

**ACT HOUSE ENERGY RATING SCHEME
(ACTHERS)
(Guidelines for Quality ACT Residences)**



PLANNING & LAND MANAGEMENT GROUP

DEPARTMENT OF URBAN SERVICES

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1. SETTING THE SCENE

1.1 *Planning and Land Management's Vision, Purpose and Goal*

The Vision of Planning and Land Management (PALM) is:

Canberra and the ACT – leading the world in livability and sustainable development.

PALM's Purpose is:

Planning and facilitating high quality sustainable development in the ACT...

By providing responsive services in planning, development, land management and information and building regulation, while ensuring that Canberra continues to be a great place to live and work.

PALM's Goal is:

To be recognised by its stakeholders as an innovative, professional and responsive organisation which leads social and urban change, reflective of the community's needs and aspirations.

To attain PALM's Vision in relation to energy use, all industry sectors will need to be considered. However, the focus of this set of Guidelines is on energy efficiency in relation to High Quality Sustainable Design (HQSD) of the Built Environment for which the ACT Government is responsible.

Within HQSD of the Built Environment, energy efficiency is considered as an integral part of PALM's Purpose towards fulfilling its Vision, and relates to the design of Subdivisions, Residential Construction, Commercial (including Industrial and Retail) Developments and Major Appliances.

1.2 *PALM's Energy Strategy Statement*

The **Energy Strategy** for the Built Environment, in line with PALM's Vision and Purpose, is:

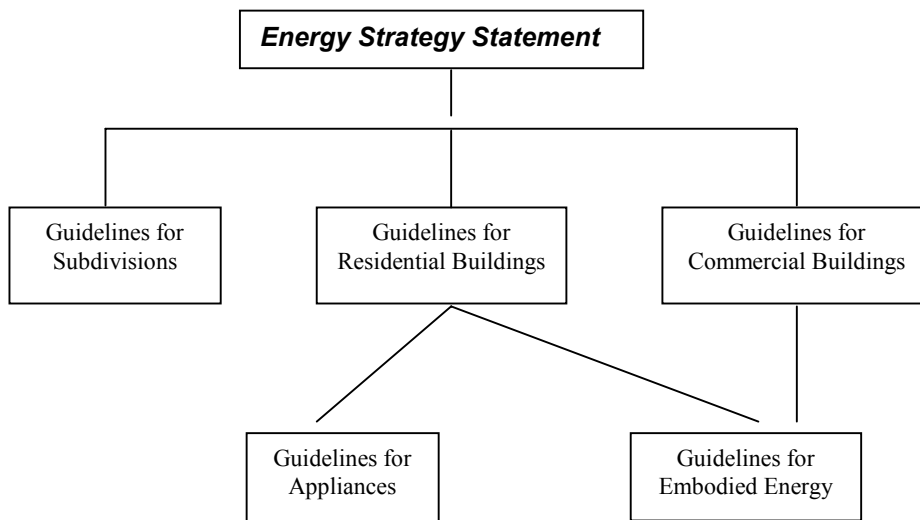
In order to contribute to a quality and sustainable design for energy efficient Subdivisions, Residential Construction and Commercial Developments, specific Guidelines have been (or are currently being) developed to assist developers and builders. Raising community awareness with regard to the use of energy-efficient major Appliances will assist in this task, and to this end, separate Appliances Guidelines are being developed.

Monitoring mechanisms will also be built into systems to provide ongoing information on performance against the Guidelines.

(COMMENT: The Guidelines for Subdivisions, Appliances and Embodied Energy are being developed. Those for Commercial Buildings are being held in abeyance until the mandatory minimum standards are established in the Building Code of Australia. The Guidelines for Residential Construction have been completed.)

1.3 Graphic Representation of PALM's Energy Planning

Graphically, the PALM Energy Guidelines are being developed as follows:



2. INTRODUCTION TO THE RESIDENTIAL GUIDELINES

This document is the Guideline which addresses Residential Buildings and the standards behind the ACT House Energy Rating Scheme.

Since 1 July 1995, in order to improve the energy efficiency of all new residences, the Territory Plan requires all residential design and siting applications to be accompanied by an energy efficiency rating assessment. All new residences are to achieve a minimum four-star rating except in special circumstances. From 1 July 2001 all assessments are produced by the new software model *FirstRate* and undertaken by ACT Accredited *FirstRate* Assessors.

The Government's decision to improve the energy efficiency of ACT residential design followed a recommendation by the Assembly's Standing Committee on Planning, Development and Infrastructure. The mandatory minimum energy efficiency rating of four stars was agreed. This was designed to encourage an awareness by the community and building industry of the benefits of energy efficiency. It also demonstrated the Government's commitment to the National Ecologically Sustainable Development and Greenhouse Strategies, the Council of Australian Government's agreement on residential energy efficiency of 1993 and the ACT Greenhouse Strategy.

2.1 Background

In consultation with the residential building industry in 1993, the Government agreed to defer the commencement of the mandatory assessment requirement for two years. This provided time for the necessary adjustments in building procedures, and to trial an energy assessment process. It was also agreed that the ACT House Energy Rating Scheme (ACTHERS) would conform to the Nationwide House Energy Rating Scheme (NatHERS) so that the ACT building industry would not be disadvantaged nationally.

An interim version of a manual energy rating – the tabular method - was launched in October 1994, and was applied to both multi-unit development projects in the B1 residential precincts of inner Canberra, and design and siting applications on a voluntary basis. This tabular method was degazetted on 9 July 1999, as the sophisticated and detailed computer method was more informative while at the same time produced a report with details that the client could reference for further information.

If the dwelling was built after July 1995, it should already have a rating of a four-star minimum. There are a minimal number of exceptions which have occurred because of unusual circumstances, or because of special conditions which have not allowed the design to achieve the minimum. These are discussed later in Section 6.2.

In December 1997, a further development occurred. The *Energy Efficiency Ratings (Sale of Premises) Act 1997* was gazetted and became operational on 31 March 1999. In essence, this Act requires the disclosure of an existing dwelling's energy rating in all advertisements for sale, and also the provision of a copy of the ACTHERS Energy Rating Report by vendors to purchasers prior to entering into a contract for sale.

For the purposes of this Act, of course it is disclosure only, and no mandatory minimum applies. Details are discussed in Section 7.

On 1 July 2001, it was necessary to introduce a new software model into ACTHERS in order to refine conformity with NatHERS. The model is *FirstRate*, which was developed by the Sustainable Energy Authority of Victoria (SEAV). It is used for all energy efficiency ratings for all ACT residential properties, including any habitable parts of a larger building, by setting the climatic zone to reflect that of the ACT (Canberra) region.

The ACT is still the leader in this field in Australia, and the ACTHERS new model *FirstRate* continues to produce a report which shows where the dwelling is well designed, as well as its overall energy efficiency.

3 THE NATIONAL BENCHMARK

The implementation of ACTHERS represents a commitment made by the ACT Government to adopt a scheme which conforms with the national benchmark, NatHERS. This benchmark was set when the National Building Energy Efficiency Coordinating Committee (NBEECC), charged with the implementation of NatHERS, adopted a modified CSIRO energy assessment computer software package (CHEETAH) to provide nationwide assessments of the energy performance of buildings. The package is maintained by CSIRO as the benchmark for validating State/Territory energy rating packages, incorporating 28 climatic zones necessary to assess locations nation-wide.

The role of NatHERS in relation to the ACT scheme is to be the standard for validation of the ACT based scheme, and as a basis in the event of dispute resolution regarding ACTHERS based ratings.

4. ENERGY EFFICIENT DESIGN IN THE A.C.T.

Design standards of energy efficient housing in the ACT aim to minimise energy consumption of non-renewable resources for heating and cooling and hot water. The associated advantage of this is to reduce costs borne by the householder. Cost-effective energy efficient housing is usually easiest to achieve at the initial design stage by integration of the dwelling and the site. This allows maximum use of

natural elements such as solar access and air movement, and enables the development of interior design elements to produce a high degree of comfort while minimising and conserving energy use.

Although ACTHERS is based on the potential of the design to reduce energy use, the behaviour of occupants and the energy efficiency of major appliances are also very important in overall energy consumption.

As already discussed above, the Scheme is based on extensive computer simulations of housing performance in the ACT climate. It focuses on insulation, orientation (of living areas and windows), air leakage and other design features to provide a comprehensive picture of the house's potential for reduced energy consumption.

In the ACT, design measures which achieve better energy efficiency include:

Orientation	north facing living areas with good winter sun access (extremely important design issue)
Insulation	appropriate R-ratings of insulation where appropriate in ceilings, framed walls and under floors (eg concrete slabs and suspended floors);
Air leakage	draughtproofing around fireplaces, windows and doors;
Design features	ceiling height, north facing windows in living areas;
Floor type	slab on ground, suspended slab or timber;
Zoning	internal zoning of living areas with ability to segregate areas for optimal heating and cooling;
Glazing	type used for various orientations (eg. Smart glass, double or tinted), and the optimal percentage of windows appropriately oriented and designed for reduction of heat loss in winter, and for shading in summer
Thermal mass	use of building materials with high thermal mass for floors and internal walls, and use of trombe thermal mass walls;
Width of eaves	optimal widths of eaves to accommodate various aspects ;
Cross Ventilation	Reduces residual heat in summer and adds benefit of diminishing fungus and bacteria in carpets and curtains:
Common walls	especially in multi-unit/townhouse developments.

Windows are a critical element in energy efficient house design, as unprotected single glazing allows the rapid transfer of heat into a residence in summer, and out in winter. The larger the window, the greater the transfer of heat.

As living areas are those most commonly used, thermal comfort in these areas is important. Where it is not possible to secure northern window access for every room, priority should be given to locating as many as possible of the living areas on the northern side of the house. These areas need to be comfortable. They should optimise natural light during winter and be shaded in summer, improving overall energy efficiency.

In order to conserve captured heat within living areas, the house design should provide for doors which separate the living areas from bedrooms and service areas. Grouping rooms with similar uses will also assist in making the most efficient use of heating and cooling systems.

South facing windows are useful for assisting cross flow ventilation, particularly in summer. However, their use should be carefully considered, especially with respect to their internal coverings. Without adequate insulation treatment, the south facing windows may also contribute to heat loss.

East and west windows if too large, may gain large amounts of unwanted heat during summer and lose heat during winter. Selection of glazing and window treatments for summer shading and winter protection is critical to the overall performance of the residence.

With its ability to reduce the amount of energy needed to heat or cool a house, insulation is an important element of energy efficient design that can be added to a home. The ACT Government recognises this, and conforms to the Building Code of Australia.

The Code has set the parameters for energy efficient design as follows:

For Class 1, 2, 3 and 4 Buildings (ie. Residential - Single detached dwellings and multi-unit developments), the standard required is an ACTHERS Rating of 4-stars as assessed by an accredited ACT House Energy Assessor.

For extensions to those Buildings, *either* an ACTHERS 4-star rating, *or* comply with the following standards:

Floors

- (a) concrete floor; or
- (b) timber floor with an R-rating of 1 including carpet; and

Roofs

- R3 insulation material in the ceiling space; or
- R2 insulation material (+ optional sarking R0.5) in exposed raked ceilings; and

Walls (see exemptions in (b) below)

- R1.5 insulation material in the external wall space.

NB: *Ceiling and underfloor provisions exempt most buildings.*

Exemptions – *The requirements of this Part of the BCA do not apply to the following types of construction:*

- (a) *a ceiling or underfloor space where unrestricted access for the installation of insulation will be available after the completion of construction; and*
- (b) *cavity brick, earth wall construction, ashlar stone or other masonry walls which have a thickness (excluding any cavity) of not less than 180 mm.*

Insulation assists in retaining any energy input to a residence, whether for cooling or heating, and whether achieved by solar access or an appliance. This reduces the rate of turnover in the replacement of that energy.

The use of building materials with high thermal mass (the ability to store heat) is also of value to an energy efficient home. Concrete floors and internal masonry walls are examples of materials which assist in the regulation of internal temperatures. High thermal mass is particularly important in climates such as the ACT where summer and winter temperatures vary greatly, and large differences occur between minimum and maximum daily temperatures.

Unwanted or uncontrolled ventilation or air-leakage may add significantly to the costs of cooling, and especially heating a home. The use of weather strips and door seals

will improve the overall performance of an energy efficient house, while reducing energy consumption and costs. However, ventilation is also an important component for regulating internal temperatures during summer and for allowing fresh air into the house to control dampness and mildew if required. Cross flow ventilation during summer is enhanced by appropriately placed windows and doors on all sides of a house.

Other elements may further add to the energy efficiency of a home. However, these do not form part of the energy rating assessment. These include:

- . an efficient and flexible heating system,
- . an energy efficient hot water system (such as solar),
- . use of energy efficient lighting and appliances, and
- . landscaping sympathetic to the microclimate of the house.

In Canberra's climate with its extremes in temperature, the potential long term benefits to the community of energy efficient housing are significant, both for individual home owners and in reducing the costs of infrastructure. A well-designed energy efficient residence will also reduce the costs of space heating and cooling, because a well oriented and insulated house will use less energy for heating and cooling.

On average, an energy efficient home is up to 5 degrees warmer in winter and up to 10 degrees cooler in summer. As well as being more comfortable all year round, an energy efficient house also has much more natural light in areas most commonly occupied, including direct sunlight which does not detract from internal thermal comfort. The principles of energy efficient design do not limit housing choice, but rather create opportunities to use a variety of design features to produce an attractive and functional home.

5 THE MODEL USED IN ACTHERS - *FirstRate*

Energy rating assessments are prepared using a detailed computer-based software modelling package, *FirstRate*, based on ACT climatic conditions. When used as a design tool for development application (design and siting) purposes, this model provides feedback to the designer to enable refinement of the final design. When used to disclose the actual energy efficiency of an existing house (which is for sale) it provides options for improvement to the efficiency of the dwelling which are incorporated into the report for use by the homeowner or prospective purchaser.

All assessments in *FirstRate*, whether for design and plan approval, or for disclosure of efficiency of existing dwellings, are undertaken in non-regulation mode. For new residences, the details which appear in the assessment reflect what is incorporated in the plan, and show what will actually be built. For existing residences, what appears in the rating is what is actually already there, and being sold by the vendor. The assessor is responsible for ensuring that the model is used appropriately with the correct ACT climate and in non-regulation mode.

The model does not make any assumptions about inclusions in the building fabric of the residence, and does not consider the appliances to be used. It is good practice to use appliances and fittings which contribute in the best manner to energy efficiency, as this will enhance comfort while reducing energy costs.

6 STAR RATINGS

6.1 How the Star ratings are Used

ACTHERS uses *Star Ratings* as the basis for its modelling. The higher the star value, the better. The *FirstRate* model ranges from 0 to 5 stars, with 4-stars being the mandatory minimum for all new residential design approvals. There are also point values within the model, which equate to the star range. Ratings are reported in half-star increments as follows:

Canberra Climate Zone

Star value	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Point score range	Less than or equal to -87	-86 to -71	-70 to -57	-56 to -46	-45 to -35	-34 to -26	-25 to -18	-17 to -11	-10 to -3	-2 to 4	Greater than or equal to 5

6.2 What is the Value of a Star?

Please note the following information is provided as a guide only. Actual energy consumption will depend on the area of the house, the individual style of occupancy and the efficiency of appliances.

6.2.1 Dollar Cost

For a 150m² home, combined annual heating and cooling cost would be as follows:

Star Rating	Estimated Cost [#]
0	\$1350
1	\$1090
2	\$800
3	\$640
4	\$510
5	\$400

1999 costs which do not include energy supply costs.

The above estimates are based on the following assumptions:

winter gas central heating to 21°C for 3hrs in the morning and 6hrs in the evening;

summer air conditioning to 25 °C throughout the house;

occupants will adjust their blinds and curtains to minimise energy use; and

windows and doors are shut during heating and cooling.

6.2.2 Energy Use in MegaJoules per Square Metre per Annum

Alternatively, it is possible to look at the annual energy consumption for the same house which would be:

Star Rating	Annual MJ/m ² for heating (h) and cooling (c)
0	720 (612h, 108c)
1	486 (413h, 73c)
2	357 (303h, 54c)
3	285 (242h, 43c)
4	228 (194h, 34c)
5	180 (153h, 27c)

7 DEVELOPMENT APPLICATION (DESIGN & SITING)

7.1 Process

An application for Design and Siting Approval of new residential designs will be required to include an energy assessment report along with other mandatory requirements.

The energy report needs to be undertaken by a current authorised ACTHERS *FirstRate* accredited assessor, indicating an energy rating of four-stars or greater (unless special conditions apply). The report will be checked by design and siting officers to determine compliance with the minimum rating requirement, or in the event of non-compliance, whether special conditions apply.

From 1 May 2001, the Development Assessment area of PALM's Development Management Branch requires, for a residential Development Application (DA), that:

five (5) copies of plans for a DA or four (4) copies of plans for a single detached dwelling DA will be submitted. Each plan must be stamped with the ACTHERS FirstRate Accredited Assessor's stamp and have its own attached appropriately-completed FirstRate Energy Rating Report, and

the Assessor will indicate on the imprints of the FirstRate energy rating stamp where indicated, the number of points as well as the star-rating achieved by the DA (eg 4.5 stars and -1point, or 4½ stars and -1pt), and

the Assessor will include comments on the report where any special conditions or considerations may apply, and if s/he feels that clarification is required for any part of the assessment.

7.2 Special Conditions

There are six special conditions under which an exemption may be claimed from achievement of the minimum house energy rating requirements for new houses. Where one or more of the special conditions apply, approval is subject to provision of ceiling and wall insulation, and under floor insulation to timber floors.

- a) *Block Geometry* - orientation or shape of block such as to preclude the northerly orientation of the house, defined as 340° to 30°
- b) *Block Overshadowing* - adverse slope of block, existing obstruction or planned or existing development resulting in overshadowing of northerly windows
- c) *Block Topography and Geology* - slope, drainage or geo-technical constraints such as to preclude the adoption of 'slab on ground' type construction
- d) *Novel Construction* - where the prescribed assessment techniques do not reliably assess the thermal performance of the construction being adopted and there are prima facie grounds for believing that the prescribed techniques significantly underestimate the construction's performance.
- e) *Conflicting Guidelines* - lease and development conditions, Territory Plan guidelines or any other imposed restriction eg. heritage requirements, which preclude the attainment of the minimum rating requirement
- f) *Uneconomic Requirements* - where it may be demonstrated that the attainment of a 4 star rating would require additional expenditure which is not cost effective.

8 ASSESSMENT OF EXISTING RESIDENCES

8.1 The Energy Efficiency Ratings (Sale of Premises) Act 1997

In December 1997, a further development occurred.

The *Energy Efficiency Ratings (Sale of Premises) Act 1997* was gazetted and became operational on 31 March 1999. This requires the disclosure of an existing dwelling's energy rating in all advertisements for sale of the premises, and also the provision of a copy of the ACTHERS Energy Rating Report by vendors to purchasers prior to entering into a contract for sale. In fact, the ACTHERS Report is to "form part of the Contract", as set out in the Act.

Unlike new home designs being submitted for Development Approval (which must achieve a minimum of 4 stars) existing homes for sale do not have to meet a minimum energy efficiency rating. The Act requires disclosure of the existing energy efficiency of the residence.

To comply with the Act, an energy efficiency rating statement is one that has been "prepared in accordance with the Energy Ratings System for Residential Buildings prescribed by the Australian Capital Territory Planning Authority for the purposes of the Territory Plan as in effect from time to time under the *Land (planning and Environment) Act 1991*." (The Act)

If a rating does not exist, one must be undertaken.

If a rating does exist but was undertaken prior to the introduction of the new *FirstRate* software model on 1 July 2001, as from 1 January 2002 a new rating must be done, as the old model does not reflect the current ACTHER Scheme policy and procedures.

If a rating does exist and was undertaken under *FirstRate* on or after 1 July, 2001, then if:

- (a) any further structural alterations or additions to the residence have been made, or
- (b) any changes have been made to external fittings (such as pergolas or blinds), or
- (c) any changes to internal fittings and soft furnishings (eg. curtains, vented downlights and carpet) have occurred,

then the existing rating is no longer current and a new one must be done.

If no changes have been made then the existing *FirstRate* rating is accepted as current. However, **it must be accompanied by a declaration by the vendor to that effect.** Copies of these declaration forms are available by following the instructions provided in Section 12.

This *FirstRate* Rating reflects the actual energy efficiency of the home, and provides yet another piece of information about the residence to both the vendor and the purchaser. All ACTHERS ratings from 1 July 2001 are undertaken in non-regulation mode, using the *FirstRate* modelling software.

A list of Current ACTHERS Accredited Assessors with their contact details, appears on the PALM website, and information regarding access to the appropriate area appears in Section 11.

9 PROFESSIONAL LIABILITY OF ASSESSORS

ACTHERS Accredited *FirstRate* Assessors are expected to have appropriate

Insurance to cover situations which may be legally challenged by their clients who believe that incorrect ACTHERS Assessment information has been provided by that Assessor. The Assessors shall indemnify themselves against any claims for losses or damages of any nature which may occur as a result of any act or omission by the Assessor. PALM will not take responsibility for inappropriate actions or resulting outcomes stemming from assessor error. It is the responsibility of each assessor to adequately insure themselves and/or their businesses against such errors, and can be done by way of Indemnity Insurance. This requirement is in accordance with the ACTHERS Assessor Code of Practice which is signed by each ACTHERS graduate under the rules applying to the ACT House Energy Rating Scheme.

10 TRAINING OF ACTHERS *FirstRate* ASSESSORS

10.1 Training Consultancy

The ACTHERS Accredited *FirstRate* Assessor course is an advanced in-depth two day course. There is a three hour examination with a pass mark of 85%, which is a necessity given that strict quality guidelines need to be met when undertaking assessments for developers and the community. The course also includes clarification of the ACTHERS procedures, the role and responsibilities of accredited assessors and the Code of Practice for the Scheme.

10.2 Eligibility Requirements

To be considered for training in this advanced technical *FirstRate* ACTHERS course, you are required to show proof of eligibility. You will qualify if you hold one of the following:

1. Qualifications in Architecture that would be accepted as part of the requirements for registration as an Architect in Australia or equivalent;
2. Qualifications in Structural Engineering or Civil Engineering with a specialty in Structure that would be accepted as part of the requirements for registration as an Engineer in Australia or equivalent;
3. An Advanced Diploma or Diploma in Drafting from the Canberra Institute of Technology or an equivalent;
4. Recognised qualifications in:
 - (i) Degree of Bachelor of Construction Management from the University of Canberra or an equivalent; or
 - (ii) Diploma in Building from the Canberra Institute of Technology or an equivalent ; or
 - (iii) Certificate IV in Building from the Canberra Institute of Technology or an equivalent;
5. An accepted pass in the ACTHERS Pre-Requisite Assessment Entrance Test which demonstrates knowledge and ability in each of the principles of:
 - (i) building design and drawing,
 - (ii) heat transfer and storage,
 - (iii) insulation, its application and thermal designation,
 - (iv) glass and glazing, and their location,
 - (v) air change and ventilation controls,
 - (vi) shading, and
 - (vii) site selection.
6. An approval from the ACTHERS Manager in response to a reasonable request identifying just cause why a prospective trainee should be accepted in the absence of 1 to 5 above. The ACTHERS Manager can be contacted on (02) 6207 2321 regarding arrangements for assessment on individual case merit.

Copies of relevant qualifications need to be supplied. If a candidate does not qualify under 1 to 4 above, and if item 5 was bypassed by speaking with the ACTHERS Manager but the outcome was not successful, then a Pre-Requisite Assessment Entrance Test will need to be undertaken and passed prior to entry to the *FirstRate* training course.

11. FURTHER DEVELOPMENTS

As the Scheme progresses in liaison with the building industry in an effort to meet community demands for more functional and comfortable homes, it is expected that many innovations will be incorporated to continue with reduction in energy resource use. It is anticipated that in the future the Scheme will address the issue of recognition of novel and efficient designs by increasing the star range to greater than 5-stars. This would identify homes worthy of recognition and indicate to prospective purchasers that the quality of these homes was superior.

12. FURTHER INFORMATION

Various documentation relating to the Scheme is available from the PALM Shopfront at 16 Challis Street Dickson, or from the internet at www.palm.act.gov.au under *Quality & Sustainable Design*, followed by ACT House Energy Rating Scheme.

Included among these are: the *List of Current ACTHERS Assessors*, the *Sale of Residence Checklist*, and the *Declaration* to be used by homeowners when no changes apply to their residence.

Information regarding technical and training aspects of ACTHERS can be obtained by contacting PALM's House Energy Rating Hotline on tel. (06) 207 1743 during office hours. Policy issues may be discussed with the ACTHERS Manager on (06) 207 2321.

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