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SPECIFICATIONS FOR GLASSHOUSE STRUCTURES B14

FEBRUARY 2025

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1. INTRODUCTION

This chapter is discussed under the following headings:

- Introduction and background
- Project location
- Project objective
- Purpose of the report
- Structure of the report.

1.1.INTRODUCTION AND BACKGROUND

The Agricultural Research Council (ARC) of South Africa has identified a need to enhance its research facilities. With a vision to bolster the nation's agricultural research capabilities, the Council has initiated an RFQ (Request for Quotation) for the construction of a glasshouse complex. This glasshouse, spanning an area of about 200 m², is pivotal for myriad research purposes. The project emphasises modern, energy-efficient solutions, from advanced cooling and heating systems to computerised control setups. With water sustainability and solar energy utilisation also on the agenda, the Council's objective is clear: to cultivate state-of-the-art, eco-conscious research environments that drive agricultural innovation forward.

1.2. PROJECT LOCATION

The project is situated at the Vegetable Industrial and Medicinal Plants Institute of the Agricultural Research Council (ARC-VIMP) located on the R573 KwaMhlanga/Moloto Road near Roodeplaat in Pretoria, South Africa.

FIGURE 1-1: SITE LOCATION

1.3. PROJECT OBJECTIVE

The primary objective of this project is to demolish an old glasshouse and construct a new state-of-the-art glasshouse complex for the Agricultural Research Council of South Africa. This enhancement aims to bolster the nation's agricultural research capabilities by creating modern, energy-efficient, and eco-conscious research environments.

1.4. PURPOSE OF THE REPORT

The purpose of the detailed specification is to clearly outline greenhouse specific requirements and materials, ensuring that there is a common and clear understanding of the greenhouse components and their functional requirements. The specification will aid the tenderer to price the design build project and to execute the design on appointment.

1.5.STRUCTURE OF REPORT

The report comprises the following sections:

- Section 2: Greenhouse B14- design specifications
- Section 3: General Specifications
- Section 4: Name Boards
- Section 5: Pricing Data

2. GREENHOUSE B14- DESIGN SPECIFICATIONS

This chapter will focus on the B14 design specifications. The design specifications for the B14 greenhouse will be subdivided into the ten (10) sub-sections:

- Overview
- Greenhouse structure
- Structural specifications
- Cladding
- Cooling, heating and climate systems
- Climate control
- Growing systems
- Water systems
- Electrical systems
- Equipment

2.1.OVERVIEW

There is an existing B14 greenhouse located at: Lat: 25°36'12.96"S; Long: 28°21'17.63"E that will require complete demolition of the existing structure and removal from the Roodeplaat campus and responsible disposal of all resultant debris in accordance with environmental and safety regulations

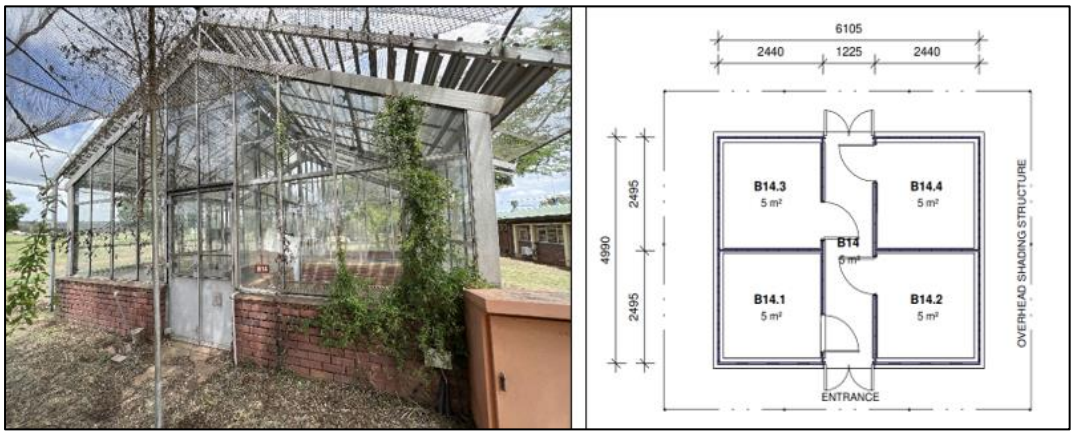

FIGURE 2-1: EXISTING B14 GREENHOUSE STRUCTURE & FLOOR PLAN

The new B14 greenhouse will be a completely new acclimatization greenhouse, functioning similarly to greenhouse C13. The location of this greenhouse is shown below.

FIGURE 2-2: LOCATION OF THE NEW B14 GREENHOUSE

2.2.GREENHOUSE STRUCTURE

2.2.1. DIMENSIONS

Growing Area: 10 Bays (7m x 2.5m) per bay - New structure

Corridor: 1 Corridor (26m x 2.46m) - New structure

Total Area: 278m² - New structure

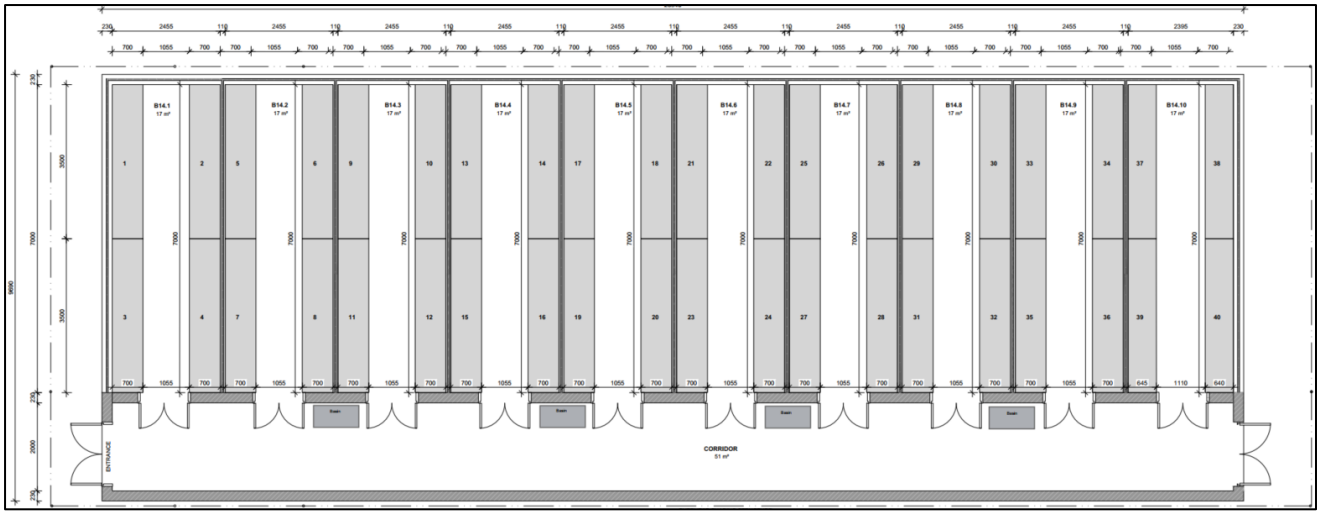

FIGURE 2-3: BASIC LAYOUT OR B14 GREENHOUSE (SEE ADDENDUM A DRAWINGS)

2.2.2. STRUCTURAL SPECIFICATIONS

2.2.2.1. LEVELLING AND EARTHWORKS

Levelling and earthworks to comply with the following standards:

- South African National Standards – SANS1200

  - SANS1200C – Site Clearance
  - SANS1200D – Earthworks
  - SANS1200DA – Earthworks (Small Works)
- South African National Standards – SANS2001
  - SANS2001-BS1 – Site Clearance
  - SANS2001-BE1 – Earthworks (General)

2.2.2.2. SOIL CONDITIONS

The following standards will be applied soil conditions:

- South African National Standards – SANS1200
  - SANS1200C – Site Clearance
  - SANS1200D – Earthworks
  - SANS1200DA – Earthworks (Small Works)
- South African National Standards – SANS2001
  - SANS2001-BS1 – Site Clearance
  - SANS2001-BE1 – Earthworks (General)

2.2.2.3. EXCAVATIONS

The following standards will be applied during excavations:

- South African National Standards – SANS10400
  - SANS10400-G – Excavations

2.2.2.4. CONCRETE & FOUNDATIONS

The following standards will be applied during construction:

- SANS 10400 Application of the National Building Regulations
- SANS 10100 The structural use of concrete
- SANS 10160 The general procedures and loadings for the design of building
- SANS 10163 The structural use of timber

2.2.2.5. SOIL POISONING

Soil poisoning will be done in accordance with SANS 10124

2.2.2.6. FOUNDATION BRICKWORK

The following standards will be applied during construction:

- SANS 10164 The structural use of masonry
- SANS 10161 The design of foundations for buildings

2.2.2.7. SURFACE BED

The following standards will be applied during construction:

- SANS 10400 Application of the National Building Regulations

- SANS 10100 The structural use of concrete
- SANS 10160 The general procedures and loadings for the design

2.2.2.8. FOUNDATIONS

- A foundation for this facility will be required with surrounding apron extending 2 metres on the at the sides adjacent to the compartments and 1 meter on the side adjacent to the corridor
- For the side where HVAC units will be placed, construction of a solid concrete slab will be required to ensure stability of the HVAC equipment.

2.2.2.9. DRAINAGE

The drainage in the compartments will be done utilising surface flow. Greenhouse B14 will require a drainage channel to enable the construction of separate outlets into the channel from each of the compartments B14.1 to B14.10.

The channel will be in the corridor just outside the door of the compartments. The channel will have to be deep enough to enable a clear level difference between the channel invert and the inlet from the different compartments (minimum 370mm wide and 405mm deep).This will prevent backflow and possible cross contamination between the compartments if there is a blockage in the channel.

The channel is also covered by a galvanised steel grid to prevent tripping and enable access into the compartments with trollies. The typical channel cross section can be seen in Section 3.2.

2.2.2.10. FLOORS

- The existing surface bed must be repaired, clean and dry with all debris removed before applying a heavy duty self-levelling screed sloping towards the draining outlets.
- All surfaces should be free from laitance, dust, and other contamination, dry to 75% RH, and free from rising damp and groundwater pressure. The primed surface should be treated with a solvent-free concrete primer and base coat, followed by a homogeneous concrete sealant. Application must be in accordance with approved applicators, ensuring proper sloping towards the drainage outlets
- Floors must be smooth trowelled finish to allow for movement of trolleys

2.2.2.11. WALLS

- Face brick walls will be required due to tables/benches being positioned near the wall. The face brick must be no less than FBS with 24 MPa
- Face brick walls of 0.8m height will be required for each compartment.

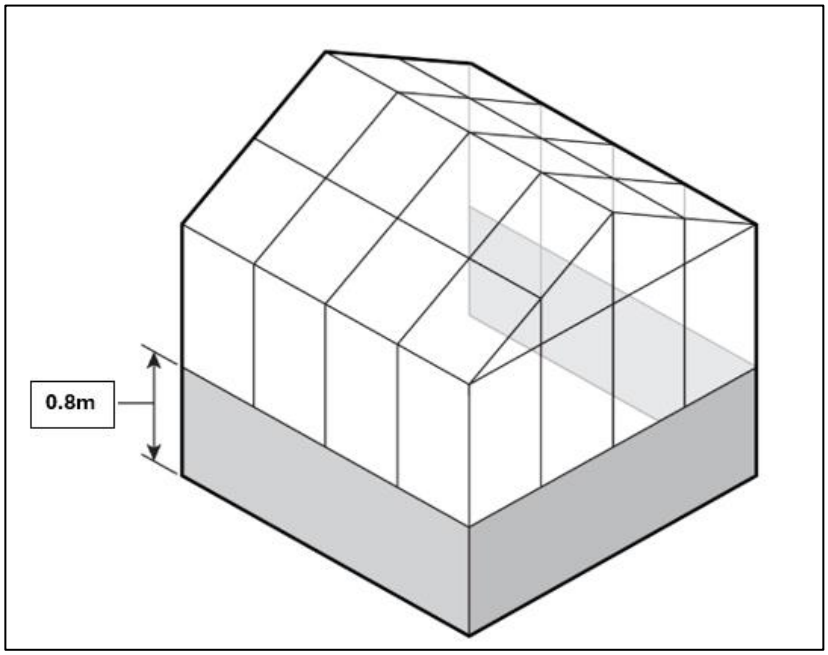

FIGURE 2-4: FACE BRICK WALLS

2.2.2.12. GUTTERS

- None

2.2.2.13. DOORS

See paragraph Locks and doors.

- One lockable entrance door – Eastern Side
  - One aluminium frame and leaf double door (standard dimensions) to the preparation of the corridor Eastern Side
  - See paragraph : Electronic access control (EACS)

- One lockable door – Western Side
  - One aluminium frame and leaf double door (standard dimensions) to the preparation of the corridor Western Side
  - To be used as an emergency exit
  - Push bar emergency exist system

- Compartment B14.1 – to B14.10.
  - Aluminium frame and leaf double doors for each compartment
  - Sealed single door that opens towards the corridor.
  - Lock and key system

2.2.2.14. FRAME OF THE GREENHOUSE ROOF STRUCTURE

- Frame to be replaced with a steel or aluminium that is compatible with Polycarbonate glazing.

TABLE 2-1: B14 FRAME SPECIFICATIONS

COMPONENT	TYPE
Greenhouse Structure	Gable Roof
Size	As per approved greenhouse shop drawings. Similar to existing B5 Greenhouse: Approx. height of existing B5: • Eave Height – 2.4m • Ridge Height – 3.58m • Gable End Height – 1.18m
Material	Aluminium or Steel Galvanizing according to EN ISO 12944-2 Category C1-C3

2.2.2.15. CORRIDOR

- Roofing
    - The corridor will be equipped with a flat roof, constructed to ensure sufficient water drainage and structural stability. The roofing material will be selected for its durability and compatibility with the overall design of the facility.
- Walls
    - Build the corridor walls using face bricks, matching the existing structure B5.

2.3.CLADDING

The cladding for this greenhouse will include the following components:

- Walls and Roof
- External hail protection

2.3.1. WALLS AND ROOF

All walls and roofs need to provide a durable, thermally insulating, and light-transmitting covering for the greenhouse roof and gable fronts that facilitates optimal plant growth and protection from external elements.

- Multi-wall polycarbonate (PC) sheets (6 -10mm) fixed to purpose made aluminium frame with end caps for sealing of top and bottom edges to keep moisture and debris out
- Customized to fit the specific measurements of the greenhouse structure.
- Dimensions will be finalized based on detailed shop drawings.
- Panels will be pre-cut to fit the designated roof and gable areas, including allowances for thermal expansion and contraction.
- All walls will need to be multi-wall polycarbonate (PC) sheets (6 -10mm)
- Ensure all panels are adequately sealed at both ends

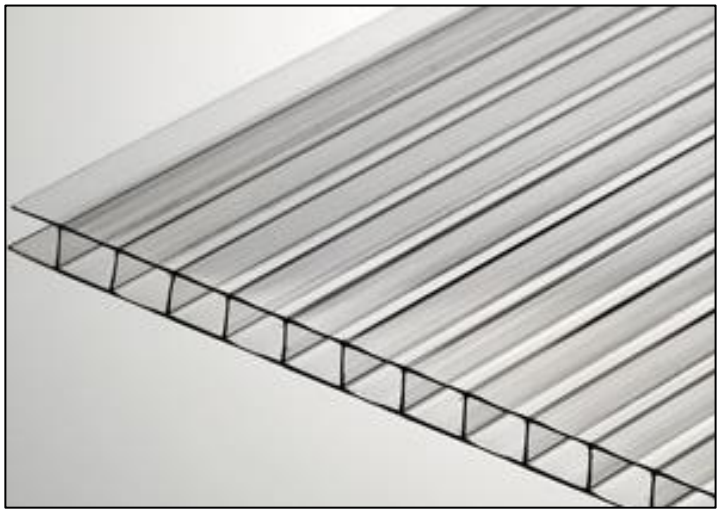

FIGURE 2-5: MULTI-WALL POLYCARBONATE SHEETING

2.3.2. EXTERNAL HAIL PROTECTION

- External hail protection will need to ensure that all polycarbonate panels are protected.
- Build a hail protection structure
- Retain and adjust existing hail structure
- Provide galvanized welded mesh with a 25.4mm x 12.7 mm aperture and 1.5 mm thickness as a separate line item for all hail protection structures
- Hail net protecting the roof and side walls for compartments B14.1 – B14.10 constructed from galvanized steel mesh or similar approved.

2.4.COOLING, HEATING AND CLIMATE SYSTEMS

The cooling, heating and climate systems can be broken down into the following:

- Heating and cooling
- Ventilation
- Humidification
- CO_2 Enrichment

2.4.1. HEATING COOLING

- HVAC system will be dual-function units capable of both heating and cooling.
- Each compartment must be able to control heating and cooling independently; should be able to achieve between 22-35 °C, suitable for the specific location and independent of external climate conditions and factors and adjacent compartments.
- See Paragraph: Climate control system

2.4.2. VENTILATION

- No Ventilation will be required as compartments will need to be sealed

2.4.3. HUMIDIFICATION

- Foggers and misters required for each compartment.

- Foggers to be placed at least 50 cm above plant headspace
- Automated misting system with adjustable misting time
- Foggers and misters to be linked to the computer system for remote control of the greenhouse.
- Be able to maintain humidity levels of 40 to 100 % Relative humidity
- Relative humidity levels must be able to turn off completely when needed.

2.4.4. CO_2 ENRICHMENT

CO_2 enrichment will be required to supply carbon dioxide through the use of CO_2 gas cylinders.

- Utilize systems equipped with compressed CO_2 gas cylinders, carefully regulated to release carbon dioxide at ranges between (800 – 1100 ppm)
- Incorporate a network of tubes to evenly distribute CO_2 throughout each compartment

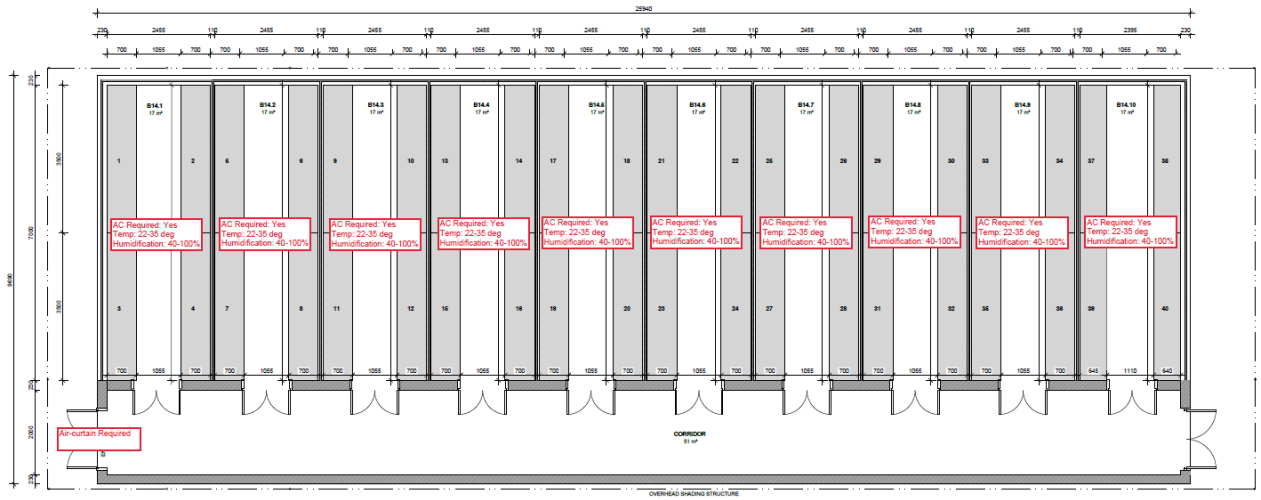

FIGURE 2-6: GREENHOUSE B14 – HVAC

2.5.CLIMATE CONTROL SYSTEM

See Paragraph: CLIMATE CONTROL SYSTEM

2.5.1. GROWING SYSTEMS

The growing systems for the B14 greenhouse are to be fixed concrete tables/benches

2.5.2. BENCHES

- 4 x (0.7 x 3.5 x 0.8) (w*L*h) Permanently fixed concrete or plastered brickwork benches per compartment for compartments B14.1 – B14.10.
- 30 - 40 cm sand & soil bin depth per table with bottom heating system
- Bottom heating system required to cover entire surface of the sand bin and provide uniform heating between 25-27 degrees °C
- Sand and soil bin must be filled with Sand.

FIGURE 2-7: CONCRETE BENCHES ILLUSTRATION

2.6.WATER SYSTEMS

The water systems for the B14 greenhouse will consist of:

- Water source
- Irrigation
- Fertigation

2.6.1. SERVICE WATER

2.6.2. WATER SOURCE

The water supply to the new B14 greenhouse will need to tie into the existing water reticulation system to the nearby existing building's water infrastructure

See paragraph Alternative water supply

2.6.3. IRRIGATION

The B14 greenhouse will require a manual micro-sprinkler irrigations system. To ensure the irrigation water used within Greenhouse B14 is free from contaminants, purified water will be required.

2.6.4. PURIFIED WATER SYSTEM

- See paragraph Purified water system.

2.6.5. IRRIGATION SYSTEM

- A moveable micro-sprinkler system that can be connected directly to the greenhouse's service water system.
- Equipped with manual valves or controls to adjust water flow and distribution patterns as required.
- The misters specified previously will serve a dual function as part of the irrigation system, providing both humidity control and supplemental water to plants.

2.6.6. FERTIGATION

- Manual fertigation will be used to deliver nutrient solutions to the plants.

2.6.7. SERVICE WATER

Service water will be needed to provide an accessible supply of fresh water for general and manual watering needs within the greenhouse.

- 1x Strategically placed tap and hose in each compartment to ensure all areas of the greenhouse can be easily reached for manual watering and cleaning tasks.

2.7.ELECTRICAL SYSTEMS

2.7.1. GENERAL

- **All equipment must be equip with Surge arresters and lightning protection**
- **See paragraph: General information on electrical systems**

2.7.2. GREENHOUSE

- Excavation of all materials for trenches, concrete capping, backfill, compact and dispose of surplus material as required from Substation F, to Kiosk B14
- Removal and disposal of existing equipment, cabling, and all associated existing electrical infrastructure from point of supply in Substation F, to Kiosk B14, including but not limited to Kiosk B14 with associated cables and switchgear.
- Installation of the following:
    - Appropriately sized three phase circuit breaker in LV panel in substation F based on expected demand
    - Low voltage cables installed in trenches, including
    - Cable terminations
    - Bare copper earth conductors
    - Cable ends for copper earth conductor including glands, lugs and connections
    - All other components as required for supply from Substation F to the B14 distribution kiosk (Kiosk B14).
    - 1 Kiosk with lockable doors complete with all necessary components, including, but not limited to busbars, switchgear, internal wiring, blanking plates, labelling etc. The kiosk is to be connected to the newly installed Sub DB in the passage.
    - PVC Insulated Conductors
    - PVC Insulated Earth Conductors
    - Galvanised screwed conduit including bending, jointing, short lengths, draw boxes, couplings, bends, saddles, hospital saddles and wastage conduit ends.
    - Vaporproof, non-heat emitting light fittings equipped with RGB and white LEDs for each compartment including wiring.
    - Light reflector must ensure the light is only radiate to the bottom.
    - Appropriately sized socket outlets and isolators for the applicable HVAC installation and PLC box.
    - Install a three-phase electrical meter to measure electrical consumption for the greenhouse complex, include phase failure and surge arrestor for protection.
    - Wall mounted lockable box complete with all equipment associated with a PLC / Climate control system.

FIGURE 2-8: VAPORPROOF LIGHTING EXAMPLE

2.7.3. CORRIDOR

- Two socket outlets per compartment including wiring
- Lighting including wiring
- Conductors and earth conductors required for lighting and socket outlets
- 1 surface mounted DB with lockable doors complete with all necessary components, including, but not limited to busbars, switchgear, internal wiring, blanking plates, labelling etc.
- RFID Access control system
- See paragraph: Electronic access control (EACS)

2.8.EQUIPMENT

The equipment for the B14 greenhouse includes the following components

- Foot baths
- Air curtains
- Basin

2.8.1. FOOTBATHS

- See paragraph Foot bath.
- Location
    - Each compartment (B14.1 - B14.10) will be equipped with an individual footbath placed outside the door for mandatory use prior to entry, to minimize the risk of external contamination.
    - An additional footbath will be installed inside the corridor at the main entrance to ensure a secondary level of sanitation for individuals entering the greenhouse.

2.8.2. AIR CURTAIN

SEE PARAGRAPH AIR CURTAIN

2.8.3. BASIN

4 (four) washing basins within the corridor/passage. Used for washing of tray and pots and should include faucets with both hot and cold water options.

- Material
  - Stainless steel for its durability, resistance to rust, and ease of cleaning.
- Dimensions
  - Adequately sized to accommodate the largest trays and pots used in the greenhouse. Typical dimensions might be 120 cm in length, 60 cm in width, and 40 cm in depth.
- Depth
  - Sufficient depth to prevent splashing and handle large volumes of water, usually around 40 cm.
- Placement
  - Located in the corridor (refer to drawing). The basins should be securely mounted to the floor to prevent movement during use and equipped with a high-capacity drain to prevent clogging.

3. GENERAL SPECIFICATIONS

3.1.ELECTRICAL SYSTEMS

3.1.1. GENERAL INFORMATION ON ELECTRICAL SYSTEMS

- **All equipment must be equipped with Surge arresters and lightning protection**
- install all electrical reticulation connection from existing ARC network
- Contractor to provide as-built drawings based on the completed installation in AutoCAD 2023/4 as well as PDF formats. Hard copies shall form part of the handover documents.
- Contractor to provide 3 sets of handover documentation that includes all equipment datasheets, guarantees and warrantees, operation and recommended maintenance manuals for all equipment and the installation.
- Issuing of an electrical certificate of compliance to achieve occupation for each installation is required
- All equipment and products used for the electrical installation shall be SABS approved and shall bare the SABS stamp of approval. This includes but not limited to, circuit breakers, light switches, socket outlets, isolators, wiring and cables, conduit and accessories, and light fittings. Non-compliance of this clause will result in rejection of the installation and all costs pertaining to rectifying the installation shall be born to the contractor.
- All designs and installation shall be done in accordance to the following standards:

- SANS 10142-1: The wiring of premises Part 1: Low voltage installations
- SANS 10114-1: Interior Lighting: Artificial lighting of interiors
- SANS 10114-2: Interior Lighting: Emergency lighting
- SANS 10389-1: Artificial lighting of exterior areas for work and safety
- SANS 10389-2: Exterior security lighting
- SANS 10400: The application of the National Building Regulations
- SANS 204: Energy Efficiency in Buildings
- SANS 10313: Protection against lightning
- SANS 61024: Protection of structures against lightning
- All municipal regulations pertaining to building codes and health and
- safety requirements
- South African Occupational Health and Safety Act (Act 85 of 1993).

3.1.2. LIGHTS

Photo indicates the Growth and normal LED light on each fitting

- Lights must be mounted underneath the trellis system.
- All lights must me IP 65 rated (Dust tight & protecting from water jets in any direction)
- Led lights: Similar or equal to
    - http://a365.acdc.co.za/Images//spec/LEDT8PG-A3FR.pdf
    - Similar or equal to: https://www.acdc.co.za/pages/led-grow-lights
- Complete with T8 fittings, switch etc.

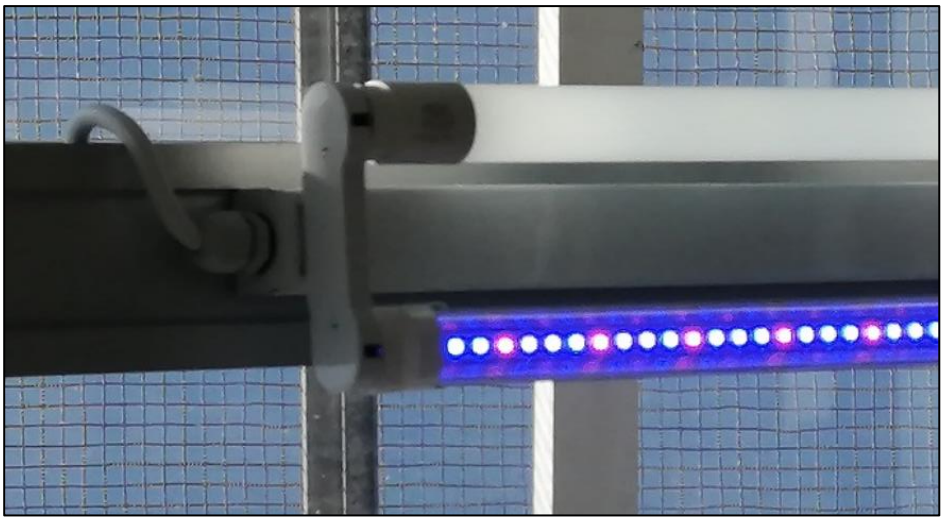

FIGURE 3-1: EXAMPLE OF GROWTH LIGHTS (NOTE: THIS EXAMPLE IS NOT IP65 RATED)

Light switches for grow lights

- 24 hour geyser timer with 8 programs mounted to wall plate
- Timer must be mounted into wall switch plate
- All wire must be in plastic trunking
- 24 hour geyser timer with 8 programs mounted
- Timer front must flash with wall (Not protruding)
- 2 lever switch plate. (1) activate lights with timer (2) activate lights

FIGURE 3-2: LIGHT AND TIMER CONFIGURATION

3.2.CHANNELS

The channel final dimensions must be minimum 300mm wide and 300mm deep to enable a clear level difference between the channel invert and the inlet from the different compartments. This will prevent backflow and possible cross contamination between the compartments if there is a blockage in the channel. The channel is also covered by a galvanised steel grid to prevent tripping and enable access into the compartments with trollies. The typical channel cross section can be seen in Figure 3-3

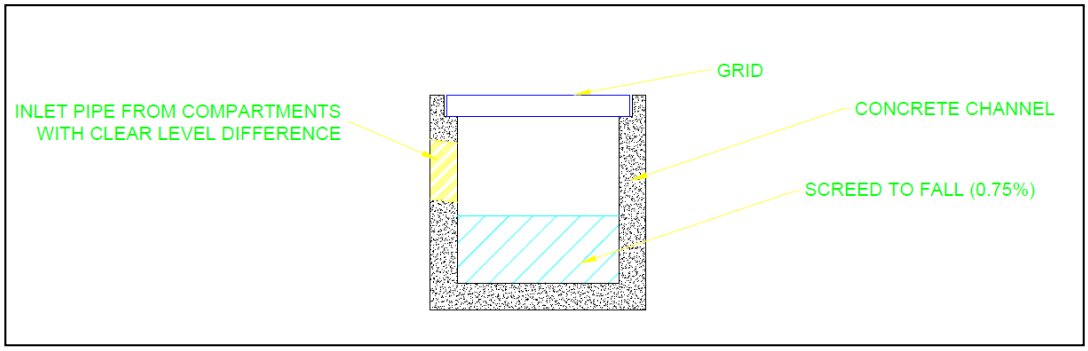

FIGURE 3-3:TYPICAL CHANNEL CROSS SECTION

3.2.1. CHANNEL CONSTRUCTION

- Floor of channel must be 80mm thick 20 MPa ready-mix concrete
- Sides must be build up with bricks, mortar with and plaster or 80mm cast concrete.
- Slope of the channel must be minimum 1:40

3.2.2. GRID OVER CHANNEL

- Heavy duty Mentis steel grating (see picture below)

- Mentis grading must be framed in 40 x 40 x 5 angle iron, the frame must be anchor in to the brick or concrete walls
- Material: **Galvanized** Heavy duty steel grating and frames.

FIGURE 3-4: GRID OVER CHANNEL

3.3.CLIMATE CONTROL SYSTEM

The climate control system must be designed to provide precise regulation of environmental conditions within each compartment of the greenhouse independently and consist of the following:

- Remove and take ownership of old cooling/heating systems for a discount price
- Existing aircons to be dismantled
- All HVAC must be digitally controlled
- A centralized, computerized system will manage and regulate the climate within each compartment of the greenhouse
- The system will need to continuously monitor the temperature and humidity levels in each compartment using a minimum of 3 sensors, ensuring that the environmental conditions are within the specified parameters.
- Automated controls will adjust heating, cooling, and humidity based on real-time data received from the sensors.
- HVAC system will be dual-function units capable of both heating and cooling.
- Design parameters of ± 3500 Btu/hr/m²
- Capable of achieving and maintaining temperatures from 22-35 °C, suitable for the specific location and independent of external climate conditions and factors and adjacent compartments.
- Capable of multiple settings per day e.g. Day and night setting

- Each unit must have the capability to independently control the temperature in its designated compartment, without affecting adjacent areas.
- Integration with a centralized computerized control system for precision management.
- Manufacture and install purpose made galvanized ducting internally insulated.
- 2x washable filter sets per unit in return ducting
- Supply and install a double deflection supply air grill per unit
- Supply and install one return air grille per unit.
- The air conditioners control unit will be housed in a steel metal electrical enclosure (IP65) with all the relevant switch gear to control the AC units, one metal electrical enclosure per compartment
- Supply and install new electrical cables from the distribution board.
- All cables must be in galvanized steel trunking or galvanized wire trays
- Screens may be installed to aid temperature control.

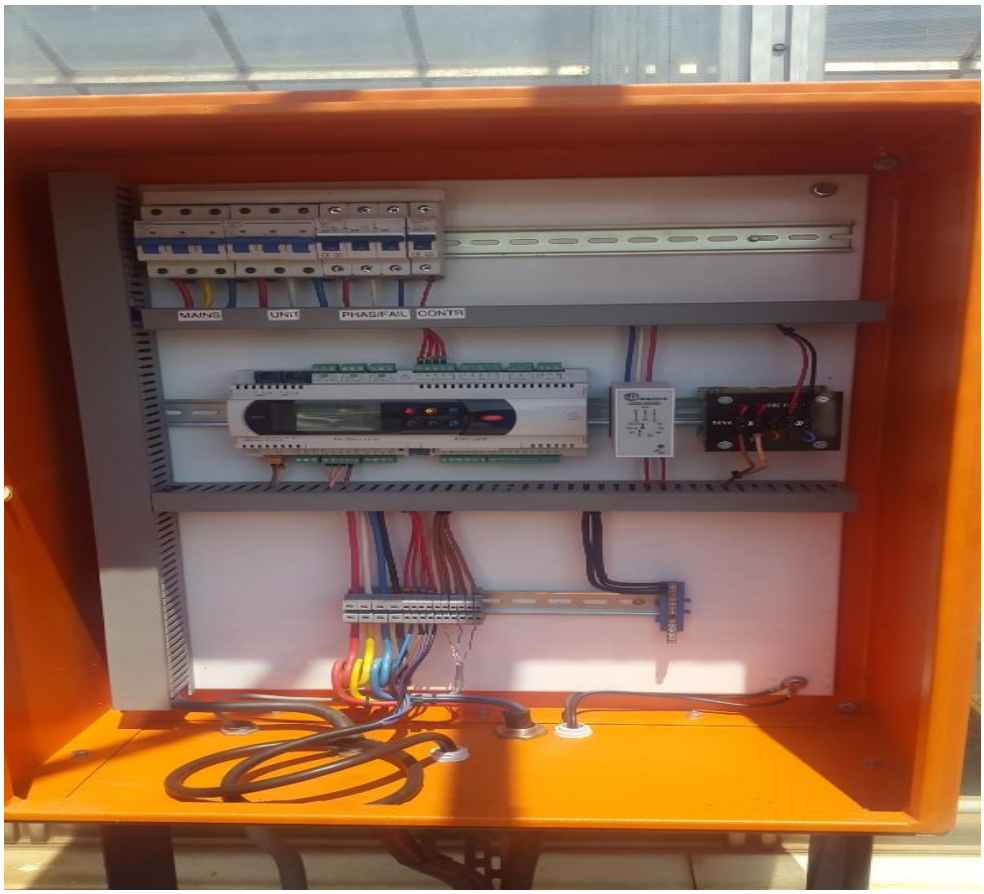

FIGURE 3-5: ELECTRIC BOX

3.3.1. SMS WARNING SYSTEM

- Alarming system that will send a warning if temperatures are out of range.

- The system must be accessible via cloud, desktop, and mobile platforms, and must utilize the existing internet infrastructure within the office area. The contractor is required to extend this existing internet service (Wi Fi) to ensure comprehensive coverage throughout the entire greenhouse
- SMS sim card and pre-loaded data to be able to send all warning messages for 1 year

3.3.2. ELECTRICITY METER

- 3 Phase electricity meter to measure the electricity consumption off each green house complex

3.3.3. CONCRETE PLINTH OF AC UNITS AND SURROUNDINGS

- Al AC units must have a concrete plinth that is a minimum of 0.5 meter larger on al 3 sides of the AC unit. The 4 th side is facing the glasshouse.
- Slightly slope away from the structure (1:100)
- 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.
- 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
- Concrete apron around B14, closing the areas to existing aprons of buildings.
- Similar specification as section 3.5

3.3.4. WIRE / CABLE MANAGEMENT

- Wire management with cable trays

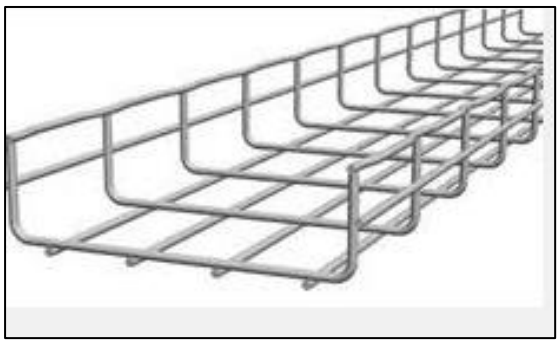

FIGURE 3-6: WIRE MESH

3.3.5. SERVICE PLAN

Once works completion has been received for the entire project, the contractor will make provision for a 12-month maintenance period. This maintenance will include all maintenance activities required for the system and equipment to perform as

intended and reach the required design lifetime. Equipment maintenance will include all regular maintenance that the installation must undergo at specific periods, like changing filters. The contractor will need to arrange access to the site with the client and will need to align maintenance activities with the client's operational requirements.

All services shall be carried out by person who hold valid Air conditioning and refrigeration certificate or certificate in safe handling of refrigerant from a recognized institution. verifiable proof of registration (Certificate/card) as Air conditioning/ Refrigeration Technician or Certificate in Safe handling of Refrigerant shall be submitted with this bid. Tenderer shall provide a list of competent registered name/names that will be made available to perform any duties for and on behalf of the bid on this contract

3.4.ELECTRONIC ACCESS CONTROL (EACS)

- Must be integrated with the existing Softcon access control system of the ARC (Used the same access cards)
- All wires must be in trunking or conduit
- 2 x HID Proximity card reader
- 2 x Emergency Break glass unit
- Door closer and maglock

3.5.CONCRETE FLOOR

All surfaces should be free from laitance, dust, and other contamination, dry to 75% RH, and free from rising dampness and groundwater pressure. The primed surface should be treated with a solvent-free concrete primer and base coat, followed by a homogeneous concrete sealant. Application must be in accordance with approved applicators, ensuring proper sloping towards the drainage outlets

- Final floor level must be 100 mm above natural ground level
- All compactions by the contractors must be tested with a minimum of two (2) successful Dynamic Cone Penetrometer (DCP) tests per unit to be recorded by a trained operator. The maximum allowable displacement per blow is 15mm.
- Floor must be slope to the outside 1:100
- REF 200 to be installed.
- 20 MPa Concrete Ready mix with a thickness of minimum thickness of 80 mm to be used.
- Concrete Certificate to be handed over to the ARC
- Steel floating surface finish

3.6.FIRE EXTINGUISHERS

- Portable fire extinguishers, SANS 1567 & SANS 1910.
- Two 9 kg or 9 Litre fire extinguishers per house complex (Total 8 for this tender)
- Appropriate signage must be mounted on the wall next to fire extinguishers.

3.7.DESIGN

Electrical, Structure and HVAC must be designed and signed off by a professional engineer, register at ECSA.

3.8.PVC CEILING MATERIAL

- Anti-fungal
- Termite proof
- Fire retardant (Classification of B/B1/B2 SANS 428)
- Minimum width of panels 250mm
- Minimum thickness of panels 7mm
- Colour of panels and trimmings: White Matt
- Existing Ceiling branding structure must be used.
- Screw all panels with a minimum of 6x30mm wood screws.
- All holes and crevices must be sealed with white silicon.
- No screws must be visible.
- Install strictly according to manufacturer instructions.

3.9.IRRIGATION

The irrigation must be design by an irrigation expert and present to the ARC Engineer for approval.

- Control by Irrigation controller (Computer)
- Minimum one zone (Station) per room
- Micro sprinkler / mister system
- Wi-Fi equip.
- Display on the computer.
- All pipes must be not in the pathway of the trollies or human traffic.
- The design must include a main line water filter system.

3.10. ALTERNATIVE WATER SUPPLY

3.10.1. WATER TANK

- Capacity 5000 liter
- No tank stand needed.
- 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
- Tank must be fill with permeant installed ball valve
- Supplied with strong sealed tank connectors
- 10 year warranty
- Anker to the cement slab with 4 galvanize cables and turn buckles

3.10.2. 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 200 mm thickness must be cast.
- A minimum of 1m 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.

3.10.3. WATER PUMP SYSTEM

- The correct pump motor combination must be design by the irrigation designer to deliver the correct water flow and water pressure to the irrigation system for optimal performance of the irrigation system. The pump must be protected from weather elements and theft.
- Water Pressure to be standard municipal pressure estimated at 400kPa

3.11. SERVICE WATER.

- Install new galvanized 25 mm water reticulation system for each compartment.

- Supply and install one 25 mm brass bib tap per compartment (SABS approved and similar or equal to Cobra).
- Height of tap, 1 m from ground level.
- Ten meter long, 20 mm diameter hose-pipe for each glasshouse complete with brass cap and lining and clamp (tap connector), with a six year warranty
- install all water reticulation connection from existing ARC network

3.12. PURIFIED WATER SYSTEM

- An in-line filtration unit will be required to remove or kill microbes from the irrigation water.
- UV System
- 110Watts sterilizer
- Flow rate: > 5400 LPH
- Lamp x2 (Length): 925mm
- Housing Material: Stainless steel 304
- Inlet/outlet connections, 1" or 25.4mm
- 2 spare lights for each unit

3.13. FOOT BATH

A foot bath will be required to reduce the risk of contamination and ensure a high level of sanitation by cleaning the footwear of all individuals entering the greenhouse.

- Corrosion-resistant material to withstand constant exposure to water and sanitizing chemicals.
- Adequate size to accommodate at least one person stepping in fully and wide enough to accommodate a lab trolley (0.6 x 1m).

PHOTO: TYPICAL FOOTBATH

3.14. AIR CURTAIN

An air curtain will be required to create an air barrier between the exterior air and the conditioned interior air of the greenhouse. The air curtain will also prevent the infiltration of cold or hot air, bugs , fumes , humidity , dust and debris.

- Location
  - Corridor
    - Mounted at the main entrance of the greenhouse corridor.
- Dimensions
  - Span the full width of the door entrance.
- Blower capacity
  - Sufficient to create a downward air stream that covers the entire entrance.
- Functionality
  - The air curtain needs to activate automatically upon door opening.

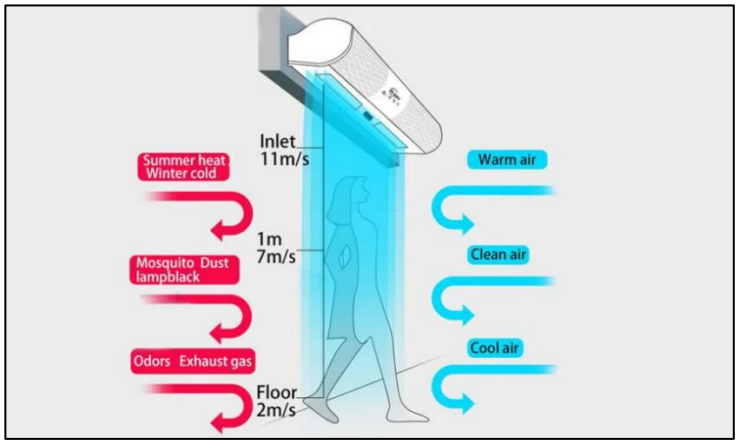

FIGURE 6-8: ILLUSTRATION OF AN AIR-CURTAIN.

4. NAME BOARDS

- To be the same as the existing ones (attached to the building) (ARC to provide details of current specifications of name boards)
- ARC will provide the Artwork in a Microsoft Word format
- Quantity: 11
- Mounting of Name boards on Building and compartments.

FIGURE 4-1: B14 NAME BOARD

5. PRICING DATA

5.1 – PRICING INSTRUCTIONS

The Tenderer shall provide a fully itemised bill of quantities, complete with item prices. The bill of quantity shall include at least the following items and allocations:

- Engineering costs
- Preliminaries
- Site establishment
- Site clearing and demobilisation
- Full equipment list broken down into the following levels of detail:
  - Cost of equipment (itemised)
  - Cost of freight
  - Installation cost.
- Provision for spares
- Provision for manuals
- Provision for all taxes applicable to the execution of the Works, including import duties.

The Bill comprises items covering the Contractor's profit and costs of general liabilities and of the Upgrading of Temporary and Permanent Works.

Descriptions in the Bill of Quantities are abbreviated and may differ from those in the Standardized and Project Specifications. No consideration will be given to any

claim by the Contractor submitted on such a basis. Should any requirement of the measurement and payment clause of the appropriate Standardized or Project Specification(s) be contrary to the terms of the Bill, the requirement of the appropriate Standardized, Project, or Particular Specification as the case may be, shall prevail.

The "Occupational Health and Safety Act No 85 of 1993" Construction Regulations are as follows:

- A payment item in the schedule of Quantities / Bill of Quantities must allow the contractors to price for compliance with OHSA and the Construction Regulations.

5.1.1 – PAYMENT SCHEDULE

The Tenderer shall provide a payment schedule.

5.1.2 – BILLS OF QUANTITIES / SCHEDULE OF QUANTITIES

Please note that it is mandatory to submit a complete Priced Bills of Quantities with the Returnable Documents.

Items	Quantity required	Price/Unit	Price (Excl VAT)
1. Shop drawing (as build) of the greenhouse complex			R
2. Building			R
3. Climate control system			R
4. Irrigation system			R
5. Growing systems			R
6. Concrete plinths and surroundings			R
7. Lights			R
8. 1 Year service plans for HVAC and all control systems			R
9. Benches			R
10. CO_2 Enrichment system			R
11. Alternative water supply			R
12. Electronic access control (EACS)			R
13. Name boards			R
14. Contingency at 10%			R
Total (excl of Vat)			R
Total (Incl of Vat)			R

APPENDIX A: GREENHOUSE B14 CONCEPT LAYOUT