Order. Each facility must maintain a copy of the order, complete with changes and supplements for reference purposes. When inserting changes to the order, enter the number, effective date, initials, and date entered on the inside cover of this order.

Chapter 2. Guidelines

2.1. Introduction. This chapter describes the types of aviation surface weather observing facilities for which the FAA may have responsibility or oversight. This chapter also describes the various types of surface weather reports, including the Aviation Routine Weather Report (METAR) and Aviation Selected Special Weather Report (SPECI), and FAA guidelines regarding the content of each of these types. Also presented are general guidelines regarding augmentation and backup of automated observations. Lastly, this chapter presents FAA guidelines on the certification of observers.

2.2. Types of Stations. The generic types of stations that take aviation weather observations are defined as follows:

a. Automated Station. A facility equipped with an automated surface weather observing system that prepares the observation without a certified observer on duty. The various types of automated stations are described in Chapter 4. Observations generated by automated stations will always be identified by the inclusion of the word AUTO in the transmitted report.

b. Augmented Station. A facility with an automated surface weather observing system that prepares the METAR/SPECI with a certified observer on duty capable of adding operationally significant weather information to the observation. The observer is completely responsible for the observation even though the automated weather observing system generates the report. At facilities where augmentation is not available full time, the facility is classed as automated during the non-augmented periods.

c. Manual Station. A facility where certified weather observers are responsible for observing, evaluating, and preparing the METAR/SPECI without the use of an automated weather observation system (ASOS/AWOS).

2.3. Non-Federal Weather Observation (NF-OBS) Station. A program in which FAA certified, non-Federal observers enter into an agreement with the appropriate FAA Office to provide backup and/or augmentation of the automated system, or provide manual weather observations. NF-OBS observers may include non-Federal control tower (NFCT) controllers, airline personnel, fixed base operator (FBO) personnel, or other entities. At these facilities, various degrees of automated sensors and/or other automated equipment may be available. However, when on duty, the NF-OBS observer must provide backup and/or augmentation in accordance with their NF-OBS agreement. Program establishment is contained in FAA JO 7210.77, Non-Federal Weather Observation Program Operation and Administration.

2.4. General Types of Observations. There are three general types of surface observations:

a. Automated Observation. Any observation, which has been prepared and transmitted by an automated observing system without human intervention.

b. Augmented Observation. Any automated observation, which has been evaluated by a human observer to which additional weather information has been manually added that, is beyond the capabilities of the automated weather observing system and/or is deemed operationally significant. The guidelines concerning augmentation are presented in

Paragraph 2.5, Augmentation Requirements. Backup is a method of providing an observation, part of an observation, documentation, or communication of an observation at selected sites when the primary method is unavailable or non-representative. The guidelines concerning backup information are presented in Paragraph 2.6 Backup Requirements.

NOTE: Backing up a failed automated system (ASOS/AWOS) is not considered a manual observation.

c. Manual Observation. Any observation, for which the human observer observes, evaluates, prepares, records, and transmits the observation without the use of an automated observing system. The guidelines for manual observations are presented in Chapter 3. General Procedures.

2.5. Augmentation Requirements. Certified observers are responsible for the completeness and accuracy of the weather observation. Automated weather observing systems are, by design, viewing a smaller area than a human observer, therefore, the observer is responsible for providing additional information that covers a larger area when operationally significant. Augmentation of automated observations must be provided in accordance with the guidelines presented in the following subsections and as specified for the station's service level standard (Appendix D, Service Standards). Separate guidelines are presented for the two general types of automated weather observing systems: automated systems with SPECI capability and automated systems without SPECI capability. Procedures and practices to be followed to accomplish the required augmentation are presented in Chapter 4, General Procedures at Automated Weather Stations, and Chapter 5, Augmentation Requirements at Automated Weather Stations**.**

a. Facilities with an Automated System with SPECI Capability.

(1) ATCT with a Surface-Based Observer. At facilities with an ATCT, and an automated system with SPECI capability, and with a surface-based observer on duty, the surface-based observer must provide augmentation of the automated observation. This augmentation must include, but not be limited to the requirements contained in Service Standards for that level of airport (see Appendix D. Service Standards). At these facilities, the ATCT must routinely provide tower visibility when applicable.

(2) All other facilities with an Automated System with SPECI Capability. At facilities with an ATCT, and an automated system with SPECI capability, but without a surface-based observer on duty, the tower observer must provide augmentation of the automated observation. At facilities with surface based observers, augmentation will be the responsibility of the collocated FSS (Alaska only) or other weather observers. This augmentation must include, but not be limited to:

(a) Thunderstorm.

(b) Tornadic activity (including tornado, waterspout, and funnel cloud).

(c) Hail.

(d) Virga.

(e) Volcanic ash.

(f) Any weather elements considered operationally significant by the observer.

b. Facilities with an Automated System without SPECI Capability. At these facilities, the observation is the responsibility of the surface-based observer, if one exists. At towered sites without a surface-based observer, the observation is the responsibility of the LAWRS observer.

REFERENCE: FAAO JO 7210.3, Para 2-9-2d, Receipt and Dissemination of Weather Observations

2.6. Backup Requirements

a. Situations Requiring Backup. Backup refers to the observer providing the same reporting capability as that provided by the automated weather sensor, consistent with service level standards specified in Appendix D Service Standards. Backup information is required for long-line dissemination for terminal forecast (TAF) production and for local, ground-to-air dissemination to legally sustain local operations at the airport.

(1) Sensor/system Malfunction. One or more sensors or the entire observing system is (are) not reporting data (for any reason). Provide backup using readings from FAA approved backup equipment (if available) and make appropriate maintenance notifications.

(2) Communications Failure **(Service A Outage).** The automated weather observing system and/or long-line communications are malfunctioning, thereby preventing the entry and/or transmission of the observation over long-line networks.

(a) At manual Automatic Terminal Information Service (ATIS) locations or uncontrolled airports, when it is apparent that observations are not being transmitted, the required information must be relayed to the overlying Air Route Traffic Control Center (ARTCC) Flight Data unit for entry into an FAA approved electronic system (for example, Aeronautical Information System Replacement (AIS-R), System Wide Information Management (SWIM) or similar systems) or, in Alaska, phoned to the tie-in Flight Service Station. Notify the appropriate office of the outage.

(b) At digital ATIS locations, the weather observer must first coordinate and receive approval from the air traffic control tower prior to disseminating reports via the alternate methods (e.g., AIS-R, SWIM, relaying to the ARTCC Flight Data unit). The observer must also ensure that any weather reports entered via alternate methods are promptly relayed to the tower for the ATIS broadcast.

b. Non-representative Data. The sensor is reporting data, but the data is incorrect or the sky condition, visibility, and/or present weather sensor(s) is/are accurately reporting conditions in the vicinity of the sensor, but those conditions are not representative of prevailing conditions for the operating areas of the airport and are considered operationally significant. When this occurs, provide backup using readings from FAA approved backup equipment and/or visibility charts. Outage notification is not required.

c. LAWRS ATCTs and FSS's. Certified air traffic control specialists (ATCS) must provide the backup information for long-line transmission that is listed in this section. The required information must be entered into the automated systems with SPECI capability via the operator interface device. At locations with automated systems without SPECI capability, the required information must be relayed to the overlying ARTCCs Flight Data unit for entry into an FAA approved electronic system (for example, AIS-R, SWIM or similar systems) or, in Alaska, phoned to the tie-in Flight Service Station. The following information must be provided at a minimum:

(1) Wind.

(2) Visibility to 10 miles.

(3) Present weather and obstructions to vision (see Table 6-2 for required elements).

(4) Sky condition to 12,000 feet.

(5) Temperature/Dew Point.

(6) Altimeter Setting.

(7) Required remarks and operationally significant remarks as deemed appropriate.

d. ATCTs with a Surface-Based Observer. At locations with a surface-based observer, the surface-based observer must provide, at a minimum, the backup information for long-line transmission according to the requirements contained in the Service Standards for the service level of the airport.

e. Non-towered Stations with a Surface-Based Observer. At all non-towered stations, the surface-based observer must provide the backup information required by the Service Standards for the service level of the airport.

2.7. Evaluating Weather Sensor Accuracy. When the observer has reason to believe that the accuracy or validity of indications from meteorological sensors is questionable, the use of such equipment should be discontinued until necessary corrective maintenance has been completed. If the use of such equipment is a sensor is discontinued, readings from FAA approved backup equipment must be used, and required backup procedures or practices must be initiated. FAA personnel and NF-OBS sponsors must disseminate appropriate maintenance notifications in the event of any equipment outages.

a. Network Enterprise Management Center (NEMC). If the observer believes that the Federal or non-Federal AWOS information is inaccurate requires maintenance, contact the Network Enterprise Management Center (NEMC) NEMC at 1-855-FAA-NEMC (322-6362). FAA Technical Operations is responsible for issuing NOTAMs on AWOS.

b. ASOS Operations and Monitoring Center (AOMC). If the observer believes that the ASOS information is inaccurate, requires maintenance, they should notify the AOMC at 1-800-242-8194 OR 8895. The National Weather Service is responsible for issuing NOTAMs on ASOS.

Chapter 3. General Procedures

3.1. Introduction. This chapter prescribes procedures and practices applicable to all facilities and to all types of observations. These general procedures also apply to observations taken to fulfill requirements for augmentation or minimum operational requirements during backup. This chapter also describes the various types of surface observations and prescribes the criteria for taking SPECI observations.

3.2. Certification of Personnel and Currency Requirements. Before assuming full responsibility for taking any type of surface observation or any part thereof, each person must be certified in accordance with Appendix J of this order. The FAA is responsible for certifying all aviation weather observers at FAA sponsored stations, in one or more of the following observer types.

a. FAA contract weather observers.

b. LAWRS observers.

c. NF-OBS observers.

d. Tower visibility observer is certified by the FAA through eLMS.

NOTE: Currency requirements are defined in FAA Order JO 3120.4, Air Traffic Technical Training and Appendix J of this order.

3.3. Definitions.

a. Actual Time of Observation. The actual time of observation is the time the last element of the observation is observed or evaluated. The actual time of a SPECI must be the time the criteria for the SPECI were met or noted.

b. Aircraft Mishap. Aircraft mishap is an inclusive term to denote the occurrence of an aircraft accident or incident.

c. Aviation Routine Weather Report (METAR). A METAR is a measurement or evaluation of meteorological elements that describe the state of the atmosphere at the surface location(s) where the observation is taken. METAR is a scheduled observation. The METAR is the primary observation code used in the United States to satisfy requirements for reporting surface meteorological data. It contains a report of wind, visibility, RVR (where connected), weather, sky condition, temperature, dew point, and altimeter setting (collectively referred to as "the body of the report"). In addition, coded plain language information that elaborates on the data in the body of the report may be appended to the METAR or SPECI. This significant information is referred to as "remarks." At Manual Observations and augmented stations, the METAR may be abridged to include one or more of the above elements. The contents of METAR observations are given in Table 3-1. METAR observations that also meet the criteria for a SPECI observation are called METAR observations.

d. Aviation Selected Special Weather Report (SPECI). A SPECI is a weather observation that is reported at other than a scheduled time. SPECI must be taken when any of the criteria for a special observation is observed or detected. A SPECI observation is an unscheduled observation taken when any of the criteria given in Paragraph 3.11, Criteria for SPECI Observations, have been observed. A SPECI observation must contain the elements in a METAR (Table 3-1, Table 3-2), plus additional coded or plain language information that elaborates on the data in the body of the report. The SPECI criteria are applicable only to stations that have the capability of evaluating the event. All SPECI must be taken as soon as possible after relevant criteria are observed.

e. Weather Watch. Observers must monitor weather conditions via a weather watch. Two types of weather watch are possible: a Basic Weather Watch and a Continuous Weather Watch. All FAA, FAA-contract, and NF-OBS observers including LAWRS must monitor weather conditions via a Basic Weather Watch as described below.

f. Basic Weather Watch. During a Basic Weather Watch, the observer may be required to perform other duties as their observing workload permits. Because of this and other restrictions (station location, structural design, etc.) that may limit the observer's capability to continuously view and evaluate weather conditions, observers performing a Basic Weather Watch cannot be expected to detect and report all weather changes as they occur. In addition to taking and disseminating required observations, facilities performing a Basic Weather Watch must recheck weather conditions to determine if a new observation (SPECI) is required when advised by any reliable source (for example, tower controller) that existing conditions differ from those reported in the last disseminated observation.

g. Continuous Weather Watch. On a Continuous Weather Watch, the observer must monitor weather conditions on a continuous basis. In addition to METAR observations, observers must take and disseminate observations as conditions meeting criteria for SPECI observations occur.

h. Observer. The generic term "observer" applies to a number of different types of personnel with various responsibilities for providing weather information. These various types are:

(1) Weather Observer. FAA, FAA-contract personnel, and non-Federal personnel who are certified by the FAA to provide a designated range of weather observation elements.

i. LAWRS Observer. An FAA certified ATCS with weather observation responsibilities.

ii. Tower Visibility Observer. An FAA-certified ATCS with tower visibility responsibilities from the control tower.

(2) NF-OBS Observer. A non-Federal observer certified by the FAA, working under the guidelines of the NF-OBS Program, providing backup and/or augmentation of the automated system with SPECI capability.

(3) DoD Aeronautical Meteorological Observer. A non- FAA aeronautical meteorological observer trained and certified by their respective DoD Service that works under the Service's regulations and provides backup and or augmentation of the automated systems with SPECI capability at airfields where the DoD has the responsibility to provide surface weather observations.

3.4. Aviation Weather Observing Locations. Surface weather observation locations must make routine reports at fixed intervals (METAR reports). Where the capability exists, the routine reports must be supplemented by non-routine reports (SPECI). The usual point of observation is defined as the point or points at which the various elements are observed. Normally, multiple observing points are confined to an area within about 2 miles of the station.

a. For elements such as clouds, prevailing visibility, present weather, and obscurations, the observing location may be coincident with the observer's physical location or it may be the touchdown area of the primary runway.

b. For temperature, dew point, and wind, the observing location may be the center of the runway complex.

c. For cloud height and ceiling, the observing location may be a point near the approach end of a runway.

d. For the location of lightning, the observing point may be the Airport Reference Point (ARP). The ARP is a permanent airport reference point defined by a latitude/longitude.

e. For tower visibility, the observing location must be the airport traffic control tower (ATCT). (NA LAWRS)

3.5. General Observing Practices. The general observing practices specified in the following subsections apply to personnel taking either full manual, augmented, backup, or tower visibility observations. They do not necessarily apply to the automated portions of observations, which are controlled by system software. Observers must be alert to situations conducive to significant changes in weather conditions and must take and disseminate SPECI observations as rapidly as feasible whenever changes are noted that meet the criteria specified in Paragraph 3.11, Criteria for SPECI Observations.

a. Order of Observing. Elements having the greatest rate of change must be evaluated last. When conditions are relatively unchanging, the observer must evaluate the elements outdoors first, and then evaluate the elements indoors, with pressure being the last element evaluated.

b. Recency of Observed Elements. Individual elements entered in an observation must, as closely as possible, reflect conditions existing at the actual time of observation. At manual locations, elements entered must have been observed within 15 minutes of the actual time of observation. Gusts and squalls must be reported if observed within 10 minutes of the actual time of observation. METAR observations must be made as close to the scheduled time as possible to meet filing deadlines, but in no case will these observations be started more than 15 minutes before the scheduled time.

c. Dark Adaptation. When taking observations outdoors at night, sufficient time should be allowed for the observer's eyes to become adjusted to the darkness.

d. Weather Not Observed. Observers are not required to report occurrences they have not observed. However, the observer may use information from reliable sources, for example, pilots, airline/airport personnel, a commissioned AWOS or other sources deemed acceptable by the observer. Weather Observers must not use the internet or other electronic systems not specifically approved by the FAA.

e. Time Disseminated in Reports. All times must refer to the 24-hour clock, for example, 1:47 a.m. must be referred to as 0147; 1:47 p.m. must be referred to as 1347. The times 0000 and 2359 must be used to indicate the beginning and ending of the day, respectively.

f. Time Standards. Times used in weather observations must be:

(1) Local Standard Time (LST). (NA LAWRS). LST is used on MF1M-10Cs to record times of observation and time checks. LST must be entered on all forms throughout the year with no consideration of daylight savings time.

(2) Coordinated Universal Time (UTC). UTC is used on all transmitted data. It is also used on MF1M-10Cs to record times of observations and time checks at LAWRS sites.

(3) METAR REPORTS. Prepare and code METAR reports for transmission between H+55 and H+00.

(4) SPECI AND DELAYED OR CORRECTED REPORTS. Transmit SPECI, delayed or corrected reports as soon as possible after H+00.

g. Accuracy of Time in Observations. The accuracy of the actual time of observation is very important in aviation safety investigations. One clock must be designated as the observing location standard, and a routine procedure set up to assure its accuracy once a day at a minimum. The clock used must be within ± 1 minute of the U.S. Naval Observatory Time. If available, the FAA Coded Time Source (CTS) may be substituted for U.S. Naval Observatory Time.

h. SPECI Observations upon Resumption of Observing Function. Observers must take, record, and disseminate a SPECI observation within 15 minutes after returning to duty following a break in normally scheduled observer coverage at the station unless a METAR observation is filed during that 15-minute period.

3.6. Dissemination. For purposes of this order, dissemination is the act of delivering a completed report to users.

a. Local. Local transmission is the transmission or delivery of a weather report to individuals or groups of users in the service area of the observing location. All reports must be given local dissemination.

b. Long-line (Service A Circuit). Long-line transmission is the transmission of a weather report beyond the service area of the observing location. At stations with long-line capabilities, reports must be given long-line dissemination.

c. If reports cannot be disseminated simultaneously, local and long-line, they must be disseminated first to the local airport traffic control users, then disseminated long-line.

d. When reports are corrected, the corrected report must be given the same dissemination as the report being corrected.

e. SPECI observations must be completed and transmitted as soon as possible after conditions meeting SPECI criteria are observed or detected.

f. A METAR entered that also meets the criteria for a SPECI must be disseminated as a METAR.

3.7. Corrections to Transmitted Data. Once an error has been detected in a transmitted report, a correction must be transmitted as soon as possible.

a. Do not transmit a correction if the original transmitted observation has been superseded by a later report.

b. Transmit the entire corrected report with (COR) as the report designator. Use the original date and time of the report being corrected.

c. The COR function is used for mistyped/misspelled entries and must not be used as a means of augmenting/editing the automated weather observation system. If a valid weather observation has transmitted and operationally significant weather conditions or SPECI criteria exist, the weather observer should generate a new observation with current sensor data.

NOTE: When a COR is issued, if the ASOS/AWOS-C is set to broadcast the Last Transmitted Observation (LTO), the telephone broadcast will be unavailable until the next METAR/SPECI is issued. If the ASOS/AWOS-C is set to broadcast the One-Minute Observation (OMO), the telephone broadcast is not affected.

3.8. Delayed Reports (Manual Stations Only). When transmission of a manual observation is delayed until time for the next regularly scheduled report, only the latest report must be transmitted. In the record of observations, the remark Filed but Impractical to Transmit (FIBI) must be appended in parentheses to the report that was not transmitted. The remark FIBI must not be included in any local dissemination of the report. When a SPECI is not transmitted long-line, later SPECIs must be transmitted long-line only when the overall change between the last transmitted report and the current report satisfies the criteria for a SPECI. If the SPECI is not transmitted long-line, the remark FIBI must be appended to the report as described above. All SPECI reports must be disseminated locally. Reports of volcanic eruption must be disseminated, by any means possible, regardless of the delay.

3.9 Rounding Off Numbers. Except where otherwise designated in this order, when computations require that a number be rounded, if the fractional part of a positive number to be dropped is equal to or greater than one-half, the preceding digit must be increased by one. If the fractional part of a negative number to be dropped is greater than one-half, the preceding digit must be decreased by one. In all other cases, the preceding digit must remain unchanged. For example, 1.5 becomes 2, 1.3 becomes 1, -1.5 becomes -1, and -2.6 becomes -3.

3.10 Record Keeping and Forms

a. Manual Observations. All manual observations at manual stations, whether complete or partial, must be recorded on the electronic version of form MF1M-10C (does not include automated/augmented stations). The form is available from the NWS at https://www.weather.gov/surface/forms. After completing the form, it must be archived at the facility for 90 days. Manual Stations must send the electronic form to the National Center for Environmental Information (NCEI) at SURFACE.QC@NOAA.GOV by the second working day of each month. Corrected copies of all forms must be retained locally for 90 days. Retention of copies beyond 90 days must be as directed by the FAA.

b. Automated Weather Observations. Automated weather observations and operator terminal entries are archived on site. No further action is required by FAA, FAA-contract, or NF-OBS facilities. In the event of a complete failure of automated equipment, observers are expected to follow manual observation reporting requirements. The MF1M-10C is not required.

3.11 Criteria for SPECI Observations. The observer must take, record, and disseminate a SPECI observation when any of the following is observed to occur:

a. Wind Shift. Wind direction changes by 45 degrees or more in less than 15 minutes, and the wind speed is 10 knots or more throughout the wind shift.

b. Visibility. Visibility as reported in the body of the report decreases to less than, or if below, increases to equal or exceed:

(1) 3 miles.

(2) 2 miles.

(3) 1 mile.

(4) 1/2 mile.

(5) 1/4 mile.

(6) The lowest standard instrument approach procedure minimum as published in the U.S. Terminal Procedures. If not listed above.

c. Runway Visual Range (NA LAWRS). The highest value from the designated RVR runway decreases to less than, or if below, increases to equal or exceed 2,400 feet during the preceding 10 minutes.

d. Tornado, Funnel Cloud, or Waterspout.

(1) Is observed.

(2) Disappears from sight or ends.

e. Thunderstorm.

(1) Begins (a SPECI report is not required to report the beginning of a new thunderstorm if one is currently reported).

(2) Ends.

f. Precipitation.

(1) Hail (including small hail) begins or ends.

(2) Freezing precipitation begins, ends, or changes intensity.

(3) Ice pellets begin, end, or change intensity.

(4) Snow begins, ends, or changes intensity.

g. Squall. Wind speed suddenly increases by at least 16 knots and is sustained at 22 knots or more for at least one minute.

h. Ceiling. The height of the base of clouds covering five eighths or more (for example, broken and overcast) of the sky forms or dissipates below, decreases to less than or, if below, increases to equal or exceed:

(1) 3,000 feet.

(2) 1,500 feet.

(3) 1,000 feet.

(4) 500 feet.

(5) The lowest standard instrument approach procedure minimum as published in the U.S. Terminal Procedures. If none published, use 200 feet.

i. Sky Condition. A layer of clouds or obscuring phenomenon aloft is present below 1,000 feet and no layer aloft was reported below 1,000 feet in the preceding METAR or SPECI observation.

j. Volcanic Eruption. When eruption is first noted.

k. Aircraft Mishap. Upon notification of an aircraft mishap, unless there has been an intervening observation.

l. Miscellaneous. Any other meteorological situation that, in the opinion of the observer, is critical. The local Air Traffic Control facility may also develop site-specific criteria for issuing a SPECI (e.g. additional ceiling criteria, Layers below criteria, Visibility criteria, RVR). Site-specific SPECI criteria can be added to automated weather system by the ASOS/AWOS-C system manager or implemented by the weather observer.

3.12 Content of METAR/SPECI Observations. Table 3-1contains the content of METAR observations. The first column of the table lists the elements of the observation both for the body of the report and the remarks section. The second column lists a reference to the section in 13 that discusses coding of the particular element. The third column presents a brief description of the element. The fourth column indicates whether the element is reported in METAR observations, and the fifth column indicates whether the element is reported in SPECI observations.

Body of METAR – Consists of 11 Elements

Element	Paragraph	Brief Description	METAR	SPECI
Type of Report (METAR/SPECI)	13.6	METAR is the routine (scheduled) report. SPECI is the non-routine (unscheduled) weather report.	X	X
Station Identifier (CCCC)	13.7	ICAO station identifier. Consists of four alphabetic characters, for example, KABC.	X	X
Date/Time (YYGGggZ)	13.8	Day of the month, followed by the actual time of the report or when the criteria for a SPECI is met or noted. Group ends with Z to indicate UTC. For example,	X	X
Report Modifier (AUTO)	13.9	AUTO indicates a fully automated report. If not automated report, this field is blank.	X	X
Report Modifier COR	13.9	COR indicates the report is a correction of a previously issued METAR or SPECI	X	X

Body of METAR - Consists of 11 Elements

Element	Paragraph	Brief Description	METAR	SPECI
Wind (dddff(f)G$f_m f_m f_m$ KT) ($d_n d_n d_n V d_x d_x d_x$)	13.10	True wind direction in tens of degrees using three digits. Speed reported in whole knots (two or three digits). Gusts (G) appended to the speed, if observed. Group ends with KT, for example, 23018G26KT. If wind direction varies by 60˚ or more and speed is >6 knots, a variable wind group may also be reported, for example, 180V250. Direction may be reported VRB (variable) if speed is <6 knots or less. For example, VRB05KT. Calm winds are coded 00000KT.	X	X
Visibility (VVVVVSM)	13.11	Prevailing visibility in statute miles. A space divides whole miles and fractions. Ends with SM: 1 1/2SM. AUTO: M pref. means "less than": M1/4SM.	X	X
Runway Visual Range ($RD_R D_R/V_R V_R V_R V_R$FT Or $RD_R D_R/V_N V_N V_N V_N VV_X V_X V_X V_X$FT) Automated Only Do Not Back Up	13.12	The 10-minute RVR value: Reported in hundreds of feet if visibility is < one statute mile or RVR is < 6000 feet. Group ends with FT to indicate feet, for example, R06L/2000FT. Prefixed with either M or P indicates the value is lower or higher than the RVR reportable values, for example, R06L/P6000FT. If variable during the evaluation period, the variability is reported, for example, R06L/2000V4000FT.	A/B	A/B
Present Weather (w'w')	13.13	Weather phenomena (other than obscurations) occurring at the station are reported in the body of the report. Weather obscurations are generally reported if visibility < 7 miles (see 14-14 for exceptions). Volcanic ash may be reported with any visibility. Reported in order of decreasing predominance. Maximum of three groups reported (pcpn included in one group; separate groups for other phenomena).	X	X

Body of METAR - Consists of 11 Elements

Element	Paragraph	Brief Description	METAR	SPECI
Sky Condition ($N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or CLR or SKC)	13.14	Automated stations report no more than three layers up to 12,000 feet; if no layers are detected, CLR is reported. At manual stations, up to six layers may be reported; if no layers observed, SKC is reported. Each layer contains the amount (FEW, SCT, BKN, OVC) immediately followed by the height using three digits, for example, FEW015, BKN030. A layer containing CB or TCU is indicated by appending the contraction to the layer height, for example, FEW015TCU. All layers are considered opaque. Vertical Visibility (VV) is reported in hundreds of feet for a total obscuration (indefinite ceiling), for example, VV002. Surface-based obscuration (manual only) reported using amount (FEW, SCT, BKN) followed by "000," for example,SCT000; remark reported as "FG SCT000".	X	X
Temperature/Dew Point ($T'T'/T'_dT'_d$)	13.15	Temperature and dew point are reported to the nearest whole degree Celsius using two digits, for example, 17/13. Sub-zero values are prefixed with an M, for example, 03/M02.	X	X
Altimeter ($AP_HP_HP_HP_H$)	13.16	Altimeter is prefixed with an A indicating altimeter in inches of mercury. Reported using four digits; tens, units, tenths, and hundredths of inches of mercury, for example, A2990.	X	X

Remarks Section of Observation

Element	Paragraph	Brief Description	METAR	SPECI
Volcanic Eruptions	13.19	Volcanic eruptions must be reported whenever first noted. Pre-eruption activity must not be reported. (Use PIREPs to report pre-eruption activity.) Encode volcanic eruptions as described in Chapter 14.	X	X
Tornadic Activity (Manual and Augmented Auto) (Tornadic activity_B/E(hh)mm LOC/DIR_(MOV))	13.20	Whenever tornadoes, funnel clouds, or waterspouts begin, are in progress, end, or disappear from sight, the event should be described directly after the "RMK" element. This remark must give, insofar as known, the phenomena, time, location and direction from the station, and direction of movement. The time the tornadic activity began must be reported and prefixed with a "B," the time the tornadic activity ended or disappeared from sight must be reported and prefixed with an "E," for example, TORNADO B13 DSNT NE.	X	X
Type of Automated Station (AO1, AO2) Automated Remark Only Do Not Back Up	13.21	This remark identifies the type of automated station. It must be included in all reports from automated stations. AO1 identifies an automated station without a precipitation discriminator; AO2 identifies an automated station with a precipitation discriminator.	X	X
Peak Wind (PK WND dddff(f)/(hh)mm) Automated Remark Only Do Not Back Up	13.22	When the peak wind exceeds 25 knots, the remark is included in the next METAR report. ddd is the direction of the peak wind, ff(f) is the peak wind speed since the last METAR report, and (hh)mm is the time of occurrence (with only the minutes reported if the hour can be inferred from the report time), for example, PK WND 28045/15.	X	

Element	Paragraph	Brief Description	METAR	SPECI
Wind Shift (WSHFT_(hh)mm)	13.23	At stations with automated systems with SPECI capability and manual stations, when a wind shift occurs, WSHFT followed by a space and the time the wind shift began must be reported (with only the minutes reported if the hour can be inferred from the report time). The contraction FROPA may be entered following the time if it is reasonably certain that the wind shift was the result of frontal passage, for example, WSHFT 30 FROPA.	X	X
Tower or Surface Visibility (TWR VIS) (SFC VIS)	13.24	If tower visibility or surface visibility is carried in the remarks, use the appropriate set of values and precede the visibility with the appropriate identifier, TWR VIS or SFC VIS, for example, TWR VIS 1.	A/B	A/B
Variable Prevailing Visibility (VIS minVmax)	13.25	Whenever the prevailing visibility is less than 3 statute miles and is variable, this remark must be entered where min is the lowest visibility evaluated and max is the highest visibility evaluated, for example, VIS 1/2V2.	X	X
Sector Visibility (VIS_dd_vv)	13.26	Sector visibility must be reported when it differs from the prevailing visibility by one or more reportable values and, either the prevailing or sector visibility is less than 3 miles or considered to be operationally significant. In the remark, dd defines the sector to 8 points of the compass and vv is the sector visibility in SM, for example, VIS N 2.	X	X
Visibility at Second Location (VIS vv location) Automated Remark Only Do Not Back Up	13.27	When an automated station uses meteorological discontinuity sensors, remarks must be added to identify site-specific visibilities, which differ from conditions reported in the body of the report. vv is the visibility value measured at the secondary location. This remark must only be generated when the condition is lower than that contained in the body of the report.	X[1]	X[1]

Element	Paragraph	Brief Description	METAR	SPECI
Lightning (Frequency_LTG(type) _ [LOC])	13.28	When lightning is manually observed, the frequency and location must be reported, along with the type of lightning, if known. For example, OCNL LTG OHD, FRQ LTGCG VC NE. When lightning is detected by an automated sensor (e.g. ALDARS) within 5NM of the ARP, it is reported as "TS" in the body of the report with no remark; within 5-10NM of the ARP, it is reported as "VCTS" in the body of the report with no remark. Beyond 10NM from the ARP lightning is reported in remarks as "LTG DSNT" followed by direction from the ARP, for example, OCNL LTG DSNT NE.	X	X
Beginning/Ending Time of Precipitation (WX)B(mm)E(mm) (NA LAWRS	13.29	At stations with automated systems with SPECI capability and Manual Stations, when precipitation begins or ends, the next METAR report must include the type of phenomena, the beginning and/or ending time (prefixed with a B and/or E). If the beginning or ending of the precipitation type (hail, freezing precipitation, or ice pellets), initiated the SPECI report, then that SPECI report must include the type of phenomena, the beginning and/or ending time, and should be reported in the next METAR report.	X	X
Beginning/Ending Time of Thunderstorms (TS)B(mm)E(mm)	13.30	When thunderstorms begin or end, the SPECI report must include the type of phenomena, the beginning and/or ending time (prefixed with a B and/or E), and should also be reported in the next METAR report, for example, TSB05E45	X	X
Thunderstorm Location (TS_LOC_(MOV_DIR))	13.31	Thunderstorm location and movement, if known, must be encoded. For example, TS SE MOV NE.	X	X

Element	Paragraph	Brief Description	METAR	SPECI
Hailstone Size (GR_{INCHES})	13.32	At augmented automated stations and at manual stations, the size of the largest hailstone is coded in 1/4 inch increments, identified with the contraction GR. When small hail less than 1/4 inch in size is occurring, the hailstone size is reported in remarks as "GR LESS THAN 1/4".	X	X
Virga (VIRGA_{Direction})	13.33	When precipitation is observed to be falling from clouds, but is not reaching the ground because of evaporation, report VIRGA; the direction from the station is optional, for example, VIRGA or VIRGA SW.	X	X
Variable Ceiling Height (CIG minVmax)	13.34	Whenever the ceiling is below 3,000 feet and is variable, enter min as the lowest ceiling height evaluated and max as the highest ceiling height evaluated, for example, CIG 005V010.	X	X
Obscurations (w'w'_($N_sN_sN_s$) $h_sh_sh_s$)	13.35	When the sky condition contains an obscuration either, at the surface or aloft, other than clouds, the type of phenomena in the layer, plus the sky cover at the layer and the height must be reported in remarks, for example, FG SCT000 or FU BKN015.	X	X
Variable Sky Condition ($N_sN_sN_s(h_sh_sh_s)$_V_N_s N_sN_s)	13.36	This remark must identify the layer that is varying and indicate the range of variability. If there are several layers of the same coverage, the variable layer must be identified by including the layer height.	X	X
Significant Cloud Types	13.37	When observed, the following clouds are reported in remarks: 1.) Cumulonimbus (CB) or Cumulonimbus Mammatus (CBMAM), distance, direction from the station, direction of movement, for example, CB W MOV E, CB DSNT W. 2.) Towering Cumulus (TCU), distance, and direction from the station, for example, TCU W. 3.) Altocumulus Castellanus (ACC), direction from station, for example, ACC NW. 4.) Standing Lenticular (stratocumulus SCSL; altocumulus ACSL, or cirrocumulus CCSL) or rotor	A	A

Element	Paragraph	Brief Description	METAR	SPECI
		clouds, direction from the station, for example, ACSL SW-W, APRNT ROTOR CLD NE, CCSL S. Cumulonimbus of any kind and towering cumulus are also identified in the body of the report.		
Ceiling Height at Second Location (CIG_ {height}_ {LOC}) Automated Remark Only Do Not Back Up	13.38	When an automated station uses meteorological discontinuity sensors, remarks must be added to identify site-specific sky conditions, which differ from conditions reported in the body of the report. This remark must only be generated when the ceiling is lower than that contained in the body of the report. For example, CIG_002_RY11.	X[1]	X[1]
Pressure Rising or Falling Rapidly (PRESRR) (PRESFR) Automated Remark Only Do Not Back Up	13.39	When the pressure is rising or falling rapidly at the time of the observation, the remark Pressure Rising Rapidly (PRESRR) or Pressure Falling Rapidly (PRESFR) is included.	X	X
Sea-Level Pressure (SLPppp) (SLPNO) Automated Remark Only Do Not Back Up	13.40	At stations with automated systems with SPECI capability and manual stations, this remark begins with SLP and is coded using the tens, units, and tenths of sea-level pressure in hectopascals, for example, SLP982. If sea-level pressure would normally be reported, but is not available, the remark is coded SLPNO.	X	
Aircraft Mishap (ACFT_ MSHP)	13.41	If a report was taken to document weather conditions when notified of an aircraft mishap, the remark ACFT MSHP is included in the report, but is not transmitted. This is indicated by putting the remark in parenthesis in the record.	X	X

Element	Paragraph	Brief Description	METAR	SPECI
Snow Increasing Rapidly (SNINCR_(ii)/(ii)) At Designated sites in Appendix F)	13.42	Report SNINCR if snow depth increases by 0.5 inch to the nearest whole inch or more in the past hour, followed by amounts. The remark SNINCR is followed by the depth of increase in the last hour, a solidus, and the total depth of snow on the ground at the time of the report. For example, a snow depth increase of 2 inches in the past hour with a total depth on the ground of 10 inches would be coded "SNINCR 2/10".	X	
Other Significant Information (Plain Language)	13.43	Other significant information important to operations, such as information on fog dispersal operations, runway conditions, or "Last" report from a manual location, etc.	X	X

Group 2`-Additive and Automated Maintenance Data

Element	Paragraph	Brief Description	METAR	SPECI
Hourly Precipitation Amount (Prrrr) Automated Remark Only Do Not Back Up	13.46	At automated stations this remark is included in METAR reports for the water equivalent of all precipitation that has occurred since the last METAR coded in hundredths of an inch, for example, P0009 indicates 9/100^{ths} of an inch of precipitation in the past hour.	X	
1-, 3- and 6-Hourly Ice Accretion Amount, I1nnn, I3nnn, I6nnn Automated Remark Only Do Not Back Up	13.47	At automated stations with a freezing rain sensor, this remark is included in METAR/SPECI reports for the ice accretion amount that has occurred in hundredths of an inch during the last 1-hour (I1nnn), 3-hour (I3nnn), and 6-hour (I6nnn) period. No manual backup is required.	X	X
3- and 6-Hourly Precipitation Amount, 6RRRR/ Automated Remark Only Do Not Back Up	13.48	At stations equipped with automated systems with SPECI capability and Manual stations, this remark is included in 3- and 6-hourly observation; encoded in inches, using tenths, and hundredths, of the amt. 2.17 inches of precipitation would be encoded 60217. When an indeterminable amount of precipitation has occurred, the 6RRRR group is coded 6////.	X	
24-Hour Precipitation, 7$R_{24}R_{24}R_{24}R_{24}$ Automated Remark Only Do Not Back Up	13.49	Included in 1200 UTC observation if more than a trace of precipitation has fallen in past 24 hours, coded using the tens, units, tenths, and hundredths of inches, for example, 1.25 inches would be coded 70125.	X	
Depth of Snow on the Ground, 4/sss (At Designated Sites in Appendix F)	13.50	At stations listed in Appendix F, the total snow depth on ground group is coded in the 0000, 0600, 1200, and 1800 UTC observations whenever there is more than a trace of snow on the ground For example, a snow depth of 21 inches would be coded as "4/021".	X	
Water Equivalent of Snow on Ground (933RRR) (At Designated sites in Appendix F)	13.51	At manual stations, this group reported in 1800UTC report if average snow depth is 2 inches or more. 933 is the code indicator for water equivalent of snow on ground. RRR represents the water equivalent of snow on the ground reported in tens, units and tenths of inches using 3 digits, for example, water equivalent of 3.6 inches would be 933036.	X	

Remarks Section of Observation

Element	Paragraph	Brief Description	METAR	SPECI
Hourly Temperature and Dew Point $Ts_nT'T'T's_nT'_dT'_dT'_d$ Automated Remark Only Do Not Back Up	13.52	At automated stations except AWOS-A, this element is used to report temperature and dew point to the tenth of a degree Celsius. T identifies the group, the sn the sign of the temperature - coded as 1 if the value is below 0 degrees Celsius and 0 if the value is 0 degrees Celsius or higher. TaTaTa is the temperature in tens, units, and tenths of degrees and T'aT'aT'a is the dew point in tens, units and tenths of degrees, for example, a temperature of 2.6 and dew point of -1.5 would be coded in the body as 03/M01 and in remarks as T00261015.	X	
6-Hour Maximum Temperature, $1s_nT_xT_xT_x$ Automated Remark Only Do Not Back Up	13.53	The maximum temperature in past 6-hours in tenths of degrees Celsius using 3 digits, where the 1 identifies the maximum temperature group, the s_n the sign of the temperature - coded as 1 if the value is below 0 degrees Celsius and 0 if the value is 0 degrees Celsius or higher. The $T_xT_xT_x$ must be the maximum temperature during the last 6 hours, for example, a temperature of 1.0 degrees Celsius is coded as 10010, a maximum temperature of -2.1 degrees Celsius is coded 11021.	X	
6 Hour Minimum Temperature, $2s_nT_nT_nT_n$ (NA Automated Remark Only Do Not Back Up	13.54	The minimum temperature in past 6-hours in tenths of degrees Celsius using 3 digits where the 2 identifies the minimum temperature group, the s_n the sign of the temperature - coded as 1 if the value is below 0 degrees Celsius and 0 if the value is 0 degrees Celsius or higher. The $T_nT_nT_n$ must be the minimum temperature during the last 6 hours, for example, a temperature of -2.1 degrees Celsius is coded as 21021, a minimum temperature of 1.2 degrees Celsius is coded 20012.	X	

Remarks Section of Observation

Element	Paragraph	Brief Description	METAR	SPECI
24-Hour Maximum and Minimum Temperature, $4s_nT_xT_xT_xs_nT_nT_nT_n$ Automated Remark Only Do Not Back Up	13.55	Reported at midnight (LST); the maximum and minimum temperatures for the day coded in tenths of degrees Celsius using 3 digits where the 4 identifies the maximum/minimum temperature group, the sn the sign of the temperature - coded as 1 if the value is below 0 degrees Celsius and 0 if the value is 0 degrees Celsius or higher. For example, a 24-hour maximum temperature of 10.0 degrees Celsius and a 24-hour minimum temperature of -1.5 degrees Celsius is coded 401001015.	X	
Pressure Tendency, 5appp Automated Remark Only Do Not Back Up	13.56	At equipped automated stations, include in 3- and 6-hourly observations where the 5 identifies the pressure tendency group, the a represents the character of pressure change over the past 3 hours, and ppp is the change in pressure in the past 3 hours. the ppp is coded based on the absolute value of the change of either the station pressure or the altimeter in the past 3 hours coded in tenths of hectopascals and using the tens, units, and tenths digits, for example, a steady increase of 3.2 hectopascals in the past 3 hours would be coded 52032.	X	
Sensor Status Indicators Automated Remark Only Do Not Back Up	13.57	At equipped automated stations: When automated stations are equipped with a precipitation identifier and that sensor is not working, the remark PWINO is included. When the tipping bucket rain gauge is not operating at an automated station equipped with the device, PNO is included in remarks. When automated stations are equipped with a Freezing Rain Sensor and it is not working, the remark FZRANO is included. When automated stations are equipped with a lightning detection system and that sensor is not working, the remark TSNO is included. At an automated station, when the secondary visibility sensor is not working, VISNO_(LOC) is included, and when the cloud height indicator is not working CHINO_(LOC) is included.	X	

Remarks Section of Observation

Element	Paragraph	Brief Description	METAR	SPECI
Maintenance Indicator Automated Remark Only Do Not Back Up	13.58	A maintenance indicator sign, $, is included when an ASOS/AWOS-C detects that maintenance is needed on the system.	X	X

X – Indicates elements included at all stations
A – Indicates elements that are at service level A
B – Indicates elements that are at service level B
[1]At stations equipped with meteorological discontinuity sensors.

Chapter 4. General Procedures at Automated Weather Stations

4.1. Purpose. This chapter prescribes procedures and practices to be followed by personnel responsible for observing, reporting, and/or transmitting surface weather information required for augmentation, and/or for sustaining minimum operations in the event of partial or total failure of the automated weather observing system. Practices applicable to LAWRS observers are located in Appendix C.

4.2. Types of Automated Stations. There are two major classes of automated surface weather observing systems used at FAA, FAA-contract, and NF-OBS sites: Automated systems with SPECI capability and automated systems without SPECI capability. The augmentation and backup of these systems are described in the next two chapters.

a. Automated systems with SPECI capability.

(1) Automated Surface Observing System (ASOS) is a type of automated surface weather observing system developed through a joint FAA/NWS/DOD agreement. ASOSs are installed at designated airports and maintained by the NWS to meet FAA requirements. ASOS contains at least one of each of the following sensors:

i. Wind speed and direction sensor.

ii. Visibility sensor.

iii. Precipitation identification sensor.

iv. Cloud height indicator sensor.

v. Temperature and dew point sensors.

vi. Pressure sensors.

vii. Precipitation accumulation sensor.

(2) ASOS may also include a freezing precipitation sensor, in addition to all of the above sensors and thunderstorm reporting via the Automated Lightning Detection and Reporting System (ALDARS).

(3) Many sites have an ASOS/ATIS Interface Unit (AAIU), which provides the capability to broadcast current weather from the ASOS over the ATIS/AFIS ground-to-air radio when the tower/FSS is closed.

(4) ASOS may also have an interface to new generation RVR equipment. See Chapter 9, Runway Visual Range (RVR).

(5) FAA AWOS-C (AWOS Type FA-29600) - Is an AWOS modified by the FAA to report METAR/SPECI data similar to an ASOS.

NOTE: Any reference to ASOS includes the AWOS-C and any future NextGen system with SPECI capability.

b. Automated systems without SPECI capability. Automated Weather Observing System (AWOS). AWOS is a type of automated surface weather observing system certified and commissioned by the FAA. Non-Federal AWOS systems are owned and maintained by the airport. A/C 150/5220-16 provides guidance to the owner for commissioning into the NAS. AWOS systems typically disseminate weather reports every 20 minutes and do not issue SPECI observations. ATCT's with LAWRS certified observers collocated with a non-Federal AWOS must adhere to FAA JO 7210.3, Paragraph 2-9-2 d. At Non-Federal AWOS Sites facilities must:

(1) FAA facilities must negotiate a letter of agreement (LOA) with the airport management or appropriate authority at locations where a non-Federal AWOS is installed at an airport with an operating control tower. The LOA must define equipment maintenance responsibilities and coordination requirements.

(2) ATCS's may disseminate only those non-Federal weather observations METAR/ SPECI that are obtained through the Weather Message Switching Center (WMSCR) or other equivalent documented means.

(3) Pilots who want non-Federal AWOS information from sites that do not include automatic long-line dissemination should be provided the appropriate frequency and/ or telephone number, if known.

4.3. Procedures for Handling Aircraft Mishaps at Automated Sites. The requirement to record the present weather following an aircraft mishap remains valid at automated sites. At a minimum, a mishap requires weather data from 1 hour before to 1 hour after the mishap occurs.

ASOS observations should be archived by the observer or by calling the AOMC

(1-800-242-8194). The AOMC has the capability to archive the 5-minute observations from the previous 12 hours of weather observation data from attended and unattended locations. The supervisor or controller-in-charge must ensure that the 5-minute observations are archived following notification of an aircraft mishap at a location where an ASOS is operational. AOMC requests must be made within 10 hours of the incident. Archive AWOS data in accordance with the procedures in the AWOS Technical Instruction Book.

4.4. Notice to Airmen (NOTAMs). The ASOS/AWOS is used to observe local weather conditions and broadcast weather information to pilots. All weather observers (LAWRS, CWO, NF-OBS etc.) are prohibited from appending NOTAM information to the automated weather system. Guidance for ATIS broadcasts are contained in FAA JO 7210.3 and 7110.65.

Chapter 5. Augmentation Requirements at Automated Weather Stations

5.1. Introduction. This chapter prescribes procedures and practices applicable to the augmentation of automated surface observations at all FAA, FAA-contract, and NF-OBS facilities. In addition, this chapter also prescribes specific differences in augmentation procedures and practices applicable to LAWRS observers, as well as tower visibility requirements.

5.2. Validity of Data. Once an observation has been augmented, the observer must ensure the augmented data is correct prior to transmission.

5.3. Sign On/Sign Off the Automated Weather Observing Systems. In order to ensure the observation is correct and to enter augmentation data into the automated weather observing system, the observer must:

a. Sign on the automated weather observation system when on duty. Sign on must be in accordance with the respective automated weather observing system's operator handbook or locally prescribed procedures. The "AUTO" tag at the beginning of the observation will be dropped when the observer signs on.

b. At part-time facilities, the observer must sign off an automated system with SPECI capability at the close of augmentation coverage of the METAR. This includes all surface, LAWRS and tower visibility observers. Prior to signing off the automated weather observation system, the observer must ensure the Present Weather Sensor has been RESET.

c. When using an ASOS (N/A AWOS-C), several augmented events (for example, tornadic activity, thunderstorm, or hail) automatically generate SPECI observations for the beginning and ending of the event. If one of these events is occurring at the close of augmentation coverage, it will be necessary to end the event. The ending of the event will automatically generate a SPECI. (e.g., GR occurring at closing or TS occurring at closing). After the SPECI transmits, Reset/Enable the Present Weather Sensor (PRESWX). The observer must then sign off the automated weather observing system.

NOTE: If a Thunderstorm was reported by ALDARS it is not necessary to end the event prior to closing. ALDARS will generate a SPECI ending the event when lightning is no longer detected.

d. Virga and volcanic ash are events that do not generate SPECIs. Virga is automatically deleted from the observation after the hourly METAR is transmitted. If virga continues to occur, it must be re-entered. If volcanic ash (VA) is occurring at the close of augmentation coverage, it will be necessary to end the event Reset/Enable the Present Weather Sensor (PRESWX) and Enter "Last" in the remarks followed by the remark "VA occurring at closing."

e. Sign On/Sign Off the AWOS. At AWOS sites, the observer must sign on/sign off the automated weather observing system following the procedures stated in the AWOS Operator's Instructions.

Table 5-1: Summary of FAA Augmentation Requirements

ELEMENT	TOWERED with ASOS/AWOS-C		NON-TOWERED with ASOS/AWOS-C	Non-Fed AWOS site with Surface Observer	LAWRS with a Non-Fed AWOS [2]
	LAWRS	w/ OBS[1]	FSS or OBS		
Thunderstorm	T[6]	O[6]	F[6]	O	T
Tornadic Activity[3]	T	O	F	O	T
Hail	T	O	F	O	T
Virga	T	O	F	O	T
Volcanic ash	T	O	F	O	T
Weather[4]	T	O	F	O	T
Tower Visibility	N/A	T[5]	N/A	T[5]	N/A

[1] Towered site with a surface-based observer.
[2] Augmentation is provided by manually disseminating
[3] Includes tornado, waterspout, and funnel cloud.
[4] See Table 6-3 for complete list of required elements.
[5] Tower visibility either provided to observer for input or entered via operator interface device.
[6] Augmented at Sites without ALDARS capability, Backup at sites with ALDARS capability.

Legend:
F - Augmentation provided by certified FSS observer or FAA-contract observer
O - Augmentation provided by surface-based observer
T - Augmentation provided by certified tower observer

5.4. Augmentation Observing Procedures. Except as specified in the following subsections, observing procedures for augmentation must be the same as specified for the corresponding manual observation in Chapters 7 through 12 depict elements to be augmented for each service level.

a. Observing Tornadic Activity. The term tornadic activity must include funnel clouds, tornadoes, and waterspouts. Observing procedures for tornadic activity are given in Paragraph 9.22, Observing and Reporting Tornado, Waterspout, or Funnel Cloud. A funnel cloud, tornado, or waterspout is considered to begin at the time it is observed by the observer. A funnel cloud, tornado, or waterspout is considered to end at the time it disappears from sight.

b. Observing Thunderstorms. Observing procedures for thunderstorms are given in Paragraph 9.23, Observing and Reporting Thunderstorms and Paragraph 9.24, Beginning and/or Ending of a Thunderstorm. A thunderstorm occurrence begins when thunder is first heard, lightning is observed over the station and the local noise level is sufficient to prevent hearing thunder, or when lightning is detected by an automated sensor within ten miles of the airport. A thunderstorm is considered to end 15 minutes after the last occurrence of any of these criteria.

c. Observing Hail. Observing procedures for hail are given in Paragraph 9.25, Reporting Hail. Hail begins at the time it is first observed falling and ends when it is no longer observed falling. No intensity must be assigned to hail; that is, the observer must not characterize hail as light, moderate, or heavy.

d. Observing Volcanic Ash. Observing procedures for volcanic ash are given in Paragraph 9.32, Special Procedures for Volcanic Ash. The observer must report volcanic ash whenever it is observed at the station.

e. Observing Virga. Virga is defined as precipitation falling from clouds but not reaching the ground. The observer must report virga when observed. Virga is not considered to be present weather or an obscuration.

f. Observing Tower Visibility. Tower visibility is only reported at sites with both an operating control tower and a surface weather observer. Observing procedures for tower visibility are given in Paragraph 8.3, Control Tower Visibility and observations and actions at collocated sites.

5.5. General Reporting Procedures. Report tornadic activity (to include funnel clouds, tornadoes, or waterspouts), thunderstorm, hail, volcanic ash, virga, or tower visibility by making the appropriate entry on the operator's interface device in accordance with procedures in the appropriate handbooks, manuals or Ready Reference Guide. Thunderstorm activity may also be reported by an automated sensor. If Thunderstorm or Lightning activity is reported by an automated sensor, it is not necessary for an observer to duplicate or report the same activity.

a. Reporting Tornadic Activity. The term tornadic activity must include funnel clouds, tornadoes, and waterspouts. These phenomena must be reported in a SPECI observation whenever they are observed or disappear from sight. At sites with an automated system with SPECI capability, the event will continue to be reported automatically until the observer deletes the entry.

b. Reporting Thunderstorms. At sites with automated systems with SPECI capability, entry or deletion of a thunderstorm report must be made by the observer or an automated sensor. The event will continue to be reported automatically until the observer or ALDARS deletes the entry. A SPECI observation is generated automatically for the beginning and ending times of thunderstorms. A thunderstorm occurrence begins when thunder is first heard, when lightning is

observed at the station and the local noise level is sufficient to prevent hearing thunder, or when lightning is detected by an automated sensor within ten miles of the airport. Location and direction of movement of the thunderstorm and the location, type, and frequency of lightning must be reported, if known. LAWRS personnel are only required to annotate the beginning/ending times of thunderstorms.

c. Reporting Hail. At sites with an automated system with SPECI capability, entry or deletion of a hail report must be made. The event will continue to be reported automatically until the observer deletes the entry. Hail begins when it is first observed and ends when it is no longer falling. No intensity must be assigned to hail; that is, the observer must not characterize hail as light or heavy. Hail size should be reported, if known.

d. Reporting Volcanic Ash. "VA" is the standard contraction used for volcanic ash. It will be reported in the body of the report as an obscuration whenever observed. At sites with an automated system with SPECI capability, the event will continue to be reported automatically until the observer deletes the entry. A special observation is not required when volcanic ash is observed. No intensity is assigned to volcanic ash; that is, the observer must not characterize volcanic ash as light, moderate, or heavy. Remarks are optional, but if the volcanic eruption producing the volcanic ash is observed, it must be entered in remarks, and a special observation must be generated.

e. Reporting Virga. When precipitation is observed to be falling from clouds, but is not reaching the ground, the observer must report VIRGA in remarks. There is no standard contraction used for virga. Virga is not considered to be present weather or an obstruction to vision. In remarks, VIRGA is spelled out in full. At sites with an automated system with SPECI capability, the event will continue to be reported automatically until the observer deletes the entry or until after the next hourly observation. The remark VIRGA will not be automatically kept in remarks of the observation past the next hourly observation. If virga persists, it must be re-entered as a remark. No SPECI is required when virga is observed. No intensity is assigned to virga; that is, the observer must not characterize virga as light, moderate, or heavy. The direction of the virga from the site is optional.

f. Reporting Tower Visibility. At towered sites with an automated system with SPECI capability with a surface-based observer, a tower visibility report must be made by notifying the surface-based observer or using the appropriate entry on the operator's interface device. The reporting of tower visibility must be in accordance with coding and dissemination procedures specified in Paragraph 13.24, Tower or Surface Visibility (TWR_VIS_vvvvv or SFC_VIS_vvvvv).

Table 5-2: Examples of Augmented Observations

Examples of Augmented Observations	
Automated system without SPECI capability w/o Aug	
METAR KHEF 011755Z AUTO 21020G35KT 1SM OVC010 27/24 A2991 RMK AO1 (NA LAWRS)	

Examples of Augmented Observations	
Automated system without SPECI capability w/ Aug	
METAR KHEF 011755Z 21020G35KT 1SM +TSRA OVC010CB 27/24 A2991 RMK AO1 WEA:TSRA OCNL LTGCG OHD TS OHD MOV E	
Automated system with SPECI capability w/o Aug	
METAR KGLD 011755Z AUTO 21020G35KT 1SM +RA OVC010 27/24 A2991 RMK AO2 SLP101	
Automated system with SPECI capability w/ Aug	
METAR KBHM 011755Z 21020G35KT 1SM +TSRA OVC010CB 27/24 A2991 RMK AO2 OCNL LTGCG OHD TSB42 TS OHD MOV E SLP101	
Automated system with SPECI capability w/o Aug with ALDARS	
METAR KSEG 171753Z AUTO 21020G30KT 1SM TSRA OVC010 27/24 A2991 RMK AO2 LTG DSNT E TSB42 SLP101	
Automated system with SPECI capability w/ Aug and ALDARS	
METAR KAOO 011753Z 21020G35KT 1SM TSRA OVC010CB 27/24 A2991 RMK AO2 LTG DSNT E TSB42 TS OHD MOV E SLP101	

Chapter 6. Backup/Editing Requirements at Automated Weather Stations

6.1. Introduction. This chapter presents the procedures and practices for providing the backup weather information required in the event of a partial or total failure of the automated weather observing system or if one or more of the elements within the automated observation are judged erroneous or non-representative. Responsible personnel must provide the backup weather information specified in Chapter 2, Guidelines. During periods when backup is required, augmentation must also be performed.

Table 6-1: Summary of Long-line Backup Requirements

ELEMENT	TOWERED		NON TOWERED WITH OBSERVER[1]
	LAWRS	NON-LAWRS WITH OBSERVER[1]	
Wind	T	O	O
Visibility to 10 Miles	T	O	O
Present Weather & Obscurations[2]	T	O	O
Sky Condition to 12K Ft.	T	O	O
Temperature/Dew Point	T	O	O
Altimeter Setting	T	O	O
Tower Visibility	N/A	T	N/A

[1] Includes all FSS, FAA-Contract, and non-Federal observers.
[2] See Table 6- for required elements.

Legend:
T - Element provided by certified Air Traffic Control Specialist
O - Element provided by surface-based observer

6.2. Validity of Data. Once an observation has been edited/backed up, the observer must ensure the augmented data is correct prior to transmission.

6.3. Equipment Requirements. The following equipment is required to provide the weather information specified in this chapter. Unless stated otherwise, the equipment is required only if that element is required at your facility. References to an "OID/OT" indicate any automated weather observing system operator interface device.

a. Equipment for Wind Direction and Speed. If available, the primary low-level wind shear alert system (LLWAS) sensor or other FAA approved on-site wind equipment (F-420, SAWS, SWS etc.) must be used. Otherwise, the wind direction and speed must be estimated using the Beaufort scale during periods when all automated wind sensors are inoperative.

b. Equipment for Visibility. There is no equipment required for automated visibility sensor backup. However, a current list or visibility chart(s) depicting day and night visibility reference points must be maintained and available at the point of observation for use at each facility. See FAA JO 7210.3.

c. Equipment for Present Weather and Obstructions to Vision. Visual procedures must be used to identify the type(s) of present weather and/or obscurations. If necessary, visual procedures must be used to determine the intensity of precipitation.

d. Equipment for Sky Condition. There is no equipment required for automated sky condition sensor backup. Visual estimates must be made using the manual techniques such as:

(1) Pilot reports (PIREPS) of cloud heights may be used if available. PIREPs normally reference Mean Sea Level (MSL), and must be converted to Above Ground Level (AGL) for inclusion into the METAR/SPECI.

(2) Terminal Aerodrome Forecast (TAF) data.

(3) METAR/SPECI from near-by adjacent airports.

e. Equipment for Temperature and Dew Point. An FAA approved remote readout hygrothermometer (Standalone Weather Sensor System (SAWS), Surface Weather System (SWS)) is an acceptable backup for temperature and dew point. Other acceptable backups are a battery-operated self-contained psychrometer or a stand-alone temperature-measuring device, as approved by FAA.

f. Equipment for Altimeter Setting. Equipment to back up altimeter setting may be any FAA installed and maintained altimeter setting indicator (ASI), digital altimeter setting indicator (DASI), SAWS, SWS, or any other FAA approved facility station pressure instrument.

g. Equipment for OID/OT. Whenever possible, backup of missing or erroneous data must be entered using the ASOS/AWOS-C OID. If the OID fails on automated systems with SPECI capability and the automated systems with SPECI capability observation is currently representative, the observer must continue to maintain oversight of the automated system through other methods. (e.g. relocate to another site with an OID/VDU, Internet, telephone broadcast). Coordinate with the ATCT and disseminate appropriate maintenance notifications to AOMC for ASOS, the NEMC for AWOS-C or Alaskan SOC for AWOS-C in Alaska.

When operationally significant weather is occurring or expected to occur:

(1) If able, arrange for local and long-line communications to be disabled. If long-line communications cannot be disabled, do not enter weather reports into an alternate system (e.g. AISR).

(2) Provide manual backup observations.

(3) Surface observers must coordinate with ATCT; anytime weather reports are disseminated through alternate methods they must be relayed to the ATCT for ATIS broadcast.

NOTE: An ATCT with digital ATIS must manually edit the weather observations that are entered via alternate methods.

(4) Notify all other users that have an ASOS interface OID, VDU, IDS-4, and/or IDSR etc. This may include the TRACON, Airport Operations, Fixed Based Operator and/or other local aviation stakeholders. It is the observer's responsibility to know where all interfaces and displays are located.

(5) Operationally significant weather is defined as:

i. Marginal VFR conditions (ceilings 1000-3000 feet and/or visibility 3SM -5SM)

ii. IFR conditions (ceilings at or below 1000 feet and/or visibility at or below 3SM)

iii. Thunderstorm activity

iv. Any form of precipitation.

h. Equipment for Communications. No additional equipment is required for the long-line communication of weather information.

(1) At manual ATIS locations or uncontrolled airports (including NF-OBS, SAWRS), when long-line communications are unavailable, the report must be relayed to the overlying ARTCCs Flight Data unit for entry into an FAA approved electronic system that provides NAS-wide dissemination (e.g., AIS-R, SWIM, or similar systems). In Alaska, disseminate weather reports to the FSS.

NOTE: If the weather observer has the capability to enter the weather into an FAA approved electronic system without calling the ARTCC they may do so.

(2) At digital ATIS locations, the weather observer must continue to use the OID to augment/edit the METAR/SPECI. The digital ATIS will continue to broadcast the augmented weather reports that are entered by the weather observer. The weather observer must also ensure that all weather reports are entered into their alternate system for NAS-wide dissemination.

6.4. Procedures for Providing Backup Information. At sites with an automated system with SPECI capability, required weather data elements must be entered into the automated weather observing system using the editing procedures for the OID.

For Non-Representative data, enter representative data into the appropriate field using the OID. Do not enter the data in the Remarks. When a certified weather observer edits/augments an automated weather system, it is transparent to the users.

a. Do not turn off report processing off (automated system with SPECI capability) or set the channel out of service (automated system without SPECI capability) unless directed to by maintenance personnel. Turning off report processing will lead to a "$" sign, and the generation of a trouble ticket for the NWS AOMC.

b. Observers must never turn off report processing for altimeter setting without appropriate maintenance notification. Once the report processing for the altimeter setting is turned off, only the appropriate ASOS or AWOS technician can turn the report processing back on.

6.5. Coding of Missing Data. If any element normally included in the body of the observation, except present weather and obscurations, is missing because of sensor failure and the lack of backup equipment, that element may be omitted. If the automated weather observing system's processor is operative, the system will do this automatically. If not operative, these missing elements must be omitted and skipped over. When an element or phenomena does not occur or cannot be observed, the corresponding group and preceding space are omitted from that particular report.

6.6. Procedures for Wind Speed and Wind Direction. FAA approved backup wind equipment (LLWS, WME, F-420, SAWS, SWS etc.) must be used to determine wind direction and speed. If no backup sensor is available, wind speed and direction must be estimated using the Beaufort scale (Table 7-1). When the wind is estimated, enter the estimated wind data into Wind field of the METAR in the same manner as if it were read from instruments.

a. Estimating Wind Direction. Wind direction must be estimated by observing the wind cone or tee, movement of twigs, leaves, smoke, etc., or by facing into the wind in an unsheltered area. When estimating wind direction, note that even small obstacles may cause variations. The movement of clouds, regardless of how low they are, must not be used for estimating the surface wind direction.

b. Estimating Wind Speed. The Beaufort scale (see Table 7-1: Estimating Wind Speed) must be used to estimate wind speed if all other wind speed measuring instruments are out of service.

6.7. Procedures for Visibility. The visibility reported must be a prevailing visibility. The prevailing visibility must be determined using a visibility chart, list or photographs. See FAA JO 7210.3.

NOTE: RVR is not addressed here because an ASOS/RVR automated interface will not be backed up by controllers or weather observers (including LAWRS). If the ASOS/RVR interface fails, the data will be omitted.

a. Reporting Visibility Values. In backing up visibility, the reportable values for visibility must be the manual visibility values as permitted by the current system software installed; see Table 8-1: Reportable Visibility Values. If the actual visibility falls between two reportable values, the lower value must be reported.

b. Tower Visibility. At towered facilities with a surface-based observer, the responsible tower controller must enter the tower visibility into the OID or:

(1) Notify the surface-based observer via landline when the tower prevailing visibility is observed to decrease to less than, or if below, increases to equal or exceed, 4 miles.

(2) Report all changes of one or more reportable values to the surface-based observer when the prevailing visibility at the tower or the surface is less than 4 miles.

(3) As required by FAA directives, use the lower of either the tower or weather station visibility as controlling visibility for aircraft operations.

6.8. Procedures for Present Weather and Obscurations. Present weather and obscurations to vision must be observed and reported in accordance with the manual procedures prescribed in Chapter 9, Weather Phenomena. Reports must include as a minimum those weather phenomena in Table 6-2: Backup and Augmentation Weather and Obscurations, when backing up automated systems with SPECI capability. (If the observer is backing up automated systems with SPECI capability at the close of augmentation/backup coverage, it will be necessary to end the event or it will continue to be reported during the hours when there is no augmentation/backup coverage.) Precipitation of unknown form is generally only reported when the automated weather observing system present weather indicator sensor is operational and is reporting precipitation of unknown form. However, if the observer can determine the type of precipitation, it should be reported according to the guidelines in Table 6-2, via the non-representative data procedures.

NOTE: Except for the Present Weather and Altimeter sensor, when sensor data is backed up or edited by the controller/observer, the sensor will revert to automated mode for the next scheduled METAR. The Present Weather sensor must be reset by the controller/observer or the automated system will continue to report the phenomenon that was manually entered by the controller/observer. Once the altimeter field is edited, the sensor must be reset by a technician.

Table 6-2: Backup and Augmentation Weather and Obscurations

PHENOMENON OBSERVED	REPORT (NOTATION)	PHENOMENON OBSERVED	REPORT (NOTATION)
Tornado	+FC (in body); TORNADO (in remarks)	Snow Pellets	GS
Funnel Cloud	FC (in body); FUNNEL CLOUD (in remarks)	Volcanic Ash	VA
Waterspout	+FC (in body); WATER-SPOUT (in remarks)	Fog (Vsby <5/8)	FG
Thunderstorm	TS	Mist (Vsby ≥ 5/8)	BR
Rain	RA	Shallow (ground) Fog	MIFG
Rain Shower	Report RA for automated systems with SPECI capability	Patchy Fog	BCFG
Drizzle	DZ	Freezing Fog	FZFG
Freezing Rain	FZRA	Blowing Snow	BLSN
Freezing Drizzle	FZDZ	Haze	HZ
Ice Crystals	Report SN for automated systems with SPECI capability	Smoke	FU
Ice Pellets	PL	Squalls	SQ

PHENOMENON OBSERVED	REPORT (NOTATION)	PHENOMENON OBSERVED	REPORT (NOTATION)
Ice Pellet Showers	Report PL for automated systems with SPECI capability	Dust	DU
Hail	GR		
Snow	SN		
Snow Showers	Report SN for automated systems with capability		
Snow Grains	Report SN for automated systems with SPECI capability		

6.9. Procedures for Sky Condition. Details on procedures for observing sky condition are included in Chapter 10, Sky Condition. If required, the following procedures for reporting sky condition must apply:

a. Report sky cover up to 12,000 feet, or as specified in the designated service level standard, whichever is greater. (See Appendix D. Service Standards.)

b. Non-opaque cloud layers must be treated as opaque and reported.

c. No more than three layers may be reported; or as specified in the designated service level standard, whichever is greater. (See Appendix D. Service Standards.)

d. "CLR" (clear) must be reported at an automated site when no clouds are visible up to 12,000 feet, or as specified in the designated service level standard, whichever is greater.

NOTE: At all locations with an automated weather observation system that report “CLR” during non-operating hours, the controllers/observers should also report “CLR” during operating hours. Only full-time manual weather stations should use the contraction “SKC”.

6.10. Procedures for Temperature and Dew Point (See Chapter 11). If either or both of the temperature and dew point modules of the automated weather observing system are inoperative, both the temperature and dew point must be reported using readings from FAA approved backup equipment (psychrometer, SAWS, SWS etc.). If approved backup equipment is not available, the temperature/dew point fields are omitted.

a. Reporting Procedures for Temperature. The temperature must be entered as two digits to the nearest whole degree Celsius (C). Sub-zero temperatures must be prefixed with an M (minus). For example, a temperature of 4 degrees Celsius with a dew point of -2°C is coded as 04/M02. See Paragraph 3.9, Rounding Off Numbers for rounding off procedures. A temperature of -0.5°C must be reported as M00 to indicate that the actual temperature is below zero but rounded to zero.

b. Reporting Procedures for Dew Point. The dew point temperature must be entered as two digits to the nearest whole degree Celsius. Sub-zero dew point temperatures must be prefixed with an M. When the dry-bulb temperature is -34.4°C or below, the dew point must be reported as unavailable. For example, when the temperature is -36, it will be reported as M36/.

6.11. Procedures for Altimeter Setting (See Chapter 12). The observer must use an ASI, DASI, SAWS, SWS, or any other altimeter setting source approved by the FAA that meets altimeter and comparison check requirements of the latest version of FAA Order JO 7210.3, Facility Operation and Administration.

a. On an ASOS/AWOS-C, if the altimeter setting is missing, enter the Altimeter setting reading from the approved backup source into the Altimeter field on the OID. The altimeter will need to be re-entered for each weather report until a technician resets and calibrates the pressure sensors.

b. If performing manual weather observations, use the readings from the approved backup source when preparing the METAR/SPECI for transmission.

Table 6-3: Automated System without SPECI Capability Backup Observation Examples

Automated system without SPECI capability observation with all sensors fully operational and no observer or augmenter on duty:
METAR JHW 011255Z AUTO 30005KT 7SM BKN110 06/03 A2991 RMK AO1 SLP101
Automated system without SPECI capability observation with ceilometer and anemometer not operational and no backup observer on duty:
METAR JHW 011255Z AUTO 7SM 06/03 A2991 RMK AO1 SLP101
Automated system without SPECI capability observation with ceilometer and anemometer not operational and with backup observer on duty:
METAR JHW 011255Z 30005KT 7SM BKN110 06/03 A2991 RMK AO1 SLP101

Table 6-4: Automated System with SPECI Capability Backup Observation Examples

Automated system with SPECI capability observation with all sensors fully operational and no observer or augmenter on duty:
METAR KIAD 011255Z AUTO 30005KT 7SM BKN110 06/03 A2991 RMK AO2 SLP101
Automated system with SPECI capability observation with ceilometer and anemometer not operational and no backup observer on duty:
METAR KIAD 011255Z AUTO 7SM 06/03 RMK AO2 SLP101 $

Automated system with SPECI capability observation with ceilometer and anemometer not operational and with backup observer on duty:
METAR KIAD 011255Z 30005KT 7SM BKN110 06/03 A2991 RMK AO2 SLP101 $

6.12. Malfunctions/Outages. Automated weather observing systems have a self-monitoring capability. The systems should discontinue reporting the affected weather element when a given weather sensor is out of tolerance or fails. FAA personnel and NF-OBS providers must make appropriate maintenance notifications in the event of any equipment outages. Information on the issuance of NOTAMs is contained in FAA Order JO 7930.2.

6.13. Emergency/Evacuations. In the event of an Emergency/Evacuation, personal safety is the highest priority. All weather-observing stations (LAWRS, CWO, NF-OBS etc.) must develop or include in their existing facility contingency plan, notification and/or shutdown procedures of their weather observing responsibilities after they have evacuated. Facilities must ensure the appropriate maintenance personnel are notified for the type of automated weather system involved (NEMC/AOMC) and any appropriate NOTAMs are issued. If weather observers are unable to sign off automated weather equipment, request maintenance personnel to sign the observer off. Stations that have an approved alternate observation location/site with FAA approved backup equipment and visibility charts may conduct weather observations from the alternate location.

Chapter 7. Wind

7.1. Introduction. Wind is the horizontal motion of the air past a given point. Wind is measured in terms of velocity, a vector that includes direction and speed. The absence of apparent motion of the air is termed CALM. The direction and speed of the wind should be measured in an unsheltered, unobstructed area. This will avoid, to a large degree, the measuring of wind directions and speeds disturbed by local obstructions and will result in the reporting of winds more representative of the general weather patterns and more representative for aircraft operations.

7.2. Definitions

a. Direction of Wind. Wind direction is defined as the direction, in tens of degrees, from which the wind is blowing.

b. Gust. A gust is a rapid fluctuation in wind speed with a variation of 10 knots or more between peaks and lulls. The wind speed data for the most recent 10 minutes must be examined to evaluate the occurrence of gusts.

c. Hourly Peak Wind Speed. Peak wind is the highest instantaneous wind speed over 25 knots, recorded since the last METAR report.

d. Magnetic Variation. Magnetic variation is the difference in degrees between true north and magnetic north. It is either "east" or "west" according to whether the compass needle points to the east or west of the agonic line.

e. Speed of Wind. Wind speed is the rate of horizontal flow of air past a given point, measured in knots.

f. Wind. As used in this chapter, wind is the horizontal motion of the air past a given point.

g. Wind Shift. Wind shift is a term applied to a change in wind direction of 45 degrees or more, which takes place in less than 15 minutes and has sustained winds of 10 knots or more throughout the wind shift.

7.3. Observing, Determining, and Reporting Procedures. Wind direction, speed, and gusts must be determined at all stations. When available, FAA approved wind equipment (e.g. LLWS, WME, F-420, SAWS, SWS) must be used to determine the wind.

7.4. Wind Direction. The observer must determine the wind direction by averaging the observed direction over a 2-minute interval when direct-reading dials are used. Wind direction must be reported in all observations. In all observations transmitted long-line, direction must be reported in tens of degrees with reference to true north. The format for reporting wind direction in such observations is given in Paragraph 13.10, Wind Group ((dddff(f)Gfmfm(fm)KT)_(dndndnVdxdxdx)). For local use, wind direction must be reported in tens of degrees with reference to magnetic north.

NOTE: Local ATC displays of wind direction are always in reference to magnetic north. Direction must be converted to true north for observational purposes.

7.5. Estimating Wind Direction. At facilities where FAA approved instruments are not available for determining wind direction, the observer must estimate the direction by observing the wind cone or tee, movement of twigs, leaves, smoke, etc., or by facing into the wind in an unsheltered area. When estimating wind direction, the observer must note that even small obstacles may cause variations in the wind direction. The observer must not use the movement of clouds in estimating the surface wind direction regardless of how low the clouds are.

7.6. Variable Wind Direction. The wind direction may be considered variable if, during the 2-minute evaluation period, the wind speed is 6 knots or less. Also, the wind direction must be considered variable if, during the 2-minute evaluation period, it varies by 60 degrees or more when the average wind speed is greater than 6 knots. The format for reporting variable wind direction is given in Paragraphs 13.10b. and c.

7.7. Wind Shifts

a. The wind data must be examined to determine the occurrence of a wind shift. A wind shift is indicated by a change in wind direction of 45 degrees or more in less than 15 minutes with sustained wind speeds of 10 knots or more throughout the wind shift. Wind shifts are normally associated with some or all of the following phenomena characteristic of a cold-front passage:

(1) Gusty winds shifting clockwise in the Northern Hemisphere.

(2) Rapid drop in dew point.

(3) Rapid drop in temperature.

(4) Rapid rise in pressure.

(5) In summer: lightning, thunder, heavy rain, and hail.

(6) In winter: Frequent rain or snow showers

b. A SPECI must be taken after a wind shift occurs. A remark reporting the wind shift and the time the wind shift occurred must be included in the observation. A wind shift must always be reported when it is observed. When the shift is believed to be associated with a frontal passage, the observer must report FROPA in the remarks section immediately after the shift begins. When a SPECI report containing a wind shift is not given long-line dissemination, the observer must include the wind shift data in the remarks section of the next transmitted report. The format for the remark is given in Paragraph 13.23, Wind Shift (WSHFT_(hh)mm).

7.8. Wind Speed. If possible, the average wind speed should not be determined during a peak or a lull in gusty winds or squalls. The wind speed must be determined by averaging the speed to the nearest knot over a 2-minute period. Wind speed must be reported in all observations and must always be reported in knots. The format for reporting wind speed is given in Paragraph 13.10, Wind Group ((dddff(f)Gfmfm(fm)KT)_(dndndnVdxdxdx)).

7.9. Estimating Wind Speed. The observer must use the Beaufort scale, Table 7-1: Estimating Wind Speed, to estimate wind speeds if instruments are out of service.

Table 7-1: Estimating Wind Speed

WIND EQUIVALENT -- BEAUFORT SCALE	
KTS	**Specifications**
<1	Calm; smoke rises vertically
1-3	Direction of wind shown by smoke drift not by wind vanes
4-6	Wind felt on face; leaves rustle; vanes moved by wind
7-10	Leaves and small twigs in constant motion; wind extends light flag
11-16	Raises dust, loose paper; small branches moved
17-21	Small trees in leaf begin to sway; crested wavelets form on inland waters
22-27	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty
28-33	Whole trees in motion; inconvenience felt walking against the wind
34-40	Breaks twigs off trees; impedes progress
41-47	Slight structural damage occurs
48-55	Trees uprooted; considerable damage occurs
56-71	Widespread damage

7.10. Wind Character (Gusts). Wind character may be determined from direct-reading dials. When a gust is detected within 10 minutes before an observation, the character of the wind must be reported in the body of the observation. The format for reporting wind gusts is given in Paragraph 13.10a.

7.11. Peak Wind Speed. The peak wind speed must be the highest instantaneous speed, greater than 25 knots, observed by automated stations only. Peak wind data must be reported in the remarks section of the next routine METAR report whenever the peak wind speed exceeds 25 knots. The format for the remark is given in Paragraph 13.22, Peak Wind (PK WIND_ddff(f)/(hh)mm) .

7.12. Calm Wind. When no motion of the air is detected (<1KT, see Table 7-1), the wind must be reported as calm; that is, the direction and speed must be reported as 00000KT. The format for reporting calm winds is given in Paragraph 13.10d.

7.13. Conversion of True and Magnetic Winds. To convert wind direction from degrees with respect to true north to degrees with respect to magnetic north, or vice versa, the observer must obtain the local magnetic variation from an aeronautical chart and proceed as follows:

a. To convert from true to magnetic wind:

(1) Add westerly variation to true direction.

(2) Subtract easterly variation from true direction.

b. To convert from magnetic to true direction:

(1) Add easterly variation to magnetic direction.

(2) Subtract westerly variation from magnetic direction.

EXAMPLE: At ABC Airport, the magnetic variation is 10º West. The local wind indicator is reading 250º (magnetic). When transmitting the wind direction in an observation, because the magnetic variation is 10º West, the observer should subtract 10º to transmit a direction of 240º (true).

NOTE: Local displays of wind direction are always in reference to magnetic north. Automated weather observing systems also show direction with respect to magnetic north locally (when the AUX/WX page is displayed), but adjust wind direction to "true" for transmission.

Chapter 8. Visibility

8.1. Introduction. This chapter presents procedures and practices for measuring and recording visibility. All visibilities referred to in this chapter are horizontal visibilities. An automated instrumentally-derived visibility value is a sensor value converted to an appropriate visibility value using standard algorithms and is considered representative of the visibility in the vicinity of the airport runway complex. A manually observed visibility value is obtained using the "prevailing visibility" concept.

8.2. Definitions

a. Prevailing Visibility. Prevailing visibility is the greatest visibility equaled or exceeded throughout at least half the horizon circle, which does not necessarily have to be continuous. This is the visibility that is considered representative of visibility conditions at the station.

b. Sector Visibility. Sector visibility is the visibility in a specified direction that represents at least a 45 degree arc (portion) of the horizon circle.

c. Surface Visibility. The prevailing visibility determined from the usual point of observation is the surface visibility.

d. Tower Visibility. Tower visibility is the prevailing visibility determined from the airport traffic control tower at locations that also report the surface visibility.

e. Variable Prevailing Visibility. Variable prevailing visibility is a condition where the prevailing visibility is less than 3 miles and rapidly increases and decreases by 1/2 statute mile or more during the period of observation.

f. Visibility. Visibility is a measure of the horizontal opacity of the atmosphere at the point of observation and is expressed in terms of the horizontal distance at which a person should be able to see and identify specific objects.

g. Visibility Markers. Visibility markers are dark or nearly dark objects viewed against the horizon sky during the day or unfocused lights of moderate intensity (about 25 candela) during the night.

h. Runway Visual Range (RVR). The RVR is an estimate of the maximum distance at which the runway, or the specified lights or markers delineating it, can be seen from a position above a specific point on its centerline. This value is normally determined by visibility sensors or transmissometers located alongside and higher than the center line of the runway. RVR is used operationally to assess whether visibility conditions are good enough to allow a particular operation, such as an instrument landing.

i. Designated RVR Runway. The designated RVR runway is the runway officially designated by the airport authority for reporting RVR values. The designated RVR runway is typically the runway with the lowest approach minimums.

j. Long-line RVR. The RVR reported in surface observations and disseminated long-line is the highest RVR achievable for the measured visibility at the touchdown zone of a specified runway. Typically, this is the RVR calculated for the highest and lowest values of visibility over the previous 10 minutes at runway light intensity step five. This is an automated report. When the automated interface fails, RVR will not be reported long-line by weather observers/controllers.

8.3. Visibility Standards. Visibility may be determined at either the surface, the tower level, or both. If visibility observations are made from just one level (for example, the airport traffic control tower), that level must be considered the "usual point of observation," and that visibility must be reported as the surface/prevailing visibility. If visibility observations are made from both levels, the lower value (if less than 4 miles) must be reported as prevailing visibility in the body of the METAR, and the other value must be a remark.

8.4. Unit of Measure. Visibility must be reported in statute miles or fractions thereof. See Table 8-1: Reportable Visibility Values.

Table 8-1: Reportable Visibility Values

Source of Visibility Report							
Automated[1]			**Manual**				
M1/4	2	9	0	5/8	1 5/8	4	12
1/4	2 1/2	10	1/16	3/4	1 3/4	5	13
1/2	3		1/8	7/8	1 7/8	6	14
3/4	4		3/16	1	2	7	15
1	5		1/4	1 1/8	2 1/4	8	20
1 1/4	6		5/16	1 1/4	2 1/2	9	25
1 1/2	7		3/8	1 3/8	2 3/4	10	30
1 3/4	8		1/2	1 1/2	3	11	35[2]

[1] Visibility values of 0, 1/16, and 1/8 can be augmented in the visibility field of automated systems with SPECI capability to meet service level requirements.
[2] Further increments of 5SM may be reported, that is, 40, 45, 50, etc.

8.5. Observing Aids for Visibility. Charts, lists, or other positive means of identifying lights or objects used as visibility markers must be posted near the observer's position. At local direction, separate lists or charts can be used for daytime and nighttime markers. In any case, the markers must be clearly identified as to whether they are daytime or nighttime markers. The observing station is responsible for creating local observing aids for visibility. See FAA JO 7210.3 for guidance on developing visibility charts or lists.

8.6. Selection of Visibility Markers. Insofar as possible, markers of the type described in Paragraph 8.2g should be used for determining visibility markers to construct visibility aids. The red or green course lights, television and radio tower obstruction lights etc., may be used as nighttime visibility markers. Because of their intensity, focused lights such as airport beacons must not be used as markers.

8.7. Dark Adaptation. Before taking visibility observations at night, the observer should spend as much time as practical in the darkness to allow the eyes to become accustomed to the limited light.

8.8. Evaluating Visibility. Visibility must be evaluated as frequently as practical. Using all available visibility markers, the observer must determine the greatest distances that can be seen in all directions around the horizon circle. When the visibility is greater than the distance to the farthest markers, the observer must estimate the greatest distance that can be seen in each direction. This estimate must be based on the appearance of all visibility markers. If they are visible with sharp outlines and little blurring of color, the visibility is much greater than the distance to them. If a marker can barely be seen and identified, the visibility is about the same as the distance to the marker.

8.9. Evaluating Prevailing Visibility. After visibilities have been determined around the entire horizon circle (Paragraph 8.8), the observer must resolve them into a single value for reporting purposes. To do this, the observer must use either the greatest distance that can be seen throughout at least half the horizon circle, or if the visibility is varying rapidly during the time of observation, use the average of all observed values. The prevailing visibility must be reported in all observations.

8.10. Evaluating Sector Visibility. When the visibility is not uniform in all directions, the horizon circle must be divided into arcs (sectors) that have uniform visibility and represent at least one eighth of the horizon circle (45 degrees). The visibility that is evaluated in each sector is sector visibility. Sector visibility must be reported in the remarks section of weather observations when it differs from the prevailing visibility by one or more reportable values and either the prevailing or sector visibility is less than 3 miles or considered operationally significant. The format for the remark is given in Paragraph 13.26, Sector Visibility (VIS_[DIR]_vvvvv).

8.11. Evaluating Variable Visibility. If the prevailing visibility rapidly increases and decreases by 1/2 mile or more during the time of the observation, and the average prevailing visibility is less than 3 miles, the visibility is considered to be variable. When variable visibility conditions are observed, the minimum and maximum visibility values observed must be reported in the remarks section. Variable visibility must not be reported in the body of the report. The format for the remark is given in Paragraph 13.25, Variable Prevailing Visibility (VIS_vnvnvnvnvnVvxvxvxvxvx).

8.12. Reporting Visibility Values. The reportable values for manual visibility observations are listed in Table 8-1. If the visibility falls halfway between two reportable values, the lower value must be reported.

8.13. Control Tower Visibility Observations and Actions at Collocated Sites. At sites with a dedicated surface observer, control tower personnel certified to take visibility observations must:

a. Notify the surface observer when they observe tower prevailing visibility to decrease to less than, or increase to equal or exceed, 4 miles.

b. When the prevailing visibility at the tower or the surface is less than 4 miles, report all changes of one or more reportable values to the surface observer.

c. As required by FAA directives, use the lower of either the tower or the surface observer visibility for aircraft operations.

8.14. Surface Observer Action at Stations with Control Tower.

a. Notify the tower as soon as possible, whenever the prevailing visibility at the surface decreases to less than, or increases to equal or exceed, 4 miles.

b. Re-evaluate the prevailing visibility, as soon as practical, upon initial receipt of a differing control tower value, and upon receipt of subsequent reportable changes at the control tower level.

Chapter 9. Weather Phenomena

9.1. Introduction. This chapter contains instructions for identifying, recording, and reporting weather. For the purpose of this order, weather is a category of atmospheric phenomena that includes tornadoes, funnel clouds, waterspouts, thunderstorms, squalls, precipitation, obscurations, and other phenomena. The types of weather phenomena reported vary according to the type of station. Weather phenomena may be evaluated instrumentally, manually, or through a combination of instrumental and manual methods.

9.2. Precipitation. Precipitation is any of the forms of water particles, whether liquid or solid, that fall from the atmosphere and reach the ground. The types of precipitation reported in surface observations are:

a. Liquid Precipitation. Liquid precipitation is any form of precipitation that does not fall as frozen precipitation and does not freeze upon impact. Types of liquid precipitation are:

(1) Drizzle (DZ). Drizzle is defined as fairly uniform precipitation composed exclusively of fine drops of liquid water particles (diameter less than 0.02 inch/0.5 mm) very close together. Drizzle appears to float, following air currents, although unlike fog droplets, it falls to the ground.

(2) Rain (RA). Rain is defined as precipitation of liquid water particles, either in the form of drops larger than 0.02 inch/0.5 mm., or smaller drops which, in contrast to drizzle, are widely separated.

b. Freezing Precipitation. Any form of precipitation that freezes upon impact and forms a glaze on the ground or on exposed objects is called freezing precipitation. Types of freezing precipitation are:

(1) Freezing Drizzle (FZDZ). Freezing drizzle is drizzle that freezes upon impact with the ground or other exposed objects.

(2) Freezing Rain (FZRA). Freezing rain is rain that freezes upon impact with the ground or other exposed objects.

c. Frozen Precipitation. Frozen precipitation is any form of precipitation that reaches the ground in solid form. Types of frozen precipitation are:

(1) Snow (SN). Snow is composed of crystals, mostly branched in the form of six-pointed stars. At temperatures higher than about -5 degrees Celsius, the crystals are generally clustered to form snowflakes.

(2) Snow Pellets (GS). Snow pellets are defined as white, opaque grains of ice. The pellets are round or sometimes conical. Diameters range from about 0.08 to 0.2 inch (2 to 5 mm). Snow pellets are brittle and easily crushed. When they fall on hard ground, they bounce and often break up.

(3) Snow Grains (SG). Snow grains are defined as precipitation of very small, white, opaque grains of ice. When the grains hit hard ground, they do not bounce or shatter. They usually fall in small quantities, mostly from stratus type clouds, and never as showers.

(4) Hail (GR). Hail is precipitation in the form of small balls or other pieces of ice falling separately or frozen together in irregular lumps. All observations concerning standard hail (GR) must report the diameter of the largest hailstones in the remarks section in 1/4 inch increments (e.g. GR 1 1/4). When small hail less than 1/4 inch in size is occurring, GR is reported in the body of the report and the hailstone size is reported in Remarks as "GR LESS THAN 1/4".

(5) Ice Pellets (PL). Ice pellets are transparent or translucent pellets of ice, which are round or irregular, rarely conical, and which have a diameter of 0.2 inch/5 mm or less. The pellets usually rebound when striking hard ground, and make a sound on impact. There are two main types:

i. One type is composed of hard grains of ice consisting of frozen raindrops, or largely melted and refrozen snowflakes (formerly sleet). This type falls as continuous or intermittent precipitation.

ii. The second type consists of snow encased in a thin layer of ice, which has formed from the freezing, either of droplets intercepted by the pellets, or of water resulting from the partial melting of the pellets. This type falls as showers.

(6) Ice Crystals (IC). Ice crystals are unbranched and fall in the form of needles, columns, or plates. (Snow crystals are branched.) These are often so tiny that they seem to be suspended in the air. They may fall from a cloud or from clear air. The crystals are visible mainly when they glitter in the sunshine or other bright light. They may then produce a luminous pillar or other optical phenomena. This hydrometeor (rarely more than the lightest precipitation), which is frequent in Polar Regions, occurs only at very low temperatures in stable air masses.

d. Unknown Precipitation (UP). Unknown precipitation is the term used by automated weather observing systems to characterize precipitation of an unknown type that cannot be identified any further by the system.

9.3. Obscurations. An obscuration is any phenomenon in the atmosphere, other than precipitation, that reduces horizontal visibility. Except where noted, obscurations are reported when the prevailing visibility is less than 7 miles or considered operationally significant. The types of obscurations reported in surface observations are:

a. Blowing Dust (BLDU). Dust consists of fine particles of earth or other matter raised or suspended in the air by a wind that may have occurred at or far away from the station. Blowing dust is dust raised by the wind to a height of 6 feet or more, sufficient to restrict horizontal visibility. When visibility decreases to 5/8 statute miles (SM) or less, this becomes a duststorm (DS). (See Paragraph 9.4g.)

b. Blowing Sand (BLSA). Blowing sand is sand raised by the wind to a height of 6 feet or more, sufficient to restrict horizontal visibility. When visibility decreases to 5/8 SM or less, this becomes a sandstorm (SS). (See Paragraph 9.4f.)

c. Blowing Snow (BLSN). Blowing snow is made up of snow particles raised by the wind to a height of 6 feet or more, sufficient to restrict horizontal visibility.

d. Spray (PY). Spray is water droplets torn by the wind from a substantial body of water, generally from the crests of waves, and carried up a short distance into the air.

e. Blowing Spray (BLPY). Blowing spray is made up of water droplets torn by the wind from a body of water, generally from the crest of waves, and carried up into the air to a height of 6 feet or more in such quantities that they reduce the horizontal visibility.

f. Widespread Dust (DU). Widespread Dust gives a tan or gray tinge to distant objects. The sun's disk is pale and colorless, or has a yellow tinge through dust.

g. Fog (FG). Fog is a visible aggregate of minute water particles (droplets) that is based at the earth's surface and reduces horizontal visibility to less than 5/8 SM, and unlike drizzle, does not fall to the ground.

h. Freezing Fog (FZFG). Freezing fog is a suspension of numerous minute ice crystals in the air, or water droplets at temperatures below 0º C, and visibility less than 5/8 SM, based at the earth's surface. A report of freezing fog does not necessarily mean that ice is forming on surfaces.

i. Haze (HZ). Haze is made up of extremely small, dry particles suspended in the air, invisible to the naked eye and sufficiently numerous to give the air an opalescent appearance. This phenomenon resembles a uniform veil over the landscape that subdues all colors. Dark objects viewed through this veil tend to have a bluish tinge while bright objects, such as the sun or distant lights, tend to have a dirty yellow or reddish hue. When haze is present and the sun is well above the horizon, its light may have a peculiar silvery tinge. Haze particles may be composed of a variety of substances; for example, dust, salt, residue from distant fires or volcanoes, and/or pollen. The particles, generally, are well diffused through the atmosphere.

j. Mist (BR). Mist is a visible aggregate of minute water particles suspended in the atmosphere that reduces visibility to less than 7 SM, but greater than or equal to 5/8 SM, and unlike drizzle, does not fall to the ground.

k. Shallow (Ground) Fog (MIFG). Shallow ground fog is fog in which the visibility at 6 feet above the ground is 5/8 SM or more and the apparent visibility in the fog layer is less than 5/8 SM.

l. Smoke (FU). Smoke is defined as small particles produced by combustion suspended in the air. This phenomenon may be present either near the Earth's surface or in the free atmosphere. When viewed through smoke, the disk of the sun at sunrise and sunset appears very red. The disk may have an orange tinge when the sun is above the horizon. Evenly distributed smoke from distant sources generally has a light grayish or bluish appearance. A transition to haze may occur when smoke particles have traveled great distances; for example, 25 to 100 miles or more, and when the larger particles have settled out and the remaining particles have become widely scattered through the atmosphere.

m. Volcanic Ash (VA). Volcanic ash consists of fine particles of rock powder that originate from a volcano and that may remain suspended in the atmosphere for long periods. Volcanic ash is always reported when observed, no matter what the value of prevailing visibility.

9.4. Other Phenomena

a. Well-Developed Dust/Sand Whirls (PO). Particles of dust or sand, sometimes accompanied by small litter, raised from the ground in the form of a whirling column of varying height with a small diameter and an approximately vertical axis.

b. Squalls (SQ). A strong wind characterized by a sudden onset, in which the wind speed increases by at least 16 knots and is sustained at 22 knots or more for at least 1 minute.

c. Tornado (+FC). A tornado is a violent, rotating column of air touching the ground. It forms a pendant, usually from a cumulonimbus cloud, nearly always starts as a funnel cloud, and is accompanied by a loud roaring noise.

d. Funnel Cloud (FC). A funnel cloud is a violent, rotating column of air, which does not touch the surface. It is usually in the form of a pendant from a cumulonimbus cloud.

e. Waterspout (+FC). A waterspout is a violent, rotating column of air that forms over a body of water, and touches the water surface.

f. Sandstorm (SS). A sandstorm is particles of sand that are carried aloft by a strong wind. The sand particles are mostly confined to the lowest ten feet, and rarely rise more than 50 feet above the ground. A sandstorm is reported when visibility is reduced to between 5/8 and 5/16 SM. If visibility is less than 5/16 SM, then heavy sandstorm (+SS) is reported.

g. Duststorm (DS). A duststorm is a severe weather condition characterized by strong winds and dust-filled air over an extensive area. A duststorm is reported when visibility is reduced to between 5/8 and 5/16 SM. If visibility is less than 5/16 SM, then heavy duststorm (+DS) is reported.

9.5. Qualifiers. Present weather qualifiers fall into two categories: qualifiers and descriptors. Qualifiers may be used in various combinations to describe weather phenomena. Details on the coding of qualifiers are contained in Chapter 13, Coding, and Appendix E. METAR User Aids.

a. Qualifiers.

(1) Intensity. The intensity qualifiers are: Light (-), Moderate (No Entry), Heavy (+).

(2) Proximity. The proximity qualifier is "vicinity" (VC).

b. Descriptors. The descriptors are: Shallow (MI), Partial (PR), Patches (BC), Low Drifting (DR), Blowing (BL), Shower or Showers (SH), Thunderstorm (TS), and Freezing (FZ).

9.6. Order for Reporting Multiple Types of Weather and Obscurations. When more than one type of weather and/or obscuration is reported at the same time, they must be reported in the following order:

a. Tornado, funnel cloud, or waterspout.

b. Thunderstorms, with or without associated precipitation.

c. Weather and obscurations in order of decreasing predominance, for example, the most dominant type is reported first.

d. From left to right in Table 9-1: Present Weather.

Table 9-1: Present Weather

Qualifier		Weather Phenomena		
Intensity or Proximity 1	**Descriptor 2**	**Precipitation 3**	**Obscuration 4**	**Other 5**
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Well-Developed Dust/Sand Whirls
Moderate[1]	**PR** Partial	**RA** Rain	**FG** Fog	**SQ** Squalls
+ Heavy	**BC** Patches	**SN** Snow	**FU** Smoke	**FC** Funnel Cloud
				Tornado[3]
				Waterspout[3]
VC In the Vicinity[2]	**DR** Low Drifting	**SG** Snow Grains	**VA** Volcanic Ash	**SS** Sandstorm
	BL Blowing	**IC** Ice Crystals	**DU** Widespread Dust	**DS** Duststorm
	SH Showers	**PL** Ice Pellets	**SA** Sand	
	TS Thunderstorm	**GR** Hail	**HZ** Haze	
	FZ Freezing	**GS** Snow Pellets	**PY** Spray	
		UP Unknown Precipitation[4]		

General Note: The weather groups must be constructed by considering columns 1 to 5 in sequence, that is, intensity, followed by description, followed by weather phenomena, for example, heavy rain shower(s) is coded as +SHRA.

[1] To denote moderate intensity, no entry or symbol is used.
[2] See Paragraph 9.7 for vicinity definition and paragraph 13.13(1) for usage.
[3] Tornadoes and waterspouts are coded as +FC.
[4] "UP" is only used by automated weather observing systems.

9.7. Rules for Phenomena Not Occurring at the Point of Observation

a. Weather occurring at the airport must be coded in the body of the report. Vicinity is defined as between 5 and 10 SM from the usual point of observation for all, but precipitation and up to 10 SM from the usual point of observation for precipitation. (See Paragraph Chapter 9.8 below.) Distant is defined as greater than 10 SM from the usual point of observation. With the exception of volcanic ash, low drifting dust, low drifting sand and low drifting snow, an obscuration must be coded in the body of the report if the surface visibility is less than 7 miles or considered operationally significant. Volcanic ash must always be coded when observed. Shallow fog (MIFG), Patches of fog (BCFG), and Partial fog (PRFG) may be reported when visibility is equal to or greater than 7 miles. Weather and/or obscurations observed, but not occurring at the station or in the vicinity must be coded in the remarks section.

b. If precipitation is not occurring at the station or airport, but is within 10 miles of the usual point of observation, the phenomena must be reported in the body of the report as "showers in the vicinity" (VCSH). For other than precipitation, (VCFG, VCBLSN, etc.), vicinity is 5 SM to 10 SM. Examples of how to use VC correctly are included in Paragraph 13.13(1) and Appendix E. METAR User Aids.

c. If the phenomenon is not occurring at the usual point of observation, but is affecting part of the operating areas of the airport, the phenomenon may be reported in remarks with the phrase “at the airport” (AT AP) appended, for example, SHRA AT AP. "At the airport" includes runways, taxiways, ramps, terminals, and/or adjacent areas. Buffer zones around the operating areas of the airport are not included in this area.

d. Weather phenomena beyond 10 SM of the point of observation must be coded as distant (DSNT) followed by the direction from the station. For example, lightning 25 SM west of the station would be coded as LTG DSNT W.

9.8. Observing and Reporting Precipitation. The type, intensity, and character of precipitation in any form must be reported in the body of the weather report whenever it is observed to occur at the station. Precipitation observed at a distance from the station must be reported in the remarks section. At LAWRS, the reporting of precipitation observed at a distance is not required, but may be done. To report and document precipitation, the observer must determine:

a. Time of beginning, ending, and changes in intensity (NA LAWRS)

b. Type, character, and intensity

9.9. Beginning and/or Ending Precipitation (NA LAWRS). The observer must note to the nearest minute the time that precipitation of any type is observed to begin and end. These times must be reported in remarks in the next METAR observation. If beginning or ending time for a precipitation type such as: hail, freezing precipitation, or ice pellets is the reason for issuing a SPECI, the beginning/ending time must be included in that SPECI report and in the following METAR. Times for separate periods must be reported only if the intervening time of no

precipitation exceeds 15 minutes. Time data must be reported by identifying the type, using the appropriate symbol, followed by B for "began" or E for "ended," as appropriate, and the time in minutes past the hour; for example, RAB04SNB19RASNE43, meaning "rain began at 04, snow began at 19, and both types ended at 43 minutes past the hour."

9.10. Determining and Reporting the Type of Precipitation. The observer must determine and report the type of precipitation by using the definitions in this chapter. The observer must use the order described in Paragraph 9.6, Order for Reporting Multiple Types of Weather and Obscurations, to report precipitation.

9.11. Determining the Character of Precipitation. The observer must use the definitions in this section to determine the character of precipitation.

a. Continuous. If precipitation intensity changes, it changes gradually.

b. Intermittent. Precipitation stops and starts at least once within the hour preceding the observation and, if the precipitation intensity changes, it changes gradually.

c. Showery. Abrupt changes in precipitation intensity or the precipitation starts and stops abruptly. The SH code must only be appended to rain (RA), snow (SN), ice pellets (PL), snow pellets (GS), or hail (GR), for example, SHRA, SHSN, SHPL, SHGS, SHGR.

9.12. Precipitation Intensity. Intensity of precipitation is an indication of the amount of precipitation falling at the time of observation. It is expressed as light, moderate, or heavy. No intensity is assigned to hail or ice crystals. Each intensity is defined with respect to the type of precipitation occurring. The intensity of rain or freezing rain should be estimated using the guidelines given in Table 9-2: Estimating Intensity of Rain. The intensity of ice pellets should be estimated using the guidelines given in Table 9-3: Estimating Intensity of Ice Pellets. The intensity of rain or ice pellets may also be estimated by rate of fall as given in Table 9-4: Intensity of Rain or Ice Pellets Based on Rate of Fall. Table 9-5: Intensity of Snow or Drizzle Based on Visibility, on the other hand, is based on the visibility at the time of observation, and must be used to determine intensity of snow and drizzle. When more than one form of precipitation is occurring at a time or precipitation is occurring with an obscuration, the intensities determined must be no greater than that which would be determined if any of the forms were occurring alone. The intensity of precipitation must be reported using the symbols in Table 9-6: Precipitation Intensity Symbols. The intensity symbol must precede the precipitation symbol without any intervening space.

Table 9-2: Estimating Intensity of Rain

Intensity	Criteria
Light	From scattered drops that, regardless of duration, do not completely wet an exposed surface up to a condition where individual drops are easily seen.
Moderate	Individual drops are not clearly identifiable; spray is observable just above pavements and other hard surfaces.
Heavy	Rain seemingly falls in sheets; individual drops are not identifiable; heavy spray to height of several inches is observed over hard surfaces.

Table 9-3: Estimating Intensity of Ice Pellets

Intensity	Criteria
Light	Scattered pellets that do not completely cover an exposed surface, regardless of duration. Visibility is not affected.
Moderate	Slow accumulation on ground. Visibility reduced by ice pellets to less than 7 miles.
Heavy	Rapid accumulation on ground. Visibility reduced by ice pellets to less than 3 miles.

Table 9-4: Intensity of Rain or Ice Pellets Based on Rate of Fall

Intensity	Criteria
Light	Up to 0.10 inch per hour; maximum 0.01 inch in 6 minutes.
Moderate	0.11 inch to 0.30 inch per hour; more than 0.01 inch to 0.03 inch in 6 minutes.
Heavy	More than 0.30 inch per hour; more than 0.03 inch in 6 minutes.

Table 9-5: Intensity of Snow or Drizzle Based on Visibility

Intensity	Criteria
Light	Visibility > 1/2 mile.
Moderate	Visibility > 1/4 mile but ≤ 1/2 mile.
Heavy	Visibility ≤ 1/4 mile.

Table 9-6: Precipitation Intensity Symbols

Intensity	Precipitation Intensity Symbols
Light	-
Moderate	No symbol is assigned to moderate.
Heavy	+
No intensity is assigned to hail or ice crystals.	

9.13. Intensity of Snow, Snow Pellets, Snow Grains, Drizzle, and Freezing Drizzle. If any one of these phenomena occurs alone, Table 9-5: Intensity of Snow or Drizzle Based on Visibility, must be used to determine intensity on the basis of prevailing visibility. If occurring with other precipitation or obscurations, the intensity assigned must be no greater than that determined using visibility criteria if any of the above were occurring alone. With or without other obscuring phenomena, heavy snow (+SN) must not be reported if the visibility is greater than 1/4 mile and moderate snow (SN) must not be reported if the visibility is greater than 1/2 mile.

NOTE: Due to ASOS/AWOS-C software limitations, intensity for GS must be manually encoded into the RMK section as “GS LGT”, “GS MOD”, or “GS HVY”. Reporting of the intensity of GS will revert to the conventional method for precipitation intensity when ASOS upgrades are implemented (projected for October 2020).

9.14. Reporting Freezing Precipitation. A SPECI observation must be taken whenever freezing precipitation begins, ends, or changes intensity.

9.15. Beginning and/or Ending of Freezing Precipitation. The time freezing precipitation began and/or ended must be included in the remarks of the first observation after the event is first observed. If a SPECI report is initiated because of the beginning or ending of the freezing precipitation, the beginning and/or ending time must be included in the remarks section of that SPECI and in the following METAR. The time must be repeated in the remarks of the next METAR observation if not previously reported in a METAR observation.

9.16. Intensity of Freezing Precipitation

a. Freezing Drizzle. When freezing drizzle is occurring alone, determine the intensity by using Table 9-5: Intensity of Snow or Drizzle Based on Visibility, using visibility as the criterion. If occurring with other precipitation or obscurations, the intensity assigned must be no greater than that determined using visibility criteria as if freezing drizzle were occurring alone. Note that moderate drizzle reduces the visibility to less than or equal to 1/2 mile. Only if visibility meets this criteria, must moderate drizzle be reported. Likewise, heavy drizzle must be reported only if the visibility is less than or equal to 1/4 mile.

b. Freezing Rain. Table 9-2: Estimating Intensity of Rain, should be used to estimate the intensity of freezing rain.

9.17. Reporting Ice Pellets. A SPECI observation must be taken whenever ice pellets begin, end, or change intensity.

9.18. Beginning and/or Ending of Ice Pellets (NA LAWRS). The time ice pellets began and/or ended must be included in the remarks of the first observation after the event occurs. If a SPECI report is initiated because of the beginning or ending of the ice pellets, the beginning and/or ending time must be included in the remarks section of that SPECI. The times must be repeated again in the remarks of the next transmitted METAR observation if not previously reported in a METAR observation.

9.19. Intensity of Ice Pellets. The intensity of ice pellets must be estimated in accordance with Table 9-3: Estimating Intensity of Ice Pellets.

9.20. Reporting Precipitation Amounts (Automated). Amounts of precipitation are expressed in terms of vertical depth. Precipitation measurements are in inches, tenths of inches, or hundredths of an inch depending on the precipitation being measured (see Table 9-7: Units of Measure for Precipitation).

Table 9-7: Units of Measure for Precipitation

Type of Measurement	Unit of Measure
Liquid Precipitation	0.01 inch
Liquid Equivalent of Solid Precipitation	0.01 inch
Solid Precipitation	0.1 inch
Snow Depth	1 inch

9.21. Snowfall within Specified Periods (See Appendix F). If practicable, these measurements must be made on a surface that has been cleared of previous snowfall. If such a spot is not available, and snowboards are not in place, the observer must measure the total depth of snow and subtract the depth previously measured. When it is likely that melting and settling of the snow make such measurements of questionable value, they should be considered as estimated. If the previous snowfall has crusted, the new fall may be measured by permitting the end of the measuring stick to rest on the crust. If different falls of snow are mixed by drifting, the observer must measure the total depth of snow and subtract the previously measured depth. The remainder is the approximate depth of the new fall, which must be adjusted, if necessary, to correct for suspected melting, evaporation, and runoff. For example, if several snow showers occur between observations, and each melts before the following one occurs, the total snowfall for the period will be the sum of the maximum depth (measured or estimated) for each occurrence. Estimate the depth only when the maximum is considered to have occurred between scheduled observations, at a time impracticable for measuring depth. If snow melts as it lands, then a trace should be recorded.

9.22. Observing and Reporting Tornado, Waterspout, or Funnel Cloud. These phenomena must be reported in a SPECI observation when they are observed to begin, end, appear, or disappear.

a. Tornadic Activity Begins or Appears. In the body of the SPECI observation, insert **+FC** (for tornado or waterspout) or **FC** (for funnel cloud) at the beginning of the present weather group (see Paragraph 13.13, Present Weather Group (w'w')). Insofar as known, the following must be reported in the remarks section for any SPECI when a tornado, waterspout, or funnel cloud appears or begins (see Paragraph 13.20, Funnel Cloud for remarks format):

(1) Type of phenomenon, spelled out

(2) Time of beginning or appearance of the phenomenon, to the nearest minute (only the minutes are required if the hour can be inferred from the report time)

(3) Location and/or direction of the phenomenon from the station

(4) Direction toward which the phenomenon is moving (if unknown, enter MOV UNKN)

(5) Example of remarks for tornadic activity beginning: TORNADO B24 6 NE MOV UNKN

b. Tornadic Activity Ends or Disappears. The following must be reported in the remarks section for any SPECI when a tornado, waterspout, or funnel cloud ends or disappears from sight (see Paragraph 13.20, Funnel Cloud, for remarks format):

(1) Type of phenomenon, spelled out.

(2) Time of ending or disappearance of the phenomenon, to the nearest minute (only the minutes are required if the hour can be inferred from the report time).

Example of remarks for a funnel cloud disappearing from site: FUNNEL CLOUD E35.

NOTE: The above elements must also appear in the remarks section of the next METAR observation if not previously reported in a METAR observation.

9.23. Observing and Reporting Thunderstorms

a. Reports concerning thunderstorms must be made whenever a thunderstorm begins or ends. In the body of the observation, TS may be coded by itself or with precipitation types such as RA, SN, PL, GS, or GR. The intensity attached to thunderstorms must be the intensity ascribed to the precipitation as described in Paragraph 13.13(4). In the remarks section, the report must include the following:

(1) If physically observed, type and frequency of lightning

(2) Time of beginning, ending, or both, to the nearest minute

(3) Location, in accordance with the rules given in Paragraph 9.7, Rules for Phenomena Not Occurring at the Point of Observation or 13.31, Thunderstorm Location (TS_LOC_(MOV_DIR)).

(4) Direction toward which the storm is moving (omit if unknown)

Table 9 8, presents the types and frequencies of lightning to be reported. The above remarks must be updated and included with the time of beginning, ending, or both on the next transmitted METAR observation if not previously reported in a METAR observation. The format for the remarks is given in Paragraphs 13.29, Beginning and Ending of Precipitation (w'w'B(hh)mmE(hh)mm) (NA LAWRS);13.30, Beginning and Ending of Thunderstorms (TSB(hh)mmE(hh)mm); 13.31, Thunderstorm Location (TS_LOC_(MOV_DIR)); and 13.32, Hailstone Size (GR_[size]).

Table 9-8: Type and Frequency of Lightning

Type of Lightning		
Type	Contraction	Definition
Cloud-ground	CG	Lightning occurring between cloud and ground.
In-cloud	IC	Lightning that takes place within the thunder cloud.
Cloud-cloud	CC	Streaks of lightning reaching from one cloud to another.
Cloud-air	CA	Streaks of lightning passing from a cloud to the air, but do not strike the ground
Frequency of Lightning		
Frequency	Contraction	Definition
Occasional	OCNL	Less than 1 flash/minute.
Frequent	FRQ	About 1 to 6 flashes/minute.
Continuous	CONS	More than 6 flashes/minute.

9.24. Beginning and/or Ending of a Thunderstorm. A thunderstorm is considered to begin at the station when thunder is heard, overhead lightning is observed and the local noise level is such as might prevent hearing thunder, or lightning is detected by an automated sensor within 10 miles of the airport. A thunderstorm is considered to have ended 15 minutes after the last occurrence of any of the above criteria. When the time of beginning or ending of a thunderstorm is reported in the remarks section of a SPECI observation, it need not be reported again until the next transmitted METAR observation if not previously reported in a METAR observation. If previously reported in a METAR observation, the time need not be reported again.

9.25. Reporting Hail. Hail must be reported in an observation whenever it begins or ends, and in all observations taken while it is occurring. Times of beginnings and endings must be included in the remarks section (NA LAWRS). All observations concerning standard hail (GR) must report the diameter of the largest hailstones in the remarks section in 1/4 inch increments (NA LAWRS). No intensity must be assigned to hail. The format for reporting hail is given in Paragraph 13.32, Hailstone Size (GR_[size]). Hail less than 1/4 inch in size is coded in Remarks as “GR LESS THAN 1/4”.

9.26. Beginning and/or Ending of Hail. If SPECI is because of hail, then begin/end time must be recorded in the remarks. When the time of beginning or ending of hail is reported in the remarks section of a SPECI observation, it need not be recorded again until the next transmitted METAR observation if not previously reported in a METAR observation. If previously reported in a METAR observation, the time need not be reported again.

9.27. Reporting Lightning. When lightning is physically observed and not already reported by an automated sensor, the type, frequency, and location must be reported in the remarks section of METAR and SPECI observations. The format for reporting lightning is given in Paragraph 13.28.

a. Lightning Frequency (Frequency_LTG(Type)_[LOC]). Table 9-8 presents definitions for the type and frequency of lightning.

b. Lightning (LTG). Lightning is defined as any of the various forms of visible electrical discharge produced by thunderstorms. Four main types of lightning can be distinguished:

(1) Cloud to ground lightning **(CG)** is lightning occurring between a cloud and the ground.

(2) In-cloud discharges **(IC)** are a type of lightning that takes place within a thundercloud.

(3) Cloud to cloud discharges **(CC)** are streaks of lightning reaching from one cloud to another.

(4) Air Discharges **(CA)** are streaks of lightning, which pass from a cloud to the air, but do not strike the ground.

9.28. Reporting Squalls. A squall is reported in the body of a METAR or SPECI only when there is a sudden increase in wind speed of at least 16 knots, the speed rises to 22 knots or more, and lasts for at least 1 minute.

9.29. Observing and Reporting Procedures for Obscurations. The following paragraphs present observing and reporting procedures for various types of obscurations when reference is made to phenomena not occurring at the station location, the rules given in Paragraph 9-7, Rules for Phenomena Not Occurring at the Point of Observation, must apply.

9.30. Observing Obscurations. Obscurations must be determined by observing the prevailing conditions at the station (usual point of observation) in accordance with the definitions of the various types of obscurations given in Paragraph 9.3, Obscurations.

9.31. Reporting Obscurations. With the exception of volcanic ash, low drifting dust, low drifting sand, and low drifting snow, an obscuration must be coded in the body of the report only if the surface visibility is less than 7 miles or considered operationally significant. Volcanic ash must always be coded when observed. MIFG, BCFG and PRFG may be reported when visibility is equal to or greater than 7 miles. The reporting format is given in Paragraphs 13.13, Present Weather Group (w'w'). If these conditions are not met, but an obscuration is observed that is considered operationally significant, it must be reported in the remarks section as not at the station. If more than one type of obscuration is occurring at the same time, they must be reported in order of decreasing estimated predominance.

9.32. Special Procedures for Volcanic Ash. Volcanic ash (VA) must be reported in the body of the report whenever it is observed. Reporting volcanic ash is different from other obscurations because volcanic ash is reported even if the visibility is greater than 7 miles.

9.33. Operationally Significant Remarks for Obscurations. Any occurrence of an obscuration, which the observer judges to be operationally significant and not reported elsewhere in the observation should be reported in the remarks section. Some examples of desirable items to be entered in the remarks section are fog dissipating or increasing, smoke drifting over the field, drifting snow, obscurations at a distance from, but not at the station.

Chapter 10. Sky Condition

10.1. Introduction. The instructions in this chapter relate to the state or appearance of the sky. Sky condition may be evaluated either automatically by instrument or manually. Clouds include obscuring phenomena aloft. Sky condition must be evaluated at all stations with this capability. Automated stations have the capability to evaluate sky condition from the surface to 12,000 feet. LAWRS is only required to report to 12,000 feet. Observers at manual stations must evaluate all clouds and obscuring phenomena visible, that is, the 12,000-foot restriction must not apply.

10.2. Sky Condition Evaluation. A complete evaluation of sky condition includes the type of clouds or obscuring phenomena present, their stratification, amount, direction of movement, height of bases, and the effect on vertical visibility of surface-based obscuring phenomena.

10.3. Cloud Forms and Obscuring Phenomena. If available, the WMO International Cloud Atlas, Volumes I and II, and the Abridged Atlas contain detailed instructions and photo-aids for identifying the various cloud forms. Additional aids may be used for identifying cloud forms (types) such as cloud code charts. Commercial products are also available that describe cloud forms and types. Descriptions of obscuring phenomena are included in Chapter 9, Weather Phenomena.

10.4.Definitions.

a. Ceiling. The ceiling is the height above the earth's surface (field elevation or ground elevation) ascribed to the lowest non-surface-based layer that is reported broken or overcast, or the vertical visibility into a surface-based obscuration that totally hides the sky.

b. Celestial Dome. The celestial dome is that portion of the sky that would be visible if all human-made structures were removed and there was an unobstructed view of the horizon in all directions from the observation site(s).

c. Cloud. A cloud is a visible accumulation of minute water droplets and/or ice particles in the atmosphere above the earth's surface. Cloud differs from ground fog, fog, or ice fog only in that the latter are, by definition, in contact with the surface.

d. Cloud Movement. When reported in remarks of a surface aviation observation, cloud movement is the direction toward which a cloud is moving.

e. Field Elevation. Field elevation is the officially designated elevation (Ha) of an airport above mean sea level. It is the elevation of the highest point on any of the runways of the airport. The field elevation for an airport can be found in the United States Government Flight Information Publication, Airport/Facility Directory or the Chart Supplements for Alaska or the Pacific.

f. Horizon. For the purposes of these instructions, the horizon is the actual lower boundary (local horizon) of the observed sky or the upper outline of terrestrial objects, including nearby natural obstructions. It is the distant line along which the earth, or the water surface at sea, and the sky appear to meet. The local horizon is based on the best practical point of observation near the earth's surface and selected to minimize obstruction by nearby buildings, towers, etc.

g. Interconnected Cloud Layers. Clouds formed by the horizontal extension of swelling cumulus or cumulonimbus, that are attached to a parent cloud, must be regarded as a separate layer only if their bases appear horizontal and at a different level from the parent cloud. Otherwise, the entire cloud system must be regarded as a single layer at a height corresponding to that of the base of the parent cloud.

h. Layer. A layer consists of clouds or obscuring phenomena, not necessarily all of the same type, whose bases are at approximately the same level. A layer may be either continuous or composed of detached elements.

i. Layer Amount. The amount of sky cover for each layer must be the eighths of sky cover attributable to the clouds or obscuring phenomena in the layer being evaluated. All cloud layers and obscuring phenomena aloft must be considered. Only that portion of surface-based obscuring phenomena that hide a portion of the sky is considered.

j. Layer Height. The height, in feet, of the layer's base above the surface or field elevation is the layer height.

k. Multiple Layers. The existence of a layer or layers above a lower layer constitutes multiple layers.

l. Obscuring Phenomena. Any collection of particles aloft or in contact with the earth's surface, dense enough to be discernible to the observer, must be considered obscuring phenomena.

m. Sky Cover. Sky cover is a term used to denote the amount (to the nearest eighth) of the sky that is:

(1) Covered by clouds and/or obscuring phenomena aloft

(2) Hidden by surface-based obscuring phenomena, or

(3) A combination of paragraphs a and b above

n. Sky Cover Classifications

(1) VERTICAL VISIBILITY (VV): The distance that an observer can see vertically upward into surface-based obscuring phenomena that totally hide the sky, or the height determined by the sensor algorithm at automated stations into the surface-based obscuring phenomena that totally hide the sky.

(2) CLEAR (SKC or CLR). SKC is the abbreviation used for manual reports to indicate that no clouds are present, and CLR is the abbreviation used for automated reports to indicate that no clouds are detected at or below the design limit of the ceilometer.

(3) FEW CLOUDS (FEW). Represents sky cover of more than zero to 2/8ths. Any layer amount less than 1/8 is considered 1/8.

(4) SCATTERED (SCT) represents sky cover of 3/8ths to 4/8ths at and below the level of a layer aloft.

(5) BROKEN (BKN) represents sky cover of 5/8ths up to, but not including, 8/8 at and below the level of a layer aloft.

(6) OVERCAST (OVC) represents sky cover of 8/8ths at and below the level of a layer aloft.

o. Summation Amount. The summation amount of sky cover for any given layer is the sum of the sky cover of the layer being evaluated, plus the sky cover of all lower layers, including that portion of surface-based obscuring phenomena that hides the sky. Portions of layers aloft detected through lower layers aloft must not increase the summation amount of the higher layer. No layer can have a summation amount greater than 8/8ths.

p. Summation Principle. The summation principle states that the sky cover at any level is equal to the summation of the sky cover of the lowest layer, plus the additional sky cover present at all successively higher layers up to and including the layer being considered. No layer can be assigned a sky cover less than a lower layer, and no sky cover can be greater than 8/8ths. This concept is applicable for the evaluation of total sky cover.

q. Surface. For height determinations, the term "surface" denotes the horizontal plane whose elevation above sea level equals the field elevation. At stations where the field elevation has not been established, "surface" will refer to the ground or elevation at the observation site. At seaplane bases, the mean high-tide mark may be regarded as the surface.

r. Total Amount. Total amount is the amount, in eighths, of the entire sky covered, not necessarily hidden, by all layers present. This amount cannot be greater than 8/8ths.

s. Variable Ceiling. Variable ceiling describes a condition in which a ceiling rapidly increases and decreases during the period of evaluation.

t. Variable Sky Condition. Variable sky condition is a sky condition that has varied between reportable conditions (for example, SCT to BKN, OVC to BKN) during the period of observation (normally the past 15 minutes).

10.5. Observing Sites. Observations of stratification, amount, direction of movement and height of bases of clouds, and the effect of obscuring phenomena on vertical visibility must be taken from as many locations as are necessary and practical to view the entire sky.

10.6. Layer Amounts. All layers visible from the station must be reported in sky cover reports. The amount of sky cover for each layer must be the eighths of sky cover attributable to the clouds or obscuring phenomena in the layer being evaluated. Table 10-1: Reporting Contractions for Sky Cover, must be used to determine the reported value for each layer visible. The report must be based on the eighths of sky covered by each layer in combination with any lower layers. Additionally, all layers with associated cumulonimbus or towering cumulus must be identified as such using the contractions CB and TCU, respectively. Automated stations will report no more than three layers of clouds. Automated stations with augmentation may report up to six layers; the layers reported must be selected in accordance with Table 10-2. At manual stations, a maximum of six layers of clouds or surface-based obscuring phenomena must be reported. If more than six layers are observed, they must be selected in accordance with Table 10-2: Priority for Reporting Layers

Table 10-1: Reporting Contractions for Sky Cover

Reportable Value	Meaning	Summation Amount of Layer
VV	Vertical Visibility	8/8
SKC or CLR[1]	Clear	0
FEW[2]	Few	> 0 - 2/8
SCT	Scattered	3/8 - 4/8
BKN[3]	Broken	5/8 - 7/8
OVC	Overcast	8/8

[1] The abbreviation CLR must be used at automated stations when no clouds at or below 12,000 feet are detected. The abbreviation SKC must be used at manual stations when no clouds are reported.
[2] Any layer amount less than 1/8, but is not 0 (zero) is reported as FEW.
[3] BKN includes sky cover from 5/8 up to, but not including, 8/8.

Table 10-2: Priority for Reporting Layers

Priority	Layer Description
1	Lowest Few
2	Lowest Broken Layer
3	Overcast Layer
4	Lowest Scattered Layer
5	Second Lowest Scattered Layer
6	Second Lowest Broken Layer
7	Highest Broken Layer
8	Highest Scattered Layer
9	Second Lowest Few Layer
10	Highest Few Layer

10.7. Summation Layer Amount. The summation amount of sky cover for any given layer is the sum of the sky cover of the layer being evaluated, plus the sky cover of all lower layers. Portions of layers aloft detected through lower layers aloft must not increase the summation amount of the higher layer. No layer can have a summation amount greater than 8/8ths. (See Table 10-3: Examples: Summation of Sky Cover.)

Table 10-3: Examples: Summation of Sky Cover

Sky Cover Layers	Summation	Appropriate Contraction	Sky Cover Entries	
			Col. 10	Col. 14
3/8 sky hidden by fog 3/8 sky cover at 1,000 feet 1/8 sky cover at 5,000 feet	3/8 6/8 7/8	SCT BKN BKN	SCT000 BKN010 BKN050	FG SCT000
Less than 1/8 sky cover at 500 feet Less than 1/8 sky cover at 2,000 feet 3/8 sky cover at 3,000 feet less than 1/8 sky cover at 9,000 feet	1/8 2/8 5/8 6/8	FEW FEW BKN BKN	FEW005 FEW020 BKN030 BKN090	
5/8 sky cover at 1,000 feet 2/8 sky cover at 5,000 feet 1/8 sky cover at 30,000 feet	5/8 7/8 8/8	BKN BKN OVC	BKN010 BKN050 OVC300	
1/8 sky cover at 1,000 feet (smoke aloft) 2/8 sky cover at 5,000 feet 1/8 sky cover at 35,000 feet	1/8 3/8 4/8	FEW SCT SCT	FEW010 SCT050 SCT350	FU FEW010
Sky hidden by snow, vertical visibility 1,000 feet	8/8	VV	VV010	
7/8 sky hidden by fog 1/8 sky cover at 500 feet	7/8 8/8	BKN OVC	BKN000 OVC005	FG BKN000

10.8. Layer Heights. The height of a layer will be the height of the cloud bases or obscurations for the layer being evaluated. Layers of clouds that are 50 feet or less above the surface must be reported as layers with a height of zero. At mountain locations, clouds below the level of the station may be observed and are reported with a height of ///. If available, a ceilometer must be used to determine the height of layers aloft and vertical visibility into obscuring phenomena. If a ceilometer is not available, layer heights should be obtained by an alternative method; for example, pilot report, etc. Known heights of unobscured portions of abrupt, isolated objects within 1 ½ SM of a runway can also be used to measure the heights of layers aloft. Heights of layers observed at the station must be reported in hun-dreds of feet above the surface (not above MSL), rounded to the nearest reportable increment. When a value falls halfway between two reportable increments, the lower value must be reported. Table 10-4: Increments of Reportable Values for Layer or Ceiling Heights, must be used to determine the reportable increments for layer heights. Observers should supplement layer data obtained from ceilometers by visual observations to determine that the instrumental values are representative of the layers to which they are ascribed.

Table 10-4: Increments of Reportable Values for Layer or Ceiling Heights

Range of Height Values (feet)	Reportable Increment (feet)
≤ 5,000	To nearest 100
> 5,000 but ≤ 10,000	To nearest 500
> 10,000	To nearest 1,000

10.9. Evaluation of Multiple Layers. Frequent observations are necessary to evaluate stratification. A series of observations will often show the existence of multiple layers. Through thin lower layers, it may be possible to observe higher layers. Differences in the directions of cloud movements often aid in observing and differentiating cloud layers. Ceilometer returns may also be used to determine the existence of multiple layers. Observers should be aware of and use these guidelines to determine and evaluate multiple layers.

10.10. Amount of Obscuration. If a portion of the sky is not visible because of surface-based obscuring phenomena, the observer must determine the portion of sky (in eighths) that is not visible. The amount of sky obscured must be indicated as FEW, SCT or BKN, as appropriate, followed by three zeros (000). In remarks, the obscuring phenomena must precede the amount of obscuration and three zeros. For example, if 5/8ths of the sky is obscured by fog, BKN000 would be in the body of the observation, with FG BKN000 in the remarks section.

10.11. Determining Amount of Sky Cover. The summation amount of sky covered at and below each layer must be determined. Also, the amount of sky cover at and below the layer under evaluation must be determined. Surface-based obscuring phenomena must not be considered sky cover if the sky, higher clouds or obscuring phenomena aloft, or the moon or stars are visible through it.

10.12. Evaluation of Sky Cover Amounts. Sky cover amounts must be evaluated:

a. In eighths of coverage of the entire sky area above the horizon, and

b. In terms of the total amount of sky cover, and

c. With reference to an observation site as near as possible to the earth's surface.

10.13. Sky Cover Classification. Select the appropriate sky cover contraction or combination of contractions to be reported after evaluating the following:

a. Step 1. Estimate (to the nearest eighth) the amount of sky covered by the lowest layer present. If this layer is a surface-based obscuring phenomenon, determine only the amount of sky that is hidden. Transparent surface-based atmospheric phenomena do not constitute sky cover.

b. Step 2. Determine if additional layers of clouds and/or obscuring phenomena aloft are present above the lowest layer. Estimate the eighths of sky covered by each of these layers in combination with the lower layers. Do not add to the total coverage amounts visible through transparencies in lower layers, except those amounts of upper layers visible through transparent surface-based atmospheric phenomena.

c. Step 3. Repeat the evaluation in step 2 for each additional layer present in ascending order of height. Estimate the summation (in eighths) of sky covered by each layer, in combination with all lower layers.

10.14. Variable Sky Cover. The sky cover must be considered variable if it varies by one or more reportable classifications during the period it is being evaluated, for example, SCT V BKN. When a layer amount varies between reportable values during the time the amount is being evaluated, a variable sky condition remark must be included in the observation. The format of the remark is given in Paragraph 13.36, Variable Sky Condition (NsNsNs**(**hshshs)_V_NsNsNs).

10.15. Non-Uniform Sky Cover. Observers must be alert to variations in sky condition that are not reflected in the sky cover reported in the body of the observation. When non-uniform sky conditions are observed (for example, a significant lower ceiling in a particular direction from the station), the observer must describe the condition in the remarks section. Unless a height is available from a reliable source, the height must be described in relation to the heights reported in the body of the report. For example, CIG LWR N would indicate that ceilings are lower to the north.

10.16. Estimated Ceiling Heights. Ceiling heights may be estimated by any of the following methods:

a. Use of height reported by a pilot (converted from height above mean sea level (MSL) to height above surface (AGL).

b. Use of known heights of unobscured portions of abrupt, isolated objects within 1 1/2 miles from any runway of the airport.

c. Use of observational experience; provided that, other guides are lacking or, in the opinion of the observer, are considered to be unreliable.

10.17. Variable Ceiling Height. Rapid fluctuations of the ceilometer indications will indicate an irregular base whose height is measured, but also variable. When the height of a ceiling layer increases and decreases rapidly during the period of evaluation by the amounts given in Table 10-5: Criteria for Variable Ceiling, and the ceiling height is below 3,000 feet, it must be considered variable and the ascribed height must be the average of all the values. A remark must be included in the observation giving the range of variability (see Paragraph 13.34, Variable Ceiling Height (CIG_hnhnhnVhxhxhx)). Variable ceilings at or above 3,000 feet may be reported as variable only if considered operationally significant.

Table 10-5: Criteria for Variable Ceiling

Ceiling (feet)	Variation (feet)
≤ 1,000	≥ 200
> 1,000 and ≤ 2,000	≥ 400
> 2,000 and < 3,000	≥ 500

10.18. Significant Clouds. Observers must be alert for the occurrence of cumulonimbus, towering cumulus, altocumulus castellanus, standing lenticular, or rotor clouds and report them whenever they occur. These clouds may be reported by entering a remark in METAR and SPECI observations. The remark must contain the identification of the cloud, and (insofar as known) the direction and distance from the station and, for cumulonimbus clouds, the direction of movement. See Paragraph 13.37, Significant Cloud Type [PLAIN LANGUAGE], for detailed instructions on coding these remarks. Cumulonimbus (CB) or towering cumulus (TCU) must be appended to the appropriate layer in the body of the observation. When TCU or CB is appended to the layer report accompanied by the remark, "TCU NW" or "CB NW MOV E", it is implied that the TCU or CB is associated with the layer and within 10 SM. When TCU or CB is outside 10 SM, a DSNT remark is appropriate, for example, "TCU DSNT NW". (In this case, TCU or CB would not be appended to the layer in the body of the METAR.) Also, see Paragraph 13.37, Significant Cloud Type [PLAIN LANGUAGE].

NOTE: Not required by LAWRS, may be reported if deemed operationally significant by the controller.

Chapter 11. Temperature and Dew Point

11.1. Introduction. This chapter describes procedures for observing and reporting temperature and dew point in a METAR or SPECI observation. The temperature data obtained using the procedures and practices in this chapter are normally in terms of the Celsius scale. However, temperature may be given in both degrees Fahrenheit and Celsius since some instruments may be marked in only one scale. Dew point must be calculated with respect to water at all temperatures.

11.2. Definitions

a. Temperature. The degree of hotness or coldness of the ambient air as measured by any approved instrument.

b. Dew Point. The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content in order for saturation to occur, as measured by any approved instrument. If the dew point is higher than the temperature, the observer must discontinue use of the sensor until it has been serviced and calibrated.

c. Psychrometer. A psychrometer is an instrument used to measure the water vapor content of the air.

11.3. Temperature and Dew Point Observing and Reporting Practices. The method of obtaining temperature and dew point varies according to the system in use at the station. The observer must use the automated weather system for temperature and dewpoint, where available.

a. Whenever the primary system is inoperative or determined to be in error, the observer must obtain the temperature and dewpoint from the station's backup system (e.g. SAWS, SWS, handheld electronic psychrometer).

b. If the observer has access to multiple backup systems for Temperature/Dew Point, readings for SAWS or SWS must be used if available.

c. As a second priority, the observer may use an FAA approved handheld electronic psychrometer or a sling psychrometer to obtain the readings.

d. Handheld psychrometers must be compared to automated weather system once per week to ensure their accuracy.

e. If no backup system is available, the temperature and/or dew point is omitted.

11.4. Obtaining Readings from a Sling Psychrometer

a. Sling Psychrometer Ventilation. The observer shall ventilate the psychrometer for about 10 seconds. The minimum speed of air passing over the psychrometer bulbs should be 15 feet per second. This is approximately one revolution per second of the geared (2 to 1 ratio)

whirling psychrometer crank, two revolutions per second of the sling psychrometer, and three and one-half revolutions per second of the crank of the psychrometer fan or motor (direct-drive) whirling psychrometer. The observer shall ventilate the sling psychrometer as follows:

(1) Select a shady spot with no obstructions within a radius of the whirling sling.

(2) Face into the wind.

(3) Hold the handle at arm's length while whirling the psychrometer.

b. After proper ventilation has been achieved, the observer shall quickly read both thermometers, wet-bulb first. The observer shall repeat this procedure until two successive wet- bulb readings are the same, indicating that the wet-bulb temperature has reached its equilibrium point. If the wet-bulb temperature rises between successive readings, the observer shall re- moisten the wick and re-ventilate. Accurate readings are especially important at low temperatures, where a given wet-bulb depression has a greater effect on the accuracy of psychrometer computations.

11.5. Maximum and Minimum Temperature. Automated systems report in remarks the maximum and minimum temperatures that occurred in the previous 6 hours to the nearest tenth of a degree Celsius for the 0000, 0600, 1200, and 1800 UTC observations. Automated systems determine and report the calendar day (LST) maximum and minimum temperatures to the nearest tenth of a degree Celsius. If the midnight LST observation is also a 6-hour synoptic observation, the system determines and reports both the 6-hour temperatures and the past 24- hour maximum and minimum temperatures. The format for reporting these temperatures is given in Paragraph 13.53, 6-Hourly Maximum Temperature (1snTxTxTx) through Paragraph 13.55, 24-Hour Maximum and Minimum Temperature (4snTxTxTxsnTnTnTn). If the Maximum/Minimum Temperature data is missing or non-representative, it is not backed up by the observer.

11.6. Maximum/Minimum Extremes. Maximum/minimum temperature values from the primary automated weather system. This measurement is not backed up when the primary automated weather system does not report the maximum/minimum temperature.

Chapter 12. Pressure

12.1. Introduction. This chapter presents procedures and practices to be followed for the reporting of pressure. Atmospheric pressure is the force exerted by the atmosphere at a given point.

12.2. Definitions

a. Altimeter Setting (ALTSG). Altimeter setting defines the pressure value to which an aircraft altimeter scale is set so that the altimeter indicates the altitude above mean sea level of an aircraft on the ground at the location for which the value was determined. Altimeter setting must be reported in the body of all reports (METAR and SPECI). Other pressure data (including sea level pressure) are reported in the remarks section only.

b. Atmospheric Pressure. Atmospheric pressure is the pressure exerted by the atmosphere at a given point. The various pressure parameters must be determined from the barometric pressure after appropriate corrections are applied. The method used must depend on the type of sensor and the available computational aids. These aids may be systems that result in a direct readout of the desired parameter.

c. Barometric Pressure. The atmospheric pressure measured by a barometer is barometric pressure. In this chapter, the term "barometric pressure" refers to the actual pressure sensor value. The sensor value may be an altimeter setting, station pressure, or simply a direct pressure value without applied corrections depending on the type of sensor.

d. Field Elevation, Ha. Field elevation, Ha, is the elevation of the highest point on any of the runways of the airport.

e. Pressure Altitude, PA. Pressure altitude is the altitude in feet, in the standard atmosphere, at which a given pressure will be observed. It is the indicated altitude of a pressure altimeter at an altitude setting of 29.92 inches (1013.2 hPa) of mercury and is therefore the indicated altitude above or below the 29.92 inches constant-pressure surface.

f. Pressure Change. Pressure change is the net difference between the barometric pressure at the beginning and end of a specified interval of time, usually the 3-hour period preceding an observation. If the pressure is rising or falling at a rate of at least 0.06 inch per hour and the pressure change totals 0.02 inch or more at the time of the observation, a pressure change remark is reported. (see Table 3-2)

g. Pressure Falling Rapidly. Pressure falling rapidly occurs when station pressure falls at the rate of at least .06 inch (2.03 hPa) or more per hour which totals 0.02 inch (0.68 hPa) or more at time of observation.

h. Pressure Rising Rapidly. Pressure rising rapidly occurs when station pressure rises at the rate of at least 0.06 inch (2.03 hPa) or more per hour, which totals 0.02 inch (0.68 hPa) or more at time of observation.

i. Pressure Tendency. Pressure tendency is the pressure characteristic and amount of pressure change during a specified period of time, usually the 3-hour period preceding an observation. The pressure tendency includes two parts: the characteristic (an indication of how the pressure has been changing over the past three hours) and the amount of the pressure change in the past three hours. The characteristic must be based on the observed changes in pressure over the past three hours. The amount of pressure change is the absolute value of the change in station pressure or altimeter setting in the past three hours converted to tenths of hectopascals.

j. Sea Level Pressure. Sea level pressure is a pressure value obtained by the theoretical reduction of barometric pressure to sea level. Where the earth's surface is above sea level, it is assumed that the atmosphere extends to sea level below the station and that the properties of the hypothetical atmosphere are related to conditions observed at the station. When the automated sea level pressure is missing at stations that would normally report sea level pressure, the remark SLPNO is added in the remarks section. (Automated only)

k. Standard Atmosphere. Standard atmosphere is a hypothetical vertical distribution of the atmospheric temperature, pressure, and density, which by international agreement is considered representative of the atmosphere for pressure-altimeter calibrations and other purposes.

l. Station Elevation, Hp. Station elevation, Hp, is the officially designated height above sea level to which station pressure pertains. There may be occasions when the station elevation differs from the field elevation.

m. Station Pressure. Station pressure is the atmospheric pressure at the assigned station elevation (Hp).

n. Density Altitude, DA. Density altitude, DA, is the pressure altitude corrected for virtual temperature deviations from the standard atmosphere.

o. Barometric Elevation, Hz. Barometer elevation (Hz) is the height of the pressure instrument(s) above mean sea level surveyed accurately to within one foot.

12.3. Observing, Determining, and Reporting Procedures

General. Observing procedures must include the reading of FAA approved pressure instruments, FAA JO 7210.3 Paragraph 2-10-3, Altimeter Requirements together with the correction of pressure values (if necessary), FAA JO 7210.3, Paragraph 2-10-4.

Table 12-1: Units of Measure of Pressure Parameters

Parameter	Units of Measure
Altimeter Setting	Inches of Mercury
Sea Level Pressure	Hectopascals
Station Pressure	Inches of Mercury

12.4. Determining Altimeter Setting. The observer must determine the altimeter setting for all observations. Altimeter setting values should be obtained or derived from one of the following types of instruments:

a. A Precision Aneroid Altimeter Setting Indicator (ASI)

b. A commissioned DASI

c. Automated Systems With SPECI Capability

d. Automated Systems Without SPECI Capability

e. Standalone Weather Sensor System (SAWS)

f. Surface Weather System (SWS)

g. Any other altimeter equipment approved by FAA Technical Operations.

12.5. Pressure Related Remarks. Each significant change in barometric pressure and its characteristics are recorded in the remarks section and transmitted. These Remarks are automated and not backed up by weather observers.

a. Pressure Falling Rapidly. (Automated Only) Whenever the pressure is falling at the rate of 0.06 inch (2.03 hPa) or more per hour with a total fall of at least 0.02 inch (0.68 hPa) at the time of an observation, the system will report PRESFR in the remarks section.

b. Pressure Rising Rapidly. (Automated Only) Whenever the pressure is rising at the rate of 0.06 inch (2.03 hPa) or more per hour with a total of at least 0.02 inch (0.68 hPa) at the time of observation, the system reports PRESRR in the remarks section.

c. Pressure Tendency. (Automated Only) The barometric pressure tendency comprises two elements.

d. Frequency of Pressure Tendency Remark. (Automated Only) Pressure tendencies should be determined at the time of each 3- and 6-hour observation.

e. Determining Pressure Change. (Automated Only) The net change in station pressure for the preceding 3 hours to the nearest 0.005 inch.

Chapter 13. Coding

13.1. Introduction. This chapter contains procedures for coding the aviation weather observation for dissemination. The types of dissemination and the general requirements for verifying and making corrections to disseminated observations are also discussed.

13.2. Aviation Weather Reports Code. The METAR/SPECI report has two major sections: the body (consisting of a maximum of 11 groups) and the remarks section (consisting of a maximum of two categories). Together, they make up the complete METAR/SPECI report and, in general, are coded as in Table 13-1.

Table 13-1: Content of METAR/SPECI

Elements in the Body of the Report	**Reference**	**METAR/SPECI**
Type of Report (METAR/SPECI)	13.6	X
Station Identifier (CCCC)	13.7	X
Date/Time (YYGGggZ)	13.8	X
Report Modifier (AUTO/COR)	13.9	X[1]
Wind (dddff(f)Gf_m f_m(f_m)KT) ($d_nd_nd_nV d_xd_xd_x$)	13.10	X
Visibility (VVVVVSM)	13.11	X
Runway Visual Range ($RD_RD_R/V_RV_RV_RV_R$FT) or ($RD_RD_R/V_nV_nV_nV_nVV_XV_XV_XV_X$FT)	13.12	X[2]
Present Weather (w'w')	13.13	X
Sky Condition ($N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or CLR or SKC)	13.14	X
Temperature/Dew Point (T'T'/$T'_dT'_d$)	13.15	X
Altimeter ($AP_HP_HP_HP_H$)	13.16	X
Categories in Remarks	**Reference**	**METAR/SPECI**
Automated, Manual, and Plain Language	13.18	See Table 2-1 for a detailed breakout of remarks
Additive and Maintenance Data	13.44	
X - Indicates element included at all facilities. X[1] – AUTO for automated stations only, COR for augmented stations with corrections. X[2] – Where so equipped.		

13.3. Format and Content of the METAR/SPECI Report. Table 13-2: METAR or SPECI Code Format, outlines the format of the METAR/SPECI code. The actual content of a surface observation depends on the observation reporting guidelines at the individual facility as defined in Chapter 2. The 0000, 0600, 1200, and 1800 UTC METAR reports include additional data and are known as 6-hourly reports. The 0300, 0900, 1500, and 2100 UTC METAR reports are known as 3-hourly reports and, also contain additional information.

Table 13-2: METAR or SPECI Code Format

METAR or SPECI Code Format
METAR or SPECI_CCCC_YYGGggZ_AUTO or COR_dddff(f)Gf_mf_m(f_m)KT_$d_nd_nd_nV d_xd_xd_x$_VVVVVSM_$RD_RD_R/V_RV_RV_RV_R$FT or

METAR or SPECI Code Format
$RD_RD_R/V_nV_nV_nV_nVV_XV_XV_XV_XFT\_w'w'\_N_sN_sN_sh_sh_sh_s$ or $VVh_sh_sh_s$ or SKC or $CLR_T'T'/T'_dT'_d_AP_HP_HP_HP_H$_RMK_(Automated, manual and plain language)_(Additive data and automated maintenance indicators)
NOTE- *1. The underscore character (_) indicates a required space.* *2. The solidus "/" indicates a required solidus.*

13.4. Coding Missing Data in METAR and SPECI Reports. When an element or phenomenon does not occur, or cannot be observed, the corresponding group and preceding space are omitted from that particular report. However, at stations where sea-level pressure is normally reported, when sea-level pressure is not available it must not be omitted, but must be coded as SLPNO. SLPNO is an automated remark.

13.5. Coding the Body of the METAR or SPECI Report. Table 13-1: Content of METAR/SPECI, indicates the applicability of the elements in the body of the surface observation. References in the figure indicate the sections where the elements are discussed and explained. The figure also indicates whether the element must be included in METAR and SPECI reports.

13.6. Type of Report (METAR or SPECI). The type of report, METAR or SPECI, must be included in all reports. The type of report must be separated from elements following it by a space. When SPECI criteria are met at the time of a routine report (METAR), the type of the report must be METAR.

13.7. Station Identifier (CCCC). The station identifier, CCCC, must be included in all reports to identify the station to which the coded report applies. The station identifier must consist of four alphabetic-only characters if the METAR/SPECI is transmitted long-line. A list of approved identifiers can be found in the latest version of FAA Order 7350.9, Location Identifiers. The station identifier must be separated from elements following it with a space.

13.8. Date and Time of Report (YYGGggZ). The date, YY, and time, GGgg, must be included in all reports. The time must be the actual time of the report or when the criteria for a SPECI is met or noted. If the report is a correction to a previously disseminated report, the time of the corrected report must be the same time used in the report being corrected. The date and time group always ends with a "Z" indicating the use of UTC.

EXAMPLE: 0900 scheduled report from KDCA should be taken at 0855 UTC on the 21st of the month: KDCA 210855Z

13.9. Report Modifier (AUTO or COR). The Report Modifier can be either of two elements:

a. "AUTO" further identifies the type of report as a fully automated report with no human intervention. The report modifier group does not appear in all reports; the absence of AUTO indicates that the report is either a manual report or an automated report with an observer "logged on" to the system.

b. "COR" must be entered into the report modifier group when a corrected METAR or SPECI is transmitted.

c. AUTO and **COR** will not be seen in the same observation. If the term COR is used, the observation cannot be AUTO, because an observer is correcting it.

13.10. Wind Group ((dddff(f)Gfmfm(fm)KT)_(dndndnVdxdxdx)). The true direction, ddd, from which the wind is blowing is coded in tens of degrees using three figures. Directions less than 100 degrees are preceded by a "0," for example, a wind direction of 90o is coded as "090". The wind speed, ff(f), is entered as a two or three digit group immediately following the wind direction. The speed is coded in whole knots using the hundreds digit (if not zero) and the tens and units digits. The wind group always ends with KT to indicate that wind speeds are reported in knots. Speeds of less than 10 knots are coded using a leading zero.

EXAMPLES: Wind speed of 8 knots: 08KT
Wind speed of 112 knots: 112KT

a. Gust. Wind gusts are coded in the format Gfmfm(fm). The wind gust is coded in two or three digits immediately following the wind speed. The wind gust is coded, in whole knots, using the units and tens digits and, if required, the hundreds digit.

EXAMPLE: A wind from due west at 20 knots with gusts to 35 knots: 27020G35KT

b. Variable Wind Direction (Speeds 6 Knots or Less). The wind direction may be reported as VRB (variable) in place of the ddd whenever the wind speed is 6 knots or less.

EXAMPLE: Wind variable at 3 knots: VRB03KT

c. Variable Wind Direction (Speeds Greater than 6 Knots). Variable wind direction with wind speed greater than 6 knots is coded in the format, dndndnVdxdxdx. The variable wind direction group must immediately follow the wind group preceded by a blank space. The directional variability is coded in a clockwise direction.

EXAMPLE: Wind variable from 180o to 240o at 10 knots: 21010KT 180V240

d. Calm Wind. Calm wind is coded as "00000KT".

13.11. Visibility Group (VVVVVSM). The surface visibility, VVVVVSM, is coded in statute miles using the values listed in Table 13-3. A space is coded between whole numbers and fractions of reportable visibility values. The visibility group always ends in SM to indicate that visibilities are in statute miles. Only automated stations may use an "M" to indicate "less than" when reporting visibility.

EXAMPLES: One and a half mile visibility: 1 1/2SM
Visibility less than one-quarter SM as reported by an automated station: M1/4SM

Table 13-3: Reporting Visibility Values

Source of Visibility Report							
Automated[1]			**Manual**				
M1/4	2	9	0	5/8	1 5/8	4	12
¼	2 1/2	10	1/16	3/4	1 3/4	5	13
½	3		1/8	7/8	1 7/8	6	14
¾	4		3/16	1	2	7	15
1	5		1/4	1 1/8	2 1/4	8	20
1 ¼	6		5/16	1 1/4	2 1/2	9	25
1 ½	7		3/8	1 3/8	2 3/4	10	30
1 ¾	8		1/2	1 1/2	3	11	35[2]

[1] Visibility values of 0, 1/8, and 1/16 can be augmented in the visibility field of automated systems with SPECI capability to meet service level requirements.
[2] Further increments of 5SM may be reported, that is, 40, 45, 50, etc.

13.12. Runway Visual Range Group (RDRDR/VRVRVRVRFT) or ($RD_RD_R/V_nV_nV_nV_nVV_xV_xV_xV_xFT$) (Automated Only).

a. RVR is coded in the format $RD_RD_R/V_RV_RV_RV_RFT$ where R indicates that the runway number follows, D_RD_R is the runway number (an additional DR may be used for runway approach directions, such as R for right, L for left and C for center), $V_RV_RV_RV_R$ is the constant reportable value, and FT indicates that units of measurement are feet.

b. RVR that is varying is coded in the format, $RDRDR/V_nV_nV_nV_nVV_xV_xV_xV_xFT$, where R indicates that the runway number follows, D_RD_R is the runway number (an additional D_R may be used for runway approach directions, such as R for right, L for left and C for center), $V_nV_nV_nV_n$ is the lowest reportable value in feet, V separates lowest and highest visual range values, $V_xV_xV_xV_x$ is the highest reportable value, and FT indicates that units of measurement are feet.

EXAMPLE: The 10-minute RVR for runway 01L varying between 600 and 1,000 feet: R01L/0600V1000FT

The values must be based on light setting 5 at manual stations. RVR values must be coded in increments of 100 feet up to 1,000 feet, increments of 200 feet from 1,000 feet to 3,000 feet and in increments of 500 feet from 3,000 feet to 6,000 feet. Manual RVR must not be reported below 600 feet. For automated stations, RVR may be reported for up to four designated runways. If the RVR is less than its lowest reportable value, the $V_RV_RV_RV_R$ or $V_nV_nV_nV_n$ groups must be preceded by M. If the RVR is greater than its highest reportable value, the $V_RV_RV_RV_R$ or $V_nV_nV_nV_n$ groups must be preceded by a P.

EXAMPLES: An RVR for runway 01L of less than 600 feet: R01L/M0600FT
An RVR of greater than 6,000 feet: R01L/P6000FT

13.13. Present Weather Group (w'w')

a. The appropriate notations in Table 13-4: Present Weather must be used to code present weather. The following general rules apply when coding present weather for a METAR or SPECI:

(1) Step 1. Weather occurring at or in the vicinity of the station is coded in the body of the report. Weather observed, but not occurring at or in the vicinity of the station, is coded in remarks.

(2) Step 2. Except when the descriptor low drifting (DR) applies, and for volcanic ash, one or more obscurations are coded in the body of the report only if the surface visibility is less than 7 miles or considered operationally significant. Volcanic ash (VA) is always coded when observed. Shallow fog (MIFG), Patches of fog (BCFG) and Partial fog (PRFG) may be reported when visibility is equal to or greater than 7 miles.

(3) Step 3. Separate groups must be used for each type of present weather; however, up to 3 types of precipitation can be coded in a single group. Each group must be separated from the other by a space. A METAR/SPECI must contain no more than three present weather groups.

(4) Step 4. The weather groups must be constructed by considering columns 1 to 5 in Table 13-4: Present Weather in sequence, that is, intensity, followed by weather phenomena, for example, heavy rain shower(s) is coded as +SHRA.

b. Intensity or Proximity Qualifier.

(1) Intensity is coded with all precipitation types, except ice crystals (IC) and hail (GR), including those associated with a thunderstorm (TS) and those of a showery nature (SH). No intensity must be ascribed to the obscurations of blowing dust (BLDU), blowing sand (BLSA), blowing snow (BLSN), blowing spray (BLPY), well-developed dust/sand whirls (PO), and squalls (SQ). Tornadoes or waterspouts are coded using the indicator +, for example, "+FC", while a funnel cloud must always be coded "FC". Only moderate or heavy intensity must be ascribed to sandstorm (SS) and Dust storm (DS). Due to ASOS/AWOS-C software limitations, intensity for GS must be manually encoded into the RMK section as "GS LGT", "GS MOD", or "GS HVY". Reporting of the intensity of GS will revert to the conventional method for precipitation intensity when ASOS upgrades are implemented (projected for October 2020).

(2) The proximity qualifier for vicinity, VC (weather phenomena observed in the vicinity of but not at the point of observation), must only be coded in combination with thunderstorm (TS), fog (FG), shower(s) (SH), well-developed dust/sand whirls (PO), blowing dust (BLDU), blowing sand (BLSA), blowing snow (BLSN), sandstorm (SS), and dust storm (DS). VCTS is only used when lightning is detected by an automated sensor. Intensity qualifiers must not be coded with VC. VCFG is coded to report any type of fog in the vicinity of the point(s) of observation. Precipitation not occurring at the point of observation but within 10 statute miles is coded as showers in the vicinity (VCSH).

c. Descriptor Qualifier.

(1) Only one descriptor must be coded for each weather phenomena group, for example, "-FZDZ". Mist (BR) must not be coded with any descriptor.

(2) The descriptors shallow (MI), partial (PR), and patches (BC) must only be coded with FG, for example, "MIFG".

(3) For MIFG (shallow fog) to be coded, fog must cover part of the station, extend no higher than 6 feet above the ground, with visibility more than 6 feet above the ground 5/8SM or more, while the apparent visibility in the fog layer is less than 5/8SM.

(4) For PRFG (partial fog) to be coded fog must cover a substantial part of the station; extend to at least 6 feet above the ground with visibility in the fog less than 5/8SM.

(5) For BCFG (fog patches) to be coded, fog must randomly cover part of the station, extend to at least 6 feet above the ground, with the apparent visibility in the fog patch or bank less than 5/8SM while visibility over other parts of the station is greater than or equal to 5/8SM.

(6) The descriptors low drifting (DR) and blowing (BL) must only be coded with dust (DU), sand (SA), and snow (SN), for example, "BLSN" or "DRSN". DR is coded for DU, SA, or SN raised by the wind to less than 6 feet above the ground. When blowing snow is observed with snow falling from clouds, both phenomena are reported, for example, "SN BLSN". When, because of blowing snow, the observer cannot determine whether snow is also falling, then only "BLSN" must be reported. BL may also be coded with spray (PY).

(7) The descriptor shower(s) (SH) is coded only with one or more of the precipitation types of rain (RA), snow (SN), ice pellets (PL), snow pellets (GS), or large/small hail (GR). The SH descriptor indicates showery-type precipitation. When showery-type precipitation is coded with VC (VCSH), the intensity and type of precipitation must not be coded.

(8) The descriptor thunderstorm (TS) may be coded by itself, that is, a thunderstorm without associated precipitation, or it may be coded with the precipitation types of rain (RA), snow (SN), ice pellets (PL), snow pellets (GS), or large/small hail (GR). For example, a thunderstorm with snow and snow pellets would be coded as "TSSNGS". TS must not be coded with SH.

(9) The descriptor freezing (FZ) must only be coded in combination with fog (FG), drizzle (DZ), or rain (RA), for example, "FZRA". FZ must not be coded with SH.

d. Precipitation.

(1) Up to three types of precipitation may be coded in a single present weather group. They are coded in decreasing dominance based upon intensity. Only one intensity indicator (+ or -) may be coded and it must refer to the total precipitation.

(2) Drizzle is coded as DZ, rain as RA, snow as SN, snow grains as SG, ice crystals as IC, and ice pellets as PL.

(3) Hail including small hail is coded as GR.

(4) At automated stations, precipitation of unknown type is coded as **UP** when the precipitation discriminator cannot identify the precipitation with any greater precision.

e. Obscuration.

(1) Mist is coded as BR when the obscuration consists of water droplets or ice crystals and the visibility is at least 5/8 SM but less than 7 statute miles.

(2) Fog is coded as FG when the obscuration consists of water droplets or ice crystals (fog or freezing fog). For FG to be reported without the qualifiers shallow (MI), partial (PR), or patches (BC), the prevailing visibility in the fog must be less than 5/8 SM. Freezing (FZ) is only reported with FG when visibility is less than 5/8 SM and temperature is less than 0 degrees Celsius. Patches of fog (BCFG) and partial fog (PRFG) may be coded with prevailing visibility of 7 statute miles or greater. See Paragraph Chapter 13.13 b. (1) for more details on coding descriptors with fog.

(3) Smoke is coded as FU and reported only when the prevailing visibility is restricted to less than 7 statute miles.

(4) Volcanic Ash is coded as VA and is reported when present, regardless of the prevailing visibility.

(5) Widespread dust is coded as DU and reported only when the prevailing visibility is restricted to less than 7 statute miles.

(6) Sand is coded as SA and reported only when the prevailing visibility is restricted to less than 7 statute miles.

(7) Haze is coded as HZ and reported only when the prevailing visibility is restricted to less than 7 statute miles.

(8) Spray is coded as PY and only when used with descriptor BL when the prevailing visibility is restricted to less than 7 statute miles.

f. Other Weather Phenomena.

(1) Well-developed dust/sand whirls are coded as PO.

(2) Squalls are coded as SQ when a sudden increase in wind speed of at least 16 knots is observed, and is sustained at 22 knots or more for at least one minute.

(3) Tornadic activity: Funnel clouds are coded as FC. Tornadoes or waterspouts are coded as +FC.

(4) Sandstorms are coded as SS; dust storms are coded as DS.

Table 13-4: Present Weather

Qualifier		Weather Phenomena		
Intensity or Proximity 1	**Descriptor 2**	**Precipitation 3**	**Obscuration 4**	**Other 5**
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Well-Developed Dust/Sand Whirls
Moderate[1]	**PR** Partial	**RA** Rain	**FG** Fog	**SQ** Squalls
+ Heavy	**BC** Patches	**SN** Snow	**FU** Smoke	**FC** Funnel Cloud Tornado[3] Waterspout[3]
VC In the Vicinity[2]	**DR** Low Drifting	**SG** Snow Grains	**VA** Volcanic Ash	**SS** Sandstorm
	BL Blowing	**IC** Ice Crystals	**DU** Widespread Dust	**DS** Duststorm
	SH Shower(s)	**PL** Ice Pellets	**SA** Sand	
	TS Thunderstorm	**GR** Hail	**HZ** Haze	
	FZ Freezing	**GS** Snow Pellets	**PY** Spray	
		UP Unknown Precipitation		

The weather groups must be constructed by considering columns 1 to 5 in this table in sequence, that is, intensity, followed by description, followed by weather phenomena, for example, heavy rain shower(s) is coded as +SHRA.

[1] To denote moderate intensity, no entry or symbol is used.
[2] See Paragraph 9.7 for vicinity definition and Paragraph 13.13(1) for usage.
[3] Tornadoes and waterspouts are coded as +FC.

NOTE: The automated systems do not accept the SH entry.

13.14. Sky Condition Group (NsNsNshshshs or VVhshshs or CLR or SKC)

a. Sky condition is coded in the format, $N_sN_sN_sh_sh_sh_s$, where $N_sN_sN_s$ is the amount of sky cover and $h_sh_sh_s$ is the height of the layer. There must be no space between the amount of sky cover and the height of the layer.

b. Sky condition is coded in ascending order up to the first overcast layer. At this time, layers above 12,000 feet are not reported by automated sky condition sensors. At mountain stations, if the cloud layer is below station elevation, the height of the layer must be reported in the body of the METAR or SPECI as "///".

c. Partial obscurations by a ground-based phenomenon are coded by indicating the amount of obscuration as FEW, SCT, or BKN followed by three zeros (000). (See Paragraph 13.35, Obscuration (w'w'_[$N_sN_sN_s$]$h_sh_sh_s$) for the required remarks.)

d. Automated sky condition sensors may truncate the sky condition group to 3 layers. Otherwise, all stations must observe all cloud layers in ascending order up to the first overcast layer. No more than 6 layers must be reported.

e. Vertical visibility is coded in the format, VV$h_sh_sh_s$, where VV identifies an indefinite ceiling and $h_sh_sh_s$ is the vertical visibility into the indefinite ceiling in hundreds of feet. There must be no space between the group identifier and the vertical visibility.

f. Clear skies are coded in the format, SKC or CLR, where SKC is the abbreviation used for manual reports to indicate no clouds are present and CLR is the abbreviation used for automated reports to indicate no clouds are detected at or below the design limit of the ceilometer.

g. Each layer must be separated from other layers by a space. The sky covers for each layer reported are coded by using the appropriate reportable contraction from Table 13-5: Reportable Values for Sky Cover Amount. The reports of clear skies (CLR or SKC) are complete layer reports within themselves. The abbreviations FEW, SCT, BKN, and OVC must be followed, without a space, by the height of the cloud layer.

Table 13-5: Reportable Values for Sky Cover Amount

Reportable Value (Contraction)	Meaning	Summation Amount of Layer
VV	Vertical Visibility	8/8
SKC or CLR[1]	Clear	0
FEW[2]	Few	> 0 - 2/8
SCT	Scattered	3/8 - 4/8
BKN[3]	Broken	5/8 - 7/8
OVC	Overcast	8/8
[1] The abbreviation CLR must be used at automated stations when no clouds at or below 12,000 feet or design limit of ceilometer) are detected; the abbreviation SKC must be used at manual stations when no clouds are observed. [2] Any layer amount less than 1/8 is reported as FEW. [3] BKN includes sky cover from 5/8 up to, but not including, 8/8.		

The height of the base of each layer, $h_sh_sh_s$, is coded in hundreds of feet above the surface using three digits in accordance with Table 13-6: Increments of Reportable Values of Sky Cover Height.

Table 13-6: Increments of Reportable Values of Sky Cover Height

Range of Heights (feet)	Reportable Values (feet)
5,000 or less	To nearest 100
>5,000 but ≤10,000	To nearest 500
Above 10,000	To nearest 1,000

Observers must identify cumulonimbus or towering cumulus by appending cumulonimbus (CB) or towering cumulus (TCU), respectively, to the layer report. When the TCU or CB is appended to the layer report, accompanied by the remark, "TCU NW" or "CB NW MOV E", it is implied that the TCU or CB is associated with that layer and is within 10 SM. When the TCU or CB is outside of 10 SM, a DSNT remark is appropriate, for example, "TCU DSNT NW". (In this case, TCU or CB would not be appended to the layer in the body of the METAR.)

13.15. Temperature/Dew Point Group (T'T'/T'dT'd)

a. The temperature must be separated from the dew point following it by a solidus (/).

b. The temperature and dew point is coded as two digits rounded to the nearest whole degree Celsius (see Paragraph 3.9). Sub-zero temperatures and dew points must be prefixed with an M. For example, a temperature of 4ºC with a dew point of -2ºC is coded as "04/M02". A temperature of -0.5ºC is coded as "M00".

c. If the temperature is not available, the entire temperature/dew point group must not be coded. If the dew point is not available, code the temperature followed by a solidus (/) and no entry made for dew point. For example, a temperature of 1.5ºC and a missing dew point would be reported as "02/".

13.16. Altimeter (APHPHPHPH). The altimeter group always starts with an A (the international indicator for altimeter in inches of mercury). The altimeter is coded as a four digit group immediately following the A using the tens, units, tenths, and hundredths of inches of mercury. The decimal point is not coded.

13.17. Remarks (RMK). Remarks must be included in all METAR and SPECI, if appropriate. Remarks must be separated from the altimeter group by a space and the contraction RMK. If there are no remarks, the contraction RMK must not be entered.

a. Remarks Categories. METAR/SPECI remarks fall into 2 major categories: Automated, Manual and Plain Language Remarks, and Additive and Maintenance Data.

b. General Procedures for Remarks. Remarks must be made in accordance with the following:

(1) Use of Contractions and Abbreviations. Where plain language is called for, authorized contractions, abbreviations, and symbols should be used to conserve time and space. However, in no case should an essential remark, of which the observer is aware, be omitted for the lack of readily available contractions. In such cases, the only requirement is that the remark be clear. For a detailed list of authorized contractions, see FAA Order 7340.2, Contractions.

(2) Time Entries in Remarks. Time entries must be made in minutes past the hour if the time reported occurs during the same hour the observation is taken. Hours and minutes must be used if the hour is different, or this order prescribes the use of the hour and minutes.

(3) Location Entries. With the exception of lightning and thunderstorms detected by an automated weather observing system, the location of phenomena within 5 statute miles of the point of observation must be reported as occurring at the station. Phenomena between 5 and 10 statute miles must be reported as vicinity (VC), followed by direction from the station, if known. Phenomena beyond 10 statute miles of the point of observation must be reported as distant (DSNT) followed by the direction from the station. In the case of a tornado, the exact location should be included if possible. See Paragraph 13.20, Funnel Cloud (TORNADIC ACTIVITY_B/E(hh)mm_LOC/DIR_(MOV)).

(4) Movement Entries. Movement of clouds or weather, if known, is coded with respect to the direction toward which the phenomenon is moving.

(5) Direction. Directions must use the eight points of the compass coded in a clockwise order beginning with north.

(6) Order of Entry. Insofar as possible, remarks must be entered in the order in which they are presented in the following paragraphs.

13.18. Automated, Manual, and Plain Language Remarks. These remarks generally elaborate on parameters reported in the body of the report. Automated and manual remarks may be generated either by an automated or manual station. Plain language remarks can only be added by an observer.

13.19. Volcanic Eruptions. Volcanic eruptions must be reported, whenever observed. Pre-eruption volcanic activity must not be reported. Pre-eruption refers to unusual and/or increasing volcanic activity, which could precede a volcanic eruption. The remark must be plain language and contain the following, if known:

a. Name of volcano.

b. Latitude/longitude or the direction and the approximate distance from the station.

c. Date/time (UTC) of the eruption.

d. Size description, approximate height, and direction of movement of the ash cloud.

e. Any other pertinent data about the eruption.

EXAMPLE: MT AUGUSTINE VOLCANO 70 MILES SW ERUPTED 231505 LARGE ASH CLOUD EXTENDING TO APRX 30000 FEET MOVING NE

13.20. Funnel Cloud (TORNADIC ACTIVITY_B/E(hh)mm_LOC/DIR_(MOV))

a. At manual stations, tornadoes, funnel clouds, or waterspouts are coded in the above format, where TORNADO, FUNNEL CLOUD, or WATERSPOUT identifies the specific tornadic activity. B/E denotes the beginning and/or ending time, (hh)mm is the time of occurrence (only the minutes are required if the hour can be inferred from the report time). LOC/DIR is the location and/or direction of the phenomenon from the station, and MOV is the movement, if known. Tornadic activity is coded as the first remark after the "RMK" entry, unless a volcanic remark is required.

EXAMPLE: A tornado 6 statute miles northeast of the station, beginning at 13 minutes past the hour: TORNADO B13 6 NE MOV UNKN

b. At augmented sites with an automated system with SPECI capability, +FC is coded for tornadoes and waterspouts. In remarks, TORNADO, along with beginning or end time, would indicate either a tornado, funnel cloud, or waterspout began or ended.

13.21. Type of Automated Station (AO1 or AO2). AO1 or AO2 is coded in all METAR/SPECI from automated stations. Automated stations without a precipitation discriminator are identified as AO1; automated stations with a precipitation discriminator are identified as AO2.

13.22. Peak Wind (PK WIND_ddff(f)/(hh)mm) (Automated Only). The peak wind is coded in the above format in the next METAR where PK WND is the remark identifier, ddd is the direction of the peak wind, ff(f) is the peak wind speed since the last METAR, and (hh)mm is the time of occurrence (only the minutes are required if the hour can be inferred from the report time). There must be one space between the two elements of the remark identifier and the wind direction/speed group; a solidus (/) (without spaces) must separate the wind direction/speed group and the time.

EXAMPLE: A peak wind of 45 knots from 280 degrees that occurred at 15 minutes past the hour:PK WND 28045/15

13.23. Wind Shift (WSHFT_(hh)mm). At stations with automated systems with SPECI capability and manual stations, a wind shift is coded in the above format, where WSHFT is the remark identifier and (hh)mm is the time the wind shift began (only the minutes are required if the hour can be inferred from the report time). The contraction FROPA may be entered following the time if it is reasonably certain that the wind shift was the result of frontal passage. There must be a space between the remark identifier and the time, and if applicable, between the time and the frontal passage contraction.

EXAMPLE: Wind shift accompanied by a frontal passage that began at 30 minutes after the hour: WSHFT 30 FROPA

13.24. Tower or Surface Visibility (TWR_VIS_vvvvv or SFC_VIS_vvvvv). Tower visibility or surface visibility is coded in the above formats, where vvvvv is the observed tower/surface visibility value. A space must be coded between each of the remark elements.

EXAMPLE: 1 1/2 SM visibility from the control tower: TWR VIS 1 1/2

13.25. Variable Prevailing Visibility (VIS_vnvnvnvnvnVvxvxvxvxvx). Variable prevailing visibility is coded in the above format where VIS is the remark identifier, and $v_nv_nv_nv_nv_n$ is the lowest visibility evaluated. V denotes variability between the two values, and $v_xv_xv_xv_xv_x$ is the highest visibility evaluated. There must be a space following the remark identifier; no spaces between the letter V and the lowest/highest values.

EXAMPLE: Visibility varying between 1/2 and 2 statute miles: VIS 1/2V2

13.26. Sector Visibility (VIS_[DIR]_vvvvv). The sector visibility is coded in the above format when either the prevailing or sector visibility is less than 3 miles or is considered operationally significant and sector visibility differs from the prevailing visibility by one or more reportable values. In the format of the remark, VIS is the remark identifier, [DIR] defines the sector to 8 points of the compass, and vvvvv is the sector visibility in statute miles, using the appropriate set of values in Table 13-3.

EXAMPLE: 2 1/2 mile visibility in the northeastern octant: VIS NE 2 1/2

NOTE: Not required by LAWRS, may be reported if deemed operationally significant by the controller/observer.

13.27. Visibility at Second Location((VIS_vvvvv_[LOC]) (Automated Only). At stations with meteorological discontinuity sensors, the visibility at a second location on the same airport is coded in the above format, where VIS is the remark identifier, vvvvv is the measured visibility value, and [LOC] is the specific location of the visibility sensor(s) at the station. This remark must only be generated when the condition is lower than that contained in the body of the report.

EXAMPLE: 2 1/2 statute mile visibility measured by a second sensor located at runway 11: VIS 2 1/2 RWY11

13.28. Lightning Frequency (Frequency_LTG(Type)_[LOC])

a. Manual Location. When lightning is observed at a manual location, the frequency and location must be reported. Type of lightning must be reported, if known. The remark is coded in the above format. The contractions for the type of lightning must be based on Table 13-7. The location and direction are coded in accordance with Paragraph 13.17(3).

EXAMPLES: CONS LTGIC OHD, or

FRQ LTGCG VC W, or
OCNL LTG DSNT W

Table 13-7: Type and Frequency of Lightning

Type of Lightning		
Type	**Contraction**	**Definition**
Cloud to Ground	CG	Lightning occurring between cloud and ground.
In the Cloud	IC	Lightning which takes place within the thundercloud.
Cloud to Cloud	CC	Streaks of lightning reaching from one cloud to another.
Cloud to Air	CA	Streaks of lightning, which pass from a cloud to the air, but do not strike the ground.
Frequency of Lightning		
Frequency	**Contraction**	**Definition**
Occasional	OCNL	Less than 1 flash/minute.
Frequent	FRQ	About 1 to 6 flashes/minute.
Continuous	CONS	More than 6 flashes/minute.

b. When lightning is detected by an automated weather observing system with ALDARS:

(1) Within 5 nautical miles of the Airport Reference Point (ARP), it will be reported as "TS" in the body of the report with no remark;

(2) Between 5 and 10 miles of the ARP, it will be reported as "VCTS" in the body of the report with no remark;

(3) Beyond 10 but less than 30 nautical miles of the ARP, it will be reported in remarks as "DSNT" followed by the direction from the ARP.

EXAMPLE: LTG DSNT W

13.29. Beginning and Ending of Precipitation (w'w'B(hh)mmE(hh)mm) (NA LAWRS). At stations with automated systems with SPECI capability and manual stations, the beginning and ending of precipitation is coded in the above format, where w'w' is the type of precipitation, B denotes the beginning, E denotes the ending, and (hh)mm is the time of occurrence (only the minutes are required if the hour can be inferred from the report time). There must be no spaces between the elements. Report the beginning and ending times of precipitation in a SPECI if that precipitation caused the SPECI. Intensity qualifiers must not be coded.

EXAMPLES: Rain beginning at 0005 and ending at 0030, and snow beginning at 0020 and ending at 0055: RAB05E30SNB20E55

If the above precipitation is showery: SHRAB05E30SHSNB20E55

13.30. Beginning and Ending of Thunderstorms (TSB(hh)mmE(hh)mm). The beginning and ending of thunderstorm(s) are coded in the above format, where TS indicates thunderstorm, B denotes the beginning, E denotes the ending, and (hh)mm is the time of occurrence (only the minutes are required if the hour can be inferred from the report time). There must be no spaces between the elements. These coded remarks are required in the SPECI and in the next METAR after the event.

EXAMPLE: Thunderstorm beginning at 0159 and ending at 0230: TSB0159E30

13.31. Thunderstorm Location (TS_LOC_(MOV_DIR))

a. Thunderstorms are coded in the above format, where TS identifies the thunderstorm activity, LOC is the location of the thunderstorm(s) from the station, and MOV_DIR is the movement with direction, if known.

EXAMPLE: Thunderstorm within 5SM of station moving NE is reported as TS OHD MOV NE

b. Thunderstorms beyond 10 SM are coded as distant.

EXAMPLE: TS DSNT NW

c. Any other thunderstorm location or movement remarks the observer judges appropriate must be added manually.

13.32. Hailstone Size (GR_[size]). At augmented automated stations and at manual stations the hailstone size is coded in the above format where GR is the remark identifier and [size] is the diameter of the largest hailstone, coded in 1/4 inch increments. When the largest hailstone observed is 1/4 inch or more in diameter, it is coded with the contraction GR. Hail less than 1/4 inch in size is coded in Remarks as "GR LESS THAN 1/4".

EXAMPLES: Largest hailstones 1 3/4 inches in diameter: GR 1 3/4
Small hail: GR LESS THAN 1/4

13.33. Virga (VIRGA_(DIR)). At augmented automated stations and at manual stations, virga is coded in the indicated format, when precipitation is observed to be falling from clouds but is not reaching the ground because of evaporation. The direction, DIR, of the phenomenon from the station is optional.

EXAMPLES: VIRGA, or
VIRGA SW

13.34. Variable Ceiling Height (CIG_hnhnhnVhxhxhx). The variable ceiling height is coded in the above format, where CIG is the remark identifier, $h_nh_nh_n$ is the lowest ceiling height evaluated. V denotes variability between two values, and $h_Xh_Xh_X$ is the highest ceiling height evaluated. There must be one space following the remark identifier, and no spaces between the letter V and the lowest/highest values.

EXAMPLE: Ceiling varying between 500 and 1,000 feet: CIG 005V010

13.35. Obscuration (w'w'_[$N_SN_SN_S$]$h_Sh_Sh_S$). Obscurations are coded in the indicated format, where w'w' is the present weather causing the obscuration at the surface or aloft, and $N_SN_SN_S$ is the applicable sky cover amount of the obscuration aloft (FEW, SCT, BKN, OVC) or at the surface (FEW, SCT, BKN), and $h_Sh_Sh_S$ is the applicable height. Surface-based obscurations must have a height of "000". The type of present weather must be prefixed (separated by a space) to the sky cover layer that represents the obscuration.

EXAMPLES: Fog is hiding 3 to 4 eighths of the sky: FG SCT000
A broken layer at 2,000 feet composed of smoke: FU BKN020

13.36. Variable Sky Condition ($N_SN_SN_S$($h_Sh_Sh_S$)_V_$N_SN_SN_S$). The variable sky condition remark is coded in the above format, where $N_SN_SN_S$($h_Sh_Sh_S$) and $N_SN_SN_S$ identify the two operationally significant sky conditions, and V denotes the variability between the two ranges. For example, "SCT V BKN" would identify a scattered layer that is variably broken. If there are several layers with the same sky condition amount in the report, the layer height is coded with the variable layer.

EXAMPLE: Cloud layer at 1,400 feet, varying between broken and overcast: BKN014 V OVC

13.37. Significant Cloud Type [PLAIN LANGUAGE]. Cumulonimbus or Cumulonimbus Mammatus (CB or CBMAM_LOC_ (MOV_DIR). Cumulonimbus (CB) or cumulonimbus mammatus (CBMAM), as appropriate, (for which no thunderstorm is being reported) is coded in the above format, where CB or CBMAM is the cloud type, LOC is the direction from the station, and MOV_DIR is the movement with direction (if known). The cloud type, location, movement, and direction entries must be separated from each other with a space.

EXAMPLES:

CB up to 10 SM west of the point of observation, moving toward the east: CB W MOV E
Cloud is more than 10 SM away: CB DSNT W

a. Towering Cumulus (TCU_[DIR]). Towering cumulus (TCU) clouds are coded in the format, TCU_[DIR], where TCU is the cloud type and DIR is the direction from the point of observation. The cloud type and direction entries must be separated by a space.

EXAMPLE: Towering cumulus clouds up to 10 SM west of the point of observation: TCU W

b. Altocumulus Castellanus (ACC_[DIR]). Altocumulus Castellanus (ACC) is coded in the format, ACC_[DIR], where ACC is the cloud type and DIR is the direction from the point of observation. The cloud type and direction entries must be separated by a space.

EXAMPLE: Altocumulus castellanus up to 10 statute miles northwest of the point of observation: ACC NW

c. Standing Lenticular or Rotor Clouds (CLD_[DIR]). Stratocumulus standing lenticular (SCSL), altocumulus standing lenticular (ACSL), or cirrocumulus standing lenticular (CCSL), or rotor clouds are coded in the format, CLD_[DIR], where CLD is the cloud type and DIR is the direction from the point of observation. The cloud type and direction entries must be separated by a space.

EXAMPLES: Altocumulus standing lenticular clouds observed southwest through west of the point of observation: ACSL SW-W

Apparent rotor cloud northeast of the point of observation: APRNT ROTOR CLD NE
Cirrocumulus standing lenticular clouds south of the point of observation: CCSL S

13.38. Ceiling Height at Second Location (CIG_hhh_[LOC]) (Automated Only). At automated stations equipped with the meteorological discontinuity sensors, the ceiling height at a second location on the same airport is coded in the above format, where CIG is the remark identifier, hhh is the measured height of the ceiling, and [LOC] is the specific location of the ceilometer(s) at the station. This remark must only be generated when the ceiling is lower than that contained in the body of the report.

EXAMPLE: Ceiling measured by a second sensor located at runway 11 is broken at 200 feet: CIG 002 RWY11

13.39. Pressure Rising or Falling Rapidly (PRESRR or PRESFR) (Automated Only). At automated stations and manual stations, when the pressure is rising or falling rapidly at the time of the observation (METAR AND/OR SPECI) the remark PRESRR or PRESFR is included in the report.

13.40. Sea-Level Pressure (SLPppp) (Automated Only). Sea-level pressure is reported in the above format. The remark begins with SLP and is coded using the tens, units, and tenths of the sea-level pressure in hectopascals. For example, a sea-level pressure of 998.2 hectopascals would be coded as "SLP982". For a METAR, if sea-level pressure is not available at stations where it would normally be reported, it is coded as "SLPNO".

13.41. Aircraft Mishap (ACFT_MSHP). If a report is taken to document weather conditions when notified of an aircraft mishap, the remark ACFT_MSHP must be included in the report, but not transmitted. The act of non-transmission must be indicated by enclosing the remark in parentheses in the record, that is, "(ACFT MSHP)".

13.42. Snow Increasing Rapidly (SNINCR_(inches-hour/inches on ground)) (Sites listed in Appendix F). At Service Level A and B and manual stations, the snow increasing rapidly remark is coded, in the next METAR, whenever the snow depth increases by 0.5 inch (1 inch to the nearest whole inch) or more in the past hour and the reportable value (in whole inches) of the total depth of snow on the ground increases by one inch or more. The remark is coded in the above format, where SNINCR is the remark indicator, "inches-hour" is the depth increase in the past hour, and "inches on ground" is the total depth of snow on the ground at the time of the report. The depth increase in the past hour and the total depth on the ground are separated from each other by a solidus (/).

EXAMPLE: Snow depth increase of 2 inches in the last hour with a total depth on the ground of 10 inches: SNINCR 2/10

13.43. Other Significant Information. Agencies may have other information significant to their operations, such as information on fog dispersal operations, runway conditions, and other information important to aircraft operations.

13.44. Additive and Automated Maintenance Data. Additive data groups are reported at automated and manual stations. Maintenance data groups are only reported from automated stations. Additive data groups reported by automated weather systems (Automated Only) are not backed up by weather observers.

13.45. Precipitation Additive Data. The amount of liquid precipitation is evaluated as the depth of precipitation that accumulates in an exposed vessel during the time period being evaluated. The amount of freezing or frozen precipitation must be the water equivalent of the solid precipitation accumulated during the appropriate time period. Precipitation measurements are in inches, tenths of inches, or hundredths of inches depending on the precipitation being measured (see Table 13-8: Units of Measure for Precipitation). The depth of freezing and/or frozen precipitation is the actual vertical depth of the precipitation accumulated on a horizontal surface during the appropriate time period. If snow falls, melts, and refreezes, the depth of ice formed is included in the measurement.

Table 13-8: Units of Measure for Precipitation

Type of Measurement	Unit of Measure
Liquid Precipitation	0.01 inch
Water Equivalent of Solid Precipitation	0.01 inch
Solid Precipitation	0.1 inch
Snow Depth	1.0 inch

13.46. Hourly Precipitation Amount (Prrrr) (Automated Only). At automated stations, the hourly precipitation amount remark is coded in the format, Prrrr, where P is the group indicator, and rrrr is the water equivalent of all precipitation that has occurred since the last METAR. The amount is coded in hundredths of an inch. The group must be omitted if no precipitation occurred since the last METAR.

EXAMPLES: 9/100 of an inch of precipitation fell in the past hour:P0009
Less than 1/100 of an inch of precipitation fell in the past hour:P0000

13.47. 1, 3, and 6 Hourly Ice Accretion Amounts (I1nnn, I3nnn, I6nnn) (Automated Only). NWS and FAA have developed an algorithm to be applied to the automated system with SPECI capability freezing rain sensor that can accurately measure and report the amount of surface ice accretion at a specific point over a given time period. The automated system with SPECI capability freezing rain sensor, and the newly developed ice accretion algorithm will generate information that will be included in the remarks section of a METAR/ SPECI. Ice accretion remarks must only be included in the METAR and SPECI reports when accretion is occurring, or has occurred during the reporting period. The remark will be updated each minute when encoded. This requirement is for automated encoding of these remarks, and no manual backup is required. Although the ice accretion remark was not available at the time of this writing, it is scheduled to be available following an upcoming ASOS software revision. The format for the hourly, 3-hourly, and 6-hourly reports follows.

a. Hourly Ice Accretion Amount (I1nnn) (Automated Only). This remark provides the ice accretion amount during the preceding hour. The accretion of ice over the past one hour time period in one-hundredths of an inch (0.01 in.) would have the format: "I1nnn"; where "I" is the icing indicator for the group, "1" is the reported time period (one hour), and "nnn" is the thickness accumulated to the nearest one-hundredth of an inch (0.01 in.), during the reported time period (one hour). This remark must be reset immediately after the hourly METAR report is transmitted. When this remark is included in the automated system with SPECI capability software, it will most likely be encoded immediately following the hourly precipitation amount, and before the 3- and 6-hour precipitation amount.

b. 3-Hourly Ice Accretion Amount (I3nnn) (Automated Only). This remark provides the ice accretion amount during the last three hours, and is included in the reports taken at the intermediate synoptic times of 0300, 0900, 1500, and 2100 UTC. The accretion of ice over the past three hour time period in one-hundredths of an inch (0.01 in.) would have the format: "I3nnn"; where "I" is the icing indicator for the group, "3" is the reported time period (three hours), and "nnn" is the thickness accumulated to the nearest one-hundredth of an inch (0.01 in.), during the reported time period (three hours). This remark must be reset immediately after the intermediate synoptic or mandatory synoptic METAR is transmitted (0300, 0600, 0900, 1200, 1500, 1800, 2100 and 0000 UTC). When this remark is included in the automated system with SPECI capability software, it will most likely be encoded immediately following the hourly ice accretion amount, and before the 3- and 6-hour precipitation amount.

c. 6-Hourly Ice Accretion Amount (I6nnn) (Automated Only). This remark provides the ice accretion amount during the last six hours, and is included in the reports taken at the synoptic times of 0600, 1200, 1800, and 0000 UTC. The accretion of ice over the past six hour time period in one-hundredths of an inch (0.01 in.) would have the format: "I6nnn"; where "I" is the icing indicator for the group, "6" is the reported time period (six hours), and "nnn" is the thickness accumulated to the nearest one-hundredth of an inch (0.01 in.), during the reported time period (six hours). This remark must be reset immediately after the mandatory synoptic METAR is transmitted (0600, 1200, 1800, and 0000 UTC). When this remark is included in the automated system with SPECI capability software, it will most likely be encoded immediately following the hourly ice accretion amount, and before the 3- and 6-hour precipitation amount.

d. Missing Data. If the freezing rain sensor is inoperative for more than 25 percent of the reporting period, the icing remark must be considered missing. Missing groups must be encoded as I1///, I3///, or I6///, as appropriate. If no icing is detected, then the groups must not be encoded. Note that an automated icing event will always report at least 0.01 in. of ice accretion.

13.48. 3- and 6- Hour Precipitation Amount (6RRRR) (Automated Only). At stations equipped with automated systems with SPECI capability and manual stations, the 3- and 6-hourly precipitation group is coded in the above format, where 6 is the group indicator and RRRR is the amount of precipitation. The amount of precipitation (water equivalent) accumulated in the past 3 hours must be reported in the 3-hourly report, and the amount accumulated in the past 6 hours must be reported in the 6-hourly report. The amount of precipitation is coded in inches, using the ten, units, tenths, and hundredths digits of the amount. When an indeterminable amount of precipitation has occurred during the period, RRRR is coded "6////". A trace is coded "60000".

EXAMPLE: 2.17 inches of precipitation: 60217

13.49. 24-Hour Precipitation Amount (7R24 R24 R24 R24) (Automated Only). The 24-hour precipitation amount is coded in the above format, where 7 is the group indicator and R24R24R24R24 is the 24-hour amount of precipitation included in the 1200 UTC (or other agency- designated time) report whenever more than a trace of precipitation (water equivalent) has fallen in the past 24 hours. The amount of precipitation is coded by using the tens, units, tenths, and hundredths of inches (water equivalent) for the 24-hour period. If more than a trace (water equivalent) has occurred and the amount cannot be determined, the group is coded "7////".

13.50. Snow Depth on Ground (4/sss) (Sites listed in Appendix F). At stations listed in Appendix F, the total snow depth on ground group is coded in the 0000, 0600, 1200, and 1800 UTC observations whenever there is more than a trace of snow on the ground. The remark is coded in the format 4/sss, where 4/ is the group indicator and sss is the snow depth in whole inches using three digits.

EXAMPLE: Snow depth of 21 inches: 4/021

13.51. Water Equivalent of Snow on Ground (933RRR) (Sites Listed in Appendix F). The water equivalent of snow on ground group is reported each day in the 1800 UTC report if the average snow depth is 2 inches or more. The remark is coded in the format 933RRR, where 933 is the group indicator and RRR is the water equivalent of snow; that is, snow, snow pellets, snow grains, ice pellets, ice crystals, hail, on the ground. The water equivalent is reported in tens, units, and tenths of inches, using three digits. Do not code the group if it consists entirely of hail. Estimations, ratios (for example, 10 to 1), or temperature/snow water equivalent tables are not to be used to determine water equivalency of snow for this group.

EXAMPLES: 3.6 inches water equivalent of snow: 933036
12.5 water equivalent of snow: 933125

13.52. Hourly Temperature and Dew Point (TsnT'T'T'snT'dT'dT'd) (Automated Only). At automated stations except AWOS-A, the hourly temperature and dew point group is coded in the above format, where T is the group indicator, sn is the sign of the temperature, T'T'T' is the temperature, and T'dT'dT'd is the dew point. The sign of the temperature and dew point is coded as 1 if the value is below 0oC and 0 if the value is 0oC or higher. The temperature and dew point is reported in tens, units, and tenths of degrees Celsius. There are no spaces between the entries. If dew point is missing, the temperature is reported; if the temperature is missing, the temperature/dew point group is not reported.

EXAMPLES: Temperature of 2.6°C and dew point of -1.5°C reported in the body of the report: 03/M01….Temperature of 2.6°C and dew point of -1.5°C reported in the temperature/dew point group; T00261015

13.53. 6-Hourly Maximum Temperature (1snTxTxTx) (Automated Only). The 6-hourly maximum temperature group is coded in the above format, where 1 is the group indicator, sn is the sign of the temperature, and TxTxTx is the maximum temperature in tenths of degrees Celsius using three digits. The sign of the maximum temperature is coded as 1 if the maximum temperature is below 0°C and 0 if the maximum temperature is 0°C or higher.

EXAMPLES: A maximum temperature of -0.1°C: 11001

A maximum temperature of 14.2°C: 10142

13.54. 6-Hourly Minimum Temperature ($2s_nT_nT_nT_n$) (Automated Only). The 6-hourly minimum temperature group is coded in the above format, where 2 is the group indicator, s_n is the sign of the temperature, and $T_nT_nT_n$ is the minimum temperature in tenths of degrees Celsius using three digits. The sign of the minimum temperature is coded as 1 if the minimum temperature is below 0°C and 0 if the minimum temperature is 0°C or higher.

EXAMPLES: A minimum temperature of -2.1°C:21021
A minimum temperature of 1.2°C:20012

13.55. 24-Hour Maximum and Minimum Temperature ($4s_nT_xT_xT_xs_nT_nT_nT_n$) (Automated Only). The 24-hour maximum temperature and the 24-hour minimum temperature is coded in the above format, where 4 is the group indicator, s_n is the sign of the temperature, $T_xT_xT_x$ is the maximum 24-hour temperature, and $T_nT_nT_n$ is the 24-hour minimum temperature. Temperature is coded in tenths of degrees Celsius using three digits. The sign of the maximum or minimum temperature is coded as 1 if it is below 0°C and 0 if it is 0°C or higher.

EXAMPLE: A 24-hour maximum temperature of 10.0°C and 24-hour minimum temperature of -1.5°C:401001015

13.56. 3-Hourly Pressure Tendency (5appp) (Automated Only). At equipped automated stations, the 3-hourly pressure tendency group is coded in the format 5appp where 5 is the group indicator, a is the character of pressure change over the past 3 hours, and ppp is the amount of barometric change in tenths of hectopascals using the tens, units, and tenths digits (see example below). The character a is coded by selecting the code figure from Table 13-9 that best describes the pressure change in the past 3 hours. For example, a steady increase of 3.2 hectopascals in the past three hours would be coded "52032". The ppp is coded based on the absolute value of the change of either the station pressure or the altimeter setting in the past 3 hours in tenths of hectopascals and using the tens, units, and tenths digits.

EXAMPLE: A steady increase of 3.2 hectopascals in the past 3 hours: 52032

Table 13-9: Characteristics of Barometer Tendency

Primary Requirement	Description	Code Figure
Atmospheric pressure now higher than 3 hours ago.	Increasing, then decreasing.	0
	Increasing, then steady; or increasing, then increasing more slowly.	1
	Increasing steadily or unsteadily.	2
	Decreasing or steady, then increasing; or increasing, then increasing more rapidly.	3
Atmospheric pressure now the same as 3 hours ago.	Increasing, then decreasing.	0
	Steady.	4
	Decreasing, then increasing.	5

Primary Requirement	Description	Code Figure
Atmospheric pressure now lower than 3 hours ago.	Decreasing, then increasing.	5
	Decreasing, then steady; or decreasing, then decreasing more slowly.	6
	Decreasing steadily or unsteadily.	7
	Steady or increasing, then decreasing; or decreasing, then decreasing more rapidly.	8

13.57. Sensor Status Indicators. At equipped automated stations, sensor status indicators should be reported as indicated below:

a. When automated stations are equipped with a precipitation identifier and that sensor is not operating, the remark **PWINO** is coded.

b. When automated stations are equipped with a tipping bucket rain gauge and that sensor is not operating, **PNO** is coded.

c. When automated stations are equipped with a freezing rain sensor and that sensor is not operating, the remark **FZRANO** is coded.

d. When automated stations are equipped with a lightning detection system and that sensor is not operating, the remark **TSNO** is coded.

e. When automated stations are equipped with a secondary visibility sensor and that sensor is not operating, the remark **VISNO_LOC** is coded.

f. When automated stations are equipped with a secondary ceiling height indicator and that sensor is not operating, the remark **CHINO_LOC** is coded.

g. When equipped with RVR and the sensor is not operating, the remark **RVRNO** is coded. The ASOS does this automatically.

13.58. Maintenance Indicator. A maintenance indicator sign $ is coded when an ASOS/AWOS-C detects that maintenance is needed on the system. While the $ sign indicates there is an internal problem with the automated weather system, not all problems are self-detected. The controller/observer must routinely monitor the system to ensure valid weather reports are properly disseminated.

Chapter 14. Entries on Observational Forms

14.1. Introduction. This chapter prescribes procedures and practices for making entries on various observational forms. At all manual FAA facilities, all observations must be recorded on Form MF1M-10C, Surface Weather Observations (METAR/SPECI). The form is available from the NWS at https://www.weather.gov/surface/forms. Many of the instructions in this chap-ter relating to the observational form (MF1M-10C) are duplicated from Chapter 13, Coding References to other chapters are noted where applicable. Automated weather stations only use the MF1M-10C for recording practice weather observations and training.

14.2. Entries on Meteorological Form 1M-10C (MF1M-10C). Manual weather observers must normally complete all entries on MF1M-10C. Non-certified trainees/observers may make entries on the form under the immediate supervision of a certified observer who assumes re-sponsibility for the validity of the entries by initialing in column 15. Non-certified observers may initial the observation, but the certified observer must initial first. Initials must be separated by a solidus (/).

14.3. Writing Instrument. To ensure legible copies and ample contrast for reproduction, the observer must use a black-inked, fine-tipped, ballpoint pen. Handwritten copies may be retained at the station. Only electronic versions of the MF1M-10C can be emailed to surface.qc@noaa.gov.

14.4. Parenthetical Data. Data entered in columns 3 through 14 of Form MF1M-10C that are not intended to be transmitted must be enclosed in parentheses.

14.5. Missing Data. See Paragraph 13.4, Coding Missing Data in METAR and SPECI Reports. When using Form MF1M-10C, the observer must explain briefly the reasons for any missing data in block 65, Remarks, Notes, and Miscellaneous Phenomena.

14.6. Late Observations. When a METAR observation is taken late, but within 15 minutes of the standard time of observation, and no appreciable changes have occurred since the standard time, the observer must record the observation and transmit it using the actual time of obser-vation. If conditions have changed appreciably or the observation is more than 15 minutes late, the observer must skip a line and record and transmit a SPECI observation containing all the elements in a METAR observation. After transmitting the SPECI, using the actual time of observation, the observer must estimate the conditions probable at the standard time using recording instruments whenever possible. The observer must record this data on the skipped line using the standard time in column 2. The estimated observation must not be transmitted. The observer must make note in column 65 referencing the actual time of observation that the estimated observation was recorded.

14.7. Corrections. If the paper version of Form MF1M-10C is used at the station, the observer must not erase or otherwise obliterate entries. To make a correction on Form MF1M-10C (paper version), the observer must draw a single line through the erroneous entry. Record corrected data in the appropriate blocks on the same or next line appropriately identified. If only the Elec-tronic version is used and retained, only the corrected entries are required to be entered. The electronic version of MF1M-10C must only contain all of the observations that were transmitted before sending to NCEI at surface.qc@noaa.gov.

14.8. Heading on Form MF1M-10C at LAWRS. At a manual LAWRS station, the observer must enter the official station name and state abbreviation in the block labeled STATION. The four-letter Airport ID must be included in the SID block. Also in the blocks provided, the observer must enter the date and time (in Coordinated Universal Time (UTC)) and the conversion factor used to convert Local Standard Time (LST) to UTC. The observer must check after UTC to indicate that the times used in column 2 of the form are in UTC. In the blocks labeled LATITUDE and LONGITUDE, enter the station's latitude and longitude to the nearest minute of a degree. In the block labeled STATION ELEVATION, enter the station's elevation (Hp) to the nearest foot.

14.9. Heading on Form MF1M-10C at Other Stations (NA LAWRS). In the block labeled STATION, the observer must enter the type of station, the official station name and state abbreviation. The four-letter Airport ID must be included in the SID block. Also in the blocks provided, the observer must enter the date and time (in LST), and conversion factor used to convert LST to UTC. In the blocks labeled LATITUDE and LONGITUDE, enter the station's latitude and longitude to the nearest minute of a degree. In the block labeled STATION ELEVATION, enter the station's elevation (Hp) to the nearest foot.

14.10. Entries on Form MF1M-10C by Columns. The procedures and practices given below are only for those columns applicable at FAA facilities.

a. Type of Observation (Column 1). **M** must be recorded to designate a METAR observation; **S** must be recorded to designate a SPECI observation.

b. Time of Observation (Column 2). At a manual LAWRS station, the observer must record the actual time of the observation in Coordinated Universal Time (UTC). At all other stations, the observer must record the actual time of observation in Local Standard Time (LST).

c. Wind Direction (Column 3). The observer must record the true wind direction from which the wind is blowing in tens of degrees using three figures. Directions less than 100 degrees must be preceded with a 0. When the wind is calm, the observer must enter 000 for the direction. When the wind speed is 6 knots or less, the direction may be recorded as VRB.

d. Wind Speed (Column 4). The observer must record the wind speed in whole knots using the hundreds digit (if not zero), and the tens and units digit. The observer must record speeds of less than 10 knots with a leading zero. For example, a wind speed of 5 knots must be logged as 05. A wind speed of 105 knots must be logged as 105. Calm winds must be recorded as 00.

e. Wind Gust (Column 5). When gusts have been recorded or observed during the 10 minutes prior to the actual time of observation, the observer must enter the peak speed.

f. Wind Variability (Column 6). When wind direction fluctuates by 60 degrees or more during the 2-minute evaluation period and the wind speed is greater than 6 knots, the observer must enter the range of variability. A wind direction fluctuating between 260 degrees and 40 degrees must be entered as 260V040.

g. Surface Visibility (Column 7a) and Tower Visibility (Column 7b). The observer must record the surface prevailing visibility (column 7a) determined from the weather station's usual point(s) of observation using the nearest reportable value listed in Table 13-3, Reportable Visibility Values.

h. Runway Visual Range (Column 8). At stations with a standalone RVR display, the observer must record the RVR to match the coding in Paragraph 13.12, Runway Visual Range Group (RDRDR/VRVRVRVRFT) or (RDRDR/VnVnVnVnVVxVxVxVxFT) . When the automation interface fails, RVR will not be reported by observers/controllers.

i. Present Weather (Column 9). Record weather and obscurations occurring at the station using the order described in Paragraph 9.6, Order for Reporting Multiple Types of Weather and Obscurations. Weather intensity symbols and codes are shown in Table 9-1: Present Weather. Only record obscurations if the visibility is reduced to less than 7 miles, except for volcanic ash, which is always recorded.

j. Sky Condition (Column 10). The procedures for reporting sky condition are given in Chapter 10, Sky Condition. The observer must record sky cover data according to Paragraph 13.14, Sky Condition Group (NsNsNshshshs or VVhshshs or CLR or SKC). The observer must record data for each layer of clouds and obscuring phenomena visible from the station regardless of amount. The observer must make entries in ascending order of height for bases of each layer. An additional line can be added if more space is needed.

(1) Sky Cover. The observer must record any sky cover, which is visible from the station using the appropriate contractions or combination of contractions from Table 10-1: Reporting Contractions for Sky Cover. If the sky cover is variable, see Paragraphs 10.13, Variable Sky Cover and 13.36, Variable Sky Condition (NsNsNs**(**hshshs)_V_NsNsNs).

(2) Height of Sky Cover. Heights of layers must be reported and rounded to the nearest reportable increment listed in Table 10-4: Increments of Reportable Values for Layer or Ceiling Heights. When a value falls halfway between two reportable increments, the lower value must be reported. When a layer is 50 feet or less above the surface, the height reported is **000**. If the ceiling height is variable, see Paragraph 10.16, Variable Ceiling Height and Paragraph 13.34, Variable Ceiling Height (CIG_hnhnhnVhxhxhx) for reporting procedures.

k. Temperature (Column 11). The observer must record the temperature to the nearest whole degree Celsius (see Paragraph 3.9, Rounding Off Numbers). Sub-zero temperatures must be prefixed with a minus sign (-). An "M" must be prefixed to sub-zero temperatures in the transmitted observation. The observer must add a leading zero to temperatures of only one digit (2 is recorded as 02.).

l. Dew Point Temperature (Column 12). The observer must record the dew point temperature to the nearest whole degree Celsius. Sub-zero dew point temperatures must be prefixed with a minus sign (-). An "M" must be prefixed to sub-zero dew point temperatures in the transmitted observation. When the temperature is -34 C (-30°F) or below, the dew point is

considered to be statistical data. In such cases, the observer must leave column 12 blank and not transmit a value. The observer must add a leading zero to temperatures of only one digit (4 is recorded as 04). If dew point temperature is unavailable, leave the column blank.

m. Altimeter Setting (Column 13). The observer must record the altimeter setting in inches of mercury using only the tens, units, tenths, and hundredths digits (without a decimal point).

For example, record 29.94 as 2994. Altimeter settings must never be estimated; however, if the altimeter setting is missing, column 13 is left blank.

n. Remarks (Column 14). The observer must record all remarks in column 14 according to the procedures in Chapter 13, Coding. The procedures for coding remarks are the same procedures for entering the data into column 14, MF1M-10C. The observer may use additional lines of the form, if required.

o. Observers Initials (Column 15). The certified observer responsible for the observation must initial this column.

p. Total Sky Cover (Column 17). For each hourly observation, the observer must record the eighths of sky hidden by surface-based obscuring phenomena and sky covered (not necessarily hidden) by all clouds and obscuring phenomena aloft that are visible from the station. For example, record 1 for any clouds up to one-eighth sky cover, 5 for five-eighths, 8 for eight eighths.

q. Dry Bulb Temperature (Column 19). NA

r. Wet Bulb Temperature (Column 20). NA

s. Station Pressure (Column 22) (Not Applicable). The observer must record the station pressure in this column to the nearest 0.005 inches of mercury.

t. Time (Column 26). The observer must record the beginning time of the first 6-hourly observation scheduled after 0000 LST on the line captioned "MID TO" and the following line captioned "1" from column 27. On the following three lines, the observer must record in chronological order the beginning times of the subsequent 6-hourly observations. The observer must record entries in hours and minutes (4 digits) to the nearest minute. At stations in the time zone where midnight LST corresponds to the time of a 6-hourly observation, the lines captioned "MID TO" and "MID" must not be used. Observers at stations not open for the full 24-hour calendar day must follow these same instructions.

u. Observation Number (Column 27). The observation number identifies the first, second, third, and fourth 6-hourly observations of the day. No entry is required.

v. Maximum Temperature (Column 31) and Minimum Temperature (Column 32) (Not Applicable). The observer must record the maximum temperature in column 31 and the minimum temperature in column 32 in tenths of degrees Celsius, using 3-digits that occurred: between midnight and the first 6-hourly observation, in the 6 hours prior to each 6-hourly observation, and between the last 6-hourly observation and midnight, in the lines labeled "MID TO," "1," "2," "3," "4," and "MID," respectively. The temperature recorded on the last METAR observation of the previous day, having a standard time 0000 LST of the current day, must be considered when determining the maximum and minimum temperature from midnight to the first 6 hourly. At part-time stations, the loss of data can be avoided by using base temperature extremes for the 24-hour period beginning when the station closes to the time the station closes the next day. If the station is open at midnight, temperature extremes should be maintained from midnight to midnight. Otherwise, the observer must do as follows:

(1) Reset the maximum and minimum displays or thermometers at the time of the last 6-hourly taken before the station closes.

(2) At the time of the first 6-hourly after the station opens, record the extremes on the appropriate line of columns 31 and 32 that correspond to the 6-hour time frame. Record in block 65, the period during which the temperature extremes were recorded.

EXAMPLE: COL31-32 0645 12HR TEMP EXTREMES

(3) Use the extremes that occurred during the 24 hours before the station closes to complete the summary of the day temperature data. Record in block 65, the column numbers and the temperature period covered.

EXAMPLE: COL66-67 TEMPERATURE DATA FROM 1800 TO 1800

w. Precipitation (Column 33) (Not Applicable). At 6-hourly observation times, the observer must record the amounts of precipitation that occurred during the periods as indicated below. The observer must record amounts to the nearest hundredth of an inch except that "T" must be recorded for amounts less than 0.005 inch and "0" must be recorded if no precipitation occurred.

(1) At stations taking midnight observations, the observer must record, the amount of precipitation that occurred between midnight LST and the first 6-hourly observation time on the line captioned "MID TO."

(2) On lines "1," "2," "3," and "4" (as indicated in column 27), the observer must record the amount of precipitation that occurred in the previous six hours.

(3) When midnight observations are taken, the observer must record the amount of precipitation that occurred between the last 6-hourly observation time and the midnight observation on the line captioned "MID."

(4) Whenever the water equivalent of solid precipitation cannot be measured by melting or weighing of the sample or core sampling, the observer must estimate the water equivalent on the basis of a 1/10 ratio method unless a different ratio is more appropriate for the individual

storm or station. The observer must record in block 65, the column number, the time of the observation, and the ratio used.

EXAMPLE: BLOCK65 COL33 1245 1:10 RATIO USED

x. Snowfall (Column 34) (Not Applicable). At 6-hourly observation times, the observer must record the amount of solid precipitation that fell in the six hours prior to the observation on the lines numbered (in column 27) "1," "2" "3," and "4". The 6-hourly is a separate measure-ment from any one-hour snowfall. The 6-hourly is not achieved by adding the hourly snowfall together. It is its own measurement, done once every 6 hours. At stations taking midnight observations, the observer must record, the snowfall between midnight and the first 6-hourly observation on the line captioned "MID TO." On the line captioned "MID," the observer must record the amount of snowfall that occurred between the last 6-hourly observation and midnight. "Snow" as used in this and the following snow depth sections includes all types

of solid precipitation; for example, SN, GS, SG, PL, IC, and GR. The observer must make entries as follows:

(1) If there is no solid precipitation, record a "0".

(2) A trace, but less than 0.05 inch, record a "T".

(3) A measurable amount occurred, record the maximum depth of solid precipitation to the nearest 0.1 inch. If solid precipitation occurred several times during the period, and each fall melted either completely or in part before the next fall, record the total of the maximum depths of each fall.

(4) If an amount consists entirely of hail, record in block 65, the column number, the time of the observation, and HAIL.

EXAMPLE: BLOCK65 COL34 0045 HAIL

(5) In order to preserve climatological snowfall records at stations operating under reduced hours, the following guidelines are presented. It is important that you exercise your acquired skills to make this estimate. If it is reasonable to assume that all new precipitation which fell was frozen and the conditions were rather consistent throughout the period, various methods may be used to estimate the snowfall for the period; for example, basis of 1/10 ratio method unless a different ratio is more appropriate for the individual storm or station, or measurements in protected areas. The estimate should be based upon your best judgment. Record in block 65, the column number, the time of the observation, and ESTIMATED. The reason for the estimation may also be included.

EXAMPLE: COL34 0045 ESTIMATED DUE TO STATION CLOSURE

(6) If an estimated amount cannot be reasonably made, (for example, several days of closure, mixed precipitation, etc.) missing (M) should be recorded in column 34 and column 60 for the day.

(7) It is assumed that if an estimated amount is explained in block 65 for column 34, the summary of the day (column 61) is also considered to be estimated. A second remark to denote that column 61 is estimated is not required. Any estimated amounts in column 34 should be explained in block 65. Record the column number, the time of the observation, and the reason for the estimation.

EXAMPLE: COL34 1244 ESTIMATED DUE TO MELTING

y. Snow Depth (Column 35) (Not Applicable). The observer must record the depth of solid precipitation and ice on the ground at the time of each 6-hourly observation and, if taken, at the time of the midnight observation on the lines identified as "1," "2," "3," "4," and "MID," respectively. Entries must be as follows:

(1) No snow or ice on the ground in exposed areas (snow may be present in surrounding forested or otherwise protected areas), record a "**0**".

(2) A trace, but less than 0.5 inch, on the ground in representative areas, is recorded as "**T**". inch.

(3) If there is a measurable amount on the ground, record the depth to the nearest whole

(4) When solid precipitation has occurred in the past six hours and, because of melting or sublimation, the current depth is less than previously recorded during the six hours (reportable value); record the current depth in column 35. In block 65, record the maximum snow depth and the approximate time (LST) of the occurrence. Record the column number, the time of the observation, and the approximate time of the occurrence.

EXAMPLE: COL35 1846 MAX SNOW DEPTH 1 AT 1530

(5) If the depth consists entirely of hail, record in block 65 the column number, the time of the observation, and HAIL.

EXAMPLE: COL35 1844 HAIL

(6) Snow depth is entered in column 35 at the main synoptic times (00, 06, 12, and 18 UTC) when measured by observing personnel. When observing personnel are not on duty the entry must be an "**M**".

z. Station Pressure (Column 36) (Not Applicable). Precision Aneroid Barometer or Altimeter Setting Indicator. If a precision aneroid barometer or altimeter-setting indicator is used to determine station pressure, the observer must record the reading to the nearest 0.005 inch (or 0.1 hectopascal).

aa. Barograph (Column 37). (Not Applicable).

bb. Barograph Correction (Column 38). (Not Applicable).

cc. 24-Hour Maximum Temperature (Column 57) (Not Applicable).

dd. 24-Hour Minimum Temperature (Column 58) (Not Applicable).

ee. 24-Hour Precipitation (Column 59) (Not Applicable). The observer must record the total precipitation for the 24 hours ending at midnight (LST) as follows:

(1) No precipitation, record a "0".

(2) A trace (less than 0.005 inch), record a "**T**". A trace amount includes the sum of any number of "**T**" observations, unless a recording or totalizing gauge indicates 0.005 inch or more.

(3) A measurable amount has occurred, record the amount (water equivalent) to the nearest 0.01 inch.

(4) Where the 24-hour precipitation is derived from entries in column 33, disregard the entry in column 33 on the line captioned "**1**" if the midnight observation is taken. Record "**M**" if any data are missing.

(5) If the station is closed and unless measurable precipitation has occurred, record "**0**".

(6) If any entries in column 33 are missing, the entry in column 59 will also be missing (**M**).

(7) If any entries in column 33 are estimated (block 65 remark), the entry in column 59 must also be considered estimated. A remark in block 65 is not required to denote an estimated amount in column 59 since a remark is already noted for column 33.

ff. 24-Hour Snowfall (Column 60) (Not Applicable). The observer must record the total amount (unmelted) of solid precipitation that fell in the 24 hours ending at midnight (LST) as follows:

(1) No 6-hour solid precipitation, record a "0".

(2) A trace (less than 0.05 inch), record a "T".

(3) A measurable amount occurred, record the total amount that fell in inches and tenths. Note that it is the total amount of fall that is entered. Therefore, the amount entered must be the amount that accumulated in the past 24 hours adjusted for any melting or evaporation that has taken place.

(4) Where the 24-hour precipitation is derived from entries in column 34, disregard the entry in column 34 on the line captioned "1" if the midnight observation is taken. Record "M" if any data are missing. The sum of all trace entries is a trace.

(5) If any entries in column 34 are estimated (block 65 remark), the entry in column 60 will also be considered estimated. A remark in block 65 is not required to denote an estimated amount in column 60 since a remark is already noted for column 34.

(6) If any entries in column 34 are missing, the entry in column 60 will also be missing (**M**).

gg. Snow Depth (Column 61) (Not Applicable). The observer must record the depth of solid precipitation or ice on the ground at 1200 UTC. In areas outside the contiguous United States, enter a modified time at the top of the column as necessary to meet regional needs. The observer must make entries to the nearest whole inch, or as follows:

(1) No snow or ice on the ground in exposed areas (snow may be present in surrounding forested or otherwise protected areas), record a "0".

(2) For a trace (less than 0.5 inch), in exposed areas, record a "T".

(3) Use the 1200 UTC value in column 35, if appropriate.

(4) If personnel are not on duty at 1200 UTC, enter the depth measured as near 1200 UTC as practicable and indicate the time (UTC) in block 65.

EXAMPLE: COL61 OBSERVED AT 1120 UTC

hh. Remarks, Notes, and Miscellaneous Phenomena (Block 65). The observer must use this block to record data considered significant, but not recorded elsewhere along with information in the following subsections.

(1) The observer must record the Local Standard Time (LST) of occurrence with all entries unless otherwise specified.

(2) The observer must make entries to report:

i. Conditions affecting the representativeness or accuracy of the recorded data. For example, the possible effect of construction on instrument readings, accumulation of ice or snow on sensors.

ii. Outages, changes in instruments, reasons for change, times of change or outage.

iii. Reasons for omission of mandatory data.

iv. Change in hours of station operation, effective dates, if temporary, or date if

permanent. (Format properly)

v. Estimated data.

vi. Miscellaneous items; for example, when a Basic Weather Watch or Continuous Weather Watch began or ended; approximate date/time and location of an aircraft mishap, when notified by the FAA (FSS/TWR) of an aircraft mishap.

vii. Separate individual remarks by a single solidus (/).

EXAMPLE: COL34 0245 ESTIMATED DUE TO HIGH WINDS/COL45 LAST OF SEVERAL OCCURRENCES/GLAZE 1155-1405

viii. The clock designated as the station standard must be checked at intervals as stated in Paragraph 3.5 (g). At least one time check must be recorded and annotated daily. If a facility has another procedure for taking and recording time checks, the time check block may remain blank.

14.11. Additional Instructions for Part-Time Stations. M must be recorded to designate a METAR observation; S must be recorded to designate a SPECI observation.

14.12. Additive Data Groups (Not Applicable). Although the observer may make entries on the form to suit the data available, all data transmitted must be in accordance with the instructions in this order. Each character encoded and transmitted in the 3- and 6-hourly observation additive data groups has a meaning as specified in Chapter 13, Coding, and must not be changed to station's available data.

14.13. Tailoring MF1M-10C, Synoptic Data, and Summary of the Day (Not Applicable). Columns 26 and higher were designed for stations that operate continuously. Part-time stations must also record data for a 24-hour period, but because many part-time stations are not open at midnight, and do not have continuous recording instruments, their 24-hour day (or their station day) begins when the station closes and ends 24 hours later. Although the station day begins on the previous calendar day, the times entered in column 26 must be the times (LST) of the main

6-hourly synoptic reports made during the calendar day entered in the heading of the form. In column 26, the observer must disregard the "MID TO" and "MID" lines and on the line captioned "1," record the time of the first 6-hourly of the day. The precipitation and temperature extremes entered on that line cover the period from the last 6-hourly observation taken before the station closed (the previous day) to the current 6-hourly observation. The observer must reference the time of observation (column 26) and in block 65, record the number of hours, 12 or more since the last 6-hourly.

EXAMPLE: COL42 0645 12HR DATA

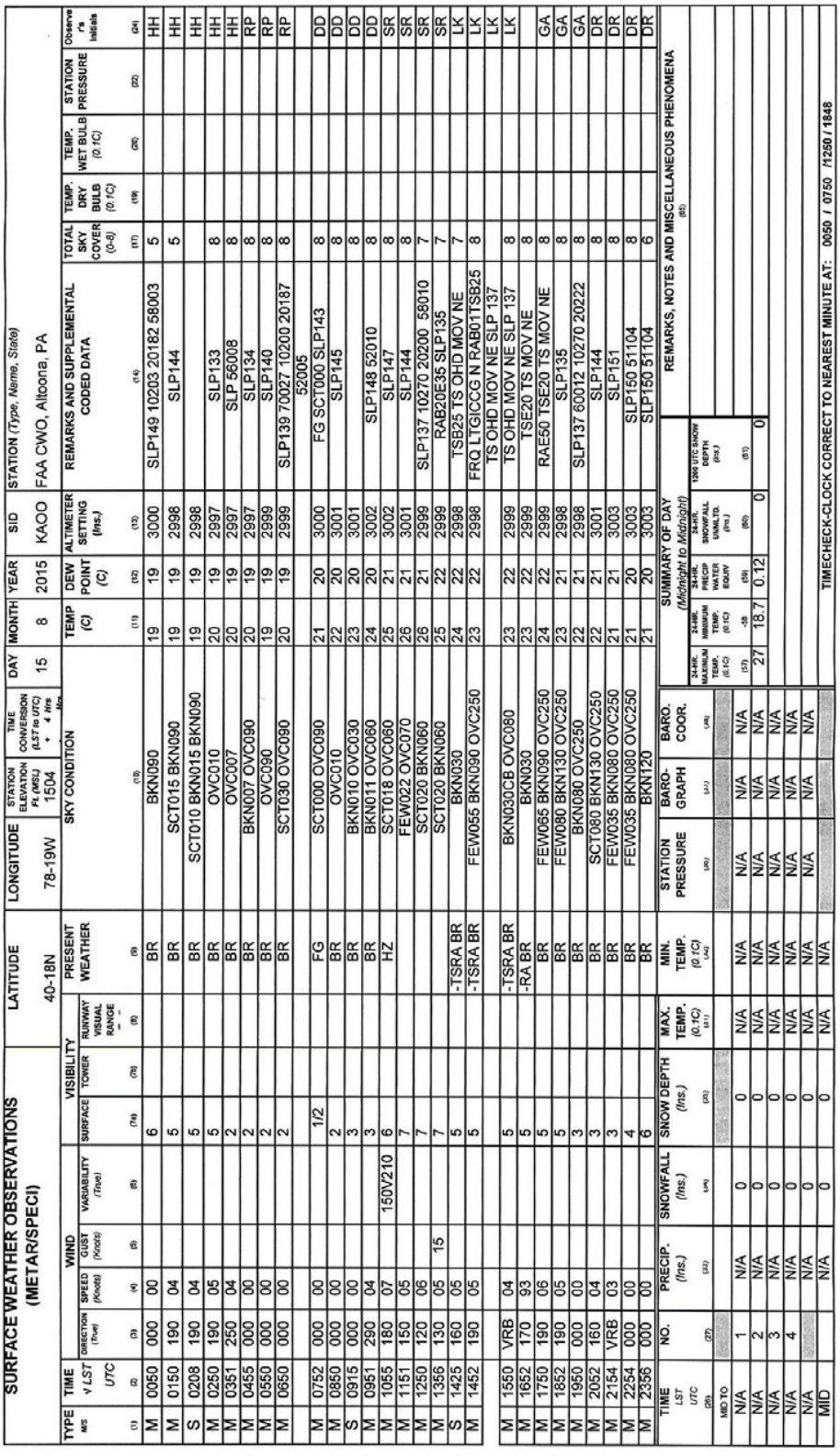
The times on the following lines must be 6 hours apart and the entries must cover the previous 6 hours:

a. Snowfall, Column 34 (Not Applicable). The entry on line "**1**" for snowfall, column 34, during the period when observing personnel were not on duty can be either "**0**," an amount, or missing (M). The observer must record "**0**" if, from conditions before the station closed until it opened, it is reasonably certain that no solid precipitation occurred. If the observer is unsure, because of mixed precipitation or several days of station closure, the observer must record "**M**" (missing) in this column and also in column 60. If any amount in column 34 is missing, the M must be carried in column 60. The observer must estimate snowfall if conditions were generally consistent throughout the period and all new precipitation was considered to be frozen. If any amount in column 34 is estimated, the observer must reference the column number and the time of observation in block 65, and must record that the data was estimated; for example, COL34 0644 ESTIMATED. The observer may also indicate why the data was estimated. If any amount in column 34 was estimated, and none was considered missing, column 60 must also be considered as estimated.

b. Station Day, Columns 57 through 61 (Not Applicable). The observer must use the entries in columns 31 through 35 to complete the summary of day columns 57 through 61 for the "station" day. The observer must line out "MIDNIGHT TO MIDNIGHT" and must record the 24-hour period covered unless recording instruments are used for precipitation or temperature. For example, if the station's hours of operation are from 0600 to 1800, the station day is from 1800 the previous day to 1800 the current day (remember the first 6-hourly observation contained data for a 12-hour period).

14.14. Notice of Corrections to Weather Records. The accuracy of weather observations is important after the fact since the National Center for Environmental Information (NCEI) utilizes this information to update climatological records for the U.S. If a station discovers that erroneous weather information was transmitted long-line, they are encouraged to send the corrected weather data electronically using U.S. Department of Commerce, WS Form B-14 to: surface.qc@noaa.gov. This form can be found at https://www.weather.gov/surface/forms.

Figure 14-1: Example of Entries on MF1M-10C, presents an example of a filled-in MF1M-10C form



SURFACE WEATHER OBSERVATIONS (METAR/SPECI)

LATITUDE 40-18N | LONGITUDE 78-19W | STATION ELEVATION FT. (MSL) 1504 | TIME CONVERSION (LST to UTC) + 4 Hrs | DAY 15 | MONTH 8 | YEAR 2015 | SID KAOO | STATION (Type, Name, State) FAA CWO, Altoona, PA

TYPE MOS (1)	TIME √ LST / UTC (2)	WIND DIRECTION (Tens) (3)	WIND SPEED (Knots) (4)	WIND GUST (Knots) (5)	WIND VARIABILITY (Tens) (6)	VISIBILITY SURFACE (7a)	VISIBILITY TOWER (7b)	VISIBILITY RUNWAY VISUAL RANGE (8)	PRESENT WEATHER (9)	SKY CONDITION (10)	TEMP (C) (11)	DEW POINT (C) (12)	ALTIMETER SETTING (Ins.) (13)	REMARKS AND SUPPLEMENTAL CODED DATA (14)	TOTAL SKY COVER (0-8) (17)	TEMP. DRY BULB (0.1C) (19)	TEMP. WET BULB (0.1C) (20)	STATION PRESSURE (22)	Observer Ck. & Initials (24)
M	0050	000	00			6			BR	BKN090	19	19	3000	SLP149 10203 20182 58003	5				HH
M	0150	190	04			5			BR	SCT015 BKN090	19	19	2998	SLP144	5				HH
S	0208	190	04			5			BR	SCT010 BKN015 BKN090	19	19	2998						HH
M	0250	190	05			5			BR	OVC010	20	19	2997	SLP133	8				HH
M	0351	250	04			2			BR	OVC007	20	19	2997	SLP 56008	8				HH
M	0455	000	00			2			BR	BKN007 OVC090	20	19	2997	SLP134	8				RP
M	0550	000	00			2			BR	OVC090	19	19	2999	SLP140	8				RP
M	0650	000	00			2			BR	SCT030 OVC090	20	19	2999	SLP139 70027 10200 20187 52005	8				RP
M	0752	000	00			1/2			FG	SCT000 OVC090	21	20	3000	FG SCT000 SLP143	8				DD
M	0850	000	00			2			BR	OVC010	22	20	3001	SLP145	8				DD
S	0915	000	00			3			BR	BKN010 OVC030	23	20	3001		8				DD
M	0951	290	04			3			BR	BKN011 OVC060	24	20	3002	SLP148 52010	8				DD
M	1055	180	07		150V210	6			HZ	SCT018 OVC050	25	21	3002	SLP147	8				SR
M	1151	150	05			7				FEW022 OVC070	26	21	3001	SLP144	8				SR
M	1250	120	06			7				SCT020 BKN060	26	21	2999	SLP137 10270 20200 58010	7				SR
M	1356	130	05	15		7				SCT020 BKN060	25	22	2999	RAB20E35 SLP135	7				SR
S	1425	160	05			5			-TSRA BR	BKN030	24	22	2998	TSB25 TS OHD MOV NE	7				LK
M	1452	190	05			5			-TSRA BR	FEW055 BKN090 OVC250	23	22	2998	FRQ LTGICCG N RAB01TSB25 TS OHD MOV NE SLP 137	8				LK
M	1550	VRB	04			5			-TSRA BR	BKN030CB OVC080	23	22	2999	TS OHD MOV NE SLP 137	8				LK
M	1652	170	93			5			-RA BR	BKN030	23	22	2999	TSE20 TS MOV NE	8				LK
M	1750	190	06			5			BR	FEW065 BKN090 OVC250	24	22	2999	RAE50 TSE20 TS MOV NE	8				GA
M	1852	190	05			5			BR	FEW080 BKN130 OVC250	23	21	2998	SLP135	8				GA
M	1950	000	00			3			BR	BKN080 OVC250	22	21	2998	SLP137 60012 10270 20222	8				GA
M	2052	160	04			3			BR	SCT080 BKN130 OVC250	22	21	3001	SLP144	8				DR
M	2154	VRB	03			3			BR	FEW035 BKN080 OVC250	21	21	3003	SLP151	8				DR
M	2254	000	00			4			BR	FEW035 BKN080 OVC250	21	20	3003	SLP150 51104	8				DR
M	2356	000	00			6			BR	BKN120	21	20	3003	SLP150 51104	6				DR

TIME LST / UTC (25)	NO. (27)	PRECIP. (Ins.) (32)	SNOWFALL (Ins.) (34)	SNOW DEPTH (Ins.) (35)	MAX. TEMP. (0.1C) (37)	MIN. TEMP. (0.1C) (42)	STATION PRESSURE (45)	BARO-GRAPH (47)	BARO. COOR. (48)
MID TO									
N/A	1	N/A	0	0	N/A	N/A	N/A	N/A	N/A
N/A	2	N/A	0	0	N/A	N/A	N/A	N/A	N/A
N/A	3	N/A	0	0	N/A	N/A	N/A	N/A	N/A
N/A	4	N/A	0	0	N/A	N/A	N/A	N/A	N/A
N/A		N/A	0	0	N/A	N/A	N/A	N/A	N/A
MID		N/A	0	0	N/A	N/A	N/A	N/A	N/A

SUMMARY OF DAY (Midnight to Midnight)

24-HR. MAXIMUM TEMP. (0.1C) (57)	24-HR. MINIMUM TEMP. (0.1C) (58)	24-HR. PRECIP WATER EQUIV (59)	24-HR. SNOWFALL UNMLTD. (Ins.) (60)	1300 UTC SNOW DEPTH (Ins.) (61)
27	18.7	0.12	0	0

REMARKS, NOTES AND MISCELLANEOUS PHENOMENA (85)

TIMECHECK-CLOCK CORRECT TO NEAREST MINUTE AT: 0050 / 0750 /1250 / 1848

MF1M-10C (1-96)

Appendix A. ABBREVIATIONS AND ACRONYMS

The abbreviations and acronyms included in this Appendix are defined in accordance with how they are used in this order.

Terms	Definitions
$	ASOS maintenance check indicator
-	light intensity
+	heavy intensity
/	indicator that runway visual range data follows; separator between temperature and dew point data
ACFT MSHP	aircraft mishap
AFIS	Automatic Flight Information Service
AGL	Above Ground Level
AISR	Aeronautical Information System Replacement
ALDARS	Automated Lightning Detection and Reporting System
AO1	automated station without precipitation discriminator
AO2	automated station with precipitation discriminator
AOMC	ASOS Operations and Monitoring Center
ASI	altimeter setting indicator
ASOS	Automated Surface Observing System
AT AP	at airport
ATCS	Air Traffic Control Specialist
ATCT	Airport Traffic Control Tower
ATIS	Automatic Terminal Information Service
AUTO	automated report
AWOS	Automated Weather Observing System
B	Began
BC	Patches
BKN	Broken
BL	Blowing

Terms	Definitions
BR	Mist
C	Celsius, center (with reference to runway designation)
CA	cloud-air lightning
CB	cumulonimbus cloud
CC	cloud-cloud lightning
CG	cloud-ground lightning
CHI	cloud-height indicator
CHINO	sky condition at secondary location not available
CIG	Ceiling
CLR	no clouds detected at, or below, design limit of ceilometer (automated system)
CONS	Continuous
COR	correction to a previously disseminated report
DA	density altitude
DASI	Digital Altimeter Setting Indicator
DIR	Direction
DOC	Department of Commerce
DOD	Department of Defense
DOT	Department of Transportation
DR	low drifting
DS	Duststorm
DSNT	Distant
DU	widespread dust
DZ	Drizzle
E	east, ended
F	Fahrenheit
FAA	Federal Aviation Administration
FBO	fixed base operator

Terms	Definitions
FC	funnel cloud
FMH-1	Federal Meteorological Handbook No.1, Surface Weather Observations and Reports
FEW	few clouds
FG	Fog
FIBI	filed but impracticable to transmit
FROPA	frontal passage
FRQ	Frequent
FSS	Flight Service Station
FT	Feet
FU	Smoke
FZ	Freezing
FZRA	freezing rain
FZRANO	freezing rain sensor not available
G	Gust
GR	Hail
GS	snow pellets
H	Hour
Ha	field elevation
Hp	station elevation
H_Z	Barometric elevation
hPa	Hectopascal
HZ	Haze
IC	ice crystals, in-cloud lightning
ICAO	International Civil Aviation Organization
KT	Knot
L	left (with reference to runway designation)
LAST	last observation before a break in coverage at a manual station

Terms	Definitions
LAWRS	Limited Aviation Weather Reporting Station
LLWS	Low Level Wind Shear
LOC	Location
LST	Local Standard Time
LTG	Lightning
LWR	Lower
M	minus, less than, missing
METAR	aviation routine weather report
MF1M-10C	Meteorological Form 1M-10C
MI	Shallow
MID	Midnight
MOV	moved/moving/movement
MSL	mean sea level
MT	Mountains
N	North
NA	not applicable
NCEI	National Center for Environmental Information
NE	Northeast
NFCT	Non-Federal control tower
NF-OBS	Non-Federal Weather Observation
NGRVR	New Generation Runway Visual Range
NOAA	National Oceanic and Atmospheric Administration
NOSPECI	no SPECI reports are taken at the station
NOTAM	Notice to Airmen
NW	Northwest
NWS	National Weather Service
OBS	observer, observation

Terms	Definitions
OCNL	Occasional
OFCM	Office of the Federal Coordinator for Meteorology
OHD	Overhead
OID	operator interface device
OT	operator terminal
OVC	Overcast
P	greater than
PK WND	peak wind
PL	ice pellets
PNO	precipitation amount not available
PO	dust/sand whirls (dust devils)
PR	Partial
PRESFR	pressure falling rapidly
PRESRR	pressure rising rapidly
PREWX	present weather
PWINO	present weather information not available (automated system)
PY	Spray
R	right (with reference to runway designation)
RA	Rain
RMK	Remark
RVR	Runway Visual Range
RWY	Runway
S	South
SA	Sand
SAWS	Standalone Weather Sensor System
SCT	Scattered
SE	Southeast

Terms	Definitions
SFC	Surface
SG	snow grains
SH	shower(s)
SKC	sky clear (manual observation)
SLP	sea-level pressure
SLPNO	sea-level pressure not available
SM	statute miles
SN	Snow
SNINCR	snow increasing rapidly
SPECI	aviation selected special weather report
SQ	Squalls
SS	Sandstorm
SW	Southwest
SWS	Surface Weather System
TAF	aerodrome forecast (terminal)
TCU	towering cumulus
TRACON	Terminal Radar Approach Control
TS	Thunderstorm
TSNO	thunderstorm information not available
TWR	Tower
UP	unknown precipitation
USCG	United States Coast Guard
UTC	Coordinated Universal Time
V	Variable
VA	volcanic ash
VC	in the vicinity
VDU	Video Display Unit

Terms	Definitions
VFR	visual flight rules
VIS	Visibility
VISNO	visibility at secondary location not available
VRB	Variable
VV	vertical visibility
W	West
WME	Wind Measuring Equipment
WMO	World Meteorological Organization
WND	Wind
WSHFT	wind shift
Z	zulu, that is, Coordinated Universal Time

Appendix B. MIKE-IN-HAND

B.1 Introduction. At designated sites in Alaska, FAA certified weather observers augment/backup the automated weather observation system at their airport. Mike-in-Hand is a supplemental service that surface weather observers provide to arriving/departing aircraft. Pilots are not required to use the service.

B.2 Mike-in-Hand Equipment Requirements.

a. Telephone

b. Radio (transmitter/receiver)

c. Wind Equipment and display

d. Altimeter Equipment and display

NOTE: If the ASOS/AWOS-C is used to provide arriving/departing aircraft Mike-in-Hand services, The One-Minute Display must be used to provide the current wind and altimeter.

B.3 Services Provided:

a. The local weather reports.

b. Current airport runway conditions provided to the observer by the FAA or airport manager. The information must be relayed to the pilot verbatim.

c. Conditions potentially hazardous to pilots.

NOTE: Mike-in-hand services does not include providing aircraft traffic alerts.

B.4 Additional Guidelines:

a. Weather Observers providing Mike-in-hand services must use weather phraseology prescribed in the FAA JO 7110.10, Flight Services.

b. All weather observers providing Mike-in-Hand services must receive semi-annual refresher training to include using the proper weather phraseology.

c. Weather Observers must refer the aircraft to the appropriate flight service station or ARTCC if additional services are requested by an aircraft. (e.g., flight planning, clearances, forecasts etc.)

d. Mike-in-hand Service providers must maintain a log and document the date, time and aircraft call sign for each arrival/departure that requested the service. Only one log entry for each aircraft arriving/departing is needed if multiple transmission are involved. The log must be retained for a period 45 days.

Appendix C. LIMITED AVIATION WEATHER REPORTING STATION (LAWRS) REQUIREMENTS

C.1 Purpose

This Appendix contains the general requirements and describes the procedures and practices for LAWRS observers. References to the order (for example, Table C-1: LAWRS Requirements for Body of METAR) are provided for additional information.

C.2 General

LAWRS are facilities where observations are taken, prepared and transmitted by certified FAA control tower personnel, FAA-contract control tower personnel or Flight Service (Alaska only) Station personnel on a limited basis. At these facilities, various degrees of automated sensors and/or other automated equipment may be available. However, when on duty, the LAWRS observer has the complete responsibility for the surface aviation weather elements in the METAR/SPECI.

C.3 Requirements

LAWRS observers at different locations have differing observing requirements based upon whether or not an automated observation system is available, and the type of system they have. This Appendix states minimum requirements for what the LAWRS observer must put into the observation. The observation can be augmented beyond the stated requirements. Table C-1: LAWRS Requirements for Body of METAR gives the requirements for what the LAWRS observer must manually put in the body of the observation, and Table C-2: LAWRS Requirements for Remarks Section gives the requirements for what the LAWRS observer must insert in the remarks section. Additive and automated maintenance data included in the remarks section may be added by an automated system, but are not required to be augmented or backed up by LAWRS. Table C-3: LAWRS Requirements for SPECIs lists SPECI criteria and LAWRS requirements. Listed with each element in these tables is a paragraph reference for how to code the particular element. Details on the procedures for observing each element are given in the appropriate chapter (for example, tornadic activity procedures are included in Chapter 10, Sky Condition; variable visibility procedures are given in Chapter 8, Visibility).

C.4 Requirements for LAWRS without an Automated System

At locations without an automated weather observing system, Manual LAWRS observers must take METAR/SPECI observations in accordance with general instructions for all observers, found in Chapter 3. Observed elements are reported in accordance with the standards of an automated system with SPECI capability as outlined in Paragraph C.5 of this Appendix. Specific instructions on individual elements of the METAR/SPECI are found in Chapters 7 through 14. The last column in Table C-1 through Table C-3 in this Appendix gives an outline of the requirements for providing manual LAWRS observations.

C.5 Procedures for LAWRS Using Automated Systems with SPECI Capability

a. Augmenting observations using automated systems with SPECI capability. An outline of the requirements for augmentation is provided in Table C-1 through Table C-3 of this Appendix. More detail is given in Chapter 4 and Chapter 5. LAWRS observers must augment the following weather phenomena at sites equipped with automated systems with SPECI capability:

(1) Thunderstorm (at non-ALDARS sites)

(2) Tornadic activity (including tornado, waterspout, and funnel cloud)

(3) Hail

(4) Snow

(5) Virga

(6) Volcanic ash

(7) Operationally significant remarks as deemed appropriate by the observer

b. Backup of automated systems with SPECI capability. If portions of, or the complete automated systems with SPECI capability observation is unavailable due to sensor/system malfunction, communications failure, erroneous data and/or non-representative data (see Paragraph 2.6, Backup Requirements and Chapter 6, Backup/Editing Requirements at Automated Weather Stations), LAWRS must backup, at a minimum, the following weather elements at sites with an automated system with SPECI capability: (Table C-1 through Table C-3 provides an outline of backup requirements for LAWRS.)

(1) Wind

(2) Visibility to 10 miles

(3) Present weather and obscurations (thunderstorms, at ALDARS sites), see Table 6-2

(4) Sky condition to 12K feet

(5) Temperature/dew point

(6) Altimeter setting

NOTE: Documentation requirements, equipment requirements, and examples of augmented and backup observations are given in Chapters 4, 5 and 6.

C.6 Procedures for LAWRS with Automated Systems without SPECI Capability.

At facilities where an automated system without SPECI capability is the automated system, LAWRS certified controllers must only use the automated system without SPECI capability OID (that is, AWOS) information to generate an hourly METAR/SPECI observation. LAWRS certified controllers must use the information displayed on the OID to formulate a METAR/ SPECI, which will then be entered into AIS-R or relayed to the overlying ARTCCs Flight Data unit for entry into an FAA approved electronic system (for example, AIS-R, SWIM or similar systems) or, in Alaska, telephoned to the Flight Service Station.

An outline of the requirements for automated systems without SPECI capability METAR/SPECI reports is provided in Table C-1 of this Appendix. More detail is given in Chapter 4 and Chapter 5.

Table C-1: LAWRS Requirements for Body of METAR

LAWRS Requirements for Body of METAR			
Element	**LAWRS w/ ASOS or AWOS-C**	**LAWRS w/ Non-Federal AWOS**	**LAWRS Manual**
Type of Report (METAR/SPECI)		X	X
Station Identifier (CCCC)		X	X
Date/Time (YYGGggZ)		X	X
Report Modifier (AUTO or COR)	X[1]	X[1]	X[1]
Wind (dddff(f)G$f_m f_m$KT) ($d_n d_n d_n V d_x d_x d_x$)	X	X	X
Visibility (VVVVVSM)	X	X	X
Present Weather (w'w')	X	X	X
Sky Condition ($N_s N_s N_s h_s h_s h_s$ or $VVh_s h_s h_s$ or CLR/SKC)	X	X	X
Temperature/Dew Point (T'T'/$T'_d T'_d$)	X	X	X
Altimeter ($AP_H P_H P_H P_H$)	X	X	X
[1] COR Only. Legend: X = Required.			

Table C-2: LAWRS Requirements for Remarks Section

LAWRS Requirements for Remarks Section of Observation (Automated, Manual, and Plain Language)			
Element	**LAWRS w/ ASOS or AWOS-C**	**LAWRS w/ Non-Federal AWOS**	**LAWRS Manual**
Volcanic Eruptions	X	X	X
Tornadic Activity (Tornadic activity_B/E(hh)mm LOC/DIR_(MOV))	X	X	X
Type of Automated Station (AO1, AO2)			
Peak Wind (PK WND dddff(f)/(hh)mm)			
Wind Shift (WSHFT_(hh)mm)	X	X	X
Variable Prevailing Visibility (VIS minVmax)			
Sector Visibility (VIS_dd_vv)			
Lightning ({FREQ}_ LTG{TYPE}_{LOC})	X	X	X
Beginning/Ending Time of Precipitation (WX)B(mm)E(mm) \			
Beginning/Ending Time of Thunderstorms (TS)B(mm)E(mm)	X	X	X
Thunderstorm Location (TS_LOC_(MOV_DIR))	X	X	X
Hailstone Size (GR_{INCHES})	X	X	X
Virga (VIRGA_{Direction})	X	X	X
Variable Ceiling (CIG minVmax)			
Obscurations (w'w'_($N_sN_sN_s$) $h_sh_sh_s$)	X	X	X
Variable Sky Condition ($N_sN_sN_s$($h_sh_sh_s$)_V_$N_sN_sN_s$)			
Pressure Rising or Falling Rapidly (PRESRR) (PRESFR)			
Aircraft Mishap (ACFT_ MSHP) [1]			X

LAWRS Requirements for Remarks Section of Observation (Automated, Manual, and Plain Language)

Element	LAWRS w/ ASOS or AWOS-C	LAWRS w/ Non-Federal AWOS	LAWRS Manual
No SPECI Reports Taken (NOSPECI)			X
Other Significant Information (Plain Language)			X

[1] Automated stations automatically archive the weather before and after the event Legend: X = Required.

LAWRS Requirements for SPECI

SPECI Criteria	LAWRS w/ ASOS or AWOS-C	LAWRS w/ Non-Fed AWOS[1]	LAWRS Manual
Wind Shift - Wind direction changes by 45 degrees or more in less than 15 minutes and the wind speed is 10 knots or more throughout the wind shift.	X	X	X
Visibility - Surface visibility as reported in the body of the report decreases to less than, or if below, increases to equal or exceed: 3 miles, 2 miles, 1 mile, and 1 2 mile or the lowest standard instrument approach procedure minimum as published in the National Ocean Survey (NOS) U.S. Terminal Procedures.	X	X	X
Runway Visual Range - Automated Report Only	N/A	N/A	N/A
Tornado, Funnel Cloud, Or Waterspout - Is observed or disappears from sight.	X	X	X
Thunderstorm - Begins (a SPECI report is not required to report the beginning of a new thunderstorm if one is currently reported) or ends.	X	X	X
Precipitation - Hail begins or ends; freezing precipitation begins, ends, or changes intensity; Snow begins, ends, or changes intensity; ice pellets begin, end, or change intensity at manual stations.	X	X	X
Squall - Wind suddenly increases at least 16 knots and is sustained at 22 knots or more for at least one minute.	X	X	X
Ceiling - When the height of the base of clouds covering five oktas or more (for example, broken and overcast) of the sky forms or dissipates below, decreases to less than or, if below, increases to equal or exceed: 3,000 ft., 1,500 ft., 1,000 ft., 500 ft., and 200 ft. or the lowest standard instrument approach procedure minimum as published in the National Ocean Survey (NOS) U.S. Terminal Procedures.	X	X	X
Sky Condition - A layer of clouds or obscuring phenomena aloft is present below 1,000 feet and no layer aloft was reported below 1,000 feet in the preceding METAR or SPECI observation.	X	X	X
Volcanic Eruption - When eruption is first noted.	X	X	X

	LAWRS Requirements for SPECI		
SPECI Criteria	**LAWRS w/ ASOS or AWOS-C**	**LAWRS w/ Non-Federal AWOS**	**LAWRS Manual**
Aircraft Mishap - Upon notification of an Aircraft Mishap unless there has been an intervening observation. [2]			X
Miscellaneous - Any other meteorological situation that, in the opinion of the observer, is critical.	X	X	X

[1] Non-Federal AWOS's do not have SPECI capability. The AWOS is disabled from disseminating longline during ATCT operating hours and the observations are entered through an alternate method (e.g. AISR).
[2] Automated stations automatically archive the weather before and after the event.
Legend:
X = Required.

Appendix D. SERVICE STANDARDS

D.1 Description

The term Service Standards refers to four levels of detail in weather observations at sites where there is a commissioned ASOS/AWOS. The first category, known as Service Level D, is completely automated service in which the ASOS/AWOS observation constitutes the entire observation, that is, no additional weather information is added by a human observer. A large number of airfields that receive level D service have never had weather information available. Service Level D provides information on wind, visibility, precipitation/obstruction to vision, cloud height and sky cover, temperature/dewpoint, altimeter, and in some cases freezing rain and lightning reporting capability.

The second category, known as Service Level C, consists of all the elements of Service Level D, in addition to a human observer, who adds information to the automated observation. This is referred to as "augmentation." The augmented information includes, as a minimum, such weather phenomena as thunderstorms, tornadoes, hail, virga, volcanic ash, and tower visibility. Service Level C also includes "backup" of ASOS elements in the event of an ASOS malfunction or an unrepresentative ASOS report. In the backup mode, the controller inserts the correct or missing value for the automated ASOS elements. Service Level C is provided at all airports with a properly sited, fully qualified FAA facility during facility hours of operation. During hours that the facility is closed, the airport reverts to stand-alone ASOS or Service Level D as described above. Although this category is listed as tower augmented, the service may be provided by Flight Service Station personnel (Alaska only), contract weather observers, or NF- OBS observers.

To enhance air traffic control efficiency and increase system capacity, additional detail beyond Service Level C was required at some airports. These airports were divided into two categories. The highest category, referred to as Service Level A, includes major aviation hubs and high traffic volume airports with average or worse weather. The remaining group of airports (smaller hubs or special airports in other ways, that have worse than average bad weather operations for thunderstorms and/or freezing/frozen precipitation, and/or that are remote airports) are referred to as Service Level B airports.

Service Level B consists of all the elements of Service Levels C and D plus long-line runway visual range (RVR), where connected, freezing drizzle versus freezing rain, ice pellets, and remarks for snow depth and snow increasing rapidly, thunderstorm/lightning location, and observed significant weather not at the station.

Service Level A airports will receive, in addition to the services described above, 10-minute long-line RVR or additional visibility increments of 1/8, 1/16 and 0. If observed, the following elements will be added to the observation; sector visibility, variable sky condition, cloud layers above 12,000 feet and significant cloud types, widespread dust, sand and other obscurations, and volcanic eruptions.

Table D-1: Service Standard Levels lists the available capabilities in each Service Level.

D.2 Determining Level of Service

In order to determine which airports would receive a particular service level of weather support, airports were ranked according to their scores in three areas: (1) occurrence of significant weather weighted by traffic counts; (2) distance to the nearest suitable alternate airport; and (3) critical airport characteristics. These criteria produced a score, which determined the airport's level of service.

The significant weather score is calculated by taking into consideration the percentage of times that the airport is impacted by bad weather such as low visibility, thunderstorms, and freezing precipitation. This percentage is then multiplied by the total number of operations at the airport. For sites that did not have climatological weather information available, an alternate method was devised which assigned weather information from the nearest airport with similar weather.

The score for distance to the nearest suitable alternate airport gave credit to airports for which the nearest suitable alternate was a greater distance away.

The airport characteristics score was based upon the tower level of the airport, whether or not the airport is considered a hub, the category qualification of the airport, and other characteristic factors.

The scores from the three areas described above were added together and each airport was assigned a composite score and ranked accordingly. The overall ranking determined the airport's Service Standard Level.

D.3 Procedures

Augmentation and backup at A, B, and C locations is provided by a combination of Federal and non-Federal personnel and existing contract weather observers through implementation of an ASOS basic weather watch. During a basic weather watch, the observer may be required to perform other duties as their observing workload permits. Because of this and other restrictions (station location, structural design, etc.) which limit the observer's capability to continuously view and evaluate weather conditions, observers performing a basic weather watch cannot be expected to detect and report all weather changes as they occur. In addition to taking and disseminating required observations, facilities performing a basic weather watch must recheck weather conditions to determine if a new observation (SPECI) is required when advised by any reliable source (for example, tower controller) that existing conditions differ from those reported in the last disseminated observation. For ASOS augmentation and backup, the observer should augment routine hourly observations in accordance with the appropriate service level standards, periodically check the current observation to determine if a special has been generated requiring augmentation or backup, and conduct a timely evaluation of the representativeness and accuracy of the current observations when advised by any reliable source that existing conditions differ from those being reported.

Table D-1: Service Standard Levels

Service Level A	
Service Level A consists of all the elements of service levels B, C and D plus the elements listed to the right, if observed.	10 minute longline RVR[1] where connected sites *or* additional visibility increments of 1/8, 1/16 and 0 Sector visibility Variable sky condition Cloud layers above 12,000 feet and significant cloud types (that is, CB, TCU). Widespread dust, sand and other obscurations Volcanic eruptions

Service Level B	
Service Level B consists of all the elements of service levels C and D plus the elements listed to the right, if observed.	Longline RVR* at where connected (may be instantaneous readout) Freezing drizzle versus freezing rain Ice pellets Snow depth and snow increasing rapidly remarks[2] Thunderstorm and lightning location remarks Observed significant weather not at the station remarks

Service Level C	
Service Level C consists of all the elements of Service Level D plus augmentation and backup of the system by a human observer or an air traffic control specialist on location nearby. The National Air Traffic Controllers Association (NATCA), the groups representing the interests of the air traffic controllers, and the FAA have agreed that at this level of service, the air traffic control specialists are allowed the option of adding operationally significant remarks. Backup consists of inserting the correct value if the system malfunctions or is unrepresentative. Augmentation consists of adding the weather elements listed to the right, if observed. During hours that the observing facility is closed, the site reverts to Service Level D.	Thunderstorms Tornadoes Hail Virga Volcanic ash Prevailing visibility Any reportable weather elements considered operationally significant by the observer

Service Level D	
This level of service consists of an ASOS continually measuring the atmosphere at a point near the runway. The Automated System with SPECI capability senses and measures the weather parameters listed to the right.	Wind Visibility Precipitation/Obstruction to vision Cloud height and sky cover Temperature and dewpoint Altimeter Freezing rain capability Lightning reporting capability

[1]Longline RVR will be automated at all RVR sites with ASOS and New Generation RVR systems as the interface is fielded at these sites.

[2]Only sites listed in Appendix F are capable of reporting snow depth and snow increasing rapidly in remarks.

Appendix E. METAR USER AIDS

METAR
User Aids

Contents:

NOTE: This Appendix is included as a quick reference guide for users. In the event of any discrepancies between the material in this order and this Appendix, the text must take priority.

E.1 U.S. METAR/SPECI Code Format with Remarks

U.S. METARSPECI CODE FORMAT WITH REMARKS	
METAR/SPECI_ CCCC_ YYGGggZ_AUTO_COR_dddff(f)G$f_m f_m(f_m)$KT_$d_n d_n d_n V d_x d_x d_x$_VVVVVSM_[$RD_R D_R/V_R V_R V_R V_R$FT or $RD_R D_R/V_n V_n V_n V_n VV_x V_x V_x V_x$FT]_w'w'_[$N_s N_s N_s h_s h_s h_s h_s$ or $VVh_s h_s h_s$ or SKC/CLR]_T'T'/T'dT'd_AP$_H P_H P_H P_H$_RMK_(Automated, Manual, Plain Language)_(Additive and Automated Maintenance Data)	
Body of Report: PARAMETER	**DESCRIPTION**
Type of Report (METARSPECI)	METAR is the routine (scheduled) report. SPECI is the non-routine (unscheduled) weather report.
Station Identifier (CCCC)	ICAO station identifier. Consists of four alphabetic characters, for example, KABC.
Date/Time (YYGGggZ)	Day of the month, followed by the actual time of the report or when the criteria for a SPECI is met or noted. Group ends with Z to indicate use of UTC. For example, 251456Z.
Report Modifier (AUTO or COR))	AUTO indicates a fully automated report. No human intervention. COR indicates a correction to a previously disseminated report.
Wind (dddff(f)G$f_m f_m(f_m)$KT) ($d_n d_n d_n V d_x d_x d_x$)	True wind direction in tens of degrees using three digits. Speed is reported in whole knots (two or three digits). Gusts (G) are appended to the speed if required. Group ends with KT to indicate knots. For example, 23018G26KT. If wind direction varies by 60° or more and speed is > 6 knots a variable wind group is also reported, for example, 180V250. Direction may be reported VRB (variable) if speed is ≤ 6 knots, for example, VRB05KT. Calm winds are reported 00000KT.
Visibility (VVVVVSM)	Surface visibility reported in statute miles. A space divides whole miles and fractions. Group ends with SM to indicate statute miles. For example, 1 1/2SM. Auto only: M prefixed to value < 1/4 mile, for example, M1/4SM.
Runway Visual Range ($RD_R D_R/V_R V_R V_R V_R$FT or $RD_R D_R/V_n V_n V_n V_n VV_x V_x V_x V_x$FT)	10-Minute RVR value: Reported in hundreds of feet if visibility is ≤ one statute mile or RVR is ≤ 6000 feet. Group ends with FT to indicate feet. For example, R06L/2000FT. The RVR value is prefixed with either M or P to indicate the value is lower or higher than the RVR reportable values, for example, R06L/P6000FT. If the RVR is variable during the 10-minute evaluation period, the variability is reported, for example, R06L/2000V4000FT.
Present Weather (w'w')	Present weather (other than obscurations) occurring at the station are reported in the body of the METAR/SPECI. Obscurations are reported if visibility < 7 miles. VA may be reported with any visibility. BCFG and PRFG may also be reported if visibility ≥ 7SM. Some present weather and qualifiers may be reported if In-the-Vicinity (not at point-of-observation), for example, TS, FG, SH, PO, BLDU, BLSA, BLSN, SS and DS. Weather is reported in order of decreasing dominance. Maximum of three groups reported (precipitation included in one group; separate groups for other weather). Automated stations can only report RA, SN, UP, FG, BR, FZFG, HZ, and SQ without augmentation. See table on reverse for more information on qualifiers and weather phenomena.
Sky Condition ($N_s N_s N_s h_s h_s h_s h_s$ or $VVh_s h_s h_s$ or SKC/CLR)	Automated stations truncate to three layers up to 12000 feet; if no layers are detected CLR is reported. At manual stations up to six layers can be reported; if no layers observed SKC is reported. Each layer contains the amount (FEW, SCT, BKN, OVC) immediately followed by the height using three digits, for example, FEW015 BKN030. Any layer containing CB or TCU (manual only) the contraction is appended to the layer height, for example, FEW015TCU. All layers are considered opaque. Vertical visibility (VV) is reported in hundreds of feet for an indefinite ceiling, for example, VV002. Surface obscuration (manual only) reported using amount (FEW, SCT, BKN), followed by "000," for example, SCT000; remark required.
Temperature/Dew Point (T'T'/$T'_d T'_d$)	Temperature and dew point are reported to the nearest whole degree Celsius using two digits, for example, 17/13. Sub-zero values are prefixed with an M, for example, 03/M02.

U.S. METARSPECI CODE FORMAT WITH REMARKS	
Altimeter ($AP_HP_HP_HP_H$)	Altimeter is prefixed with an A indicating altimeter in inches of mercury. Reported using four digits; tens, units, tenths, and hundredths of inches of mercury, for example, A2990.
Remarks (RMK) -- Divided into two categories: 1. Automated, Manual (Augmented), Plain Language (Manual Only), 2. Additive and Automated Maintenance Data. The following describes the order in which remarks are reported.	
Automated, Manual, Plain Language	Volcanic Eruption, Tornadic Activity (B/E_(hh)mm_LOC/DIR_(MOV)), Type of Automated Station (AO1, AO2), Peak Wind (PK_WND_dddff(f)/(hh)mm), Wind Shift (WSHFT_(hh)mm_FROPA), Tower Visibility (TWR_VIS_vvvvv), Surface Visibility (SFC_VIS_vvvvv), Variable Prevailing Visibility ($VIS\_v_nv_nv_nv_nv_nVv_xv_xv_xv_xv_x$), Sector Visibility (VIS_[DIR]_vvvvv), Visibility at 2nd Location (VIS_vvvvv_[LOC], Lightning ([FREQ]_LTG[type]_[LOC]), Begin/End Pcpn (w'w'B(hh)mmE(hh)mm), Begin/End Thunderstorm (TSB(hh)mmE(hh)mm), Thunderstorm Location (TS_LOC_(MOV_DIR)), Hailstone Size (GR_[size]), Virga (VIRGA_(DIR)), Variable Ceiling Height ($CIG\_h_nh_nh_nVh_xh_xh_x$), Obscurations (w'w'_[$N_sN_sN_s$]($h_sh_sh_s$), Variable Sky Condition ($N_sN_sN_s(h_sh_sh_s)\_V\_N_sN_sN_s$), Significant Cloud Types, Ceiling Height at 2nd Location (CIG_hhh_[LOC], Pressure Rising/Falling Rapidly (PRESRR, PRESFR), Sea-Level Pressure (SLPppp or SLPNO), Aircraft Mishap (ACFT MSHP), No SPECI ReportsTaken (NOSPECI), Snow Increasing Rapidly (SNINCR_[inches-hr/inches on ground]), Other Significant Information (agency specific, for example, LAST)
Additive and Automated Maintenance Data	Hourly Precipitation Amount (Prrrr), 3- and 6-Hour Precipitation Amount (6RRRR), 24-Hour Precipitation Amount ($7R_{24}R_{24}R_{24}R_{24}$), Snow Depth on the Ground (4/sss), Water Equivalent of Snow on Ground (933RRR), Cloud Types ($8/C_LC_MC_H$), Duration of Sunshine (98mmm), Hourly Temperature and Dew point: 0.1□C ($Ts_nT'T'T's_nT'_dT'_dT'_d$), 6-Hour Maximum Temperature: 0.1°C ($1s_nT_xT_xT_x$), 6-Hour Minimum Temperature: 0.1□C ($2s_nT_nT_nT_n$), 24-Hour Maximum/Minimum Temperature: 0.1°C ($4s_nT_xT_xT_xs_nT_nT_nT_n$), 3-Hour Pressure Tendency (5appp), Sensor Status Indicators: RVRNO, PWINO, PNO, FZRANO, TSNO, VISNO_LOC, CHINO_LOC, Maintenance Check Indicator: $
If an element or phenomena does not occur, is missing, or cannot be observed, the corresponding group and space are omitted (body and/or remarks) from that particular report, except for Sea-Level Pressure (SLPppp), and 3-, 6-, and 24-Hour precipitation groups. At stations equipped with automated systems with SPECI capability equipped and manual stations, SLPNO must be reported in a METAR when the SLP is not available. Precipitation groups can be reported as missing.	

E.2 Notations for Reporting Weather Phenomena

NOTATIONS FOR REPORTING WEATHER PHENOMENA							
QUALIFIER							
Intensity or Proximity							
-	Light	no sign	Moderate	**+**	Heavy		
VC	In the Vicinity						
Descriptor							
MI	Shallow	**PR**	Partial	**BC**	Patches	**DR**	Low Drifting
BL	Blowing	**SH**	Shower(s)	**TS**	Thunderstorm	**FZ**	Freezing
WEATHER PHENOMENA							
Precipitation							
DZ	Drizzle	**RA**	Rain	**SN**	Snow	**SG**	Snow Grains
IC	Ice Crystals	**PL**	Ice Pellets	**GR**	Hail	**GS**	Snow Pellets
UP	Unknown Precipitation (auto; no intensity)						
Obscuration							
BR	Mist	**FG**	Fog	**FU**	Smoke	**VA**	Volcanic Ash
DU	Widespread Dust	**SA**	Sand	**HZ**	Haze	**PY**	Spray
Other							
PO	Well Developed Dust/Sand Whirls	**SQ**	Squalls	**FC**	Funnel Cloud(s) (Tornado, or Waterspout)	**SS**	Sandstorm
DS	Duststorm						

REPORTABLE CONTRACTIONS FOR SKY COVER			REPORTING OF LAYERS AUTOMATED STATIONS	
Reportable Contraction	Meaning	Summation Amount of Layer	Priority	Layer Description
VV	Vertical Visibility	8/8	1	lowest few layer
SKC or CLR	Clear	0	2	lowest broken layer
FEW	Few	less than 1/8 to 2/8	3	overcast layer
SCT	Scattered	3/8 to 4/8	4	lowest scattered layer
BKN	Broken	5/8 to less than 8/8	5	second lowest scattered layer
OVC	Overcast	8/8	6	second lowest broken layer
SKC is reported at manual stations when no clouds are observed.			7	highest broken layer
CLR is reported at automated stations when no clouds are detected at or below 12000 feet.			8	highest scattered layer

REPORTABLE VISIBILITY VALUES – Automated	REPORTABLE VISIBILITY VALUES -- Manual
M1/4, 1/4, 1/2, 3/4, 1, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/2, 3, 4, 5, 6, 7, 8, 9, 10	0, 1/16, 1/8, 3/16, 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1 1/8, 1 1/4, 1 3/8, 1 1/2, 1 5/8, 1 3/4, 1 7/8, 2, 2 1/4, 2 1/2, 2 3/4, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 20, 25, 30, 35, 40, etc., in 5 mile increments.

FORMAT AND ORDER OF CODED REMARKS -- Times of Transmission	00	03	06	09	12	15	18	21
Synoptic Cloud Types, $8/C_LC_MC_H$ (manual)	X	X	X	X	X	X	X	X
Snow Increasing Rapidly SNINCR [inches/hr]/[inches on ground] (manual)	Hourly							
Depth of Snow on the Ground, 4/sss (manual)	X[1]		X[1]		X[1]		X[1]	
Water Equivalent of Snow on the Ground, 933RRR (manual)							X	
Duration of Sunshine, 98mmm (manual)	0800 UTC							
Hourly Precipitation Amount, Prrrr (automated stations only)	Hourly							
6-Hour Precipitation Amount, 6RRRR	X[3]	X4	X[3]	X[4]	X[3]	X[4]	X[3]	X[4]
FORMAT AND ORDER OF CODED REMARKS -- Times of Transmission	**00**	**03**	**06**	**09**	**12**	**15**	**18**	**21**
24-Hour Precipitation Amount, $7R_{24}R_{24}R_{24}R_{24}$					X			

Hourly Temperature and Dew Point, $Ts_nT_aT_aT_aS_nT'_aT'_aT'_a$	Hourly														
6-Hour Maximum Temperature, $1s_nT_xT_xT_x$	X		X		X		X								
6-Hour Minimum Temperature, $2s_nT_nT_nT_n$	X		X		X		X								
24-Hour Maximum/Minimum Temperature, $4s_nT_xT_xT_xs_nT_nT_nT_n$	Midnight Local Standard Time (LST)														
Pressure Tendency, 5appp	X		X		X		X		X		X		X		X

[1] included whenever there is more than a trace of snow on the ground
[3] 6-hour precipitation amount
[4] 3-hour precipitation amount

E.3 Key to Decode METAR/SPECI Observations

KEY TO DECODE METAR/SPECI OBSERVATIONS		
METAR KABC 121755Z AUTO 21016G24KT 180V240 1SM R11/P6000FT -RA BR BKN015 OVC025 06/04 A2990 RMK AO2 PK WND 20032/25 WSHFT 1715 VIS 3/4V1 1/2 VIS 3/4 RWY11 RAB07 CIG 013V017 CIG 017 RWY11 PRESFR SLP125 P0003 60009 T00640036 10066 21012 58033 TSNO $		
TYPE OF REPORT	METAR: hourly (scheduled) report; SPECI: special (unscheduled) report.	METAR
STATION IDENTIFIER	Four alphabetic characters; ICAO location identifier.	KABC
DATE/TIME	All dates and times in UTC using a 24-hour clock; two-digit date and four-digit time; always appended with Z to indicate UTC.	121755Z
REPORT MODIFIER	Fully automated report, no human intervention; removed when observer signed-on.	AUTO
WIND DIRECTION AND SPEED	Direction to nearest ten degrees from true north (first three digits); next two digits: speed in whole knots; as needed Gusts (character) followed by maximum observed speed; always appended with KT to indicate knots; 00000KT for calm; if direction varies by 60□or more a Variable wind direction group is reported.	21016G24KT 180V240
VISIBILITY	Prevailing visibility in statute miles and fractions (space between whole miles and fractions); always appended with SM to indicate statute miles; values <1/4 reported as M1/4.	1SM
RUNWAY VISUAL RANGE	10-minute RVR value in hundreds of feet; reported if prevailing visibility is ≤ one mile or RVR ≤ 6000 feet; always appended with FT to indicate feet; value prefixed with M or P to indicate value is lower or higher than the reportable RVR value .	R11/P6000FT
WEATHER PHENOMENA	RA: liquid precipitation that does not freeze; SN: frozen precipitation other than hail; UP: precipitation of unknown type; intensity prefixed to precipitation: light (-), moderate (no sign), heavy (+); FG: fog; FZFG: freezing fog (temperature below 0°C); BR: mist; HZ: haze; SQ: squall; maximum of three groups reported; augmented by observer: FC (funnel cloud/tornado/waterspout); TS (thunderstorm); PL (ice pellets); GR (hail); GS (snow pellets); FZRA (intensity; freezing rain); VA (volcanic ash).	-RA BR
SKY CONDITION	Cloud amount and height: CLR (no clouds detected below 12000 feet); FEW (few); SCT (scattered); BKN (broken); OVC (overcast); followed by 3-digit height in hundreds of feet; or vertical visibility (VV) followed by height for indefinite ceiling.	BKN015 OVC025
TEMPERATURE/DEW POINT	Each is reported in whole degrees Celsius using two digits; values are separated by a solidus; sub-zero values are prefixed with an M (minus).	06/04
ALTIMETER	Altimeter always prefixed with an A indicating inches of mercury; reported using four digits: tens, units, tenths, and hundredths.	A2990

E.4 Weather Phenomena Matrix

The shaded blocks indicate which qualifiers and weather phenomena are not accepted by the ASOS and AWOS C software for the present weather field.

WX PHENOMENA		**QUALIFIER**											
Precipitation		**Intensity or Proximity**				**Descriptor[1]**							
		Light **-**	Moderate	Heavy **+**	Vicinity **VC**[2]	Shallow **MI**	Partial **PR**	Patches **BC**	Low Drifting **DR**[3]	Blowing **BL**	Shower(s) **SH**	Thunder storm **TS**[4]	Freezing **FZ**
Drizzle	**DZ**	-DZ	Drizzle	+DZ	-	-	-	-	-	-	-	-	FZDZ
Rain	**RA**	-RA	RA	+RA	-	-	-	-	-	-	SHRA	TSRA	FZRA
Snow	**SN**	-SN	SN	+SN	-	-	-	-	DRSN	BLSN	SHSN	TSSN	-
Snow Grains	**SG**	-SG	SG	+SG	-	-	-	-	-	-	-	-	-
Ice Crystals[5]	**IC**	-	IC	-	-	-	-	-	-	-	-	-	-
Ice Pellets	**PL**	-PL	PL	+PL	-	-	-	-	-	-	SHPL	TSPL	-
Hail[5,6]	**GR**	-	GR	-	-	-	-	-	-	-	SHGR	TSGR	-
Snow pellets[7]	**GS**	-	GS	-	-	-	-	-	-	-	SHGS	TSGS	-
Unknown Precipitation	**UP**	Automated Stations Only – No Intensity											
Thunderstorms, Showers, Freezing, and their Intensity or Proximity													
Indicator													
TS	-	-	TS	-	VCTS[8]	-	-	-	-	-	-	-	-
TSRA	-	-TSRA	TSRA	+TSRA	-	-	-	-	-	-	-	-	-
TSSN	-	-TSSN	TSSN	+TSSN	-	-	-	-	-	-	-	-	-
TSPL	-	-TSPL	TSPL	+TSPL	-	-	-	-	-	-	-	-	-
TSGS	-	-	TSGA	-	-	-	-	-	-	-	-	-	-
SH	-	-	-	-	VCSH[9]	-	-	-	-	-	-	-	-
SHRA	-	-SHRA	SHRA	+SHRA	-	-	-	-	-	-	-	-	-
SHSN	-	-SHSN	SHSN	+SHSN	-	-	-	-	-	-	-	-	-
SHPL	-	-SHPL	SHPL	+SHPL	-	-	-	-	-	-	-	-	-
SHGR	-	-	SHGR	-	-	-	-	-	-	-	-	-	-
SHGS	-	-	SHGS	-	-	-	-	-	-	-	-	-	-
FZDZ	-	-FZDZ	FZDZ	+FZDZ	-	-	-	-	-	-	-	-	-
FZRA	-	-FZRA	FZRA	+FZRA	-	-	-	-	-	-	-	-	-
FZFG													
Obscurations													
Mist[10]	BR	-	BR10	-	-	-	-	-	-	-	-	-	-
Fog[11]	FG	-	FG[11]	-	VCFG[12]	MIFG[13]	PRFG[14]	BCFG[15]	-	-	-	FZFG[16]	-
Smoke	FU	-	FU	-	-	-	-	-	-	-	-	-	-
Volcanic Ash[17]	VA	-	VA[17]	-	-	-	-	-	-	-	-	-	-
Widespread Dust	DU	-	DU	-	-	-	-	-	DRDU	BLDU	-	-	-
Sand	SA	-	SA	-	-	-	-	-	DRSA	BLSA	-	-	-
Haze	HZ	-	HZ	-	-	-	-	-	-	-	-	-	-
Spray	PY	-	-	-	-	-	-	-	-	BLPY	-	-	-
Blowing Phenomena													
BLSN[18]	-	-	BLSN	-	VCBLSN	-	-	-	-	BLSN	-	-	-
BLSA	-	-	BLSA	-	VCBLSA	-	-	-	-	BLSA	-	-	-
BLDU	-	-	BLDI	-	VCBLDU	-	-	-	-	BLDU	-	-	-
Other													
Sand/ Dust Whirls	**PO**	-	PO	-	VCPO	-	-	-	-	-	-	-	-
Squalls[19]	**SQ**	-	SQ	-	-	-	-	-	-	-	-	-	-
Funnel Cloud	**FC**	-	FC	-	-	-	-	-	-	-	-	-	-
Tunnel/ Waterspout	**+FC**	-	-	+FC	-	-	-	-	-	-	-	-	-
Sandstorm[21]	**SS**	-	SS	+SS	VCSS	-	-	-	-	-	-	-	-
Duststorm[22]	**DS**	-	DS	+DS	VCDS	-	-	-	-	-	-	-	-

[1] Only 1 descriptor must be included for each weather phenomena group, for example, BCFG. Only 2 exceptions exist to this rule: VCSH and VCTS.

[2] Vicinity is defined as >0SM (not at point of observation) to 10SM of the point of observation for precipitation. Other than precipitation (VCFG, VCBLSN, VCBLSA, VCBLDU, VCPO, VCSS, VCDS), vicinity is 5SM to 10SM.

[3] Raised by wind to less than 6 feet above the ground.

[4] TS may be reported by itself if no precipitation is associated with the thunderstorm.

[5] No intensity is ever given to hail (GR) or ice crystals (IC).

[6] Hailstone size is coded in Remarks in 1/4 inch increments. Small Hail less than 1/4 inches is coded in Remarks as “LESS THAN 1/4”

[7] - Snow Pellets Intensity is Reported in Remarks as “GS LGT, GS MOD or GS HVY” until software is upgraded.

[8] - VCTS must only be used when lightning is detected by an automated sensor. Not a manual entry. If thunder is heard, TS must be reported.

[9] - Showers (SH), when associated with the indicator VC, the type and intensity of the showery precipitation must not be specified, that is, +VCSHRA is not allowed; only VCSH would be reported. VCSH must be used to report any type of precipitation not at point of observation, but >0 to 10SM.

[10] BR (mist) must only be used when the visibility is at least 5/8SM, but not more than 6SM.

[11] For FG (fog) to be reported without the qualifiers VC[12], MI[13], PR[14], or BC[15] the visibility must be less than 5/8 SM.

[12] VC is used to report any type of fog observed in the vicinity (5-10SM) of the station.

[13] MIFG (shallow fog) to be reported, the visibility at 6 feet above ground level must be 5/8SM or more and the apparent visibility in the fog layer must be less than 5/8SM.

[14] PRFG (partial fog) indicates that a substantial part of the station is covered by fog while the remainder is clear of fog.

[15] BCFG (patches fog) indicates that patches of fog randomly cover the station.

[16] FZFG is any fog consisting predominately of water droplets at temperatures below 0ºC and visibility less than 5/8 statute miles, whether it is depositing rime or not.

[17] Volcanic Ash is always reported in the body of the METAR/SPECI when present. Visibility is not a factor.

[18] SN BLSN indicates snow falling from clouds with blowing snow occurring. If the observer cannot determine whether or not snow is also falling from clouds, then only BLSN must be reported.

[19] SQ (squall) is a sudden increase in wind speed of at least 16 knots, the speed rising to 22 knots or more and lasting for at least one minute.

[20] Tornadoes and Waterspouts must be reported using the indicator "+," that is, +FC.

[21] SS (sandstorm) reported if the visibility is ≥ 5/16SM and ≤ 5/8SM. Report +SS if the visibility is < 5/16SM.

[22] DS (duststorm) reported if the visibility is ≥ 5/16SM and ≤ 5/8SM. Report +DS if the visibility is < 5/16SM.

No more than three weather groups must be used to report weather phenomena at or near the station. If more than one significant weather phenomena is observed, separate weather phenomena groups must be included in the report. If more than one form of precipitation is observed, the appropriate abbreviations must be combined in a single group with the dominant type of precipitation being reported first. In such a single group, the intensity must refer to the first type of precipitation reported, for example, -RASN FG HZ.

METAR.TA3 - Last Update 10/30/98

E.5 Fahrenheit to Celsius

°F	.0 °C	.1 °C	.2 °C	.3 °C	.4 °C	.5 °C	.6 °C	.7 °C	.8 °C	.9 °C	°F	.0 °C	.1 °C	.2 °C	.3 °C	.4 °C	.5 °C	.6 °C	.7 °C	.8 °C	.9 °C
+130	+54.4	+54.5	+54.6	+54.6	+54.7	+54.7	+54.8	+54.8	+54.9	+54.9	**+80**	+26.7	+26.7	+26.8	+26.8	+26.9	+26.9	+27.0	+27.1	+27.1	+27.2
129	53.9	53.9	54.0	54.1	54.1	54.2	54.2	54.3	54.3	54.4	**79**	26.1	26.2	26.2	26.3	26.3	26.4	26.4	26.5	26.6	26.6
128	53.3	53.4	53.4	53.5	53.6	53.6	53.7	53.7	53.8	53.8	**78**	25.6	25.6	25.7	25.7	25.8	25.8	25.9	25.9	26.0	26.1
127	52.8	52.8	52.9	52.9	53.0	53.1	53.1	53.2	53.2	53.3	**77**	25.0	25.1	25.1	25.2	25.2	25.3	25.3	25.4	25.4	25.5
126	52.2	52.3	52.3	52.4	52.4	52.5	52.6	52.6	52.7	52.7	**76**	24.4	24.5	24.6	24.6	24.7	24.7	24.8	24.8	24.9	24.9
+125	+51.7	+51.7	+51.8	+51.8	+51.9	+51.9	+52.0	+52.1	+52.1	+52.2	**+75**	+23.9	+23.9	+24.0	+24.1	+24.1	+24.2	+24.2	+24.3	+24.3	+24.4
124	51.1	51.2	51.2	51.3	51.3	51.4	51.4	51.5	51.6	51.6	**74**	23.3	23.4	23.4	23.5	23.6	23.6	23.7	23.7	23.8	23.8
123	50.6	50.6	50.7	50.7	50.8	50.8	50.9	50.9	51.0	51.1	**73**	22.8	22.8	22.9	22.9	23.0	23.1	23.1	23.2	23.2	23.3
122	50.0	50.1	50.1	50.2	50.2	50.3	50.3	50.4	50.4	50.5	**72**	22.2	22.3	22.3	22.4	22.4	22.5	22.6	22.6	22.7	22.7
121	49.4	49.5	49.6	49.6	49.7	49.7	49.8	49.8	49.9	49.9	**71**	21.7	21.7	21.8	21.8	21.9	21.9	22.0	22.1	22.1	22.2
+120	+48.9	+48.9	+49.0	+49.1	+49.1	+49.2	+49.2	+49.3	+49.3	+49.4	**+70**	+21.1	+21.2	+21.2	+21.3	+21.3	+21.4	+21.4	+21.5	+21.6	+21.6
119	48.3	48.4	48.4	48.5	48.6	48.6	48.7	48.7	48.8	48.8	**69**	20.6	20.6	20.7	20.7	20.8	20.8	20.9	20.9	21.0	21.1
118	47.8	47.8	47.9	47.9	48.0	48.1	48.1	48.2	48.2	48.3	**68**	20.0	20.1	20.1	20.2	20.2	20.3	20.3	20.4	20.4	20.5
117	47.2	47.3	47.3	47.4	47.4	47.5	47.6	47.6	47.7	47.7	**67**	19.4	19.5	19.6	19.6	19.7	19.7	19.8	19.8	19.9	19.9
116	46.7	46.7	46.8	46.8	46.9	46.9	47.0	47.1	47.1	47.2	**66**	18.9	18.9	19.0	19.1	19.1	19.2	19.2	19.3	19.3	19.4
+115	+46.1	+46.2	+46.2	+46.3	+46.3	+46.4	+46.4	+46.5	+46.6	+46.6	**+65**	+18.3	+18.4	+18.4	+18.5	+18.6	+18.6	+18.7	+18.7	+18.8	+18.8
114	45.6	45.6	45.7	45.7	45.8	45.8	45.9	45.9	46.0	46.1	**64**	17.8	17.8	17.9	17.9	18.0	18.1	18.1	18.2	18.2	18.3
113	45.0	45.1	45.1	45.2	45.2	45.3	45.3	45.4	45.4	45.5	**63**	17.2	17.3	17.3	17.4	17.4	17.5	17.6	17.6	17.7	17.7
112	44.4	44.5	44.6	44.6	44.7	44.7	44.8	44.8	44.9	44.9	**62**	16.7	16.7	16.8	16.8	16.9	16.9	17.0	17.1	17.1	17.2
111	43.9	43.9	44.0	44.1	44.1	44.2	44.2	44.3	44.3	44.4	**61**	16.1	16.2	16.2	16.3	16.3	16.4	16.4	16.5	16.6	16.6
+110	+43.3	+43.4	+43.4	+43.5	+43.6	+43.6	+43.7	+43.7	+43.8	+43.8	**+60**	+15.6	+15.6	+15.7	+15.7	+15.8	+15.8	+15.9	+15.9	+16.0	+16.1
109	42.8	42.8	42.9	42.9	43.0	43.1	43.1	43.2	43.2	43.3	**59**	15.0	15.1	15.1	15.2	15.2	15.3	15.3	15.4	15.4	15.5
108	42.2	42.3	42.3	42.4	42.4	42.5	42.6	42.6	42.7	42.7	**58**	14.4	14.5	14.6	14.6	14.7	14.7	14.8	14.8	14.9	14.9
107	41.7	41.7	41.8	41.8	41.9	41.9	42.0	42.1	42.1	42.2	**57**	13.9	13.9	14.0	14.1	14.1	14.2	14.2	14.3	14.3	14.4
106	41.1	41.2	41.2	41.3	41.3	41.4	41.4	41.5	41.6	41.6	**56**	13.3	13.4	13.4	13.5	13.6	13.6	13.7	13.7	13.8	13.8
+105	+40.6	+40.6	+40.7	+40.7	+40.8	+40.8	+40.9	+40.9	+41.0	+41.1	**+55**	+12.8	+12.8	+12.9	+12.9	+13.0	+13.1	+13.1	+13.2	+13.2	+13.3
104	40.0	40.1	40.1	40.2	40.2	40.3	40.3	40.4	40.4	40.5	**54**	12.2	12.3	12.3	12.4	12.4	12.5	12.6	12.6	12.7	12.7
103	39.4	39.5	39.6	39.6	39.7	39.7	39.8	39.8	39.9	39.9	**53**	11.7	11.7	11.8	11.8	11.9	11.9	12.0	12.1	12.1	12.2
102	38.9	38.9	39.0	39.1	39.1	39.2	39.2	39.3	39.3	39.4	**52**	11.1	11.2	11.2	11.3	11.3	11.4	11.4	11.5	11.6	11.6
101	38.3	38.4	38.4	38.5	38.6	38.6	38.7	38.7	38.8	38.8	**51**	10.6	10.6	10.7	10.7	10.8	10.8	10.9	10.9	11.0	11.1
+100	+37.8	+37.8	+37.9	+37.9	+38.0	+38.1	+38.1	+38.2	+38.2	+38.3	**+50**	+10.0	+10.1	+10.1	+10.2	+10.2	+10.3	+10.3	+10.4	+10.4	+10.5
99	37.2	37.3	37.3	37.4	37.4	37.5	37.6	37.6	37.7	37.7	**49**	9.4	9.5	9.6	9.6	9.7	9.7	9.8	9.8	9.9	9.9
98	36.7	36.7	36.8	36.8	36.9	36.9	37.0	37.1	37.1	37.2	**48**	8.9	8.9	9.0	9.1	9.1	9.2	9.2	9.3	9.3	9.4
97	36.1	36.2	36.2	36.3	36.3	36.4	36.4	36.5	36.6	36.6	**47**	8.3	8.4	8.4	8.5	8.6	8.6	8.7	8.7	8.8	8.8
96	35.6	35.6	35.7	35.7	35.8	35.8	35.9	35.9	36.0	36.1	**46**	7.8	7.8	7.9	7.9	8.0	8.1	8.1	8.2	8.2	8.3
+95	+35.0	+35.1	+35.1	+35.2	+35.2	+35.3	+35.3	+35.4	+35.4	+35.5	**+45**	+7.2	+7.3	+7.3	+7.4	+7.4	+7.5	+7.6	+7.6	+7.7	+7.7
94	34.4	34.5	34.6	34.6	34.7	34.7	34.8	34.8	34.9	34.9	**44**	6.7	6.7	6.8	6.8	6.9	6.9	7.0	7.1	7.1	7.2
93	33.9	33.9	34.0	34.1	34.1	34.2	34.2	34.3	34.3	34.4	**43**	6.1	6.2	6.2	6.3	6.3	6.4	6.4	6.5	6.6	6.6
92	33.3	33.4	33.4	33.5	33.6	33.6	33.7	33.7	33.8	33.8	**42**	5.6	5.6	5.7	5.7	5.8	5.8	5.9	5.9	6.0	6.1
91	32.8	32.8	32.9	32.9	33.0	33.1	33.1	33.2	33.2	33.3	**41**	5.0	5.1	5.1	5.2	5.2	5.3	5.3	5.4	5.4	5.5
+90	+32.2	+32.3	+32.3	+32.4	32.4	+32.5	+32.6	+32.6	+32.7	+32.7	**+40**	+4.4	+4.5	+4.6	+4.6	+4.7	+4.7	+4.8	+4.8	+4.9	+4.9
89	31.7	31.7	31.8	31.8	31.9	31.9	32.0	32.1	32.1	32.2	**39**	3.9	3.9	4.0	4.1	4.1	4.2	4.2	4.3	4.3	4.4
88	31.1	31.2	31.2	31.3	31.3	31.4	31.4	31.5	31.6	31.6	**38**	3.3	3.4	3.4	3.5	3.6	3.6	3.7	3.7	3.8	3.8
87	30.6	30.6	30.7	30.7	30.8	30.8	30.9	30.9	31.0	31.1	**37**	2.8	2.8	2.9	2.9	3.0	3.1	3.1	3.2	3.2	3.3
86	30.0	30.1	30.1	30.2	30.2	30.3	30.3	30.4	30.4	30.5	**36**	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.7
+85	+29.4	+29.5	+29.6	+29.6	+29.7	+29.7	+29.8	+29.8	+29.9	+29.9	**+35**	+1.7	+1.7	+1.8	+1.8	+1.9	+1.9	+2.0	+2.1	+2.1	+2.2
84	28.9	28.9	29.0	29.1	29.1	29.2	29.2	29.3	29.3	29.4	**34**	+1.1	+1.2	+1.2	+1.3	+1.3	+1.4	+1.4	+1.5	+1.6	+1.6
83	28.3	28.4	28.4	28.5	28.6	28.6	28.7	28.7	28.8	28.8	**33**	+0.6	+0.6	+0.7	+0.7	+0.8	+0.8	+0.9	+0.9	+1.0	+1.1
82	27.8	27.8	27.9	27.9	28.0	28.1	28.1	28.2	28.2	28.3	**32**	0.0	+0.1	+0.1	+0.2	+0.2	+0.3	+0.3	+0.4	+0.4	+0.5
81	27.2	27.3	27.3	27.4	27.4	27.5	27.6	27.6	27.7	27.7	**31**	-0.6	-0.5	-0.4	-0.4	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1

	.0 °C	.1 °C	.2 °C	3 °C	.4 °C	.5 °C	.6 °C	.7 °C	.8 °C	.9 °C	°F	.0 °C	.1 °C	.2 °C	.3 °C	.4 °C	.5 °C	.6 °C	.7 °C	.8 °C	.9 °C
+30	-1.1	-1.1	-1.0	-0.9	-0.9	-0.8	-0.8	-0.7	-0.7	-0.6	**-25**	-31.7	-31.7	-31.8	-31.8	-31.9	-31.9	-32.0	-32.1	-32.1	-32.2
29	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.3	1.2	1.2	**26**	32.2	32.3	32.3	32.4	32.4	32.5	32.6	32.6	32.7	32.7

°F	.0 °C	.1 °C	.2 °C	.3 °C	.4 °C	.5 °C	.6 °C	.7 °C	.8 °C	.9 °C	°F	.0 °C	.1 °C	.2 °C	.3 °C	.4 °C	.5 °C	.6 °C	.7 °C	.8 C	9 C
28	2.2	2.2	2.1	2.1	2.0	1.9	1.9	1.8	1.8	1.7	27	32.8	32.8	32.9	32.9	33.0	33.1	33.1	33.2	33.2	33.3
27	2.8	2.7	2.7	2.6	2.6	2.5	2.4	2.4	2.3	2.3	28	33.3	33.4	33.4	33.5	33.6	33.6	33.7	33.7	33.8	33.8
26	3.3	3.3	3.2	3.2	3.1	3.1	3.0	2.9	2.9	2.8	29	33.9	33.9	34.0	34.1	34.1	34.2	34.2	34.3	34.3	34.4
+25	-3.9	-3.8	-3.8	-3.7	-3.7	-3.6	-3.6	-3.5	-3.4	-3.4	-30	-34.4	-34.5	-34.6	-34.6	-34.7	-34.7	-34.8	-34.8	-34.9	-34.9
24	4.4	4.4	4.3	4.3	4.2	4.2	4.1	4.1	4.0	3.9	31	35.0	35.1	35.1	35.2	35.2	35.3	35.3	35.4	35.4	35.5
23	5.0	4.9	4.9	4.8	4.8	4.7	4.7	4.6	4.6	4.5	32	35.6	35.6	35.7	35.7	35.8	35.8	35.9	35.9	36.0	36.1
22	5.6	5.5	5.4	5.4	5.3	5.3	5.2	5.2	5.1	5.1	33	36.1	36.2	36.2	36.3	36.3	36.4	36.4	36.5	36.6	36.6
21	6.1	6.1	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	34	36.7	36.7	36.8	36.8	36.9	36.9	37.0	37.1	37.1	37.2
+20	-6.7	-6.6	-6.6	-6.5	-6.4	-6.4	-6.3	-6.3	-6.2	-6.2	-35	-37.2	-37.3	-37.3	-37.4	-37.4	-37.5	-37.6	-37.1	-37.7	-37.7
19	7.2	7.2	7.1	7.1	7.0	6.9	6.9	6.8	6.8	6.7	36	37.8	37.8	37.9	37.9	38.0	38.1	38.1	38.2	38.2	38.3
18	7.8	7.7	7.7	7.6	7.6	7.5	7.4	7.4	7.3	7.3	37	38.3	38.4	38.4	38.5	38.6	38.6	38.7	38.7	38.8	38.8
17	8.3	8.3	8.2	8.2	8.1	8.1	8.0	7.9	7.9	7.8	38	38.9	38.9	39.0	39.1	39.1	39.2	39.2	39.3	39.3	39.4
16	8.9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.4	8.4	39	39.4	39.5	39.6	39.6	39.7	39.7	39.8	39.8	39.9	39.9
+15	-9.4	-9.4	-9.3	-9.3	-9.2	-9.2	-9.1	-9.1	-9.0	-8.9	-40	-40.0	-40.1	-40.1	-40.2	-40.2	-40.3	-40.3	-40.4	-40.4	-40.5
14	10.0	9.9	9.9	9.8	9.8	9.7	9.7	9.6	9.6	9.5	41	40.6	40.6	40.7	40.7	40.8	40.8	40.9	40.9	41.0	41.1
13	10.6	10.5	10.4	10.4	10.3	10.3	10.2	10.2	10.1	10.1	42	41.1	41.2	41.2	41.3	41.3	41.4	41.4	41.5	41.6	41.6
12	11.1	11.1	11.0	10.9	10.9	10.8	10.8	10.7	10.7	10.6	43	41.7	41.7	41.8	41.8	41.9	41.9	42.0	42.1	42.1	42.2
11	11.7	11.6	11.6	11.5	11.4	11.4	11.3	11.3	11.2	11.2	44	42.2	42.3	42.3	42.4	42.4	42.5	42.6	42.6	42.7	42.7
+10	-12.2	-12.2	-12.1	-12.1	-12.0	-11.9	-11.9	-11.8	-11.8	-11.7	-45	-42.8	-42.8	-42.9	-42.9	-43.0	-43.1	-43.1	-43.2	-43.2	-43.3
9	12.8	12.7	12.7	12.6	12.6	12.5	12.4	12.4	12.3	12.3	46	43.3	43.4	43.4	43.5	43.6	43.6	43.7	43.7	43.8	43.8
8	13.3	13.3	13.2	13.2	13.1	13.1	13.0	12.9	12.9	12.8	47	43.9	43.9	44.0	44.1	44.1	44.2	44.2	44.3	44.3	44.4
7	13.9	13.8	13.8	13.7	13.7	13.6	13.6	13.5	13.4	13.4	48	44.4	44.5	44.6	44.6	44.7	44.7	44.8	44.8	44.9	44.9
6	14.4	14.4	14.3	14.3	14.2	14.2	14.1	14.1	14.0	13.9	49	45.0	45.1	45.1	45.2	45.2	45.3	45.3	45.4	45.4	45.5
+5	-15.0	-14.9	-14.9	-14.8	-14.8	-14.7	-14.7	-14.6	-14.6	-14.5	-50	-45.6	-45.6	-45.7	-45.7	-45.8	-45.8	-45.9	-45.9	-46.0	-46.1
4	15.6	15.5	15.4	15.4	15.3	15.3	15.2	15.2	15.1	15.1	51	46.1	46.2	46.2	46.3	46.3	46.4	46.4	46.5	46.6	46.6
3	16.1	16.1	16.0	15.9	15.9	15.8	15.8	15.7	15.7	15.6	52	46.7	46.7	46.8	46.8	46.9	46.9	47.0	47.1	47.1	47.2
2	16.7	16.6	16.6	16.5	16.4	16.4	16.3	16.3	16.2	16.2	53	47.2	47.3	47.3	47.4	47.4	47.5	47.6	47.6	47.7	47.7
1	17.2	17.2	17.1	17.1	17.0	16.9	16.9	16.8	16.8	16.7	54	47.8	47.8	47.9	47.9	48.0	48.1	48.1	48.2	48.2	48.3
+0	17.8	17.7	17.7	17.6	17.6	17.5	17.4	17.4	17.3	17.3											
											-55	-48.3	-48.4	-48.4	-48.5	-48.6	-48.6	-48.7	-48.7	-48.8	-48.8
-0	-17.8	-17.8	-17.9	-17.9	-18.0	-18.1	-18.1	-18.2	-18.2	-18.3	56	48.9	48.9	49.0	49.1	49.1	49.2	49.2	49.3	49.3	49.4
1	18.3	18.4	18.4	18.5	18.6	18.6	18.7	18.7	18.8	18.8	57	49.4	49.5	49.6	49.6	49.7	49.7	49.8	49.8	49.9	49.9
2	18.9	18.9	19.0	19.1	19.1	19.2	19.2	19.3	19.3	19.4	58	50.0	50.1	50.1	50.2	50.2	50.3	50.3	50.4	50.4	50.5
3	19.4	19.5	19.6	19.6	19.7	19.7	19.8	19.8	19.9	19.9	59	50.6	50.6	50.7	50.7	50.8	50.8	50.9	50.9	51.0	51.1
4	20.0	20.1	20.1	20.2	20.2	20.3	20.3	20.4	20.4	20.5											
											-60	-51.1	-51.2	-51.2	-51.3	-51.3	-51.4	-51.4	-51.5	-51.6	-51.6
-5	-20.6	-20.6	-20.7	-20.7	-20.8	-20.8	-20.9	-20.9	-21.0	-21.1	61	51.7	51.7	51.8	51.8	51.9	51.9	52.0	52.1	52.1	52.2
6	21.1	21.2	21.2	21.3	21.3	21.4	21.4	21.5	21.6	21.6	62	52.2	52.3	52.3	52.4	52.4	52.5	52.6	52.6	52.7	52.7
7	21.7	21.7	21.8	21.8	21.9	21.9	22.0	22.1	22.1	22.2	63	52.8	52.8	52.9	52.9	53.0	53.1	53.1	53.2	53.2	53.3
8	22.2	22.3	22.3	22.4	22.4	22.5	22.6	22.6	22.7	22.7	64	53.3	53.4	53.4	53.5	53.6	53.6	53.7	53.7	53.8	53.8
9	22.8	22.8	22.9	22.9	23.0	23.1	23.1	23.2	23.2	23.3											
											-65	-53.9	-53.9	-54.0	-54.1	-54.1	-54.2	-54.2	-54.3	-54.3	-54.4
-10	-23.3	-23.4	-23.4	-23.5	-23.6	-23.6	-23.7	-23.7	-23.8	-23.8	66	54.4	54.5	54.6	54.6	54.7	54.7	54.8	54.8	54.9	54.9
11	23.9	23.9	24.0	24.1	24.1	24.2	24.2	24.3	24.3	24.4	67	55.0	55.1	55.1	55.2	55.2	55.3	55.3	55.4	55.4	55.5
12	24.4	24.5	24.6	24.6	24.7	24.7	24.8	24.8	24.9	24.9	68	55.6	55.6	55.7	55.7	55.8	55.8	55.9	55.9	56.0	56.1
13	25.0	25.1	25.1	25.2	25.2	25.3	25.3	25.4	25.4	25.5	69	56.1	56.2	56.2	56.3	56.3	56.4	56.4	56.5	56.6	56.6
14	25.6	25.6	25.7	25.7	25.8	25.8	25.9	25.9	26.0	26.1											
											-70	-56.7	-56.7	-56.8	-56.8	-56.9	-56.9	-57.0	-57.1	-57.1	-57.2
-15	-26.1	-26.2	-26.2	-26.3	-26.3	-26.4	-26.4	-26.5	-26.6	-26.6	71	57.2	57.3	57.3	57.4	57.4	57.5	57.6	57.6	57.7	57.7
16	26.7	26.7	26.8	26.8	26.9	26.9	27.0	27.1	27.1	27.2	72	57.8	57.8	57.9	57.9	58.0	58.1	58.1	58.2	58.2	58.3
17	27.2	27.3	27.3	27.4	27.4	27.5	27.6	27.6	27.7	27.7	73	58.3	58.4	58.4	58.5	58.6	58.6	58.7	58.7	58.8	58.8
18	27.8	27.8	27.9	27.9	28.0	28.1	28.1	28.2	28.2	28.3	74	58.9	58.9	59.0	59.1	59.1	59.2	59.2	59.3	59.3	59.4
19	28.3	28.4	28.4	28.5	28.6	28.6	28.7	28.7	28.8	28.8											
											-75	-59.4	-59.5	-59.6	-59.6	-59.7	-59.7	-59.8	-59.8	-59.9	-59.9
-20	-28.9	-28.9	-29.0	-29.1	-29.1	-29.2	-29.2	-29.3	-29.3	-29.4	76	60.0	60.1	60.1	60.2	60.2	60.3	60.3	60.4	60.4	60.5
21	29.4	29.5	29.6	29.6	29.7	29.7	29.8	29.8	29.9	29.9	77	60.6	60.6	60.7	60.7	60.8	60.8	60.9	60.9	61.0	61.1
22	30.0	30.1	30.1	30.2	30.2	30.3	30.3	30.4	30.4	30.5	78	61.1	61.2	61.2	61.3	61.3	61.4	61.4	61.5	61.6	61.6
23	30.6	30.6	30.7	30.7	30.8	30.8	30.9	30.9	31.0	31.1	79	61.7	61.7	61.8	61.8	61.9	61.9	62.0	62.1	62.1	62.2
24	31.1	31.2	31.2	31.3	31.3	31.4	31.4	31.5	31.6	31.6											

E.6 Tenth of Degrees Celsius to Whole Degrees Fahrenheit

°C	.0 °F	.1 °F	.2 °F	.3 °F	.4 °F	.5 °F	.6 °F	.7 °F	.8 °F	.9 °F	°C	.0 °F	.1 °F	.2 °F	.3 °F	.4 °F	.5 °F	.6 °F	.7 °F	.8 °F	.9 °F
+55	+131	+131	+131	+132	+132	+132	+132	+132	+132	+133	**-0**	+32	+32	+32	+31	+31	+31	+31	+31	+31	+30
54	129	129	130	130	130	130	130	130	131	131	**1**	30	30	30	30	29	29	29	29	29	29
53	127	128	128	128	128	128	128	129	129	129	**2**	28	28	28	28	28	28	27	27	27	27
52	125	126	126	126	126	127	127	127	127	127	**3**	27	26	26	26	26	26	26	25	25	25
51	123	124	124	124	125	125	125	125	125	125	**4**	25	25	24	24	24	24	24	24	23	23
											-5	+23	+23	+23	+22	+22	+22	+22	+22	+22	+21
+50	+122	+122	+122	+123	+123	+123	+123	+123	+123	+124	**6**	21	21	21	21	20	20	20	20	20	20
49	120	120	121	121	121	121	121	121	122	122	**7**	19	19	19	19	19	19	18	18	18	18
48	118	119	119	119	119	119	119	120	120	120	**8**	18	17	17	17	17	17	17	16	16	16
47	117	117	117	117	117	118	118	118	118	118	**9**	16	16	15	15	15	15	15	15	14	14
46	115	115	115	115	116	116	116	116	116	116											
+45	+113	+113	+113	+114	+114	+114	+114	+114	+114	+115	**-10**	+14	+14	+14	+13	+13	+13	+13	+13	+13	+12
44	111	111	112	112	112	112	112	112	113	113	**11**	12	12	12	12	11	11	11	11	11	11
43	109	110	110	110	110	110	110	111	111	111	**12**	10	10	10	10	10	10	9	9	9	9
42	108	108	108	108	108	109	109	109	109	109	**13**	9	8	8	8	8	8	8	7	7	7
41	106	106	106	106	107	107	107	107	107	107	**14**	7	7	6	6	6	6	6	6	5	5
											-15	+5	+5	+5	+4	+4	+4	+4	+4	+4	+3
+40	+104	+104	+104	+105	+105	+105	+105	+105	+105	+106	**16**	+3	+3	+3	+3	+2	+2	+2	+2	+2	+2
39	102	102	103	103	103	103	103	103	104	104	**17**	+1	+1	+1	+1	+1	+1	0	0	0	0
38	100	101	101	101	101	101	101	102	102	102	**18**	0	-1	-1	-1	-1	-1	-1	-2	-2	-2
37	99	99	99	99	99	100	100	100	100	100	**19**	-2	-2	-3	-3	-3	-3	-3	-4	-4	-4
36	97	97	97	97	98	98	98	98	98	98											
+35	+95	+95	+95	+96	+96	+96	+96	+96	+96	+97	**-20**	-4	-4	-4	-5	-5	-5	-5	-5	-5	-6
34	93	93	94	94	94	94	94	94	95	95	**21**	6	6	6	6	7	7	7	7	7	7
33	91	92	92	92	92	92	92	93	93	93	**22**	8	8	8	8	8	8	9	9	9	9
32	90	90	90	90	90	91	91	91	91	91	**23**	9	10	10	10	10	10	10	11	11	11
31	88	88	88	88	89	89	89	89	89	89	**24**	11	11	12	12	12	12	12	12	13	13
											-25	-13	-13	-13	-14	-14	-14	-14	-14	-14	-15
+30	+86	+86	+86	+87	+87	+87	+87	+87	+87	+88	**26**	15	15	15	15	16	16	16	16	16	16
29	84	84	85	85	85	85	85	85	86	86	**27**	17	17	17	17	17	17	18	18	18	18
28	82	83	83	83	83	83	83	84	84	84	**28**	18	19	19	19	19	19	19	20	20	20
27	81	81	81	81	81	82	82	82	82	82	**29**	20	20	21	21	21	21	21	21	22	22
26	79	79	79	79	80	80	80	80	80	80											
+25	+77	+77	+77	+78	+78	+78	+78	+78	+78	+79	**-30**	-22	-22	-22	-23	-23	-23	-23	-23	-23	-24
24	75	75	76	76	76	76	76	76	77	77	**31**	24	24	24	24	25	25	25	25	25	25
23	73	74	74	74	74	74	74	75	75	75	**32**	26	26	26	26	26	26	27	27	27	27
22	72	72	72	72	72	73	73	73	73	73	**33**	27	28	28	28	28	28	28	29	29	29
21	70	70	70	70	71	71	71	71	71	71	**34**	29	29	30	30	30	30	30	30	31	31
											-35	-31	-31	-31	-32	-32	-32	-32	-32	-32	-33
+20	+68	+68	+68	+69	+69	+69	+69	+69	+69	+70	**36**	33	33	33	33	34	34	34	34	34	34
19	66	66	67	67	67	67	67	67	68	68	**37**	35	35	35	35	35	35	36	36	36	36
18	64	65	65	65	65	65	65	66	66	66	**38**	36	37	37	37	37	37	37	38	38	38
17	63	63	63	63	63	64	64	64	64	64	**39**	38	38	39	39	39	39	39	39	40	40
16	61	61	61	61	62	62	62	62	62	62											
+15	+59	+59	+59	+60	60	+60	+60	+60	+60	+61	**-40**	-40	-40	-40	-41	-41	-41	-41	-41	-41	-42
14	57	57	58	58	58	58	58	58	59	59	**41**	42	42	42	42	43	43	43	43	43	43
13	55	56	56	56	56	56	56	57	57	57	**42**	44	44	44	44	44	44	45	45	45	45
12	54	54	54	54	54	55	55	55	55	55	**43**	45	46	46	46	46	46	46	47	47	47
11	52	52	52	52	53	53	53	53	53	53	**44**	47	47	48	48	48	48	48	48	49	49
											-45	-49	-49	-49	-50	-50	-50	-50	-50	-50	-51
+10	+50	+50	+50	+51	+51	+51	+51	+51	+51	+52	**46**	51	51	51	51	52	52	52	52	52	52
9	48	48	49	49	49	49	49	50	50	50	**47**	53	53	53	53	53	53	54	54	54	54
8	46	47	47	47	47	47	47	48	48	48	**48**	54	55	55	55	55	55	55	56	56	56
7	45	45	45	45	45	46	46	46	46	46	**49**	56	56	57	57	57	57	57	57	58	58
6	43	43	43	43	44	44	44	44	44	44											
+5	+41	+41	+41	+42	+42	+42	+42	+42	+42	+43	**-50**	-58	-58	-58	-59	-59	-59	-59	-59	-59	-60
4	39	39	40	40	40	40	40	40	41	41	**51**	60	60	60	60	61	61	61	61	61	61
3	37	38	38	38	38	38	38	39	39	39	**52**	62	62	62	62	62	62	63	63	63	63
2	36	36	36	36	36	37	37	37	37	37	**53**	63	64	64	64	64	64	64	65	65	65
1	34	34	34	34	35	35	35	35	35	35	**54**	65	65	66	66	66	66	66	66	67	67
+0	+32	+32	+32	+33	+33	+33	+33	+33	+33	+34	**-55**	-67	-67	-67	-68	-68	-68	-68	-68	-68	-69
-0	+32	+32	+32	+31	+31	+31	+31	+31	+31	+30											

Appendix F. GENERAL REQUIREMENTS FOR MEASURING SNOW DEPTH

F.1 Purpose

This Appendix contains the agreement between the National Weather Service (NWS) and the FAA and provides general requirements for measuring snow depth. This agreement was developed to enable contract weather observers (CWO) at specified locations with automated systems with SPECI capability to provide snow depth measurement in support of the National Oceanic and Atmospheric Administration's (NOAA) NWS forecast, warning and climate programs. These sites with an automated system with SPECI capability are supported by FAA's CWOs.

F.2 Description

In 2004, the NWS and the FAA entered into a snow measuring agreement with the following provisions. The FAA agreed to provide snow depth reporting at CWO sites, provided the following conditions are met:

a. The measuring location is within 200 feet of the normal point of observation.

NOTE: If the measuring location is between 200 – 500 feet it must be mutually agreed upon between the two organizations in order for CWOs to perform this function.

b. The NWS agreed to provide initial and follow on training to the observers.

c. The NWS agreed to purchase, install and maintain snow measuring equipment at all agreed to sites.

F.3 FAA Order 7900.5 Guidelines

In accordance with this order, all CWO weather observers at sites that meet the requirements in Paragraph F.2 are required to disseminate and observe only the following weather elements:

a. Snow Depth on Ground (Remarks: 4/sss): Reference Paragraph 13.50

b. Water Equivalent of Snow on Ground (Remarks: 933RRR): Reference Paragraph 13.51

c. 6-Hour Snowfall (Column 34): Reference Paragraph 14.10.x

d. Snow Depth (Column 35): Reference Paragraph 14.10.y

NOTE:

1. Weather elements a and b are transmitted long- line. Weather elements c and d are recorded on MF1M-10C.

2. Tasks concerning snowfall measurements must not exceed the tasks outlined in FAA Order 7900.5.

F.4 List of CWO Sites that will be required to perform snow depth measurements

AK PABI (BIG) Allen AAF (Ft. Greely)

AK PABT (BTT) Bettles Airport

AK PACV (CDV) Cordova Airport

AK PAJN (JNU) Juneau International

AK PATA (TAL) Tanana Airport

AK PABE (BET) Bethel Airport

AK PFYU (FYU) Fort Yukon Airport AK

PAIL (ILI) Illiamna Airport

AK PAOR (ORT) Northway Airport

AK PASI (SIT) Sitka Airport

AK PASC (SSC) Deadhorse Airport

AL KBHM Birmingham International

AL KHSV Huntsville International Airport

AL KMOB Mobile Regional Airport

CO KCOS Colorado Springs Airport

FL KDAB Daytona Beach International

FL KFLL Fort Lauderdale-Hollywood International Airport

FL KJAX Jacksonville International

FL KMCO Orlando International Airport

FL KTLH Tallahassee Regional Airport

FL KTPA Tampa International Airport

GA KATL Hartsfield-Jackson Atlanta International Airport

GA KSAV Savannah International Airport

HI PHNL Honolulu International Airport

IA KDSM Des Moines International

ID KFSD Sioux Falls/Joe Foss Field

IL KMDW Chicago Midway International Airport

IL KORD Chicago O'Hare International Airport

IL KRFD Greater Rockford Airport

IN KFWA Fort Wayne International Airport

IN KIND Indianapolis International Airport

KY KCVG Cincinnati/Northern Kentucky International Airport

KY KSDF Louisville International Airport

LA KMSY New Orleans International Airport

LA KSHV Shreveport Regional Airport

ME KBGR Bangor International Airport

MI KMKG Muskegon County Airport

MI KTVC Traverse City/Cherry Capital Airport

MN KDLH Duluth International Airport

MN KMSP Minneapolis-St. Paul International Airport

MO KMCI Kansas City International Airport

MO KSTL St. Louis International Airport

MT KBIL Billings Logan International Airport

NC KCLT Charlotte/Douglas International Airport

NC KGSO Piedmont Triad International Airport

NC KRDU Raleigh-Durham International Airport

ND KGFK Grand Forks Airport

NE KOMA Omaha -Eppley Airfield

NH KMHT Manchester-Boston Regional Airport

NJ KEWR Newark International Airport

NM KABQ Albuquerque International Airport

NV KRNO Reno-Tahoe International Airport

NY KALB Albany International Airport

NY KISP Long Island MacArthur Airport

NY KJFK John F. Kennedy International Airport

NY KLGA LaGuardia Airport

NY KROC Greater Rochester International Airport

NY KSYR Syracuse International Airport

OH KCAK Akron - Canton Regional Airport

OH KCLE Cleveland - Hopkins International Airport

OH KCMH Columbus International Airport

OH KDAY Dayton International Airport

OH KYNG Youngstown - Warren Regional Airport

OK KTUL Tulsa International Airport

OK KOKC Will Rogers World Airport

OR KEUG Eugene-Mahlon Sweet Field Airport

PA KMDT Harrisburg International Airport

RI KPVD Theodore Francis Green State Airport

SC KCAE Columbia Metropolitan Airport

SC KCHS Charleston International Airport

SD KFSD Sioux Falls Regional International Airport

TN KCHA Chattanooga Metropolitan Airport

TN KMEM Memphis International Airport

TN KTRI Tri-Cities Regional TN/VA Airport

TN KTYS Knoxville-McGhee Tyson Airport

TN KBNA Nashville International Airport

TX KAUS Austin - Bergstrom International Airport

TX KAFW Forth Worth Alliance Airport

TX KHOU William P. Hobby Airport TX

KIAH George Bush Intercontinental

TX KLBB Lubbock International Airport

VA KDCA Ronald Regan - Washington National Airport

VA KRIC Richmond International Airport

VA KROA Roanoke Regional Airport

VT KBTV Burlington International Airport

WA KSEA Seattle - Tacoma International

WA KGEG Spokane International Airport

WI KMSN Dane County Regional Airport

WI KMKE General Mitchell International Airport

Appendix G. GLOSSARY

Additive Data. A group of coded remarks that includes pressure tendency, amount of precipitation, and maximum/minimum temperature during specified periods of time.

Airport Location Point. ALP, the permanent airport reference point defined by the latitude and longitude published in the Airport Facility Directory.

Altimeter Setting. That pressure value to which an aircraft altimeter scale is set so that it will indicate the altitude above mean sea level of an aircraft on the ground at the location for which the value was determined.

Archive. A permanent record of surface weather reports and related data used to establish a climatological record for the United States.

ASOS Meteorological Discontinuity Sensors – At locations that commonly experience weather that affects only a portion of the airport, multi-sensor algorithms provide information about meteorological discontinuities in sky condition and visibility. The meteorological discontinuity sensor is sited to detect operationally significant discontinuities in ceiling and/or visibility.

The report generated by the primary sensor is used in the body of all official observations. Once ASOS generates the reports, they are compared for significant differences. If the values are different by site-determined criteria, the discontinuity sensor observation is included in the remarks of the METAR/SPECI.

NOTE: ASOS may also have backup sensors that are collocated with the primary sensor group and will automatically report until the primary sensor is returned to service.

Atmospheric Pressure. The pressure exerted by the atmosphere at a given point (see altimeter setting, pressure, sea-level pressure, station pressure).

Augmented Report. A meteorological report prepared by an automated surface weather observing system for transmission to certified observers signed on to the system in order to add information to the report.

Automated Report. A meteorological report prepared by an automated surface weather observing system for transmission, and with no certified weather observers signed on to the system.

Backup. An alternate method for providing a meteorological report, parts of reports or documentation of reports when the primary method is unavailable or non-representative.

Barometer. An instrument that measures atmospheric pressure.

Barometric Pressure. The actual pressure value indicated by a pressure sensor.

Blowing. A descriptor used to amplify observed weather phenomena whenever the phenomena are raised to a height of 6 feet or more above the ground.

Blowing Dust. Dust picked up locally from the surface of the earth and blown about in clouds or sheets, reducing the reported horizontal visibility to less than 7 statute miles.

Blowing Sand. Sand particles picked up from the surface of the earth by the wind to moderate heights above the ground, reducing the reported horizontal visibility to less than 7 statute miles.

Blowing Snow. Snow lifted from the surface of the earth by the wind to a height of 6 feet or more above the ground and blown about in such quantities that the reported horizontal visibility is reduced to less than 7 miles.

Blowing Spray. Water droplets torn by the wind from a body of water, generally from the crests of waves, and carried up into the air in such quantities that they reduce the reported horizontal visibility to less than 7 statute miles.

Body of Report. That portion of a METAR or SPECI beginning with the type of report and ending with the altimeter setting.

Broken Layer. A layer covering whose summation amount of sky cover is 5/8ths through 7/8ths.

Calm. A condition when no motion of the air is detected.

Ceiling. The height above the earth's surface of the lowest layer that is reported as broken or overcast; or the vertical visibility into an indefinite ceiling.

Ceiling Light. A type of cloud-height indicator that uses a focused light to project vertically a narrow beam of light onto a cloud base.

Ceilometer. A device used to evaluate the height of clouds or the vertical visibility into a surface-based obscuration.

Certified Observer. An individual approved by designated Federal agencies to take surface observations used in aircraft operations.

Clear Sky. The absence of sky cover.

Cloud. A visible aggregate of minute water droplets or ice particles in the atmosphere above the Earth's surface.

Cloud-Air Lightning (CA). Streaks of lightning, which pass from a cloud to the air, but do not strike the ground.

Cloud-Cloud Lightning (CC). Streaks of lightning reaching from one cloud to another.

Cloud-Ground Lightning (CG). Lightning occurring between cloud and ground.

Cloud Height. The height of the base of a cloud or cloud layer above the surface of the earth.

Cloud Layer. An array of clouds whose bases are at approximately the same level.

Contraction. A shortened form of a word, title, or phrase used for brevity.

Coordinated Universal Time (UTC). The time in the zero degree meridian time zone.

Cumulus. A principal cloud type in the form of individual, detached elements, which are generally dense and possess sharp non-fibrous outlines.

Cumulonimbus. An exceptionally dense and vertically developed cloud, occurring either isolated or as a line or wall of clouds with separated upper portions. These clouds appear as mountains or huge towers, at least a part of the upper portions of which are usually smooth, fibrous, or striated, and almost flattened.

Designated RVR Runway. A runway at civilian airports designated by the FAA for reporting RVR.

Designated Stations. Weather observing stations that have the capability and have been instructed by their responsible agency to perform a specified task that is not required by standards to be performed at all stations.

Dew Point. The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content in order for saturation to occur.

Drizzle. Fairly uniform precipitation composed exclusively of fine drops (diameter less than 0.02 inch or 0.5 mm) very close together. Drizzle appears to float while following air current, although unlike fog droplets, it falls to the ground.

Dust Storm. A severe weather condition characterized by strong winds and dust-filled air over an extensive area.

Field Elevation. The elevation above sea level of the highest point on any of the runways of the airport.

Fog. A visible aggregate of minute water particles (droplets) which are based at the Earth's surface and reduce horizontal visibility to less than 5/8 statute mile and, unlike drizzle, it does not fall to the ground.

Freezing. A descriptor, FZ, used to describe drizzle and/or rain that freezes on contact with the ground or exposed objects, and used to describe fog that is composed of minute ice crystals.

Freezing Drizzle. Drizzle that freezes upon impact with the ground, or other exposed objects.

Freezing Fog. A suspension of numerous minute ice crystals in the air, or water droplets at temperatures below 0 Celsius, based at the Earth's surface, which reduces horizontal visibility; also called ice fog.

Freezing Precipitation. Any form of precipitation that freezes upon impact and forms a glaze on the ground or exposed objects.

Freezing Rain. Rain that freezes upon impact and forms a glaze on the ground or exposed objects.

Frozen Precipitation. Any form of precipitation that reaches the ground in solid form (snow, snow pellets, snow grains, hail, ice pellets, and ice crystals).

Funnel Cloud. A violent, rotating column of air which does not touch the surface, usually appended to a cumulonimbus cloud.

Ground Elevation. The official height of a weather station with reference to sea level when a field elevation has not been established. It is the height of the ground at the base of the ceilometer.

Gust. Rapid fluctuations in wind speed with a variation of 10 knots or more between peaks and lulls.

Hail. Precipitation in the form of small balls or other pieces of ice falling separately or frozen together in irregular lumps. Also see "Small Hail"

Haze. A suspension in the air of extremely small, dry particles invisible to the naked eye and sufficiently numerous to give the air an opalescent appearance.

Horizon. The actual lower boundary of the observed sky or the upper outline of terrestrial objects, including nearby natural obstructions. It is the distant line along which the earth, or the water surface at sea, and the sky appear to meet.

Ice Crystals (diamond dust). A fall of non-branched (snow crystals are branched) ice crystals in the form of needles, columns, or plates.

Ice Pellets. Hard grains of ice consisting of frozen raindrops or largely melted and refrozen snowflakes. Precipitation of transparent or translucent pellets of ice, which are round or irregular, rarely conical, and which have a diameter of 0.2 inch (5 mm), or less.

In-Cloud Lightning (IC). Lightning which takes place within the cloud.

Indefinite Ceiling. The ceiling classification applied when the reported ceiling value represents the vertical visibility upward into surface-based obscuration.

Intensity Qualifier. Intensity qualifiers are used to describe whether a phenomena is light (-), moderate (no symbol used), or heavy (+).

Layer. An array of clouds and/or obscurations whose bases are at approximately the same level.

Layer Amount. The amount of sky covered by clouds and/or obscurations at a given level above the Earth's surface.

Layer Height. The height of the bases of each reported layer of clouds and/or obscuration; or the vertical visibility into an indefinite ceiling.

Lightning. The luminous phenomenon accompanying a sudden electrical discharge (see cloud-air lightning, cloud-cloud lightning, cloud-ground lightning and in-cloud lightning).

Liquid Precipitation. Any form of precipitation that does not fall as frozen precipitation and does not freeze upon impact.

Local Dissemination. The transmission or delivery of a weather report to individuals or groups of users near the observing location.

Local Standard Time (LST). A time based on the geographic location of the station in one of the legally established time zones of the globe.

Long-line Dissemination (also long-line transmission). The transmission of a weather report by a communication media to a group of users on a regional or national scale.

Long-Line RVR. The RVR reported in surface observations and disseminated -line is the highest RVR achievable for the measured visibility at the touchdown zone of a specified runway. Typically, this is the RVR calculated for the highest and lowest values of visibility over the previous 10 minutes at runway light intensity step five. With New Generation RVR (NGRVR), this is an automated report. When the automated interface fails, RVR will not be reported long-line.

Low Drifting. A descriptor, DR, used to describe snow, sand, or dust raised to a height of less than 6 feet above the ground.

Low Drifting Dust. Dust that is raised by the wind to less than 6 feet above the ground; visibility is not reduced below 7 statute miles at eye level although objects below this level may be veiled or hidden by the particles moving nearly horizontal to the ground.

Low Drifting Sand. Sand that is raised by the wind to less than 6 feet above the ground; visibility is not reduced below 7 statute miles at eye level although objects below this level may be veiled or hidden by the particles moving nearly horizontal to the ground.

Low Drifting Snow. Snow that is raised by the wind to less than 6 feet above the ground; visibility is not reduced below 7 statute miles at eye level although objects below this level may be veiled or hidden by the particles moving nearly horizontal to the ground.

Manual Station. A station, with or without an automated surface weather observing system, where the certified observers are totally responsible for all meteorological reports that are transmitted.

Maximum Temperature. The highest temperature during a specified time period.

METAR/SPECI. An evaluation of select weather elements from a point or points on or near the ground according to a set of procedures. It may include type of report, station identifier, date and time of report, a report modifier, wind, visibility, runway visual range, weather and obstructions to vision, sky condition, temperature and dew point, altimeter setting, and Remarks.

METAR/SPECI Code. WMO code forms (FM 15-X Ext. METAR and FM 16-X Ext. SPECI) consisting of abbreviations, contractions, numbers, plain language, and symbols to provide a uniform means of disseminating surface weather reports.

Minimum Temperature. The lowest temperature during a specified time period.

Mist. A visible aggregate of minute water droplets or ice crystals suspended in the atmosphere that reduces visibility to less than 7 statute miles but greater than or equal to 5/8 statute mile.

Non-Uniform Sky Condition. A localized sky condition, which varies from that reported in the body of the report.

Non-Uniform Visibility. A localized visibility, which varies from that reported in the body of the report.

Obscured Sky. The condition when the entire sky is hidden by surface-based obscurations.

Obscurations. Any phenomenon in the atmosphere, other than precipitation, that reduces the horizontal visibility in the atmosphere.

Observing Location. The point or points from which an element is evaluated.

Observing Station. The point or points from which the various elements of the report are evaluated.

Overcast. A layer whose summation amount of sky cover is 8/8ths.

Parameter. A subset of the group of evaluations that constitute each element of an observation; for example, sky condition is an element; sky cover and ceiling are parameters.

Peak Wind Speed. The maximum instantaneous wind speed since the last METAR that exceeded 25 knots.

Precipitation. Any of the forms of water particles, whether liquid or solid, that fall from the atmosphere and reach the ground.

Precipitation Discriminator. A sensor, or array of sensors, that differentiates between different types of precipitation (liquid, freezing, frozen).

Precipitation Intensity. An indication of the rate at which precipitation is falling at the time of observation.

Precipitation Rate. The amount of water, liquid or solid, that reaches the ground in a specified period of time.

Pressure. The force exerted by a column of air above the point of measurement.

Pressure Characteristic. The indication of how the pressure has been changing during a specified period of time, usually the 3-hour period preceding an observation; for example, decreasing then increasing, pressure same or lower than 3 hours ago.

Pressure Falling Rapidly. A decrease in station pressure at a rate of 0.06 inch of mercury or more per hour, which totals 0.02 inch, or more.

Pressure Unsteady. A pressure that fluctuates by 0.03 inch of mercury or more from the mean pressure during the period of measurement.

Prevailing Visibility. The visibility that is considered representative of conditions at the station; the greatest distance that can be seen throughout at least half the horizon circle, not necessarily continuous.

Rain. Precipitation, either in the form of drops larger than 0.02 inch (0.5 mm), or smaller drops, which in contrast to drizzle, are widely separated; for automated stations, precipitation that remains in the liquid state upon impact with the ground or other exposed objects.

Remarks. Plain language or coded data added to the body of the METAR/SPECI to report significant information not provided for in the body of the report.

Rotor Cloud. A turbulent cloud formation found in the lee of some large mountain barriers. The air in the cloud rotates around an axis parallel to the mountain range.

Runway Visual Range. The RVR is an estimate of the maximum distance at which the runway, or the specified lights or markers delineating it, can be seen from a position above a specific point on its centerline. This value is normally determined by visibility sensors or trans-misso-meters located alongside and higher than the center line of the runway. RVR is used operationally to assess whether visibility conditions are good enough to allow a particular operation, such as an instrument landing.

Sandstorm. Particles of sand carried aloft by a strong wind. The sand particles are mostly confined to the lowest ten feet, and rarely rise more than fifty feet above the ground.

Scattered Layer. A layer whose summation amount of sky cover is 3/8ths through 4/8ths.

Sea-level Pressure. The pressure value obtained by the theoretical reduction or increase of barometric pressure to sea level.

Sector Visibility. The visibility in a specified direction that represents at least a 45-degree arc of the horizon circle.

Shallow. A descriptor, MI, used only to describe fog when the visibility at 6 feet above the ground is 5/8ths statute mile or more and the apparent visibility in the fog layer is less than 5/8ths statute mile.

Short-term Storage. Storage of data for 4 or more days to assist in sensor/system maintenance and verification of sensor/system records in the event of an aircraft mishap.

Should. A term used to indicate that a standard is recommended.

Shower(s). A descriptor, SH, used to qualify precipitation characterized by the suddenness with which they start and stop, by the rapid changes of intensity, and usually by rapid changes in the appearance of the sky.

Significant Clouds. Cumulonimbus, cumulonimbus mammatus, towering cumulus, altocumulus castellanus, and standing lenticular or rotor clouds.

Sky Condition. The state of the sky in terms of such parameters as sky cover, layers and associated heights, ceiling, and cloud types.

Sky Cover. The amount of the sky, which is covered by clouds or obscurations in contact with the surface.

Smoke. A suspension in the air of small particles produced by combustion. A transition to haze may occur when smoke particles have traveled great distances (25 to 100 statute miles or more) and when the larger particles have settled out and the remaining particles have become widely scattered through the atmosphere.

Snow. Precipitation of snow crystals, mostly branched in the form of six-pointed stars; for automated stations, any form of frozen precipitation other than hail.

Snow Depth. The vertical height of frozen precipitation on the ground. For this purpose, frozen precipitation includes ice pellets, glaze, hail, any combination of these, and sheet ice formed directly or indirectly from precipitation.

Snow Grains. Precipitation of very small, white, opaque grains of ice.

Snow Pellets. Precipitation of white, opaque grains of ice. The grains are round or sometimes conical. Diameters range from about 0.08 to 0.2 inch (2 to 5 mm).

Spray. An ensemble of water droplets torn by the wind from an extensive body of water, generally from the crests of waves, and carried up into the air in such quantities that it reduces the horizontal visibility.

SPECI. A surface weather report taken to record a change in weather conditions that meets specified criteria or is otherwise considered to be significant.

Squall. A strong wind characterized by a sudden onset in which the wind speed increases at least 16 knots and is sustained at 22 knots or more for at least one minute.

Standard Atmosphere. A hypothetical vertical distribution of the atmospheric temperature, pressure, and density, which by international agreement is considered representative of the atmosphere for pressure-altimeter calibrations and other purposes (29.92INS or 1013hPa).

Standing Lenticular Cloud. A, more or less, isolated cloud with sharp outlines that is generally in the form of a smooth lens or almond. These clouds often form on the lee side of and generally

parallel to mountain ranges. Depending on their height above the surface, they may be reported as stratocumulus standing lenticular cloud (SCSL); altocumulus standing lenticular cloud (ACSL); or cirrocumulus standing lenticular cloud CCSL).

Station Elevation. The officially designated height above sea level to which station pressure pertains. It is generally the same as field elevation at an airport station.

Station Identifier. A four alphabetic character code group used to identify the observing location.

Station Information File. A record that documents the site characteristics of an observing location and the reporting program at the location.

Station Pressure. The atmospheric pressure at the designated station elevation.

Summation Layer Amount. A categorization of the amount of sky cover at and below each reported layer.

Surface. The horizontal plane whose elevation above sea level equals the field elevation. At stations where the field elevation has not been established, the surface refers to the ground elevation at the observation site.

Surface Visibility. The prevailing visibility determined from the usual point of observation.

Temperature. A measure of the hotness or coldness of the ambient air as measured by a suitable instrument.

Thunderstorm. A cumulonimbus cloud that is accompanied by lightning and thunder, or for automated systems, a storm detected by lightning detection systems.

Time of Occurrence. A report of the time weather begins and ends.

Tornadic Activity. The occurrence or disappearance of tornados, funnel clouds, or waterspouts.

Tornado. A violent, rotating column of air touching the ground; funnel cloud that touches the ground (see funnel cloud and waterspout).

Tower Visibility. The prevailing visibility determined from the airport traffic control tower when the surface visibility is determined from another location.

Towering Cumulus. A descriptive term for a cloud with generally sharp outlines and with moderate to great vertical development, characterized by its cauliflower or tower appearance.

Type of Report. A code (METAR, SPECI) included in the weather report to indicate the content of the observation, and to indicate whether certain reporting criteria have been met.

Type of Station. A code figure (AO1, or AO2) for automated stations, which is included in the remarks section of the report to indicate the scope of the observation program at the station that generated the report.

Unknown Precipitation. Precipitation type that is reported if the automated station detects the occurrence of light precipitation but the precipitation discriminator cannot recognize the type.

Variable Ceiling. A ceiling of less than 3,000 feet, which rapidly increases, or decreases in height by established criteria during the period of observation.

Variable Layer Amounts. A condition when the reportable amount of a layer varies by one or more reportable values during the period it is being evaluated.

Variable Prevailing Visibility. A condition when the prevailing visibility is less than 3 statute miles and rapidly increases and decreases by 1/2 mile or more during the period of observation.

Variable Wind Direction. A condition when (1) the wind direction fluctuates by 60 degrees or more during the 2-minute evaluation period and the wind speed is greater than 6 knots; or (2) the direction is variable and the wind speed is 6 knots or less.

Vertical Visibility. A subjective or instrumental evaluation of the vertical distance into a surface-based obscuration that an observer would be able to see.

Vicinity. A proximity qualifier, VC, used to indicate weather phenomena observed between 5 and 10 statute miles of the usual point of observation but not at the station.

Virga. Visible wisps or strands of precipitation falling from clouds that evaporates before reaching the surface.

Visibility. The greatest horizontal distance at which selected objects can be seen and identified or its equivalent derived from instrumental measurements.

Visibility Markers. Visibility markers are dark or nearly dark objects viewed against the horizon sky during the day or unfocused lights of moderate intensity (about 25 candelas) during the night.

Visibility Reference Points. Selected objects at known distances from the weather station used to manually evaluate visibility.

Volcanic Ash. Fine particles of rock powder that originate from a volcano and that may remain suspended in the atmosphere for long periods.

Water Equivalent. The liquid content of solid precipitation that has accumulated on the ground (snow depth). The accumulation may consist of snow, ice formed by freezing precipitation, freezing liquid precipitation, or ice formed by the refreezing of melted snow.

Waterspout. A violent, rotating column of air that forms over a body of water, and touches the water surface; tornado or funnel cloud that touches a body of water (see funnel cloud and tornado).

Weather. A category of individual and combined atmospheric phenomena, which must be drawn upon to describe the local atmospheric conditions at the time of observation.

Wind. The horizontal motion of the air past a given point.

Wind Character. The description of the variability of the wind speed in terms of gusts.

Wind Direction. The true direction from which the wind is moving at a given location.

Wind Shift. A change in the wind direction of 45 degrees or more in less than 15 minutes with sustained wind speeds of 10 knots or more throughout the wind shift.

Wind Speed. The rate at which air is moving horizontally past a given point. It may be a 2-minute average speed (reported as wind speed) or an instantaneous speed (reported as a peak wind speed, or gust).

Appendix H. AUTOMATED WEATHER SYSTEM OPERATION AND BROADCAST

H.1 When automated weather systems are equipped with local broadcast capabilities the Air Traffic Facility must ensure that weather information being broadcast properly.

a. During hours of operation, facilities that have ATIS/AFIS capabilities and automated weather system with broadcast capability, the Automated Weather Observation System may be set to broadcast the Last Transmitted Observation (METAR/SPECI) or the One-Minute-Observation data (OMO) at the discretion of the Air Traffic Facility.

(1) Ensure ASOS/AWOS ground to air radio weather communications are not simultaneously broadcast with the ATIS/AFIS.

(2) Ensure that the Automated Lightning Detection and Reporting System (ALDARS) capability is enabled on the ASOS and at the associated ARTCC (ALDARS capable locations only.)

b. During hours of nonoperation, facilities that have ATIS/AFIS capabilities and automated weather system with broadcast capability must.

(1) Ensure the one minute observation (OMO) data is broadcast on all automated weather system communications outlets; this includes any automated weather system with ATIS interface capability.

(2) Ensure that the ALDARS capability is enabled on the ASOS and the associated ARTCC (ALDARS capable locations only.)

c. ASOS Procedures for changing the ASOS broadcast (Controllers and/or Observers)

(1) On the ASOS Operator Interface Device (OID) Main Screen, Log in using the ATC user id and password.

(2) In the EDIT Box in the lower right corner, select **CMD.**

(3) Then Select **VOICE.**

(4) Then Select **TYPE.** *(The current setting is indicated in the lower center of the page)*

(5) Select the **TYPE** key until the desired setting is indicated. *(Last Transmitted Observation or One-Minute Observation)*

(6) Select **EXIT.** *(The setting selected is automatically saved upon EXIT)*

d. Unstaffed locations must always be set to broadcast the OMO data.

NOTE: ASOS defaults to the One-Minute-Observation after a system reboot.

Appendix I. AVIATION WEATHER OBSERVATION QUALITY CONTROL

I.1 Advisory Board. Air Traffic Services (AJT) joint Aviation Weather Observation Advisory Board will meet semi-annually to review FAA quality control practices and procedures and make necessary recommendations and/or adjustments. The Advisory Board should consist of FAA Air Traffic, Technical Operations, Quality Control Group (QCG) and Flight Standards personnel. The Board may also include National Weather Service and/or Union representatives.

I.2 Daily Quality Control of Automated Weather Systems

a. The daily quality control of federally owned ASOS systems is conducted by the ASOS Operations and Monitoring Center (AOMC) and NWS ASOS technicians. AOMC is available 24 hours a day, 7 days a week at 1-800-242-8194/8895. The FAA has a Technical Operations ASOS representative in AJW-135 who coordinates ASOS equipment issues with the NWS (202-267-9435).

b. The daily quality control of federally owned and non-federally owned AWOS systems is conducted by the FAA Network Enterprise Management Center (NEMC) at 1-855-FAA-NEMC (322-6362) for CONUS sites, and by the Alaska SOC (907-269-1803) for Alaskan AWOS sites. NEMC and Alaska SOC report AWOS technical problems to the appropriate FAA technicians or certified non-federal technicians who are responsible for maintaining the equipment. NEMC and the Alaska SOC are available 24 hours a day, 7 days a week.

I.3 Daily Quality Control of Aviation Weather Observations (METAR/SPECI). NWS field office personnel and FAA Air Traffic personnel verify the quality of aviation weather observations on a routine and regular basis.

Whenever NWS or FAA Air Traffic staff identifies a problem or errors in the quality of aviation weather observations, they contact the local Certified Weather Observer on duty or Air Traffic Manager (LAWRS) for resolution. If the problem cannot be resolved promptly at the local level or is a persistent problem, relay the location, a brief description of the problem, and Point-of-Contact information to AJT at 9-AJT-HQ-ASWO@faa.gov for resolution through:

(1) The Contract Weather Observer vendor for CWO facilities.

(2) The FAA Contract Tower vendor for FCT LAWRS facilities.

(3) The Airport Sponsor for Non-Federal OBS or SAWRS facilities.

(4) Air Traffic Services, Technical Advisory Group (TAG), for FAA Tower LAWRS facilities.

(5) FAA System Operations, Flight Service Group AJR-B for Alaska Flight Service facilities.

(6) The National Weather Service Headquarters for NWS maintenance issues.

(7) FAA Technical Operations, AJW-135 for ASOS technical issues.

I.4 Routine Quality Control of Weather Observations. AJT will conduct aviation weather observation desk audits on FAA and FCT LAWRS facilities as well as FAA Contract Weather Observers and non-Federal Weather Observing stations. AJT will conduct audits based on reports of erroneous weather observations received from internal or external FAA stakeholders and/or on a random basis. To ensure compliance with FAA JO 7900.5, data from various sources may be reviewed including:

a. The ASOS Operations and Monitoring Center (AOMC) Trouble Tickets

b. The FAA/NWS Aviation Digital Data Service (ADDS)

c. The National Center for Environmental Information (NCEI)

d. The National Center for Atmospheric Research (NCAR)

e. Other Various third party weather reporting services

f. Automated Weather System archives and edit logs

Ratings – AJT will assess the quality of weather observations using the following categories:

a. Exemplary (E) – This finding is assigned to items that demonstrate exemplary performance in quality.

b. Compliant (C) – This finding is assigned to items that are completed in compliance with national requirements (e.g. FAA JO 7900.5).

c. Non-compliant Low Risk (NL) – This finding is assigned to items that are non-compliant but do not represent a significant safety risk to the NAS (e.g. signing on/off improperly).

d. Non-compliant High Risk (NH) – This finding is assigned to items that are non-compliant and represent a significant safety risk to the NAS (e.g. weather elements missing and not backed up or coded incorrectly).

Findings – AJT will forward findings of the evaluation with a rating of NL or NH and a request for a Risk Mitigation Plan via email to:

a. The Technical Advisory Group, AJT-22 Manager (FAA facilities only).

b. The FAA Terminal General Manager.

c. The FAA Vendor for FAA contract sites.

d. The FAA Contracting Officer (CO) and Contracting Officers Representative (COR) (FAA contract sites).

e. The Service Center Program Implementation Manager (PIM).

f. The Service Center Quality Control Group Manager.

Responding to Findings – Facilities must respond to items identified as non-compliant in the following manner:

a. NL – Facilities must develop a Risk Mitigation Plan to correct the item(s) and submit the Plan to AJT and the Terminal General Manager for concurrence. To close the item, the facility must document the processes used to ensure the effectiveness of the mitigation.

b. NH – Due to the severity of the finding and subsequent risk to the NAS, facilities must, within 3 administrative days of being notified of the rating by AJT, develop a Risk Mitigation Plan to correct the item(s) and obtain Terminal District and AJT concurrence. To close the item, the facility must document the processes used to ensure the effectiveness of the mitigation.

c. No action is required for checklist items rated “E” or “C.”

NOTE: The Contracting Officer (CO) and Contract Officers Representative (COR) must receive a copy of all Contractor Risk Mitigation Plans.

Follow-up Evaluations – AJT will conduct a follow-up evaluation for all NL and NH rated sites within 30 days, and conduct 90-day follow-up quality control audits for any site rated NL or NH.

I.5 Routine Inspections. All FAA sponsored aviation weather observation personnel and sites are subject to inspection with the FAA Internal Compliance Verification (ICV) tool, FAA External Compliance Verification (ECV) visits, FAA Service Center or FAA HQ physical on-site inspections, and the quality control process described in paragraph L.4. This is done in order to ensure compliance with FAA JO 7900.5 and other FAA weather observation practices and procedures.

The FAA reserves the right to revoke the certification of any weather observer or weather observing station for poor performance or non-compliance with the procedures and practices outlined in FAA JO 7900.5, Surface Weather Observing, and any other weather observing related guidance.

Appendix J. AVIATION WEATHER OBSERVER CERTIFICATION PROCESS

J.1 Requirements. Candidates for observer certification must meet the vision, training and proficiency requirements listed below, and must receive a grade of 70% or higher on the examination.

a. Vision requirements: Vision requirements for FAA LAWRS observers are governed by FAA Order 3930.3B. All other candidates for observer certification must have distant vision, corrected if necessary, of not less than 20/30 in the better eye. If an observer must wear corrective lenses to meet vision standards, the observer must also wear corrective lenses while taking official observations.

b. Training Requirements: FAA LAWRS training requirements are governed by FAA JO 3120.4. Training for all other candidates for observer certification is the responsibility of the candidate's employer.

c. Demonstration of Proficiency: FAA LAWRS proficiency requirements are governed by FAA JO 3120.4. All other candidates must demonstrate, to the satisfaction of another currently certified weather observer, the ability to take, record, encode, and disseminate timely and accurate weather observations in accordance with the practices and procedures established in FAA JO 7900.5 and Office of the Federal Coordinator for Meteorological Services (OFCM) FMH-1.

J.2 FAA Examination. Candidates must take an examination via either electronic delivery or paper examination. The examinations are standardized across the observer certification program.

a. FAA, FSS, and FCT LAWRS candidates. Must take the examination via the FAA Electronic Learning Management System (eLMS) (Course Exam #60004715).

(1) Proctor codes for FCT employees should be requested through the District Training Coordinator. Proctor codes for FAA employees should be requested through the Service Center Training Coordinator.

(2) The AJT eLMS Administrator will assign the LAWRS eLMS Course when new FCT employee eLMS accounts are created or at the request of the FCT Air Traffic Manager.

(3) The Air Traffic Manager or designee must provide a completed and signed copy of the FAA Form 7900-1 Certification Qualification Statement (CQS) (Figure J-1). For expedited processing, the CQS may be scanned and returned to 9-AJT-HQ-ASWO@faa.gov.

(4) AJT will verify eLMS records that the candidate received a passing grade.

(5) Once all requirements have been verified, AJT will issue a temporary authorization via email, to the Supervisor or designee, permitting the newly certified observer to begin providing weather observation services immediately.

(6) AJT will archive all documentation supporting the observer's certification.

(7) AJT will generate and distribute a weather observer certificate to the Supervisor or designee via email.

NOTE: The Supervisor or designee must ensure e-mail authorizations and certificates readily available, if requested during an inspection. AJT may provide a duplicate copy of the certificate or authorization upon request.

b. Non-FAA candidates. Must take the paper examination. The supervisor or manager of the candidate's weather program or station (NFCT Air Traffic Manager (ATM), Contract Weather Observation (CWO) Senior Weather Observer (SWO), Non-Federal Observation (NF-OBS) manager, or Supplemental Aviation Weather Observing Service (SAWRS) manager, heretofore collectively known as the 'Supervisor'), or the Supervisor's designee, must send a request for the paper examination to 9-AJT-HQ-ASWO@faa.gov. Provide:

(1) Name, title, location, email address, and phone number, of the Supervisor or designee.

(2) Name of the candidate. (DO NOT SEND SOCIAL SECURITY NUMBERS.)

(3) The name, location identifier (LOCID), and mailing address of the facility where the candidate will take the examination.

(4) The name and LOCID of the facility where the candidate will be certified to take weather observations, if different.

(5) The email address to which the temporary authorization/certificate is to be sent, if different from the Supervisor or designee email address.

NOTE: All requests for paper examinations must allow at least 2 weeks from the date of request to the desired examination date. To ensure the integrity of the paper examination process, the paper examination package will not be distributed electronically.

c. Paper Examination Packages: The following documents are included in the paper examination package:

(1) Paper examination. A list of questions intended to examine the candidate's ability to observe, encode, and disseminate weather observations.

(2) Answer sheet. A sheet wherein the candidate indicates his/her answers to each of the questions in the examination.

(3) FAA Form 7900-1, Certification Qualification Statement (CQS) (Figure J-1). A statement to be signed by the Supervisor or designee, indicating that he/she acknowledges and confirms the candidate meets the vision requirements in paragraph J.1.a., and by the presiding observer, indicating that he/she acknowledges and confirms the candidate meets the proficiency requirements in Paragraph J.1.c.

(4) Memorandum to the Supervisor (Figure J-2). The memorandum provides instructions for handling, administering, and returning the paper examination package.

(5) FAA Form 7900-2, Examination Custodian Statement (ECS) (Figure J-3). A statement must be signed by the Supervisor or designee indicating the proper handling of the paper exam package.

(6) Securing and Administering Paper Examination Packages: All paper examination materials received by the Supervisor must be maintained in a secure location until it is returned to AJT.

(7) The examination must be administered within 10 business days of receipt. If the administration of the examination is delayed beyond 10 business days, paper examination material must be returned to AJT. An extension beyond the 10 working day period may be granted upon request.

(8) Paper examinations must be taken closed book. Supervisors or their designees must act as proctors. The proctor must:

(a) Supervise the administration of the examination to ensure security, and must not allow copying or dissemination of examination questions.

(b) Proctors may discuss a question with the candidate to clarify the intent of the question. Proctors may not, however, discuss questions in such a manner as to divulge answers.

(c) The time limit for paper examinations is 2 hours and the examinations must be completed in one sitting.

(d) Scrap paper and a blank copy of National Weather Service (NWS) Form MF1M-10C may be used during the examination. The Supervisor or designee must also return any scratch paper, and the MF1M-10C form used during the examination.

(e) Each answer sheet must be filled out completely and signed by the proctor. The completed answer sheet may be copied by the Supervisor or designee, but must be maintained in a secure location and destroyed upon notification that the original answer sheet was received by AJT.

(f) Returning Paper Examination Packages. After the paper examination has been administered, the Supervisor or designee must return all paper examination package materials, completed and signed, to AJT at the following address:

Federal Aviation Administration
600 Independence Ave., S.W.
FOB 10B, 5th Floor, Attn: AJT-22
Washington, D.C. 20591

NOTE: For expedited processing, the completed answer sheet, ECS, and CQS may be scanned and returned to 9-AJT-HQ-ASWO@faa.gov.

d. Paper Examination Grading and Results: Paper examinations will be graded by AJT.

(1) A 70 percent or higher score is a passing grade.

(2) Individuals who fail an examination must wait a minimum of 24 hours from the day they took the previous examination before another examination can be administered.

e. Certification: Upon completion of all certification requirements, the Supervisor or designee must contact AJT to complete the certification process.

J.3 Maintaining Currency: Certified observers must maintain currency in their assigned duties, as described below:

a. FAA, FSS, and FCT LAWRS. LAWRS observers must meet the currency requirements in FAA JO 3120.4.

b. CWO. A certified observer must take a minimum of one weather observation every 60 days to maintain currency. Observers signed on to an automated observing system for at least 1 hour satisfy this requirement. Observers unable to sign on to an automated observing system must take and record at least one official or practice observation every 60 days on NWS Form MF1M-10C. Practice observations must be retained on site for 6 months.

c. NF-OBS and SAWRS. A certified observer must take a minimum of five official or practice observations each month. Observers signed on to an automated observing system for at least 5 hours satisfy this requirement. Practice observations must be emailed to 9-AJT-HQ-ASWO@faa.gov by the 6th of the following month, and retained on site for 6 months.

J.4 Maintaining Currency Exceptions. Whenever the following individuals' duties require the taking or daily use of weather observations or the immediate supervision or training of personnel to take official weather observations, they are exempt from the maintaining currency requirements as long as they continue in any of the duties for which they are certified:

a. FAA field supervisors and training personnel.

b. FAA Flight Service Station personnel located in Alaska.

c. Other certified weather observers involved in training weather observers who are approved by AJT.

J.5 Seasonal Sites. AJT may exempt certified weather observers from the currency requirements during the period the facility is closed. The Air Traffic Manager, Supervisor, or designee must apply for exemption to 9-AJT-HQ-ASWO@faa.gov. AJT holds final arbitration whether to grant an exemption.

J.6 Rover Certificates. Aviation Weather Observers may be certified to work at multiple sites with prior written approval from AJT. A site must be an FAA approved aviation weather station.

J.7 Lapsed Certificate. It is the responsibility of the Supervisor or designee to notify AJT of any lapsed certificate. A lapsed certificate is a temporary suspension of the observer's ability to provide weather observation services. An observer with a lapsed certificate may not take official weather observations until the certificate has been reinstated. A lapsed certificate may be reinstated when the conditions causing the temporary suspension have been corrected. There are two conditions under which an observer's certificate may lapse:

a. If the requirements in Paragraphs J.3 are not met, the observer's certificate will lapse. Under this condition, reinstatement of a lapsed certificate requires the Supervisor or designee to evaluate the lapsed certificate holder's performance via the requirements of Paragraph J.1.c., and submit a newly completed copy of the CQS to AJT.

b. An observer may be required, at any time, to demonstrate proficiency to an FAA inspector or to the observer's Supervisor. AJT, the Supervisor, or an FAA inspector may lapse an observer's certificate for cause, if it is determined that the observer demonstrates sub-standard performance. The cause must be documented via written notification to AJT, with a copy to the Supervisor. In order to reinstate a certificate lapsed for cause, the Supervisor must:

(1) Evaluate the lapsed certificate holder's performance via the requirements of Paragraph J.1.c.

(2) Document the actions taken to rectify the observer's performance

(3) Submit that documentation and a newly completed copy of the CQS to AJT. AJT will evaluate documentation submitted for an observer who has demonstrated sub-standard performance, and holds final arbitration whether to reinstate the observer's lapsed certificate.

J.8 Cancelled Certificates. It is the responsibility of the Supervisor or designee to notify AJT of any cancelled certificate. Certificates are cancelled when one of the following conditions is met:

a. The observer terminates employment and is not re-employed as a weather observer within 150 consecutive days. The Supervisor or designee must notify AJT upon termination of an observer's employment.

b. The observer's certificate remains lapsed for 90 consecutive days. In the case of termination of an observer's employment, AJT will cancel the observer's certificate on day 151 after termination. AJT will retain a record of cancelled certificates for two years. In the event of litigation, AJT will retain a record of the cancelled certificate for an additional two years beyond the completion of the litigation.

J.9 Transfers. When a certified observer changes location:

a. The facility the observer is leaving must email or mail a copy of the observer's certificate to the new facility.

b. The observer's new Supervisor (or designee) must complete and send a new CQS, indicating the location change, to AJT (9-AJT-HQ-ASWO@faa.gov) within 45 calendar days of the relocation.

c. The receiving facility may contact AJT to verify the certification of any observer via email at 9-AJT-HQ-ASWO@faa.gov.

J.10 Quality Control. The authority to temporarily suspend an observer's certificate, due to the observer's demonstration of sub-standard performance, is granted to AJT, the observer's Supervisor and FAA Inspectors. Additionally, quality control may be conducted through random audits of returned testing material and/or the review of official or practice observations submitted by an observer.

Figure J-1
Certification Qualification Statement

Certification Qualification Statement
Aviation Weather Observer

Federal Aviation Administration

The CERTIFICATE QUALIFICATION STATEMENT is completed when an applicant has satisfactorily demonstrated (to a certified observer) the ability to take weather observations.

CERTIFICATE QUALIFICATION STATMENT

_____ is under my supervision and is a
(Print candidate's name)
candidate to take aviation weather observations at _____.
(Print candidate's duty station)

For transferees only:
The candidate is a transfer from _____, and holds
(Print candidate's previous duty station)
certificate number _____.
(Print candidate's certificate number)

I, the Presiding Observer, acknowledge and confirm the candidate has demonstrated the ability to take and record accurate and timely weather observations.

_____ _____
(Presiding Observer Signature and Date) Presiding Observer's Certificate Number

I, the undersigned, acknowledge and confirm the candidate's eyesight meets the vision standards specified in JO 7900.5 Appendix J.

_____
(ATM/SWO/NF-OBS/SAWRS Manager Signature and Date)

Failure to include the required signature on this statement will delay or suspend issuing the applicant's "Certificate of Authority to take Aviation Weather Observations".

FAA Form 7900-8 (07-2017)

Figure J-2
Sample: Memorandum to Supervisor

Federal Aviation Administration

Memorandum

Date: [Type date here]

To: <Firstname Lastname>, Manager/SWO

From: , Manager, AJT-22

Prepared by: , AJT-22

Subject: Certification Examination Request

Attached is the requested weather certification examination to be administered under your personal supervision or under the personal supervision of your training officer as the exam proctor. This material is administratively restricted. All examination material must be maintained in a secure location until it is mailed back to this office. The completed answer sheet may be copied but must be destroyed upon notification the original was received at this office.

The proctor must administer the examination under close supervision to ensure proper security. The proctor must not allow copying or discussion of examination questions. Discussion of questions after the examination is also not permitted. No reference to the agency's handbook (FAA Order 7900.5) is permitted. Assistance of any type, other than clarifying the intent of a question, is not permitted during the examination. It is not appropriate to discuss questions in such a manner as to divulge answers. No person has the authority to say to the candidate that a particular question is inappropriate or that a question does not have to be answered.

A blank observation form MF1M-10C along with scratch paper is permissible. Instruct the applicant to circle the selected answers on the provided answer sheet.

Once the examination is complete, scan the Examination Custodial, Certificate Qualification, and Exam Answer sheet and email to 9-AJT-HQ-@FAA.GOV for expedited processing. All paper examination material, including scratch paper and scratch MF1M-10C forms, must be mailed back to the for disposition at: Federal Aviation Administration, FOB 10-B 5th Floor, Attn: AJT-22, 600 Independence Ave., SW, Washington, D.C. 20591.

Figure J-2
Sample: Memorandum to Supervisor

A certificate will be issued if the score is 70 percent or higher and the answer sheet is properly completed. If the examination cannot be administered within 10 business days of receipt, you must return all the material or email this office to request an extension.

An enclosed "Examination Custodian Statement" is provided and must be signed and dated by the ATMs/SWOs/NF-OBS/SAWRS Manager.

All examinations must be taken closed book. Only ATMs/SWOs/NF-OBS/SAWRS Managers will act as responsible persons as proctors. The time limit for all examinations is two hours and the examination must be completed in one sitting.

Failure to provide the required signatures and date on the completed answer sheet or the Examination Custodian Statement may delay the certification process.

Air Traffic Services
Manager, FCT and Aviation Weather Team, AJT-22

Figure J-3
Examination Custodial Statement

Examination Custodial Statement
Aviation Weather Observer

Federal Aviation Administration

The EXAMINATION CUSTODIAL STATEMENT is completed whenever weather certification examination material is mailed to a facility.

EXAMINATION CUSTODIAL STATEMENT

I, _____, CERTIFY that the enclosed weather
(ATM/SWO/NF-OBS/SAWRS Manager Printed Name)
examination material was administratively restricted and controlled while in my possession. At no time was the examination material compromised.

_____
(ATM/SWO/NF-OBS/SAWRS Manager Signature and Date)

FAA Form 7900-9 (07-2017)