BUILDINGS CONSUME ABOUT 50% OF ALL ENERGY PRODUCED. CONVENTIONAL ENERGY PRODUCTION IS RESPONSIBLE FOR MAKING A LARGE CONTRIBUTION TO ENVIRONMENTAL DAMAGE AN NON-RENEWABLE RESOURCES DEPLETION. USING LESS ENERGY OR USING RENEWABLE ENERGY IN BUILDINGS THEREFORE CAN A SUBSTANTIAL CONTRIBUTIO STAINABILITY. BUILDINGS 0% OF ALL ENERGY PR AL ENERGY PRODUCTI MAKING A LARGE CO ONMENTAL DAMAGE A RESOURCE DEPLETION. GY OR USING RENEWABLE E IN BUILDINGS THEREFORE CAN MAKE A SUBSTANTIAL CONTRIBUTION TO SUSTAINABILITY. BUILDINGS CONSUME ABOUT 50% OF ALL ENERGY PRODUCED. CONVENTIONAL ENERGY PRODUCTION IS RESPONSIBLE FOR MAKING A LARGE CONTRIBUTION TO ENVIRONMENTAL DAMAGE AND NON-RENEWABLE RESOURCE DEPLETION. USING LESS ENERGY OF USING RENEWABLE ENERGY IN BUILDINGS THEREFORE CAN MAKE A SUBSTANTIAL CONTR

energy

[Gibberd, 2000:SBAT]

3.2 ENERGY:

Buildings consume about 50% of all energy produced. Conventional energy production is responsible for making a large contribution to environmental damage and non-renewable resource depletion. Using less energy or using renewable energy in buildings therefore can make a substantial contribution to sustainability. [Gibberd, 2000:SBAT]

3.2.1 LOCATION:

Building located within 400m of public transport.

The road network serving in Administrative Region 7 is composed of: [LIDP, 2002:33-34]

- two north-south freeways; N3 and M1
- three east-west freeways; N1, R24 and M2
- East-west arterials; which include Marlboro Drive

BUS SERVICES:
Bus services in the area are provided by Metropolitan Bus Services, Putco Soweto and Putco Commuta. The bus routes are very pervasive in the southern parts of the region but less so in the northern parts.

Minibus routes are more evenly distributed in the region than the bus services.
(See plans – Transportation – Administrative Region 7).

Develop a pattern that will encourage:

- public transport
- pedestrians (15 min. to walk 1 km)

3.2.2 APPLIANCES AND FITTINGS:

Energy efficient fittings and devices specified. 80% of light fittings are fluorescent/low energy consumption.

- use ambient energy as much as possible (energy that is in the environment – natural daylighting)
- one drop of water per second can waste over 1000 litre per month – check for leaks
- by switching the geyser off at night/ times during day will save a lot of energy (not that much warm water will be used by the furniture warehouse)
- computers – most draw around 100 watts, unless using, switch on/off as required

3.2.3 VENTILATION SYSTEM:

80% of ventilation requirements met through passive ventilation.

Ventilation rate per person:
= 2 x volume of room (m3) / 3 600 seconds
= (m3/s)

3.2.4 HEATING AND COOLING SYSTEM:

All heating and cooling requirements met through passive environmental control system use.

RAW MATERIALS AND NEW COMPONENTS USED IN BUILDINGS CONSUME RESOURCES AND ENERGY IN THEIR MANUFACTUR AND PROCESSES. BUILDINGS ACCOMMODATE ACTIVITIES THAT CONSUME LARGE AMOUNTS OF RESOURCES AND PRODUCTS AND PRODUCE LARGE AMOUNTS OF WASTE. REDUCING THE USE OF NEW MATE[illegible]D COMPONENTS IN BUILDINGS [illegible] ACTIVITIES ACCOMMOD[illegible] WASTE BY RECYCLING [illegible] SUPPORTS SUSTAINAB[illegible]E ENERGY CONSUMPT[illegible]NSUMPTION RAW MATE[illegible]OMPONENTS USED IN BU[illegible]E RESOURCES AND ENERGY IN [illegible]ANUFACTUR AND PROCESSES. BUILDINGS ACCOMMODATE ACTIVITIES THAT CONSUME LARGE AMOUNTS OF RESOURCES AND PRODUCTS AND PRODUCE LARGE AMOUNTS OF WASTE. REDUCING THE USE OF NEW MATERIALS AND COMPONENTS IN BUILDINGS AND IN THE ACTIVITIES ACCOMMODATED AND REDUCING WASTE BY RECYCLING AND REUSE SUPPORTS SUSTAINABILITY BY REDUCING THE ENERGY CONSUMPTION AND RESOURCE CONSUMPTION

recycling & reuse

[Gibberd, 2000:SBAT]

3.3 RECYCLING AND REUSE:

Raw materials and new components used in buildings consume resources and energy in their manufacture and processes. Buildings accommodate activities that consume large amounts of resources and products and produce large amounts of waste. Reducing the use of new materials and components in buildings and in the activities accommodated and reducing waste by recycling and reuse supports sustainability by reducing the energy consumption and resource consumption. [Gibberd, 2000:SBAT]

3.3.1 TOXIC WASTE:

Arrangements made for the safe disposal/recycling of toxic/harmful substances i.e. batteries, printer toners, vehicles etc.

3.3.2 INORGANIC WASTE:

Arrangements for sorting, storage and pick up of recyclable waste.

3.3.3 ORANIC WASTE:

All organic waste recycled on site i.e. compost.

3.3.4 SEWERAGE:

Contribution to mains sewerage form toilet minimized through use of compost toilets, and other 'local' systems.

3.3.5 CONSTRUCTION WASTE:

Construction waste minimized through design and careful management of construction practices. Design limits wastage by designing to comply with modular dimensions of materials. Construction waste minimized by specifying this requirement in tender document and monitoring compliance.

- minimise the production of waste through working with suppliers etc. to avoid packaging
- look at linkages within site and with neighbours to enable recycling (composting, glass bins etc.)
- create linkages with neighbouring buildings

There are a huge waste disposal site in Linbro Park. Fees are to be paid for dumping at the Linbro Park disposal site. The non-removal of waste will increase the likelihood of contamination of groundwater and soil.

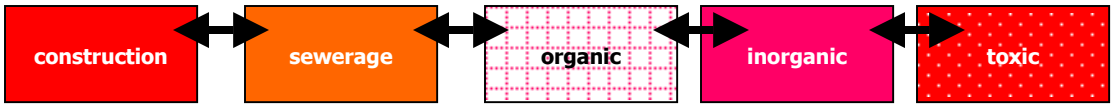
The provision of proper waste services will have a positive impact on the curbing of the spread of certain diseases, the aesthetic quality of the area and an improvement in living conditions for people.

The following types of waste are to be considered to be recycled/reuse: [Gibberd, 2000:SBAT]

- construction
- sewerage
- organic
- inorganic
- toxic

Important considerations:

- bins provided on site
- specify the use of the bins very clearly
- smaller bins can be in the building
- adequate space are essential
- collection of the waste to be specified
- contractors to be appointed



USEFUL INPUT INTO ANOTHER USEFUL INPUT

Fig. 77 – Waste to be recycle/reuse on building site.

THE CONSTRUCTION OF BUILDINGS USUALLY REQUIRES LARGE QUANTITIES OF MATERIALS AND COMPONENTS. THESE MAY REQUIRE LARGE AMOUNTS OF ENERGY TO PRODUCE. THEIR DEVELOPMENT MAY ALSO REQUIRE PROCESSES THAT ARE HARMFUL TO THE ENVIRONMENT AND CONSUME NON-RENEWABLE RESOURCES. THE CONSTRUCTION OF BUILDINGS USUALLY REQUIRES LARGE QUANTITIES OF MATERIALS AND COMPONENTS. THESE MAY REQUIRE LARGE AMOUNTS OF ENERGY TO PRODUCE. THEIR DEVELOPMENT MAY ALSO REQUIRE PROCESSES THAT ARE HARMFUL TO THE ENVIRONMENT AND CONSUME NON-RENEWABLE RESOURCES. THE CONSTRUCTION OF BUILDINGS USUALLY REQUIRES LARGE QUALITIES OF MATERIALS AND COMPONENTS. THESE MAY REQUIRE LARGE AMOUNTS OF ENERGY TO PRODUCE. THEIR DEVELOPMENT MAY ALSO REQUIRE PROCESSES THAT ARE HARMFUL TO THE ENVIRONMENT AND CONSUME NON-RENEWABLE RESOURCES. THE CONSTRUCTION OF BUILDINGS USUALLY REQUIRES LARGE QUANTITIES OF MATERIALS

materials & components

[Gibberd, 2000:SBAT]

Listen to LeCorbusier in 1927:
You employ stone, wood and concrete, and with these
Materials you build houses and palaces; that is construction.
Ingenuity is at work.
But suddenly you touch my hart,
You do me good, I am happy and I say: "This is beautiful".
That is architecture. Art enters in.

3.4 MATERIALS AND COMPONENTS:

The construction of buildings usually requires large quantities of materials and components. These may require large amounts of energy to produce. Their development may also require processes that are harmful to the environment and consume non-renewable resources. [Gibberd, 2000:SBAT]

3.4.1 EMBODIED ENERGY:

80% of the building materials and components made from materials and components with low embodied energy. Low embodied energy. Low embodied energy materials include locally (within country) made and sourced timber, concrete, concrete block timber, windows and doors.

3.4.2 MATERIAL/COMPONENT SOURCES:

90% of materials and resources from renewable resources.

3.4.3 MANUFACTURING PROCESSES:

Environmental damage limited during product component development. No green house gases released, no pollution caused.

3.4.4 RECYCLED/REUSED MATERIALS AND COMPONENTS:

10% of building materials and components are reused or from recycled sources.

3.4.5 CONSTRUCTION PROCESSES:

Building and construction process designed to minimally impact the environment. Requirement for large-scale vegetation clearing and earth movement minimized.

WATER CONSUMED IN BUILDING MATERIALS:
- 1 tonne bricks – 2 200 litre
- 1 tonne steel – 165,000 litre
- 1 tonne plastic – 1,32 million litre
- concrete: typical bag – 23 litre

[Gibberd, 2002]

- ensure that the manufacturing process will not be harmful to people/environment
- encourage suppliers to incorporate recycling material in their materials
- recycling of aluminium reduces the requirement of energy by 96%, steel by 53%
- the building must be designed to minimize the requirement for large-scale groundwork on-site
- energy conscious design attempts to reduce energy wasted of cutting and placing of building materials

The basic strategy for choice of sustainable building materials consists of the following steps:
- prevention of unnecessary use and efficient use of materials
- use of renewable and recycled sources
- selection of materials with the least environmental impact

[Anink, Boonstra, Mak, 1995:10]

- 50% of material resources taken from nature are building related
- >50% of national waste production comes from the building sector
- pollution per kg created by stone, concrete and brick-like material is, generally minimal
- stone, concrete and related products last the entire life-span of a building
- concrete has a low energy content per kg
- glass – large amount of energy needed to achieve high temperature require for processing the raw materials
- glass – successfully recycled – remelting
- glass waste – only recycled into low-grade glass

- sand-lime-brick – unsuitable for reuse (only for low-grade application)
- metals – reusability (economically attractive)
- aluminium – high-grade recycling
- steel – reuse (less than al.)

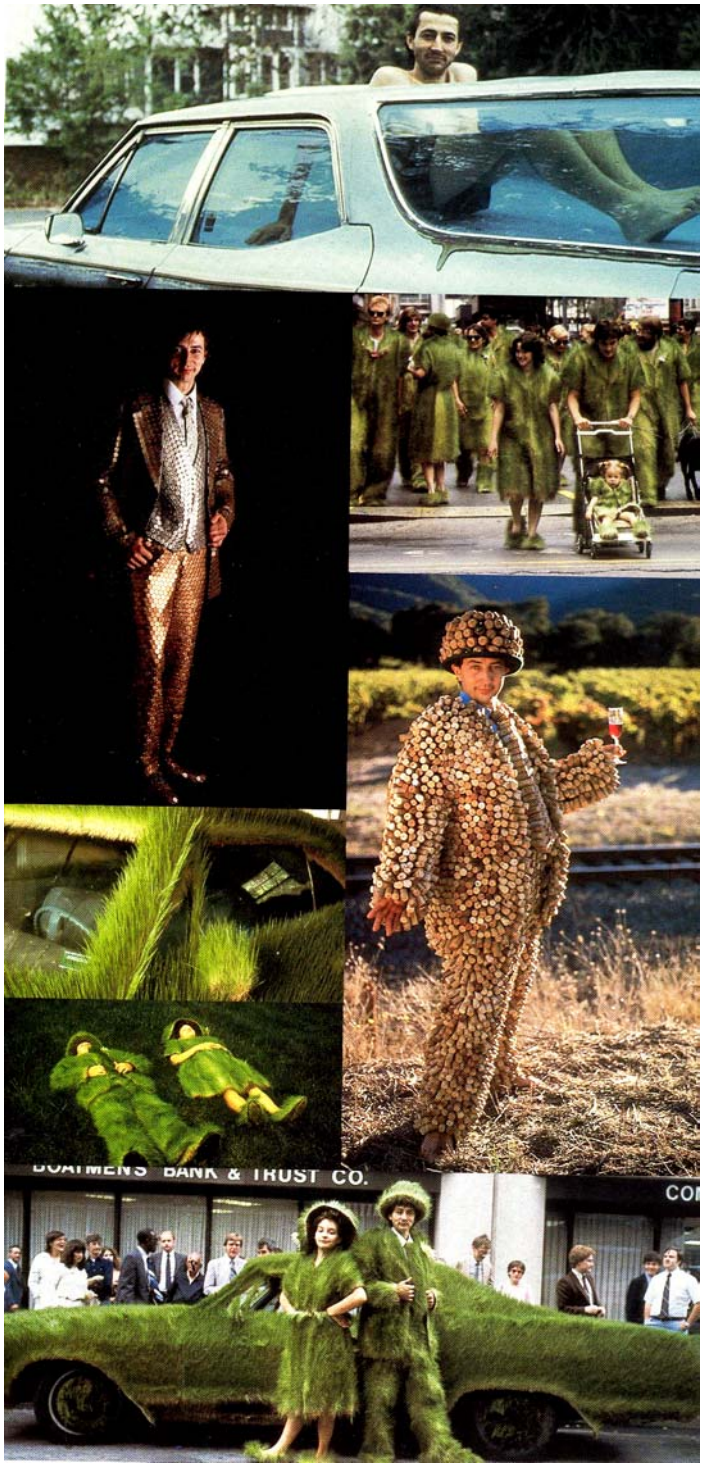
[Anink, Boonstra, Mak, 1995: 166-167]

Material	GJ/TON
Steel	20
Steel, recycled	3,6 – 5,6 (82% saving)
Aluminium (by hydro electricity)	75
Aluminium (by coal fired power)	167
Aluminium, recycled	4,7 (97,2% saving)
Lead	31
Copper	40
Zinc	46 – 52
Polythene	137,5
Cement	13,1
Glass, sheet bottles	14 – 18
Tiles	4
Clay bricks	1 – 6 (3,5)
Soft wood	3,4
Copper	40
Zinc	46 - 52

Table 78 – Energy content of building materials.

Material	GJ/TON
Brick	2,5
Concrete	1,7
Superstructure (roof structure)	
Plasterboard	4,4
Stabilized earth	0,7
Concrete tiles	12
Vinyl	70
Glass, technical ware	54

Table 79 – Energy content of building materials.



[Domus No 813-814, 1999:89]