

1 EXTERNAL SHELL STUDY

1.1 INTRODUCTION

1.1.1 Purpose of the report

The following document has been created specifically for this project

The purpose of the report is to outline the structural and performance principles of the envelope and establish the loading parameters to be adopted in the design of the building envelope.

1.1.2 Scope of report

The report scope consists of the glazed wall, aluminum panels, precast elements, aluminum screens, roof skylights and waterproofing.

1.2 DESIGN PHILOSOPHY

1.2.1 Architectural aspirations

The glazed curtain walls are along most of the building along with precast and aluminum screens.

1.2.2 Structural description

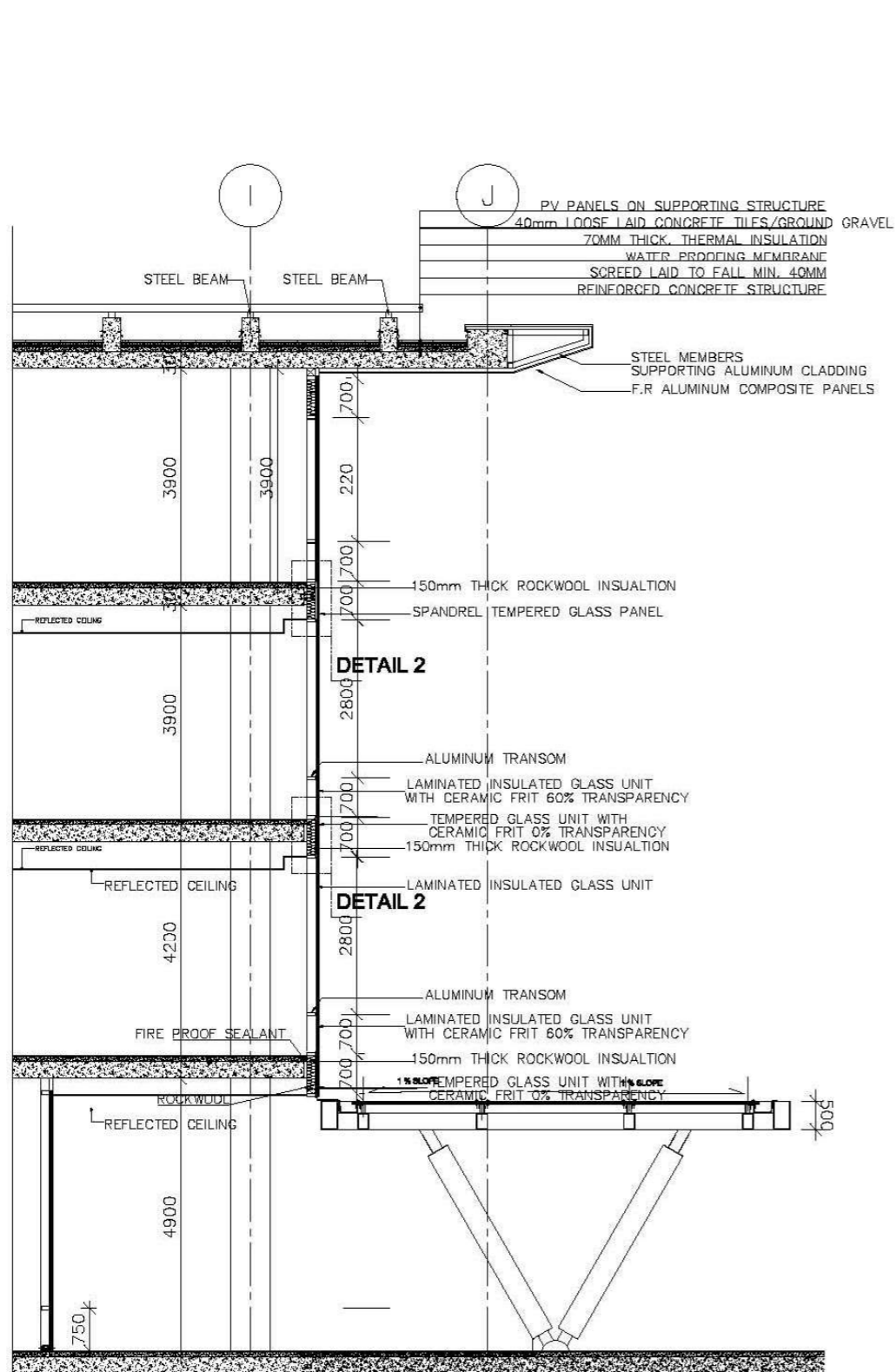
Curtain wall elements are spliced at every floor level; weight/wind brackets hold elements from top and wind brackets at bottom. Similarly this concept applies on aluminum screens.

Perimeter weatherproof details shall be adopted at the interface between the glazed walls and other elements.

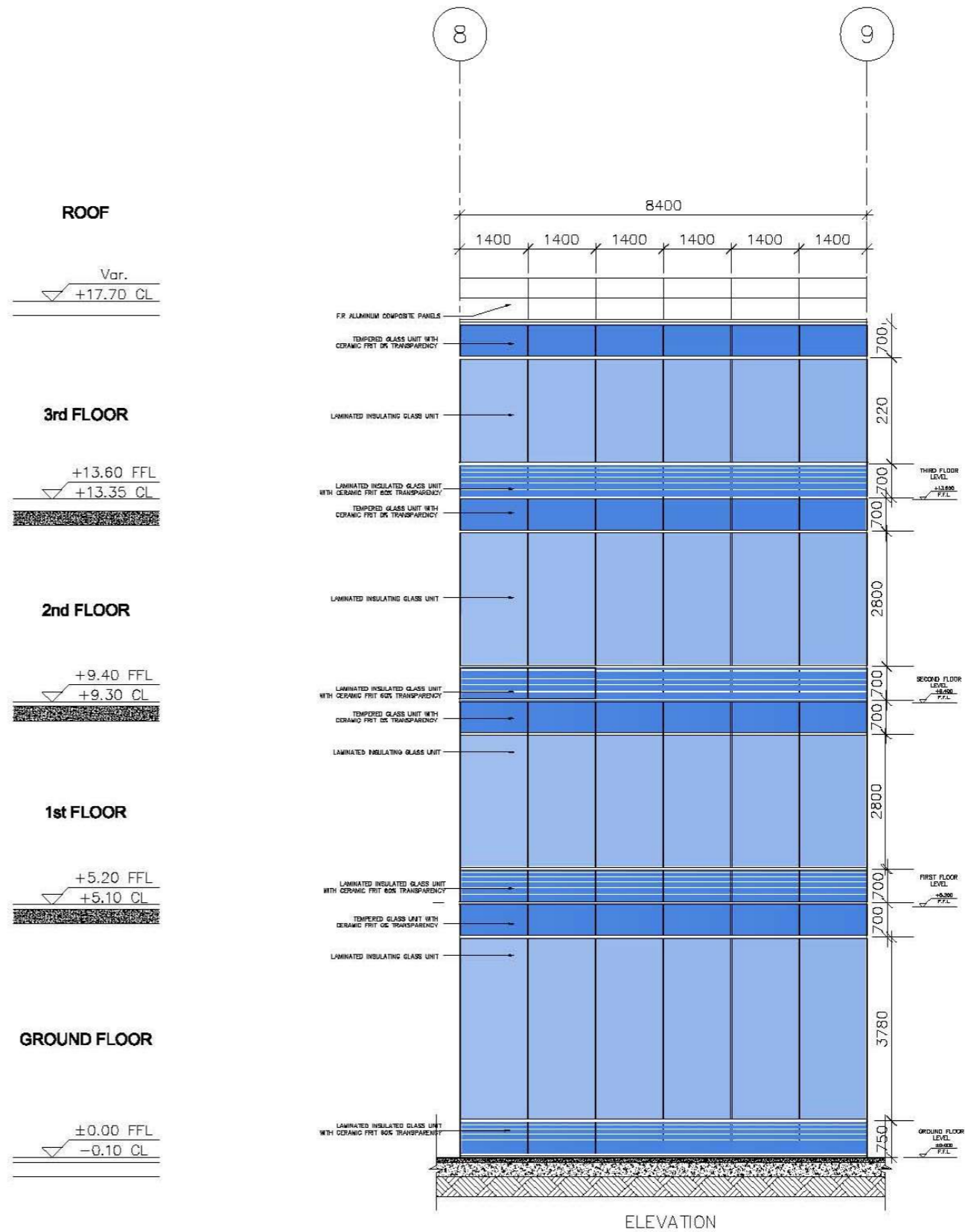
Perimeter fire stopping details shall be utilized where required.

1.3 CURTAIN WALL

Mullion size about 200mmx60mm is envisaged (steel reinforcement in some mullions might be required in order to withstand loads). 800mm deep sunshades are utilized at some facades.

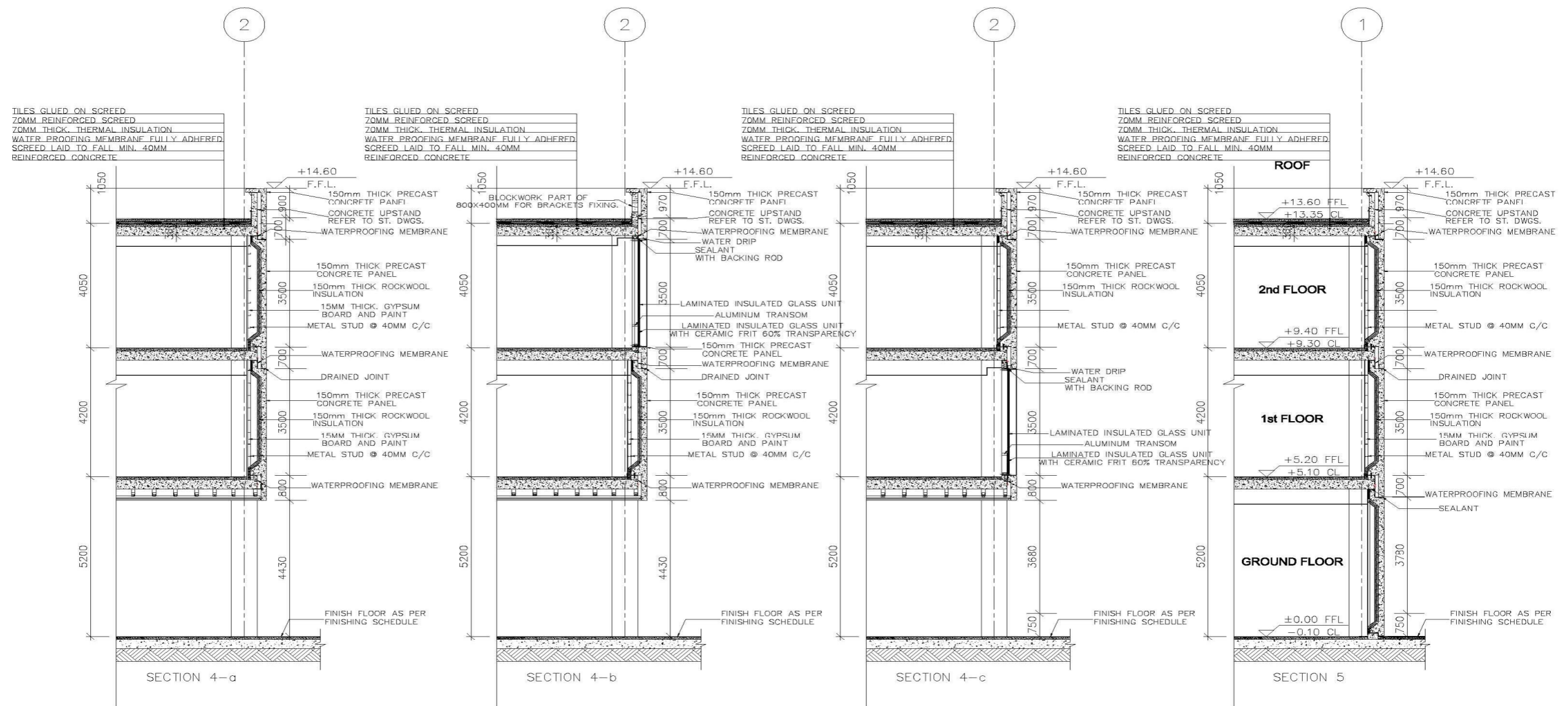


TYPICAL SECTION 3
 Showing curtain wall with connections and joints (3 spans)



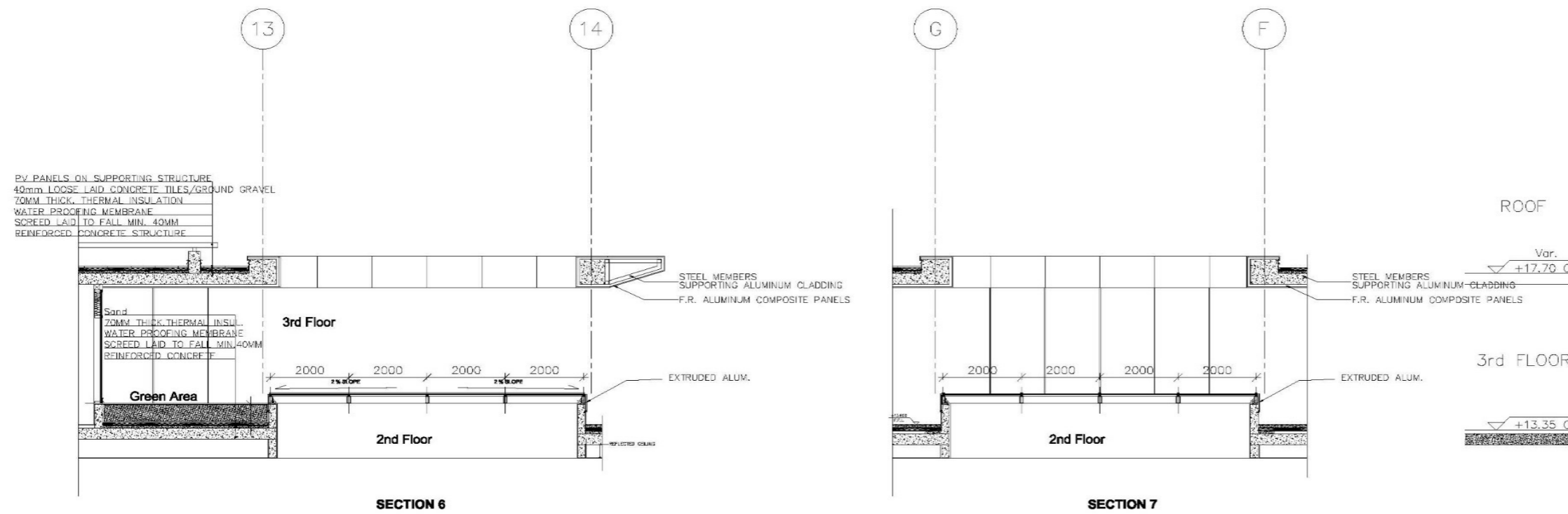
1.4 Precast

Other façade walls are mainly composite wall made up of, from inside to outside, 15mm painted gypsum boards, 150 mm. rock wool insulation; precast concrete elements of 150mm carried at the base and laterally supported at the top. Proper Flashing and waterproofing membrane are required at precast terminations with needed drainage details; double sealants with ventilated cavity are required at interfaces between precast elements



1.5 SKYLIGHT

Utilizing extruded aluminum members/shapes to support the required design loads of the entire skylight with integral condensate gutters, gasket pockets, concealed clips and fasteners. System must be designed to prevent air and moisture infiltration, utilizing gutter system to channel any moisture to the exterior of the structure.



1.6 Roof Waterproofing

The roof is waterproofed with the use of membranes to protect contents as well as protecting structural integrity. The roof section constitutes of the following: screed laid to fall min 40mm, waterproofing membrane fully adhered, 70mm thick thermal insulation, 40 mm loose laid concrete tiles/ round gravel.

1.7 MATERIALS

1.7.1 Glass

The following glass Specifications have been adopted in the design of the façade for the Dubai airport Engineering projects Headquarters (DAEP)

Glass type 1:

Curtain Wall		<p>10 mm clear HS</p> <p>Interspace content: Air</p> <p>Interspace dimension: 16mm</p> <p>Laminated glass with two plies float glass:</p> <ul style="list-style-type: none"> • Thickness of each glass ply: 8mm clear minimum • PVB interlayer thickness: 4 layers of PVB (1.52mm) <p>Overall unit thickness: 43.52 mm.</p>	<p>U-Value of Glass (W/Km²): 1.3</p> <p>Visible Light Transmittance LT (%) : 55%</p> <p>Visible Light Reflectance (%): 12%</p> <p>Shading Coefficient (%): 28%</p> <p>OITC about 39.</p>
	Inside		

Note: Safety glazing requirements must be met.

Glass type 2:

<p>Curtain Wall</p>	<p>Outside</p> <p>10mm</p> <p>16mm Air Gap</p> <p>8mm</p> <p>8 mm</p> <p>Inside</p>	<p>Ceramic frit 60% transparency glass 10 mm minimum HS</p> <p>Interspace content: Air</p> <p>Interspace dimension: 16mm</p> <p>Laminated glass with two plies float glass:</p> <ul style="list-style-type: none"> • Thickness of each glass ply: 8mm clear minimum • PVB interlayer thickness: 4 layers of PVB (1.52mm) <p>Overall unit thickness: 43.52 mm.</p>	<p>U-Value of Glass (W/Km2): 1.3</p> <p>Visible Light Transmittance LT (%) : 55%</p> <p>Visible Light reflectance (%): 12%</p> <p>Shading Coefficient (%): 28%</p> <p>OITC about 39.</p>
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Note: Safety glazing requirements must be met.

Glass type 3:

<p>Canopy glass</p>	<p>TOP</p> <p>8mm</p> <p>8mm</p> <p>BOTTOM</p>	<p>Laminated glass with two plies float glass:</p> <ul style="list-style-type: none"> • Thickness of each glass ply: 8mm clear minimum FT (top) and 8mm clear minimum HS (bottom) • PVB interlayer thickness: 4 layers of PVB (1.52mm) <p>Overall unit thickness: 16.52 mm.</p>	
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Glass type 4:

Skylight		<p>10 mm minimum clear FT</p> <p>Interspace content: Air</p> <p>Interspace dimension: 16mm</p> <p>Laminated glass with two plies float glass:</p> <ul style="list-style-type: none"> •Thickness of each glass ply: 8mm minimum clear FT and 8mm minimum clear HS •PVB interlayer thickness: 4 layers of PVB (1.52mm) <p>Overall unit thickness: 43.52 mm.</p>	<p>U-Value of Glass (W/Km2): 1.3</p> <p>Visible Light Transmittance LT (%) : 55%</p> <p>Visible Light reflectance (%): 12%</p> <p>Shading Coefficient (%): 28%</p> <p>OITC about 39.</p>
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These tables present the glass technical specifications for curtain wall at north, east, west and south facades.

1.7.2 Metals

- All steel should be either S275 or S355 material and meet all the requirements of the Specifications regarding the quality of the material and the chemical composition. The steelwork should be welding using compatible welding rods for the steel grade.
- All the steelwork should have corrosion protection applied to the surface; the protection will vary depending on the location and visibility of the steelwork.
- The aluminum extrusions are usually made and tempered to ASTM B 221. Unprotected aluminum will corrode in the external environment present at the airport site and will need to be protected at the manufacturing stage by a polyester based coating. The choice of finish type and the color will be specified by the architect.

1.8 LOADING

1.8.1 Dead Loads

- Generally the self-weight of the glass should be calculated from the glass thicknesses and the interlayer thicknesses based on the glass and PVB densities stated below.
- For the design of the glazing support structure and fixings a minimum allowance for aluminum framing (excluding steel) and fixings of 0.075kN/m2 which should be added to the self-weight of the glass.
- Where the aluminum sections are the principal support structure the weight of the aluminum sections should be calculated using a density of 25kN/m3.
- An allowance of 15% should be added to the Self-weight of the supporting aluminum members for the connections and fixings.
- An allowance of 15% should be added to the Self-weight of the supporting steel members for the connections and fixings. Steel weight should be calculated using a density of 78.5kN/m3.
- The minimum allowance for the framing load should be 0.25kN/m2 (25kg/m2).

1.8.2 Wind loads: according to ASCE.

- Basic wind speed : 100 mph
- Exposure category: C

Seismic loads: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined in accordance with UBC 1997-Zone 2A . **(to be confirmed upon receiving the final Geotechnical recommendations)**

Thermal action: System must accommodate for thermal movement resulting from ambient change being 67deg° C ambient 100deg° C material surfaces.

Live Loads: Maintenance loads

1.9 PERFORMANCE REQUIREMENTS

1.9.1 Air permeability

Maximum air leakage through fixed glazing and framing areas as determined according to ASTM E 283 at a minimum static-air-pressure differential of 600 Pa shall be 1 m³/hr/m²

1.9.2 Water tightness – static

Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 600Pa.

1.9.3 Water tightness – dynamic

No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 600 Pa. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

1.9.4 Condensation Resistance

Fixed glazing and framing areas shall have condensation resistance rating of no less than 55, when tested according to NFRC 500

1.9.5 Wind resistance – serviceability

Glazed aluminum curtain-wall systems, including anchorage, capable of withstanding test pressure indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.

When tested using design wind pressure and negative wind pressure, assemblies do not evidence deflection exceeding specified limits.

When tested at 150 percent of positive and negative wind-load design pressures, assemblies including anchorage do not evidence material failures, structural distress, and permanent deformation of main framing members in accordance with the following:

- a. No permanent set of more than L/1000 is allowed.
- b. No permanent set in anchors of more than 1/16 is allowed

1.9.6 Impact – safety

Areas of the building envelope shall remain safe under impact load.

2 FAÇADE CLEANING EQUIPMENT SYSTEMS

We recommend the use of articulated boom and tucker pole for the cleaning system due to:

- Architectural restraint (existing column at roof) which does not allow the use of continuous rail.
- The low rise building which is easily reachable from the ground floor also justifies the use of the above system