

# The Evolution of WMO Guidelines and Requirements For the Education and Training of Meteorological Personnel

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## **WMO 258 First Edition (1969)**

Early work on education and training within WMO was led by Professor J. Van Mieghem who wrote early planning documents for WMO, and Chaired the EC Panel of Experts on Education and Training when it was created in 1965. Professor Mieghem led the effort to create the first Guideline for the Education and Training of Meteorological Personnel at the direction of the Executive Council in 1966.

Since this first edition of the guide was driven substantially by the need of developing nations, it seems that having four classes of personnel, and especially the class I and II levels, was the result of having very few universities available to provide the education and training needed for Class I. For example, the University of Nairobi was commissioned in 1963 but did not spin up to begin offering classes until around 1970. The authors recognized the need for university level education describing modern meteorology as having evolved *“to become a sophisticated branch of physics”*.

Several things should be noted about this first edition of WMO 258:

- The guide, developed primarily at the request of developing nations, proposed four classes of personnel:
  - Class I: university trained meteorologists working as weather forecasters, and in forecast technique development, research, and management;
  - Class II: secondary level and university level training enabling them to analyze and interpret observational data, provide weather forecasts under the guidance of Class I meteorologists, in addition to other duties. The forward to the Guideline includes mention that inclusion of Class II personnel is controversial (presumably some WMO Members felt that only Class I should be involved in weather forecasting);
  - Class III: secondary level education leading to a focus on observations and observational instruments including calibration, plotting, and data analysis;
  - Class IV: sufficient training to enable them to observe meteorological conditions and provide routine maintenance for observational networks.

- The Guide, called WMO 258 First Edition, laid out the education and training in the format of a typical university curriculum or secondary education curriculum in the case of meteorological technicians;
- Specializations included Aeronautical Meteorology, Agricultural Meteorology, Climatology, and Hydrometeorology. Marine meteorology was not listed separately. Specializations were described as a list of topics and their application. Climatology did not include climate forecasting but did include a mention of climate change.
- The preface noted that a substantial minority of WMO Members formulated objections to the four classes of personnel, and asserted that Class II personnel should not be a temporary substitute for Class I.

The study of numerical models included understanding capabilities and limitations of barotropic models, simple baroclinic models, and structure of non-geostrophic models. Integration of numerical models into operations is not covered. In fact the guide mentions the need for some personnel to understand the application of graphical forecast methods. Radar meteorology and satellite meteorology are not treated with any depth.

### **WMO 258 Second Edition (1977) and Third Edition (1984)**

These two editions contained incremental improvements and changes. In each case, the idea of four classes versus two classes was apparently considered but perhaps the problem of having university level opportunities was still limited as it was in 1969 and precluded moving to merge Class I and II. The forward to both the second and third editions describe the four class system as a “compromise”.

A few highlights:

- Hydrology was added after the WMO convention was changed in 1975 to include operational hydrology
- More education on the use of satellites and the estimation of vertical atmospheric structure from satellites, and the use of computers;
- Radar meteorology and marine meteorology are added explicitly;
- Numerical weather prediction was improving and the need for meteorologists to understand the use of models in weather prediction was expanded but the models were still primitive;

- Revision of the four class system is mentioned but not implemented as there was no consensus;
- Qualifications for class I are still in the vernacular of a University Curriculum.

### **WMO 258 Fourth Edition (2002)**

This edition was the first major revision since the original in 1969. Prompted by the WMO Congress and the well-developed national meteorological services, the WMO Symposium in 1995 recommended that the classification system be reviewed and revised. This seemed feasible since the opportunities for university level education had significantly increased. The process began in 1996 and was driven partly by a somewhat revamped EC Panel of Experts on Education and Training during their meeting in Nanjing and chaired by the President of WMO Dr. John Zillman.

The new guideline, WMO 258 Fourth Edition, included a description of three pathways where an individual could become a class I meteorologist:

- typical university degree in meteorology,
- university degree in a related science and additional graduate level education (called a condensed BIP-M)
- Combination of education and experience through which a meteorological technician could attain the equivalent of the BIP-M.

The BIP-M and BIP-MT continued to be described in terms that are typical of a university curriculum but for the first time, the WMO community was encouraged to think in terms of job competencies. The Fourth Edition also included new topics or greatly expanded topics in a number of areas including:

- Satellite interpretation
- Radar Interpretation
- Climate prediction
- Integration of mesoscale numerical weather prediction into the forecast process
- Information technology and data processing

## **WMO 1083 Manual on Implementation of Education and Training Standards in Meteorology and Hydrology (2012)**

This new publication was intended to become more than a guideline and was published as a companion to Chapter B.4 of the WMO Technical Regulations (WMO No.49) General Meteorological Standards and recommended practices, and constitutes Annex VIII to the WMO Technical Regulations. This effort was partly driven by pressure from ICAO to have more rigorous standards in place for aeronautical meteorological forecasters.

The needs and requirements were described in somewhat different ways. The classification (two classes) of personnel was related to qualifications, described via learning outcomes. The jobs that would be performed were described in terms of competencies (what a person should be capable of doing). The idea that a meteorological technician could become a meteorologist through a combination of experience and training was largely abandoned and the clear message that meteorologists must have a university level degree or completed a program that satisfied the BIP-M at the university degree level. There was no “equivalent” path described like presented in figure 1.3 in WMO 258 Fourth edition. Rather than describe ways that an individual could demonstrate equivalence to Class I, WMO 1083 describes ways that a training program could demonstrate equivalence to a Class I traditional university type of program.

There are few essential topical differences between the BIP-M in 2002 and the BIP-M in WMO 1083 except that certain evolving topics continue to be developed more completely such as the use of mesoscale models, climate modeling, Doppler radar, and the integration of satellite meteorology into both nowcasting and numerical weather prediction.