

ENVIRONDATA WEATHER STATIONS' GUIDE TO WIND MONITORING STANDARDS AND REQUIREMENTS

When it is necessary to monitor wind speed and wind direction it can be quite confusing to determine exactly what equipment is required. What will meet the required specifications, the accuracy, resolution, siting, data collection, reporting and maintenance?

This document provides you with a brief guide to the standards that are most often referred to, with particular reference to Environdata's weather sensors and weather stations.

In no way is this guide meant to replace or supercede the official standards. We strongly recommend that you obtain the relevant documents for yourself, and base your conclusions and recommendations on those documents. We have provided links to the documents, or where they may be obtained, where possible. These were correct at the time of writing (March 2009).

Australian Standards

Many of the regulations mentioned below refer to two key documents, Australian Standards "AS 2922-1987 Ambient Air – Guide for the siting of sampling units" & "AS2923-1987 Ambient Air – Guide for measurement of horizontal wind for air quality applications".

These documents outline siting issues, and equipment requirements, which are relevant to the decisions about what equipment you will need to purchase. They also cover maintenance routines, report writing and operational issues. We strongly recommend obtaining these documents for your own use.

Due to the strict copyright and licensing restrictions placed upon these documents we are unable to reproduce portions of them within this guide, however, they are available for purchase from several sources including: <http://infostore.saiglobal.com/store/Portal.aspx?publisher=AS>

NSW EPA

The NSW EPA Guide is "Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales" by the NSW Environment Protection Authority (EPA), Published in the *NSW Government Gazette* on 5 January 2007, p. 32. This document was available on the Internet at the time of writing at: <https://www.dec.nsw.gov.au/resources/07001amsaap.pdf>

| Table 1: Methods for the sampling and analysis of ambient air pollutants in NSW | | |
|---|--|-------------------------------|
| A. General methods for ambient air monitoring (AM) | | |
| Method no. | Parameter measured | Method |
| AM-1 | Guide for the siting of sampling units | AS 2922-1987 |
| AM-2 | Guide for measurement of horizontal wind for air quality applications | AS 2923-1987 |
| AM-4 | Meteorological monitoring guidance for regulatory modelling applications | USEPA (2000) EPA 454/R-99-005 |

Table 1 above summarises the methods & standards referred to by the NSW EPA when you are required to monitor wind speed and direction.

AM-1

AM-1 refers to The Australian Standard AS 2922-1987. This standard specifies the siting requirements for the sampling units, (weather sensors). Envirodata equipment is designed to meet these requirements, including the supply of 10m masts where required.

AM-2

AM-2 refers to the Australian Standard AS2923-1987. All Envirodata WS and WD series sensors meet and exceed the operating range, threshold and accuracy specified for both wind speed and direction. Further, our data loggers and continuous sampling methodology far exceed the minimum sampling rate required for vector analysis (determining the true wind movement) and sigma theta calculations. Our sampling methodology (continuous sampling) also virtually eliminates any errors caused by light or fluctuating winds.

AM-4

AM-4 refers to the U.S. ENVIRONMENTAL PROTECTION AGENCY, Office of Air and Radiation, Office of Air Quality Planning and Standards February 2000 publication, "**Meteorological Monitoring Guidance for Regulatory Modeling Applications**" EPA 454/R-99-005, available at the time of writing from: <http://www.epa.gov/scram001/guidance/met/mmgrma.pdf>

Table 2, below, highlights the accuracy, resolution and starting thresholds for meteorological sensors to suit AM-4:

| Table 2: AM-4; EPA-454/R-99-005 Recommendations Vs Envirodata Specifications | | |
|---|-------------------------------------|--|
| System Accuracies | | |
| Meteorological Variable | AM-4 Minimum System Accuracy | Envirodata WS40, WD42, TA50, RG12H Accuracy |
| Wind Speed | ± (0.2 m/s + 5% of observed) | ± 0.2 m/s |
| Wind Direction | ± 5 degrees | ± 2 degrees |
| Ambient Temperature | ± 0.5 C | ± 0.1 C |
| Precipitation | ± 10% of observed or ± 0.5 mm | ± 2% of observed or ± 0.2 mm |
| System Resolutions | | |
| Meteorological Variable | AM-4 Measurement Resolution | Envirodata WS40, WD42, TA50, RG12H Resolution |
| Wind Speed | 0.1 m/s | 0.1 m/s |
| Wind Direction | 1.0 degree | 1.0 degree |
| Ambient Temperature | 0.1 C | 0.1 C |
| Precipitation | 0.3 mm | 0.2 mm |
| Starting Thresholds | | |
| Meteorological Variable | AM-4 Starting Thresholds | Envirodata WS40, WD42 Starting Thresholds |
| Wind Speed | 0.5 m/s | 0.3 m/s |
| Wind Direction | 0.5 m/s | 0.3 m/s |

To summarise, Envirodata weather stations and weather sensors meet or exceed all relevant parameters required for the weather sensors, sampling rate, vector calculations, sigma theta calculations and data logging, according to AM-2 and AM-4. This will enable you to satisfy the NSW EPA requirements for air quality meteorological monitoring.

Victorian EPA

The Victorian EPA has written a document entitled “A Guide To the Sampling and Analysis of Air Emissions and Air Quality“. Written by EPA Victoria in December 2002, Publication 440.1, ISBN 0 7306 7627 7, at the time of compiling this guide it was available on their website at:

[http://epanote2.epa.vic.gov.au/EPA/publications.nsf/2f1c2625731746aa4a256ce90001cbb5/c46815ea4aeaeb98ca256c860015906a/\\$FILE/440.1.pdf](http://epanote2.epa.vic.gov.au/EPA/publications.nsf/2f1c2625731746aa4a256ce90001cbb5/c46815ea4aeaeb98ca256c860015906a/$FILE/440.1.pdf)

This document refers in particular to the need for meteorological stations, & wind speed and direction monitoring to meet the Australian Standards “AS 2922-1987 Ambient Air – Guide for the siting of sampling units” & “AS2923-1987 Ambient Air – Guide for measurement of horizontal wind for air quality applications”. These are the equivalent of AM1 and AM2 as mentioned above in the NSW EPA Section.

To summarise, Envirodata weather stations and weather sensors meet or exceed all relevant parameters required for the weather sensors, sampling rate, vector calculations, sigma theta calculations and data logging, according to AS2922-1987 & AS 2923-1987. Further, utilising our IS35 10m tilt down mast allows you to meet the siting requirements in most instances.

Envirodata Weather Stations enable you to satisfy the VIC EPA requirements for air quality meteorological monitoring.

Queensland EPA

The Queensland guide for Air Quality Monitoring is called “Air Quality Sampling Manual” published in 1997, ISBN 0 7242 6998 3. At the time of writing it was available from the QLD EPA website at:

http://www.epa.qld.gov.au/publications/p00363aa.pdf/Air_quality_sampling_manual.pdf

This document refers to the need for meteorological stations and wind speed and direction monitoring to meet the Australian Standards “AS 2922-1987 Ambient Air – Guide for the siting of sampling units” & “AS2923-1987 Ambient Air – Guide for measurement of horizontal wind for air quality applications”. These are the equivalent of AM1 and AM2 as mentioned above in the NSW EPA Section.

To summarise, Envirodata weather stations and weather sensors meet or exceed all relevant parameters required for the weather sensors, sampling rate, vector calculations, sigma theta calculations and data logging, according to AS2922-1987 & AS 2923-1987. Further, utilising our IS35 10m tilt down mast allows you to meet the siting requirements in most instances.

Envirodata Weather Stations enable you to satisfy the QLD EPA requirements for air quality meteorological monitoring.

Weather Sensors Siting: what you need to do

Siting the weather instruments is one of the most important considerations when adhering to the relevant standards. To satisfy AM-1, AS 2922-1987 Ambient Air – Guide for the siting of Sampling Units, or AM-4, you will need to locate the wind speed and direction sensors to conform with the following basic rules:

- 10m height above ground level on an appropriate instrument mast
- The rule of 10: The base of your tower should be 10 times the height from neighbouring obstructions (such as trees or buildings). That is, the tower should be at least 100m from a 10m high tree and 140m from a 14m high building.
- The terrain should be as flat and level as possible
- Ideally, the terrain would be grass covered.
- In addition, allowing easy access to the sensors should be considered, so a 'tilt-down' style of mast is preferred over a fixed or static mast.

We would like to note that often you cannot meet all of these requirements to the letter; it is simply not physically possible. In such cases, common sense must prevail and the weather instruments should be located with as little compromise to the ideal methodology as is practical in your situation. Variances in siting should of course be noted in the reports to your regulatory Authority.

If you need any further information or advice on the weather monitoring equipment you require, please contact our friendly team on (07) 4661 4699.