ANNEX: Detailed specification for the erection of two rainout shelters at ARC-VIMP

Definition of Rain-out shelter

Rainout shelters are designed to protect a certain area (ARC criteria 30 x 12m) of land against receiving precipitations so that an experimentally controlled drought stress can be imposed on that area. When rain droplets are sensed, a roof with side walls structure on heave duty wheels is signalled to move over the protected plot by a rain sensor and an electric drive system. The shelter parking place cannot be used for growing experimental plots.

Scope of work

- To construct two (2) rainout shelters.
- To exactly copy the existing rain-out structure on the ARC VIMP farm, (design & Steel profiles, except length), compile drawings, manufacture, and commission.
- Designing a new PLC control system to automatically open and close movable parts when raindrops are sensed.
- Fence area for security.
- Install and supply one (1) shipping container for housing instrumentation and tools.
- Water harvesting system.
- Irrigation system.
- All steel work to be hot dipped galvanized.
- No welding permitted after hot dipped galvanized process.

Photos of existing ARC structures

Site survey

- The contractor is to determine the conditions before providing the ARC with a quotation.
- The contractor must submit a project plan and a plan of action to indicate the method of solving the situation like rock foundation, loose sand etc.
- The contractor is to determine, prior to commencing work, the location of all underground services such as water, electricity, and communication pipes or lines by engaging relevant ARC staff.
- The contractor will make good any services, surfaces, and finishing damaged during construction.
  The contractor is responsible for the following: All building material and parts to complete this project. (e.g. steel bolts, nuts, cement, sand, etc.).
- The contractor is responsible for the Safety and Health Environment requirements according to the OHS Act until the site is handed over to the ARC-VIMP. **NB: Contractor must provide personnel with appropriate PPE.**

- **ARC reserve the right to shut down operations if OHS and PPE regalia is not available and/or not applied.**
- The contractor is responsible for electricity and water supply needed by the contractor, if and when there is no electricity and water supply at VIMP.

Standards & dimensions

- All work to comply with the National Building Regulations & Building Standards Act 103 of 1977, SANS 10400, Local council, or any relevant municipal by-laws requirements & all relevant specifications and codes to be adhered to.
- All dimensions, levels, and heights have to be verified on-site and any discrepancies to be reported to the ARC project leader before any work takes place.
- No second-hand equipment of any description may be offered for supply or installation.
- Tenderers must satisfy themselves that the equipment offered by them can be accommodated in the available space and positioned in such a way that access for maintenance, repairs, or removal is not obstructed.
- Within 7 days of being issued with a purchase order, the contractor must indicate what information, or specifications are still outstanding or need clarification. After 7 days, it is assumed that the contractor knows exactly what must be done and no delays will result in this respect.
- All drawings, PLC Programs and intellectual property remain the property of the ARC. The contractor to provide a full set of as build drawings in A1 paper format and DWG format. (Steel structure, water reticulation and wire diagrams)
- Contractor to provide an SOP (Standard operation procedure ducument) and training to ARC personnel.

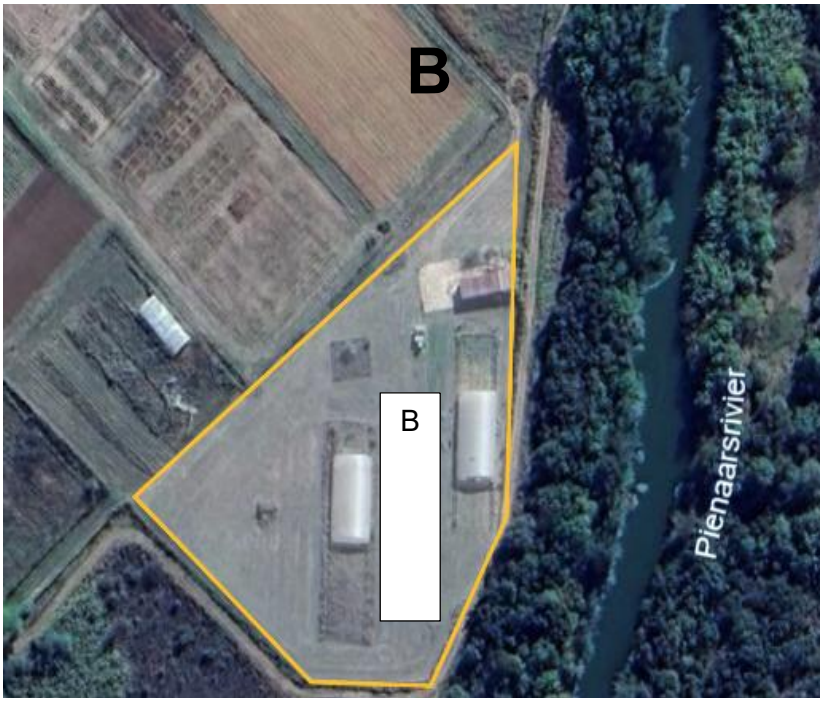
Price breakdown

- There is a limited budget for this project. The ARC has the right to choose only certain aspects of the quotation as set out in the detailed specification document. One contractor will do the selected work. The remaining work will be re-advertised in the new financial year.

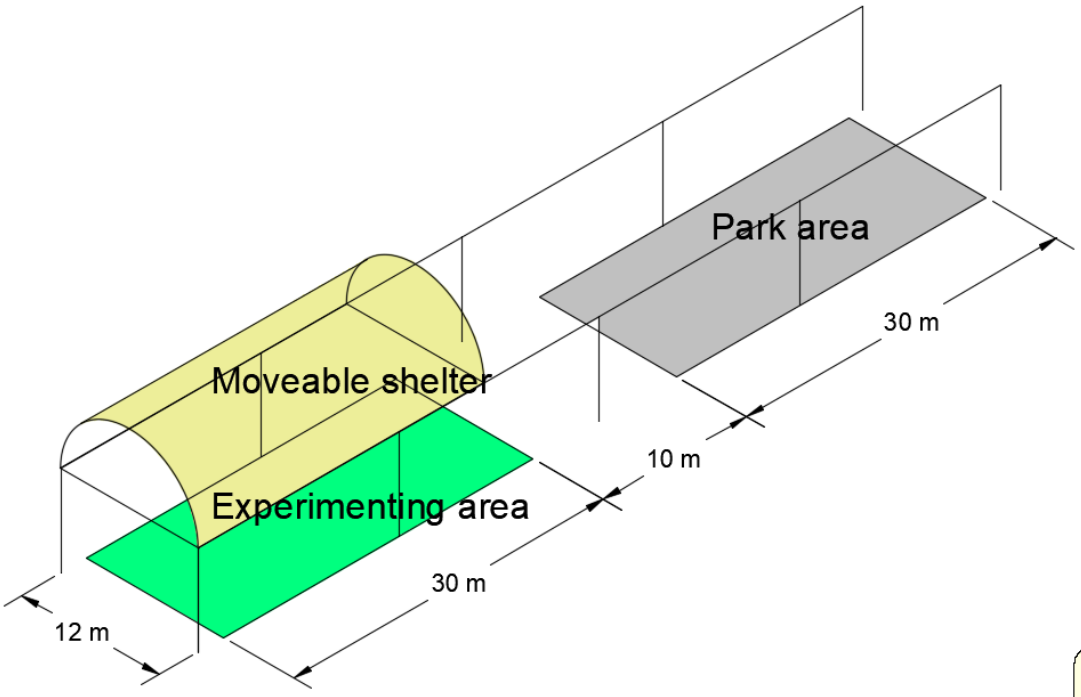
Items	Quantity requires	Price/Unit	Price (Excl VAT)
1. Complete structure inclusive moveable and fix structures, motor and automation, electrical supply and covering of movable structure	2	R	R
2. Irrigation system and water tank	2	R	R
3. Shipping container 6m	1	R	R
4. Water harvesting system	2	R	R
5. Name boards	5	R	R
6. OHS file cost	1	R	R
Sub total amount			R
Contingency (**5%**)			R
Total amount (Excl Vat)			R
Vat (**15%**)			R
Total (Vat Incl)			R

Placement

A) 1 x rainshelter at: GPS coordinates of new structures -25.599043° 28.360846°
B) 1 x rainshelter at: between rainshelters 1 and 2

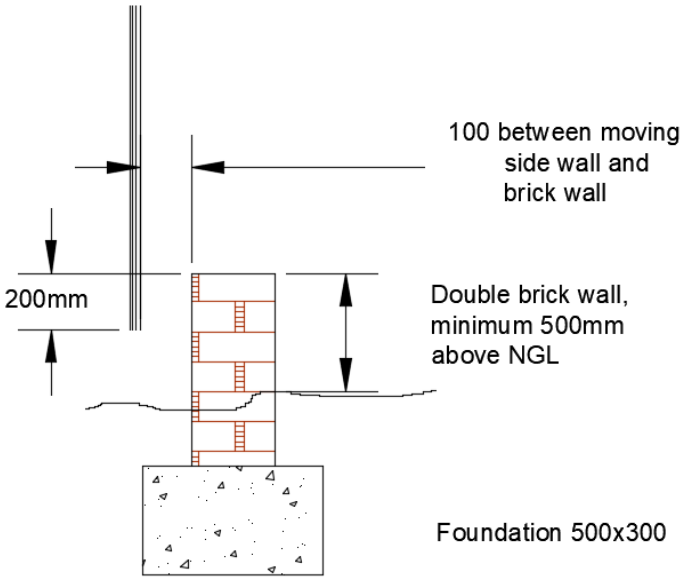


Overall size



Movable structure

- Length of rails Minimum 70m
- Area under roof of the movable structure 12 x 30m
- Structure will be positioned in the same orientation as the existing structures on both lands.
- Structure must be operated with steel cable.



Fix Structured

- Copy the exact design from the existing rainout shelters and all steel profiles (pillars, rails, plastic tunnel framework, etc.), except for brick walls (should be double brick wall).
- 400 x 1000 x 600 (deep) foundation for posts
- 25 MPa Ready-mix concrete
- Use of rebar in foundations for posts
- All steel to be hot-dipped galvanized.
- All fasteners are to be hot-dipped galvanized.
- 70m Double un-plastered brick wall (total 140m), on both sides of the structure, minimum of 500mm above natural ground level.
- Wall foundation for wall 500 x 300 (25 MPa Ready-mix concrete)

Motor and automation

- All DB's, and control units must be housed in a shipping container.
- Automatic Motorized Rolling Mechanism on wheels on rails with arrangements for easy movement, quick locking and unlocking, latches and adequate safety features while operating.
- Rolling mechanism electric operated geared motor to move the rainout shelter.
- Opening and closing time is 240 seconds. (70m / 240 sec = ± 0.3 m/s)
- Use VFD (variable frequency drive) for soft start/stop and speed controlled on moving motors
- The complete motorized rolling mechanism must include a control panel, motor drive etc.
- Manual override enabling the structure to be moved by hand.
- In the park state, automatic catches must prevent any movement of the structure, especially in high wind conditions.
- PLC operated (programmable logic controller) with the necessary safety precautions.
- When rain droplets are measured (not humidity) the structure must automatically be closed, and SMS sent.
- Wind, Light & Rain Sensor with data logger.
- All cables to be stainless steel.

Electrical supply

- 3 phase motors
- 500m electrical supply cable (include in tender) from kiosk/transformer.
- Switchgear must be supplied
- All wires must be in water pipes (Not conduit) to prevent theft of cables. Electrical supply cable must be at least 1,5 m under soil.
- Aluminium conductors
- COC (Electrical Certificate of Compliance) before payment will be considered.

Covering of movable structure

- Corrugated polycarbonate sheet.
- Thickness 1.25mm.
- Maximum Purlin spacing for 1.25mm is up to 1.8m apart.
- Colour: clear
- Minimum 2 years guarantee of the entire structure
- Roofing – use UV protected polycarb material
- Movable structure must include corrugated polycarbonate sheet side walls with a maximum opening of 100 mm between the fixed brick wall and movable sides.

Rainwater harvesting

- Rainwater runoff from the roof must be directed into gutters that divert rainwater into downpipes.
- Roof structure must have gutters and downpipes for rain harvesting that drain into a pipes system to water conservancy tanks at each parking station (10 000 liters x 2) buried below the surface. (see existing rain-out shelters for guttering).
- Submersible pump to pump water to plastic water storage tank.
- Overflow if conservancy tank is full.
- Use in in-line rainwater stainer to filter water to the conservancy tank.

- Installation of conservancy tanks as per manufacturer instructions.

Irrigation system

Below system is per Rainout shelter.

- All pumps, Irrigation computers, valves etc must be housed in the shipping container.
- Ensure drainage inside the container is provided if valves and pumps are leaking.
- Irrigation controller with at least six stations
- Disk filter minimum 100 microns, 50mm.
- 32mm reticulation pipes
- 6 water meters
- 6 Solenoid valves after water meters
- 1.1kw swimming pool pump to deliver the irrigation water from tank to irrigation system.

Water tank

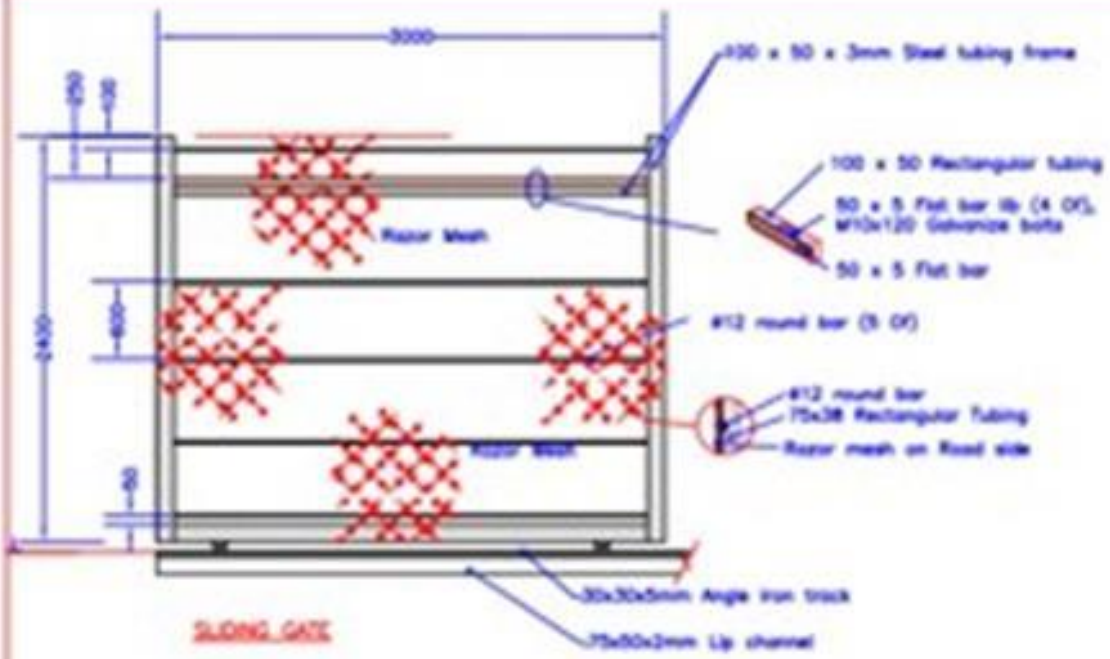
Below system is per Rainout shelter.

- Capacity 10 000 litres vertical water storage tanks similar to Jo-Jo tanks
- Manufactured from food grade LLDPE plastics.

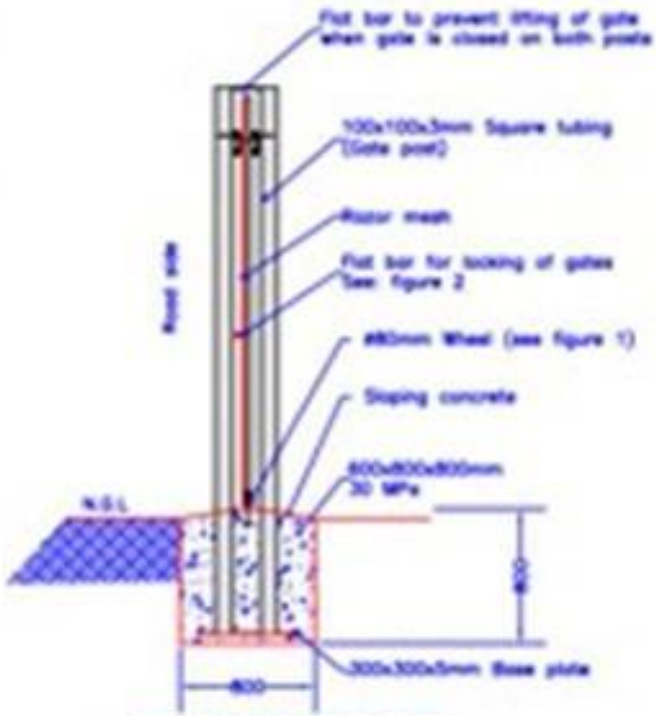
- UV Resistant & BPA free prevents algae growth.
- Secure child-safety lids
- Black inner liner – prevents algae growth.
- Supplied with 50/40mm yellow tank connectors at the bottom and top.
- Supplied with strong sealed tank connectors.
- 10-year warranty
- Anker to the cement slab with 4 galvanize cables and turn buckles.
- Must be kept full with Magalies-counsel-water with ball valve. Water supply line will be available next to the existing rainshelters.

The base for water tank

- Compacting of soil. Minimum of two (2) successful Dynamic Cone Penetrometer (DCP) test per unit to be recorded by a trained operator. The maximum allowable displacement per blow is 15mm to a dept of 0.5m deep.
- Concrete floor of 500 mm thickness must be cast.
- A minimum of 1.5m larger than the tank mut be cast around the structure (Veld fires)
- Slightly slope away from the structure (1:100)
- Minimum reinforcement for concrete Ref. 245 (200 x 200 x 6.3 mm) SANS 1024:2012 welded steel mesh
- 25 MPa Concrete mixes must be supplied by an approved ready mix concrete supplier.
- Concrete must be vibrated to expel entrapped air.
- Broom finish of the concrete
- The placing of concrete must be done to maintain the quality and uniformity, and, once the concrete has been placed and vibrated, it is necessary to protect it from drying out and extreme of temperatures. It must also be cured to maintain a satisfactory moisture content and temperature in the concrete during early stages so that the desired properties may develop.



SLIDING GATE



GATEPOST FOR SLIDING GATE

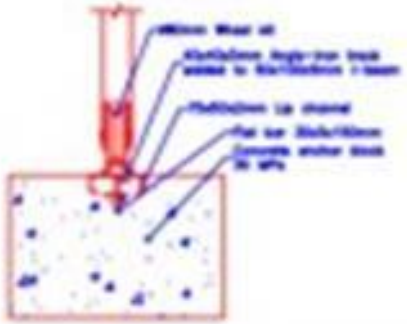


FIG 1

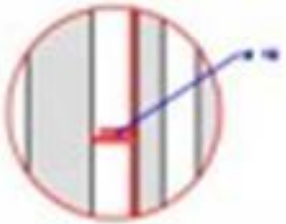


FIG 2

Note: The complete gate must be Hot Dip galvanized after manufacturing.
(Including Track assembly)

Shipping Container (for the Rainshelter 1&2 site only)

- 6-meter container
- Containers must be watertight after all the cut outs have been made.
- Clean all rust spots with a wire brush with angle grinder.
- Painted with one coat merit universal undercoat (UC1) and apply two coats of enamel paint similar to Plascon Velvaglo to manufacturer's specification.
- Colour: White
- Flooring – drainage for in case leaks in pumps and pipes
- High-security padlock to lock the container.
    - Minimum width 75mm
    - 4 keys for each lock
    - Quantity of locks 4

Contingency

- The maximum contingency for this project will be 5%.
- No variations or contingency will be valid unless approved by the ARC project manager in writing.
- The ARC has the right not to spend this contingency or only part of it.
- The 5% must be clearly stated in the quotation as Contingency.

Name boards.

- Full colour printing material: 1.4 mm chromadek (CKS 191 standards)
- Size of name board: A2
- Chromadek, printed at 300 dpi on a monomeric vinyl sticker.
- Mounted with galvanized bolts.
- The Chromadek label shall have a minimum guaranteed life of 2 years
- ARC will provide the Artwork in a Microsoft Word format.
- Quantity: 2
- Mounting of Name boards on structures

General condition

- The contractor is responsible of proper housekeeping of site and removing of all rubble after completion of the project.

- All materials and equipment used should be SABS approved.