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TECHNICAL NOTE #15

SANS 204: Energy Efficiency in Buildings

Compliance for Clay Brick Masonry Walling

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Title

SANS 204: Energy Efficiency in Buildings compliance for Clay Brick masonry walling in South Africa

Status

This Technical Note is provided as an information sheet for appending to the ClayBrick.org website.

Scope

A concise explanation of the provisions made for Clay Brick masonry walling as outlined in the National Building Regulations, SANS 204 for Energy Efficiency in Buildings, with guidelines as to how this Standard is of benefit to the end-user/homeowner.

Introduction

The South African National Standard 'SANS 204: Energy Efficiency in Buildings' was developed as a voluntary standard to guide the design of new buildings to achieve a rational [financially sensible], best practice level of energy efficiency through the application of the appropriate construction methods.

As a subsequent objective, the SANS 204 document was revised to fulfil the requirements of the National Building Regulations for the Construction Sector, i.e. SANS 10400, of which Part XA specifies the minimum deemed-to-satisfy requirements for compliance to Energy Usage in Buildings.

In the case of walling, less stringent and less effective walling systems will meet the minimum requirements of the National Building Regulations and SANS 10400XA.

SANS 204 - Provisions for Walling

The provisions for walling in SANS 204 include a tool for conveniently selecting the optimal energy efficient walling system for various building types/occupancies and climate zones.

The tool identifies the ideal combination of Thermal Resistance [R] and Thermal Capacity or Thermal Mass [C] within the CR-value for specific building types and climate zones, and enables the designer to select an appropriate double-skin masonry and thermal insulation combination solution - within Tables 3 and 4, respectively of SANS 204, as per below.

The theory and method for calculating, the CR-value in walling is set out in the Clay Brick technical note, titled: Thermal Resistance and Thermal Capacity of Clay Brick Masonry Walls. An online CR-value Calculator is also accessible at www.claybrick.org.

The provisions for External Walling as set out in SANS 204 are detailed below:

4.4.3 External Walls

4.4.3.1 **Masonry walls** such as, but not limited to, cavity, grouted cavity, diaphragm, collar-jointed and single leaf masonry, shall achieve the minimum CR-value given in Table 3 for the different types of occupancies in the different climatic zones (see Annexure A for Climatic Zones).

Table 3:

Minimum Thermal Capacity & Resistance (CR-Value) in Hours, for External Walling						
Occupancy Group	**Climatic Zone**					
	1	**2**	**3**	**4**	**5**	**6**
Residential E1-3,H1-5	100	80	80	100	60	90
Office & Institutional A1-4,C1-2,B1-3,G1	80	80	100	100	80	80
Retail D1-4, F1-3, J1-3	80	80	120	80	60	100
Unclassified A5, J4	NR	NR	NR	NR	NR	NR
Note: NR = No Requirement						

SANS 204 - Provisions for Walling, cont'd

Table 4:

Typical CR-Values	
Wall Type *Double-Skin Brick*	**CR Product** *Hours*
2 x 106mm with no air cavity	40
2 x 106mm with 50mm air cavity	60
above with *R*=0,5 cavity insulation	90
above with *R*=1 cavity insulation	130

Note :

1. Table 4 provides typical values for double-skin Clay Brick masonry walls, with/without additional insulation. To establish the CR-value of prescribed walling systems, contact the relevant manufacturer/s.
2. *R*=0,5 and *R*=1,0 refers to the Thermal Resistance of the insulation only, in m^2K/W. Thermal resistance that is added to external walling with high Thermal Capacity, should be placed between layers e.g. in the cavity of a masonry wall. Thermal Resistance should not be added to the internal face of a wall with high Thermal Capacity.
3. Wall systems that have low Thermal Capacity or Resistance (or both) will not meet the requirements given in Table 4.
4. Designers should consider that interstitial condensation occurs in walling systems which are not able to prevent or accommodate moisture migration. The selection of vapour barriers and appropriate construction materials, including insulation and weep-holes, is important for the thermal efficiency of walling in climate zones where damp and high relative humidity is experienced.
5. Internal walls in buildings with external walling (double brick), as above, should ideally have CR product values of at least 20 hours as would be provided by a single brick plastered wall . However, this is not a requirement for compliance.
6. See Annexure A for Climatic Zones.

SANS 204 - Provisions for Walling, cont'd

4.4.3.2 External non-masonry walls shall**:**

a) Achieve the *CR*-values given in Table 4 by the addition of Capacity or Resistance (or both),

b) Have the following minimum *R*-values (except A5, D1 to D4, J1 to J4 which have no minimum *R*-value requirements) :

1. For climatic zones 1 and 6, a total *R*-value of 2,2; and
2. For climatic zones 2, 3, 4 and 5, a total *R*-value of 1,9; or

c) Have *R*-values that comply with the requirements of ASTM C177, ASTM C518 and ASTM C1363.

NOTE: Internal walls in buildings with this type of external walling may be masonry or non-masonry.

Discussion

The thermal performance of walling as indicted by the CR-value corresponds with the property of thermal diffusivity which is the product of thermal conductivity and the specific heat of any material. The thermal diffusivity takes the time for transfer of heat through a building element into consideration.

The tool in SANS 204 provides only for double-brick cavity wall constructions. However, by calculating in terms of a Rational Design, building professionals can achieve a similar CR-value result as those of Table 2.

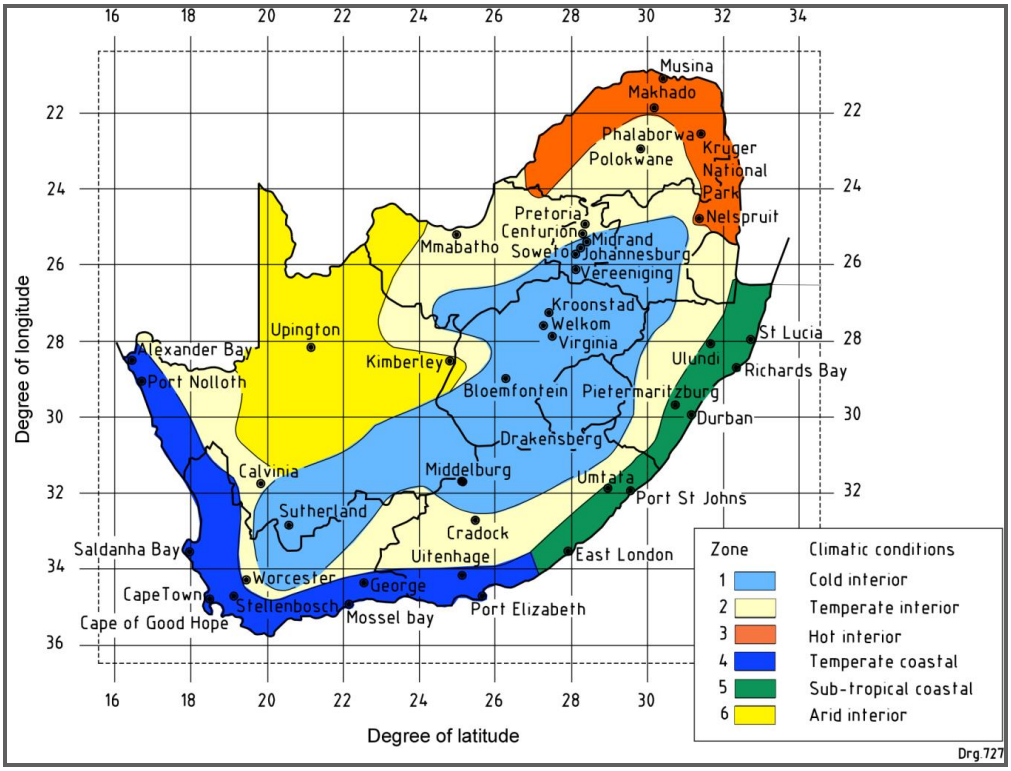
Designers can check the CR-value of various combinations of high mass walling and thermal insulation products by making use of the online CR-value calculator available at: www.claybrick.org.

Conclusion

The most energy efficient walling systems can be designed and specified for South Africa's climatic conditions by making use of the CR-value tool in SANS 204.

Annexure A

Climate Zones of South Africa



Zone	Description	Major centre
1	Cold interior	Johannesburg, Bloemfontein
2	Temperate interior	Pretoria, Polokwane
3	Hot interior	Makhado, Nelspruit
4	Temperate coastal	Cape Town, Port Elizabeth
5	Sub-tropical coastal	East London, Durban, Richards Bay
6	Arid interior	Upington, Kimberley