NATIONAL DIGITAL HERITAGE CENTER

MOBILE PHONE MEDIA FAÇADE

- August 2022 -

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PART I. INSTALLATION EXECUTION CONDITIONS

I.1. Description of systems

I.1. DESCRIPTION OF SYSTEMS

For North and East façade of the National Digital Heritage Center it is proposed a media screen which has the role of showcasing the contents of the museum, and any kind of information which is required, while promoting the institution, making attractive for newer generations, and that it will, one day, become a piece of cultural heritage in itself.

MOBILE PHONE MEDIA FACADE, ONLY THREE SCREENS AND POSSIBILITY OF GROWING FURTHER. SWITCHED OFF PHONES AS SOLAR SCREEN.

A media façade made of second-hand mobile phones is proposed and studied. This mobile phone media façade is divided in three phases:

- **Phase 1: Install circuits and phone holders for installation**
- **Phase 2: 3 media screens of a small size**
- **Phase 3: Optionally extend media façade further, as a "growing device". It is a scalable system.**

I.1.1. GENERAL DESCRIPTION OF MOBILE PHONE MEDIA SCREEN

The purpose of this media screen is the projection of multimedia files (hereinafter referred to as video), video only, not audio, in mp4 format, on the screen of mobile phones in a synchronized manner and interconnected via a WiFi wireless network. This means that an administrator software, which will be installed on the central computer, will take a video, subdivide it into as many parts as mobile phones you want to install, then another application will upload each of the parts of the videos to a server on the web. The mobile phones, through a mobile application, will automatically access this web server at a pre-established time and download the corresponding part of the video, then each of them will load the video and enter a waiting state, until it automatically starts to play this part of the video at a pre-established time.

I.1.2. MOBILE PHONE MEDIA FAÇADE DESCRIPTION

Phase 1: Install circuits and phone holders for installation
Phase 2: 3 media screens of a small size. MOMENT OF INAUGURATION OF MUSEUM.
Phase 2: Optionally extend media façade further, as a "growing device". It is a scalable system.

PHASE 1

-GLASS CURTAIN WALL
-SUBSTRUCTURE
-CABLES AND HUBS
-HOLDERS
-NO MOBILE PHONES YET

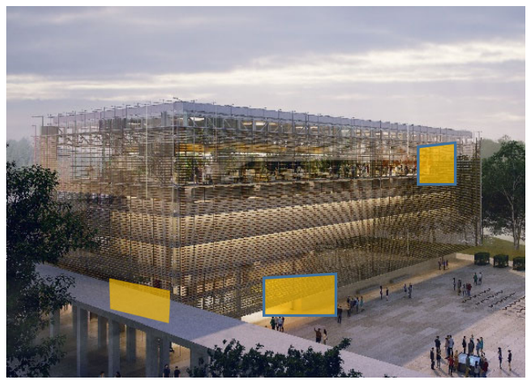
PHASE 2

-GLASS CURTAIN WALL
-SUBSTRUCTURE
-CABLES AND HUBS
-HOLDERS
-3 SCREENS
-MODULES ALLOW FOR SCREEN EXPANSION
-ALL MOBILES IN PLACE, ONLY FEW ARE A MEDIA SCREEN, REST IS A SHADING DEVICE..

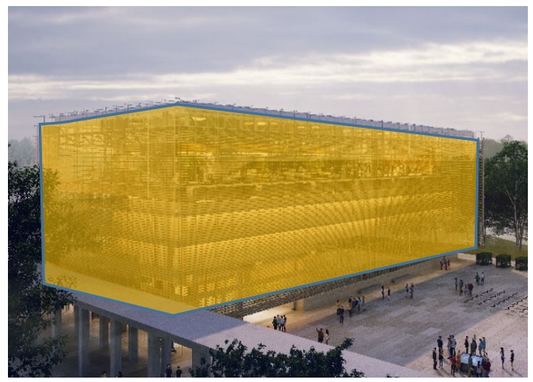
PHASE 3
Optional

-GLASS CURTAIN WALL
-SUBSTRUCTURE
-CABLES AND HUBS
-HOLDERS
-ALL MODULES WORKING AS A GIANT SCREEN





Screen 1, 2,3. Inauguration of building.



Full Screen. Full range

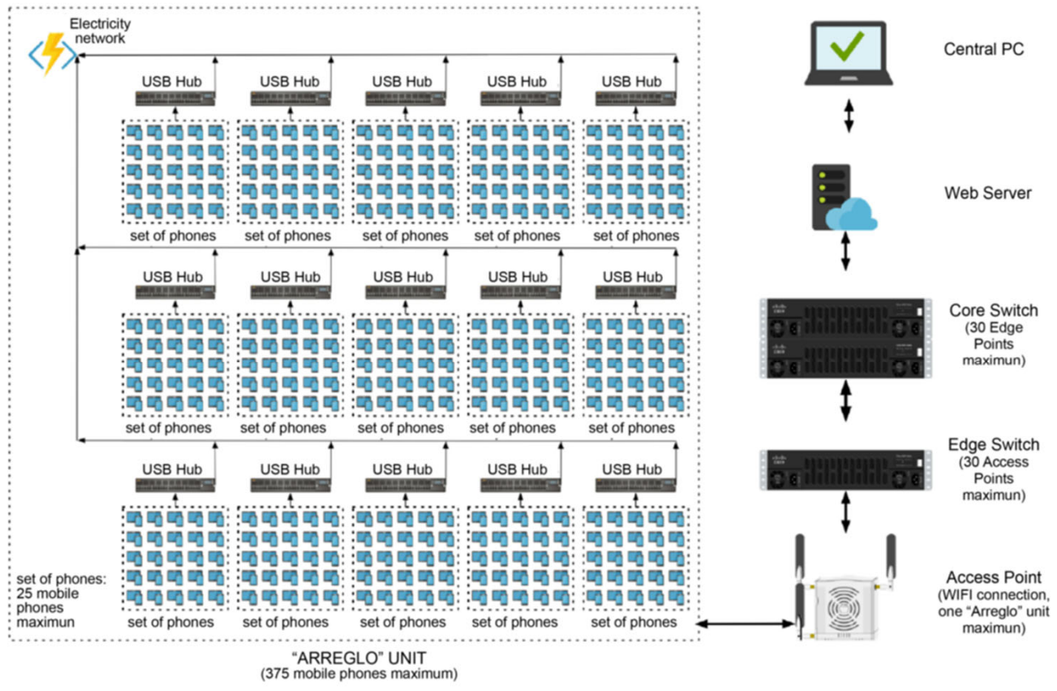
I.1.3. MOBILE PHONE MEDIA FAÇADE GENERAL CARACTERISTICS

Phase 1: install circuits and phone holders for installation
Phase 2: 3 media screens of a small size.
Screen 1: 880 phones, Screen 2: 1100 phones, Screen 3: 880 phones
Phase 3: Optionally extend media façade further, as a “growing device”. It is a scalable system.

The purpose of this media screen is the projection of multimedia files (hereinafter referred to as video), video only, not audio, in mp4 format, on the screen of mobile phones in a synchronized manner and interconnected via a WiFi wireless network. This means that an administrator software, which will be installed on the central computer, will take a video, subdivide it into as many parts as mobile phones you want to install, then another application will upload each of the parts of the videos to a server on the web. The mobile phones, through a mobile application, will automatically access this web server at a pre-established time and download the corresponding part of the video, then each of them will load the video and enter a waiting state, until it automatically starts to play this part of the video at a pre-established time.

I.1.4. MOBILE PHONE MEDIA FACADE INSTALLATION DESCRIPTION

The mobile phones will be powered through the USB port included in each mobile phone, connected by a Micro USB type B cable to an ORICO ORICO IH30P-US-BK 30 port USB 2.0 USB charging HUB, industrial grade HUB, supports high speed 480M/s, built-in 300W power supply, over current detection and protection. The mobile phones will connect via 2.4GHz WiFi with IEEE 802.11b, 802.11g, 802.11n (B, G and N) standard using their own wireless connection card included inside the mobile phone, to Xirrus XD4-240 802.11ac High-Density Quad Radio AP's with Software-Defined Radios. These Access Points will connect via a cable through the physical RJ45 interface using the Ethernet local area network communication standard to Riverbed SteelConnect SDI-S48 POE+ Switch modules. The Switch modules will be connected via a cable through the RJ45 physical interface using the Ethernet LAN communication standard to a host computer.



GENERAL SCHEME OF THE SYSTEM

I.1.4. MOBILE PHONE MEDIA FACADE INSTALLATION DESCRIPTION

The electrical connections of the different electronic devices used must comply with the standard established in South Korea, which is:

Voltage: 220 V
Frequency: 60 Hz
Plugs: Type C / F

In South Korea the common voltage is 220V. The frequency is 60 Hz. The plugs and sockets are type C / F. In South Korea you can use your electrical appliances as long as the voltage in your country is between 220V - 240V (as in Spain, UK, Australia and most countries in Asia and Africa).

The Central Computer, the Core and Edge Switches and the USC charging HUBs must be connected to the mains power supply via the cables supplied by the manufacturers and included in the boxes in which the equipment is packaged.

I.1.4 MOBILE PHONE MEDIA FACADE INSTALLATION DESCRIPTION

NUMBER OF PHONES TO BE INSTALLED

Phase 2: 2860 Mobile Phones
Phase 3: 70.000 Mobile Phones

I.1.4. MOBILE PHONE MEDIA FACADE INSTALLATION DESCRIPTION

COMPONENTS OF THE INSTALLATION

A. Mobile phones + phone holders
B. USB charging hub for mobile phones
C. Micro USB type B cable
D. RJ 45 cables
E. Access Point
F. Edge Switch
G.Core Switch
H. Web Server

I.1.4. MOBILE PHONE MEDIA FACADE INSTALLATION DESCRIPTION

COMPONENTS, PHASING OF THE INSTALLATION

A. Mobile phones + phone holders over substructure
B. USB charging hub for mobile phones (number of USB hubs: 130)
C. Micro USB type B cable
D. RJ 45 cables
E. Access Point (number of access points: 13)
F. Edge Switch (number of edge switches: 5)
G.Core Switch (number of core switches: 1)
H. Web Server (number of Web Servers: 1)

ORDER OF INSTALLATION

Phase 1: Install Components in RED.
Phase 2: Add 3 screens and (number of) components in BLUE.
Phase 3: Add all components.

PART I. INSTALLATION EXECUTION CONDITIONS

I.2. Product prescriptions. Qualities and characteristics of the materials used in the installation

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.1. ACCESS POINT

Xirrus XD4-240
802.11ac High-Density Quad Radio AP's with Software-Defined Radios
Supported Standards: 802.11a/b/g/n/ac (Wave 2)



Electrical Specifications
According to the Xirrus XD4-240 specification sheet, which is attached to this document, the manufacturer states a maximum power consumption of 46 Watts.

Physical Specifications
Dimensions: 254mm (10 in)
Weight: 1.043kg (2.3 lbs)
Operating Temperature: 0°C to 50°C (32°F to 131°F)
Humidity: 5-90% non-condensing
Certification: CE/FCC/RoHS

Quantity of Access Points for the Media Façade
Phase 2: 13 Access Points
Phase 3: 318 Access Points

Antenna
16 Internal Antenna
Max Tx power per radio: 2.4/5GHz bands: 24dBm
The Access Point employ integrated antennas that cannot be removed and which are not user accessible. Nevertheless, users may need to adjust the conducted power setting for the radio to meet the EIRP limits. Adjustments can be made from the product's management interface - either Web Management Interface (WMI) or Command Line Interface (CLI).

*NOTE: The maximum number of connected mobile phones will be 70,000, i.e. the number of Access Points will be 318. However, this Access Point allows a maximum amount of 960 mobile phones connected simultaneously, but for this solution we will use only up to 50% of its capacity, i.e. maximum 480 mobile phones connected simultaneously. This is in order to allow the scalability of the system in the future.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS



Figura 2 Vista Frontal



Figura 3 Vista Trasera

I.2.2. EDGE SWITCH AND CORE SWITCH

Riverbed SteelConnect SDI-S48 POE+

Electrical Specifications
According to the Switch specification sheet, which is attached to this document, the maximum power consumption is 42 Watts.

Physical Specifications
Dimensions: 44.1 x 45.0 x 4.4 cm (17.4 x 15.9 x 1.7in)
Weight: 5.95 kg (13.11lb)
Relative humidity: 10-90% non-condensing for storage and operating conditions
Operating Noise (typical): 50db (50% of fan duty cycle)
BTU: 143.3
Temperature Range: Operating: 0 to 45°C (32° to 113°F), Storage: -20 to 60°C (-4° to 140°F)
Certification: CE/FCC/RoHS

Quantity of Edge and Core Switches for the Media Façade
Phase 2: 5 Edge Switches and 1 Core Switch
Phase 3: 16 Edge Switches and 1 Core Switch

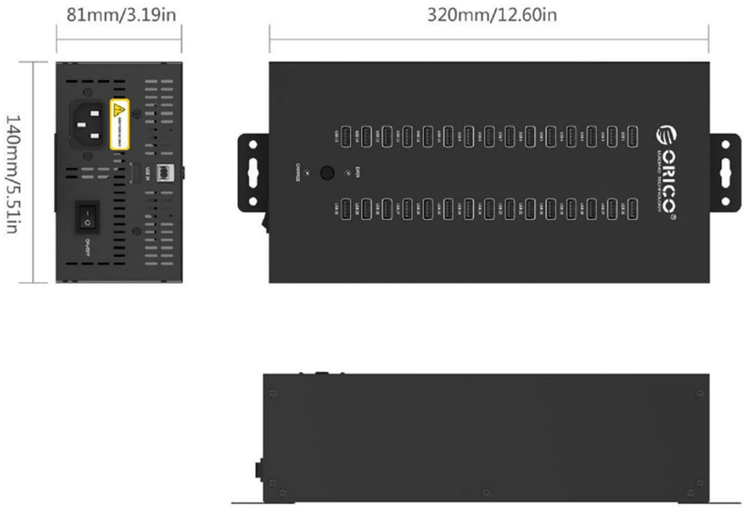
*NOTE: It is recommended that no more than three switches be stacked for a total of 144 ports. This means that a total of 17 switches will be required for the development of the Software Development and Interconnection Engineering Project for the construction of a display based on a network of interconnected mobile phones. This is in order to allow the scalability of the system in the future.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.3. USB POWER HUB

ORICO IH30P-US-BK



Electrical Specifications
30-port USB 2.0 hub, industrial grade hub, supports high speed 480M/s,
built-in 300W power supply, over current detection and protection.

Physical Specifications
Function: Synchronization and charging
Output interface: Type-A USB2.0 x 30
Input Interface: Type-B USB2.0 x 1&90-130V AC IN x 1 Data Transmission Format: STT Compatible Working Temperature: -40 to 85 C, -104 to 185 F Dimensions: 320 x 140 x 81 mm, 12.6 x 5.5 x 3.1 inches Weight:1.5kg, 3.3lb
Relative Humidity: 5%-95%, non-condensing Certification: CE/FCC/RoHS

Quantity of USB Power Hubs for the Media Façade
Phase 2: 130 USB Power Hubs
Phase 3: 3180 USB Power Hubs

*NOTE: To charge up to 70,000 mobile phones simultaneously, it is recommended to install 3182 of these devices. This is because for each of these devices a maximum of 22 mobile phones will be connected.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.4. MICRO USB TYPE B CABLES



Specifications

Transfer rate: 480 Mbps Load: 5 Volts 3 Amps
Cable Diameter: 4.5mm
Weight: Depends on Cable Length
Colour: Yellow

Quantity of Micro USB Type B Cables for the Media Façade
Phase 2: 70000 Micro USB Type B Cables
Phase 3: 70000 Micro USB Type B Cables

*NOTE: For a system consisting of 70,000 mobile phones, 70,000 micro-USB cables will be required.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION



DESCRIPTION OF COMPONENTS

I.2.5. RJ45 CABLES

Specifications
0.5m (metre) Cat.6 network cable (compatible with earlier and later versions) | 2 RJ-45 connectors | Rubber jacketed connectors | High transmission speed with a working frequency up to 250 MHz
- High transmission speed due to an operating frequency of up to 250 MHz
- High-quality copper inner conductors / Halogen-free insulation / ROHS-compliant / 100 % sealed strain relief | Rubber jacket
- Assignment according to EIA/TIA 568B | Backward and forward compatibility guaranteed: Cat.5e/Cat.5/Cat.7 / UTP compliant to EIA/TIA 568B standard
- Suitable for 10/100/1000 MBit Gigabit networks | For connection of computers, game consoles, DSL modems, switches, routers, network sockets or patch panels within a 10/100/1000 Mbit network
Cable category: Category 6
Compatible with: Cat.5 Cat.5e Cat.7
Data transfer rate: 1 Gigabits per second Compliant specification: EIA, TIA, RoHS
Cable Diameter: 7mm
Weight: Depends on Cable Length
Colour: Yellow

Quantity of RJ45 cables for the Media Façade
Phase 2: 20 RJ45 cables
Phase 3: 328 RJ45 cables

*NOTE: For a system consisting of 70,000 mobile phones, 328 RJ45 cables will be required.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.6. CENTRAL PC

Specifications
Processor
Processor Manufacturer: Intel
Processor model: i9-11900K
Processor family: Intel Core i9-11xxx
Number of processor cores: 8
Processor frequency: 3.5GHz
Turbo Processor Frequency: 5.3GHz
Processor cache: 16MB
Processor cache type: SmartCache
Number of execution threads: 16
Thermal Design Powerconfigurable-low: 95 W
Design power frequencythermal configurable-low: 3 GHz
Number of processors installed: 1

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.6. CENTRAL PC

Specifications
Memory
Internal memory type: DDR4-SDRAM
Internal memory: 64GB
Maximum internal memory: 64 GB
Memory Layout: 2 x 32GB
Memory slots: 2x DIMMs
Clock memory speed: 2933MHz

Graphics
Discrete graphics adapter: SiGPU
Manufacturer (GPUgraphics processing) external: NVIDIA
Graphics adapter template Discrete: NVIDIA GeForce RTX 3080
Discrete graphics memory type:GDDR6X
Adapter memory capacity graphic: 10GB
Number of graphics adapters discreet: 1
Built-in graphics adapter: Yes
Graphic adapter family Embedded: Intel® UHD Graphics
Graphics adapter template Embedded: Intel UHD Graphics 750
NVIDIA G-SYNC: Yes
CUDA: Yes

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.6. CENTRAL PC

Specifications
Storage media
Integrated reading card: No
Total storage capacity: 5000UK
Storage drive: HDD+SSD
Optical drive type: No
Total HDD Capacity: 4000GB
Number of HDDs installed: 2
HDD Capacity: 2000GB
HDD interface: SATA
HDD Rotation Speed: 5400RPM
HDD size: 2.5“
Number of SSD drives installed: 1
SSD, capacity: 1000GB
SSD Interfaces: PCI Express
SSD Drive Form Factor: M.2

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.6. CENTRAL PC

Specifications
Connection
Ethernet : Yes

Ports and Interfaces
Number of USB 2.0 ports: 3

Quantity of Central PC for the Media Façade
Phase 2: 1 Central PC
Phase 3: 1 Central PC

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.7. SCALABILITY

The USB HUB used in the project has 30 connection ports, i.e. a maximum of 30 mobile phones can be connected per HUB. The Access Point used can simultaneously connect up to 960 mobile phones; however, it is recommended to use half of the maximum capacity. Both the Edge Switch and the Core Switch have the capacity to connect up to 48 Access Points per unit and power them through the RJ45 cable of the Ethernet port. Up to 3 Access Points can be linked together to expand their connection capacity and have a maximum of 144 mobile phones connected. A single host computer can be connected to a Core Switch. This means that the system is scalable.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.8. TECHNICAL ROOM FOR MEDIA FAÇADE

It will be necessary technical room to locate the Central PC, which must be connected to WEB Server, and the rack with the core switch. This technical room is on the first floor, next to the west core.

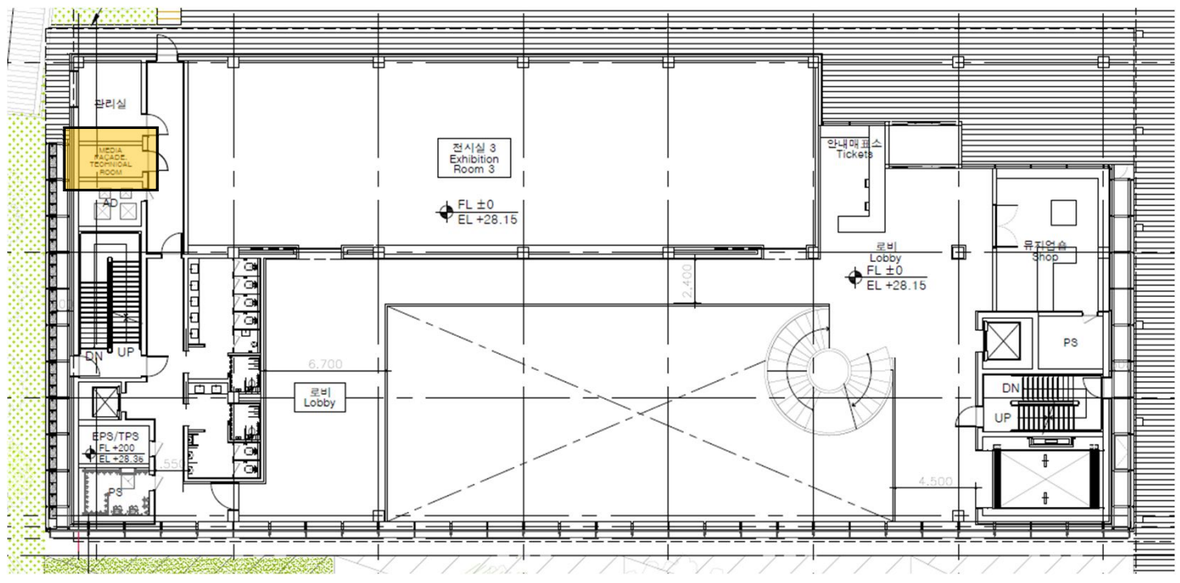
Technical room dimensions:
Width x Length: 1,80 x 3,50 m
Height: 3,00 m

Technical room requirements:
This technical room needs to be refrigerated.

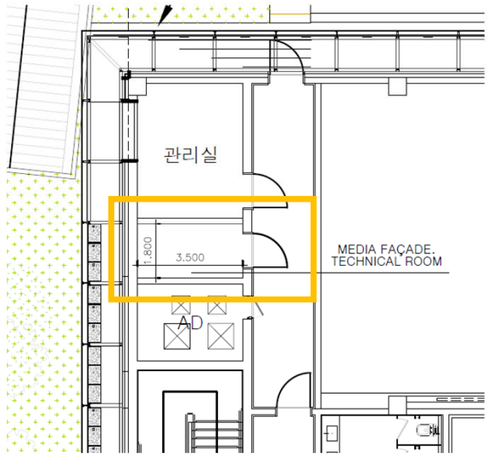
I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

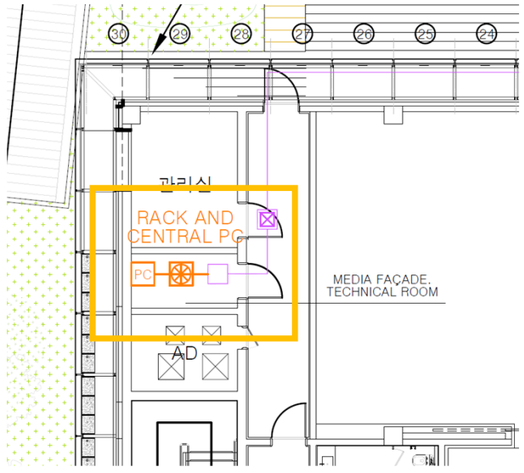
DESCRIPTION OF COMPONENTS

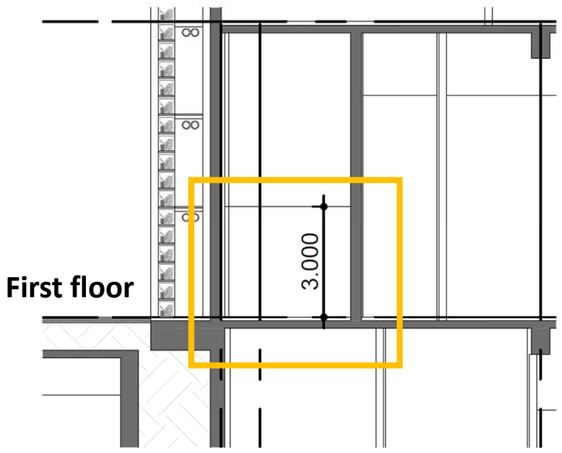
I.2.8. TECHNICAL ROOM FOR MEDIA FAÇADE



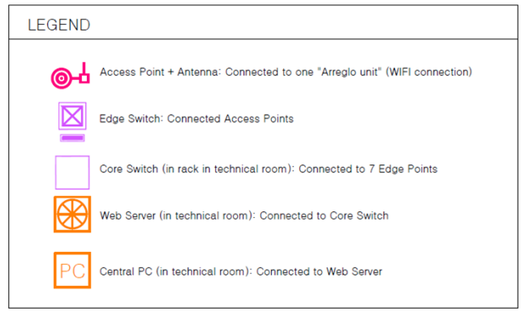
First floor







Section



I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.9. CHARACTERISTICS OF PHONES THAT CAN GO INTO THE MEDIA FAÇADE

1. It is recommended to use terminals beyond 2015 and Android 5.0 or later.
2. OLED screen preferably but not necessary.
3. All models need to have micro USB port.
4. A specific list of phones can be provided, but others can be tried.
5. All terminals must be rooted and have a factory reset.
6. All terminals must be revised by third party to check its parts, rooting of phone and installation of software.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

DESCRIPTION OF COMPONENTS

I.2.10. SOFTWARE TO BE INSTALLED IN CENTRAL PC AND MOBILE PHONE MEDIA FACADE.

Software 1: Divides the video in the necessary fragments, according to the size of the screen. To be installed in the web server.
Software 2: Receives a fragment of video in every phone according to its position, and showcases the fragment of video in every phone. To be installed in every phone that is received. Runs in ANDROID.
Software 3: Roots phones.
Software 4: Synchronizes phones

Web platform and mobile phone management software
Where it is installed: It will be installed on the central PC
Installation time: It is installed at the beginning of the project
The Software is implemented in Qt Creator and will allow:
1. Manage Mobile Phones and server, includes:
a. Main Video Upload
b. Upload to a server (local or on the web) the main video and the parts of the subdivided video
c. Associate a new mobile phone
d. Damaged mobile phone detection
e. Sends instructions to mobile phones

Video processing software
Where it is installed: It will be installed on the central PC
Installation time: It is installed at the beginning of the project
The Software is implemented in Qt Creator and will allow:
Subdivide a video into a number of parts equal to the number of mobile phones (up to 70,000 devices) that you want to install on the façade.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

Android Mobile Application
Application for mobile devices, compatible with the Android operating system (with a version equal to or higher than Android KitKat 4.4), developed under Xamarin technology that will allow:
1. Download the part of the video associated with the mobile phone
2. Prepare the part of the video for playback
3. Synchronize the clocks for the playback of the video part
4. Play the part of the video
5. Select date and time for video playback
6. synchronize and receive instructions from the software installed on the central PC

The instructions mobile phones can receive from the central PC are:
a. Mobile application software update.
b. send diagnostic information from the mobile application to the central PC
c. start video playback test protocol and synchronization of the clock of the mobile application
d. modify the start time of video playback by mobile phones.
and. Modify the screen on and off times when the mobile phone is in standby period for video playback.
F. modify the IP address of the server where the parts of the videos to be played are hosted.
g. Sending information from the phone's internal sensors as well as the status of the internal battery of mobile phones (charge cycles, temperature, battery integrity).
h. Sending alerts when there is an anomaly in the battery.
I. Send alert when mobile phone screen does not turn on
J. Mobile phone restart and shutdown.

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

Both the software of the central PC as well as that of the mobile phones can be updated depending on the needs of the users.

The source codes of the software can be rewritten by a programmer specialized in C and Java programming languages

I.2. PRODUCT PRESCRIPTIONS. QUALITIES AND CHARACTERISTICS OF THE MATERIALS USED IN THE INSTALLATION

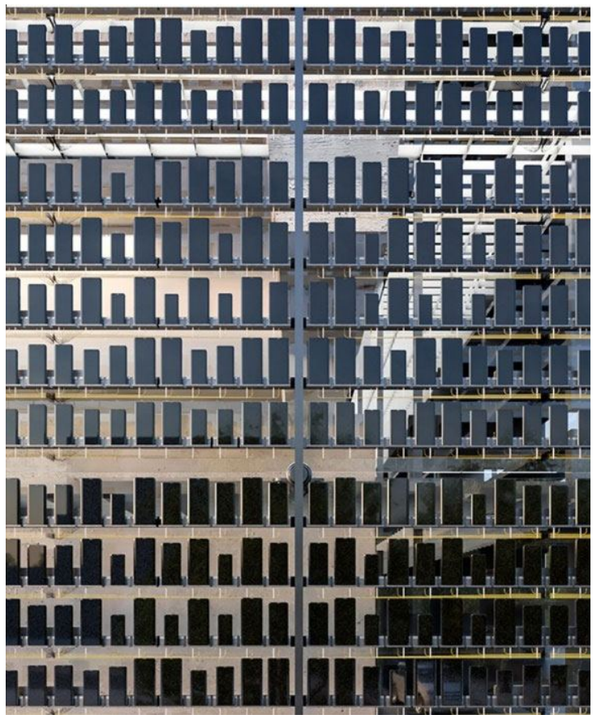
DESCRIPTION OF COMPONENTS

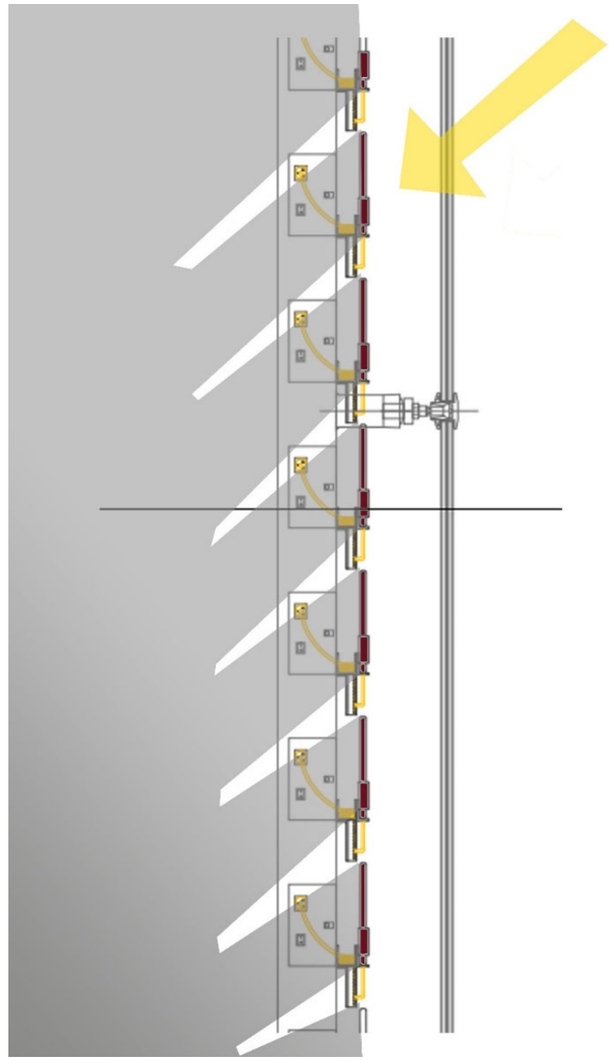
I.2.11. PHASE 2: PHONES WORK AS SUN AND LIGHT FILTER ONLY

Mobiles only work as sun blinds.

The mobile phones are mostly switched off. Only some small areas become activated with image and video.

The mobile phones, while switched, work as sun shades and as highly reflective surfaces of the exterior, with all the values mentioned before. Also they are a contribution to electronic waste reduction.





PART I. INSTALLATION EXECUTION CONDITIONS

I.3. Prescription regarding the installation of the system

I.3. PRESCRIPTION REGARDING THE INSTALLATION OF THE SYSTEM

I.3.1. ORDER OF INSTALLATION OF MOBILE PHONE MEDIA FAÇADE SYSTEM

1. Host Computer: The host computer with Windows operating system running natively shall be connected to the mains power supply.

2. Core Switch: The Core Switch module will be connected via a cable through the physical RJ45 interface using the Ethernet local area network communication standard to the host computer. Additionally this module shall be connected to the mains.

3. Edge Switch: The Edge Switch Modules shall be connected via a cable through the RJ45 physical interface using the Ethernet LAN communication standard to the Core Switch module. Additionally these modules shall be connected to the mains.

4. Access Point: The Access Points shall be connected via a cable through the RJ45 physical interface using the Ethernet LAN communication standard to the Edge Switch modules. These modules are powered directly through the Ethernet port cable.

5. The USB charging HUBs of the mobile phones must be connected to the mains power supply.

6. Mobile phones: the power supply for mobile phones shall be provided by a Micro USB type B cable connected to the USB connection ports of the USB HUBs.

I.3. PRESCRIPTION REGARDING THE INSTALLATION OF THE SYSTEM

I.3.2. PROTOCOL OF RECEPTION AND INSTALLATION OF MOBILE PHONES FOR MEDIA FAÇADE

A. Conditions for initial acceptance of a mobile phone, physical integrity and battery charge and power-up

Upon receipt of a mobile phone, it must be visually inspected for faults, if any of the points listed below are not met, the mobile phone will be rejected.

1. Visually verify that the screen of the mobile phone is in good condition, i.e. not broken or cracked.
2. Visually identify the location of the mobile phone's USB port.
3. Visually verify that the USB port of the mobile phone is of the Micro USB type.
4. Visually verify that the USB port of the mobile phone is not obstructed by any foreign material or has any apparent physical damage identifiable by visual inspection.
5. Connect the mobile phone to a USB charger using a Micro USB type B connection cable. This USB charger must provide 5 Volt output and a minimum current of 2 Amps of direct current.
6. Verify that the display turns on, showing an image of a battery being charged.
7. Leave the phone plugged in for a minimum of 10 hours.
8. Visually identify the location of the mobile phone's power button.
9. Press the power button on the mobile phone and hold for a minimum of 5 seconds or until the screen is visually identified as illuminated and displays the brand name and manufacturer of the phone.

I.3. PRESCRIPTION REGARDING THE INSTALLATION OF THE SYSTEM

I.3.2. PROTOCOL OF RECEPTION AND INSTALLATION OF MOBILE PHONES FOR MEDIA FAÇADE

B. Conditions for initially accepting a mobile phone, USB connection to the computer, loading applications and installing third party applications. This process takes up to 12 mins per used phone.

Once the mobile phone is fully charged and it is verified that it can power on and the screen works, then we continue with the software verification.

1. Switch on the mobile phone
2. Enter the phone settings application
3. Find the Factory Reset option and proceed as instructed by the phone.
4. Wait for the Factory Reset to finish automatically.
5. Follow the instructions on the mobile phone screen and finish the configuration of the mobile phone.
6. Enter the phone settings application
7. In the phone settings application, look for the option that says "About phone" and click on it.
8. Now inside the about phone menu, look for the Build Number option and click 10 times in a row on this option.
9. Go back in the menu and find the option that says Developer options and click on it.
10. In the Developer options menu, enable the Enable OEM unlock option.

I.3. PRESCRIPTION REGARDING THE INSTALLATION OF THE SYSTEM

I.3.2. PROTOCOL OF RECEPTION AND INSTALLATION OF MOBILE PHONES FOR MEDIA FAÇADE

B. Conditions for initially accepting a mobile phone, USB connection to the computer, loading applications and installing third party applications.

11. In the Developer options menu, enable the USB Debugging option.
12. Go back in the menu and look for the Security option and click on it.
13. In the security menu, find the menu that says phone management and enable the Unknown sources option.
14. Connect the mobile phone to a computer that has a Windows operating system running natively via the USB cable.
15. The computer must have previously installed the Android File Transfer application.
16. Once the USB cable is connected between the mobile phone and the computer, open the Android File Transfer application.
17. Transfer the Android mobile application for the upload and playback of the main video sections to the download folder of the mobile phone using the Android File Transfer application installed on the computer.
18. If the application is successfully transferred to the mobile phone, the mobile phone can continue with the next steps, otherwise it should be discarded.
19. On the mobile phone, find the file and folder management application that is installed by default and click on it.
20. Inside the application, find the download folder and click on it.

I.3. PRESCRIPTION REGARDING THE INSTALLATION OF THE SYSTEM

I.3.2. PROTOCOL OF RECEPTION AND INSTALLATION OF MOBILE PHONES FOR MEDIA FAÇADE

B. Conditions for initially accepting a mobile phone, USB connection to the computer, loading applications and installing third party applications.

21. Inside the downloads folder, look for the Android mobile application and click on it.
22. Follow the installation instructions that will be shown on the screen until the installation process is finished.
23. Go to the main window of the mobile phone and enter the menu where you will find all the applications that are installed inside the mobile phone, look for the Android mobile application to load and play the sections of the main video that was previously installed and click on it.
24. If the application runs successfully, the mobile phone will be able to continue with the following steps, otherwise it should be discarded.

I.3. PRESCRIPTION REGARDING THE INSTALLATION OF THE SYSTEM

I.3.2. PROTOCOL OF RECEPTION AND INSTALLATION OF MOBILE PHONES FOR MEDIA FAÇADE

C. Conditions for initially accepting a mobile phone, Rooting the mobile phone.

1. On a computer with Windows operating system running natively, install the Kingroot EXE application.
2. Once the installation process is complete, find the program icon on the windows desktop and run the program.
3. Connect the phone to the computer via the USB port, using the Micro USB cable.
4. Now in the Kingroot program window run the root option and follow the procedure shown on the screen.
5. Once this process is completed, the phone will be rooted and you can continue with the next steps, otherwise it should be discarded.

I.3. PRESCRIPTION REGARDING THE INSTALLATION OF THE SYSTEM

I.3.2. PROTOCOL OF RECEPTION AND INSTALLATION OF MOBILE PHONES FOR MEDIA FAÇADE

D. Test the Android mobile application for uploading and playing the main video sections.

1. Connect the mobile phone to a WiFi network.
2. On the mobile phone, find the Android mobile application for uploading and playback of the main video sections and run it.
3. In the menu that appears click on the option that says Test.
4. The screen will darken and after two minutes a video will start playing automatically.
5. Once this process is finished, the phone will be ready to be configured within the system and you can continue with the following steps, otherwise it should be discarded.

PART I. INSTALLATION EXECUTION CONDITIONS

I.4. Prescription regarding the execution of the installation

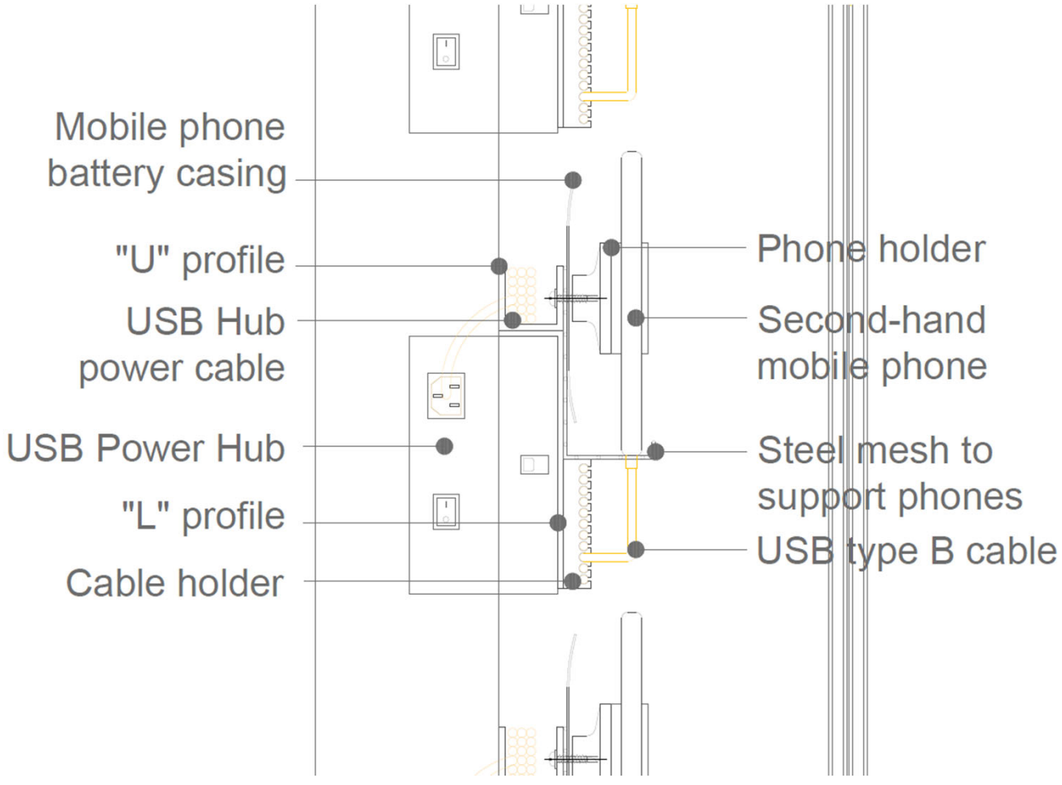
I.4. PRESCRIPTION REGARDING THE EXECUTION OF THE INSTALLATION

I.4.1. EXECUTION OF MOBILE PHONE SCREEN

Previous steps:
- Galvanized steel "U" profile screwed to HEB 100 uprights.
- Steel mesh screwed to “U” profile.
- Fixation by means of adhesive of cable holder to profile "L“.
- “L” profile to “U” profile welded.

1. Phone holder anchoring to substructure (“U” profile).
- A 6 mm diameter hole will be drilled in the "U" profile.
- A 6 mm diameter hole will be drilled in the battery casing.
- A 4 mm diameter thread will be made on the phone holder.
- Therefore, the screw to be used will be 4 mm in diameter and will go through the "u" profile, through the steel mesh and through the battery casing, and threaded into the phone holder.

2. Placing the mobile phone in phone holder.
- Manual opening of the phone holder by elongating its side walls.
- Introduction of the mobile phone in the phone holder.
- Automatic adjustment of the phone holder to the mobile phone width.

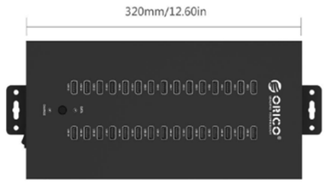


I.4. PRESCRIPTION REGARDING THE EXECUTION OF THE INSTALLATION

I.4.1. EXECUTION OF MOBILE PHONE SCREEN

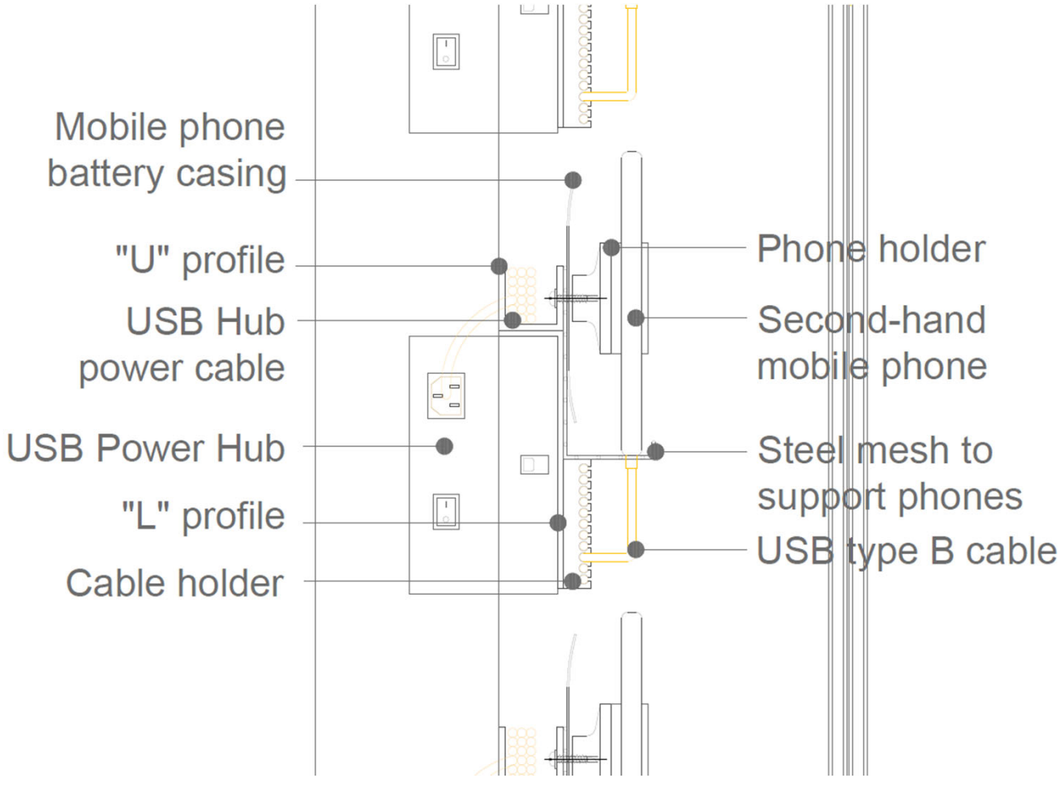
3. Placing USB type B cables (mobile phones).
- Pass each cable through the corresponding cable holder (depending on the position of the mobile in question).
- Plugged of USB cable to each mobile phone.

4. USB Power Hub Attachment.
- Screwing of USB Power Hub side plates to “L” profiles.



5. Placement of USB type B cables (USB Power Hub).
- USB cable plugged into each port of the USB Power Hub.

6. Placing power cables for USB Power Hub.
- Laying power cables from the electrical source to the interior of the "U" profile.
- Plugged of power cable to USB Power Hub.



I.4. PRESCRIPTION REGARDING THE EXECUTION OF THE INSTALLATION

I.4.2. EXECUTION OF ACCESS POINT AND EDGE SWITCH

Previous steps:
- Execution of structure: HE100 Steel uprights and beams.
- Fixing of steel grille platform to HE100 Steel beams.
- Steel plate to HE100 Steel upright welded.
- Fixation by means of adhesive of cable holder for RJ45 cables to steel plate.

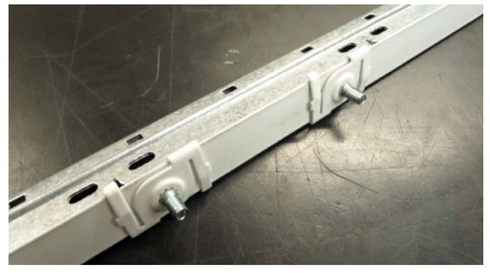
1. Fixing of T- bar to HE100 Steel beam.
- Screwing of T-bar to Steel rod.
- Screwing of Steel rod to HE100 Steel beam.

2. Placing Access point mounting plate.
- Mounting plate must be used with T-bar clips supplied with Access Point.
- Use two of the four holes on the Access Point mounting plate to mark the placement of the two T-bar clips(supplied with the Access Point.
- Note: use the mounting bolts supplied with the clips on the T-bar.
- Thread the two T-bar clamps into the marked locations, and tighten the screw posts to 10-12 lbf.ft (1.38-1.66 kgf.m). Do not over-tighten the screws.
- Align the Access Point mounting plate over the clip screw posts and secure with the supplied nuts. Tighten the nuts to 10-12 lbf.ft (1.38-1.66 kgf.m), but do not overtighten.

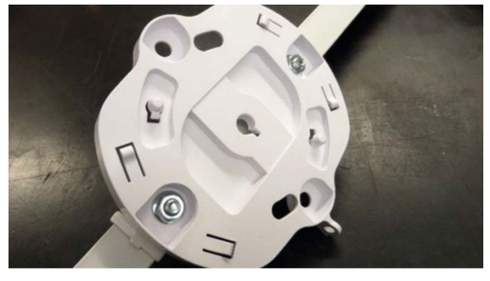
Access point mounting plate



T-bar and clips



T-bar and mounting plate



I.4. PRESCRIPTION REGARDING THE EXECUTION OF THE INSTALLATION

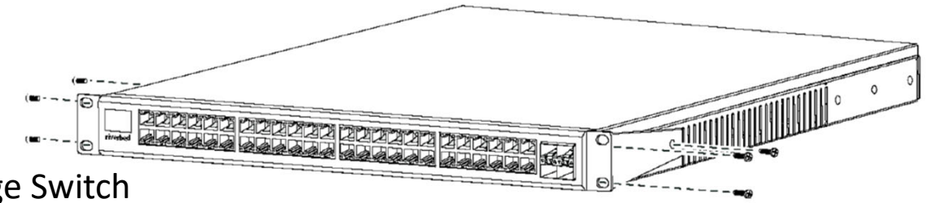
I.4.2. EXECUTION OF ACCESS POINT AND EDGE SWITCH

3. Fixing of Access Point to mounting plate.
- The Access Point will be placed on the T-bar in a central position, in order to optimize the transmission of the WIFI signal to mobile phones.

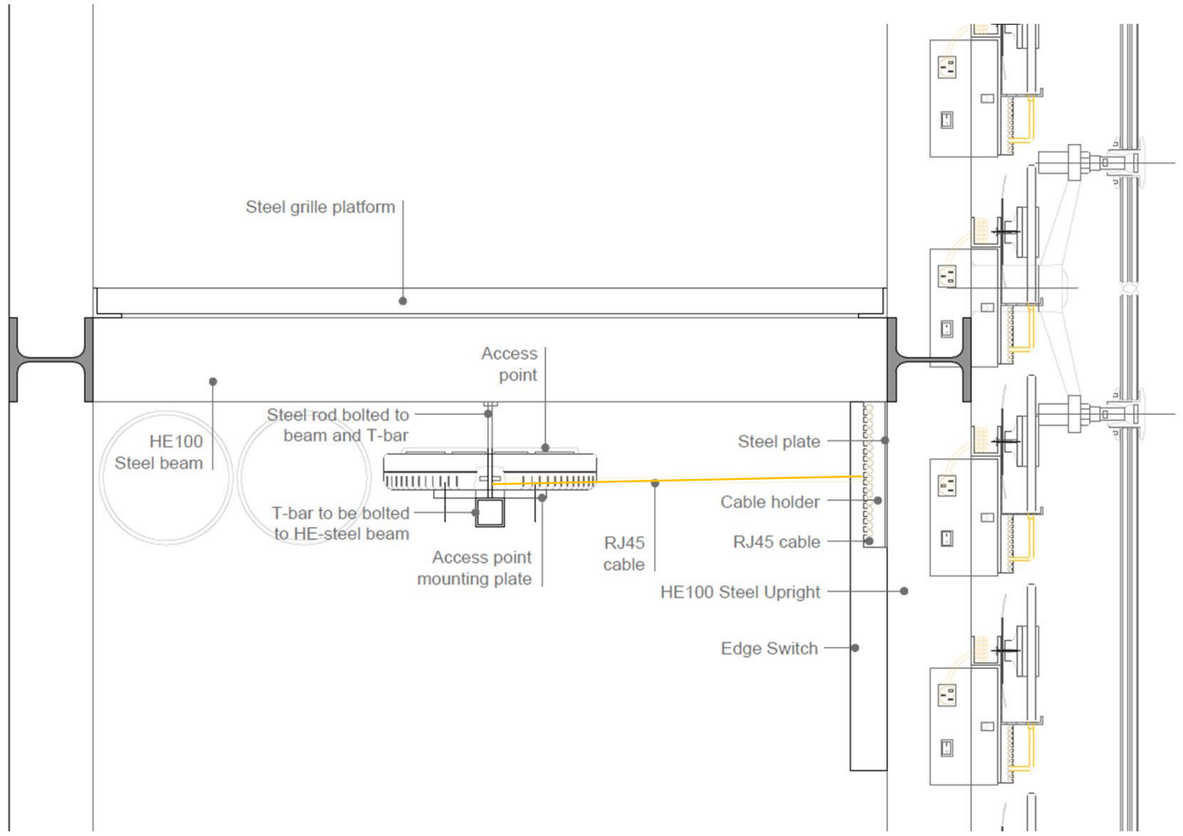
4. Placing RJ45 cables (cable holder).
- Pass each RJ45 cable through the corresponding cable holder (depending on the position of the Access point in question).

5. Fixing of Edge Switch to HE100 Steel Upright.
- Screwing of Switch support (vertical position) to HE100 Steel upright.
- Fixing of Edge Switch side plates to support (vertical position).

6. Placing RJ45 cables (Access Point and Edge Switch).
- Plugged of RJ45 cable to every Access Point.
- Plugged of RJ45 cable to Edge Switch port.



Edge Switch



PART I. INSTALLATION EXECUTION CONDITIONS

I.5. Prescription regarding the storing

I.5. PRESCRIPTION REGARDING THE STORING

I.5.1. PROTOCOL OF MOBILE PHONE STORING

Preparing the phone for storage

1. Charge the phone battery: Start by charging the phone battery to between 50% and a maximum of 60%. Now. Avoid to fully charge the device or fully discharge it because a fully discharged device is always in danger of falling into a deep discharge state.
2. Power off the device: It is necessary to powering off the device before storing it for a long time. This will prevent further battery use and keep it at optimum health for longer.
3. Store it at an optimal temperature: Batteries should always be stored in a cool and dry environment. The temperature should not be freezing cold or boiling hot. The optimum temperature for storing a phone or tablet is 90° F (32° C) and a relative humidity of 30%.
4. In some cases, removing the battery from your device is also recommended, but whether you should remove the battery or not depends on the device.
5. Some devices have a power consumption of 0 when they’re powered off, but sometimes, the battery is over-discharged and damaged when stored for months.
6. To stay on the safe side, we recommend charging the battery every three to six months. That will keep the battery from over-discharging, and you will be able to check the phone’s health every now and then.

PART I. INSTALLATION EXECUTION CONDITIONS

I.6. Implementing legislation and execution standards of the installation

I.6. IMPLEMENTING LEGISLATION AND EXECUTION STANDARDS OF THE INSTALLATION

The implementing legislation for the Media Façade installation will refer to the electricity regulations for buildings in Republic of Korea.

In the same way, the execution standards of the installation will refer to the corresponding implementing legislation in Republic of Korea.

PART I. INSTALLATION EXECUTION CONDITIONS

I.7. Regulatory tests, trials and verifications

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

The installation must be tested and verified according to the code requirements of Republic of Korea.
The tests and trials of the Media Façade must be done on the following elements:

1. Software maintenance test
2. Mobile phone tests
3. Tests of every component of the system
4. Phone holder operation test
5. System levelling test
6. Test of the accessibility for the maintenance of the system
7. System lighting tests

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.1. SOFTWARE MAINTENANCE TEST

Performance Testing:
This test allows to evaluate the performance of the software, it helps to guarantee that the response time aligns with the desired time. By setting up a considerable load in continuous video playback, the application is tested for response time of several critical processes.

Load Testing:
Load testing is carried out to check whether the system can sustain the pressure or load of many mobile phones accessing the application at a time. In this case, the Web platform and mobile phone management software will be tested, making each Access Points connect to as many mobile phones as possible at the same time.

Stress Testing:
Stress testing is conducted to push the Android Mobile Application and the Web platform and mobile phone management software, beyond its capabilities to observe how it reacts. Contrary to load testing where maximum capacity of load is generated, stress testing is conducted where the load which is generated is more than the software can manage. Hence, it is considered as an evaluation method of application performance in critical situations.

Volume Testing:
Volume testing is carried out to check the storage requirements and capabilities of the Web platform and mobile phone management software. At times, when the database is very large in size, performance of the software and its ability to exchange data and information are tested with volume testing implementation.

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.1. SOFTWARE MAINTENANCE TEST

Failover Testing:
Failover testing helps in understanding how the redundancy mechanism works when the system encounters heavy load or unexpected failure. Also, when the specific failed system is back again, it must begin to function as per requirements, thus, failover testing is not only required but also important in the nonfunctional testing of the application.

Security Testing:
The foremost requirement, even more than smooth functioning of the Software is Security. Various methods of security testing are implemented in order to test how well the Software can preserve itself and the data it holds in situations of malicious attacks. Network security, system security, Confidentiality, integrity, availability, authentication and authorization are the key areas that are focused to be tested when security testing is conducted. In addition, network security, system security and software security will also be tested.

Usability Testing:
The purpose of usability testing is to verify the ease of usage of an interface within the Android Mobile Application and the Web platform and mobile phone management software.

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.2. MOBILE PHONE TEST

It will be necessary make these tests to every mobile phone of the installation:

1. Visually verify that the screen of the mobile phone is in good condition, i.e. not broken or cracked.
2. Visually identify the location of the mobile phone's USB port.
3. Visually verify that the USB port of the mobile phone is of the Micro USB type.
4. Visually verify that the USB port of the mobile phone is not obstructed by any foreign material or has any apparent physical damage identifiable by visual inspection.
5. Verify that the display turns on, showing an image of a battery being charged.
6. Visual check of battery status. For mobiles that have removable batteries, check that they are completely flat and do not present bulges or are inflated. For phones that do not have a removable battery, visually check that the back of the phone is completely flat and there are no bulges.

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.3. TESTS OF EVERY COMPONENT OF THE SYSTEM

Setting up the Access Point to verify and test performance and physical integrity

1. Unbox the access point
2. Plug the power injector into the Wireless Array
3. Plug Cat5/6 From the ARRAY on the Power Injector to the Xirrus ARRAY Gigabit POE port
4. Plug Cat5/6 from the Switch port on the Power Injector to the central PC
5. Set the central PC Ethernet Connection settings so that you can connect to the array.
6. use 10.0.2.15, subnet 255.255.255.0 gateway 10.0.2.1
7. Log into the Xirrus Array, The default IP address is 10.0.2.1
8. Since we don’t have a certificate installed at the beginning of the install, click “Continue to this website (not recommended)”.
9. Login to the Array: Default User = admin Password = admin (change this credentials during setup for safety reasons)
10. Click on the Express Setup Tab
11. Insert Contact information, License Key supplied by your Xirrus Distributor, IP Address/Subnet Mask, Default Gateway and click apply
12. Connect the Xirrus Array to the principal network
13. Log back into the Xirrus Array using the newly assigned IP Address.
14. Click on the Network Tab to set the DNS settings
15. Create the SSIDs avoid using WEP because it is easily hacked no matter how long the password is.

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.3. TESTS OF EVERY COMPONENT OF THE SYSTEM

Setting up the Riverbed SteelConnect SDI-S48 POE+ Switch to verify and test performance and physical integrity

1. Unbox the Switch
2. Plug the power supply into the Switch
3. Plug Cat5/6 from the Switch port to the central PC
4. Set the central PC Ethernet Connection settings
5. Log into the Riverbed SteelConnect SDI-S48 POE+ using the default IP address provide for each switch
6. Click on the Express Setup Tab
7. Follow Instructions and configure the network and the access to the Access Point

Hub USB
ORICO IH30P-US-BK

1. Unbox the Hub USB
2. Plug the power supply into the Hub USB
3. Connect a test mobile phone to one of the 30 ports of the Hub USB
4. Check the status battery icon on the phone that shows the phone is charging
5. Repeat steps 3 and 4 until all the 30 ports of the Hub USB are tested
6. If one of the ports doesn’t charge the test phone its means that this port is not working and the Hub USB need to be change or replaced

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.3. TESTS OF EVERY COMPONENT OF THE SYSTEM

Micro-USB Type-B Cables
USB micro cable continuity tester

1. Take both ends of the same USB cable under test and plug each corresponding end into the USB type A and micro type B ports. Do not leave the cable connected to another device while it is connected to the tester.
2. If the data lines work, the included battery will light up the corresponding LEDs in the "smart" section. This means the cable should be able to transfer data and to charge a device with higher power.
3. You can also tell if the USB cable is defective or worn out internally if one of the "basic" V+ or GND LEDs don't light up or if any of the LEDs flicker or switch erratically when the cable is handled. If this happens the cable under test is probably not suitable for use and should be discarded.
4. Repeat steps 1, 2, and 3 for each Micro USB Cable.

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.3. TESTS OF EVERY COMPONENT OF THE SYSTEM

RJ 45 Cables

1. Connect one end of a network, to the Network / Phone (RJ45/12) on the Transmitter. Connect the other end of the network, phone to the Remote Terminator.
2. Switch the power button to the On position; it will perform a Quick Test by default.

Quick Test Mode

Quick Test mode quickly identifies the type of cable. If a test cable pin out matches the pin out of a standard cable, the TC-NT3 Transmitter will indicate this by lighting up the corresponding LED. The default mode on TC-NT3 is set to Quick Test mode. You can also press the Test button 3 times to enter to Quick Test mode.

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.4. PHONE HOLDER OPERATION TEST

It will be necessary make these tests to every phone holder of the installation:

- Verify that the phone holder is in good condition, i.e. not broken or deteriorated.
- Check the correct operation of the phone holder
- Verify that the material of the phone holder works in a suitable temperature range.
- Check that the fixing of the phone holder to the u profile is adequate to support the weight of a mobile phone.
- Check that the fixing of the phone holder to the u profile is adequate to withstand an increase in air pressure.
- Check that the material of the phone holder does not damage the fastening screw
- Verify that the material of the phone holder does not deteriorate against the incidence of the sun and guarantees the necessary durability

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.5. SYSTEM LEVELLING TEST

It will be necessary make these tests to every mobile phone and phone holder of the installation in order to guarantee the levelling of the system:

- Verify the correct horizontal alignment of each phone holder
- Verify the correct horizontal alignment of each mobile phone
- Verify the correct vertical alignment of each phone holder
- Verify the correct vertical alignment of each mobile phone
- Verify that the separation between each phone holder is the same
- Visually check that each mobile phone is located in the center of the phone holder

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.6. TEST OF THE ACCESSIBILITY FOR THE MAINTENANCE OF THE SYSTEM

In order to guarantee the accessibility for the maintenance of the system, it will be necessary make these tests:

- Verify that the access to maintenance platforms from inside the building is correct.
- Verify that the temperature, humidity and lighting levels inside the Media Façade are optimal so that the users in charge can carry out a correct maintenance.
- Check the flatness of the maintenance platform.
- Check that the maintenance platform is not slippery.
- Verify safety against falls from the maintenance platform.
- Verify that it is possible to access all the mobiles phones from the maintenance platform.
- Verify that it is possible to access all the phone holders from the maintenance platform.
- Verify that it is possible to access all the USB type B cables from the maintenance platform.
- Verify that it is possible to access all the USB hubs from the maintenance platform.
- Verify that it is possible to access all the Access points from the maintenance platform.
- Verify that it is possible to access all the RJ45 cables from the maintenance platform.
- Verify that it is possible to access all the Edge and Core Switches from the maintenance platform.
- Verify that the access to the technical room for the Media Façade is correct and restricted to the users in charge of maintenance.

I.7. REGULATORY TESTS, TRIALS AND VERIFICATIONS

I.7.7. SYSTEM LIGHTING TESTS

It will be necessary make these tests to every mobile phone of the installation in order to guarantee a correct level of lighting to the exterior:

- Verify that the mobile screens do not present deficiencies in terms of lighting.
- Check on each mobile phone it is possible to adjust the light intensity.
- Check that the regulation of the light intensity is adequate and identical for each mobile phone.

PART I. INSTALLATION EXECUTION CONDITIONS

I.8. Prescriptions on verifications in the finished installation

I.8. PRESCRIPTIONS ON VERIFICATIONS IN THE FINISHED INSTALLATION

- Verify that all equipment is properly connected to electrical power
- Verify that the mobile phones turn on correctly and the screen shows the test image
- Check that there is no excessive heating (above 90C) in the USB Hub, Switch and Access Point
- Verify that the temperature of mobile phones does not exceed 45 degrees
- Verify that the USB Hub, Switch and Access Point do not make buzzing noises due to the power supply
- Verify that the cooling systems of the USB Hub, Switch and Access Point (fans) work correctly
- Verify that none of the equipment produces vibrations due to electric current

PART I. INSTALLATION EXECUTION CONDITIONS

I.9. Conditions of use, maintenance and safety

I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

I.9.1. CONDITIONS OF USE

Two types of users of the media façade can be defined:

- On the one hand, the users and the visitors of the National Digital Heritage Center and its square, who is going to watch what the Media Façade plays.
- On the other hand, the users in charge of the activation and maintenance of the Media Façade.

The users in charge of the activation and maintenance of the Media Façade depends on the periodicity of the maintenance:

- **Daily use and maintenance of phones and hardware equipment. Recommendation of personnel responsible: in-house engineer.**
- **Weekly maintenance of phones and hardware equipment. Recommendation of personnel responsible: in-house engineer.**
- **Monthly maintenance of phones and hardware equipment. Recommendation of personnel responsible: by third party technical engineer with specialization in telecommunications**.

In order to carry out a correct activation and maintenance of mobile phones and hardware equipment, in-house engineer must receive a specialized training. They also will have access to Media Façade and its the technical room thanks to an access card.

The daily use of the Media Façade will consist of activating and turning off it. For that purpose, in-house engineer will access to technical room with an access card, will access to Web Server with a user code, and will upload the file or files which will be shown on the media façade.

I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

I.9.1. CONDITIONS OF USE

The media façade will have a main emergency switch with which, in the event of an emergency, the entire half façade can be isolated from the electrical power supply. From the Web platform and mobile phone management software, all mobile phones can be instructed to turn off their screens at any time of the day. Likewise, mobile phones can be instructed to restart. It will be possible to program the automatic switching on and off of mobile phones.

The way in which mobile phones receive instructions from the Web platform and mobile phone management software It is through the synchronization of instructions, that is, the mobile phones are synchronized every hour with the Web platform and mobile phone management software where they ask the server if there is any change in the instruction that had been sent the previous hour, if there is a change the mobile phone is synchronized with the new instruction otherwise it continues to carry out the previously received instruction.

Likewise, when there are new versions of the software, the mobile phone will be synchronized with the instruction to update the version of the application and in this way it will download the new version, install it and restart.

The Web platform and mobile phone management software will also be able to ask mobile phones to send diagnostic information from their internal sensors to know the status of each one of them, as well as to know when one of the mobile phones did not connect or disconnect. correctly to the server. In this way it will help in the detection of mobile phones that are damaged, as well as make preventive diagnoses.

I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

I.9.2. CONDITIONS OF MAINTENANCE

A. Maintenance of phones and hardware equipment.

Weekly maintenance of phones and hardware equipment. Recommendation of personnel responsible: in house engineer.
Weekly maintenance:
1. Visual check of the front of phones when emitting signal. If any phone stops working, check and/or substitute.
Estimated time Phase 2, 5 minutes. Estimated time Phase 3, 15 mins.
2. Visual inspection of back of phones, will reveal possible damages in batteries and or connections.
Estimated time Phase 2, 8 minutes. Estimated time Phase 3, 1hour.

Monthly maintenance of phones and hardware equipment. Recommendation of personnel responsible: by third party technical engineer with specialization in telecommunications.
Monthly maintenance :
1. Visual inspection for condensation or corrosion on USB ports or other hardware equipment.
Estimated time Phase 2, 10 mins. Estimated time Phase 3, 1 hour.
2. Do a test of how all equipment works: Disconnect and reconnect USB hubs, check tension, check if USB port keeps integrity, reconnect, initiate computer, send signal, demo of image being projected. Estimated time Phase 2, 10 mins. Estimated time Phase 3, 4 hour.
3. Visual inspection of phones back and front. Estimated time Phase 2, 8 minutes. Estimated time Phase 3, 1hour.
4. Test speed of web server and reception of data by phones, test server.
Estimated time Phase 2, 8 minutes. Estimated time Phase 3, 1hour.
5. Substitute phones if they are not emitting signal or other failures due to visual inspection.
Estimated time Phase 2, 8 minutes. Estimated time Phase 3, 1hour.

I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

I.9.2. CONDITIONS OF MAINTENANCE

B. Maintenance of software equipment.

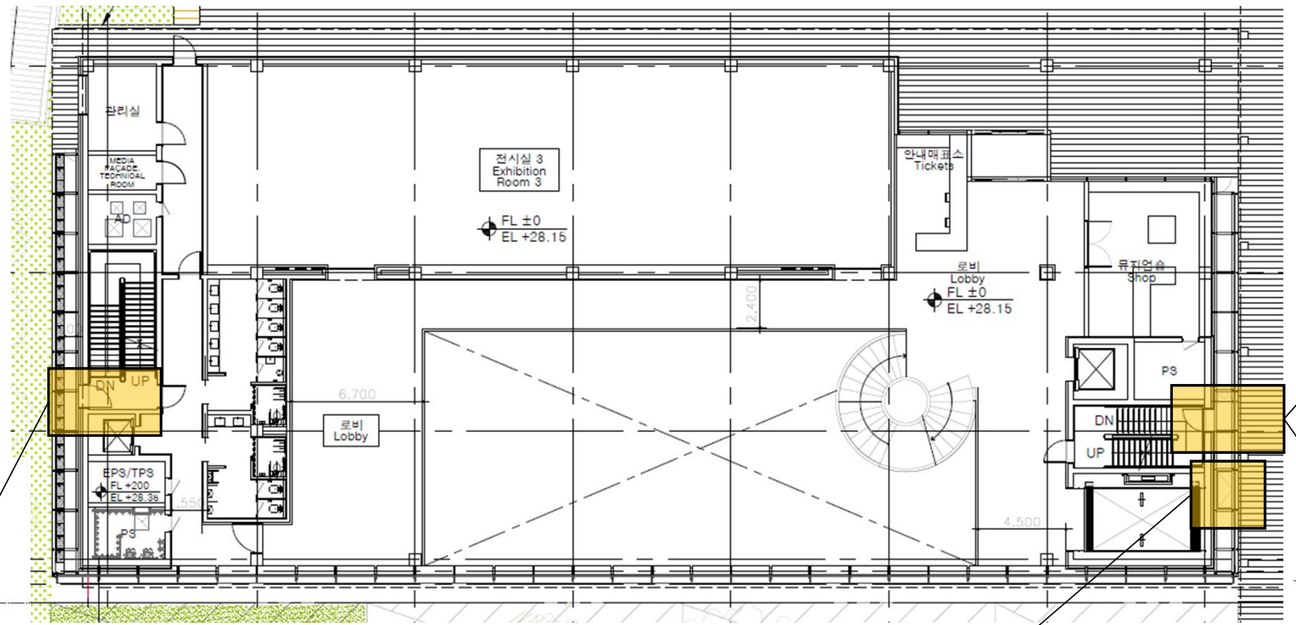
Monthly maintenance of software equipment. Recommendation of personnel responsible: by third party technical engineer with specialization in telecommunications.

Monthly maintenance:
1. Eliminate videos that had been charged in the webserver.
Estimated time Phase 2, 5 minutes. Estimated time Phase 3, 5 mins.
2. Play a quick demo to check that whole system is working.
Estimated time Phase 2, 5 minutes. Estimated time Phase 3, 5 mins.
3. Reinstall software in phones if they have been substituted.
Estimated time Phase 2, 10 minutes. Estimated time Phase 3, 1 hour.

I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

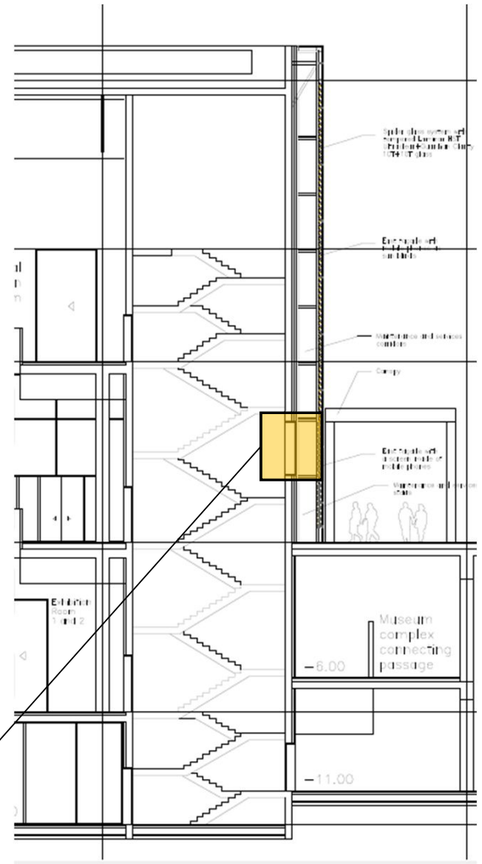
I.9.2. CONDITIONS OF MAINTENANCE

C. Access to maintenance operations in media façade.

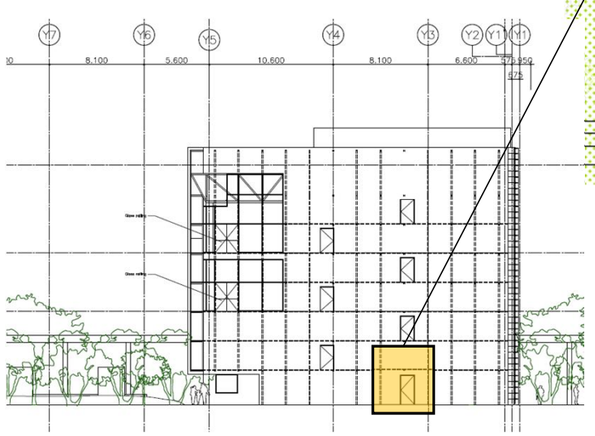


FLOOR 1

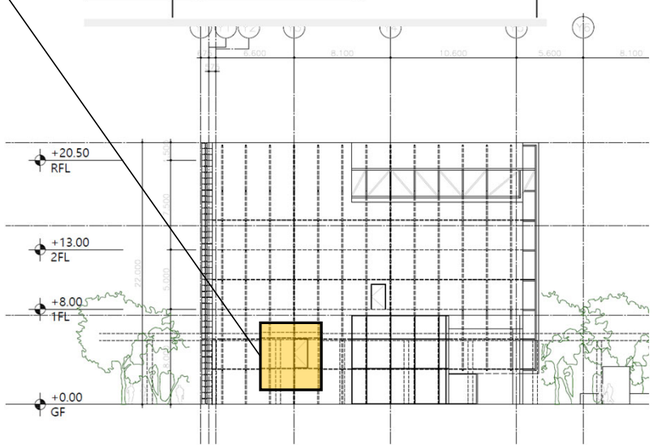
SECTION



HATCH FOR LADDER



INTERIOR WEST ELEVATION

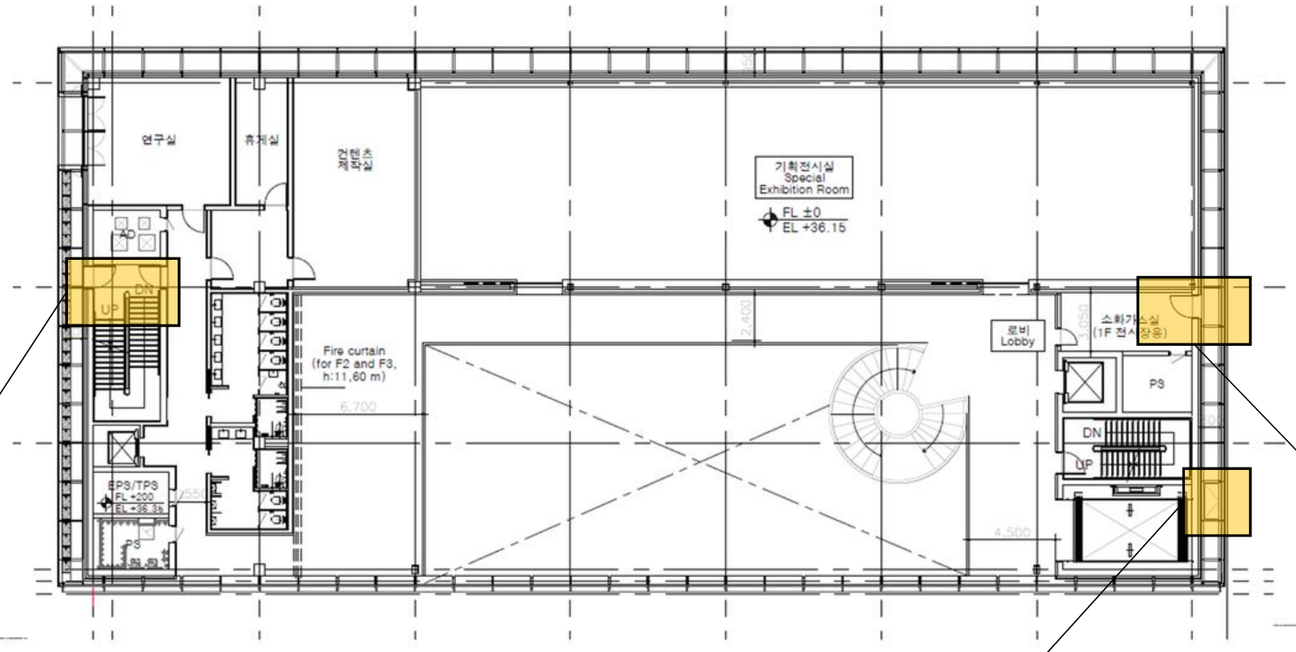


INTERIOR EAST ELEVATION

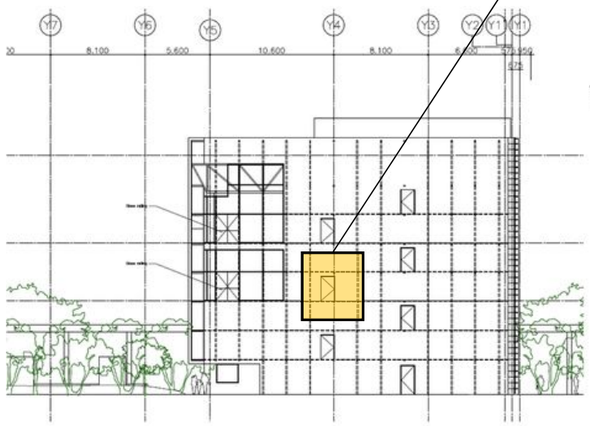
I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

I.9.2. CONDITIONS OF MAINTENANCE

C. Access to maintenance operations in media façade.

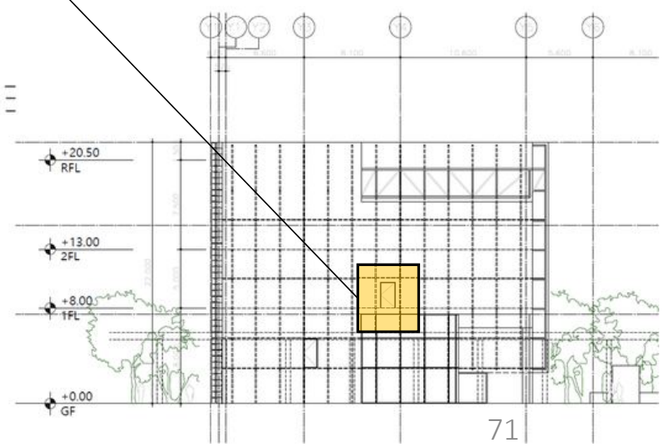


FLOOR 2



INTERIOR WEST ELEVATION

HATCH FOR LADDER

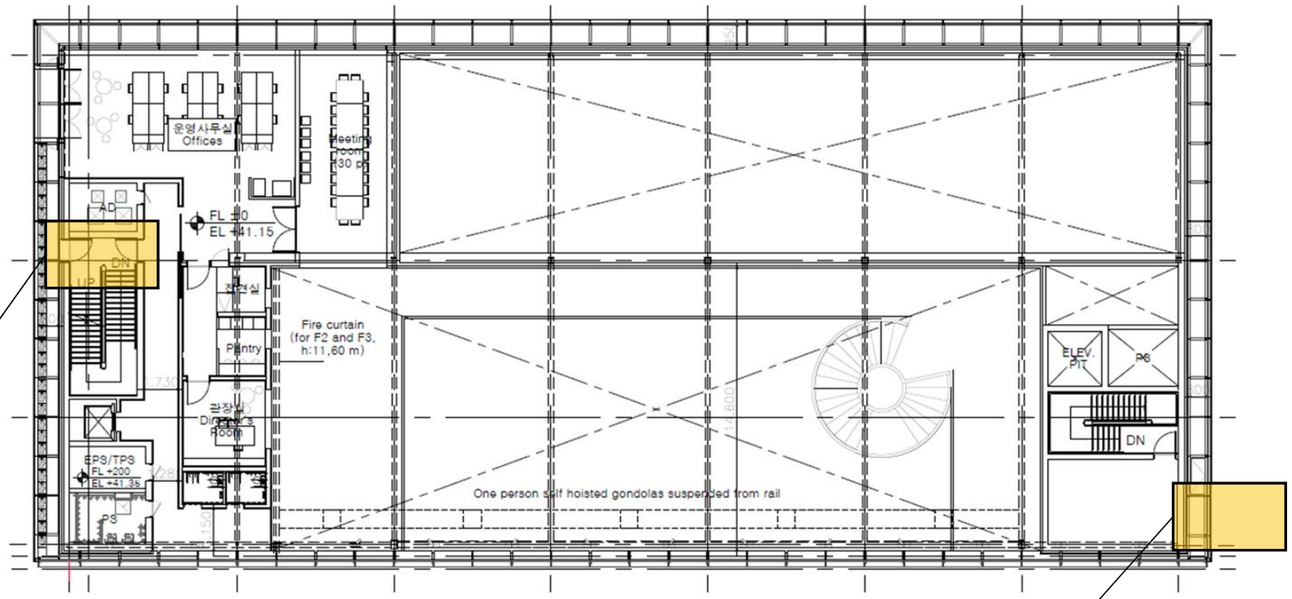


INTERIOR EAST ELEVATION

I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

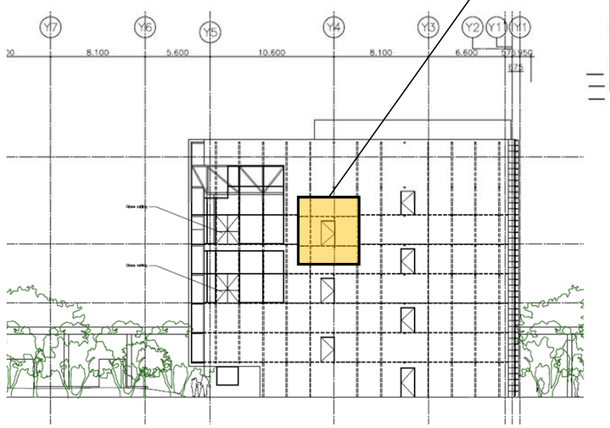
I.9.2. CONDITIONS OF MAINTENANCE

C. Access to maintenance operations in media façade.



FLOOR 3

HATCH FOR LADDER



INTERIOR WEST ELEVATION

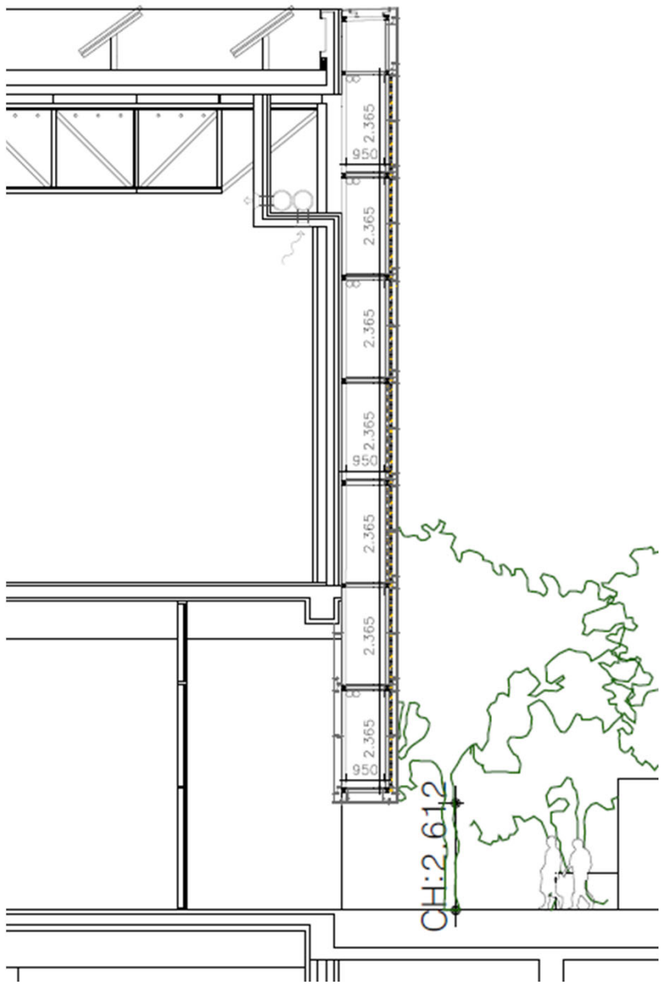
I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

I.9.2. CONDITIONS OF MAINTENANCE

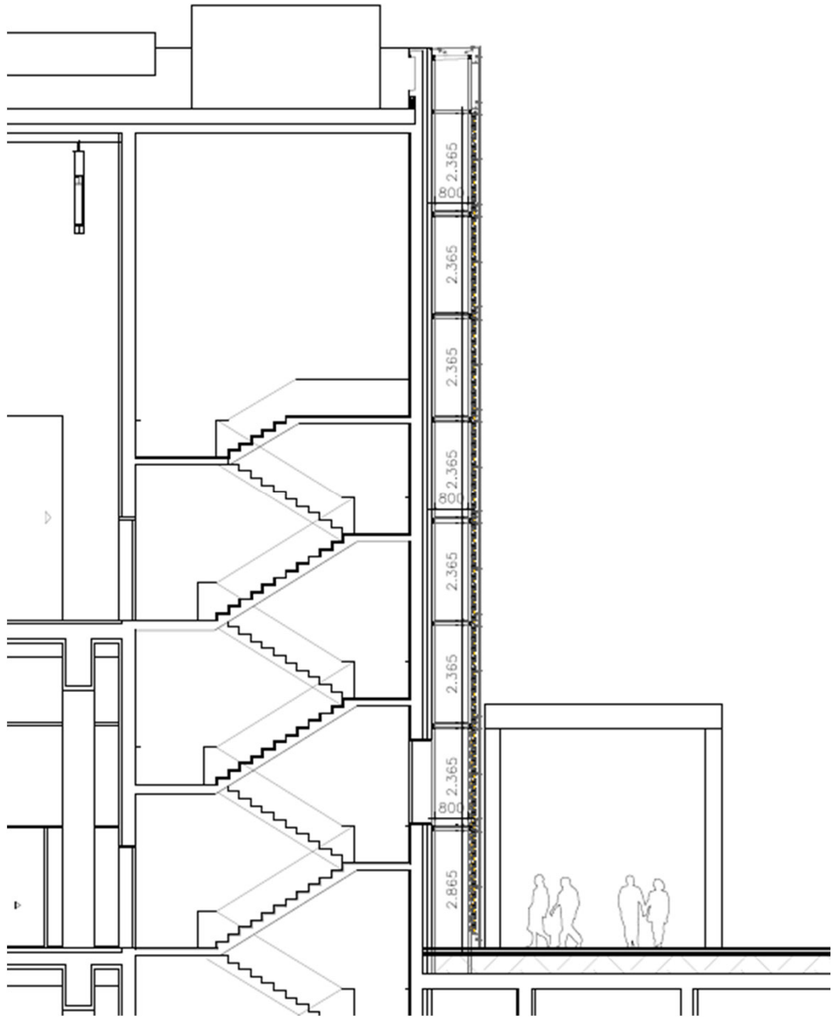
D. Maintenance corridor dimensions.



IMAGE



NORTH FAÇADE



EAST FAÇADE

I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

I.9.3. CONDITIONS OF SAFETY

The safety conditions correspond to the conditions of an electrical installation according to the code requirements of Republic of Korea.

Electronic devices
Due to none of the electronic devices installed have IP68 certification, it is necessary that none of them come into contact with water or any other liquid that could cause short circuits. Likewise, it is necessary that all equipment work within the limits of temperature and humidity recommended by the manufacturer. A constant and uniform electrical power supply must be guaranteed at the frequency and voltage recommended by the manufacturer.

I.9. CONDITIONS OF USE, MAINTENANCE AND SAFETY

I.9.3. CONDITIONS OF SAFETY

The safety conditions correspond to the conditions of an electrical installation according to the code requirements of Republic of Korea.

Electrical installation
According to the IEC 60364-6 international standard:
- Verify Electrical continuity and conductivity tests of protective, equipotential and earthbonding conductors
- Verify Insulation resistance tests between live conductors and the protective conductors connected to the earthing arrangement
- Test of compliance of SELV (Safety Extra Low Voltage) and PELV (Protection by Extra Low Voltage) circuits or for electrical separation
- Verify Insulation resistance/impedance of floors and walls
- Verify Protection by automatic disconnection of the supply
  - For TN, by measurement of the fault loop impedance, and by verification of the characteristics and/or the effectiveness of the associated protective devices (overcurrent protective device and RCD)
  - For TT, by measurement of the resistance RA of the earth electrode of the exposed-conductive-parts, and by verification of the characteristics and/or the effectiveness of the associated protective devices (overcurrent protective device and RCD)
  - For IT, by calculation or measurement of the current Id in case of a fist fault at the line conductor or at the neutral, and with the test done for TN system where conditions are similar to TN system in case of a double insulation fault situation, with the test done for TT system where the conditions are similar to TT system in case of a double insulation fault situation.
- Verify Additional protection by verifying the effectiveness of the protective measure
- Do a Polarity test where the rules prohibit the installation of single pole switching devices in the neutral conductor.
- Verify of phase sequence in case of multiphase circuit
- Do a Functional test of switchgear and controlgear by verifying their installation and adjustment
- Voltage drop by measuring the circuit impedance or by using diagrams

PART I. INSTALLATION EXECUTION CONDITIONS

I.10. Replacement of equipment

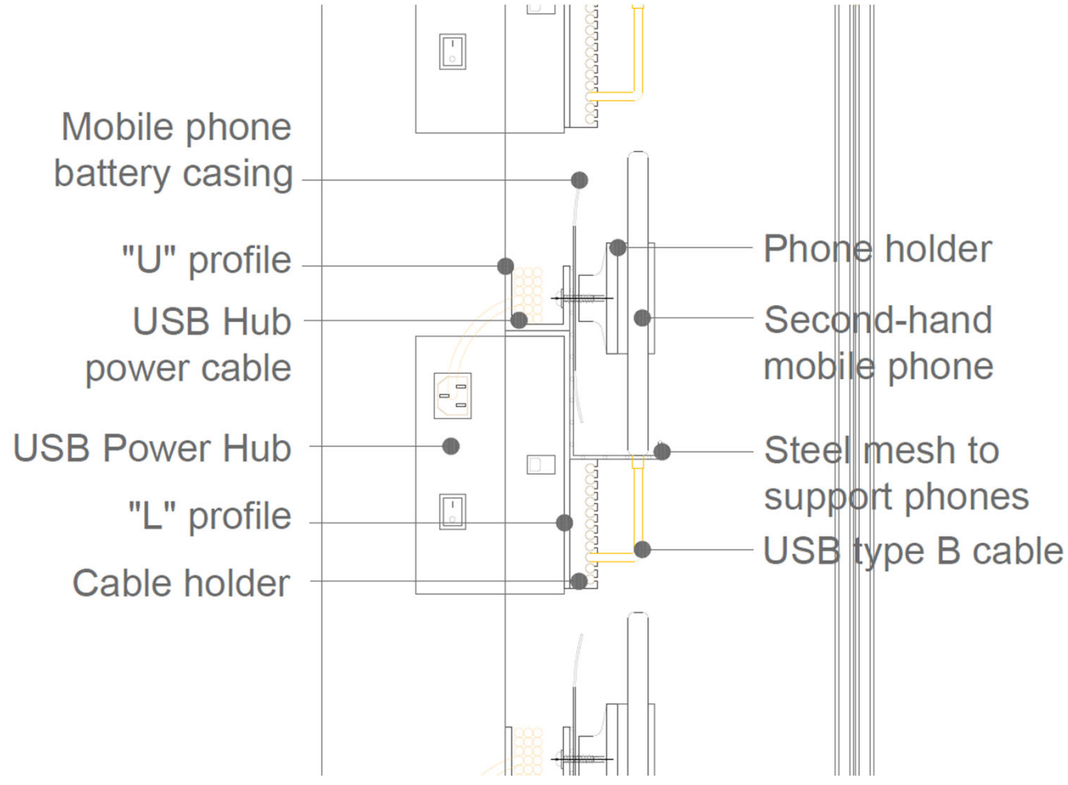
I.10. REPLACEMENT OF EQUIPMENT

I.10.1. MOBILE PHONE

1. Manual opening of the phone holder by elongating its side walls.
2. Removal of the mobile phone.
3. Automatic adjustment of the phone holder to original position.
4. Manual opening of the phone holder by elongating its side walls.
5. Introduction of the new mobile phone (previously inspected) in the phone holder.
6. Automatic adjustment of the phone holder to the new mobile phone width.

I.10.2. USB TYPE B CABLE

1. Disconnecting the cable from the USB Power Hub.
2. Disconecting the cable from the mobile phone.
3. Removal of the cable from each cable holder.
4. Pass the new cable through the corresponding cable holders.
5. Plugged of the new USB cable to mobile phone.
6. Plugged of the new USB cable to USB Power Hub port.



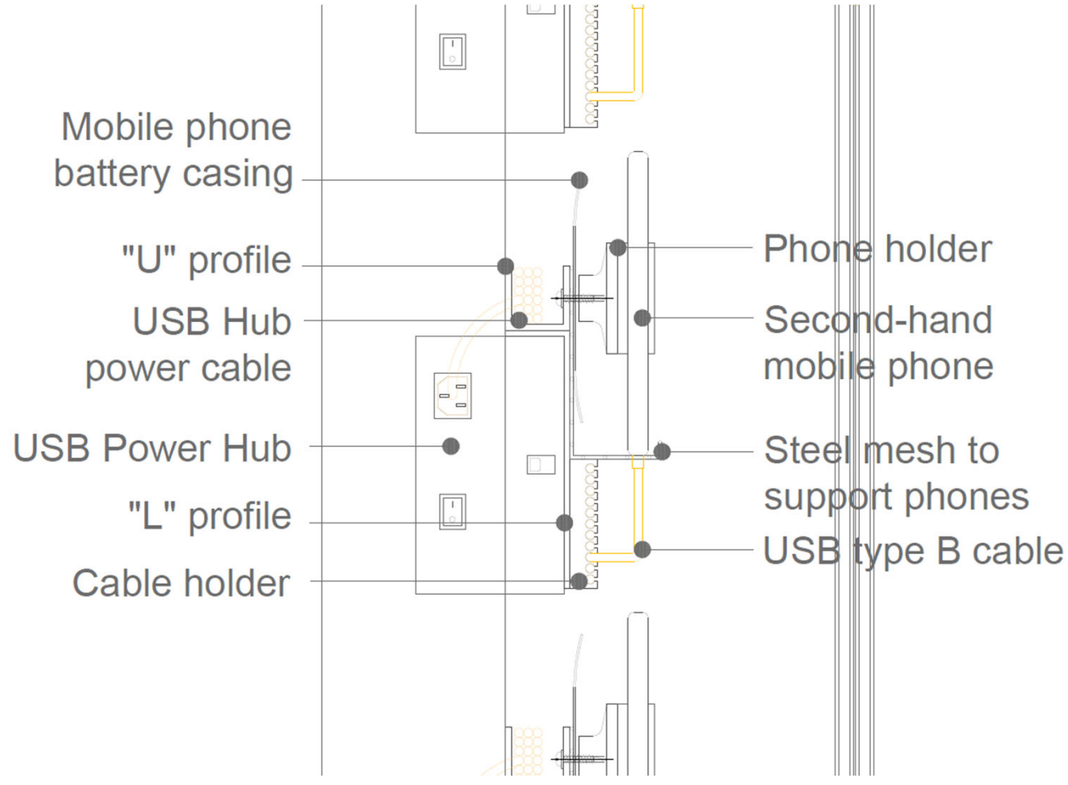
I.10. REPLACEMENT OF EQUIPMENT

I.10.3. PHONE HOLDER

1. Phone holder unscrewing.
2. Visually check if screw is in good condition
(if not, replace by a new one).
3. Screwing of the new phone holder to substructure (“U” profile), in the same way as it is shown in “I.4.1 Execution of Mobile Phone Screen”.

I.10.4. USB POWER HUB

1. Disconnecting all the USB cables from the USB Hub.
2. Disconnecting the power cable from the USB Hub.
3. Phone holder unscrewing.
4. Visually check if screws are in good condition
(if not, replace them).
5. Screwing of the new USB Power Hub side plates to “L” profiles.
6. USB cable plugged into each port of the new USB Power Hub.
7. Plugged of power cable to the new USB Power Hub



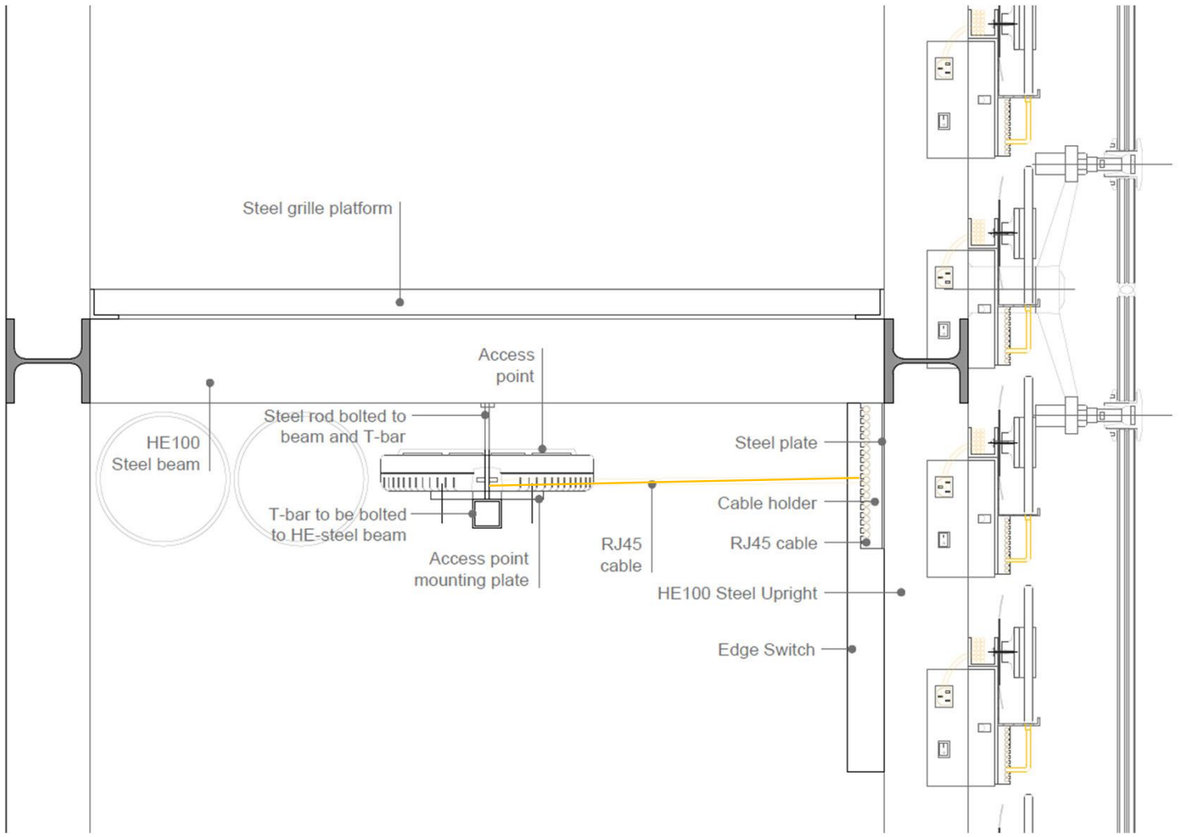
I.10. REPLACEMENT OF EQUIPMENT

I.10.5. ACCESS POINT

1. Disconnecting RJ45 cable from the Access Point.
2. Access point unscrewing.
3. Visually check if screws are in good condition
(if not, replace them).
4. Fixing of the new Access Point to mounting plate.

I.10.6. RJ45 CABLES

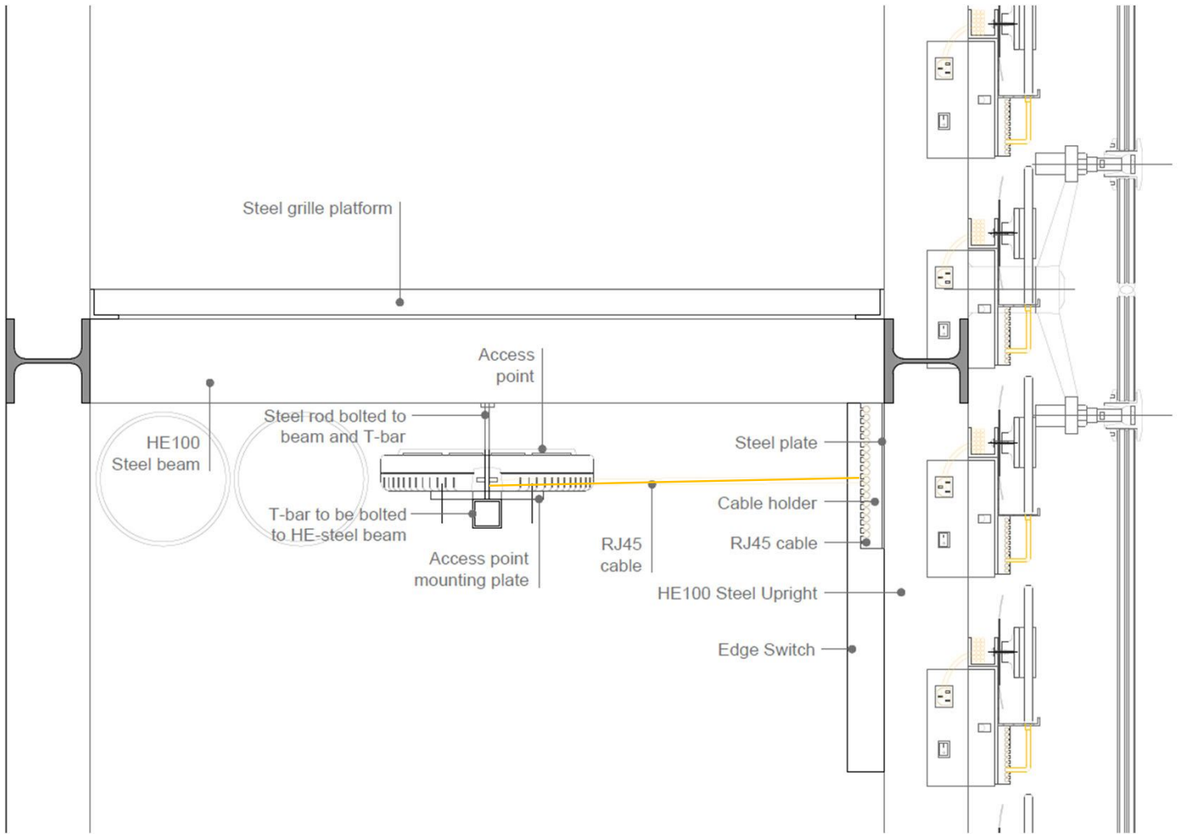
1. Disconnecting the RJ45 cable from the Access Point.
2. Disconnecting the RJ45 cable from the Edge Switch.
3. Removal of the cable from each cable holder.
4. Pass the new RJ45 cable through the corresponding cable holders.
5. Plugged of the new RJ45 cable to Access Point.
6. Plugged of the new RJ45 cable to Edge Switch.



I.10. REPLACEMENT OF EQUIPMENT

I.10.7. EDGE SWITCH

1. Disconnecting all the RJ45 cables from the Edge Switch.
2. Edge switch unscrewing of support.
3. Visually check if screws are in good condition (if not, replace them).
4. Fixing of the new Edge Switch side plates to support (vertical position).
5. Plugged of all RJ45 cables to the new Edge Switch port.



PART I. INSTALLATION EXECUTION CONDITIONS

I.11. Guarantees

I.11. GUARANTEES

Access Point and Switch
Xirrus XD4-240 Wi-Fi Access Point. Hardware warranty
Cambium Networks's standard hardware warranty is for one (1) year from date of shipment from Cambium Networks or a Cambium distributor. Cambium Networks warrants that hardware will conform to the relevant published specifications and will be free from material defects in material and workmanship under normal use and service. Cambium Networks shall within this time, at its own option, either repair or replace the defective product within thirty (30) days of receipt of the defective product. Repaired or replaced product will be subject to the original warranty period but not less than thirty (30) days. To register PTP products or activate warranties, visit the support website. For warranty assistance, contact the reseller or distributor.

Hub USB
ORICO IH30P-US-BK. Hardware warranty
2 Years by BACK N Co., LTD

Central PC. Hardware warranty
In general, the warranty period is 3 years from the delivery of the order. For this, it is essential to have the purchase ticket, which will serve the user to demonstrate that the product was purchased in an establishment and the date on which it was purchased appears on it.

Micro USB type B and RJ45 cables
Our comprehensive warranty service for 3 years guarantees the replacement or reimbursement within 24 hours* (from receipt of the product at PcComponentes) of those products that are defective, with our company commitment and regardless of the solution of the problem. brand or supplier.

PART II. RECEPTION OF PRODUCTS CONDITIONS

II.1. Certificates and documentation. List of products with quality markings

II.1. CERTIFICATES AND DOCUMENTATION. LIST OF PRODUCTS WITH QUALITY MARKINGS

SYSTEM	CERTIFICATE
Xirrus XD4-240	EN55022, CISPR 22, ICES-003 Class B, AS/NZS 60950-1, EMC, UL 2043, UL 60950-1, IEC 60950-1, EN 60950-1, CSA C22.2 No. 60950-1-03, AS/NZS 4268, FCC CFR47 Part 15 B, EN 62311, EN 300 328, EN 301 489-1, RSS-247, EN 301 893, FCC Subpart C 15.247, FCC Subpart E 15.407, EN 301 489-17
Riverbed SteelConnect SDI-S48 POE+	CE, FCC, IC
ORICO IH30P-US-BK	CE, FCC, RoHS
Micro USB Type B	CE, FCC y ROHS
RJ45 Cable	CE, FCC y ROHS

PART II. RECEPTION OF PRODUCTS CONDITIONS

II.2. Carbon consumption

II.2. CARBON CONSUMPTION

SYSTEM	CARBON CONSUMPTION
Xirrus XD4-240	0.02 Kg of CO2
Riverbed SteelConnect SDI-S48 POE+	0.324 Kg of CO2
ORICO IH30P-US-BK	0.13 Kg of CO2
Central PC	0.216 Kg of CO2

PART III. PLANS

III.1 Option 2, Phase 2: With 3 screens

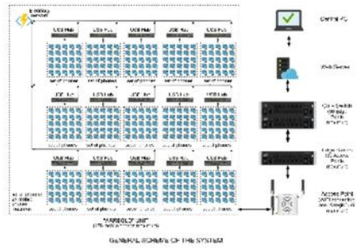
Also:

A1 PDF´s attached with all circuit of facades.

A1 PDF´s attached with all detailed drawings of North and East facades and media façade arrangement.

A1 PDF's attached with legend and details of elements.

III.1.1. ELEVATIONS. CIRCUITS



Media façade system. Scheme

DEVICE	QUANTITY	CONSUMPTION (WATTS)	TOTAL (WATTS)
Access point	15	25	285
Switch	6	42	252
USB HUB	150	74	9740
TOTAL			10301

- Constant electricity consumption: 10301 W
- Annual electricity consumption (operating time of 10 hours*)

10301 W · 10 h · 365 days = 37598650 Wh = 37598.65 kWh

OPTION 2. PHASE 2
(2860 mobile phones)
ELECTRICITY CONSUMPTION:
37598.65 kWh (a year)

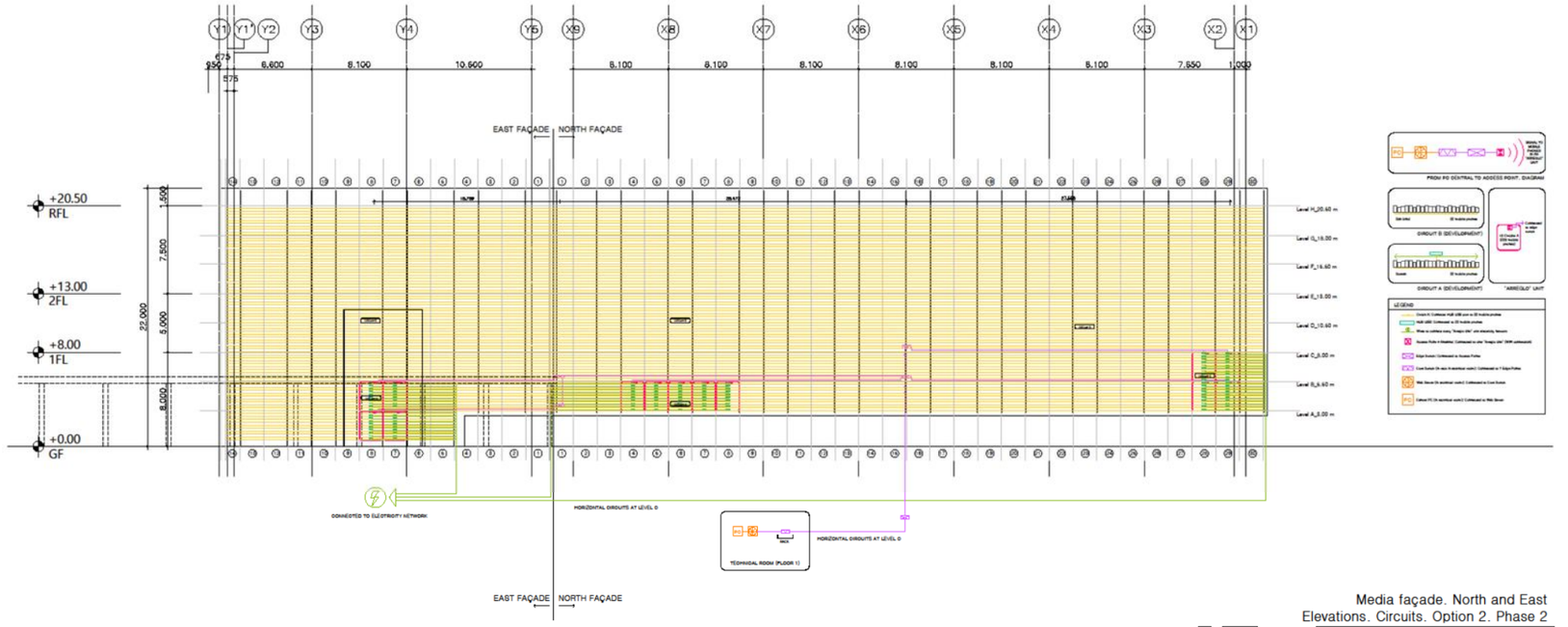
*Operating time of 10 hours: 8 hours, when mobile phone will be playing video plus 2 hours to consider the fact that mobile phone will not be playing video but they will be connected to electricity network.

Media façade system. Option 2. Phase 2. Electricity consumption



Media façade. Circuits. Option 2. Phase 2. Zoom

SCALE : A1 1/100
A3 1/200



Media façade. North and East Elevations. Circuits. Option 2. Phase 2

SCALE : A1 1/200
A3 1/400

CLIENT
행정중심복합도시건설청

GilBartolome Architects

HIA 한공틀 도시·건축
서울시 송파구 법원로 11길 25 H 비즈니스파크 B동 1011호

NOTES

NO.	DESCRIPTION	DATE
Rev.	NAME	

PROJECT TITLE
국립디지털문화유산센터 건립사업
기본 및 실시설계 용역

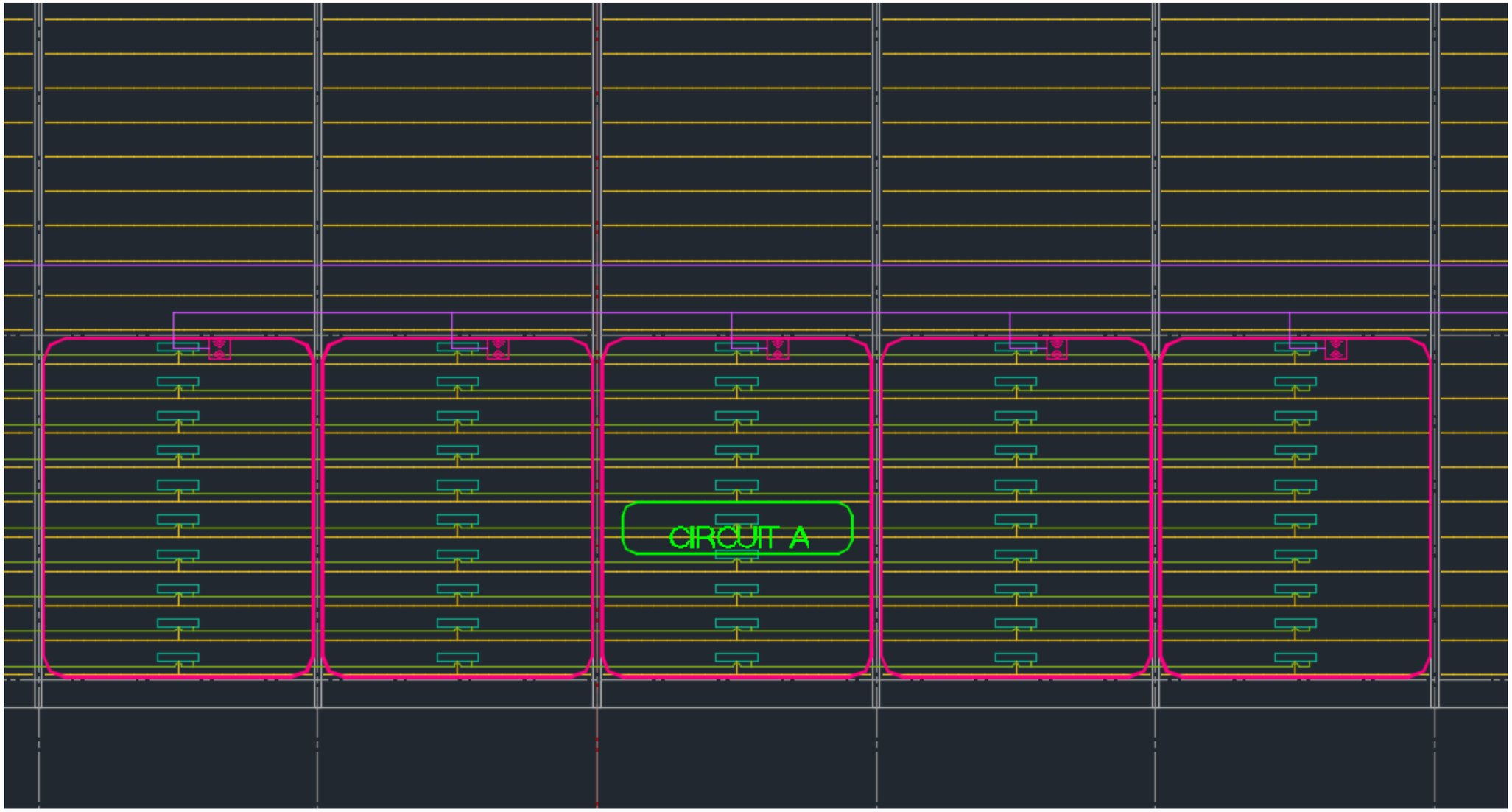
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MEDIA FAÇADE. ELEVATIONS. CIRCUITS. OPT.2, PHASE 2: WITH 3 SCREENS

DRAWN BY | APPROVED BY

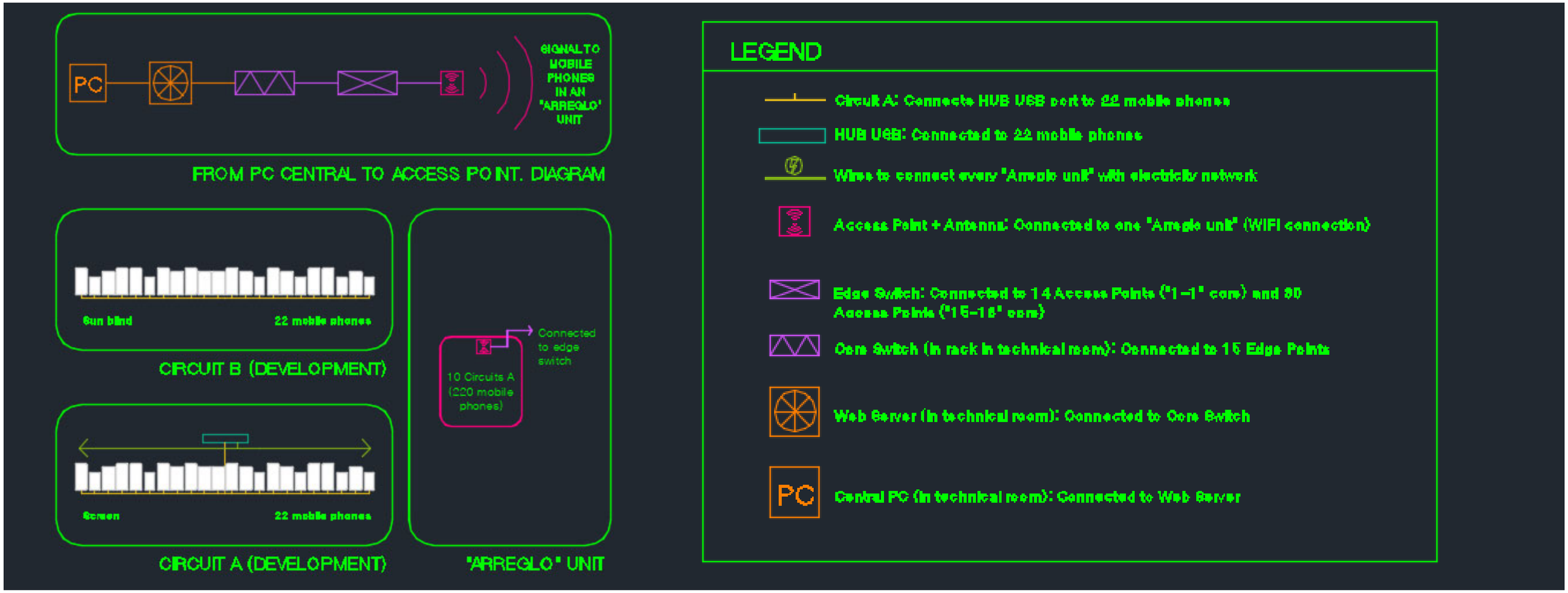
SCALE A1 : 1/200 A3 : 1/400

DRAWING NO.
88 A-341

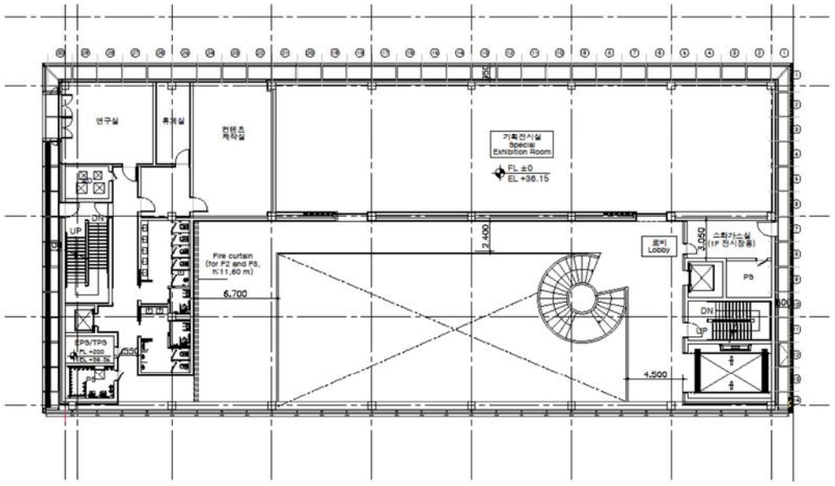
III.1.1. ELEVATIONS. CIRCUITS



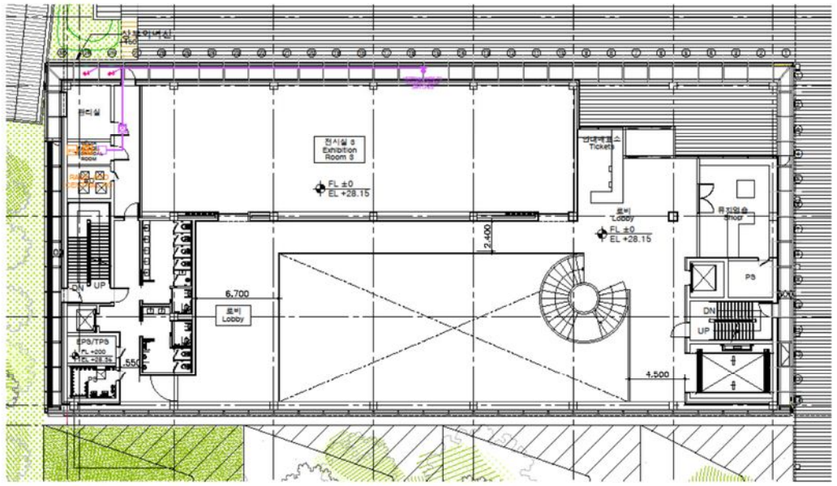
III.1.1. ELEVATIONS.
CIRCUITS



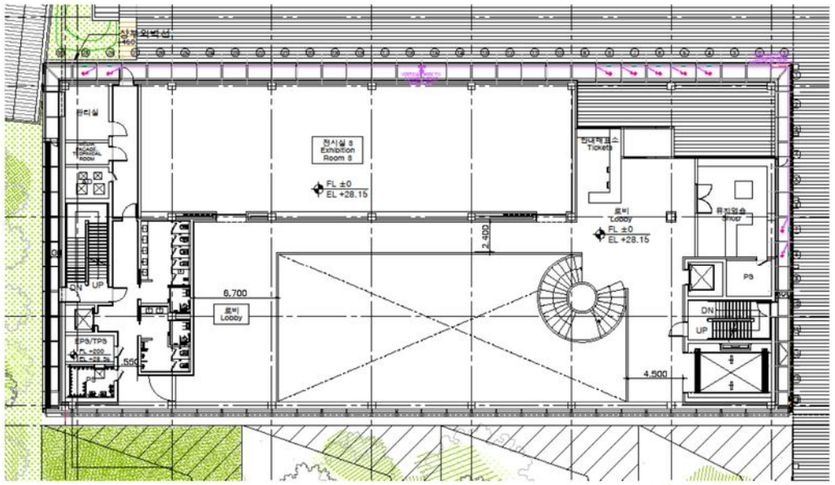
III.1.2. FLOOR PLANS. CIRCUITS - 01



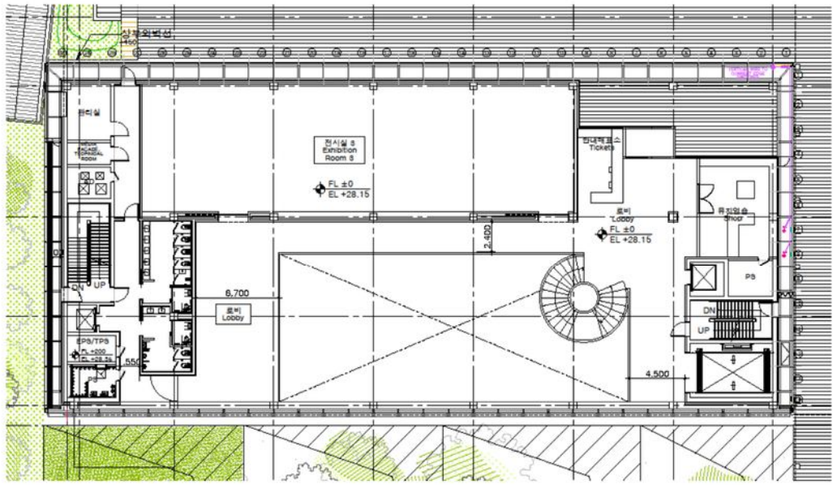
Media façade. Level D_10.50 m.
Plan. Circuits. Option 2. Phase 2
0 2 5 10
SCALE : A1 1/200
A3 1/400



Media façade. Level C_8.00 m.
Plan. Circuits. Option 2. Phase 2
0 2 5 10
SCALE : A1 1/200
A3 1/400



Media façade. Level B_5.50 m.
Plan. Circuits. Option 2. Phase 2
0 2 5 10
SCALE : A1 1/200
A3 1/400



Media façade. Level A_3.00 m.
Plan. Circuits. Option 2. Phase 2
0 2 5 10
SCALE : A1 1/200
A3 1/400



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HIA 한종률 도시·건축
AHN INTERNATIONAL ARCHITECTS
서울시 송파구 법원로 11길 26 H 비즈니스파크 B동 1011호

NOTES

NO.	DESCRIPTION	DATE
3		
2		
1		
0		
Rev.	NAME	

PROJECT TITLE
국립디지털문화유산센터
건립사업
기본 및 실시설계 용역

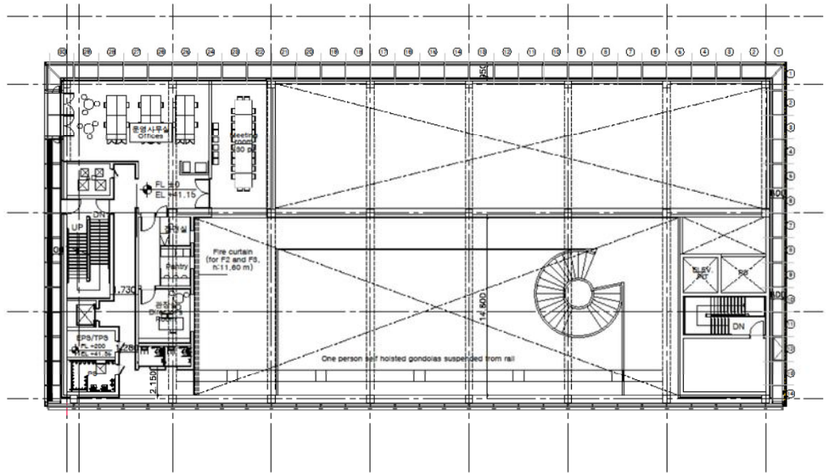
DRAWING TITLE
MEDIA FAÇADE.
FLOOR PLANS. CIRCUITS.
OPT.2, PHASE 2:
WITH 3 SCREENS

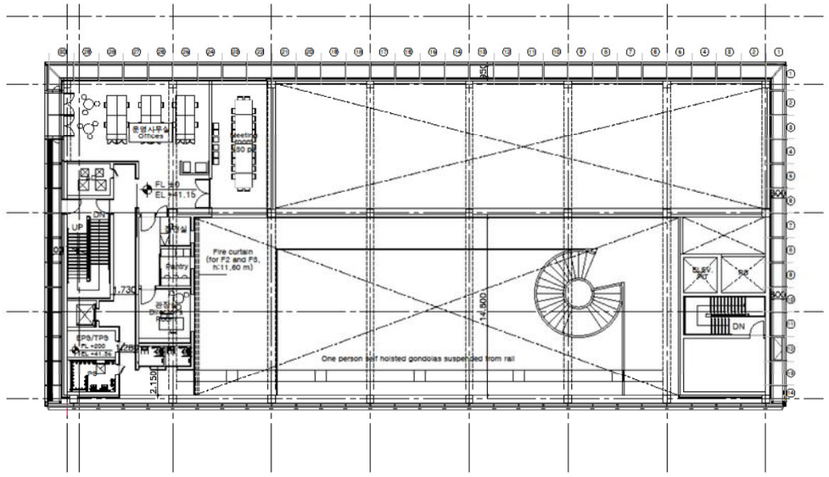
DRAWN BY | APPROVED BY

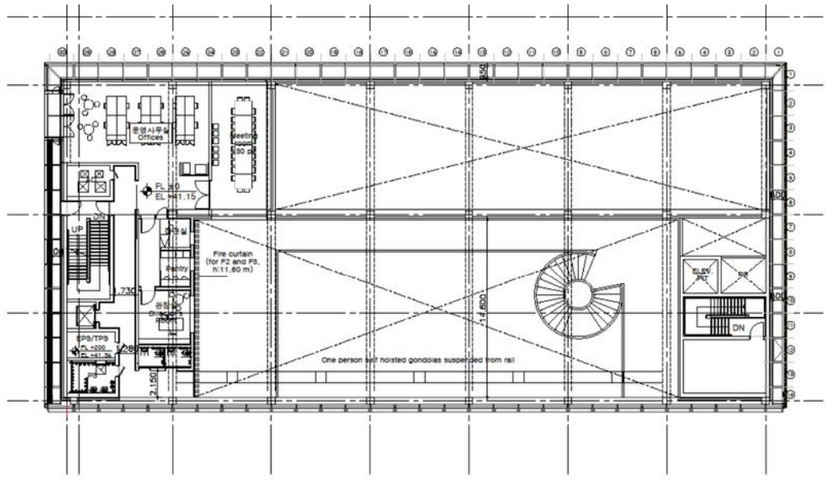
SCALE A1 : 1/200 A3 : 1/400

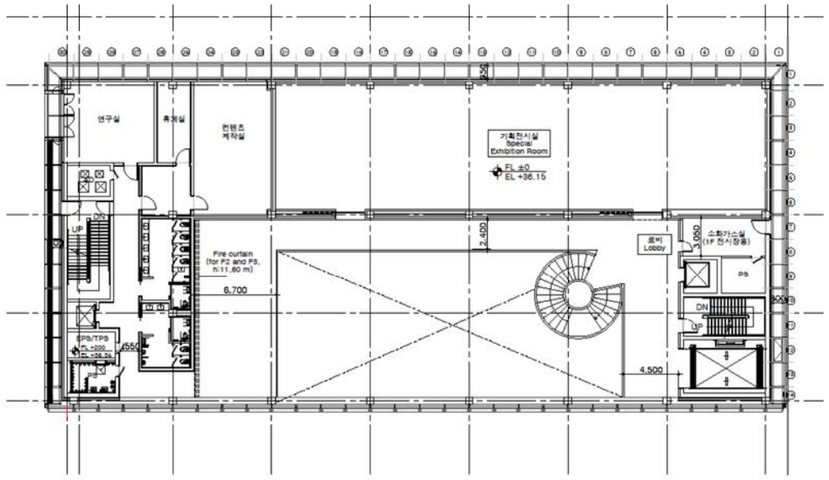
DRAWING NO. A-342

III.1.3. FLOOR PLANS. CIRCUITS – 02











CLIENT
행정중심복합도시건설청

GilBartolome Architects

HIA 한종률 도시·건축

NOTES

NO.	DESCRIPTION	DATE
Rev.	NAME	

PROJECT TITLE
국립디지털문화유산센터 건립사업
기본 및 실시설계 용역

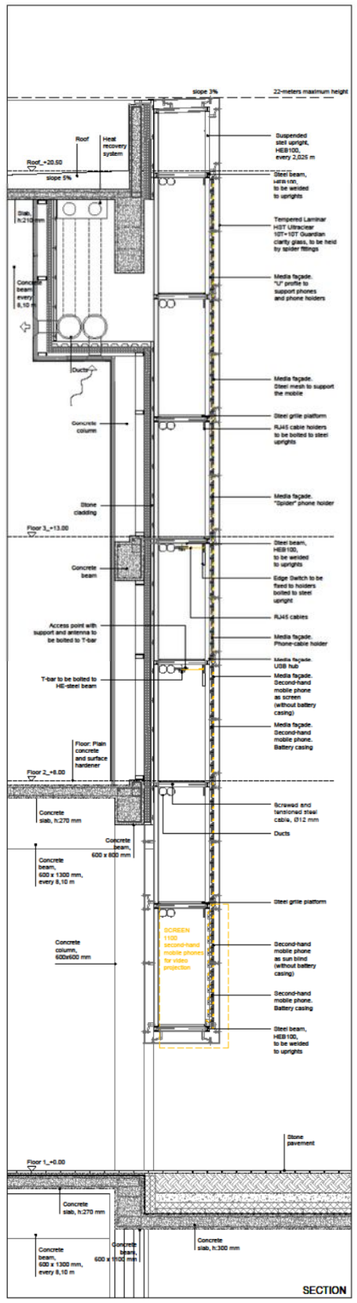
DRAWING TITLE
MEDIA FAÇADE.
FLOOR PLANS. CIRCUITS.
OPT.2, PHASE 2:
WITH 3 SCREENS

DRAWN BY | APPROVED BY

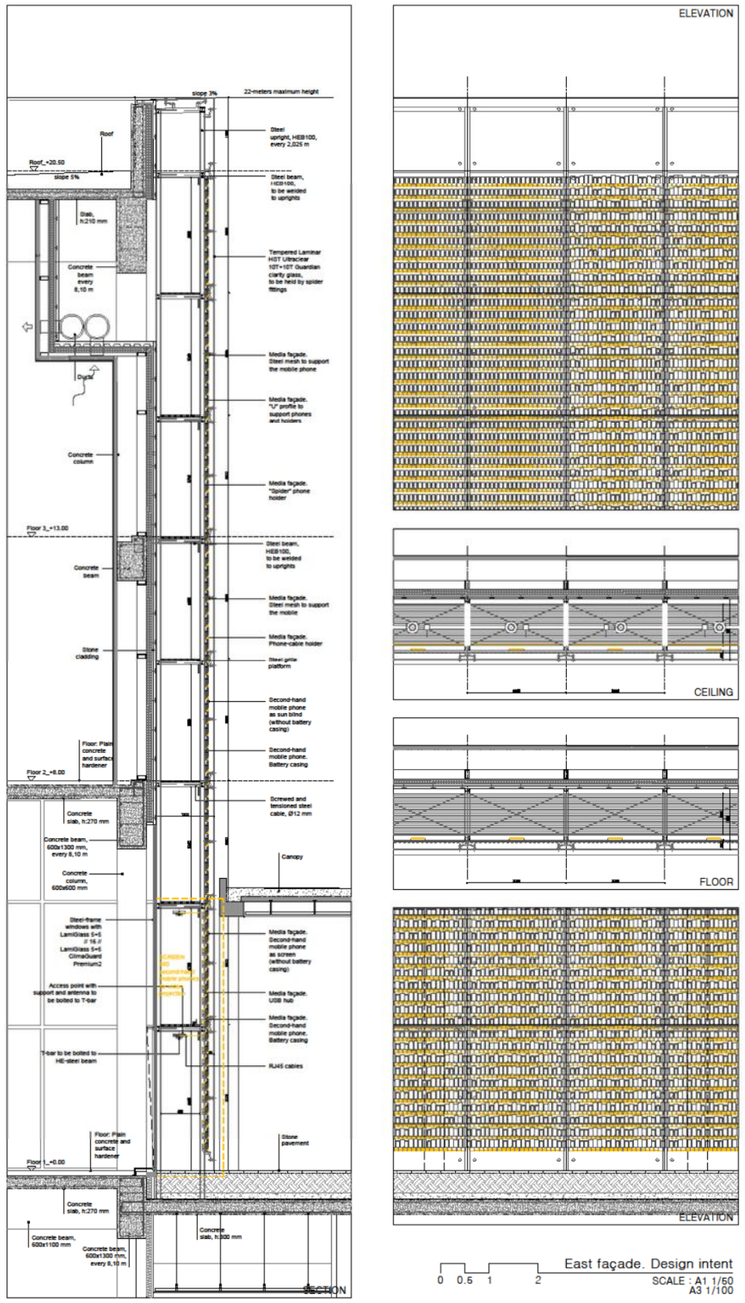
SCALE A1 : 1/200 A3 : 1/400

DRAWING NO.
92 A-343

III.1.4. DESIGN INTENT.
NORTH FAÇADE



III.1.5. DESIGN INTENT.
EAST FAÇADE

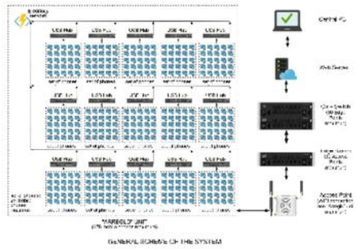


PART III. PLANS

III.2 Option 2, Phase 3: With all mobiles as screen

Also:
A1 PDF´s attached with all circuit of facades.
A1 PDF´s attached with all detailed drawings of North and East facades and media façade arrangement.
A1 PDF's attached with legend and details of elements.

III.2.1. ELEVATIONS. CIRCUITS



Media façade system. Scheme

DEVICE	QUANTITY	CONSUMPTION (WATTS)	TOTAL (WATTS)
Access point	318	22	7214
Switch	17	42	714
USB HUB	3180	76	258600
TOTAL			246528

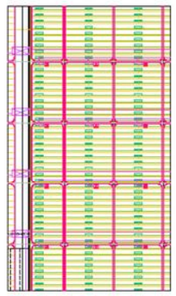
- Constant electricity consumption: 246528 W
- Annual electricity consumption (operating time of 10 hours*)

246528 W · 10 h · 365 days = 899827200 Wh = 899827,20 kWh

OPTION 2. PHASE 3
(70000 mobile phones)
ELECTRICITY CONSUMPTION:
899827,20 kWh (a year)

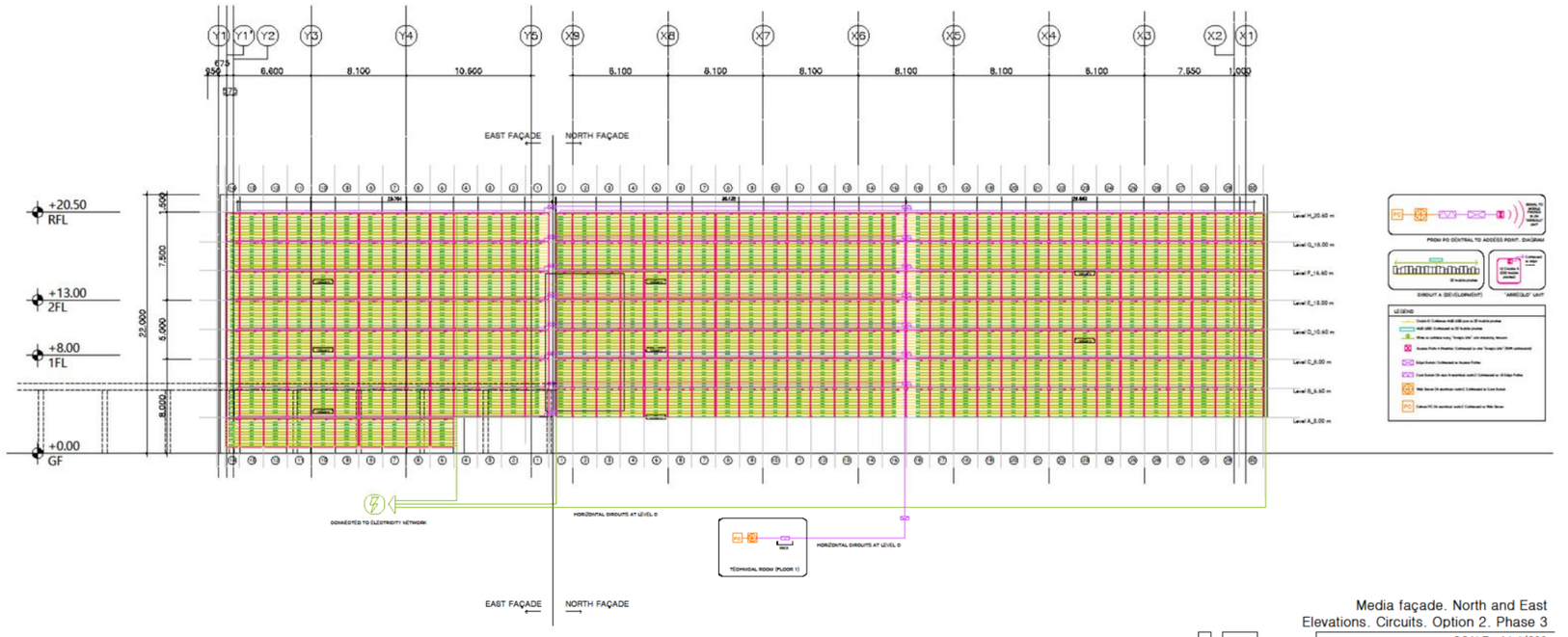
*Operating time of 10 hours: 8 hours, when mobile phone will be playing video plus 2 hours to consider the fact that mobile phone will not be playing video but they will be connected to electricity network.

Media façade system. Option 2. Phase 3. Electricity consumption



Media façade. Circuits. Option 2. Phase 3. Zoom

0 2 SCALE : A1 1/100 A3 1/200



Media façade. North and East Elevations. Circuits. Option 2. Phase 3

0 2 5 10 SCALE : A1 1/200 A3 1/400

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서울시 송파구 법원로 11길 25 H 비즈니스파크 8동 1011호

NOTES

NO.	DESCRIPTION	DATE
Rev.	NAME	

PROJECT TITLE
국립디지털문화유산센터 건립사업
기본 및 실시설계 용역

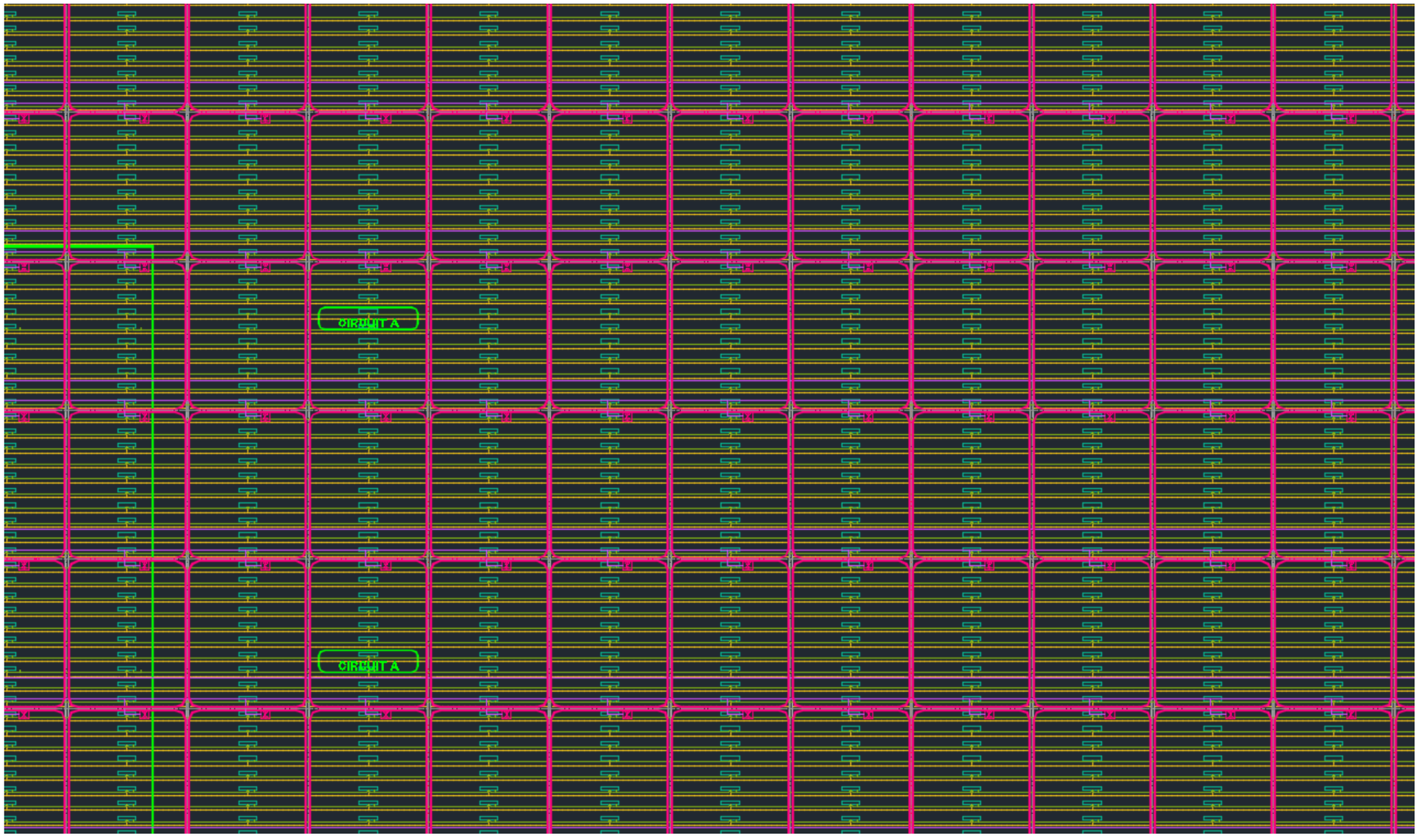
DRAWING TITLE
MEDIA FAÇADE. ELEVATIONS. CIRCUITS. OPT. 2, PHASE 3: WITH ALL MOBILES AS SCREEN

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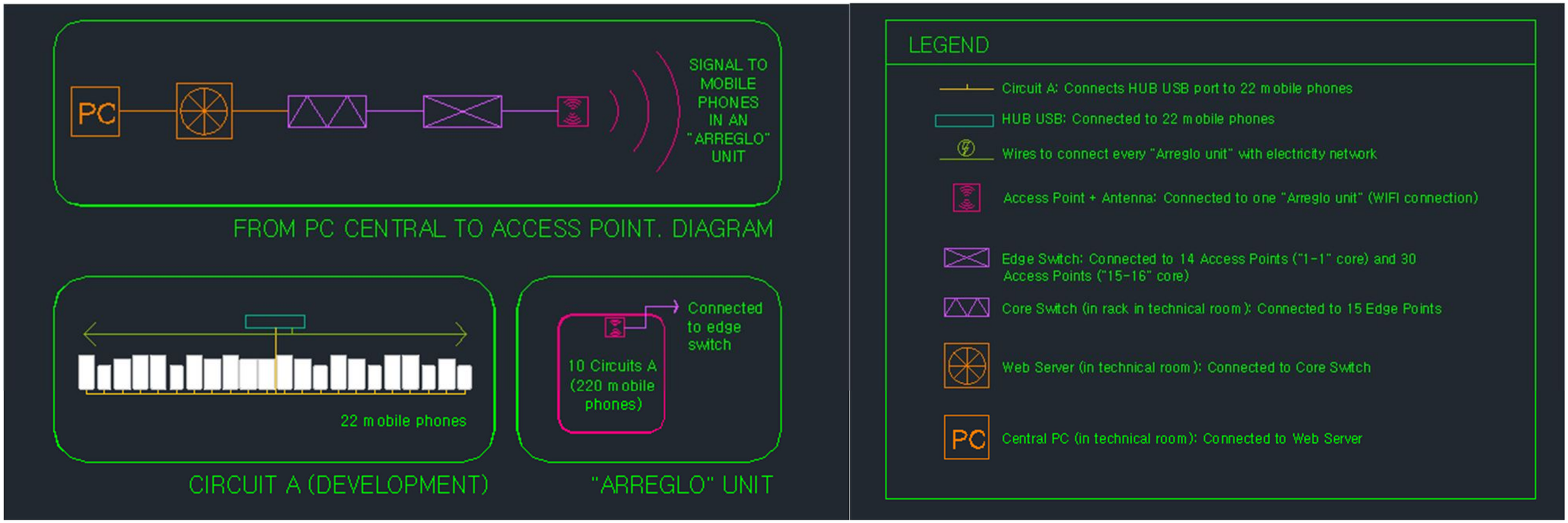
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DRAWING NO.
96 A-344

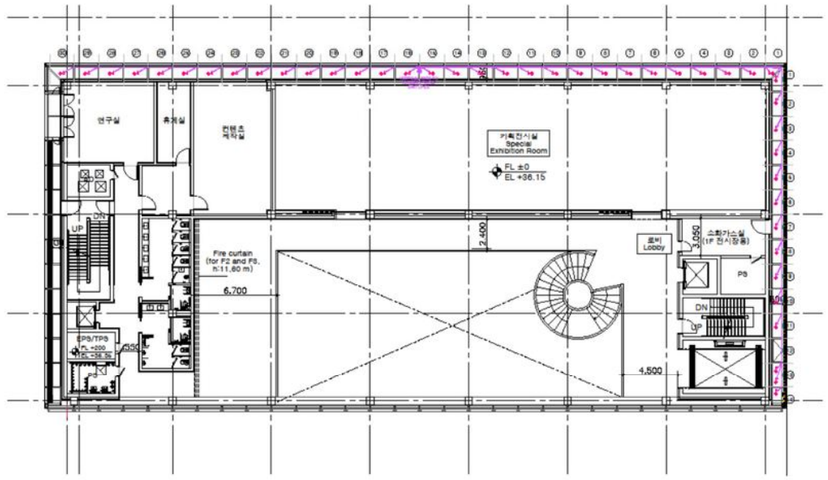
III.2.1. ELEVATIONS. CIRCUITS

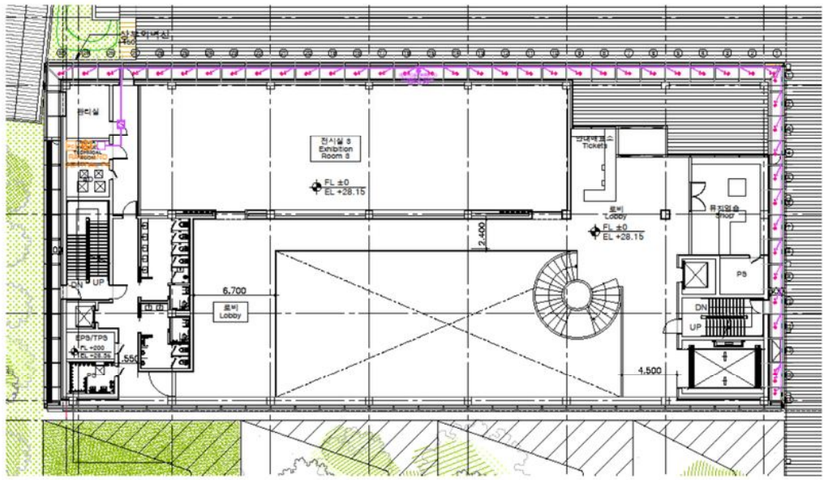


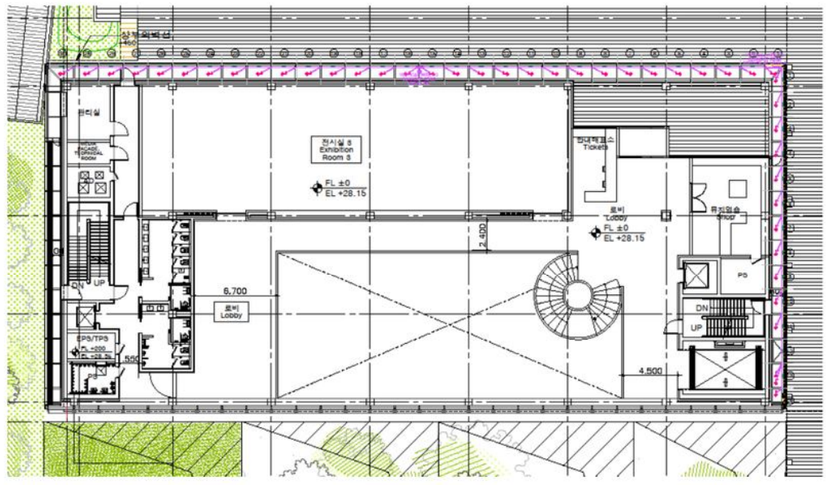
III.2.1. ELEVATIONS.
CIRCUITS

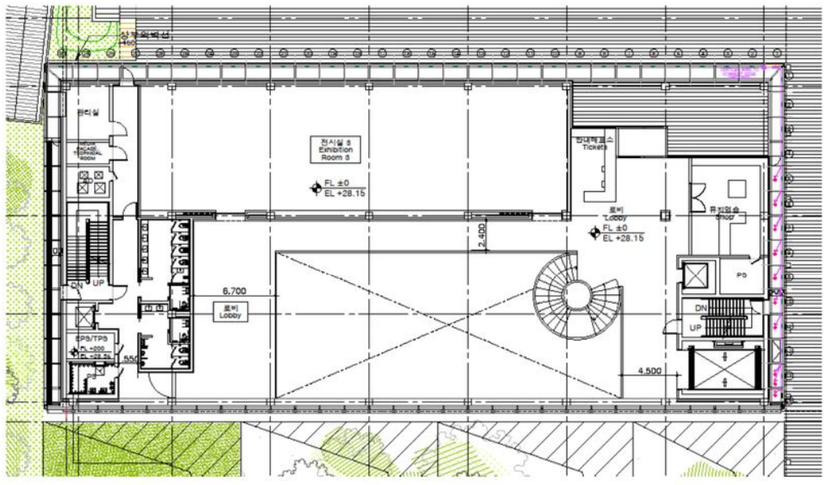


III.2.2. FLOOR PLANS. CIRCUITS - 01











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NO.	DESCRIPTION	DATE
3		
2		
1		
0		
Rev.	NAME	

PROJECT TITLE
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기본 및 실시설계 용역

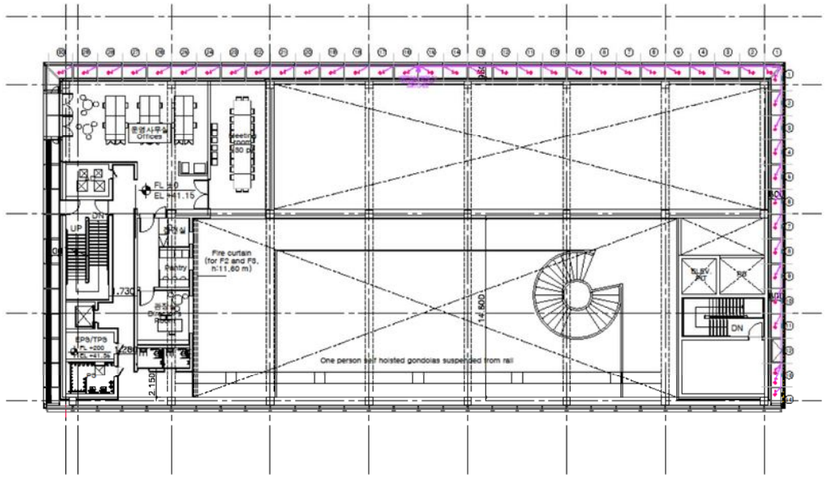
도면명 DRAWING NAME
MEDIA FAÇADE. FLOOR PLANS. CIRCUITS. OPT. 2, PHASE 3: WITH ALL MOBILES AS SCREEN

작성 DRAWN BY | 승인 APPROVED BY

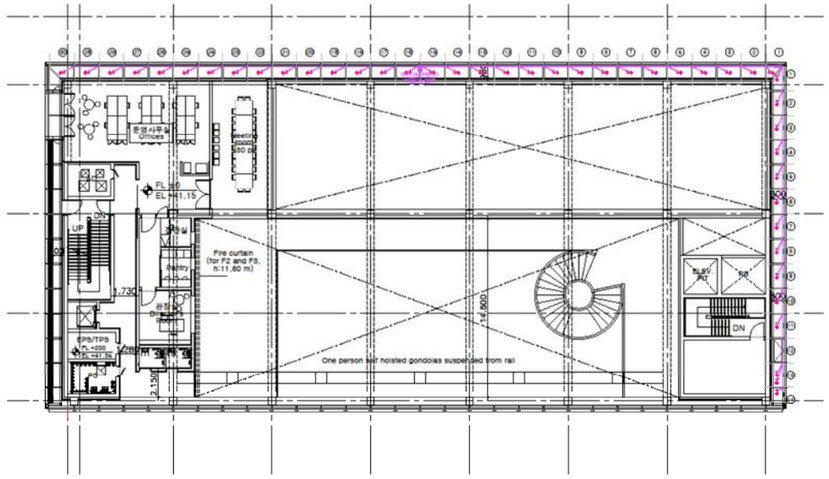
축척 SCALE A1 : 1/200 A3 : 1/400

도면번호 DRAWING NO.
99 A-345

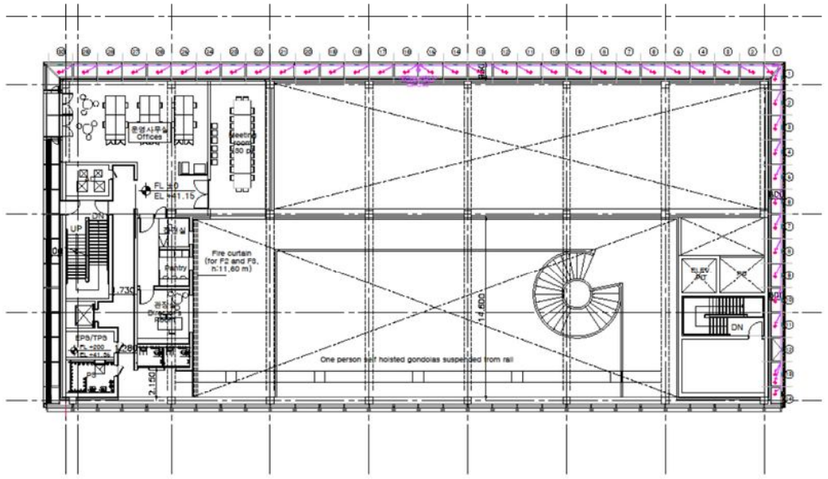
III.2.3. FLOOR PLANS. CIRCUITS – 02



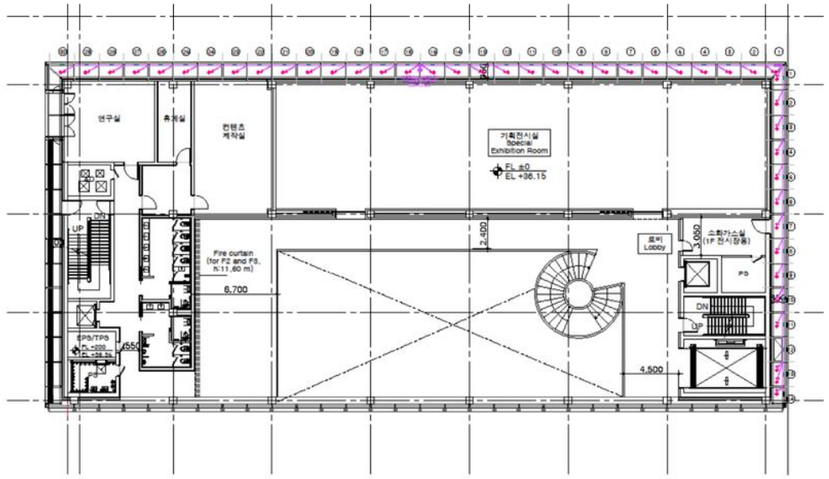
Media façade. Level H_20.50 m.
Plan. Circuits. Option 2. Phase 3
0 2 5 10
SCALE : A1 1/200
A3 1/400



Media façade. Level G_18.00 m.
Plan. Circuits. Option 2. Phase 3
0 2 5 10
SCALE : A1 1/200
A3 1/400



Media façade. Level F_15.50 m.
Plan. Circuits. Option 2. Phase 3
0 2 5 10
SCALE : A1 1/200
A3 1/400



Media façade. Level E_13.00 m.
Plan. Circuits. Option 2. Phase 3
0 2 5 10
SCALE : A1 1/200
A3 1/400



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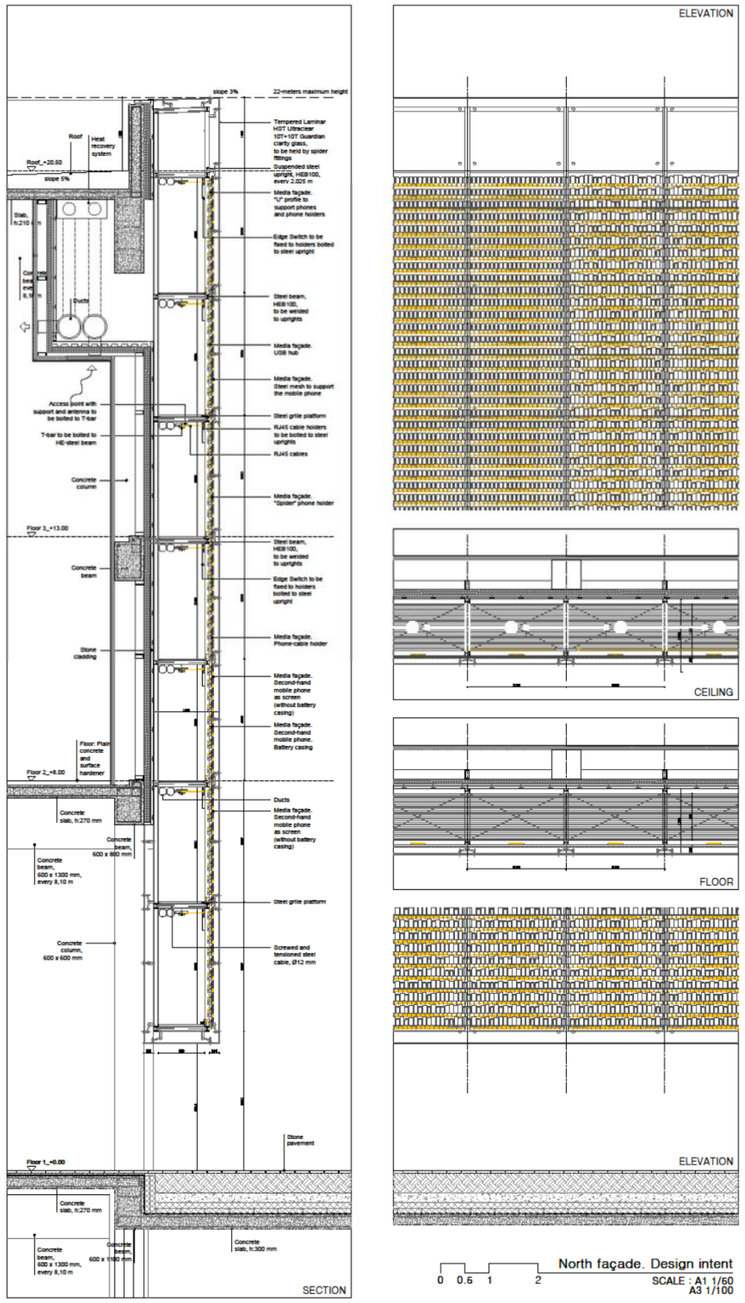
NO.	DESCRIPTION	DATE
Rev.	NAME	

PROJECT TITLE
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건립사업
기본 및 실시설계 용역

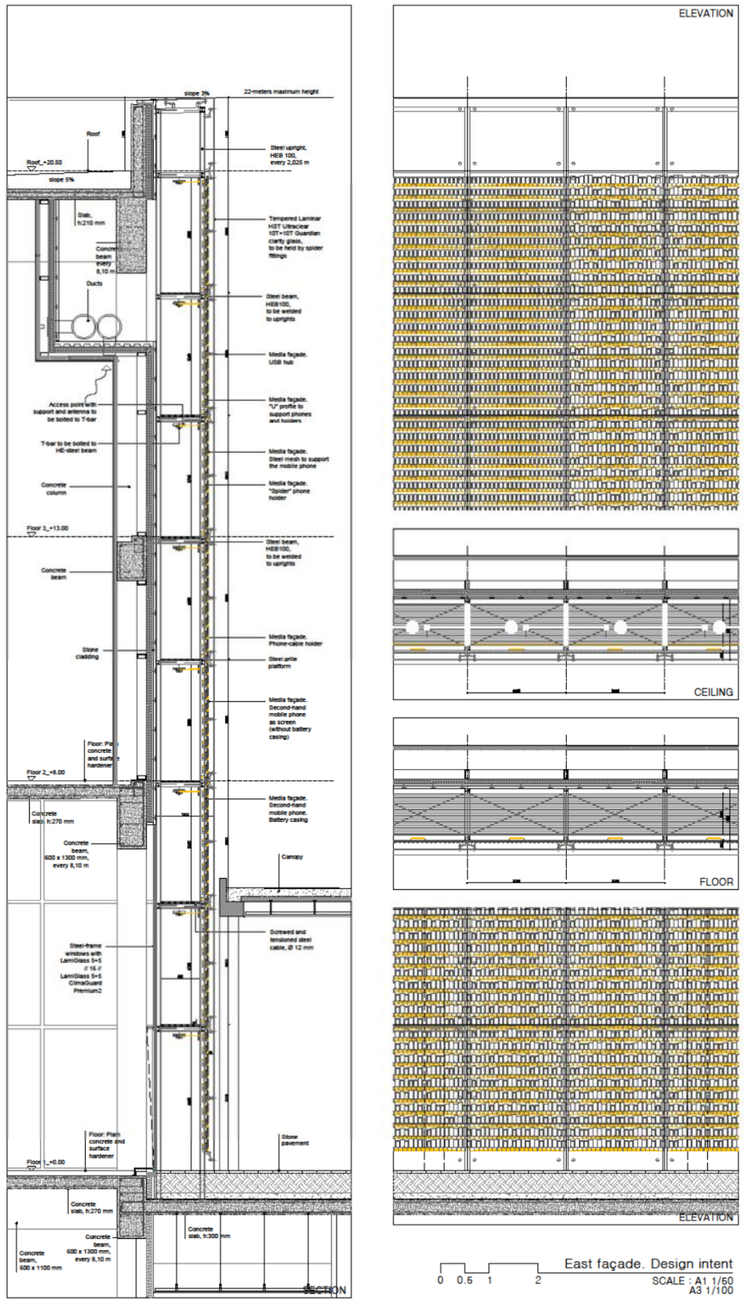
DRAWING TITLE
MEDIA FAÇADE.
FLOOR PLANS. CIRCUITS.
OPT.2, PHASE 3:
WITH ALL MOBILES AS SCREEN

DRAWN BY | APPROVED BY
SCALE A1 : 1/200 A3 : 1/400
DRAWING NO. 100 A-346

III.2.4. DESIGN INTENT.
NORTH FAÇADE



III.2.5. DESIGN INTENT.
EAST FAÇADE



PART III. PLANS

III.3 Legend and details of elements

Also:

A1 PDF´s attached with all circuit of facades.

A1 PDF´s attached with all detailed drawings of North and East facades and media façade arrangement.

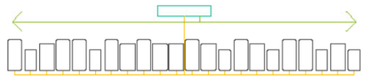
A1 PDF's attached with legend and details of elements.

OPTION 2

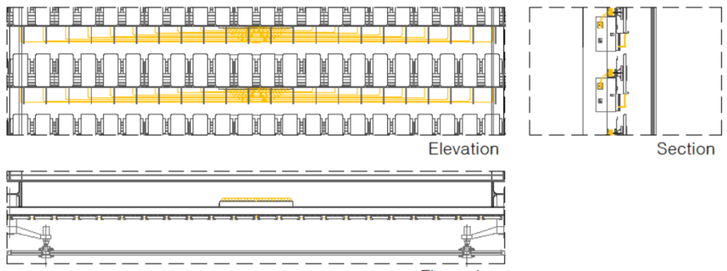
III.3.1. LEGEND AND DETAILS OF COMPONENTS

CIRCUIT A

LEGEND



DETAIL

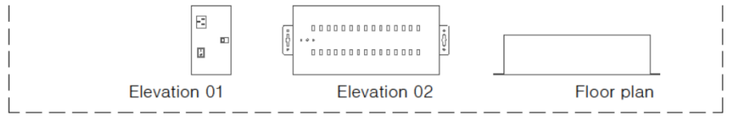


USB POWER HUB

LEGEND

HUB USB: Connected to 22 mobile phones

DETAIL



SCALE A1:1/5; SCALE A3:1/10

ACCESS POINT

LEGEND



Access Point
+ Antenna: Connected to one "Arreglo unit" (WIFI connection)

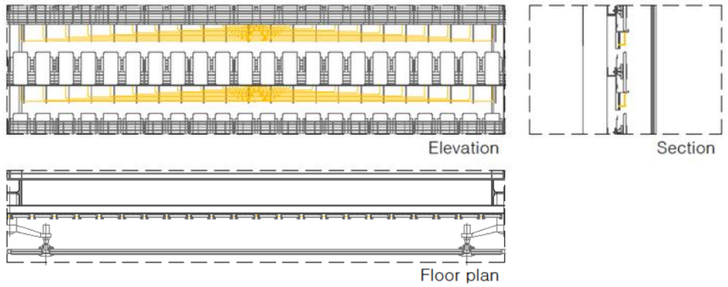
DETAIL

CIRCUIT B

LEGEND



DETAIL



EDGE SWITCH AND CORE SWITCH

Core Switch (in rack in technical room): Connected to Edge Points

LEGEND



Core Switch (in rack in technical room): Connected to Edge Points

DETAIL



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Rev.	NAME	

PROJECT TITLE
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기본 및 실시설계 용역

DRAWING TITLE
LEGEND AND DETAILS OF COMPONENTS

DRAWN BY | APPROVED BY

SCALE A1 : 1/10 A3 : 1/20

DRAWING NO. A-347

PART IV. ENERGY AND FIRE CONDITIONS

IV.1 Energy consumption of the media façade

OPTION 2, PHASE 2

IV.1.1. OPTION 2, PHASE 2: WITH 3 SCREENS

DEVICE	QUANTITY	CONSUMPTION (WATTS)	TOTAL (WATTS)
Access point	13	23	299
Switch	6	42	252
USB HUB	130	75	9750
TOTAL			10301

- Constant electricity consumption: 10301 W
- Annual electricity consumption (operating time of 10 hours*)

10301 W · 10 h · 365 days = 37598650 Wh = 37598.65 kWh

OPTION 2. PHASE 2
(2860 mobile phones)
ELECTRICITY CONSUMPTION:
37598.65 kWh (a year)

*Operating time of 10 hours: 8 hours, when mobile phone will be playing video plus 2 hours to consider the fact that mobile phone will not be playing video but they will be connected to electricity network.

Media façade system. Option 2.
Phase 2. Electricity consumption

OPTION 2, PHASE 3

IV.1.2. OPTION 2, PHASE 3: WITH ALL MOBILES AS SCREEN

DEVICE	QUANTITY	CONSUMPTION (WATTS)	TOTAL (WATTS)
Access point	318	23	7314
Switch	17	42	714
USB HUB	3180	76	238600
TOTAL			246628

- Constant electricity consumption: 246528 W
- Annual electricity consumption (operating time of 10 hours*)

246528 W · 10 h · 365 days = 899827200 Wh = 899827,20 kWh

OPTION 2. PHASE 3
(70000 mobile phones)
ELECTRICITY CONSUMPTION:
899827,20 kWh (a year)

*Operating time of 10 hours: 8 hours, when mobile phone will be playing video plus 2 hours to consider the fact that mobile phone will not be playing video but they will be connected to electricity network.

Media façade system. Option 2.
Phase 3. Electricity consumption

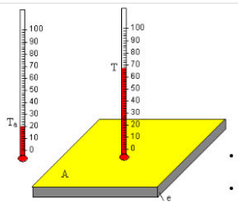
PART IV. ENERGY AND FIRE CONDITIONS

IV.2 Effect of sun exposure to telephones

IV.2 EFFECT OF SUN EXPOSURE TO TELEPHONES

TEMPERATURE FORESEEN ON NORTH AND EAST FAÇADE PHONES ON PEAK HOURS DURING SUMMER AND WITH AN AVERAGE RADIATION

In order to calculate the temperature foreseen on north and east façade phones on peak hours during summer and with an average radiation, this formula has been used:



Consideremos una placa de área A y espesor e, que está a la temperatura ambiente T_a. La superficie de la placa de área A está pintada de negro. En un instante dado, se expone al Sol que ilumina la placa con una intensidad constante de I W/m^2. Vamos a determinar la evolución de la temperatura T de la placa a medida que transcurre el tiempo.

Supondremos que:

- La superficie de la placa pintada de negro absorbe toda la energía solar que recibe, en cada segundo $I \cdot A$.
- Es aplicable la ley de enfriamiento de Newton, por lo que la placa pierde en cada segundo una energía $\alpha S(T-T_a)$.

Donde T es la temperatura de la placa, S es el área de la placa en contacto con el ambiente y α es un parámetro a determinar experimentalmente.

La variación de la temperatura T de la placa con el tiempo se obtiene integrando la ecuación diferencial de primer orden

$$mc\frac{dT}{dt} = -\alpha S(T - T_a) + I \cdot A$$

donde $m=\rho Ae$ es la masa de la placa y c es el calor específico y ρ la densidad del material que está hecha la placa.

$$\frac{dT}{dt} + kT = kT_\infty \qquad k = \frac{\alpha S}{\rho Acc} \qquad T_\infty = T_a + \frac{I}{\rho eck}$$

Integramos la ecuación diferencial de primer orden con la condición inicial siguiente: en el instante $t=0$, la temperatura de la placa es T_a.

$$T = (T_a - T_\infty)\exp(-kt) + T_\infty$$

Al cabo de un tiempo muy grande $t \to \infty$ la placa alcanza la máxima temperatura T_∞.

Ejemplo:

- Intensidad de la radiación solar I=700 W/m^2
- Temperatura ambiente T_a=20ºC
- Espesor de la placa e=2 mm
- Material aluminio: ρ=2700 kg/m^3 y c=880 J/(kgºC)
- La constante k=0.00277 s^{-1}

La máxima temperatura que alcanza la placa cuando se ilumina indefinidamente $t \to \infty$ es

$$T_\infty = T_a + \frac{I}{\rho eck} \qquad T_\infty = 20 + \frac{700}{2700 \cdot 0.002 \cdot 880 \cdot 2.77 \cdot 10^{-3}} = 73.1\,^{\circ}\mathrm{C}$$

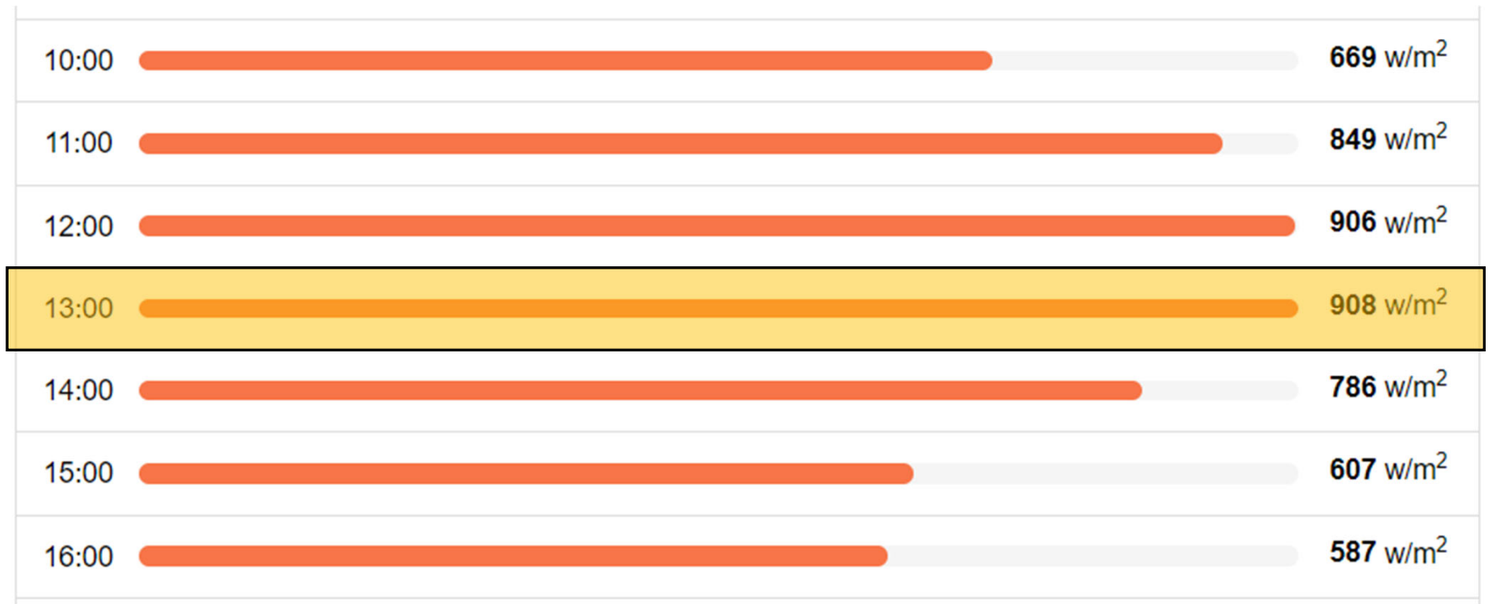
```
Ta=20; %temperatura inicial de la placa y ambiente
k=0.00277; %constante
I=700; %intensidad de la radiación incidente
e=0.002; %espesor de la placa
rho=2700; %densidad del aluminio
c=880; %calor especifico del aluminio
Tf=Ta+I/(rho*e*c*k); %temperatura final

t=0:10:2000;
T=(Ta-Tf)*exp(-k*t)+Tf;
plot(t,T,'b')
```

IV.2 EFFECT OF SUN EXPOSURE TO TELEPHONES

TEMPERATURE FORESEEN ON NORTH AND EAST FAÇADE PHONES ON PEAK HOURS DURING SUMMER AND WITH AN AVERAGE RADIATION

In order to obtain intensity of solar radiation, I (W/m2) on peak hours during summer, this web page has been looked at:
https://www.tutiempo.net/radiacion-solar/seul.html



This is the intensity of solar radiation in Seoul, on July 21st at 1:00 p.m.

IV.2 EFFECT OF SUN EXPOSURE TO TELEPHONES

TEMPERATURE FORESEEN ON NORTH AND EAST FAÇADE PHONES ON PEAK HOURS DURING SUMMER AND WITH AN AVERAGE RADIATION

INPUT DATA:

- Intensity of solar radiation, I: 908 W/m^2

- Media façade chamber temperature, T_a : 25 ºC

- Mobile phone thickness: 8,5 mm = 0,0085 m

- Glass:
  - Density, ρ: 2500 kg/m^3
  - Specific heat, c: 0,2 cal/gK = 837,36 J/kgºC

- Constant, k: 0,00277 s^{-1}

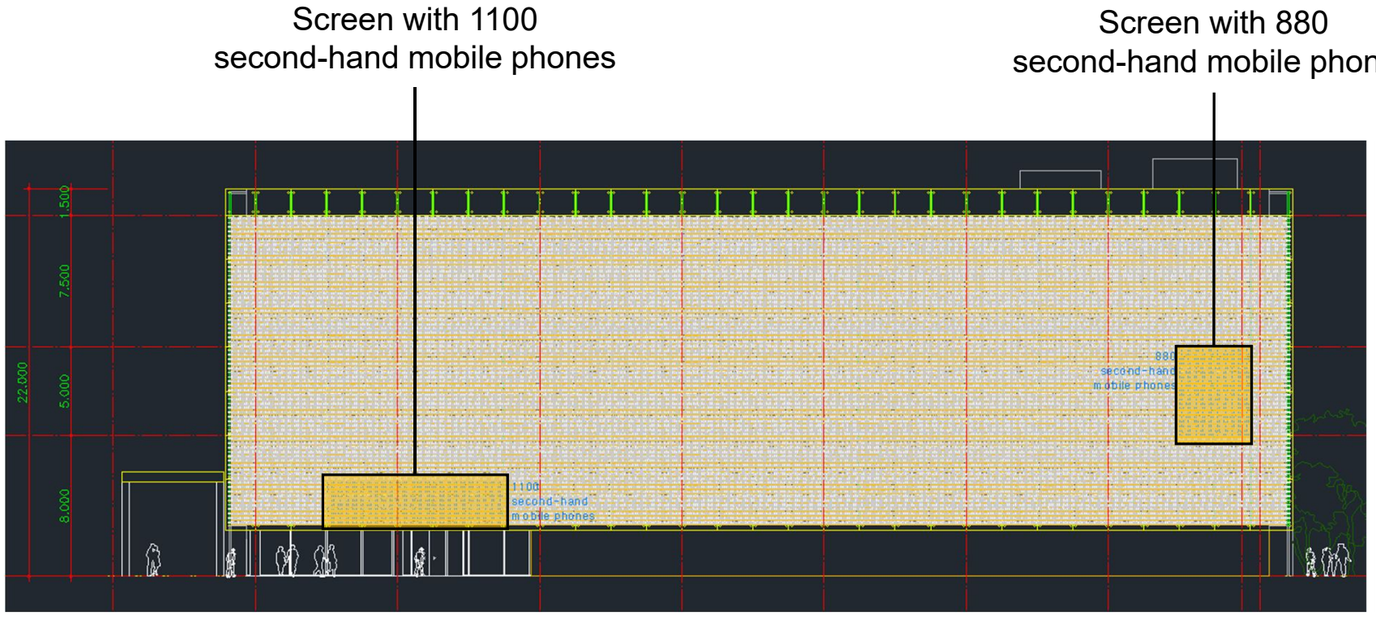
$$T_\infty = T_a + \frac{I}{\rho \cdot e \cdot c \cdot k} = \frac{908}{2500 \cdot 0{,}0085 \cdot 837{,}36 \cdot 0{,}00377} = 43{,}4\ ºC$$

When a mobile phone reaches its maximum allowable temperature, the system automatically turns off the mobile phone to prevent damage. Once the mobile phone has cooled down to a safe temperature, the phone can be turned back on and it will work again without any problem.

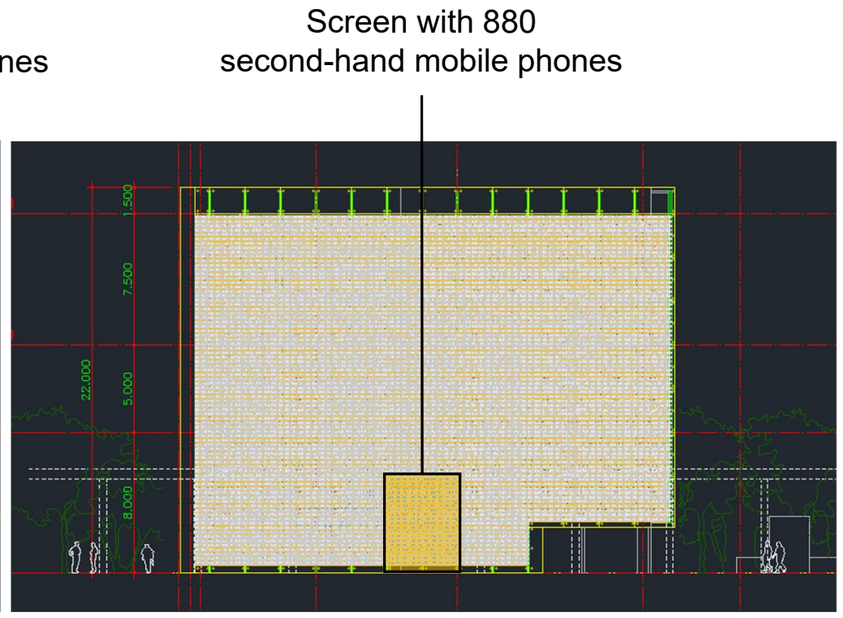
IV.2 EFFECT OF SUN EXPOSURE TO TELEPHONES

ABOUT THE LOCATION OF THE THREE SCREENS

In order to mitigate the risks derived from the exposure of mobile phones to solar radiation, we decided to locate the screens on the lower levels of the north façade, which will not receive solar radiation, and on the east façade under the canopy, which will protect it from sun.



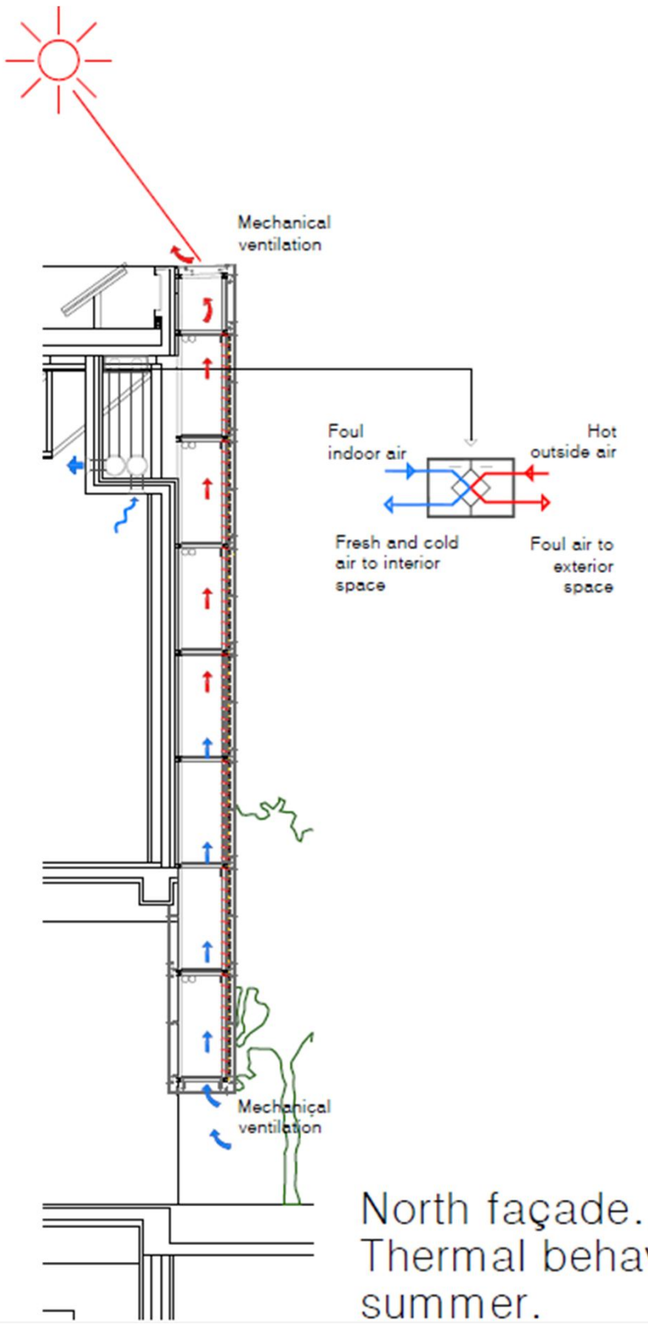
NORTH FAÇADE



EAST FAÇADE

IV.2 EFFECT OF SUN EXPOSURE TO TELEPHONES

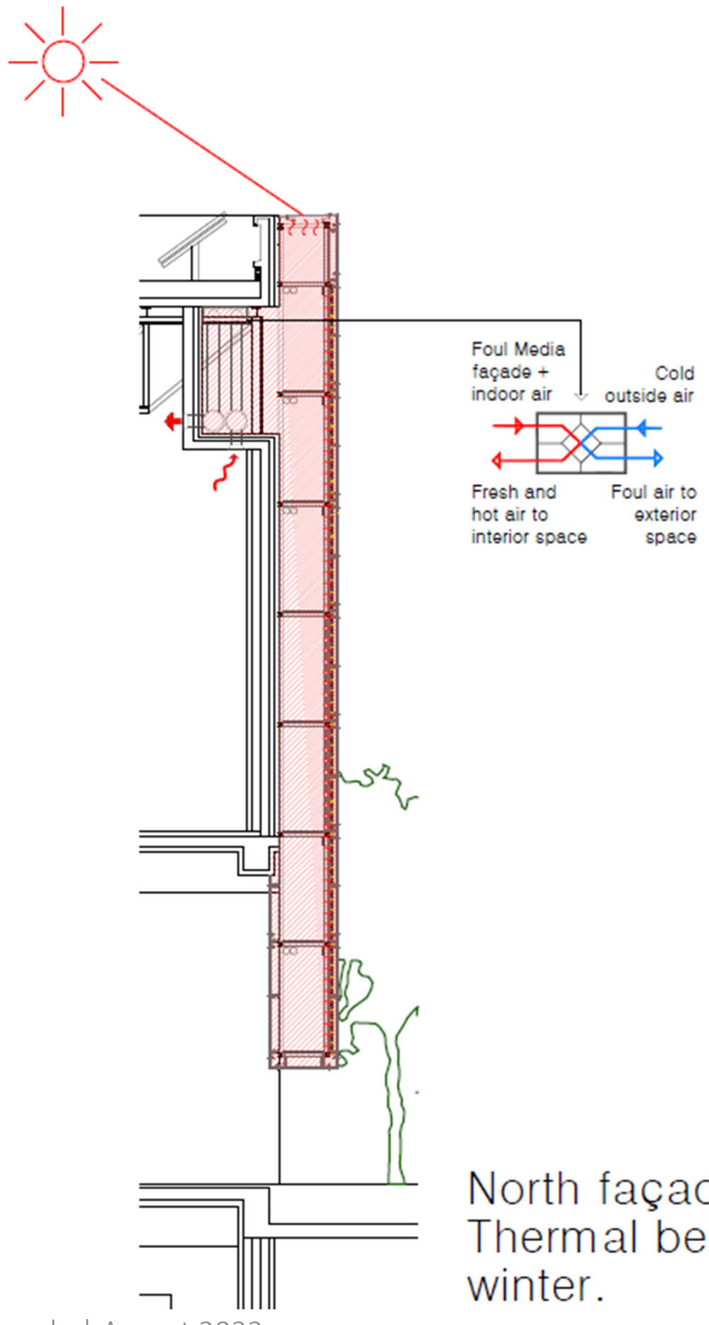
ABOUT THE ENERGY DISSPATION OF THE MEDIA FAÇADE



North façade.
Thermal behaviour, summer.

IV.2 EFFECT OF SUN EXPOSURE TO TELEPHONES

ABOUT THE ENERGY DISSPATION OF THE MEDIA FAÇADE



North façade.
Thermal behaviour,
winter.

PART IV. ENERGY AND FIRE CONDITIONS

IV.3 Fire detection and mitigation measures

IV.3. FIRE DETECTION AND MITIGATION MEASURES

In the even of fire there are several measures to detect and mitigate it:

1. In case a phone overheats, it has internal hardware that it switches off automatically.
2. In case a battery starts to swell, the Web platform and mobile phone management system will detect it. The app on the phone is able to detect a failure in the battery or if there is overheating in the phone, it can send an alarm to the web platform. This will happen when either voltage values or temperature values of the phones go beyond the normal functioning parameters.
3. There should be periodical visual inspections as a means to double check and control the correct functioning of the automatic detection system.
4. The maintenance gallery is separated from the interior of the building to mitigate fire entering the interior. This chamber is naturally and mechanically ventilated.
5. In the event of fire of a unit it is not likely that the fire will expand to neighbouring units.
6. There can be active mitigation systems through gas extinguishers.

Gas extinguishing systems

Gas fire extinguishing systems are fixed extinguishing systems that are installed in places where powder or water cannot be used. These are clean extinguishing systems that do not cause material or electrical damage and that fundamentally work in two ways, absorbing heat and reducing or eliminating oxygen in order to eliminate combustion. Gas extinguishing systems operate in a similar way to traditional water or water spray sprinklers. When the fire alarm is triggered, the sprinklers expel the gas that is in the installation and that is normally stored in pressurized containers. It is very important that everyone is evacuated beforehand, as some of these gases can be dangerous by reducing the oxygen level to almost zero.

Carbon dioxide CO_2, which reduces the amount of oxygen until the fire is extinguished. They are dangerous to people and need high concentrations.Inert gases: they displace oxygen until there is not enough value in the area to allow combustion. Indicated in electrical areas and produce a clean extinction, without residues. Fluorinated gases: they are used directly against fire and act by cooling the flame, requiring relatively low concentrations. Indicated for electrical risks where it is not possible to clean the goods and they have low toxicity for people.

PART IV. ENERGY AND FIRE CONDITIONS

IV.4 Risk of battery explosion

IV.4. RISK OF BATTERY EXPLOSION

1. In case a battery starts to swell, the Web platform and mobile phone management system will detect it. The app on the phone is able to detect a failure in the battery or if there is overheating in the phone, it can send an alarm to the web platform. This will happen when either voltage values or temperature values of the phones go beyond the normal functioning parameters. Due to the components of batteries used in mobile phones, there is a possible fire hazard. However, batteries do not degrade so quickly and as they do so, their physical characteristics change, which are easily identifiable visually. Mobile phone batteries can begin to be damaged due to an overcharge of energy due to internal damage to the mobile phone battery charging circuits. In this case the battery will begin to store more energy than it can and will begin to swell little by little, this process can last days or weeks depending on the amount of energy that is being sent to the battery; However, if this happens, the Web platform and mobile phone management software will detect this anomaly in a maximum time of one hour and will give an alarm to remove the mobile phone

2. In case the battery is damaged due to a not normal increase in temperature the Web platform and mobile phone management software will detect this anomaly in a maximum time of one hour and will give an alarm so that this mobile phone is removed.

3. Periodical inspections of the installation will allow to visually detect when a battery is starting to deteriorate and in this way the mobile phone can be removed in time.

PART V. MEASUREMENTS AND COST ESTIMATION

V.1 Option 2, Phase 2: With 3 screens

V.1 OPTION 2, PHASE 2: WITH 3 SCREENS

V.1.1. MEASUREMENTS

	unit	*quantity*
1. Second-hand mobile phone	each	70000
2. Mobile phone holder	each	70000
3. Micro USB cable holder for 11 USB type B cables	each	70000
4. USB Power HUB. ORICO ORICO IH30P-US-BK. 30-port USB 2.0 hub, industrial grade hub, supports high speed 480M/s, built-in 300W power supply, over current detection and protection. Function: Synchronization and charging; Output interface: Type-A USB2.0 x 30; Input Interface: Type-B USB2.0 x 1&90-130V AC IN x 1 Data Transmission; Format: STT Compatible Working Temperature: -40 to 85 C, -104 to 185 F; Dimensions: 320 x 140 x 81 mm, 12.6 x 5.5 x 3.1 inches Weight:1.5kg, 3.3lb;Relative Humidity: 5%-95%, non-condensing; Certification: CE/FCC/RoHS	each	130

V.1 OPTION 2, PHASE 2: WITH 3 SCREENS

V.1.1. MEASUREMENTS

	unit	*quantity*
5. Access Point. Xirrus XD4-240, 802.11ac High-Density Quad Radio AP's with Software-Defined Radios. Maximum power consumption of 46 Watts. Dimensions: 254mm (10 in); Weight: 1.043kg (2.3 lbs); Operating Temperature: 0°C to 50°C (32°F to 131°F); Humidity: 5-90% non-condensing; Certification: CE/FCC/RoHS	each	13
6. Antenna connected to Access Point	each	13
7. Edge Switch. Riverbed SteelConnect SDI-S48 POE+. Maximum power consumption is 42 Watts. Dimensions: 44.1 x 45.0 x 4.4 cm (17.4 x 15.9 x 1.7in); Weight: 5.95 kg (13.11lb); Relative humidity: 10-90% non-condensing for storage and operating conditions; Operating Noise (typical): 50db (50% of fan duty cycle) BTU: 143.3; Temperature Range: Operating: 0 to 45°C (32° to 113°F), Storage: -20 to 60°C (-4° to 140°F); Certification: CE/FCC/RoHS	each	5
8. Core Switch. Riverbed SteelConnect SDI-S48 POE+. Maximum power consumption is 42 Watts. Dimensions: 44.1 x 45.0 x 4.4 cm (17.4 x 15.9 x 1.7in); Weight: 5.95 kg (13.11lb); Relative humidity: 10-90% non-condensing for storage and operating conditions; Operating Noise (typical): 50db (50% of fan duty cycle) BTU: 143.3; Temperature Range: Operating: 0 to 45°C (32° to 113°F), Storage: -20 to 60°C (-4° to 140°F); Certification: CE/FCC/RoHS	each	1

V.1 OPTION 2, PHASE 2: WITH 3 SCREENS

V.1.1. MEASUREMENTS

	unit	*quantity*
9. Central PC Processor Manufacturer: Intel; Processor model: i9-11900K; Processor family: Intel Core i9-11xxx; Number of processor cores: 8; Processor frequency: 3.5GHz; Turbo Processor Frequency: 5.3GHz; Processor cache: 16MB; Processor cache type: SmartCache; Number of execution threads: 16; Thermal Design Power configurable-low: 95 W; Design power frequency thermal configurable-low: 3 GHz; Number of processors installed: 1 Internal memory type: DDR4-SDRAM; Internal memory: 64GB; Maximum internal memory: 64 GB; Memory Layout: 2 x 32GB; Memory slots: 2x DIMMs; Clock memory speed: 2933MHz. Discrete graphics adapter: SiGPU; Manufacturer (GPUgraphics processing) external: NVIDIA Graphics adapter template Discrete: NVIDIA GeForce RTX 3080; Discrete graphics memory type:GDDR6X; Adapter memory capacity graphic: 10GB; Number of graphics adapters discreet: 1; Built-in graphics adapter: Yes; Graphic adapter family Embedded: Intel® UHD Graphics; Graphics adapter template Embedded: Intel UHD Graphics 750; NVIDIA G-SYNC: Yes; CUDA: Yes. Integrated reading card: No; Total storage capacity: 5000UK; Storage drive: HDD+SSD Optical drive type: No; Total HDD Capacity: 4000GB; Number of HDDs installed: 2; HDD; Capacity: 2000GB; HDD interface: SATA; HDD Rotation Speed: 5400RPM; HDD size: 2.5“; Number of SSD drives installed: 1; SSD, capacity: 1000GB; SSD Interfaces: PCI Express; SSD Drive Form Factor: M.2 Ethernet : Yes. Number of USB 2.0 ports: 3.	each	1

V.1 OPTION 2, PHASE 2: WITH 3 SCREENS

V.1.1. MEASUREMENTS

	unit	*quantity*
10. Micro USB type B cables. Transfer rate: 480 Mbps Load: 5 Volts 3 Amps; Cable Diameter: 4.5mm; Weight: Depends on Cable Length; Colour: Yellow.	each	70000
11. RJ45 cable 0.5m (metre) Cat.6 network cable (compatible with earlier and later versions) | 2 RJ-45 connectors | Rubber jacketed connectors | High transmission speed with a working frequency up to 250 MHz; High transmission speed due to an operating frequency of up to 250 MHz; High-quality copper inner conductors / Halogen-free insulation / ROHS-compliant / 100 % sealed strain relief | Rubber jacket; Assignment according to EIA/TIA 568B | Backward and forward compatibility guaranteed: Cat.5e/Cat.5/Cat.7 / UTP compliant to EIA/TIA 568B standard; Suitable for 10/100/1000 MBit Gigabit networks | For connection of computers, game consoles, DSL modems, switches, routers, network sockets or patch panels within a 10/100/1000 Mbit network; Cable category: Category 6; Compatible with: Cat.5 Cat.5e Cat.7; Data transfer rate: 1 Gigabits per second Compliant specification: EIA, TIA, RoHS; Cable Diameter: 7mm; Weight: Depends on Cable Length; Colour: Yellow	each	20
12. RJ45 cable holder for up to 18 RJ45 cables	each	328

V.1 OPTION 2, PHASE 2: WITH 3 SCREENS

V.1.1. MEASUREMENTS

	unit	*quantity*
13. “U” profile, galvanized steel	kg	19561
14. T-bar, length: 3700 mm	each	200
15. Anchorings, fixings, screws, etcétera.		

V.1 OPTION 2, PHASE 2: WITH 3 SCREENS

V.1.2. COST ESTIMATION

MEDIA FAÇADE -ESTIMATED COST					
DESCRIPTION	QUANTITY	UNIT	PRICE (€)	AMOUNT (€)	INSTALLATION PRICE
Mobile phone	70000	each	0	0	140000
Mobile phone holder	70000	each	0,5	35000	56000
Micro USB cables holder	70000	each	0,5	35000	56000
USB Hub	130	each	25,5	3315	260
Access Point	13	each	1894,3	24625,9	52
Antenna	13	each	70	910	52
Edge Switch	5	each	4440,3	22201,5	33,33
Core Switch	1	each	4440,3	4440,3	6,67
Central PC	1	each	3783	3783	2000
Micro USB cables type B	70000	each	0,33	23100	28000
RJ45 cables	20	each	19,89	397,8	80
RJ45 cable holder	328	each	5,55	1820,4	1312
U-profile, galvanized and	19561	kg	2	39122	39122
Tee Bar 3700 mm long	200	each	5,91	1182	1333,33
Anchorings, fixings, screws, etcetera.				15000	15000
TOTAL (€)				209897,9	339251,33	**549149,23**

PART V. MEASUREMENTS AND COST ESTIMATION

V.2 Option 2, Phase 3: With all mobiles as screen

V.2 OPTION 2, PHASE 3: WITH ALL MOBILES AS SCREEN

V.2.1. MEASUREMENTS

	unit	*quantity*
1. Second-hand mobile phone	each	70000
2. Mobile phone holder	each	70000
3. Micro USB cable holder for 11 USB type B cables	each	70000
4. USB Power HUB. ORICO ORICO IH30P-US-BK. 30-port USB 2.0 hub, industrial grade hub, supports high speed 480M/s, built-in 300W power supply, over current detection and protection. Function: Synchronization and charging; Output interface: Type-A USB2.0 x 30; Input Interface: Type-B USB2.0 x 1&90-130V AC IN x 1 Data Transmission; Format: STT Compatible Working Temperature: -40 to 85 C, -104 to 185 F; Dimensions: 320 x 140 x 81 mm, 12.6 x 5.5 x 3.1 inches Weight:1.5kg, 3.3lb;Relative Humidity: 5%-95%, non-condensing; Certification: CE/FCC/RoHS	each	3180

V.2 OPTION 2, PHASE 3: WITH ALL MOBILES AS SCREEN

V.2.1. MEASUREMENTS

	unit	*quantity*
5. Access Point. Xirrus XD4-240, 802.11ac High-Density Quad Radio AP's with Software-Defined Radios. Maximum power consumption of 46 Watts. Dimensions: 254mm (10 in); Weight: 1.043kg (2.3 lbs); Operating Temperature: 0°C to 50°C (32°F to 131°F); Humidity: 5-90% non-condensing; Certification: CE/FCC/RoHS	each	318
6. Antenna connected to Access Point	each	318
7. Edge Switch. Riverbed SteelConnect SDI-S48 POE+. Maximum power consumption is 42 Watts. Dimensions: 44.1 x 45.0 x 4.4 cm (17.4 x 15.9 x 1.7in); Weight: 5.95 kg (13.11lb); Relative humidity: 10-90% non-condensing for storage and operating conditions; Operating Noise (typical): 50db (50% of fan duty cycle) BTU: 143.3; Temperature Range: Operating: 0 to 45°C (32° to 113°F), Storage: -20 to 60°C (-4° to 140°F); Certification: CE/FCC/RoHS	each	16
8. Core Switch. Riverbed SteelConnect SDI-S48 POE+. Maximum power consumption is 42 Watts. Dimensions: 44.1 x 45.0 x 4.4 cm (17.4 x 15.9 x 1.7in); Weight: 5.95 kg (13.11lb); Relative humidity: 10-90% non-condensing for storage and operating conditions; Operating Noise (typical): 50db (50% of fan duty cycle) BTU: 143.3; Temperature Range: Operating: 0 to 45°C (32° to 113°F), Storage: -20 to 60°C (-4° to 140°F); Certification: CE/FCC/RoHS	each	1

V.2 OPTION 2, PHASE 3: WITH ALL MOBILES AS SCREEN

V.2.1. MEASUREMENTS

	unit	*quantity*
9. Central PC Processor Manufacturer: Intel; Processor model: i9-11900K; Processor family: Intel Core i9-11xxx; Number of processor cores: 8; Processor frequency: 3.5GHz; Turbo Processor Frequency: 5.3GHz; Processor cache: 16MB; Processor cache type: SmartCache; Number of execution threads: 16; Thermal Design Power configurable-low: 95 W; Design power frequency thermal configurable-low: 3 GHz; Number of processors installed: 1 Internal memory type: DDR4-SDRAM; Internal memory: 64GB; Maximum internal memory: 64 GB; Memory Layout: 2 x 32GB; Memory slots: 2x DIMMs; Clock memory speed: 2933MHz. Discrete graphics adapter: SiGPU; Manufacturer (GPUgraphics processing) external: NVIDIA Graphics adapter template Discrete: NVIDIA GeForce RTX 3080; Discrete graphics memory type:GDDR6X; Adapter memory capacity graphic: 10GB; Number of graphics adapters discreet: 1; Built-in graphics adapter: Yes; Graphic adapter family Embedded: Intel® UHD Graphics; Graphics adapter template Embedded: Intel UHD Graphics 750; NVIDIA G-SYNC: Yes; CUDA: Yes. Integrated reading card: No; Total storage capacity: 5000UK; Storage drive: HDD+SSD Optical drive type: No; Total HDD Capacity: 4000GB; Number of HDDs installed: 2; HDD; Capacity: 2000GB; HDD interface: SATA; HDD Rotation Speed: 5400RPM; HDD size: 2.5“; Number of SSD drives installed: 1; SSD, capacity: 1000GB; SSD Interfaces: PCI Express; SSD Drive Form Factor: M.2 Ethernet : Yes. Number of USB 2.0 ports: 3.	each	1

V.2 OPTION 2, PHASE 3: WITH ALL MOBILES AS SCREEN

V.2.1. MEASUREMENTS

	unit	*quantity*
10. Micro USB type B cables. Transfer rate: 480 Mbps Load: 5 Volts 3 Amps; Cable Diameter: 4.5mm; Weight: Depends on Cable Length; Colour: Yellow.	each	70000
11. RJ45 cable 0.5m (metre) Cat.6 network cable (compatible with earlier and later versions) | 2 RJ-45 connectors | Rubber jacketed connectors | High transmission speed with a working frequency up to 250 MHz; High transmission speed due to an operating frequency of up to 250 MHz; High-quality copper inner conductors / Halogen-free insulation / ROHS-compliant / 100 % sealed strain relief | Rubber jacket; Assignment according to EIA/TIA 568B | Backward and forward compatibility guaranteed: Cat.5e/Cat.5/Cat.7 / UTP compliant to EIA/TIA 568B standard; Suitable for 10/100/1000 MBit Gigabit networks | For connection of computers, game consoles, DSL modems, switches, routers, network sockets or patch panels within a 10/100/1000 Mbit network; Cable category: Category 6; Compatible with: Cat.5 Cat.5e Cat.7; Data transfer rate: 1 Gigabits per second Compliant specification: EIA, TIA, RoHS; Cable Diameter: 7mm; Weight: Depends on Cable Length; Colour: Yellow	each	328
12. RJ45 cable holder for up to 18 RJ45 cables	each	328

V.2 OPTION 2, PHASE 3: WITH ALL MOBILES AS SCREEN

V.2.1. MEASUREMENTS

	unit	*quantity*
13. “U” profile, galvanized steel	kg	19561
14. T-bar, length: 3700 mm	each	200
15. Anchorings, fixings, screws, etcétera.		

V.2 OPTION 2, PHASE 3: WITH ALL MOBILES AS SCREEN

V.2.2. COST ESTIMATION

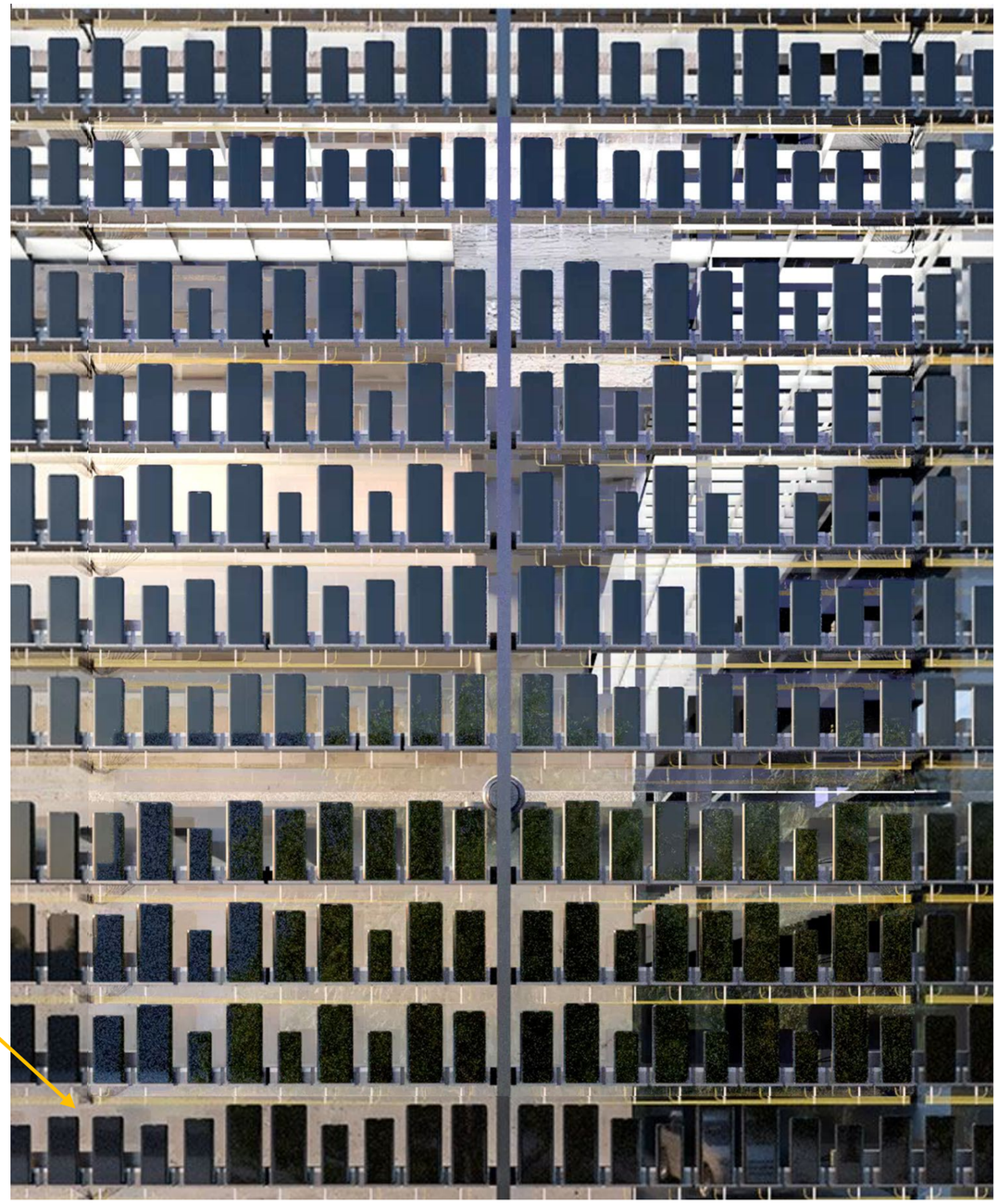
MEDIA FAÇADE -ESTIMATED COST						
DESCRIPTION	QUANTITY	UNIT	PRICE (€)	AMOUNT (€)	INSTALLATION PRICE	
Mobile phone	70000	each	0	0	140000	
Mobile phone holder	70000	each	0,5	35000	56000	
Micro USB cables holder	70000	each	0,5	35000	56000	
USB Hub	3180	each	25,5	81090	6360	
Access Point	318	each	1894,3	602387,4	1272	
Antenna	318	each	70	22260	1272	
Edge Switch	16	each	4440,3	71044,8	106,67	
Core Switch	1	each	4440,3	4440,3	6,67	
Central PC	1	each	3783	3783	2000	
Micro USB cables type B	70000	each	0,33	23100	28000	
RJ45 cables	328	each	19,89	6523,92	1312	
RJ45 cable holder	328	each	5,55	1820,4	1312	
U-profile, galvanized and	19561	kg	2	39122	39122	
Tee Bar 3700 mm long	200	each	5,91	1182	1333,33	
Anchorings, fixings, screws, etcetera.				15000	15000	
TOTAL (€)				941753,82	349096,67	**1290850,49**

PART VI. MEDIA FILES

PART VI. MEDIA FILES

VIDEO

CLICK TO
PLAY THE VIDEO



PART VI. MEDIA FILES

OPTION 2

RENDER



PART VI. MEDIA FILES

RENDER



<u>Screens:</u>

1. Under canopy: image, video and text
2. Entrance info
3. Large video imagery

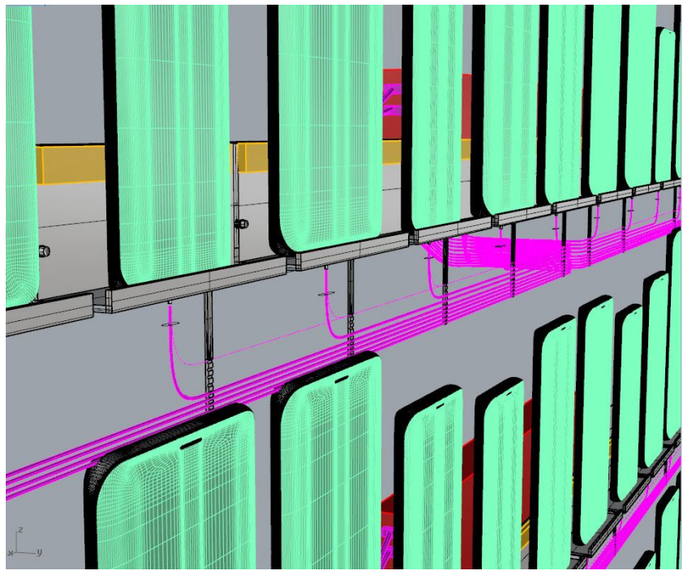
PART VI. MEDIA FILES

SCREENS OFF

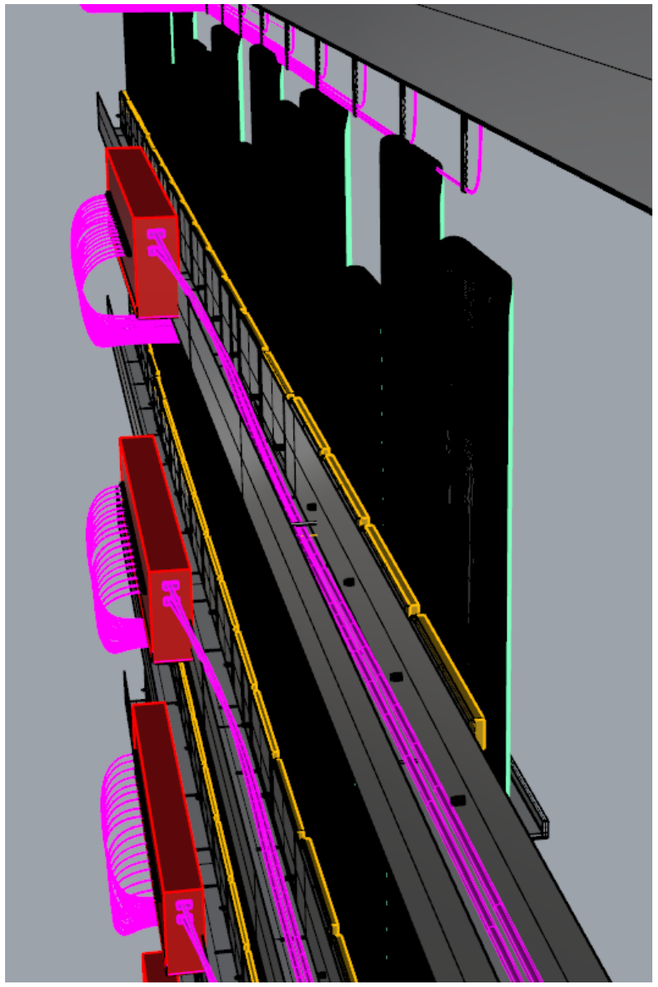


PART VI. MEDIA FILES

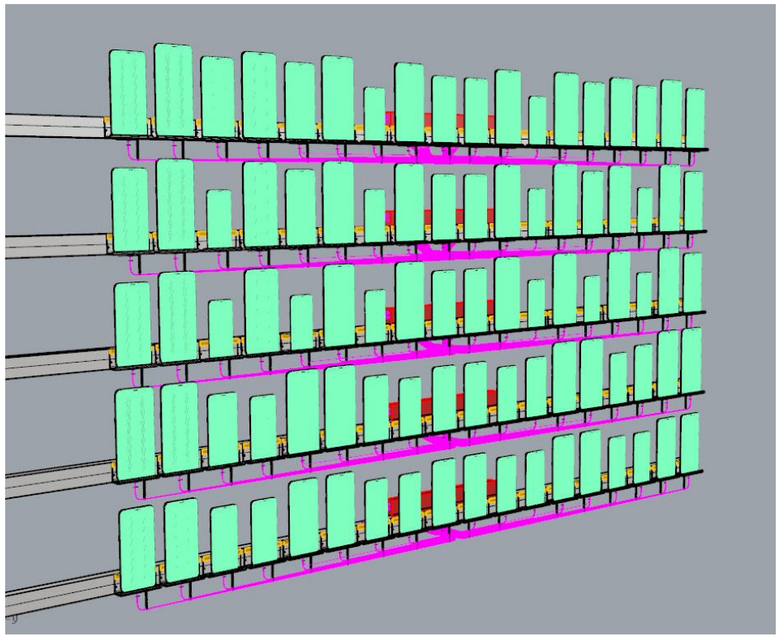
MODULE



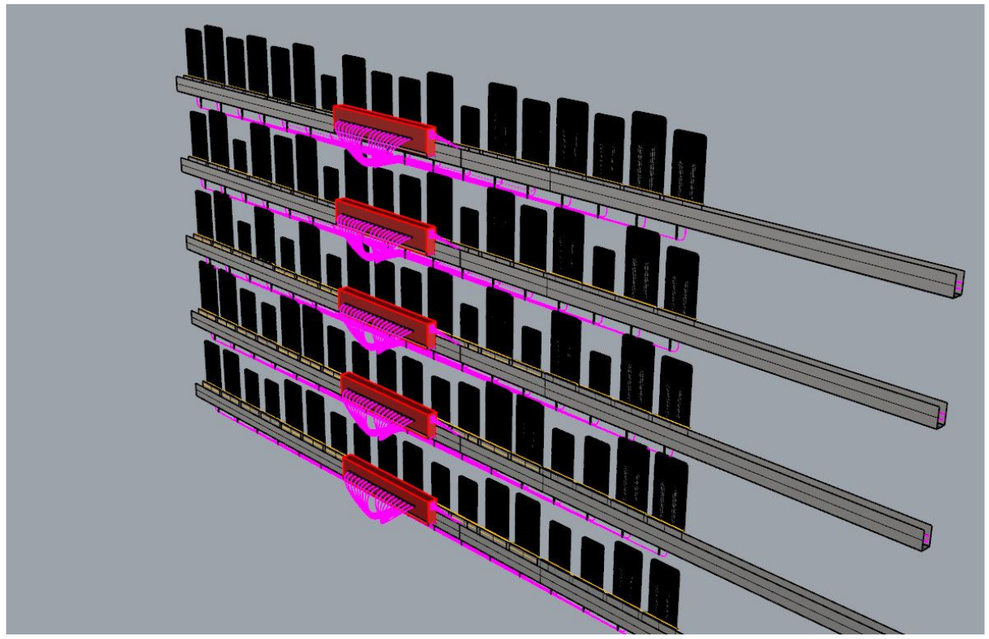
Detail



Detail circuit USB hubs and holders

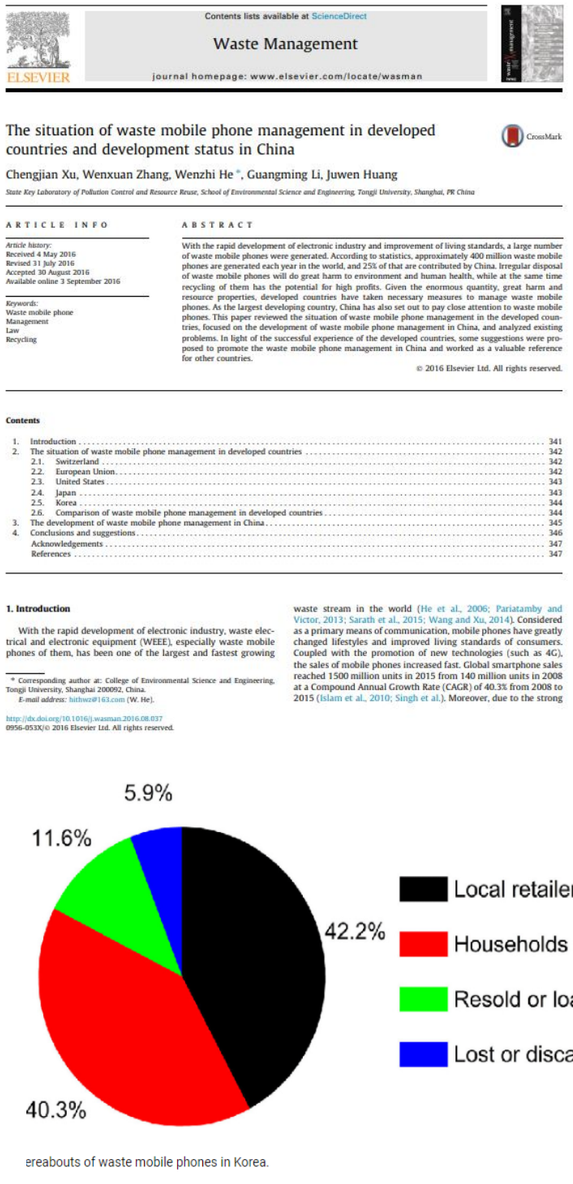


Prototype front



Prototype back

MARKETING PLAN



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The situation of waste mobile phone management in developed countries and development status in China

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ABSTRACT

With the rapid development of electronic industry and improvement of living standards, a large number of waste mobile phones were generated. According to statistics, approximately 400 million waste mobile phones are generated each year in the world, and 25% of that are contributed by China. Irregular disposal of waste mobile phones will do great harm to environment and human health, while at the same time recycling of them has the potential for high profits. Given the enormous quantity, great harm and resource properties, developed countries have taken necessary measures to manage waste mobile phones. As the largest developing country, China has also set out to pay close attention to waste mobile phones. This paper reviewed the situation of waste mobile phone management in the developed countries, focused on the development of waste mobile phone management in China, and analyzed existing problems. In light of the successful experience of the developed countries, some suggestions were proposed to promote the waste mobile phone management in China and worked as a valuable reference for other countries.

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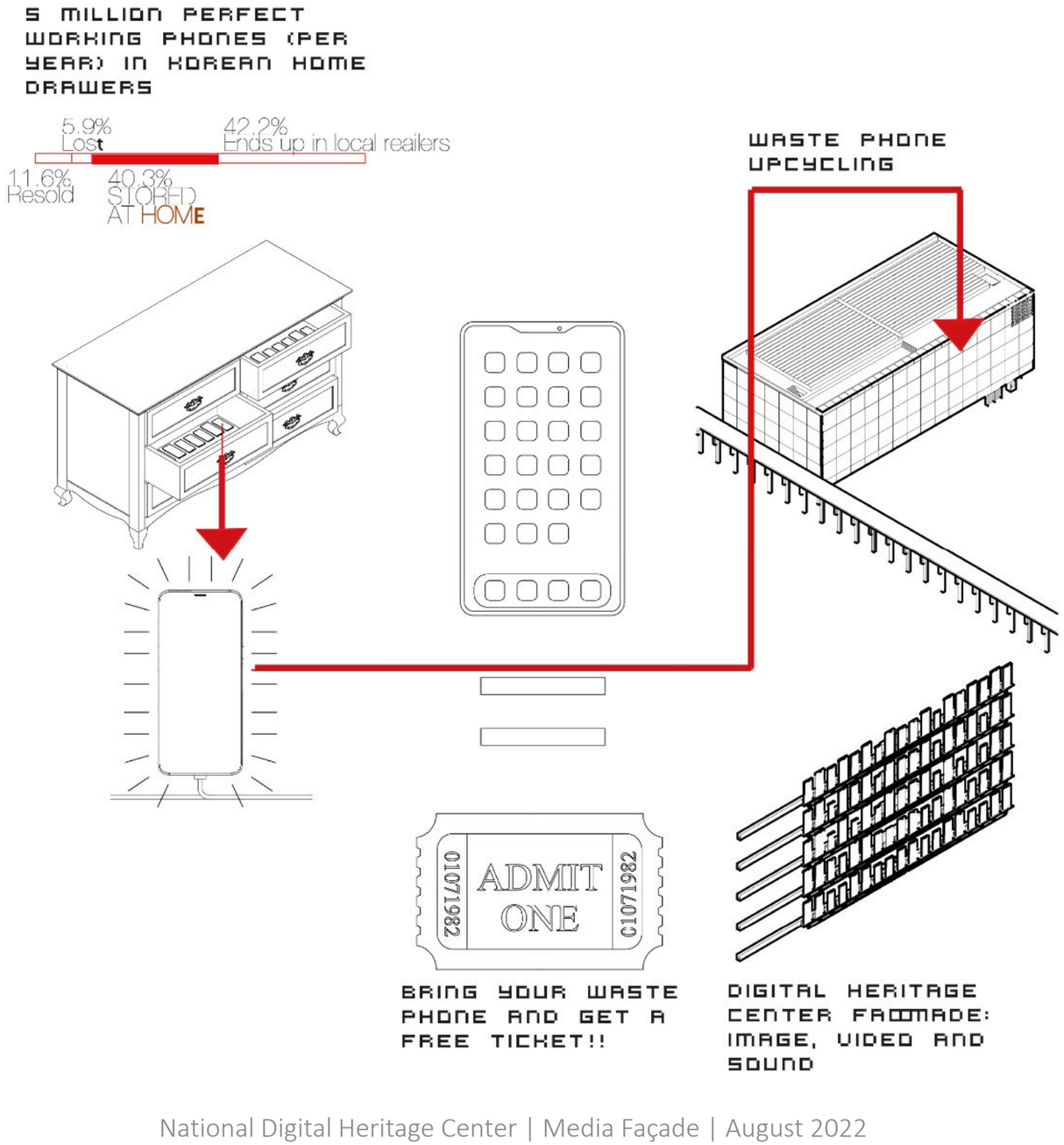
1. Introduction

With the rapid development of electronic industry, waste electrical and electronic equipment (WEEE), especially waste mobile phones of them, has been one of the largest and fastest growing waste stream in the world (He et al., 2006; Pariatamby and Victor, 2013; Sarath et al., 2015; Wang and Xu, 2014). Considered as a primary means of communication, mobile phones have greatly changed lifestyles and improved living standards of consumers. Coupled with the promotion of new technologies (such as 4G), the sales of mobile phones increased fast. Global smartphone sales reached 1500 million units in 2015 from 140 million units in 2008 at a Compound Annual Growth Rate (CAGR) of 40.3% from 2008 to 2015 (Islam et al., 2010; Singh et al.). Moreover, due to the strong

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ereabouts of waste mobile phones in Korea.



PART VI. MEDIA FILES

MOCK UP VIDEO

ATTACHED

PART VII. TECHNICAL SHEETS

VII.1 Access point

OPTION 2

VII. TECHNICAL SHEETS

VII.1. ACCESS POINT

Cambium Networks™ DATA SHEET

XD4 Wi-Fi 5 Indoor Access Points

802.11ac High-Density Quad Radio AP's with Software-Defined Radios

QUICK LOOK:

- **High-density quad-radio 802.11ac Wave 2 3x3 and 4x4 APs**
- **Software-defined radios enable all-5 GHz deployment**
- **Application visibility and control of 2,000+ apps**
- **EasyPass simplified Wi-Fi access**
- **SSO with Office 365 and Google G Suite**



DELIVER SUPERIOR PRICE-PERFORMANCE

Cambium Networks' quad-radio XD4 series High Density Access Points are the highest capacity Wi-Fi AP in the industry, delivering massive scalability to meet the demands of today's mobile users. These High Density APs feature a powerful multi-core integrated controller, application-level intelligence, automated provisioning, and cloud or on-premises management. XD4 High Density APs are ideal for providing robust wireless connectivity in areas of medium to high density such as 1:1 classrooms, lecture halls, meeting rooms, open floor office areas and for Internet of Things (IOT) sensor networks. These highly extensible APs easily integrate with third party software through standards-based JSON APIs and the XD4-240 with Bluetooth Low Energy (BLE) radio is built ready for advanced capabilities such as location services.

SOFTWARE-DEFINED FLEXIBILITY

Packed with performance, the XD4 dual-radio APs support Software-Defined Radios (SDR) to deliver up to four times the 5 GHz Wi-Fi capacity compared to competitive APs. Instantly boost performance with the click of a mouse to adapt to changing client devices and optimize the user experience.



EASY TO MANAGE

Combined with the Xirrus Management System (XMS), the XD4 series APs deliver complete visibility and control of the Wi-Fi network, including users, devices, applications, network traffic and the RF environment - all from a single console. Designed for simple deployment, zero-touch configuration gets your network up and running in just minutes.

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Cambium Networks™ DATA SHEET

XD4 High-Density Wi-Fi 5 Access Points

Access Point Specifications

	XD4-130	XD4-240
Radios	4 - 2.4 GHz / 5 GHz software-defined radios	4 - 2.4 GHz / 5 GHz software-defined radios
	3x3 11ac 1.3 Gbps	4x4 11ac 3.47 Gbps
	SU-MIMO	MU-MIMO: 16 Streams
Maximum Wi-Fi Bandwidth	5.2 Gbps	13.88 Gbps
Dedicated Wi-Fi Threat Sensor	Yes	Yes
Bluetooth Technology	n/a	Yes
Antennas	12 (internal)	16 (internal)
Max TX Power Per Radio (conducted)	2.4/5 GHz bands: 22.5 dBm	2.4/5 GHz bands: 24 dBm
Maximum Wi-Fi Backhaul	3.9 Gbps	10.4 Gbps
Maximum Associated Users	960	960
Wired Uplinks 802.3ad (AGGREGATE TRAFFIC), BROADCAST, LINK-BACKUP (FAILOVER), LOAD BALANCE, MIRRORED	2 - 1 GbE	1 - 2.5 GbE, 1 - GbE
Maximum Power Consumption	25.5 W (802.3at PoE)	46 W
Dimensions	254 mm (10 in)	254 mm (10 in)
Weight	1,134 g (2.5 lbs)	1,043 g (2.3 lbs)
Operating Temperature	0°C to 50°C (32°F to 131°F), 5-90% humidity, non-condensing	
Storage Temperature	-40°C to 70°C (-40°F to 158°F)	

Security	IEEE 802.11i WPA2, RSN	RFC 3280 Internet X.509 PKI certificate and CRL profile
	WPA	RFC 4347 Datagram transport layer security
	RFC 1321 MD5 Message-digest algorithm	RFC 4346 TLS protocol version 1.1
	RFC 2246 TLS protocol version 1.0	

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OPTION 2

VII. TECHNICAL SHEETS

VII.1. ACCESS POINT

Cambium Networks™ DATA SHEET

XD4 High-Density Wi-Fi 5 Access Points

Access Point Specifications cont'd

Regulatory Compliance	EMC, Safety and Wireless	**Channel Support 2.4 GHz** (BASED UPON COUNTRY CODE SELECTIONS)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
	FCC CFR 47 Part 15, Class B	**Channel Support 5 GHz** (BASED UPON COUNTRY CODE SELECTIONS)	U-NII-1 – Non-DFS channels
	ICES-003 Class B		36 40 44 48
	FCC Subpart C 15.247		U-NII-2A DFS channels
	FCC Subpart E 15.407		52 56 60 64
	RSS-247		U-NII-2C DFS channels
	EN 301 893		100 104 108 112 116 120 124 128 132 136 140 144
	EN 300 328		U-NII-3 Non-DFS channels
	EN 301 489 1 & 17		149 153 157 161 165
	EN 62311		
	EN 55022 (CISPR 22)		
	AS/NZS4268 + CISPR22		
	SAFETY		
	IEC 60950-1		
	EN 60950-1		
	UL 60950-1		
	CSA 22.2 No.60950-1A		
	AS/NZS 60950.1		
	Air handling space (UL 2043)		

Cambium Networks™ DATA SHEET

XD4 High-Density Wi-Fi 5 Access Points

Network Specifications

WLAN	16 SSIDs	**IPv6 Support** (IN CLI ONLY)	IPv4 and IPv6 dual-stack client support
Max VLAN	64		IPv6 only network
RF Management	Dynamic channel configuration		Increase wireless device density through control of unnecessary IPv6 traffic over IPv4 only networks
	Dynamic cell size configuration		IPv6 functions: IP addressing, DNS, filters, application control, syslog, SNMP management, SSH
	Monitor radio for threat assessment and mitigation		Telnet, FTP, DHCP clients
	Wired and Wireless RMON / Packet Captures	**RFC Support**	RFC 768 UDP
	Radio assurance for radio self test and healing		RFC 791 IP
	RF monitor		RFC 2460 IPV6 (Bridging only)
	2.4 & 5 GHz Honeypot Control – Increase available 2.4 & 5 GHz wireless device density through management of spurious 2.4 & 5 GHz association traffic.		RFC 792 ICMP
			RFC 793 TCP
	Re-use and increase wireless device density through tight power controls		RFC 826 ARP
High Availability	Supports hot stand-by mode for mission-critical areas		RFC 1122 Requirements for internet hosts – communication layers
Environmentally Friendly	Supports ability to turn off radios based on schedule configuration		RFC 1542 BOOTP
			RFC 2131 DHCP
		Encryption Types	Open, WEP, TKIP-MIC: RC4 40, 104 and 128 bits
			SSL and TLS: RC4 128-bit and RDA 1024 and 2048 bit

Authentication	IEEE 802.1x	RFC 5281 EAP-TTLS
	RFC 2548 Microsoft vendor-specific RADIUS attributes	RFC 2284 EAP-GTC
	RFC 2716 PPP EAP-TLS	RFC 4186 EAP-SIM
	RFC 2865 RADIUS Authentication	RFC 3748 Leap Passthrough
	RFC 2866 RADIUS Accounting	RFC 3748 Extensible Authentication Protocol
	RFC 2867 Tunnel Accounting	Web Page Authentication
	RFC 2869 RADIUS Extensions	WPR, Landing Page, Redirect
	RFC 3576 Dynamic Authorizations extensions to RADIUS	Support for Internal WPR, Landing Page and Authentication
	RFC 3579 RADIUS Support for EAP	Support for External WPR, Landing Page and Authentication
	RFC 3748 EAP-PEAP	Support for Xirrus EasyPass Access Services
	RFC 5216 EAP-TLS	

OPTION 2

VII. TECHNICAL SHEETS

VII.1. ACCESS POINT

XD4 High-Density Wi-Fi 5 Access Points

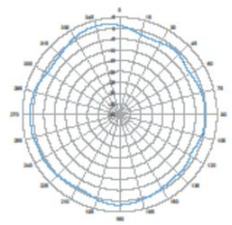
Management

Management Interfaces	Command line interface	Xirrus Management System (XMS) XMS-Cloud XMS-Enterprise
	Web interface (http / https)	
Management	SNMP v1, v2c, v3	RFC 2819 Remote Network Monitoring Management Information Base
	RFC 854 Telnet	RFC 2863 The Interface Group MIB
	RFC 1155 Management Information for TCP/IP Based Internets	RFC 3164 BSD Syslog Protocol
	RFC 1156 MIB	RFC 3414 User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
	RFC 1157 SNMP	RFC 3416 Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)
	RFC 1212 Concise MIB Definitions	RFC 3417 Transport Mappings for the Simple Network Management Protocol (SNMP)
	RFC 1213 SNMP MIB II	RFC 3418 Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
	RFC 1215 A Convention for Defining Traps for use with the SNMP	RFC 3584 Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework
	RFC 1350 TFTP	RFC 3636 Definitions of Managed Objects for IEEE Xirrus Private MIBs
	RFC 1643 Ethernet MIB	Integration with Splunk for accurate search and analysis of intra-organizational IT events
	RFC 2030 Simple Network Time Protocol SNTP	Netflow Export v9 and IPFIX compatibility allows for IP traffic statistics collection
	RFC 2578 Structure of Management Information Version 2 (SMIv2)	RFC 6455 Two way WebSocket based communication protocol
	RFC 2579 Textual Conventions for SMIv2	STOMP Simple Text-Oriented Message Protocol for message-oriented middleware
	RFC 2616 HTTP 1.1	
	RFC 2665 Definitions of Managed Objects for the Ethernet-Like Interface Types	
	RFC 2674 Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and Virtual LAN Extensions	

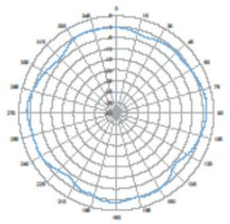
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XD4 High-Density Wi-Fi 5 Access Points

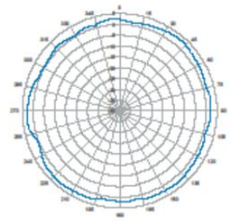
Antenna Patterns for XD-240



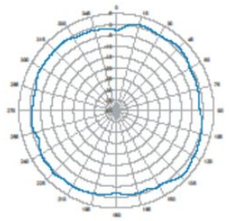
2.4 GHz Azimuth



2.4 GHz Elevation



5 GHz Azimuth



5 GHz Elevation

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OPTION 2

VII. TECHNICAL SHEETS

VII.1. ACCESS POINT

XD4 High-Density Wi-Fi 5 Access Points

Receive Sensitivity[2]

2.4 GHz	XD4-130	XD4-240
802.11b		
1 Mbps	-93	-95
11 Mbps	-80	-88
802.11g		
6 Mbps	-93	-93
54 Mbps	-80	-75
802.11n HT20		
MSC0	-93	-91
MSC7	-79	-72
802.11n HT40		
MSC0	-93	-88
MSC7	-77	-69

5 GHz	XD4-130	XD4-240
802.11a		
6 Mbps	-92	-89
54 Mbps	-78	-74
802.11n HT20		
MSC0	-93	-90
MSC7	-75	-71
802.11n HT40		
MSC0	-91	-87
MSC7	-73	-68
802.11ac VHT20		
MSC0	-91	-90
MSC9	-67	-66
802.11ac VHT40		
MSC0	-88	-87
MSC9	-66	-61
802.11ac VHT80		
MSC0	-86	-84
MSC9	-64	-58
802.11ac VHT160		
MSC0		
MSC9		

1 Composite antenna pattern of 4 directional antennas
2 Single radio chain

XD4 High-Density Wi-Fi 5 Access Points

Standards

	XD4-130	XD4-240
Wi-Fi Protocols	802.11 a/b/g/n/ac - Wave 1	802.11 a/b/g/n/ac - Wave 2
	IEEE 802.11a, 802.11ac, 802.11b, 802.11d, 802.11e, 802.11g, 802.11h, 802.11i, 802.11j, 802.11k, 802.11n, 802.11w	
	IEEE 802.3 10BASE-T, IEEE 802.3.u 100BASE-TX , 1000BASE-T, 802.3ab 1000BASE-T	
	IEEE 802.1q – VLAN tagging	
	IEEE 802.3ad– Link aggregation	
	IEEE 802.1d – Spanning tree	
	IEEE 802.1p – Layer 2 traffic prioritization	
	IPv6 Control – Increase wireless device density through control of unnecessary IPv6 traffic on IPv4-only networks	
	DHCP option 82	
Modulation	DSSS\BPSK\QPSK\16-QAM\64-QAM\256-QAM	
Wired Protocols	IEEE 802.3 10BASE-T, IEEE 802.3.u 100BASE-TX , 1000BASE-T, 802.3ab 1000BASE-T	
	IEEE 802.1q – VLAN tagging	
	IEEE 802.3ad – Link aggregation	
	IEEE 802.1d – Spanning tree	
	IEEE 802.1p – Layer 2 traffic prioritization	
	IPv6 Control – Increase wireless device density through control of unnecessary IPv6 traffic on IPv4-only networks	
	DHCP option 82	

Ordering Information

XD4-130	Xirrus Indoor 3x3 AP. 11ac Wave 2, 5 GHz + one SDR (2.4/5 GHz). Internal antennas
XD4-130-US	Xirrus Indoor 3x3 AP. 11ac Wave 2, 5 GHz + one SDR (2.4/5 GHz). Internal antennas, US
XD4-130-EU	Xirrus Indoor 3x3 AP. 11ac Wave 2, 5 GHz + one SDR (2.4/5 GHz). Internal antennas, EU
XD4-130-CA	Xirrus Indoor 3x3 AP. 11ac Wave 2, 5 GHz + one SDR (2.4/5 GHz). Internal antennas, CA
XD4-240	Xirrus Indoor 4x4 AP. Dual 11ac Wave 2 SDR radios (2.4/5 GHz). Internal antennas
XD4-240-US	Xirrus Indoor 4x4 AP. Dual 11ac Wave 2 SDR radios (2.4/5 GHz). Internal antennas, US
XD4-240-EU	Xirrus Indoor 4x4 AP. Dual 11ac Wave 2 SDR radios (2.4/5 GHz). Internal antennas, EU
XD4-240-CA	Xirrus Indoor 4x4 AP. Dual 11ac Wave 2 SDR radios (2.4/5 GHz). Internal antennas, CA

OPTION 2

VII. TECHNICAL SHEETS

VII.1. ACCESS POINT

Cambium Networks™ DATA SHEET

XD4 High-Density Wi-Fi 5 Access Points

Cambium XMS and Support Ordering Information	
XMSC-SUB-2R-1	XMS-Cloud 1-year subscription: 2-radio AP with EasyPass Guest Self-Registration and Guest Ambassador modules and Cambium Care Advanced Support
XMSC-SUB-2R-3	XMS-Cloud 3-year subscription: 2-radio AP with EasyPass Guest Self-Registration and Guest Ambassador modules and Cambium Care Advanced Support
XMSC-SUB-2R-5	XMS-Cloud 5-year subscription: 2-radio AP with EasyPass Guest Self-Registration and Guest Ambassador modules and Cambium Care Advanced Support
EASY-SUB-2R-1	EasyPass 1-year subscription for a 2-radio AP operating with XMS-Cloud or XMS-Enterprise
EASY-SUB-2R-3	EasyPass 3-year subscription for a 2-radio AP operating with XMS-Cloud or XMS-Enterprise
EASY-SUB-2R-5	EasyPass 5-year subscription for a 2-radio AP operating with XMS-Cloud or XMS-Enterprise
CCADV-SUP-XD4-1	Cambium Care Advanced, 1-year support for one XD4 Wireless AP. 24x7 TAC support, SW updates, and NBD advance replacement for HW
CCADV-SUP-XD4-3	Cambium Care Advanced, 3-year support for one XD4 Wireless AP. 24x7 TAC upport, SW updates, and NBD advance replacement for HW
CCADV-SUP-XD4-5	Cambium Care Advanced, 5-year support for one XD4 Wireless AP. 24x7 TAC support, SW updates, and NBD advance replacement for HW
CCPRO-SUP-XD4-1	Cambium Care Pro, 1-year support for one XD4 Wireless AP. 24x7 TAC support, SW updates
CCPRO-SUP-XD4-3	Cambium Care Pro, 3-year support for one XD4 Wireless AP. 24x7 TAC support, SW updates
CCPRO-SUP-XD4-5	Cambium Care Pro, 5-year support for one XD4 Wireless AP. 24x7 TAC support, SW updates

ABOUT CAMBIUM NETWORKS

Cambium Networks empowers millions of people with wireless connectivity worldwide. Its wireless portfolio is used by commercial and government network operators as well as broadband service providers to connect people, places and things. With a single network architecture spanning fixed wireless and Wi-Fi, Cambium Networks enables operators to achieve maximum performance with minimal spectrum. End-to-end cloud management transforms networks into dynamic environments that evolve to meet changing needs with minimal physical human intervention. Cambium Networks empowers a growing ecosystem of partners who design and deliver gigabit wireless solutions that just work.

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PART VII. TECHNICAL SHEETS

VII.2 Edge Switch and Core Switch

VII. TECHNICAL SHEETS

VII.2. EDGE SWITCH AND CORE SWITCH

Spec Sheet: SteelConnect
01.10.2017

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STEELCONNECT

Riverbed® SteelConnect™ is a next-generation software-defined networking and SD-WAN solution designed to revolutionize and transform networking in a cloud-centric world. SteelConnect unifies network connectivity and enables orchestration of application delivery across hybrid WANs, remote LANs, and cloud networks. Solution components include:

- SteelConnect Manager
- SteelConnect Gateway
- SteelConnect Switches
- SteelConnect Access Points

SteelConnect Gateway Model Specifications – Physical Appliances

Model	SDI-130/SDI-130W	SDI-330	SDI-1030
Use Case	Small branch or retail	Medium branch	Large branch
Recommended # of users	5-50 users	25-250 users	200-2000 users
Performance	25 Mbps VPN 50 Mbps VPN 100 Mbps VPN	50 Mbps VPN 100 Mbps VPN 200 Mbps VPN	200 Mbps VPN 1 Gbps VPN
Interfaces	2x GbE WAN ports 8x GbE LAN ports 2x WLAN (2.4/5 GHz, 2x2 MIMO, only SDI-130W) 1x USB 2.0 port	2x GbE WAN ports 8x GbE LAN ports 1x USB 2.0 port OLED status display	8x 1GbE RJ45 ports (LAN or WAN) 4x 10GbE SFP+ ports 10GbE Copper, SR or LR SFP+ orderable separately 1x USB 2.0 port 1x RJ45 Serial Port OLED status display
AC/DC Power	12V/2A DC power adapter (included)	100-240V 50/60Hz AC (built-in)	Dual Power Supplies (redundant & hot-swappable) 100-240V 50/60Hz AC (built-in)
Power (Watts)	10.8 / 11.4	13.2	80.5
BTU	36.8 / 38.9	45.0	274.7
Physical Design	Industrial design Snapdisc mount Desktop/wall mountable	Industrial design 1U rackmount	1U rackmount
Operating Acoustic noise (Typical)	N/A (fanless)	N/A (fanless)	Light Load: 42dB Full Load: 61dB
Relative Humidity	10-90% non-condensing for both storage & operating conditions	10-90% non-condensing for both storage & operating conditions NA (fanless)	10-90% non-condensing for both storage & operating conditions
System Dimensions	32.0 x 23.5 x 4.5cm (12.6 x 9.3 x 1.8in)	44.1 x 21.9 x 4.4cm (17.4 x 8.6 x 1.7in)	44.1 x 36.5 x 4.5 cm (17.36 x 14.37 x 1.8 in)
System Weight	0.8 kg (1.76lb)	3 kg (6.61lb)	6.3 kg (13.76 lb)

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Spec Sheet: SteelConnect
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Packaged Dimensions	52.4 x 26.8 x 7cm (20.63 x 10.55 x 2.75 in)	59.9 x 53.3 x 14cm (23.58 x 20.98 x 5.51 in)	66.6 x 53.3 x 14.0 cm (26.22 x 20.98 x 5.51 in)
Packaged Weight	1.9 kg (4.2 lb)	6.6 kg (14.6 lb)	10.7 kg (23.59 lb)
Temperature Range	Operating: 0 to 40°C (32 to 104°F) Storage: -20 to 60°C (-4 to 140°F)	Operating: 0 to 40°C (32 to 104°F) Storage: -20 to 60°C (-4 to 140°F)	Operating: 0 to 45°C (32 to 113°F) Storage: -20 to 60°C (-4 to 140°F)

Model	SDI-5030
Use Case	Campus or Data Center
Recommended # of users	Not Applicable
Performance	5 Gbps VPN [a]
Cluster Configuration	Minimum of 3 nodes (2+1) N+K set up N= active nodes K= spare nodes
Interfaces	2x 10GbE (RJ45) ports 4x 1GbE (RJ45) ports via IOM Slot 3x USB 2.0 ports 1x VGA port 1x Serial Console port 1x PCIe Slot (optional NICs can be purchased separately)
AC/DC Power	Dual Power Supplies (redundant & hot-swappable) 100-240V 50/60Hz AC (built-in)
Power (Watts)	285.0
BTU	972.5
Physical Design	1U Rackmount
Operating Acoustic noise (Typical)	70 db
Relative Humidity	50%-90% non-condensing with maximum wet bulb of 28 C.
System Dimensions	71.1 x 43.7 x 4.3cm (28.0 x 17.3 x 1.7in)
System Weight	15 kg (33 lb)
Packaged Dimensions	89.2 x 60.9 x 24.5cm (35.1 x 24.0 x 9.25 in)
Packaged Weight	19 kg (42 lb)
Temperature Range	Operating: 0 to 35°C (32 to 95°F) Storage: -40 to 70°C (-40 to 158°F)

Note:
(a) 5 Gbps VPN when using two or more Interfaces

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VII. TECHNICAL SHEETS

VII.2. EDGE SWITCH AND CORE SWITCH

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SteelConnect Gateway Model Specifications – Virtual

Model	SDI-VGW
Use Case	Virtual- and Cloud Environments
Recommended # of users	5-2500 users
Performance	VGW-LIC-BW010: 100Mbps VPN Hardware requirements: 1 CPU core @ 2.1 GHz (Intel E5-2600v4) 1GB DRAM & 200MB storage VGW-LIC: 2.5 Gbps VPN Hardware requirements: 4 CPU cores @ 3.0 GHz or 6 CPU cores @ 2.1 GHz (Intel E5-2600v4) 8GB DRAM & 2GB storage Actual performance will vary depending on hypervisor/virtualization & hardware platform design
Interfaces	3x 1GbE or 1x 10GbE WAN ports 8x LAN ports
Power	N/A
Physical Design	Compatible with VMware, KVM, Hyper-V, Citrix, Virtual Box, Amazon Web Services
Operating Acoustic noise (Typical)	N/A
Relative Humidity	N/A
System Dimensions	N/A
System Weight	N/A
Packaged Dimensions	N/A
Packaged Weight	N/A
Temperature Range	N/A

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Spec Sheet: SteelConnect
01.10.2017

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SteelConnect Switch Model Specifications

Model	SDI-S12 POE+	SDI-S24 POE+	SDI-S48 POE+
Use Case	Small branch or retail	Medium branch	Medium and large branch
Performance	30 Gbps switching capacity Non-blocking fabric Ultra-low latency	70 Gbps switching capacity Non-blocking fabric Ultra-low latency	130 Gbit/s switching capacity Non-blocking fabric Ultra-low latency
Interfaces	12x GbE PoE+ ports 4x GbE SFP ports	24x GbE PoE+ ports 4x 10GbE SFP+ ports OLED status display	48x GbE PoE+ ports 4x 10GbE SFP+ ports 2x QSFP ports (on the rear) [Stacking of no more than 3 S48 switches is recommended.] OLED status display
AC/DC Power	150W PoE Budget 180W Built-in power supply 100-240V 50/60Hz AC	270W PoE Budget 300W Built-in power supply 100-240V 50/60Hz AC	550W PoE Budget 2x 600W Built-in power supply (redundant & hot-swappable) 100-240V 50/60Hz AC
Power (Watts)	12.5	16.7	42.0
BTU	42.7	57.0	143.3
Physical Design	Industrial design Desktop/wall mountable 1U rackmount kit	Industrial design 1U rackmount kit	Industrial design 1U rackmount kit
Operating Acoustic noise (Typical)	N/A (fanless)	15.3dB (10% fan duty)	50db (50% fan duty)
Relative Humidity	10-90% non-condensing for both storage & operating conditions	10-90% non-condensing for both storage & operating conditions	10-90% non-condensing for both storage & operating conditions
System Dimensions	30.6 x 21.9 x 4.4 cm (12.0 x 8.6 x 1.7in)	44.1 x 30.5 x 4.4 cm (17.4 x 12.0 x 1.7in)	44.1 x 45.0 x 4.4 cm (17.4 x 15.9 x 1.7in)
System Weight	2 kg (4.41lb)	4.95 kg (10.91lb)	5.95 kg (13.11lb)
Packaged Dimensions	59.9 x 53.3 x 14 cm (23.58 x 20.98 x 5.51 in)	59.9 x 53.3 x 14 cm (23.58 x 20.98 x 5.51 in)	66.6 x 53.3 x 14 cm (26.22 x 20.98 x 5.51 in)
Packaged Weight	6.5 kg (14.4 lb)	8.4 kg (18.6 lb)	13.1 kg (28.9 lb)
Temperature Range	Operating: 0 to 45°C (32 to 113°F) Storage: -20 to 60°C (-4 to 140°F)	Operating: 0 to 45°C (32° to 113°F) Storage: -20 to 60°C (-4° to 140°F)	Operating: 0 to 45°C (32° to 113°F) Storage: -20 to 60°C (-4° to 140°F)

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VII. TECHNICAL SHEETS

VII.2. EDGE SWITCH AND CORE SWITCH

Spec Sheet: SteelConnect
01.10.2017

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SteelConnect Access Point Model Specifications

Model	SDI-AP5	SDI-AP5r
Radio Specification	1x 802.11g/n radio on 2.4 GHz 1x 802.11a/N/Ac radio on 5 GHz 1750 Mbps max rate 3x3 MIMO with 3 spatial streams Internal 3D sectorized antenna array 3x 4dBi on 2.4 GHz 3x 5dBi on 5.0 GHz	1x 802.11g/n radio on 2.4 GHz 1x 802.11a/N/Ac radio on 5 GHz 1750 Mbps max rate 3x3 MIMO with 3 spatial streams Omni-directional antennas (N-Type) 3x 5dBi on 2.4 GHz 3x 7dBi on 5 GHz
Interface	1x GbE port	2x GbE ports
AC/DC Power	802.3at Power-over-Ethernet	802.3at Power-over-Ethernet
	12V/2A DC power adapter (optional)	24W PoE Injector (optional)
Power (Watts) with power adapter	15.0	NA
BTU with power adapter	51.2	NA
Power (Watts) PoE	19.0	36.0
BTU PoE	64.8	122.8
Physical Design	Industrial design Snapdisc mount Desktop/wall/ceiling mountable	Industrial design Wall, pole mountable IP68-rated waterproof housing
Operating Acoustic noise (Typical)	N/A (fanless)	N/A (fanless)
Relative Humidity	10-90% non-condensing for both storage & operating conditions	10-90% non-condensing for both storage & operating conditions
System Dimensions	18.9 x 21.0 x 4.5cm (7.44 x 8.26 x 1.77in)	28.5 x 21.8 x 5.3cm (11.22 x 8.58 x 2.10in)
System Weight	0.9 kg (2.0 lb)	4 kg (8.8 lb)
Packaged Dimensions	26.0 x 26.0 x 6.5 cm (10.24 x 10.24 x 2.56 in)	39.0 x 26.0 13.0 cm (15.35 x 10.24 x 5.12 in)
Packaged Weight	1.04 kg (2.3 lb)	4.2 kg (9.2 lb)
Temperature Range	Operating: 0 to 40°C (32 to 104°F) Storage: -20 to 60°C (-4 to 140°F)	Operating: -20 to 70°C (-4 to 158°F) Storage: -30 to 80°C (-22 to 176°F)

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