UNIVERSITY ESTATES

REVISED TECHNICAL MANUAL
2021

UFS

UNIVERSITY OF THE **FREE STATE**
UNIVERSITEIT VAN DIE **VRYSTAAT**
YUNIVESITHI YA **FREISTATA**

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This document is of utmost importance for the correct implementation of technical guidelines and was designed to address specific and unique needs as compiled by University Estates, University of the Free State. This guideline manual is directed specifically at problem-solving as a preventative informational guideline within the University and took time and knowledge to compile and may not be copied/altered/re-designed or provided/introduced to a third party, unless under specific direction (in writing) from University Estates.

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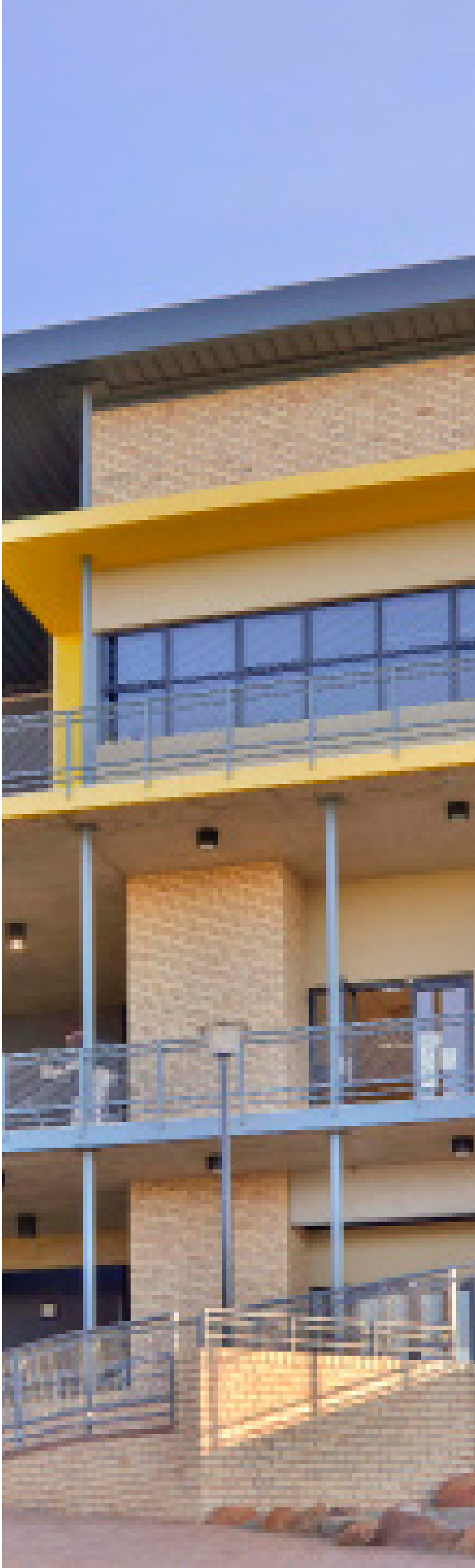
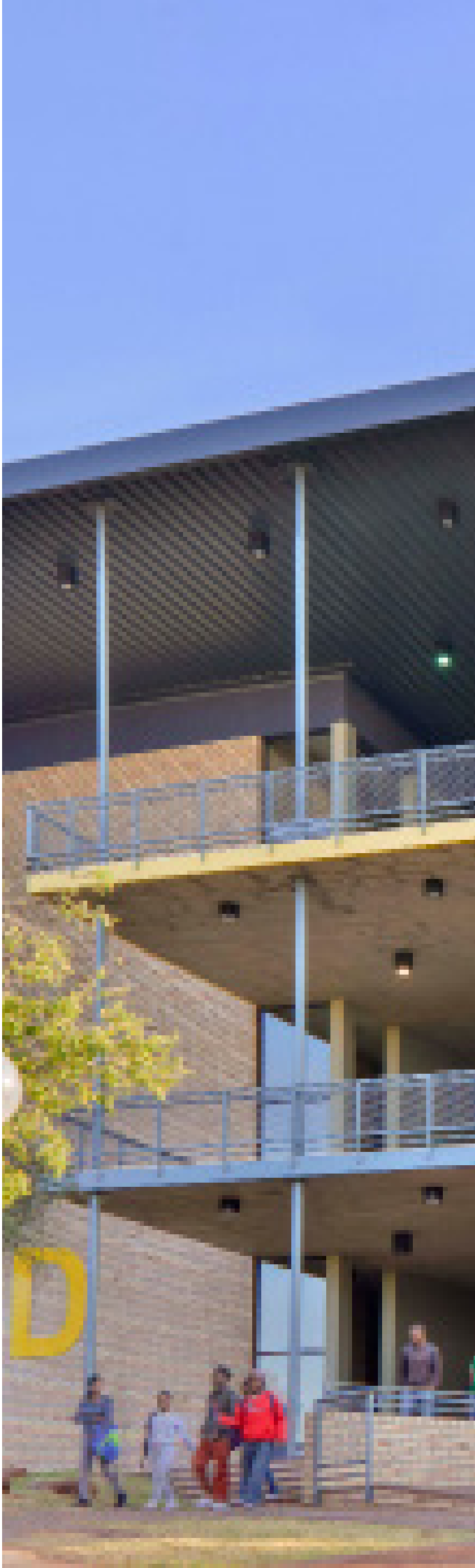




UE = University Estates : 1. Capital projects
2. Maintenance projects

DO = Drawing office

PA = Principal Agent

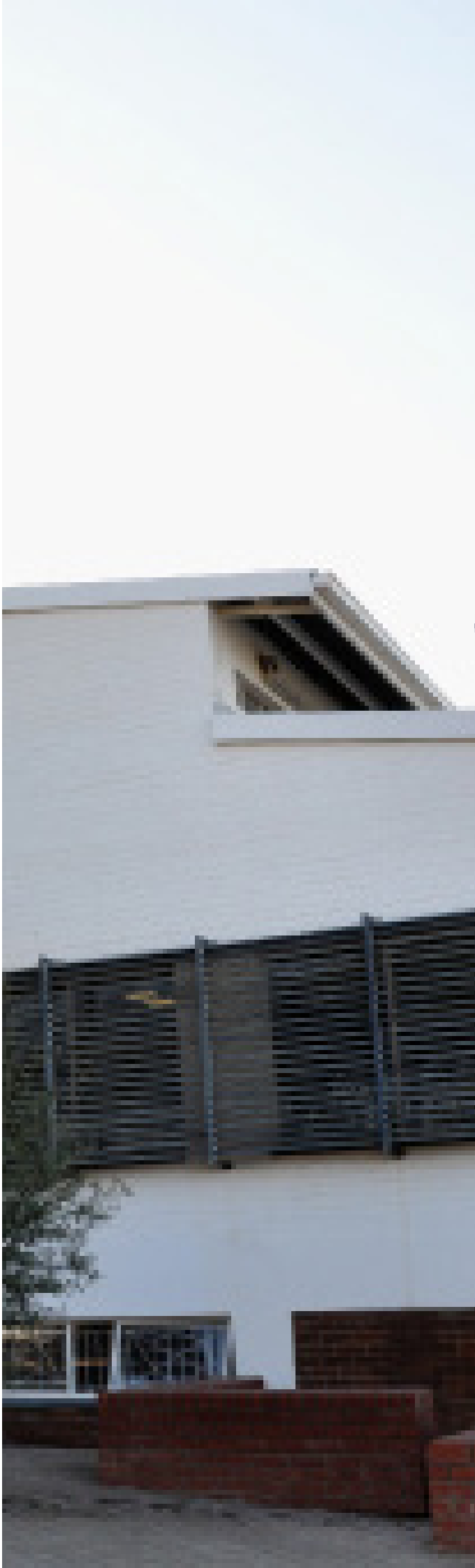
PMO = Project Management Office

PM = Project Manager

QS= Quantity Surveyor

ICT= Information Computer Technology

AV= Audio Visual



INTRODUCTION

This document is an overview of the key elements of the material and/or methods to be used in all UFS facilities, representing all preceding directives. It has been compiled to establish principles while at the same time endeavouring to promote uniformity in regard to the usage of materials and regulations. Building materials and methods given preference to would be economically justifiable and suitable for long-term usage and implementation in order to reduce maintenance and repair work.

The guidelines in this manual will be updated regularly.

If for any reason there should be a deviation from regulations laid down in this document, this deviation will have to be cleared with UE prior to any action begin taken.

The descriptions of the different products/items/materials in this document only serve as the required bases and all items must be clearly and meticulously described when drawings are made and bills of quantities are drawn up, so that no doubt can arise in respect to intended meanings.

1. UNIVERSAL ACCESS

1.1 PURPOSE AND APPLICATION OF THIS DOCUMENT

The UFS commits itself, within reasonable capacity (e.g. finance, facilities, etc.) to create a barrier-free physical and built environment for the inclusion of persons with disabilities.

- All buildings to be accessable
- Stairs to be avoided and only ramps are allowed
- Ramps are prefered as the main access into a building

Thus, the introduction and first chapter of this technical manual is purposed to assist and expand the application of the South African National Standard (SANS) 10400-S: 2011 speaking to facilities for persons with disabilities at the University of the Free State by providing

- Principles of Universal Design;
- Universal Design guidelines
- Norms and Standards for specific building types

The guidelines apply to contractors, architects and other persons involved with capital projects as well as upgrading of existing infrastructure projects together with the University of the Free State (UFS) Grounds and Estates Department.

1.2 PRINCIPLES OF UNIVERSAL DESIGN

Best practices in universal design is defined as building practices and procedures that comply with universal design principles and provide affordable design practices that meet the needs of the widest possible range of people who use the facilities. Not all best practices apply in the same situation and therefore all technical specifications must be carefully considered and discussed together with local authorities, architects and building owners.

1.2.1 UNIVERSAL DESIGN

“Universal Design is the design of products and environments to be usable by all people to the greatest extent possible, without the need for adaptation or specialized design” (Ron Mace).“The intent of the universal design concept is to simplify life for everyone by making products, communication and the built environment more usable by more people at little or no extra cost.

The universal design concept targets all people of all ages, sizes and abilities” (Ron Mace).“Universal Design is a strategy, which aims to make the design and composition of different environments and products accessible and understandable to as well as usable by everyone, to

the greatest extent in the most independent and natural manner possible, without the need for adaptation or specialized design solutions” (Council of Europe Committee of Ministers).

The main basis of Universal Design is moving away from the concept of the ‘average man’ or the ‘individual with a problem’ and thus the recognition of human diversity.

Previous approaches to the concept of Universal Design included ‘environmental access’, ‘special needs facilities’, ‘barrier-free design’ and many other initiatives, which focused more on physical access, whereas Universal Design extends to information nd communication technology, orientation and way-finding systems and most important pro-active management and operational systems.

1.2.2 PRINCIPLES OF UNIVERSAL DESIGN

1.2.2.1 PRINCIPLE ONE: EQUITABLE USE

“The design is useful and marketable to people with diverse abilities”

Guidelines	Measurements
Provide the same means of use for all users; identical wherever possible; equivalent when not	All potential users could use this product in essentially the same way, regardless of differences in personal capabilities
Avoid segregating or stigmatizing any users	Potential users could use this product without feeling segregated or stigmatized because of differences in personal capabilities
Make provisions for privacy, security and safety equally available to all users	Potential users of this product have access to all features of privacy, security, and safety, regardless of personal capabilities
Make the design appealing to all users	This product appeals to all potential users

1.2.2.2 PRINCIPLE TWO: FLEXIBILITY IN USE

"The design accommodates a wide range of individual preferences and abilities"

Guidelines	Measurements
Provide choice in methods of us	Every potential user can find at least one way to use this product effectively
Accommodate right-or-left handed access and use	This product can be used with either the right or left hand alone
Facilitate the user's accuracy and precision	This product facilitates (or does not require) user accuracy and precision
Provide adaptability to the user's pace	This product can be used at whatever pace

1.2.2.3 PRINCIPLE THREE: SIMPLE AND INTUITIVE

"Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level."

Guidelines	Measurements
Eliminate unnecessary complexity	This product is as simple and straightforward as it can be
Be consistent with user expectations and intuition	An untrained person could use this product without instructions
Accommodate a wide range of literacy and language skills	Any potential user can understand the language used in this product
Arrange information consistent with its importance	The most important features of this product are the most obvious
Provide effective prompting and feedback during and after task completion	This product provides feedback to the user

1.2.2.4 PRINCIPLE FOUR: PERCEPTIBLE INFORMATION

"The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities."

Guidelines	Measurements
Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information	This production can be used without hearing
Maximize 'legibility' of essential information	This product can be used without sight
Differentiate elements in ways that can be described i.e. make it easy to give instructions or directions	The features of this product can be clearly described in words (e.g. in instruction manuals or on telephone help lines)
Provide compatibility with a variety of techniques or devices used by people with sensory limitations	This product can be used by persons who use assistive devices (e.g. eyeglasses, hearing aids, sign language or service animals)

1.2.2.5 PRINCIPLE FIVE: TOLERANCE FOR ERROR

"The design minimizes hazards and the adverse consequences of accidental or unintended actions"

Guidelines	Measurements
Arrange elements to minimize hazards and errors: most used elements, most accessible, hazardous elements eliminated, isolated, or shielded	Product features are arranged according to their importance
Provide warnings of hazards or errors	This product draws the user's attention to errors and hazards
Provide fail safe features	If the user makes a mistake with this product, it won't cause damage or injure the user
Discourage unconscious action in tasks that require vigilance	This product prompts the user to pay attention during critical tasks

1.2.2.6 PRINCIPLE SIX: LOW PHYSICAL EFFORT

"The design can be used efficiently and comfortably and with a minimum of fatigue"

Guidelines	Measurements
Allow user to maintain a neutral body position	This product can be used comfortable (e.g. without awkward movements or postures)
Use reasonable operating forces	This product can be used by someone who is weak or tired
Minimize repetitive actions	This product can be used without repeating any motion enough to cause fatigue or pain
Minimize sustained physical effort	This product can be used without having to rest afterward

1.2.2.7 PRINCIPLE SEVEN: SIZE AND SPACE FOR APPROACH AND USE

"Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture or mobility."

Guidelines	Measurements
Provide a clear line of sight to important elements for any seated or standing user	It is easy for a person of any size to see all important elements of this product from any position (e.g. standing or seated)
Make reach to all components comfortable for any seated or standing user	It is easy for a person of any size to reach all the important elements of this product from any position (e.g. standing or seated)
Accommodate variations in hand and grip size	This product can be used by a person with hands of any size
Provide adequate space for the use of assistive devices or personal assistance	There is enough space to use this product with devices or assistance (e.g. wheelchair, oxygen tank, or service animal)

1.3. EXPLANATION OF SYMBOLS

The following provides an outline the explanation of the symbols used.

1.3.1 THIS SYMBOL IS USED TO DENOTE ACCESSIBILITY ELEMENTS THAT ARE MOBILITY-RELATED:

- Persons experiencing balance and dexterity difficulties. People lacking touch or are haptic impaired.
- Persons with terminal conditions such as HIV/AIDS and Cancer.
- Persons experiencing high levels of incontinence.
- Persons experiencing problems with fatigue and operating mechanisms and tools.
- Persons outside the 90th Percentile of Height ('persons of shorter stature – "dwarfs"' and persons taller than 1.8m).
- Persons with reach, dexterity and manipulation problems.
- Persons with circulation problems.
- Persons with physical impairments/disabilities: paraplegia, quadriplegia, hemiplegia, cerebral palsy, post-polio paralysis.

1.3.2 THIS SYMBOL IS USED TO DENOTE ACCESSIBILITY ELEMENTS THAT ARE VISUALLYRELATED.

- Persons with visual impairments.
- Persons with vision just short of 'normal' visual range.
- Visual disorders arising from age or disease.
- Persons with total/profound blindness.
- Persons with navigational difficulties.
- People with difficulties orientating themselves in environments.
- Persons who experience difficulty processing visual information.
- Persons requiring non-visual means of communicating information.

1.3.3 HIS SYMBOL IS USED TO DENOTE ACCESSIBILITY ELEMENTS THAT ARE INTELLECTUALLY, COGNITIVELY OR PSYCHOLOGICALLY RELATED.

- Persons with intellectual impairments.
- Persons with neurological disorders.
- Persons with mental disabilities
- Persons with learning difficulties (dyslexia).
- Persons with developmental disorders (e.g. autism, Down's Syndrome)
- Persons with psychosocial impairments (e.g. Depression, Anxiety, Bipolar, Schizophrenia)
- Persons with difficulty navigating and orientating themselves in environments.
- Persons experiencing difficulties with comprehension.
- Persons experiencing difficulties in understanding visual information especially text.
- Persons that require non-text visual forms of information.
- Includes persons who have epilepsy and have albinism.

1.3.4 THIS SYMBOL IS USED TO DENOTE ACCESSIBILITY ELEMENTS RELATED TO AUDITORY AND OTHER COMMUNICATION RELATED ISSUES.

- Persons with hearing impairments.
- Persons with residual hearing loss.
- Persons with pre-lingual and post-lingual hearing loss.
- Persons experiencing difficulties with superfluous environmental sound.
- Persons who experience signal-tonoise problems.
- Persons who require safety and clarity in the visual environment.
- Persons requiring communication points and aids.

1.4 PARKING AND LOADING/ UNLOADING ZONES

DESIGN GUIDELINES

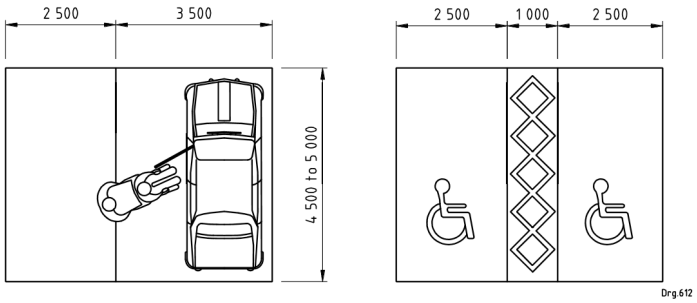
1.4.1 RUN-IN/OUT

- Location of parking areas and loading/unloading areas should be conspicuous at the run-in/out, with adequate directional signage wherever necessary;
- Signage for the direction to way out should be conspicuous from the parking areas and loading/ unloading facilities.

1.4.2 ACCESSIBLE CAR PARKING

Accessible car parking means that sufficient space is provided next to the vehicle so that the user of a wheelchair and people requiring assisted devices can transfer and maneuver to and from the vehicle on level ground. The following items require attention:

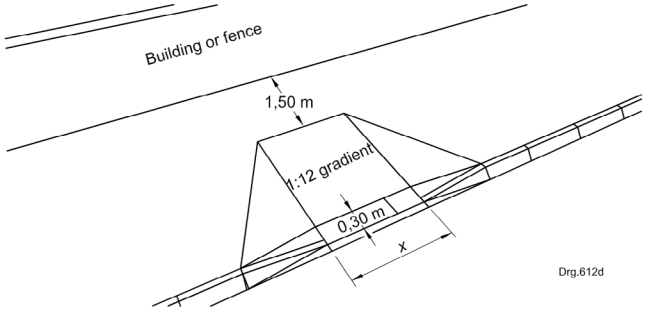
- The accessible car parking space should be on level ground and gradient of accessible parking area should not exceed 1:50.
- Locate designated parking bays close to the main building entry or lift lobby linking to the main entrance and upper floors.
- Provide safe accessible path to the building entry i.e. the main front door or the entry to the building used by most people.
- Provide the International Symbol of Accessibility in front of each designated car park space, not lower than 1500mm from the floor so that it can be seen over the car, with good color contrast to the background.
- Provide kerb ramps for safe access to adjacent walkways.
- Post restricted speed limit signage at conspicuous locations in the car park.



a) Full width for wheelchair needed adjacent to standard bay

b) Marked out shared space between two standard bays

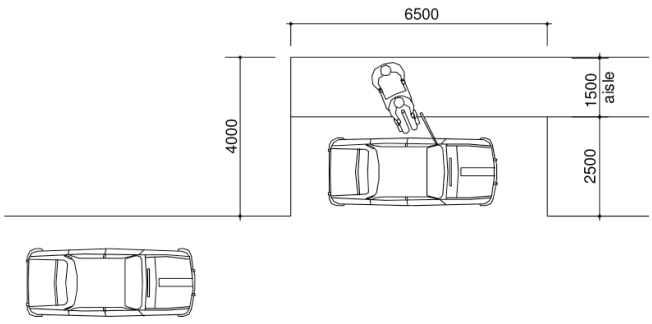
- Provide adequate maneuvering space at junctions where the vehicular access links with the vehicular ramp to higher levels of the car park.



- Consider a more gentle gradient like 1:8 for the vehicular ramp to higher levels of car parks to allow for maneuvering requirements of larger paratransit vehicles, mini-vans and coaches.

1.4.3 LOADING/UNLOADING AREAS

- Loading/unloading areas for vehicles with wheelchair passengers should be provided near the access to the main entrance or lift zone;
- A smooth and safe accessible route should be provided from the loading/unloading areas to the major facilities, entrance or lift lobby.



1.4.4 CONTINUOUS ACCESSIBLE ROUTE

In planning for accessible parking, the principle of continuous accessible route and details such as signage, kerb ramps, car park entry should be considered. The following items require attention:

- The access aisle for share use of two accessible car spaces should be a minimum of 1500mm wide;
- Provide slip-resistant floor finish and paving at the accessible path;
- Post clear directory signage showing entrances to lifts, and along accessible routes to the car park.

1.5 SIGNAGE

DESIGN GUIDELINES

Wayfinding should be included with general signage.

1.5.1 INFORMATION

Facilities for people with diverse abilities should be identified by the International Symbols of Accessibility.

Inaccessible routes shall have directional signage to indicate the route to the nearest accessible entrance.

1.5.2 INFORMATION COUNTERS

- Tactile guide path should lead from the entrance to the information counter, and from the counter to major circulation routes, lift zones or major circulation routes
- High and low counters should be with a projecting counter.
- Low counter should be a projecting counter top to provide knee space for wheelchair users.
- Notches at sides of counter tops are preferable for holding crutches, guiding sticks, and umbrellas.

1.5.3 ORIENTATION

The design of distinct functional areas and routes in a building should be clearly identified through color, signage and in other ways to assist orientation within a building. Landmarks that can easily be distinguished by visually impaired individuals are useful as orientation cues. Such cues include changes in illumination level, bright colors, unique patterns, wall murals, location of special equipment or other architectural features.

- Internal layout for public facilities should be able to communicate itself to orient visitors with a sense of direction within the space.
- Major functional points should have a heightened design language to tell its location.
- Spatial treatment of different facilities should be able to reflect their relative significance.

1.5.4 LANDMARKS

Landmark objects can assist at wayfinding decision points, e.g. sculptures, wall paintings, trees or plantings or a water feature.

1.5.5 SIGNAGE DISPOSITION

- Signage should be adequately provided at eye-catching locations at an appropriate height and with an appropriate size.
- Directional signage should be provided at wayfinding decision points.
- Effective lighting should be provided to make the signage noticeable at all times.
- Warning signs should be provided for all clear glazed panels and glass doors.

1.5.6 INFORMATION TRANSMISSION

- Directional and location signs should be provided to give information on accessible routes, lifts and escalators, entrances and exits, information counters, sanitary facilities, health care facilities, communication facilities and functional areas.
- Assistive listening systems should be provided for hearing impaired persons, where possible.

1.5.7 MAPS AND DIRECTIONS

Directories and floor plans, where provided, should be located at the main entrance to a building, or in a designated place on the floor of entry,

and at other strategic locations on different floors and levels. Although they should be located at a prominent position, they should not obstruct the general pedestrian flow.

Bottom level of directories should be at a maximum height of 900mm from floor level. They may be free standing o wall mounted and with 'You are here' indicated. For free standing ones, they should ideally be slightly inclined from the horizontal, in line with the building's orientation.

1.5.8 SIGNAGE DETAILS

- Contrasting colors should be used for the signs against its background
- Words and letters should be of adequate size, height, boldness and suitable fonts for legibility.
- Graphics and wordings should be informative and easy to comprehend.

1.5.9 IDENTIFICATION AND ROOM SIGNS

Many people with disabilities have limitations in movement of their heads and have reduced peripheral vision. Signage positioned perpendicular to the path of travel is easiest for them to notice. People can generally distinguish signage within an angle of 30 degrees to either side of the centerlines of their faces without moving their heads.

1.5.10 ILLUMINATION AND COLOR CONTRAST

Signage should be well lit. Illumination levels on the sign surface should be in the range of 100 to 300 lux and shall be uniform over the sign surface. Signs shall be located such that the illumination level on the surface of the sign is not significantly exceeded by the ambient light or visible bright lighting source behind or in front of the sign.

Materials for signs should have a non-reflective surface. An eggshell finish is recommended. Signs are more legible for persons with low vision when characters contrast with their background by at least 70 percent.

1.5.11 VISUAL TEXT

- Text on signs should be clear and simple.

Avoid long lists of items on signs. Shorter columns are easier to read and remember.

1.5.12 TACTILE TEXT AND BRAILLE

For tactile text, all characters should preferably be uppercase in simple font style such as sans-serif. Characters should preferably not be italic, oblique, script, highly decorative, or of other unusual forms.

Tactile characters shall be raised 1mm minimum above their background and should be accompanied with Braille directly below the text. The depth of any embossing should be at least 2mm.

Braille shall be located below the corresponding text and preferably be justified to the left. If text is multilined, Braille shall be placed below the entire text. Braille shall be separated 6.5mm minimum from any other tactile characters.

1.5.13 PICTORIAL SYMBOLS

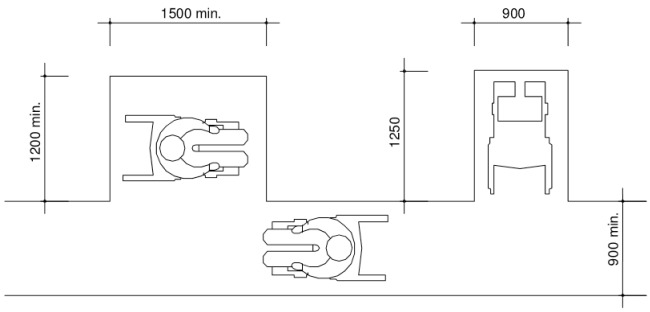
Internationally recognized pictorial symbols or pictograms, with explanatory text, should be used wherever possible.

Pictograms shall have a field height of 150mm minimum. Characters or Braille should preferably not be located in the pictogram field.

1.6 PEDESTRIAN CIRCULATION

DESIGN GUIDELINES

1.6.1 CONFIGURATION



- Pathway width should be sufficient to allow at least two wheelchair users to pass each other.
- Straight pathway is preferred.
- Pathway edges should be conspicuous and protected to avoid wheels from dropping off.
- Projections should be of suitable height and projecting width to avoid accidental bumping, and should not obstruct the pathway users.
- Channel grating slots should not be parallel to the major traffic direction, slot sizes should be small enough to avoid trapping of crutches or wheels.
- Effective lighting should be provided.
- Accessible walking surface
- Persons with special needs or with a disability shall have the same level of freedom of movement as ordinary persons within a building or at external area.
- Access should be made available for all people to approach, enter or leave a building and to use the facilities independently.
- A walkway with a gradient not steeper than 1 in 20 or a ramp of gradient not steeper than 1 in 12 would form an accessible route.

1.6.2 WALKWAYS

- Width of walkways shall not be less than 1100mm clear. Best practice is to provide 1200mm wide walkway to enable a wheelchair to turn, and preferably 1500mm to allow two wheelchairs to pass.
- Safety measures in the form of buffer planters, railings, safety barriers or warning should be provided if a walkway passes through any area.
- Walkways should be clear of obstruction.
- Special consideration is required to recess or eliminate obstacles when walkways cross over spaces with low headroom such as spaces under escalators and staircases, or when fittings projecting more than 100mm beyond the wall surfaces and below 2000mm high are found along the walkway.
- A covered walkway or ramps is recommended where access is provided between platforms or facilities at different levels. A covered walkway should be provided linking two buildings where frequent access between the buildings is required.

1.6.3 SURFACE AND LEVEL CHANGES

- Walkway surfaces should be stable, firm and should general in a continuous plan with a minimum of surface warping.
- A cross-slope of walkways should not exceed 1:50 pavement on streets with the natural topography not exceeding 1:20.
- Walkways should have a continuous common surfaces and not interrupted by steps or changes in level greater than 6mm.
- Thresholds should not exceed 25mm in height and should be bevelled to facilitate smooth passage of wheels.
- The intersecting surface where a walkway crosses or joins streets, public footpaths, driveways or parking area should blend into a common level with slope no greater than 1:20, or a dropped kerb should be provided.

1.6.4 DRAINAGE

- Fall and drainage shall be designed to minimize water ponding or flow of water across walkways.
- Channel cover gratings located in walkways should be designed with spaces less than 13mm. Holes in channel covers should not be greater than 20mm.
- Covers to a channel shall be flushed with the surface of the walkway.
- Outdoor walkways, ramps and their approach should be designed so that water will not accumulate on walking surfaces.
- Structural fail should be considered for effective rainwater discharge.

1.6.5 BRAILLE AND TACTILE GUIDE

- Tactile roots and guides are allowed for in general curculation as part of landscaping

1.6.6 CHANGES IN LEVEL

- Ramps, dropped kerbs or sloping grounds should be used to connect changes in level, in addition to steps and stars if any.
- Warning should be provided at a suitable distance before the change in level.
- For slight change in level, a full width continuous sloping ground accessible for all its preferable than a separate ramp.
- Effective lighting or footlight should be provided to make the change in level clearly visible.

1.7 RAMPS AND SLOPING GROUNDS

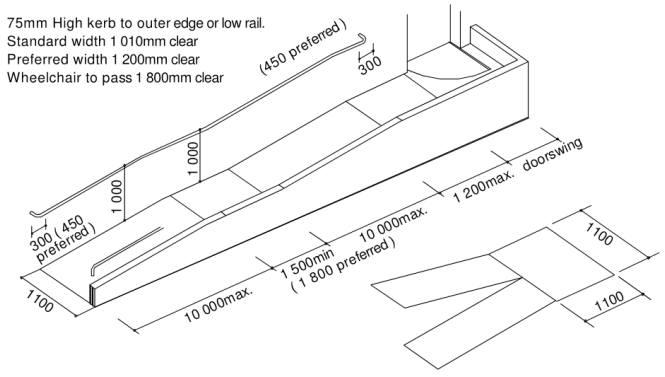
DESIGN GUIDELINES

Ramps are sloping walkways and should have the least possible gradient. It is desirable to have more gentle slopes and slopes are recommended to reduce a gradient of 1 in 20 if possible. The maximum gradient of a ramp shall be 1:12 measured between any two points on the ramp.

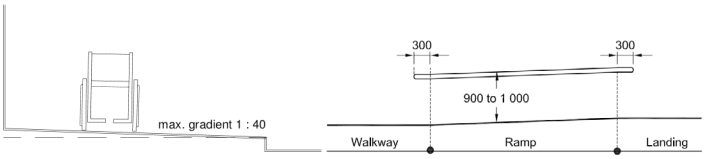
The minimum clear width of a ramp shall be 1100mm. Similar to walkways, a width of a ramp should be at least 1200m for a wheelchair to turn or at least 1500mm for 2 wheelchairs to pass. Handrails shall be provided on both sides of a ramp.

1.7.1 GRADIENT, RISE AND LANDING

Ramps that change direction between runs through 90 degrees at landings shall have a 1200x1100mm (minimum) landing. Where a ramp changes direction through 180 degrees, the landing at the switchback shall be at least 1200mm wide. (See Figure 3.4.3)



- The recommended maximum rise for any run is 800mm.
- Landings for turning and resting should be provided. A minimum landing of 1500mm by 1500mm shall be located at the bottom and the top of each ramp. A landing of width and length not less than the width of the ramp should be provided with the ramp changes direction.
- The maximum length of a ramp run between landings shall not exceed 10m length of horizontal run or part thereof, and the landing should not be less than 1200mm long.
- Circular ramps are not recommended.
- The cross slope of ramp surfaces should not be greater than 1:50.
- Landings shall be level and unobstructed by protections and door swings.
- If a ramp with a rise greater than 200mm leads down towards an area with vehicular traffic, a railing or barrier across the full width of its lower end, not less than 1500mm from the foot of the ramp shall be provided for safety purposes.



1.7.2 SURFACES

- Ramp surfaces shall be stable, firm, and slipresistant.
- Similar to walkways, ramps should be clear of obstruction. If unavoidable, they shall extended downwards to the ramp level or be guided by tactile flooring materials.
- Outdoor pedestrian ramps should be provided with adequate drainage guiles at each side of the ramp to drain away exclusive surface water running down the ramp.

1.7.3 EDGE PROTECTION

- Ramps and landings with drop-offs should have edge kerb, railings or projecting surfaces to prevent people from slipping of the ramp.
- Edge kerbs should have a minimum height of 100m. For difference of adjacent levels greater than 600mm, lowermost solid protective edge should be 150mm high.

1.7.4 STAIRS AND STEPS

Staircases and steps should not be used as the main means of vertical circulation if alternative means such as ramps or elevators are feasible. This is because staircases cannot be used by wheelchair users and are not easily negotiated by a number of users, e.g. ambulant impairment persons, pregnant women, young and elderly.

- The 150mm level difference between the floor next above the external ground or adjoining surface is required.

- Slopes not steeper than 1:20 or ramps not steeper than 1:12 should be used to replace the 150mm step at all entrances/exit to buildings or facilities wherever feasible. The priority choice in means of access provision are shown in the table below:

Priority	**Means of access**	**Approach space requirement (150mm rise)**
1st	The whole width of the entrance/exit is accessible with a slope not steeper than 1:20	3000mm (f there is no door) + 1500mm (landing for door)
2nd	The whole width of the entrance/exit is accessible with a ramp not steeper than 1:12 (railings are required on both sides)	1800mm (if there is no door) + 1500mm (landing for door)
Last	150mm step with a 1:12 ramp attached (railings are required on both sides of ramps)	1800mm for a perpendicular ramp (no door) + 1500mm (landing for door) or 1500mm for a ramp parallel to the entrance

An alternative accessible route, e.g. by means of a lift or ramp, should be provided nearby within sight from the position of the staircase.

- If the accessible route is not available within sight, appropriate signage should be provided to guide users in need to the accessible route.

- Stairlifts are not means of universal access. Facilities requiring universal access will not be considered satisfying the universal access requirement if only stairlifts are provided without an alternative accessible route. Stairlifts should not be used in the design of new buildings.

1.8 FLOOR SURFACE MATERIALS

DESIGN GUIDELINES

- External ground floor materials should be non-slippery.

- Floor materials should not be too rough to make the surface too bumpy or to give wheels flat fires.

- Surface materials with less glare are preferred.

- Material joints should be smooth with minimum recess/projections and minimum width.

- Floor surfaces should be level and even.

- Types of surface materials should preferably be different for the main pathway and other pathways, but too many different surface materials may cause confusion.

1.8.1 GRATINGS

- If gratings are located on walking surfaces, the size of the openings shall be as small as possible to avoid trapping wheelchairs or sticks.

- Elongated openings in gratings shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

- The gratings should be of approximate material and securely fixed to avoid removal; otherwise, the uncovered drainage channel will form a difficult barrier.

1.8.2 TACTILE SURFACES

Tactile surfaces are used for guidance paths, information and warning to openings and edges for persons with visual impairments. There are three types of tactile surfaces that are commonly used to guide and alert people.

- Directional tile: It consists of raised parallel bars to guide people along the direction of a tactile path.

- Warning tile: It consists of raised truncated domes arranged in square grid parallel to the sides of the tile to alert people of potential hazards such as top and bottom of stairs, door openings and at pedestrian crossings.

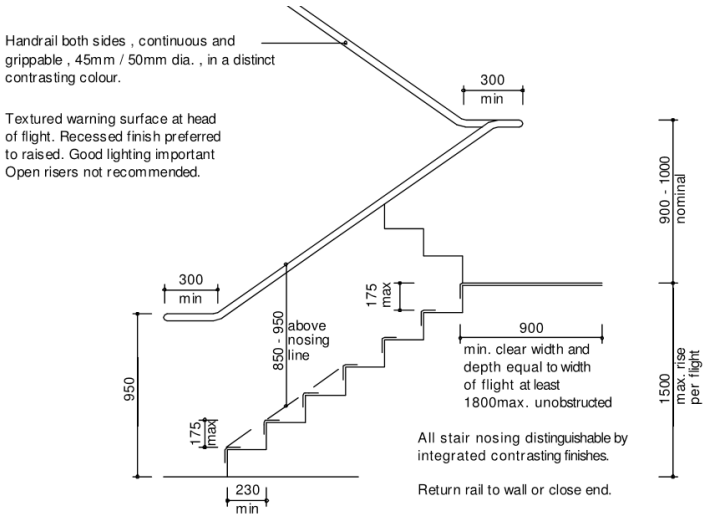
- Positional tile: It consists of raised small dots arranged in staggered positions to indicate change of walking direction.

In designing an access to a facility or a building, the selection of floor materials may be different for exterior or interior environment. In all cases, it is important to bear in mind that the tactile surfaces should be firm and slip resistant.

- The material used to provide contrast should be an integral part of the walking surface.
- It is desirable for tactile surfaces used on interior surfaces to differ from adjoining walking surfaces in resiliency or in the sound made by contact with the guiding stick of the visually impaired.
- Tactile surfaces should convey meaningful and continuous information to the user, e.g. the tactile guide path to the lift lobby should lead to the lift button position and then the lift door opening position. The call buttons and other associated information in Braille should convey the necessary information to complement accessibility.
- Continuous tactile guide paths should be provided to entrance/major facilities, information counters, braille maps and lifts.
- Directional, positional, location and hazard warning tactile surfaces should be correctly laid to convey correct information.
- Tactile surfaces should be laid at a distance from wall surfaces to facilitate left handed or right handed persons with guiding sticks.
- Avoid any door swings into the tactile surfaces.
- Tactile surfaces should preferably be segregated from pathways for wheelchair users to avoid conflict between the two user groups.
- Contrasting colors can make the tactile surface noticeable.

1.9 HANDRAILS

DESIGN GUIDELINES



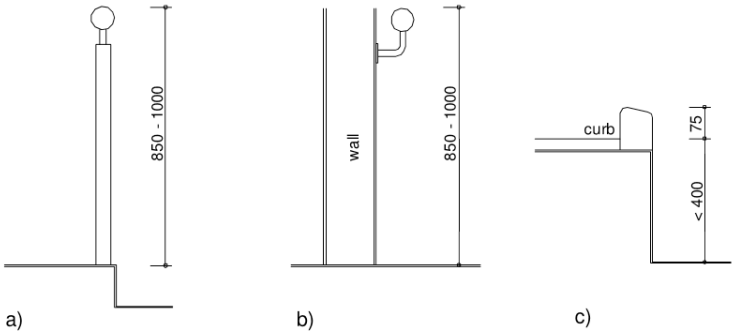
External stair (stepped approach)

Handrails should be provided to all ramps, staircases and steps. They can also be used alongside with a tactile guide path, along corridors, as protective barriers and guard against hazards, and can be a directional guide to doorways or positions of signage.

Where continuous handrails are necessary, for example, in elderly residencies, or handrail is used as a means for way-finding by persons with visual impairments, the arrangement at openings such as doorways, service ducts, hose reels should be carefully considered to avoid conflict or breaking of the handrail.

The following items require attention:

- Handrails at two-level mounting heights should be provided for places frequently visited by children.
- Handrails should be continuous with recessed brackets.
- Ends of handrails should be returned to the wall, floor or post so that they do not become obstructions.
- Handrails should be securely fixed and durable to avoid posting danger to users relying on them for assisted walking.
- Materials should be smooth and offer a firm grip
- Size and shape of handrails should offer a firm grip
- Materials for external handrails should not retain large amount of heat or coldness



- Braille, tactile or 3-dimensional signage at top and bottom ends of handrails can provide direction and location information.

- The entire component should be securely fixed to the building structure and conveniently located so they can provide secure hand grip for persons to take their entire weight when required. Handrails should not rotate within their fittings.

- Railings designs that allow children to climb must be avoided.

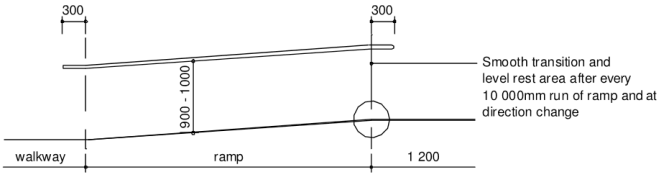
- Heights of handrails are preferably to be provided in pairs for adults and children, one at a height between 850-950mm and a lower one at a height between 450-500mm, measured vertically from the surface of the ramp or finished floor level to top of handrail.

- Handrails shall be continuous without interruption, except at doorways and openings and with recessed brackets so that a hand can move from end to end without interruption.

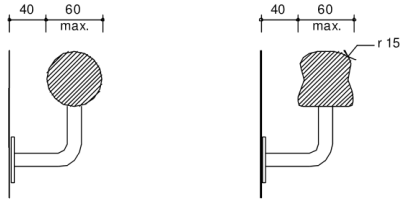
- The gripping surface should be free of any sharp or abrasive elements.

- The handrail should be consistent throughout the entire length to avoid sending false messages to visually impaired due to change of material.

- Handrails should be installed to resist a load of not less than 1.3kN applied vertically or horizontally.



a) Elevation of handrail



b) Typical profiles of handrail

1.10 LIGHTING AND ILLUMINATION

DESIGN GUIDELINES

Lighting is the key element in defining the shape of spaces and helps with orientation.

- Entrance areas, foyers and lobbies should be used as transition areas to enable people to adjust to changes in lighting levels from outside to inside and vice versa, and to lighting levels within different parts of a building or facility. In public buildings, electronic monitoring of lighting levels inside and outside should be considered.

- Light fittings should be positioned 2000mm from ground or floor level in accessible pathways.

- Uplighters should never be used as street or floor level as they will cause confusion and pose as an obstacle.

- Light fittings should be positioned where they do not cause glare, reflection, shadows or pools of light and dark. The illumination level is much affected by where the fittings are located. For example, if the light fittings are located near one side of the corridor wall, the illumination level on the opposite wall may be inadequate. The situation may be worsen if there are other services running along the counter blocking the light source.

- Light colors for walls and ceilings will help to reflect and diffuse the light. Large areas of gloss finish on walls or ceilings are not desirable.

- Light fittings in circulation and work areas should be selected to have non-directional even light spread.

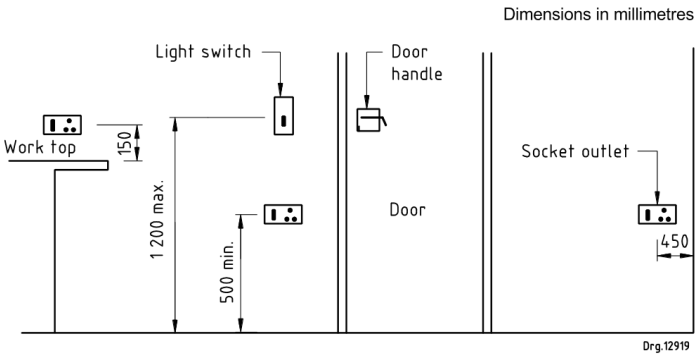
1.10.1 USE OF LIGHTING

- Use lamps with good color rendering properties where appropriate, for example, use ‘daylight’ lamps.

- Fluorescent light fittings should be screened, maintained to avoid flicker, and located to avoid interference with hearing maintenance systems.

- All lighting systems should be compatible with hearing enhancement and radio frequency systems.

1.10.2 SWITCHES, SOCKETS AND CONTROLS



- Light switches at 1100mm to 1200mm high, and thermostats 1200mm maximum height.
- Electrical sockets at 450 to 500mm high from floor level.
- Electrical panel with top not more than 1400mm above floor level with a minimum 760mm x 1200mm clear floor space in front.
- Switches or sockets with color and luminous contrast from surrounding finishes and walls should be provided.
- Large button type switches, easy-touch rocker or hands-free motion detector light switches should be considered.
- Remote controls are desirable for lights, heating and cooling.
- Doorbell intercoms connecting to portable telephones are desirable.
- • Audible and visual alarms for doorbell, baby monitor, and smoke detectors should be considered.

1.10.3 LUMINOUS CONTRAST

Color and luminous contrast is essential for differentiating an object with its background and detecting level difference. The use of lighting can improve color contrast difference between stair treads and risers. Illumination from above the stairs to provide higher illumination to the tread surface to contrast with the riser surface is preferred. Lighting should also be used to provide better contrast between countertops and front edges or cabinet surfaces.

- Luminous contrast should be provided to distinguish floor and wall surfaces.
- Luminous contrast should be provided at changes in levels.
- Too strong visual contrast is undesirable to persons with low vision.
- Natural lighting provision at passageways or corridors provides clues and stimulation for day and night orientation.

2. GENERAL SPECIFICATIONS

- It is considered that if a professional service is being rendered, the service provider is aware of national legislation and provincial and municipal regulations and will adhere to such requirements. All inspections, etc. applicable in this respect remain the responsibility of the PA to see that it is adhered to.

- It is the responsibility of the PA or his delegates to obtain all relevant service plans and existing fixtures from PM before planning and that it must be pointed out on site before actual construction.

- Contractors to consider current ongoing activities associated with the UFS.

- Rubble to be removed on a weekly basis with the least amount of disruption.

- It will be regarded the Contractor's responsibility to timeously prepare, submit and obtain the specified designs and guarantee certificates applicable to each project as well as all the necessary service drawings eg: sewerage, low- and high voltage cabling, water, etc.

- All bills of quantities to be submitted for approval by PP prior to tender invitation.

-Only selected sub-contractors to be used for electrical and mechanical installations.

- All Bills of quantities above R1 million to contain targeted procurement.

- Public reliability to be provided by the contractor.

- No payment guarantees will be issued by the UFS.

- Escalation to be always excluded. (Fixed sum contracts).

- The contractor will not be allowed to use the option of retention as guarantee.

- Applicable Municipal inspections must always be adhered to.

- Health and safety requirements to be included in tender documents. Safety requirements must be clearly stipulated in this document.

-JBCC principal building agreement to be used as contract. Deviations to be included as specified by PP.

- A Building Life Cycle Maintenance document to be handed over to PP upon first delivery. Consultants must aquaint themselves with the required content.
- No construction above or over existing infrastructure without prior written approval of PM.

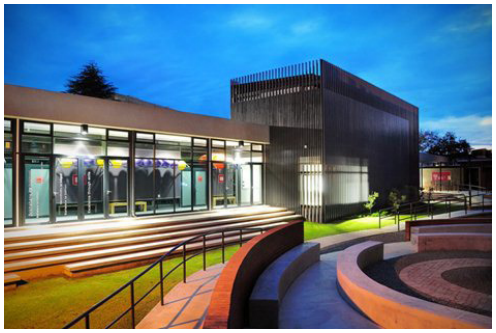
- Colour schemes and finishes must be presented to PP as a complete presentation and to be approved before issuing any instructions to contractor.

- Staff Quarters to be provided at each building.

- Professional cleaning of building to be included in bill of quantities.

- All ground floors of buildings to be access able for persons with disabilities.

-All work must comply with NBR (National Building regulations) and SABS (South African Bureau of Standards).


2.1 DRAWINGS

- Drawings must comply with the local authority and PP specifications.

- Drawings to be submitted electronically to PP on site handover date by e-mail and on CD-Rom and hard copies, delivered to the PP office.

- The electronic format of drawings must be in CAD format (Caddie or AutoCAD) - thus drw, cex, dwg or dxf format.
- If caddie format is used, edition 9-16 is acceptable

- If AutoCAD format is used, up to edition 2008 is acceptable because AutoCAD is not generally used by UFS.

- When using Model Space (when making sketches, etc.) in AutoCAD, each drawing must be layered separately on the relevant A0 or A1 size paper.

- Each drawing submitted must be to the scale of 1:100 and the Title Block must contain all the necessary information regarding the Name of the Architect, drawing particulars and the specific drawing number. Revisions to be indicated clearly.

- If detail drawings (e.g. bathrooms, toilets, cabinets, etc.) are submitted according to another scale as mentioned above, (e.g. 1:50) it must be clearly mentioned/ indicated.

- If working with program layers they must not be locked or hidden but must be open and accessible.

- As-built-drawings should be submitted:
    - upon practical completion.
    - Municipal approved drawings to form part of contract documentation and kept at PP.
- No Final Drawings in .pdf format will be accepted.
- As-built drawings must consist of:
    - Foundations
    - Electrical
    - Mechanical
    - Water
    - Ground floor layout
    - Elevations
    - Roofing layout
    - Ceiling
    - All schedules: Doors, windows
    - Cabinet and other detail drawings

3. EARTHWORKS

Poison the foil/filling of foundations and under floors with soil insecticide to eliminate termite infestation. A certificate should be obtained from the contractor.

4. CONCRETE,FORMWORK AND REINFORCEMENT

To be done in accordance with engineers' specifications.

5. MASONRY

- No cement bricks to be used
- Lintels to be installed above doors, arches, and windows.
- Brick force to be minimum every third course and above lintel height every second course.
- Only prior approved face bricks to be used.
- The cavity between the wall and the sides of steel door frames must be filled.

6. WATERPROOFING

-Damp proof membrane must always be placed underneath concrete floors up to the outside end of the brickwork
-Only prior approved products may be used.
-Waterproofing must carry a 10-year written guarantee
-Damp proof course to be installed under windowsill.

7. ROOF COVERING

- Rainwater goods to be omitted and only used by exceptions. Provision must be made for run-off water.
- If gutters and down pipes are used (the exception), it must be sealed off with waterproofing material. All down pipes to be at least 100mm diameter.
- Plastic down pipes and gutters is not allowed.
- Outlets and down pipes inside concrete columns are not allowed.
- Outlets must be easily accessible.
- Only 45-degree bends may be used for down pipes.
- Roof slopes to be sufficient.

7.1 METAL

- Corrugated roof iron to be minimum 0.6mm thick.

7.2 TILES

- Plastic damp proof membrane to be placed over trusses before battens are installed.
- Every second tile on the ridge of the roof to be secured with nails.
- The bottom 3 rows of roof tiles must be nailed to the battens and thereafter, every consecutive row. The final row at the ridge, regardless of the subsequent row of tiles, must also be nailed to the battens.

7.3 FASCIA BOARDS

- Fascia boards to be fixed to trusses/purlins with screws and not with nails and joined with 0.5mm thick H-profile galvanised sheet metal cover strips.

8. CARPENTRY AND JOINERY

- Supawood to be used as far as possible and no chipboard. Solid wood at request of the customer.
- All wall plates, including areas where building work around trusses etc. are required, must be treated with Carbolinium.
- Trusses must be fixed with wire ties to brickwork and then secured with hoop iron roof ties to wall plates.
- All purlins must be fixed in accordance to engineers' specifications.

8.1 SKIRTINGS-ALL SKIRTINGS MUST BE PRIOR APPROVED AND FIXED WITH HILTI NAILS.

8.2 DOORS

8.2.1 INTERNAL DOORS

- All internal doors must be semi-solid or solid wood.

8.2.2 EXTERNAL DOORS(WOODEN)

- Must be from meranti or saligna. Where FLB doors are used, braces must be applied.

8.2.3 DOOR STOPS

- All doors must have door stops.

8.3 CUPBOARRDS

- Should have a base to match skirtings.
- Impact edging to be used.
- Where doors exceed 700mm, 3 hinges must be used.
- Tops of cupboards should be prior approved.

9. CEILINGS, PARTITIONS AND ACCESS FLOORING

- Minimum ceiling height to be discussed with PP.
- Brandering to be tampered screwed to trusses.
- No plastered ceilings, bulkheads or decorative ceilings without prior approval of PP.
- Access to ceilings to be sufficient.
- 38mm x 38mm Brandering may not exceed 300mm centres when fixed to bearers.
- Fix brandering, joists or runners with the larger dimension in the vertical position.
- Install supporting brandering where light fittings are to be suspended.
- No decorative cornices and should be prior approved.

10. FLOOR COVERINGS

10.1 VINYL TILES

- Vinyl tiles to be used generally and should be prior approved by PP.
- Vinyl covering should be stripped and sealed by specialists with a relevant guarantee.
- 500 x 500mm Flortime Berber Point 920 carpet tile to be used in offices. Colour to be approved by PR.

10.2 LAMINATED FLOORING

- Wooden laminated flooring or any other floor covering must be approved prior to specified, by PR.
- Entrances to have dust trappers.

10.3 TILING

- Use locally available tiles as far as possible.
- A-grade tiles to be used.
- All tiles must be non-skid.
- Use sufficient expansion joints.
- Expansion joints to be lined with movable joint strip with synthetic rubber inserts.
- Ceramic and porcelain tiles are preferred in areas of high frequency.

11. IRONMONGERY

- A Presentation regarding Ironmongery must be presented to PP and approved before being specified.
- Only generally known trade names to be used.

11.1 SIGNAGE

11.1.1 EXTERNAL SIGNAGE

11.1.1.1 BUILDING NAMES

-Building names attached to exterior of building.
- Cut-out lettering in “Optima font” to be used.
- Size of building name - 320mm high letters. (any other size must be submitted for approval to PP).
- 2/3mm laser-cut mild steel with 5mm/6mm machine screw pins welded on. Powder coated and duco sprayed to required colour.
- Use drilling template, drill holes to allow for required stand-off distance
- Mount using chemical epoxy cement
- Distance from wall: 35mm to 80mm letters - 10mm standoff 100mm to 200mm letters - 15mm standoff 200mm to 300mm letters - 20/25mm standoff

11.1.1.2 DIRECTIONAL ROAD SIGNS

- Use reflective vinyl for lettering, frame and symbols.
- Board: 1mm Chromadec sheet, re-inforced at the back.
- Framework: Round tubing, white painted with 2k paint.
- 2/50x3x300 long plates welded to CHS, installed 600x600x500 Concrete base
- Lettering: Helvetica, 100mm high, Upper and lower case.
- Frame: 20mm with a radius of 100mm
- Arrow: 222mm wide when directing left of right.
- Lettering to be applied 315mm from the left of the board (minimum starting point) and 70mm from the right of the board (ending point).
- Spacing between end of arrow to the left and starting point of lettering to be 238mm.
- A full detailed drawing is available on request from PP.

11.1.2 INTERNAL SIGNAGE

- To be vista or to match existing.

11.1.2.1 DOOR NUMBERING

- Door numbering – Drawings to be forwarded to DO for the allocation of door numbers and approval of size and font.
-Door numbers to be screwed to door frames.

11.1.2.2 OFFICE DOORS

-Vista (V150x400mm).
-Mount 50mm from left door frame, 1600mm from floor. If not possible, then right of door, if not possible, then above door. Only on door at customers request.
-Fasten with mirror tape and adhesive.

11.1.2.3 DIRECTIONAL WALL SIGN

-Vista (V500 x1600 portrait).
-With full colour bubble jet, large format printed insert & clear, nonreflective plastic coating.
-Mount as per architectural layout and customers’ requirements.
-Fasten with Hilti or similar fasteners.

11.1.2.4 SUSPENDED SIGNS

- VL series, landscape. Size will depend on building layout and quantity of information, normally 150 x 600 (landscape)
- Mount with cables provided by supplier. Ceiling mounted 2.5m from floor.
- Install with ceiling hooks.

11.1.3 SAFETY SIGNAGE

11.1.3.1 ESCAPE ROUTE SIGNS

- Photoluminescent (SANS approved)
- Size of sign 190mm x 380mm or 190mm x 570mm

11.1.3.2 FIRE SIGNAGE

- Photoluminescent (SANS approved)
- Size of sign 190mm x 380mm or 190mm x 570mm

11.1.3.3 ELECTRICAL DISTRIBUTION POINTS

- Photoluminescent WW7 (SANS approved)
- Size of sign 190mm x 190

11.2 LOCKS

- Minimum Two keys to every door to be marked and handed to PP

11.2.1 DOOR LOCKS

- Internal doors must be fitted with minimum 2-lever locks. Use well-known brands such as Esco, Union, Yale, or BBL.
- External doors must be fitted with minimum 4-lever locks. Use well-known brands such as Esco, Union, Yale, or BBL.

11.2.2 MAGNETIC LOCKS

- FITTED NOT TO REDUCE DOOR OPENING.

- Install top and bottom barrel bolts.

11.2.3 AUTOMATIC DOOR CLOSERS

11.2.3.1 OVERHEAD TYPE

- When installed onto aluminium doors, install 2 hinges at the top of the door.

11.2.3.2 FLOOR TYPE

- Install on floor level.

12. STRUCTURAL STEELWORK

- Strictly according to engineer detail and specification.

13. ALUMINIUM WORK

- All aluminium doors, windows, shop fronts, etc. are to be manufactured, supplied and installed complete by an approved firm of Specialists and shall comply with AAAMSA design criteria.
- Anodizing or powder coating has been processed in accordance with SANS 999 and SANS 1796 respectively.
- Glazing to be installed in accordance with SANS 0137

14. PLASTERING

- No double plastered walls
- Screed thickness on floors, cast to minimum of 25mm, with 1:4 ration sand/cement.

15. PLUMBING AND DRAINAGE

15.1 GENERAL- SEPARATE BOOSTER PUMPS MUST BE INSTALLED FOR FIRE- AND HOUSEHOLD PURPOSES WHERE NECESSARY.

- All new water pipes that are installed in walls must be pressured tested and inspected.
- Use good quality, heavy duty material as a basic principle. Eg. Cobra heavy duty taps with the code starting with 1.
- If other PVC piping is used, make use of Class 12 pipes.
- Make use of Hilti clamps to fasten piping against walls and ceilings. The use of wire is not acceptable.
- Where piping stops, it must not be bent over but must be sealed with stoppers.
- When installing PVC or sewerage piping, avoid sharp 90-degree bends. Rather make use of 2 x 45-degree bends where applicable.

15.2 INSIDE BUILDINGS - USE CLASS 2 COPPER PIPES WITH CONEX CONNECTIONS. (SOLDERING MATERIAL NOT ALLOWED).

- No stopcocks, -valves, inspection eyes, etc. may be installed behind any cupboard, etc.
- All new water pipes in ceilings to be insulated with Thermo Flex.
- All PVC and Plythene piping in shafts and labs must be clamped and supported well against walls.
- Geysers must be installed securely and in such a way that the electrical heating elements can be easily removed.
- Pressure taps are for use in low pressure piping and is not suitable for high pressure piping. A pressure reducing valve must be installed.

15.3 OUTSIDE BUILDINGS - WARM WATER PIPES TO BE INSULATED TO REDUCE HEAT LOSS.

- Use class 2 copper pipes with Conex connections. (Soldering material not allowed).
- Use galvanised pipes class B. (class A not allowed).
- Use class 12 Duroflo pipes with cast iron fittings or class 10/12 HDPE Plasson pipes with Plasson fittings for subsoil cold water installations.
- All underground water pipes with no thread must be fastened with strong metal pins at the back of all bends and T-pieces, then mortar must be poured around the bends and T-pieces.
- Thread on pipes should be as short as possible, exposed thread to be painted with a rust resistant Epoxy paint. Pipes must be fitted with galvanised connections (preferably Unions) for easy disconnection.
- All water pipes should be cleaned, rinsed and pressure-tested before installing taps or valves.
- Gullies should be fitted with a grid.
- All PVC and Plythene pipes in shafts and labs must be thoroughly clamped and supported.
- Sewerage inspection eyes must be built above ground and be covered with a cast iron lid.
- Stormwater pipes must be big enough to accommodate bigger than usual water run-off.

15.4 STOP TAPS - STOP TAP MUST BE EASY ACCESSIBLE, IF INSTALLED BEHIND A PANEL, THE PANEL SHOULD HAVE HINGES.

- One visible and easy accessible CP Lever Ballcock stop tap must be installed on main pipeline that leads to each bathroom.
- Additional to the main water supply stop tap, (code: 1060-15) Full way CP Ball cocks must be installed on warm and cold-water pipes under taps of basins, sinks and lab basins, etc., as well as toilet ball valves. Note that ballcocks may not be coupled directly to existing pipes.
- Install Stop taps on both sides of the compression valves on a geyser. Ball-oFix taps are allowed.

15.5 FIRE EQUIPMENT- FIRE HOSE VALVES (PREFERABLY SAUNDERS VALVES) MUST BE CLEARLY VISIBLE AND EASILY ACCESSIBLE AND MUST NOT BE LOCKED.

- Connection point of fire hoses must be easily accessible.
- Seal all exposed water & drainage pipes during construction to ensure no rubble will block the pipes and make sure that there are no stoppages before completing the work.

15.6 BATHROOM EQUIPMENT- INSPECTION EYES TO BE INSTALLED WITH EVERY BEND/JUNCTION.

- Install a good quality closable door at the side of a bath.
- Plastic toilet bowls, basins, etc. will not be allowed.
- Stretch-joint in pipe at expansion joint is needed.

16. ELECTRICAL INSTALLATION

16.1 BULK POWER SUPPLY AND MEDIUM VOLTAGE

Bulk Power Supply and Medium Voltage
The bulk power supply authority to respective University of the Free State campuses is as follows:

Bloemfontein Campus	-	Eskom
South Campus	-	Eskom
QwaQwa Campus	-	Eskom

The supply voltage from ESKOM for all Campuses is 11 kV.
The Eskom tariff structure is XXXX, Eskom do all the metering for billing purposes.
The MV reticulation system at each Campus is a ring network connected by means of underground electrical cables. (XLPE & PILC).

16.1.1 SUBSTATIONS

16.1.1.1 GENERAL CONSTRUCTION

- All Substations shall be brick buildings, with the Architectural design depended on the neighbouring buildings. The size and layout of the substations shall be calculated based on the demand requirement and potential future growth.
- All substation buildings must be equipped with an automatic fire detection and suppression system (where applicable based on the risk exposure) that is not harmful to humans, equipment, or the environment.
- All substation buildings must be equipped with an automatic intruder detection alarm system.
- All substation buildings shall be equipment with a local distribution board.
- All internal walls shall be plaster and painted white.
- Floors shall be painted, or epoxy coated green.
- Cable trenches shall be 800mm deep and 600mm wide and covered with minimum 3mm checkered plate.
- Lighting and small power installations shall be chased in walls via PVC conduiting. (please see Lighting and Small Power installations under Section 3 E)
- Safety Signage shall be installed on external doors indicating the voltage rating of each room.
- Signage must include all relevant telephone numbers of the applicable responsible persons pertaining to the specific as well as emergency numbers.
- Photo luminescent signs to be used inside substation buildings.

15.1.1.2 TRANSFORMERS

For all new installations, transformers shall comply to the following standards:
- Rating plate with indelibly marked specifications and data, rived to the transformer body.
- All dry type transformers must be:
    - Delta-Star
    - Dyn11
- All transformers must have an off-line, lockable tap-changer, locked with the correct padlock, with range ±5%, adjustable in increments of 2.5%. If no tap changer does exist the tap connections will be securely bolted and locked inside the enclosure.
- All dry type transformers must comply to the following:
    - Cast resin type
    - Equipped with a lifting point
- When a NER is required, the NER will have the facilities to be monitor for earth continuity. The monitoring of the NER will on an alarm system or monitored in the same way as the rest of the electrical equipment.

16.1.2 MINIATURE SUBSTATIONS

16.1.2.1 CONSTRUCTION

For all new installations, the LV room equipment and layout shall include the following:
- The mini-substations shall be a type B, consisting of three separate compartments, bolted together with a common interlocked canopy and padlocked access doors to the high voltage and low voltage compartments and shall be in accordance with SANS 1029, SANS 1030 and NRS 004 as amended. The outer housing shall be manufactured from 3 mm mild steel, painted a “light stone” colour and protected against corrosion as per SANS 1029.
- The miniature substation shall be manufactured in accordance with NRS 004.
- The transformer tank shall be of the top bolted on type with re-fillable screw-on filler cap. The tank shall be equipped with a replaceable silica gel breather and oil level indicator. The tank shall also be equipped with a tap at the bottom for sampling of oil.

- The substation and transformer shall be submitted for the routine tests as stipulated in SANS 780 and 1029. The contractor shall hand over to the Engineer a certificate with the test results. The mini-sub shall not be regarded as “approved” as long as this certificate is outstanding.
- Handles shall be of the lockable 3 point with steel lever type, equal or similar to BARKER and NELSON Series 2410 or other approved make.
-Hinges shall be concealed, manufactured of brass to be equal or similar to BARKER and NELSON Series 500, order code 522 or another approved make.
The miniature substation shall be completely tamper proof, supplied ready for mounting on a concrete plinth.
- Ventilation louvers shall be provided in all compartments.
- The dimensions of the plinth shall be in accordance with the mini-sub suppliers’ recommendations and to the approval of the Engineer. The plinth shall be boxed and then cast with 27 MPA concrete, 1,000 mm thick of which 400 mm above ground level.

16.1.2.2 SWITCHGEAR & TRANSFORMERS
- The high voltage compartment shall be provided with three sets of doors.
- The high voltage switch shall be an 11 kV isolator switch unit of the SF6 gas type with a current rating of 630 A per phase. The switch must be designed to be switched on load.
- Labelling of the HT Switch must be allowed for only, the correct wording shall be finalised on site.
- Fitted to the HT compartment shall be one (1) 11 kV cable end boxes mounted on an iron channel, suitable to take one (1) 3-core 70 mm2 Cu PLIC cable. 11k V – SF6
- (Heat shrink termination kit plus Raytech RICS 3133/SS screen connect boot set)
- Allowance must allow for the making off and installation of two HT cables in the mini-sub.
- The transformer shall be of the three-phase double wound, oil immersed natural cooled step-down type, designed for a maximum rating of 500 kVA.
- The unit shall be of the LOW-LOSS type, in accordance with SANS 780, rated to have a maximum temperature rise of 60°C in oil, or 65°C as measured by the increase in the resistance of the windings, following a continuous full-load run at an altitude not exceeding 1,416 m above sea-level maximum ambient temperature of 40°C peak, 30°C daily average.
- The high voltage winding shall be connected in delta and the low voltage winding in star, with the neutral point brought out. The vector relationship shall be Dyn 11.
- The transformer shall be fitted with isolated bushings and earth terminals, filled with oil in accordance with SANS 555/1959.
- Tappings of + 2,5% and + 5% of normal voltage shall be provided at the centre of the high voltage windings, such tappings being selected by an externally operated tap-changer, with positive indicating facilities.
- Certified copies of test certificates shall be forwarded to the Engineer as soon as possible after the tests have been carried out. These tests shall be the “Group III” tests all in accordance with SANS 780/1966

16.1.2.3 COMMUNICATION
For all new installations, allowance shall be made for the installation of minimum two (2) network points located in the MV and LV compartment, respectively. The allowance shall include all costs associated with the fiber reticulation, converters, socket outlets and CAT5 wiring.

16.1.2.4 METERING
For all new installations, metering shall be achieved by means of Schneider Electric Power Tags. Power tags shall be installed on all outgoing feeders.

16.1.3 MV CABLES

16.1.3.1 CABLES SIZES AND TYPES:
- All new MV cables shall comply with table 17 of SANS 97 of 2010.
- All new MV cables shall be 3-core, XLPE copper conductor, steel wire armoured, PVC served, 6,35/11 kV cables
- Applicable bare copper wires shall be installed parallel with the MV cables.
- Cables sizes shall be depended and calculated as per the maximum required load specific to existing and new MV ring networks.

16.1.3.2 TRENCHES AND INSTALLATION
- MV cable trenches shall be 1000mm deep x 600mm wide, the cable shall be installed in between bedding of minimum 200mm either side of the cable.
- All directional changes shall comply with the minimum bending radius as specified by SANS.

16.1.3.3 CABLE MARKERS AND LABELLING
- Concrete cable markers shall be place at a minimum of 50m intervals, changes in trench direction and at road crossings.
- Cable marker plate shall indicate the following:
    - Buried Depth
    - Cable size
    - Directional Arrows

16.2 LOW VOLTAGE

16.2.1 LV PANELS, KIOSKS AND DISTRIBUTION BOARDS

16.2.1.1 MATERIAL AND CONSTRUCTION

For all new installations, LV panels, kiosks and distribution boards shall comply with the following:

- Only “Schneider” type circuit breakers and contactors shall be used, any deviation shall require written approval form the University.
- All distribution boards shall be manufactured according to the detail specifications and drawings and shall be inspected and approved by the Engineer before installation.
- The Engineer shall first approve any other type of distribution board, which may be submitted as an alternative.

16.2.1.2 EQUIPMENT AND WIRING

- All bus bars and lugs shall be insulated, and wiring shall enter the switch gear from the back of the distribution board.
- The manufacturers shall internally wire all distribution boards.
- Wiring between switchgear and bus bars shall be done by means of PVC insulated stranded copper conductors, fixed to the bus bars with copper lugs, and brass bolts.
- Only colour coded wiring shall be accepted, e.g.: Red, yellow, and blue for phases, and black for neutral.
- Wiring coloured by means of PVC insulated tape shall not be accepted.
- Wiring shall be neatly strapped in a vertical and horizontal manner.
- All instrument and control wiring shall be 2,5mm² PVC insulated copper conductors, and shall be numbered for ease of tracing circuits.
- Where distribution boards have separate compartments, they shall be separated by means of a metal dividing section and be equipped with individual removable circuit breaker covers.
- Colour coding as follows:
    - All external panels shall be AVO green,
    - All internal panels shall be White
    - All face plates shall be coloured either white (normal) red (emergency).

16.2.1.3 METERING

Metering shall only be installed on feeders at distribution kiosks, metering shall be achieved by means of Schneider Electric Power Tags. Power tags shall be installed on all outgoing feeders

16.2.1.4 LABELING

All equipment labels shall be approved by the university prior to any manufacturing or installation thereof.

16.2.2 LV CABLES

16.2.2.1 CABLES SIZES AND TYPES

- All new LV cables shall comply with SANS 1507/3.
- All new LV cables shall be 3/4-core, XLPE copper conductor, steel wire armoured, PVC served, 600/1000V cables
-nApplicable bare copper wires shall be installed parallel with the LV cables.
- Cables sizes shall be depended and calculated as per the maximum required load.
- All new installations shall be accompanied by a cable schedule, complete with voltage drop and fault level indications.

16.2.2.2 TRENCHES AND INSTALLATION

- MV cable trenches shall be 600mm deep x 600mm wide, the cable shall be installed in between bedding of minimum 150mm either side of the cable.
- All directional changes shall comply with the minimum bending radius as specified by SANS.

16.2.2.3 CABLE MARKERS AND LABELLING

- Concrete cable markers shall be place at a minimum of 50m intervals, changes in trench direction and at road crossings.
- Cable marker plate shall indicate the following:
    - Buried Depth
    - Cable size
    - Directional Arrows

16.3 BUILDING INSTALLATIONS

16.3.1 OFFICE INSTALLATIONS

16.3.1.1 SMALL POWER EQUIPMENT AND INSTALLATIONS

•Small power installations shall compromise of the following and shall comply to the standards as indicated:

- All socket outlets shall be Crabtree classic range
- All power skirting shall be O-Line MS2, colour to be advised during project construction stage
- All power skirting accessories shall be O-line approved and compatible.

•Each workstation shall be equipped with the following:

- 2 x Dedicated socket outlet
- 1 x Normal Socket outlet
- 1 x Euro Socket outlet
- 2 x Data outlets

•All socket outlet circuit wiring shall consist of 4mm GP wiring.

16.3.1.2 LIGHTING EQUIPMENT AND INSTALLATION

•Lighting equipment and installation shall compromise of the following and shall comply to the standards as indicated:

- All lighting shall be controlled with light switches, switches shall be of Crabtree classic range unless otherwise specified.
- All light fittings shall be complete with 5m cord and 5A socket.
- A Schedule of light fittings specific to each installation shall be submitted for approval during design stage.

16.3.1.3 MECHANICAL INTERFACING AND INSTALLATION

•Mechanical interfacing and installation of electrical components shall comply with the following standards:

- Split units – Isolators shall be provided for both internal and external units. External isolators shall be installed in a lockable weatherproof York box.
- Centralized units – isolators shall be provided for all internal units; External units shall be connected via a dedicated Distribution board.
- Extractor Fans - Isolators shall be provided inside the ceiling void, and controlled by a single load motion sensor

16.3.2 RESIDENTIAL INSTALLATIONS

16.3.2.1 SMALL POWER EQUIPMENT AND INSTALLATIONS

•Small power installations shall compromise of the following and shall comply to the standards as indicated:

- All socket outlets shall be Crabtree classic range
- All power skirting shall be O-Line MS2, colour to be advised during project construction stage
- All power skirting accessories shall be O-line approved and compatible.

•Residence Bedroom workstations shall consist of the following:

- 2 x Normal/Euro Combination Socket outlets
- All socket outlet circuit wiring shall consist of 4mm GP wiring.

16.3.1.2 LIGHTING EQUIPMENT AND INSTALLATION

•Lighting equipment and installation shall compromise of the following and shall comply to the standards as indicated:

- All lighting shall be controlled with light switches, switches shall be of Crabtree classic range unless otherwise specified.
- All ablutions and Passages shall be controlled by a Single load Motion Sensor.
- All light fittings shall be complete with 5m cord and 5A socket.
- A Schedule of light fittings specific to each installation shall be submitted for approval during design stage.

16.3.2.3 MECHANICAL INTERFACING AND INSTALLATION

•Mechanical interfacing and installation of electrical components shall comply with the following standards:

- Split units – Isolators shall be provided for both internal and external units. External isolators shall be installed in a lockable weatherproof York box.
- Centralized units – isolators shall be provided for all internal units; External units shall be connected via a dedicated Distribution board.
- Extractor Fans - Isolators shall be provided inside the ceiling void, and controlled by a single load motion sensor

17. MECHANICAL INSTALLATION

17.1 GENERAL UNIVERSITY ESTATES: ENGINEERING SERVICES IS RESPONSIBLE TO ENSURE ALL MECHANICAL INSTALLATIONS ARE SAFE, EFFECTIVE AND ADHERES TO THIS STANDARD.

RESPONSIBILITIES:
-Determine scope of the project
-Hand-over to consultant
-Ensure adoption of these standards
-Sign off on designs (Projects)
-Quality control of design and execution (Projects and workshop)
-Process payment certificates and invoices
-Long term planning of phase replacement and upkeep of mechanical installations

TYPES OF MECHANICAL INSTALLATIONS:
-Air conditioning (Centralized and individual units)
-Hot water systems for residences
-Central heating systems
-Elevators
-Steam generating plant
-Specialized systems (polypropylene ducting, BSL3 lab)

17.1.1 OFFICE INSTALLATION

A complete heat load calculation must be done. The optimum room temperature should be 22°C. The Mechanical Engineer must look at different options for units including, Mid Wall Split or Cassette Units. We typically prefer cassette units in the boardrooms to keep the sound levels down. We do not allow condensate pumps to be installed, unless stated otherwise. Where an office block needs air conditioning that consists of multiple offices and restrictions on space for condenser units are a challenge, a centralized system can be considered. All installation guidelines and specifications should be followed as mentioned below.

17.1.2 LECTURING HALL

A complete heat load calculation must be done. The optimum room temperature should be 22°C. The Mechanical Engineer must look at different options including, Under ceiling, Ducted Hide Away or Package Units. The Mechanical Engineer must keep in mind to keep the sound levels appropriate when designing a system that operates in a lecture environment. All installation guidelines and specifications should be followed as mentioned below.

17.1.3 RESIDENCE

The Mechanical Engineer will be responsible for the hot water, the hot water storage and hot water supply to the residence. All installation guidelines and specifications should be followed as mentioned below.

17.2 MAINTENANCE MANUALS

Each installation should include a maintenance manual (1 x hard copy and electronic copy) upon final competition of the project for approval (final account will not be processed without this information). Details of the maintenance manual is included in the annexure below.

17.3 SERVICE AND WARRANTY

The 12-month guarantee period will start on the date of first delivery as indicated on the completion certificate. During this period, the contractor shall be responsible to service the entire installation at regular intervals of no longer than 3 months, to do all repairs and to replace all broken parts at no cost to the client. Monthly services shall also include cleaning of filters and, if necessary, fine adjustments of temperatures. The contractor will compile a service book in which all services must be documented. The book will be kept at Facilities Planning to sign off when a service is completed. In the book there must be a checklist to indicate what was inspected and by whom. Refrigerant pressures must also be documented.

17.4 BMS COMPATIBILITY

THE UFS MAKES USE OF A BUILDING MANAGEMENT SYSTEM THAT IS CONNECTED TO CENTRALIZED OR MULTIPLE AIR CONDITIONING UNITS, HOT STORAGE VESSELS AND BOILERS. JOHNSON CONTROLS WITH BACNET OVER IP IS PREFERRED. ALL UNITS SHOULD BE COMPATIBLE WITH THIS STANDARD (EXCEPT INDIVIDUAL UNITS).

There are two main goals:
• Monitoring and reporting of units
• Energy management of unit to limit demand and inefficiencies to save on energy as much as possible.
All BMS unit communicate over IP to the UFS BMS server. All installations will therefore require network access.

17.5 AIR CONDITIONING

Various types of air conditioning are deployed across campus for a variety of needs compromising of centralized and individual units.

CENTRALIZED UNITS:

- Chiller
- Package unit
- Ducted Hide Away
- VRV/F
- AHU (Air Handling Units)

INDIVIDUAL UNITS:

- Split units
- Cassette units
- Under ceilings
- Console unit

17.5.1 CHILLERS

APPROVED MANUFACTURES:
Carrier, Daiken, Trane, Mitsubishi and Climaveneta

INSTALLATIONS SPECIFICATIONS:
-The electrical point of supply shall be confirmed and verified to be within the operation limits of the specified equipment.
-The service provider must do a heat load calculation to determine the size of the chiller.
-Hail Guards on the chillers are a requirement where the condenser coil will be exposed to the elements and vandalism.
-Units must be cordoned off with easy access to prevent vandalism.
-All pipes must be clearly marked with arrows indicating the direction of flow.
-All pipes to be treated for all weather conditions.
-All pipes should have adequate brackets to support its weight.
-All new installations must be fitted with inlet and outlet shutoff valves.
-Municipal water will be strained before entering the system.
-Units must have strainers on both condensing and evaporative inlet pipes.
-Thermometers must be installed on both supply and return lines.
-Pressure balancing bladders needs to be installed to prevent water hammering.
•Unit must be installed with ant-vibration pads.
•Laminated Wiring diagrams of the unit must be kept in the panel.
•All chilled water pipes need to be covered with lagging.
•All valves should be clearly marked with their operation.
•Practical completion will not be given if the system is not on the BMS.
•BMS compatible (See specifications Below)
•Asset Tag
The following information will be required for commissioning.

- Make
- Model number
- Cooling cap (kW)
- Chilled water flow (l/s)
- Condenser water flow (l/s)
- Chilled Water Temperature (in/out °C)
- Condenser Water Temperature (in/out °C)
- Serial Number
- Capitalization Form

BMS CONFIGURATION

- •Network Point must be included
- •BMS Enable
- •BMS Auto/Manual
- •Water Temperature Entering Chiller °C
- •Water Temperature Exiting Chiller °C
- •Chiller Setpoint °C
- •Chilled Water
- •Differential Pressure Setpoint kPa
- •Supply Pressure Setpoint kPa
- •Return Pressure Setpoint kPa
- •Flow Switch Flow/No Flow
- •Trip Status Tripped/Running

Graphics must be included with the following:

- •water Entering Temperature Trend
- •water Exiting Temperature Trend

-Unit must be connected to demand limiting and load rolling on campus.

17.5.2 PACKAGE UNITS

APPROVED MANUFACTURES:
Daikin, Mitsubishi, Carrier

INSTALLATIONS SPECIFICATIONS:
-The electrical point of supply shall be confirmed and verified to be within the operation limits of the specified equipment.
-The service provider must do a heat load calculation to determine the size of the unit.
-Hail Guards on the condensers are a requirement where the condenser coil will be exposed to the elements and vandalism.
-All units must be heating and cooling - Heat Pumps.
-Units will be of the non-inverter type unless stated otherwise.
-Units will be installed on anti-vibration pads.
-Drain piping must have a minimum outer diameter of 32mm and blue UPVC irrigation piping must be used.
-A spare set of washable primary filters must be allowed for maintenance purposes.
-Allowance must be made to water point near the unit/s.
-Installation must come with surge protection.
-All components need to label
-Laminated Wiring diagrams of the unit must be kept in the panel.
-BMS Compatible
-Practical Completion will not be given if the units are not on the BMS.
-Asset Tag
The flowing information will be required for commissioning.
-Area served (e.g. “Offices North”) Room No

- •Make
- •Model number
- •Supply air (l/s)
- •Return air (l/s)
- •Fresh Air (l/s)
- •Coil on (°C DB / °C WB)
- •Coil off (°C DB / °C WB)
- •Total Cooling (kW)
- •Sens. Cooling (kW)
- •Serial Number
- •Capitalization Form

BMS CONFIGURATION
-Network point must be allowed for

-BMS Enable	ON/OFF
-Room Setpoint	°C
-Supply Air Temperature	°C
-Return Air Temperature	°C
-Room Temperature	°C
-Condenser Temperature	°C
-Outside Temperature	°C
-Room CO2 Setpoint	ppm
-Defrost ON Setpoint	°C
-Defrost OFF Setpoint	°C
-Room CO2 Level	ppm
-Fresh Air Damper Level	0 -100%
-Unit in Auto/Manual	DB and Graphics
-Supply Fan	ON/OFF
-Airflow	Flow/No Flow
-Compressor Start	ON/OFF
-Reverse Valve	Cooling/Heating
-Dirty Filter Status	Clean/Dirty

-Laminated Wiring diagrams of the BMS must be kept in the DB panel.
-Graphics must be included with a

- o schedule
- o Room Temperature Trend
- o Supply Temperature Trend

-Unit must be connected to demand limiting and load rolling on campus

-Controller inside lecture hall with the following specifications:

- o Room Temperature on display
- o Room Setpoint °C
- o User must have the option to adjust the setpoint 3°C up on down from preprogramed setpoint on the system (22°C)
- o If the user forgets to switch off the unit after using the lecture hall, the BMS must shut down the unit with the preprogramed schedule

17.5.3 VRV

APPROVED MANUFACTURES:
Daikin, Mitsubishi

INSTALLATIONS SPECIFICATIONS
-The electrical point of supply shall be confirmed and verified to be within the operation limits of the specified equipment.
-The service provider must do a heat load calculation to determine the size of the units.
-The VRV system shall be of the invertor type.
-Hail guards must installed on all exposed condenser units.-All air conditioning VRV indoor shall be standard factory assembled, pipe wired and charged with refrigerant.
-The air conditioning units, pipes, cable connection and the installation thereof will have the approval of the unit's manufacturer and it will be according to their recommendations.
-All refrigerant pipework will be insulated with thermal insulation, Armaflex. All exposed Armaflex will be covered against all weather conditions.
-Units must be installed on anti-vibration pads
-Pipework will be continuously purged during all brazing operations.
-Drain piping must have a minimum outer diameter of 32mm and blue uPVC irrigation piping must be used. No drain piping shall be chased into walls. If surface mounting is not possible all pipes shall be installed in steel trunking with removable lids. If wall thickness permits, trunking may be chased into walls with the removable lids flush with wall finish.
-Practical completion will not be given if the units are not on the BMS.
-Allowance must be made to water point near the unit/s
-Training must be included with installation.
-Laminated Wiring diagrams of the unit must be kept in the panel.
-Installation must come complete with surge protection.
-Corresponding Indoor and Outdoor units must be clearly marked.
-Asset Tags
-BMS Compatible

The following information will be required for commissioning:

- Make
- Model Number Outdoor unit
- Cooling Capacity
- Heating Capacity
- Refrigerant
- Serial number
- Indoor units:
- Area served
- Type
- Sens. Cooling Cap (kW)
- Sens. Heating Cap (kW)
- Serial number
- Capitalization Form

BMS CONFIGURATION
BMS configuration
-Network point must be allowed for

-Start Stop Command	ON/OFF
-Room Setpoint	°C
-Room Temperature	°C
-Unit Mode Command	Cooling/Heating/ Fan Only/Auto
-Unit Mode Status	Cooling/Heating/ Fan Only/Auto
-Fan Speed Command	High/Low/Auto
-Fan Speed Status	High/Low/Auto
-Indoor Fan Status	ON/OFF
-Alarm Status	Normal
-Malfunction Code	E3/E6 ect.
-Communication Status	Online/Offline
-Unit in Auto/Manual	DB and Graphics
-Remote Control AirCon Mode Set	Enable/Disable
-Remote Control Start	Enable/Disable
-Remote Control Temperature Adjust	Enable/Disable

-Graphics must be included with
  - o schedule
  - o Room Temperature Trend

-Unit must be connected to demand limiting and load rolling on campus

17.5.4 COOLING TOWERS

APPROVED MANUFACTURES:
BAC (Baltimore Air Coil Company)

INSTALLATIONS SPECIFICATIONS
-The electrical point of supply shall be confirmed and verified to be within the operation limits of the specified equipment.
-The service provider must determine the specifications for the cooling tower based on the amount of heat needed to be dispersed from the chillers.
-Dosing systems will be included in all installations.
-All pipes must be clearly marked with arrows indication the direction of flow.
-All pipes to be treated for all weather conditions.
-All pipes should have adequate brackets to support its weight.
-All units will be mounted on anti-vibrational pads.
-All cooling towers will be installed with a UV resistant eliminator.
-All new installations must be fitted with inlet and outlet shutoff valves. These valves must be clearly marked.
-Municipal water will be strained before entering and exiting the cooling tower.
-Practical completion will not be given if the unit is not on the BMS
-Allowance must be made for a water point
-Asset Tag
-BMS compatible (See specifications Below)

The following information will be required for commissioning.

- Make
- Model number
- Cooling capacity (kW)
- Condenser water flow (l/s)
- Arrows on piping showing direction of flow
- Serial number
- Capitalization Form
- Pumps (list each pump separately)
- Service (e.g. Chilled water/Condenser water)
- Make
- Model number
- Impeller diameter (mm)
- Suction pressure (kPa)
- Head pressure (kPa)
- Motor (kW)
- Serial number

BMS CONFIGURATION
-Network Point must be included
-BMS Enable
-BMS Auto/Manual
-Fan VSD Start/Stop
-Fan VSD Output 0-100%
-VSD Trip Status
-VSD Run Status
-Water Temperature Entering Tower °C
-Water Temperature Exiting Tower °C
-Cooling Tower Setpoint °C
-Flow Switch Flow/No Flow
-Trip Status Tripped/Running
-Graphics must be included with:
  - o Water Entering Temperature Trend
  - o Water Exiting Temperature Trend

17.5.5 STANDALONE UNITS

(Split, Cassette, Console, Under ceiling)

APPROVED MANUFACTURES:
Daikin, Mitsubishi, Carrier, Dunham Bush, Samsung

INSTALLATIONS SPECIFICATIONS
-Powder coated canter-lever brackets must be supplied for the condenser: Bolted to the wall with M2 rawl bolts 600mm long and complete with M10 spring nuts and washers. The serial and model numbers must be supplied to project management. All removed Air Conditioners will remain the property of the UFS and must be delivered to project management or if stated otherwise. All air conditioning units must be heating and cooling - heat pumps. Units will be of the non-inverter type unless stated otherwise. Where under ceiling and cassette units have been removed, the ceiling must be repaired, replaced, and painted to match the existing. Where Mid Wall, Window Shaker and Console units have been removed or replaced, the wall must be repaired to match the existing surface as well as the glass fitted to match.
-Condenser units will be installed on anti-vibration pads where applicable
-All exposed Armaflex must be dressed in waterproofing membrane and painted with waterproofing
-Copper tubing for refrigerant circuits must be hard or soft drawn refrigeration grade. The piping will be done with pipe bender.
-Drain piping must have a minimum outer diameter of 25mm and blue UPVC irrigation piping must be used. No drain piping shall be chased into walls. If surface mounting is not possible all pipes shall be installed in steel trunking with removable lids. If wall thickness permits, trunking may be chased into walls with the removable lids flush with wall finish.

The flowing information will be required for commissioning.

- Area served (Office Number) Room No
- Make
- Type
- Model number
- Nominal Cooling (kW)
- Serial Number Indoor
- Serial Number Outdoor
- Capitalization Form
- Asset Tag

BMS CONFIGURATION
Normally, standalone units will not be connected to the BMS. Where multiple units are installed, a NAE will be installed. A schedule will be implemented as well with graphics. The NAE will also be connected to the demand limiting and load rolling schedule.

17.5.6 AIR HANDLING UNITS

APPROVED MANUFACTURES:

INSTALLATION SPECIFICATIONS

-The electrical point of supply shall be confirmed and verified to be within the operation limits of the specified equipment.
-The service provider must do a heat load calculation to determine the size of the unit.
-All units must be heating and cooling compatible.
-Units will be installed on anti-vibration pads.
-Drain piping must have a minimum outer diameter of 32mm and blue UPVC irrigation piping must be used.
-A spare set of washable primary filters must be allowed for maintenance purposes.
-Allowance must be made to water point near the unit/s.
-Fans to be driven by a variable speed drive.
-All components need to label
-Laminated Wiring diagrams of the unit must be kept in the panel.
-BMS Compatible
-Practical Completion will not be given if the units are not on the BMS.
-Asset Tag

The following information will be required for commissioning.

- Area served (e.g. “Offices North”) Room no:
- Make
- Model number
- Supply air (l/s)
- Return air (l/s)
- Fresh Air (l/s)
- Coil on (°C DB / °C WB)
- Coil off (°C DB / °C WB)
- Serial Number
- Capitalization Form
- Asset Tag
- BMS compatible

BMS CONFIGURATION

- Network point must be allowed for
- BMS Enable ON/OFF
- Room Setpoint °C
- Supply Air Temperature °C
- Return Air Temperature °C
- Room Temperature °C
- Outside Temperature °C
- Room CO2 Setpoint ppm
- Room CO2 Level ppm
- Fresh Air Damper Level 0 -100%
- Cooling Actuator 0 -100%
- Unit in Auto/Manual DB and Graphics
- Supply Fan ON/OFF
- Airflow Flow/No Flow
- Chilled Water Entering System °C
- Dirty Filter Status Clean/Dirty
- Graphics must be included with:
  - schedule
  - Room Temperature Trend
  - Supply Temperature Trend
- Unit must be connected to demand limiting and load rolling on campus

ON/OFF Controller inside lecture hall with the following specifications:

- Room Temperature on display
- Room Setpoint °C
- User must have the option to adjust the setpoint 3°C up on down from preprogramed setpoint on the system (22°C)
- If the user forgets to switch off the unit after using the lecture hall, the BMS must be shut down the unit with the preprogramed schedule

17.6 HOT WATER SUPPLY

17.6.1 HEAT PUMPS

APPROVED MANUFACTURES:
Tekniheat

INSTALLATIONS SPECIFICATIONS
-The electrical point of supply shall be confirmed and verified to be within the operation limits of the specified equipment.
-Heat pumps shall be designed for South African conditions and shall be locally manufactured units where local companies can also supply expertise, competent service and spares.
-The system will allow 100 liters of hot water per person per day and allow for storage capacity of 60 liters of hot water per day.
-Approved hot water pipes are Rifeng and Geberit Mepla.
-Consultant to take note that the UFS no longer works with the design of municipal water and return water in a separate storage tank as the hot water.
-A Water point must be allowed for.
-Municipal water must run through a strainer before entering the system.
-Only machines having a 60°C hot water COP of at least 3.6 at 15°C wet-bulb ambient will be considered. All heat pumps shall have the following minimum capacities at the following conditions at sea level:
-The heat pumps shall be of the air to water type specifically designed to heat water to a constant 60°C at condensing temperatures at or below 55°C. The heat pumps shall be completely self-contained units with robust casing manufactured from 304 stainless steel. Removable panels shall be provided to ensure access to all parts of the unit.

Each heat pump unit shall be complete with independent compressor circuits where more than 1 compressor is utilized, tube-in-tube water heater condenser, evaporation coil, axial
-fan(s), primary water circulation pump, check valves, gate valves, gauges, and automatic control system.
-Time delay relays and/or system design shall prevent cycling of the compressors and the number of starts per hour shall not exceed the number recommended by the compressor manufacturer.

The following operating and safety controls shall be provided:
•High and low refrigerant pressure, manual reset type, safety switch
•Low ambient air temperature safety
switch
•Current overload protection on compressor(s), pump(s), and fans
•The manufacturer shall provide a recommended control unit to ensure that only one of two heat pumps run when only circulation losses are to be replaced, as indicated in the schematic. This control unit will provide a choice to change the “lead/lag” unit.
-Condensers/water heaters shall be designed for a working pressure of at least 10 000kPa water side and 3000kPa refrigerant side. Normal operating condenser temperatures shall not exceed 55°C.
-Condensers shall be manufactured in accordance with the relevant SABS, BS or other recognized codes which shall comply with the requirements of the Health and Occupational Safety Act No 85 of 1993.
-Condensers shall be guaranteed against scaling for 10 years. Required capacities shall be based on a fouling factor of (1,762 x10^-4 k/w). Tube-in-tube condensers shall have the water flow in the inner tube and the hot gas in the annular space.
-Refrigerant tubing shall be class 2 medium copper tubing to SABS 460.
-Refrigerant tubing shall be provided with soldered copper fittings. For small lines, less than 16mm outside diameter and on packaged equipment, flared fittings may be used.
-All joints in pipelines shall be soldered with an appropriate copper solder. Ordinary soft solder shall not be used. All soldered joints on proprietary manufactured units shall be carefully checked and remade if found damaged in transit.
-Refrigerant piping shall be arranged so that normal inspection and servicing of the compressor and other equipment is not hindered. Location where copper tubing will be exposed to mechanical damage shall be avoided. Receivers shall be provided in the liquid line between the condenser and evaporator if the condenser does not have sufficient capacity to hold the full refrigerant charge.

-The liquid piping from the condenser to receiver shall allow for free drainage of the liquid. The condenser to receiver piping shall be as short as possible and shall be pitched towards the receiver. A refrigerant drier shall be provided in the liquid line. A reliable moisture indicator shall be provided for positive indication of when the drier should be replaced.

-A strainer shall be provided in the liquid line. Combination filter-dryers are also acceptable. Strainers shall be adequately sized to ensure adequate foreign material storage capacity without excessive pressure drop. Sight glasses shall be installed in a vertical section of the liquid line after the receiver or condenser (if no receiver is used) and before the expansion valve to check the state of the refrigerant.

-A central digital control box shall be provided by the manufacturer which will act as the thermostat(s) to activate and control the heat pump(s). The set point of these digital displays shall be protected from tampering/adjustment by third parties.

-The system circulating return line temperature shall be controlled automatically at 40°C with a Danfoss AVTA20 temperature control valve in the plant room. This return line shall be connected to the cold-water inlet to the hot water tank.

-The heat pump plant room installation shall have a central plant room control panel with communications electronics for internet monitoring of faults, amps, running time, and with external stop/start thermostat re-set capability.

-The external viewing of control stops start temperature settings, alarms, leaving tank hot water and return circulating water temperatures shall be monitored and recorded remotely on an internet system provided by the supplier.

-A local digital display of control stops start digital temperature settings, alarms, and leaving tank hot

-Water temperature shall also be housed in the plant room.

-Each heat pump shall be fitted with a sheet metal exhaust air plenum on top to divert the vertically discharged air through the mesh covered openings in the side wall of the building. The plenums shall be lined internally with 25 mm thick Sonic Liner for sound attenuation purposes to avoid disturbing fan noise being caused at the nearby residences if it is necessary.

The flowing information will be required for commissioning.

- Make
- Model number
- Total Heating (kW)
- Sens. Heating (kW)
- Serial Number
- Capitalization Form
- Asset Tag
- Water point to wash coils
- Supply Water to be strained with strainer
- Pipes to be cladded with arrows to show direction of flow
- Water meter must be installed
- Elster Electric meter to be installed to monitor power usage
- Booster Pump to be installed (With auto restart after load shedding)
- Drainage point to be installed to measure discharge by maintenance team
- BMS compatible (See specifications Below)

BMS CONFIGURATION

-Network point must be allowed for

-BMS Enable	ON/OFF
-Supply Hot Water Temperature	°C
-Return Hot Water Temperature	°C
-Unit in Auto/Manual	DB and Graphics
-Flow switch	Flow/No Flow
-Panel Heaters	ON/OFF
-In-Line Heaters	ON/OFF

-Sensors must be installed inside hot water storage tanks

-Sensors must be installed in the shaft of the residence to monitor supply hot water temperature to each block on the furthest point.

-Graphics must be included with

- o schedule for the BMS enable
- o schedule for the Panel Heaters
- o supply Hot Water Temperature Trend
- o return Hot Water Temperature Trend
- o storage Hot Water Temperature Trend
- o water Meter Reading
- o water Meter Reading Trend
- o electric measurement
- o litre/kW usage (to be discussed) (dan moet ons ‘n IME insit?)
- o shaft Supply Hot Water Tempera ture Trend

17.7 ELECTRIC HOT WATER BOILERS

APPROVED MANUFACTURES:
John Tompson

INSTALLATION SPECIFICATIONS
Vessels must be manufactured and supplied in compliance with the SANS 347 – 2019 – EDITION 3 and the Occupational Health and Safety Act – Pressure Equipment Regulations.

Further with regard to your query the vessels as described must be designed and manufactured to:
•Pressure vessel – All un fired pressure vessels EN – 13445 Latest edition – (All Parts)
•All pressure pipe work – BS EN 13480 – Latest edition – (All Parts)
•All Shell boilers – BS EN 12953 – Latest edition – (All Parts)

-Even though the equipment must be designed and manufactured in accordance to the codes and references above – they must all conform to SANS 347 and Osh Act.

The flowing information will be required for commissioning.
- Make
- Type
- Heating capacity (kW)
- Number of heating steps
- Storage Volume (Litres or m3)
- Test Pressure (kPa)
- AIA Certification (Internal/External)
- Data plate
- Material certificate (Manufacturer)
- Max. working pressure (kPa)
- Capitalization Form
- Asset Tag
- BMS compatible (See specifications Below)

BMS CONFIGURATION
- Network point must be allowed for
- BMS Enable ON/OFF
- Boiler Setpoint °C
- Hot Water Supply Temperature °C
- Heating Actuator 0 -100%
- Unit in Auto/Manual DB and Graphics
- Graphics must be included with
  - o schedule
  - o boiler Storage Temperature Trend
  - o supply Temperature Trend

- Unit must be connected to demand limiting and load rolling on campus

17.8 HOT WATER STORAGE TANKS

APPROVED CONTACTORS:
John Tompson

INSTALLATION SPECIFICATIONS
All pressure vessels must be manufactured and supplied in compliance with the SANS 347 – 2019 – EDITION 3 and the Occupational Health and Safety Act – Pressure Equipment Regulations.
Vessels as described must be designed and manufactured to:
-Pressure vessel – All unfired pressure vessels EN – 13445 Latest edition – (All Parts)
-All pressure pipe work – BS EN 13480 – Latest edition – (All Parts)
-All Shell boilers – BS EN 12953 – Latest edition – (All Parts)

Even though the equipment must be designed and manufactured in accordance to the codes and references above – they must all conform to SANS 347 and Osh Act.

The flowing information will be required for commissioning.
-Make
-Type
-Heating capacity (kW)
-Number of heating steps
-Storage Volume (Litres or m3)
-Test Pressure (kPa)
-AIA Certification (Internal/External)
-Data plate
-Material certificate (Manufacturer)
-Max. working pressure (kPa)
-Capitalization Form
-Asset Tag
-BMS compatible

BMS Configuration
-Network point must be allowed for
-BMS Enable ON/OFF
-Boiler Setpoint °C
-Hot Water Supply Temperature °C
-Heating Actuator 0 -100%
-Unit in Auto/Manual DB and Graphics
-Graphics must be included with
  - o schedule
  - o boiler Storage Temperature Trend
  - o supply Temperature Trend

-Unit must be connected to demand limiting and load rolling on campus
-Proposed Hot Water Storage Schedule
  - 06:55 OFF
  - 10:05 ON
  - 12:00 OFF
  - 14:00 ON
  - 17:55 OFF
  - 22:05 ON

-Unit must be connected to demand limiting and load rolling on campus

17.9 STEAM GENERATING BOILERS

APPROVED CONTACTORS:
John Tompson

INSTALLATION SPECIFICATIONS
All pressure vessels must be manufactured and supplied in compliance with the SANS 347 – 2019 – EDITION 3 and the Occupational Health and Safety Act – Pressure Equipment Regulations.
Vessels as described must be designed and manufactured to:
-Pressure vessel – All unfired pressure vessels EN – 13445 Latest edition – (All Parts)
-All pressure pipe work – BS EN 13480 – Latest edition – (All Parts)
-All Shell boilers – BS EN 12953 – Latest edition – (All Parts)
Even though the equipment must be designed and manufactured in accordance to the codes and references above – they must all conform to SANS 347 and Osh Act.
The flowing information will be required for commissioning.

- Make
- Type
- Heating capacity (kW)
- Number of heating steps
- Storage Volume (Litres or m3)
- Test Pressure (kPa)
- AIA Certification (Internal/External)
- Data plate
- Material certificate (Manufacturer)
- Max. working pressure (kPa)
- Capitalization Form
- Asset Tag
- BMS compatible

BMS CONFIGURATION
-Network point must be allowed for
-BMS Enable ON/OFF
-Boiler Setpoint °C
-Hot Water Supply Temperature °C
-Heating Actuator 0 -100%
-Unit in Auto/Manual DB and Graphics
-Graphics must be included with

- o a schedule
- o supply Temperature Trend

-Unit must be connected to demand limiting and load rolling on campus if possible. Where humidity is needed on a constant basis for tests like at Animal research, the unit may not be switched off.

17.10 CENTRAL HEATING

Panel Heaters

For more information on the installation of panel heater, please see electrical consultant guideline.
Central Heating Schedule

- 06:55 OFF
- 10:05 ON
- 12:00 OFF
- 14:00 ON
- 17:55 OFF
- 22:05 ON

-Unit must be connected to demand limiting and load rolling on campus

18. PAINTWORK

18.1 GENERAL PREPARATIONS

All surfaces must be clean, sound, and dry.
Remove all loose flakes and apply PlasterSeal/ Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer, to obtain a stable surface.
Even-out imperfections with WallSkim/Terraco Handycoat Ext/Smoothover Skim Plaster and fill cracks with Fill. To stabilize chalky surfaces, apply PlasterSeal/Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer.
Previously painted sound surfaces can be washed with sugar soap and rinse thoroughly with clean water.
To ease application, sand previously painted stable surfaces.
For water damaged, porous and alkaline surfaces, Apply PlasterSeal/Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer, to stabilize surface.
Remove rust on mild steel and galvanize. Apply HydroFlex/Multi Seal/Rainshield, to stabilize surface.
If rust cannot be removed completely, spot prime with a rust converter before application of primer.
Before recoating, sand previously varnished surfaces well to remove mirror-like image to a flat film.

18.2 PRECAUTIONS

Do not paint over surfaces with moisture content above 15%. Stir paint well with a flat paddle.
Avoid painting in moist / humid conditions. To allow applied paint to cure, there should be no rain forecast for at least 7 days.
Ideal application conditions and surface temperature should be between 10°C –35°C with a relative humidity of less than 75%. It is not recommended to paint in direct sunlight as this will result in the paint drying to fast leading to visible “lap-marks”. Windy conditions might have a similar effect and can cause a deposit of dust particles on the wet paint.
To ensure colour- and sheen level consistency, purchase from the same production batch of paint.
Tint bases contain fewer litres than advertised.
Spreading rates are theoretical and based on smooth / flat surfaces. Do not wash or abrade newly painted surfaces until properly cured. Allow 7 days for paint to dry properly and 30 days to reach full strength.

18.3 HEALTH & SAFETY

Keep out of children’s reach.
Do not eat, drink, or smoke during any application.
Ensure appropriate ventilation during application and drying. May be harmful if swallowed.
Wear protective equipment during preparation, application and cleaning.
Avoid contact with eyes. In case of contact, immediately rinse with clean water and seek medical advice.
Avoid contact with skin. In case of contact, wash thoroughly with soap and water. If skin irritation occurs, seek medical advice.

18.4 SPECIFICATION 1

18.4.1 EXTERIOR WALLS: PREVIOUSLY PAINTED

Plastered walls, smooth concrete surfaces, fair face brickwork, rough plaster and stipple plaster

PRODUCTS REQUIRED:
- EnviroSilk/Wall & All/WallGuard
- Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer
- PlasterSeal/Waterbased Masonry Filler/ Ecosure Plaster Primer
- HydroFlex/Multi Seal/Rainshield

SURFACE PREPARATION:
Wall areas to be re-coated must be high-pressure washed in order to remove any loose and flaking paint, contaminants and to provide a sound surface for subsequent paint coatings. All areas containing fungal growth should be brushed off and treated with anti-fungal wash.
Hairline & Structural Cracks:
Open and allow to dry until moisture content is below 15%
Apply Kwartz Fill/Polyfilla/Smoothover Skim Plaster to surface cracks.
WallSkim/Terraco Handycoat Ext/Smoothover may be applied to smooth out uneven surfaces.

APPLICATION PRIMER:
Substrate moisture content must be below 15%.
Apply a single coat Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer to all bare and unstable previously painted surfaces for superior moisture tolerance.
OR
Apply a single coat PlasterSeal/Waterbased Masonry Filler/Ecosure Plaster Primer to all bare, unstable dry and porous previously painted surfaces.

APPLICATION UNDERCOAT:
Universal UnderCoat/Universal Undercoat (UC 1)/Universal Undercoat may be applied to improve opacity and adhesion over previously painted stable water based and alkyd systems.
OR
MaxiCoat/PEM 600/Bergermaster Nukote may be applied to improve opacity and adhesion over previously painted stable water-based systems.

APPLICATION TOPCOAT:
Apply two coats EnviroSilk/Wall & All/WallGuard according to datasheet specification.

PARAPETS:
All parapets must be sealed by applying two coats of HydroFlex/Multi Seal/Rainshield in a crisscross pattern.

18.4.2 EXTERIOR WALLS: NEWLY PLASTERED

Plastered walls, smooth concrete surfaces, fair face brickwork, rough plaster, and stipple plaster

PRODUCTS REQUIRED:
- EnviroSilk/Wall & All/WallGuard
- Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer
- PlasterSeal/Waterbased Masonry Filler/ Ecosure Plaster Primer
- HydroFlex/Multi Seal/Rainshield
- WallSkim/Terraco Handycoat Ext/Smoothover Skim Plaster

SURFACE PREPARATION:
Newly plastered surfaces must be sound, dry and stable with moisture content below 15%. Apply Kwartz Fill/Polyfilla/Multi Purpose Crack Filler to surface cracks.
WallSkim/Terraco Handycoat Ext/Smoothover Skim Plaster may be applied to smooth out uneven surfaces.

APPLICATION PRIMER:
Substrate moisture content must be below 15%.
Apply a single coat Alkyd PlasterPrime/Plascon Plaster Primer (UC 56)/Alkali Plaster Primer for superior moisture tolerance.
OR
Apply a single coat PlasterSeal/Masonry Filler (GPS 1)/Ecosure Plaster Primer to dry and porous surfaces.

APPLICATION TOPCOAT:
Apply two coats EnviroSilk/Wall & All/WallGuard according to datasheet specification.

PARAPETS:
All parapets must be sealed by applying two coats of HydroFlex/Multi Seal/Rainshield in a crisscross pattern.

18.5 SPECIFICATION 2

18.5.1 INTERIOR WALLS: PREVIOUSLY PAINTED

Plastered walls, smooth concrete surfaces, fair face brickwork, rough plaster and stipple plaster

PRODUCTS REQUIRED:

- TruVelvet/Double Velvet/Luxurious Silk
- Alkyd PlasterPrime/Plascon Plaster Primer (UC 1)/Alkali Plaster Primer
- PlasterSeal/Masonry Sealer (GPS 1)/ Ecosure Plaster Primer

SURFACE PREPARATION:

Remove all loose and flaking paint to provide a sound surface for subsequent paint coatings

Hairline & Structural Cracks:
Open and allow to dry until moisture content is below 15%
Apply Kwartz Fill/Polyfilla/Multi Purpose Crack Filler to surface cracks.
WallSkim/Terraco Ez Skim (TER)/Smoothover Skim Plaster may be applied to smooth out uneven surfaces.

APPLICATION PRIMER:

Substrate moisture content must be below 15%.
Apply a single coat Alkyd PlasterPrime/Plascon Plaster Primer (UC 1)/Alkali Plaster Primer to all bare and unstable previously painted surfaces for superior moisture tolerance.
OR
Apply a single coat PlasterSeal/Masonry Sealer (GPS 1)/Ecosure Plaster Primer to all bare, unstable dry and porous previously painted surfaces.

APPLICATION UNDERCOAT:

Universal UnderCoat/Universal Undercoat (UC 1)/Universal Undercoat may be applied to improve opacity and adhesion over previously painted stable water based and alkyd systems.
OR
MaxiCoat/PEM 600/Bergermaster Nukote may be applied to improve opacity and adhesion over previously painted stable water based systems.

APPLICATION TOPCOAT:

Apply two coats TruVelvet/Double Velvet/Luxurious Silk according to datasheet specification.

18.5.2 INTERIOR WALLS: NEWLY PLASTERED

Plastered walls, smooth concrete surfaces, fair face brickwork, rough plaster and stipple plaster

PRODUCTS REQUIRED:

- TruVelvet/Double Velvet/Luxurious Silk
- Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer
- PlasterSeal/Masonry Sealer (GPS 1)/ Ecosure Plaster Primer
- WallSkim/Terraco Ez Skim/Smoothover Skim Plaster

SURFACE PREPARATION:

Newly plastered surfaces must be sound, dry and stable with moisture content below 15%. Apply Kwartz Fill/Polyfilla/Multi Purpose Crack Filler to surface cracks.
WallSkim/Terraco Ez Skim/Smoothover Skim Plaster may be applied to smooth out uneven surfaces.

APPLICATION PRIMER:

Substrate moisture content must be below 15%.
Apply a single coat Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer for superior moisture tolerance.
OR
Apply a single coat PlasterSeal/Masonry Sealer (GPS 1)/Ecosure Plaster Primer to dry and porous surfaces.

APPLICATION TOPCOAT:

Apply two coats TruVelvet/Double Velvet/Luxurious Silk according to datasheet specification.

18.6 SPECIFICATION 3

18.6.1 WOODWORK: PREVIOUSLY PAINTED

Timber surfaces to be painted

PRODUCTS REQUIRED:

- WoodPrime/Pink Wood Primer (UC 2)/ Pink Wood Primer
- HiGloss/Super Universal Enamel/Gloss Enamel

SURRFACE PREPARATION:

Remove all loose and flaking paint to provide a sound surface for subsequent paint coatings

APPLICATION PRIMER AND UNDERCOAT:

Apply one coat WoodPrime/Pink Wood Primer (UC 2)/Pink Wood Primer to all bare wooden substrates.
Apply Kwartz Fill/Polyfilla/Multi Purpose Crack Filler to surface cracks.
WallSkim/Terraco Handycoat Ext/Smoothover Skim Plaster may be applied to smooth out uneven surfaces.

APPLICATION TOPCOAT:

Apply two coats HiGloss/Super Universal Enamel/Gloss Enamel according to datasheet specification. For interior and exterior use
OR
Apply two coats NonDrip/Velvaglo/Trade Pearlglo according to datasheet specification. For a satin finish interior only

18.6.2 WOODWORK: NEWLY PAINTED

Timber surfaces to be painted

PRODUCTS REQUIRED:

- WoodPrime/Pink Wood Primer/Pink Wood Primer
- HiGloss/Super Universal Enamel/Gloss Enamel

SURFACE PREPARATION:

Wooden surfaces must be sound, dry and stable.
Apply Kwartz Fill/Polyfilla/Multi Purpose Crack Filler to surface cracks.
WallSkim/Terraco Handycoat Ext/Smoothover Skim Plaster may be applied to smooth out uneven surfaces.

APPLICATION PRIMER AND UNDERCOAT:

Apply one coat WoodPrime/Pink Wood Primer/ Pink Wood Primer to all bare wooden substrates.
Apply Kwartz Fill/Polyfille/Multi Purpose Crack Filler to surface cracks.
WallSkim/Terraco Handycoat Ext/Smoothover Skim Plaster may be applied to smooth out uneven surfaces.

APPLICATION TOPCOAT:

Apply two coats HiGloss/Super Universal Enamel/ Gloss Enamel according to datasheet specification. For interior and exterior use
OR
Apply two coats NonDrip/Velvaglo/Trade Pearlglo according to datasheet specification. For a satin finish interior only

18.6.3 WOODWORK: NEWLY VARNISH

Timber surfaces to be varnished

PRODUCTS REQUIRED:

- WoodVarnish Interior/Woodcare Ultra Varnish X33 X44/Double Life Timbavarnish
- WoodVarnish Exterior/Woodcare Sunproof (WSP)/Timbavarnish

SURFACE PREPARATION:

Wooden surfaces must be sound, dry and stable.

APPLICATION TOPCOAT:

Apply one coat of WoodVarnish Interior/Woodcare Ultra Varnish X33 X44/Double Life Timbavarnish thinned with 10% mineral turpentine followed by two undiluted coats.

OR

Apply one coat of WoodVarnish Exterior/Woodcare Sunproof (WSP)/Timbavarnish thinned with 10% mineral turpentine followed by two undiluted coats.

18.6.4 WOODWORK: PREVIOUSLY VARNISH

Timber surfaces to be varnished

PRODUCTS REQUIRED:

- WoodVarnish Interior/Woodcare Ultra Varnish X33 X44/Double Life Timbavarnish
- WoodVarnish Exterior/Woodcare Sunproof (WSP)/Timbavarnish
- WoodPreserve/WoodcarePreservative/ Timbapreservative

SURFACE PREPARATION:

Sand exiting varnish to remove mirror-like image to a flat surface. Sand lightly if previously coated with a wax sealer or oil.

APPLICATION TOPCOAT:

Apply three coats WoodVarnish Interior/Woodcare Ultra Varnish X33 X44/Double Life Timbavarnish if previously coated with a varnish.

OR

Apply three coats WoodVarnish Exterior/Woodcare Sunproof/Timbavarnish if previously coated with a varnish.

OR

Apply three coats WoodPreserve/Woodcare Preservative/Timbapreservative if previously coated with

18.7 SPECIFICATION 4

18.7.1 FIBER CEMENT: PREVIOUSLY PAINTED

PRODUCTS REQUIRED

- Alkyd PlasterPrime/Plaster PR/Alkali Plaster Primer
- PlasterSeal/Masonry Sealer (GPS 1)/ Ecosure Plaster Primer
- EnviroSilk/Wall & All/WallGuard
- SuperAcrylic/Polvin/Trade 65 Matt
- TruVelvet/Double Velvet/Luxurious Silk

SURFACE PREPARATION:

Remove all loose and flaking paint to provide a sound surface for subsequent paint coatings

APPLICATION PRIMER:

Substrate moisture content must be below 15%.

Apply a single coat Alkyd PlasterPrime/Plaster PR/Alkali Plaster Primer to all bare and unstable previously painted surfaces for superior moisture tolerance.

OR

Apply a single coat PlasterSeal/Masonry Sealer (GPS 1)/Ecosure Plaster Primer to all bare, unstable dry and porous previously painted surfaces.

APPLICATION TOPCOAT:

Interior ceilings: apply two coats SuperAcrylic/Polvin/Trade 65 Matt according to datasheet specification.

Interior walls: apply two coats TruVelvet/Double Velvet/Luxurious Silk according to datasheet specification.

Exterior walls and ceilings: apply two coats EnviroSilk/Wall & All/WallGuard according to datasheet specification

18.7.2 FIBER CEMENT: NEWLY PAINTED

PRODUCTS REQUIRED

- Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer
- PlasterSeal/Masonry Sealer (GPS 1)/ Ecosure Plaster
- EnviroSilk/Wall & All/WallGuard
- SuperAcrylic/Polvin/Trade 65 Matt
- TruVelvet/Double Velvet/Luxurious Silk

SURFACE PREPARATION:

Surfaces must be sound, dry and stable.

Apply Kwartz Fill/Polyfilla/Multi Purpose Crack Filler to surface cracks.

WallSkim/Terraco Ez Skim/Smoothover Skim Plaster may be applied to smooth out uneven surfaces

APPLICATION PRIMER:

Substrate moisture content must be below 15%.

Apply a single coat Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer for superior moisture tolerance.

OR

Apply a single coat PlasterSeal/Masonry Sealer (GPS 1)/Ecosure Plaster Primer to dry and porous surfaces.

APPLICATION TOPCOAT:

Interior ceilings: apply two coats SuperAcrylic/Polvin/Trade 65 Matt according to datasheet specification.

Interior walls: apply two coats TruVelvet/Double Velvet/Luxurious Silk according to datasheet specification.

Exterior walls and ceilings: apply two coats EnviroSilk/Wall & All/WallGuard according to datasheet specification

18.8 SPECIFICATION 5

18.8.1 CEILING BOARDS (GYPSUM): PREVIOUSLY PAINTED

PRODUCTS REQUIRED

- Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer
- PlasterSeal/True Colour Pirmer, Sealer/ Ecosure Plaster Primer
- EnviroSilk/Wall & All/WallGuard
- SuperAcrylic/Polvin/Trade 65 Matt TruVelvet/Double Velvet/Luxurious Silk

SURFACE PREPARATION:

Remove all loose and flaking paint to provide a sound surface for subsequent paint coatings

APPLICATION PRIMER:

Substrate moisture content must be below 15%.
Apply a single coat Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer to all bare and unstable previously painted surfaces for superior moisture tolerance.
OR
Apply a single coat PlasterSeal/True Colour Pirmer, Sealer/Ecosure Plaster Primer to all bare, unstable dry and porous previously painted surfaces.

APPLICATION TOPCOAT:

Interior ceilings: apply two coats SuperAcrylic/ Polvin/Trade 65 Matt according to datasheet specification.
Interior walls: apply two coats TruVelvet/Double Velvet/Luxurious Silk according to datasheet specification.
Exterior walls and ceilings: apply two coats EnviroSilk/Wall & All/WallGuard according to datasheet

18.8.2 CEILING BOARDS (GYPSUM): NEWLY PAINTED

PRODUCTS REQUIRED

- Alkyd PlasterPrime/Plascon Plaster Primer/Alkali Plaster Primer
- PlasterSeal/True Colour Pirmer, Sealer/ Ecosure Plaster Primer
- EnviroSilk/Wall & All/WallGuard
- SuperAcrylic/Polvin/Trade 65 Matt
- TruVelvet/Double Velvet/Luxurious Silk

SURFACE PREPARATION:

Surfaces must be sound, dry, and stable.
Apply Kwartz Fill/Polyfilla/Multi-Purpose Crack Filler to surface cracks.
WallSkim/Terraco Ez Skim/Smoothover Skim Plaster may be applied to smooth out uneven surfaces

APPLICATION PRIMER:

Substrate moisture content must be below 15%.
Apply a single coat Alkyd PlasterPrime/Plascon Plaster Primer UC 56/Alkali Plaster Primer for superior moisture tolerance.
OR
Apply a single coat PlasterSeal/True Colour Sealer, Primer/Ecosure Plaster Primer to dry and porous surfaces.

APPLICATION TOPCOAT:

Interior ceilings: apply two coats SuperAcrylic/ Polvin/Trade 65 Matt according to datasheet specification.
Interior walls: apply two coats TruVelvet/Double Velvet/Luxurious Silk according to datasheet specification.
Exterior walls and ceilings: apply two coats EnviroSilk/Wall & All/WallGuard according to datasheet specification

18.9 SPECIFICATION 6

18.9.1 METAL WORK – MILD STEEL: PREVIOUSLY PAINTED

PRODUCTS REQUIERED

- HiGloss/ Super Universal Enamel/ Enamel
- Hydro Etch/Galvanized Iron Primer/ Steel Primer Grey
- Rust Converter/Rust End/Hammerite No. 1 Primer

SURFACE PREPARATION:

Remove all loose and flaking paint to provide a sound surface for subsequent paint coatings.

APPLICATION PRIMER AND UNDERCOAT:

Apply Rust Converter/Rust End/Hammerite No. 1 Primer to existing rusted areas. Apply a single coat HydroEtch/Galvanized Iron Primer/Steel Primer Grey.

APPLICATION TOPCOAT:

Apply two coats HiGloss/Super Universal Enamel/ Gloss Enamel according to datasheet specification.

18.9.2 METAL WORK – MILD STEEL: NEWLY PAINTED

PRODUCTS REQUIERED

- Roof/Nu Roof Cool/ Roofguard
- Hydro Etch/Galvanized Iron Primer (GIP 1)/ Steel Primer Grey
- Galvanized Cleaner/Galvanized Iron Cleaner GIC/Galvanized Iron Cleaner

SURFACE PREPARATION:

Wash surface with Galvanized Cleaner/Galvanized Iron Cleaner GIC/Galvanized Iron Cleaner. Rinse thoroughly with clean water until a water break free line is acquired

APPLICATION PRIMER AND UNDERCOAT:

Apply a single coat Hydro Etch/Galvanized Iron Primer (GIP 1)/Steel Primer Grey.

APPLICATION TOPCOAT:

Apply two coats HiGloss/Super Universal Enamel/Gloss Enamel according to datasheet

18.10 SPECIFICATION 7

18.10.1 METAL WORK – GALVANISED STEEL: PREVIOUSLY PAINTED

PRODUCTS REQUIERED

- Roof/Nu Roof Cool/ Roofguard
- Hydro Etch/ Galvanised Iron primer/ Galvanised Iron primer
- Galvanized Cleaner/Galvanized Iron Cleaner (GIC 1)/Galvanized Iron Cleaner

SURFACE PREPARATION:
Remove all loose and flaking paint to provide a sound surface for subsequent paint coatings.

APPLICATION PRIMER AND UNDERCOAT:
Apply a single coat Hydro Etch/Galvanized Iron Primer/Galvanized Iron Primer.

APPLICATION TOPCOAT:
Apply two coats Roof/Nu Roof Cool/Roof Guard according to datasheet specification.

18.10.2 METAL WORK – GALVANISED STEEL: NEWLY PAINTED

PRODUCTS REQUIERED

- Roof/Nu Roof Cool/ Roofguard
- Hydro Etch/ Galvanised Iron primer/ Galvanised Iron primer
- Galvanized Cleaner/Galvanized Iron Cleaner (GIC 1)/Galvanized Iron Cleaner

SURFACE PREPARATION:
Remove all loose and flaking paint to provide a sound surface for subsequent paint coatings.

APPLICATION PRIMER AND UNDERCOAT:
Apply a single coat Hydro Etch/Galvanized Iron Primer/Galvanized Iron Primer.

APPLICATION TOPCOAT:
Apply two coats Roof/Nu Roof Cool/Roof Guard according to datasheet specification.

18.11 SPECIFICATION 8

18.11.1 ROOFS: TILES

PRODUCTS REQUIRED

- Roof/Nu Roof Cool/ Roofguard
- Hydro Flex / Hydro Seal/Multi Seal/Rain shield / Damp shield system
- Bond All (Acrylic)/N/A/Bonding Liquid

SURFACE PREPARATION

Wash with high pressure to ensure surface is free from dust, loose debris, or flaking paint. Replace all old and inadequate roof seal membrane and reseal with Hydro Flex / Hydro Seal/Multi Seal/ Rain shield / Damp shield system. Remove all fungal growth and treat with fungal wash.

APPLICATION PRIMER

Apply Bond All (Acrylic)/N/A/Bonding Liquid to all bare surfaces until stabilized

APPLICATION TOPCOAT

Apply two coats Roof/Nu Roof Cool/Roofguard according to datasheet specification.

19. PROJECT SPECIFICATION FOR PASSENGER LIFT INSTALLATION

19.1 GENERAL

This specification is for the supply, delivery, erection and commissioning of the new passenger lift for the Flippie Groenewoud Building on the UFS Bloemfontein Campus.
This work will be carried out as a sub-contract.
Any discrepancies or any clause, paragraph or description in this or any other part of the specification or drawings that are not clear or cause any doubt shall be referred by the tenderer to the engineer for clarification. No claims resulting from any such discrepancies or indistinctness will be considered or granted after the tender closing date or time.

SCOPE OF WORK

The scope of the work is as follows:

- Supply, delivery, erection and commissioning of a new 630 kg 8 passenger lift for Flippie Groenewoud Building ICT

OCCUPANCY OF BUILDINGS

The buildings will be occupied and in full functional operation with important meetings in various meeting rooms during the construction period.
For this reason it is essential that the contractor shall take care and ensure that inconvenience of the users of the building is limited to the minimum, not only by proper planning of the works, but also by the execution thereof.
Loudness of workers is not acceptable.

QUALITY STANDARD, MATERIAL AND WORKMANSHIP

It is a specific requirement that all work done and equipment supplied under this contract shall be of a high standard. All material used and equipment supplied shall be new.
By tendering the tenderer hereby unequivocally declares that, should his tender be successful, he will ensure that through proper management, personal supervision,
dedication and commitment, he will ensure delivery of a final product on which he himself and the client will be proud of.

The works shall be inspected by the engineer and representatives of the client on a regular basis. All work done and materials and equipment of substandard quality shall be rejected and shall be replaced.

Should any unsatisfactory workmanship or equipment be pointed out for rectification twice the contractor will be charged for the supervision time of the Engineer at normal hourly Consulting Engineers' Fees.

STANDARDS AND SPECIFICATIONS

The latest edition of all specifications mentioned in this document shall apply at all times.
Where no standard or specification is specifically mentioned it shall be assumed that the applicable SABS, ISO, BSS, DIN or applicable American Standard, listed in order of preference will apply.
The metric standard of SI units shall apply for this specification.

COMPLIANCE WITH HEALTH & SAFETY LEGISLATION

The works shall be carried out in strict accordance with latest edition of the Occupational Health & Safety Act, Act 85 of 1993 (as amended).
Before commencing on site, the required Health and Safety file, with the full content as described in the Act, shall be handed in to the Engineer.
No work on site shall be allowed without this requirement complied with.

GUARANTEES

By tendering the contractor guarantees that he is capable of erecting the specified installation so that it will perform satisfactorily and safely in all respects to the requirements of the specification and to the satisfaction of the engineer. The entire installation shall be safe for use and shall comply in all respects with the applicable statutory regulations, laws and bylaws.

VISIT TO SITE
Only tenders received from tenderers who attended the official site visit arranged by the engineer will be considered.

DELIVERY TIMES
Due to the urgency of having the lifts in full operation within a short period it is required that delivery to site shall be 16 (sixteen) weeks maximum. If this is not possible, prospective tenderers shall state so explicitly in their tender proposal.

TESTS AND COMMISSIONING
Following the complete erection of the installation the contractor shall perform all necessary tests to verify the performance thereof. The contractor shall notify the engineer prior to any such tests being performed to enable the latter to attend.
The final tests shall be carried out in the presence of the engineer and representatives of the client. Any faults that are discovered during these final inspections or any unsatisfactory work shall be repaired at the cost of the contractor and shall have no influence on the contract completion date.

OPERATING AND MAINTENANCE MANUALS
The contractor shall, at his cost, prepare and supply detailed and comprehensive manuals for the successful operation and maintenance of the Installation.
Two weeks prior to the commencement of commissioning, the contractor shall supply a draft of the manual to the Engineer for approval. At the commencement of commissioning the contractor shall supply three (3) updated additional manuals plus a CD containing the complete manual. The document shall also include record drawings. Commissioning shall not commence unless this requirement has been adhered to.

The instruction manuals shall be comprehensive and informative. It shall have full details of all operating procedures, fault finding lists and help instructions and shall cover all foreseeable problem situations in detail.
The maintenance manuals shall contain all the instructions for the regular maintenance of the equipment. It shall also include a list of all spare parts recommended to be kept in stock for repairs. The spare parts lists shall be comprehensive with regard to part numbers, descriptions, detailed drawings showing the exact positions and recommended intervals of replacement (if any) to avoid unwanted breakdowns of the lift.

19.2 PASSENGER LIFTS THIS SPECIFICATION CALLS FOR THE INSTALLATION OF A FULL FUNCTION PASSENGER LIFT..

The lifts shall meet the following specifications:

Flippie Groenewoud	
Capacity:	8 persons, 630 kg.
Speed:	1,0 m/s
Stops:	3 (Ground,1st floor & 2nd)
Doors:	2 panel, centre opening
-Door width	800 mm
-Door Height (mm)	2 100
-Internal dimensions (mm)	1 400 (W) x 1 350 (D) x 2 350 (H)
Operation system	Full electronic

The lift shall be supplied as a complete package and the following items shall be provided and considered as an integral part of the equipment:

- Distribution board including circuit breakers and earth leakage for control equipment,
- Car lights,
- Car plug sockets,
- Motor room lights (minimum 200-lux),
- Pit lights (minimum 50-lux),
- Shaft lights (minimum 50-lux),
- Motor room plug socket (15-A),
- Pit plug socket (15-A).

CAR FINISHES
Walls, transom panel and doors: Stainless steel
Front return panel and columns: Stainless steel
Floor: Standard
Ceiling: Painted steel sheet with indirect full lighting
Operating panel: Fitted in front return panel in matching stainless steel.

Immediately after being informed that his tender was successful, the sub contractor shall submit full details of proposed car finishes to the engineer for approval and to make final selections of colours.

CAR ILLUMINATION
The lift car shall be adequately illuminated by utilizing low energy type light fittings such as LED spot lights or similar. The illumination level shall not be less than 150 lux on the lift floor level.

EMERGENCY LIGHTING

The lift car shall be provided with emergency re-chargeable battery operated lighting and alarm units. The alarm switch shall be connected to the emergency battery source to ring the alarm bell in the lift shaft when the normal and the standby power source is not available. A button for the testing of the emergency-light battery power pack shall be mounted on top of the car. The emergency light unit shall form an integral part of the normal car lighting including fluorescent lighting and down lighter. Separate emergency light units mounted within the car enclosure shall not be accepted.

The lighting shall be automatically switched on in the event of failure of normal lighting supply to the lift.

EMERGENCY ALARM BELLS

The lift shall be provided with two emergency alarm bells, which are operated by a push button inside the lift car. One alarm bell shall be installed on the roof of each car and one common alarm bell at high level on the landing of a designated point of entry. The electricity supply for the alarm hells shall be fed from the batteries in Cause 10.2.

LIFT ENCLOSURE FAN

Provide silent running squirrel cage, centrifugal flow exhaust blowers mounted in the car roof to draw air out car enclosure from the landing when the doors are open and through car vents and door clearance gaps when doors are closed. The car ceiling or suspended ceiling shall be designed so as not to restrict the flow of air to the fan. The extraction fan(s) shall be capable of delivering not less than 5 litres per second of free air per square metre of floor area. The fan shall be switched via a toggle switch or latching push button mounted in the car-operating panel. The contractor shall provide the ventilation specification to prove that the ventilation provided meets the requirements of this specification.

EMERGENCY EXITS

The lift car shall be provided with an imperforate emergency exit in the roof of minimum size 500 mm x 350 mm or 400 mm in diameter.

Panels for emergency exits shall: -

(1) be opened only from the outside;

(2) be clear of any apparatus mounted above the roof of the lift car;

(3) be capable of being opened, reclosed and relocked without a key;

(4) be provided with an electric safety device which will prevent operation of the lift when the panel is not locked, and operate the alarm bells.

CONTROL STATION IN CAR

The lift car shall have a flush mounted control station comprising:-

(1) Call buttons with acceptance signals to correspond with the landing served.

(2) An alarm push button with protection from being operated accidentally; the colour of this button shall he yellow;

(3) “Door open” and “door close” push buttons;

(4) Audible and visible signals in connection with the overload device;

(5) Light switch, alarm reset switch, fan switch and cleaner’s “Stop-switch” keeping the car door open in the form of key switches or housed in a recessed metal box with hinged or sliding lid which will be key-locked.

(6) Two-way intercom speaker.

All push buttons shall be at a height that will be in reach of disabled persons in wheel chairs.

All wordings shall be engraved in English characters. The material for the control station shall be stainless steel with a thickness of not less than 2.5 mm. The control station shall be fixed onto the car panel by stainless steel screws of secret-head type.

The direction indicators and the position indicator shall be of digital type display with lamp matrix actuated by solid state circuitry.

The position indicator shall have a minimum height of 50 mm and easy to read even from a wide angle of view and under an illumination level of 500 lux.

The indicators shall be mounted onto the back of at least 2.5 mm stainless steel faceplates by weld studs and screws.

All push buttons shall be of vandal-resistant design and flush mounted construction.

HALL POSITION INDICATORS AND CALL BUTTONS

One (1) panel with call buttons and digital position indicators shall be installed next to the door opening at each floor.
The panels shall have stainless steel face plates, matching the lift door finishes. It shall be installed at a height within reach of a person in a wheel chair.
The call button shall be of the vandal proof type.

BRAILLE BUTTONS

Car call buttons shall have Braille incorporated (engraved) into the button unit. Stick on Braille plates shall not be accepted.

The car operating panels shall be Disabled friendly and shall be located so that all operating and emergency buttons are located within 1200-mm and 900-mm above the car platform. The emergency buttons and switches including the alarms, door-open button, intercom button and control key switches shall be mounted at the bottom and the call buttons shall be mounted in numerical order starting above the emergency button and numbering from left to right.

The minimum area of the active part of the button shall be 490mm square or an inscribed circle of 20-mm square diameter.

The position of the symbol shall be on the active part or 10-mm to 15-mm left of it.

The minimum distance between active parts of the buttons shall be 10-mm.

VOICE ANNUNCIATION

The lift car shall be provided with blind friendly full range volume-controlled voice annunciation / voice synthesizer in each lift. The voice annunciation shall be software generated and shall have the capabilities of being re-programmed to enunciate special words or messages as required and approved by the Principal Agent.

Voice annunciation shall be in English and shall have a clearly understandable English accent.
Voice annunciation shall include:
• Next selected landing at which the lift will stop,
• The direction the lift is committed to travel,
• Special door safety instructions,
• Special instructions if the lift is held up at a landing for an extended period of time.

CAR TOP CONTROL

A control station shall be fitted on the car roof and it shall be so made that when in use :-

(1) it is not possible to control the car from any other position;
(2) the car will only travel at a speed not exceeding 0.63 m/s;
(3) the car will not move until all safety devices are in, and remain in, the safe position; the car will move only whilst two buttons are subjected to continuous pressure.

The control station shall comprise the following switches clearly marked:
(1) ‘STOP’ switch;
(2) ‘NORMAL/INSPECTION’ switch;
(3) directional inspection buttons protected against accidental operation; and
(4) movement buttons protected against accidental

CAR AND LANDING DOORS

The lift car entrance shall be provided with an imperforate car door which shall extend the full height and width of the car opening. The top track of the door shall not obstruct the car entrance.

All landing openings in lift well enclosures shall be protected by imperforate doors which shall extend the full height and width of the landing opening. The top track of landing door shall not obstruct the entrance to the lift car. Every such door shall have an F.R.P. of not less than two hours.

Any projections on or recesses in the exposed parts of the car doors or landing doors shall be kept to a minimum in order to avoid finger trapping between sliding parts of the door and any fixed part of the car or landing entrance.

The clearance between panels or between panels and any fixed part of the car or landing entrance shall not exceed 6 mm.

Sliding car and landing doors shall be guided on door tracks and sills for the full travel of the doors. The distance between the car and landing sills shall not exceed 35 mm.

The clear height of all entrances on car and landings shall not be less than 2 m.

The doors for the passenger lift shall be of metal construction, and the internal face of the car door shall he lined the same as the car. The doors shall be two panels, centre opening with automatic power opening and closing.

The car shall be equipped with an electronic door sensor which can detect an obstruction at the car entrances and controls the closing of the doors. This prevents the passenger, wheeled stretcher or wheeled chair from getting humped by the closing doors, and relieves the user from holding down the OPEN button. The sensor shall scan for any object across the full height of the car entrance. The doors shall reverse immediately if the sensor detects any obstruction at the car entrances, and reverse operation is possible up to 2 times.

EMERGENCY KEY SWITCH FOR PASSENGER LIFT

(1) An emergency key switch system comprising the following facilities shall he provided for the passenger lift:

(i) An on-off key switch above the landing fixture at each landing and on the lift car control station.

(ii) “Emergency Use” indicator in English at each landing and on the lift car control station.

(2) The emergency key switch shall be operated as follows:

(i) When the key switch at the required landing is operated, the lift will immediately stop at the next floor in the direction in which it is travelling. Lift doors will remain closed and lift will immediately go to the floor at which the key switch has been operated. Should the lift be already travelling in the direction of the floor where the key switch has been operated the lift will go to that floor without stopping. At the same time of the key switch operation, an indicator will illuminate on the car control station, and on each landing to warn the passengers that the lift is required for ‘Emergency Use’ only.

(ii) On arrival at the requesting floor the lift will stop, doors open and remain open until the same key is used to operate the key switch in the lift car. Should the key switch in the lift car is not operated for an adjustable period of 5 minutes, the lift will return to its normal operation.

(iii) With the same key to operate the key switch in the lift car, the person requiring the lift will gain full control over the lift. The lift will return to its normal operation when the key switch in lift car is returned to its ‘off position.

(iv) The key at each landing shall be of the spring loaded type to ensure that the switch returns to ‘off position. The key in lift car shall be withdrawn at ‘off’ position only. The operation of key switch in lift car will override the ‘on’ position of key switch at any landing. The ‘Emergency Use’ indicators will remain illuminated until all the key switches are returned to their ‘off positions or the pre-set period or time has been expired.

This emergency key switch shall not override the Fireman’s Switch.

DIRECTION AND POSITION INDICATOR

Audible and visual direction indicators shall he provided on each landing. The indicator shall sound once for the arriving lift that is travelling upwards and twice for downwards. Audible signal shall be at least 58 dBA measured at 1 m from the landing door while the visual signal shall he an illuminated directional indicator with an illuminated area not less than 1125 mm2. The visual direction indicator shall he designed with a minimum protrusion of 10 mm to give a better visual effect to the passengers waiting.

Illuminated position indicator will be provided only at the landing of designated point of entry and on other floors.

SAFETY GEAR AND OVER SPEED GOVERNOR

The lift shall be provided with a safety gear capable of operating only in the downward direction and capable of stopping a fully laden car, at the tripping speed of the over-speed governor, even if the suspension devices break, by gripping the guides and holding the car there.

If accessible spaces do exist underneath the counterweight, the counterweight, as well as the car, shall be provided with a safety gear.

Safety gears shall comply with the following general requirements:

(1) The release of the safety gear on the car (or the counterweight) shall only be possible by raising the car (or the counterweight).

(2) Each safety gear shall be tripped by its own over speed governor.

(3) The operation of the safety gear shall not cause the car platform to slope at more than 1 in 20 to the horizontal.

(4) Vibration of the car shall not in any case cause a safety gear to operate.

(5) The tripping of safety gears by devices which operate electrically, hydraulically, or pneumatically is forbidden.

OVER SPEED GOVERNOR

The lift shall be equipped with an over speed governor of the centrifugal type which shall operate the safety gear at a speed at least equal to 115% of the rated speed. The means of adjusting the over speed governor shall be sealed after setting the tripping speed.
The motor control and brake-control circuits shall be opened before or at the same time as the governor trips and cause the lift to stop.
The governor ropes shall not be less than 6 mm in diameter and shall he of flexible wire rope.
The breakage or slackening of the governor rope shall cause the motor to stop by means of an electric safety device.

OVERLOAD DEVICE AND FULL LOAD DEVICE

The lift shall be provided with an overload device which shall operate when the load in the car is 10% or more in excess of the rated load of such lift.

The overload device, when in operation, shall

1. prevent any movement of the car,

2. prevent the closing of any power operated door whether fitted to the car or to the landing at which the car is resting, and

3. give audible and visible signals.

The lift shall resume normal operation automatically on removal of the excessive load. The overload device shall he inoperative while the lift car is in motion.

The lift shall also be provided with a full load device having an adjustable setting range from 80% to 100% of the rated load and when operated, it shall by-pass all landing calls. When the load in the car is reduced, the car shall stop for landing calls as normal

LIFT MOTOR

The lift motor shall be of the gearless traction, permanent magnet type mounted inside the lift shaft.

The motor shall be fitted with internal double **brakes to comply with safety regulations.**

SOLID STATE CONTROLS
Microprocessor-based control shall include the following design features:

(1) The system hardware shall be capable of supporting fully software based supervisory and motor control systems.

(2) Interruption of the electrical supply to the lift shall not affect the system memory or software.

(3) It shall be possible to change the supervisory control algorithm to meet a change in the use of the building by re-programming the instruction memory.

(4) It shall be possible to interrogate, by means of communication access/test points on the controller, the system operating functions by use of a portable unit using diagnostic routines.

(5) Visual indicators, e.g. LED'S, shall be provided on the controller to display information on the operational status of the lift.

(6) Multiplexing techniques may be employed to reduce the number of trailing cables normally required, if considered cost effective to do so.

(7) Automatic push button control shall allow only one call to be registered at a time. The car answers one call before another can he registered. All car and landing doors must be properly closed before the car will respond to either a landing or car call. On stopping, a short period elapses during which no landing call is effective and priority is given to the car pushes to allow passengers to enter the car and register a car call.

If no car call is registered after the car stops at a floor and the car and landing doors remain closed, then a landing call may be registered after an adjustable time delay of not more than 8 seconds, when the lift becomes free.

(8) All calls shall be stored in the system and answered in sequence regardless of the order in which they are registered.

(9) When travelling in the 'Up' direction, the car travels to the highest call, stopping at any intermediate floor for which a car call has been registered. On stopping for the highest call, preference is established for the 'Down' direction.

(10) When travelling downwards the car stops for all car and landing calls that have been registered. When all calls have been answered, the car remains with doors closed at the floor to which it last travelled.

GUIDE RAILS AND BRACKETS
Rigid steel guides shall be used for guiding lift cars and counterweights throughout their travel.

The strength of the guides, their attachments and joints shall comply with BS 5655 Part 9 and be sufficient to withstand the forces imposed due to the operation of the safety gear and deflection due to uneven loading of the car;

The guides shall have machined guide surfaces for rated speeds exceeding 0.4 m/s.

Guide brackets shall be provided at suitable intervals and shall be fixed to the lift shaft walls with anchor bolts.

Wood or fibre blocks or plugs shall not be used for securing any guide brackets.

BUFFERS
Buffers shall be provided at the bottom limit of travel for cars and counterweights.

COUNTERWEIGHTS
The counterweights shall be of metal and constructed from multiple sections, contained and secured within a steel frame, and shall equal to the weight of the complete car plus approximately 40% - 45% of the Contract Load.

At least, four guide shoes, capable of being easily renewed or having renewable linings shall be provided on the counterweight.

If there are pulleys on the counterweight, they shall incorporate devices to avoid:
(1) the suspension ropes, if slack, leaving the grooves.
(2) the introduction of objects between ropes & grooves.

SUSPENSION ROPES
The lift shall be provided with hoist ropes of sizes and numbers sufficient to comply with the requirements of the relevant code and traction requirements. The shop drawings shall indicate the type, the number and sizes of ropes proposed, together with the name of the manufacturer, type, ultimate strength, the proper working load and that the core is of manila fibre. All hoist ropes shall be cut in sequence from the rope reel and tagged for sequential adjacent installation.

The ends of the hoist ropes shall be properly secured to the car and counterweight crosshead or to the dead-end hitch plates on 2:1-roping, with adjustable rope shackles having approved sockets. Screw adjustment shall permit equalisation of the tension in all ropes.

A 9-mm wire rope minimum shall be threaded and clamped to prevent the group of shackles from turning.

GOVERNOR ROPES:
Governor ropes shall be in accordance with SABS-1545. The two ends shall be securely fastened together at the lift and shall be attached to the safety operating mechanism. The governor rope shall pass over the governor sheave and over an approved tensioner sheave in the pit. An electrical contact shall be fitted to the pit sheave and shall stop the lift if the governor rope becomes slack or breaks.

Hoisting Rope Attachment:
The lift car hoisting rope attachment / hitch shall be suitably vibration isolated to prevent rope noise from being transferred to the car enclosure and shall ensure a ride quality as specified.

Rope dead-end hitching points (2:1 roping) shall be accomplished with up-stands of adequate construction and height floor to allow the inspection of the entire rope fixing and sockets. Removable kick plates shall be provided if the kick plate inhibits the inspection of the rope fixing and socket.

Hoisting rope sockets shall be suitably vibration / noise isolated from the hitching plate and this shall be accomplished by inserting nylon sleeves into the hitching plate rope holes before inserting the sockets.

Hoisting Rope Noise:
The suspension rope hitch and sheaves shall be designed to limit the rope noise to a level that is not audible in the car enclosure or on the landings during travel. Sheave and rope hitch designed and manufacture shall prevent hoisting ropes from vibrating against each other during travel.

TERMINAL STOPPING AND FINAL LIMIT SWITCH
The lift shall be provided with normal terminal stopping switches and final limit switches. They shall be positively operated by the movement of the car. These switches shall either be mounted on the car frame or in the lift well.

FINAL LIMIT SWITCHES
The final limit switches shall either open directly when required by mechanical separation the power feeding the motor and brake, or break by an electric safety device the circuit controlling two contactors, the contacts of which are in series in the circuit of the motor and brake.

GENERAL REQUIREMENTS
All dangerous parts shall be effectively guarded. Where applicable, components shall be designed to be inherently safe, obviating the need for external or removable guards.

Counterweights shall be guarded by means of a rigid metal screen extending from a position 0.30 m above the lift pit floor to a position at least 2.50 m above the lift pit floor.

The lift car body shall be carried in a steel car frame sufficiently rigid to withstand the operation of the safety-gear without permanent deformation of the car frame.

The deflection of the members carrying the platform shall not exceed 1/1000 of their span under static conditions with the rated load evenly distributed over the platform.

At least four renewable guide shoes, or guide shoes with renewable linings, or sets of guide rollers shall be provided, two at the top and two at the bottom of the car frame.

19.3 REQUIREMENTS FOR THE DISABLED

ESSENTIAL LIFT CONTROLS BUTTONS SUCH AS THE EMERGENCY ALARM BUTTON, INTERCOM BUTTON, DOOR OPENING BUTTON, CALL BUTTONS ON LANDINGS, FLOOR BUTTONS IN THE LIFT CAR, SHALL NOT BE LOWER THAN 900 MM OR HIGHER THAN 1200 MM ABOVE FLOOR LEVEL. BRAILLE AND TACTILE MARKINGS SHALL BE PLACED EITHER ON OR TO THE LEFT OF THE CONTROL BUTTONS. SUCH MARKINGS SHALL BE MINIMUM 15 MM IN HEIGHT AND 1 MM RAISED. ALL LIFT CONTROL BUTTONS SHALL HAVE A MINIMUM DIMENSION OF 20 MM.

HANDRAIL

A tubular stainless-steel handrail between 45 mm and 51 mm in diameter shall he provided on 3 sides of the lift car, extending to within 150 mm of all corners. The handrail shall be 25 mm or more clear of walls and other obstructions and shall he above floor level.

LANDING AND CAR DOORS

On arrival of the lift to a landing in response to a car call or landing call, the landing and car doors shall be open automatically and be kept open for a period before closing. This period shall be adjustable from 5 seconds to 30 seconds. An audible signal shall be provided to signify the closing action of the doors. The closing landing and car doors shall be reopen in the event that a person is about to be struck.

EMERGENCY ALARM PUSH BUTTON AND INTERCOM

There shall be an emergency alarm push button together with an indication light, a buzzer and an intercom inside the lift car such that the person inside can speak to the Building Management Office or the caretakers office as the case may be. The indication light for acknowledgement shall be in form of a blinking light adjacent to the intercom speaker and a notice “When light blinks, please speak or press alarm button again” shall be provided next to the indication light.

19.4 CONTROLLER

CONSTRUCTION

The controller shall be mounted in a ventilated steel cubicle with hinged front doors and removable hinged rear panels, in which all contactors, solenoids, relays, motor starting equipment etc., shall be fitted. All steel sheet shall be no less than 1.2 mm thick.

GENERAL REQUIREMENTS

1. Materials used in the construction of the control equipment shall not support combustion.
2. The components shall he designed and mounted in a manner which facilitates inspection, maintenance, adjustment and replacement. Wirings shall be terminated in such a way that the wires are not damaged. Accessible terminals suitably marked, shall be provided for incoming and outgoing cables.
3. Control circuits at normal mains voltage shall be connected between phase and neutral and shall be supplied through double wound isolating transformer.
4. Where rectifier is used it shall be of the full wave silicon type fed from a transformer.
5. The control circuit shall be protected by suitably rated over-current circuit breakers or HRC fuses independently.
6. The brake solenoid and any retiring cam shall operate on direct current.
7. Motors connected to polyphase ac. power supplies shall incorporate means to prevent the motor from being energised in the event of phase failure.

SOLID STATE CONTROLS

Microprocessor-based control shall include the following design features:

1. The system hardware shall be capable of supporting fully software based supervisory and motor control systems.
2. Interruption of the electrical supply to the lift shall not affect the system memory or software.
3. It shall be possible to change the supervisory control algorithm to meet a change in the use of the building by re-programming the instruction memory.
4. It shall be possible to interrogate, by means of communication access/ test points on the controller, the system operating functions by use of a portable unit using diagnostic routines.
5. Visual indicators, e.g. LED'S, shall be provided on the controller to display information on the operational status of the lift.
6. Multiplexing techniques may be employed to reduce the number of trailing cables normally required, if considered cost effective to do so.

AUTOMATIC FULL LOAD BY-PASS

To eliminate the inconvenience of having fully-loaded cars stop for landing calls, all lifts shall be equipped with a full load device which detects the load condition in the car and allow landing calls to be by-passed.

AUTOMATIC PUSH BUTTON CONTROL

Automatic push button control shall allow only one call to be registered at a time. The car answers one call before another can he registered. All car and landing doors must be properly closed before the car will respond to either a landing or car call. On stopping, a short period elapses during which no landing call is effective and priority is given to the car pushes to allow passengers to enter the car and register a car call.

If no car call is registered after the car stops at a floor and the car and landing doors remain closed then a landing call may he registered after an adjustable time delay of not more than 8 seconds, when the lift becomes free.

ELECTRICAL EQUIPMENT AND WIRING

The electrical supply for the lift installation is existing..

All electrical work carried out shall be of a high standard and shall conform to all respects with SABS 0142. No work of inferior standard shall be accepted and shall be rectified at the cost of the contractor without any extension of the contract period.

ARD (AUTOMATIC RESCUE DEVICE)

An automatic rescue devise shall be included. When the power fails, the lift shall travel to the nearest floor and the doors will open automatically.

SUMP PUMP

A submersible pump will be included in the tender.

PAINTWORK

All equipment supplied and installed under this contract shall be properly painted after installation. Galvanized surfaces shall be treated correctly and strictly in accordance with suppliers' details before the undercoats are applied. Undercoats shall be followed with at least 2 (two) final coats. In general, the final colours shall match the building finishes but chilled water pipes shall be painted according to SABS colour codes. The colours of the pipe support structure and the sections of the chilled water pipes in the structure will be provided at a later stage.

All galvanised steel surfaces shall receive a first coat of "Galvo Grip" paint, followed by a coat of Universal Undercoat. This shall be followed by two coats of matt black oil-based paint.

All steel surfaces shall be painted with a zinc-chromate steel primer, a universal undercoat and two final coats of good quality enamel paint. The tender price shall make provision for any standard colour paint for the final coats.

All paints shall be SABS approved and shall be Plascon

GUARANTEE AND MAINTENANCE PERIOD

The 12 month guarantee period will start on the date of first delivery as indicated on the completion certificate. During this period the contractor shall be responsible to service the entire installation at regular intervals of not longer than 3 months, to do all repairs and to replace all broken parts at no cost to the client.

The maintenance for all the lift equipment shall be fully comprehensive and shall exclude monthly inspections. This maintenance shall include monthly examinations; adjustments and lubrication of all lift equipment.

Electrical and mechanical parts shall be repaired or replaced whenever it is required to maintain optimum performance using only parts produced by the original Manufacturer, unless caused by misuse or abuse of the lift equipment.

Maintenance work included shall be performed by competent, qualified personnel under the supervision and in the direct employ of the Sub-Contractor and shall not be assigned or transferred to any non-affiliated agent.

Maintenance and repair work shall be done during regular working hours and shall further provide emergency call back service twenty-four (24) hours a day, seven (7) days a week.

The sub-contractor shall at the end of the twelve (12) months Free Maintenance / Guarantee Period covered under this section, verify by way of a detailed stop / breakdown report that the lifts have been performing reliably. Failing to do so will result in an extension of the twelve (12) months free maintenance period. Until such time that the lift equipment is proven to operate reliably, the twelve (12) months free maintenance period shall be extended and considered valid. The period, during which the reliability shall be measured, shall be as a minimum, the three (3) month period prior to the conclusion or any extension of the Maintenance Guarantee Period.

It is a special condition of contract that any defects reported during the twelve month guarantee period shall be attended to within 24 hours without any costs to the client.

The Sub-Contractor shall be prepared enter into the Employer's National fully comprehensive Maintenance Agreement for a term of not less than five (5) years at the end of the twelve (12) month free maintenance period. It is accepted that the Sub-Contractor is acquainted with the Employer's performance-based Maintenance Agreement and consequently a specimen copy of the Maintenance Agreement will only be presented on request.

The terms and conditions of this fully comprehensive maintenance agreement excluding the costs shall apply to the lift maintenance called for above.

The sub-contractor shall submit at tender stage, the proposed current day monthly maintenance costs for each unit. These maintenance costs will be escalated using the Consumer Price Index (CPI) Table-3 to determine the maintenance costs applicable after the 12-month free maintenance period and the CPI Base-Date use to adjust the maintenance costs shall be the date of Tender. Maintenance costs submitted and escalated over a 5-year period will significantly influence the Tender evaluation and recommendation process.

The costs of the maintenance agreement shall not be included in the Scope of the Works Information.

The Employer reserves the right to appoint the Sub-Contractor (Manufacturer) or any alternative Maintenance Contractor of its choice at the end of the free maintenance period

20. LANDSCAPING

20.1 GENERAL

-It is the contractor's responsibility to obtain all relevant requirements, service plans and existing fixtures from University Estates before quotation.

- Only waterless landscaping is allowed and must be approved by PMO.

20.2 PLANTING

20.2.1 PLANTING OF TREES

-Holes for planting of trees should be square. Measurements in comparison to a 20 liter tree: 500mm x 500mm x 750mm deep.

-Compost should be mixed with soil. At least 30dm (one bag) or one third of total soil that is to be placed back in the hole of the tree should be compost.

-Superphosphate, 60 gram per tree, should be mixed with the above-mentioned soil before backfilling.

-Absorbs ion granules may be applicable, as determined by the soil composition and area where the tree is going to be planted.

-Be certain that trees are planted without their black bags and roots are just under the soil level.

-On grass areas, trees should be supplied with a tree ring 350mm for protection against machine damage.

-Where bubblers are being used to water trees, a tree ring of 500mm should be placed around the tree base. This will be used as watering area.

-All trees shall be staked. Two stakes shall be driven into the pit, one on either side of the centre position of the pit, prior to placing the tree. The stakes shall be of round timber, 40 – 50 mm in diameter, exceeding 2000 mm in height. The tree shall be attached to stakes using approved tree ties and ensuring that stakes does not chafe the tree. Two tree ties shall be placed approximately 600mm above ground level and 2 within the crown of the tree approximately 300mm below the top of the stake.

-Supports in the form of Y droppers (2.1m) should be placed to keep the trees upright. The poles should be uniform, the same height above the ground and planted deep enough to prevent theft.

Wire with hose, at least 2 bonds should be used to fasten the tree in an upright position to the Y dropper.

-Plants are then watered to a depth of at least 300mm. The plant should be kept moist until the final inspection and hand over is completed.

-Before final site handover from the contractorto the University a representative fromUniversity Estates project and the horticulturistshould be invited to sign off on the finalinspection.

20.3 PARKING AND PAVING

-Treat ground underneath paving with an approved weed killer.

-Concrete block paving must be replaced with paving brick that is locally available.

-Paving must be at the same level as manholes.

-Reinforce restrain with brick force to reduce cracking.

20.4 PEDESTRIAN ROUTES & SPEED BUMPS

-Install larger drainage pipes of approximately 150mm underneath bumps and pedestrian routes

-Where a route crosses a road, use 80mm paving stones.

21. CLEANING SERVICES

21.1 ITEMS TO BE INCLUDED WHEN UNDERTAKING NEW PROJECTS (NEW BUILDING/UPGRADING)

21.1.1 REST ROOMS FOR CLEANING PERSONNEL

• The entrance to a rest room must preferably beon the outside of a building

• Windows must be ample size with an outside view

• Standard shelves, lockers, a basin for cutlery, a wall mounted platform for kitchen equipment must be provided according to the existing standard on campus Flooring must preferably be of ceramic tiles with loose carpets otherwise plain concrete with a loose carpet.

• At least one double electric wall outlet must be provided near the tabletop for a two-plate stove, a kettle, a fan, etc. and also a double electric wall outlet for e.g. a heater elsewhere in the room

22. ICT SERVICES

22.1 RESPONSIBILITIES

• Data

• Telephone

• Access Control

• WiFi

• AV

22.2 PROCUREMENT

After the project commences on site, the UFS ICT department is required to provide specifications and source quotations respectively, and recommend an appointment of the relevant subcontractor through the electrical engineer.

ADDENDUM 1

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

University Estates:

Maintenance Manual/ Close-out Report Checklist

	INDEX	**Yes**	**No**	**N/A**
1	Consultants Team contact details			
2	Sub-contractor's contact details			
3	**Architectural Aspects**			
	Municipal Approvals			
	Architectural Drawings			
	Architect Specifications			
	Guarantees for loose and fixed furniture			
	Glass and aluminium installation certificate			
	As Built Drawings			
4	**Summary of colours and finishes**			
	Paint colours			
	Floor Tiles			
	Wall tiles			
	Finishes: Care Instructions			
5	**Mechanical Aspects**			
	Mechanical Drawings			
	Fire installation certificate			
6	**Electrical Aspects**			
	Electrical Drawings			
	Electrical Shop Drawings			
	Electrical Certificates of Compliance			

7	**Structural Aspects**			
	Structural Drawings			
	Survey & Geotechnical report			
	Mix designs			
	Soil poisoning/ Pest control certificate			
	Compaction results			
	Concrete cube results			
	Roof Covering Workmanship Guarantee			
	Waterproofing Guarantee			
	Structural Shop Drawings			
	Structural As -built drawings			
8	**Civil Aspects**			
	Civil Drawings			
	Traffic count & Survey Report			
	Compaction test results			
	Concrete cube results			
	Pressure test certificate			
	Plumbing and drainage work certificate			
	Civil As -built drawings			
9	**Certificate of Practical Completion**			
	Artic stock- to be signed by all relevant parties			
	Signed register of receipt of Artic stock			
10	**Certificate of Works Completion**			
11	**Retention Period**			
12	**Certificate of Final Completion**			
13	**Lessons learned by the team and how can the team improve**			
14	**Signed Final Account Statement Summary**			
15	**Final Cost Report**			
13	**Client's Report**			

ADDENDUM 2

HOUSING AND RESIDENCE AFFAIRS

PHYSICAL RESIDENCE SERVICES

Standard Maintenance Specification: Material – Draft 1

PLUMBING

1. WC: Hibiscus Elite Front Flush Close Coupled Suite. Vaal Sanitaryware

2. WHB: Vaal Tuscany wall hung basin/Vaal Cameo-Drop in Basin

Tuscany Wall hung

Cameo Drop-in

3. Shower Tap

3.1 Mixer: Hansgrohne Mixer. HG Décor shower mix. Conc. Chr. Export.
Model: 31967000

3.2 Stop taps: Cobra Carina Heavy Pattern Stop taps

4. Basin Tap

4.1 Mixer: Hansgrohe Mixer. HG single lever basin mixer 70 with push open waste set.
Model.: 31730003.

4.2 Pillar tap: Cobra Carina/Star – Heavy Pattern

Carina

Star

5. Bath Mixer: Cobra Carina Heavy Pattern Bath Mixer

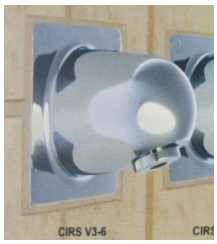
6. Shower head – Match Existing

6.1 **Normal:** Cobra Prestex Shower Head

6.2 Water saving: Walcro V3-6/V2

V2

V3-6



7. Kitchen

7.1 Sink : Franke Quinline Double bowl sink – Drop in

7.2 Mixer : Cobra Carina Kitchen Mixer

BUILDERS

1. Steel Window Ironmongery : Only solid brass
2. Waterproofing
   - 2.1 Shower walls and floors : ABE Duraflex 2 coats
   - 2.2 Concrete roofs : ABE Unigum with 2 coats Silvakote
   - 2.3 Ceramic Tiles : • Match existing (Always check for Stock at HRA store before procuring or HRA to supply spec)
     • For new tiles, HRA to supply spec

CARPENTRY

1. Doors : Semi-solid/Solid

2. Door handles : Union Gower Chrome or match existing

3. Lockbody's : Union lockset

PAINTERS

1. Blinds : 50mm Blinds - colour to match existing

2. Vinyl Tiles : Floorworx Marley Tiles

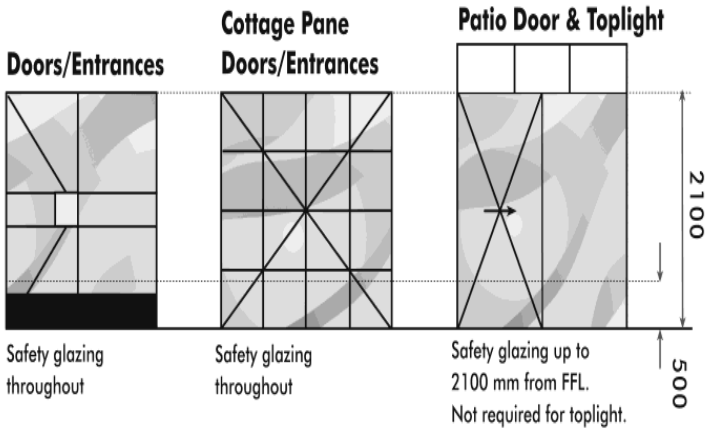
3. Paint : Dulux, Plascon, Laminin as per UFS Paint Spec

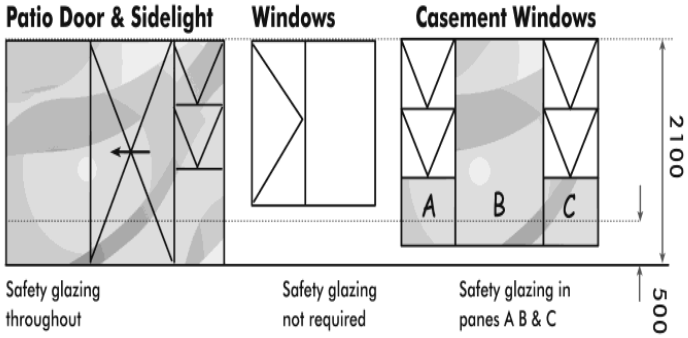
- 3.1 Bathroom Ceilings and walls : Enamel
- 3.2 All other interior walls : Washable Acrylic Paint
- 3.3 Colour to match existing or spec to be provided by HRA

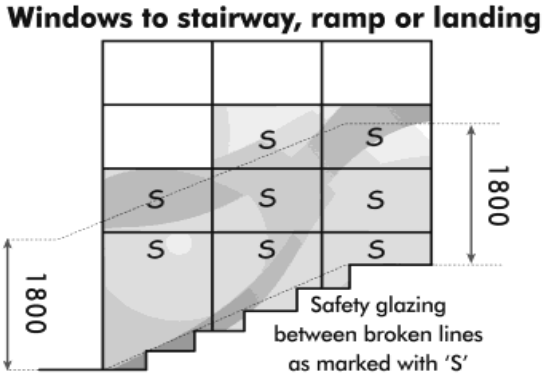
4. Glazing

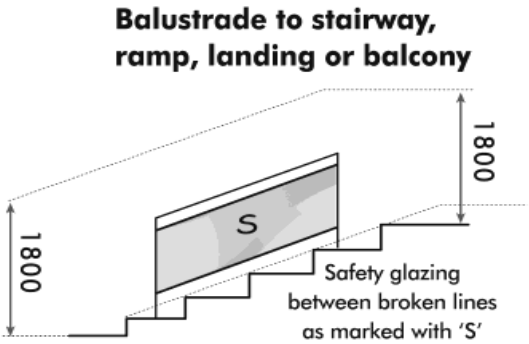
VERTICAL GLAZING SUPPORTED ALL AROUND - EXTERNAL							
	Maximum Pane Sizes in Square Metres						
Nominal Glass Thickness(mm)	**3**	**4**	**5**	**6**	**8**	**10**	**12**
Monothilic Annealed Glass	0.75	1.5	2.1	3.2	4.6	6.0	6.0
Patterned Annealed & Wired Glass	-	0.75	1.2	1.9	2.6	3.4	-
Laminated Annealed Safety Glass	-	-	-	2.9	4.3	5.7	5.7
Toughened Safety Glass	-	1.9	3.0	4.5	8.0	8.0	8.0

VERTICAL GLAZING SUPPORTED ALL AROUND - INTERNAL							
	Maximum Pane Sizes in Square Metres						
Nominal Glass Thickness(mm)	**3**	**4**	**5**	**6**	**8**	**10**	**12**
Monothilic Annealed Glass	0.75	1.5	2.1	3.2	4.6	6.0	6.0
Patterned Annealed & Wired Glass	-	0.75	1.2	1.9	2.6	3.4	-
Laminated Annealed Safety Glass	-	-	-	4.1	6.0	7.2	7.2
Toughened Safety Glass	-	3.0	4.2	6.4	9.2	9.2	9.2

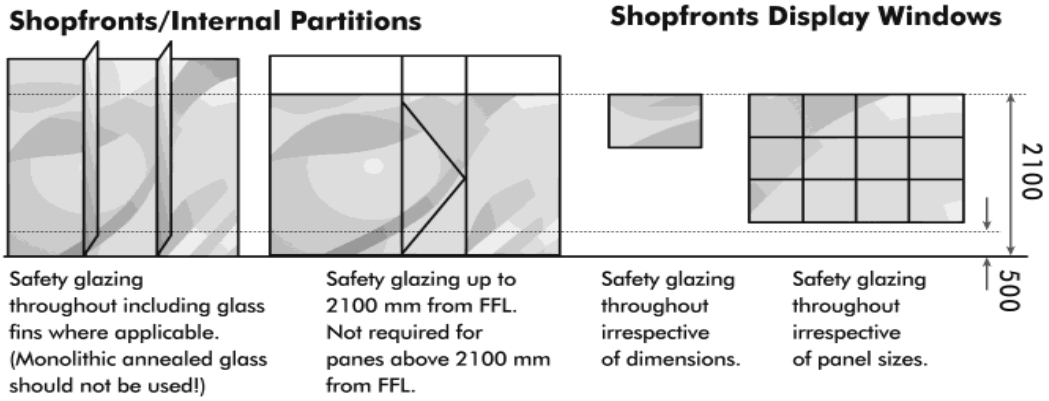








White areas do NOT require Safety Glass



ADDENDUM 3

IRONMONGERY SCHEDULE

ASSA ABLOY

Project	**UFS - TECHNICAL MANUAL (15039)**
Reference	**AG000**
Revision	
Originator	**Annemarie Furstenburg (+27845147462)**

Date : 2021/04/15

Ironmongery Set **D01 - TYPICAL ENTRANCE DOOR - DOUBLE ALUMINIUM**

	Product	Qty	Unit
	Aluminium Flush Bolt BY DOOR FRAME MANUFACTURER	2.00	Each
	DC500 CAM ACTION CLOSER EN1-4 SIL	2.00	EA
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	2.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	5905BBSS BACK TO BACK PULL HANDLE 457MMX32MM	2.00	PR
	8852SC DUST PROOF STRIKE	1.00	EA
	QD35X85MM-SS DEADBOLT LOCK 35MM	1.00	EA

Door No's (1)

D01	ENTRANCE DOOR

Notes

Ironmongery Set **D03 - TYPICAL LOUNGE DOOR - ALUMINIUM**

	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	6503-05SS NARROW STILE FURNITURE PROFILE	1.00	PR
	Q35X85MM-SS SPRING LATCH & DEADBOLT LOCK	1.00	EA

Door No's (1)

D03 LOUNGE DOOR

Notes

Ironmongery Set **D04A - TYPICAL DOOR STUDY SPACE - ALUMINIUM**

	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	6503-05SS NARROW STILE FURNITURE PROFILE	1.00	PR
	Q35X85MM-SS SPRING LATCH & DEADBOLT LOCK	1.00	EA

Door No's (1)

D04A STUDY SPACE DOOR

Notes

Ironmongery Set **D05 - TYPICAL KICK OUT WINDOW - ALUMINIUM**

	Product	Qty	Unit
No image available	SP(5774)SPECIALIST ALUMINIUM KICK-OUT WINDOWS	1.00	Each

Door No's (1)

D05 ALUMINIUM KICK-OUT WINDOW

Notes

Ironmongery Set **D06 - TYPICAL BEDROOM ENTRANCE DOOR - TIMBER**

	Product	Qty	Unit
	L-2215-78SS/SL UNION MORTICE SASH LOCK SS	1.00	EA
	M72X19SCGMK CYL EURO 7X7 TURN KNOB SC GMK	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	SS6166-05SS NEW HANDLE ON PLATE PROFILE	1.00	PR

Door No's (1)

D06 BEDROOM ENTRANCE DOOR

Notes

Ironmongery Set **D07 - TYPICAL LAUNDRY/CLEANERS DOOR - TIMBER**

	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	L-22315-76SS UNION 315 DOORLOCK SS	1.00	EA
	SS5089-150W KICK PLATE 150X800MM WORKS	2.00	EA
	SS6166-05SS NEW HANDLE ON PLATE PROFILE	1.00	PR

Door No's (1)

D07 CLEANERS / LAUNDRY DOOR

Notes ACCESS CONTROL BY SPECIALIST

Ironmongery Set **D08 - TYPICAL BATHROOM ENTRANCE DOOR - TIMBER**

	Product	Qty	Unit
	DC500 CAM ACTION CLOSER EN1-4 SIL	1.00	EA
	SS5023-06-304W PUSH PLATE 152x304mm STAINLESS STEEL BLANK, 304SS 304mm high X 152mm wide X 1,2mm thick with no sharp corners or edges, 4 times coutersunk drilled for back to back screw fixing. Blank with no piercing. Brushed finish. 304 grade SS	1.00	Each
	SS5D152X304-06 UNION 22MM DIAMETER TUBULAR STAINLESS STEEL pull handle bolted to 304mm high X 152mm wide back plate. Latter to have no sharp corners or edges.	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
	SS5066-06SSE12 MALE AND FEMALE SIGN	1.00	EA
	SS5089-150W KICK PLATE 150X800MM WORKS	2.00	EA

Door No's (1)

D08 BATRHROOM ENTRANCE DOOR

Notes NO LOCK

Ironmongery Set **D09 - TYPICAL SHOWER CUBICLE DOOR - MANUFACTURER**

	Product	Qty	Unit
No image available	SP(1866)MANUFACTURER AS SUPPLIED BY MANUFACTURER	1.00	Each

Door No's (1)

D09 SHOWER CUBICLE DOORS/BY MANUFACTURER

Notes BY MANUFACTURER - 70 doors

Ironmongery Set **D10 - TYPICAL TOILET CUBICLE DOOR - TIMBER**

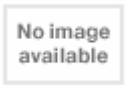
	Product	Qty	Unit
	CZ80941SCR INDICATOR BOLT SC PLATED IMP	1.00	EA
	SS5066-06SS PUSH PLATE BLANK	1.00	EA
	SS5D66-06SS DOVE STAINLESS STEEL PULL HANDLE ON 152X152 BACKPLATE PULL HANDLE ON BACK PLATE; DOVE; 152 X 152mm; BLANK; S/STEEL	1.00	EA
	SS8025SS HAT & COAT HOOK WITH BUFFER	1.00	EA

Door No's (1)

D10	TOILET CUBICLE DOOR

Notes

Ironmongery Set **D11 - TYPICAL PASSAGE DOOR - TIMBER**

	Product	Qty	Unit
	DC500 CAM ACTION CLOSER EN1-4 SIL	1.00	EA
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	SS5D152X304I-05 22MM DIAMETER TUBULAR STAINLESS STEEL PULL HANDLE ON 152X304	1.00	Each
	SS5D152X304R-05 22MM DIAMETER TUBULAR STAINLESS STEEL PULL HANDLE ON 152X304	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
	M51058898 KEY BLANK 7X7	5.00	EA
	L-21315-76SS UNION 323 CYL DEADLOCK SS	1.00	EA
	SS5089-150W KICK PLATE 150X800MM WORKS	2.00	EA

Door No's (1)

D11	PASSAGE DOOR

Notes

Ironmongery Set **D12 - TYPICAL KITCHEN DOOR - TIMBER**

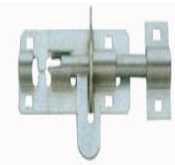
	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	L-22315-76SS UNION 315 DOORLOCK SS	1.00	EA
	SS5066-06SSE02 TEA/KITCHEN SIGN	1.00	EA
	SS5089-150W KICK PLATE 150X800MM WORKS	2.00	EA
	SS6166-05SS NEW HANDLE ON PLATE PROFILE	1.00	PR

Door No's (1)

D12 KITCHEN DOOR

Notes

Ironmongery Set **D13A - TYPICAL ELECTRICAL CUPBOARD DOOR - TIMBER**

	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3570GA-200MM GALVANIZED PADBOLT - 200MM LONG	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	2700SS UNION 2700 REBATE SET SS	1.00	EA
	L-22315-76SS UNION 315 DOORLOCK SS	1.00	EA
	SS6166-05SS NEW HANDLE ON PLATE PROFILE	1.00	PR

Door No's (1)

D13/03 ELECTRICAL CUPBOARD DOOR

Notes

Ironmongery Set **D13B - TYPICAL FHR DOOR - TIMBER**

	Product	Qty	Unit
	B3570GA-200MM GALVANIZED PADBOLT - 200MM LONG	1.00	Each
	26310-76SS UNION 310 LATCH LOCK SS	1.00	EA
	2700SS UNION 2700 REBATE SET SS	1.00	EA
	SS5066-06SSE05 FIRE HOSE SIGN	1.00	EA
	SS6166-06SS NEW HANDLE ON PLATE BLANK	1.00	PR

Door No's (1)

D13/01 FHR DOOR

Notes

Ironmongery Set **D14 - TYPICAL DUCT GATE - STEEL GATE**

Product	Qty	Unit
UN335070206300 50MM BRASS PDLK 63MM SH MK	1.00	EA

Door No's (1)

D14 DUCT GATE

Notes PADLOCKS

Ironmongery Set **D15 - TYPICAL DISABLED SHOWER DOOR - TIMBER**

	Product	Qty	Unit
	21314-76/8SS UNION WC 8MM DEADLOCK SS	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
	SS5004-73SS ESCUTCHEON ON ROSE BATHROOM	1.00	EA
	SS5066-06SSE14 PARAPLEGIC TOILET SIGN	1.00	EA
	SS5089-150W KICK PLATE 150X800MM WORKS	2.00	EA
	SS5D66-06SS DOVE STAINLESS STEEL PULL HANDLE ON 152X152 BACKPLATE PULL HANDLE ON BACK PLATE; DOVE; 152 X 152mm; BLANK; S/STEEL	2.00	EA

Door No's (1)

D15 PARAPLEGIC SHOWER DOOR

Notes

Ironmongery Set **D17 - TYPICAL STORE ROOM - TIMBER**

	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	L-22315-76SS UNION 315 DOORLOCK SS	1.00	EA
	SS5089-150W KICK PLATE 150X800MM WORKS	2.00	EA
	SS6166-05SS NEW HANDLE ON PLATE PROFILE	1.00	PR

Door No's (1)

D17 STORE ROOM DOOR

Notes

Ironmongery Set **D18 - TYPICAL MALE/FEMALE WC DOOR - TIMBER**

	Product	Qty	Unit
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
	2X815/TNP 815T/B31 W/C PRIVACY CYL	1.00	EA
	L-22315-76SS UNION 315 DOORLOCK SS	1.00	EA
	SS5066-06SSE12 MALE AND FEMALE SIGN	1.00	EA
	SS6166-05SS NEW HANDLE ON PLATE PROFILE	1.00	PR

Door No's (1)

D18 MALE / FEMALE WC DOOR

Notes

Ironmongery Set **D19 - TYPICAL FOYER DOOR - DOUBLE ALUMINIUM**

	Product	Qty	Unit
	Aluminium Flush Bolt BY DOOR FRAME MANUFACTURER	2.00	Each
	DC500 CAM ACTION CLOSER EN1-4 SIL	2.00	EA
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	2.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	5905BBSS BACK TO BACK PULL HANDLE 457MMX32MM	2.00	PR
	8852SC DUST PROOF STRIKE	1.00	EA
	PZ-05SS ESCUTCHEON ON ROSE PROFILE	1.00	EA

QD35X85MM-SS
DEADBOLT LOCK 35MM

1.00 EA

Door No's (1)

D19 FOYER - DOUBLE ALUMINIUM DOOR

Notes

Ironmongery Set **D20 - TYPICAL LOUNGE DOOR - DOUBLE ALUMINIUM**

	Product	Qty	Unit
	Aluminium Flush Bolt BY DOOR FRAME MANUFACTURER	2.00	Each
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	2.00	Each
	6503-05SS NARROW STILE FURNITURE PROFILE	1.00	PR
	8852SC DUST PROOF STRIKE	1.00	EA
	Q35X85MM-SS SPRING LATCH & DEADBOLT LOCK	1.00	EA

Door No's (1)

D20 LOUNGE / RECEPTION - DOUBLE ALUMINIUM DOOR

Notes

Ironmongery Set **D23 - TYPICAL SCULLERY DOORS - TIMBER**

	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	L-22315-76SS UNION 315 DOORLOCK SS	1.00	EA
	SS6166-05SS NEW HANDLE ON PLATE PROFILE	1.00	PR

Door No's (1)

D23 SCULLERY DOOR

Notes

Ironmongery Set **D24**

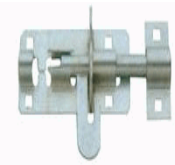
	Product	Qty	Unit
	21314-76/8SS UNION WC 8MM DEADLOCK SS	1.00	Each
	B3446 RUBBER DOOR STOP. BLACK.	1.00	Each
	SS5004-73SS ESCUTCHEON ON ROSE BATHROOM	1.00	EA
	SS5066-06SSE14 PARAPLEGIC TOILET SIGN	1.00	EA
	SS5089-150W KICK PLATE 150X800MM WORKS	2.00	EA
	SS5D66-06SS DOVE STAINLESS STEEL PULL HANDLE ON 152X152 BACKPLATE PULL HANDLE ON BACK PLATE; DOVE; 152 X 152mm; BLANK; S/STEEL	2.00	EA

Door No's (1)

D24 DISABLED BATHROOM DOOR

Notes

Ironmongery Set **D26 - TYPICAL DATA CUPBOARD DOOR - DOUBLE TIMBER**

	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3570GA-200MM GALVANIZED PADBOLT - 200MM LONG	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	2700SS UNION 2700 REBATE SET SS	1.00	EA
	L-21315-76SS UNION 323 CYL DEADLOCK SS	1.00	EA
	SS5D66L-05SS DOVE STAINLESS STEEL PULL HANDLE ON 152X152MM PLATE WITH EUR PULL HANDLE ON BACK PLATE; DOVE; 152 X 152mm; LEFT HAND; PROFILE PIERCING; S/STEEL	1.00	EA

Door No's (1)

D26 DOUBLE DATA CUPBOARD DOOR

Notes

IRONMONGERY SCHEDULE

ASSA ABLOY

Project	**UFS - TECHNICAL MANUAL (15039)**
Reference	**AG000**
Revision	
Originator	**Annemarie Furstenburg (+27845147462)**

Date : 2021/04/15

Ironmongery Set **D27 - TYPICAL CUPBOARD - DOUBLE TIMBER**

	Product	Qty	Unit
	M72X18SCGMK CYL EURO 7X7 SC GMK Mul-T-Lock	1.00	Each
	B3570GA-200MM GALVANIZED PADBOLT - 200MM LONG	1.00	Each
No image available	M51058898 KEY BLANK 7X7	5.00	EA
	2700SS UNION 2700 REBATE SET SS	1.00	EA
	L-21315-76SS UNION 323 CYL DEADLOCK SS	1.00	EA
	SS5D66L-05SS DOVE STAINLESS STEEL PULL HANDLE ON 152X152MM PLATE WITH EUR PULL HANDLE ON BACK PLATE; DOVE; 152 X 152mm; LEFT HAND; PROFILE PIERCING; S/STEEL	1.00	EA

Door No's (1)

D27 DOUBLE CUPBOARD DOOR

Notes

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