Section A

CODE FORMS

a. FM system of numbering code forms
b. List of code forms with notes and regulations

a. FM SYSTEM OF NUMBERING CODE FORMS

Each code form bears a number, preceded by the letters FM. This number is followed by a Roman numeral to identify the session of CSM or (from 1974 onwards) of CBS which either approved the code form as a new one or made the latest amendment to its previous version. A code form approved or amended by correspondence after a session of CSM/CBS receives the number of that session.

Furthermore, an indicator term is used to designate the code form colloquially and is therefore called a "code name". In some cases, this code name is included as a symbolic prefix in the code form and during transmission ensures ready identification of the type of report (e.g. CLIMAT).

The FM system of numbering the code forms, together with the corresponding code names and their reference list of CBS approved decisions, is the following:

FM SYSTEM OF CODE FORMS

FM 12–XIV SYNOP	**Report of surface observation from a fixed land station** Res. 5 (EC-XXXI), Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLV), Res. 4 (EC-XLVII), Res. 4 (EC-XLIX), Res. 8 (EC-LI), Res. 8 (EC-LV) and Res. 7 (EC-LXI)
FM 13–XIV SHIP	**Report of surface observation from a sea station** Res. 5 (EC-XXXI), Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLV), Res. 4 (EC-XLIX), Res. 8 (EC-LI), Res. 8 (EC-LV) and Res. 7 (EC-LXI)
FM 14–XIV SYNOP MOBIL	**Report of surface observation from a mobile land station** Res. 4 (EC-XLVII), Res. 4 (EC-XLIX), Res. 8 (EC-LI), Res. 8 (EC-LV) and Res. 7 (EC-LXI)
FM 15–XIV METAR	**Aerodrome routine meteorological report (with or without trend forecast)** Res. 13 (EC-XVIII), paragraph 4.10.10 of the general summary of EC-XXI, Res. 15 (EC-XXII), Res. 4 (EC-XXXVIII), Res. 8 (EC-XLIII), Rec. 14 (CBS-95), approved by the President of WMO, Res. 4 (EC-LIII), Res. 8 (EC-LV), Res. 2 (EC-LVII), Res. 10 (EC-LIX) and Res. 7 (EC-LXI)
FM 16–XIV SPECI	**Aerodrome special meteorological report (with or without trend forecast)** Res. 13 (EC-XVIII), paragraph 4.10.10 of the general summary of EC-XXI, Res. 15 (EC-XXII), Res. 4 (EC-XXXVIII), Res. 8 (EC-XLIII), Rec. 14 (CBS-95), approved by the President of WMO, Res. 4 (EC-LIII), Res. 8 (EC-LV), Res. 2 (EC-LVII), Res. 10 (EC-LIX) and Res. 7 (EC-LXI)
FM 18–XII BUOY	**Report of a buoy observation** Res. 8 (EC-XLIII), Res. 4 (EC-XLV), Rec. 16 (CBS-94), approved by the President of WMO, Res. 4 (EC-XLIX), Rec. 9 (CBS-97), approved by the President of WMO, and Res. 4 (EC-LIII)
FM 20–VIII RADOB	**Report of ground radar weather observation** Res. 15 (EC-XXII) and Res. 4 (EC-XXXV)

FM 22–IX Ext. RADREP **Radiological data report (monitored on a routine basis and/or in case of accident)**

Res. 8 (EC-XLIII)

FM 32–XI Ext. PILOT **Upper-wind report from a fixed land station**

Res. 21 (EC-IV), Res. 22 (EC-X), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 1 (EC-XL), Rec. 22 (CBS-89), approved by the President of WMO and Res. 8 (EC-LI)

FM 33–XI Ext. PILOT SHIP **Upper-wind report from a sea station**

Res. 21 (EC-IV), Res. 22 (EC-X), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 1 (EC-XL) and Res. 8 (EC-LI)

FM 34–XI Ext. PILOT MOBIL **Upper-wind report from a mobile land station**

Rec. 22 (CBS-89), approved by the President of WMO and Res. 8 (EC-LI)

FM 35–XI Ext. TEMP **Upper-level pressure, temperature, humidity and wind report from a fixed land station**

Res. 21 (EC-IV), Res. 22 (EC-X), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 1 (EC-XL), Rec. 22 (CBS-89), approved by the President of WMO, Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI)

FM 36–XI Ext. TEMP SHIP **Upper-level pressure, temperature, humidity and wind report from a sea station**

Res. 21 (EC-IV), Res. 22 (EC-X), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI)

FM 37–XI Ext. TEMP DROP **Upper-level pressure, temperature, humidity and wind report from a sonde released by carrier balloons or aircraft**

Res. 4 (EC-XXXI), Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI)

FM 38–XI Ext. TEMP MOBIL **Upper-level pressure, temperature, humidity and wind report from a mobile land station**

Rec. 22 (CBS-89), approved by the President of WMO, Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI)

FM 39–VI ROCOB **Upper-level temperature, wind and air density report from a land rocketsonde station**

Paragraph 2.1.4 of the general summary of EC-XVI, Res.15 (EC-XXII) and Res. 3 (EC-XXVI)

FM 40–VI ROCOB SHIP **Upper-level temperature, wind and air density report from a rocketsonde station on a ship**

Paragraph 2.1.4 of the general summary of EC-XVI, Res. 15 (EC-XXII) and Res. 3 (EC-XXVI)

FM 41–IV CODAR **Upper-air report from an aircraft (other than weather reconnaissance aircraft)**

Res. 13 (EC-XVIII)

FM 42–XI Ext. AMDAR **Aircraft report (aircraft meteorological data relay)**

Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLIX) and Res. 8 (EC-LI)

FM 44–V ICEAN **Ice analysis**

Rec. 47 (CBS-74), approved by the President of WMO

FM 45–IV IAC **Analysis in full form**

Res. 156 (CD Washington 1947), Res. 22 (EC-X), Res. 34 (EC-XIV) and Res. 13 (EC-XVIII)

FM 46–IV IAC FLEET **Analysis in abbreviated form**

Res. 156 (CD Washington 1947), Res. 21 (EC-IV), Res. 34 (EC-XIV) and Res. 13 (EC-XVIII)

FM 47–IX Ext. GRID **Processed data in the form of grid-point values**

Rec. 46 (CBS-73), approved by the President of WMO, Res. 4 (EC-XXXI) and Res. 8 (EC-XLIII)

FM 49–IX Ext. GRAF **Processed data in the form of grid-point values (abbreviated code form)**

Res. 4 (EC-XXXI) and Res. 8 (EC-XLIII)

FM 50–XIII WINTEM **Forecast upper wind and temperature for aviation**

Res. 5 (EC-XXXV), Res. 4 (EC-XXXVIII) and Res. 2 (EC-LVII)

FM 51–XIV TAF **Aerodrome forecast**

Res. 21 (EC-IV), Res. 34 (EC-XIV), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), paragraph 2.1.4 of the general summary of EC–XXII, Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Rec. 14 (CBS-95), approved by the President of WMO, Res. 4 (EC-LIII), Res. 8 (EC-LV), Res. 2 (EC-LVII), Res.10 (EC-LIX) and Res. 7 (EC-LXI)

FM 53–X Ext. ARFOR **Area forecast for aviation**

Res. 21 (EC-IV), Res. 22 (EC-X), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 4 (EC-XXXVIII), Res. 8 (EC-XLIII) and Rec. 14 (CBS-95), approved by the President of WMO

FM 54–X Ext. ROFOR **Route forecast for aviation**

Res. 21 (EC-IV), Res. 22 (EC-X), Res. 13 (EC-XVIII), Res. 15 (EC-XXII), Res. 4 (EC-XXXVIII), Res. 8 (EC-XLIII) and Rec. 14 (CBS-95), approved by the President of WMO

FM 57–IX Ext. RADOF **Radiological trajectory dose forecast (defined time of arrival and location)**

Res. 8 (EC-XLIII)

FM 61–IV MAFOR — **Forecast for shipping**

Res. 22 (EC-X), Res. 34 (EC-XIV) and Res. 13 (EC-XVIII)

FM 62–VIII Ext. TRACKOB — **Report of marine surface observation along a ship's track**

Res. 4 (EC-XXXVIII)

FM 63–XI Ext. BATHY — **Report of bathythermal observation**

Res. 15 (EC-XXII), Res. 4 (EC-XXXV), Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII), Res. 4 (EC-XLVII) and Res. 8 (EC-LI)

FM 64–XI Ext. TESAC — **Temperature, salinity and current report from a sea station**

Res. 15 (EC-XXII), Res. 4 (EC-XXXV), Res. 4 (EC-XXXVIII), Res. 1 (EC-XL), Res. 8 (EC-XLIII) and Res. 8 (EC-LI)

FM 65–XI Ext. WAVEOB — **Report of spectral wave information from a sea station or from a remote platform (aircraft or satellite)**

Res. 1 (EC-XL), Res. 4 (EC-XLIX) and Res. 8 (EC-LI)

FM 67–VI HYDRA — **Report of hydrological observation from a hydrological station**

Res. 3 (EC-XXVI)

FM 68–VI HYFOR — **Hydrological forecast**

Res. 3 (EC-XXVI)

FM 71–XII CLIMAT — **Report of monthly values from a land station**

Res. 71 and 72 (CD Washington 1947), Res. 13 (EC-XVIII), paragraph 2.1.4 of the general summary of EC–XXII, Res. 3 (EC-XXVI), Res. 4 (EC-XLV), Res. 4 (EC-XLIX) and Res. 4 (EC-LIII)

FM 72–XII CLIMAT SHIP — **Report of monthly means and totals from an ocean weather station**

Res. 71 and 72 (CD Washington 1947), Res. 22 (EC-X), Res. 13 (EC-XVIII), paragraph 2.1.4 of the general summary of EC-XXII, Res. 3 (EC-XXVI) and Res. 4 (EC-LIII)

FM 73–VI { **NACLI** / **CLINP** / **SPCLI** / **CLISA** / **INCLI** } — **Report of monthly means for an oceanic area**

Res. 22 (IMC Salzburg 1937), Res. 71 (CD Washington 1947) and Res. 3 (EC-XXVI)

FM 75–XII Ext. CLIMAT TEMP — **Report of monthly aerological means from a land station**

Res. 71 (CD Washington 1947), paragraph 5.11 of the general summary of EC-XV, Res. 13 (EC-XVIII), Res. 3 (EC-XXVI), Res. 4 (EC-XLV), Res. 4 (EC-LIII) and Res. 8 (EC-LV)

FM 76–XII Ext. CLIMAT TEMP SHIP — **Report of monthly aerological means from an ocean weather station**

Res. 71 (CD Washington 1947), paragraph 5.11 of the general summary of EC-XV, Res. 13 (EC-XVIII), Res. 3 (EC-XXVI), Res. 4 (EC-XLV), Res. 4 (EC-LIII) and Res. 8 (EC-LV)

FM 81–I SFAZI **Synoptic report of bearings of sources of atmospherics**

Res. 21 (EC-IV)

FM 82–I SFLOC **Synoptic report of the geographical location of sources of atmospherics**

Res. 21 (EC-IV)

FM 83–I SFAZU **Detailed report of the distribution of sources of atmospherics by bearings for any period up to and including 24 hours**

Res. 21 (EC-IV)

FM 85–IX SAREP **Report of synoptic interpretation of cloud data obtained by a meteorological satellite**

Res. 15 (EC-XXII), Res. 3 (EC-XXVI) and Res. 1 (EC-XL)

FM 86–XI SATEM **Report of satellite remote upper-air soundings of pressure, temperature and humidity**

Rec. 2 (CBS-Ext.(76)), approved by the President of WMO, Res. 4 (EC-XXXVIII) and Res. 4 (EC-XLIX)

FM 87–XI SARAD **Report of satellite clear radiance observations**

Rec. 3 (CBS-Ext.(76)), approved by the President of WMO, 4 (EC–XXXVIII) and Res. 4 (EC-XLIX)

FM 88–XI SATOB **Report of satellite observations of wind, surface temperature, cloud, humidity and radiation**

Rec. 4 (CBS-Ext.(76)), approved by the President of WMO, Res. 4 (EC-XLV) and Res. 4 (EC-XLIX)

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b. LIST OF CODE FORMS WITH NOTES AND REGULATIONS

FM 12–XIV SYNOP **Report of surface observation from a fixed land station**

FM 13–XIV SHIP **Report of surface observation from a sea station**

FM 14–XIV SYNOP MOBIL **Report of surface observation from a mobile land station**

C O D E F O R M :

SECTION 0 $M_iM_iM_jM_j$ { D . . . . D**** or $A_1b_wn_bn_bn_b$** } $YYGGi_w$ { IIiii* or $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$**** } $MMMU_{La}U_{Lo}$*** $h_0h_0h_0h_0i_m$***

SECTION 1 i_Ri_xhVV Nddff (00fff) $1s_nTTT$ { $2s_nT_dT_dT_d$ or 29UUU } $3P_0P_0P_0P_0$

{ 4PPPP or $4a_3hhh$ } 5appp $6RRRt_R$ { $7wwW_1W_2$ or $7w_aw_aW_{a1}W_{a2}$ } $8N_hC_LC_MC_H$ 9GGgg

SECTION 2 $222D_sv_s$ ($0s_sT_wT_wT_w$) ($1P_{wa}P_{wa}H_{wa}H_{wa}$) ($2P_wP_wH_wH_w$) (($3d_{w1}d_{w1}d_{w2}d_{w2}$)

($4P_{w1}P_{w1}H_{w1}H_{w1}$) ($5P_{w2}P_{w2}H_{w2}H_{w2}$)) ({ $6I_sE_sE_sR_s$ or ICING + plain language })

($70H_{wa}H_{wa}H_{wa}$) ($8s_wT_bT_bT_b$) (ICE + { $c_iS_ib_iD_iz_i$ or plain language })

SECTION 3 333 (0 . . . .) ($1s_nT_xT_xT_x$) ($2s_nT_nT_nT_n$) ($3Ejjj$) ($4E'sss$) ($5j_1j_2j_3j_4$ ($j_5j_6j_7j_8j_9$))

($6RRRt_R$) ($7R_{24}R_{24}R_{24}R_{24}$) ($8N_sCh_sh_s$) ($9S_PS_Ps_ps_p$)

(80000 (0 . . . .) (1 . . . .) . . . . .)

SECTION 4 444 $N'C'H'H'C_t$

SECTION 5 555 Groups to be developed nationally

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* Used in FM 12 only.
** Used in FM 13 only.
*** Used in FM 14 only.
**** Used in FM 13 and FM 14 only.

Notes:

(1) The code form FM 12 SYNOP is used for reporting synoptic surface observations from a fixed land station, manned or automatic. The code form FM 13 SHIP is used for the same kind of observations from a sea station, manned or automatic. The code form FM 14 SYNOP MOBIL is used for surface observations from an automatic or manned land station not at a fixed location.

(2) A SYNOP report from a fixed land station is identified by the symbolic letters $M_iM_iM_jM_j$ = AAXX.

(3) A SHIP report from a sea station is identified by the symbolic letters $M_iM_iM_jM_j$ = BBXX.

(4) A SYNOP MOBIL report from a mobile land station is identified by the symbolic letters $M_iM_iM_jM_j$ = OOXX.

(5) The code form is made up of figure groups arranged by sections in ascending order of their numerical indicators with the exception of the following:

(*a*) All the groups of Section 0 and for the first two groups of Section 1, which are always included in the report of any surface observing station;

(*b*) The first data group of Section 2 – $222D_sv_s$, which is always included in the report of a sea station if data are available;

(*c*) The data group of Section 4, which is clearly identified by a three-figure indicator group.

As a result, the following features are achieved:

(*d*) The loss of information due to the accidental loss of any one of these groups is strictly limited to the information content of that group;

(*e*) The rules of inclusion or omission of sections or of groups between brackets can be laid down for each specific case of station type or of data requirements;

(*f*) The length of the report can be kept to a strict minimum by dropping out some groups whenever their information content is considered insignificant or when that information content is not normally available.

It is to be noted that the code word ICE of Section 2 plays the role of a numerical indicator for the last data group of the section or for the equivalent plain language information.

(6) The code form is divided into a number of sections as follows:

Section number	*Symbolic figure group*	*Contents*
0	—	Data for reporting identification (type, ship's call sign/buoy identifier, date, time, location) and units of wind speed used
1	—	Data for global exchange which are common to the SYNOP, SHIP and SYNOP MOBIL code forms
2	222	Maritime data for global exchange pertaining to a sea, or to a coastal station
3	333	Data for regional exchange
4	444	Data for national use for clouds with base below station level, included by national decision
5	555	Data for national use

R E G U L A T I O N S :

12.1 General

12.1.1 The code name SYNOP, SHIP or SYNOP MOBIL shall not be included in the report.

Note: See Regulation 12.1.7.

12.1.1.1 SYNOP MOBIL is intended for encoding meteorological observations from a non-fixed location. SYNOP MOBIL shall not be used as a replacement to SYNOP from a fixed location.

Note: An example of the intended application is to temporarily monitor meteorological parameters in the area of an environmental emergency.

12.1.2 ***Use of groups*** $M_iM_iM_jM_j \begin{Bmatrix} D\ldots.D^{**} \\ \text{or} \\ A_1b_wn_bn_bn_b^{*} \end{Bmatrix} YYGGi_w$

Note: See Regulation 18.2.3, Notes (1), (2) and (3).

12.1.2.1 In a bulletin of SYNOP reports from fixed land stations, the groups $M_iM_iM_jM_j$ $YYGGi_w$ shall be included only as the first line of the text, provided all the reports of the bulletin were taken at the same time and use the same unit for reporting wind speed.

12.1.2.2 In a bulletin of SHIP reports from sea stations or SYNOP MOBIL reports from mobile land stations, the group $M_iM_iM_jM_j$ shall be included only as the first line of the text, and the groups $\begin{Bmatrix} D\ldots.D^{**} \\ \text{or} \\ A_1b_wn_bn_bn_b^{*} \end{Bmatrix} YYGGi_w$ shall be included in every individual report.

Note: See Regulation 12.1.7.

12.1.3 ***Use of sections***

12.1.3.1 Reports from a fixed or mobile land station shall always contain at least Sections 0 and 1. When a report from a coastal land station contains maritime data, that report shall also include Section 2. The identification and position of a fixed land station shall be indicated by means of the group IIiii.

12.1.3.2 The identification of a mobile land station shall be indicated by the group D . . . . D. The observing station shall indicate its position by means of the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$ for mobile land stations. In addition, a mobile land station shall include the group $h_0h_0h_0h_0i_m$ to indicate the elevation of the station, including the units of measure for the elevation and the accuracy of the elevation.

12.1.3.3 Mobile land station reports shall include (besides Sections 0 and 1), whenever the corresponding data are available, Section 3 containing at least the groups with indicator figures 5, 8 and 9.

12.1.3.4 Reports from a sea station shall always include Sections 0 and 1 and, whenever the corresponding data are available, Section 2. Section 2 shall always include the maximum number of data groups consistent with observed conditions. The identification of a sea station shall be indicated by either the group D . . . . D or the group $A_1b_wn_bn_bn_b$. The position of a sea station shall be indicated by the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$.

12.1.3.5 Ocean weather station reports shall include (besides Sections 0, 1 and 2), whenever the corresponding data are available, Section 3 containing at least the groups with indicator figures 5, 8 and 9.

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* Used in FM 13 only.
** Used in FM 13 and FM 14 only.

12.1.3.6 In reports from supplementary ships, Section 1 shall contain at least:
$i_R i_x$hVV Nddff $1s_n$TTT 4PPPP $7wwW_1W_2$ $8N_hC_LC_MC_H$
where
(*a*) i_R shall be set to code figure 4;
(*b*) i_x shall be coded as 1 or 3 as the case may be.

12.1.3.7 In reports from auxiliary ships, Section 1 shall contain at least:
$i_R i_x$hVV Nddff $1s_n$TTT 4PPPP $7wwW_1W_2$
where
(*a*) i_R shall be set to code figure 4;
(*b*) i_x shall be coded as 1 or 3 as the case may be.

Notes:

(1) The above-mentioned version of Section 1 is considered suitable for any ship which is not supplied with tested instruments and may be requested to report in areas where shipping is relatively sparse, or on request, and especially when storm conditions threaten or prevail. These ships may report in plain language if the use of code is impracticable.

(2) If the ship does not report cloud data, h should be coded with a solidus (/).

(3) If the ship is not equipped with tested instruments permitting the determination of tenths of degrees of air temperature and/or tenths of hectopascals of pressure, a solidus should be coded for the tenths of degrees and/or tenths of hectopascals, as appropriate.

12.1.4 In reports from automatic stations, mandatory group elements specified by symbolic letters shall be coded with solidi (/) if the station is not equipped to report the relevant data, taking into account that i_R, i_x, and N = 0, N = 9, N = / provide for omission of groups $6RRRt_R$, $7w_aw_aW_{a1}W_{a2}$ and $8N_hC_LC_MC_H$, as the case may be.

12.1.5 A fixed sea station (other than an ocean weather station or a moored buoy), which is considered by the Member operating it to be in the same category as a fixed land station, shall report its identification and position by means of the group IIiii.

12.1.6 The actual time of observation shall be the time at which the barometer is read.

12.1.7 (*a*) The identification of stations located at sea on a drilling rig or an oil- or gas-production platform shall be indicated by the group $A_1b_wn_bn_bn_b$.

(*b*) In reports of sea stations other than buoys, drilling rigs and oil- or gas-production platforms, and in the absence of a ship's call sign, the word SHIP shall be used for D . . . . D.

(*c*) In reports from a mobile land station, only in the absence of a suitable call sign, the word MOBIL shall be used for D . . . . D.

12.2 Section 1

12.2.1 ***Group*** $i_R i_x$hVV

12.2.1.1 This group shall always be included in the report.

12.2.1.2 *Base of lowest cloud:* h

When the station is in fog, a sandstorm or a duststorm or in blowing snow but the sky is discernible, h shall refer to the base of the lowest cloud observed, if any. When, under the above conditions, the sky is not discernible, h shall be reported as /.

Note: See regulations relative to the use of Section 4.

12.2.1.3 *Visibility:* VV

12.2.1.3.1 When the horizontal visibility is not the same in different directions, the shortest distance shall be given for VV.

12.2.1.3.2 In reporting visibility at sea, the decile 90–99 shall be used for VV.

12.2.2 ***Group*** Nddff

12.2.2.1 This group shall always be included in the report.

12.2.2.2 *Total cloud cover:* N

12.2.2.2.1 N shall be reported as actually seen by the observer during the observation.

12.2.2.2.2 Altocumulus perlucidus or Stratocumulus perlucidus ("mackerel sky") shall be reported using N = 7 or less (unless overlying clouds appear to cover the whole sky) since breaks are always present in this cloud form even if it extends over the whole celestial dome.

12.2.2.2.3 N shall be coded as 0 when blue sky or stars are seen through existing fog or other analogous phenomena without any trace of cloud being seen.

12.2.2.2.4 When clouds are observed through fog or analogous phenomena, their amount shall be evaluated and reported as if these phenomena were non-existent.

12.2.2.2.5 The total cloud cover shall not include the amount resulting from rapidly dissipating condensation trails.

12.2.2.2.6 Persistent condensation trails and cloud masses which have obviously developed from condensation trails shall be reported as cloud, using the appropriate C_H or C_M code figure.

12.2.2.3 *Wind direction and speed:* ddff

12.2.2.3.1 The mean direction and speed of the wind over the 10-minute period immediately preceding the observation shall be reported for ddff. However, when the 10-minute period includes a discontinuity in the wind characteristics, only data obtained after the discontinuity shall be used for reporting the mean values, and hence the period in these circumstances shall be correspondingly reduced.

12.2.2.3.2 In the absence of wind instruments, the wind speed shall be estimated on the basis of the Beaufort wind scale. The Beaufort number obtained by estimation is converted into metres per second or knots by the use of the wind speed equivalent columns of the Beaufort scale, and this speed is reported for ff.

12.2.2.3.3 When the wind speed, in units indicated by i_w, is 99 units or more:

(*a*) ff in the group Nddff shall be encoded 99;

(*b*) The group 00fff shall be included immediately following the group Nddff.

Note: The apparent wind speed measured on board a moving ship is to be corrected for the course and the speed of the ship, in order to obtain the speed of the true wind, which is to be reported. The correction can be made on the basis of the parallelogram of velocities or by means of special tables.

12.2.3 ***Groups*** $1s_nTTT$, $2s_nT_dT_dT_d$, 4PPPP, 5appp

12.2.3.1 Groups $1s_nTTT$, $2s_nT_dT_dT_d$ and 4PPPP shall be included whenever the corresponding data are available, unless stated otherwise in specific regulations.

Note: See Regulation 12.2.3.5 relative to group 5appp.

12.2.3.2 *Group* $1s_nTTT$

When the data are not available as a result of a temporary instrument failure, automatic weather stations programmed to transmit this group shall either omit the group altogether or include it in their reports in the form 1////.

12.2.3.3 *Group* $2s_nT_dT_dT_d$

12.2.3.3.1 Under unusual conditions, when the dew-point temperature is temporarily unavailable (e.g. because of instrument failure) but relative humidity is available, the group 29UUU shall replace the group $2s_nT_dT_dT_d$. Every attempt shall first be made, however, to convert relative humidity to dew-point temperature, and the relative humidity included only as a last resort.

12.2.3.3.2 Regulation 12.2.3.2 shall apply to this group, which shall in that case either be omitted or encoded as 2////.

12.2.3.4 *Group* 4PPPP

12.2.3.4.1 Whenever air pressure at mean sea level can be computed with reasonable accuracy, this pressure shall be reported in the 4PPPP group.

Notes:

(1) For a station situated in a region of normal synoptic network density, the pressure at mean sea level is considered not to be computed with reasonable accuracy when it introduces a deformation into the analysis of the horizontal pressure field which is purely local and recurring.

(2) For a station lying in a data-sparse area of the synoptic network, reasonable accuracy will be obtained when using a reduction method which has proved to be satisfactory in a region of normal network density and under similar geographical conditions.

12.2.3.4.2 By regional decision, a high-level station which cannot give pressure at mean sea level to a satisfactory degree of accuracy shall report both the station-level pressure group $3P_0P_0P_0P_0$ and the geopotential height of an agreed standard isobaric surface. In that case, the group 4PPPP shall be replaced by the group $4a_3$hhh.

Note: The level chosen for each station is indicated in Volume A of publication WMO – No. 9.

12.2.3.5 *Group* 5appp

12.2.3.5.1 Unless specified otherwise by regional decision, this group shall be included whenever the three-hourly pressure tendency is available.

12.2.3.5.2 The pressure tendency over the past three hours, a, shall, wherever possible, be determined on the basis of pressure samplet at equi-spaced intervals not exceeding one hour.

Note: Algorithms for selecting the appropriate code figure are included in publication WMO – No. 8 — *Guide to Meteorological Instruments and Methods of Observation*.

12.2.3.5.3 Where it is not possible to apply the algorithms specified in Regulation 12.2.3.5.2 in reports from automatic weather stations, a shall be coded as 2 when the tendency is positive; as 7 when the tendency is negative; and as 4 when the atmospheric pressure is the same as three hours before.

12.2.4 ***Group*** $3P_0P_0P_0P_0$

This group shall be included in reports for global exchange from land stations, together with either the group 4PPPP or, in accordance with Regulation 12.2.3.4.2, the group $4a_3$hhh.

Note: Inclusion of this group at other times is left to the decision of individual Members.

12.2.5 Group $6RRRt_R$

12.2.5.1 When precipitation data are to be exchanged in time periods of six hours at main standard times (i.e. to report the amount of precipitation over the preceding 6, 12, 18 and 24 hours), this group shall be included in Section 1.

12.2.5.2 When precipitation data are to be exchanged in time periods of three hours or other periods required for regional exchange, this group shall be included in Section 3.

12.2.5.3 For lightships reporting in the SHIP code form and for ocean weather stations, the use of this group shall be fixed regionally or nationally. In the case of mobile ship stations which make precipitation observations, the group shall be included in each SHIP report.

12.2.5.4 This group shall:

(*a*) Coded with RRR = 000 (3 zeros) when precipitation is measured but no precipitation occurred during the reference period;

(*b*) Coded with RRR = /// (3 solidi) when precipitation is normally measured but is not available for the current report;

(*c*) Omitted when precipitation is not normally measured. In this case, i_R should be coded as 4;

(*d*) Existing automated weather stations (AWS) may continue to report no precipitation with i_R coded as 3 and the 6RRRt_R group omitted. New systems and human observer should report the 6RRRt_R group with RRR = 000 (3 zeros) to indicate no precipitation occurred during the reference period.

12.2.6 ***Group*** 7wwW_1W_2 ***or*** 7$w_aw_aW_{a1}W_{a2}$

12.2.6.1 This group shall be included in an observation by a manually operated station after a period of closure or at start up, when past weather conditions for the period applicable to the report are unknown, and shall take the form 7ww// (with i_x = 1), even if ww = 00–03. Otherwise it shall only be included if present or past weather phenomena of significance, or both, were observed. W_1W_2 = // shall indicate that previous conditions are unknown. This regulation shall also apply to automatic reporting stations with the facility to report present and past weather. Where a single past weather form is recognized it shall take the form of 7wwW_1/ or 7$w_aw_aW_{a1}$/.

12.2.6.2 Code figures 00, 01, 02, 03 of the ww code table and code figures 0, 1 and 2 of the W_1, W_2 code table shall be considered to represent phenomena without significance.

Note: All present weather and past weather including phenomena without significance observed at sea shall be reported in the SHIP message.

12.2.6.3 This group shall be omitted if both present and past weather were:

(*a*) Not available (no observation made); or

(*b*) Observation made but observed phenomena were not of significance.

The indicator i_x shall indicate which one of these conditions applies.

12.2.6.4 *Present weather reported from a manned weather station:* ww

12.2.6.4.1 If more than one form of weather is observed, the highest applicable code figure shall be selected for the group 7wwW_1W_2. Other weather may be reported in Section 3, using the group 960ww or 961w_1w_1, repeated as necessary. In any case, in the group 7wwW_1W_2, code figure 17 shall have precedence over figures 20–49.

12.2.6.4.2 In coding 01, 02 and 03, there is no limitation on the magnitude of the change of the cloud amount. ww = 00, 01 and 02 can each be used when the sky is clear at the time of observation. In this case, the following interpretation of the specifications shall apply:

00 is used when the preceding conditions are not known;

01 is used when the clouds have dissolved during the past hour;

02 is used when the sky has been continuously clear during the past hour.

12.2.6.4.3 When the phenomenon is not predominantly water droplets, the appropriate code figure shall be selected without regard to VV.

12.2.6.4.4 The code figure 05 shall be used when the obstruction to vision consists predominantly of lithometeors.

12.2.6.4.5 National instructions shall be used to indicate the specifications for ww = 07 and 09.

12.2.6.4.6 The visibility restriction on ww = 10 shall be 1 000 metres or more. The specification refers only to water droplets and ice crystals.

12.2.6.4.7 For ww = 11 or 12 to be reported, the apparent visibility shall be less than 1 000 metres.

12.2.6.4.8 For ww = 18, the following criteria for reporting squalls shall be used:

(*a*) When wind speed is measured:

A sudden increase of wind speed of at least eight metres per second (16 knots), the speed rising to 11 metres per second (22 knots) or more and lasting for at least one minute;

(*b*) When the Beaufort scale is used for estimating wind speed:

A sudden increase of wind speed by at least three stages of the Beaufort scale, the speed rising to force 6 or more and lasting for at least one minute.

12.2.6.4.9 Figures 20–29 shall never be used when precipitation is observed at the time of observation.

12.2.6.4.10 For ww = 28, visibility shall have been less than 1 000 metres.

Note: The specification refers only to visibility restrictions which occurred as a result of water droplets or ice crystals.

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

12.2.6.4.12 The necessary uniformity in reporting ww = 36, 37, 38 and 39 which may be desirable within certain regions shall be obtained by means of national instructions.

12.2.6.4.13 A visibility restriction “less than 1 000 metres” shall be applied to ww = 42–49. In the case of ww = 40 or 41, the apparent visibility in the fog or ice fog patch or bank shall be less than 1 000 metres. 40–47 shall be used when the obstructions to vision consist predominantly of water droplets or ice crystals, and 48 or 49 when the obstructions consist predominantly of water droplets.

12.2.6.4.14 When referring to precipitation, the phrase “at the station” in the ww table shall mean “at the point where the observation is normally taken”.

12.2.6.4.15 The precipitation shall be encoded as intermittent if it has been discontinuous during the preceding hour, without presenting the character of a shower.

12.2.6.4.16 The intensity of precipitation shall be determined by the intensity at the time of observation.

12.2.6.4.17 Code figures 80–90 shall be used only when the precipitation is of the shower type and takes place at the time of observation.

Note: Showers are produced by convective clouds. They are characterized by their abrupt beginning and end and by the generally rapid and sometimes great variations in the intensity of the precipitation. Drops and solid particles falling in a shower are generally larger than those falling in non-showery precipitation. Between showers openings may be observed unless stratiform clouds fill the intervals between the cumuliform clouds.

12.2.6.4.18 In reporting code figure 98, the observer shall be allowed considerable latitude in determining whether precipitation is or is not occurring, if it is not actually visible.

12.2.6.5 *Present weather reported from an automatic weather station:* $w_a w_a$

12.2.6.5.1 The highest applicable figure shall be selected.

12.2.6.5.2 In coding 01, 02 and 03, there is no limitation on the magnitude of the change of the cloud amount. $w_a w_a$ = 00, 01 and 02 can each be used when the sky is clear at the time of observation. In this case, the following interpretation of the specifications shall apply:

00 is used when the preceding conditions are not known;

01 is used when the clouds have dissolved during the past hour;

02 is used when the sky has been continuously clear during the past hour.

12.2.6.5.3 When the phenomenon is not predominantly water droplets, the appropriate code figure shall be selected without regard to VV.

12.2.6.5.4 The code figures 04 and 05 shall be used when the obstruction to vision consists predominantly of lithometeors.

12.2.6.5.5 The visibility restriction on $w_a w_a$ = 10 shall be 1 000 metres or more. The specification refers only to water droplets and ice crystals.

12.2.6.5.6 For $w_a w_a$ = 18, the following criteria for reporting squalls shall be used:

A sudden increase of wind speed of at least eight metres per second (16 knots), the speed rising to 11 metres per second (22 knots) or more and lasting for at least one minute.

12.2.6.5.7 Code figures 20–26 shall never be used when precipitation is observed at the time of observation.

12.2.6.5.8 For $w_a w_a$ = 20, visibility shall have been less than 1 000 metres.

Note: The specification refers only to visibility restrictions which occurred as a result of water droplets or ice crystals.

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

12.2.6.5.10 A visibility restriction "less than 1 000 metres" shall be applied to $w_a w_a$ = 30–35.

12.2.6.5.11 The precipitation shall be encoded as intermittent if it has been discontinuous during the preceding hour, without presenting the character of a shower.

12.2.6.5.12 The intensity of precipitation shall be determined by the intensity at the time of observation.

12.2.6.5.13 Code figures 80–89 shall be used only when the precipitation is intermittent or of the shower type and takes place at the time of observation.

Note: Showers are produced by convective clouds. They are characterized by their abrupt beginning and end and by the generally rapid and sometimes great variations in the intensity of the precipitation. Drops and solid particles falling in a shower are generally larger than those falling in non-showery precipitation. Between showers openings may be observed unless stratiform clouds fill the intervals between the cumuliform clouds.

12.2.6.6 *Past weather reported from a manned weather station:* W_1W_2

12.2.6.6.1 The period covered by W_1 and W_2 shall be:

(*a*) Six hours for observations at 0000, 0600, 1200 and 1800 UTC;

(*b*) Three hours for observations at 0300, 0900, 1500 and 2100 UTC;

(*c*) Two hours for intermediate observations if taken every two hours.

12.2.6.6.2 The code figures for W_1 and W_2 shall be selected in such a way that W_1W_2 and ww together give as complete a description as possible of the weather in the time interval concerned. For example, if the type of weather undergoes a complete change during the time interval concerned, the code figures selected for W_1 and W_2 shall describe the weather prevailing before the type of weather indicated by ww began.

12.2.6.6.3 When W_1 and W_2 are used in hourly reports other than those covered by Regulation 12.2.6.6.1 (*a*) and (*b*), they cover a short period of time and Regulation 12.2.6.6.2 shall apply.

12.2.6.6.4 If, using Regulation 12.2.6.6.2, more than one code figure may be given to W_1 with regard to the past weather, the highest figure shall be reported for W_1 and the second highest code figure shall be reported for W_2.

12.2.6.6.5 If the weather during the period has not changed so that only one code figure may be selected for the past weather, then that code figure shall be reported for both W_1 and W_2. For example, rain during the entire period shall be reported as W_1W_2 = 66.

12.2.6.7 *Past weather reported from an automatic weather station :* $W_{a1}W_{a2}$

12.2.6.7.1 The period covered by $W_{a1}W_{a2}$ shall be :

(*a*) Six hours for observations at 0000, 0600, 1200 and 1800 UTC;

(*b*) Three hours for observations at 0300, 0900, 1500 and 2100 UTC;

(*c*) Two hours for intermediate observations if taken every two hours.

12.2.6.7.2 The code figures for $W_{a1}W_{a2}$ shall be selected so that the maximum capability of the automatic station to discern past weather is utilized, and so that $W_{a1}W_{a2}$ and w_aw_a together give as complete a description as possible of the weather in the time interval concerned.

12.2.6.7.3 In cases where the automatic station is capable only of discerning very basic weather conditions, the lower code figures representing basic and generic phenomena may be used. If the automatic station has higher discrimination capabilities, the higher code figures representing more detailed explanation of the phenomena shall be used. For each basic type of phenomenon, the highest code figure within the discrimination capability of the automatic station shall be reported.

12.2.6.7.4 If the type of weather during the time interval concerned undergoes complete and discernible changes, the code figures selected for W_{a1} and W_{a2} shall describe the weather prevailing before the type of weather indicated by w_aw_a began. The highest figure shall be reported for W_{a1}, and the second highest code figure shall be reported for W_{a2}.

12.2.6.7.5 If a discernible change in weather has not occurred during the period, so that only one code figure may be selected for the past weather, then that code figure shall be reported for both W_{a1} and W_{a2}. For example, rain during the entire period shall be reported as $W_{a1}W_{a2}$ = 44 in the case of an automatic station incapable of differentiating types of precipitation, or $W_{a1}W_{a2}$ = 66 in the case of a station with the higher discrimination capability.

12.2.7 ***Group*** $8N_hC_LC_MC_H$

12.2.7.1 This group shall be omitted in the following cases:

(*a*) When there are no clouds (N = 0);

(*b*) When the sky is obscured by fog and/or other meteorological phenomena (N = 9);

(*c*) When the cloud cover is indiscernible for reasons other than (*b*) above, or observation is not made (N = /).

Note: All cloud observations at sea including no cloud observation shall be reported in the SHIP message.

12.2.7.2 Certain regulations concerning the coding of N shall also apply to the coding of N_h.

12.2.7.2.1

(*a*) If there are C_L clouds then the total amount on all C_L clouds, as actually seen by the observer during the observation, shall be reported for N_h;

(*b*) If there are no C_L clouds but there are C_M clouds, then the total amount of the C_M clouds shall be reported for N_h;

(*c*) If there are no C_L clouds and there are no C_M level clouds, but there are C_H clouds, then N_h shall be coded as 0.

12.2.7.2.2 If the variety of the cloud reported for N_h is perlucidus (Stratocumulus perlucidus for a C_L cloud or Altocumulus perlucidus for a C_M cloud) then N_h shall be coded as 7 or less.

Note: See Regulation 12.2.2.2.2.

12.2.7.2.3 When the clouds reported for N_h are observed through fog or an analogous phenomenon their amount shall be reported as if these phenomena were not present.

12.2.7.2.4 If the clouds reported for N_h include contrails, then N_h shall include the amount of persistent contrails. Rapidly dissipating contrails shall not be included in the value for N_h.

Note: See Regulation 12.5 concerning the use of Section 4.

12.2.7.3 The coding of C_L, C_M and C_H clouds shall be as specified in publication WMO-No. 407 — *International Cloud Atlas,* Volume I.

Note: It is recommended that the pictorial guides included at the end of Chapter II.8 in the *International Cloud Atlas,* Volume I, be fully utilized in determining the priority of reporting the code figures for C_L, C_M and C_H.

12.2.8 ***Group*** 9GGgg

This group shall be included:

(*a*) When the actual time of observation differs by more than 10 minutes from the standard time GG reported in Section 0;

(*b*) When additionally specified by regional decision.

Note: See Regulation 12.1.6.

12.3 **Section 2**

General

The inclusion of the groups of Section 2 in reports of merchant ships shall be determined by the Member who recruits the ship. The same rule shall be applied for automatic sea stations.

Note: Members are recommended to encourage the inclusion of the maximum possible number of data groups in Section 2 in accordance with Regulation 12.1.3.4.

12.3.1 ***Group*** $222D_sv_s$

12.3.1.1 This group shall always be included in reports from stations which have observed maritime conditions and in reports from ships being requested to include D_sv_s as a routine procedure.

12.3.1.2 This group shall be encoded as:

(*a*) 22200 for a stationary sea station;

(*b*) 222// for:

(i) A coastal land station which reports maritime conditions;

(ii) A supplementary or auxiliary ship, except when reporting from an area for which the ship report collecting centre, in order to meet a requirement of a search and rescue centre, has requested inclusion of D_sv_s as a routine procedure.

12.3.2 ***Group*** $(0s_sT_wT_wT_w)$

This group shall always be included in reports from ocean weather stations, when data are available.

12.3.3 ***Groups*** $(1P_{wa}P_{wa}H_{wa}H_{wa})$, $(2P_wP_wH_wH_w)$, $(70H_{wa}H_{wa}H_{wa})$

12.3.3.1 Regulation 12.3.2 shall apply to these groups.

12.3.3.2 The group $1P_{wa}P_{wa}H_{wa}H_{wa}$ shall be used to report instrumental wave data in units of 0.5 metre.

12.3.3.3 The group $2P_wP_wH_wH_w$ shall be used to report wind waves, when instrumental wave data are not available.

12.3.3.4 (*a*) When the sea is calm (no waves and no swell) $P_{wa}P_{wa}H_{wa}H_{wa}$, or $P_wP_wH_wH_w$ as the case may be, shall be reported as 0000;

(*b*) When the estimation of the period is impossible owing to confused sea, P_wP_w shall be reported as 99. When, for the same reason, the height of the waves cannot be determined, H_wH_w shall be encoded as //;

(*c*) In a report from a station that includes instrumental wave data, if data are not available for any other reason for either period or height of waves, $P_{wa}P_{wa}$ or $H_{wa}H_{wa}$, as the case may be, shall be encoded as //. If data are not available for either period or height

of waves, Regulation 12.2.3.2 shall apply and the group $1P_{wa}P_{wa}H_{wa}H_{wa}$ shall either be omitted or encoded as 1////;

(*d*) In a report from a station that does not include instrumental wave data, if data are not available for any other reason for either period or height of waves, P_wP_w or H_wH_w, as the case may be, shall be encoded as //. If data are not available for either period or height of waves, the group $2P_wP_wH_wH_w$ shall be omitted.

12.3.3.5 The group $70H_{wa}H_{wa}H_{wa}$ shall be reported in addition to the group $1P_{wa}P_{wa}H_{wa}H_{wa}$ when the following conditions have been met:

(*a*) The sea is not calm (e.g. $P_{wa}P_{wa}H_{wa}H_{wa}$ has not been reported as 0000);

(*b*) $H_{wa}H_{wa}$ has not been reported as //;

(*c*) The station has the capability of accurately measuring instrumental wave height in units of 0.1 metre.

12.3.4 ***Groups*** $((3d_{w1}d_{w1}d_{w2}d_{w2})\ (4P_{w1}P_{w1}H_{w1}H_{w1})\ (5P_{w2}P_{w2}H_{w2}H_{w2}))$

12.3.4.1 These groups shall be used to report swell data only when swell can be distinguished from wind waves.

12.3.4.2 If only one system of swell is observed:

(*a*) Its direction, period and height shall be indicated, respectively, by $d_{w1}d_{w1}$, $P_{w1}P_{w1}$, $H_{w1}H_{w1}$;

(*b*) $d_{w2}d_{w2}$ shall be encoded as //;

(*c*) Group $5P_{w2}P_{w2}H_{w2}H_{w2}$ shall be omitted.

12.3.4.3 If a second system of swell is observed:

(*a*) Its direction, period and height shall be indicated, respectively, by $d_{w2}d_{w2}$, $P_{w2}P_{w2}$, $H_{w2}H_{w2}$;

(*b*) The corresponding data for the first system of swell shall be reported as prescribed by Regulation 12.3.4.2 (*a*).

12.3.4.4 Ocean weather stations shall always include swell data when data are available.

12.3.5 ***Group*** $(6I_sE_sE_sR_s)$

When the ice accretion on ships is reported in plain language, it shall be preceded by the word ICING.

12.3.6 ***Group*** $(8s_wT_bT_bT_b)$

When the wet bulb is used to derive dew-point value in a SHIP report, the group $8s_wT_bT_bT_b$ shall be included to report the wet-bulb temperature measurement.

12.3.7 ***Groups*** $(\text{ICE} + \left\{\begin{array}{l} c_iS_ib_iD_iz_i \\ \text{or} \\ \text{plain language} \end{array}\right\})$

12.3.7.1 The reporting of sea ice and ice of land origin in FM 13 shall not supersede the reporting of sea ice and icebergs in accordance with the International Convention for the Safety of Life at Sea.

12.3.7.2 The group $c_iS_ib_iD_iz_i$ shall be reported whenever sea ice and/or ice of land origin are observed from the ship's position at the time of observation, unless the ship is required to report ice conditions by means of a special sea-ice code.

12.3.7.3 When an ice edge is crossed or sighted between observation hours, it shall be reported as a plain-language addition in the form "ice edge lat. long." (with position in degrees and minutes).

12.3.7.4 If the ship is in the open sea reporting an ice edge, the concentration c_i and stage of development S_i shall be reported only if the ship is close to the ice (i.e. within 0.5 nautical mile).

12.3.7.5 The situation in which the ship is in an open lead more than 1.0 nautical mile wide shall be coded as $c_i = 1$ and $D_i = 0$. The situation in which the ship is in fast ice with ice boundary beyond limit of visibility shall be coded as $c_i = 1$ and $D_i = 9$.

12.3.7.6 If no sea ice is visible and the code group is used to report ice of land origin only, the group shall be coded as $0/b_i/0$; e.g. 0/2/0 would mean 6–10 icebergs in sight, but no sea ice.

12.3.7.7 In coding concentration or arrangement of sea ice (code c_i), that condition shall be reported which is of the most navigational significance.

12.3.7.8 The bearing of the principal ice edge reported shall be to the closest part of that edge.

Note: The requirements for sea-ice reporting are covered in the following way by the associated code tables:

Symbolic code letter c_i

(*a*) The purpose of the first code figure (0) is to establish in relation to code z_i (code figure 0) and code b_i whether the floating ice that is visible is only ice of land origin;

(*b*) The possible variations in sea-ice concentration and arrangement within an area of observation are almost infinite. However, the field of reasonably accurate observation from a ship's bridge is limited. For this reason, and also because minor variations are of temporary significance, the choice of concentrations and arrangements has been restricted for reporting purposes to those representing significantly different conditions from a navigational point of view. The code figures 2–9 have been divided into two sections depending on:

(i) Whether sea-ice concentration within the area of observation is more or less uniform (code figures 2–5); or

(ii) Whether there are marked contrasts in concentration or arrangement (code figures 6–9).

Symbolic code letter S_i

(*a*) This table represents a series of increasing navigational difficulties for any given concentration; i.e. if the concentration is, for example, $^{8}/_{10}$ths, then new ice would hardly have any effect on navigation while predominantly old ice would provide difficult conditions requiring reductions in speed and frequent course alterations;

(*b*) The correlation between the stage of development of sea ice and its thickness is explained in publication WMO-No. 8 — *Guide to Meteorological Instruments and Methods of Observation*.

Symbolic code letter b_i

(*a*) This code provides a scale of increasing navigational hazard;

(*b*) Growlers and bergy bits, being much smaller and lower in the water than icebergs, are more difficult to see either by eye or radar. This is especially so if there is a heavy sea running. For this reason, code figures 4 and 5 represent more hazardous conditions than code figures 1 to 3.

Symbolic code letter D_i

There is no provision in this code for the reporting of distance from the ice edge. It will be assumed by those receiving the report that the bearing has been given to the closest part of the ice edge. From the reported code figures for concentration and stage of development, it will be clear whether the ship is in ice or within 0.5 nautical mile of the ice edge. If the ship is in open water and more than 0.5 nautical mile from the ice edge, the ice edge will be assumed to be aligned at right angles to the bearing which is reported.

Symbolic code letter z_i

(*a*) The purpose of this element in the code is to establish:

(i) Whether the ship is in pack ice or is viewing floating ice (i.e. sea ice and/or ice of land origin) from the open sea; and

(ii) A qualitative estimate, dependent on the sea-ice navigation capabilities of the reporting ship, of the penetrability of the sea ice and of the recent trend in conditions;

(*b*) The reporting of the conditions represented by code figures 1–9 in Code table 5239 can be used to help in the interpretation of reports from the two code tables (concentration c_i and stage of development S_i).

12.4 **Section 3**

This section shall be used for regional exchange.

12.4.1 The inclusion of groups with indicator figures 1 to 6, 8 and 9 shall be decided regionally. However group $7R_{24}R_{24}R_{24}R_{24}$ shall be included by all stations (with the exception of stations situated in the Antarctic) capable of doing so, once a day at one appropriate time of the main standard times (0000, 0600, 1200 or 1800 UTC).

12.4.2 The symbolic form of the group with indicator figure 0 shall be developed regionally, as well as the rules for its inclusion in Section 3.

12.4.3 Other figure groups shall be developed regionally in order to cover requirements which cannot be satisfied by the existing groups. In order to avoid ambiguities, these other groups shall be:

(*a*) Provided with indicator figures 0, 1, 2, etc.;

(*b*) Preceded by an indicator group 80000 located after the last of the existing figure groups that was included in the report.

Notes:

(1) For example, if three supplementary groups are developed, a report including state of the ground, precipitation and cloud data would present Section 3 as 333 3Ejjj $6RRRt_R$ $8N_SCh_Sh_S$ 80000 0 . . . . 1 . . . . 2 . . . .

(2) See Regulation 12.1.3.5.

12.4.4 ***Groups*** $(1s_nT_xT_xT_x)$, $(2s_nT_nT_nT_n)$

The period of time covered by the maximum and the minimum temperature and the synoptic hour at which these temperatures are reported shall be determined by regional decision.

12.4.5 ***Group*** (3Ejjj)

The use of the parameter(s) jjj shall be fixed regionally.

12.4.6 ***Group*** (4E´sss)

12.4.6.1 The measurement shall include snow, ice and all other forms of solid precipitation on the ground at the time of observation.

12.4.6.2 When the depth is not uniform, the average depth over a representative area shall be reported.

12.4.7 ***Groups*** $(5j_1j_2j_3j_4$ $(j_5j_6j_7j_8j_9))$

12.4.7.1 *Symbolic expression*

12.4.7.1.1 When the group $5j_1j_2j_3j_4$ is used in the form $55j_2j_3j_4$, $553j_3j_4$, $554j_3j_4$ or $555j_3j_4$, the supplementary group $j_5j_6j_7j_8j_9$ shall be added to report net radiation, global solar radiation, diffused solar radiation, long-wave radiation, short-wave radiation, net short-wave radiation or direct solar radiation if data are available. The group shall be repeated as often as necessary.

Note: If sunshine duration is not available, the group shall be reported as 55///, 553//, 55407, 55408, 55507 or 55508 whenever the group $j_5j_6j_7j_8j_9$ is required to report radiation data.

12.4.7.1.2 When the group $5j_1j_2j_3j_4$ is used, one or more of the following symbolic expressions shall be adopted:

(*a*) $5EEEi_E$ to report the daily amount of either evaporation or evapotranspiration;

(*b*) $54g_0s_nd_T$ to report temperature change data in period covered by W_1W_2;

(*c*) 55SSS to report the daily hours of sunshine;

(*d*) 553SS to report the duration of sunshine in the past hour;

(*e*) 55407 to indicate that the supplementary group 4FFFF, which follows immediately, is used to report net short-wave radiation during the previous hour, in kJ m^{-2};

(*f*) 55408 to indicate that the supplementary group 4FFFF, which follows immediately, is used to report direct solar radiation during the previous hour, in kJ m^{-2};

(*g*) 55507 to indicate that the supplementary group $5F_{24}F_{24}F_{24}F_{24}$, which follows immediately, is used to report net short-wave radiation during the preceding 24 hours, in J cm^{-2};

(*h*) 55508 to indicate that the supplementary group $5F_{24}F_{24}F_{24}F_{24}$, which follows immediately, is used to report direct solar radiation during the preceding 24 hours, in J cm^{-2};

(*i*) $56D_LD_MD_{\mathbf{H}}$ to report data on direction of cloud drift;

(*j*) $57CD_ae_{\mathbf{C}}$ to report data on direction and elevation of cloud;

(*k*) $58p_{24}p_{24}p_{24}$ to report positive or zero change of surface pressure over the last 24 hours;

(*l*) $59p_{24}p_{24}p_{24}$ to report negative change of surface pressure over the last 24 hours.

12.4.7.1.3 When more than one group $5j_1j_2j_3j_4$ is used, these groups shall be included in the order as listed in Regulation 12.4.7.1.2 with the supplementary groups $j_5j_6j_7j_8j_9$ at the appropriate place.

12.4.7.2 *Daily evaporation or evapotranspiration*

12.4.7.2.1 The symbolic expression $5EEEi_E$ shall be used to report either daily evaporation or evapotranspiration.

12.4.7.2.2 EEE shall indicate the amount of either evaporation or evapotranspiration, in tenths of a millimetre, during the preceding 24 hours at either 0000, 0600 or 1200 UTC.

12.4.7.3 *Temperature change*

For a change of temperature to be reported, the change shall be equal to or more than 5°C and occur in less than 30 minutes during the period covered by W_1W_2.

Note: The reporting of this information is restricted by regional or national decision to islands or other widely separated stations.

12.4.7.4 *Duration of sunshine and radiation data*

12.4.7.4.1 The symbolic expression SSS shall be used to report the daily sunshine, in hours and tenths of an hour. The symbolic expression SS (in group 553SS) shall be used to report the duration of sunshine in the past hour, in tenths of an hour.

12.4.7.4.2 In the form 55SSS, this group shall, by regional decision, be reported by all stations capable of doing so and included at either 0000, 0600, 1200 or 1800 UTC.

12.4.7.4.3 When the group $5j_1j_2j_3j_4$ has the form 553SS, the supplementary group(s) j_5FFFF may take one or more of the following forms:

$j_5 = 0$ FFFF = positive net radiation during the previous hour, in kJ m^{-2};

$j_5 = 1$ FFFF = negative net radiation during the previous hour, in kJ m^{-2};

$j_5 = 2$ FFFF = global solar radiation during the previous hour, in kJ m^{-2};

$j_5 = 3$ FFFF = diffused solar radiation during the previous hour, in kJ m^{-2};

$j_5 = 4$ FFFF = downward long-wave radiation during the previous hour, in kJ m^{-2};

$j_5 = 5$ FFFF = upward long-wave radiation during the previous hour, in kJ m^{-2};

$j_5 = 6$ FFFF = short-wave radiation during the previous hour, in kJ m^{-2}.

Note: For reporting net short-wave and direct solar radiation during the previous hour, see Regulation 12.4.7.1.2 (*e*) and (*f*), respectively.

12.4.7.4.4 When the group $5j_1j_2j_3j_4$ has the form 55SSS, the supplementary group(s) $j_5F_{24}F_{24}F_{24}F_{24}$ may take one or more of the following forms:

$j_5 = 0$ $F_{24}F_{24}F_{24}F_{24}$ = positive net radiation during the preceding 24 hours, in J cm^{-2};

$j_5 = 1$ $F_{24}F_{24}F_{24}F_{24}$ = negative net radiation during the preceding 24 hours, in J cm^{-2};

$j_5 = 2$ $F_{24}F_{24}F_{24}F_{24}$ = global solar radiation during the preceding 24 hours, in J cm^{-2};

$j_5 = 3$ $F_{24}F_{24}F_{24}F_{24}$ = diffused solar radiation during the preceding 24 hours, in J cm^{-2};

$j_5 = 4$ $F_{24}F_{24}F_{24}F_{24}$ = downward long-wave radiation during the preceding 24 hours, in J cm^{-2};

$j_5 = 5$ $F_{24}F_{24}F_{24}F_{24}$ = upward long-wave radiation during the preceding 24 hours, in J cm^{-2};

$j_5 = 6$ $F_{24}F_{24}F_{24}F_{24}$ = short-wave radiation during the preceding 24 hours, in J cm^{-2}.

Note: For reporting net short-wave and direct solar radiation during the preceding 24 hours, see Regulation 12.4.7.1.2 (*g*) and (*h*), respectively.

12.4.7.4.5 FFFF shall indicate the absolute value of the amount of solar or terrestrial radiation as appropriate, in kJ m^{-2}, during the preceding hour. $F_{24}F_{24}F_{24}F_{24}$ shall indicate the absolute value of the amount of solar or terrestrial radiation as appropriate, in J cm^{-2}, during the preceding 24 hours at either 0000, 0600, 1200 or 1800 UTC.

12.4.7.5 *Direction, drift and elevation of cloud*

Note: This information is required from land stations and fixed ship stations, mainly in the tropics.

12.4.8 ***Group*** ($6RRRt_R$)

12.4.8.1 This group shall be included in Section 3 only when Regulation 12.2.5.2 applies.

12.4.8.2 The decision to implement Regulation 12.2.5.2 shall be taken at the regional level.

12.4.9 ***Group*** ($7R_{24}R_{24}R_{24}R_{24}$)

This group shall be used to report the total amount of precipitation during the 24-hour period ending at the time of observation, in tenths of a millimetre (coded 9998 for 999.8 mm or more, and coded 9999 for trace).

12.4.10 ***Group*** ($8N_sCh_sh_s$)

12.4.10.1 This group shall be repeated to report a number of different layers or masses of cloud. When reported from a manned station, the number of such groups shall in the absence of Cumulonimbus clouds not exceed three. Cumulonimbus clouds, when observed, shall always be reported, so that the total number of groups can be four. When the station operates in the automatic mode, the total number of groups shall not exceed four.

The selection of layers (masses) to be reported shall be made in accordance with the following criteria:

(*a*) The lowest individual layer (mass) of any amount (N_s equals 1 or more);

(*b*) The next higher individual layer (mass) the amount of which is greater than two oktas (N_s equals 3 or more);

(*c*) The next higher individual layer (mass) the amount of which is greater than four oktas (N_s equals 5 or more);

(*d*) Cumulonimbus clouds, whenever observed and not reported under (*a*), (*b*) and (*c*) above by means of a group referring exclusively to Cb.

12.4.10.2 The order of reporting the groups shall always be from lower to higher levels.

12.4.10.3 In determining the cloud amounts to be reported for individual layers or masses in the 8-group, the observer shall estimate, by taking into consideration the evolution of the sky, the cloud amounts of each layer or mass at the different levels, as if no other clouds existed.

12.4.10.4 When the sky is clear (N = 0), the 8-group shall not be used.

12.4.10.5 When the sky is obscured (N_s = 9), the 8-group shall read 89/h_sh_s, where h_sh_s is the vertical visibility. When the observation of clouds is not made (N = /), the 8-group shall not be included.

Note: The vertical visibility is defined as the vertical visual range into an obscuring medium.

12.4.10.6 If two or more types of cloud occur with their bases at the same level and this level is one to be reported in accordance with Regulation 12.4.10.1, the selection for C and N_s shall be made in accordance with the following criteria:

(*a*) If these types do not include Cumulonimbus then C shall refer to the cloud type that represents the greatest amount, or if there are two or more types of cloud all having the same amount, the highest applicable code figure for C shall be reported. N_s shall refer to the total amount of cloud whose bases are all at the same level;

(*b*) If these types do include Cumulonimbus then one group shall be used to describe only this type with C reported as 9 and N_s as the amount of Cumulonimbus. If the total amount of the remaining type(s) of cloud (excluding Cumulonimbus) whose bases are all at the same level is greater than that required by Regulation 12.4.10.1, then another group shall be reported with C being selected in accordance with (*a*) and N_s referring to the total amount of the remaining cloud (excluding Cumulonimbus).

12.4.10.7 Regulations 12.2.2.2.3 to 12.2.2.2.6, inclusive, shall apply.

12.4.11 ***Group*** ($9S_PS_Ps_ps_p$)

The use of this group and the specifications for the supplementary information shall be as specified in Code table 3778.

12.5 Section 4

12.5.1 The inclusion of this section shall be fixed nationally.

12.5.2 Clouds with tops below station level shall be reported only by this section and any coexistent clouds with bases above station level shall be reported in group $8N_hC_LC_MC_H$ of Section 1.

12.5.3 C_L clouds with bases below and tops above station level shall be reported in both $8N_hC_LC_MC_H$ and Section 4, provided that the station is out of cloud sufficiently frequently to enable the various features to be recognized. In this case:

(*a*) N_h shall correspond with N′ and C_L with C′ while h shall be coded as /;

(*b*) If the upper surface of the clouds with tops above station level can be observed, it shall be reported by means of H′H′. If the upper surface cannot be observed, H′H′ shall be coded as //;

(*c*) Other C_L clouds present with tops below station level shall be reported in a second N′C′H′H′C_t group;

(*d*) Other C_L clouds present with bases above station level shall be reported in plain language after the N′C′H′H′C_t group.

12.5.4 If the station is in almost continuous cloud, Regulation 12.2.7.1 shall apply and Section 4 shall be omitted.

12.5.5 When two or more cloud layers with their bases below station level occur at different levels, two or more groups N′C′H′H′C_t shall be used. C_t shall be reported as 9 in the groups indicating the layer of the smaller cloud amount and, in the remaining group, C_t shall be coded in Code table 0552.

12.5.6 Rapidly dissipating condensation trails shall not be reported in Section 4.

Note: See Regulation 12.2.2.2.5.

12.5.7 The top of persistent condensation trails and cloud masses which have obviously developed from condensation trails shall be reported, using the appropriate C_t code figure.

12.5.8 Regulations 12.2.2.2.1 to 12.2.2.2.6, inclusive, shall apply.

12.5.9 Spaces occupied by mountains emerging from the cloud layers shall be counted as occupied by cloud.

12.6 Section 5

12.6.1 The use of this section, the symbolic form of groups and the specifications of symbolic letters shall be determined by national decision.

12.6.2 Preference shall be given to symbolic 5-figure groups identified by numerical indicator figures.

FM 15–XIV METAR **Aerodrome routine meteorological report (with or without trend forecast)**

FM 16–XIV SPECI **Aerodrome special meteorological report (with or without trend forecast)**

C O D E F O R M :

METAR or **SPECI** **COR** CCCC YYGGgg**Z** **NIL** **AUTO** dddff**G**$f_m f_m$ {**KMH** or **KT** or **MPS**} $d_n d_n d_n$**V**$d_x d_x d_x$

{VVVV or VVVV**NDV** or **CAVOK**} $V_N V_N V_N V_N D_v$ {**R**$D_R D_R$/$V_R V_R V_R V_R$i or **R**$D_R D_R$/$V_R V_R V_R V_R$**V**$V_R V_R V_R V_R$i} w´w´ {$N_s N_s N_s h_s h_s h_s$ or **VV**$h_s h_s h_s$ or **NSC** or **NCD**}

T´T´/T´$_d$T´$_d$ **Q**$P_H P_H P_H P_H$ **RE**w´w´ {**WS R**$D_R D_R$ or **WS ALL RWY**} (**W**$T_s T_s$**/S**S´) (**R**$D_R D_R$/$E_R C_R e_R e_R$**B**$_R B_R$)

{(TTTTT or **NOSIG**)} TTGGgg dddff**G**$f_m f_m$ {**KMH** or **KT** or **MPS**} {VVVV or **CAVOK**} {w´w´ or **NSW**} {$N_s N_s N_s h_s h_s h_s$ or **VV**$h_s h_s h_s$ or **NSC**}

(**RMK** .....)

Notes:

(1) METAR is the name of the code for an aerodrome routine meteorological report. SPECI is the name of the code for an aerodrome special meteorological report. A METAR report and a SPECI report may have a trend forecast appended.

(2) The groups contain a non-uniform number of characters. When an element or phenomenon does not occur, the corresponding group, or the extension of a group, is omitted from a particular report. Detailed instructions are given for each group in the following Regulations. The groups enclosed in brackets are used in accordance with regional or national decisions. Groups may have to be repeated in accordance with the detailed instructions for each group. The code words COR and NIL shall be used, as appropriate, for corrected and missing reports, respectively.

(3) The code form includes a section containing the trend forecast identified either by a change indicator (TTTTT = BECMG or TEMPO as the case may be), or by the code word NOSIG.

(4) The governing criteria for issuing SPECI reports are specified in publication WMO-No. 49 – *Technical Regulations* [C.3.1].

R E G U L A T I O N S :

15.1 **General**

15.1.1 The code name **METAR** or **SPECI** shall be included at the beginning of each individual report.

15.1.2 When a deterioration of one weather element is accompanied by an improvement in another element (for example, lowering of clouds and an improvement in visibility), a single SPECI report shall be issued.

15.2 **Group** CCCC

The identification of the reporting station in each individual report shall be indicated by means of the ICAO location indicator.

15.3 **Group** YYGGgg**Z**

15.3.1 The day of the month and the time of observation in hours and minutes UTC followed, without a space, by the letter indicator **Z** shall be included in each individual METAR report.

15.3.2 This group shall be included in each individual SPECI report. In SPECI reports, this group shall indicate the time of occurrence of the change(s) which justified the issue of the report.

15.4 **Code word AUTO**

The optional code word **AUTO** shall be inserted before the wind group when a report contains fully automated observations without human intervention. The ICAO requirement is that all of the specified elements shall be reported. However, if any element cannot be observed, the group in which it would have been encoded shall be replaced by the appropriate number of solidi. The number of solidi depends on the number of symbolic letters for the specific group which is not able to be reported; i.e. four for the visibility group, two for the present weather group and three or six for the cloud group, as appropriate.

15.5 **Groups** $ddd ff \mathbf{G} f_m f_m \left\{ \begin{array}{l} \textbf{KMH} \text{ or} \\ \textbf{KT} \text{ or} \\ \textbf{MPS} \end{array} \right\} d_n d_n d_n \mathbf{V} d_x d_x d_x$

15.5.1 The mean true direction in degrees rounded off to the nearest 10 degrees from which the wind is blowing and the mean speed of the wind over the 10-minute period immediately preceding the observation shall be reported for dddff followed, without a space, by one of the abbreviations **KMH**, **KT** or **MPS**, to specify the unit used for reporting wind speed. Values of wind direction less than 100° shall be preceded by 0 and a wind from true north shall be reported as 360. Values of wind speed less than 10 units shall be preceded by 0. However, when the 10-minute period includes a marked discontinuity in the wind characteristics, only data after the discontinuity shall be used for obtaining mean wind speed and maximum gust values, and mean wind direction and variations of the wind direction, hence the time interval in these circumstances shall be correspondingly reduced.

Notes:

(1) **KMH**, **KT** and **MPS** are the standard ICAO abbreviations for kilometres per hour, knots and metres per second, respectively.

(2) The unit of wind speed used is determined by national decision. However, the primary unit prescribed in ICAO Annex 5 for wind speed is the kilometre per hour (KMH), with the knot (KT) permitted for use as a non-SI alternative unit until a termination date is decided.

(3) A marked discontinuity occurs when there is an abrupt and sustained change in wind direction of 30° or more, with a wind speed of 20 km h^{-1} (10 kt) or more before or after the change, or a change in wind speed of 20 km h^{-1} (10 kt) or more, lasting at least two minutes.

15.5.2 In the case of variable wind direction, ddd shall be encoded as VRB when the mean wind speed is less than 3 knots (2 m s^{-1} or 6 km h^{-1}). A variable wind at higher speeds shall be reported only when the variation of wind direction is 180° or more or when it is impossible to determine a single wind direction, for example when a thunderstorm passes over the aerodrome.

15.5.3 If, during the 10-minute period preceding the observation, the total variation in wind direction is 60° or more but less than 180° and the mean wind speed is 3 knots (2 m s^{-1} or 6 km h^{-1}) or more, the observed two extreme directions between which the wind has varied shall be given for $d_nd_nd_n\mathbf{V}d_xd_xd_x$ in clockwise order. Otherwise this group shall not be included.

15.5.4 "Calm" shall be coded as 00000 followed immediately, without a space, by one of the abbreviations **KMH**, **KT** or **MPS** to specify the unit, used normally for reporting wind.

15.5.5 If, during the 10-minute period preceding the observation, the maximum wind gust speed exceeds the mean speed by 10 knots (5 m s^{-1} or 20 km h^{-1}) or more, this maximum speed shall be reported as $\mathbf{G}f_mf_m$ immediately after dddff, followed immediately, without a space, by one of the abbreviations **KMH**, **KT** or **MPS** to specify the units used for reporting wind speed. Otherwise the element $\mathbf{G}f_mf_m$ shall not be included.

Note: It is recommended that the wind measuring systems should be such that peak gusts should represent a three-second average.

15.5.6 For wind speeds of 100 units or greater, the exact number of wind speed units shall be given in lieu of the two-figure code ff or f_mf_m. When the wind speed is 100 knots or more (50 m s^{-1} or 200 km h^{-1}), the groups ff and f_mf_m shall be preceded by the letter indicator P and reported as P99 **KT** (P49 **MPS** or P199 **KMH**).

Note: There is no aeronautical requirement to report surface wind speeds of 200 km h^{-1} (100 kt) or more; however, provision has been made for reporting wind speeds up to 399 km h^{-1} (199 kt) for non-aeronautical purposes, as necessary.

15.6 **Groups** VVVV VVVV**NDV** $V_NV_NV_NV_ND_v$

Note: The coding of visibility is based on the use of the metre and kilometre, in accordance with the units specified in ICAO Annex 5.

15.6.1 The group VVVV shall be used to report prevailing visibility. When the horizontal visibility is not the same in different directions and when the visibility is fluctuating rapidly and the prevailing visibility cannot be determined, the group VVVV shall be used to report the lowest visibility. When visibility sensors are used and they are sited in such a manner that no directional variations can be given, the abbreviation **NDV** shall be appended to visibility reported.

15.6.2 ***Directional variation in visibility*** $V_NV_NV_NV_ND_v$

When the horizontal visibility is not the same in different directions and when the minimum visibility is different from the prevailing visibility, and less than 1 500 metres or less than 50% of the prevailing visibility, and less than 5000 metres, the group $V_NV_NV_NV_ND_v$ shall also be used to report the minimum visibility and its general direction in relation to the aerodrome indicated by reference to one of the eight points of the compass. If the minimum visibility is observed in more than one direction, the D_v shall represent the most operationally significant direction.

15.6.3 Visibility shall be reported using the following reporting steps:

(*a*) Up to 800 metres rounded down to the nearest 50 metres;

(*b*) Between 800 and 5 000 metres rounded down to the nearest 100 metres;

(*c*) Between 5 000 metres up to 9 999 metres rounded down to the nearest 1 000 metres;

(*d*) With 9999 indicating 10 km and above.

15.6.4 ***Code word* CAVOK**

Regulation 15.10 shall apply.

15.7 **Groups** $\begin{cases} \mathbf{R}D_RD_R/V_RV_RV_RV_Ri \\ \text{or} \\ \mathbf{R}D_RD_R/V_RV_RV_RV_R\mathbf{V}V_RV_RV_RV_Ri \end{cases}$

Note: The coding of runway visual range is based on the use of the metre in accordance with the unit specified in ICAO Annex 5.

15.7.1 During periods when either the horizontal visibility reported in the group VVVV or the runway visual range for one or more runways available for landing is observed to be less than 1 500 metres, one or more groups under Regulation 15.7 shall be included in the report. The letter indicator **R** followed immediately, without a space, by the runway designator D_RD_R shall always precede the RVR reports.

15.7.2 The groups shall be repeated to report runway visual range values for each runway, up to a maximum of four, which is available for landing and for which runway visual range is determined.

15.7.3 ***Runway designator*** D_RD_R

The designator of each runway for which runway visual range is reported shall be indicated by D_RD_R. Parallel runways should be distinguished by appending to D_RD_R letters L, C or R indicating the left, central or right parallel runway, respectively. The letter(s) shall be appended to D_RD_R as necessary in accordance with the standard practice for runway designation, as laid down by ICAO in Annex 14 — Aerodromes, Volume I — Aerodrome design and operations, paragraphs 5.2.2.4 and 5.2.2.5.

15.7.4 ***Mean value and tendency of runway visual range over the 10-minute period immediately preceding the observation*** $V_RV_RV_RV_Ri$

15.7.4.1 The runway visual range values to be reported shall be representative of the touchdown zone of the active landing runway(s) up to a maximum of four.

15.7.4.2 The mean value of the runway visual range over the 10-minute period immediately preceding the observation shall be reported for $V_RV_RV_RV_R$. However, when the 10-minute period includes a marked discontinuity in the RVR (for example, sudden advection of fog, rapid onset or cessation of an obscuring snow shower), only data after the discontinuity shall be used for obtaining mean RVR values and variations thereof, hence the time interval in these circumstances shall be correspondingly reduced.

Notes:

(1) See Regulation 15.7.5.

(2) Any observed value which does not fit the reporting scale in use should be rounded down to the nearest lower step in the scale.

(3) A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least two minutes, consistent with the issuance of selected special reports given in *Technical Regulation* [C.3.1.] 4.3.3.

15.7.4.3 If the runway visual range values during the 10-minute period preceding the observation show a distinct upward or downward tendency such that the mean during the first five minutes varies by 100 metres or more from the mean during the second five minutes of the period, this shall be indicated by i = U for upward and i = D for downward tendency of runway visual range values. When no distinct change in runway visual range is observed, i = N shall be used. When it is not possible to determine the tendency, i shall be omitted.

15.7.5 ***Significant variations of runway visual range*** **R**$D_RD_R/V_RV_RV_RV_R$**V**$V_RV_RV_RV_R$i

When the RVR at a runway varies significantly and when during the 10-minute period preceding the nominal observation time the one-minute mean extreme values assessed vary from the mean value by more than 50 metres or more than 20% of the mean value, whichever is greater, the one-minute mean minimum and the one-minute mean maximum values shall be given in that order in the form **R**$D_RD_R/V_RV_RV_RV_R$**V**$V_RV_RV_RV_R$i instead of the 10-minute mean. Extreme RVR values shall be reported in accordance with Regulation 15.7.6 and the tendency shall be indicated in accordance with Regulation 15.7.4.3.

15.7.6 ***Extreme values of runway visual range***

When actual RVR values are outside the measuring range of the observing system in use, the following procedure shall apply:

(*a*) When the RVR, to be reported in accordance with the *Technical Regulations*, is greater than the maximum value which can be assessed with the system in use, the group $V_RV_RV_RV_R$ shall be preceded by the letter indicator P (**P**$V_RV_RV_RV_R$) in which $V_RV_RV_RV_R$ is the highest value which can be assessed. When the RVR is assessed to be more than 2 000 metres, it shall be reported as P2000;

(*b*) When the RVR is below the minimum value which can be assessed with the system in use, the group $V_RV_RV_RV_R$ shall be preceded by the letter indicator M (**M**$V_RV_RV_RV_R$) in which $V_RV_RV_RV_R$ is the lowest value which can be assessed. When the RVR is assessed to be less than 50 metres, it shall be reported as M0050.

15.8 **Group** w′w′

15.8.1 One or more groups w′w′, but not more than three, shall be used to report all present weather phenomena observed at or near the aerodrome and of significance to aeronautical operations in accordance with Code table 4678.

Appropriate intensity indicators and letter abbreviations (Code table 4678) shall be combined in groups of two to nine characters to indicate present weather phenomena.

15.8.2 If the observed present weather cannot be reported by use of Code table 4678, the group w′w′ shall be omitted from the report.

15.8.3 The w′w′ groups shall be ordered as follows:

(*a*) First, if appropriate, the qualifier for intensity *or* for proximity, followed without a space by;

(*b*) If appropriate, the abbreviation for the descriptor followed without a space by;

(*c*) The abbreviation for the observed weather phenomenon or combinations thereof.

15.8.4 Intensity shall be indicated only with precipitation, precipitation associated with showers and/or thunderstorms, duststorm or sandstorm. If the intensity of the phenomena reported in the group is either light or heavy, this shall be indicated by the appropriate sign (see Code table 4678 and specially Note (5)). No indicator shall be included in the group when the intensity of the reported phenomenon is moderate.

15.8.5 The intensity of present weather phenomena reported in the group w′w′ shall be determined by the intensity at the time of observation.

15.8.6 If more than one significant weather phenomenon is observed, separate w′w′ groups shall be included in the report in accordance with Code table 4678. However, if more than one form of precipitation is observed, the appropriate letter abbreviations shall be combined in a single group with the dominant type of precipitation being reported first. In such a single group, the intensity shall refer to the total precipitation and be reported with one or no indicator as appropriate.

When an automatic observing system is used and when the type of the precipitation cannot be identified by this system, the abbreviation **UP** shall be used for precipitation. The abbreviation **UP** may be combined, as necessary, with the following characteristics of present weather: **FZ**, **SH** and **TS**.

15.8.7 The qualifier **SH** shall be used to indicate precipitation of the shower type. When associated with the indicator VC, the type and intensity of precipitation shall not be specified.

Note: Showers are produced by convective clouds. They are characterized by their abrupt beginning and end and by the generally rapid and sometimes great variations in the intensity of the precipitation. Drops and solid particles falling in a shower are generally larger than those falling in non-showery precipitation. Between showers, openings may be observed unless stratiform clouds fill the intervals between the cumuliform clouds.

15.8.8 The qualifier **TS** shall be used whenever thunder is heard or lightning is detected at the aerodrome within the 10-minute period preceding the time of observation. When appropriate, **TS** shall be followed immediately, without a space, by relevant letter abbreviations to indicate any precipitation observed. The letter abbreviation **TS** on its own shall be used when thunder is heard or lightning detected at the aerodrome but no precipitation observed.

Note: A thunderstorm shall be regarded as being at the aerodrome from the time thunder is first heard, whether or not lightning is seen or precipitation is observed at the aerodrome. A thunderstorm shall be regarded as having ceased or being no longer at the aerodrome at the time thunder is last heard, and the cessation is confirmed if thunder is not heard for 10 minutes after this time.

15.8.9 The qualifier **FZ** shall be used only to indicate supercooled water droplets or supercooled precipitation.

Notes:

(1) Any fog consisting predominantly of water droplets at temperatures below 0°C shall be reported as freezing fog (FZFG) whether it is depositing rime ice or not.

(2) Whether or not the supercooled precipitation is of the shower type shall not be specified.

15.8.10 The qualifier **VC** shall be used to indicate the following significant weather phenomena observed in the vicinity of the aerodrome: TS, DS, SS, FG, FC, SH, PO, BLDU, BLSA, BLSN and VA. Regulations referring to the combination of VC and FG are given in Regulation 15.8.17.

Notes:

(1) Such weather phenomena should be reported with the qualifier VC only when observed between approximately 8 km and 16 km from the aerodrome reference point.

(2) See Regulation 15.8.7.

15.8.11 The letter abbreviation **GR** shall be used to report hail only when the diameter of the largest hailstones observed is 5 mm or more. The letter abbreviation **GS** shall be used to report small hail (diameter of the hailstones less than 5 mm) and/or snow pellets.

15.8.12 The letter abbreviation **IC** shall be used to indicate the phenomenon ice crystals (diamond dust). For w′w′ = **IC** to be reported, the visibility shall be reduced by this phenomenon to 5 000 metres or less.

15.8.13 The letter abbreviations **FU**, **HZ**, **DU** and **SA** (except **DRSA**) shall be used only when the obstruction to vision consists predominantly of lithometeors and the visibility is reduced by the reported phenomenon to 5 000 metres or less.

15.8.14 The letter abbreviation **BR** shall be used when the obstruction to vision consists of water droplets or ice crystals. For w′w′= **BR** to be reported, the visibility reported in the group VVVV shall be at least 1 000 metres but not more than 5 000 metres.

15.8.15 The letter abbreviation **FG** shall be used when the obstruction to vision consists of water droplets or ice crystals (fog or ice fog). For w′w′= **FG** to be reported without the qualifiers **MI**, **BC** or **VC**, the visibility reported in the group VVVV shall be less than 1 000 metres.

15.8.16 For w′w′= **MIFG** to be reported, the visibility at two metres above ground level shall be 1 000 metres or more and the apparent visibility in the fog layer shall be less than 1 000 metres.

15.8.17 The letter abbreviation **VCFG** shall be used to report any type of fog observed in the vicinity of the aerodrome.

15.8.18 The letter abbreviation **BCFG** shall be used to report fog patches and the letter abbreviation **PRFG** to report fog covering part of the aerodrome; the apparent visibility in the fog patch or bank shall be less than 1 000 metres, the fog extending to at least two metres above ground level.

Note: BCFG should be used only when the visibility in parts of the aerodrome is 1 000 metres or more although, when the fog is close to the observing point, the minimum visibility reported by $V_NV_NV_NV_ND_V$ will be less than 1 000 metres.

15.8.19 The letter abbreviation **SQ** shall be used to report squalls when a sudden increase in wind speed is observed of at least 16 knots (32 km h^{-1}, 8 m s^{-1}), the speed rising to 22 knots (44 km h^{-1}, 11 m s^{-1}) or more and lasting for at least one minute.

15.8.20 Regulation 15.10 shall apply.

15.9 **Group** $N_sN_sN_sh_sh_sh_s$ or **VV**$h_sh_sh_s$ or **NSC** or **NCD**

15.9.1 ***Cloud amount and cloud height*** $N_sN_sN_sh_sh_sh_s$

15.9.1.1 Cloud amount, cloud type and height of cloud base shall be reported to describe the clouds of operational significance, i.e. clouds with the height of base below 1500 meters (5000 ft) or below the highest minimum sector altitude, whichever is greater, or cumulonimbus or towering cumulus at any height. The cloud amount $N_sN_sN_s$ shall be reported as few (1 to 2 oktas), scattered (3 to 4 oktas), broken (5 to 7 oktas) or overcast (8 oktas), using the three-letter abbreviations FEW, SCT, BKN and OVC followed, without a space, by the height of the base of the cloud layer (mass) $h_sh_sh_s$. If there are no clouds below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, no cumulonimbus and no towering cumulus and no restriction on vertical visibility, and the abbreviations **CAVOK** is not appropriate, then the abbreviation **NSC** shall be used. When an automatic observing system is used and no clouds are detected by that system, the abbreviation **NCD** shall be used.

15.9.1.2 The amount of each cloud layer (mass) shall be determined as if no other clouds were existing.

15.9.1.3 The cloud group shall be repeated to report different layers or masses of cloud. The number of groups shall not exceed three, except that significant convective clouds, when observed, shall always be reported.

Note: The following clouds shall be reported as significant convective clouds:

(*a*) Cumulonimbus cloud (CB);

(*b*) Cumulus congestus of great vertical extent (TCU). The contraction TCU, taken from the term "towering cumulus", is an ICAO abbreviation used in aeronautical meteorology to describe this cloud.

15.9.1.4 The selection of layers or masses of cloud to be reported shall be made in accordance with the following criteria:

1st group:	the lowest individual layer (mass) of any amount, to be reported as FEW, SCT, BKN or OVC;
2nd group:	the next individual layer (mass) covering more than two oktas, to be reported as SCT, BKN or OVC;
3rd group:	the next higher individual layer (mass) covering more than four oktas, to be reported as BKN or OVC;
Additional groups:	significant convective clouds (CB or TCU) when observed and not already reported in one of the three groups above.

The order of reporting the groups shall be from lower to higher levels.

15.9.1.5 The height of cloud base shall be reported in steps of 30 m (100 ft) up to 3 000 m (10 000 ft). Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

Note: See Note (2) to Regulation 15.7.4.2.

15.9.1.6 When cumulonimbus clouds or towering cumulus clouds are detected by the automatic observing system and the cloud amount and the height of cloud base cannot be observed, the cloud amount and the height of cloud base should be replaced by //////.

15.9.1.7 Types of cloud other than significant convective clouds shall not be identified. Significant convective clouds, when observed, shall be identified by appending the letter abbreviations CB (cumulonimbus) or TCU (cumulus congestus of great vertical extent), as appropriate, to the cloud group without a space. When an automatic observing system is used and the cloud type cannot be observed by that system, the cloud type in each cloud group shall be replaced by ///.

Note: When an individual layer (mass) of cloud is composed of cumulonimbus and towering cumulus clouds with a common cloud base, the type of cloud should be reported as cumulonimbus only and the amount of clouds shall be encoded as the sum of the CB and TCU amounts.

15.9.2 Vertical visibility **VV**$h_s h_s h_s$

When the sky is obscured and information on vertical visibility is available, the group **VV**$h_s h_s h_s$ shall be reported, where $h_s h_s h_s$ is the vertical visibility in units of 30 metres (hundreds of feet). When information on vertical visibility is not available, the group shall read **VV**///.

Notes:

(1) The vertical visibility is defined as the vertical visual range into an obscuring medium.

(2) See Note (2) to Regulation 15.7.4.2.

15.9.3 Regulation 15.10 shall apply.

15.10 Code word CAVOK

The code word **CAVOK** shall be included in place of the groups under Regulations 15.6, 15.8 and 15.9, when the following conditions occur simultaneously at the time of observation:

(*a*) Visibility reported in the group VVVV is 10 km or more and criteria for inclusion of the group $V_NV_NV_NV_ND_V$ are not met;

(*b*) No cloud below 1 500 metres (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus and no towering cumulus;

(*c*) No significant weather phenomena (see Code table 4678).

Note: Highest minimum sector altitude is defined in ICAO PANS–OPS, Part 1 – *Definitions*, as the lowest altitude which may be used under emergency conditions which will provide a minimum clearance of 300 metres (1 000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 nautical miles) radius centred on a radio aid to navigation.

15.11 **Group** $T'T'/T'_dT'_d$

15.11.1 The observed air temperature and dew-point temperature rounded to the nearest whole degree Celsius shall be given for $T'T'/T'_dT'_d$. Observed values involving 0.5°C shall be rounded up to the next higher Celsius degree.

15.11.2 Rounded whole degree values of air temperature and dew-point temperature of –9°C to +9°C shall be preceded by 0; for example, +9°C shall be reported as 09.

15.11.3 Temperatures below 0°C shall be immediately preceded by M, that is minus; for example, –9°C shall be reported as M09 and –0.5°C shall be reported as M00.

15.12 **Group** **Q**$P_HP_HP_HP_H$

15.12.1 The observed QNH value rounded down to the nearest whole hectopascal shall be given for $P_HP_HP_HP_H$ preceded, without a space, by the letter indicator **Q**.

15.12.2 If the value of QNH is less than 1000 hPa, it shall be preceded by 0; for example, QNH 995.6 shall be reported as Q0995.

Notes:

(1) When the first digit following the letter indicator Q is either 0 or 1, the QNH value is reported in the unit hectopascal (hPa).

(2) The unit prescribed by ICAO Annex 5 for pressure is the hectopascal.

15.13 **Supplementary information – groups**

REw′w′ { **WS R**D_RD_R / or / **WS ALL RWY** } **(W**T_ST_S**/S**S′**)** **(R**D_RD_R/$E_RC_Re_Re_RB_RB_R$**)**

15.13.1 For international dissemination, the section on supplementary information shall be used only to report recent weather phenomena of operational significance, available information on wind shear in the lower layers and, subject to regional air navigation agreement, sea-surface temperature and state of the sea, and also subject to regional air navigation agreement, the state of the runway.

15.13.2 ***Recent weather phenomena of operational significance*** **RE**w′w′

15.13.2.1 Up to three groups of information on recent weather shall be given by the indicator letters **RE** followed, without a space, by the appropriate abbreviations, in accordance with Regulation 15.8 (but no intensity of the recent weather phenomena shall be indicated) if the following weather phenomena were observed during the period since the last routine report, or last hour, whichever is shorter, but not at the time of observation:

- Freezing precipitation;
- Moderate or heavy drizzle, rain or snow;
- Moderate or heavy: ice pellets, hail, small hail and/or snow pellets;
- Blowing snow;
- Sandstorm or duststorm;
- Thunderstorm;
- Funnel cloud(s) (tornado or water-spout);
- Volcanic ash.

When an automatic observing system is used and when the type of the precipitation cannot be identified by this system, the abbreviation **REUP** shall be used for recent precipitation. It may be combined with the characteristics of the present weather in accordance with Regulation 15.8.6.

15.13.3 ***Wind shear in the lower layers*** **WS R**D_RD_R or **WS ALL RWY**

Information on the existence of wind shear along the take-off path or approach path between one runway level and 500 metres (1 600 ft) significant to aircraft operations shall be reported whenever available and if local circumstances so warrant, using the group set **WS R**D_RD_R repeated as necessary. If the wind shear along the take-off path or approach path is affecting all runways in the airport, **WS ALL RWY** shall be used.

Note: Concerning runway designator D_RD_R, Regulation 15.7.3 applies.

15.13.4 Supplementary information other than specified by Regulations 15.13.2 and 15.13.3 shall be added only in accordance with regional decision.

15.13.5 Sea-surface temperature and the state of the sea (**W**T_ST_S**/S**S′**)**

15.13.5.1 The sea-surface temperature shall, by regional agreement, be reported according to the regional ICAO Regulation 15.11. The state of the sea shall be reported in accordance with Code table 3700.

15.13.6 State of the runway (**R**D_RD_R/$E_RC_Re_Re_RB_RB_R$)

15.13.6.1 Subject to regional air navigation agreement, information on the state of the runway provided by the appropriate airport authority shall be included. The runway deposits E_R, the extent of runway contamination C_R, the depth of deposit e_Re_R and the friction coefficient/braking action B_RB_R shall be indicated in accordance with code tables 0919, 0519, 1079 and 0366, respectively. The state of the runway group shall be replaced by the abbreviation SNOCLO when the aerodrome is closed due to extreme deposit of snow. If contaminations on a single runway or on all runways at an aerodrome have ceased to exist, this should be reported by replacing the last six digits of the group by CLRD//.

Note: Concerning runway designator D_RD_R, Regulation 15.7.3 applies. Additional code figures 88 and 99 are reported in accordance with the European Air Navigation Plan, FASID, Part III-AOP, Attachment A.

15.14 Trend forecasts

Note: The governing criteria for issuing trend forecasts are specified in publication WMO-No. 49 – *Technical Regulations* [C.3.1].

15.14.1 When included in METAR or SPECI reports, the trend forecasts shall be in coded form.

15.14.2 When a change, required to be indicated in accordance with the governing criteria for significant changes, is expected for one or several of the observed elements — wind, horizontal visibility, present weather, clouds or vertical visibility — one of the following change indicators shall be used for TTTTT: **BECMG** or **TEMPO**.

Note: Where possible, values corresponding to the local operating minima should be selected to indicate changes.

15.14.3 The time group GGgg, preceded without a space by one of the letter indicators TT = FM (from), TL (until) or AT (at), shall be used as appropriate, to indicate the beginning (FM) or the end (TL) of a forecast change, or the time (AT) at which specific forecast condition(s) is (are) expected.

15.14.4 The change indicator **BECMG** shall be used to describe expected changes to meteorological conditions which reach or pass specified threshold criteria at either a regular or irregular rate.

15.14.5 Changes in meteorological conditions which reach or pass specified threshold criteria for trend forecasts shall be indicated as follows:

(*a*) When the change is forecast to begin and end wholly within the trend forecast period: by the change indicator BECMG followed by the letter indicators FM and TL respectively with their associated time groups, to indicate the beginning and end of the change (for example, for a trend forecast period from 1000 to 1200 UTC in the form: **BECMG** FM1030 TL1130);

(*b*) When the change is forecast to occur from the beginning of the trend forecast period and be completed before the end of that period: by the change indicator BECMG followed only by the letter indicator TL and its associated time group (the letter indicator FM and its associated time group being omitted), to indicate the end of the change (for example: **BECMG** TL1100);

(*c*) When the change is forecast to begin during the trend forecast period and be completed at the end of that period: by the change indicator BECMG followed only by the letter indicator FM and its associated time group (the letter indicator TL and its associated time group being omitted), to indicate the beginning of the change (for example: **BECMG** FM1100);

(*d*) When it is possible to specify a time for the change to occur during the trend forecast period: by the change indicator BECMG followed by the letter indicator AT and its associated time group, to indicate the time of the change (for example: **BECMG** AT1100);

(*e*) When changes are forecast to take place at midnight UTC, the time shall be indicated:

(i) By 0000 when associated with FM and AT;

(ii) By 2400 when associated with TL.

15.14.6 When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period, or when the change is forecast to occur within the trend forecast period but the time of the change is uncertain (possibly shortly after the beginning of the trend forecast period, or midway or near the end of that period), the change shall be indicated by only the change indicator **BECMG** (letter indicator(s) FM and TL or AT and associated time group(s) being omitted).

15.14.7 The change indicator **TEMPO** shall be used to describe expected temporary fluctuations to meteorological conditions which reach or pass specified threshold criteria and last for a period of less than one hour in each instance and in the aggregate cover less than half of the forecast period during which the fluctuations are expected to occur.

15.14.8 Periods of temporary fluctuations to meteorological conditions which reach or pass specified threshold criteria shall be indicated as follows:

(*a*) When the period of temporary fluctuations is forecast to begin and end wholly within the trend forecast period: by the change indicator **TEMPO** followed by the letter indicators FM and TL respectively with their associated time groups, to indicate the beginning and end of the fluctuations (for example, for a trend forecast period from 1000 to 1200 UTC in the form: **TEMPO** FM1030 TL1130);

(*b*) When the period of temporary fluctuations is forecast to occur from the beginning of the trend forecast period but cease before the end of that period: by the change indicator **TEMPO** followed only by the letter indicator TL and its associated time group (the letter indicator FM and its associated time group being omitted), to indicate the cessation of the fluctuations (for example: **TEMPO** TL1130);

(*c*) When the period of temporary fluctuations is forecast to begin during the trend forecast period and cease by the end of that period: by the change indicator **TEMPO** followed only by the letter indicator FM and its associated time group (the letter indicator TL and its associated time group being omitted), to indicate the beginning of the fluctuation (for example: **TEMPO** FM1030).

15.14.9 When the period of temporary fluctuations to meteorological conditions is forecast to occur from the beginning of the trend forecast period and cease by the end of that period, the temporary fluctuations shall be indicated by only the change indicator TEMPO (letter indicators FM and TL and associated time groups being omitted).

15.14.10 Following the change groups TTTTT TTGGgg, only the group(s) referring to the element(s) which is (are) forecast to change significantly shall be included. However, in the case of significant changes of the clouds, all cloud groups, including any significant layer(s) or masses not expected to change, shall be given.

15.14.11 Regulation 15.5.6 shall apply.

15.14.12 Inclusion of significant forecast weather w'w', using the appropriate abbreviations in accordance with Regulation 15.8, shall be restricted to indicate:

(1) the onset, cessation or change in intensity of the following weather phenomena:
- Freezing precipitation;
- Moderate or heavy precipitation (including showers);
- Duststorm;
- Sandstorm;
- Thunderstorm (with precipitation)

(2) the onset or cessation of the following weather phenomena:
- Freezing fog;
- Ice crystals;
- Low drifting dust, sand or snow;
- Blowing dust, sand or snow;
- Thunderstorm (without precipitation);
- Squall;
- Funnel cloud (tornado or waterspout).

15.14.13 To indicate the end of significant weather phenomena w´w´, the abbreviation **NSW** (Nil Significant Weather) shall replace the group w´w´.

15.14.14 When no cloud below 1500 metres (5000 ft) or the highest minimum sector altitude, whichever is greater, and no cumulonimbus and no towering cumulus are forecast, and **CAVOK** is not appropriate, the abbreviation **NSC** shall be used.

15.14.15 When none of the elements listed in Regulation 15.14.2 is expected to change significantly as to require a change to be indicated, this shall be indicated by the code word **NOSIG**. **NOSIG** (no significant change) shall be used to indicate meteorological conditions which do not reach or pass specified threshold criteria.

15.15 **Group** (**RMK** .....)

The indicator **RMK** denotes the beginning of a section containing information included by national decision which shall not be disseminated internationally.

FM 18–XII BUOY Report of a buoy observation

C O D E F O R M :

SECTION 0 $M_iM_iM_jM_j$ $A_1b_wn_bn_bn_b$ YYMMJ GGgg_iw $Q_cL_aL_aL_aL_a$
$L_oL_oL_oL_oL_o$ $(6Q_lQ_tQ_A/)$

SECTION 1 $(111Q_dQ_x$ 0ddff 1s_nTTT $\left\{\begin{array}{l}2s_nT_dT_dT_d\\ \text{or}\\ 29UUU\end{array}\right\}$ $3P_0P_0P_0P_0$
4PPPP 5appp)

SECTION 2 $(222Q_dQ_x$ $0s_nT_wT_wT_w$ $1P_{wa}P_{wa}H_{wa}H_{wa}$ $20P_{wa}P_{wa}P_{wa}$ $21H_{wa}H_{wa}H_{wa})$

SECTION 3 $(333Q_{d1}Q_{d2}$ $(8887k_2$ $2z_0z_0z_0z_0$ $3T_0T_0T_0T_0$ $4S_0S_0S_0S_0$
. . . .
$2z_nz_nz_nz_n$ $3T_nT_nT_nT_n$ $4S_nS_nS_nS_n)$
$(66k_69k_3$ $2z_0z_0z_0z_0$ $d_0d_0c_0c_0c_0$
. . . .
$2z_nz_nz_nz_n$ $d_nd_nc_nc_nc_n))$

SECTION 4 $(444$ $(1Q_PQ_2Q_{TW}Q_4)$ $(2Q_NQ_LQ_AQ_z)\left\{\begin{array}{l}(Q_cL_aL_aL_aL_a \quad L_oL_oL_oL_oL_o)\\ \text{or}\\ (\text{YYMMJ GGgg/})\end{array}\right\}$
$(3Z_hZ_hZ_hZ_h\ 4Z_cZ_cZ_cZ_c)$ $(5B_tB_tX_tX_t)$
$(6A_hA_hA_hA_N)$ $(7V_BV_Bd_Bd_B)$ $(8V_iV_iV_iV_i)$ $(9/Z_dZ_dZ_d))$

SECTION 5 (555 Groups to be developed nationally)

Notes:

(1) BUOY is the name of the code for reporting buoy observations.

(2) A BUOY report, or a bulletin of BUOY reports, is identified by the group $M_iM_iM_jM_j$ = ZZYY.

(3) The inclusion of the group $9/Z_dZ_dZ_d$ is strongly recommended for buoys which have been deployed with drogues.

(4) The group $9/Z_dZ_dZ_d$ should not be used in reports from a buoy on which a drogue has never been installed.

(5) The code form is divided into six sections, the first being mandatory in its entirety, except group $6Q_lQ_tQ_A/$, and the remainder optional as data are available:

Section number	*Symbolic figure group*	*Contents*
0	—	Identification, time and position data
1	111	Meteorological and other non-marine data
2	222	Surface marine data
3	333	Temperatures, salinity and current (when available) at selected depths
4	444	Information on engineering and technical parameters, including quality control data
5	555	Data for national use

R E G U L A T I O N S :

18.1 General

The code name BUOY shall not be included in the report.

18.2 Section 0

18.2.1 All groups in Section 0 are mandatory, except group $6Q_lQ_tQ_A$/, and shall be included in each report, even if no other data are reported.

18.2.2 Each individual BUOY report, even if included in a bulletin of such reports, shall contain as the first group the identification group $M_iM_iM_jM_j$.

18.2.3 ***Group*** $A_1b_wn_bn_bn_b$

Only buoy numbers ($n_bn_bn_b$) 001 through 499 are assigned. In the case of a drifting buoy, 500 shall be added to the original $n_bn_bn_b$ number.

N O T E S :

(1) A_1b_w normally corresponds to the maritime zone in which the buoy was deployed. The WMO Secretariat allocates to Members, who request and indicate the maritime zone(s) of interest, a block or blocks of serial numbers ($n_bn_bn_b$) to be used by their environmental buoy stations.

(2) The Member concerned registers with the WMO Secretariat the serial numbers actually assigned to individual stations together with their geographical positions of deployment.

(3) The Secretariat informs all concerned of the allocation of serial numbers and registrations made by individual Members.

18.2.4 ***Groups*** $Q_cL_aL_aL_aL_a$ $L_oL_oL_oL_oL_o$

Position shall be reported in tenths, hundredths or thousandths of a degree, depending on the capability of the positioning system. When the position is in tenths of a degree, the groups shall be encoded as $Q_cL_aL_aL_a$// $L_oL_oL_oL_o$//. When the position is in hundredths of a degree, the groups shall be encoded as $Q_cL_aL_aL_aL_a$/ $L_oL_oL_oL_oL_o$/.

18.2.5 ***Group*** ($6Q_lQ_tQ_A$/)

$Q_lQ_tQ_A$ are quality control indicators. Q_l and Q_A apply to position and Q_t to time.

18.3 Section 1

18.3.1 Each of the groups in Section 1 shall be included for all parameters that have been measured, when data are available.

18.3.2 When data are missing for all groups, the entire section shall be omitted from the report.

18.3.3 ***Group*** $111Q_dQ_x$

Q_d is a quality control indicator for the section. If all data groups have the same quality control flag value, Q_d shall be coded with that value and Q_x shall be set to 9. If only one data group in the section has a quality control flag other than 1, Q_d shall be coded with that flag and Q_x shall indicate the position of this group within the section. If more than one data group have a quality control flag greater than 1, Q_d shall be set to the greater flag value and Q_x shall be set to 9.

Note: When Q_x shows the position of the data group, it should be relative to the group containing Q_x. For example, Q_x = 1 refers to the data group immediately following.

18.4 **Section 2**

18.4.1 Each of the groups in Section 2 shall be included for all parameters that have been measured, when data are available.

18.4.2 When data are missing for all groups, the entire section shall be omitted from the report.

18.4.3 ***Group*** $222Q_dQ_x$

Regulation 18.3.3 shall apply.

18.5 **Section 3**

18.5.1 ***General***

Section 3 is in two parts. The first part, identified by the indicator group $8887k_2$, shall be used to report temperatures and/or salinity at selected depths. The second part, identified by the indicator group $66k_69k_3$, shall be used to report current at selected depths. Either or both parts shall be transmitted, depending on the availability of the temperature and/or salinity data for the first part and of the current data for the second part.

18.5.2 Temperatures shall be reported in hundredths of a degree Celsius. When accuracy is limited to tenths of a degree, data shall be encoded using the general form $3T_nT_nT_n/$.

18.5.3 ***Group*** $333Q_{d1}Q_{d2}$

$Q_{d1}Q_{d2}$ are two quality control indicators. Q_{d1} is used to indicate the quality of the temperature and salinity profile and Q_{d2} is used to indicate the quality of the current speed and direction profile.

18.6 **Section 4**

18.6.1 ***General***

Additional groups in this section shall be included as data are available or required.

18.6.2 ***Group*** $(1Q_PQ_2Q_{TW}Q_4)$

When Q_P, Q_2, Q_{TW} and Q_4 = 0, the corresponding group shall not be transmitted. Its absence thus indicates a satisfactory general operation.

18.6.3 ***Group*** $(2Q_NQ_LQ_AQ_z)$

Q_N gives the quality of the satellite transmission. Q_L and Q_A are indicators on the quality of location. Q_z indicates whether or not probe depths as reported in Section 3 are corrected using hydrostatic pressure.

18.6.4 In Section 4, pressure of fields $(Q_cL_aL_aL_aL_aL_a\ L_oL_oL_oL_oL_oL_o)$ and (YYMMJ GGgg/) is driven by the value of the Q_L indicator:

(*a*) Group $2Q_NQ_LQ_AQ_z$ absent: fields $(Q_cL_aL_aL_aL_aL_a\ L_oL_oL_oL_oL_oL_o)$ and (YYMMJ GGgg/) not coded;

(*b*) Q_L = 1: fields YYMMJ GGgg/ coded (fields $Q_cL_aL_aL_aL_aL_a\ L_oL_oL_oL_oL_oL_o$ absent);

(*c*) Q_L = 2: fields $Q_cL_aL_aL_aL_aL_a\ L_oL_oL_oL_oL_oL_o$ coded (fields YYMMJ GGgg/ absent.

18.6.5 ***Group*** $(Q_cL_aL_aL_aL_aL_a)$

This group shall be transmitted only when Q_L = 2 (location over one pass only). It gives the latitude of the second possible solution (symmetrical to the satellite subtrack).

Note: Same coding as in Section 0.

18.6.6 ***Group*** ($L_oL_oL_oL_oL_oL_o$)

This group shall be transmitted only when $Q_L = 2$ and it gives the longitude of the second possible position, the latitude being indicated by the previous group.

Note: Same coding as in Section 0.

18.6.7 ***Groups*** (YYMMJ GGgg/)

The groups YYMMJ GGgg/ give the exact time of the last known position and shall be transmitted only when $Q_L = 1$ together with the following group $7V_BV_Bd_Bd_B$.

18.6.8 ***Group*** ($3Z_hZ_hZ_hZ_h$)

Hydrostatic pressure of lower end of cable. Pressure is expressed in units of kPa (kilopascal, i.e. centibars). If group ($3Z_hZ_hZ_hZ_h$) is present, then group ($4Z_cZ_cZ_cZ_c$) is mandatory.

18.6.9 ***Group*** ($4Z_cZ_cZ_cZ_c$)

Length of cable in metres (thermistor strings).

18.6.10 ***Group*** ($5B_tB_tX_tX_t$)

Group ($5B_tB_tX_tX_t$) should be omitted if buoy-type and drogue-type information is not available.

18.6.11 ***Group*** ($6A_hA_hA_hA_N$)

Group 6 ($6A_hA_hA_hA_N$) should be omitted if the buoy is not reporting wind or if the information is not available for both anemometer height and anemometer type. $A_hA_hA_h$ is the anemometer height above station level. Height is expressed in decimetres. For drifting and moored buoys, station level is assumed to be sea level. /// shall be used for unknown values. A value of 999 shall be used to say that anemometer height is artificially corrected to 10 metres by applying a formula.

18.6.12 ***Group*** ($7V_BV_Bd_Bd_B$)

This group shall be transmitted only when $Q_L = 1$.

Example: At the last location, the true direction of the buoy is 47° and its speed is 13 cm s^{-1} — the group is coded 71304.

18.6.13 ***Group*** ($8V_iV_iV_iV_i$)

The number of groups $8V_iV_iV_iV_i$ containing information on the engineering status of the buoy shall not exceed three.

Notes:

(1) The physical equivalent of the value $V_iV_iV_iV_i$ will be different from one buoy to another.

(2) Interpretation of these groups will not be necessary to permit use of the meteorological data.

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FM 20–VIII RADOB Report of ground radar weather observation

C O D E F O R M :

Part A

$M_iM_iM_jM_j$	YYGGg	IIiii or $99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$
$4R_wL_aL_aL_a$	$Q_cL_oL_oL_oL_o$	$A_CS_CW_Ca_Cr_t$	$t_ed_sd_sf_sf_s$
D . . . . D			

Part B

SECTION 1	$M_iM_iM_jM_j$	YYGGg	IIiii or $99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$
	$N_eN_eW_RH_eI_e$	. . . . .	. . . . .	$N_eN_eW_RH_eI_e$
	/555/	$N_eN_ea_eD_ef_e$	. . . . .	$N_eN_ea_eD_ef_e$
SECTION 2	51515	Code groups to be developed regionally		
SECTION 3	61616	Code groups to be developed nationally		
	D . . . . D			

Notes:

(1) RADOB is the name of the code for reporting ground radar weather observations.

(2) A RADOB report from a land station is identified by M_iM_i = FF, a RADOB report from a sea station by M_iM_i = GG.

(3) The code form is divided into two parts:

Part	*Identifier letters* (M_jM_j)	*Contents*
A	AA	Information on tropical cyclone
B	BB	Information on significant features

Each part can be transmitted separately.

(4) Part B is divided into three sections:

Section number	*Symbolic figure group*	*Contents*
1	—	Identification and position data; information on significant features
2	51515	Code groups to be developed regionally
3	61616	Code groups to be developed nationally

R E G U L A T I O N S :

20.1 General

20.1.1 The code name RADOB shall not be included in the report.

20.1.2 The call sign D . . . . D shall be included only in RADOB reports from sea stations.

20.2 Part A

20.2.1 Part A shall be used whenever the observed echo pattern is recognized as relating to a tropical cyclone.

20.2.2 ***Groups*** $4R_wL_aL_aL_a\ Q_cL_oL_oL_oL_o$

The position of the centre, or the eye, of the tropical cyclone shall be reported by means of the groups $4R_wL_aL_aL_a\ Q_cL_oL_oL_oL_o$.

20.2.3 ***Group*** $A_CS_CW_Ca_Cr_t$

20.2.3.1 The characteristics as regards size, development and relative location of the centre or the eye of the tropical cyclone shall be reported by the group $A_CS_CW_Ca_Cr_t$.

20.2.3.2 Whenever doubt exists as to the location of the eye or whether the outermost spiral band is indeed visible on the radar scope, r_t shall be coded as /.

20.2.4 ***Group*** $t_ed_sd_sf_sf_s$

20.2.4.1 Information on the movement of the centre, or eye, of the tropical cyclone shall be included in the report by means of the group $t_ed_sd_sf_sf_s$.

20.2.4.2 If no information on the movement of the centre, or eye, of the tropical cyclone is available, the group $t_ed_sd_sf_sf_s$ shall be coded as /////.

20.3 Part B

20.3.1 In Part B, one series of groups $N_eN_eW_RH_eI_e$ shall be used to report the location of phenomena and/or clouds and their characteristics. Group $N_eN_eW_RH_eI_e$ shall be repeated as necessary for a full description of the spatial distribution of the echo on the radar scope in 60 × 60 km squares.

20.3.2 ***Group*** $N_eN_eW_RH_eI_e$

20.3.2.1 Characteristics concerning the location, type of phenomena and/or clouds and the elevation and intensity of their echoes shall be reported by groups $N_eN_eW_RH_eI_e$.

20.3.2.2 Groups $N_eN_eW_RH_eI_e$ shall be included in the report in the rising order of the squares´ sequential numbers N_eN_e.

20.3.2.3 If several weather phenomena were observed in a single 60 × 60 km square, the most dangerous phenomenon shall be reported in W_R, the highest echo elevation in H_e and the greatest echo intensity in I_e.

20.3.2.4 Cloud type data (W_R) shall be reported only if no weather phenomena were observed in the 60 × 60 km square.

20.3.2.5 Data on stratiform cloud without precipitation shall be reported if it occupies no less than $^1/_4$ of the 60 × 60 km square´s area.

20.3.2.6 Data on convective cloud shall be reported irrespective of the centres´ dimensions within the limits of the 60 × 60 km square.

20.3.2.7 If, in the 60 × 60 km square, convective and stratiform clouds were observed, only data on the convective clouds shall be reported.

20.3.2.8 Cloud echo intensity (I_e) shall be coded as /.

20.3.3 ***Group*** $N_eN_ea_eD_ef_e$

20.3.3.1 Characteristics concerning change and movement of the echo pattern shall be reported by groups $N_eN_ea_eD_ef_e$, preceded by the identifier group /555/.

20.3.3.2 Group $N_eN_ea_eD_ef_e$ shall be used to report the evolutionary characteristics of no more than three echo patterns. The identifier group /555/ shall not be repeated.

20.3.3.3 N_eN_e shall be used to report the number of the 60 × 60 km square in which the radar operator placed the origin of the speed vector characterizing the direction of movement D_e of the echo pattern. If only the tendency of the echo pattern a_e has been estimated, the number of any square covered by the pattern shall be reported in N_eN_e.

20.3.3.4 The tendency of the echo pattern a_e shall be estimated over a period of approximately one hour, but not longer than 90 minutes and not shorter than 30 minutes. The echo area shall be considered as increasing or diminishing if it changes by more than 25 per cent over a period of time not exceeding 90 minutes.

20.3.3.5 If no information is available on the change and movement of the echo, groups /555/ and $N_eN_ea_eD_ef_e$ shall not be included in the report.

20.3.3.6 The movement of individual echoes in the echo pattern shall not be reported.

20.3.4 ***Reporting of inoperative equipment, anomalous propagation and absence of an echo***

In the case of inoperative equipment, anomalous propagation or absence of an echo on the radar scope, groups $N_eN_eW_RH_eI_e$, /555/ and $N_eN_ea_eD_ef_e$ shall be replaced by one of the following groups, as appropriate:

0/0/0 Radar equipment inoperative; or
0//// Anomalous propagation; or
00000 No echo visible on radar scope.

FM 22–IX Ext. RADREP Radiological data report (monitored on a routine basis and/or in case of accident)

C O D E F O R M :

SECTION 0 RADREP { IIiii* / or / D . . . . D** / or / $A_1b_wn_bn_bn_b$ } $Y_rY_rG_rG_ra_5$ $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$

SECTION 1 111AA MMJJJ $Y_aY_aG_aG_ag_ag_a$ $L_a{}^1L_a{}^1L_a{}^1L_a{}^1A$ $L_o{}^1L_o{}^1L_o{}^1L_o{}^1L_o{}^1B$
$4A_aB_TR_cR_cR_cR_c$ $5A_cA_eE_cE_sE_e$ $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$ { $(7h_ah_ah_ah_a)$ / or / $(7h_eh_eh_eh_e)$ }
$(8d_{ta}d_{ta}d_{ta}f_{ta}f_{ta})$ $(9d_{tw}d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa)

SECTION 2 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ (5nnnIS) $6XXXs_naa$ $(7XXXs_naa)$

SECTION 3 333 $GGggi_w$ (ddfff) (5nnnIS) $6XXXs_naa$

SECTION 4 444 $GGggi_w$ (Nddff) (00fff) $(1s_nTTT)$ $(2s_nT_dT_dT_d)$ $(3P_0P_0P_0P_0)$
$(6RRRt_R)$ (7wwW/) (80000 $0d_ad_ad_cd_c$)

SECTION 5 555 TTGGgg $4A_aB_TR_cR_cR_cR_c$ $5A_cA_eE_cE_sE_e$ $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$
{ $(7h_ah_ah_ah_a)$ / or / $(7h_eh_eh_eh_e)$ } $(8d_{ta}d_{ta}d_{ta}f_{ta}f_{ta})$ $(9d_{tw}d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa) $122R_pI_n$

SECTION 6 666 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ (5nnnIS) $6XXXs_naa$ $(7XXXs_naa)$

SECTION 7 777 TTGGgg (Nddff) (00fff) $(1s_nTTT)$ $(6RRRt_R)$ (7ww//)

Notes:

(1) RADREP is the name of the code for reporting radiological data monitored on a routine basis and/or in case of an accident. A RADREP report may have a trend forecast appended.

(2) A RADREP report, or a bulletin of RADREP reports, is identified by the word RADREP.

(3) Relevant groups of Section 0, the first three groups and the group $6XXXs_naa$ of Section 2 are always included in a report of radiological data from a surface observing station. Section 1 is only included when data on accident notification is reported.

(4) Relevant groups of Section 0, the first two groups and the group $6XXXs_naa$ of Section 3 are always included in a report of radiological data from an airborne observing station.

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* Included in a fixed land station report only.
** Included in a sea or mobile land station report only.

(5) The code form is divided into seven sections:

Section number	*Symbolic figure group*	*Contents*
0	—	Identification and position data (ship's call sign/buoy identifier, date and reporting time, location and elevation/altitude), type of report and unit of reported radiological quantity
1	111AA	Data on accident notification: activity or facility involved, date and time of accident, location of accident, early notification convention article applicable, type and composition of release, cause and evolution of incident, characteristics, state and evolution of release, possible health effect, protective measures taken with its radius, actual or effective release height, main transport in atmosphere and/or water, and discharge of receiving water body
2	222	Data on date and time of start and end of monitoring (when relevant, isotope mass and element name), observed radiological quantity, dose on land surface and density of deposits from a surface observing station
3	333	Data on time of monitoring, unit of wind speed, upper wind (when relevant, isotope mass and element name) and observed radiological quantity from an airborne observing station
4	444	Data on time of observed meteorological conditions, unit of wind speed, total cloud cover, surface wind, temperature, dew point, station pressure, precipitation and related duration, weather and variation of surface wind direction
5	555	Data on forecast trend of accident in next six hours: time or period of expected change, early notification convention article applicable, type and composition of release, cause and evolution of incident, characteristics, state and evolution of release, possible health effect, protective measures to be taken and its radius, actual or effective release height, main transport in atmosphere and/or water, discharge of receiving water body, and possibility that plume will encounter precipitation and/or change in wind
6	666	Data on forecast trend of radiological quantity in next six hours: date and time (when relevant, isotope mass and element name), expected radiological quantity, expected dose on land surface and density of deposits
7	777	Data on forecast trend in surface meteorological conditions in next six hours: time or period of expected change, total cloud cover, surface wind, temperature, precipitation and related duration, and weather

R E G U L A T I O N S :

22.1 General

22.1.1 The code name RADREP shall be included at the beginning of an individual RADREP report. In the case of a bulletin, which may consist of more than one RADREP report, the code name RADREP shall be included in the first line of the text of the bulletin, and the identification, date, reporting time, type of report and position groups shall be included in every individual report.

Note: See Regulation 12.1.7.

22.1.2 ***Groups*** { IIiii* / or / D . . . . D** / or / $A_1b_wn_bn_bn_b$ } $Y_rY_rG_rG_ra_5$ $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$

Note: See Regulation 18.2.3, Notes (1), (2) and (3).

The identification and position of a fixed land station shall be indicated by means of the group IIiii. The identification of a sea or mobile land station shall be indicated by the group D . . . . D or $A_1b_wn_bn_bn_b$. The position and elevation/altitude of fixed and mobile land stations, sea stations or airborne observing stations shall be indicated by the groups $L_aL_aL_aL_aA$ $L_oL_oL_oL_oL_oB$ $h_rh_rh_rh_ri_h$.

22.1.3 ***Use of sections***

22.1.3.1 Accident notification reports shall always contain at least Sections 0 and 1. When the report contains environmental (on site) radiological monitoring results and/or meteorological monitoring results, that report shall also include Sections 2 and/or 4, respectively.

22.1.3.2 Environmental radiological data monitoring results reports from surface observing stations of a routine nature or activated following an accident shall always contain at least Sections 0 and 2. When in addition the report contains meteorological monitoring results, that report shall also include Section 4.

22.1.3.3 In radiological data monitoring results reports of gamma dose in air along the main transport path (defined location and time period), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ 6XXX$s_n$aa.

22.1.3.4 In radiological data monitoring results reports of air concentration (of named isotope type including gross beta), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ 5nnnIS 6XXX$s_n$aa.

22.1.3.5 In radiological data monitoring results reports of concentration in precipitation (of named isotope type), Section 2 shall contain the groups 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$ 5nnnIS 6XXX$s_n$aa, and Section 4 at least the groups 444 6RRRt_R.

22.1.3.6 When relevant forecast data are available, Sections 5, 6 and/or 7 shall be appended as appropriate to an accident notification report or an environmental radiological data monitoring report, to indicate expected changes in radiological and/or meteorological conditions in the next six hours.

22.2 Section 1 — Data on accident notification

22.2.1 ***Group*** 111AA

This group shall always be included in accident notification reports. AA shall be encoded in accordance with Code table 0177 — Activity or facility involved in incident.

22.2.2 ***Groups*** MMJJJ $Y_aY_aG_aG_ag_ag_a$ $L_a{}^1L_a{}^1L_a{}^1L_a{}^1A$ $L_o{}^1L_o{}^1L_o{}^1L_o{}^1L_o{}^1B$

These groups shall always be included in accident notification reports to give the date, time and location of the accident: month, three last digits of year, day of the month, hours and minutes in UTC, latitude and longitude in degrees and minutes.

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* Included in a fixed land station report only.

** Included in a sea or mobile land station report only.

22.2.3 ***Group*** $4A_aB_TR_cR_cR_cR_c$

This group shall always be included in accident notification reports. A_a shall be encoded in accordance with Code table 0131 — Accident early notification – article applicable. B_T shall be encoded in accordance with Code table 0324 — Type of release. $R_cR_cR_cR_c$ shall be encoded such that each R_c is in accordance with Code table 3533 — Composition of release, so that a combination of up to four elements shall be reported in order of significance. If less than four elements are to be reported, the group shall be completed with solidi (/).

22.2.4 ***Group*** $5A_cA_eE_cE_sE_e$

This group shall always be included in accident notification reports. A_c shall be encoded in accordance with Code table 0133 — Cause of incident; A_e in accordance with Code table 0135 — Incident situation; E_c in accordance with Code table 0933 — Characteristics of release; E_s in accordance with Code table 0943 — State of current or expected release; and E_e in accordance with Code table 0935 — Release behaviour over time.

22.2.5 ***Group*** $6R_eP_aD_{Pa}D_{Pa}D_{Pa}D_{Pa}$

This group shall always be included in accident notification reports. R_e shall be encoded in accordance with Code table 3535 — Possibility of significant chemical toxic health effect; and P_a in accordance with Code table 3131 — Countermeasures taken near border.

Note: This group may be repeated as necessary, e.g. if more than one protective measure is to be indicated.

22.2.6 ***Groups*** $\left\{\begin{array}{l}(7h_ah_ah_ah_a)\\ \text{or}\\ (7h_eh_eh_eh_e)\end{array}\right\}(8d_{ta}d_{ta}d_{ta}f_{ta}f_{ta})$

If release is not ground-level release and relevant data are available, these groups shall be included in accident notification reports to give either the actual release height or the effective release height, in metres, the main transport direction in atmosphere, in degrees from north, and the main transport speed in atmosphere, in metres per second.

22.2.7 ***Groups*** $(9d_{tw}d_{tw}d_{tw}f_{tw}f_{tw})$ (0qqq0aa)

If release is to water and relevant data are available, these groups shall be included in accident notification reports to give the main transport direction in water, in degrees from north, and the main transport speed in water, in metres per second, and the discharge of the main receiving water body, in cubic metres per second, as appropriate.

22.3 **Section 2 — Radiological monitoring data from a surface observing station**

22.3.1 ***Groups*** 222 $Y_sY_sG_sG_sg_sg_s$ $Y_eY_eG_eG_eg_eg_e$

These groups shall always be included in radiological data monitoring result reports or accident reports to give the day and time of start and day and time of end, in hours and minutes UTC, of monitoring operations or release.

22.3.2 ***Group*** (5nnnIS)

22.3.2.1 The group 5nnnIS shall be included in either radiological data monitoring result reports of air concentration of named isotope type including gross beta or to give the isotope mass and element name.

Notes:

(1) This group may be repeated as necessary, e.g. if more than one isotope is to be included.

(2) See Regulation 22.1.3.5.

22.3.2.2 The group 5nnnIS shall be omitted from the report in radiological data monitoring results of gamma dose in air along the main transport path for defined location and time.

22.3.3 ***Group*** 6XXX$s_n$aa

This group shall always be included in radiological data monitoring results reports or accident reports to give the three most significant digits of the reported monitored radiological quantity or estimated release quantity followed, without a space, by the sign of the exponent (s_n) and the decimal exponent (aa). The type of report and the unit of the reported radiological quantity shall be indicated by a_5 in the group $Y_rY_rG_rG_ra_5$ of Section 0.

Note: See Note (1) to Regulation 22.3.2.1.

22.3.4 ***Group*** (7XXX$s_n$aa)

If relevant data are available, this group shall be included in reports of radiological data monitoring results to give the dose of gamma radiation or the density of deposits (total beta activity) on land surface.

22.4 Section 3 — Radiological monitoring data from an airborne observing station

22.4.1 Inclusion of groups of Section 3 shall be determined by national decision.

22.4.2 Section 3 shall always be preceded by Section 0.

22.4.3 ***Group*** (5nnnIS)

This group shall be included in radiological data monitoring results of air concentration of named isotope type followed by the group 6XXX$s_n$aa (radiological quantity of the isotope).

Note: See Note (1) to Regulation 22.3.2.1.

22.4.4 ***Group*** 6XXX$s_n$aa

Regulation 22.3.3 shall apply.

22.5 Section 4 — Meteorological monitoring data

22.5.1 If meteorological data are available, relevant groups of this section shall be included in a radiological data report.

Note: See Regulation 22.1.3.5.

22.5.2 ***Group*** (6RRRt_R)

22.5.2.1 When no precipitation occurred during the reference period, RRR shall be encoded 000.

22.5.2.2 When precipitation occurred during the reference period but the amount of precipitation has not been measured, RRR shall be encoded ///.

22.5.3 ***Groups*** (80000 0$d_ad_ad_cd_c$)

If relevant data are available, these groups shall be included in addition to the group Nddff or the groups Nddff 00fff, as the case may be, to give the variation in wind direction.

Note: Variation and mean wind direction are measured over the 10-minute period immediately preceding the observation.

22.6 Section 5 — Accident behaviour over time

22.6.1 ***Group*** TTGGgg

The time group GGgg, preceded without a space by one of the letter indicators TT = FM (from) or AT (at), shall be used, as appropriate, to indicate the beginning (FM) of a forecast

change, or the time (AT) at which specific forecast conditions are expected.

22.6.2 ***Group*** 122$R_p I_n$

This group shall be included to indicate the possibility that a plume will encounter precipitation in the State in which the incident occurred and whether the plume will encounter a change in wind direction and/or speed. R_p shall be encoded in accordance with Code table 3548, and I_n in accordance with Code table 1743.

FM 32–XI Ext. PILOT **Upper-wind report from a fixed land station**

FM 33–XI Ext. PILOT SHIP **Upper-wind report from a sea station**

FM 34–XI Ext. PILOT MOBIL **Upper-wind report from a mobile land station**

C O D E F O R M :

Part A

SECTION 1	$M_iM_iM_jM_j$	D . . . . D**	$YYGGa_4$		
		IIiii* or $99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$	$MMMU_{La}U_{Lo}$**	$h_0h_0h_0h_0i_m$***
SECTION 2	$44nP_1P_1$ or $55nP_1P_1$	ddfff	ddfff	. . . . .	etc.
SECTION 3	$77P_mP_mP_m$ or $66P_mP_mP_m$	$d_md_mf_mf_mf_m$	$(4v_bv_bv_av_a)$		
	or $7H_mH_mH_mH_m$ or $6H_mH_mH_mH_m$	$d_md_mf_mf_mf_m$	$(4v_bv_bv_av_a)$		
	or 77999				
SECTION 5	51515 52525 59595	Code groups to be developed regionally			
SECTION 6	61616 62626 69696	Code groups to be developed nationally			

Part B

SECTION 1	$M_iM_iM_jM_j$	D . . . . D**	$YYGGa_4$		
		IIiii* or $99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$	$MMMU_{La}U_{Lo}$**	$h_0h_0h_0h_0i_m$***

* Used in FM 32 only.
** Used in FM 33 and FM 34 only.
*** Used in FM 34 only.

SECTION 4	9 or 8	$t_n u_1 u_2 u_3$	ddfff	ddfff	ddfff
	. . . . .		. . . . .	. . . . .	. . . . .
	9 or 8	$t_n u_1 u_2 u_3$	ddfff	ddfff	ddfff
	or				
	21212	$n_0 n_0 P_0 P_0 P_0$ $n_1 n_1 P_1 P_1 P_1$ . . . . . $n_n n_n P_n P_n P_n$	$d_0 d_0 f_0 f_0 f_0$ $d_1 d_1 f_1 f_1 f_1$ . . . . . $d_n d_n f_n f_n f_n$		
SECTION 5	51515 52525 59595	Code groups to be developed regionally			
SECTION 6	61616 62626 69696	Code groups to be developed nationally			

Part C

SECTION 1	$M_i M_i M_j M_j$	D . . . . D**	$YYGGa_4$		
		IIiii* or $99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$	$MMMU_{La}U_{Lo}$**	$h_0h_0h_0h_0i_m$***
SECTION 2	$44nP_1P_1$ or $55nP_1P_1$	ddfff	ddfff	. . . . .	etc.
SECTION 3	$77P_mP_mP_m$ or $66P_mP_mP_m$	$d_md_mf_mf_mf_m$	$(4v_bv_bv_av_a)$		
	or				
	$7H_mH_mH_mH_m$ or $6H_mH_mH_mH_m$	$d_md_mf_mf_mf_m$	$(4v_bv_bv_av_a)$		
	or 77999				
SECTION 5	51515 52525 59595	Code groups to be developed regionally			
SECTION 6	61616 62626 69696	Code groups to be developed nationally			

* Used in FM 32 only.
** Used in FM 33 and FM 34 only.
*** Used in FM 34 only.

Part D

SECTION 1	$M_iM_iM_jM_j$	D . . . . D**	$YYGGa_4$		
		IIiii* or $99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$	$MMMU_{La}U_{Lo}$**	$h_0h_0h_0h_0i_m$***
SECTION 4	9 (or 1) or 8	$t_nu_1u_2u_3$	ddfff	ddfff	ddfff
	. . . . .		. . . . .	. . . . .	. . . . .
	9 (or 1) or 8	$t_nu_1u_2u_3$	ddfff	ddfff	ddfff
	or				
	21212	$n_1n_1P_1P_1P_1$	$d_1d_1f_1f_1f_1$		
		. . . . .	. . . . .		
		$n_nn_nP_nP_nP_n$	$d_nd_nf_nf_nf_n$		
SECTION 5	51515 52525 59595	Code groups to be developed regionally			
SECTION 6	61616 62626 69696	Code groups to be developed nationally			

Notes:

(1) PILOT is the name of the code for an upper-wind report from a fixed land station. PILOT SHIP is the name of the code for an upper-wind report from a sea station. PILOT MOBIL is the name of the code for an upper-wind report from a mobile land station.

(2) A PILOT report is identified by M_iM_i = PP, a PILOT SHIP report is identified by M_iM_i = QQ, and a PILOT MOBIL report is identified by M_iM_i = EE.

(3) The code form consists of four parts as follows:

Part	*Identifier letters* (M_jM_j)	*Isobaric surfaces*
A	AA	Up to and including the 100-hPa surface
B	BB	
C	CC	Above the100-hPa surface
D	DD	

Each part can be transmitted separately.

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* Used in FM 32 only.
** Used in FM 33 and FM 34 only.
*** Used in FM 34 only.

(4) The code form is divided into a number of sections as follows:

Section number	*Indicator figures or symbolic figure groups*	*Contents*
1	—	Identification and position data
2	44 or 55	Data for standard isobaric surfaces
3	6, 7, 66 or 77	Data for maximum wind level(s), with altitudes given in pressure units or tens of geopotential metres, and data for vertical wind shear
4	8, 9 (or 1) or 21212	Data for fixed regional levels and/or significant levels, with altitudes given either in geopotential units or in pressure units
5	51515 52525 59595	Code groups to be developed regionally In parts A and C, identifier 55555 should not be used in Section 5.
6	61616 62626 69696	Code groups to be developed nationally In parts A and C, identifier 66666 should not be used in Section 6.

R E G U L A T I O N S :

32.1 General

32.1.1 The code name PILOT, PILOT SHIP or PILOT MOBIL shall not be included.

32.1.2 Parts A and B shall contain data, in so far as available, *only* for levels up to and including the 100-hPa level.

32.1.3 Parts C and D shall contain data, in so far as available, *only* for levels above the 100-hPa level.

32.1.4 The instructions regarding Parts A and B of the report with respect to the inclusion of data up to and including 100 hPa, and regarding Parts C and D with respect to the inclusion of data above 100 hPa shall *not* be contravened. For example, if data at or below 100 hPa are not included in either Part A or B, as appropriate, they shall *not* be included in Part C or D. In this instance the non-included data shall be transmitted separately in the form of a correction report.

32.2 Parts A and C

32.2.1 ***Section 1 — Identification and position***

The identification of a sea station or a mobile land station shall be indicated by the group D . . . . D. The observing station shall indicate its position by means of the group IIiii for a fixed land station, or the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$ for a sea station or a mobile land station. In addition, a mobile land station shall include the group $h_0h_0h_0h_0i_m$ to indicate the elevation of the station (including units of elevation) and the accuracy of the elevation.

32.2.2 ***Section 2 — Standard isobaric surfaces***

32.2.2.1 Section 2 shall contain data, in ascending order with respect to altitude, for the standard isobaric surfaces of 850, 700, 500, 400, 300, 250, 200, 150 and 100 hPa in Part A and for the standard isobaric surfaces of 70, 50, 30, 20 and 10 hPa in Part C.

32.2.2.2 When pressure measurements are not available, wind data shall be reported using geopotential approximations to the standard isobaric surfaces.

32.2.2.3 All standard isobaric surfaces within the sounding shall be represented in Section 2 of the report by either a data group or a group of solidi (/////).

32.2.2.4 Indicator figures 44 shall be used when the standard isobaric surfaces are located by means of pressure equipment. Indicator figures 55 shall be used for the reporting of winds at altitudes approximating the standard isobaric surfaces. If the pressure element failed during the ascent, indicator figures 55 shall replace the indicator figures 44 for the remaining standard isobaric surfaces to be reported.

32.2.2.5 In the report, no more than three wind groups shall follow a $44nP_1P_1$ or $55nP_1P_1$ group. The latter groups shall therefore be repeated as often as necessary.

32.2.3 ***Section 3 — Maximum wind level(s) and vertical wind shear***

32.2.3.1 For coding purposes, a maximum wind level:

(*a*) Shall be determined by consideration of the list of significant levels for wind speed, as obtained by means of the relevant recommended or equivalent national method (see Note under Regulation 32.3.1) and *not* by consideration of the original wind-speed curve;

(*b*) Shall be located above the 500-hPa isobaric surface and shall correspond to a speed of more than 30 metres per second.

Note: A maximum wind level is defined as a level at which the wind speed is greater than that observed immediately above and below that level.

32.2.3.2 Whenever more than one maximum wind level exists, these levels shall be reported as follows:

(*a*) The level of greatest maximum wind speed shall be transmitted first;

(*b*) The other levels shall be classified in descending order of speed and be transmitted only if their speed exceeds those of the two adjacent minimals by at least 10 metres per second;

(*c*) The levels of maximum wind with the same speed shall be encoded successively, beginning with the lowest one;

(*d*) Furthermore, the highest level attained by the sounding shall be transmitted, provided:

(i) It satisfies the criteria set forth in Regulation 32.2.3.1 above;

(ii) It constitutes the level of the greatest speed of the whole sounding.

32.2.3.3 When more than one level of maximum wind is observed, data for each level shall be reported by repeating Section 3.

32.2.3.4 *Indicator figures*

32.2.3.4.1 When a maximum wind occurred within the sounding and its level was determined by means of pressure, the indicator figures 77 shall be used in the first group of Section 3, i.e. $77P_mP_mP_m$.

32.2.3.4.2 When a maximum wind occurred within the sounding and its altitude was expressed in tens of standard geopotential metres, the indicator figure 7 shall be used in the first group of Section 3, i.e. $7H_mH_mH_mH_m$.

32.2.3.4.3 When the greatest wind speed observed throughout the sounding occurred at the top of the sounding and the level of the greatest wind was determined by means of pressure, the indicator figures 66 shall be used in the first group of Section 3, i.e. $66P_mP_mP_m$.

32.2.3.4.4 When the greatest wind speed observed throughout the sounding occurred at the top of the sounding and the altitude of the greatest wind was expressed in tens of standard geopotential metres, the indicator figure 6 shall be used in the first group of Section 3, i.e. $6H_mH_mH_mH_m$.

32.2.3.4.5 When a maximum wind is not observed or not reported, the group 77999 shall be reported in lieu of the maximum wind section, i.e. Section 3.

32.2.3.5 *Group* ($4v_bv_bv_av_a$)

The group $4v_bv_bv_av_a$ shall be included only if data for vertical wind shear are computed and are required to be reported.

32.2.4 ***Section 5 — Regional groups***

Inclusion of groups of Section 5 shall be determined by regional decision.

32.2.5 ***Section 6 — National groups***

Inclusion of groups of Section 6 shall be determined by national decision.

32.3 Parts B and D

32.3.1 *Section 4 — Fixed regional levels and/or significant levels*

32.3.1.1 *Significant levels*

The reported significant data *alone* shall make it possible to reconstruct the wind profile with sufficient accuracy for practical use. Care shall be taken that:

(*a*) The direction and speed curves (in function of the log of pressure or altitude) can be reproduced with their prominent characteristics;

(*b*) These curves can be reproduced with an accuracy of at least 10° for direction and five metres per second for speed;

(*c*) The number of significant levels is kept strictly to a necessary minimum.

Note: To satisfy these criteria, the following method of successive approximations is recommended, but other methods of attaining equivalent results may suit some national practices better and may be used:

(1) The surface level and the highest level attained by the sounding constitute the first and the last significant levels.
The deviation from the linearly interpolated values between these two levels is then considered. If no direction deviates by more than 10° and no speed by more than five metres per second, no other significant level need be reported. Whenever one parameter deviates by more than the limit specified in paragraph (*b*) above, the level of greatest deviation becomes a supplementary significant level for *both* parameters.

(2) The additional significant levels so introduced divide the sounding into two layers. In each separate layer, the deviations from the linearly interpolated values between the base and the top are then considered. The process used in paragraph (1) above is repeated and yields other significant levels. These additional levels in turn modify the layer distribution, and the method is applied again until any level is approximated to the above-mentioned specified values.
For the purpose of computational work, it should be noted that the values derived from a PILOT report present two different resolutions:

(*a*) Winds at significant levels are reported to the resolution of 5° in direction and one metre per second in speed;

(*b*) Any interpolated wind at a level between two significant levels is *implicitly* reported to the resolution of ± 10° in direction and ± 5 metres per second in speed.

32.3.1.2 *Fixed levels*

32.3.1.2.1 The fixed levels reported in Section 4 shall be determined by regional decision.

32.3.1.2.2 In Section 4, the data groups for the fixed and significant levels within the sounding shall appear in ascending order with respect to altitude.

32.3.1.3 *Indicator figures*

32.3.1.3.1 When the altitudes of regional fixed levels and/or significant levels are given in units of 300 metres, the indicator figure 9 shall be used in Section 4 up to and including the height of 29 700 metres. Above that level, the indicator figure 1 shall be used to specify that 30 000 metres be added to the heights indicated by $t_nu_1u_2u_3$.

32.3.1.3.2 When the altitudes of regional fixed levels and/or significant levels are given in units of 500 metres, the indicator figure 8 shall be used in Section 4.

32.3.1.3.3 To indicate that the first wind group refers to station level, u_1 shall be coded / (solidus), and appropriate values shall be reported for t_n, u_2 and u_3.

32.3.1.4 *Altitudes*

The altitudes of fixed regional and significant levels shall be reported *either* in geopotential units *or* in pressure units. Only one of the units shall be used in a coded report.

32.3.1.5 *Missing data*

32.3.1.5.1 If altitude is given in geopotential units in Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level in between with a height value somewhere in between the boundary heights and a group ddfff of solidi (/////) to indicate the layer of missing data, provided that the layer is at least 1 500 geopotential metres thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet "significant level" criteria. For example:

9226/	27025	28030
9329/	/////	29035

where 28030 and 29035 are the boundary level winds in 7 800 and 11 700 gpm altitude. The fictitious altitude 9 600 gpm together with the group of solidi indicates the layer for which data are missing.

32.3.1.5.2 If altitude is given in pressure units in Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level of solidi (/////) to indicate the layer of missing data, provided that the layer is at least 50 hPa thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet "significant level" criteria. The boundary levels and the missing data level groups will be identified by appropriate nn numbers. For example:

$33P_3P_3P_3$	$d_3d_3f_3f_3f_3$
44///	/////
$55P_5P_5P_5$	$d_5d_5f_5f_5f_5$

where the levels 33 and 55 are the boundary levels and 44 indicates the layer for which data are missing.

32.3.2 ***Section 5 — Regional groups***

Inclusion of groups of Section 5 shall be determined by regional decision.

32.3.3 ***Section 6 — National groups***

Inclusion of groups of Section 6 shall be determined by national decision.

FM 35–XI Ext. TEMP **Upper-level pressure, temperature, humidity and wind report from a fixed land station**

FM 36–XI Ext. TEMP SHIP **Upper-level pressure, temperature, humidity and wind report from a sea station**

FM 37–XI Ext. TEMP DROP **Upper-level pressure, temperature, humidity and wind report from a sonde released by carrier balloons or aircraft**

FM 38–XI Ext. TEMP MOBIL **Upper-level pressure, temperature, humidity and wind report from a mobile land station**

C O D E F O R M :

Part A

SECTION 1	$M_iM_iM_jM_j$	D . . . . D**	$YYGGI_d$		
		IIiii*			
		or			
		$99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$	$MMMU_{La}U_{Lo}$***	$h_0h_0h_0h_0i_m$****
SECTION 2	$99P_0P_0P_0$	$T_0T_0T_{a0}D_0D_0$	$d_0d_0f_0f_0f_0$		
	$P_1P_1h_1h_1h_1$	$T_1T_1T_{a1}D_1D_1$	$d_1d_1f_1f_1f_1$		
	. . . . .	. . . . .	. . . . .		
	$P_nP_nh_nh_nh_n$	$T_nT_nT_{an}D_nD_n$	$d_nd_nf_nf_nf_n$		
SECTION 3	$88P_tP_tP_t$	$T_tT_tT_{at}D_tD_t$	$d_td_tf_tf_tf_t$		
	or				
	88999				
SECTION 4	$77P_mP_mP_m$	$d_md_mf_mf_mf_m$	$(4v_bv_bv_av_a)$		
	or				
	$66P_mP_mP_m$				
	or				
	77999				
SECTION 7	31313	$s_nr_ar_as_as_a$	8GGgg	$(9s_nT_wT_wT_w)$	
SECTION 9	51515	Code groups to be developed regionally			
	52525				
	. . . . .				
	59595				

* Used in FM 35 only.
** Used in FM 36 and FM 38 only.
*** Used in FM 36, FM 37 and FM 38 only.
**** Used in FM 38 only.

SECTION 10	61616 62626 69696	Code groups to be developed nationally

Part B

SECTION 1	$M_iM_iM_jM_j$	D . . . . D**	$YYGGa_4$		
		IIiii* or $99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$	$MMMU_{La}U_{Lo}$***	$h_0h_0h_0h_0i_m$****
SECTION 5	$n_0n_0P_0P_0P_0$ $n_1n_1P_1P_1P_1$ . . . . . $n_nn_nP_nP_nP_n$	$T_0T_0T_{a0}D_0D_0$ $T_1T_1T_{a1}D_1D_1$ . . . . . $T_nT_nT_{an}D_nD_n$			
SECTION 6	21212	$n_0n_0P_0P_0P_0$ $n_1n_1P_1P_1P_1$ . . . . . $n_nn_nP_nP_nP_n$	$d_0d_0f_0f_0f_0$ $d_1d_1f_1f_1f_1$ . . . . . $d_nd_nf_nf_nf_n$		
SECTION 7	31313	$s_nr_ar_as_as_a$	8GGgg	$(9s_nT_wT_wT_w)$	
SECTION 8	41414	$N_hC_LhC_MC_H$			
SECTION 9	51515 52525 59595	Code groups to be developed regionally			
SECTION 10	61616 62626 69696	Code groups to be developed nationally			

Part C

SECTION 1	$M_iM_iM_jM_j$	D . . . . D**	$YYGGI_d$		
		IIiii* or $99L_aL_aL_a$	$Q_cL_oL_oL_oL_o$	$MMMU_{La}U_{Lo}$***	$h_0h_0h_0h_0i_m$****

* Used in FM 35 only.
** Used in FM 36 and FM 38 only.
*** Used in FM 36, FM 37 and FM 38 only.
**** Used in FM 38 only.

SECTION 2	$P_1P_1h_1h_1h_1$ . . . . . $P_nP_nh_nh_nh_n$	$T_1T_1T_{a1}D_1D_1$ . . . . . $T_nT_nT_{an}D_nD_n$	$d_1d_1f_1f_1f_1$ . . . . . $d_nd_nf_nf_nf_n$		
SECTION 3	$88P_tP_tP_t$ or 88999	$T_tT_tT_{at}D_tD_t$	$d_td_tf_tf_tf_t$		
SECTION 4	$77P_mP_mP_m$ or $66P_mP_mP_m$ or 77999	$d_md_mf_mf_mf_m$	$(4v_bv_bv_av_a)$		
SECTION 7	31313	$s_nr_ar_as_as_a$	8GGgg	$(9s_nT_wT_wT_w)$	
SECTION 9	51515 52525 59595	Code groups to be developed regionally			
SECTION 10	61616 62626 69696	Code groups to be developed nationally			

Part D

SECTION 1	$M_iM_iM_jM_j$	D . . . . D** IIiii* or $99L_aL_aL_a$	YYGG/ $Q_cL_oL_oL_oL_o$	 $MMMU_{La}U_{Lo}$***	 $h_0h_0h_0h_0i_m$****
SECTION 5	$n_1n_1P_1P_1P_1$ . . . . . $n_nn_nP_nP_nP_n$	$T_1T_1T_{a1}D_1D_1$ . . . . . $T_nT_nT_{an}D_nD_n$			
SECTION 6	21212	$n_1n_1P_1P_1P_1$ . . . . . $n_nn_nP_nP_nP_n$	$d_1d_1f_1f_1f_1$ . . . . . $d_nd_nf_nf_nf_n$		
SECTION 7	31313	$s_nr_ar_as_as_a$	8GGgg	$(9s_nT_wT_wT_w)$	

* Used in FM 35 only.
** Used in FM 36 and FM 38 only.
*** Used in FM 36, FM 37 and FM 38 only.
**** Used in FM 38 only.

SECTION 9	51515 52525 59595	Code groups to be developed regionally
SECTION 10	61616 62626 69696	Code groups to be developed nationally

Notes:

(1) TEMP is the name of the code for an upper-level pressure, temperature, humidity and wind report from a fixed land station. TEMP SHIP is the name of the code for an upper-level pressure, temperature, humidity and wind report from a sea station. TEMP DROP is the name of the code for an upper-level pressure, temperature, humidity and wind report from a sonde released by a carrier balloon or aircraft equipped with dropsondes. TEMP MOBIL is the name of the code for an upper-level pressure, temperature, humidity and wind report from a mobile land station.

(2) A TEMP report is identified by M_iM_i = TT, a TEMP SHIP report is identified by M_iM_i = UU, a TEMP DROP report is identified by M_iM_i = XX, and a TEMP MOBIL report is identified by M_iM_i = II.

(3) The code form consists of four parts as follows:

Part	*Identifier letters* (M_jM_j)	*Isobaric surfaces*
A B	AA BB	Up to and including the 100-hPa surface
C D	CC DD	Above the 100-hPa surface

Each part can be transmitted separately.

(4) The code form is divided into a number of sections as follows:

Section number	*Indicator figures or symbolic figure groups*	*Contents*
1	—	Identification and position data
2	—	Data for standard isobaric surfaces
3	88	Data for tropopause level(s)
4	66 or 77	Data for maximum wind level(s) and data for vertical wind shear
5	—	Data for significant levels, with respect to temperature and/or relative humidity
6	21212	Data for significant levels, with respect to wind
7	31313	Data on sea-surface temperature and sounding system
8	41414	Cloud data
9	51515 52525 59595	Code groups to be developed regionally

10	61616 62626 69696	Code groups to be developed nationally

In parts A and C, identifier 66666 should not be used in Section 10.

R E G U L A T I O N S :

35.1 General

35.1.1 The code names TEMP, TEMP SHIP, TEMP DROP or TEMP MOBIL shall not be included in the report.

35.1.2 Parts A and B shall contain data, in so far as available, *only* for levels up to and including the 100-hPa level.

35.1.3 Parts C and D shall contain data, in so far as available, *only* for levels above the 100-hPa level.

35.1.4 The instructions regarding Parts A and B of the report with respect to the inclusion of data up to and including 100 hPa and regarding Parts C and D with respect to the inclusion of data above 100 hPa shall *not* be contravened. For example, if data at or below 100 hPa are not included in either Part A or B, as appropriate, they shall *not* be included in Part C or D. In this instance, the non-included data shall be transmitted separately in the form of a correction report.

35.1.5 When during an ascent the pressure data can no longer be obtained but wind data can be obtained, the wind data so obtained shall *not* be reported in TEMP, TEMP SHIP and TEMP MOBIL reports.

Note: These wind data so obtained may be reported in PILOT, PILOT SHIP or PILOT MOBIL.

35.1.6 Only wind data obtained from the radiosonde ascent by either visual or electronic means shall be included in the TEMP, TEMP SHIP and TEMP MOBIL reports. Wind data obtained by means other than a radiosonde-type ascent shall not be included in TEMP, TEMP SHIP and TEMP MOBIL reports.

35.1.7 Only wind data obtained from the radiosonde descent by electronic means shall be included in the TEMP DROP reports. Wind data obtained by means other than a radiosonde-type descent shall not be included in TEMP DROP reports.

35.2 Parts A and C

35.2.1 ***Section 1 — Identification and position***

The identification of a sea station or a mobile land station shall be indicated by the group D . . . . D. The observing station shall indicate its position by means of the group IIiii for a fixed land station, or the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$ for a sea station, aircraft or a carrier balloon, or a mobile land station. In addition, a mobile land station shall include the group $h_0h_0h_0h_0i_m$ to indicate the elevation of the station (including units of elevation) and the accuracy of the elevation.

35.2.2 ***Section 2 — Standard isobaric surfaces***

35.2.2.1 In section 2, the data groups for the surface level and the standard isobaric surfaces of 1 000, 925, 850, 700, 500, 400, 300, 250, 200, 150 and 100 hPa in Part A, and of 70, 50, 30, 20 and 10 hPa in Part C shall appear in ascending order with respect to altitude.

35.2.2.2 When the geopotential of a standard isobaric surface is lower than the altitude of the reporting station, the air temperature-humidity group for that surface shall be included. Solidi (/////) shall be reported for these groups. The wind groups for these levels shall be included as specified by the value reported for symbol I_d.

35.2.2.3 When wind data are available for all levels, the wind group shall be included for each level as indicated in the symbolic code form. If wind data are not available for all levels, the procedures given below shall be followed:

(*a*) When wind data are missing for one or more standard isobaric surfaces but are available for other standard isobaric surfaces below and above the level of missing wind data, the wind group(s), i.e. $d_n d_n f_n f_n f_n$, shall be coded by means of solidi (/////);

(*b*) When wind data are missing for a standard isobaric surface and are also missing for all succeeding standard isobaric surfaces up to the termination of the ascent, the wind group shall be omitted for all these levels and the symbol I_d reported accordingly.

35.2.2.4 Whenever it is desired to extrapolate a sounding for the computation of the geopotential at a standard isobaric surface, the following rules shall apply:

(*a*) Extrapolation is permissible if, and only if, the pressure difference between the minimum pressure of the sounding and the isobaric surface for which the extrapolated value is being computed does not exceed one quarter of the pressure at which the extrapolated value is desired, provided the extrapolation does not extend through a pressure interval exceeding 25 hPa;

(*b*) For the purpose of geopotential calculation, and for this purpose only, the sounding will be extrapolated, using two points only of the sounding curve on a T-log p diagram, namely that at the minimum pressure reached by the sounding and that at the pressure given by the sum of this minimum pressure and the pressure difference, mentioned in (*a*) above.

35.2.3 ***Section 3 — Tropopause level(s)***

35.2.3.1 When more than one tropopause is observed, each shall be reported by repeating section 3.

Note: For a definition of tropopause, see publication WMO-No. 182 – *International Meteorological Vocabulary*.

35.2.3.2 When no tropopause data are observed, the group 88999 shall be reported for section 3.

35.2.4 ***Section 4 — Maximum wind level(s) and vertical wind shear***

35.2.4.1 When more than one maximum wind level is observed, each shall be reported by repeating section 4.

Note: Criteria for determining maximum wind levels are given in Regulations 32.2.3.1 and 32.2.3.2.

35.2.4.2 When no maximum wind level is observed, the group 77999 shall be reported for section 4.

35.2.4.3 Indicator figures 77 shall be used when the level(s) for which maximum wind data are reported does (do) not coincide with the top of the wind sounding. Indicator figures 66 shall be used in the opposite case, i.e. whenever the top of the wind sounding corresponds to the highest wind speed observed throughout the ascent.

Note: For the purpose of the above regulation, the “top of the wind sounding” is to be understood as the highest level for which wind data are available.

35.2.4.4 *Group* ($4v_bv_bv_av_a$)

Group $4v_bv_bv_av_a$ shall be included only if data for vertical wind shear are computed and required.

35.2.5 ***Section 7 — Sounding system indication, radiosonde, system status, launch time, sea-surface temperature groups***

Section 7 is a mandatory section and shall always be reported. The groups $s_rr_ar_as_as_a$ and 8GGgg are mandatory for all TEMP reports: TEMP, TEMP SHIP, TEMP DROP and TEMP MOBIL. In TEMP SHIP reports, the group $9s_nT_wT_wT_w$ shall also be included.

35.2.6 ***Section 9 — Regional groups***

Inclusion of groups of Section 9 shall be determined by regional decision.

35.2.7 ***Section 10 — National groups***

Inclusion of groups of Section 10 shall be determined by national decision.

35.3 **Parts B and D**

35.3.1 ***Section 5 — Significant levels with respect to temperature and/or relative humidity***

35.3.1.1 If, in the determination of significant levels with respect to specified criteria for changes in air temperature and/or relative humidity, the criteria for either variable are satisfied at a particular point in altitude, data for both variables (as available) shall be reported for that level.

Dew-point data shall be derived using the function (or a near equivalent) for the relationship between saturation vapour pressure over water and air temperature (specified in publication WMO-No. 49 — *Technical Regulations*). Dew-point data shall not be reported when the air temperature is outside the range stated by WMO for the application of the function; a lesser range may be used as a national practice.

The highest level for which a dew point is reported shall be one of the levels selected in accordance with Regulations 35.3.1.2 and 35.3.1.3.

The reported significant levels *alone* shall make it possible to reconstruct the air temperature and humidity profiles within the limits of the criteria specified.

35.3.1.2 The following shall be included as “mandatory significant levels”:

(*a*) Surface level and the highest level of the sounding, or aircraft reference level and termination level for descent soundings;

(*b*) A level between 110 and 100 hPa;

(*c*) Bases and tops of inversions and isothermal layers which are at least 20 hPa thick, provided that the base of the layer occurs below the 300-hPa level or the first tropopause, whichever is the higher;

(*d*) Bases and tops of inversion layers which are characterized by a change in temperature of at least 2.5°C or a change in relative humidity of at least 20 per cent, provided that the base of the layer occurs below the 300-hPa level or the first tropopause, whichever is the higher.

Note: The inversion layers of (*c*) and (*d*) may be comprised of several thinner inversion layers separated by thin layers of temperature lapse. To allow for this situation, the tops of the inversion layers of (*c*) and (*d*) shall each be at a level such that no further inversion layers, whether thick or thin, shall occur for at least 20 hPa above the level.

35.3.1.3 The following shall be included as “additional levels”. They shall be selected in the order given, thereby giving priority to representing the temperature profile. As far as possible, these additional levels shall be the actual levels at which prominent changes in the lapse rate of air temperature occur:

(*a*) Levels which are necessary to ensure that the temperature obtained by linear interpolation (on a T-log P or essentially similar diagram) between adjacent significant levels shall not depart from the observed temperature by more than 1°C below the first significant level reported above the 300-hPa level or the first tropopause, whichever level is the lower, or by more than 2°C thereafter;

(*b*) Levels which are necessary to ensure that the relative humidity obtained by linear interpolation between adjacent significant levels shall not depart by more than 15 per cent from the observed values. (The criterion of 15 per cent refers to an amount of relative humidity and NOT to the percentage of the observed value, e.g. if an observed value is 50 per cent, the interpolated value shall lie between 35 per cent and 65 per cent.);

(*c*) Levels which are necessary to limit the interpolation error on diagrams other than T-log P. These levels shall be such that the pressure at one significant level divided by the pressure of the preceding significant level shall exceed 0.6 for levels up to the first tropopause and shall be determined by use of the method for selecting additional levels but with application of tighter criteria.

35.3.1.4 When a significant level (with respect to air temperature and/or relative humidity) and a standard isobaric surface coincide, data for that level shall be reported in Parts A and B (or C and D, as appropriate).

35.3.1.5 In Part B, the successive significant levels shall be numbered 00 (station level), the first level 11, the second level 22, . . . etc. . . . 99, 11, 22, . . . etc. In Part D, the first level above 100 hPa shall be numbered 11, the second 22, . . . etc. . . . 99, 11, 22, . . . etc. The code figure 00 for n_0n_0 in Part B shall never be used to indicate any level other than station level.

35.3.1.6 In Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level of solidi (/////) to indicate the layer of missing data, provided that the layer is at least 20 hPa thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet “significant level” criteria. The boundary levels and the missing data level groups will be identified by appropriate nn numbers. For example:

$33P_3P_3P_3$	$T_3T_3T_{a3}D_3D_3$
44///	/////
$55P_5P_5P_5$	$T_5T_5T_{a5}D_5D_5$

where the levels 33 and 55 are the boundary levels and 44 indicates the layer for which data are missing.

35.3.2 ***Section 6 — Significant levels with respect to wind***

35.3.2.1 Significant levels shall be chosen so that the data from them *alone* shall make it possible to reconstruct the wind profile with sufficient accuracy for practical use.

Note: Criteria for determining significant levels with respect to changes in wind speed and direction are given in Regulation 32.3.1.

35.3.2.2 In Parts B and D, a layer for which data are missing shall be indicated by reporting the boundary levels of the layer and a level of solidi (/////) to indicate the layer of missing data, provided that the layer is at least 50 hPa thick. The boundary levels are the levels closest to the bottom and the top of the layer for which the observed data are available. The boundary levels are not required to meet “significant level” criteria. The boundary levels and the missing data level groups will be identified by appropriate nn numbers. For example:

$33P_3P_3P_3$	$d_3d_3f_3f_3f_3$
44///	/////
$55P_5P_5P_5$	$d_5d_5f_5f_5f_5$

where the levels 33 and 55 are the boundary levels and 44 indicates the layer for which data are missing.

35.3.3 ***Section 7 — Sounding system indication, radiosonde, system status, launch time, sea-surface temperature groups***

Section 7 is a mandatory section and shall always be reported. The groups $s_r r_a r_a s_a s_a$ and 8GGgg are mandatory for all TEMP reports: TEMP, TEMP SHIP, TEMP DROP and TEMP MOBIL. In TEMP SHIP reports, the group $9s_n T_w T_w T_w$ shall also be included.

35.3.4 ***Section 8 — Cloud data***

35.3.4.1 In TEMP, TEMP SHIP and TEMP MOBIL reports, this section shall be used to report cloud data. N_h, h, C_L, C_M and C_H shall be coded in accordance with the regulations in FM 12 SYNOP (12.2.1.2, 12.2.7.2 and 12.2.7.3).

35.3.4.2 This section shall not be included in TEMP DROP reports.

35.3.5 ***Section 9 — Regional groups***

Inclusion of groups of Section 9 shall be determined by regional decision.

35.3.6 ***Section 10 — National groups***

Inclusion of groups of Section 10 shall be determined by national decision.

FM 39–VI ROCOB **Upper-level temperature, wind and air density report from a land rocketsonde station**

FM 40–VI ROCOB SHIP **Upper-level temperature, wind and air density report from a rocketsonde station on a ship**

C O D E F O R M :

SECTION 1	$M_iM_iM_jM_j$	YYGGg	MMJJJ	$\left\{\begin{array}{l}\text{IIiii*}\\ \text{or}\\ 99L_aL_aL_a \quad Q_cL_oL_oL_oL_o \quad MMMU_{La}U_{Lo}\text{**}\end{array}\right\}$
	$a_1e_Te_Tc_Tm_r$	$r_me_we_wc_wm_r$		
SECTION 2	HHZ_TTT	ddfff	$(9d_pp_1p_1p_1)$	
	HHZ_TTT	ddfff	$(9d_pp_1p_1p_1)$	
	. . . . .	. . . . .	. . . . .	
SECTION 3	$(11Z_TT_1T_1$	$P_1P_1h_1h_1h_1$	$d_1d_1f_1f_1f_1$	
	. . . . .	. . . . .	. . . . .	
	$11Z_TT_nT_n$	$P_nP_nh_nh_nh_n$	$d_nd_nf_nf_nf_n$	
	$22Z_TT_1T_1$	$P_1P_1h_1h_1h_1$	$d_1d_1f_1f_1f_1$	
	. . . . .	. . . . .	. . . . .	
	$22Z_TT_nT_n$	$P_nP_nh_nh_nh_n$	$d_nd_nf_nf_nf_n$	
	$33Z_TT_1T_1$	$P_1P_1h_1h_1h_1$	$d_1d_1f_1f_1f_1$	
	. . . . .	. . . . .	. . . . .	
	$33Z_TT_nT_n$	$P_nP_nh_nh_nh_n$	$d_nd_nf_nf_nf_n$	
	$44Z_TT_1T_1$	$P_1P_1h_1h_1h_1$	$d_1d_1f_1f_1f_1$	
	. . . . .	. . . . .	. . . . .	
	$44Z_TT_nT_n$	$P_nP_nh_nh_nh_n$	$d_nd_nf_nf_nf_n$	
	$55Z_TT_1T_1$	$P_1P_1h_1h_1h_1$	$d_1d_1f_1f_1f_1$	
	. . . . .	. . . . .	. . . . .	
	$55Z_TT_nT_n$	$P_nP_nh_nh_nh_n$	$d_nd_nf_nf_nf_n$	
	$66Z_TT_1T_1$	$P_1P_1h_1h_1h_1$	$d_1d_1f_1f_1f_1$	
	. . . . .	. . . . .	. . . . .	
	$66Z_TT_nT_n$	$P_nP_nh_nh_nh_n$	$d_nd_nf_nf_nf_n)$	

Notes:

(1) ROCOB is the name of the code for an upper-level (for altitudes greater than 20 km) temperature, wind and air density report of a rocketsonde observation from a land station. ROCOB SHIP is the name of the code of a rocketsonde report from a ship.

(2) A ROCOB report is identified by $M_iM_iM_jM_j$ = RRXX. A ROCOB SHIP report is identified by $M_iM_iM_jM_j$ = SSXX.

(3) The code form is divided into three sections as follows:

Section number	*Contents*
1	Identification data
2	Data for specified geometric altitudes
3	Data for isobaric surfaces (optional)

* Used in FM 39 only.
** Used in **FM 40 only.**

R E G U L A T I O N S :

39.1 **General**

The code name ROCOB or ROCOB SHIP shall not be included in the report.

39.2 **Section 1 — Identification**

39.2.1 The land rocketsonde station shall indicate its position by means of the group IIiii. The ship rocketsonde station shall indicate its position by means of the groups $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $MMMU_{La}U_{Lo}$.

39.2.2 Section 1 shall not be transmitted as a separate report.

39.2.3 The group MMJJJ shall be used to indicate, together with the group YYGGg, the year (JJJ), month (MM), day (YY) and time (GGg) of the firing of the rocket.

39.3 **Section 2 — Specified geometric altitudes**

39.3.1 ***Mandatory levels***

39.3.1.1 Data shall be reported for each 5 km vertical interval, beginning at 20 km, up to the top of the ascent, and for the lowest level of the ascent for which data are available, provided its altitude is higher than 20 km.

39.3.1.2 If data are not available for one or more of the mandatory altitudes specified in Regu–lation 39.3.1.1, the code groups for those levels shall be inserted in the report in their altitude sequence order with solidi (/, // or ///) reported for the missing elements.

39.3.2 ***Significant levels***

39.3.2.1 All data shall be reported for those non-mandatory levels at which significant changes in wind speed or direction or temperature occur. The mandatory and significant levels shall be intermixed in the report in ascending order with respect to altitude.

39.3.2.2 The reported significant data shall make it possible to reconstruct the wind and temperature curves between consecutive mandatory levels with sufficient accuracy for practical use.

39.3.2.3 The criteria for significant changes shall be as follows:

(*a*) A departure of the wind speed of 5 or more metres per second from a linear interpolation between any two consecutive levels selected to be reported;

(*b*) A departure of the wind direction from a linear interpolation between any two consecutive levels selected to be reported, thus:

60° or more — when the average wind speed for the layer is 8 to 15 metres per second;
30° or more — when the average wind speed for the layer is 16 to 30 metres per second;
20° or more — when the average wind speed for the layer is 31 metres per second or more;

(*c*) A temperature change of 3°C from a linear interpolation between any two consecutive levels selected to be reported.

Note: To satisfy these criteria, the following method of approximation is recommended:

(1) The bottom level and the top level of the 5 km stratum between two consecutive mandatory levels constitute the base lines for determining the significant levels in that stratum. If the wind and temperature criteria are not exceeded, no significant level need be reported. Whenever one of the parameters deviates by more than the limit specified in Regulation 39.3.2.3, the level of greatest deviation becomes a significant level, and data for all three parameters are reported for that level.

(2) The additional significant levels so introduced divide the stratum into several layers. In each separate layer, the deviations from the linearly interpolated values between the base and the top are then considered. The process used in paragraph (1) above is repeated and yields other significant levels. These additional levels in turn modify the layer distribution, and the method is applied again until any level is approximated to the specified criteria values.

39.3.3 ***Group*** ddfff

The thickness of the layer through which wind direction and speed are determined shall be 2 km for both mandatory and significant levels, i.e. from 1 km below to 1 km above the altitude reported.

39.3.4 ***Group*** ($9d_pp_1p_1p_1$)

Group $9d_pp_1p_1p_1$ shall be included only when data are available. If temperature data are missing for a stratum of more than 3 km in depth, the $9d_pp_1p_1p_1$ group shall be omitted for the remainder of the ascent.

39.4 Section 3 — Isobaric surfaces

39.4.1 Section 3 shall be included only when data are available for any of the isobaric surfaces of 70, 50, 30, 20, 10, 7, 5, 3, 2, 1, 7.10^{-1}, 5.10^{-1}, 4.10^{-1}, 3.10^{-1}, 2.10^{-1}, 1.10^{-1}, 7.10^{-2}, 5.10^{-2}, 3.10^{-2}, 2.10^{-2}, 1.10^{-2}, 7.10^{-3}, 5.10^{-3}, 3.10^{-3}, 2.10^{-3}, 1.10^{-3}, 7.10^{-4}, 5.10^{-4}, 3.10^{-4}, 2.10^{-4}, 1.10^{-4}, 7.10^{-5}, 5.10^{-5}, 3.10^{-5}, 2.10^{-5} and 1.10^{-5} hPa.

39.4.2 In Section 3, indicator figures 11, 22, 33, 44, 55 and 66 specify the following values for PP and hhh:

Indicator figures 11 shall be used when P_1P_1, P_2P_2, . . . P_nP_n are reported in whole hectopascals and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;

Indicator figures 22 shall be used when P_1P_1, P_2P_2, . . . P_nP_n are reported in tenths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;

Indicator figures 33 shall be used when P_1P_1, P_2P_2, . . . P_nP_n are reported in hundredths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;

Indicator figures 44 shall be used when P_1P_1, P_2P_2, . . . P_nP_n are reported in thousandths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;

Indicator figures 55 shall be used when P_1P_1, P_2P_2, . . . P_nP_n are reported in ten-thousandths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in hundreds of standard geopotential metres;

Indicator figures 66 shall be used when P_1P_1, P_2P_2, . . . P_nP_n are reported in hundred-thousandths of a hectopascal and $h_1h_1h_1$, $h_2h_2h_2$, . . . $h_nh_nh_n$ in thousands of standard geopotential metres.