

## Propagation and Production of *Zantedeschia* Tubers for Export

### T. E. Welsh

Massey University, Department of Plant Science, Private Bag 11122, Palmerston North, New Zealand

### B. L. McKenzie

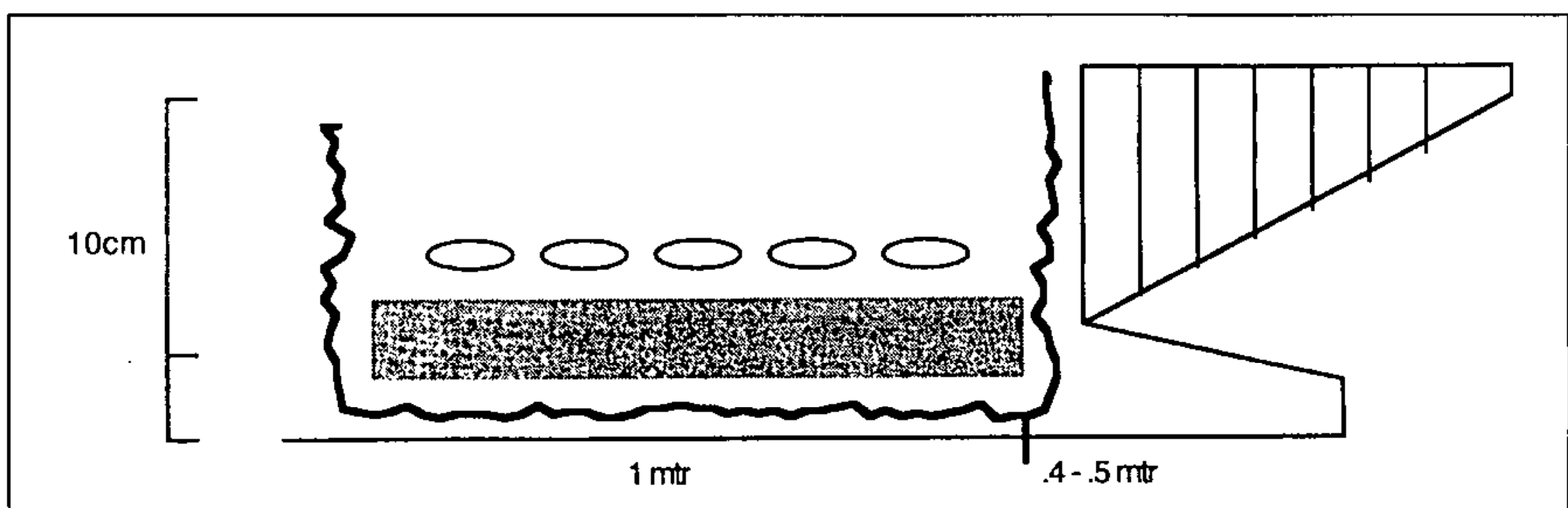
Kiwi Callas (NZ) Ltd., P O Box 15935, New Lynn, Auckland, New Zealand

The floriculture industry in New Zealand is gaining a reputation for the supply of novelty flowers to world markets. *Zantedeschia* (calla) has been one of the bulbous crops gaining in importance for exports of both cut flowers and dormant tubers. This paper will outline the various techniques used for propagation and provide detail on production of flowering-size tubers from a propagule.

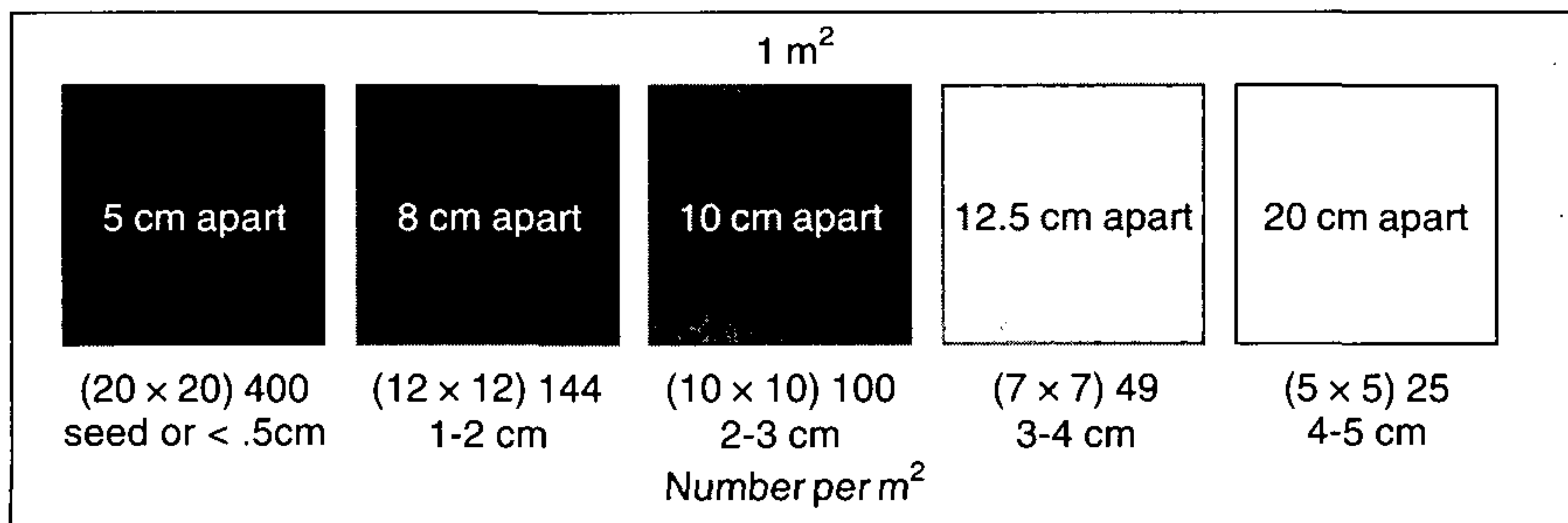
Seed propagation has been a common means for reproduction of true species or open-pollinated selections. However, the diversity of colour type and growth habit are greatly limited from seed-true lines. The hybrid selections which make up the mainstream of the New Zealand export industry are clonally propagated by tissue culture. Natural division of established tubers is sometimes used as a means of increasing flowering stock, however, divided tubers are likely to carry over disease and they are not recommended as export quality stock.

*Zantedeschia* propagules require two growing cycles to become a natural flowering-grade tuber (4- to 6-cm diameter). In the first growing cycle explants are removed from the flask with roots developed and one leaf unfurled. Agar is removed and plants are established in a pine-bark soilless growing substrate contained within plastic or polystyrene open trays. Density in the first growing cycle is 400 per m<sup>2</sup> or 5 cm apart. Newly established plants are treated with fungicide and placed in an acclimatisation environment with reduced light levels and high humidity for 10 days.

During the cycle, irrigation is applied overhead and nutrition is achieved by a combination of controlled-release and foliar application. The main pest to protect against is aphids (vectors for Dasheen Mosaic Virus). Fungal disease organisms include *Rhizoctonia*, *Pythium*, and *Phytophthora* which are readily controlled by soil drenches. The duration of the growing cycle is 6 months from establishment. Dormancy is brought about by withholding irrigation.



**Figure 1.** A diagram from a cross section of strata culture beds.



**Figure 2.** Planting densities for various tuber sizes.

At the conclusion of the growing cycle, the tubers are removed from the trays, cured, cleaned, and graded for size. Tubers are cured under ambient air temperatures away from full sun when lifted in late summer and autumn. If lifting occurs in winter, curing takes place at 20 to 30C with forced air movement for a period of 3 to 5 days. Desiccated roots and shoots are removed and clean tubers are placed in wire mesh trays apical side up for storage. Storage temperatures are kept between 15 to 20C for immediate replanting after 6 to 8 weeks. If long-term storage is required (up to 6 months) tubers should be held at 8C and packed in dry material, such as sawdust or rice hulls, to avoid over-dehydration. Tuber size will range between 1 to 3 cm in diameter.

A flower may be obtained from tubers 2-cm diameter and larger. However, flower length will be short (20 to 30 cm) and it is generally advised to grow on marble size tubers for another cycle. The second growing cycle is often carried out in open fields, however, protected cultivation as described in this paper is gaining in popularity. Protected cropping of tubers during the second growing cycle gives reduced losses from disease and tubers ready for dispatch at times more favourable to Northern Hemisphere demands.

A growing system titled "strata culture" is employed for protected cropping in the second cycle. Strata culture provides for efficient use of labour in planting and harvesting. Tubers are harvested clean and do not require washing. Density in the second cycle is dependant on starting size: 1 cm at 144 m<sup>-2</sup>, 2 cm at 100 m<sup>-2</sup>, and 3 cm at 64 m<sup>-2</sup>.

To set up strata beds, soil is prepared in the usual manner with controlled-release fertilisers incorporated. Woven shade cloth at 70% to 80% mesh is placed over the cultivated bed in sections no longer than 2 m. A layer of untreated sawdust is placed to the depth of 25 mm and tubers are set on top at the desired density. A minimum of 75 mm of sawdust is placed over the tubers. Frequent overhead irrigation is required until roots have emerged and penetrated through the mats into the soil substrate. The mulch effect of the sawdust will keep roots moist and cool. Weeds will also be kept at bay as there will not be sufficient light for germination.

At the end of the growing cycle water is withheld for 4 weeks prior to lifting. Mats are easily lifted by hand and workers can lift and sift out 1350 tubers per person per hour. Once lifted, tubers are cured identically to those harvested after cycle one. Cleaning and storage is also the same after each growing cycle. Tuber size will range between 4 to 6 cm at the conclusion of the second growing cycle.

Protected cropping will greatly reduce *Erwinia* soft-rot infection if growing cycles are scheduled to commence or conclude during the warm months of summer. In New Zealand, early planting in June/July under heated glasshouse conditions (16C minimum) gives finished tubers ready to lift in January. After an 8-week rest period tubers are ready for dispatch and planting in March. *Zantedeschia* are day-length neutral and scheduling for year-round production of tubers and cut flowers is possible.

## Propagation of *Camellia japonica* in Horticultural Rockwool

### Ralph Scott

Spencer Scott & Sons, Kurrajong Heights, New South Wales, 2758 Australia

Our Nursery grows 225,000 camellias annually and is situated at Kurrajong Heights which is 80 km west of Sydney in the Lower Blue Mountains at approximately 500 m above sea level. The climate is mild with minimum temperatures of 0C in the early mornings during winter, to a maximum of 40C during mid summer.

Propagation commences in mid December, which is early summer in Australia.

Our Nursery began using rockwool 10 years ago, when we were researching different propagation materials. The rockwool is delivered to the nursery in sheets, each of these consisting of 21 smaller blocks measuring 38 mm × 38 mm × 57 mm

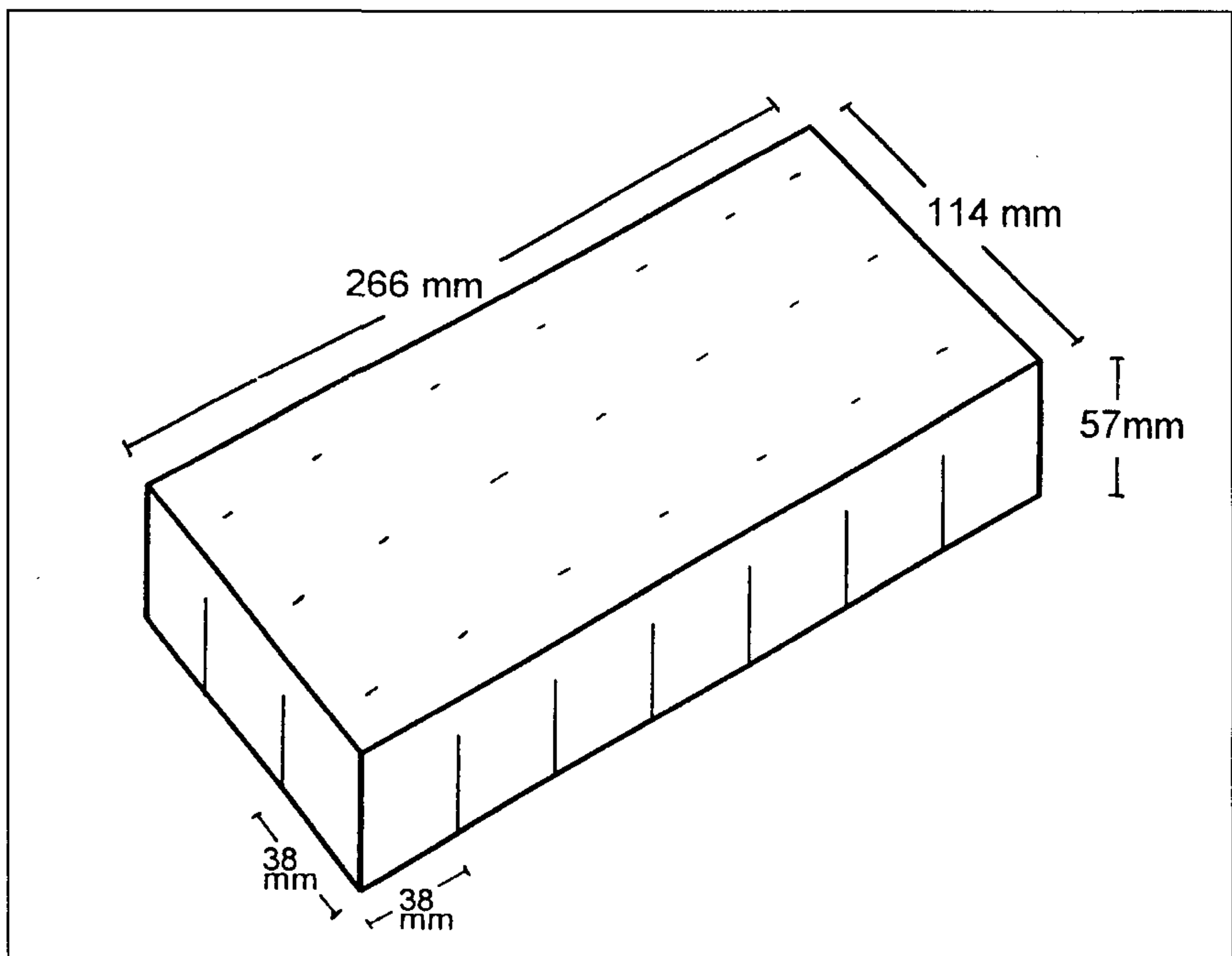


Figure 1. Rockwool sheet not to scale.