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# 06 | TECHNICAL INVESTIGATION

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## 6.1 | HVAC, HEATING, VENTILATION AND COOLING

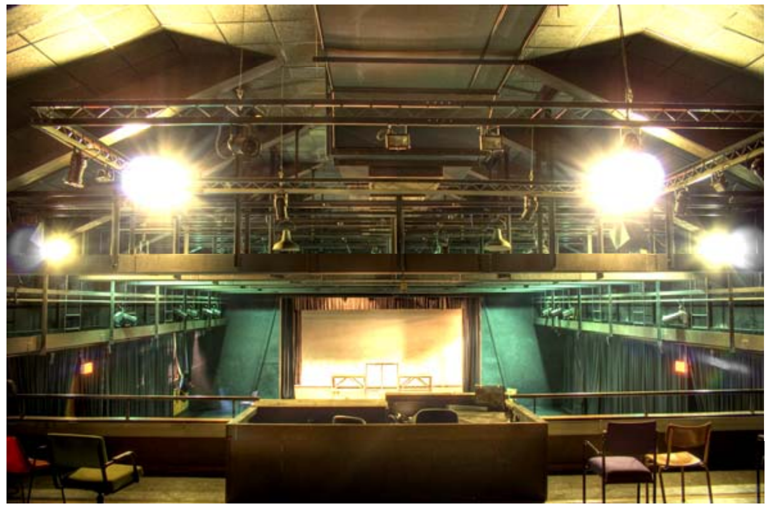

**Figure 6.1.1: Interior photograph of Di e Masker showing the existing AC duct in roof ridge. By Misra S, May 2008**

Mechanical systems should only be used where necessary, because they use a large amount of energy. The building typology requires the use of an HVAC system that will be part of the design, in order to meet the comfort and acoustic requirements of a theatre. The interiors are to be comfortable with temperatures ranging between 20˚C and 26˚C, which should be maintained for a range of activities (Thomas, 1996:14).

The consideration of the existing HVAC system in Die Masker Theatre was the base of the design for the mechanical systems incorporated. The location and rerouting of ducting for a new system would have been costly and labour-intensive. After consultation with Pieter Joubert, a mechanical engineer, it was clear that the best possible solution was to relocate the air conditioning unit on the roof of the extension. This would reduce the ducting to feed directly into the theatre using the existing ducting, which is located within the ceiling space.

Where required, single serving air-conditioning units would be installed on the roof and routed accordingly to the studio and the service areas. These spaces have been designed to be naturally ventilated and the air conditioning should only be used when necessary.

The system uses only ten percent fresh air, the rest of the air will be filtered and re-circulated. The unit cools the circulating air and then transports it to the specific areas using the existing 1200mm x 600mm ducts. All the existing ducts are located in the ceiling space. The placement of the ducts is appropriate to allow the cold air to be released from above so that when it reaches the ground level it will be warmed, resulting in the hot air rising, being extracted from the ducts above, and being re-circulated. In this way energy can be saved with regards to not having to warm the air in order for it to be recaptured and circulated. Cooling from above also allows for the cooling of the lighting and equipment above, and therefore the location of the ducting at the highest point of the ceiling in the existing building will be left exposed. In the extended spaces cool air will be circulated through vents in the ceilings or directly from the ducts.

In theatre the noise pollution from the air conditioning system must be controlled. Sound filters will be fitted into the duct that leads from the main air conditioning unit. The extraction fans will also be fitted with the sound filters. The air conditioning units on the roof will be fitted on acoustic rubber sheets in order to reduce noise pollution on the outside.

The theatre requires a constant airflow to keep the space from becoming stagnant or allowing dust to collect. In order to do that, air needs to be circulated continuously, and the circulated air will be filtered for dust in the unit. In the winter months the system would be changed to process the air to be warmed and routed to the specified areas. Thus this system will operate similarly to the cooling system.

## 6.2 | ACOUSTICS

Acoustic design is an important aspect of theatre design. Theatres for legitimate drama require a good speech intelligibility level with a one second or one and a half second reverberation time (Moore 1983:95). The conditions necessary to obtain good sound reproduction in an auditorium are that the sound should be sufficiently loud in all parts of the auditorium. The original quality of sound should be maintained and the successive sounds in rapid speech and music should be heard clearly and distinctly. External noises should be absent.

Rectangular rooms with parallel walls, floor and ceiling surfaces which are generally long and narrow, tend to have the worst acoustic properties. The flexible theatre space has an acoustic goal which creates an acoustic intimacy around the space where all the performers and audience are situated. This is done by absorbing the sound at the higher levels and sound is diffused at a lower interactive level.

Ideal material characteristics for sound absorption are typically porous soft resilient blankets or panels as well as thicker panels with a porous membrane and absorptive backing material that is located at a distance of not more than a hundred millimetres from the surface. These materials cause delays in the reflection of bass sounds. The mass and rigidity of the material used affect the insulation of sound within spaces. The optimal sound insulation principal to use is that of a higher mass and a lower rigidity.

**THEATRE ACOUSTICS: Existing**

Room dimensions: 17.7m x 15.5m x 8.5m
Volume: 2332m³
Wall surface area: 431.11m²
Floor surface area: 274.35m²
Ceiling surface area: 286.74m²

Current acoustics:

**Walls:**

| Materials | Area | S.A.C | Absorption |
|---|---|---|---|
| Brick | 431.11 m² | 0.03 | 12.9m² |

**Ceiling:**

| Materials | Area | S.A.C | Absorption |
|---|---|---|---|
| Suspended Acoustiboard | 286.74m² | 0.5 | 143.37m² |

**Floor:**

| Materials | Area | S.A.C | Absorption |
|---|---|---|---|
| Vinyl tiling on concrete | 274.35m² | 0.02 | 5.487 m² |

Total absorption 161.757 m² (Effective areas)

[S.A.C: Sound Absorption Coefficient for 125Hz]
(Coefficients taken from: Watson, 1923:25)

**Reverberation time (RT60):**

$RT60 = 0.161(V/A)$

$RT60 = 0.161(2332m^3/ 161.757m^2)$

**RT60 = 2.32 seconds**

The absorption materials in the theatre need to be increased in order to generate the reverberation time of 1.5 seconds in comparison to the existing reverberation time of 2.32 seconds. The time of reverberation that gives optimum results is 1.5 seconds, because in this time sound waves overlap beneficially to increase the loudness of the sound. When this overlapping increases the sound gets distorted and becomes a blur. The reverberation time in any space should not be more than two seconds.

Critical distance (Dc) is the distance at which the reverberant sound field is equal in level to the direct sound from a sound source. For reverberation times of less than 1.6 seconds, a listener can be up to 3.16 times the critical distance from the sound source. For a reverberation time above 1.6 seconds this value drops to 1 time the distance. This is important in sound system design in reverberant spaces.

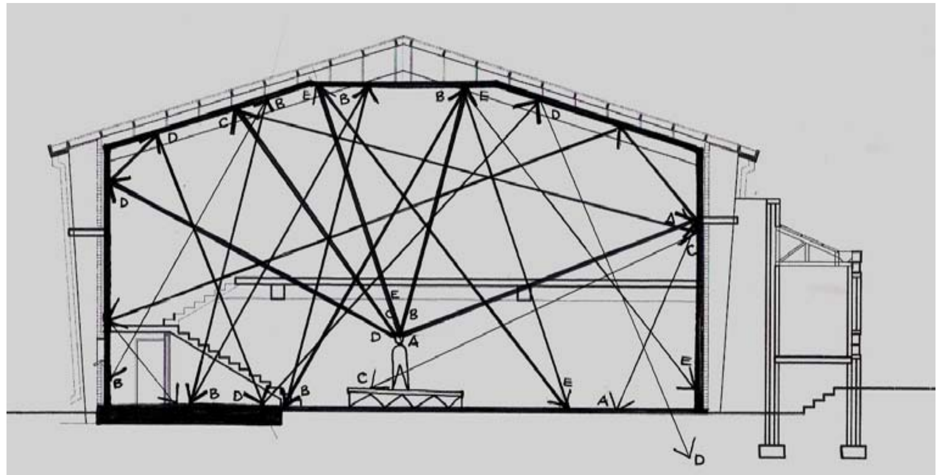

**Figure 6.1.2: diagram showing reverberation in the existing theatre**

**Critical distance (Dc):**

$Dc = 0.057. \sqrt{V/RT60}$

$Dc = 0.057. \sqrt{2332m^3/2.32}$

$Dc = 1.8m$

The reverberation time is over 1.6 seconds, so the listener can only be 1.8m from the sound source, which is problematic. The audience in the theatre cause the time of reverberation to vary because each audience member absorbs a quantity of sound. It is therefore desirable to have the acoustics designed to the average sized audience in order to have average acoustics as any time, but also to have excellent acoustics at 1 second reverberation time when the theatre is at its maximum capacity (Watson, 1923:25).

The acoustic goals in a Black Box theatre are excellent in regards to speech intelligibility and acoustic intimacy. To achieve these goals the upper half of the theatre (3m and above) needs to absorb most of the sound, but also diffuse a little, while the lower half of the room needs to be reflective and spread sound evenly.

The existing reverberation time proved to be above 1.5 seconds. This had to be rectified by the addition of absorptive elements in the space, which would control the reverberation time between 1-1.5 seconds. The speech delivery to the audience is also to be contained within critical distance range in order to give good speech intelligibility in the auditorium. For this reason the sound reflection has to be absorbed to decrease the amount of sound reflected back into the audience. This will concentrate the speech levels at performance level, where the diffuser elements would be used to refract sound waves in varying directions, but also absorb some sound. The applied acoustic elements improve the acoustics as follows.

**THEATRE ACOUSTICS: New**

**Walls:**

| Materials | Area | SAC | Absorption |
|---|---|---|---|
| Brick walls painted | 323.435 m² | 0.017 | 5.5 m² |
| Acoustic fabric panels (With fibreglass) | 71.960 m² | 0.410 | 29.5 m² |
| Diffuser panels | 13.680 m² | 0.410 | 5.61 m² |
| Glass screen | 3.250 m² | 0.027 | 0.0875m² |
| Acoustic sound Lobby curtains | 18.780 m² | 0.150 | 2.817 m² |
| Stacking door partitions | 33.6 m² | 0.410 | 13.776 m² |

**Ceiling:**

| Materials | Area | S.A.C | Absorption |
|---|---|---|---|
| Flush plaster ceilings painted black ceilings (With Prolith Thermocoustex fibre insulation) | 286.74 m² | 0.73 | 209.04 m² |

**Floor:**

| Materials | Area | S.A.C | Absorption |
|---|---|---|---|
| Marmoleum floor tiles (Above existing tiling) | 274.35 m² | 0.5 | 8.23 m² |

Total absorption
274.561 m²
(Effective areas)

[S.A.C: Sound Absorption Coefficient for 125Hz]
(Coefficients taken from: Watson 1923:25, and from the various product companies)

**Reverberation time (RT60):**

RT60 = 0.161(V/A)
RT60 = 0.161(2332m³/ 274.561m²)
**RT60 = 1.367 seconds**

**Critical distance (Dc):**

Dc = 0.057. √ V/RT60
Dc = 0.057. √ 2332m³/1.367
Dc = 2.35m

The reverberation time in the theatre will be less than 1.6 seconds. The listener therefore can be located within 3.16 times the critical distance meaning within 7.5m from the source. With the inclusion of the audience and seating elements the reverberation time would be decreased to 1 second, which is the optimal reverberation time for a dramatic arts theatre.

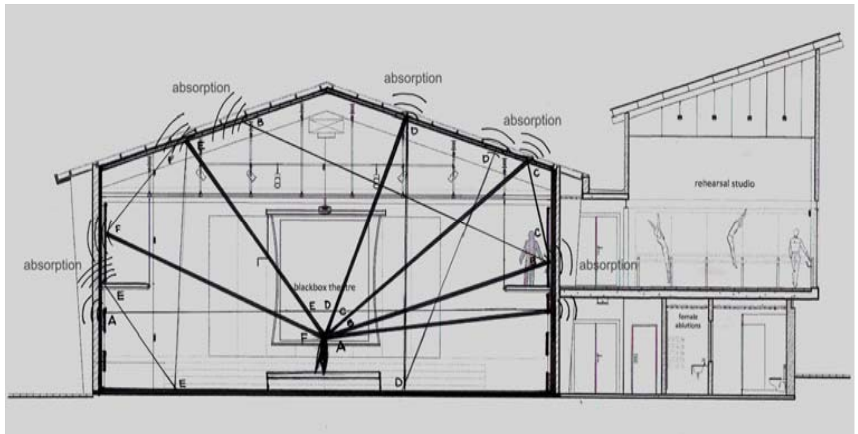


**Figure 6.1.3: Reverberation of new design showing absorbent materials and sound reflections**

## 6.3 | THEATRE RIGGING AND LIGHTING

Lighting for Die Masker means lighting design for a wide range of different types of production: dramatic plays, comedies, tragedies, musicals, and reviews. This means that the lighting design would vary in the theatre due to the changing stage set-ups.

The lighting for a production or dramatic text is not easy to determine. Most styles stem from a degree of realism. Many plays are about people, their behaviour and the environments that they are in. The audience will relate more readily to plays where the environment has some sort of relation to reality. This can be created by a designed stage lighting system.

In conjunction with these elements, the lighting design facilitates the creation of the environment in which the actions take place. In order to create these environments lighting designers need a system with which they can work, which usually consists of widespread power supply and rigs for lighting.

Today most stage and entertainment lighting designs use multi-fixture lighting methods as opposed to single source or point source methods. This method allows for lighting designers to have full control over lighting anywhere over the stage [fig 6.1.5].

Multi-fixture lighting methods use a wide range of lighting techniques. Current fixtures use dimmable tungsten-halogen lamp sources. It is also possible to integrate both the conventional lighting fixtures with the newer automated fixtures.

The method for lighting is constructed typically from breaking down the stage space into a number of sections: across the front, across mid-stage, and across upstage. These sections are then illuminated from above with one or more lighting fixtures. Typically, production lighting is designed to provide a front light, a down light and a back light, depending on the need of a production.

The lighting source for a performance should be directed at the actor where the light is angled at about 45º to generate an adequate visual impression of an actor's facial characteristics. The ranges of horizontal angles to which an actor can be illuminated adequately are between 35º minimum to 55º maximum angle. When the lighting is arranged at either 55º, 45º or 35º respectively, the sources cross and can produce an angle of light that equals the illumination of the 45º lighting (Tutt & Adler, 1995:191-192).

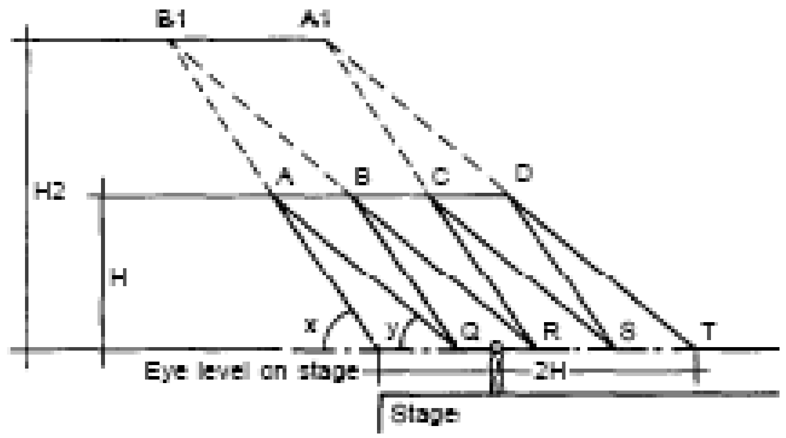


**Figure 6.1.4: Method of locating theoretical positions of spotlights. (Tutt and Adler 1995:191-192)**

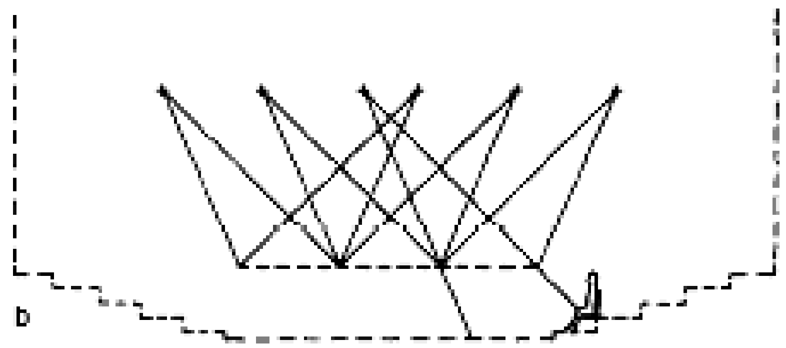


**Figure 6.1.5: On thrust and theatre-in-the-round stages virtually all the lighting comes from overhead to avoid glare in the eyes of the audience. (Tutt and Adler 1995:191-192)**

## 6.4 | APPLIED SYSTEM IN DIE MASKER:

In order to create a versatile, flexible lighting rig system for the many configurations, the theatre is to be equipped with a pipe grid configuration overhead that can accommodate the movement and rearrangement of the lighting fixtures. This system has to be accessible to students to learn about lighting, as well as for maintenance and rigging. The solution was to install a system that would act as an invisible ceiling for the theatre and that would allow easy access to most of the ceiling space above.

The tension grid ceiling is an invisible layer above the entire theatre. The structure is suspended from a retrofitted steel beam that is fixed between the existing concrete portal frames. Above the tension grid the pipe rigs are tied to the suspension structure upon which the lighting fixtures can then be hung according to lighting design.

A tension grid is a type of non-standard catwalk that is composed of a tightly stretched grid of steel cables that creates a tough flooring system, which is strong enough for technicians to walk on. There is no need for holes in the tension grid because the light from the fixtures shine through the grid. No shadows are created when the lights are in use.

**Tension grid specifications:**

The specifications of tension grid are as follows:

- 3mm aircraft cable woven in a 50mm square for a safe walking surface;
- Custom-sized sections;
- The grid is suspended from the overhead structure.
- Maximum economical size is 2440mm x 2440mm panels; and
- Removable or hinged panels can be built in to raise equipment.

The tension grid is suspended from the overhead structure using M48 Ronstan architectural stainless steel rigging rods fixed at 1750mm intervals. 900mm above the tension grid level the lighting bars are fixed to the structural rods using rigging brackets (Reid, 1992:54). They run parallel to the floor level and are located 900mm above tension grid level for ease of maintenance and service.

The lighting is not meant to be a rigid system and therefore the plug sockets are located at a high level to feed the lighting above. For convenience and maintenance, most sockets should be on one of the performance areas near the dimmer system. In order to maintain a maximum lighting flexibility some circuits are looped across to alternative sockets on the other side. The wiring cannot be placed inside the scaffold tubing because that allows for a rigid lighting positioning only. The pipes then have to be located on the outside of the rigging pipes.

Power sockets should also be located around the performance area at low levels for the convenience of feeding power to ground rows and stand equipment. Problems in wiring may occur with various staging layouts because cables are short; therefore a patching system is used. A patching system works like a telephone exchange between dimmers and the large number of socket positions. Patching reduces the amount of temporary wiring required for each production by providing a means of quick and easy central socket location that doesn't require extra cabling because it works like a telephone exchange. The dimmers and patches are then synced to the control room, which is the central point of management for all electrical systems in the theatre.

**Figure 6.1.6: This system, a 15 x 8m containment Frame, features an integral support structure complete with hangers and lighting grid, and is installed on the first floor of a Georgian villa that is now known as CCA Glasgow.**
**Tension wire grid platforms are woven from stainless or galvanized steel wire rope**

**Architect: Page & Park**
**Contractor: Lilley Construction Ltd**
**www.thecablenet.net**

## 6.5 | THE CONTROL ROOM

The control room is positioned where the operator has a clear view of the stage areas. The dimmers are controlled remotely from a compact desk by connecting the two with a thin cable. The mechanical systems in the theatre would then be controlled from the control room where the power points would be dispersed for flexible rigging. The actual lighting and controls equipment would be specified by the lighting engineer. The control room units would basically consist of:

- A dimmer channel;
- Power connectors;
- Lighting controls board; and
- A hard patch area where individual lighting fixtures can be connected to a dimmer.

This system has been utilised because it allows for flexibility of lighting for the various performance types. New lighting technologies involve dimmer systems that reduce heat generation, hence reducing the emissions, which require air conditioning. New lighting fixtures are being designed to use LED light technology. LED lamps use less energy and emit less heat.

## 6.6 |LIGHTING IN THE BUILDING:

The lighting in the other spaces of the building are designed around day lighting because most of the spaces are south facing, which reduces the amount of artificial lighting required during the day. Daylight control on the western façade is controlled by means of an electronic louvre system that can be programmed to react to the solar angles during each season. The louvers provide both adequate lighting control as well as solar balance for internal comfort in the foyer. The louvers have been designed to act as an aesthetic screen as well with screen printed images printed on the steel slats. The images can only be seen when the louvers are closed due to day lighting control or necessity. The system is controlled from within the ticket box and is a computer-aided system.

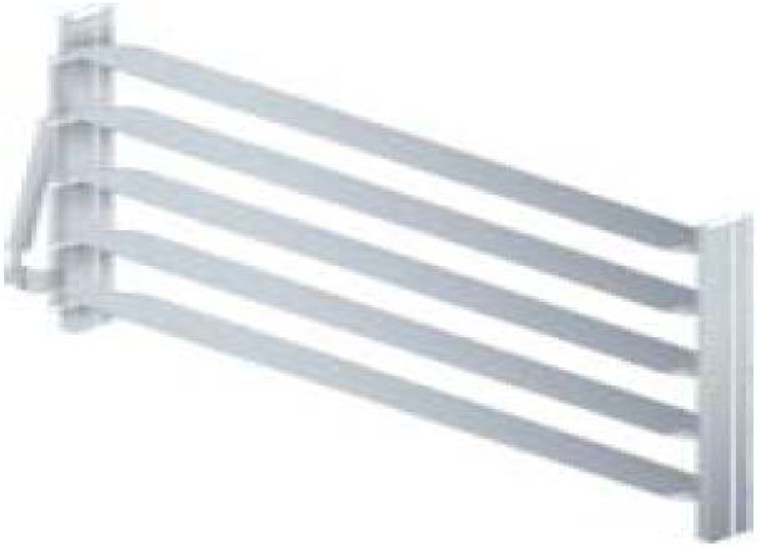

**Figure 6.1.7: movable louvre system consists of a range of aluminium elliptical louvers louvres can be motorized to provide maximum control over the amount of daylight passing through the system. (www.reynaers.com)**

Lamps are chosen for their power usage and flexibility. Tube LED lighting will be used in the studio where an ambient light is continuously required. These lighting fixtures also have a colour wheel and can be used when the space is being used for other events besides movement and dance, such as exhibitions or small performances. The public spaces are fitted with LED down lighters that are fitted into the ceiling. Service areas (storage, dressing rooms, and passages) are illuminated using single colour LED tube lights concealed behind a steel trough system for lighting and wiring that is fixed to the underside of the soffit.

The foyer is illuminated using theatrical lighting fixtures fixed to a lighting rig truss, which is suspended from the retro-fitted structure above. There are also boom rigs (vertical lighting rigs) fixed to the existing columns in the double volume foyer. Lighting fixtures are hung from these using boom arms. The lighting is controlled from the ticket office situated on the ground floor level. This system is a rigid one with regards to lighting placement, but it can allow for performance to occur in the foyer if needed.

Lighting has been designed most consciously where possible by use of lamps that use less energy (LED lighting systems). Natural lighting has also been utilised to its capacity. These design decisions would counter-balance the energy use of the lighting system used within the theatre.

## 6.7 |BASELINE CRITERIA

A theatre is not a sustainable responsible entity; this is because of the types of environments required that use a lot of energy. Theatres are enclosed spaces that need to maintain fully internalized spaces in order to create scenarios that are different to the outside world. Therefore mechanical systems for lighting and ventilation have to be used to create comfortable environments within the theatre itself.

**SOCIAL CRITERIA:**
**COMFORT:**
Comfort in a building is an important aspect that affects the user, making the building a success or a failure. Lighting and ventilation are important in creating comfort. In theatres however, both lighting and ventilation have to be very controlled systems, because theatres require various atmospheres and moods for performances, created mainly by lighting. Lighting and energy use in a theatre can only become energy efficient by means of changes in technology; advances are already being made in the use of LED lighting for theatrical lighting equipment.

In spaces other than theatres attention is paid to the use of natural lighting and systems of screening and lighting control are used to create optimum internal comfort. The larger glass facades are located on the south façade to inhibit direct sunlight heating the building unnecessarily. The glass façades on the west face are controlled using a solar louver system that reacts to day lighting and responds accordingly. The eastern glass façade is shaded by the shadow of the neighbouring building and therefore requires no brise soleil.

Buildings should be inclusive and access should not be limited to able-bodied people alone. Where necessary, spaces have been equipped with lifts or ramps at a 1:12

rising angle. Ablution facilities have been provided to accommodate people in wheelchairs. Spaces have been designed simply to create easy articulation through the space. In the theatre a flexible seating system has been used and the space allows for easy access and accommodation for wheelchairs for both performance and education purposes. Wheelchair seating is allocated on ground level near the access points (in compliance with SABS 0400).

Furthermore, there are more toilet facilities for women then for men, because the queues in the women's bathroom tend to take longer during theatre intermission periods. Additionally, movement through the building is undemanding for the elderly and for children.

Air-conditioning systems for the theatre are an essential part of the space. The theatre is an enclosed capsule, which therefore requires the use of a mechanical air-conditioning system to provide for the appropriate comfort levels in the theatre as well as to cool down the equipment. Lighting equipment use energy and in turn produce large amounts of heat in the enclosed space. To decrease the costs of the redesigned building the existing air-conditioning ducts are retained and only the plant is replaced and repositioned on the new concrete roof of the addition, thus decreasing the distance and the usable space that the air conditioning units will take.

The other spaces in the building are controlled by means of natural cross ventilation. However, if needed, the existing air conditioning system does service the existing structure. The existing ducts are to be used in the foyer when necessary. For the studio, it is necessary to install a mechanical system (single units feeding directly into the spaces from the roof) due to the type of activity in that space, but again, provision has been made for natural ventilation and the mechanical system should only be used when necessary.

**EDUCATION, HEALTH, AND SAFETY:**

Die Masker Theatre has been redesigned to be used as an educational tool as much as an entertainment venue. The main aim of the design is to create a multi-purpose theatre that is used to aid the education of dramatic arts in the university as well as be used for performances for both the university and the public. The intention with regards to education is to encourage learning through participation and visualisation, and this is conveyed in the way the theatre can morph to suit any configuration required.

The safety of the Precinct is dealt with by means of its location within the university where access is controlled and security is permanently available. Fire safety within the building is also designed to comply with the fire regulations in the SABS 0400. This can be seen in the use of fireproof sliding stacking doors that separate the stage area in the theatre. These acts as a replacement for the typical fire curtain that is used in typical proscenium arch theatres. The theatre must be fitted with a sprinkler system for fire control in the various performances spaces due to the hazards that theatrical lighting might cause. There are three direct exit routes from the theatre; they all are within accessible distance to the exterior. There is also fire escape access directly from the backstage area to the outside. These all comply with National Building Regulations 0400 on fire safety in theatres.

**ECONOMIC CRITERIA**

Improving on the existing facilities of the Drama Department to be more flexible opens up possibilities to the types of theatre training and performances that are possible. This will break free from the typical theatre restraints and will allow for better use of the spaces. The purpose of the Precinct is to make the dramatic arts an inclusive subject that involves the public in what happens in the Department and create interest in arts and culture. The Precinct and its spaces will break away from the “behind walls” training and will be more of a “display and participate” type of education.

The function of these spaces would firstly be education and secondly formal performances. The Precinct would promote local student performances as well as performances from visiting acting groups. Even though the theatre is located within the University it could be opened up for use by outside organizations, and companies, but also other faculties on the campus (the fashion school, for instance). This makes the space a multifunctional zone. The location, use, and new aesthetic of the space would enhance the attraction of the Department and the University. By promoting local performance the University would be uplifting the surrounding community and elevating culture within the surrounding society.

Local labour within the area will be contracted to do all the construction on the project, which in turn will have a positive impact on the local economy and will also provide local people with the skills to become more independent. The performance spaces would be kept by the students and university and lighting and other services would either be maintained by students or local contractors from participating organizations that are using the space.

Low-embodied energy materials that are produced locally will be used wherever possible. Building materials such as glass, concrete and standard steel sections will be sourced locally and will be used, because contractor and builders have experience working with them. The use of locally-sourced materials results in the decrease of transportation cost and energy use.

The Precinct is an educational and recreational development space. It is important that the spaces be used efficiently to maximise education as well as culture in the area. The theatre and studios will be used regularly anytime of the day or evening depending on rehearsal times, lecture times and performance times. This will create a high occupancy of the studios as currently there are not enough venues for the students to rehearse and the spaces that are available are scattered all across the University. Negative spaces are now converted into usable service spaces (between the buildings), and the Precinct concentrates the dramatic arts training in a single area. Services and plants are located on the roof of the building to reduce the abuse of usable floor space. The internal spaces have a relationship with the outdoor spaces to allow for the creation of interaction and visual access.

The theatre and studios are designed to be flexible where various theatre configurations can be set up. This allows for use by not only the University, but also by outside groups that can rent the spaces for non-University related training during the times the university is not using the spaces. In this situation the University benefit from the additional income.

**BUILDING ADAPTIBILITY AND FLEXIBILITY**:
TThe building required demolition work to remove parasitic structures that had been attached to the structure at a later stage. These structures have become unusable and therefore were not maintained well. The other spaces that have been demolished were the walls that demarcated the entrance from the foyer as well as the staircase, and both the ablution facilities. This was done to improve the quality of a foyer space in order to make it less claustrophobic and easily accessible. This in turn meant that the slab above the foyer level had to be removed to create for a double volume space. Many of the other demolitions are simple cut through the buildings to link the new to the old. For the whole part the original structure of the building has been retained and allows for restoration if need be.

The magnitude of proposed construction bas been kept to a minimum for two reasons: firstly to minimise the superfluous use of construction materials and therefore embodied energy in the renovation and, secondly, to maintain the ability of the space to adapt to the changing needs of the inhabitants. The building's existing structure has been maintained and the important façades (north and west) have been mostly retained. The building has been extended towards the east with a lighter structural steel frame. The existing structure has not been altered much because it has significant value with regards to the Christian Brothers College and the Loreto Convent School. The additions however, have been made by attaching the lighter structure to the existing building, and adapting the interior spaces to suit the spaces required.

Spaces have been left clean and uninterrupted with minimal use of internal walling to create greater open spaces that can be adapted for various uses; this can be seen to extend the lifespan of the building. The interior spaces have been designed minimally to allow for flexible spaces and adaptability. New technology can easily be introduced in the future.

**MATERIALITY AND COSTING:**
Often, ongoing costs for maintenance in buildings become an issue over time as materials need to be replaced. In the renovation of Die Masker, the Life Cycle Cost of materials has been considered above whimsical novelty and materials that are low maintenance and that are hard-wearing have been favoured throughout the building. For example, the high traffic floors in Die Masker will be finished with recycled rubber resilient floor sheeting that is easy to clean, decreases echo and is hard wearing. Equipment and systems such as air conditioning and lighting have been left exposed mostly for easy access and placement of lighting fixtures. The location of the plant on the roof of the building means that there will be less interference inside the building due to maintenance.

The design of the interior of Die Masker has been carefully considered by the use of materials that can be recycled or re-used over time. The general breakdown of the base finishes, (floor finishes, wall finishes, and insulation material) have been specified according to their recyclable and sustainable qualities. For example

- Envirodeck processed timber panels used as sound insulation between the studio, foyer and theatre as well as it being used as the flooring for the light bridge;
- Quiet floor acoustic underlay that is fully recyclable;
- Marmoleum flooring in the theatre; and
- Terrazzo recycled countertops in the bathrooms and shop.

Where necessary, arrangements will be made for the safe removal and recycling of harmful materials from the theatre. The building has been altered in such a way that the services need not be rerouted very far from the original positions. The dressing rooms are circulated around ablution facilities that are redesigned around the existing space, making use of the accessibility to existing services. Similarly the new public ablutions of Die Masker follow suit, the existing ablutions were demolished and the new ablution facilities have been located in the extension which runs parallel to the municipal sewerage and waste pipelines, enabling the pipe-work to be minimized. The kitchenette and maintenance areas are also located along this façade. The advantage of this is that the service pipes remain accessible for maintenance and cleaning.

## 6.8 | MATERIALS

The important finishes within the building allow for ease and freedom of movement for flexible theatre. The spaces are to be public orientate and require strong materials. A series of basic materials have been used to give the theatre that finished yet unadorned theatre feel that is contrasted to other theatres.

**Figure 6.1.8: Recycled rubber:** For High traffic areas: the highest quality recycled SBR tyre rubber is a single-ply non-laminated surface with high slip resistance, durability, cushioned resilience, stain resistance and consistent color (no wear layer)
Ambient Noise Reduction, Sabin/ft2 (ASTM C423): 0.10. Material proposed for use in high traffic areas: foyer and passageways.

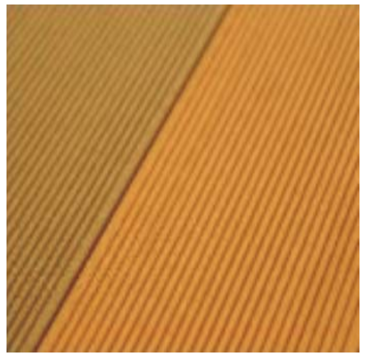

**Figure 6.1.9: Envirodeck**: bridge flooring and interior wall cladding: manufactured from polyolefin plastics and natural organic fibre's, through various treatments and processes, creating a revolutionary user-friendly decking material.  This highly engineered finishing process allows Envirodeck products to offer you better flexural strengths, load capacities, flexible designs, chemical resistance, water resistance and resistance to insects. For Cladding Applications/Decorative.  **www.wpc-decking.co.za/change/main.asp?cbit=7**. Proposed for use in the light steel and timber bridge as well as wall cladding for sound insulation in the rehearsal studio

**Figure 6.1.10: Screen printed glazing:** Double glazed screen printed glass in anodized aluminium window frames Laminated safety glass of 4mm with images screen printed. External windows to be double glazed. Maximum sizes: 1500mm x 3000mm. Utilized in the glazed envelope of the extension to Die Masker staircase seen from the square.

**Figure 6.1.11: Stretch ceiling** is a suspended ceiling system comprising of two basic components aluminium perimeter track and lightweight membrane which stretches and clips into the track. Additionally, the system can be used for wall coverings, light diffusers, floating panels, exhibitions and creative shapes. Stretch ceilings allow incorporation of all types of light fixtures, recessed lighting, vents and sprinklers by use of an appropriate backend support. The material is unique 0.2mm thick titanium based fully recyclable vinyl. The material can be printed or painted for additional effects, it is waterproof, washable, and resistant to vapor, mold and fire rated class “A”. utilized in rehearsal studio .

**Figure 6.1.12: Plastic panel:** used as an interior building material that is made from recycled polyethylene. It takes approximately 8 milk jugs to equal 1 Lb of Origins. The bottle recycling designation is HDPE #2. Polyethylene (PE) is a thermoplastic material that is resistant to chemicals and moisture. This product is ideal for restroom and shower partitions, vanity and counter tops, work surfaces and table tops. Origins will be used as a plastic laminate or a solid surfacing material.

**Figure 6.1.13: Multicolor plastic tubes with RGB LED lights** fitted inside used. This is used to change the colors of walls, and ceilings. The light has properties that allow it to be used as either a strobe, a chase , or a static lamp. This type of light fitting is controlled with the LED Manager attached to the wall.

**Figure 6.1.14: Modular Concrete block:** a co-ordination of building modules with dimensions of 200mm horizontally and 100mm vertically.
The Concrete masonry units are: hollow, non-face, grey blocks used in conjunction with the steel extension structure. The modular concrete block walls will be bag-washed and painted a dark grey.

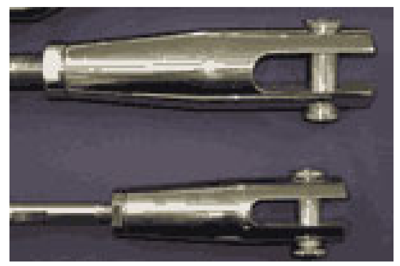

**Figure 6.1.15: The Linking Rod System:** consists of a range of stainless steel architectural rod assemblies, ideal for many structural and architectural applications. All Guy Linking tendons use high-grade 316 stainless, which ensures a long service life with very little maintenance. Guy Linking stainless rod tendons combine durability with aesthetics, whilst ensuring that loads are safely and efficiently transmitted. Used in conjunction with Envirodeck and sound proofing membrane for the light foot bridge.