

AUSTRALIAN STANDARDS FOR CERAMIC TILE FIXING AND THEIR IMPACT ON OTHER STANDARDS

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SYNOPSIS

Australia is a large country with diverse climatic conditions that impose demanding requirements on ceramic tile fixing practices. Australia has produced a Standard for the fixing of ceramic tiles that amalgamates what were considered to be the best features of the British and American Standards. These Standards have been designed to be user friendly, incorporating a lot of pictorial and tabular material, with some separation of material that pertains particularly to architects. This user friendly approach has spread to other Australia and New Zealand Standards. This approach, along with the computerisation of Australian Building Codes, has attracted interest and support from South East Asian countries that are keen to develop similar standards.

1 CURRENT AUSTRALIAN STANDARDS

Australia has three Standards relating to the use of ceramic tiles in buildings. These are AS 3958.1, AS 3958.2 and AS 2358.

AS 3958.1-1991, **Guide to the installation of ceramic tiles**, set out various methods for the fixing of ceramic tiles, based on the type of fixative to be used, for both floor and wall applications.

AS 3958.2-1992, **Guide to the selection of a ceramic tiling system**, provides information on the properties of ceramic tiles, fixatives and backgrounds. It assists the specifier in the selection of appropriate combinations to meet the requirements of particular installations.

AS 2358-1990, **Adhesives for fixing ceramic tiles**, specifies performance requirements for organic based adhesives, cement-based adhesives and cement-based tile fixing mortars containing organic additives, used as adhesives for the installation of ceramic wall and floor tiles and mosaics. The appendices contain methods for determining bond strength in shear of the adhesive at room temperature, after air drying and after cyclic water immersion. Further appendices contain methods for determining bond strength in tension after drying and cyclic accelerated ageing. There are further methods of test for staining and for determining resistance to fungal growth.

These three Standards have all been published during the period since November 1990. They are thus relatively recent documents, and draw on information contained in earlier international Standards. For example, portions of AS 3958.1 are based on the British Standard BS 5385, Wall and Floor Tiling, which was originally published as British Codes of Practice CP202 and CP212. The Australian Standards also draw on previously published American standards, e.g. American National Standards Institute document A108.1, A108.4, A108.5, etc. The Australian Standards on ceramic tiles amalgamate what were considered to be the best features of the above British and American Standards.

2. AS 3958.1-GUIDE TO THE INSTALLATION OF CERAMIC TILES

Australian Standard 3958.1 covers the subject matter as set out in Figure 1.

The Standard is directed at the architect, specifier or the tile fixer working on site. Hence Table 3.1 provides a simple guide to appropriate tiling systems for residential, commercial or industrial applications.

TABLE 3.1

FLOOR TILING INSTALLATION GUIDE

Service requirements	Concrete floor	Framed floor
Select performance level and choose installation method that meets or exceeds it	Clause N.º	Clause N.º
Industrial: Subject to heavy loads such as fork-lift trucks and requiring high strength and abrasion resistance e.g. factories, dairies, food plants	3.3.1.1 3.3.1.2 3.3.3.1. 3.3.3.2.	
Commercial: Subject to continuous foot traffic and occasional heavy loads such as fork-lift trucks and light vehicles e.g. shopping malls stores, commercial kitchens.	3.3.2.3 3.3.3.3 3.3.3.4	3.3.2.2* 3.3.4.1* 3.3.4.2* 3.3.4.4* 3.3.4.5*
Residential: Subject to irregular foot traffic and occasional moderate loads, e.g. kitchens, bathrooms, foyers.	3.3.2.1	3.3.4.3

*Unsuitable where heavy loads are anticipated.

NOTES:

1 Any system may be used for a less severe application

2 Consideration should also be given to:

- (a) the wear properties of the surface of the tile selected;
- (b) the fire-resistant properties of the installation and backing; and
- (c) the slip resistance of the surface of the tile selected.

This table is then supplemented by a suite of diagrams describing various tiling systems, including information on substrate, tile type and adhesive. Such figures include, for example, Figure 2.

A similar guide in table format is presented for wall tiles, with corresponding diagrams, such as that shown in Figure 3.

Section 5 provides general requirements for installation of ceramic tiles, with either cement mortar or adhesives, and includes recommendations as to movement joints. See Figure 4.

3 AS 3958.2 GUIDE TO THE SELECTION OF A CERAMIC TILING SYSTEM

This standard is particularly intended for architects and specifiers and sets out the procedures involved in the selection of a ceramic tiling system. It provides background material as to why decisions are made. The procedure for the planning and design of a tiling installation is presented in the following flow chart. See Figure 5. Each of the separate considerations is covered in more detail in the text.

In considering environment and performance, account of any severe climatic conditions. Australia has a wide range of climates, as depicted in Figure 6.

The Standard reflects the requirements imposed by climate and provides guidance of thermal effects on tiling, and the detailing of movement joints.

4 AS 2358 ADHESIVES FOR FIXING CERAMIC TILES

Australian Standards Committee BD/44 is responsible for the on-going maintenance of the Standards pertaining to tiling. Standards Australia has a policy of aligning Australian Standards as closely as possible with ISO Standards. Committee BD/44 is keenly monitoring development of the corresponding international standards by the CEN committee and awaiting involvement in ISO Technical Committee 189.

5 USER-FRIENDLINESS OF AS 3958.1 AND AS 3958.2

The Australian Standards on the use of ceramic tiling AS 3958.1 and AS 3958.2 contain abundant tables and illustrations. Part 1, for example, contains over 50 diagrams. This is to present an easy-to-use body of information to the architect, specifier or tile fixer. The entire format of the AS 3958 series is designed to be user-friendly and to present the necessary information in as lucid and straightforward a fashion as possible.

This user-friendly approach is being adopted in other documents recently prepared by Standards Australia, such as the revision AS 3740, **Waterproofing of wet areas within residential areas**, (now out for public review) and is evidenced by the increasing number of handbooks prepared by SAA.

6 AUSTRALIAN STANDARDS AND THE BUILDING CODE OF AUSTRALIA

Worldwide over recent years there has emerged the development of a 'performance' approach to building regulations. This is concerned with the performance of a building and its elements rather than with the materials and methods of construction.

The objective of performance-based regulations and standards is to define the performance required for whole buildings, parts of buildings and building components in terms of the functional requirements of users.

The performance requirements of the vast majority of buildings do not vary greatly over time.

However, this is not true for the technology of their design, materials construction and maintenance. It is therefore important that regulations be performance based with, ideally, design and prescriptive material being reserved for standards which are called up in the regulations, and which have identical performance requirements.

This will enable new developments in technology to be expressed in standards without needing to change legislation. To change legislation is a more cumbersome process which must be enacted in each State and Territory.

The Building Code of Australia (BCA) has been in force since 1990 and reflects this performance based approach.

The BCA sets down the objectives and, so far as it can, performance requirements and deemed-to-satisfy provisions which apply to the construction of buildings for all classes of occupancy in any part of Australia. The Building Code of Australia references 76 Australian Standards.

7 BCAider

BCAider is a PC software package designed to help building professionals comply with the complex regulations of the new Building Code of Australia. It is the product of research conducted by the CSIRO Division of Building Construction and Engineering.

BCAider uses a state-of-the-art expert systems approach to apply the Code logic as closely as possible. Expert commentary is displayed on demand, providing useful background information and a guide to the way the Building Code might be applied to particular situations. BCAider is thought to be the first fully-commercial expert system for building codes in the world. For the architect, building surveyor, engineer, designer or planner, the program adds a whole new dimension to the design process.

The program enables:

- * Presentation of the Building Code of Australia (BCA) in computer-based format, including menus, help facilities, error checking and colour graphics.
- * Powerful yet user-friendly program running in the popular Microsoft Windows format. Ideal for users with limited knowledge of computers.
- * On-line expert commentary to provide background information and examples.
- * Overlay windows providing full definitions of key terms in the BCA.
- * Automatic generation of compliance report files for printing and electronic storage.
- * Entering of commonly-used plans and specifications and their retention for further reference.

8 SAA-SANZ ACTIVE COOPERATION AGREEMENT

The on-going development of the AS 3958 series will be undertaken by a committee amalgamating Australian and New Zealand interests.

As of 1 July 1992 an Active Cooperation Agreement between Standards Australia and Standards New Zealand took effect. On that day the Active Cooperation Agreement was signed by both Chief Executives. The agreement built on previous understandings between the organizations, and covers cooperation and resource sharing in the standards-making area.

Australia and New Zealand have always been friendly rivals, but are quickly discovering that economic viability is becoming more and more difficult in a world where powerful trading blocks and high subsidies dominate. This important agreement should go a long way toward strengthening the position of the two nations in both regional and world markets.

In essence, the Active Cooperation Agreement between Standards Australian and Standards New Zealand for the preparation and marketing of joint standards means that where a standard in either country is identified for development or revision, it will be drafted as a joint standard - exceptions will be rare. In most cases, a single joint Australian and New Zealand Committee will be involved.

By improving standards cooperation between Australia and New Zealand, we are not trying to produce standards unique to this region; we are trying to provide an efficient standards base equally applicable to importers and exporters to and from all parts of the world. This is similar to the European Economic Community (EEC) approach, where joint standards facilitate the movement of goods and services both between the EEC countries and in and out of the EEC.

The influence of Australian Standards is significant in the Pacific islands and Asia. For example, strong interest has been shown in Australian Standards and the Australian system of building regulations by authorities from Vietnam.

9 CONCLUSION

The Australian Standards on fixing of Ceramic Tiles have been developed to be user-friendly. Their influence has been felt in the preparation of other Australian and New Zealand Standards, and now is reaching out to countries in the Pacific and Asia.

Bearing in mind the fact that there is currently no European Norm in the ceramic tiling field, the approach taken in AS 3958 may be considered as a basis for the development of the European Norm.

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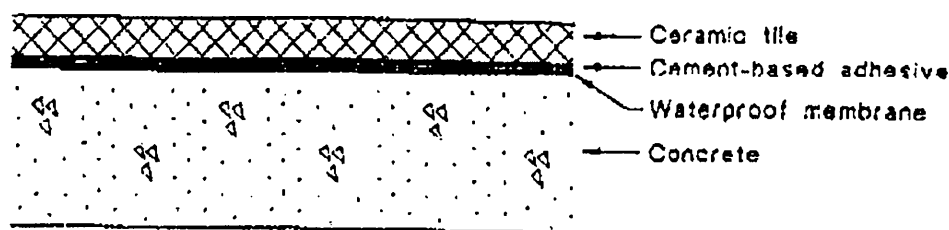
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FIGURE 1 CONTENTS OF AS 3958.1



3.3.2 Exterior floors, decks and roofs

3.3.2.1. Cement-based adhesive with integral waterproof membrane

(a) Performance level: Residential

(b) Recommended uses:

- (i) Exterior floors or patios where membrane is not used and where positive drainage below slab is provided.
- (ii) On properly-cured structural slabs where deflection does not exceed 1/360 of span.

(c) Materials:

- (i) Cement-based adhesive - Clause 2.4.
- (ii) Latex-cement mortar - Clause 2.4.
- (iii) Grout - Clause 2.5, specify type.
- (iv) Movement joints - Clause 2.7.

(d) Preparation by other trades:

- (i) Subsurface drainage should be provided.
- (ii) Slab should be sloped for complete drainage.
- (iii) Slab should be float finished to a uniform grade. Maximum variation should not exceed 10mm in 3m.
- (iv) Slab should be well cured and dry, dimensionally stable and free of waxy or oily films - Clause 4.3.
- (v) Gravel bed or other means of drainage below a ground slab is essential.

(e) Installation:

- (i) Movement joints are essential - Clause 5.4.5.
- (ii) Bedding may be thick-bed or thin-bed.

(f) Installation specifications:

- (i) Tiles - Clauses 5.6.5., 5.6.6.
- (ii) Grout - Clause 5.7.

FIGURE 2 EXAMPLE OF FLOOR TILING SYSTEM

3.5.3. Dry interior walls, framed construction.

3.5.3.1. Fibre-cement sheet with organic adhesive.

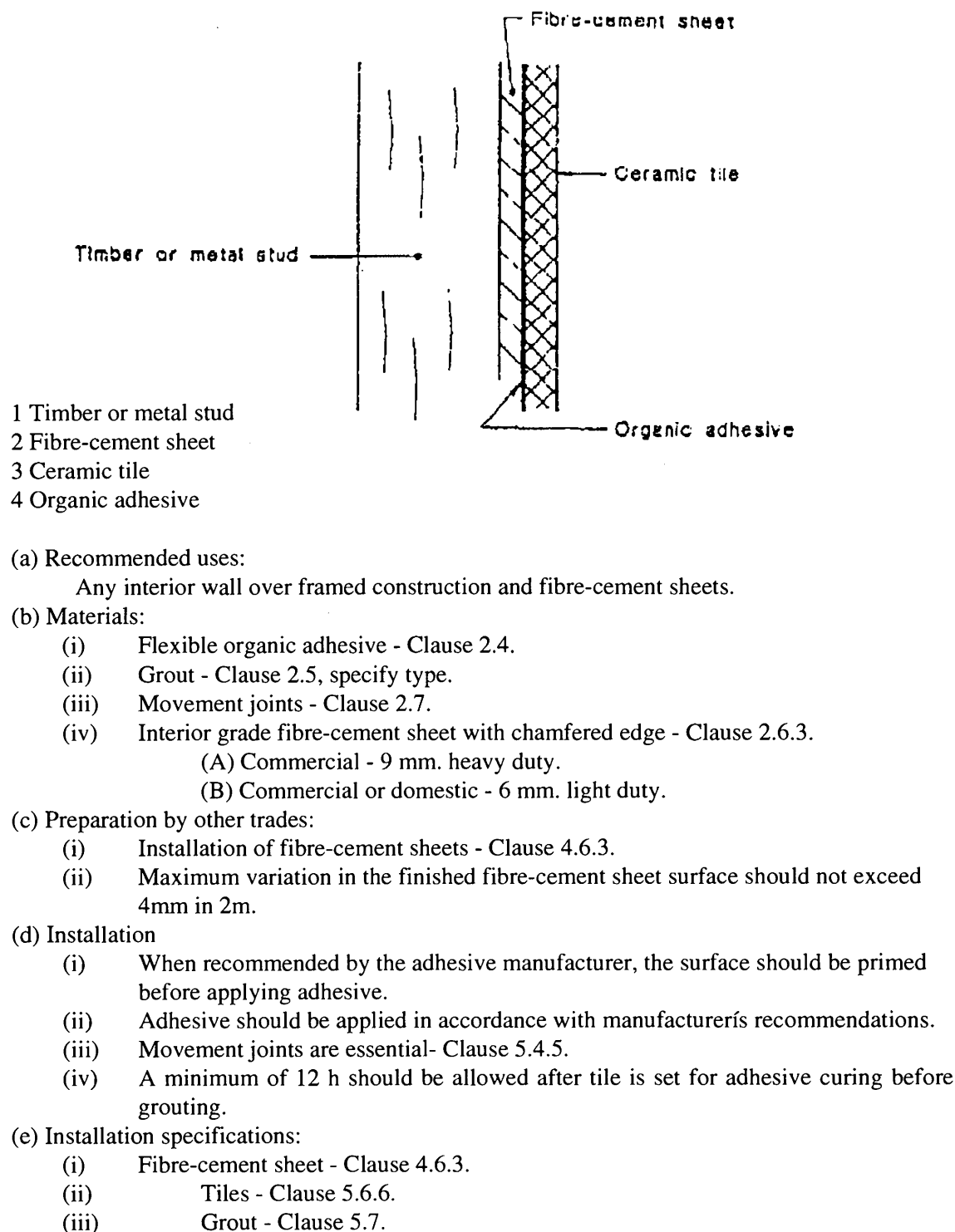
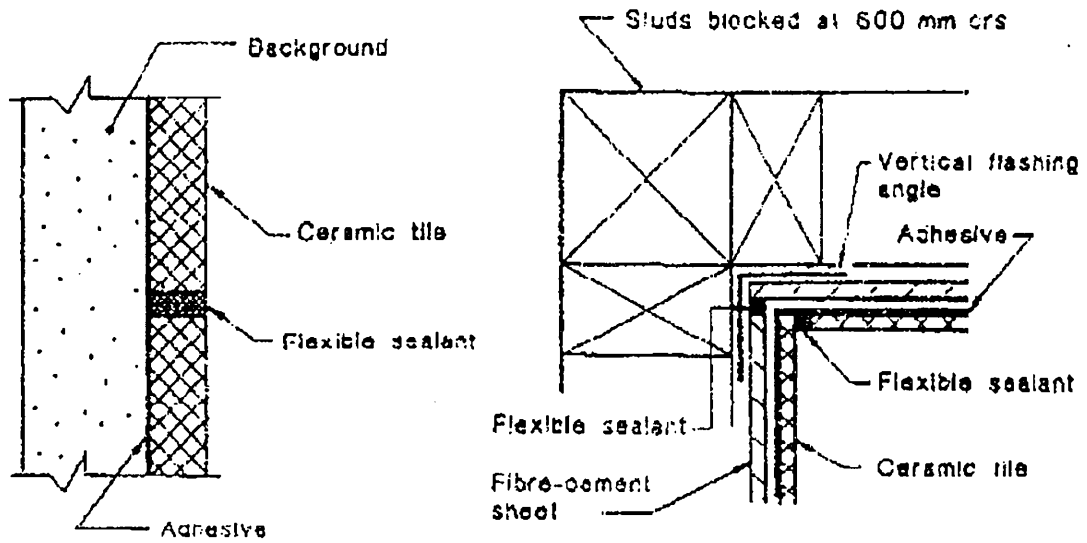
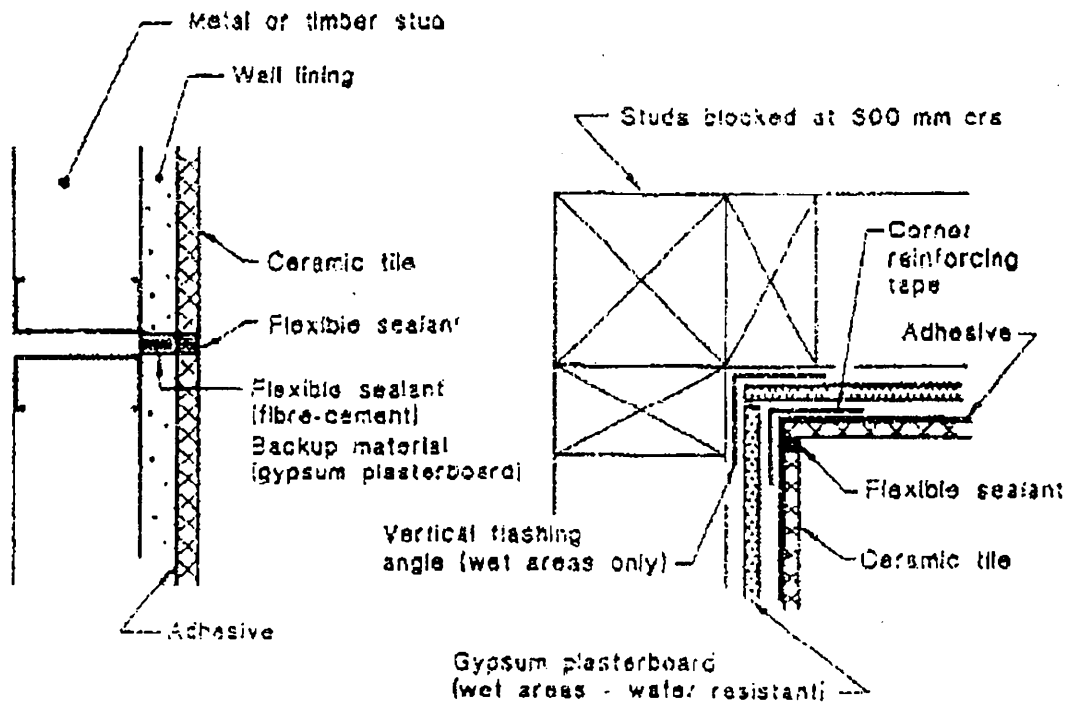


FIGURE 3 EXAMPLE OF WALL TILING SYSTEM



(a) Vertical or horizontal joint

(b) Vertical corner in shower compartment (fibre cement).



(c) Vertical joint (sheet materials)

(d) Vertical corner (gypsum plasterboard)

FIGURE 4 TYPICAL MOVEMENT JOINT SYSTEMS FOR WALLS

FIGURE 5 FLOW CHART ANALYSIS OF PROJECT DATA

ANALYSIS OF THE PROJECT DATA

ENVIRONMENT AND PERFORMANCE			
- Internal/external	- Horizontal/vertical	- Abrasion resistance	- Slip resistance
- Private/public	- Mechanical loads	- Water exposure	- Cleanability
- Civil/industrial	- Impact resistance	- Thermal exposure	- Chemical resistance
- New/renovation			

BASE STRUCTURE

- Suitability of the surface to directly receive bedding layer: cleanness, planarity, need for priming, strengthening, grading.
- Inherent dimensional stability of the substrate materials: thermal expansion characteristics.
- Reversible and irreversible moisture movements.
- Movements due to the structural design: settlement, creep, applied loads, deflection, vibration.
- Provision for movements: location and type of construction joints and other movement joints.

SUBSTRATE GEOMETRY

- Shape of the area to be tiled and location of fixed construction elements and fittings.
- Limitations on bedding system thickness.

CONSTRUCTION SCHEDULE

- Age of the substrata at the time of tile fixing.
- Age of kiln-dried products.
- Maximum time period between the commencement of fixing and opening to traffic.

PLANNING AND DESIGN

DESIGN MAY BE BASED ON EITHER MATERIALS OR BEDDING

CHOICE OF MATERIALS

- Ceramic tile: possessing the necessary physical attributes; influence of shape and size.
- Fixative: possibly defined by choice of bedding system or limits on bed thickness; may be dependent on tile type; need to know precise adhesive characteristics.
- Material for joints: consistent with anticipated environment; possibly influenced by joint width and flexibility requirements, where the joint width may be influenced by the type and size of the tile and the anticipated differential movements.
- Backgrounds.

CHOICE OF BEDDING SYSTEM

- Identification of bedding and jointing systems compatible with the type of load-bearing structure, its characteristics, the service environment and the expected performance levels.

DETAILING OF MOVEMENT JOINTS

- Type
- Dimensions
- Location

These details are influenced by the type of load-bearing structure, its age, dimensions, the geometry of the surface to be tiled, the moisture expansion potential of the tiles, the size of the tile and the grout joints and the location of any construction joints and movement joints.

VERIFICATION OF ACCEPTABILITY OF THE TILING SYSTEM

Expert assessment of the compatibility of the choices made and the ability of the specified system to perform adequately in the designated environment.

OK?

NO

YES

PREPARATION OF DRAWINGS, SPECIFICATIONS

PREPARATION OF INSTRUCTIONS

- Specific instructions to purchasers, builders, tradesmen, supervisors on crucial aspects which must be observed.
- Instructions for the operation, cleaning and maintenance of the facility.

FIGURE 6 CLIMATIC ZONES IN AUSTRALIA

