CLAY BRICK AND PAVER ASSOCIATION OF VICTORIA
ABN 67 330 141 670
PO Box 174, Carlton South, Victoria 3053
Telephone: 03 9650 8783
Facsimile: 03 9639 2427
Email: assign1@ozemail.com.au

SUBMISSION NO. 53

Secretary:.....
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HOUSE OF REPRESENTATIVES
STANDING COMMITTEE ON
ENVIRONMENT AND HERITAGE

30 October 2003

Environment and Heritage Committee
House of Representatives
Parliament House
CANBERRA ACT 2600

Dear Sirs

Sustainable Cities 2025

Attached please find a submission from the Clay Brick and Paver Association of Victoria in response to the Discussion Paper on Sustainable Cities 2025.

The Association is aware that Mr Tom McNeilly, BArch, FRAIA, has already forwarded a copy of a response to the Discussion Paper to you, however, the Association is forwarding attached a formal copy of our submission.

The Association wishes to acknowledge the assistance of Mr McNeilly in the preparation of this response.

Yours faithfully

Brian Morison
Executive Director

Attachment

House of Representatives Standing Committee on Environment and Heritage

Inquiry into Sustainable Cities 2025

DISCUSSION PAPER: SUSTAINABLE CITIES 2025

Submission by Clay Brick and Paver Association of Victoria

Introduction

This submission is primarily concerned with materials used in the construction of houses and the orientation of the main windows in order to improve their thermal performance and thus reduce the greenhouse gases created by generating the energy to maintain comfortable internal temperatures. Attention to both of these aspects would help to make both cities and the rest of the country more sustainable.

Our submission also discusses the waste of heated water often associated with hot water storage services.

Our submissions refers to the headings given in the discussion paper.

The Clay Brick and Paver Association of Victoria wishes to acknowledge the assistance of Mr Tom McNeilly, BArch, FRAIA, in the preparation of our submission.

Discussion Point 2:

Ensure equitable access to and efficient use of energy, including renewable energy sources

Should higher efficiency standards be mandated for all new dwellings, appliances and business operations?

House construction methods

Later parts of this submission describe informed opinions which indicate that the current practice of building lightweight framed walls is intrinsically unsuitable in the climate of most of Australia. It is recognised that current building regulation requirements for the incorporation of insulation in those lightweight walls significantly improves their thermal performance, however, appreciably greater energy savings – particularly for house cooling – would be achieved by building heavyweight walls, even when they are uninsulated. While we hesitate to propose that this superior method of construction be made compulsory, consideration should be given to more encouragement than currently exists in regulations for the construction of heavyweight walls. That current encouragement, or recognition, takes the form of exclusion of such walls from the mandatory fixing of insulation or the need to achieve a nominated Star Rating, using one of the approved computer simulation House Energy Rating Schemes (HERS).

It is recognised that this desirable change in building practices from framed to heavyweight walls is likely to be resisted by the house building industry, many of whose members are trained as framing carpenters, but most of whom are bright and resourceful and can learn new habits when necessary.

Discussion Point 3:

Establish an integrated sustainable water and stormwater management system addressing capture, treatment and re-use opportunities

What incentives or market based instruments might be appropriate for residential and commercial enterprises to encourage responsible water consumption and re-use?

In the recent past a consultant to this Association – a registered Architect – and his partner retired to the country after living in Melbourne where they had always been conscious that a lot of water can run to waste before any that is hot is available at the tap. The fact that their only water supply was now available from their own rain-water tanks caused them to be more conserving and to collect waste water for their garden.

The pipe that runs from their hot water system (HWS) to their en-suite shower has a length of about 18m which would contain between 5 and 6 litres of water. Experience showed them that, by the time they both showered, there was at least 5 litres in the bucket, which meant that, were they not putting it on the garden, the showers of this two-person household would be wasting about 1,800 litres of water per year.

Their kitchen sink is closer to the HWS, but even so, a little more than 1.5 litres of water needs to run before hot water arrives. Its use three times per day would waste about as much water again as does the shower were they not also collecting it for the garden. The total waste from just these two activities therefore approaches 3,500 litres per year.

This illustrates a problem that is caused because, like most houses, they have a single, large-capacity, electrically powered storage hot water service in a situation where at least one bathroom is remotely located from the HWS and the kitchen sink is not close. Not withstanding the insulation around the hot water pipe, the water in it cools down between showers and sink operations.

This matter is also relevant in the field of energy saving because their approximately 3,500 litres per year of potentially waster water has been heated to at least 60°C. It is recognised that the authority that supplies the water-heating power gives them a benefit by selling it at a reduced cost by doing the water heating overnight, or at other times of low power demand. It is also recognised that this practice helps the authority to balance their generating load, but these compensations do not eliminate the waste of energy.

In their city house, hot water for the kitchen sink came virtually instantly from a 15 litre HWS that was located very close to the sink and plugged into an ordinary power point. Water saving was considerable and the electricity they saved by the elimination of hot water waste more than compensated for the fact that they paid for it at peak rates. 15 litre units are no longer available and the Architect has been advised that this is because they are seen to be the sort of cheap substitute for a proper storage HWS that greedy landlords would otherwise provide for their exploited tenants. Not a correct view on the basis of the above.

Discussion Point 6:

Incorporate eco-efficiency principles into new buildings and housing

How can green construction and refurbishment techniques be integrated into standard building practices?

Australia's climate

Despite our ready recognition that the climate in this country is markedly warmer than that of the northern parts of Europe and America, we seem almost totally unable to avoid a "colonial cringe" that tends to make it impossible for us to dare to formally recognise this fact by using methods to control the consequences of this temperature difference that are not virtually identical to those used in the cold northern parts of our globe. This blinkered vision encourages the view that the only way to improve thermal performance is to add insulation.

The effect of insulation on the thermal performance of houses

In a cold climate the insulation properties of the elements enclosing buildings are of paramount importance in maintaining internal comfort with a minimum expenditure of energy. In warmer climates, particularly those where there is usually a significant drop in overnight temperatures, the effects of the thermal inertia properties of building materials such as brickwork and other forms of masonry can be much more relevant. This was apparent from the beginnings of settlement in this country, for example at the settlement under Major Lockyer at Corinella in Westernport Bay that began its brief life in December 1826. The following information comes from P J P Coutts: *Corinella: A Forgotten Episode in Victorian History* in which he suggests that "...whenever weatherboard cladding was used for housing it is likely that it was accompanied by brick nogging".

It is puzzling to think why scarce resources should be expended to fill the spaces between timber wall-studs with brickwork in such rudimentary structures, but Cox, Freeland & Stacey, in *Rude Timber Buildings in Australia* explain that, by about 1800 "...a unique, sound and most satisfactory way of building was evolved: a sturdy frame of heavy timbers was erected, nogging panels of brickwork or stone were set between the posts in a kind of half-timbering and the outer face of the walls were sheeted horizontally with weatherboards ... The result was a structurally sound, completely weather-tight and well insulated building. The inner face of brickwork could be plastered and painted and the buildings attained a degree of quality that made them acceptable".

"Well insulated" cannot be right; AS2627.1 *Thermal insulation of dwellings Part 1: Thermal insulation of roof/ceilings and walls in dwellings* lists the insulating value of the air space in a studwall as R0.16. If that air space is filled with 110 mm of brickwork and the AS2627.1 listed value of R0.10 is used for that brickwork, the nogging will have reduced the insulating value of the wall by R0.06. The fact that brickwork in the middle of the wall was found by our early settlers to be effective in improving the thermal performance of the house cannot therefore be because of improved insulation, it must be because of the thermal inertia effects of the brickwork's mass. It is suggested that Cox, Freeland & Stacey's assumption that improvement came from the insulating properties of brickwork is part of the "colonial cringe" to which reference has already been made: How else could one possibly improve thermal performance?

Brick nogging's slightly negative change to the R Value of the wall means that its presence will have little effect on the heating of pioneer houses, which was not much of a problem anyway because Australia's winters are not very cold, particularly when compared with those of Britain from where Australia's first settlers came, and also given that firewood was readily available. However, the thermal inertia associated with the bricks would have made a significant difference to summer comfort, with Australian temperatures much higher than in the motherland. In those days there were no air-conditioners to reduce the unaccustomed and unwelcome summer heat, and the coolness provided by the mass of the brick nogging would have been very welcome.

Research studies

The above indicates that heavyweight masonry has played an important part in improving thermal comfort in this country from early in the process of European settlement. Mr Tom McNeilly, BArch, FRAIA, who assisted with the preparation of this submission, has had an interest in this topic for more than 25 years, when, as Director of the Brick Development Research Institute (BDRI), he was involved in the use of the thermal performance computer performance program TEMPAL and cooperated in the writing of:

(i) **Susan Cumming and Tom McNeilly - The Low-Energy Full-Brick House** that was published in the Proceedings of the North American Masonry Conference held at the University of Colorado in August 1978. An important conclusion was that:

"...the heavyweight (brick-cavity) construction was found to be superior to the lightweight (brick-veneer or weatherboard) construction, primarily in that an occupant would be highly likely to regard air-conditioning as unnecessary in the former but at least highly desirable in the latter."

It is recognised that good window orientation was a feature of the house studied in that paper and it is also recognised that such a situation is far from universal in Australian house construction. With this in mind, Mr McNeilly undertook a further and much more recent study:

(ii) **Tom McNeilly - Wall Insulation in Brick Houses in the Australian Climate** which was published in the AIRAH JOURNAL, March 2000, pp 32-35 in which Mr McNeilly used the then current VicHERS program to study the performance of a typical poorly oriented house. In lightweight brick veneer construction, insulated to the then current Victoria BCA Appendix [1] Option A, a score of –9 and a three-star rating were achieved. By contrast, the same house in full brick construction with no wall insulation achieved a slightly better score of –8 and the same three-star rating.

Taken together these two papers confirm the importance of good orientation, but to regulate for it to be compulsory seems beyond the realms of possibility. However, this second paper provides added evidence of the superior performance of heavyweight construction in our climate.

Also relevant, and published in 1982, only a few years later than Mr McNeilly's first paper described above, is the CSIRO Division of Building Research *Technical Paper (Second Series) No 44*:

(iii) **P J Walsh, T A Gurr and E R Ballantyne - A Comparison of the Thermal Performance of Heavyweight and Lightweight Construction in Australian Dwellings** which concluded that, using the thermal performance computer program ZSTEP:

"For locations with an essentially temperate or Mediterranean climate, as well as sub-tropical regions such as Brisbane, heavyweight walls and floors are preferred."

Slightly more specific is the statement in the *Abstract*:

"In general, heavyweight construction or high thermal capacity is advantageous in the milder temperate climates, especially in securing summer comfort."

The above is seen as an important matter because it is clear that, for much of Australia, winter heating does not produce significant problems; it is in the summer when we turn on the electrically powered air-conditioner to cool our intrinsically sometimes-wrongly designed houses that electricity black-outs occur. It is not by accident that, in those parts of the world where, like much of Australia, hot summer days and significantly cooler nights are normal, heavyweight masonry house construction is usual.

The CSIRO paper also provides evidence that the above reported studies by Mr McNeilly, using Melbourne climate data, are adequately representative of conditions in most of the populated parts of Australia.

While the thermal performance of houses with lightweight walls is greatly improved by the inclusion of insulation, this property is not of paramount importance in determining the thermal performance of walls in a house constructed of heavyweight materials such as brickwork.

Discussion Point 6 (continued):

Incorporate eco-efficiency principles into new buildings and housing

What are the impediments to eco-efficiency principles being taken up across new housing developments and commercial areas?

House construction methods

In relation to the adoption of heavyweight walls, the impediments are seen as the general public's lack of understanding of the concept of thermal inertia plus and, particularly in eastern Australia, the house construction industry's familiarity with timber or steel framed walls.

Hot water supply

In relation to wasted hot water, a wrong but well established belief in the superiority and status of a storage HWS plus simple resistance to change is seen as the principal impediment to improvement in this area of energy conservation.

Discussion Point 6 (continued):

Incorporate eco-efficiency principles into new buildings and housing

What type of incentives or standards for new developments might be appropriate to encourage more sustainable residential complexes?

House construction methods

It is probably unacceptable to make heavyweight construction mandatory, but a possible method of encouraging this change of construction practice would be to calculate the likely energy needed to control temperature in a well oriented house with good thermal inertia properties and, in new houses, to increase the tariff on any that is used above that amount.

House orientation

The evidence offered in this submission is not needed to establish the importance of orientation; many others have provided much more. To regulate for this seems likely to be too difficult, but more encouragement is desirable. Perhaps achieving this objective would be assisted by the just mentioned possibility of a higher tariff for the energy used above what would be needed for a well oriented and thermally efficient house.

Hot water supply

On the basis of information provided in this submission, it seems to be appropriate that the maximum distance between a hot water outlet and that water's source be regulated. Such a change may likely involve the use of hot water services different from those most commonly in current use.

Discussion Point 6 (continued):

Incorporate eco-efficiency principles into new buildings and housing

Are existing building standards and product labelling sufficient to enable informed consumer choices and to ensure that the use of eco-efficiency materials and designs are maximised?

House construction methods

This Association finds it difficult to see how standards or product labelling are relevant to the case being presented. However, official publicity describing the advantages of good orientation and thermal inertia resulting from heavyweight construction, as advocated in this submission, could assist in the broader acceptance of these beneficial practices

Hot water supply

Hot water units could have two different star ratings, with more stars being allocated only if the unit is located within a stated maximum distance from the outlet.

END

28 October 2003

REFERENCES

Page 5: P J P Coutts: *Corinella: A Forgotten Episode in Victorian History*

Page 6: Cox, Freeland & Stacey: *Rude Timber Buildings in Australia*

Page 6: AS2627.1 *Thermal insulation of dwellings Part 1: Thermal insulation of roof/ceilings and walls in dwellings*

Page 7: Susan Cumming and Tom McNeilly: *The Low-Energy Full-Brick House,* published in the *Proceedings of the North American Masonry Conference* held at the University of Colorado in August 1978

Page 7: Tom McNeilly: *Wall Insulation in Brick Houses in the Australian Climate*, published in the AIRAH JOURNAL, March 2000, pp 32-35

Page 8: CSIRO Division of Building Research *Technical Paper (Second Series) No 44*: P J Walsh, T A Gurr and E R Ballantyne: *A Comparison of the Thermal Performance of Heavyweight and Lightweight Construction in Australian Dwellings*