Kristin Jarmund
—Arkitekter

STATSBYGG

Sketch project for a new Norwegian Embassy complex in Nairobi, Kenya. 15.06.2018

Kristin Jarmund
—Arkitekter

Project:
Sketch project for a new Norwegian Embassy complex in Nairobi, Kenya

Client:
Statsbygg

Date:
15.06.2018

SKETCH PROJECT FOR A NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI

Statsbygg has been engaged by the Ministry of Foreign Affairs of Norway to prepare a Sketch project for a new Norwegian embassy complex in Nairobi, Kenya.

The complex is to include the following functions; Chancellery for Norway, housing for staff members, recreational facilities and parking facilities.

The sketch project is is based on a the approved feasability study dated 26.10.2017.

The sketch project has been developed together with technical consultants within the following areas, RIB, RIE, RIV og RIBr.

The following meetings have been held during the the process of the sketch project;
4 meetings with Stastbygg
1 meeting with both Statsbygg and MFA
6 project group meetings

The sketch project is based on the order from MFA dated 14.06.17 which stipulate size reguirements based on the Norwegian "Statens norm" of 23m2/ employee.

ARCHITECT

Kristin Jarmund Arkitekter AS
Stortingsgata 20
0161 Oslo
Norway

Tel: +47 22 92 60 60

Project team:
Kristin Jarmund, siv.ark. MNIL, MNAL, Hon. Faia (responsible) kj@kj-a.no
Graeme Ferguson, chartered architect RIBA (project architect) gf@kj-a.no
Zuzanna Sulikowska, Arrkitekt M.Arch MNAL zs@kj-a.no

CONSULTANT GROUP

Multiconsult AS
Nedre Skøyen vei 2
0213 Oslo

Project team
RIB, Svein Barstad, Karoline Baksaas Hersleth, Ørjan Brunstad
RIE, Terje Aaserud
RIV; Kristine Bekkelund
RIBr; Silje Haktorson

Table of contents

1.0 Specification
1.1 Location
1.2 Site
1.3 Local planning requirements
1.4 Site restrictions, security issues

2.0 Background
2.1 Proposal 2011
2.2 Proposal 2015
2.3 Feasibility study 2017
2.4 Conclusion from Feasibility study

3.0 Sketch project
3.1 Site boundary
3.2 Entrances
3.3 Form/volume/spaces
3.4 Zone divisions/location
3.5 Materials
3.6 Outdoor spaces/vegetation/lighting
3.7 Solution acoustics

4.0 Room program

5.0 Drawings

6.0 Technical consultants
6.1 Structural design priciples
6.2 Electrical specification
6.3 Mechanical installations
6.4 RIBr

7.0 Green document
7.1 Ambitions
7.2 Proposal

1.0 Specification

1.1 Location
The plot is located in what is generally called Whispers Estate that appears as a continuation of Gigiri Estate, with the UN road as the main access road. The area is a high cost residential district in northern Nairobi with high quality housing for single family occupancy.

The area has attracted many international institutions which include the United Nations Environmental Program (UNEP) headquarters and other UN bodies. The United States of America embassy is also to be found in the immediate neighborhood.

Greater security is found in this area and as a consequence it offers a higher degree of comfort than many areas in the city.

1.2 Site
The plot has a leasehold title for 99 years from Nov 1987.

The size of the plot is 8000 m2. It slopes at an average of 10% from the highest level in the south west corner to the lowest point in the north east corner which gives a total height difference of 11 meters. The soil found on the site is a rich, red soil which goes down to a depth of up to 3 m, - which is good for landscaping. There is an excavated depression in the lower northern central part of the plot.

There are two roads that pass adjacent to the site; the major road United Nations road to the east and Gardenia Road to the west. Due to the fast development of the surrounding areas, UN Road has become heavily trafficated. Due to this, no parking or vehicular entrance to the compound is proposed along this road. The main entrance for vehicles and employees is therefore located along Gardenia road.

There are three existing neighboring villas along the northern boundary of the site and a villa and an empty plot to the south.

1.3 Local planning requirements
The site´s current permitted use is for commercial development, which includes the function of a chancery. In order to allow for residential development, an application for the extension of use has to be submitted.

The zoning policy of the area stipulates a maximum of 50 % ground coverage and 100 % plot ratio. This means that an area equal to 8000 m2 can be developed on 50 % of the plot. The maximum height restriction is 4 floors.

Legal setbacks include a 9 metre setback from UN Road, a 6 metre setback from Gardenia Road and a 2.5 metre setback from both the northern and southern boundaries.

The following steps form's the statutory approval process to obtain permits from the various department/ agencies in Kenya:

Site. Satelite image from google maps

Site photo

1.3.1 NEMA License

Application for NEMA license (National Environment Management Authority) needs to be made using an EIA (Environmental Impact Assessment) registered professional. They will prepare an EIA report based on the development that is planned and attach concept drawings.

Neighbours are consulted as part of this report. A statutory fee of 0.1% of the construction cost estimate is payable on application. The report should take between 2-3 weeks and after submission a period of 2 months for issuing the NEMA license.

1.3.2 Change of Use
The original application made for change of use to embassy offices & residential has probably expired by now. A new application with correct use should be submitted before a building permit can be given. The first application is done to the County level and after their approval, a further application is to be done at the lands office (and eventually endorsed in the ownership documents). The embassy lawyers should advise on this.

1.3.3 Nairobi City County Building Permit
Application is done online by a registered architect/practice. Drawings need to show all finishes and basic services layouts integrated into the architectural plan (drainage, fire egress and equipment, water storage, sewer systems, ventilation to washrooms/offices, clearly show which windows have permanent ventilation etc.) Fee payable is based on m2. The application goes through various departments for review and comments (which must be addressed) before a permit is issued. The process should take 6-8 weeks but can be substantially longer.

1.3.4 Borehole
Any drilling for a water borehole requires permit from both WRMA (Water Resources Management Authority) & NEMA (National Environment Management Authority). Usually, the contractor who is commissioned to do the drilling is responsible for getting the relevant permits. This usually takes two months before any drilling can start.

1.3.5 Structural Drawings Approval
Once the architectural building permit is received, the structural engineer needs to get approval for structural drawings separately (applied at the structural department of the council) before any construction can start. This usually takes 3-4 weeks.

1.3.6 Occupation Certificate
Once the construction is nearing completion (practical completion) an application for occupation is made. Once this is received from the county, the client can move in.

1.4 Site restrictions, security issues
The level of security is extremely high in Kenya. It is envisaged that this will continue for the foreseeable future.

The sketch project has a “blasting zone” of 30 meters from the site boundaries along Gardenia and UN road.

Site photo

Site photo

2.0 Background

2.1 Proposal from 2011
A design proposal was made for a combined Embassy and Ambassador's residence with common representational areas.

Rather than designing two separate buildings, the project was planned as one building volume, under one roof which housed all the necessary functions.

The building was literally carved into the sloping landscape; opening up into an open atrium that was located outside the 30m blast zone.

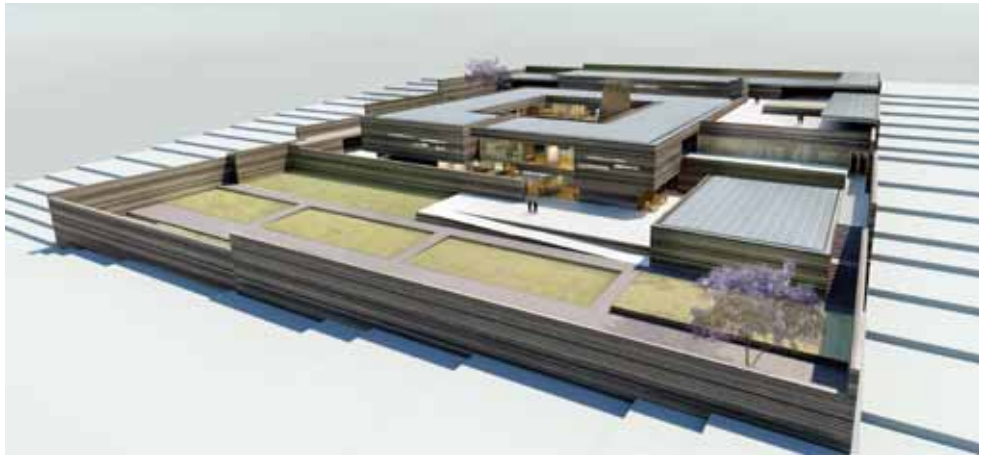
By integrating the building and landscape, we were left with a very modest exterior, thus allowing the landscaped garden to blend in with the built structure.

The residence was placed in the northern wing of the building.

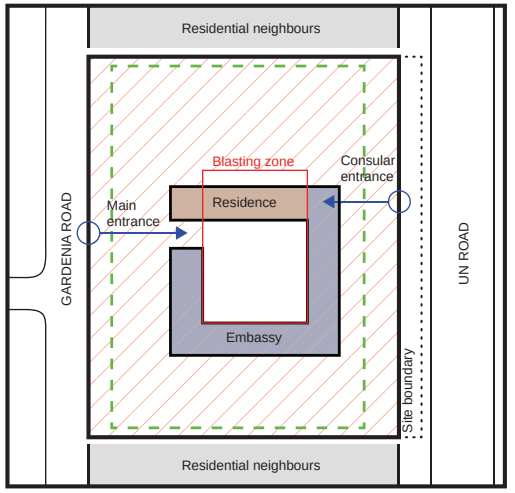
2.2 Proposal from 2015
A design proposal was made for a combined Norwegian/ Netherlands embassy.

Rather than designing two separate embassies, the project was planned as one building volume, under one roof which housed all the necessary functions, it's principal design similar to the proposal from 2011.

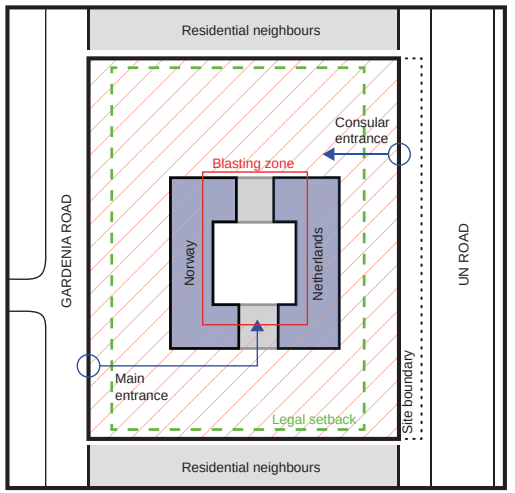
The spaces and rooms within the building were draped around the atrium on two floors. Communication areas between the two embassies and the communal areas are via covered outdoor walkways.



3D illustration - preliminary proposal from 2015



Plan solution 2011



Plan solution 2015

2.3 Feasibility study 2017

Background; The Norwegian MFA engaged a professional security analyst to do a vulnerability assessment of the 2015 proposal based on the Norwegian threat assessment of the area.

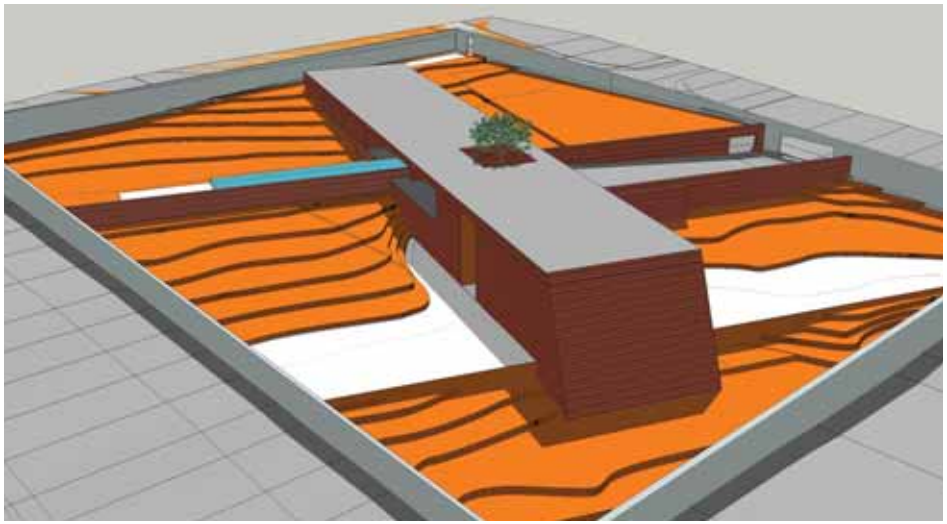
The conclusion was that an embassy building should not have an inner atrium in the building.

A series of meetings were held in 2017 with Statsbygg and MFA and it was concluded that more focus should be placed on a 30 meter distance from the two sides on UN Road and Gardenia road.

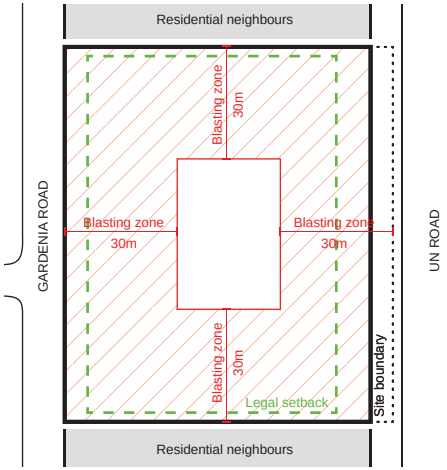
The final proposal (Alternative 2) was a linear form where the embassy and housing are placed under one roof placed on a tilted north/south axis. Tilting the building improves the conditions relating to blasting.

The diagonally placed building is literally carved into the sloping landscape. The partially covered central space acts as the main entrance for the embassy and divides it from the housing wing.

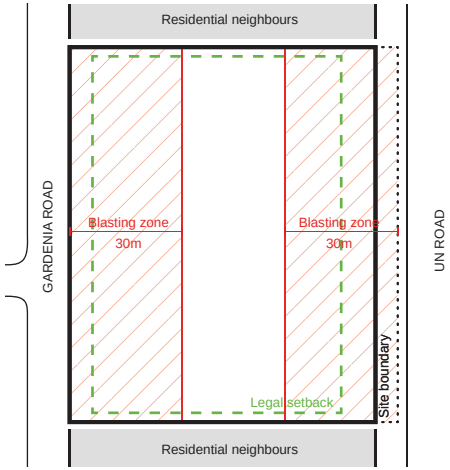
By integrating the building and landscape, we are left with a very modest exterior, thus allowing the landscaped garden to blend in with the built structure.



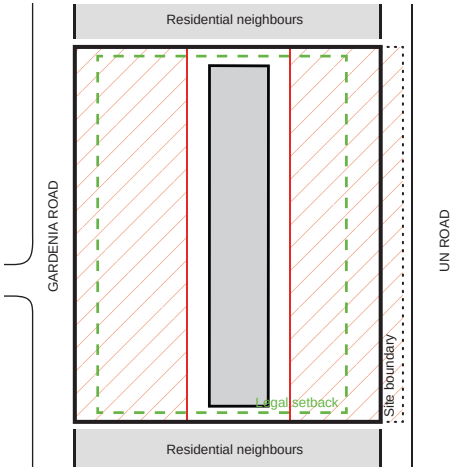
Sketch illustration from feasibility study 2017



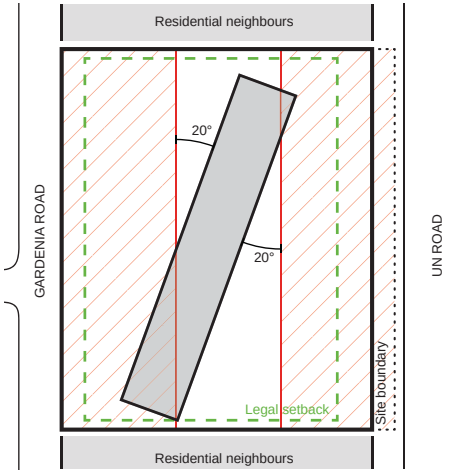
Blasting zone - 30m from all sides



Blasting zone - 30m from UN and Gardenia road



Alternative 2 - outside the blasting zone



Alternative 2 - diagonal placement

3D illustration from feasibility study 2017

2.4 Conclusion from feasibility study

The sketch project is a further development for the feasibility study with focus on the following issues;

- Entrances to the site
- Importance of good private outdoor areas for the apartments
- Clear seperation between public and private spaces
- Daylight levels for workspaces
- Development of internal communication and plan solutions within the embassy
- Review necessity of outdoor niches in the facades with regards to safety/explosion.
- Creating an embassy complex that can be flexible, robust and be built within a given economical framework

The sketch project has been developed in conjunction with Multiconsult who have provided technical assistance with regards to the following areas;
- structural design with focus on protection against an explosion
- electrical design and daylight calcuations
- ventilation & services
- daylight calculations and fire safety

TEK 17 is the basis for the sketch project with local solutions used with regards to drainage and rainwater solutions.

3D illustration from feasibility study 2017

3. Sketch project

The aim of the project is to create a representative yet modest building, which presents Norway in a modern and quality conscious way. There will be an emphasis on that the forming and detailing of the building should not be alien to Kenya and that the use of materials should reflect local ways of construction and culture.

Ambitions for an environmentally friendly solution are important for the embassy. A Green document included in the sketch project addresses these ambitions. The Green document sets out objectives, targets and solutions for the project at all stages.

3.1 The site boundary

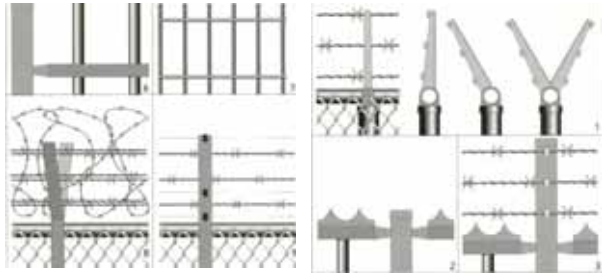
The site is to be bound by a stone clad boundary wall on all four sides. The solid boundary wall with a minimum of 3 meters measured from street level will have additional electrical fences on top.

The "blasting zone" of 30 meters is defined from the site boundary along Gardenia road and future bollards placed along UN road.

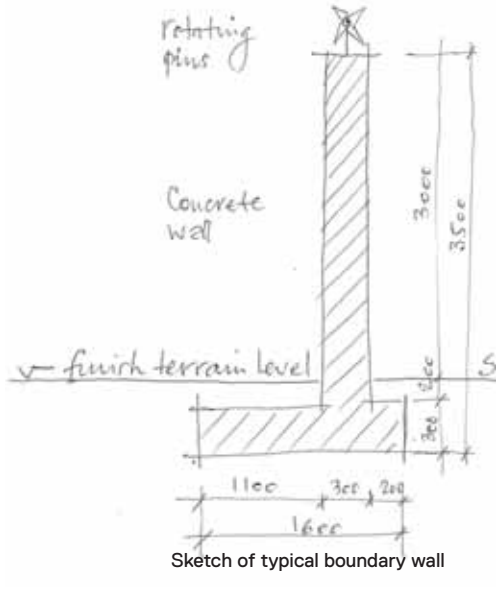
UN road has been developed since 2011. By May 2015 a new cycle path has been introduced with bollard separation to the main road. A guard post to the south controls traffic passing by the site. The "new" bollards however do not meet the security requirement of the Ministries of Foreign affairs so additional bollards will have to be placed between the cycle path and boundary wall.

The distance from the boundary wall to the new bollards should be a minimum of 6m.

Bollards



Electric fence types



Sketch of typical boundary wall

Site photo along UN road 2015

3.2 Entrances

There are two entrances to the site.

3.2.1 Main entrance

The main entrance to the embassy complex for both vehicular and pedestrian access is provided along Gardenia road. A manual drop barrier behind the main gate will be provided. A guardhouse with scanning facilities is located directly beside the main gate.

An covered parking garage is located adjacent to the main gate. 28 spaces will be provided with allocated spaces for both residents and embassy staff. Direct access from the garage to the housing is provided.

A wide ramp up from the main gate to the entrance vestibule space allows guests to be driven up to the main covered entrance. The outdoor vestibule will act as an outdoor lounge space with a sculpture as a main focal point.

The housing and recreational areas sit above the main entrance level. Access to a communal area is via a ramp or staircase directly behind the outdoor lounge space. A monolithic wall visually separates the spaces.

3.2.2 Consular section entrance

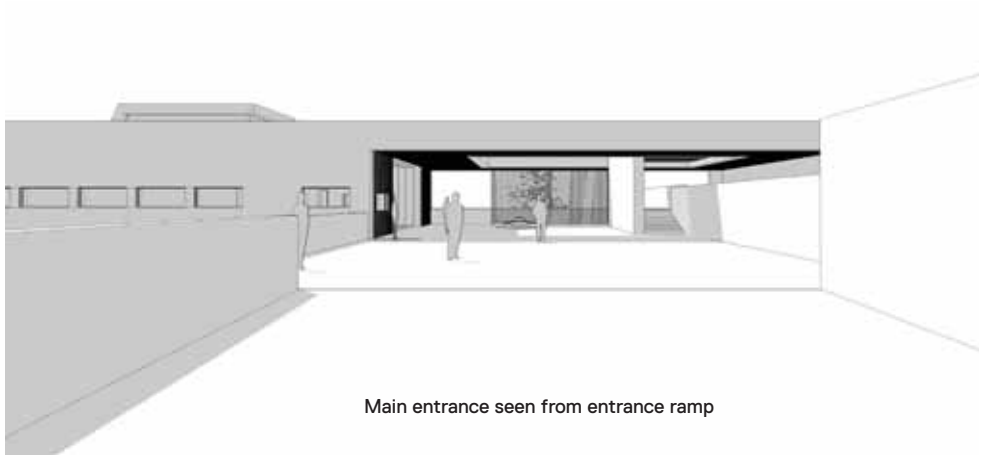
For visa applicants a pedestrian entrance is located on the north east corner of the site from UN road. A guardhouse with sluice and an integrated scanning room is provided.

Baggage with personal belongings are to be left in lockers outside the boundary wall.

Parking is not allowed along UN road. Neither is there any allocated area for “drop off”. Visa applicants should be made aware of this before visiting the embassy. Visa applicants are not allowed to park inside the compound.

All areas, outside and inside the building complex, will be accessible by disabled users.

Entrances and eventual escape route



Main entrance seen from entrance ramp

Manual drop barrier by main entrance

3.3 Form/volume/spaces

The Embassy and housing under one roof form a linear form on a tilted north/south axis. During the sketch project phase heights and the rotation of the building have been slightly adjusted by 5 degrees to match the existing heights in and around the site. The embassy now sits 15 degrees off the bounday wall line.

The diagonally placed building is literally carved into the sloping landscape. The partially covered central space acts both as the main entrance/lounge space for the embassy and a communal recreational area for the housing wing.

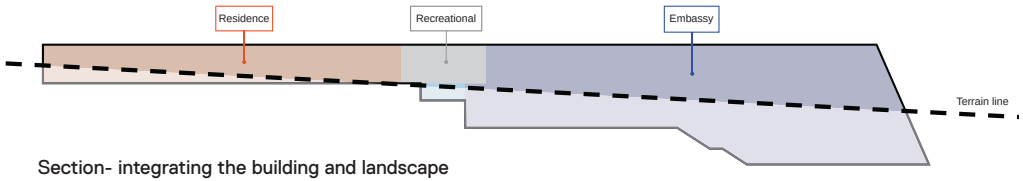
By integrating the building and landscape, we are left with a very modest exterior, thus allowing the landscaped garden to blend in with the built structure.

The building is envisaged as a monolithic form. Due to security issues glazed areas are kept to a minimum and the outdoor niches for informal meeting rooms presented in the feasibility study have been removed.

The "underground garage is also integreated into the landscape and forms part of the boundary wall to the west and south.

3D view- integrating the building and the landscape

Diagonal placement. The angle of the embassy has been rotated 5 degrees from the feasibility study. The embassy is now rotated 15 degrees to the boundary wall on UN road.



Section- integrating the building and landscape

3.4 Zone divisions/location

3.4.1 The Embassy
The Norwegian Embassy is solved on three levels. Connection between the levels is via a central open staircase and lift.

The two upper levels are for the embassy whereas the lower level is for the consular section.

3.4.1.1 Level 2
The main entrance is situated at this level A reception desk with a glass window is located directly by the main entrance and airlock so that the receptionist has full control on who is coming and going from the embassy.

A cloakroom and toilet facilities are directly accessible upon entering the embassy. The Ambassadors office, cellular offices and a large meeting room are located on this floor.

In the central core a lift, technical shaft, archive 2, copy room and a quiet room have been provided.

During the sketch project phase Innovation Norway were introduced as new tenants. They have been allocated space for 8 workstations, private and shared facilities and a private meeting room. Due to the reduction of outdoor covered spaces we have been able to accommodate them without having to increase the length or width of the building

At this stage there has been no subdivision of areas with regards to inner and outer zoning. This however can be achieved either by defining areas or having lockable doors on all offices. This will be developed further in the next phase of the project.

All working spaces are placed along the facades and have direct access to daylight.

3.4.1.2 Level 1
Level 1 is accessible via the main staircase from level 2 The plan can be subdivided into three zones;

Technical areas
Technical areas are placed between axis 5-7 and are partially underground. The entrance to the technical areas is from the garden area.

The sizes and placement of the technical rooms have been verified by Multiconsult. The roof of the technical areas is the main outdoor entrance space.

Communal areas
Communal areas; gym/safe haven, toilets and changing rooms, canteen and meeting rooms.

The safe haven room for emergencies has been combined with a gym room for the staff. In an emergency situation it will provide short term protection for embassy personnel and guests of the embassy.

Clarification is needed to ascertain if an escape corridor by the technical areas and staircase which allows for escape is required.

All doors into the safe haven open outwards. The safe haven is to be prepared for communication equipment.

Office spaces
Landscape office spaces.
In the central core a lift, technical shaft, archive, copy room, server room and quiet room have been provided.

All working spaces are placed along the facades and have direct access to daylight.

3.4.1.3 Level 0
The consular section and storage/archive facilities is placed on level 0 in the northern end of the building. Access for embassy staff is via a central staircase.

Visitors to the consular section have no access to the main building.

The size of the consular section has been dramatically reduced from the feasibility study. There is now only one interview room as it is envisaged that most visa interviews will be held off site.

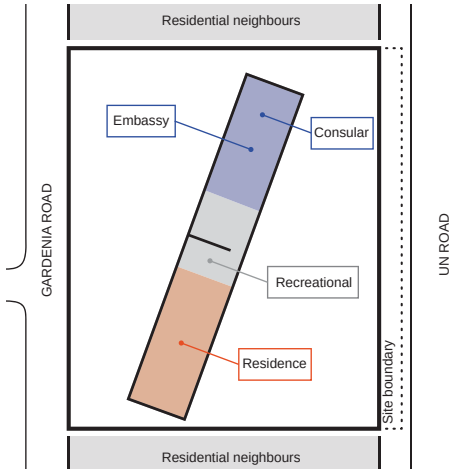
3.4.2 Housing
The housing is located on the southern side of the site on an upper plateau yet under the same unifying roof.

The sketch project proposes 4 apartments; two 3 bedroom apartments and two 1 bedroom apartments. The proposal is flexible and can be subdivided in other ways according to the embassy's needs.

3.4.3 Guardhouse/technical areas/garage
The guardhouse is placed by the main entrance. The guardhose will have a window out to Gardenia road and will have full controll of the main gate. Toilet and mini kitchen facilities will be provided.

The generator and transformer are placed directly behind the guardhouse. They open into an Atrium as part of the garage structure. This allows for natural ventilation and easy access for service purposes.

An above ground diesel tank is placed directly beside the generator.



All functions placed under the unifying roof

3.5 Materials

Facades; will be clad in local natural stone. The previous project proposed the use of red stone to match the rich red soil of the site. The sketch project proposes the use of the greyish harder volcano stone; "Nairobi Blue stone". This stone which is sawed and sanded is used in "high end" quality facades in Kenya.

The stone should be laid in irregular bond of variable lengths and heights.

The elements of the building that are visible above ground level inside the blasting area will be constructed so that they comply with the blast proof requirements from the Ministry of Foreign Affairs.

The window profile system will be in powder coated aluminium/steel. Windows outside the blast zone are planned with laminated glazed windows Windows inside the blast zone should be constructed with blast proof window and door frames. All windows will have a layer of protecting film.

Elements of bamboo strips will be used in the outdoor areas both as screen walls and ceilings.

Niches and other features will be in coloured cement based plaster.

The flooring inside is to be of both a light natural stone and timber/bamboo parquet. The natural stone and its surface finish will have to address the issue of maintenance and cleaning. There is very little choice in local natural stone for outdoor flooring areas in Kenya. Most stone/slate will need to be imported to suit safety and performance requirements.

A waterproofing membrane will be applied on the roof and over the technincal areas situated below the outdoor entrance area . The quality of the membrane has to be approved by Statsbygg and meet Norwegian standards.

Bamboo facade

Sancalkar mosque
Emre Arolat Architects

St. Trinitas Church, Leipzig
Schulz und Schulz

Referances bamboo by Kengo Kuma

Nairobi blue stone

3.6 Outdoor spaces/vegetation/lighting

The surrounding garden is designed with a series of linear terraces which stretch from east to west and step down in harmony with the existing fall of the site.

Thoughout the garden, drought resistant plant species from Kenya wil be planted.

A main ramped driveway leads up to a partially covered outdoor vestibule/lounge space by the main entrance. Ribs of thin bamboo clad both side walls and ceiling.

A walled off recreational area is provided for the residents. It is pulled away from the main entrance area to give privacy. A swimming pool with a shallow end and deep end (max 1,5m) is provided and is to be “child” friendly. Areas for sunbathing, grilling, showering and playing have been provided. The area is secure and lockable.

A communal garden/play area behind the recreational area has been provided.

Pivate outdoor spaces are created under the roof for all apartments. All apartments have a small private garden. Each apartment and garden are raised up 25cm to clearly define the areas.

The roof of the garage will either be integrated into the landscape or as an option the roof space can be actively used for solar panels

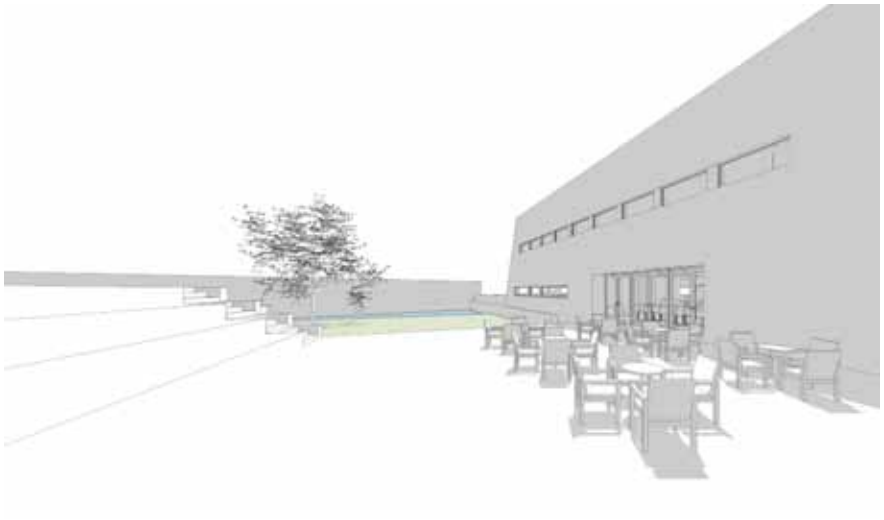
At level 1, an outdoor seating area is proposed which can be used by the canteen. A large outdoor staircase allows for informal seating or the possibility to have concert performances in the garden.

A greywater pond is placed to the north for collecting and processing grey water. Plants and fish will assist in the ”cleaning” process.

The lower courtyard is a waiting area for visa applicants. It is a confined space with no direct connection to the surrounding gardens. A covered outdoor waiting area is also provided.

The outdoor lighting concept will include feature lighting of the facades. The lighting should also highlight the gates, entrances, the entrance courtyard and the lobby, and recessed areas in the walls etc. Lighting should also be integrated in the terraced flower beds (serviced by solar power)

The garden is proposed furnished with loose chairs and tables for flexible use, in combination with secondary sitting edges.



Outdoor space by canteen

Walled off recreational space

Drought resistant plant species from Kenya

3.7 Solution Acoustics

3.7.1 Sound Isolation
It is proposed to build walls in plastered brickwork and floors in concrete so that Rw44dB between rooms is upheld. Any puncturing between walls will be filled properly.

3.7.2 Room acoustics
The surface materials proposed are mostly hard. These surfaces will reflect sound in the room. There are many simple ways of reducing this; rugs, wall hanging textiles, perforated plasterboard ceilings, curtains, cushions, soft furniture and felt under table and chair legs.

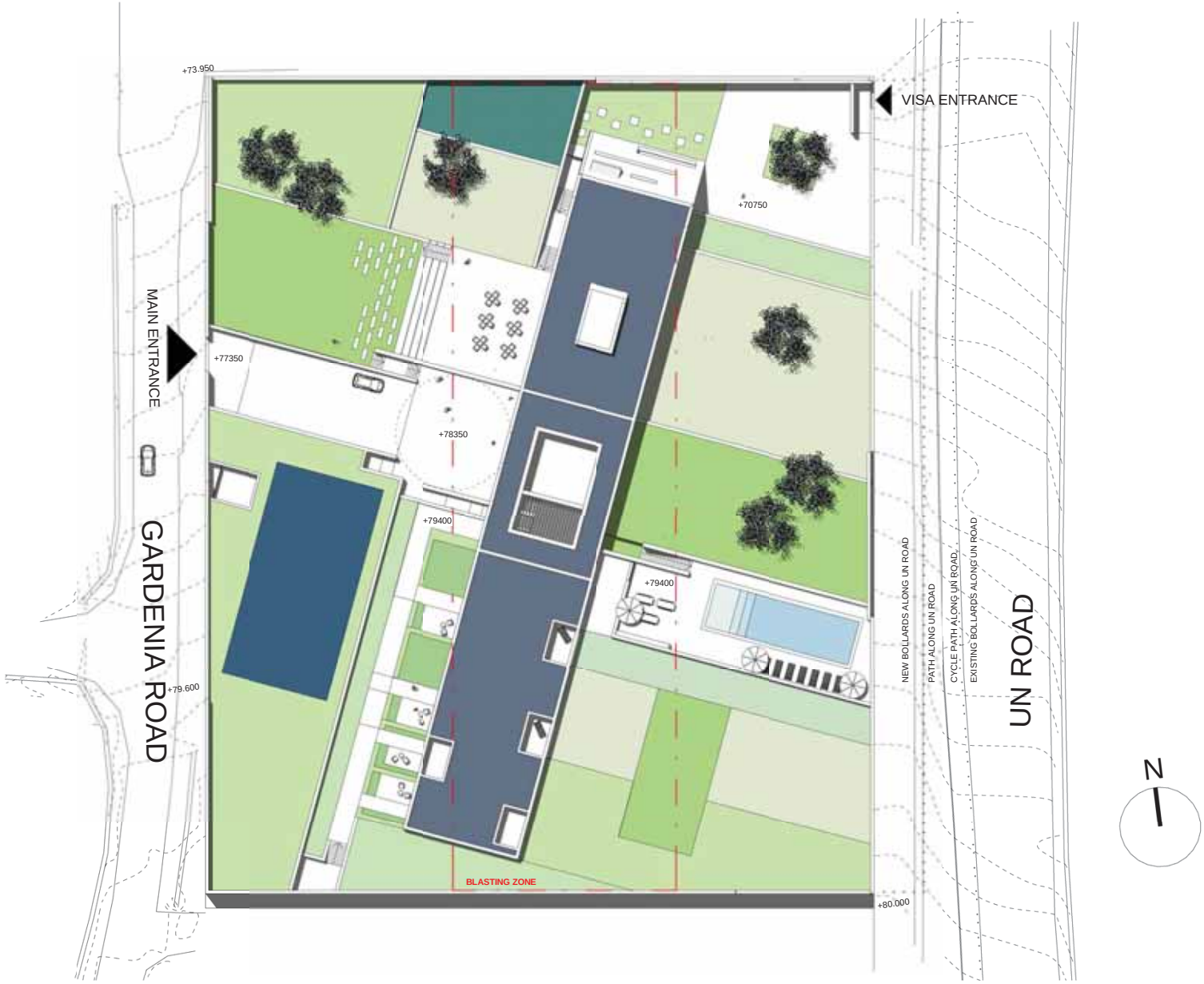
4.0 ROOM PROGRAM

The room program for the feasablity study is based on the size requirements stipulated in the order from MFA. It is our intention to meet the size requirements stipulated in the “statens norm” = 23m2/employee.

The sketch project has an embassy with a 23m2/employee ratio

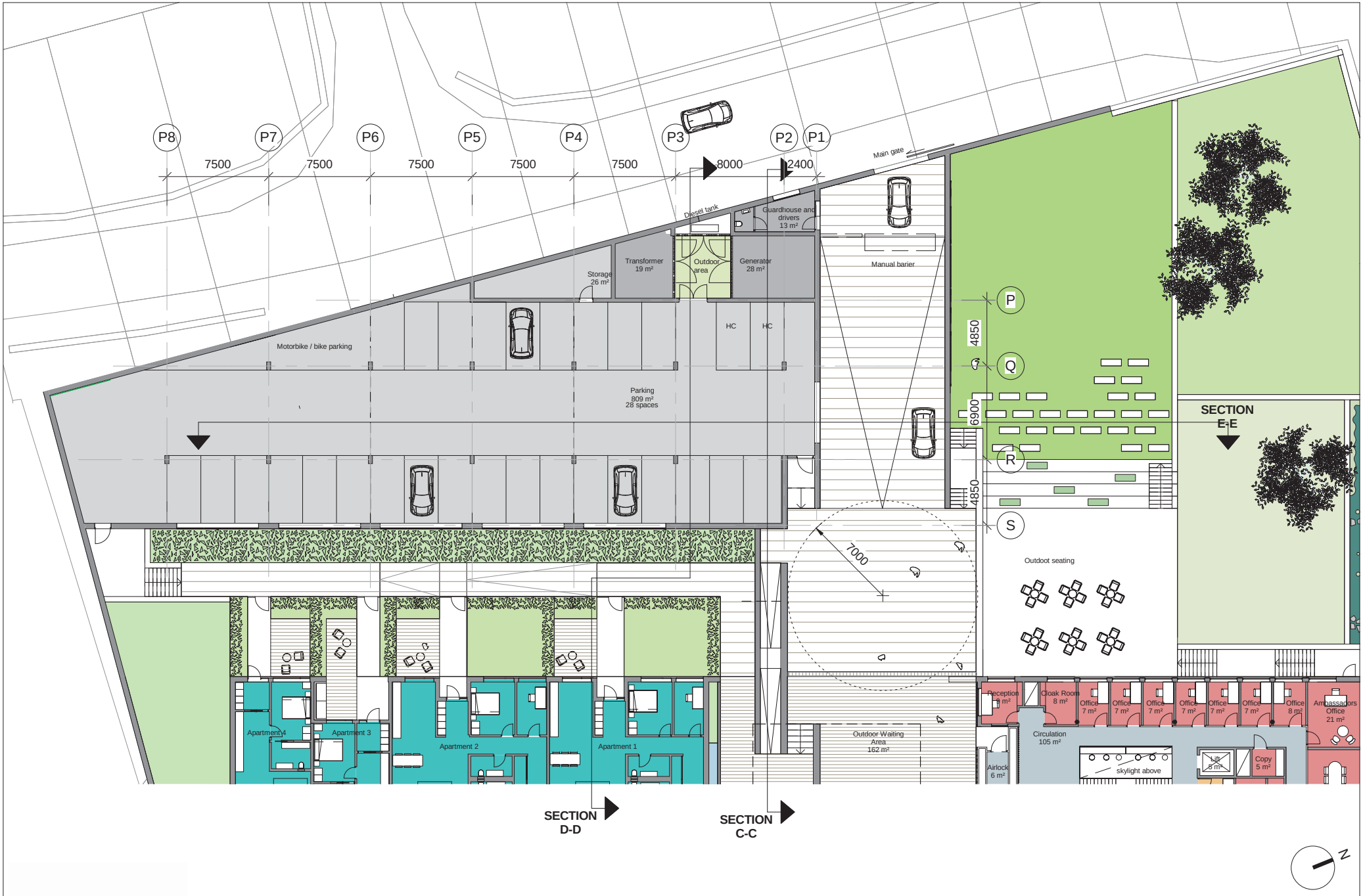
Technical areas are shared between the embassy and the housing

Room	No.	Size	TOTAL m2	persons	m2/pers	Comments
Plan 0						
Interview room	1	19	19			
Copy	1	7	7			
Storage	1	29	29			
HCWC (Visum applicants)	1	7	7			
WC (staff)	1	3	3			
Garden storage (access from outs	1	8	8			
Circulation	1	16	16			
Staircase	1	13	13			
Lift	1	5	5			
Plan 1						
Landscape office	1	158	158			
Quiet room	1	6	6			
Copy	1	5	5			
Meeting room	1	14	14			
Meeting room	1	14	14			
Safe Haven / Gym	1	36	36			
HCWC	1	6	6			
WC	2	4	8			
Changing room	1	7	7			
Changing room	1	4	4			
Corridor	1	7	7			
Server	1	8	8			
Canteen	1	44	44			
Waste	1	8	8			
Circulation	1	59	59			
Corridor	1	11	11			
Staircase	1	13	13			
Lift						
Ventilation	1	60	60			
Ventilation	1	37	37			
Electrical room	1	34	34			
Solar battery room	1	13	13			
Plan 2						
Ambassadors office	1	21	21			
Meeting Room	1	24	24			
Offices	10	7	70			
Landscape offices IN	1	32	32			
Meeting Room IN	1	14	14			
Quiet room IN	1	4	4			
Copy	1	5	5			
Archive 2	1	6	6			
Reception	1	9	9			
Cloakroom	1	8	8			
Airlock	1	6	0			
Circulation	1	104	104			
WC	1	6	6			
WC	1	7	7			
HC WC	1	5	5			
Staircase						
Lift						
Generator	1	28	28			
Transformer	1	19	19			
Gardhouse	1	13	13			
Storage	1	26	26			
TOTAL			**1060**			
Gross area embassy						
Plan 0			140			
Plan 1			445			
Plan 2			400			
TOTAL			**985**			
Gross area technical						
Tavlerom og Ventilasjon			159			
Generator og Guard House			50			
Trafo			25			
TOTAL			**234**			
0,5			**117,0**			Divided between embassy & housing
Gross area embassy/technical			**1102,0**	**48**	**23,0**	
Apartments			**460**			
Garage			**896**			including storage
TOTAL PROJECT GROSS AREA			**2575**			

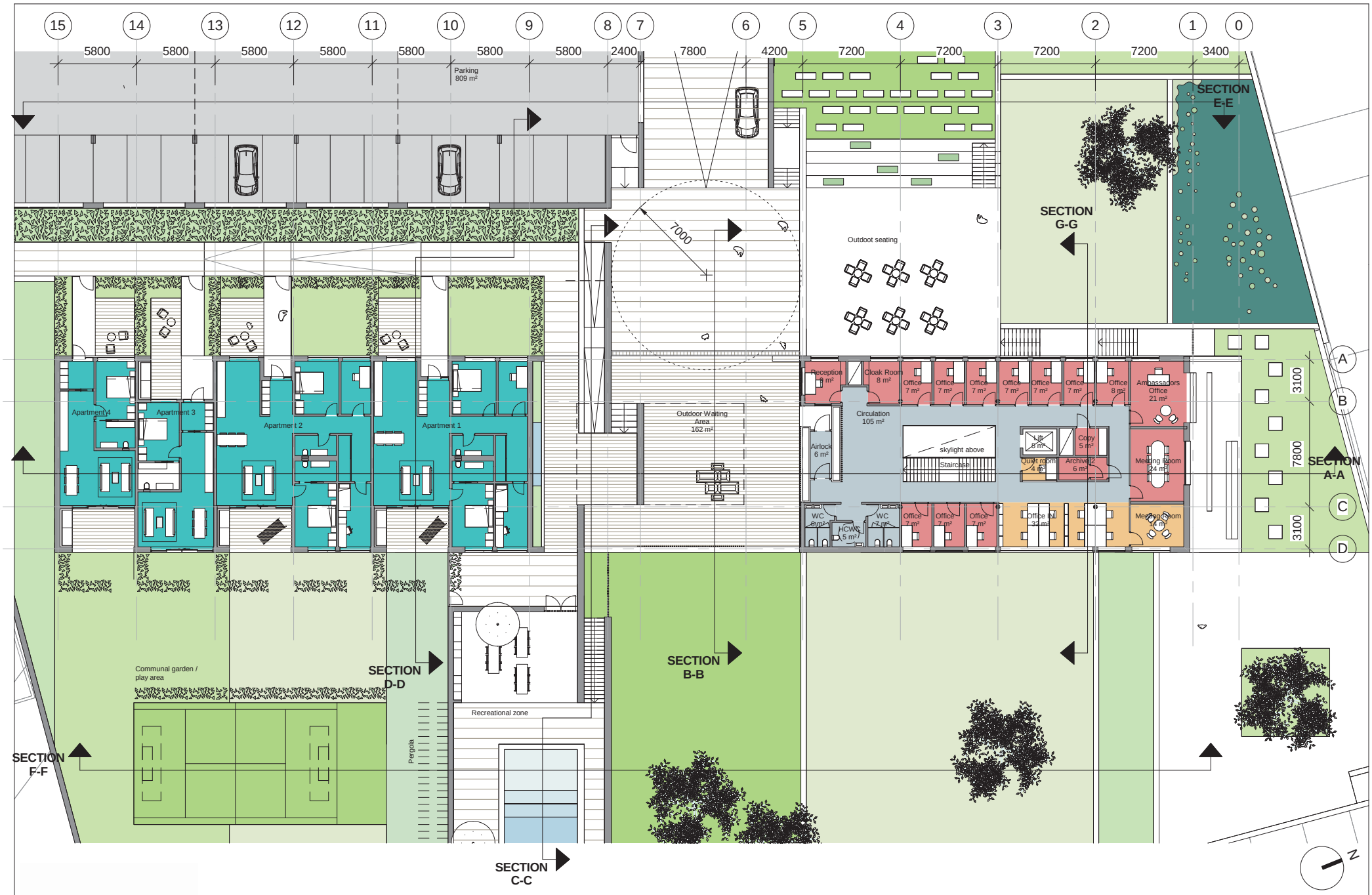


N

STATSBYGG	PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
	NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	SITE PLAN	SKETCH PROJECT	15.06.2018	1:500	A3	Kristin Jarmund —Arkitekter

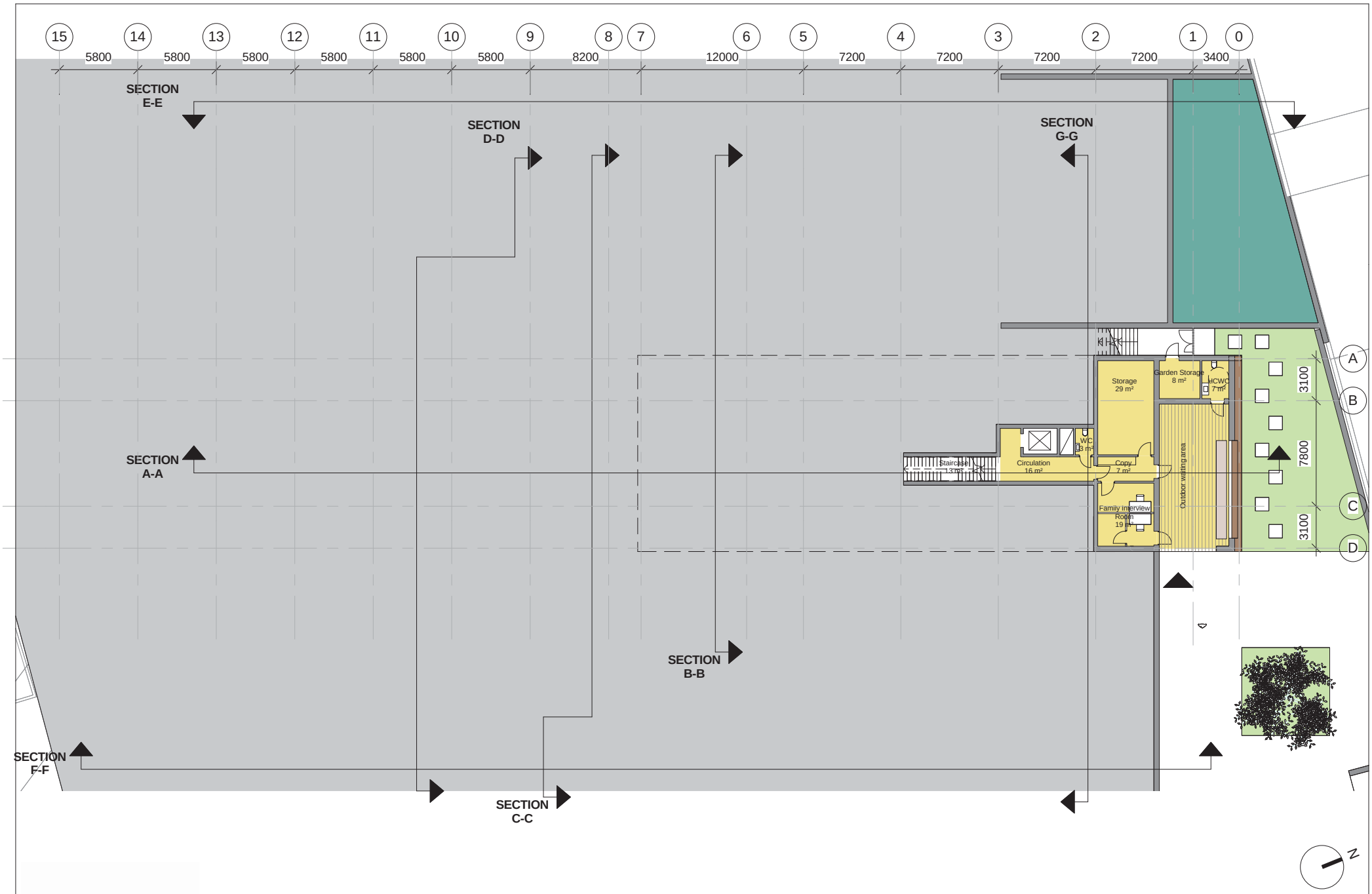


STATSBYGG	PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
	NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	PLAN 2 - PARKING	SKETCH PROJECT	15.06.2018	1:250	A3	Kristin Jarmund —Arkitekter

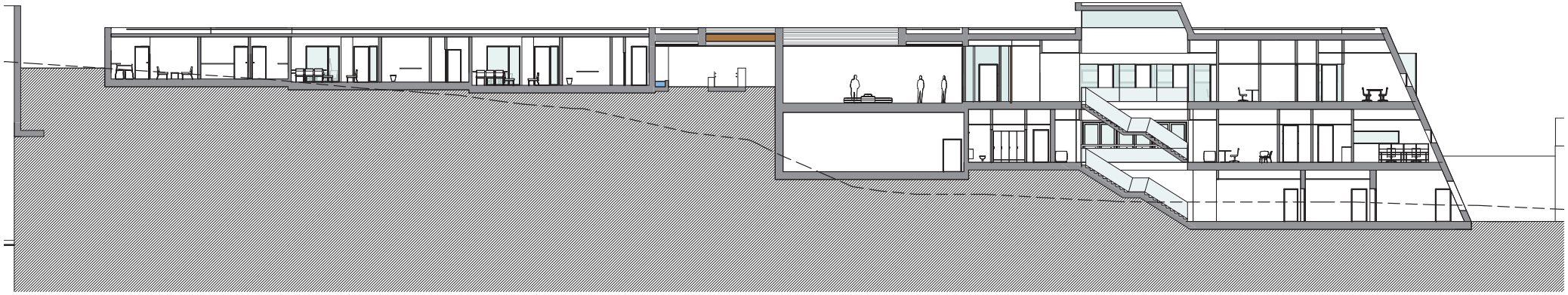


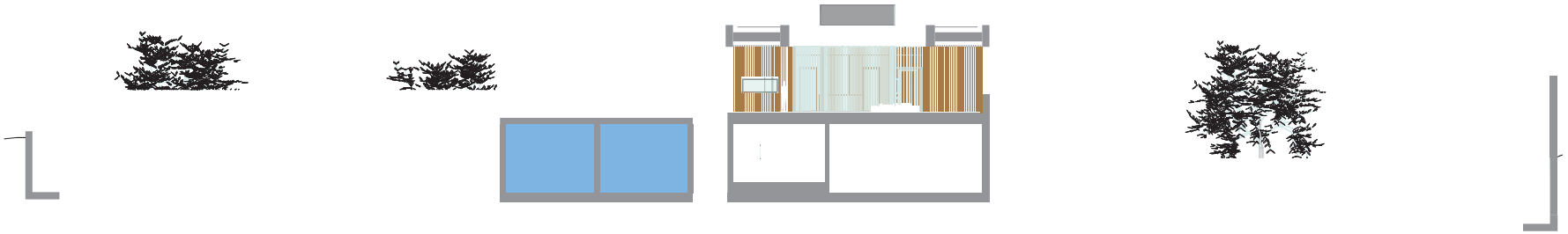
STATSBYGG	PROSJEKT: NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	TEGNINGSNAVN: PLAN 2	PROSJEKTFASE: SKETCH PROJECT	DATO: 15.06.2018	MÅLESTOKK: 1:250	FORMAT: A3	Kristin Jarmund —Arkitekter

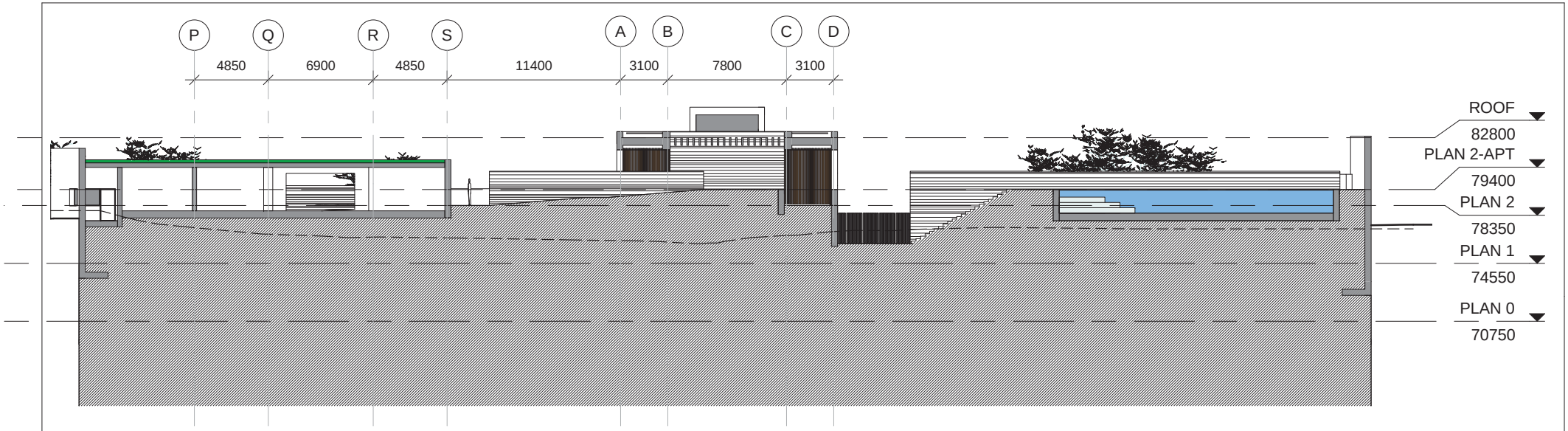
STATSBYGG	PROSJEKT: NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	TEGNINGSNAVN: PLAN 1	PROSJEKTFASE: SKETCH PROJECT	DATO: 15.06.2018	MÅLESTOKK: 1:250	FORMAT: A3	Kristin Jarmund —Arkitekter



STATSBYGG	PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
	NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	PLAN 0	SKETCH PROJECT	15.06.2018	1:250	A3	Kristin Jarmund —Arkitekter

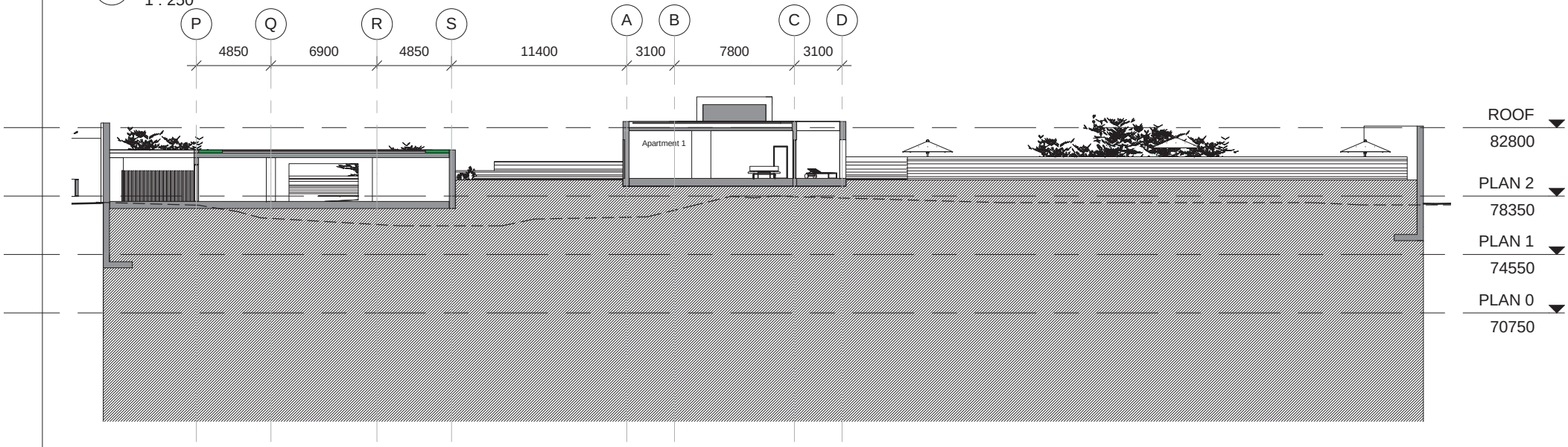






1 SECTION C-C

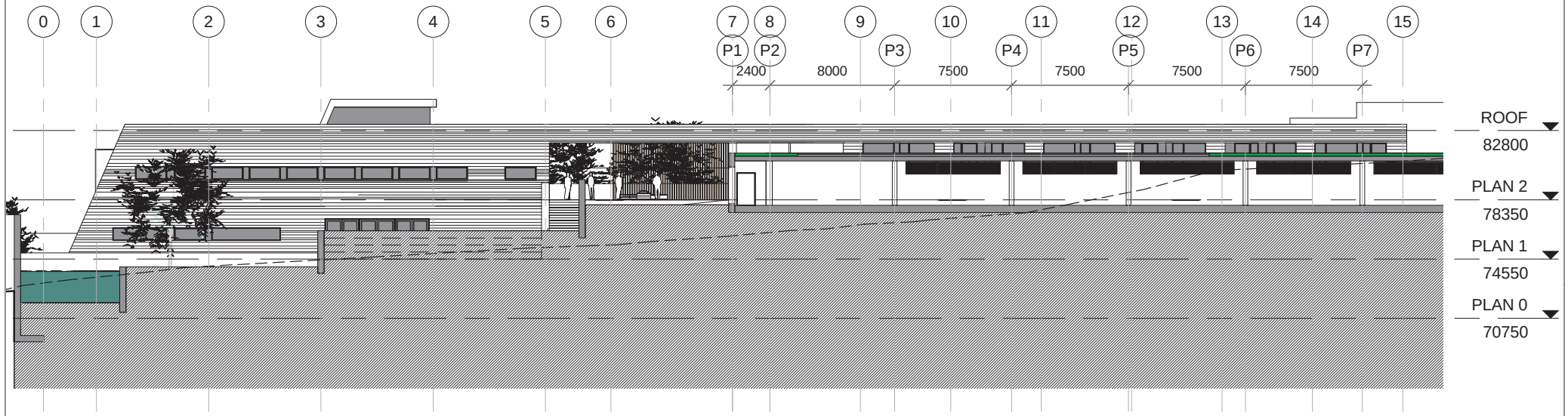
1 : 250



2 SECTION D-D

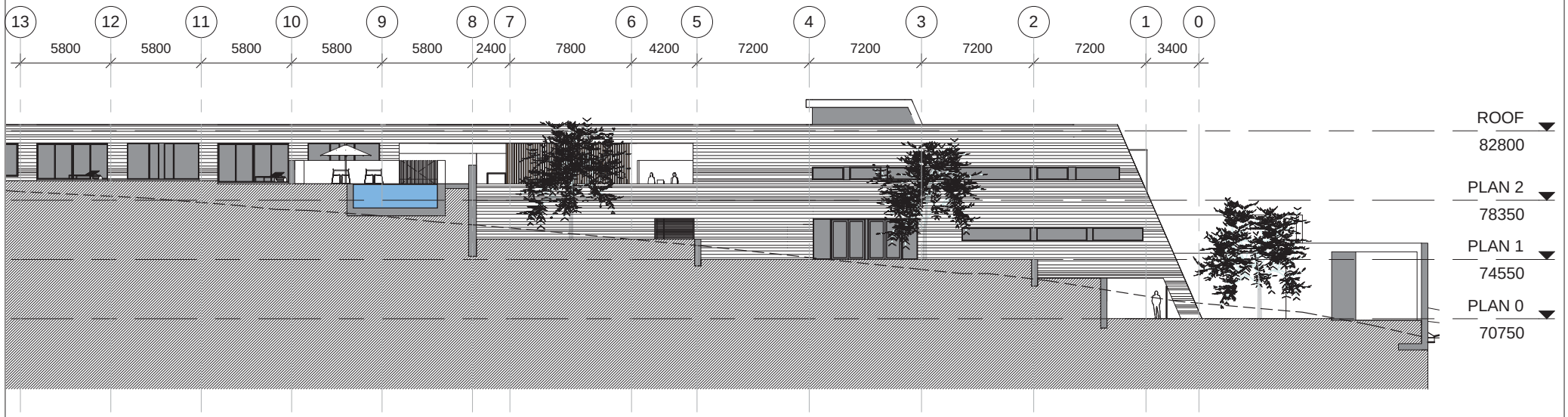
1 : 250

STATSBYGG	PROSJEKT: NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	TEGNINGSNAVN: SECTION C-C, D-D	PROSJEKTFASE: SKETCH PROJECT	DATO: 15.06.2018	MÅLESTOKK: 1:250	FORMAT: A3	Kristin Jarmund —Arkitekter



1 SECTION E-E

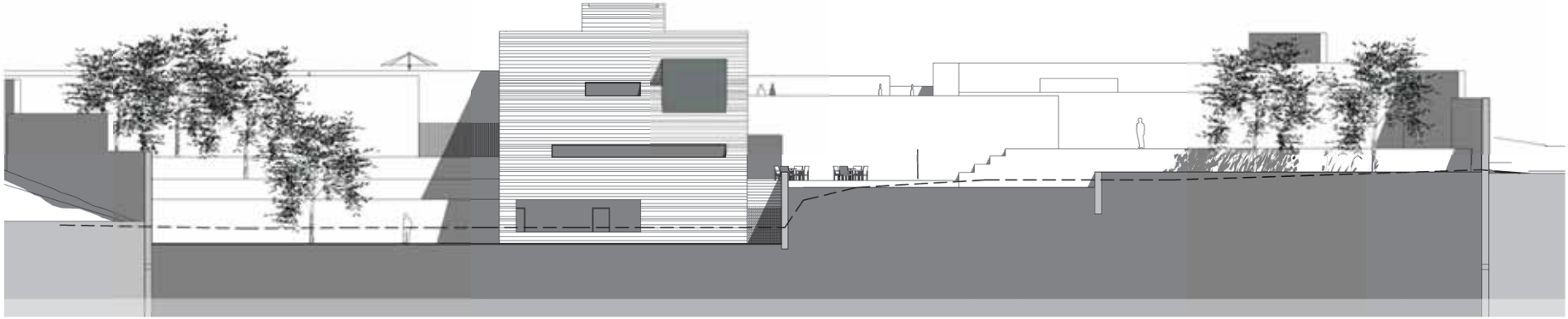
1 : 250



2 SECTION F-F

1 : 250

STATSBYGG	PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
	NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	SECTION E-E, F-F	SKETCH PROJECT	15.06.2018	1:250	A3	Kristin Jarmund —Arkitekter



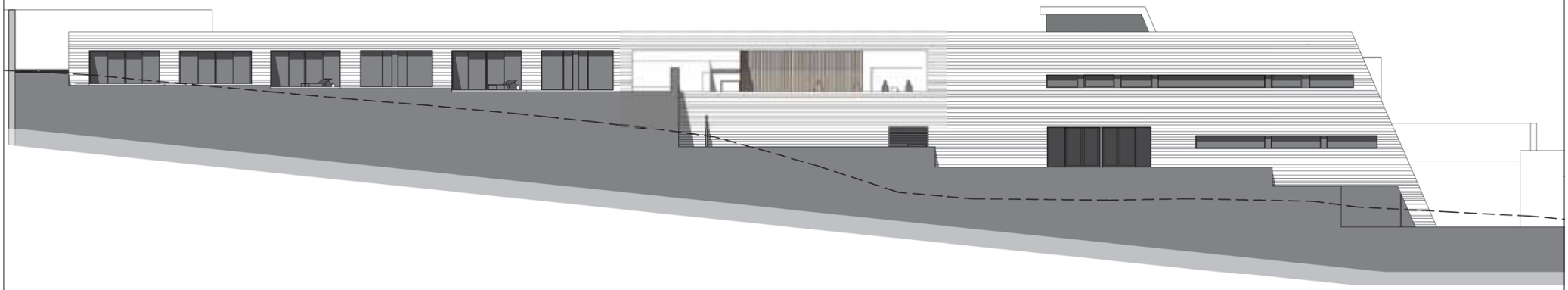
1 ELEVATION NORTH

1 : 250

2 SECTION G-G

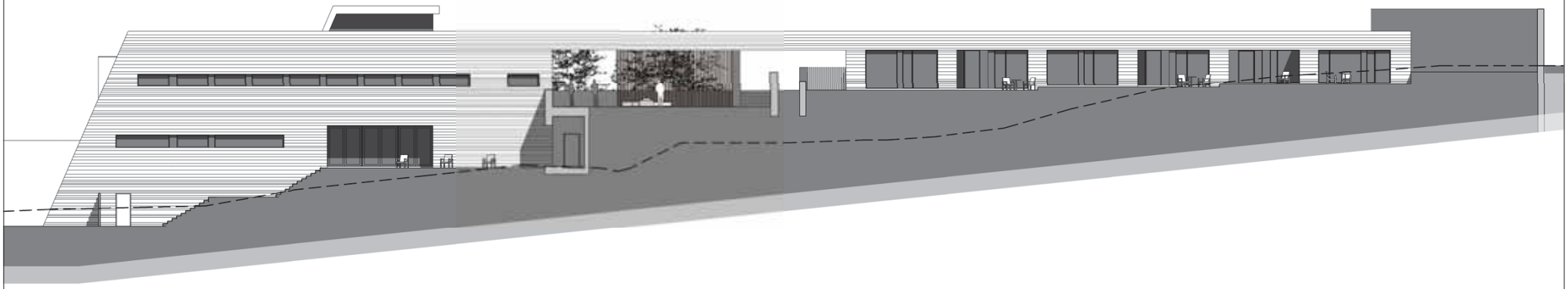
1 : 250

STATSBYGG	PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
	NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	EL. NORTH, SEC. G-G	SKETCH PROJECT	15.06.2018	1:250	A3	Kristin Jarmund —Arkitekter



1 ELEVATION EAST

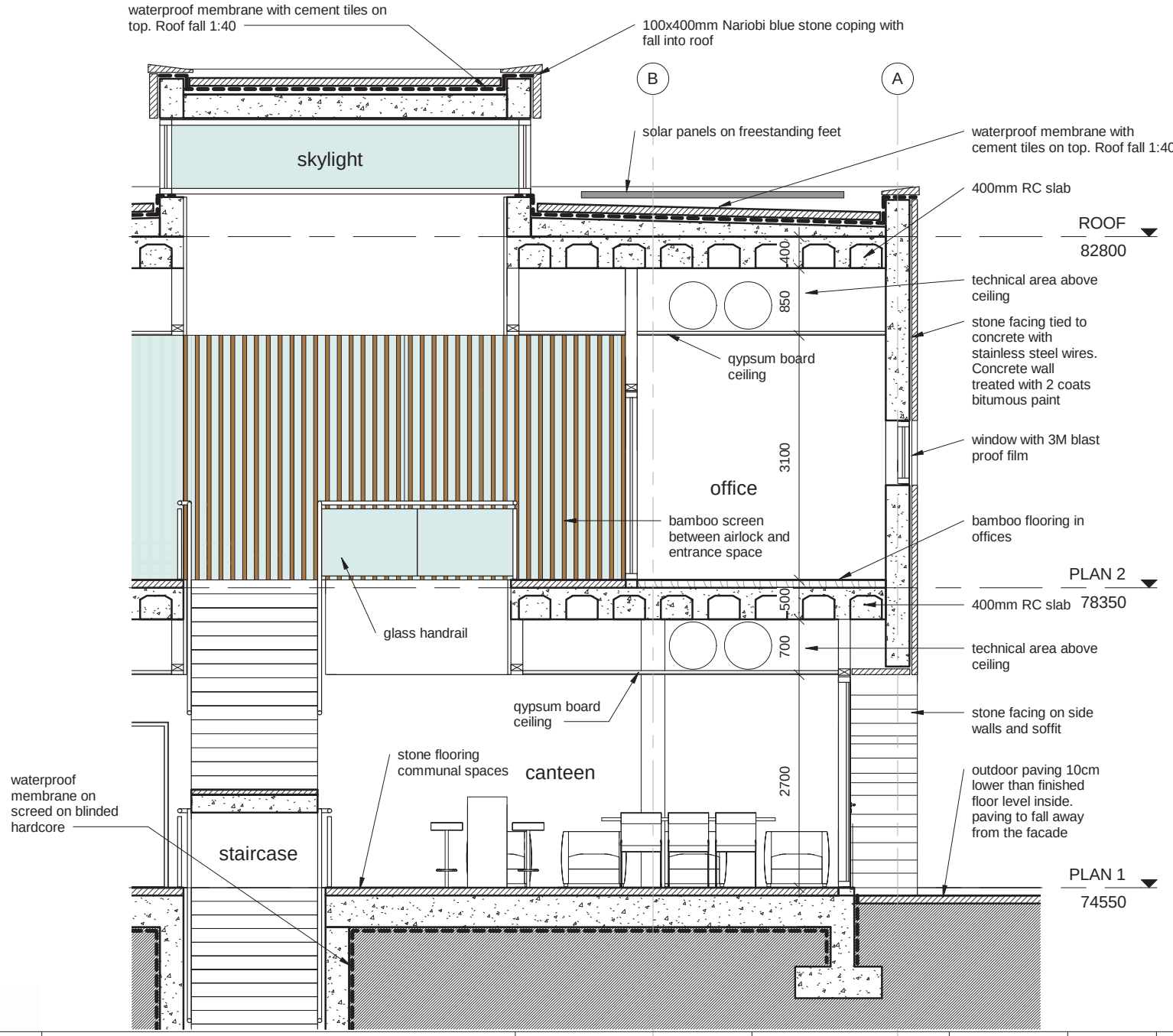
1 : 250



2 ELEVATION WEST

1 : 250

STATSBYGG	PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
	NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	ELEVATION EAST, WEST	SKETCH PROJECT	15.06.2018	1:250	A3	Kristin Jarmund —Arkitekter



STATSBYGG	PROSJEKT: NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	TEGNINGSNAVN: SECTION	PROSJEKTFASE: SKETCH PROJECT	DATO: 15.06.2018	MÅLESTOKK: 1:50	FORMAT: A3	Kristin Jarmund —Arkitekter

NAIROBI – STRUCTURAL CONCEPT

STRUCTURAL DESIGN PRINCIPLES & PHILOSOPHY

Superstructure
The suspended floor slabs at levels 1 and 2 in the main building, as well as the roof slab, consist of hollow concrete pot slabs supported on peripheral RC downstand beams / RC walls, and internal strip beams within the slab thickness in both directions between columns. All beams, downstand as well as strip beams, are supported on RC walls / columns. In the southern part of the building, RC roof slabs are supported on RC walls.

Sub-structure
All RC columns are sitting on isolated foundation pads, while the RC walls are sitting on strip footings.
All floor slabs are RC solid slabs sitting on well compacted hard core fill.

In this schematic design stage, a structural system is proposed. This is shown in drawings B20-01-04. The dimensions of structural members shown are based on estimations in this stage. Detailed design of the structural system and its major components is to be considered in the preliminary and detailed design stages. Which design loads the structure will be designed to withstand, as well as which building codes the structure will be designed to meet the requirements of, is described in the following two paragraphs.

Design Loads
Dead Loads:include weights of the structure itself and any permanent fixtures, finishes, computers, service areas, ceilings etc.

Live Loads:include all external loads imposed upon the structure while serving its intended purpose and include the weight of stored materials, furniture, movable equipment, people, etc.

Wind Loads:the wind loading on vertical faces checked for lateral stability as required by the local codes considering local basic wind speed of 28 m / sec.

Seismic Loading:provision against seismic shocks and wind effects will be made vis a vis their effect on the stability of the building structure, using Local Code of Practice, which places Nairobi in Zone VII.

Blast Loading: loading on the structure caused by an explosion.

Building Codes
The structure will be designed to meet the required standards of performance with a margin of safety against failure, using a design philosophy and method that covers safety, serviceability and economy. The design will be controlled in accordance with the following Eurocodes, but even within such bounds, judgement will be exercised in interpretation of the requirements, endeavouring to grasp the spirit of the requirements rather than to the minimum allowed by the letter of a clause.
- EN 1991: Eurocode 1: Actions on Structures
- EN 1992: Eurocode 2: Design of Concrete Structures

BLAST RESISTANT BUILDING DESIGN

An assessment of the building layout has been made with respect to blast loading. The assessment is based on sketches from the Architect and blast loads as presented in the report “171026 Presentasjon UD”.

Security measures around the site is planned. These measures include
- Bollards along UN Road
- RC boundary wall around the perimeter of the site
- “Blasting zone” of 30 m from the site boundaries and bollards
- Robust RC external walls where blast resistant windows and doors can be mounted if needed
- Robust RC structural system with RC suspended floor slabs and RC walls

Perimeter protection
The purpose of the bollards is to prevent vehicles loaded with explosives to park adjacent to the boundary wall. Placing bollards a distance of 6 m from the boundary wall increase the distance to the façade of the building, mitigating the debris hazard in the event of an explosion. Due to the security issue of flying wall fragments in the event of an explosion, it is recommended to place bollards along Gardenia Road as well as along UN Road.

Global stability
A RC structure, with RC walls and RC suspended floor slabs, provides structural robustness. The specified wall and suspended floor slab thicknesses gives the structural system the required mass and strength to withstand the given blast loading.
- RC suspended floor slabs: Minimum 200 mm
- Internal RC walls: 200 mm
- External RC walls: 300 mm

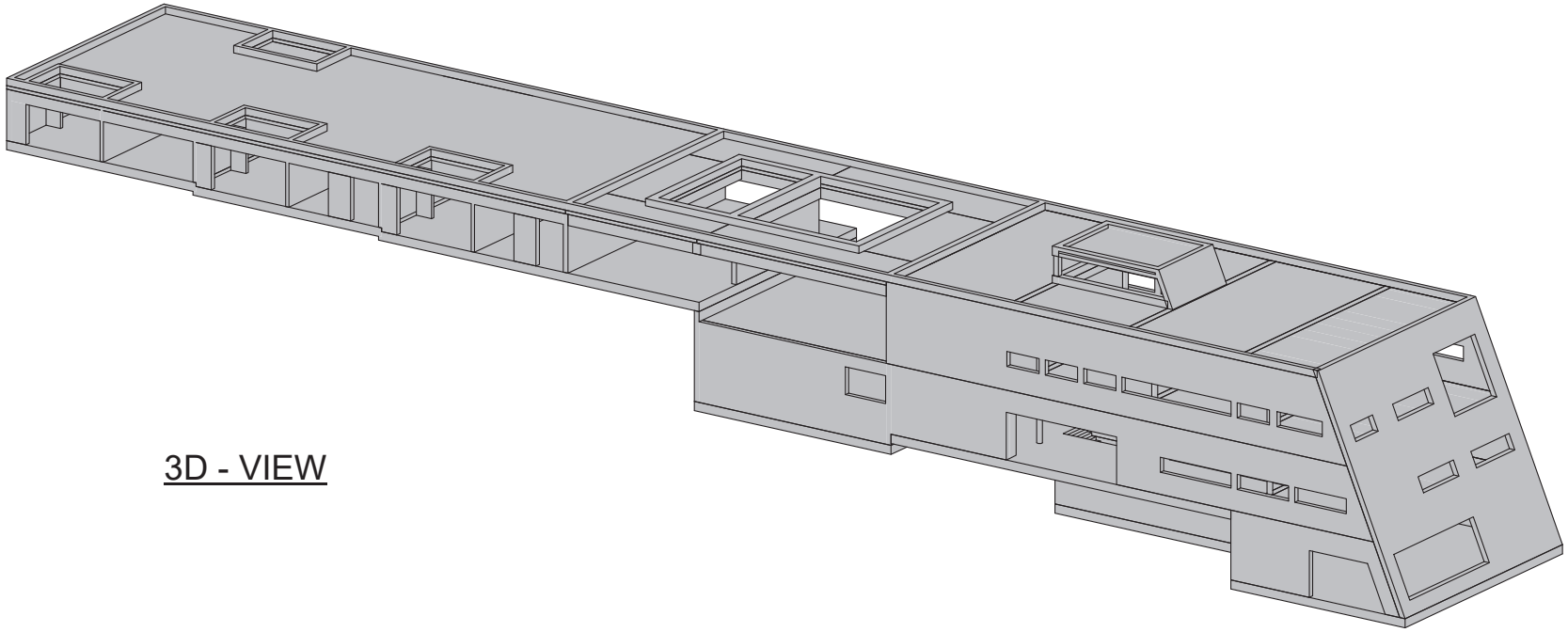
Façade protection
The assessment is based on a specific scenario mentioned in chapter 3.1 of the report “171026 Presentasjon UD”:
200 kg TNT arbitrarily placed along UN Road or Gardenia Road

Perimeter protection and “blasting zone” are the most effective physical protection strategies to reduce the vulnerability of the façade. However, blast resistant windows and doors in the façade may be required to comply with the blast proof requirements from the Ministry of Foreign Affairs.
If blast resistant windows are required, and the concrete around the window is less than that required to absorb the forces from the explosion, the concrete must be replaced by a steel frame. The steel profiles is typically HUP200x200.

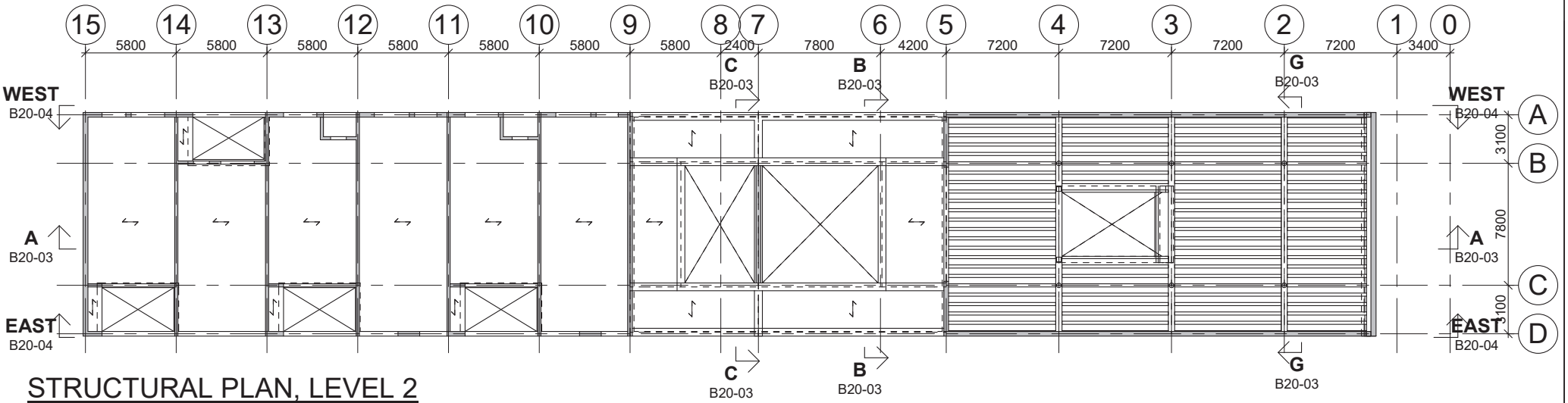
Blast resistant doors and external windows are available with classification EPR1 – EPR4 (EN 13123). EPR4 provides the highest level of protection. The availability of blast resistant sliding glass doors is unknown at this stage.

The blast loading on the façade equals the strength of an EPR2 window, given a blasting zone of 30 m from façade to perimeter and an explosion as describes above. An EPR2 window provides the required level of protection for windows more than 30 m from the perimeter.

While the rotation of the building by 15 degrees may help in reducing the blast pressure on the façade in the event of an explosion, the rotation of the building places some of the building inside the blasting zone. These parts of the structure are prone to larger blast loading and therefore require a higher level of protection. The rotation does, however place the building along the slope of the site, reducing the cut and fill during construction.



3D - VIEW



STRUCTURAL PLAN, LEVEL 2

1 : 250

Rev	Beskrivelse	Dato	Tegn	Kontr	Godkj.

Kommentar:

STATSBYGG
NEW NORWEGIAN EMBASSY
COMPLEX IN NAIROBI

Tegningsnavn: STRUCTURAL PLAN LEVEL 2

Oppdragsnr.: 10204336-01

Tegningsnr.: B20-01

Dato: 07/06/18

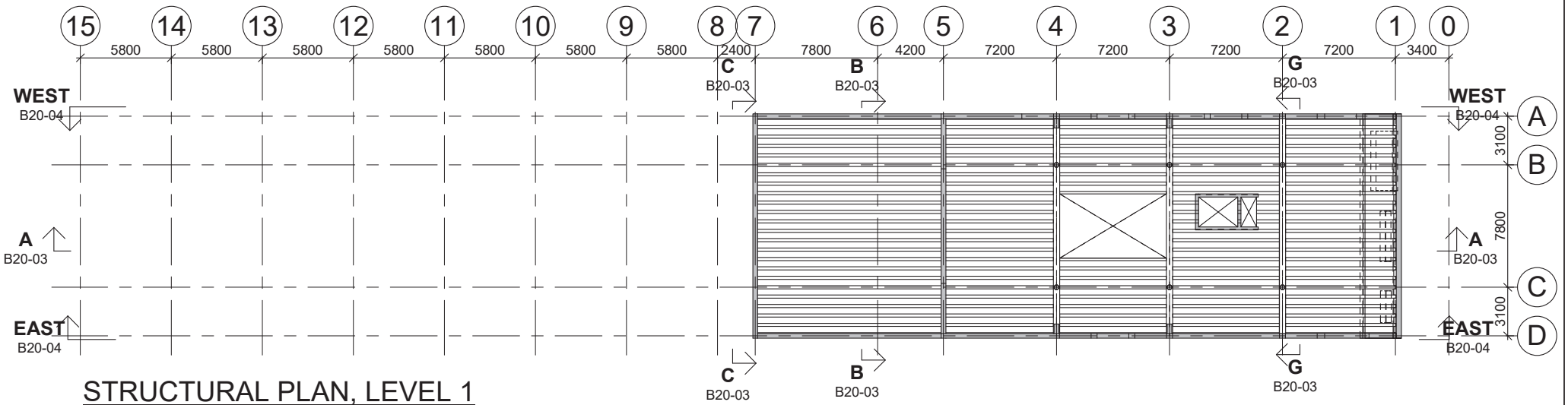
Status: SKETCH PROJECT

Revisjon:

Multiconsult
Totalleverander av rådgivningstjenester

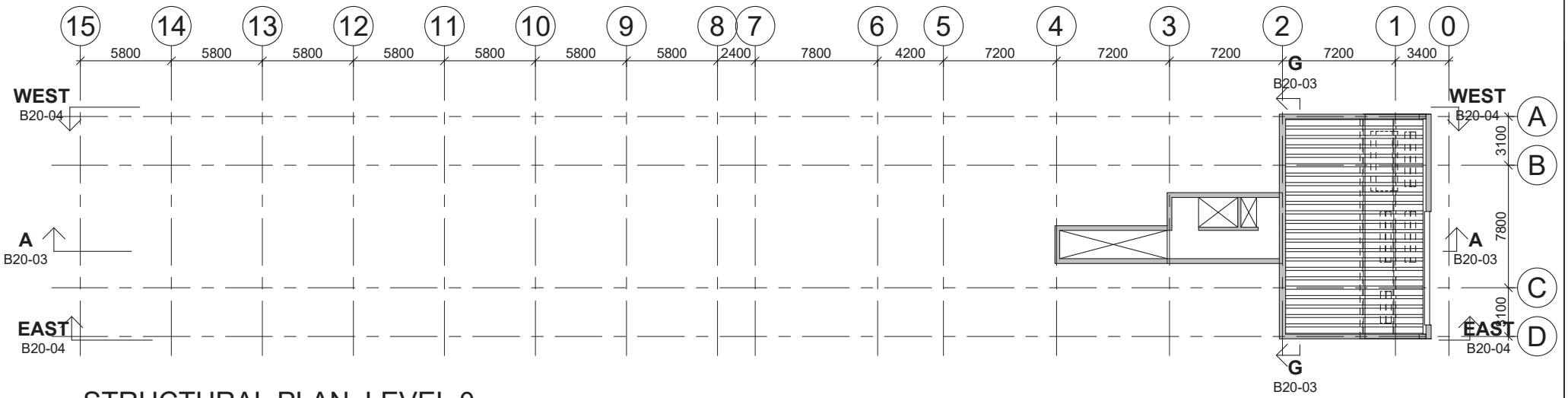
Web: http://www.multiconsult.no
E-post: multiconsult@multiconsult.no
Org.nr: 910 253 158

A3



STRUCTURAL PLAN, LEVEL 1

1 : 250



STRUCTURAL PLAN, LEVEL 0

1 : 250

Rev	Beskrivelse	Dato	Tegn	Kontr	Godkj.		

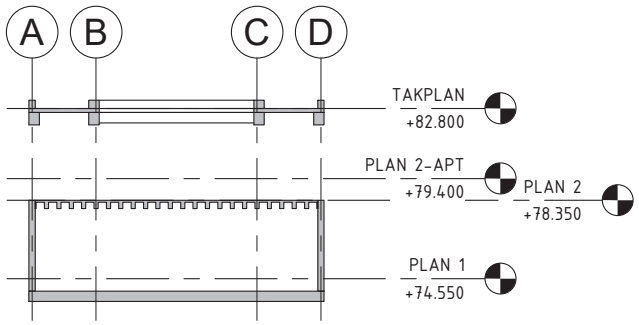
Kommentar:

STATSBYGG NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	Tegningsnavn STRUCTURAL PLAN LEVEL 0 AND 1	Oppdragsnr. 10204336-01	Dato 07/06/18	Revisjon:
		Tegningsnr. B20-02	Status SKETCH PROJECT	

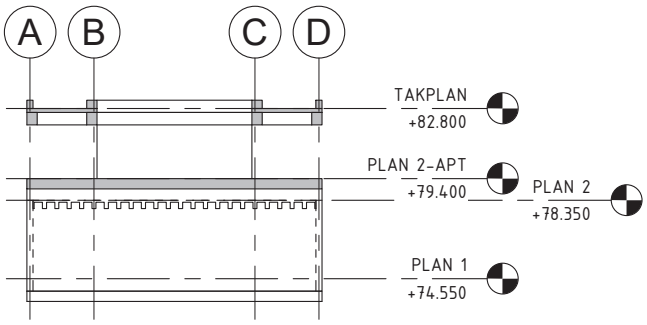
Totalleverander av rådgivningstjenester

Web: http://www.multiconsult.no
E-post: multiconsult@multiconsult.no
Org.nr: 910 253 158

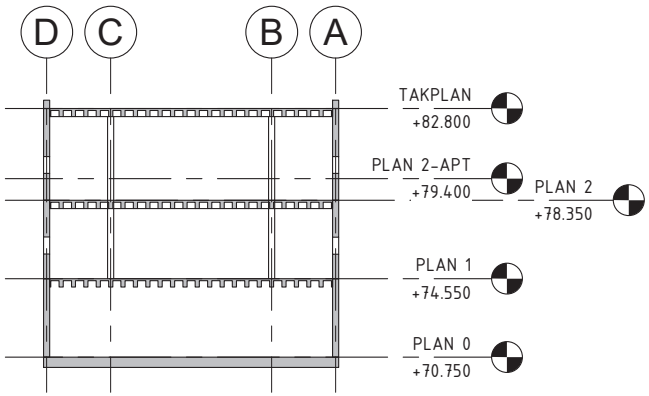
A3



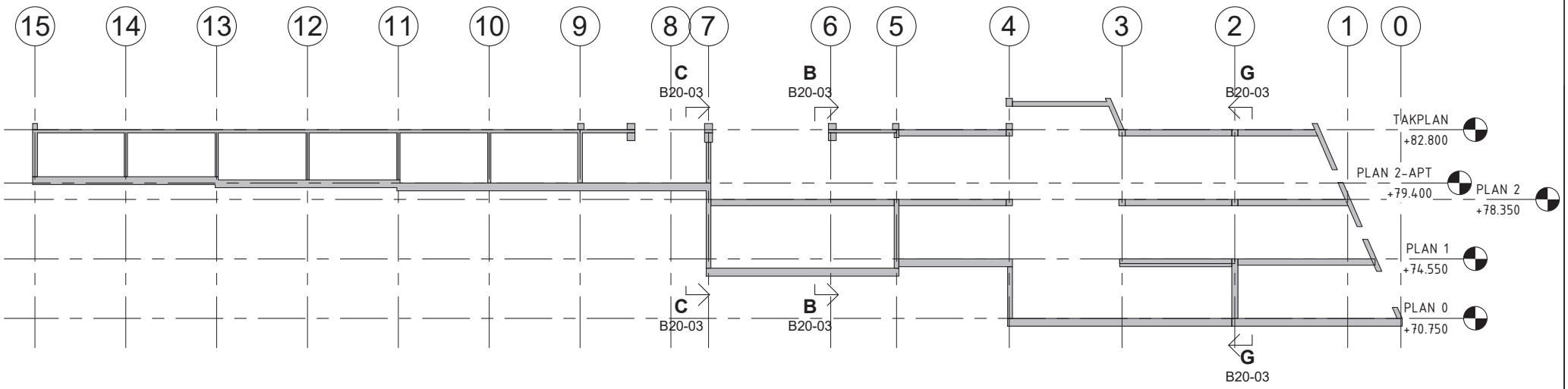
SECTION BB
1 : 250



SECTION CC
1 : 250



SECTION GG
1 : 250



SECTION AA
1 : 250

Rev	Beskrivelse	Dato	Tegn	Kontr	Godkj.

Kommentar:

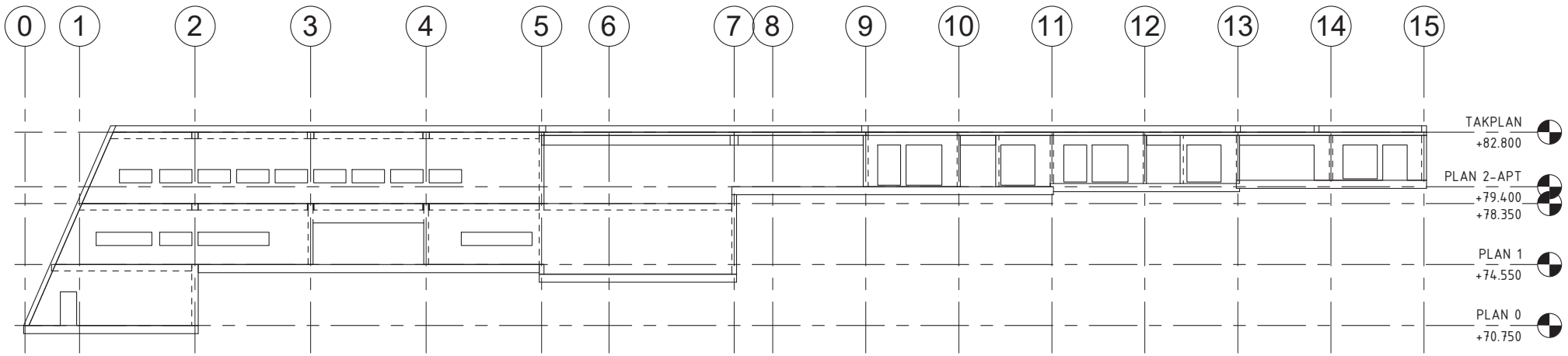
STATSBYGG
NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI

Tegningsnavn: SECTIONS
Oppdragsnr.: 10204336-01
Dato: 07/06/18
Tegningsnr.: B20-03
Status: SKETCH PROJECT
Revisjon:

Multiconsult
Totalleverandør av rådgivningstjenester

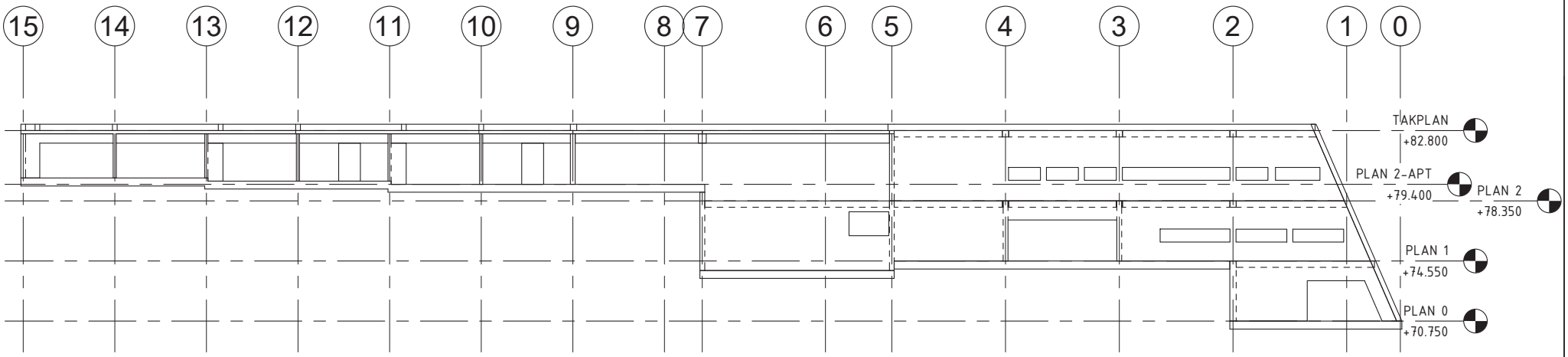
Web: http://www.multiconsult.no
E-post: multiconsult@multiconsult.no
Org.nr: 910 253 158

A3



WEST ELEVATION

1 : 250



EAST ELEVATION

1 : 250

Rev	Beskrivelse	Dato	Tegn	Kontr	Godkj.

Kommentar:

STATSBYGG
NEW NORWEGIAN EMBASSY
COMPLEX IN NAIROBI

Tegningsnavn: ELEVATIONS

Oppdragsnr.: 10204336-01

Tegningsnr.: B20-04

Dato: 07/06/18

Status: SKETCH PROJECT

Revisjon:

Multiconsult
Totalleverander av rådgivningstjenester

Web: http://www.multiconsult.no
E-post: multiconsult@multiconsult.no
Org.nr: 910 253 158

A3

Electrical Specification

Standards and regulations
The electrical equipment shall be engineered and documented in accordance with:

Regulations:
FELRegulation on Electrical low-voltage plant with guidance. The Directorate for Civil Protection and Emergency Planning (DSB).
FEU Regulation on Electrical Equipment. The Directorate for Civil Protection and Emergency Planning (DSB).
TEKTechnical regulations to the plan- and building law. The Department for local and regional authorities

Standards:
NEK 400Electrical low-voltage installation. Norwegian Electrotechnical standard. The Norwegian National Committee of The international Electrotechnical Commission, IEC. NEK 400 is based on European Electrotechnical standards CENELEC HD 60364 and IEC 60364.

Example for other relevant standards:
IEC/EN 60439Low-voltage switchgear and control gear assemblies. Relevant parts.
IEC/EN 60947 Low-voltage switchgear and control gear. Relevant parts.
IEC/EN 60076 Power transformers. Relevant parts.

The latest issue of the regulation and standard shall be used unless otherwise agreed.

Electrical load
The Electrical Load of the building is categorized as following:
•Lighting load
•Small power load
•Ventilation and air condition Load
•Mechanical load: water pumps, utility systems etc.

Transformer
A Distribution transformer is located indoor near the main gate. The proposed location takes into account accessibility for maintenance and security. The transformer capacity will be decided when the total load data for the Embassy is defined. The need of an isolation switch upstream the transformer has to be clarified with the grid owner. The transformer will connect to the Low Voltage Main Distribution Board located in the electrical room at level 1.

Generators
A generator is located indoor near the main gate. The proposed location takes into account accessibility for maintenance and security. The generator capacity will be decided when the total load data for the Embassy is defined and the solar battery “option” is decided to be implemented.
The generator will be connected to the Low Voltage Main Distribution Board located in the electrical room at level 1.

An above ground diesel tank will arranged outdoor, close to the generator with a tank capacity of three days consumption

Electrical room
The current architectural design drawings indicates a specific location of the Electrical room at level 1.

The proposed location of the Electrical room takes into account various factors such as, length of cable runs for feeders to offices, apartments, transformer and generator, accessibility for maintenance and security.

The room will be arranged with a raised cable floor.

The electrical room will contain the following equipment:
•Main Distribution Switchboard
•Generator Change Over Breaker
•Voltage Stabilizer
•Power Factor Correction Bank
•Solar Power Battery Converter / Charger (Optional)
•UPS for Sever / Data System

Main Distribution Switchboard
Low Voltage Switchboard -Type Tested Assemblies, modular, metal clad cubicle.
The switchboard shall be a type tested assembly complying to form 3b architecture. This ensures safety for maintenance personal during ‘live’ conditions and the modularity for expansion of the switchboard. The Switchboard distribute power to building installations, light, socket outlets, HVAC, utility systems etc.
The switchboard have interface and connect the Generator, Voltage Stabilizer and the Power Factor Correction Bank

The system monitor the incoming mains supply for under / over voltage when either of these fall out of the stipulated limits and gives a start command to the generator set.

Voltage Stabilizer
The design allows for a voltage stabilizer dimensioned for the total electrical load for the Embassy.
The availability of steady voltage supply is critical for a number of situations involving voltage sensitive equipment. High quality voltage supply regardless of the incoming fluctuation is essential for ensuring efficiency and reliability to the final user.

A voltage stabilizer has proved to be an efficient solution in order to prevent from potentially dangerous situations due to voltage instability.

Power Factor Correction Bank
Free Standing Power Factor Correction Bank type fully type tested. The system will automatically maintaining power factor at the set level and regulating the switching of capacitor steps.

Lighting / emergency lighting
Lighting for the various areas of the building.
•Parking Level
•Apartments
•Lobbies
•Technical rooms
•Offices
•Outdoor area

The lighting system is a LED light installation with motion sensors and timer switches.
The emergency lighting system is a decentralized system with battery integrated in the fixtures
Building Management System (BMS) for control and monitoring purposes and energy metering for power consumption monitoring

The lux levels are based on the guidelines of "lyskultur" NS-EN-12464.

LED lighting has the following benefits:
•Low environmental impact
•Low maintenance costs
•Low operational costs
•Low heat dissipation thereby reducing the 'heat' load and reducing the costs of 'cooling' the building

Earthing System
Installation of an earthing system to obtaining touch voltages below the regulation requirements.
The roof of the building will have a lightning protection system installed. The lightning will be directed the shortest distance to the ground and connected to the earthing system.

The earthing system consist of:
•Building foundation earth wires in combination with earthing rods
•Lightning protection

Electrical Distribution and Cable Runs
The distribution will be via sub main cables in ceiling to shafts in the office area.
Electrical Sub Distribution Boards will be installed in the shafts for distribution of electrical power for lighting, socket outlets and equipment.
Each apartment will have separate fuse panel for power distribution.
Feeder cables between transformer and generator will be in underground pulling pipes.

Fire Detection
An addressable fire detection system will be installed with a central monitoring panel in the security office.
Addressable smoke and heat detectors will be provided at all building levels as required by building services regulations.

Security, CCTV, Access Control, Data Network
CCTV points will be installed in the following areas:
•Main entrance and exit points at the gates.
•Parking levels
•Ground Floor lobby
•Building perimeter•Wall mounted lighting fittings for outdoor area

Access control points will be allowed in the following areas:
•Main security office
•Other areas as deemed necessary by the clients

Office Workplace:
Each workplace will be equipped with 6 - 230V sockets and 3 - data sockets

The final detailed design of the security, CCTV, access control and data network is the responsibility of the Norwegian Foreign Department.

Earthing & Lightning Protection
The purpose of an earthing system is for obtaining touch voltages below the regulation requirements.
The roof of the building will have a lightning protection system installed. The lightning will be directed the shortest distance to the ground.

The earthing system consist of:
•Building foundation earth wires in combination with earthing rods
•Lightning protection

SOLAR POWER PROPOSAL
Installation of Solar Panel at the roof
•Nominal Capacity of 95 kWp on the total available roof space.
•The system will produce around 135 MWh/year. To increase the capacity of the solar panel system the garage roof can be utilized for installation of additional panels.
•Installation of a battery bank is optional. The most efficient size of the backup battery can only be determined once we know the embassies' consumption pattern.

Multiconsult

NOTAT 002

OPPDRAG	Ambassaden i Nairobi	DOKUMENTKODE	10204336-01-LYS-NOT
EMNE	Dagslysberegninger	TILGJENGELIGHET	Åpen
OPPDRAGSGIVER:	Statsbygg	OPPDRAGSLEDER	Terje Aaserud
KONTAKTPERSON:	Arkitekt Zuzanna Sulikowsak host KJA	SAKSBEHANDLER	Linda Knoph
KOPI: TERJE AASERUD	-	DATO:	24.05.18

SAMMENDRAG

- **Iht. Byggeteknisk forskrift (TEK17)**

1. Krav til dagslys kan oppfylles slik:

Gjennomsnittlig dagslysfaktor i rommet må være minimum 2,0 %. Samsvar dokumenteres med beregninger av mest kritiske rom i forhold til dagslysforhold. Beregninger utføres med simuleringsverktøy validert etter CIE 171:2006 og forutsetninger gitt i NS-EN 12464-1:2011 kapittel 4.4.

Det er blitt bedt om nye beregninger for å se hvilken vindusstørrelse det må være for å oppnå gjennomsnittlig dagslysfaktor på minimum 2,0 %. Dette er blitt sendt i mail til arkitekt Graeme 03.05.18 der det ble beregnet med fem ulike størrelser, hvor tre størrelser tilfredsstilte gjennomsnittlig daglysfaktor. Beregningen tok da utgangspunkt i at kontoret av 4X2,5, Høyde: 280cm og plassering av vindu 100cm over gulv.

Nylige reviderte tegninger sendt til meg 18.05.18, viser et kontor i 2. etasje på 330cmX225cm. Høyde: 310cm. Med en vindusstørrelse på 80X200cm. Med denne utformingen oppnås en gjennomsnittlig dagslysfaktor på 2,91 %.

Innhold

1 Begrepsforklaring 2
1.1 Dagslysfaktor 2
1.2 Refleksjonsfaktor 2
2 Forutsetninger 2
3 Resultat 3
4 Kommentar og illustrasjon av vindusstørrelse 4

001	23.05.18		LK		
REV.	DATO	BESKRIVELSE	UTARBEIDET AV	KONTROLLERT AV	GODKJENT AV

For beregningen er det benyttet Relux med Raytracing som beregningsprogram. Det er brukt standard refleksjonsgrader i beregningene, tegninger mottatt fra arkitekt er brukt som underlag.

1 Begrepsforklaring

1.1 Dagslysfaktor

Dagslysfaktor er definert som dagslysbelysningen fra en jevnt overskyet himmel på en horisontal flate innendørs, angitt i prosent av den samtidige belysningen på en uskjermet horisontal flate utendørs. Luminansfordelingen for en jevnt overskyet himmel er normert av den internasjonale belysningskommisjonen CIE.

Dagslysfaktoren er sammensatt av tre komponenter, himmelkomponenten (direkte himmellys), utereflektert komponent (lys reflektert fra flater utenfor rommet) og innereflektert komponent (lys reflektert fra flater inne i rommet).

Gjennomsnittlig dagslysfaktor beregnes i et horisontalt beregningsfelt 0,80 m over gulv. Beregningsfeltet er trukket 0,5 m fra vegg. For rom med varig opphold anbefaler veiledningen til TEK 17 en gjennomsnittlig dagslysfaktor på minimum 2,0 %.

1.2 Refleksjonsfaktor

Refleksjonsfaktoren angir hvor stor andel av lyset som treffer en flate som reflekteres tilbake fra flaten. Refleksjonsfaktoren en overflate har bestemmes av materialets farge og overflatestruktur. Faktoren oppgis som et forholdstall mellom 0 og 1, eller i prosent.

En flate ansees som mørk når refleksjonsfaktoren er 30 % (0,3) eller lavere, lys når refleksjonsfaktoren er 70 % (0,7) eller høyere, og middels lys/mørk hvis den har en refleksjonsfaktor på ca. 50 % (0,5).

2 Forutsetninger

Beregningen er basert på plantegninger og mål fra IFC modell mottatt fra arkitekt Zuzanne Sulikowska.

Det er beregnet med overskyet himmel i henhold til den internasjonale belysningskommisjonen CIE.

Beregningen er utført med umøblerte rom.

Høyde på beregningsfelt er 0,75m fra gulv og 0,5m fra vegg.

Refleksjonsfaktor som er benyttet i beregningen er standard i Relux.

Himling: 70 %
Vegger: 50 %
Gulv: 20 %
Utvendig fasade: 30 %
Terreng: 30%

Transmisjonsfaktor vindusglass: 75%

Rom hvor det er foretatt dagslysberegning: Kontor: 2. etasje. Størrelse: 330cmX225cm. Høyde: 310cm. Vindusstørrelse på 80X200cm.

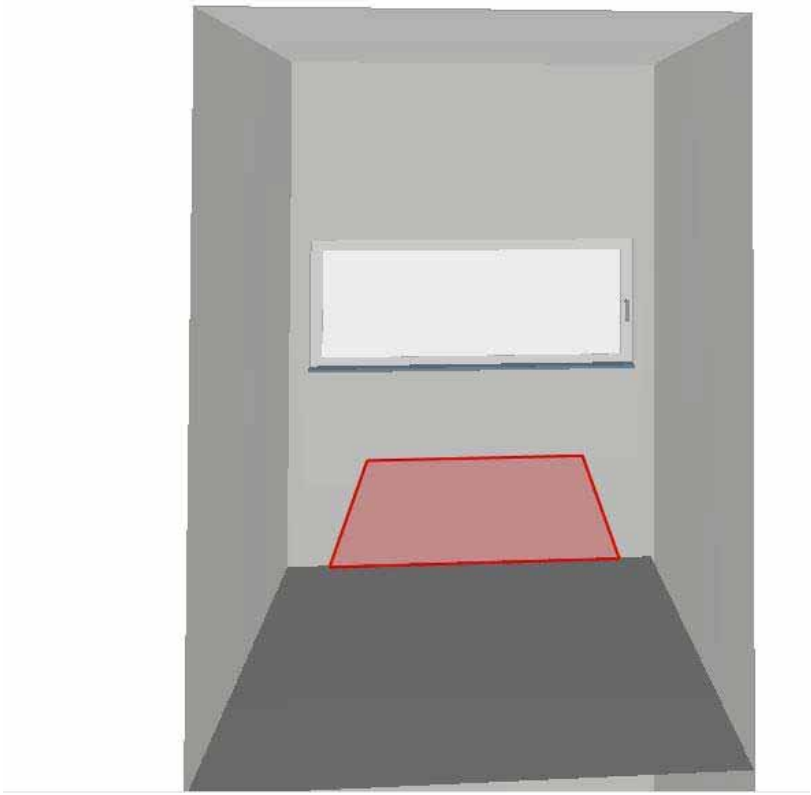
RESULTAT

	Rom	Bredde på vindu	Høyde på vindu	Gjennomsnittlig dagslysfaktor (%)	TEK 17
Sted:	Kontor 2. etg. 330X225cm H: 310cm	200cm	080cm	**2,91 %**	Tilfredsstilt

3 Kommentar

Resultatene viser at kontoret med de overnevnte forutsetningene tilfredsstiller gjennomsnittlig dagslysfaktor 2,0 %.

Beregningsresultater fra Relux.



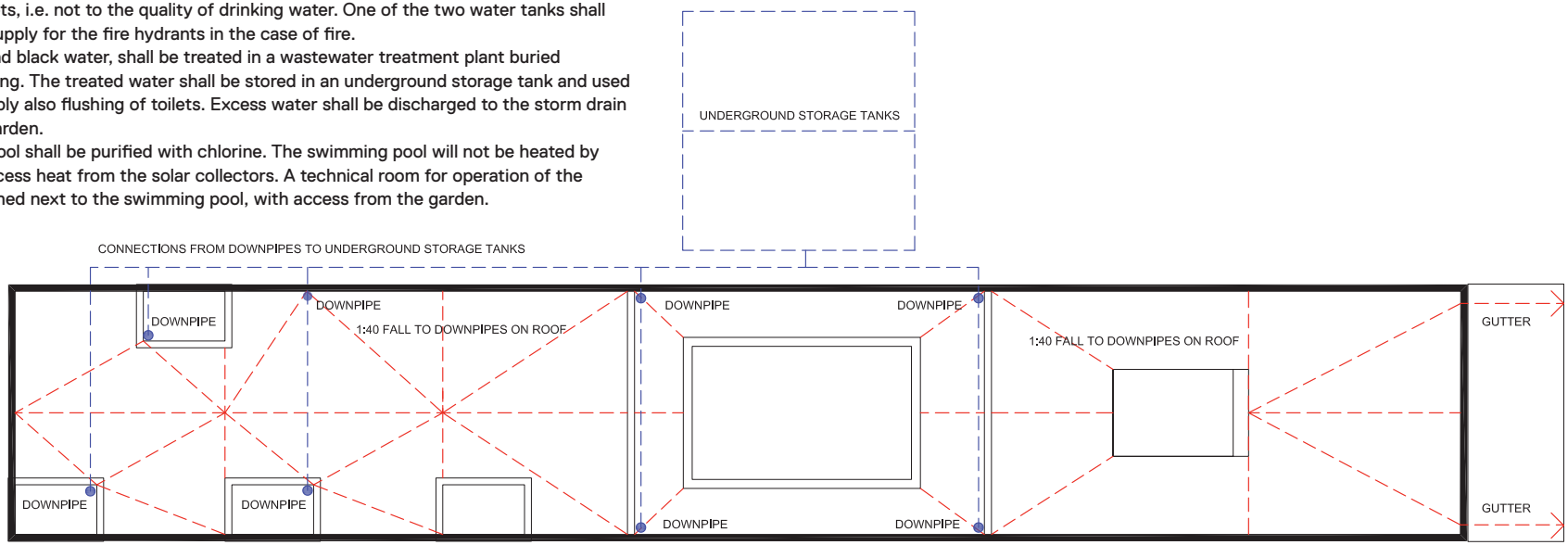
NB! Hvis vindusflatene skal ha avskjerming, folie e.l., som skal redusere sol/varme innslipp i rommet, eller løsninger i forhold f.eks. eksplosjonssikring. Dette kan gi en lavere lystransmisjon og påvirke daglysfaktoren negativt.

Technical specifications for sanitation, heating, fire fighting, ventilation and air conditioning systems

General requirements and building codes
The mechanical installations shall fulfil the technical requirements from Statsbygg and the Ministry of Foreign Affairs, in addition to the official building code of Norway, i.e. TEK 17 and the instruction booklet nr. 444 from the Norwegian Labour Inspection Authority ("Veiledning om Klima og Luftkvalitet på arbeidsplassen"). This includes e.g. air quantity requirements and thermal indoor climate requirements.

Technical room
The technical room for HVAC-installations is located in the south end of the building, on the first floor. The room will roughly contain the following installations:
- Installation for water treatment of domestic water.
- Water heaters and heat exchanger.
- Compressor and condenser for an air-to-water heating pump.
- Two air handling units.
- Ice water machine (compressor) and evaporator for an ice water system.
- Accumulator tank for ice water.

Sanitary installations and plumbing
The domestic water is provided by rain harvesting. The rainwater from the roof shall be collected in two underground water storage tanks. Excess water shall be disposed to the storm drain through a sand trap and out into the pond in the garden. The storage tanks shall be designed to cover approximately six months of water consumption. The storage tanks will be filled up at each rain period (April – May and November – January) and last to the next. The water from the storage tanks will be purified for purposes of washing, showering and flushing of toilets, i.e. not to the quality of drinking water. One of the two water tanks shall always be full and will act as supply for the fire hydrants in the case of fire.
All sewage, both grey water and black water, shall be treated in a wastewater treatment plant buried underground outside the building. The treated water shall be stored in an underground storage tank and used for garden irrigation and possibly also flushing of toilets. Excess water shall be discharged to the storm drain and out into the pond in the garden.
The water for the swimming pool shall be purified with chlorine. The swimming pool will not be heated by other means than potential excess heat from the solar collectors. A technical room for operation of the swimming pool will be established next to the swimming pool, with access from the garden.



Heating systems
The heating demand is mainly related to domestic hot water. Solar collectors will be placed on the roof of the main building (possibly also on the roof of the garage) and exchange heat to water heaters placed in the technical rom. Excess heat shall be supplied to the swimming pool. The water heaters will have electric coils for backup.
Depending on the calculated heating demand, electrical demand and available roof area, it might be necessary to use solar photovoltaic thermal panels (PVT-panels) instead of solar collectors. A PVT-panel provides both electricity and heating in one installation. It has the advantage of cooling the PV-part of the installation (solar cells), hence improving the efficiency of the solar cells (electricity production). Detailed calculations will be performed in a later phase of the project, which will determine what type of solar installation is ideal to use in this project.
Depending on the calculated heating demand, electrical demand and available roof area, it might be necessary to use solar photovoltaic thermal panels (PVT-panels) instead of solar collectors. A PVT-panel provides both electricity and heating in one installation. It has the advantage of cooling the PV-part of the installation (solar cells), hence improving the efficiency of the solar cells (electricity production). Detailed calculations will be performed in a later phase of the project, which will determine what type of solar installation is ideal to use in this project.

An air-to-water heating pump shall be installed to cover a potential room heating demand. The heating pump will supply heat to the ventilation via the heating coil and the active chilled beams (see “Ventilation”). A natural refrigerant shall be used. The heating pump will only operate in the case of heating demand in the rooms. The outdoor temperature in Nairobi varies between 10 to 28 °C (based on historic climatic data).

Fire fighting
Fire hydrants connected to the underground rainwater storage tanks shall be installed at strategic points around the building to cover all areas in case of fire. Powder extinguishers shall be installed inside the building.

Ventilation
Two air handling units with heat recovery and filtration of the air shall be installed in the technical room. One air-handling unit will supply the office areas, while the other one will supply the residential part. Each air-handling unit shall have a heating coil and a cooling coil for heating and cooling of the air respectively. The heating coil shall be waterborne and supplied by an air-to-water heating pump. The cooling coil shall be waterborne and supplied by an ice water system.

The air intake shall be placed in the facade of the technical room in first floor. The air exhaust shall be placed in the camp sheathing by the swimming pool, as far away from the air intake as possible.

The ducts suppling the residential part will go from the technical room, buried in the ground under the apartments and up in shafts in each apartment. The ducts suppling the office areas will go from the technical room and to the different floors through shafts. The ducts will be hidden above the panelled ceiling.

The treated air will mainly be supplied to the office areas and the residential part through active chilled beams, placed within and in flush with the panelled ceiling. The active chilled beams will cool or heat the air further (depending on the indoor climatic conditions) before it is supplied to the rooms. The room temperature should be kept at approximately 22 °C ± 2 °C. Relative humidity should be ≤ 65 %. The active chilled beams have the advantage that they can be multifunctional, i.e. they can be integrated together with lighting fixture and different types of sensors/detectors (Multi Service Chilled Beams).

A separate extract fan shall be installed in the battery room to extract potential hydrogen gas.

Fan coils shall be installed in the switchboard room and computer/server room(s).
Grids shall be installed in the garage facade facing the apartments to ensure ventilation of the garage.
Impulse fans shall be installed in the garage. The impulse fans will operate when the CO2 - concentration in the air is above a preset level.

Air conditioning
The air conditioning system shall be an ice water system. An accumulator tank placed in the technical rom will provide buffer capacity for the system. The ice water system will supply cooling to active chilled beams placed in both the office areas and the residential part (see “Ventilation”), and to the fan coils. The heat will be removed from the rooms and discharged to the outdoors through dry coolers placed outside. A natural refrigerant shall be used. When the outdoor temperature is lower than the indoor room temperature, the dry coolers shall supply free cooling to the ice water system.

Multiconsult

REPORT

OPPDRAG	**The Norwegian embassy of Nairobi**	DOKUMENTKODE	10204336-RIBR-NOT-001
EMNE	Fire safety concept	TILGJENGELIGHET	Åpen
OPPDRAGSGIVER	**Kristin Jarmund Arkitekter**	OPPDRAGSLEDER	Olav Økern
KONTAKTPERSON	Graeme Ferguson	SAKSBEHANDLER	Silje Haktorson
KOPI		ANSVARLIG ENHET	10106010 Brannsikkerhet

SAMMENDRAG

This report contains the fire safety concept for the Norwegian embassy of Nairobi. The report is manly for the detailed design for architect (ARK) and other consulting engineers (RI).

This report meets the requirements given in the Norwegian building regulations (Byggeteknisk forskrift, TEK17) and the structures is designed according to the pre-accepted performance requirements in Guidline to TEK17 (Veiledning til Byggeteknisk forskrift, VETK17).

1 General

This document is the fire safety concept for the Norwegian embassy of Nairobi.

The report is basis for the detailed design for architect (ARK) and other consulting engineers (RI).

The report follows the one-digit level table of contents as specified in NS-3451:2009 Table for building elements (NO: Bygningsdelstabell).

1.1 Fire sketches

The report must be seen in context with the following fire sketches:

- 10204336-RIBR-TEG-01
- 10204336-RIBR-TEG-02
- 10204336-RIBR-TEG-03

1.2 Abbrevations

SAK10 Regulations relating to building applications (NO: Byggesaksforskriten)

TEK17 Technical regulations for buildings (NO: Byggteknisk forskrift)

VTEK Guideline to TEK17 (NO: Veiledning til TEK17)

RKL Hazard class according TEK17 § 11-2

BKL Fire class according TEK17 § 11-3

0	14.6.2018	Fire safety concept for feasibility study	Silje Haktorson	Åshild Bokn	Silje Haktorson
REV.	DATO	BESKRIVELSE	UTARBEIDET AV	KONTROLLERT AV	GODKJENT AV

NS-EN Norwegian Standard – European Norm

ARK Architect

LARK Landscape architect

RIE Electrical engineering

RIB Civil engineering

RIV Mechanical & Plumbing engineering

RIBr Fire safety engineer

2 Purpose of document

2.1 Regulations

- Planning and Building Act from 2008 (2) - PBL
- FOR-2010-03-26 nr 489 – Technical regulations for buildings (TEK10) (3)
- HO-2/2011 - Guideline document to TEK10 (VTEK) (4)
- Fire and Explosion Act from 2002 (5)

2.2 Supporting documents

Architect sketches plan 0, 1 and 2 dated 30.5.2018 are basis for the mark-ups on the fire sketches.

2.3 Project description

It is planned a new Norwegian embassy in the city of Nairobi in Kenya. The embassy consists of an office building (here after called embassy building), a residential building and a garage. The accommodation has one floor. The embassy building is set in sloping terrain and has three counting floors. There are exits direct to terrain form every floor. The garage is partly underground, on the same level as the residential building.

The area of residential building is approximately 490m^2, the area of the office building is approximately 1170 m^2 (totally for tree floors), and the area of the garage is approximately 1120m^2

Distance between the buildings are over 8 meters.

The project follow pre-accepted solutions in VTEK.

3 Fire safety design

3.1 Prerequisites for detail design

All other engineers/designers are responsible for Fire Safety Design compliance as specified in this chapter. The chapter follows the one-digit level table of contents as specified in NS-3451:2009 Table for building elements (NO: Bygningsdelstabell).

Fire safety detail design of building, structure, technical systems, outdoor area, and other installation shall be ensured by ARK (Architect), RIB (Civlil engineering), RIE (Electrical engineering) and RIV (HVAC, Mechanical & Plumbing engineering) acc. as specified in the building application.

Only certified products and solutions in accordance with TEK17 Chapter 3 Documentation of products are allowed in the design.

Detail designers must document solutions before practical completion. This includes manuals describing solutions/systems, assumptions, certificates, etc.

3.1.1 About products, constructions and installations

Fire rating classifications as given in VTEK, i.e. R, E, I, etc. is used instead of the former classifications A, B and F. As the European standardization in CEN regarding harmonized fire rating classification is delayed, there are few constructions and products with the new classifications. Products and constructions that are classified according to NS 3919 are therefore accepted.

Products, constructions and installations shall have the fire rating as given in this document. Products, constructions and installations shall have documented fire rating according to relevant standards.

1.1.1 Hazard (RKL)- and fire classification (BKL) of buildings

Hazard (RKL) classification

- RKL1: Technical rooms not representing a serious fire hazard
- RKL2: Office, garage and technical rooms
- RKL4: Residential area

Fire classification

- BKL1: Garage and residential building
- BKL2: embassy building

3.2 Building constructions

Bearing constructions for the embassy building

- Load bearing system and secondary load-bearing: R60 [B60]
- Stairs: R30 [B30]
- Outside stairs protected from flame effect: A2,s1-d0 [non-combustible]

Bearing constructions for the residential building

- Load bearing system and secondary load-bearing: R15[B15]

Bearing constructions for the garage

The garage can be built without specified fire resistance when the bearing structure meet the requirement class A2-s1, d0 [non-combustible material].

Fire cells (compartments)

See fire safety sketches for information about dividing the buildings into fire compartments.

The embassy building is open over tree floor. The total area without compartmentation must not exceeds 800m2.

Internal fire compartment constructions shall have minimum fire rating EI 60 [B 60] in the embassy building and EI30 [B30] in the residential building.

The doors in the embassy building must have the same classification as the wall EI_2 60-Sa. See fire sketches.

In the embassy building there can be up to three floors in the same fire cell.

Rooms with different uses and fire hazards must be divided with compartments construction (fire cells), for example:

- Storage and technical rooms
- Apartments
- Safe haven room
- Trafo and generator room

Means of egress

Generally

See fire sketches for RIBrs proposal to main escape routes. (Normally a minimum of two escape routes from any location or one exit to safe location outside building.)

Doors shall open in the direction of travel, except from rooms where the maximum number of people is under 10.

Exit doors can usually be locked, but has to be able to open without a key, i.e. a lock knob on the inside.

Doors with opening force of more than 30 N shall have automation. The requirement also applies if loss of electric supply or triggered fire alarm, i.e. uninterruptible power supply (UPS) will be required.

Embassy

From the embassy there is directly access to terrain from every floor (free width minimum 0,9 m). Alternative escape route is via the stairs to the exit form another floor.

From the garage, there is two exits directly to terrain.

From the apartments, there are access directly to terrain.

Maximum travel distance from all areas to nearest emergency exit shall not exceed 50 meters.

Technical rooms and other rooms with periodically use can have exit through other fire compartments. The total distance to emergency exit shall be less than 50 meters.

3.3 “HVAC”

HVAC units and ducting

Ventilation units that serves more than one fire compartment shall be placed in their own fire compartment. This fire compartment can include other technical installations.

HVAC units and ducting shall be designed so that it does not contribute to the increased risk of fire and smoke spread. Ventilation system shall be built in materials that satisfies A2-s1,d0 [non-combustible material]. For ventilation ducts, this requirement applies to the entire cross section. Exceptions may be made for small components that do not contribute to the spread of fire.

For detailed information regarding fire safety of ventilation units and ducting, see byggdetaljblad 520.342 (20). RIV has to decide which strategy shall be used to achieve fireproof ventilation:

Table 5: Strategy for fireproof ventilation

Strategy	Fire safety measures	Notice
Shut down	Fire dampers in all fire rated structures	Fire dampers shall have the same fire rating as the wall/slab.
Draw out	HVAC units shall generally go as normal when fire is detected. Ducts shall have fire insulation. Extractor fans shall withstand calculated flue gas temperature.	RIV must calculate temperature in the ducts.

Facilitating the manual extinguishing of fires

All areas shall have means for firefighting. This can be either fire hoses or portable fire extinguishers (6 kg ABC according to NS-EN 3-7 or similar efficiency classification). All areas shall be covered with maximum 30 meter hose length. In the apartments, a form-stable fire hose with an internal diameter of minimum 10 mm can be used.
Portable fire extinguishers shall be placed internally covering the same area and should generally be placed near exits.
Firefighting equipment shall be marked with certificated illuminating signs as given in NS ISO 6309. Equipment that requires manual description(s) shall have this by or on the equipment, including the most relevant foreign languages.

3.4 Electrical Power

Transformer station, main switchboard, UPS-room, etc

Transformer station (NO: Nettstasjon) is separated as a fire compartment. Fire resistance of the constructions depends on the amount of oil in the transformer. See *REN blad 6038* (6). Placement of ventilation openings must be clarified with RIBr in next phase.

Emergency lighting

The emergency lighting shall

- minimum be planned and executed according to NS 3926 (7) and seen in context with *NS 1838* (8).
- minimum cover escape routes (except for apartments), fire fighting and first aid equipment.
- be operable in minimum 60 minutes in case of fire or loss of main power supply.

Emergency power

Electrical installations that have a function during fire, i.e. fire alarm system, exit signs etc., shall have emergency power backup in case of primary power loss. The emergency power backup shall ensure a minimum of 60 minutes of duration in case of main power loss.

3.5 Telecommunications and automatic applications

Fire Alarm System

All buildings are required to be protected with a fire alarm system according to NS 3960 and NS-EN 54-serien (9).

A staffed operating centre shall be alarmed automatically at detected and verified fire alarms.

Fire alarm system shall be operable in minimum 60 minutes in case of fire or loss of main power supply.

3.6 Outdoor

Outdoor fire water

The embassy will get water supply through a tank placed on the property. The tank need a capacity of 50 l/s in 60 minutes, i.e. 180 m^3 of water.

Fire manhole/hydrant has to be placed within 25-50 m from main access point.

Maximum distance from the fire manhole/ hydrants to the façade and entrances can be 50 meters.

Water supply from the manhole or hydrants need to be at least 50 l/sec distribute into minimum two tubs.

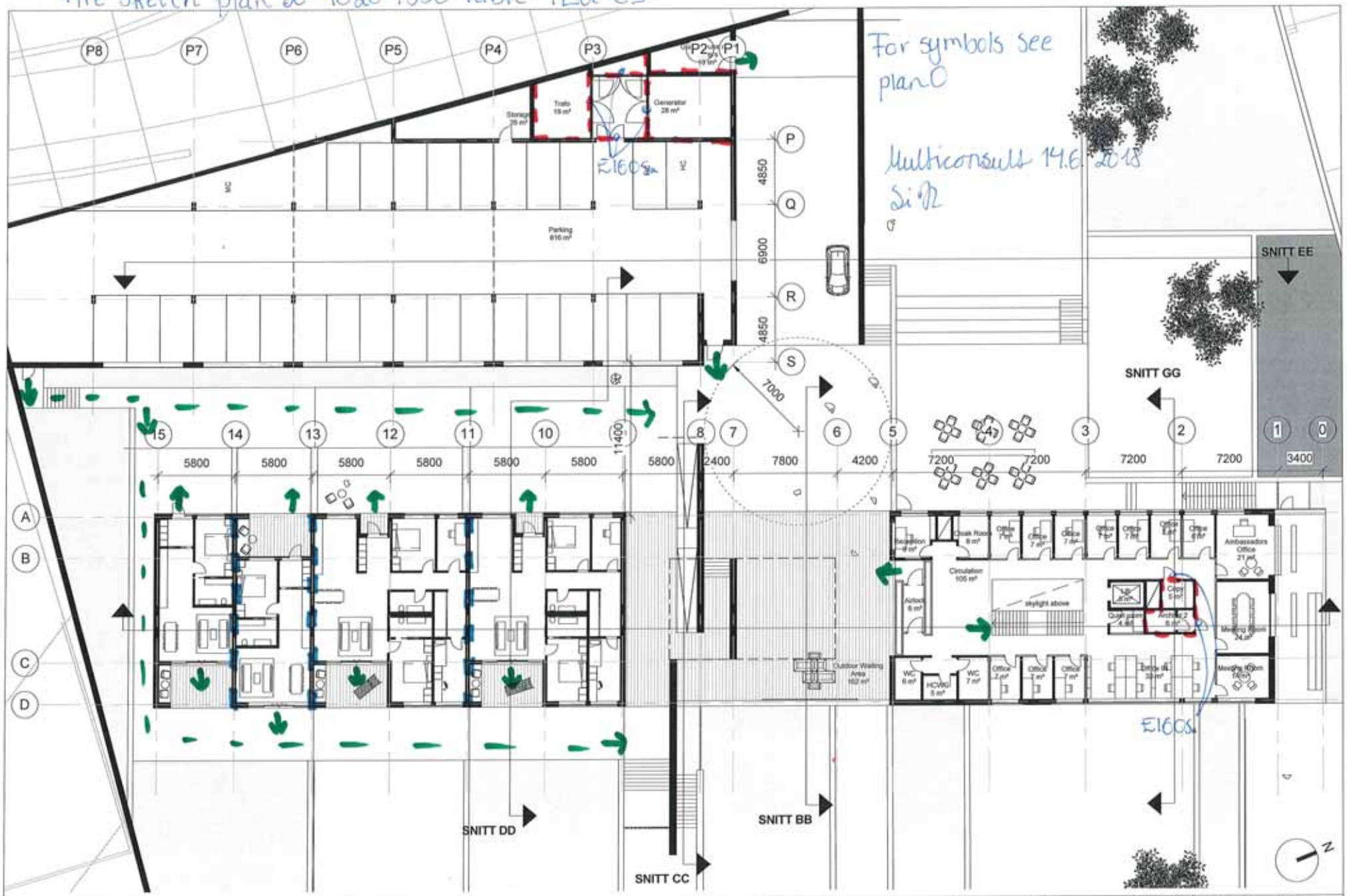
Arrangements for fire brigade operation

The embassy have their own security people trained for firefighting. They will be located at the embassy 24 hours a day.

4 Bibliography

1. **Miljøverndepartementet (MD).** *LOV 2008-06-27 nr 71: Lov om planlegging og byggesaksbehandling (plan- og bygningsloven).* 2010-07-01. Oslo : Miljøverndepartementet, 2008. LOV 2008-06-27 nr 71.
2. **Kommunal- og regionaldepartementet.** *FOR 2010-03-26 nr 489: Forskrift om tekniske krav til byggverk.* 2013-01-01. Oslo : Kommunal- og regionaldepartementet, 2010. FOR 2010-03-26 nr 489.
3. **Direktoratet for Byggkvalitet (DiBK).** Veiledning om tekniske krav til byggverk. *Kapittel 11. Sikkerhet ved brann.* [Internett] Oktober 2014. http://byggeregler.dibk.no/dxp/content/tekniskekrav/11/. HO-2/2011.
4. **Justis- og politidepartementet.** *LOV 2002-06-14 nr 20: Lov om vern mot brann, eksplosjon og ulykker med farlig stoff og om brannvesenets redningsoppgaver.* Oslo : Justis- og politidepartementet, 2002. LOV 2002-06-14 nr 20.
5. **Rasjonell Elektrisk Nettvirksomhet (REN).** *Nettstasjon - I bygg - brannteknisk krav.* Oslo : Rasjonell Elektrisk Nettvirksomhet, 2010. REN 6038 - VER 3.1 / 2010.
6. **Standard Norge.** *NS 3926-1:2009 Visuelle ledesystemer for rømning i byggverk - Del 1: Planlegging og utforming.* Lysaker : Standard Norge, 2009. NS 3926-1:2009.
7. —. *NS-EN 1838:1999 Anvendt belysning - Nødbelysning.* Lysaker : Standard Norge, 1999. NS-EN 1838:1999.
8. —. *NS-EN 54 Brannalarmanlegg - Del 1 til 25.* Lysaker : Standard Norge, 1996. NS-EN 54.

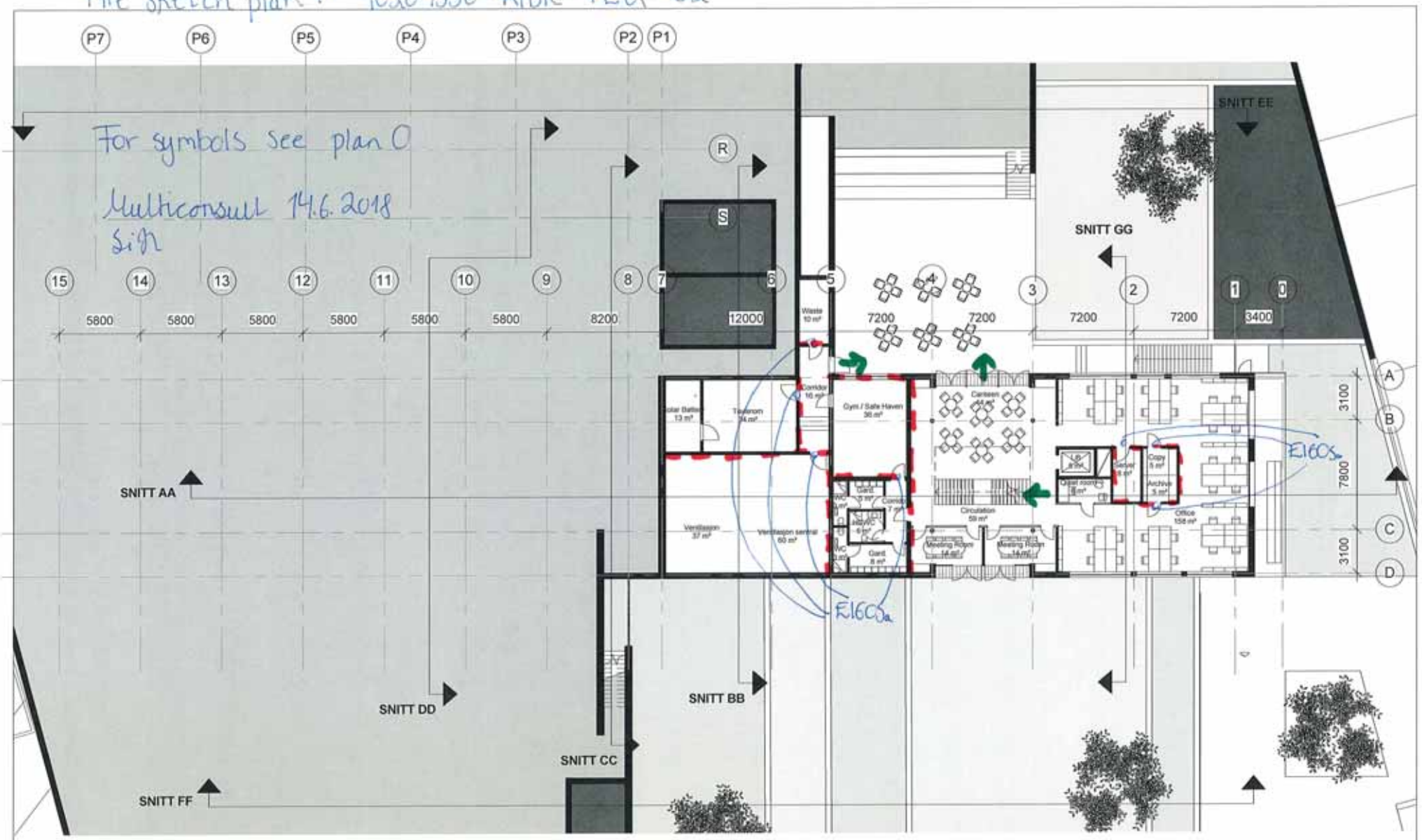
Fire sketch plan 2: 10204336-RIBR-TEA-03



PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	PLAN 2	SKISSEPROSJEKT	30.05.2018	1:250	A3	Kristin Jarmund —Arkitekter

31.05.2018 13:52:08

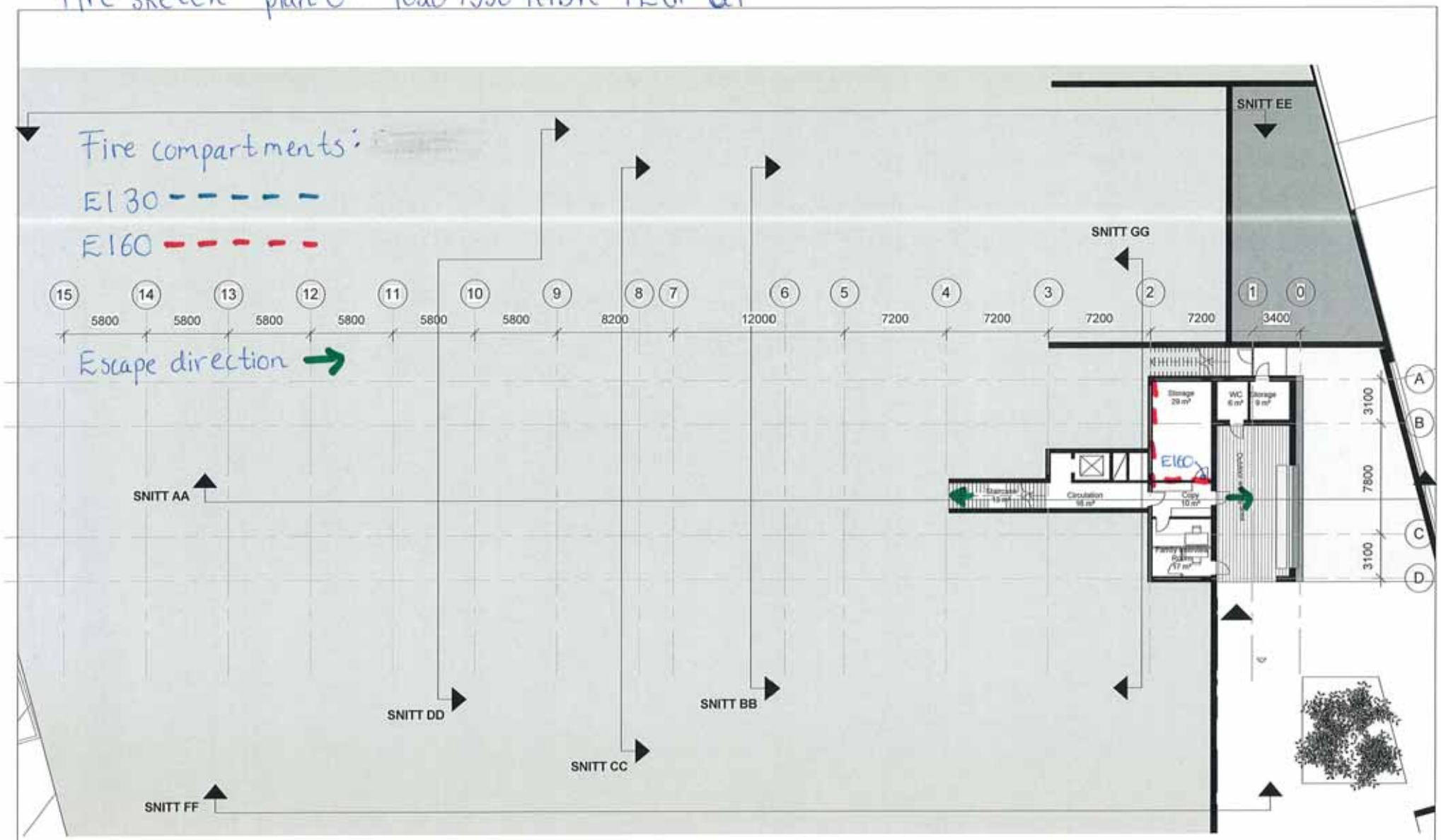
Fire sketch plan 1: 1C204336-RIBR-TEG-02



PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	PLAN 1	SKISSEPROSJEKT	30.05.2018	1:250	A3	Kristin Jarmund —Arkitekter

30.05.2018 08:52:48

Fire sketch plan 0: 10204336-RIBR-TEG-01



Multiconsult 14.6.2018
Sign

PROSJEKT:	TEGNINGSNAVN:	PROSJEKTFASE:	DATO:	MÅLESTOKK:	FORMAT:	
NEW NORWEGIAN EMBASSY COMPLEX IN NAIROBI	PLAN 0	SKISSEPROSJEKT	30.05.2018	1:250	A3	Kristin Jarmund —Arkitekter

30.05.2018 08:51:01

7.0 Green document

AMBITIONS

This document is based on the following;
-Green building guidelines – Kenya relevant to the tropical upland climate of Nairobi.
-UN Habitat; Green building design review form
-Green services proposal from Planning Systems
-Technical requirements from Statsbygg and the Norwegian Foreign department.

During the planning phase, the construction phase and operational phase of the Embassy, the primary aims are for;

Power
- Less consumption of electricity
- Self production and storage of power

Water
- Less consumption of potable water
- Provide for the reuse of water
- Use the sun to heat the water
- Provide handling of rainwater

Indoor comfort
-Have a good indoor environment in terms of light, air quality and noise levels.

Other
- Safeguard and not strain the site unnecessary
- Enviromentally friendly building materials
- Use of local and/or short travel materials
- No use of tropical timber anywhere on the property

OBJECTIVES AND TARGETS

Power
- The building shall be designed for a maximum total energy demand of 140 kWh/m² year.
- Oil burner shall not be installed.
- Minimum 60% of energy demand for heating shall be renewable energy.
- A system of meters.
- Sensors for light regulation.
- Solar cells to the production of electricity to the power supply of office spaces (PC's and lighting).

Water and waset management
- Water storage tanks.
- Sun heated hot water.
- Water treatment plant.
- Duo flush toilets.
- Cooling tower will not be accepted.
- Rain water harvesting.
- Sewage treatment plant

Indoor comfort
- Room temperature 22°C ± 2°C. Room control in each room for occupancy.
- Relative humidity ≤ 65%
- Only environmentally friendly refrigerant shall be used.

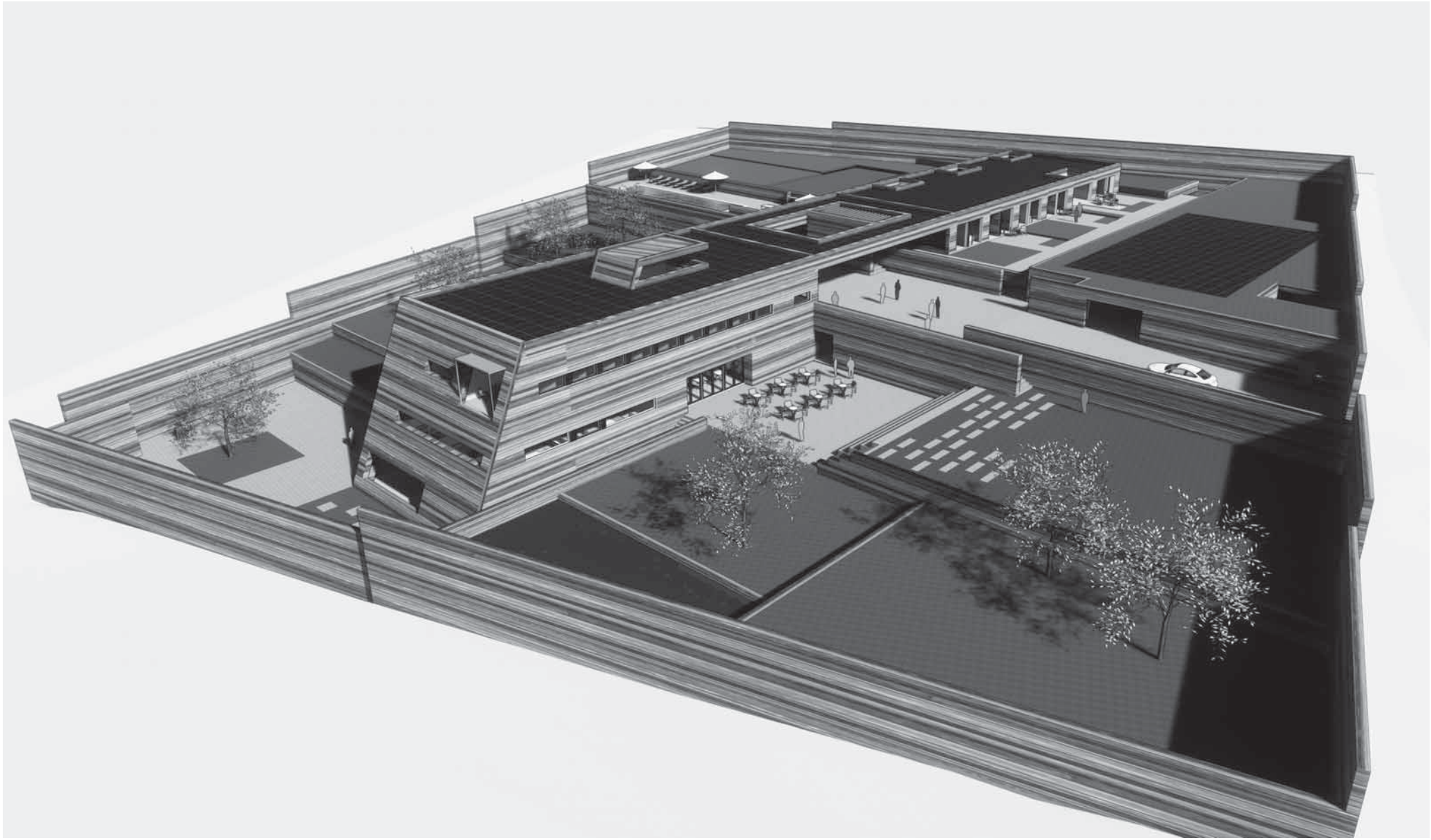
PROPOSAL ON HOW TARGETS WILL BE ACHIEVED

Power
- LED Lighting
- Motion Sensors
-Timer Switches for the common areas together with the motion sensors
- Use of Optimum lighting lux level
- Lighting Building Management System (BMS) for control and monitoring purposes
- Selection of efficient mechanical motors
- Installation of Energy Meter for effective power consumption monitoring
- Solar PV Cells: the roof space shall be utilised to position the Solar Photovoltaic (PV) Cells. This will give an average output of 135 MkWh per year. Additional panels on the garage roof will increase the capacity.

Water and waset management
- No Potable Water for Irrigation
- Rainwater Collection Tank
- Grey-water Treatment Plant
- Filtration Pit
- Heat Pump

Indoor comfort
- Ice water air conditioning System
- Natural refrigerant
- Air handling units with heat recovery system
- Window wall ratio to recommendations for Highland or tropical upland climate
- Trees and vegetation as secondary shading.
- Garden with local climatic effect (use of water, shade and air flow)
- Use high thermal mass on walls.
- Use external finishes that reduce solar heat absorption.

Other
- The building will use locally available materials, with low embodied energy, with none or minimal maintenance, materials that are sustainably harvested, non-toxic, those with minimal internal pollution and damage to health and those, which are easy to re-cycle or to re-use.



Kristin Jarmund
—Arkitekter

K J

—A