

## **8 ASBESTOS-CEMENT BUILDING AND CONSTRUCTION MATERIALS**

### **8.1 INTRODUCTION**

Asbestos cement products have traditionally been valued for their ease and relative low cost of manufacture; their strength and durability; their resistance to corrosion (particularly at coastal locations); and their waterproof and insulating properties. As such, they have been used extensively in the building of affordable housing, commercial and industrial buildings, and water and sewage reticulation systems.

The major use of asbestos fibre in South Africa is for manufacturing building materials and pipes in which approximately 10% asbestos is bound in a cement matrix. As in many countries of the world, asbestos cement roofing sheets and external cladding have been used for generations to provide cost-effective, safe and sturdy shelters. Asbestos cement pipes are the single most popular solution for distributing drinking water throughout the world and there are few sewage disposal plants that do not use this durable product.

In the past, asbestos was used in many building materials. These included: insulation boards used for sound protection or temperature insulation and vinyl-asbestos floor tiles. Asbestos lagging was also used as insulation for boilers, hot water geysers and pipes. Although this is no longer allowed, the asbestos used in the past is often still in place in the buildings where it was installed.

### **8.2 PROPERTY OWNERSHIP IN SOUTH AFRICA**

There are no reliable statistics regarding the number of buildings that contain asbestos materials and products in South Africa. However, anecdotal evidence indicates that asbestos cement products were almost routinely used in the building of low cost, mass housing up until the mid 1980's, particularly in coastal developments. In addition, it is estimated that "as many as 80% of State buildings contain asbestos materials and products – including insulation materials used for insulating hot water piping".

Broadly speaking, property can be categorised as:

- Civil Constructions (i.e. bridges, dams, roads, ports, etc.)
- Non-Residential Buildings:
  - Commercial/Office Buildings
  - Industrial/Warehouse Buildings
  - Retail Buildings
  - Other Buildings (hotels, casinos, schools, hospitals, etc)
- Residential Buildings
  - Suburban housing
  - Apartments/flats
  - Cluster/Town houses
  - Affordable houses
  - Low Cost "RDP" housing

Construction and building properties in South Africa are either owned by the state (i.e. central, provincial or local government) or are privately owned.

### 8.2.1 Government Owned Properties

Government (i.e. the Public Works Department) is in the process of building an Asset Register database that contains the number and value of buildings and civil constructions owned by central and provincial governments. Table 16 on the following page reflects the various types of government-owned buildings that can be found in this database.

**TABLE 16: NATIONAL REGISTER OF STATE-OWNED FIXED ASSETS**

|                              |                                |
|------------------------------|--------------------------------|
| Offices                      | Store                          |
| Open Parking                 | House: Office                  |
| Under Cover Parking          | Fencing                        |
| Parking Garage               | Police Station                 |
| Open Car Park                | House                          |
| Under Cover Car Park         | Flat                           |
| Shop                         | Single Quarters                |
| Ablution                     | Duplex                         |
| Hall                         | Simplex: Town House            |
| Museum, Library              | Semi-Detached House            |
| Private Siding               | Free Offices                   |
| Miscellaneous Farm Buildings | Free Parking                   |
| Dog Kennel                   | Land                           |
| Civil Works                  | Office/Miscellaneous Buildings |
| Court Buildings              | Interstate Boundary Fences     |
| Restaurant                   | Living Quarters                |
| Mess                         | Industrial Buildings           |
| Hanger                       | Hospital/Clinic                |
| Computer Bureau              | Classrooms                     |
| Miscellaneous Structures     | Schools                        |
| Cell                         |                                |
| Mortuary                     |                                |

### 8.2.2 Privately Owned Non-Residential Property in South Africa

Privately owned non-residential property is concentrated in the hands of large financial institutions (i.e. Sanlam, Old Mutual, Investec, Liberty, Metropolitan, RMB, etc.), who own this property as part of their overall asset investment portfolios; and listed and non-listed companies that own their own buildings and facilities.

### 8.2.3 Privately Owned Residential (and Non-Residential) Properties

Statistics South Africa publishes various statistics related to the private sector building and construction industry, including the number of buildings completed each year. Unfortunately, this institution does not keep a cumulative record of its data. Therefore, it does not have a readily available set of data that would reflect the entire "installed base" of privately owned buildings in South Africa.

As an indication of the type of data available from this source, Table 17 reflects "Buildings Completed" data for the 1997 to 2000 period<sup>77</sup>.

**TABLE 17: BUILDINGS COMPLETED**

| THOUSANDS                                                          | 1997    | 1998    | 1999    | 2000    |
|--------------------------------------------------------------------|---------|---------|---------|---------|
| <b>Residential Buildings</b>                                       |         |         |         |         |
| • Houses                                                           | 52, 885 | 50, 022 | 58, 313 | 48, 594 |
| • Flats/Townhouses                                                 | 15, 060 | 11, 907 | 8, 402  | 7, 527  |
| • Other Residential                                                | 127     | 103     | 194     | 255     |
| • Additions and Alterations                                        | 27, 626 | 24, 170 | 28, 397 | 26, 611 |
| <b>Non-Residential Buildings</b>                                   |         |         |         |         |
| • Industrial and Warehouse                                         | 831     | 815     | 780     | 704     |
| • Office and Banking                                               | 336     | 357     | 241     | 274     |
| • Shopping                                                         | 377     | 360     | 262     | 232     |
| • Other (Schools, Crèches, Hospitals, Churches, Sport, Recreation) | 751     | 593     | 564     | 494     |
| • Additions and Alterations                                        | 2, 735  | 2, 244  | 2, 381  | 2, 152  |

## 8.24 The Low Cost Housing Sector

A study for the Department of Housing in 2001 to investigate "the use of asbestos in the low cost housing sector" states that "asbestos materials are still widely used in affordable housing, particularly in the coastal areas of KwaZulu Natal and the Eastern and Western Capes"<sup>78</sup>. This study estimates that "up to 1million state-funded lower income housing units with asbestos based products, predominantly roof sheeting, exist".

In addition, rural communities have used asbestos fibre as a material for building, where asbestos tailings – obtained from mine dumps – are mixed with mud to plaster the walls of traditional houses<sup>79</sup>.

The Housing Monitor database contains details of 1,323 subsidised housing projects that have been constructed since 1994, involving 874,757 housing units. Information regarding the construction materials used is available for 341 projects, involving 240,833 units. Of these, 24% (i.e. 57,800 units) were constructed with asbestos-cement roof sheeting.

The National Department of Housing provided the information reflected in Table 18 on the following page<sup>80</sup>.

**TABLE 18: HOUSES COMPLETED OR UNDERCONSTRUCTION**

| PROVINCE          | 1994/1997      | 1997/1998      | 1998/1999      | 1999/2000      | 2000/2001      | 2001/2002      | TOTAL            |
|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|
| Eastern Cape      | 6,511          | 42,223         | 29,659         | 21,345         | 44,021         | 11,816         | 155,575          |
| Free State        | 16,042         | 21,001         | 20,391         | 8,177          | 26,088         | 9,005          | 100,704          |
| Gauteng           | 65,660         | 83,416         | 28,726         | 144,575        | 25,911         | 20,233         | 368,521          |
| KwaZulu-Natal     | 17,553         | 78,468         | 53,105         | 28,997         | 28,547         | 14,379         | 221,049          |
| Mpumalanga        | 19,884         | 10,873         | 16,838         | 4,808          | 16,457         | 14,584         | 83,444           |
| Northern Cape     | 8,666          | 6,768          | 3,387          | 3,600          | 7,148          | 3,588          | 33,157           |
| Northern Province | 11,108         | 15,743         | 22,899         | 12,401         | 20,996         | 16,667         | 99,814           |
| North West        | 21,287         | 20,977         | 18,367         | 12,944         | 17,609         | 17,385         | 108,569          |
| Western Cape      | 25,321         | 43,834         | 34,575         | 26,916         | 17,730         | 16,634         | 165,010          |
| <b>TOTAL</b>      | <b>192,032</b> | <b>323,303</b> | <b>227,947</b> | <b>263,763</b> | <b>204,507</b> | <b>124,291</b> | <b>1,335,843</b> |

Applying the 24% statistic from the Housing Monitor database to the above figures, suggests that approximately 320,600 of these houses may include asbestos-containing materials.

Unsupervised and inappropriate construction techniques in both the construction of new houses as well as the maintenance of existing houses, specifically roofing, may result in occupational exposure to asbestos. This is exacerbated in the low income housing environment where:

- The use of unskilled and ill-equipped local labour is extensive
- Limited financial resources often result in inadequate or no provision of protective clothing and masks for workers

Prevailing winds and the generation of dust by cutting and drilling the asbestos products on the construction site are common occurrences, enhancing the chances of inhalation of asbestos. A further hazard to health will arise from unskilled attempts to clean asbestos cement products prior to coating application and from physical injury during such operations, e.g. falling off or through a roof.

Although there is no legislation prohibiting the use of asbestos-containing building materials, some Local Authorities in the Free State, Mpumalanga, Northern Province, and Western Cape have specified that asbestos-containing materials may not be used, i.e. City of Cape Town Specification for the Construction of 791 Houses at KTC 2B1, KTV 2B2 and Millerscamp in Nyanga, Cape Town (Q02/18) states in clause 3 that "Roofing to be 6,0mm thick "Bigsix" or other equal and approved pattern fibre-reinforced cement sheets, free of asbestos fibre, ...".

There appears to be a developing trend towards the use of corrugated metal roofing in low cost "RDP" housing (i.e. very basic 30 sqm houses). The reason for this is that this roofing material requires a minimum of support (virtually no wooden trusses) and, therefore, can cost as little as one-third of the cost of using fibre cement sheeting and concrete tiles – both of which require substantial support structures. The only exception to this trend occurs in coastal housing projects. Here, metal roofing is subject to relatively rapid corrosion by salt-containing sea air.

Fibre cement sheeting generally represents the roofing material of choice as it the cheapest alternative – particularly asbestos cement roof sheets imported from Zimbabwe.

### 8.3 ASBESTOS CEMENT PRODUCT MANUFACTURING

The sole South African manufacturer of asbestos cement building products has been undertaking a "conversion program" for the past twenty years. This program involves the identification and development of alternative fibres to replace asbestos in its range of fibre-cement products.

Traditionally, this company has manufactured and sold a range of asbestos cement products that include:

- **Roofing Products** (i.e. roof tiles, roof sheeting, fascia boards, barge boards, soffit boards, and window sills), equal to 20% of sales
- **Flat Sheet Products** (i.e. ceiling boards, partitioning boards, etc.), equal to 70% of sales
- **Moulded Products** (i.e. gutters, down pipes, containers), equal to 10% of sales
- **Water and Sewage Reticulation Piping** (sold through the AC Pipes division)

This conversion program began in the early 1980's and is almost complete. The first products to be converted in 1985 were the flat products (i.e. fascia boards, window sills, external cladding and internal partitioning). The remaining products (i.e. profiled roof sheets, barge boards, moulded containers, etc.) will be replaced by the end of 2002. Products that cannot be converted to non-asbestos fibre formulations have/will be discontinued (i.e. certain roofing profiles, rain water goods, water tanks, water and sewage piping). During this time, this business has progressively discontinued the production and sale of most of its asbestos cement products. Currently, 90% of this business's fibre-based products (by volume) are manufactured using cellulose fibres.

This business anticipates that the remaining asbestos containing products will have been converted to cellulose fibres by the end of 2002. The asbestos cement water pipe division stopped manufacturing asbestos cement water and sewage products early in 2002 and is currently selling off stock-on-hand – it is anticipated that this sell-off will have been completed by the end of March 2003

#### 8.3.1 Technical Challenges of Cellulose Cement

According to the company its non-asbestos fibre cement is manufactured using a calcium silicate hydrate binder reinforced with organic cellulose (or softwood) fibres.

The introduction of cellulose cement flat sheets products in 1985 was successful but difficulties were experienced with load bearing roof sheets. An investment of R40 million in research and development and assistance from fibre-cement manufacturer, James Hardie of the United States, saw a breakthrough in 1998. This breakthrough resulted in the development of traditional Big Six profiled roofing sheets spanning 1,4 metres. Non-asbestos "Nutech" Big Six sheets comply with SABS ISO 9933.

Full conversion of the Big Six range to non-asbestos fibre-cement was completed by September 2002. The company will, however, no longer manufacture roofing sheets such as Span, Canalit and Profile B because of their longer spanning requirements and the manufacturing complexities involved.

The further addition of PVA to the product mix allowed the full conversion of moulded goods (plant containers and roof fittings) by the end of October 2002.

The company reports that quality problems were experienced in 2001 after it closed and relocated both its Durban and Cape Town factories into one plant near Johannesburg. During this time senior management were changed a number of times and it was only in early 2002 that the new company structure became entirely settled. Plant and process stability are now reported to be exceptional with reject rates reduced to world-class benchmarks.

Product quality is now at a standard where volumes are being exported to a number of countries where asbestos has been banned. The company reports that manufacturing capacity is well in excess of local market requirements.

The company is satisfied that the raw materials used in the manufacture of cellulose cement products are generally considered safe:

- Portland cement (tri & di-calcium silicate) is a fine powder that can cause skin or eye irritation with prolonged exposure. Prolonged inhalation of more than 10 milligrams/ cubic metre may cause coughing. It is non-toxic in the environment in small quantities but large quantities can adversely affect the pH of water.
- Cellulose fibre is unbleached softwood pulp. These fibres are identical to those used in the paper and cardboard manufacturing industries and are sourced from renewable commercial forests.

In the mid 1980s, Swiss toxicologist, Professor Ulrich Gruber, conducted an extensive literature search on the possible health effects of cellulose fibres. He concluded that, although cellulose can also release respirable fibres, it does not present a health threat in the human lung. The American Conference of Government and Industrial Hygienists (ACGIH) considers softwood pulp to be inert and of low risk below 10 milligrams/cubic metre. Nevertheless, dust control measures are necessary during production and fabrication, as would apply to any other potentially dusty material.

- Condensed silica fume is an amorphous non-crystalline silica of sub-micron particle size. It is a fly ash resulting from cement kiln production. Silica fume is considered to be of low toxicity, although prolonged exposure to high concentrations of dust should be avoided as it can cause irritation to the eyes, nose and throat.
- Aluminium trihydroxide is a non-fibrous powder that can cause mild irritation to eyes, skin and upper respiratory tract for people with asthma, chronic lung disease and skin rashes.
- Bentonite is non-toxic clay. Inhaling large quantities will cause temporary discomfort and coughing.
- Polyvinyl alcohol (PVA) is a synthetic fibre that does not present a health threat through inhalation and will not emit toxic gas when burned.

Cellulose cement is now a technology in use worldwide for both exterior and interior applications.

### 8.3.2 Asbestos Fibre Purchases

Table 19 reflects this business's purchases of chrysotile asbestos fibres for the past four years. All of this asbestos fibre is purchased from AA Mines in Zimbabwe.

**TABLE 19: ASBESTOS FIBRE PURCHASES**

|                      | 1999   | 2000   | 2001   | 2002   | 2003  |
|----------------------|--------|--------|--------|--------|-------|
| <b>Volume (tons)</b> | 8, 000 | 4, 000 | 3, 000 | 2, 000 | 0.000 |

### 8.3.3 Sales Volumes

Table 20 reflects sales of fibre cement products to the local market. (Both asbestos and cellulose cement).

**TABLE 20: LOCAL SALES**

| TYPE OF PRODUCT                          | 1999 |       | 2000 |       | 2001 |       | 2002 |        |
|------------------------------------------|------|-------|------|-------|------|-------|------|--------|
|                                          | VOL  | VAL   | VOL  | VAL   | VOL  | VAL   | VOL  | VAL    |
| Profiled Roof Sheetting (sq. m/millions) | 3.2  | R53.6 | 3.1  | R54.9 | 2.3  | R46.4 | 2.8  | R64.99 |
| Flat Sheet (sq. m/millions)              | 4.4  | R66.8 | 4.7  | R75.9 | 4.9  | R87.2 | 5.3  | R113.1 |
| Moulded Products                         | 0.85 | R39.1 | 0.79 | R39.6 | 0.78 | R41.7 | 0.83 | R50.3  |

80% of this business's local sales are made to Building Merchants. The remaining 20% is sold directly to developers, building contractors, municipalities and plant nurseries. Table 21 reflects export sales.

**TABLE 21: EXPORTS (BOTH ASBESTOS AND CELLULOSE CEMENT.)**

| TYPE OF PRODUCT                          | 7/99 – 6/00 |       | 7/00 – 6/01 |      | 7/01 – 6/02 |       | 7/02 – 6/03 |       |
|------------------------------------------|-------------|-------|-------------|------|-------------|-------|-------------|-------|
|                                          | VOL         | VAL   | VOL         | VAL  | VOL         | VAL   | VOL         | VAL   |
| Profiled Roof Sheetting (sq. m millions) | 0.16        | R2.2  | 0.11        | R1.6 | 0.13        | R1.9  | 0.27        | R4.9  |
| Flat Sheets (sq. m millions)             | 1.3         | R15.1 | 0.67        | R9.3 | 0.69        | R13.8 | 1.2         | R24.9 |
| Moulded Products                         | 0.009       | R0.34 | 0.010       | R0.5 | 0.006       | R0.28 | 0.034       | R1.6  |

Destination countries include: Australia, Far East, Middle East, South America, and the United Kingdom.

### 8.3.4 Employment

Table 22 reflects the number of people employed in the manufacturing business.

**TABLE 22: EMPLOYMENT**

|                               | 2000  | 2001 | 2002 | 2003 |
|-------------------------------|-------|------|------|------|
| Management                    | 19    | 9    | 9    | 8    |
| Professional (Acc/Leg/R&D/IT) |       |      |      |      |
| Administration                |       |      |      |      |
| Technical/Artisans            | 12    | 12   | 12   | 10   |
| Workers                       | 1,479 | 848  | 803  | 762  |
| TOTAL                         | 1,510 | 869  | 824  | 780  |

The major reasons for the decline in employment include:

- Declining demand from the building and construction markets
- A loss of market share to imports of asbestos cement building products from Zimbabwe

- A loss of market share to substitute products (i.e. metal roof sheeting, concrete roof tiles; gypsum flat products; PVC, GRP and HDPE water piping)

These factors have caused this business to undertake a major restructuring and rationalisation programme which has involved the closure of a number of manufacturing plants and the retrenchment of significant numbers of management and staff.

Management is of the opinion that most of the job losses have resulted from the restructuring and "right sizing" exercise and not because of the challenges associated with the conversion from asbestos cement to cellulose fibre-based products. Anticipated job losses in 2003 will come about as a result of the closure of the water pipe division.

### 8.3.5 Investment

Table 23 reflects investment that has been made in the manufacturing business during the past few years.

**TABLE 23: NEW INVESTMENT**

|                          | 2000 | 2001 | 2002 |
|--------------------------|------|------|------|
| Production               | 65   | 35   | 27   |
| Distribution             |      |      |      |
| Other                    |      |      |      |
| <b>TOTAL (R Million)</b> | 65   | 35   | 27   |

Despite the restructuring process, this business is still investing in new production equipment. Management estimates that the total cost of rationalising the business to a single manufacturing site, and converting from asbestos cement to cellulose fibre-based products has required an investment of approximately R100 million over the past three years. This investment programme will be completed during the 2002/3 financial years.

### 8.4 COMPETITORS

This business has only one direct competitor in the fibre-based building and construction product category: a Zimbabwean company. This company manufactures asbestos cement profiled roofing sheets (58% of its sales), flat sheets (27% of its sales), moulded products (i.e. barge boards, 14% of its sales) and water pipes.

The Zimbabwean manufacturer has been exporting asbestos cement products into South Africa for the past 5 years. In this time, it is estimated that they have captured 25% of the South African fibre cement roofing market. Table 24 reflects a breakdown of their current sales mix.

**TABLE 24: ZIMBABWE MARKET SHARE**

| PRODUCT CATEGORY | UNIT SALES    | SALES VALUE   | SHARE OF THE FIBRE CEMENT MARKET SEGMENT | SHARE OF THE TOTAL PRODUCT CATEGORY |
|------------------|---------------|---------------|------------------------------------------|-------------------------------------|
| Roof Sheet       | 774,000 sq m  | R22.3 million | 25%                                      | 2.6%                                |
| Flat Sheet       | 563,093 sq m  | R10.4 million | 21%                                      | 2.8%                                |
| Barge Boards     | 126,696 units | R5.5 million  | 25%                                      | 10%                                 |

This analysis indicates that although imports of asbestos cement products from Zimbabwe represent a relatively small percentage of each product category's RSA sales, they do represent a significant proportion of the "Fibre Cement" product category and clearly represent a threat to the South African business.

## 8.5 SUBSTITUTE PRODUCTS

There are a number of substitute products that can be used in place of fibre cement products. Table 25 illustrates the range of products by product category.

**TABLE 25: SUBSTITUTE PRODUCTS**

| PRODUCT CATEGORY               | SUBSTITUTE PRODUCTS                                                                                                                                                   |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Roofing Products</b>        | <ul style="list-style-type: none"> <li>• Corrugated Metal Sheetting (galvanised and coated)</li> <li>• Concrete Roof Tiles</li> <li>• Pressed Metal Tiles</li> </ul>  |
| <b>Flat Sheet products</b>     | <ul style="list-style-type: none"> <li>• Gypsum Board</li> <li>• Vermiculite Board</li> <li>• Plastic products</li> </ul>                                             |
| <b>Water and Sewage Piping</b> | <ul style="list-style-type: none"> <li>• Metal Piping</li> <li>• (U)PVC Piping</li> <li>• GRP Piping</li> <li>• HDPE Piping</li> <li>• Ductile Iron Piping</li> </ul> |

Many of these products provide a superior value-for-money proposition when compared to (asbestos) fibre cement products. This is evidenced by the fact that (asbestos) fibre cement products represent a very small proportion of new installations within each product category. Table 26 illustrates this point.

**TABLE 26: (ASBESTOS) FIBRE CEMENT'S MARKET SHARE**

| PRODUCT CATEGORY               | (ASBESTOS) CEMENT'S MARKET SHARE OF NEW INSTALLATIONS |
|--------------------------------|-------------------------------------------------------|
| <b>Roofing Products</b>        | Less than 10%                                         |
| <b>Flat Sheet products</b>     | Less than 5%                                          |
| <b>Water and Sewage Piping</b> | Less than 5%                                          |

### 8.5.1 Roofing

On average, the market for roofing products represents sales of approximately 30 million sq.m of various roofing products per annum. Table 27 on the following page reflects a breakdown of this market by type of roofing material.

**TABLE 27: RSA ROOFING MATERIAL MARKET**

| ROOFING MATERIAL                         | MARKET SHARE | PRICE PER SQ. METER<br>(MERCHANT'S SELLING PRICE) | MARKET VALUE |
|------------------------------------------|--------------|---------------------------------------------------|--------------|
| Corrugated Iron & Coloured IBR Sheet ing | 51%          | R16 to R32                                        | R325 million |
| Concrete Roof Tiles                      | 31%          | R38                                               | R425 million |
| Asbestos/Fibre Cement Sheet ing          | 10%          | R46                                               | R166 million |
| Coated Pressed Metal Tiles               | 3%           | R56                                               | R60 million  |
| Others                                   | 5%           |                                                   |              |

Table 28 reflects a breakdown of the roofing market by building type.

**TABLE 28: RSA ROOFING TYPES**

| BUILDING TYPE                 | MARKET SHARE | APPROXIMATE SQ. METERS |
|-------------------------------|--------------|------------------------|
| Non-Residential Buildings     | 10%          | 3 million              |
| Residential                   | 90%          | 27 million             |
| • Standard/Suburban Housing   | 59%          |                        |
| • Low Cost/Affordable Housing | 31%          |                        |

Asbestos cement's roofing market share has declined from approximately 25% in the mid 1970's to its current 10% level. This decline has been caused by a number of factors, including:

- Industry resistance to asbestos (mainly amongst architects, engineers and building developers)
- Growing resistance to asbestos amongst property owners, and
- Developments by substitute product manufacturers that have made their products more durable, attractive and affordable.

Table 29 reflects a cost comparison of roofing materials prepared by the Concrete Manufacturers Association that compares the costs of a complete erected roof structure on a 57m<sup>2</sup> house.

**TABLE 29: ROOFING COST COMPARISON**

| ROOFING MATERIAL                   | TOTAL ROOF COST | COST PER SQ. METER |
|------------------------------------|-----------------|--------------------|
| Corrugated Iron Sheet ing          | R7, 469         | R108               |
| Concrete Roof Tiles                | R7, 647         | R103               |
| Profiled Asbestos Cement Sheet ing | R8, 061         | R115               |
| Coloured IBR Sheet ing             | R8, 674         | R126               |
| Pressed Metal Tiles                | R9, 624         | R136               |

This comparison indicates that asbestos cement roofing is not the lowest cost alternative for low cost housing

Table 30 on the following page reflects a comparison of the advantages and disadvantages of asbestos cement, cellulose fibre and the most popular substitute roofing products.

**TABLE 30: COMPARISON OF ALTERNATIVE FIBRES AND SUBSTITUTE PRODUCTS**

|                      | ASBESTOS CEMENT SHEETING                                                                                                           | CELLULOSE FIBRE CEMENT SHEETING                                                                                                             | CONCRETE ROOF TILES                                                                      | CORRUGATED IRON SHEETING                                                                                      |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Advantages</b>    | <ul style="list-style-type: none"> <li>• Strong</li> <li>• Durable (50 to 60 year lifespan)</li> <li>• 7 m roofing span</li> </ul> | <ul style="list-style-type: none"> <li>• Non-asbestos</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>• Looks good</li> <li>• Cost-effective</li> </ul> | <ul style="list-style-type: none"> <li>• Durable</li> <li>• Lightweight</li> <li>• Easy to install</li> </ul> |
| <b>Disadvantages</b> | <ul style="list-style-type: none"> <li>• Asbestos-related diseases</li> </ul>                                                      | <ul style="list-style-type: none"> <li>• Less durable (20 year lifespan)</li> <li>• 3 m roofing span</li> <li>• High maintenance</li> </ul> | <ul style="list-style-type: none"> <li>• Expensive installation</li> </ul>               | <ul style="list-style-type: none"> <li>• High maintenance</li> </ul>                                          |

### 8.5.2 Flat Sheets

Asbestos has been used as a key raw material in the manufacturing of flat sheets used for internal walling, and ceilings.

#### 8.5.2.1 Internal Walling

Table 31 reflects an assessment of the market shares of the alternative products used for internal walling.

**TABLE 31: INTERNAL WALLING MARKET**

|                                             | FIBRE CEMENT SHEETING | GYPSUM SHEETING |
|---------------------------------------------|-----------------------|-----------------|
| <b>Commercial Buildings</b>                 | 5%                    | 95%             |
| <b>Hospital and Clinics</b>                 | 0%                    | 10%             |
| <b>Manufacturers Selling Price per Sq M</b> | R20 to R25            | R20             |

The market for internal walling is estimated at approximately 2million sq m per annum. These statistics indicate that fibre cement wall sheeting is already a very small proportion of this market segment. Furthermore, the South African fibre cement manufacturer has already converted its fibre cement wall sheeting range to a non-asbestos formulation. Therefore, the phasing out of asbestos will not have any impact on this market segment.

#### 8.5.2.2 Ceilings

Table 32 reflects an assessment of the market shares of the alternative products used in the ceiling board market segment.

**TABLE 32: CEILING BOARD MARKET**

|                                             | FIBRE CEMENT BOARD | GYPSUM BOARD | MINERAL FIBRE BOARD |
|---------------------------------------------|--------------------|--------------|---------------------|
| <b>Residential Buildings</b>                | 15%                | 80%          | 5%                  |
| <b>Commercial Buildings</b>                 | 5%                 | 45%          | 50%                 |
| <b>Schools</b>                              | 85%                | 10%          | 5%                  |
| <b>Hospitals and Clinics</b>                | 85%                | 5%           | 10%                 |
| <b>Manufacturers Selling Price per sq m</b> | R8.50              | R8.60        | R30 to R60          |

The ceiling board market segment is approximately 18million sq m per annum. Once again, the South African fibre cement manufacturer has already converted its fibre cement ceiling board range to a non-asbestos formulation and, as such, phasing out of asbestos will not have any impact on this market segment.

Table 33 reflects a comparison of the Merchant's Selling Price of the most popular flat sheet products used for ceilings.

**TABLE 33: FLAT SHEET COST COMPARISON**

| FLAT SHEET MATERIALS        | PRICE PER SQ. METER |
|-----------------------------|---------------------|
| Asbestos Cement (Zimbabwe)  | R14.79              |
| Gypsum Board                | R16.34              |
| Fibre Cement (South Africa) | R16.56              |
| Masonite                    | R17.25              |
| Isowhite Board              | R19.51              |

Despite increased production costs, the South African manufacturer of fibre cement products proposes to sell its new, non-asbestos product range at the same price as their current asbestos cement products in order to retain market share.

### 8.5.3 Water and Sewage Pipes

There are approximately 150,000 km of installed water pipelines in South Africa, of which approximately 75% carry water, with the remaining 25% carrying sewage effluent. Each year, this installed base is extended by approximately a further 4,000 km of new piping.

The major customers of underground water and sewage piping include:

- Municipalities: 60%
- Irrigation projects: 35%
- Mining: 5%

Traditionally, asbestos cement piping has been particularly popular with municipalities, where as much as 80% of the installed base could be asbestos cement piping.

The following is a list of the substitute products that can be used in the place of asbestos cement piping:

- Carbon steel piping
- Ductile iron piping
- Stainless steel piping
- UPVC piping
- Concrete piping
- GRP (glass reinforced silica) piping
- HDPE piping

Of these, UPVC, HDPE and GRP are the most appropriate for replacing asbestos cement piping.

Asbestos cement piping's share of the water/sewage market has declined from approximately 60% in the mid 1970's to approximately 22% in the mid 1990's and to less than 5% in 2001.

Table 34 reflects a breakdown of the market shares held by the most popular piping materials for the 1991 to 1995 period.

**TABLE 34: PIPING MARKET SHARES**

| PIPING MATERIAL | MARKET SHARE |
|-----------------|--------------|
| Asbestos Cement | 22%          |
| Steel           | 17%          |
| Plastics/Others | 61%          |

Table 35 reflects a comparison of the manufacturers selling prices of the most popular piping products. For comparative purposes, a 200mm, class 6 pipe – one of the most popular pipe sizes/pressure ratings – has been used.

**TABLE 35: COMPARATIVE PIPING PRICES**

| PIPING MATERIALS           | MANUFACTURERS SELLING PRICE PER METER |
|----------------------------|---------------------------------------|
| UPVC                       | R110                                  |
| HDPE                       | R110                                  |
| Steel                      | R140                                  |
| Asbestos Cement (Zimbabwe) | R85                                   |

The only manufacturer of asbestos cement piping in South Africa is scheduled to have discontinued distribution of asbestos cement piping by the end of 2002. A Zimbabwe manufacturer is able to offer South African customers a very competitive price and is still selling a significant quantity of asbestos cement water piping in South Africa.

## **8.6 DEALING WITH THE INSTALLED BASE OF ASBESTOS CONTAINING MATERIALS**

There are three broad possibilities for dealing with an installed base of asbestos-containing materials and/or products already in place in existing buildings:

- Do nothing
- Remove it
- Encapsulate, enclose it or repair it

The most appropriate approach to be adopted depends upon the condition and location of the asbestos material, and should be based on the following factors:

- The type of asbestos that is contained in in-situ materials and product
- How the materials/products are used and how friable they are
- The surface condition and age of the product
- The position of the asbestos-containing materials and/or products within the building

### **8.6.1 Option 1: Do Nothing**

Throughout the literature, this is proposed as the best alternative where the asbestos is in an acceptable condition and is in a non-friable form. As one scientist put it: "*asbestos is like a big sleeping dog. If not stirred up, it does no harm. If hammered or sawed upon, it may bite anyone near it.*".

If asbestos is not removed or treated, information must be given to those who live or work nearby, on the potential dangers and how to monitor it. This alternative may be best until the skills and the resources are available to deal with it properly. This approach requires regular inspection and education with the associated cost implications.

### **8.6.2 Option 2: Removal**

Removal and safe disposal is ultimately the long-term safest solution for asbestos-containing materials and/or products within existing buildings. However, it is the most costly and potentially the most dangerous option. The costs and skills involved in the removal of asbestos are significant.

Therefore, removal is only recommended when the asbestos is in poor physical condition, exposed to vibration or impacts, friable, and if the necessary pre-requisites for the removal are present (such as sufficient space and equipment).

In the United States, the cost of removing asbestos is significant: "Sprayed on for about 25 cents a foot in the 1960s, it can now cost \$25 or more a foot to remove, owing to the safety precautions that must be taken to protect the remover and occupants of the building."<sup>81</sup>

The risks of inappropriate asbestos removal and/or disposal can be more dangerous than no intervention at all as these can result in high concentrations of fibres being released into the air. Studies have shown that spraying or injecting of wetting agents into asbestos-containing materials and/or products reduces the hazard associated with the removal process by aggregating the fibres together.<sup>82</sup>

The internationally recommended steps for removal of asbestos material include<sup>83</sup>:

- When renovating or removing asbestos cement products, appropriate control measures should considerably reduce risks of developing asbestos related illnesses. Data from industries where such measures have been introduced demonstrate the feasibility of keeping exposure at levels generally below 0.5 fibres/ml of air.
- Although suppression of asbestos emissions from roof sheets by wetting or sealing of weathered surfaces is partly effective, additional precautions such as respiratory protection and clothing decontamination are considered to be essential for the demolition of roofing containing asbestos<sup>84</sup>.
- Only if damaged asbestos cannot be managed in place by sealing it or enclosing it, should it be removed
- The contractor should enclose the work area in a plastic bag (for small jobs) or in plastic sheets attached to the floor and ceiling with duct tape. The work area should be enclosed completely, including the floor, ceiling, and any air vents.
- Everything inside the area should be washed and then vacuumed with a special asbestos vacuum. Furniture should be removed
- No one should go into the work area without proper equipment (including approved respirators), protective clothing, and training. No one should leave the work area unless they have taken the proper steps to make sure that the asbestos fibres will not be taken out with them. This means that any equipment or clothing in the work area must be cleaned or taken off before leaving the area.
- The asbestos material must be kept wet during removal to reduce the amount of asbestos fibres entering the air.
- As the asbestos is removed, it should be placed in two heavy-duty plastic bags that are sealed and labelled. For larger jobs, asbestos waste may be placed in specially designed drums or boxes that must also be labelled. All wastes must be kept moist until they are deposited at the landfill. Asbestos wastes must not be considered reusable and their incineration is not allowed.

In South Africa, the requirements for the removal and safe disposal of asbestos-containing materials (and the demolition of buildings containing asbestos) are laid out in the draft Asbestos Regulations 2001<sup>85</sup>. These regulations require that:

- All asbestos and asbestos-containing materials likely to become airborne must be identified and a plan of work must be submitted for approval to an approved inspection authority
- All asbestos-containing materials must be handled and disposed of in a safe manner
- Asbestos cement sheeting must be carefully removed before demolition.
- All employees exposed to asbestos-containing materials must be given appropriate personal protective equipment
- The premises, structure or area must be thoroughly checked to ensure that all asbestos waste has been removed.

The regulations also specify that a contractor that has been accredited by the Department of Labour must carry out work involving the installation or removal of asbestos-containing materials and/or products from existing buildings. (Except for asbestos cement materials that may be removed by a building contractor.)

### 8.6.3 Option 3: Encapsulation or Enclosure

Some researchers contend that damaged asbestos can be made safe by repairing it and, either sealing it to prevent further damage, or enclosing it, if the asbestos product is in good condition and is not likely to be disturbed.

Enclosure, encapsulation, and even spot repairs should be performed by someone trained in the proper handling of asbestos, and may require enclosure of the work area and use of protective clothing and approved respirators.

- **Encapsulation** involves treating the asbestos with a sealant (like paint) that can temporarily keep the fibres within the matrix or in their original state. This method is used in situations where the asbestos product has a hard, sealed surface and is not worn through as a result of repairs or impacts. If the material is crumbling and deteriorating, encapsulation can do more harm than good. This is because the sealant pulls down the loosened asbestos material and can allow additional fibres to be released into the air.
- **Enclosure** involves isolating the asbestos-containing materials from potential damage by using a sturdy, airtight barrier such as spraying on a coating of cement. It is considered a suitable, but temporary remedy for some asbestos problems and is usually recommended for friable forms of asbestos. This method is preferable when the asbestos product is in good condition, is easily accessible and lies in an area not associated with physical impact.
- **Repairs** can be undertaken in situations where there are minor damaged areas, such as holes in roof sheets. In these cases the sheet can be removed and replaced with an alternative sheet. Sealing material can also be glued in place on asbestos sheets.
- **Maintenance:** if asbestos materials are left in place, they should be monitored and treated with respect. Household members should avoid exposure to asbestos and inspect the material regularly to see if its condition changes.

There are no regulations in North America requiring the immediate removal of in-place friable insulation materials, however, building owners are required to put in place appropriate management programmes<sup>1</sup>. Moreover, any work, which disturbs in-place friable insulation materials, must be undertaken according to very strict workplace standards. This applies not only to removal operations, but also maintenance and custodial work.

#### **8.6.4 Friable Asbestos Insulation in North American Buildings**

In North America, the policy debate over management versus immediate universal removal of in-place friable asbestos insulation materials was effectively concluded in September 1990, following the publication of the US EPA Green Book entitled "Managing Asbestos In Place".

The authors of this reference state: "Consistent with many scientific reviews on the subject, it is now generally agreed that intact, undisturbed asbestos-containing materials generally do not pose a health hazard. Therefore, unless asbestos-containing materials are in a poor condition or located where they can be easily disturbed, the best approach is to manage the problem and defer removal until the time of major renovation or demolition of a building".

Their conclusions, based on the "EPA's Five Facts", is:

- Although asbestos is a hazard, the risk of asbestos-related disease depends upon exposure to airborne asbestos fibres
- Based on the available data, the average airborne asbestos levels in buildings seem to be very low. Accordingly, the health risk to most building occupants also appears to be very low.
- Removal is often not a building owner's best course of action to reduce asbestos exposure. In fact, improper removal can create a dangerous situation where none previously existed
- The EPA only requires asbestos removal in order to prevent significant public exposure to airborne asbestos fibres during building demolition or renovation activities
- The EPA recommends a proactive, in-place management programme whenever asbestos-containing material is discovered in a building

### **8.7 ANTICIPATED IMPACTS OF PHASING OUT ASBESTOS**

#### **8.7.1 Investment**

The sole South African manufacturer of asbestos cement building and construction products has been involved in a conversion process for the past 20 years. As such, nearly all of the investment impacts associated with this conversion process have already been absorbed. It is estimated that this conversion process has cost this business in excess of R100million.

These impacts included:

- Significant downsizing and disinvestments of capital plant
- A significant retrenchment of staff
- A significant investment in research and development
- Rationalisation of the product range
- A significant investment in new production equipment

In most instances, the manufacturers and marketers of substitute products have used this restructuring phase as an opportunity to capture market share. As such, nearly all of the investment in product development and expansion of manufacturing capacity of substitutes has already occurred.

### **8.7.2 Employment**

The South African manufacturer of asbestos cement building and construction products will retrench a further 44 people as part of the final phase of its conversion process. In total, this business will have retrenched approximately 750 people over the past three years as part of its conversion and business rationalization programmes.

## **8.8 BUSINESS VIABILITY**

The sole South African manufacturer of fibre cement building and construction has almost completed converting its entire product range from asbestos cement to alternative fibre cement formulations. This business has already absorbed most of the impacts of conversion and has transformed itself into a viable new entity.

The only factor threatening this business is the presence of a Zimbabwean competitor that continues to market a range of asbestos cement building and construction products in South Africa. This business is exploiting the advantage which the weakening SAR/Z\$ exchange rate gives it.

This Zimbabwean business is easily able to undercut the South African fibre cement business's pricing and, as a result, is continuing to capture an ever-increasing share of the South African market. If this trend continues, the South African business's survival will soon be jeopardized.