CTAN – Technical Building Briefing Document

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Contents

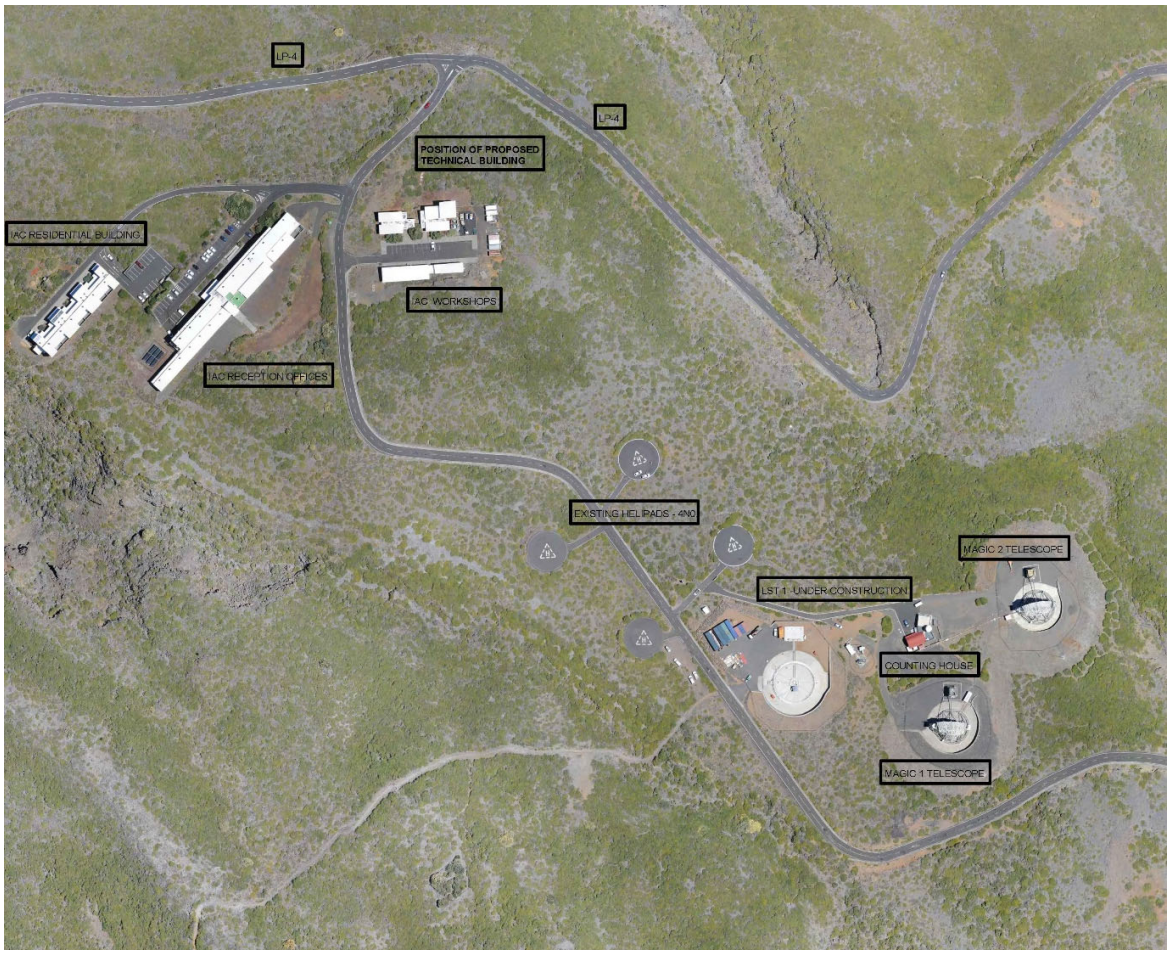
1.0 Site Location

The project is located on the Island of La Palma at the Observatorio del Roque de los Muchachos (ORM) at an altitude of approximately 2,200 metres above sea level and is situated in the municipality of Garafia.

The ORM is home for an extensive number of telescopes and is an increasingly popular location for Astro Tourism particularly with imminent completion of the nearby Visitors Centre.

The current site envisaged for the Technical Building is in a prominent position at the entry road to the ORM next to LP-4 road and to the East of the existing Residentic Building and to the North of the existing Operations Building. The land is undeveloped and is covered by the natural flora for the area. The land is rises from the North to South and it is the intention where it is thought to be appropriate to take advantage of the topography in the design of the building. From a recent topographical survey, the elevation of the ground at the north end of the site is at 2147.5m whilst at the south side of the site, adjacent the IAC workshops this is at an elevation of 2150m. At the road (LP-4) the elevation is closer to 2145m.

The approximate co-ordinates of the building to UTM Zone 28R is E 217470 N 3185317.



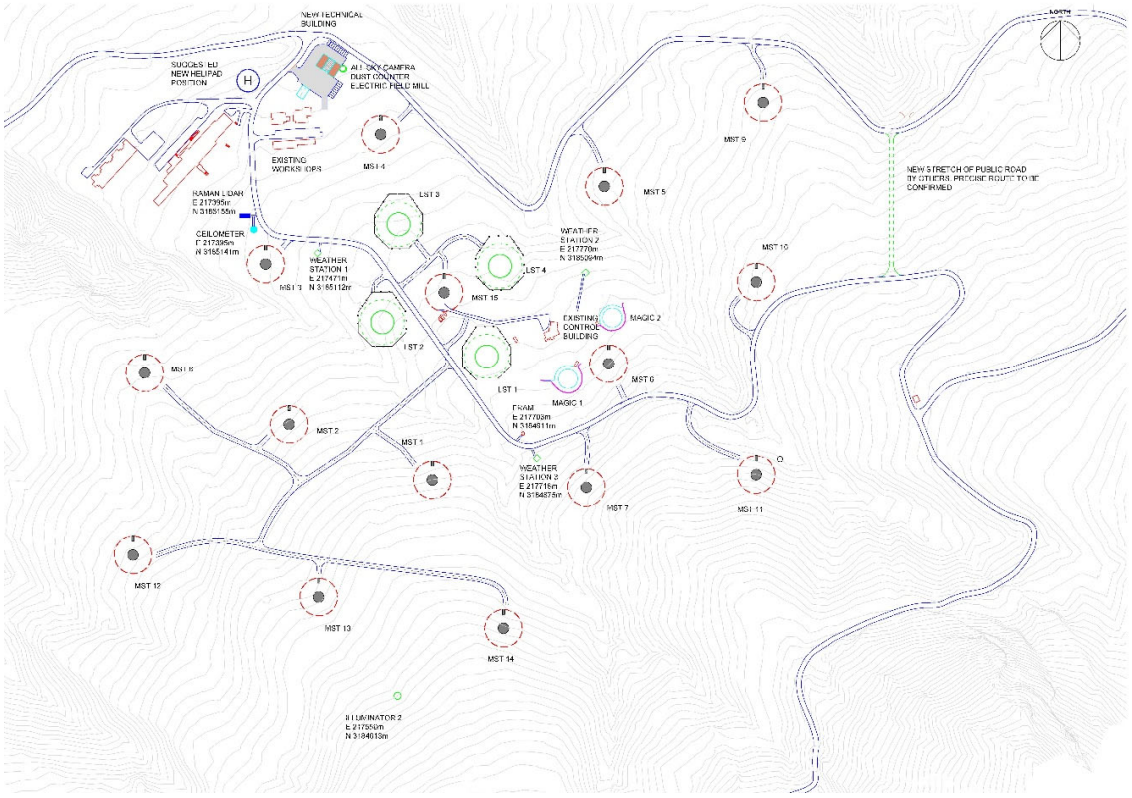
EXISTING SITE LAYOUT SHOWING PROPOSED LOCATION OF THE TECHNICAL BUILDING

2.0 Context

The CTA Observatory when complete will comprise of a group of 19 telescopes of two types, 4 Large Sized Telescopes (LST's) and 15 Medium Sized Telescopes (MST's). The Technical Building will serve as the Observatories Operations and Data Centre, Offices and Workshops. The planned position for the building means that it will virtually be one of the first buildings to be seen by visitors to ORM and therefore needs to be iconic in nature using materials relating back to that used for the Residentia and the Operations Building whilst clearly projecting the CTAO as a unique entity.

The CTAO building will be in constant use for most of the year. The Technical Building will be occupied by observatory scientist during night time and day time hours for collecting and analysing data from night time telescopes observations. During daylight hours the building will take on other functions performed by office based staff and workshop maintenance technicians.

It's important to state that currently the building of a single LST (LST1) is expected to be completed during September 2018 after which commissioning, verification and performance testing phases will be carried out soon after. To allow this to happen a containerised Data Centre has been designed and has been installed initially adjacent to LST1 but will be moved in its entirety into the Technical Building once this has been completed. Technically this is challenging due to the complexity of the issues relating power supply and data network links that must be reconnected from the technical Building back to the Telescope array. However, this move needs to be accommodated.



CTA DEVELOPMENT PLAN

3.0 ORM requirements

Any operations at the Observatorio del Roque de los Muchachos (ORM) must comply with the general guidelines and requirements of the observatory, to guarantee the sustainability of the installation at all times.

As a general policy, the construction of buildings and facilities in the observatory should be minimized to only those strictly essential to perform or support the scientific activities. Therefore, the buildings to be constructed should always be optimised, and any activity that is not justified or that can be carried out outside the limits of the observatory should be discarded.

On the other hand, the ORM is located within the outskirt area of the Parque Nacional de La Caldera de Taburiente. This area is classified as undeveloped land under special protection, prohibiting any construction except those of preferential public interest. This classification includes facilities for astrophysical observation only.

For that reason, the IAC direction and the ORM administration request that the CTA Operations and Technical Building should be adapted to just the essential activities required for the operations of the the CTA North observatory, minimizing impact, volumes and areas.

The operations of CTA North shall be supported whenever it is necessary with working spaces at sea level: such as in the CALP, or in the future CATELP building in Los Cancajos (Breña Baja), including administrative offices, warehouse, specialised workshops and laboratories.

Likewise, visits to the observatory will take place through the Roque de los Muchachos visitors centre and the associated ORM visitors plan licensed by the IAC for the whole installation. There are currently no plans for the visits to include the control building for security and operational reasons.

The considered location is currently in the turn at the entrance of the observatory, but the final location should be decided in concurrence with other projects at the ORM, specially the future decision about TMT site.

4.0 Feasibility Stage Design

The building will have the most efficient orientation (i.e east-west doors and windows), having its main access from inside the observatory road for reasons of safety and functionality. Access to the building shall not be from the LP-4 road.

Some initial work has been completed in gathering information on the spatial requirements and the functional requirements for the building which are listed below.

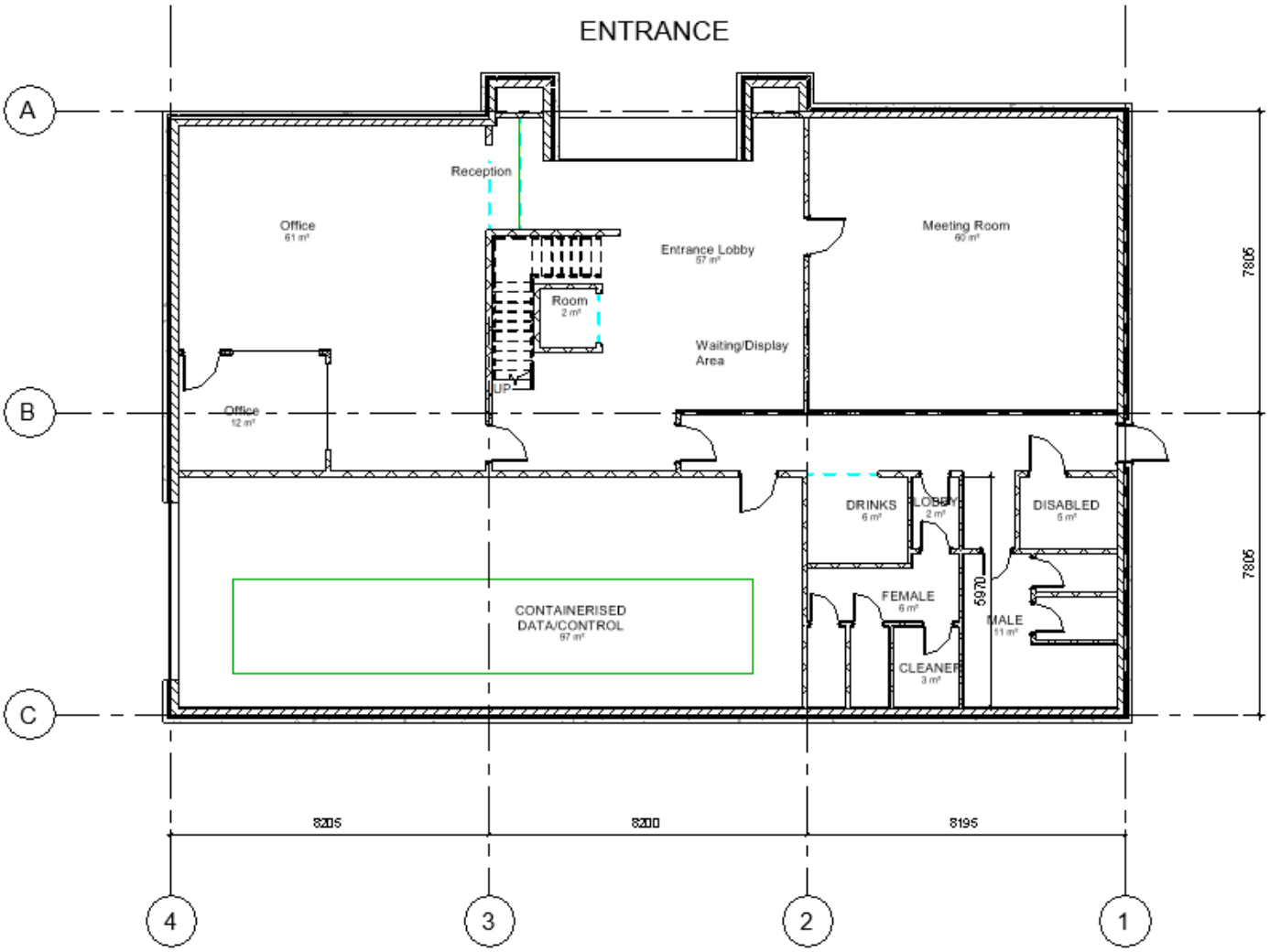
Additionally, at a recent CTA operator Graphical User Interface (GUI) design workshop the design requirements of the layout of the Control Room was discussed. The result of this information gathering exercise is summarised in Section 5

1. Room for containerised Datacentre. Container dimensions 2.4m x 12.0mx2.5m high. Dedicated cooling system – may be externally located.
2. Control room for the operation of the array.
3. Small Reception. – NOT REQUIRED
4. Open plan office - 8 persons maximum
5. Meeting room.-.8 persons maximum
6. Kitchen.
7. Male, Female and disabled toilets.
8. Storage room – (122 sqm)
9. Electronics workshop (122 sq.m)
10. Mechanical workshop (122 sqm)
11. Dedicated heating system and air conditioning (HVAC) for the building and IT equipment– heating needed during evenings and night time.
12. Room for the electrical switch room, HVAC, room
13. Parking places for staff and visitors

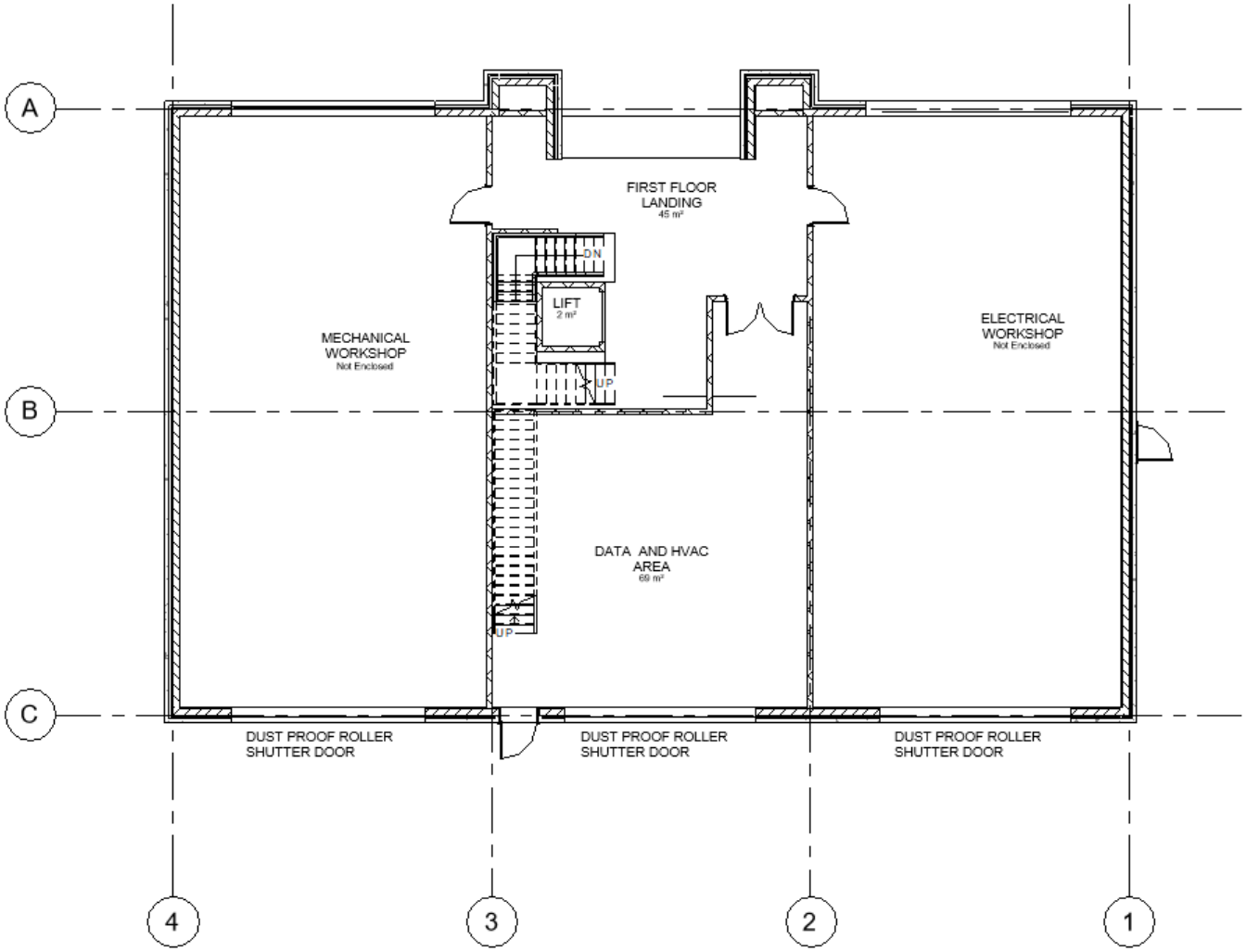
Using the above information as an initial design brief a feasibility scheme was developed. The basis of the design attempts to utilise the natural fall of the land. Planned for level 0 and accessed from the main entrance of the building are offices, reception, meeting room, wc's, kitchen and mechanical services. Accessed from the rear of the building, level 1 are workshops and the Data Centre container. At Level 2 is the Control Room. All these areas are linked by stairways and lifts.

Below are several images of the feasibility design that is intended to give an initial idea of the character of the building and what could be achieved using the existing topography of the site and should be viewed as indicative only. Alternative proposals to those indicated may be explored by the Architect. Note that the floor plans are included in this document are not definitive and do not reflect the required spatial requirements as defined above or reflect accurately the rendered images.

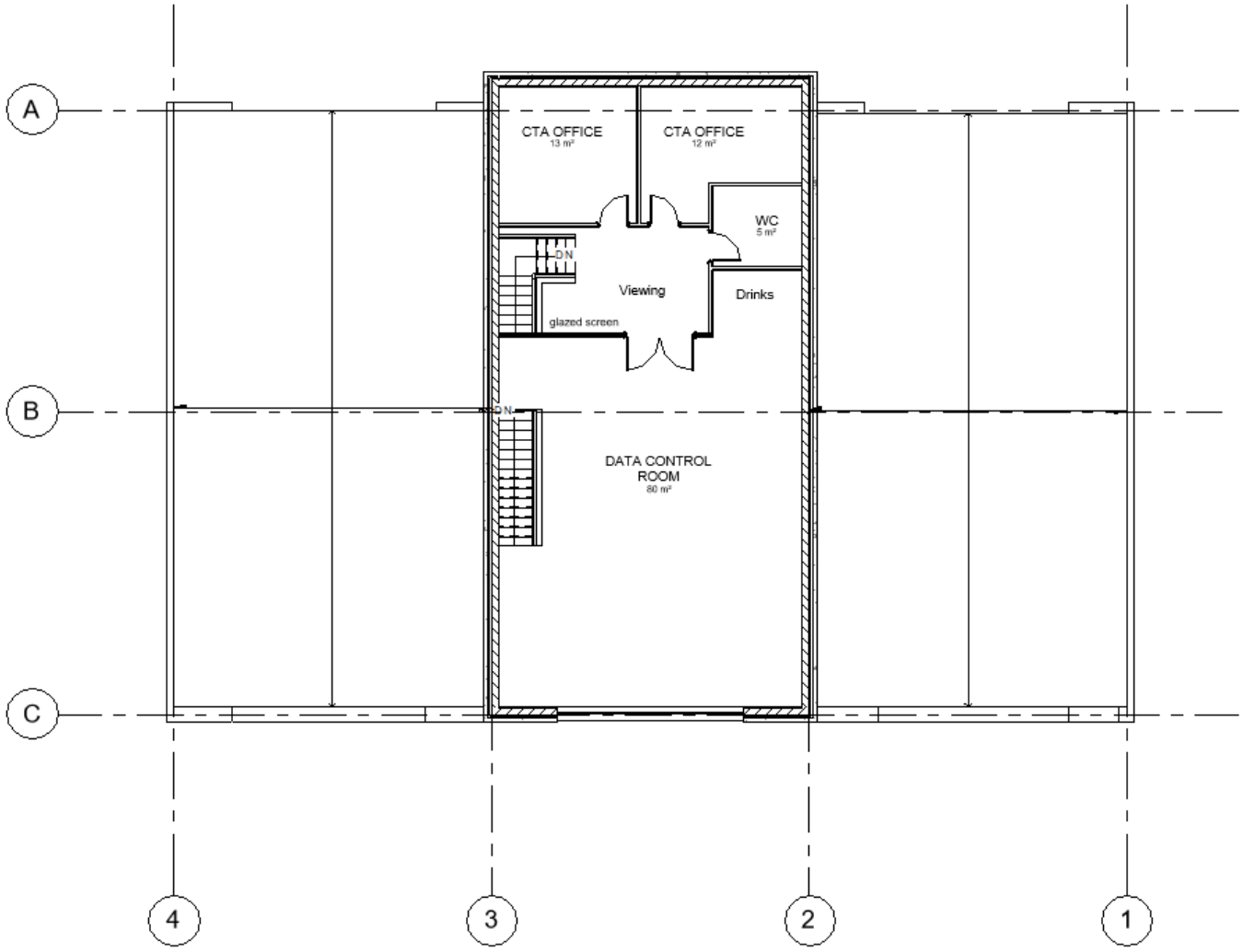
FEASIBILITY DESIGN – FLOOR PLANS



LEVEL 0 -GROUND FLOOR PLAN



LEVEL 1 – FIRST FLOOR PLAN



LEVEL 2 -SECOND FLOOR PLAN

FEASIBILITY DESIGN – MAIN ELEVATION TO TECHNICAL BUILDING

FEASIBILITY DESIGN – SECONDARY ELEVATION TO WORKSHOPS AND CONTROL ROOM

5.0 Design Requirements

This section briefly describes the character of the construction and the level of finishes and fittings of the building and should be used as a guide to the formulation of a cost plan for the building.

The CTAO actively encourages the use of sustainable construction materials throughout the design of the Technical Building. In accordance with Spanish Building Codes it is essential that green technologies are considered in the areas of energy conservation, power generation, heating, cooling, disposal of waste water and storm water

The design of the building shall conform fully with the relevant Euro codes for design and the Spanish Technical Building Codes.

The topography of the site should be used to its best advantage to avoid excessive excavation and filling works. At this stage a building having 3 storey heights to the main entrance side of the building and 2 storey heights to the workshop side is a feasible proposition. However, other solutions that have greater advantages in design, construction and cost may be possible.

4.01 Substructure

The Architect is to work closely with suitably experienced Engineers familiar with the Geology on the ORM to propose a workable foundation and retaining wall solution to safely sustain all combinations of design loadings transferred from columns, walls and the roof structure.

4.02 Superstructure

The building will require a designed structural frame in reinforced concrete (or steel) together with a cast in-situ reinforced concrete or precast concrete floor to all levels of the building. Main cross walls to be formed in reinforced concrete or structural blockwork.

4.03 Roof Construction

A pre-cast concrete beam and infill slab or block or cast in-situ concrete roof incorporating insulation and a waterproof membrane. It is preferred a parapet wall to all edges of the roof. A safety restraint system is required to all roof areas together with dedicated means of access onto the roof. The roof should also be designed to mount the following scientific equipment

- All Sky Camera
- Dust Counter
- Electric Field Mill

Access to the scientific will paved and guarded.

4.04 External Wall Construction

The external wall construction shall be designed to incorporate thermal insulation and to prevent water ingress into the building. The external façade will comprise of a cast in-situ and specialised precast concrete panels. An alternative approach to the treatment of the building façade is open for discussion.

4.05 Windows and Curtain walling

Windows to all elevations of the building and the curtain walling system to the main entrance shall be powder coated and incorporate tinted double glazing. Where appropriate and for design effect solar shading shall be provided in the form of brise soleil panels. All windows shall be fitted with light proof blinds operable from inside the building.

4.06 External Doors - Entrance and Workshops

External doors to the main entrance and other entrances shall be powder coated aluminium. The large workshop doors shall be of a type that is fully light and dust proof with a powder coated finish.

4.07 Internal Doors

Internal doors shall be a solid and robust construction and shall comply with the requirements of the Technical Building Code for access to buildings for the disabled i.e they shall correctly sized, have glazing panels at the appropriate heights and ironmongery shall be in contrasting colours to the doors.

Doors shall be compliant with the relevant documents contained with Technical Building Codes for Fire Protection.

4.08 Internal Walls

Internal walls shall be high density blockwork to receive a cement based render and finishing for direct decorating.

4.09 Floor Finishes

Generally, throughout the building all areas shall be tiled. Areas such as workshops, equipment stores and plant rooms should be power floated concrete to give a dust free finish. Kitchen and wc's areas may be sheet polyvinyl flooring with welded joints.

4.10 Wall Finishes

Generally, surfaces of walls shall be painted finished. Kitchen and wc's areas shall have tiled walls.

4.11 Ceiling Finishes

The ceilings throughout the building shall be suspended grids and acoustic tiles. Wet areas shall incorporate moisture resistant tiles

4.12 HVAC

HVAC is required throughout the building and the containerised Data Centre will require its dedicated cooling system. It is possible that some workshop areas will not require heating but will still require ventilation and cooling.

4.13 Electrical power and Lighting

Power for the building will be generated close to the site. This will be delivered under a separate project.

Lighting throughout the building shall be specified to save energy and shall be controlled passively in each room.

Special requirements will be required in the workshops to comply with the Spanish Machine Working Regulations.

The Control Room layout will determine power and data socket layouts. It is envisaged however that power and data will be via floor to ceiling power poles.

4.14 Water Supply

A potable water supply will be available close to the site proposed for the Technical Building

4.15 Drainage

Waste water shall connect to an existing an existing sewage treatment plant adjacent to the ORM residence

4.16 Sanitaryware

Sanitaryware and associated fittings shall be of a good standard throughout the building

4.17 Circulation Areas

It is envisaged to have an Atrium extending from the entrance to the building up to the roof level. This space will accommodate a concrete constructed stairway with glass balusters and stainless steel handrails. A passenger lift will also be accommodated in this space. The stairway and lift shall be fully compliant for the use of persons with disabilities.

4.17 Fittings and Fixtures

The WC cubicles and counter tops shall be of impact grade laminate and have robust fittings throughout. All cisterns and pipework shall be concealed behind a panel system

4.18 Fire and Detection

The building shall be designed to have passive and active protection. Active shall include fire detection and alarm system (audible and visual) fire alarm call points. The building shall be protected by a fire sprinkler system in accordance with to the relevant regulations together with fire extinguishers. Passive shall include fire and smoke damping, fire doors and fire walls and floors.

4.19 Signage

Signage shall be provided to the externally to identify the building, parking and pedestrian areas. Internal directions signs, fire signage and signage for doors will also be provided.

4.20 Security

A swipe card system to the building and individual offices will be required.

4.21 External works

Car parking and drainage shall be provided to the front and rear of the building. This shall be integrated with pedestrian access using contrasting and raised areas of paving. Parking bays shall be in a contrasting material. Use of planting and hard landscaping design shall be provided to the entrance road and parking areas to provide a visual impact.

Artificial lighting shall be minimal mounted at low level with light projected downwards.

6.0 Control Room

The following is an extract from the minutes of the 4th CTA operator GUI design workshop and that should be considered as a development brief for the Control Room design

- **Visitors are expected often at La Palma (ORM).*
- **Consider a glass separation as an option to enable visitors to view Control Room.*
- *Consider putting the computer terminal towers in another room to avoid noise - this does not mean to use the computing cluster, but just the towers for terminals of the operators.*
- *Static electricity due to low humidity must be controlled, otherwise it is very uncomfortable.*
- *Ideas of type of light (blue) for the control room.*
- *Blackout shutters to avoid light leaking out.*
- ***Cafeteria or a kitchen close should be close to the Control Room.*
- *It was commented about the usual issue about the typical "U" shape in the control room.where people are back to back. Alternative solution would be to consider the LSST project example for an alternative.*
- *Preference for putting displays in the wall instead of pedestals.*
- *Preference of using large displays instead of projectors.*
- *A brief discussion was held whether to have webcams at each telescope or for areas of telescopes.*
- *It is believed that some webcams would be needed, an could have some that are movable and permit to see several telescopes. It is unclear if these auxiliary displays belong inside the controlroom.*

*Following further consultations there will be no visitors to the Control Room – visitors shall be received in the new Visitors Centre. Therefore the Viewing Area is not required.

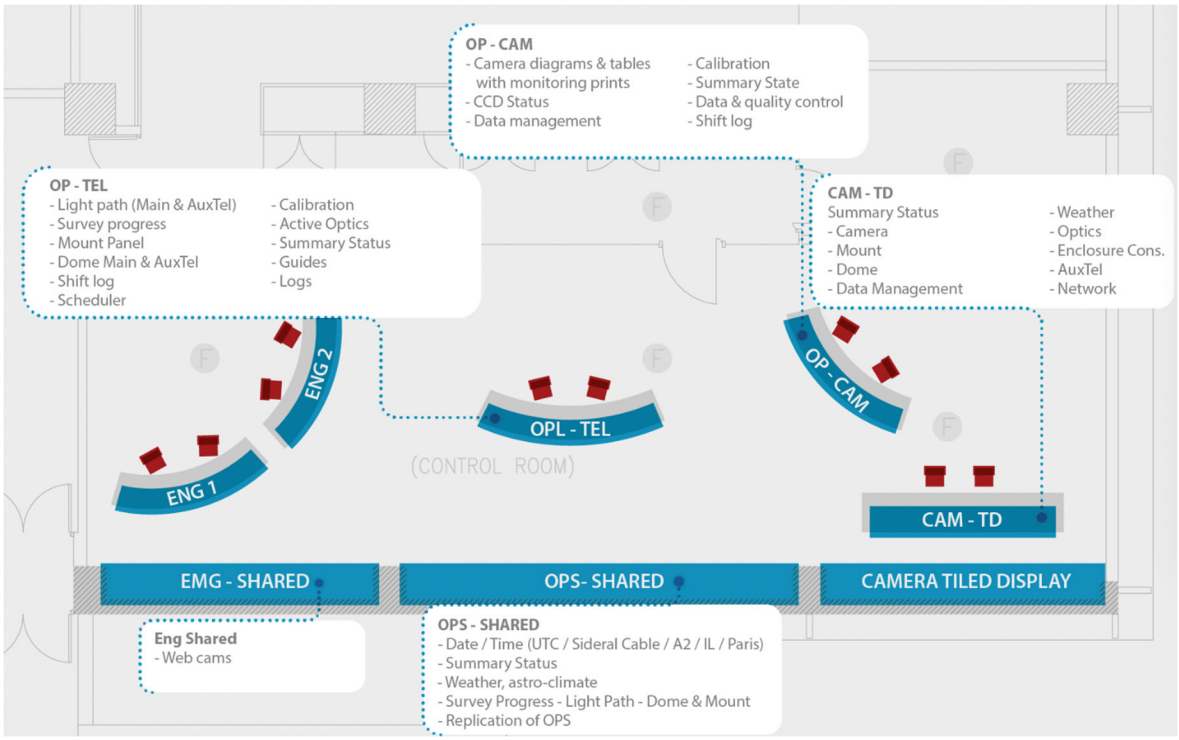
**Following further consultation this faciilty is no longer required.

A discussion on how many displays are needed:

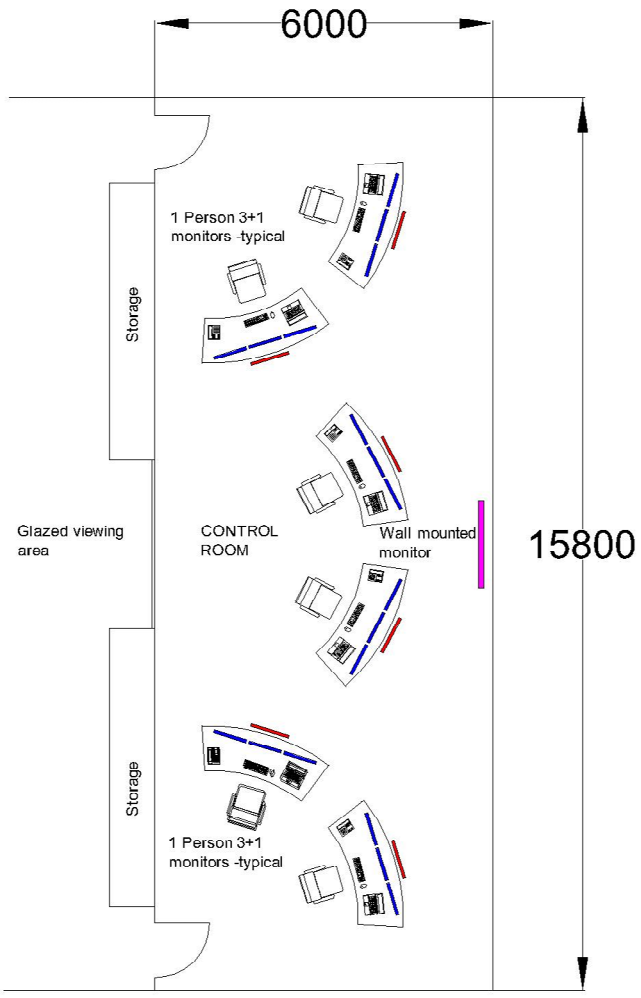
- *Many panels may be needed*
- *It was thought to start with 3 workstations (at least)*
- *A big screen on the front wall*
- *A desk for each workstation with working space*
- *To include personal space for e.g. laptop*

Initial specifications for each of the three workstations:

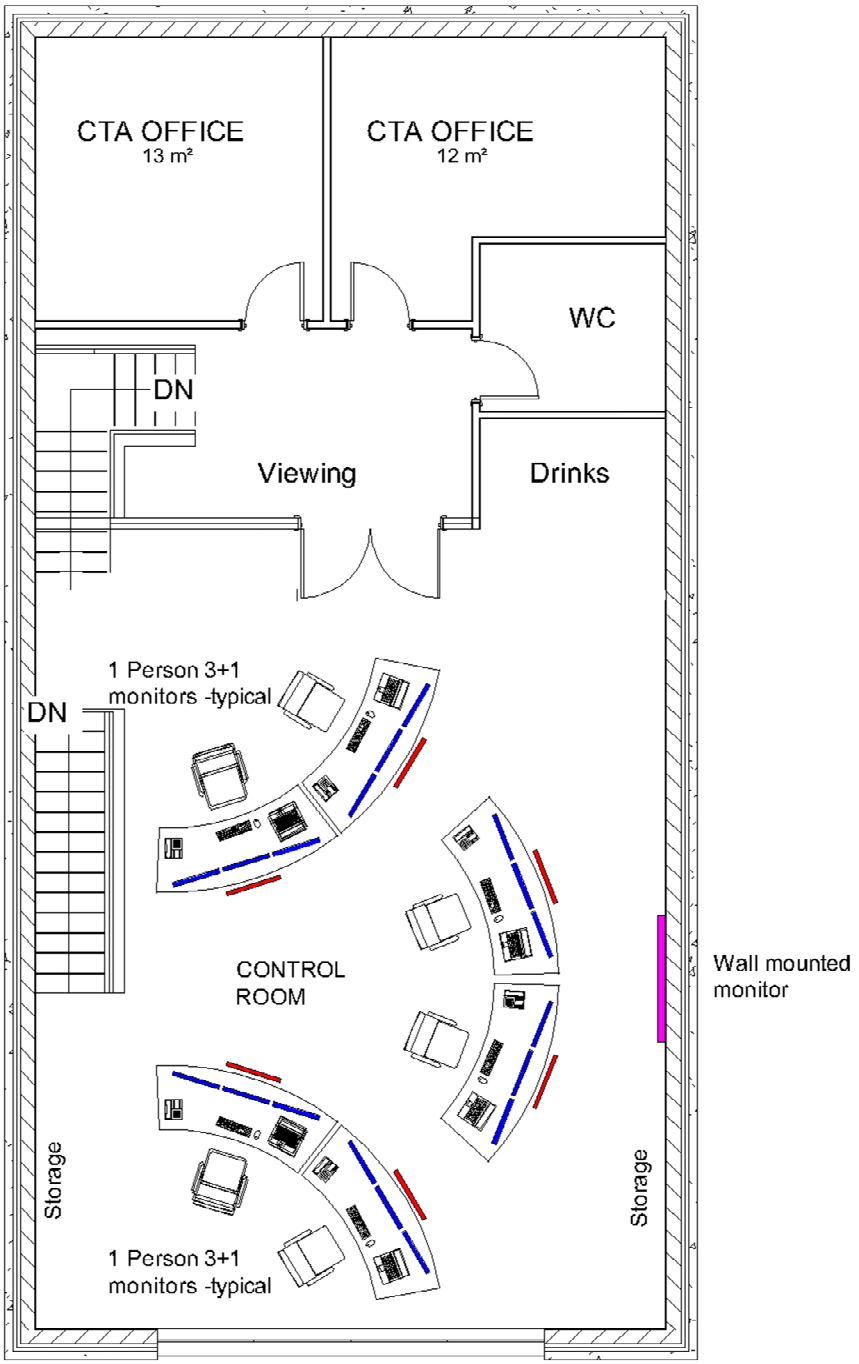
- *Each workstation should be able to accommodate two persons.*
- *This includes 3 screens per-person lower than eye level (attached close to the desk, slanted). In addition, 1 big screen per person slightly above eye level, but further away (mounted from the back of the desk).*



LSST Control room Layout presented at the meeting – as example/starting point for discussions



CTA PO Feasibility Layout derived from the GUI Development Brief



Developed layout in context with feasibility design for Level 2 – Second Floor Plan.

NOTE

Following meetings with IAC the control room may only need to accommodate a total of 4 persons.