

## **ELECTRICAL ENGINEERING DETAILED DESIGN REPORT**

**SOUTH AFRICAN REVENUE SERVICE – PRETORIA CBD ROR BUILDING - ELECTRICAL ENGINEERING  
SCOPE OF WORK AND DETAILED DESIGN**

JANUARY 2020

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## **1. EXECUTIVE SUMMARY**

The South African Revenue Service (SARS) received an Improvement Notice, from the Department of Labour, for its Pretoria ROR building. There were two issues addressed in the notice, of which one was an improvement required on the interior lighting of the building. SARS has therefore initiated a project to address the concerns raised in the notice.

The project will aim to;

- Redesign the lighting layout for the entire building
- Ensure compliance to SANS 10114-1 and OHS Act 85 of 1993
- Perform all necessary construction and installations for interior lighting

This report entails the electrical engineering scope of works and detailed design specifications.

## **2. ELECTRICAL WORKS**

The electrical works on this project will include interior lighting. This design will not take into account nor make provisions for Information and Communications Technology (ICT), and Technical Security.

Furthermore, as this is an existing site, some of the electrical works will include refurbishment and upgrades rather than new installations, i.e. some wiring may be re-used. There are some material or equipment that are reusable on this project, any material that needs to be re-used shall be presented to Physical Facilities' electrical engineer who will carefully analyse and if approved, the appointed service provider will continue with reinstallation.

The most delicate aspect of the electrical works, from a design point of view, is the design of the lighting in the office. The lighting design shall conform to the requirements of SANS 10114-1. Due to the existing building design, most of the electrical infrastructure will be surface-mount, unless the existing infrastructure is flush-mount, then it will be replaced with flush-mount.

### **3. DESIGN SPECIFICATIONS**

#### **3.1 Electrical Reticulation Requirements**

The following are high-level requirements for the wiring and reticulation, should it be required at any stage of this project;

- All wiring for small power shall be with 2.5mm<sup>2</sup> single core Slipdac or similar PVC insulated 600/1000V copper cable
- The colour coding for wiring shall be red (live), black (neutral), and green/yellow (earth)
- All unarmoured conductors shall be installed in conduits, cable channels (trunking) or power skirting and shall not be exposed under no circumstances
- A minimum diameter of 20mm conduit shall be used for each circuit, multiple circuits from the same distribution board may be installed on the same wire-way where possible
- Where grouping of multiple circuits is done on the same wire-way, the conductors of each circuit shall be taped together at intervals of 1m with PVC insulation tape. The conductors for different circuits shall remain separated in order to allow for any one of the circuit to be withdrawn when required
- Cable joints are not permitted. Where joints cannot be avoided, they shall be installed in cable channels (not in conduits), shall be soldered or alternatively consist of approved ferruling, and must be covered with heat-shrink sleeves (no insulation tape is allowed)

#### **3.2 Interior Lighting Requirements**

The following are high-level requirements for the installation of interior lighting;

- The mounting positions of luminaries shall be verified on site. All luminaries shall be placed symmetrically with respect to ceiling panels (where there are ceiling panels), battens, beams, columns or other architectural features of the space unless otherwise indicated. The layout as shown in the drawings shall generally be adhered to, but any discrepancies or clashes with structural or other features must be referred to SARS, before commencing erection of the installation.

- Cover plates shall be fitted over all draw-boxes and outlets intended for luminaries that are not covered by the luminaries' canopy, lamp-holder, ceiling rose or similar accessories.
- Where an outlet box or draw-box provides the necessary support for a luminaries, all luminaries with the exception of fluorescent luminaries mounted against ceilings, shall be fixed directly to the box. Fluorescent luminaries and luminaries with a mass in excess of 10kg shall however be suspended independently of the outlet box.
- Where provision has not been made for the fixing of luminaries, the Contractor shall supply the necessary supports, hangers, conduit extensions, angle brackets or any other fixing method approved by the Department.
- The necessary hangers shall be provided where luminaries, which are of the non-suspension type, have to be fixed below false ceilings or roof slabs. The use of 20mm conduits fixed to the roof slab or ceiling is preferred. Provision shall be made for adjustments to enable the levelling of luminaries. Suspended conduits shall be fixed to the ceiling by means of screwed dome lids, bolts and nuts. Ball-and-spigot type dome lids shall be used where conduit lengths exceed 600mm. Wiring shall be installed in the conduit hangers.
- Luminaries (especially fluorescent luminaries) may also be suspended from ceilings by means of suspended metal channels. The metal channel may be supported by conduits or threaded rods. Should metal rods be utilised, these shall be screwed to anchor bolts fixed in the roof slab. Wiring shall either be installed in conduits fixed to the metal channel or in the metal channels and covered with a suitable cover plate. Purpose-made clamps shall be used to fix the luminaries to the cable channel.
- Where wooden blocks are used to suspend luminaries, ceiling battens shall not be cut. The wooden blocks shall be cut to fit around battens and shall be screwed to the ceiling. Battens may however be cut where fluorescent or incandescent luminaries with metal canopies have to be installed against a false ceiling.
- Unless specified to the contrary, suspended glass-bowl luminaries shall be installed with the underside at least 2,1 m above finished floor level.
- Fluorescent luminaries to be installed directly against concrete slabs or walls shall be securely fixed to the outlet box and at two additional points. Shot-fired fixings are not

acceptable. Where approved, fluorescent luminaries may be installed against metal wiring channels in which the wiring is housed. The channel fixing may in this case be shot-fired. Purpose-made fluorescent fixing adaptors shall be used to fix luminaries to cable channels.

- In all cases where luminaries are fixed to false ceilings, the Contractor shall ensure that the ceiling is capable of carrying the weight of the luminaries before commencing installation. Should any doubt exist in this regard, the matter shall be referred to SARS.
- In cases where the weight of the luminaire is not carried by the ceiling but by a support or other suspension method, provision shall be made to prevent relative movement between the ceiling and luminaire, ceiling rose or connection point.
- Surface mounted fluorescent luminaries shall fit firmly against the ceiling brand ring without leaving gaps between luminaire and ceiling. The luminaire shall be fixed directly to the ceiling by means of brass plated round-head wood screws and washers.
- In the case of tiled ceilings with exposed or concealed T-section supports, surface mounted luminaries shall be fixed only to the tiles by means of butterfly screws or bolts with nuts and washers. The tiles shall be suitably reinforced.
- Luminaries may alternatively be fixed to metal cross-pieces resting in the ceiling tees.
- Drilling of holes in ceiling tees to support luminaries will not be allowed.
- Luminaries shall be fixed in neat relation to the ceiling lay-out.
- In cases where fluorescent luminaries are installed in tandem, only one connection outlet need be supplied per circuit. All luminaries shall be coupled to one another by means of nipples or brass bushes and locknuts to ensure that wiring is not exposed and that earth continuity is maintained. Luminaries on the same circuit may be wired through the channel formed by the luminaire bodies. In this case silicon-rubber insulated conductors shall be used and internal connections shall be made at porcelain terminal blocks. "SCREW-IT" or similar connectors may only be used if prior permission is obtained from SARS. The wiring for any other circuits or outlets, even though these may be in the same row, may not be installed through the luminaire bodies. The Contractor shall ensure that continuous rows are straight and parallel to the relevant building lines.
- Where recessed luminaries are specified, the Contractor shall maintain close liaison with the ceiling Contractor. In the case of tiled ceilings, the luminaries shall preferably be installed while the metal supports are being installed and before the

tiles are placed in position. The Electrical Contractor shall be responsible for the co-ordination of the cutting of ceiling tiles with the other contractors concerned.

- All mounting rings and other accessories shall fit closely into cut-outs to ensure a proper finish
- In all false ceilings where wiring channels are used, recessed luminaries shall be connected to the wiring channels by means of unswitched 5 A socket-outlets.
- The connector cord attached to the luminaire may not exceed 3m in length and shall consist of 1,5mm<sup>2</sup> minimum, 3-core, PVC-insulated flexible cord.
- The 5A socket-outlets shall be positioned such that they are not more than 600mm above the false ceiling.
- In cases where special ceilings e.g. aluminium strips, decorative glass, metal leaves, etc. are to be installed, the Contractor and the Manufacturer of the ceiling shall agree upon the method of fixing of luminaries in the ceiling.
- Surface mounted bulkhead luminaries shall not be screwed directly to conduit ends. The conduit shall terminate in a round draw-box at the top or rear of the luminaire. The PVC-insulated conductors shall terminate in a porcelain terminal strip in the draw-box. Silicon-rubber-insulated conductors shall be installed from the terminal strip to the luminaire lamp-holder. "SCREW-IT" or similar connectors may only be used if prior permission is obtained from the Department.
- PVC-insulated conductors, unless protected by an approved heat-resistant sheathing, shall not be used where the temperature of the insulation is likely to exceed 70°C.

### **3.3 Interior Lighting Detailed Design**

The interior lighting design and installation for the office shall meet the requirements of SANS 10114-1 and emergency lighting requirements shall be as per SANS 10114-2 and SANS 10400. LED lighting is preferred over fluorescent, however, this will be further analysed and guided by the budgetary constraints.

There are different types of light fittings utilised in the design and each shall have the following or similar specifications as a minimum;

Surface-mount and recessed channel fittings;

- Dimensions of or similar to 1200mm x 600mm
- Recessed and/or surface-mount type fitting

- Mid Power LED panels or louvre and grille
- Colour temperature of 3100K – 4500K (Cool white)
- Colour Rendering Index (CRI) of at least 80
- Minimum efficiency of 80%
- System light flux of 10050 lm

Suspended light fittings;

- Mid Power LED panels or louvre and grille
- Colour temperature of 3100K – 4500K (Cool white)
- Colour Rendering Index (CRI) of at least 80
- Minimum efficiency of 80%
- System light flux of 5200 lm

Bulkhead light fittings;

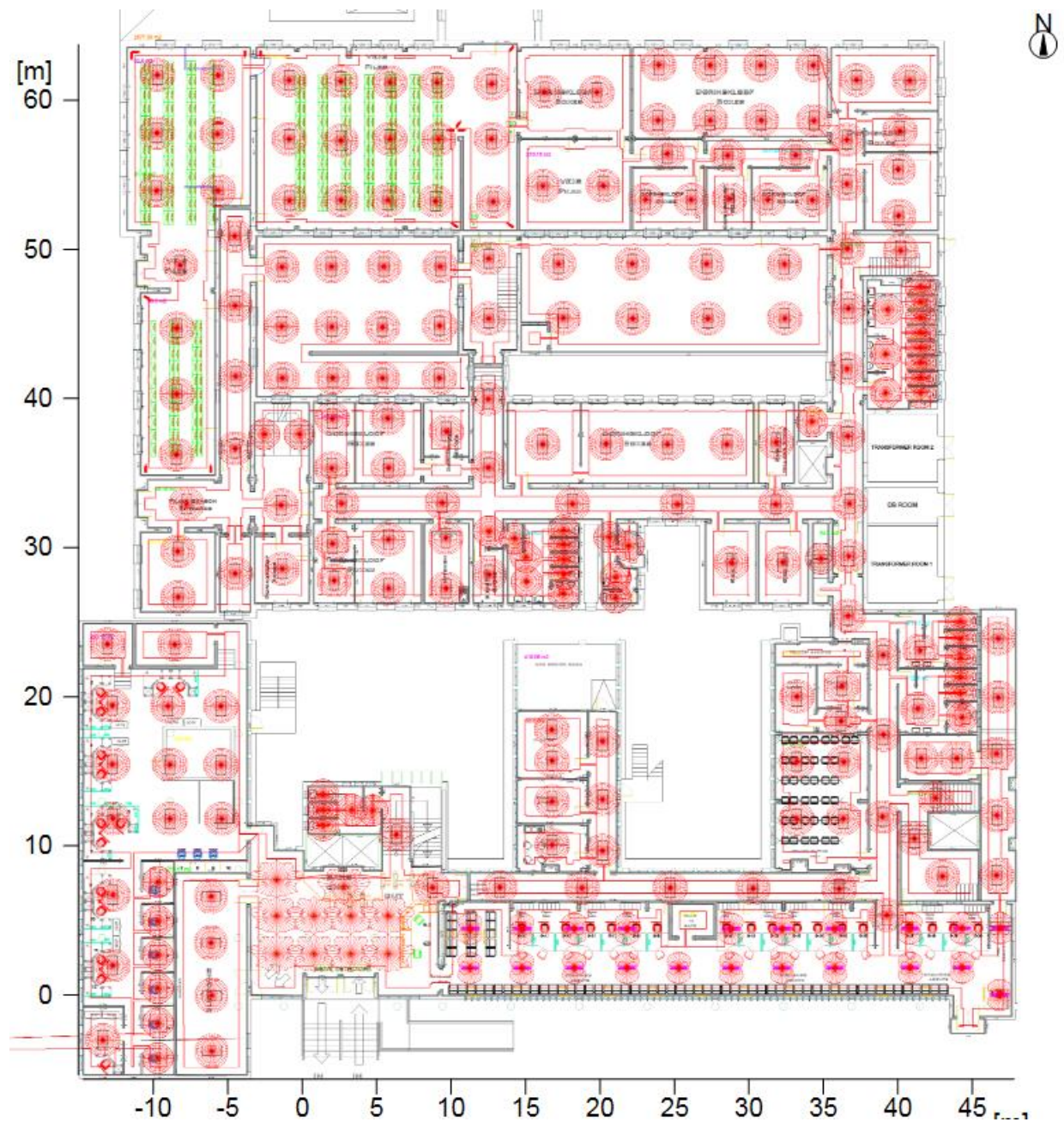
- Colour temperature of 3100K – 4500K (Cool white)
- Colour Rendering Index (CRI) of at least 80
- Minimum efficiency of 80%
- System light flux of 2000 lm

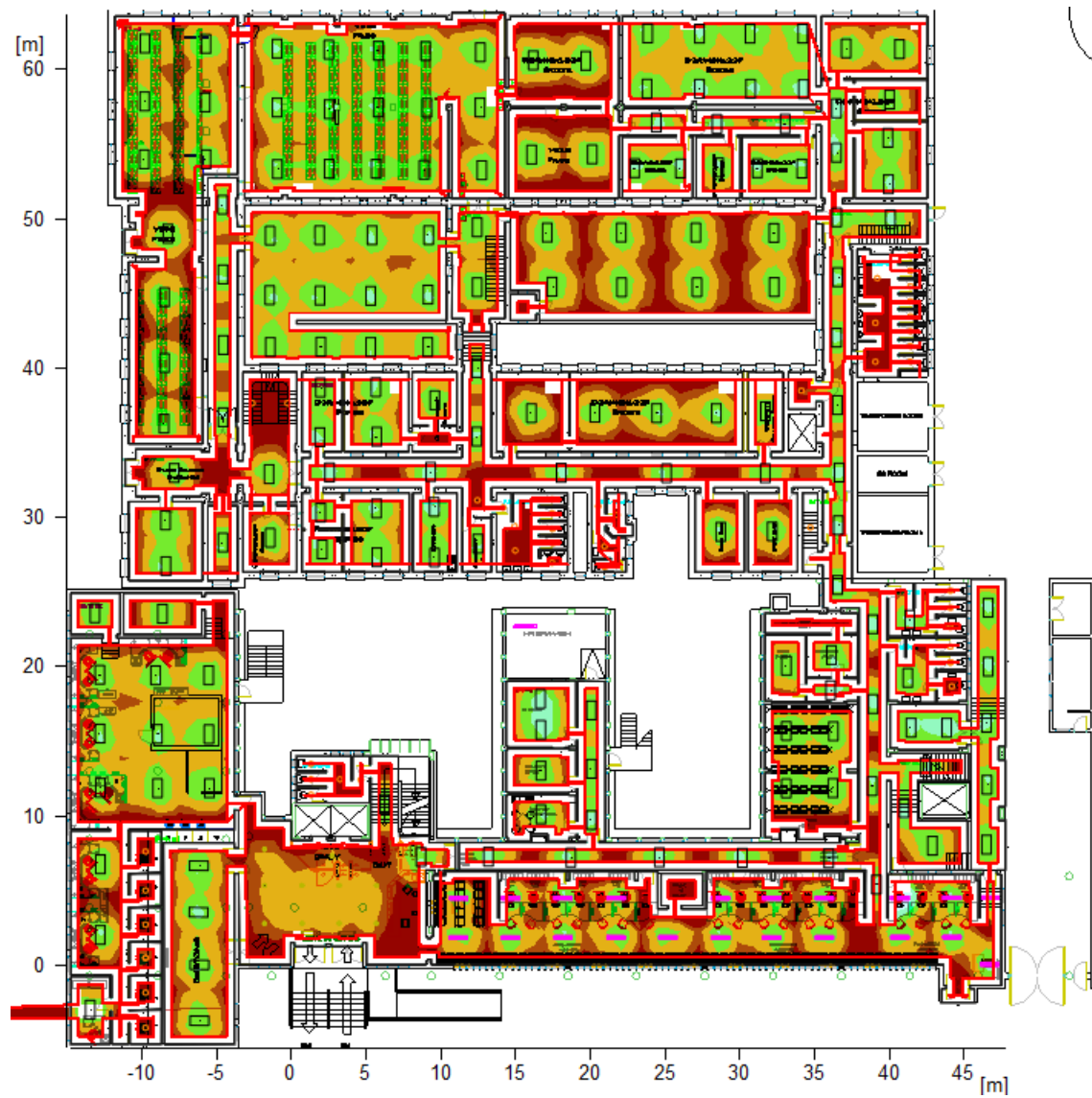
Recessed and surface-mount downlight fittings;

- Colour temperature of 3100K – 4500K (Cool white)
- Colour Rendering Index (CRI) of at least 80
- Minimum efficiency of 80%
- System light flux of 2100 lm

The furniture layout issued by the architect will be used as a guide for the lighting design, should there arise a need to change the seating layout in a significant way, then the lighting design may need to be revised. The lighting design will also take into account the CCTV requirements; this will be guided by the final placement of the CCTV cameras throughout the office, should the camera layout significantly change, then the lighting design may need to be revised.

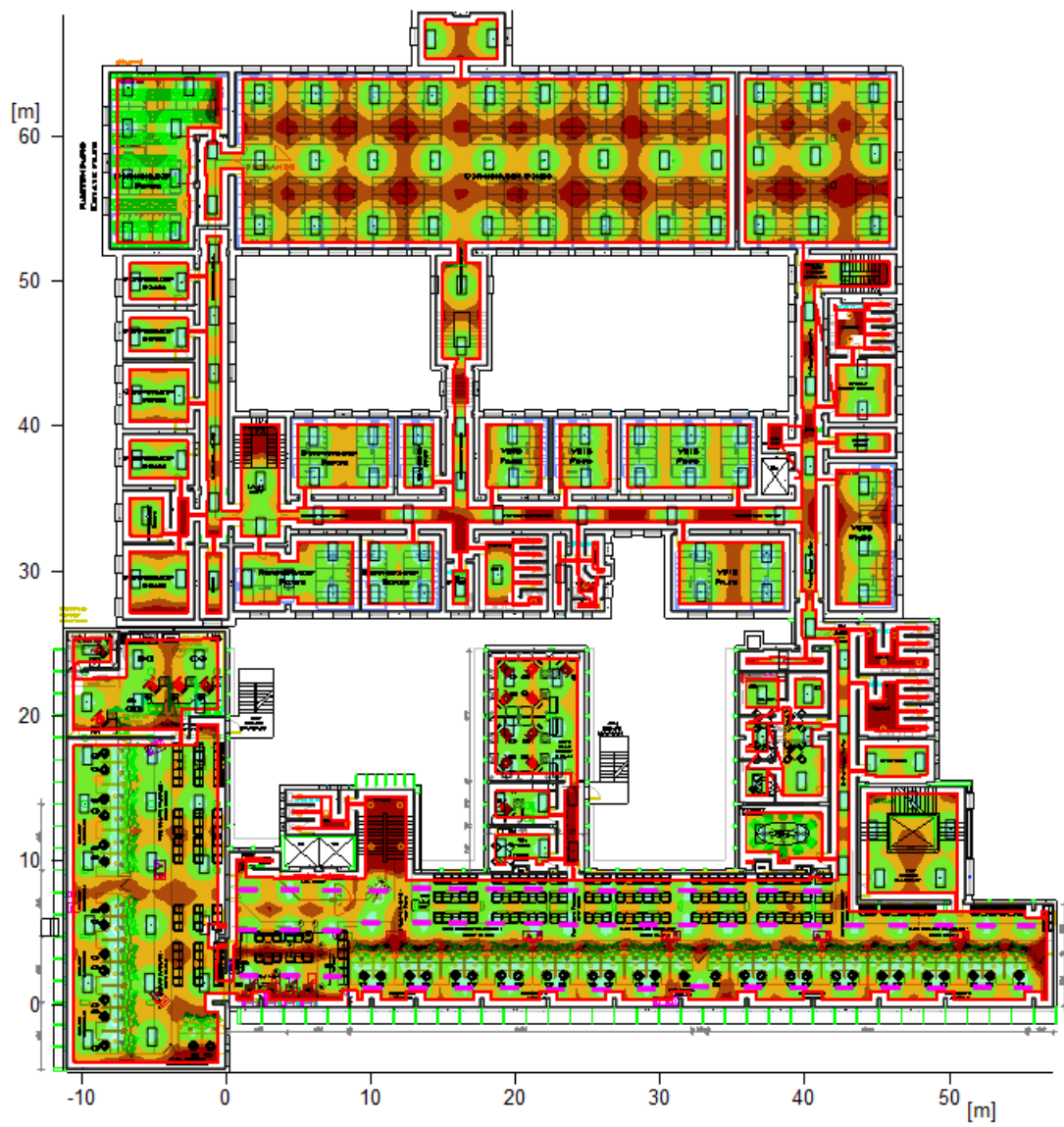
## Ground Floor





## First Floor

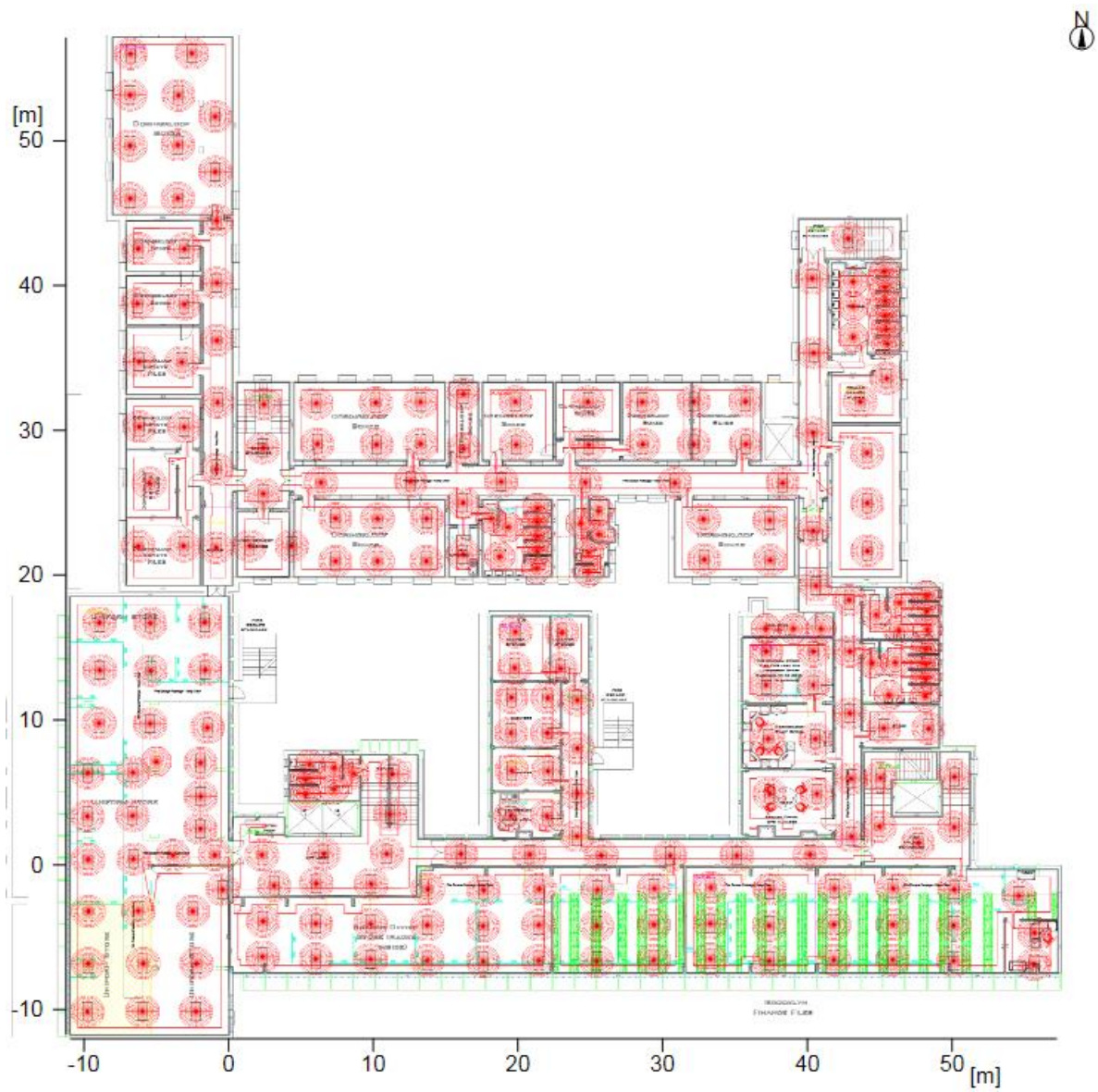






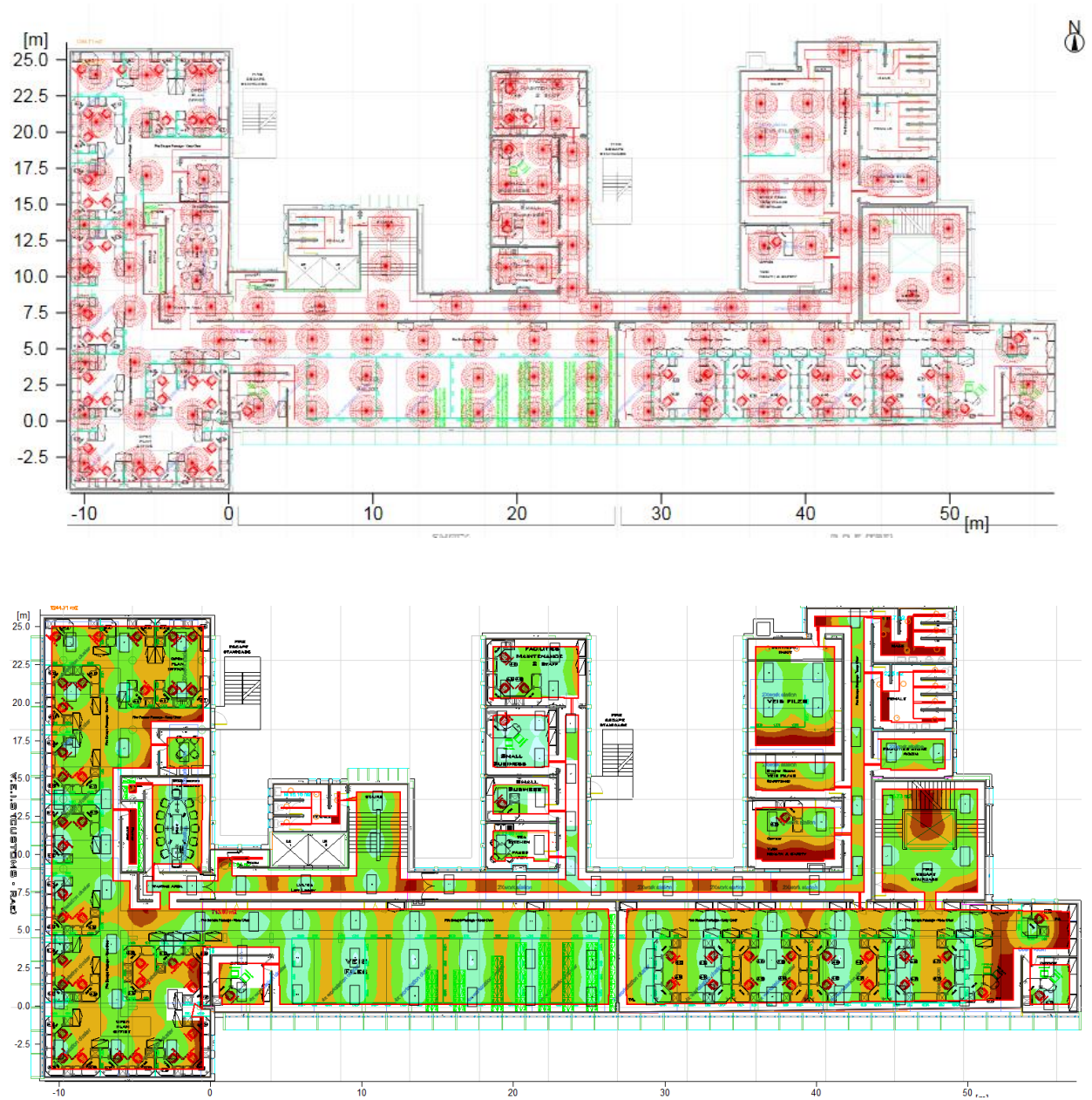


## Third Floor

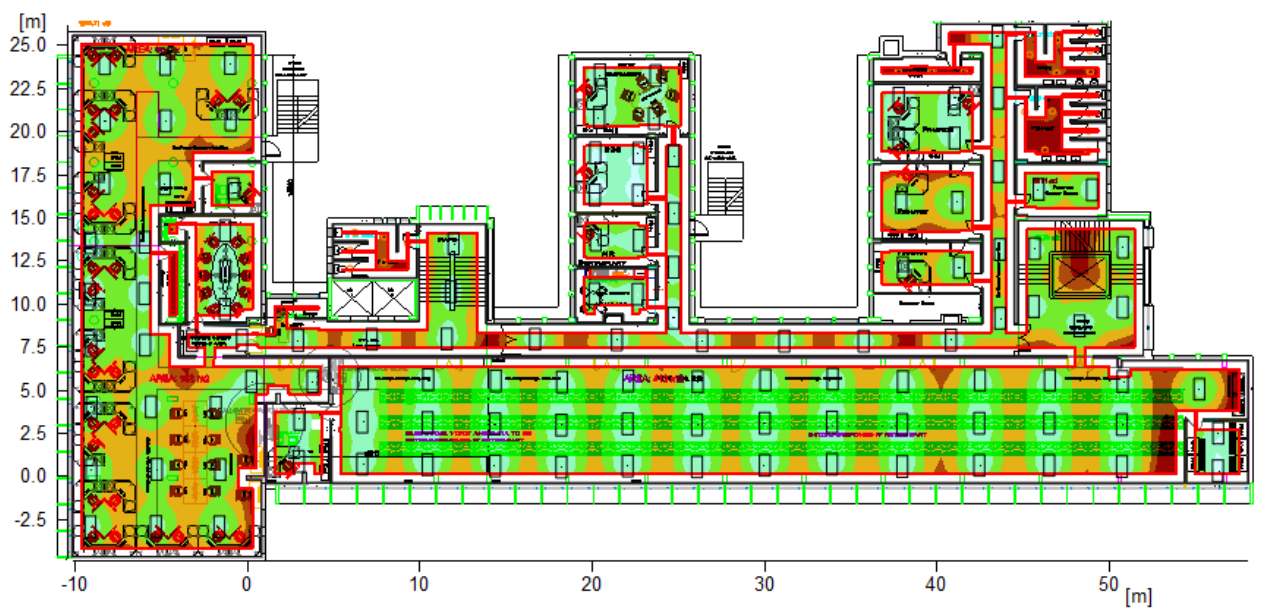
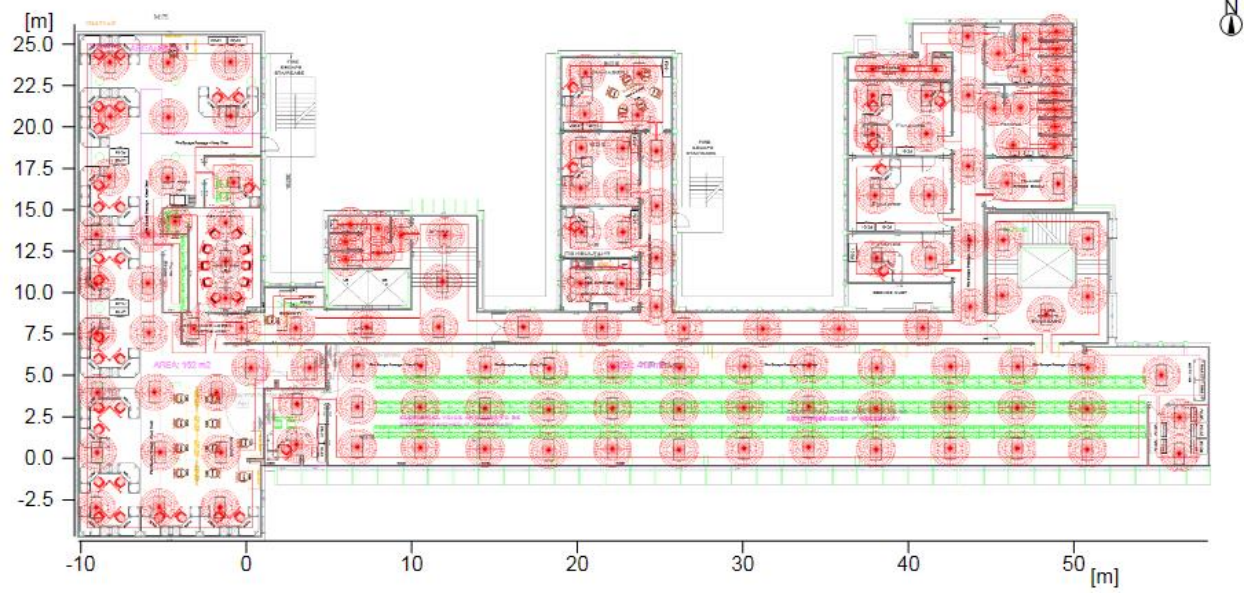




## Fourth Floor



## Fifth Floor



## Sixth Floor

