



**1.1.5 THERMAL COMFORT:**

= A personal issue.

Thermal comfort in a building depend on a range of factors including: [Holm, 1996:5]

- radiant temperature of surrounding surfaces
- air movement
- solar radiation
- activities
- clothing
- acclimatization
- age etc.

Working policy must encourage occupants to wear for example no ties in summer and thick coats during winter temperatures. That will ensure comfort and will minimize costs of heaters and air conditioners.

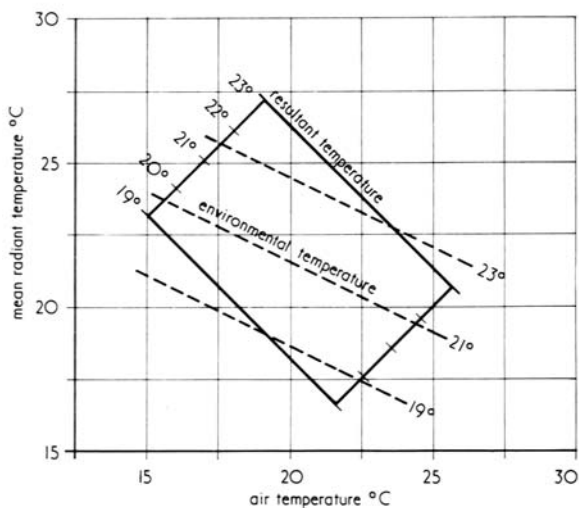


Fig. 56 – Comfort zone for sedentary occupation with air velocity 0,1m/s.

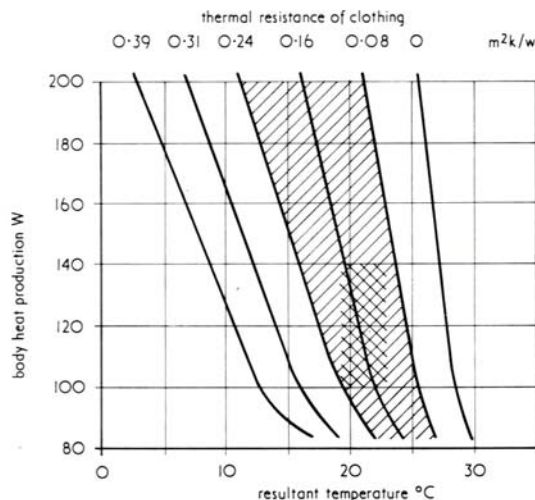


Fig. 57 – Room temperature in relation to activity and clothing: normal range of clothing shown single hatched comfort zone shown cross hatched.

**HUMIDITY AND COMFORT:**

It will be the humidity or lack of it that will cause the discomfort rather than the temperature. The range of acceptable relative humidities is quite large: for secondary occupations between 40 and 70%. Very high and very low humidities both have a deleterious effect on the building fabric and furniture. The build-up of static energy is encourage by low humidity. [Tutt, Adler, 1998:396]

Thus, a fan will not be effective for cooling the building in Johannesburg because it will only dry the air. Use a system that will moisten the air by passing it through water.

(A suitable system that will be consider is the rock-bin system – the air will be cooled by cold water passing through a rock bin situated near constant ground temperature).

Example: An internal environment with relative humidity of 60% and temperature of 25 degrees Celsius is required where the outside RH is 90% and temperature is 30 degrees Celsius. How could this be achieved?

The point on the psychrometric chart (next page), corresponding to RH 90% and 30 degrees Celsius, corresponds to a mixing ration of 24,6g/kg. If the air is cooled to 28,2 degrees, it can be seen that the air will become saturated. Further cooling will cause water to condense out of it, and the saturation line on the chart will be followed down. At a temperature of 17 degrees, the mixing ratio will be 12,2g/kg, which is the same as for the required combination of RH 60% and temperature 25 degrees Celsius.

The air, now conditioned, can be allowed to reach the required temperature by passing it over the ducts carrying the inlet air at 30 degrees Celsius, without allowing it to mix with it. This it the basic principle by which effect an air conditioner will have on the building. [Tutt, Adler, 1998:396]

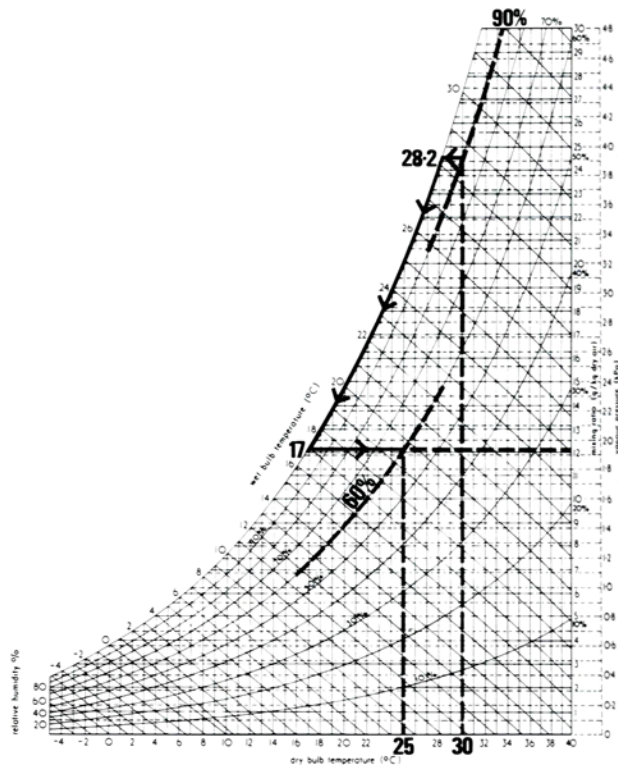


Fig. 58 – Psychrometric chart for reduction of humidity by cooling.

Definition: Thermal comfort involves the human response to climatic factors. Comfort is usually described as a range. The human body responds to thermal stresses (whether hot or cold) to reach equilibrium. [Holm, 1996:5]

The following variables will have an effect on human comfort and must be considered throughout the design:

- Temperature – the comfort range is defined from 16 – 32 degrees Celsius with the optimum temperature being 21 – 22 degrees Celsius for seated persons exposed to air movement of 1 m/s.
- Humidity – the desirable relative humidity range lies between 30 and 65% with the optimum being approximately 50%. The combination of high humidity and temperature promotes discomfort as does the combination of low temperature and low humidity.
- Air movement – the mean radiant temperature may increase with increased ventilation, but the air movement will still create a cooling effect especially in hot humid climates provided that the air temperature is lower than the body temperature.
- Radiation – it is absorbed by objects without heating the air, for example, a person seated at a window may sit in the sun and will feel hotter than colleagues in the shade. [Holm, 1996:5]

The furniture warehouse must provide the desired comfort zone and promote productivity, health and mental and physical energy.

Productivity will be adversely affected by discomfort. It has been established that work efficiency can drop up to 40% with an increase in dry bulb temperature from 28 – 34 degrees Celsius. However, optimum performance conditions do not coincide those for optimum comfort. Cooler than optimum promotes mental activity and warmer, physical activity. Optimum conditions will promote sleep and relaxation.

The design must take all the variables mentioned above in consideration to provide the sufficient thermal comfort zone for all occupants.



BUILDINGS CAN BE DESIGNED TO ACCOMMODATE EVERYONE, OR SPECIALLY DESIGNED BUILDINGS NEED TO BE PROVIDED. ENSURING THAT BUILDINGS ARE INCLUSIVE SUPPORTS SUSTAINABILITY AS REPLICATION IS AVOIDED AND CHANGE OF USE SUPPORTED. BUILDINGS CAN BE DESIGNED TO ACCOMMODATE EVERYONE, OR SPECIALLY DESIGNED BUILDINGS NEED TO BE PROVIDED. ENSURING THAT BUILDINGS ARE INCLUSIVE SUPPORTS SUSTAINABILITY AS REPLICATION IS AVOIDED AND CHANGE OF USE SUPPORTED. BUILDINGS CAN BE DESIGNED TO ACCOMMODATE EVERYONE, OR SPECIALLY DESIGNED BUILDINGS NEED TO BE PROVIDED. ENSURING THAT BUILDINGS ARE INCLUSIVE SUPPORTS SUSTAINABILITY AS REPLICATION IS AVOIDED AND CHANGE OF USE SUPPORTED. BUILDINGS CAN BE DESIGNED TO ACCOMMODATE EVERYONE, OR SPECIALLY DESIGNED BUILDINGS NEED TO BE PROVIDED. ENSURING THAT BUILDINGS ARE INCLUSIVE SUPPORTS SUSTAINABILITY AS REPLICATION IS AVOIDED AND CHANGE OF USE SUPPORTED. BUILDINGS CAN BE DESIGNED TO ACCOMMODATE EVERYONE, OR SPECIALLY DESIGNED BUILDINGS NEED TO BE PROVIDED. ENSURING THAT BUILDINGS ARE INCLUSIVE SUPPORTS SUSTAINABILITY AS REPLICATION IS AVOIDED AND CHANGE OF USE SUPPORTED. BUILDINGS CAN BE DESIGNED TO ACCOMMODATE EVERYONE, OR SPECIALLY DESIGNED BUILDINGS NEED TO BE PROVIDED. ENSURING THAT BUILDINGS ARE INCLUSIVE SUPPORTS SUSTAINABILITY AS REPLICATION IS AVOIDED AND CHANGE OF USE SUPPORTED.

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**1.2 INCLUSIVE ENVIRONMENTS:**

Buildings can be designed to accommodate everyone, or specially designed buildings need to be provided. Ensuring that buildings are inclusive supports sustainability as replication is avoided and change of use supported.

[Gibberd, 2000:SBAT]

**1.2.1 THE DISABLED:**

Disabled people are remarkably adaptable and often of necessity extremely determined to manage for themselves, albeit with considerable discomfort, in buildings designed primarily for able-bodied people. For many ambulant disabled people, the difficulties are surmountable, but for wheelchair users the problems are more serious for if an area is not negotiable by a wheelchair, then the user is forbidden entry and this is intolerable in new buildings.

It is therefore vital that proper consideration should be given to the provision of wc and access to and from the building.

Wc compartments for the disabled can often usefully be unisex; this has several advantages:

- husbands and wives can assist each other which is not possible in single sex compartments
- they avoid the need for and cost of duplicated facilities for each sex; one decent unisex facility can be considerably more economic than two inadequate single sex facilities
- they simplify signposting and access to disabled facilities

A wc compartment for general use by disabled people should allow for frontal or lateral transfer from the wheelchair, with space for an attendant to assist.

In wcs for wheelchair users in public buildings or special buildings for disabled people a hand rinse basin should be installed where it can be conveniently reached by a person seated on the wc. However it is desirable that the basin is also usable from the wheelchair. These opposing criteria together with the requirements for handrails and supports present a difficult problem usually resulting in a poor or even unworkable compromise.

The preferred diameter for support rails is 35mm diameter with 50mm clearance between the rail and the wall. Most proprietary rails are incorrectly sized. Rails must be securely fixed to the structural surface, and horizontal or inclined rails should be capable of carrying a static load of 150kg.

[Tutt, Adler, 1998:341-342]

Ramps and access to and from the building will accommodate the disabled. They will have equally access to all the spaces and exhibitions as the other people.

Where the display routes involves changes in level by steps, or other difficulties for wheelchair users, lifts or ramps should be provided. Ensure that these will be adequately signposted, they need not exactly parallel the ambulant route. (All changes in level catered for with appropriate ramps of 1:12 fall, or lifts).

All edges i.e. between walls and floors and stair nosings will be clearly distinguished through the use of contrasting colour.

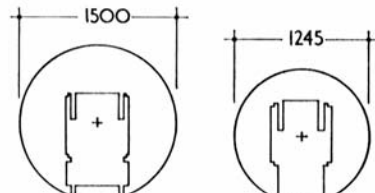


Fig. 29 – Small wheelchairs: comparative turning space requirements (front propelling wheels).

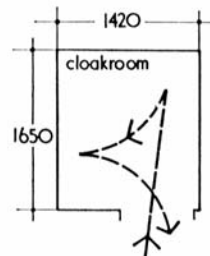


Fig. 30 – Three-point turn in cloakroom.

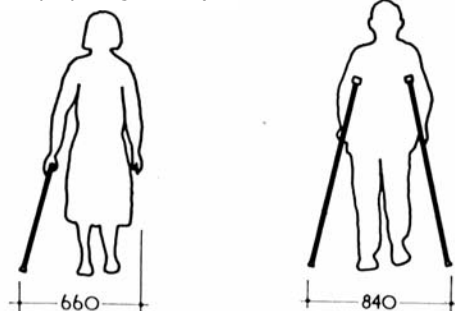


Fig. 59 – Stick user (left) and crutch user (right).

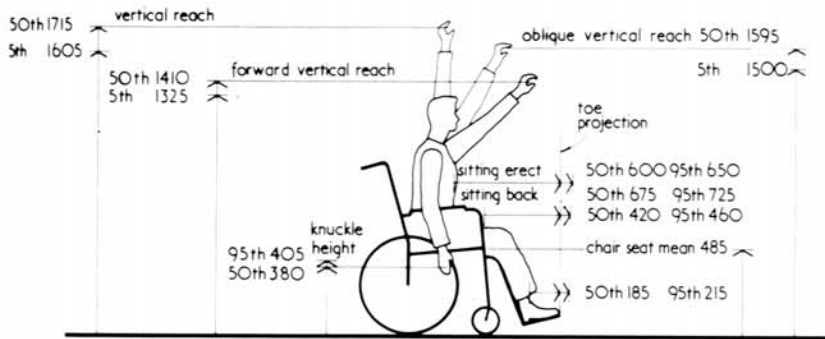
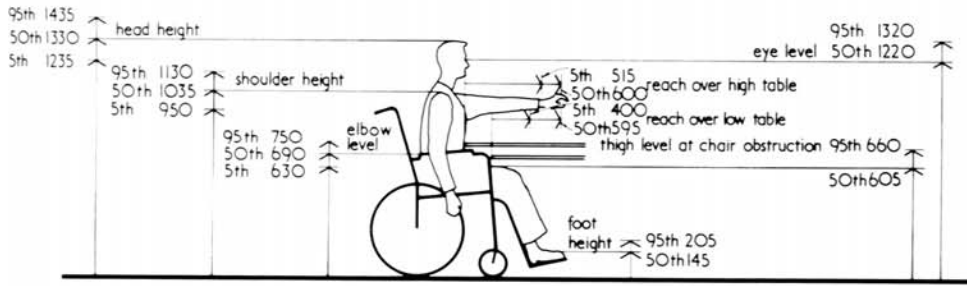


Fig.60 – Dimensions of different percentiles of adult male wheelchair users. These dimensions relate to people who use standard wheelchairs and who have no major impairment of upper limbs.

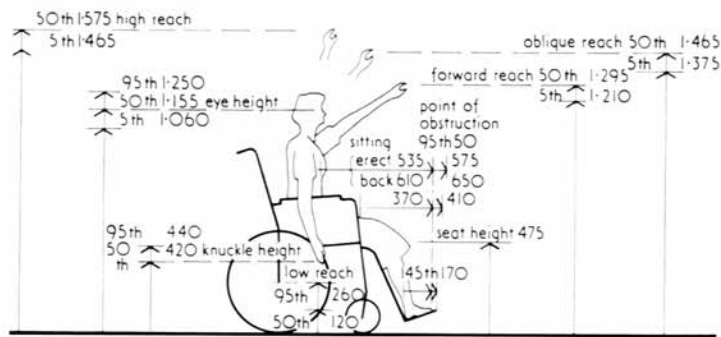
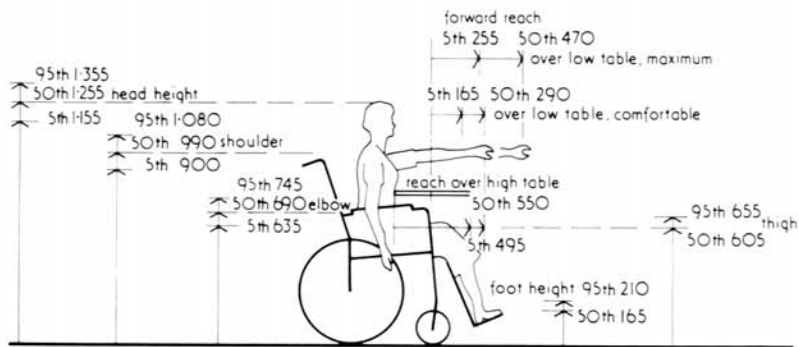


Fig. 61 – Dimensions of adult female wheelchair users.

ENSURING THAT USERS PARTICIPATE IN DECISIONS ABOUT THEIR ENVIRONMENT HELPS ENSURE THAT THEY CARE FOR AND MANAGE THIS PROPERTY. CONTROL OVER ASPECTS OF THEIR LOCAL ENVIRONMENT ENABLES PERSONAL SATISFACTION AND COMFORT. BOTH OF THESE SUPPORT SUSTAINABILITY BY PROMOTING PROPER MANAGEMENT OF BUILDINGS AND INCREASING PRODUCTIVITY. ENSURING THAT USERS PARTICIPATE IN DECISIONS ABOUT THEIR ENVIRONMENT HELPS ENSURE THAT THEY CARE FOR AND MANAGE THIS PROPERTY. CONTROL OVER ASPECTS OF THEIR LOCAL ENVIRONMENT ENABLES PERSONAL SATISFACTION AND COMFORT. BOTH OF THESE SUPPORT SUSTAINABILITY BY PROMOTING PROPER MANAGEMENT OF BUILDINGS AND INCREASING PRODUCTIVITY.

## participation & control



### 1.3 PARTICIPATION & CONTROL:

Ensuring that users participate in decisions about their environment helps ensure that they care for and manage this properly. Control over aspects of their local environment enables personal satisfaction and comfort. Both of these support sustainability by promoting proper management of buildings and increasing productivity. [Gibberd, 2000:SBAT]

#### 1.3.1 ENVIRONMENTAL CONTROL:

Users in the building have reasonable control over their environmental conditions; this should include opening windows and adjustable blinds.

The occupants in the building will have control over the following aspects in the building (to suit their individual preferences):

- louver panels
- grills in floor that can open/close (warm/cold air)
- openable windows
- moveable partitions and showcases for exhibitions
- lights
- ramps
- staircases
- more than one entrance
- different parking bays

The ramps and staircases will allow an open interactive viewing, inspiring the occupant of DiD furniture warehouse to choose his/her own route through the spaces – provokes moments of pause, reflection and discovery.

The ramps will drive movement through a series of spatial sequences. It will provide curved elements of both mystery and surprise.

#### 1.3.2 SOCIAL SPACES, AMENITY AND COMMUNITY INVOLVEMENT:

Design for easy informal/formal social interaction. This could involve a tearoom with comfortable seating. Seating provided along regularly used routes. Spaces shared between occupants/users that are large enough to allow for comfortable social interaction. Easy access to refreshment facilities and wcs for all user of the building.

The building will have sufficient social spaces. There will be sitting spaces, coffee shops, restaurants, reading rooms, exhibitions with social gatherings related to it and by creating lots of different spaces in different parts of the building will there definitely be sufficient social interaction and gatherings. Tables and chairs will be outside as well to create a social atmosphere outside and inside the building.

Ablution facilities will be easily accessible and there will be two separate blocks on a level (west and east side of the building).

Spaces, activities, shops, exhibitions, restaurants etc. will be available to the community and their involvement will be valuable in terms of future innovation.





BUILDINGS NEED TO CATER FOR THE WELL-BEING, DEVELOPMENT AND SAFETY OF THE PEOPLE THAT USE THEM. AWARENESS, AND ENVIRONMENTS THAT PROMOTE HEALTH CAN HELP REDUCE THE INCIDENCE OF DISEASES SUCH AS AIDS. SAFE ENVIRONMENTS AND FIRST AID CAN HELP LIMIT THE INCIDENCE OF ACCIDENTS AND WHERE THESE OCCUR, REDUCE THE EFFECT. L

education,  
health,  
safety



#### 1.4 EDUCATION, HEALTH AND SAFETY:

Buildings need to cater for the well-being, development and safety of the people that use them. Awareness, and environments that promote health can help reduce the incidence of diseases such as aids. Safe environments and first aid can help limit the incidence of accidents and where these occur, reduce the effect. Learning and access to information is increasingly seen as a requirement of a competitive work force. All of these factors contribute to sustainability by helping ensure that people remain healthy and economically active, thus reducing the 'costs' (to society, the environment and the economy) of unemployment and ill health. [Gibberd, 2000:SBAT]

##### 1.4.1 EDUCATION:

Access to support for learning must be provided. This can be in the form of internet access, structured courses, or the provision of learning material such as books and newspapers.

There will be a lot of educational facilities provided in DiD furniture warehouse, such as:

- bookshop with books such as furniture design, furniture history, furniture designers and the latest trends (locally/internationally)
- internet access
- computer rooms
- newspapers available in coffee shops
- skills learning courses
- exhibitions
- info boards (all over the building) – info. cable structure electric board – every 10 sec. new info.

##### 1.4.2 SAFETY AND SECURITY:

Measures taken to ensure that areas of the building and routes to and from the building are safe, and feel safe. Measures taken could include well lit routes, routes and spaces overlooked by occupied areas, clear visual links between spaces. Building must comply with all the health and safety requirements. Policy/regular checks in place to ensure that these are complied with.

DiD furniture warehouse will contain objects and furniture of high value. The highest possible level of security must be maintained. Although the building is situated in a security business park with access control at the main entrance, it is still an open environment and a risk in terms of security.

Reliance will be mainly on wardens on site (near entrances) and inside the building. The human element is to be considered important, but technology allow good mechanical and electronic measures and detection of removal by alarms will be used as well.

Entrances and exits will be checked by electronic detection. The amount of hiding places, such as cupboards, opening directly off the public areas, should be limited.

All external doors and windows will be protected from illegal entry. The security room on the ground floor level will act as a control room in terms of security. There will be cameras installed on each floor to control the entire building.

There must be very strict control when delivering. "Camera-eyes" must be activated 24 hours in the delivery room to check furniture coming in and out of the building. It will also monitor staff and visitors' entries and exits. There are only two main entrances – for safety purposes mainly.

At night, when the building is more or less empty, security will be very strict because during that time will the crime be high.

The types of crime to be considered are: [Tutt, Adler, 1998:487]

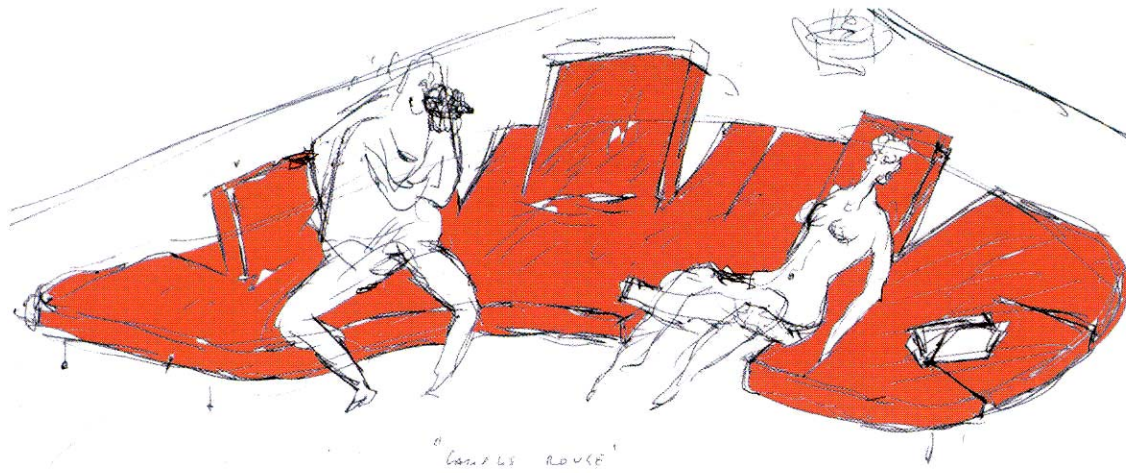
1. pilferage by staff or other insiders
2. pilferage by public (shoplifting)
3. vandalism without gain to the perpetrator
4. casual break-ins
5. planned break-ins

On site, fences will be used rather than a wall, because of the view towards the building and one will see through it for security purposes. It will be more or less 2,5m high (not less) and topped with two strands of barbed wire.

Window panes less than 0,05m<sup>2</sup> in area can not be climbed through (consider it on ground level).

Vertical bars will be more effective than horizontal bars. The bars will be of square cross-section minimum 20mm at a maximum spacing of 125mm and built in 75mm. Transverse tie-bars will be provided at 600mm centers. [Tutt, Adler, 1998:487]





[Domus No 827-828, 2000:66]

Type of building	Principal risks	Vulnerable points	Design solutions
Shops	1,2,4,5	Ground floor doors and windows, stores and rear corridors, unfrequented areas of sales.	Security locks and easy observation, constant casual observation.
Offices	1,4,5	Ground floor doors and windows, particularly rear fire escapes.	Panic-type locks on rear escape doors. All areas under constant casual observation. Supply all staff with lockable furniture for personal valuables.
Factories and storage buildings	1,4,5	Ground floor doors and windows, loading banks.	Doors barred with heavy duty locks – in many cases machinery for cutting through such devices will be to hand.
Restaurants	1	Kitchens, stores, cash desk	Constant casual observation will be necessary.
Car parks	1,2,3,4		Observation at all times, including the use of lighting and closed circuit television. In this case public acceptance is universal.

Fig. 62 – Relationship between crime and building type.

The delivery store, internet café and computer room's door (and other valuable rooms) should be as stout as possible. It will be solid, and the hinge will be internal. The lock must be a mortice lock. No lock will be fitted that can be opened from inside without the key – it will hinder an intruder's escape.

Safety and security measures must be strict in the interest of the occupants of the building. Lifts must be serviced on a monthly basis to ensure that people will be safe and feel secure. It will be the best way of security control to appoint a security firm to handle all aspects of security and safety on site and in the building. They will be held responsible for the security.

The LIDP's report on safety and security in the larger area (Region 7):

Police stations are situated in Alexandra, Buccleuch, Bramley, Edenvale, Sandringham and Sebenza.

Safety and security are a problem in certain areas of Administrative Region 7, especially in the Greater Alexandra Region, due to amongst others, the lack of recreational facilities, unemployment and low educational levels. The police station where the highest number of serious crimes relative to overall GJMC crime situation are reported, is within the Alexandra area. More than 50% of incidents reported at the Alexandra Police Station were classified as serious crime.

The top five crimes are other thefts, burglary from residential premises, thefts of motor vehicles and motorcycles, thefts out of or from motor vehicles and robbery with aggravating circumstances (with a firearm).

Safety and security is a serious problem which must be addressed in the industrial areas, as well as the residential areas, to provide a safe and friendly environment in which to work and play.

An unsafe environment is not conducive to the well-being of society, because of the social impacts of criminal activities for example higher death rates and increased anti-social and criminal behavior. [LIDP, 2002:23]

Vehicle control will be secure by booms and security guards on duty in parking area and basement. (During working hours and after hours). When entering, each vehicle will receive a passing ticket to control passback.

A manned guard point will be provided adjacent to the main entrance of the site. The vehicle exit will be clearly visible from the guard point.

Sufficient lighting must be provided, especially besides walkways and pavement entrance points and landscape areas. Specific lighting in front of retail shopfront glass façade must be provided.

**1.4.3 HEALTH:**

First aid kit provided in a central location. Policy to ensure that this can be used effectively. Information readily available on health, education and career development issues. This could be in the form of a well serviced notice board located in a central position.

To prevent a "sick-building-syndrome", ensure that the building was sufficient: [Gibberd, 2000:SBAT]

- sunlight
- ventilation (natural)
- clean ablutions
- access to green outside
- views to the outside
- enough space per person
- sufficient lighting
- routes (either by stairs, lifts, ramps)
- information boards
- emergency exits and plans (first aid kits)
- clean water supply
- a clean and hygienic building (appoint a cleaning team)

#### 1.4.4 SMOKING AND FIRE CONTROL:

No smoking in public spaces. Space allocated for smoking where it will not affect other users, i.e. away from air intakes etc.

NO SMOKING WILL BE ALLOWED INSIDE DID FURNITURE WAREHOUSE. There will be sufficient outside space, balconies etc. provided to smoke outside.

According to the new smoking law, restaurants must have separate outside, closed smoking areas. That will be provided.

There are a lot of products that meet the standards of fire on the market today: [Raubenheimer, 2002,(1):48]

- **Factorylite** (glass wool) – an improved industrial roofing product designed to insulate commercial buildings speedily and cost-effectively. Non-combustible, and meeting all the requirements of the fire and smoke index (ASTM E84), Factorylite assists in reducing the fire hazard in any commercial building. This material also creates a saving on energy bills by reducing heat loss during the roof and walls, and it also insulates against noise, thus improving interior acoustics for a quieter working environment. Maintenance-free, Factorylite is a non-corrosive material, and is supplied with the option of a foil, lacquered foil or black cloth facing.
- **Factoryboard** (wall cladding, roof insulation) – a multi-purpose wall cladding and/or roof insulation designed to insulate walls and new or existing roofs. In addition to the thermal and acoustical properties shared by both new products, Factoryboard is visually attractive, with a finish that can be adapted to complement a sophisticated or utility environment. This adaptable product can be installed in areas subjected to a high humidity level where there is no risk of sagging or distortion of the boards.
- **Solaris** (glass bricks) – they are aesthetically pleasing, admit light, save energy and discourage burglaries. They also have a high fire resistance. Ideally suited for feature walls in any type of building – or for use as room dividers, entrances, etc. Solaris glass bricks have been tested in accordance with the German DIN 4102 to determine the range of their application as fire-resistant glazing. It was found that glass bricks provided a rating of G60 (fire-resistance up to 60 minutes) for a single wall and G120 for a double glass brick wall.
- **Variflex** (partition wall system) – a mobile acoustic partition wall system. It has passed stringent fire testing by the SABS with flying colours. Marketed, manufactured and installed in South Africa by Aluglass, Variflex has been used with great success at major venues. The Variflex mobile partition walls provide excellent acoustic properties and allow flexible use of large areas. Rooms may be subdivided for privacy, and after the partitions can be moved away on an overhead track and positioned neatly on one side or in a cupboard. No floor track is required, and the mobile walls stand firm once locked in position. Available in three basic types, Variflex can accommodate heights from 2000 to 10 000mm. The test conducted by the SABS were to determine the fire resistance of the partition wall in accordance with WABS 0177-1981 Fire resistance test for building elements, and since the partition was symmetrical in construction in respect of both faces, it was tested from one side only – a special panel finish was applied. The 80 minute furnace test, where the furnace temperature eventually reached 990 degrees Celsius, showed that the exposed face on the non-fire side of the panel reached an average temperature of 79 degrees Celsius, with no failure being observed.

Fire-extinguishers (CO2) must be provided on each level according to basis fire requirements codes such as SABS 0139, BS 6266, BS 7273 and BS 5839.

A control facility (in security room) will integrate and monitor all fire safety installations on a 24 hour, 7 days a week basis.

Should a fire break out, a signal to the control room will be immediate, enabling the fire to be investigated by trained security personnel, and tenants of the building alerted quickly.

Simultaneously, the alarm will be transmitted via radio telemetry to the Fire Department's control center, to respond to the incident.

Fire escape staircases and routes will be designed according to SABS.

Smoke exhaust fans will be provided in the two atriums in terms of the rational fire design.

Escape routes in case of fire will not exceed the maximum of 45m.

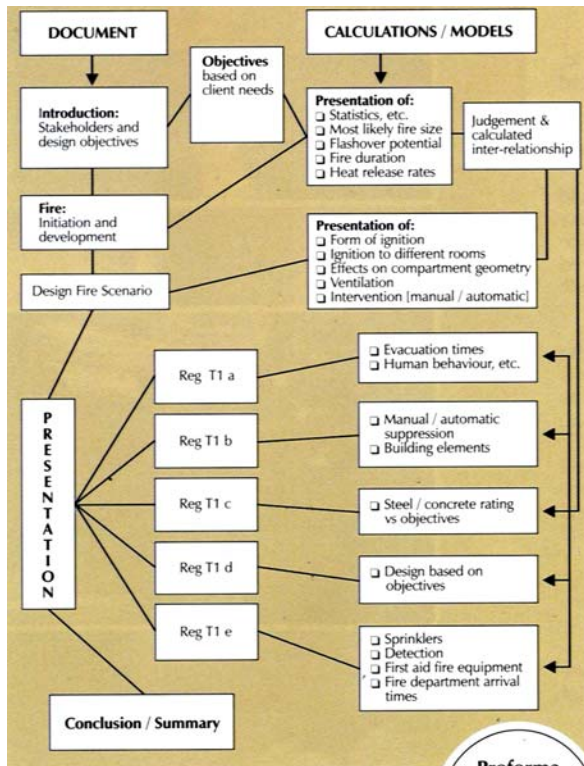
[SABS, 1990:T1/W1]

There will be six alternative fire exits in the furniture warehouse.

They will be well spread to provide exits from all angles; north, south, east and west.

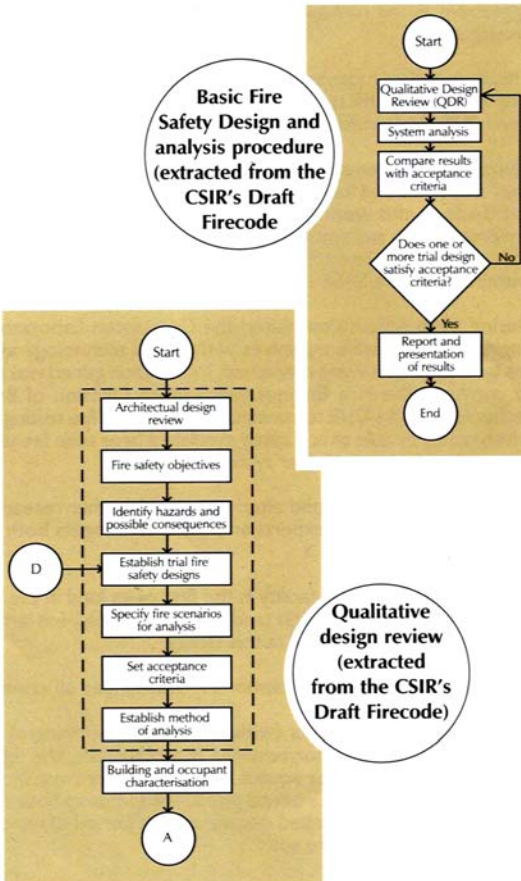


FIRE FIRE FIRE FIRE



Copies of this proforma are readily available from the Fire Engineers Association of South Africa.

**Proforma flow chart: Rational Design Submissions**



**THE BASIC REQUIREMENTS OF SABS 0400:1990, PART T1 FIRE PROTECTION**

This Code states that any building shall be so designed, constructed and equipped that in case of fire:

T1(a) the protection of occupants or users therein is ensured and that provision is made for the safe evacuation of such occupants or users;

T1(b) the spread and intensity of such fire within such building and the spread of fire to any other building will be minimised;

T1(c) sufficient stability will be retained to ensure that such building will not endanger any other building; Provided that in the case of any multi-storey building no major failure of the structural system shall occur;

T1(d) the generation and spread of smoke will be minimised or controlled to the greatest extent reasonably practicable, and

T1(e) adequate means of access, and equipment for detecting, fighting, controlling and extinguishing such fire, is provided.

Fig. 63 – Proforma flow chart – recommended by the Fire Engineers Association of South Africa – specific reference to the Part T1 of SABS 0400:1990.

