10. ADDENDUM

10.1 BASELINE CRITERIA
10.1.1 ENVIRONMENTAL CRITERIA
10.1.2 ECONOMIC CRITERIA
10.1.3 SOCIAL CRITERIA
10.2 SOURCES
10.3 ACKNOWLEDGEMENTS
.10. ADDENDUM

.10.1. ENVIRONMENTAL CRITERIA

.10.1.1. WATER

i. Rainwater

Water flow

Excessive water flows experienced during the peak rainy season and the subsequent floods are to be reduced through the introduction of vegetation, such as veld grass, along the run-off course; through permeable surfaces along the fall of the site; and through the rehabilitation of the natural meander of the river. These factors will combat erosion and loss of valuable topsoil.

Water consumption

20 ℓ x person/day

Accommodation: people: 1000 people x .75 (75% occupancy)

20 x 750
=15 000 ℓ
Hot water =3 ℓ x person /day
=3 x 750
=2250 ℓ /day (x 365)
=821.25 kℓ/annum

Wetland size
=2250 ℓ /day x 7 days (for absorption)
= 15750 m³ (1m³ /1000 ℓ)
=15750 x 4 (add 75% for aggregate and root space)
Depth of 600 mm (max depth of absorption
= 63000 m³
Collected Water

Total amount of collected rainwater
= collection area x annual rainfall
Collection area: 4735 m²
Annual rainfall 709 mm/year
= 4734 m² x 0.709 m
= 3356.4 m³ (x 1000 ℓ)
= 33.5 k ℓ

Size of rainwater storage

Collection area x highest months’ rainfall
= 4735 m² + 304 mm² for January
= 1439.44 m³
ii. Grey water

Grey water is to be recycled in order to reduce the overall mains consumption. A typical cycle for the water would be the following:

Water collection from roofs and other surfaces into storage > to kitchen or restaurant for cooking, or to the bath house for bathing > to treatment basins like wetland > to toilets > treated through biolytic filter > irrigation for landscape > filtered through the ground back into the river.

Organic soaps should be used in the bath house facility.

The water from kitchen is to pass through a fat and grease trap first before it is filtered through wetland (the grease prevents aeration, which can lead to lack of oxygen and perishing of plants).

The thermal mass of water should be applied in climate control or for heating up...
water as the grey water cycle is continuing. Roof ponds can be incorporated into the building design. Roof ponds act as a cooling mechanism in summer, and buffer the building from heat loss in winter.

iii. Water efficient devices
Water efficient devices such as taps, showers, dishwashers and toilets are to be fitted.
Toilets should have use efficiency if below 6 litres of water
All taps to have a flow of below 1.13 to 1.13 litres per second

iv. Runoff
Minimize storm water runoff by implementing porous paving materials, which reduce runoff during peak rainy seasons.) A moisture-retaining surface can also be used
as part of an environmental control strategy via evaporative cooling. Impermeable surfaces are limited to walkways and social-gathering spaces. Permeable surfaces over most of the landscape, such as natural vegetation, are encouraged on the largest part of the site. Although parking takes up a great deal of the landscape, permeable paving is used to allow rainwater to filter back into the water table.

v. Water storage roof
The water storage roof’s main purpose is to collect and store rainwater to use within the building for non-potable purposes and reduce mains consumption. The water storage roof needs a parapet with a 100% waterproof membrane turned up at the edges. The water protects the membrane from ultra-violet rays and acts as a thermal buffer. The collected water can be used for flushing toilets. A top-up mains supply should still be provided. The water roof eliminates the need for falls, outlets and down pipes, soakaways and surface drains, as the usage of water will be greater than the
collection. (Woolley and Kimmins, 2000:107)
A 100 mm depth capacity for a roof that collects from an area 5 times bigger than
itself should be adequate
Surplus spill provision should also be provided in case of excessive rain.

.vi. Vegetation
The landscape is to be rehabilitated to host only indigenous grass species and trees.
An exception is to be made for the exotic poplar forest on the river bank; it contributes
to the ambience of the site. The poplar forest is to be systematically phased out and
supplanted by an indigenous species.
10.1.1.2. ENERGY

i. Energy consumption and resources
The building is to be developed in such a way that it can be serviced by public transport and can promote walking and cycling as alternative means of transport. Development patterns encouraging higher densities on transport routes and minimizing private car parks should be encouraged. The parking distance should be no more than 400 m away.

Develop settlements and buildings with emphasis on pedestrians and a reduced dependency on fossil fuels, which can be serviced by public transport, walking or cycling.
Encourage walking through walkways, hiking paths etc.
Prioritise pedestrians, public transport and cyclists.
In coordination with efficient public transport to serve to reinforce less consumptive lifestyles, the rental of bicycles should be promoted. Minimize and make private vehicle car parking expensive (Camberdine 1994: 73).

ii. Ventilation systems

Mechanical ventilation systems are to be avoided, while optimum environmental comfort is to be achieved through passive systems such as cross ventilations, stack effect, direct gain, indirect gain, cross ventilation, night time cooling. When mechanical ventilation systems are unavoidable, systems should be put in place that can be switched off and manually controlled to reduce energy consumption.
iii. Heating and cooling systems

The minimum requirement for energy is to be used as target:

Use solar heating systems
Use high efficiency water tanks, insulate older tanks
Insulate hot water supply lines

When solar water heating is not an option, use energy efficient alternatives such as heat pumps, high efficiency electric or gas water heaters.

Use air conditioning only when it is required by special circumstances such as environmental noise, dust and pollution, very warm micro climates, home offices where heat or humidity control is needed to provide appropriate comfort levels for occupants with special needs. Mechanical air-conditioning is energy-intensive and conservation awareness is needed.
Seal the building envelope if air conditioning is being used to prevent air leaks and loss of cooled air to the exterior and to control interior humidity levels. Shade windows or use high performance glazing.

Select and design energy efficient air conditioning system.

Insulate and ventilate attic spaces housing air conditioning equipment and ducts.

iv. Renewable energy

Sun energy is to be harvested through the implementation of photovoltaic panels and through the heating of water by solar radiation. The harvesting of wind and water energy as well as of biomass should be investigated.

Investigate wind and water energy harvesting as well as biomass as an energy source.
Solar energy: In South African conditions it is important to take full advantage of solar gain. A broad range of technologies exists.

Domestic hot water heaters: These heaters are closed-loop systems used for providing potable hot water to household or commercial facilities.

Medium temperature thermal systems: Typical application for these systems is Air-conditioning or industrial-process water heating.

Photovoltaic Systems: For remote energy generation this system is an attractive option because of low maintenance, ample sunlight, high reliability and widespread support (Camberdine 1994: 73).

Bio-mass and waste utilization: biogas is a by-product of the anaerobic digestion of the solid waste stream; it offers benefits of waste and wastewater processing, methane...
production for cooking and refrigeration, and the generations of organics for soil enhancement. The possibility of all energy needs in a sustainable may be met through the use of biogas. It can be used to directly fuel gas refrigerators, stoves, absorption chillers, and water heaters (Camberdine 1994: 73).

v. Solar water heaters.

Solar water heaters can be used to heat buildings, domestic hot water and swimming pools. The most common solar heaters consist of a 2m² flat-plate solar collector and a storage tank. The expensive corrosion-resistant metals of solar collectors can be replaced with plastics. These plastics weigh less, and are more cost-effective to transport, install and connect. The only draw back is that plastics do not conduct heat well. (Deudney & Flavin 1983: 69)
vi. Appliances and fittings

Energy saving devices should be specified for the building. The following reductions in energy consumption can be expected:

<table>
<thead>
<tr>
<th></th>
<th>Conventional kW/h</th>
<th>Possible kW/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fridge</td>
<td>1900</td>
<td>900</td>
</tr>
<tr>
<td>Washing machine</td>
<td>960</td>
<td>540</td>
</tr>
<tr>
<td>Freezer</td>
<td>1800</td>
<td>765</td>
</tr>
<tr>
<td>Lights</td>
<td>4% efficient</td>
<td>24% efficient and lasts 10 times longer</td>
</tr>
</tbody>
</table>

Table 6.1: Conventional versus Energy Efficient Appliances (Gibberd 2004: 4)
10.1.1.3. SITE

The site is to be rehabilitated with indigenous veld grass and trees.
Avoid landscaping that requires large-scale artificial inputs
Enforce manual means of maintenance, for example manual grass cutting for resale.

10.1.1.4. WASTE

Minimize the production of waste and work with neighbouring businesses and institutions to enable recycling.
No mixing of organic and inorganic waste should take place. Recycle organic waste by making compost; by feeding waste to pigs; or by selling it to worm farms.
Inorganic waste includes glass, metal and plastics; and paper that should be sorted in provided bins. Adequate storage should be provided.
The use of local sewage systems to be encouraged such biolytic systems, compost,
aqua privies etc. Water recycling also encouraged in conjunction with these systems

Minimize waste by site monitoring; including clauses in the contract documentation; and designing for minimal waste; for instance, avoid the cutting of components and design according to modular and standard sizes.

.10.1.1.5. MATERIALS AND COMPONENTS
i. Embodied energy
The embodied energy of a material indicates the amount of energy applied in the manufacturing of the product. Materials of a low embodied energy should be specified for the construction. If high embodied energy products need to be used, it should be recycled again when it is replaced.

.10_18.
i. Material and component resources
Maximize the use of materials and components that come from renewable sources such as timber, thatch and rock
Building components should be designed in such a way so that it can be reused
Second hand and recycled materials is to be used
Imported materials are to be minimised.
Keep use of non-renewable materials to a minimum
Use locally sourced materials
Use materials found on site
Use materials which are as close to their natural state as possible (Brewis, 2003: 2).

ii. Manufacturing processes
Ensure that the manufacturing process of components and materials are not
harmful to man or the environment. Reduce embodied energy and resource depletion. Look at factors such as the extraction, manufacture, the carbon content, transport, processing and disposal stages of a product's life. Materials are also classified as renewable (organically produced, i.e. timber) and non-renewable (i.e. aluminium) of which the renewable materials are the environmentally sound option.

Encourage suppliers to incorporate recycled material in their products. Encourage use of recycled aluminium or steel and cardboard. The material from the existing buildings which are to be demolished should be recycled. The rubble can be used for fill, while corrugated iron roof sheets can be re-used.

Minimize large-scale ground works by designing along the existing contours of the site and design the building in such a way that the minimum material is required.
.10.2. ECONOMIC CRITERIA

.10.2.1. LOCAL ECONOMY

i. Local contractors

As this project is aimed at sustaining the community economically, local contractors, labour and suppliers are to benefit from the construction. This should be kept in mind when materials and systems are to be specified. Concrete Blocks are to be locally made according to engineering specifications to generate employment and skill development. The stone for the wall cladding is available from a distance of approximately 15 km from the site. The saw mill from which the roof beams will be brought is only 2 km away from the site. Labour will be sourced 1.5 km from the site in Masising. The construction elements that are to be sourced the farthest from the site, are the laminated beams for the roof system. There is a company in White River, approximately 90 km from Lydenburg, which manufactures these beams.
ii. Local material and component suppliers
80% of construction materials such as sand, cement and wood are to be locally sourced. Masonry elements in the form of cement brick units are to be manufactured by the community as a community upliftment and employment scheme.

iii. Local furniture and fittings manufacture
Local furniture and fittings are to be manufactured on site in the Joinery workshop. All maintenance and repair are to be dealt with through the joinery, which will employ only local contract workers.

10.1.2.2. EFFICIENCY OF USE
The use of space is to be maximised through space management, sharing of facilities and the implementation of flexible design through fold-out stack doors and moveable partitions.
All functional spaces are to be managed so as to have an occupancy rate of 30 hours per week. A 24-hour usage cycle is to be employed through the sharing of facilities by different occupants by day and by night.

The sharing of ablution facilities by members of the public and private residents is a practical consideration for efficient use. The business school and catering facility also share classroom facilities, as well as a communal foyer and gathering space. Optimum space employment is to be maintained at all times to ensure economical feasibility. Space use should be under continual scrutiny and be placed on a continual space management system as the building program develops with the economy and the needs of the town.

Recycle facilities.
Have facilities serve multiple functions.
Build only the minimum to serve multiple functions.
Ease of service to be maintained by making building accessible for repairs and services from the roads' side with least disruption to the natural rhythm of the occupants.

10.1.2.3. ADAPTABILITY AND FLEXIBILITY

Services are to run through hanging ceilings as well as raised floors. Servicing for ablution facilities is to be enclosed in an easily reached shaft with a width accommodating easy maintenance. Services should be placed in such a way that they accommodate future change in use.

Cassette system Air conditioning units are used in the offices and are installed into the ceiling. They are typically square units and require +/- 450mm ceiling space. Individual room control and group control options are available. These are to be individually controlled and should not act as a substitute for the passive climate control measures.
The structure should be designed along a grid to facilitate ease of planning and layout. A modular system also decreases waste of components and space.

Internal partitions are to be custom made by the local joinery shop where applicable, and should be designed to be foldable and stackable.

Vertical circulation and service cores should be placed in such a way that they accommodate change in the building program.

10.1.2.4. ONGOING COSTS

No external surfaces are specified to be painted, leading to minimal ongoing maintenance.

The life cycles of materials are to be considered during the design process.
Site security is to be provided by sufficient lighting at night and regular patrolling of the walkways. A lookout point on which the maintenance and security office is located will add to the surveillance factor. Security at the lockers in the bathhouse facility should also be provided.

Electrical and communication systems as well as HVAC and plant are to be placed in such a way that they provide ease of access with minimum discomfort to the building occupants. Access from circulation (movement) areas is more feasible than from stationary areas (“pool” areas). Lift-off panels to vertical and horizontal ducting are to be provided. Masonry shafts are to be employed when ducts are not feasible.
.10.2.5. CAPITAL COSTS

The cost of the development is to be shared jointly by the council (the building will be used as a community facility) and private investors (the office space, the restaurant, and the facility will be used to promote private ventures such as adventure courses and trout fishing courses).

Materials of demolished buildings are to be re-used. The largest part of the site is undeveloped; therefore there are no existing infrastructure that can be incorporated into the plan.

Long-term income is to be generated primarily by the tourism sector and by rent generated from private entities for the use of offices and the exhibition areas for functions and events.
.10.1.3. SOCIAL CRITERIA

.10.1.3.1. OCCUPANT COMFORT

i. Thermal comfort

The recommended thermal comfort temperatures for the building are to range from between 20° C and 22° C with humidity levels of 45 -50 % RH. Optimum comfort is to be achieved primarily by implementing passive climate control devices. Occupants should be encouraged to dress according to temperature and season. Cooling and heating systems that have been investigated are the following:

ii. Evaporative Cooling

Evaporative cooling uses the local atmosphere as a heat rejection resource. An adiabatic process achieves evaporative cooling, since no system energy is gained or lost. The heat loss potential of evaporating water to the atmosphere is dependent on the local humidity, as less evaporation will occur in humid conditions. A breeze
over the water surface will ensure that humid air is constantly ‘removed’ from the evaporation zone and replaced with dry (unsaturated) air, thus promoting evaporation. This system is suited to warm dry climates. In designing a building climate control system utilising evaporative cooling principals, the local precipitation pattern may be used to enable an evaporative pond or to wet building elements that will act as evaporative coolers to the system.

iii. Direct systems

Direct gain systems are the most widely used and generally the most efficient passive heating mechanisms. For example, a typical building with north facing windows allows direct heat gain into rooms, heating the room’s atmosphere. Thermal collection and storage are integral with the building’s interior. Solar-orientated windows can hence be called collectors.
iv. Indirect systems
Building encasing elements with high thermal mass are orientated to receive direct solar radiation during daytime. Heat is stored in building materials. When the local climate cools down, after sunset, heat energy is radiated back into adjacent internal spaces. The storage and release of heat energy can stretch over seasons if the thermal masses of the building elements are large enough.

v. Isolated system
This system also works with the principal of stored heat in building elements, but these heat stores do not release heat directly to adjacent rooms. The storing mass can either be integral or isolated from space served by storing mass. One way of delivering stored heat to a room is via natural convection. As air is heated in thermal store, it rises and can be channelled upwards to a room where thermal adjustment
is required. Only one collector can serve many rooms, this allows the building to face any direction with only the collector having to face the sun. The thermal store can be charged without affecting the internal climate of the whole building.

vi. Lighting

Minimize electric lighting energy demand and heat gain: Provide ample natural lighting wherever possible, the ambiance and quality is unsurpassed and it is free.

Use low energy electric lighting (fluorescent) to reduce heat gain and energy demand. “Fluorescents are greatly improved with colour rendition comparable to incandescent and electronic ballasts to totally eliminate perceptible flicker. They use 75% less electricity. Average life is 10 times longer than incandescent, reducing maintenance and transportation costs. In most circumstances, the economic payback for new
fluorescents is under two years. The environmental payback is immediate” (Camberdine 1994: 73).

Don’t over light exterior or interior spaces. Use focused or task lighting in preference to whole room or large area lighting.

Use controlled, filtered and indirect day lighting to light interior spaces and reduce electric lighting loads. Increase the effectiveness of day lighting with generous wall openings, open floor plans and light coloured interior finishes.

Extensive implementation of natural day lighting will reduce the use of energy of artificial lighting. Design application includes incorporating optimum window sizes and room depths; colours; and the orientation of the building, as well as solar control. Sun control devices are to be used, and the maximum amount of daylight is to
penetrate the building. In addition, glare is to be minimized and direct
summer sun is to be blocked.
Sun control devices are to be used such as moveable louver systems.
Maximum daylight is to penetrate the building through apertures letting light
through.
Glare is to be minimized through shading devices such as louver systems and roof
overhangs.
Direct summer sun is to be blocked through overhangs and louver systems.

Standard luminance to be maintained:

- Walkways: 50 lux
- Corridors: 100 lux
- Loading bays: 150 lux
- Classrooms: 300 lux
- Offices: 500 lux
- Workshop precision assembly (joinery): 1500 lux
- Workshop minute assembly (fly tying): 2000 lux

(Metric Handbook, 1999: 39-12)
vii. Ventilation

Air changes (liters per person per hour)

Minimum fresh air is to be supplied to be allowed as follows:

accommodation air changes (liters per person per hour)

- offices: 2-6
- kitchens: 10-20
- public toilets: 6-12
- restaurant: 10-15
- storage rooms: 1-2
- exhibition hall: 3-6
- class room: 3-4

(Metric Handbook: 1999:38-9)
Cross ventilation
Buildings are to be climatically controlled by means of cross ventilation, the stack effect and a rock bin system. To utilise natural ventilation, an uninterrupted building depth of 12 m is required. Potential airflow velocity at crucial areas or locations forms the basis for most air-handling systems. For comfort air-conditioning, dead spots or too high airflow velocity should be avoided. Openings are to be orientated directly towards the ruling wind direction.

Rock-bin ventilation
The rock-bin ventilation system is a layer of rocks underneath the building through which outside air is pumped. The air is cooled due to the low temperature of the rocks, and filtrated through the building. A pump mechanism is necessary for this system. For every 10 m² of space that needs to be ventilated, 1 m² of rock-bin is
needed.

The Stack Effect

The Stack Effect results from the rising of warm air rising and exiting from high-level openings. The warm air is replaced by cooler air drawn into the building through lower openings. For the stack effect to be effective there needs to be a significant difference between the outside and inside temperature (outside air being cooler than inside air). The stack effect is therefore more effective during night-time.

Other ventilation mechanisms
Louvers to allow ventilation in summer
Openings are to be orientated directly towards the ruling wind direction
viii. Noise & acoustics

Acoustic control is to be implemented in exhibition facilities (museum, exhibition hall) and the amphitheatre. The restaurant’s acoustic qualities are required to be ambient. Low background noise of 40-50 dBA is acceptable. On the western side of the site, a line source of noise is found to be generated by the frequent passing by of trucks along Viljoen Street. The placing of the buildings is such that a buffer or barrier is created to lessen the intrusion of sound.

ix. Views

The views are located on the southern and south-eastern of the site. According to Jeremy Gibberd, occupants must be placed 6m maximum from the windows for optimum occupant comfort (Gibberd, 2004: 6).
10. ADDENDUM

x. Access to outside

The building should be easily accessible, from a fire safety point of view, as well as for public transport. Layout is to be legible and intuitive for occupants to orientate themselves.

10.1.3.2. INCLUSIVE ENVIRONMENTS

i. Access

Access to viewing areas and the park area is to be provided via a ramp system. WC compartments for the disabled and wheelchair−bound are to be provided on the ground level.

Ramps are to be at a fall of 1:12 (8.3%) Edges between walls and floors and steps should be well defined

Hand railings and support should satisfy the national building regulations

A minimum exit width of 2.2 m is to be maintained in all instances
ii. Signage
All signage is to be easy to read and should be noted by the image and branding committee and should be incorporated in the design guidelines.

iii. Kitchens and bathrooms
All kitchens and bathrooms should be readily accessible and fitted with the appropriate equipment according to energy consumptions specifications. The location and layout are to be designed for optimal use.

iv. Furniture
Furniture for workspaces should promote ease of use, and movement within workspace should be considered in the design concept phase.
10.1.3.3. ACCESS TO FACILITIES

The development is within comfortable walking distance from residential areas (400 m).
Retail facilities are to be provided on site.
Postal and telephone facilities are within walking distance from facility.
Email facilities are to be provided within the building.
Email facilities are to be provided within building.
Banking facilities are found close by (2.5 km) (400 m). No ATM should be accommodated on the site, as to encourage walking to and from the Central Business District.
Childcare is to be provided in the building or in close proximity (within 1 km from site)
10.1.3.4. PARTICIPATION AND CONTROL

Fittings and components such as windows and louvers should be able to be manually controlled by the users themselves.

It is important that occupants understand the systems of the building, in order to maintain optimum performance of the system. Most of the systems are to be "opened up" and visually observed in order to bring across the concept of interconnected services relying on each other.

Spaces for social interaction are to be provided. The building program should also encourage social interaction. This is done by accommodating a sidewalk café culture, a marketplace (both informal and formal), parks as well as unprogrammed spaces in the building with spaces to sit and views to enjoy.
Facilities such as recreation facilities, libraries and sport fields should be shared between different private enterprises, or between the public and these private institutions, and encouragement should be given in this regard.

.10.1.3.5. EDUCATION, HEALTH AND SAFETY

i. Lifelong learning
In light of the current knowledge-based economy era, a culture of lifelong learning should be nurtured. This can be done by including and encouraging access to the Internet; creating programs and spaces for structured courses; providing spaces with learning materials such as books, journals and physical artefacts; and posters.

ii. Fire regulation
Fire escapes are to be designed according to SABS 0400.
The length of the escape route from the furthest point from the exit to the outside is not to exceed 25 m, as stipulated by SABS 0400.
Fire extinguishers are to be provided on every level and in every functional space (exhibition areas, reception, offices, restaurant, kitchen, catering school, coffee shop, business school, workshops and ablutions). Open areas are to be fitted with fire hoses.

iii. Smoking

According to the law, smoking is prohibited in every interior space. Because of the largely outdoor character of the building and site, smoking should be allowed in certain selected areas so as not to expose children and non-smoking users of the building to unwanted smoke.

iv. Security

Users of the development should feel safe and secure at all times, both in the building and on the site. Safety is to be provided by surveillance by having the buildings’ “eyes” (windows and view points) face the interior of the terrain and by
supplying adequate lighting. The park areas should also be constantly patrolled, day and night, as the building will run on a 24-hour cycle.

v. Exercise

A healthy lifestyle is to be promoted by the layout of the building. The circulation systems will include cycling and walking routes, while a climbing wall is also to be incorporated. Functions that correlate with each other, such as the hiring of fishing equipment and the acquisition of a fishing day permit, are purposely separated from each other to facilitate movement throughout the building.


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.10.2.62. Mr. D. Blyth. Branding Specialist: Enterprise IG. February 2005
.10.2.63. Mr. F. Nel. Creative Director: Enterprise IG. February 2005
.10.2.64. Mr. A. Davidson. Design Director: Switch Design Group. September 2005 and October 2005
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