AS 4180.1—1994

Australian Standard®

Drift loss from cooling towers—Laboratory measurement

Part 1: Chloride balance method

This Australian Standard was prepared by Committee ME/62, Mechanical Ventilation and Airconditioning. It was approved on behalf of the Council of Standards Australia on 30 December 1993 and published on 21 February 1994.

The following interests are represented on Committee ME/62:

- Association of Consulting Engineers, Australia
- Australian Assembly of Fire Authorities
- Australian Chamber of Commerce and Industry
- Australian Chemical Industry Council
- Australian Institute of Environment Health
- Australian Institute of Refrigeration Air Conditioning and Heating
- Australian Uniform Building Regulations Coordinating Council
- Building Management Authority, W.A.
- Building Owners and Managers Association of Australia
- CSIRO, Division of Building, Construction and Engineering
- Department of Administrative Services—Australian Construction Services
- Fire Protection Industry Association of Australia
- Institution of Refrigeration Heating and Air Conditioning Engineers
- Insurance Council of Australia
- Metal Trades Industry Association of Australia
- Public Works Department, New South Wales
- Thermal Insulation Contractors Association of Australia
- The University of New South Wales

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Part 1: Chloride balance method

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PREFACE

This Standard was prepared by the Standards Australia Committee on Mechanical Ventilation and Airconditioning.

This Standard provides standardized testing methods which may be used by manufacturers for product development and to substantiate drift loss performance claims.

Work on the Standard started in 1990 following the publication of AS 3666—1989, *Air-handling and water systems of buildings— Microbial control*, which stated that an acceptable level of drift was 0.02% of the design circulation rate.

An Australian test method (Chloride Balance Method) and two international testing methods (Heated Bead Isokinetic Method and Thermal Balance Method) were assessed as acceptable. The Chloride Balance Method is described in this Standard.

The HBIK Method being standardized by the Cooling Tower Institute in the USA is not included in this Standard, but may be obtained from CTI at 530 Wells Fargo Drive, Suite 113, Houston, Texas 77090, USA.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

CONTENTS

FOREWORD

Cooling towers are equipment devices commonly used to dissipate heat from water-cooled refrigeration, airconditioning and industrial processes.

Cooling towers lower the temperature of water by evaporative cooling in which atmospheric air passes through sprayed water, thereby exchanging heat. They have been refined to be highly efficient in operation and are a significant factor in the achievement of energy efficient buildings in Australia.

The evaporation that takes place produces a plume that is often visible. The density and persistency of this plume depend upon the heat load and atmospheric conditions. The plume is often visible as fog because of its elevated temperature and high moisture content relative to the surrounding weather conditions; the ambient air is unable to absorb all the moisture in the tower discharge airstream and the excess condenses as fog.

Condensation droplets formed from this water vapour (steam) plume will be essentially pure water.

In addition, droplets are formed within the cooling tower as a result of shattering of drops of water falling onto the components of the tower. Accordingly, water droplets may become entrained in the airstream as it passes through the tower. Most of this water is stripped from the discharge airstream by elimination methods, most notably the use of inertial impaction separators known as drift eliminators. (Sometimes the assembly is known as a drift eliminator.) Some water is discharged from the tower as drift, which is a mist of fine droplets.

The rate of drift loss from a tower is a function of tower configuration, eliminator design, airflow rate through the tower and water load on the tower.

Drift eliminators have evolved from simple timber slats arranged in a labyrinth to more complex arrangements constructed from thermoformed-UPVC sheets. The latter are commercially available and perform very efficiently.

Since drift contains essentially the same minerals, chemicals and microbial components as the circulating water, environmental quality is improved when drift loss is reduced. Test methods need to distinguish between those water droplets formed as drift and those resulting from recondensation of evaporated water resulting from the thermal process in the tower.

This Standard describes an indirect method known as the Chloride Balance Method (CBM) of measuring drift loss, which is suitable for laboratory use.

A second method, known as the Thermal Balance Method (TBM), is described in the British Standard BS 4485.2 *Water Cooling Towers—Methods for Performance Testing*.

The third method, widely accepted overseas, is known as the Heated Bead Isokinetic (HBIK) Method, which is being developed by the Cooling Tower Institute in the USA. Several cooling towers with drift eliminators have been tested according to the HBIK method.*

These drift testing methods are considered by Standards Australia to be appropriate for laboratory use. They are not intended for use as field tests.

Although this Standard describes the CBM as an acceptable method, this does not necessarily imply a preference for this technique over either of the other two methods mentioned, or over other suitable methods as they become available; acceptance of performance data for drift eliminators is by arrangement between the equipment supplier and the purchaser.

Further overseas development of drift eliminators and performance measurement techniques is known to be taking place as manufacturers, owners and government agencies seek to improve the role cooling towers play in reducing the thermal pollution of the environment.

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* At time of publication the Cooling Tower Institute (CTI) had not published its standard specification for the Isokinetic drift test for water cooling towers.

STANDARDS AUSTRALIA

Australian Standard

Drift loss from cooling towers—Laboratory measurement

Part 1: Chloride balance method

1 SCOPE This Standard sets out the requirements necessary to obtain measurements of drift of circulating water into the atmosphere, by a chloride ion mass balance on the water circuit, under laboratory conditions.

2 APPLICATION The test applies to water circuits in direct contact with the atmosphere.

NOTE: The method measures the sum of all drift and any leakage losses. Circulating water leaks that are much smaller in flow rate than the drift loss are highly visible.

3 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS	
2031	Selection of containers and preservation of water samples for chemical and microbiological analysis
2031.1	Part 1: Chemical
2093	Salt for use in the manufacture of dairy products
2360	Measurement of fluid flow in closed conduits
2360.1.1	Measurement using orifice plates, nozzles or Venturi tubes—Conduits with diameters from 50 mm to 1200 mm
2360.1.2	Part 1.2: Measurement using orifice plates or nozzles—Conduits with diameters less than 50 mm
2360.1.3	Part 1.3: Measurement using orifice plates or nozzles or Venturi tubes—Guide to methods specified in Parts 1.1 and 1.2
2360.1.4	Part 1.4: Measurement using orifice plates, nozzles or Venturi tubes—Guide to effect of departure from the conditions specified in Part 1.1
3666	Air-handling and water systems of buildings—Microbial control
ISO	
6227	Chemical products for industrial use—General method for determination of chloride ions—Potentiometric method

4 DEFINITIONS For the purpose of this Standard, the definitions below apply.

4.1 Circulating water temperature—the Celsius temperature of the circulating water measured in the cold water basin.

4.2 Clean—visually free from sludge, slime, algae, fungi, rust, and scale.

4.3 Cooling tower—a device for lowering the temperature of water by evaporative cooling in which atmospheric air passes through falling water, thereby exchanging heat. The term also includes those devices which incorporate a refrigerant or water heat exchanger.

4.4 Drift—water loss from the tower as liquid droplets entrained in the exhaust air, excluding condensation.