

Technical Requirements

Project: PF45SL

Section: A. Building Requirements

Architect:
Lead design engineer:

Project scope

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1	Building Requirements *	A
2	Wind tunnel equipment location *	T
3	Equipment loads *	E
4	Equipment bases tolerance requirements *	H
5	Cooling System *	C
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* - Full versions of all documents are available in the Tunnel Tech customer portal.
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PROJECT, SECTION

PF45SL



TITLE

Project scope

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Revision Schedule

No.	Index	Description	Date
1	0	Release of technical requirements.	31.08.2022



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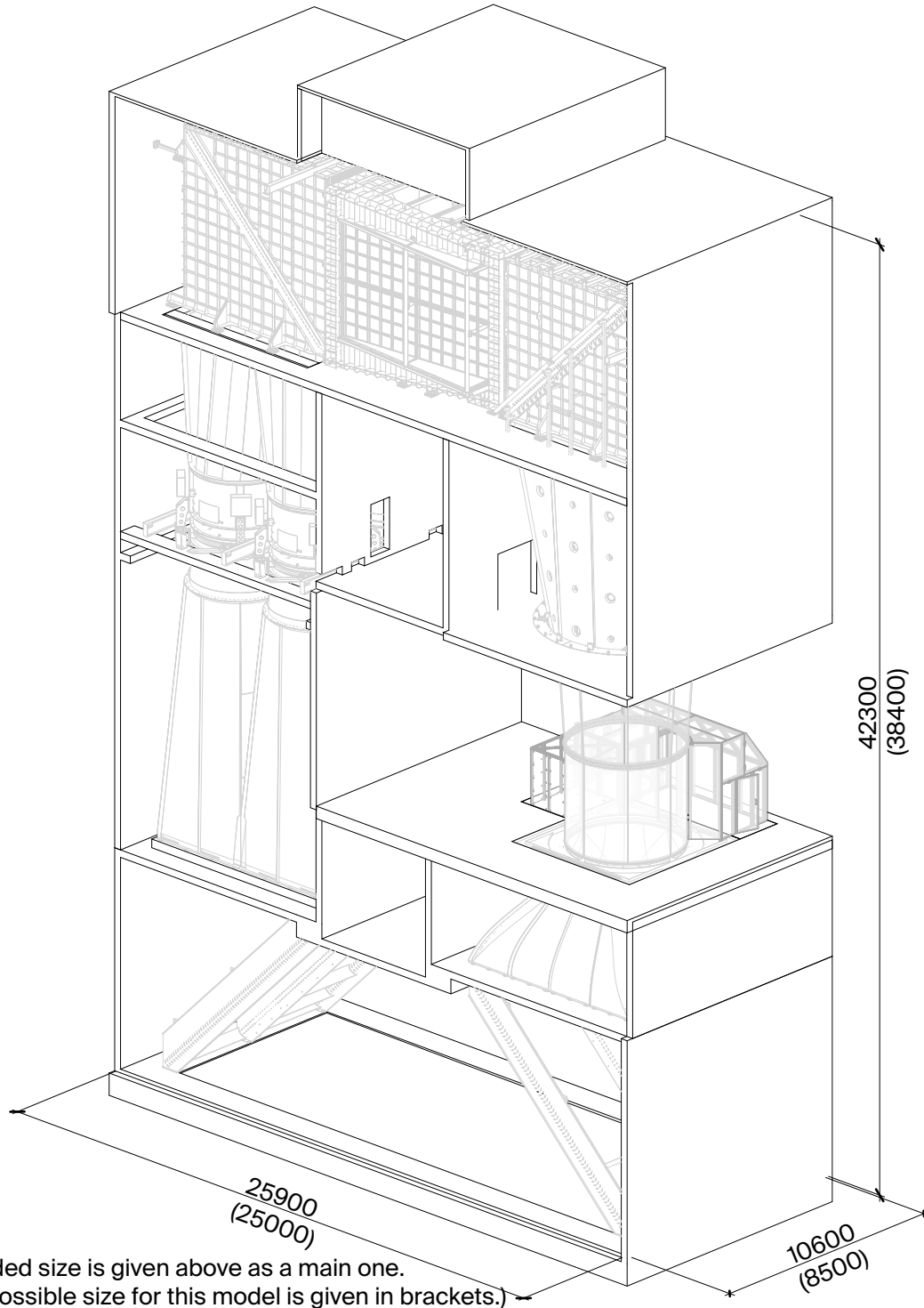
* - All drawings are available in the full version of the document.
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Introduction

This section of the technical requirements documentation contains explanations on the following:

- Architectural restrictions for the technological space of the wind tunnel in the building;
- Requirements and recommendations for the technological space of the wind tunnel and ways of access there;
- Specifics of the building design in order to provide the installation, commissioning and maintenance of the wind tunnel.



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Technological space of the wind tunnel

The technological volumes of the wind tunnel are aligned and described in relation to two main axes and seven levels. See the following drawings for the necessary axes positioning and the relative elevations of the levels.

The intersections of the two principal axes of the wind tunnel mark the centers of the two vertical shafts of the technological volumes:

- The central shaft (where the Flight Chamber is located);
 - The side shaft, (where Axial Fans that create the air flow are located);
- The following levels and their relative elevations are crucial for the wind tunnel equipment:

1. **Lower Duct base level.** The base face for the Lower Turning Vanes' Blocks;
2. **Airjet and Axial Fans' Outlet Duct base level.** The base face of the Airjet and of the Axial Fans' Outlet Duct;
3. **Waiting Zone base level.** The base surface of the Lower Ring with the Safety Net, the base face of the Waiting Zone frame, finish floor thickness;
4. **Axial Fans' and Flight Chamber Diffuser base level.** The base face (or faces) of the Axial Fans' in the side shaft and the base face of the Flight Chamber Diffuser and Upper Ring in central shaft;
5. **Axial Fans' Inlet Duct base level.** The base face of the Axial Fans' Inlet Duct.
6. **Upper Duct base level.** The base faces of the Upper Axial Fans' Turning Vanes' Blocks and the Air Exchange Diffuser.
7. **Intake/Exhaust level.** The level at which the inlet and outlet air exchange openings are located.

Dimensions of the technological space of the wind tunnel

The internal dimensions of the technological space of the wind tunnel are shown in the following architectural drawings.

All dimensions (linear, radial and elev. marks) that are shown in the architectural drawings are dictated by the wind tunnel technology. The dimensions must be respected in order to provide the wind tunnel equipment installation, functioning and maintenance.

Dimensions marked with '#' and '*' are shown only as a reference and are not dictated by TunnelTech.

Prior to the wind tunnel equipment installation the measurements of the technological space must be conducted by the contractor. The measured data must be provided by the contractor to TunnelTech in accordance to "Building Markup and Inspection" section of the technical requirements documentation.

If, according to the measurements' report, the precision of the structure is not sufficient for the equipment installation purposes, after careful consideration TunnelTech might request the contractor to fix. The process of installing wind tunnel equipment in a building can't begin until all changes and control measurements have been made.

See the "Building Markup and Inspection" section of the technical requirements documentation for further information.

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The specifics of installation, commissioning and maintenance of the wind tunnel by levels of the building.

Lower Duct base level.

The pit for collecting water and draining must be provided on the foundation slab.

A slope between the base faces of the Lower Turning Vanes' Blocks should be organized on the foundation slab to direct the water to the draining pits.

The Lower Duct base level can be accessed via a door from the other volumes on the level or via manholes in the slab above the level. The general requirement for the door or the manhole cover is that it must be airtight to withstand the pressure up to 2000Pa. The final position of the door/manhole must be confirmed with TunnelTech.

All concrete Lower Duct's surfaces must be treated with a dedusting compound.

Airjet and Axial Fans' Outlet Duct base level.

To provide access to the side shaft during the installation and commissioning of the wind tunnel equipment technical opening must be provided. After the wind tunnel equipment is installed, it is possible to install door in the opening.

The dimensions of the two openings in the floor slab must be respected in relation to the principal axes of the wind tunnel equipment with the tolerance of -20mm .. +20mm.

Manhole to provide an access to the Lower Duct base level during installation and maintenance of the wind tunnel must be provided. The dimensions and position of the manhole must be clarified later in course of the project.

The door to the central technological volume on the level must be provided for installation, commissioning and maintenance of the wind tunnel.

Waiting Zone base level.


The final position of the Waiting Zone, the Airlock, the Control room and their attachment to the building structure must be clarified in course of the project. The slab elevation and the thickness of the finish floor under the Airlock, Control room and the Waiting Zone must be implemented in accordance with the technical requirements.

The tolerance for the position of the center of the central round opening in plan view in relation to the project values is 15mm;

The tolerance for the actual radius of the central round opening (or the shape of the opening, its "roundness") is 10mm.

The stability requirement for the slab around the central opening (Lower Ring base slab) is that the slab must not bend or shift more than 5mm. That includes the shifts of the structure (if any) during the first years after the construction.

Areas for storage and installation of the Flight Chamber equipment must be provided. Spider crane access must be provided in these areas. The finish floor in these areas is installed after the installation of the Flight Chamber and Waiting Zone equipment.

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The specifics of installation, commissioning and maintenance of the wind tunnel by levels of the building.

Axial Fans' and Flight Chamber Diffuser base level.

To provide the possibility of extracting the Axial Fans for maintenance after the equipment is installed, the technological openings must be created in the external wall of side shaft. The openings must have demountable filling. The position and dimensions of the openings must be clarified in course of the project and confirmed with TunnelTech.

The additional beams needed for the Axial Fans extraction are supplied by TunnelTech.

After an Axial Fan is rolled out of a side shaft volume on the additional beams, it is the customer's responsibility to provide a way of replacing the Axial Fan.

It is necessary to provide access to the axial fans in the side shaft.

An access to the Axial Fans and Flight Chamber Diffuser base level must be provided for the installation, commissioning and maintenance.

The stability requirement for the slab around the central opening (Flight Chamber Diffuser base slab) is that the slab must not bend or shift more than 5mm. That includes the shifts of the structure (if any) during the first years after the construction.

The tolerance for the position of the center of the central round opening in plan view in relation to the project values is 15mm;

The tolerance for the actual radius of the central round opening (or the shape of the opening, its "roundness") is 10mm.

External wide doors are required on the Axial Fans' and Flight Chamber Diffuser base level for loading in and out the Variable Frequency Drives (VFDs).

Openings in partition wall from Technological room to Machine rooms for the cable networks must be provided.

It is necessary to ensure the removal of heat generated by VDF's in the central shaft room. Detailed heat dissipation values will be specified in the technical requirements section "P - Cable networks".

Upper Duct base level.

Two beams above the side shaft are the base of the Upper Axial Fans' Turning Vanes' Blocks.

The installation sequence for the beams is the following:

1. All the wind tunnel equipment for the side shaft below the Upper Duct base level is installed;
2. The beams are installed on the Upper Duct base level;
3. The Upper Axial Fans' Turning Vanes' Block is installed onto these beams.

These beams are contractor's responsibility. Their design, position and installation method must be confirmed with TunnelTech.

For installation, commissioning and maintenance, the top horizontal duct must be accessible.

The wind tunnel equipment must be fixed to the walls of the building at the level of the Upper Duct. Therefore, the walls must be designed and implemented to withstand the load of the equipment, or must be reinforced with additional beams.


Intake/Exhaust level

The structure of the walls at the level of the upper air duct and the roof has several openings for air capture and exhaust. Their dimensions must be agreed with Tunnel Tech in the course of development, with the elimination of possible intersection with the wind tunnel equipment and the prevention of interference with the air flow.

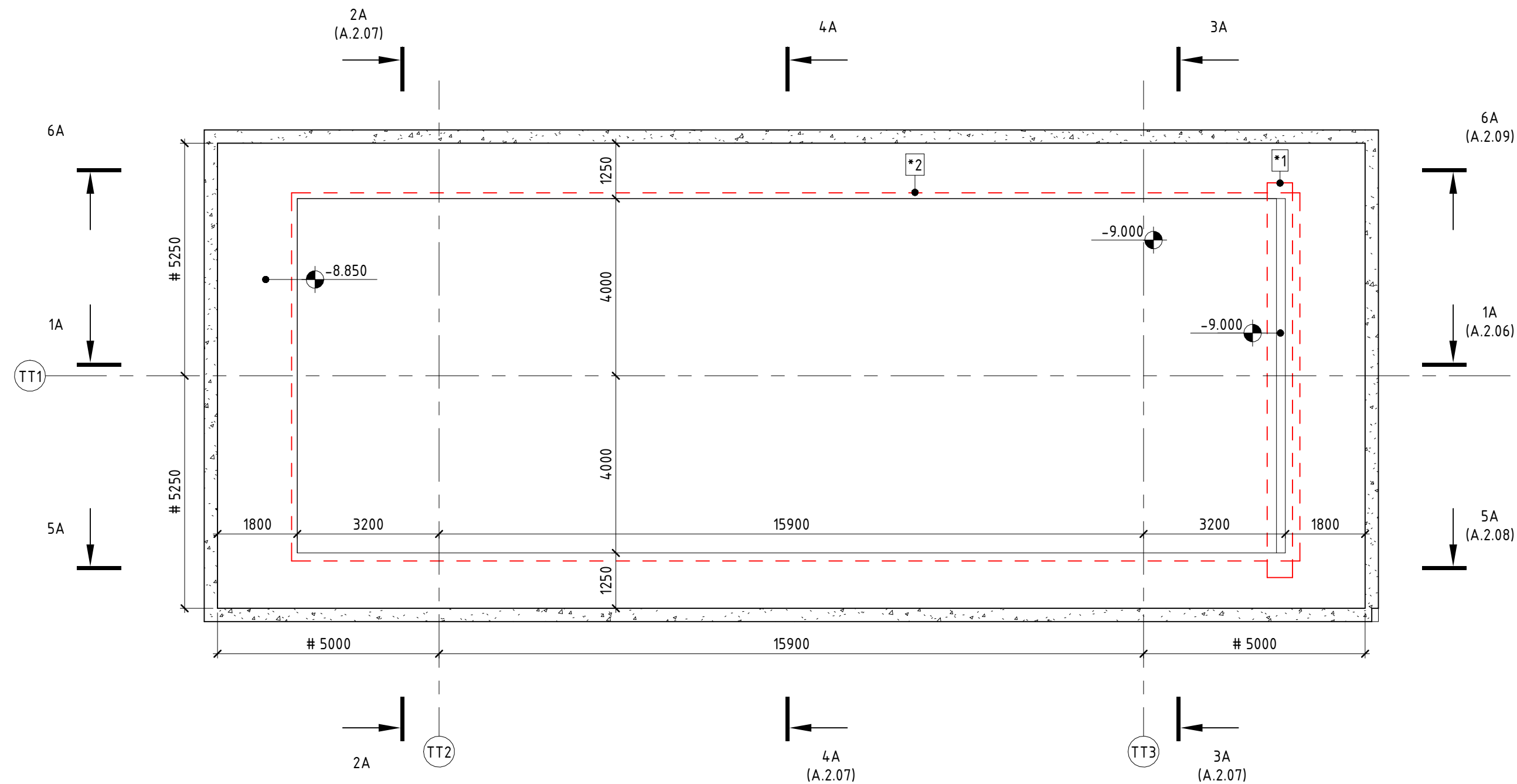
Wide openings for air intake and exhaust must be implemented above the Upper Duct base level. See the drawings below for positioning of the openings. The minimum free areas for these openings are:

- Air intake openings minimum required free area is 16 m² (2 openings in total)
- Air exhaust opening minimum required free area is 8 m² (1 opening in total)

Installation of roof structures should be carried out after the installation of the Upper Duct equipment in the building.

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NOTES

Lower Duct base level

Access to Lower Duct base level must be provided through manhole in Airjet and Axial Fans Outlet Duct level slab. All concrete Lower Duct's surfaces must be treated with a dedusting compound.

*1 - A draining pit must be organized on the level for draining water removal

*2 - Slope for collecting water.

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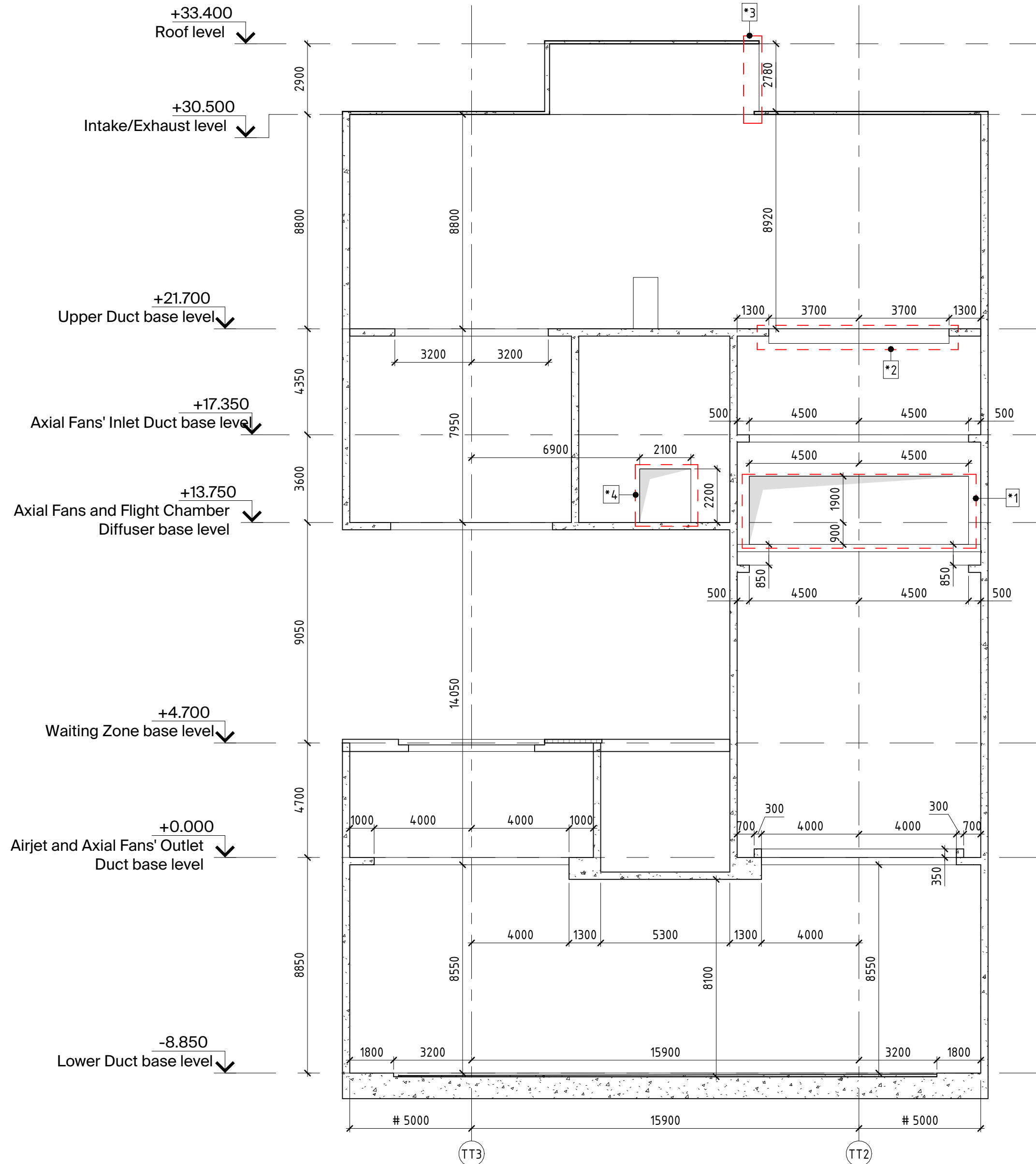
Lower Duct base level, Airjet and Axial Fans' Outlet Duct base level plan views

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NOTES

1A-1A section

*1 - Technological openings with demountable filling is required to provide the possibility of removing the fans.

*2 - Two precast concrete or steel beams. Installation sequence: The beams can be installed in the design positions strictly after all equipment on lower levels has been loaded.

*3 - Area for the exhaust opening. Air exhaust opening minimum required free area is 8 m2 (1 opening in total)

*4 - External wide doors are required for loading in and out the VFDs.

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1A-1A Section view (longitudinal section)

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