

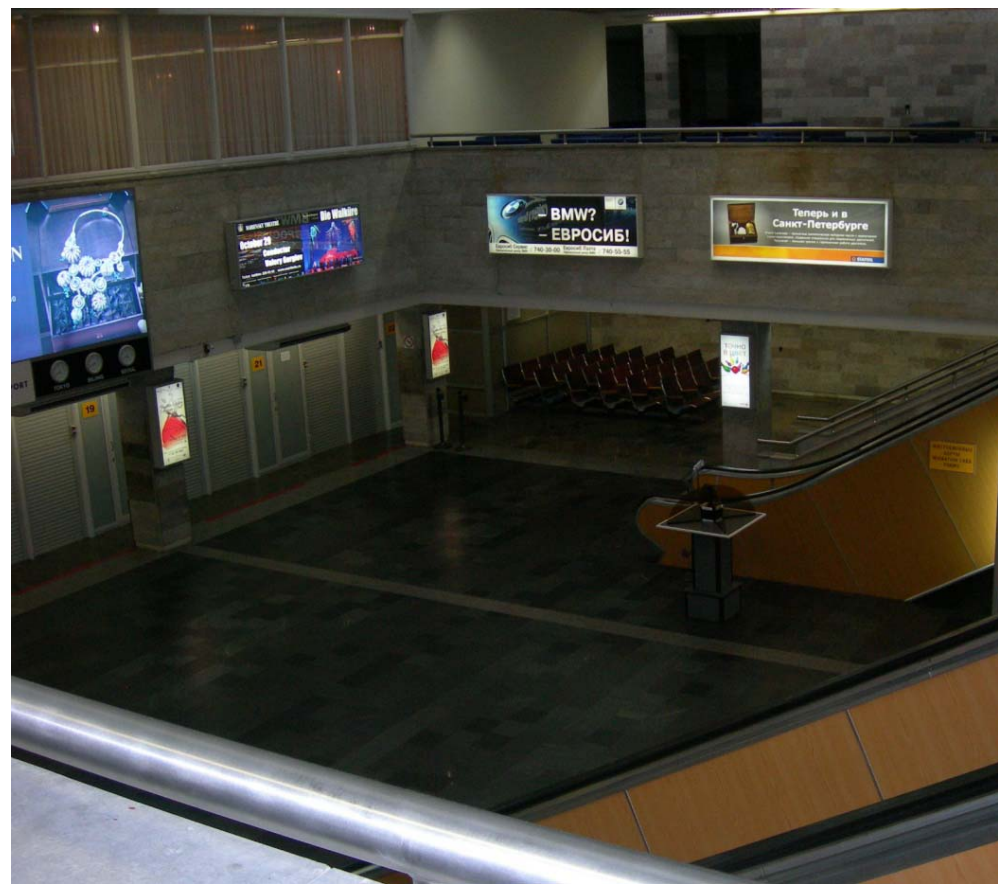
Ramboll Project Case Study

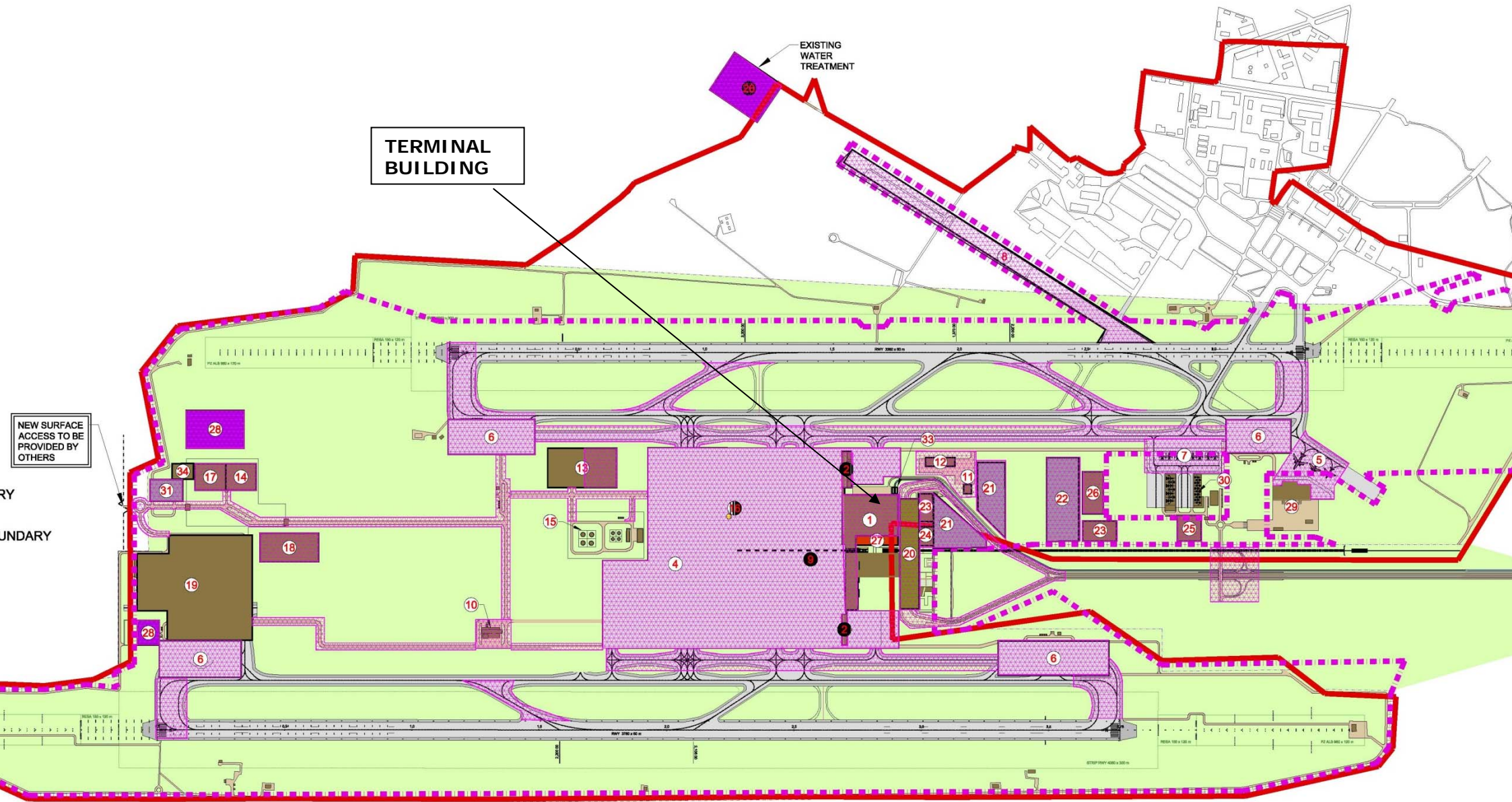
Pulkovo Airport Roof Design

November











Terminal Facilities

Passenger Terminal Building;
 Outer Terminal Pier;
 Apron of Pulkovo 1.

Facilities

Airside improvements include an overhaul of the existing Pulkovo
 infrastructure as well as large expansions and operational
 facilities including:

• and rapid exit taxiways;
 • Boundary fencing and gates;
 • Apron and taxiway expansions;
 • Repairs;
 • New Apron and taxiways;
 • New taxiways;
 • Facilities;
 • Fuel system;
 • Improvements;
 • Wastewater treatment plant improvements;
 • Sewerage system expansions;
 • Support facilities

Landside Facilities

The Phase 1 landside improvement project includes
 support facilities as well as commercial
 developments including:

- Hotel;
- Business Centre;
- Offices;
- Short term and long stay car park;
- Warehouse;
- Administrative support facilities.

- Public Private Partnership Agreement;
- 30 year concession;
- 1 billion Euro Investment;
- 17 million passengers per annum

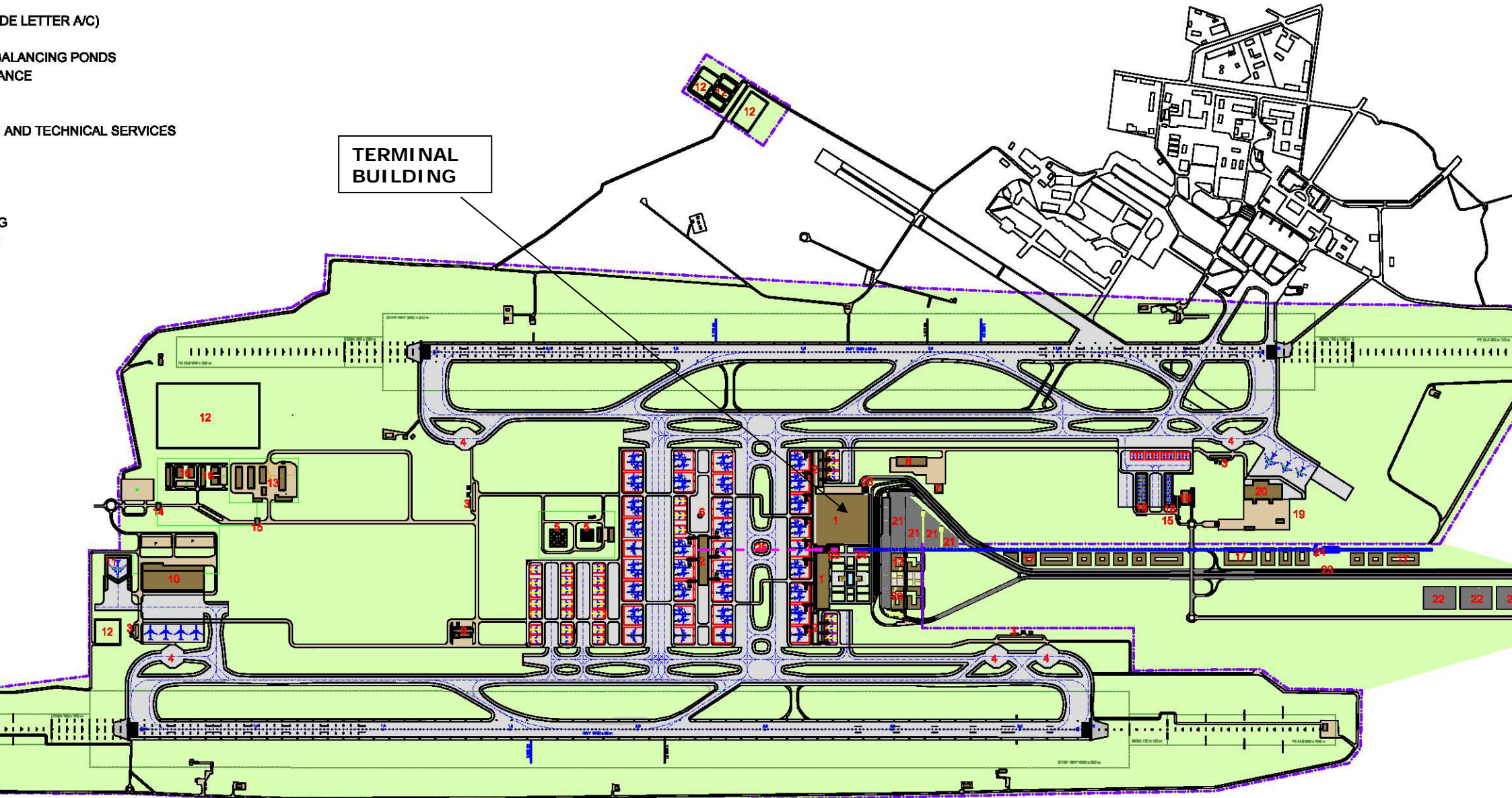
NOTE:
THE REFERENCE MASTER PLAN HAS BEEN PROVIDED AS PART OF THE TENDER DOCUMENTATION TO PROVIDE GUIDANCE TO THE BIDDERS IN PREPARING THEIR BIDS. THIS REFERENCE MASTER PLAN IS PRELIMINARY AND IS NOT TO BE RELIED ON BY THE BIDDERS FOR THE ACCURACY, COMPLETENESS OR COMPLIANCE. THE BIDDERS ARE NOT REQUIRED TO COMPLY WITH THE LAYOUT OF THE REFERENCE MASTER PLAN. THE PREFERRED BIDDER WILL BE REQUIRED TO PREPARED THEIR OWN DETAILED MASTER PLAN WHICH SHALL BE FULLY COMPLIANT WITH REGULATIONS AND OBLIGATIONS UNDER THE AGREEMENT.

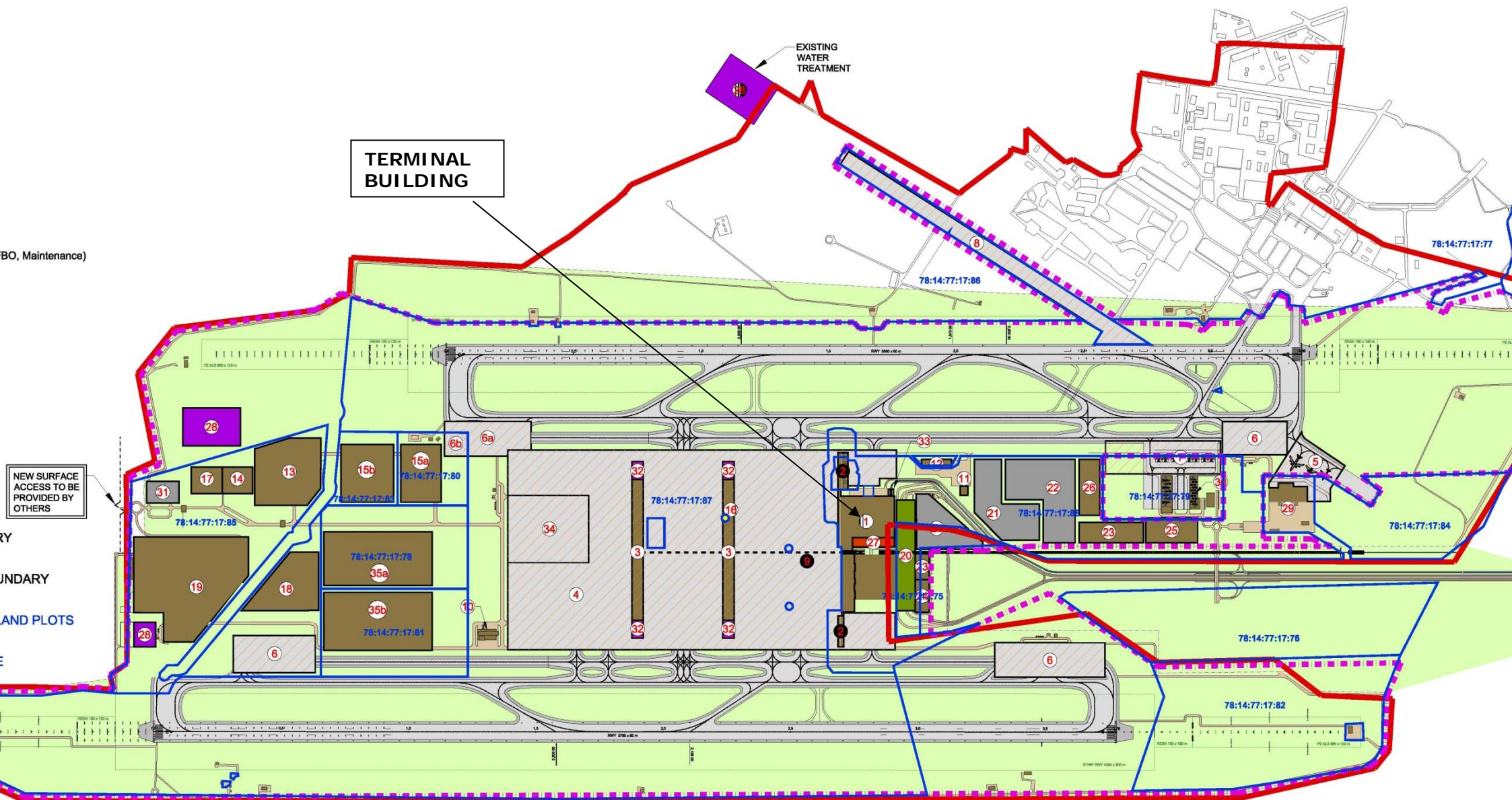
DE LETTER A/C)

BALANCING PONDS
ANCE

AND TECHNICAL SERVICES

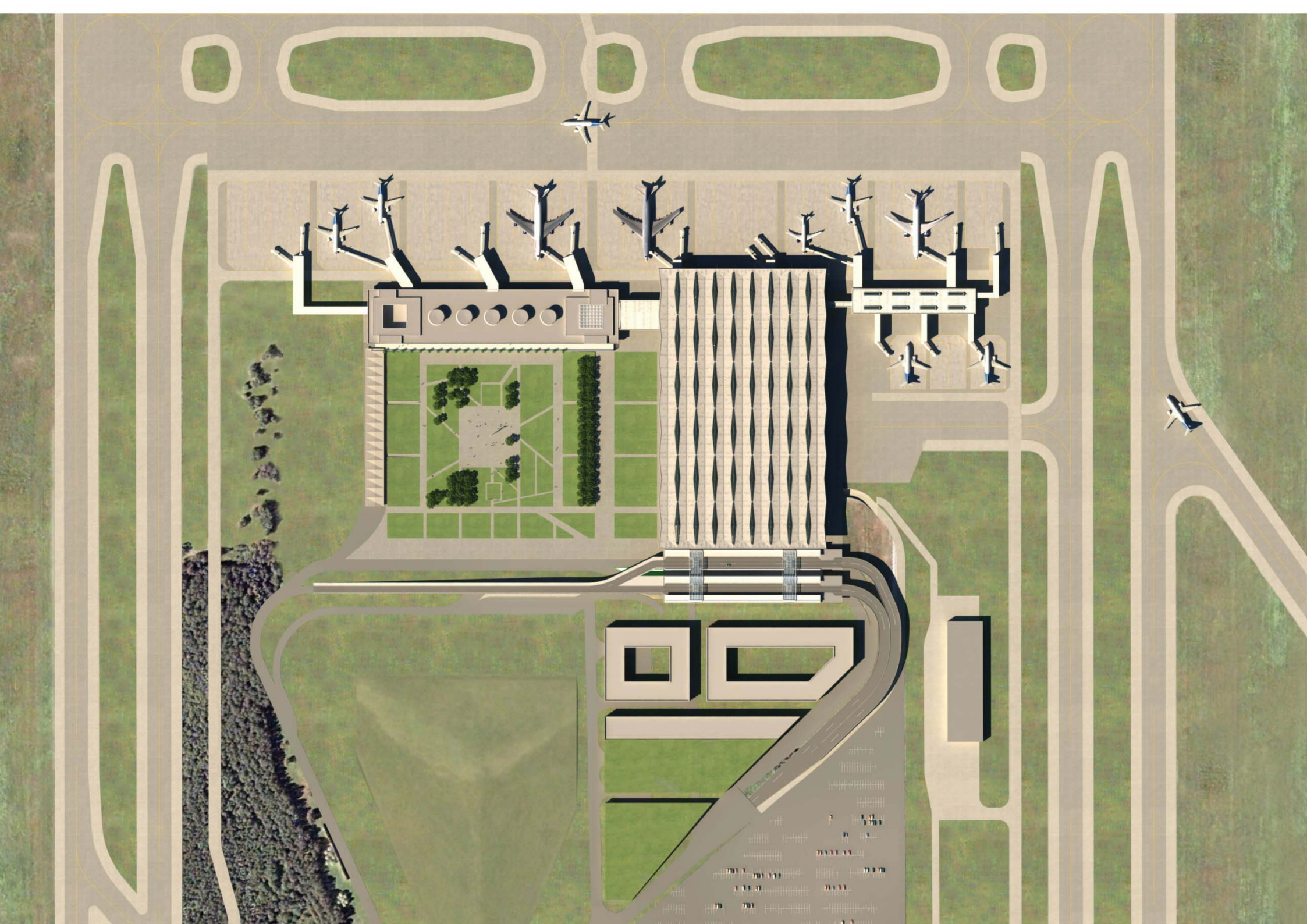
G





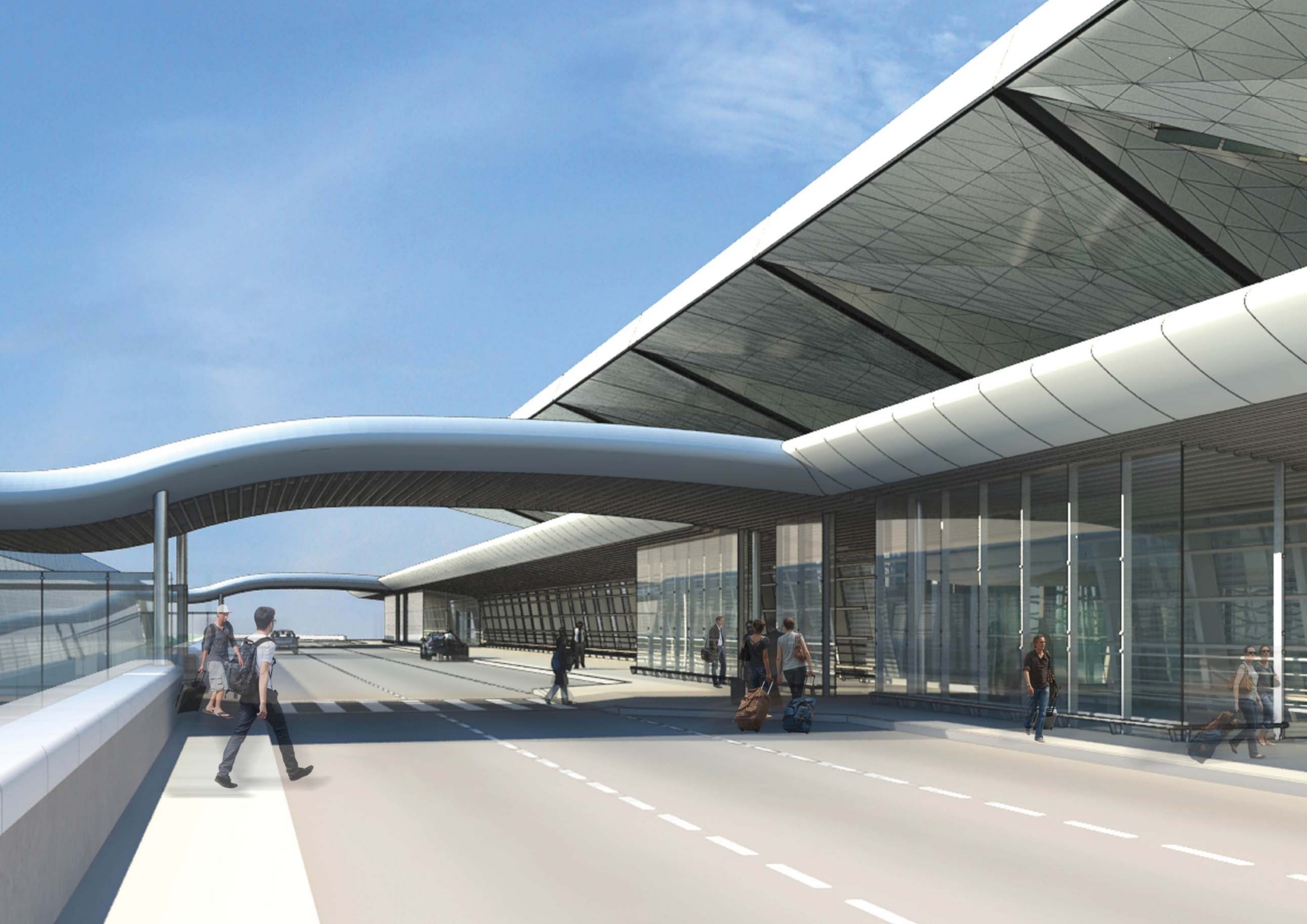
(BO, Maintenance)

RY
UNDARY
AND PLOTS



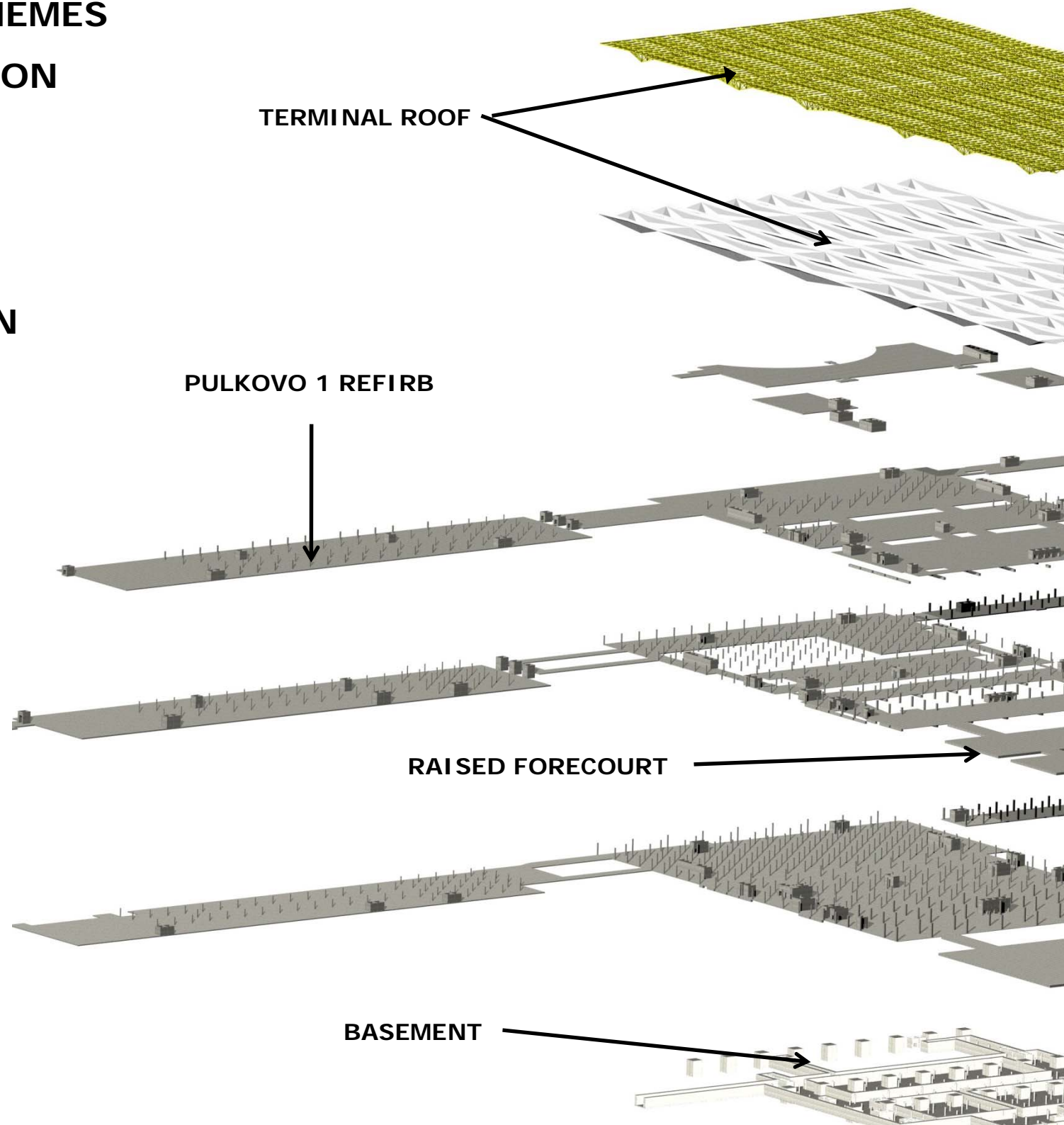


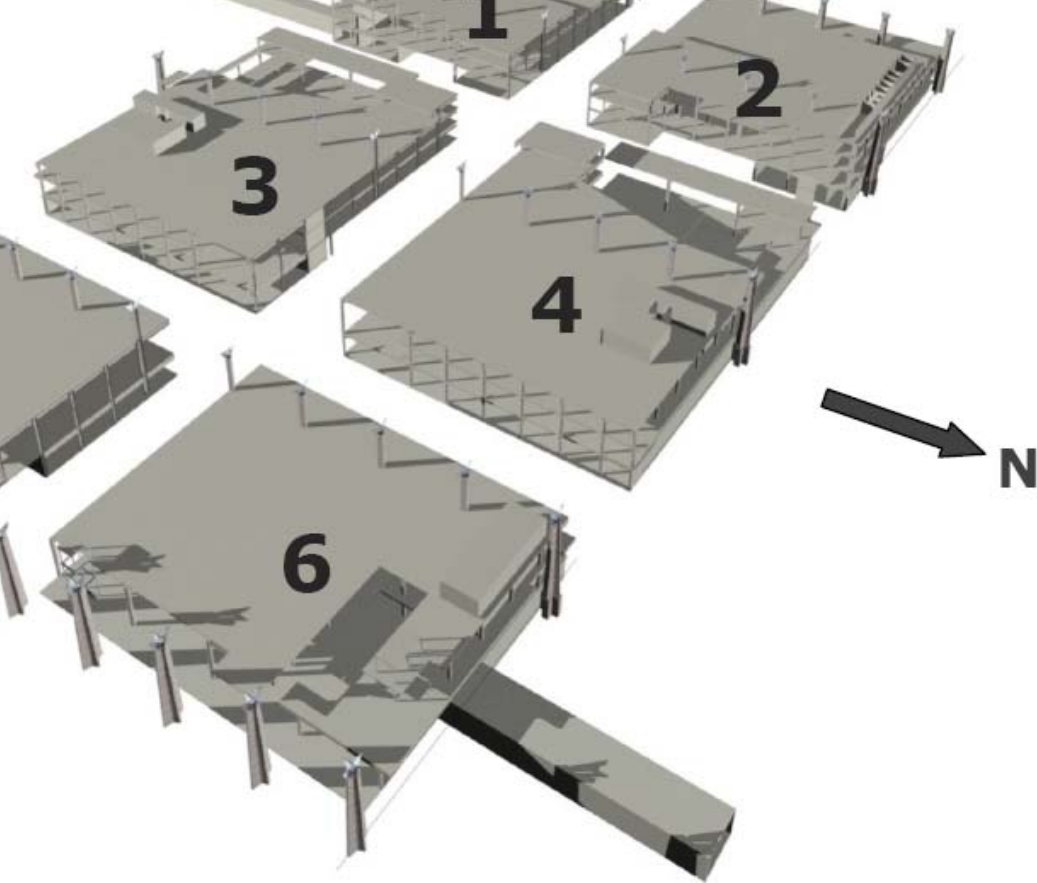






Y WITH ARCHITECTURAL THEMES
ATED ENGINEERING SOLUTION
RDISATION 'TOOLKIT'
IMPLICITY
EFFECTIVE
ND EASE OF CONSTRUCTION
TION / ECONOMY OF SCALE
FLEXIBILITY





STRUCTURAL

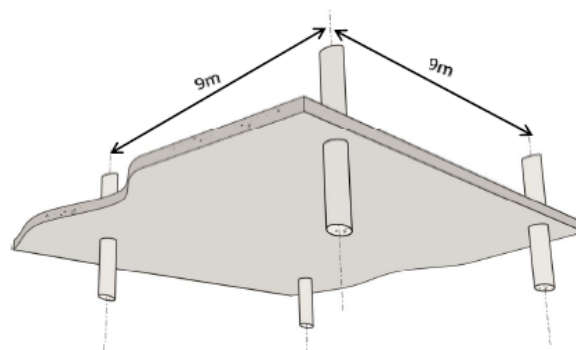
ADDING MODULE
F DECKING MODULE
JCTURAL GRID
CTURAL GRID

OMPONENTS;

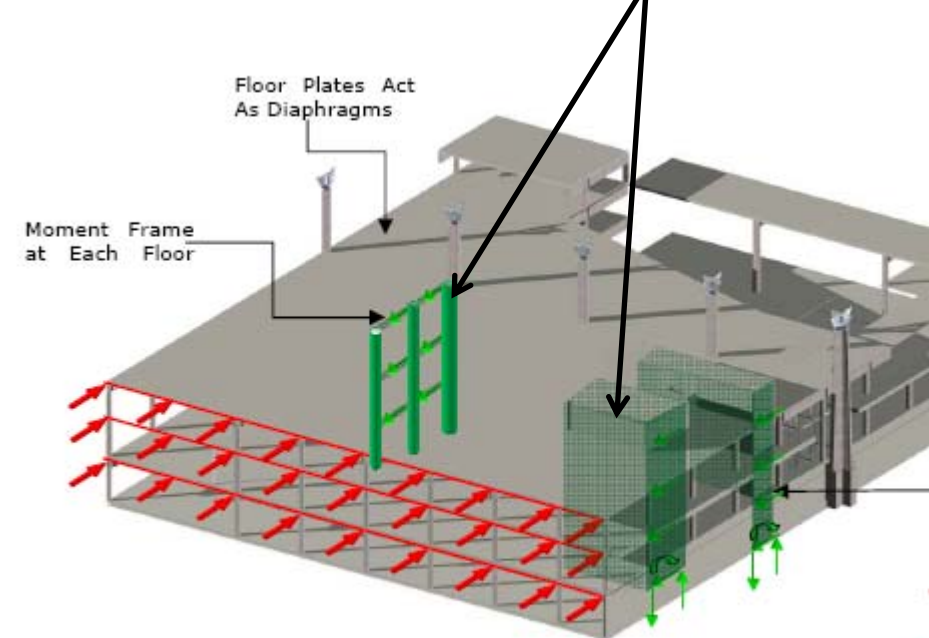
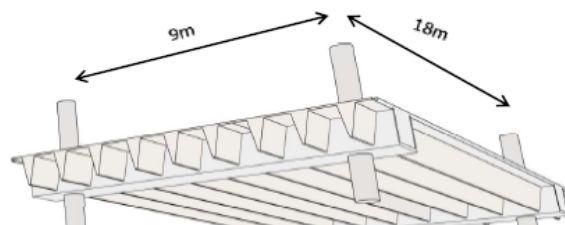
TERFACES;

E;

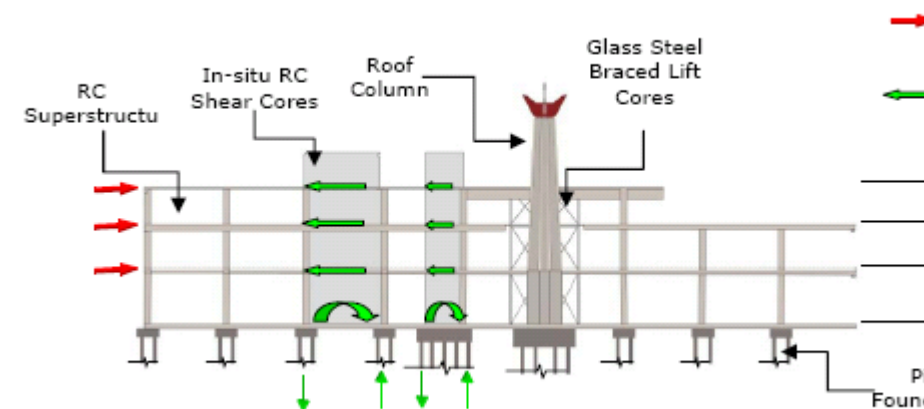
OF CONSTRUCTION.



9 x 9 IN-SITU FLAT SLAB

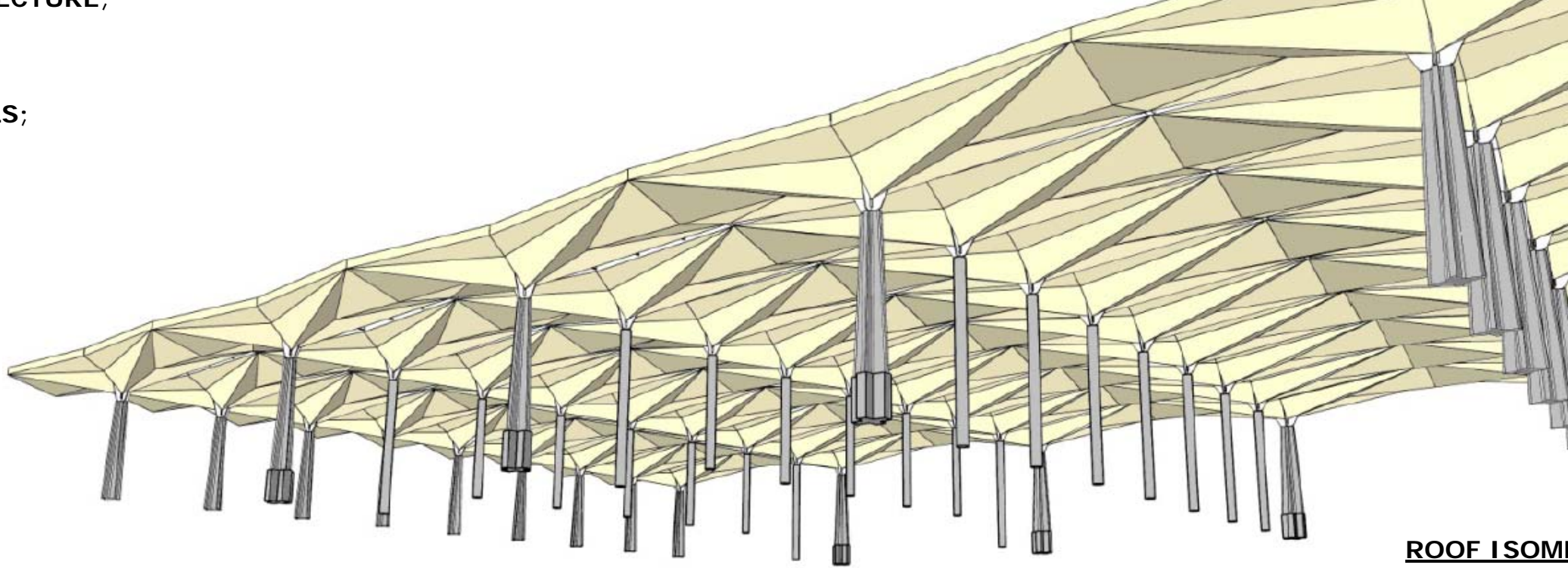


BUILDING 4 – STABILITY ISOMETRIC

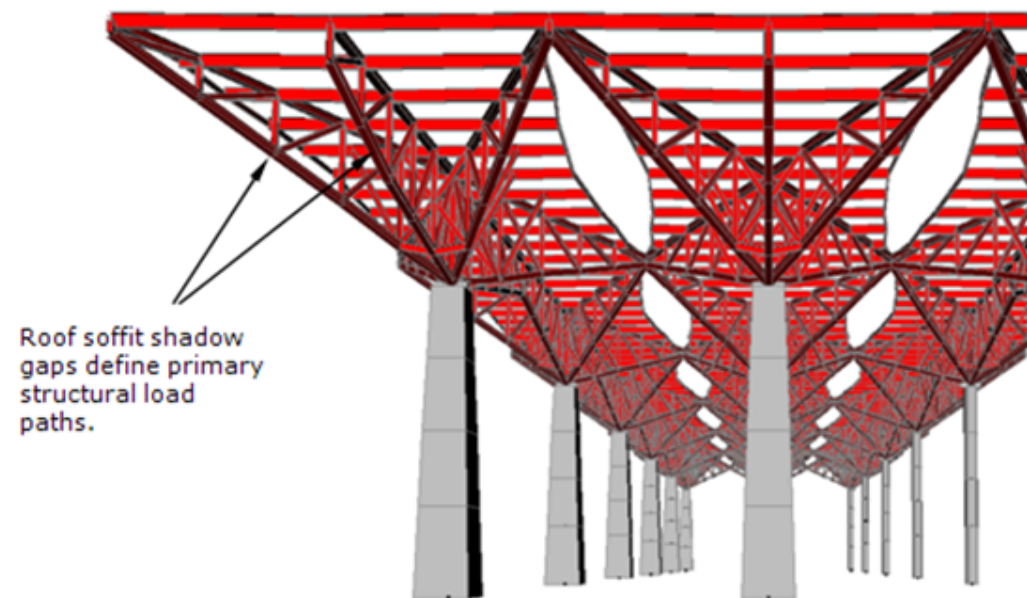
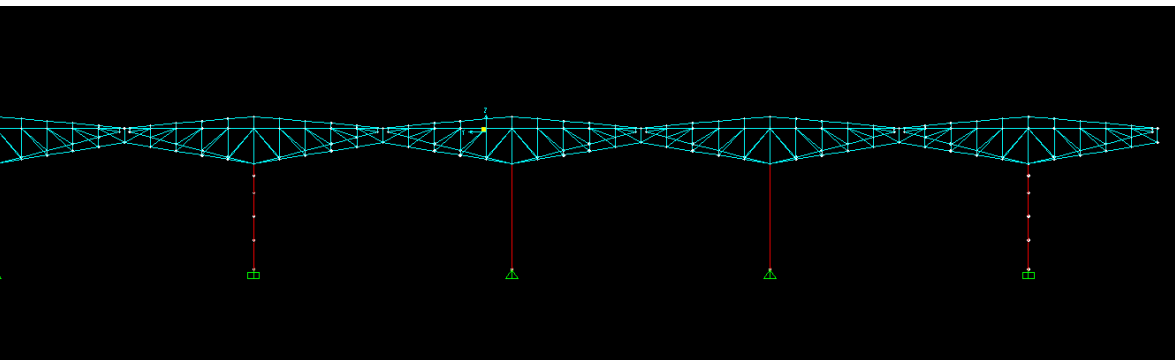


BUILDING 4 – STABILITY SECTION

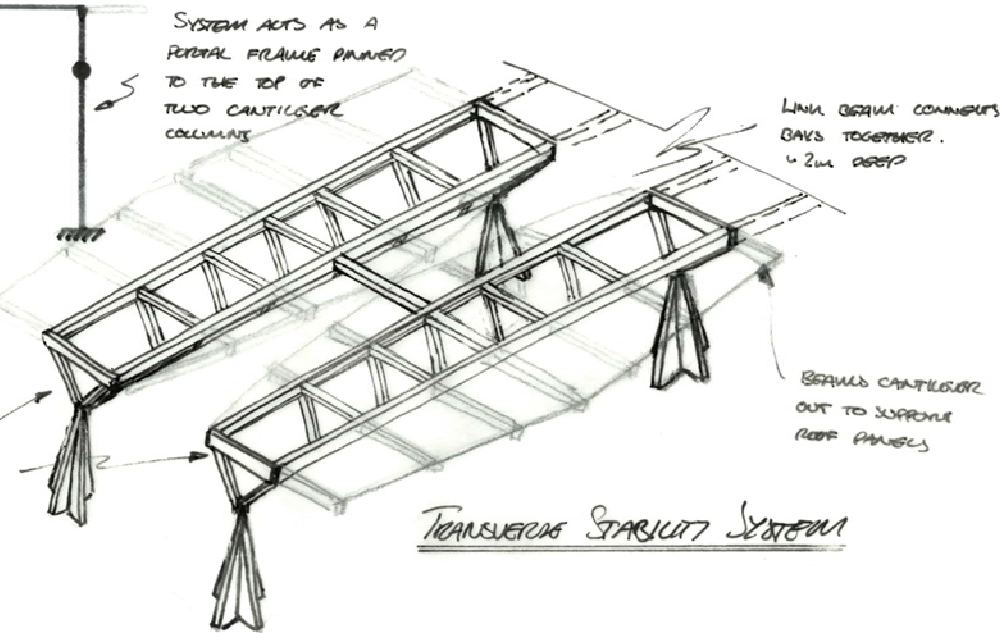
ARCHITECTURE,
IENCY;
MATERIALS;
ON;



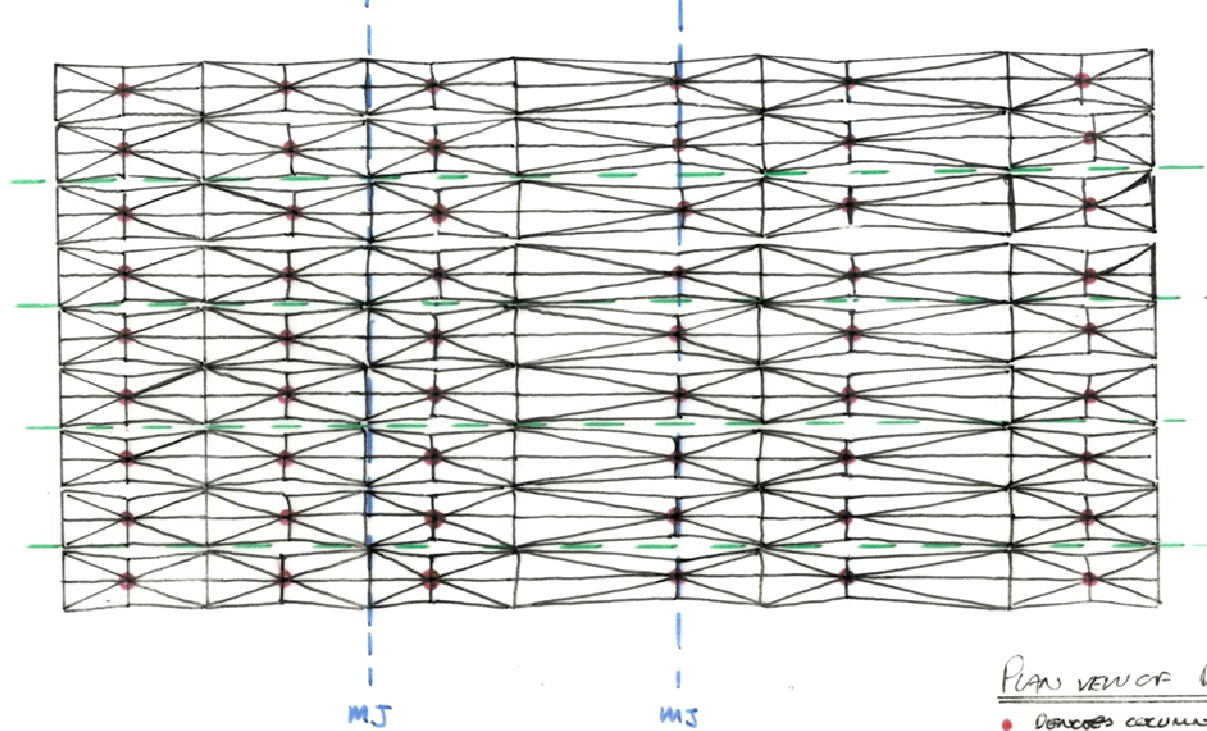
ROOF ISOM



Roof soffit shadow
gaps define primary
structural load
paths.



TRANSVERSE STABILITY SYSTEM

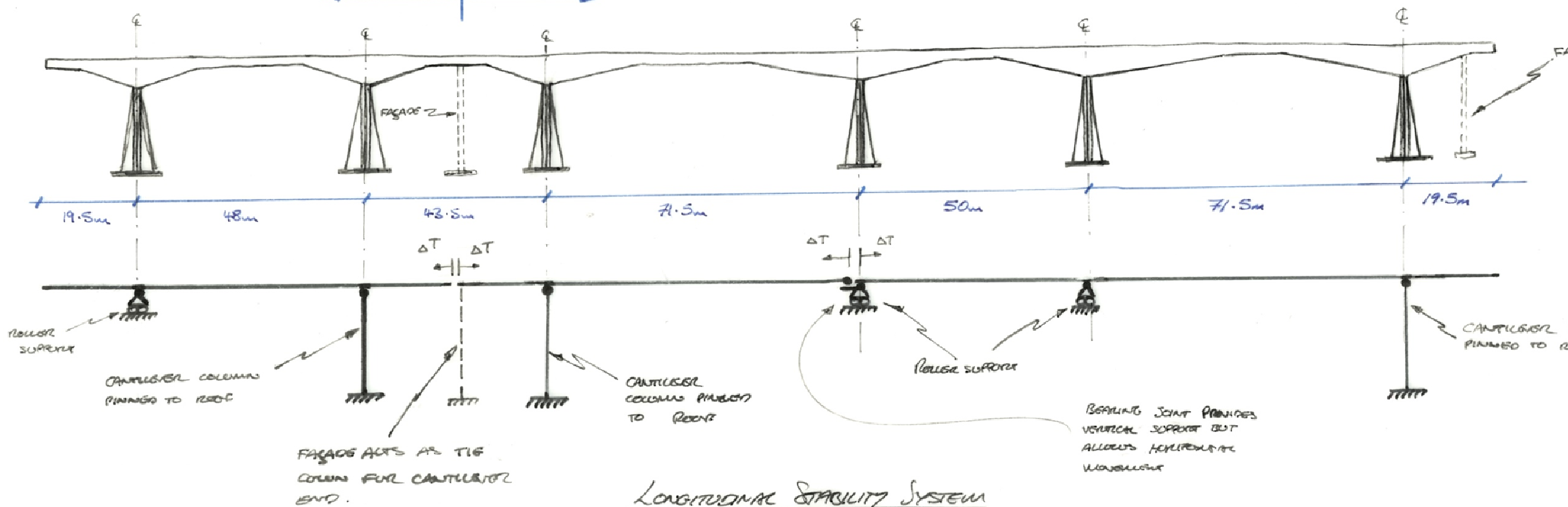


PLAN VIEW OF

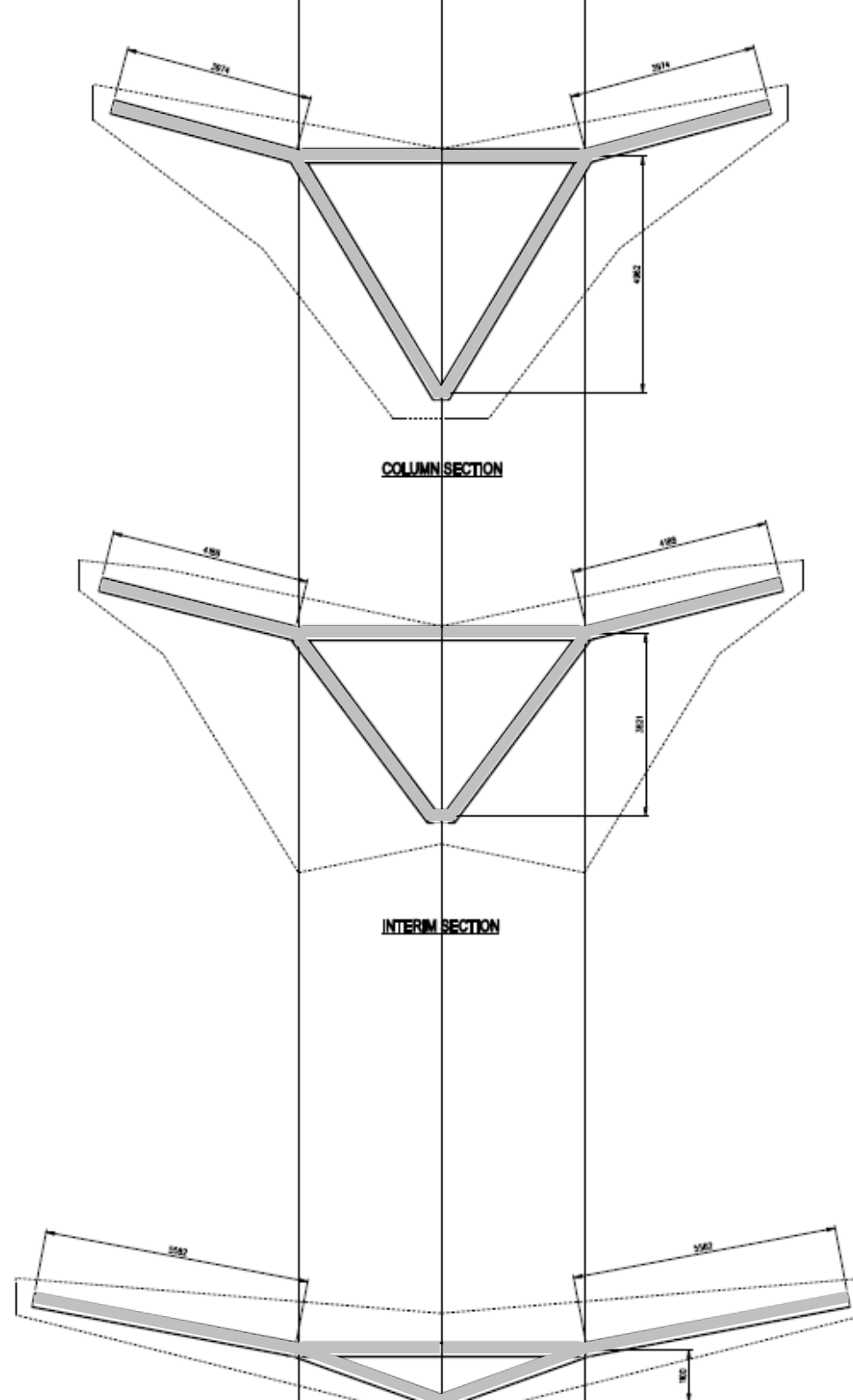
- DETECTED COLUMNS
- - - DETECTED LONGITUDINAL
- - - DETECTED TRANSVERSE

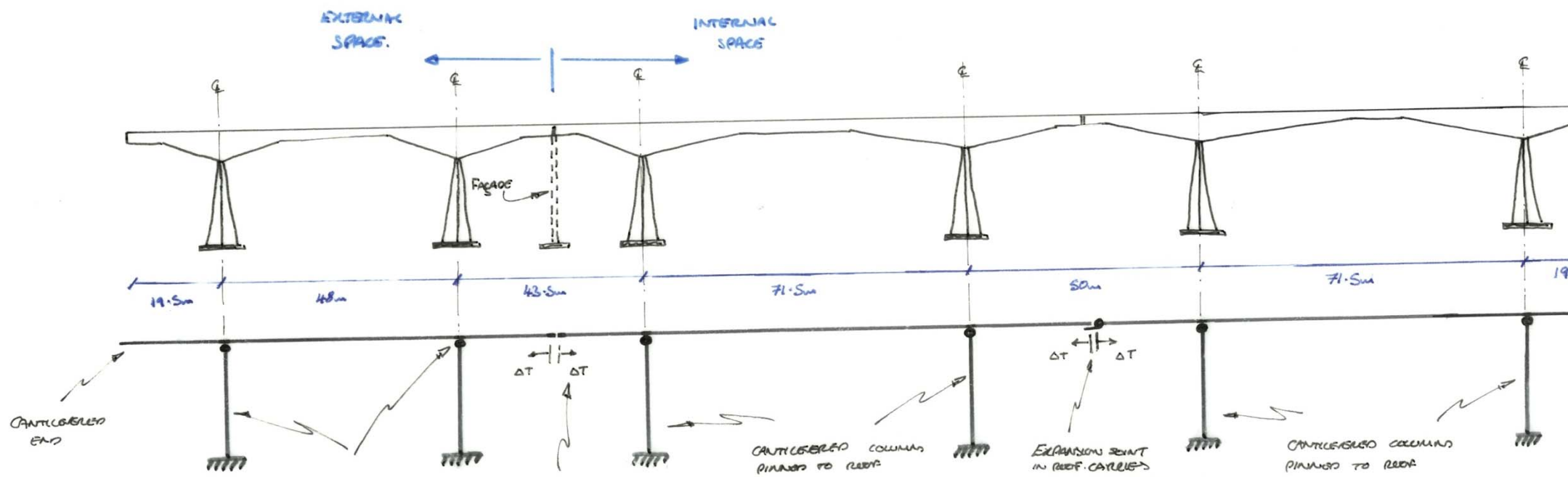
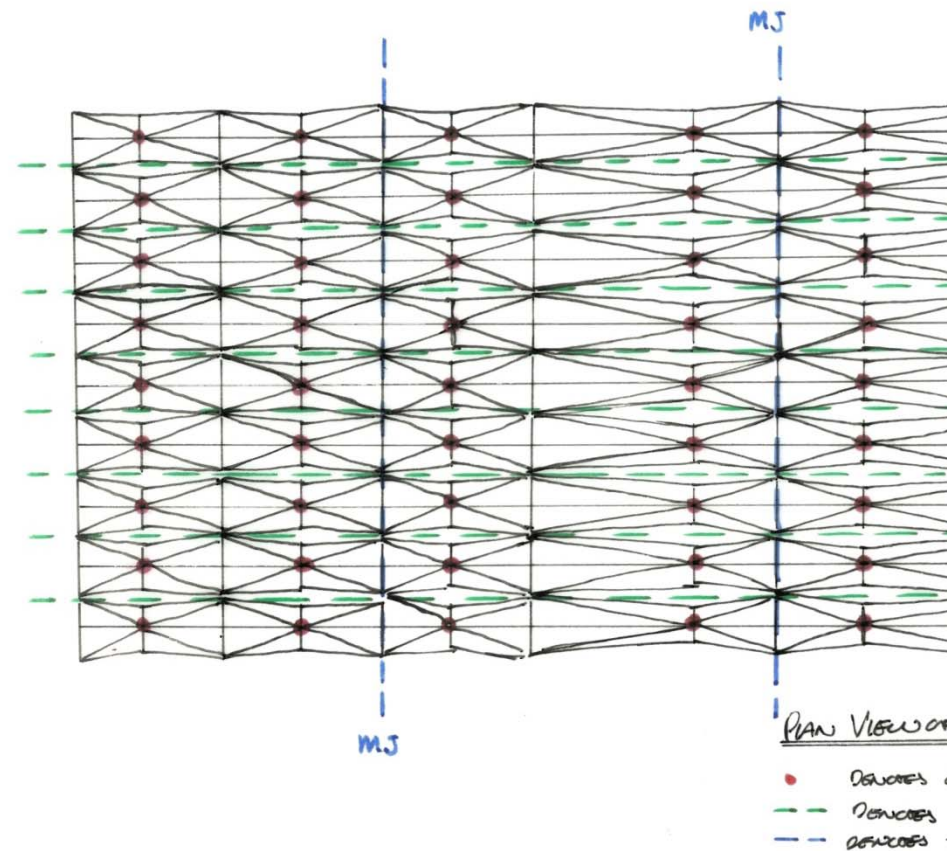
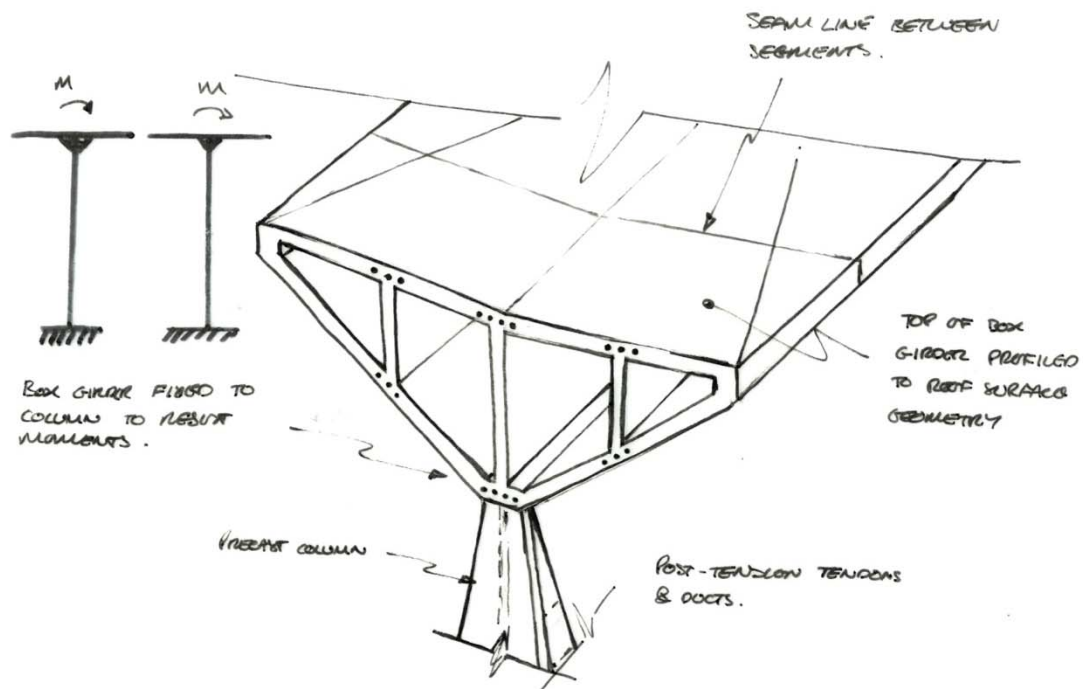
EXTERNAL
SPACE

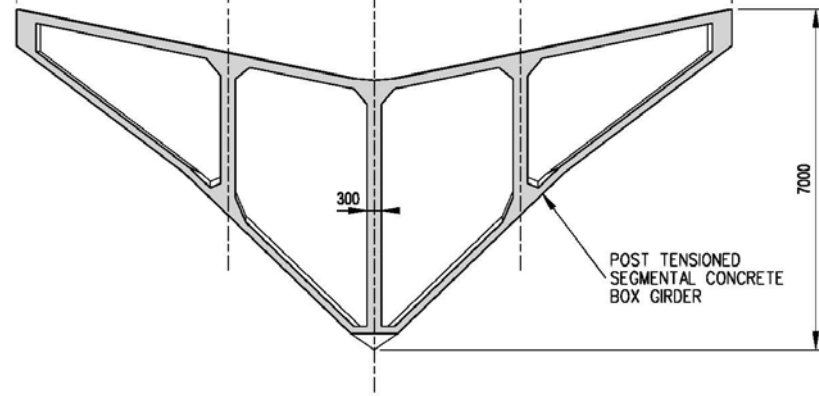
INTERNAL
SPACE



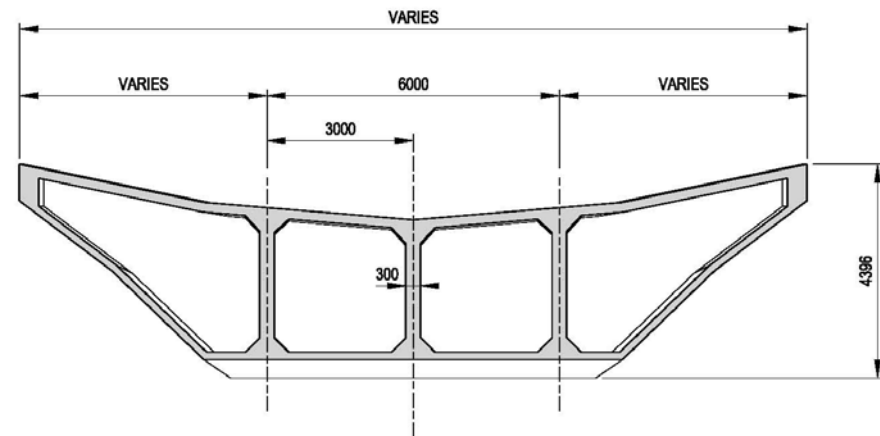
LONGITUDINAL STABILITY SYSTEM



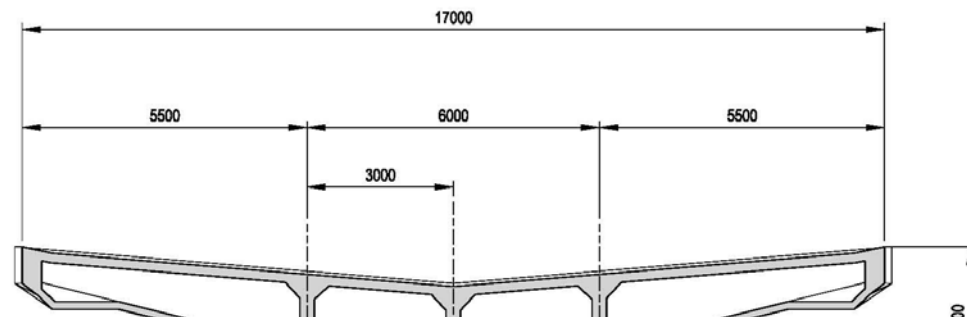




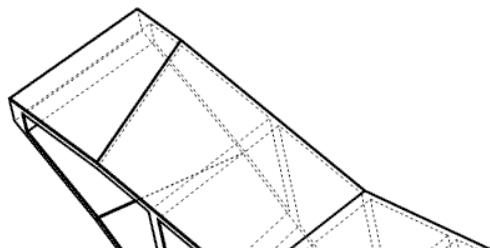
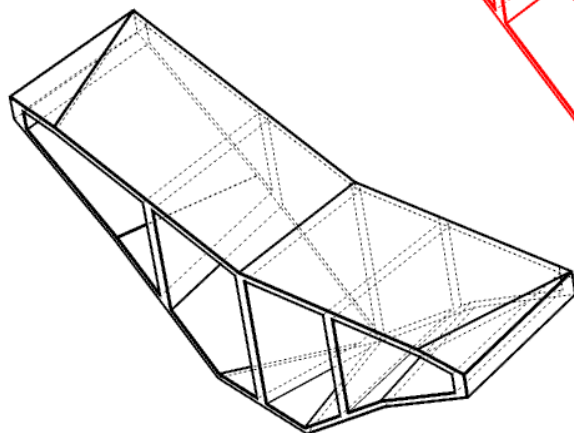
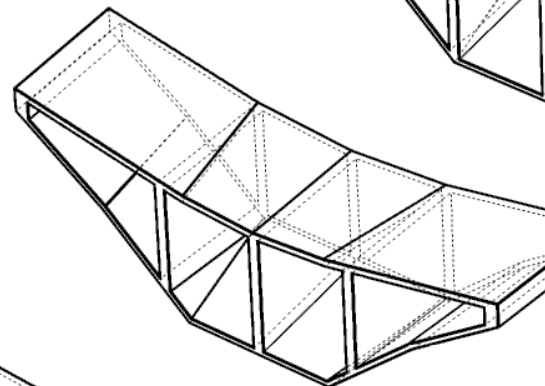
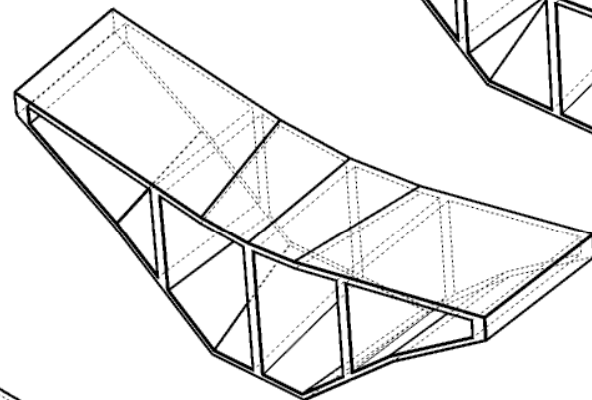
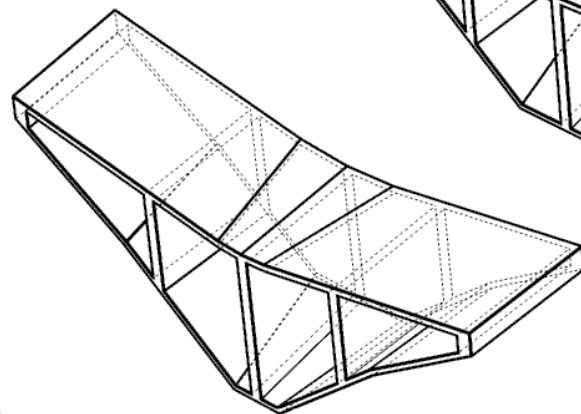
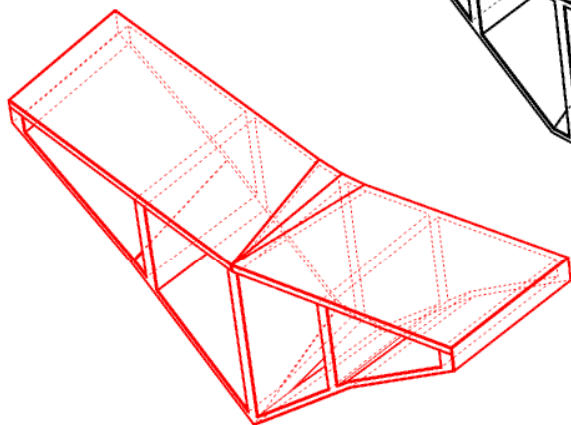
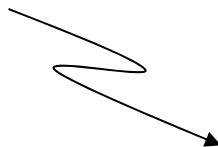
COLUMN SECTION

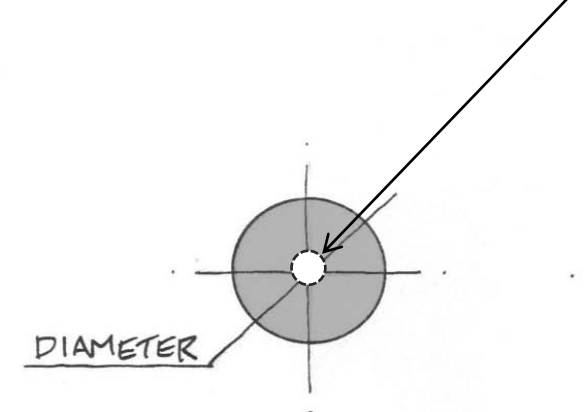
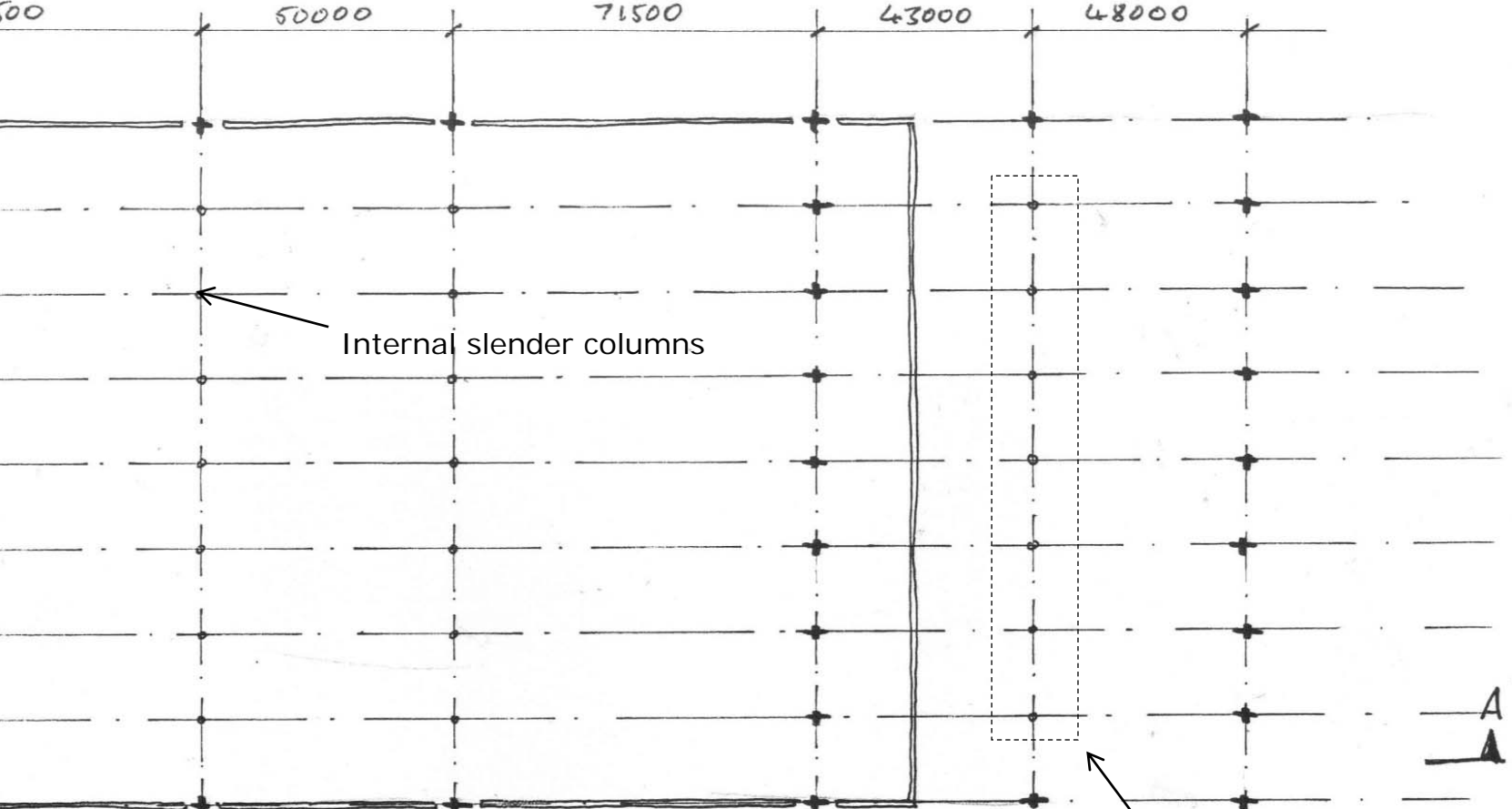


INTERIM SECTION

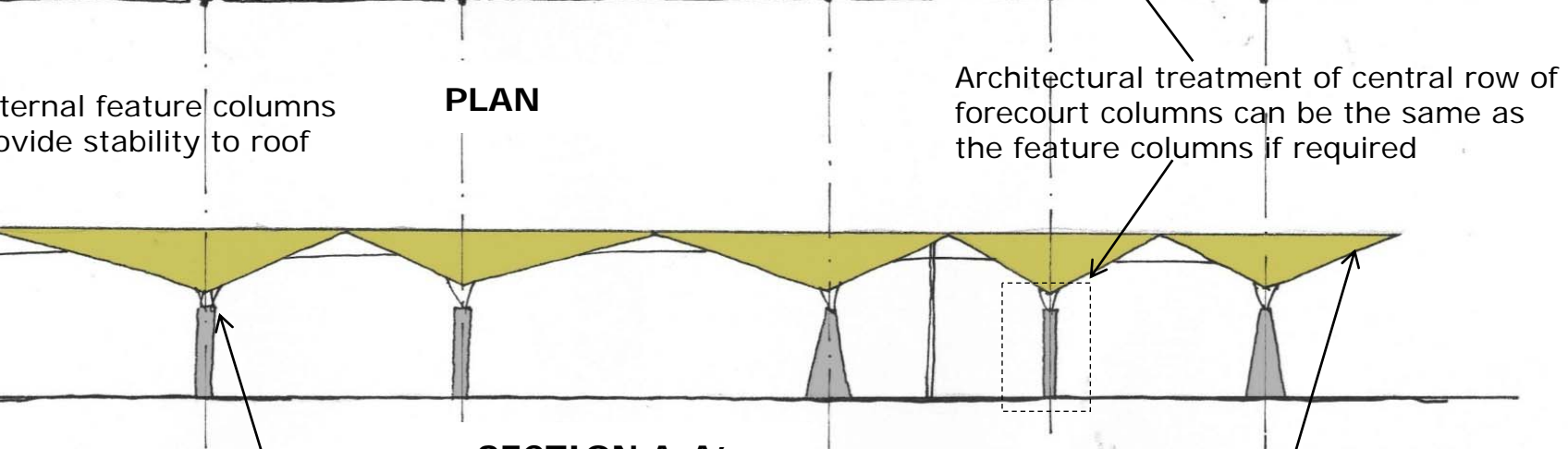


PRECAST POST-TENSION
BOX GIRDER SEGMENT





CIRCULAR



PLAN

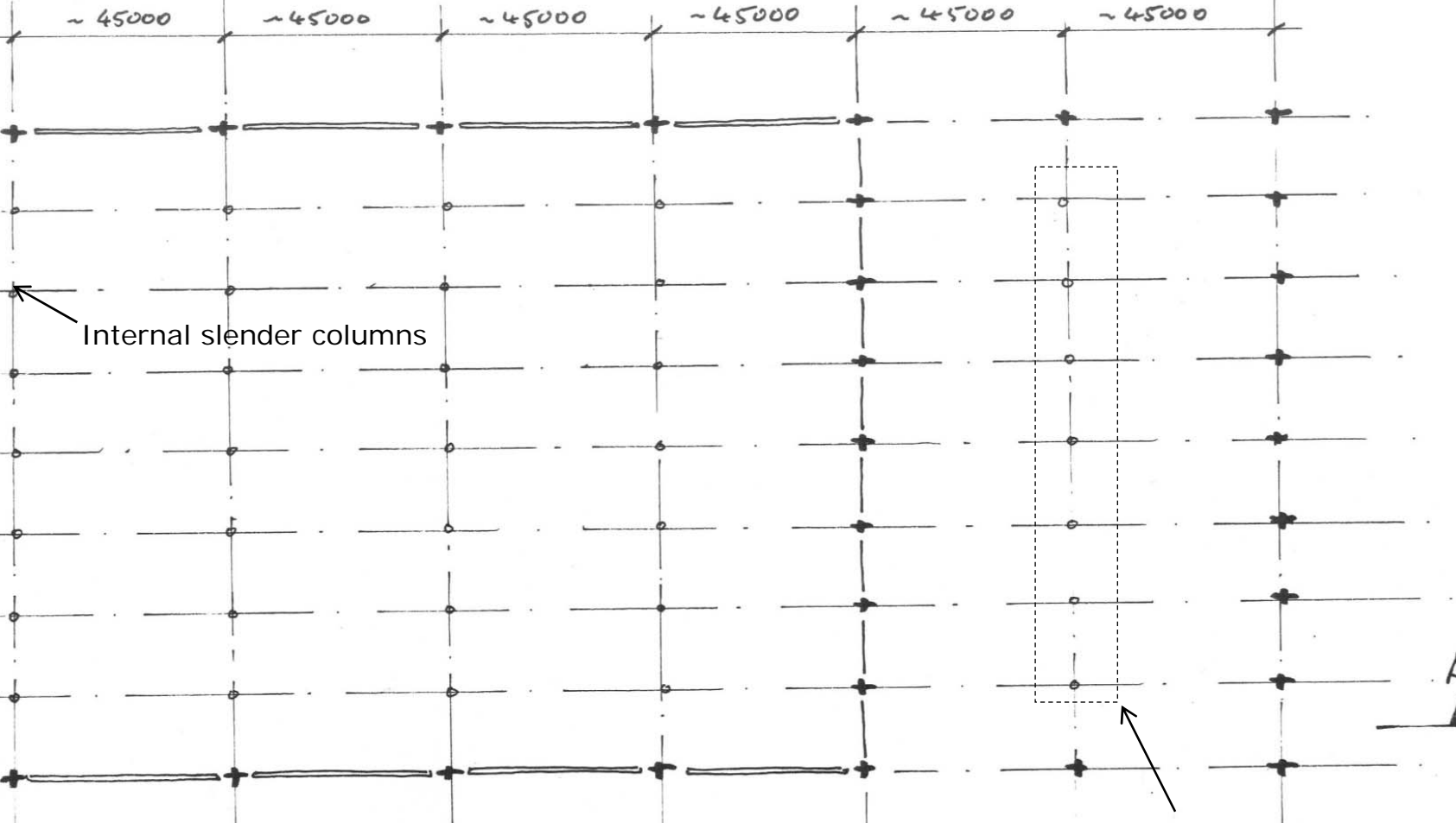
SECTION A-A'

INTERNAL CO	
	Ci dia
Roof Only Option A ¹	1
Roof Only (Restrained) Option B ¹	1
Roof and Frame (Restrained) Option C ¹	1

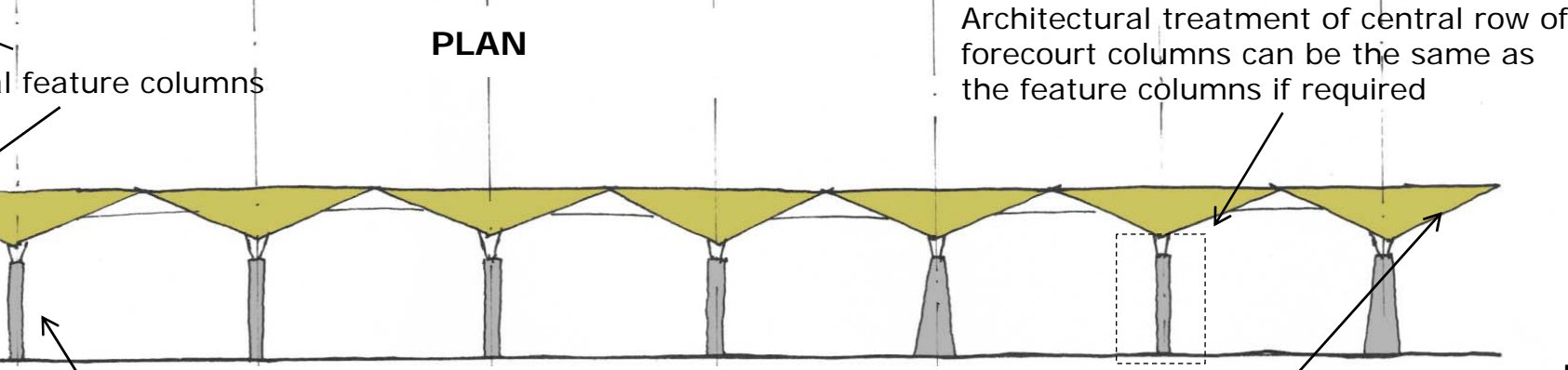
¹- Refer to S/SK012

POTENTIAL BENEFITS

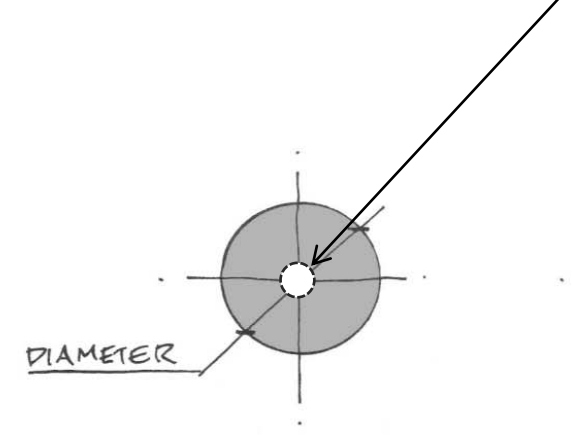
- Improved terminal circu
- Improved terminal capa



PLAN



SECTION A-A'



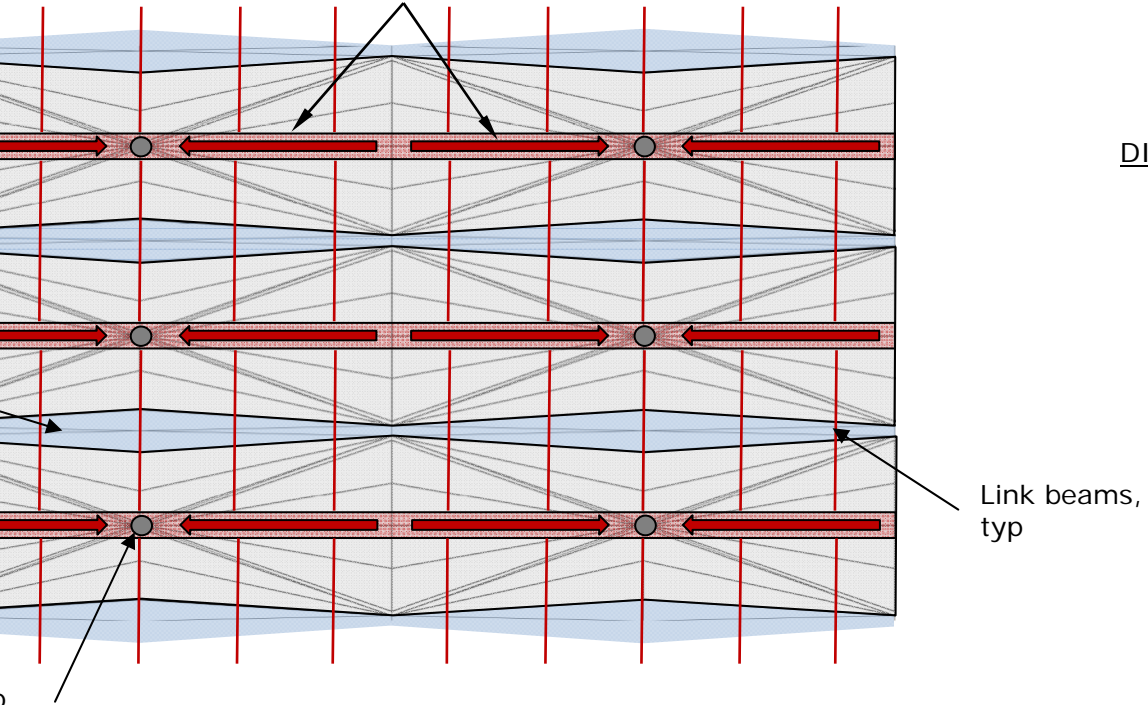
CIRCULAR

INTERNAL CO	
	Ci dia
Roof Only Option A ¹	1
Roof Only (Restrained) Option B ¹	1
Roof and Frame (Restrained) Option C ¹	1

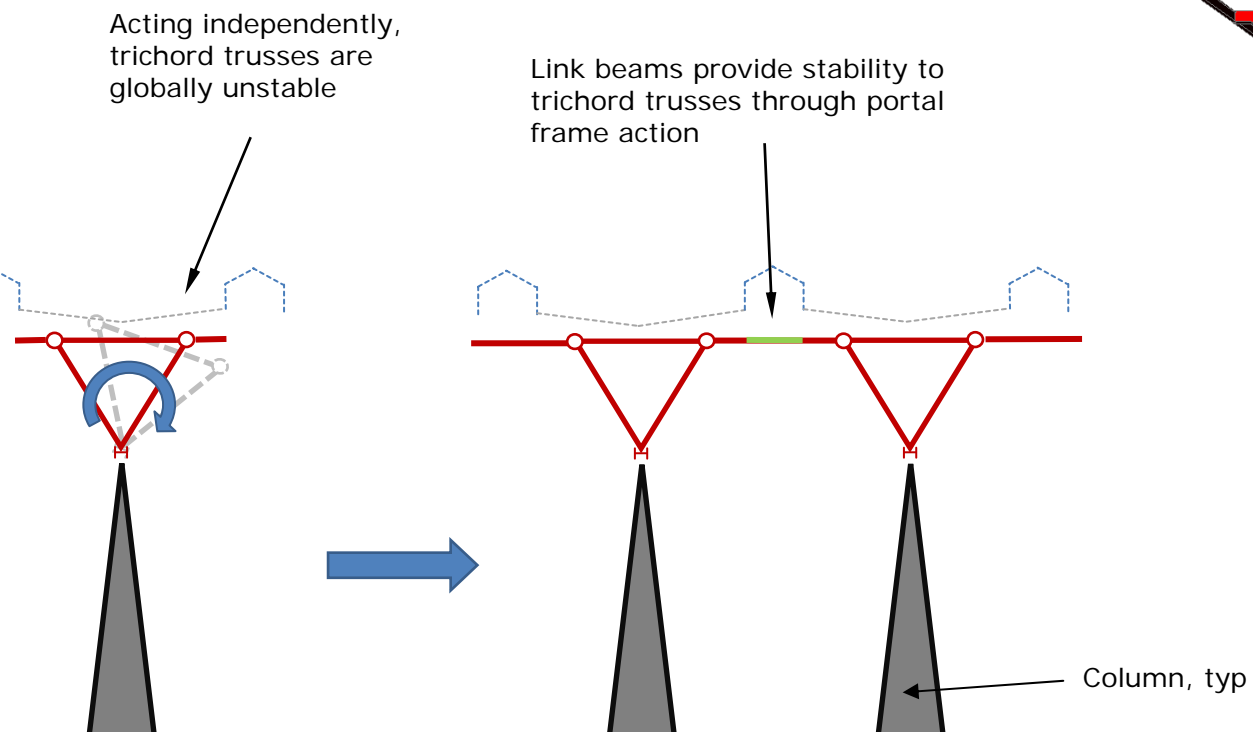
¹- Refer to S/SK012

POTENTIAL BENEFITS

- Reduction in roof steelwork ton
- Standardized roof module, incr



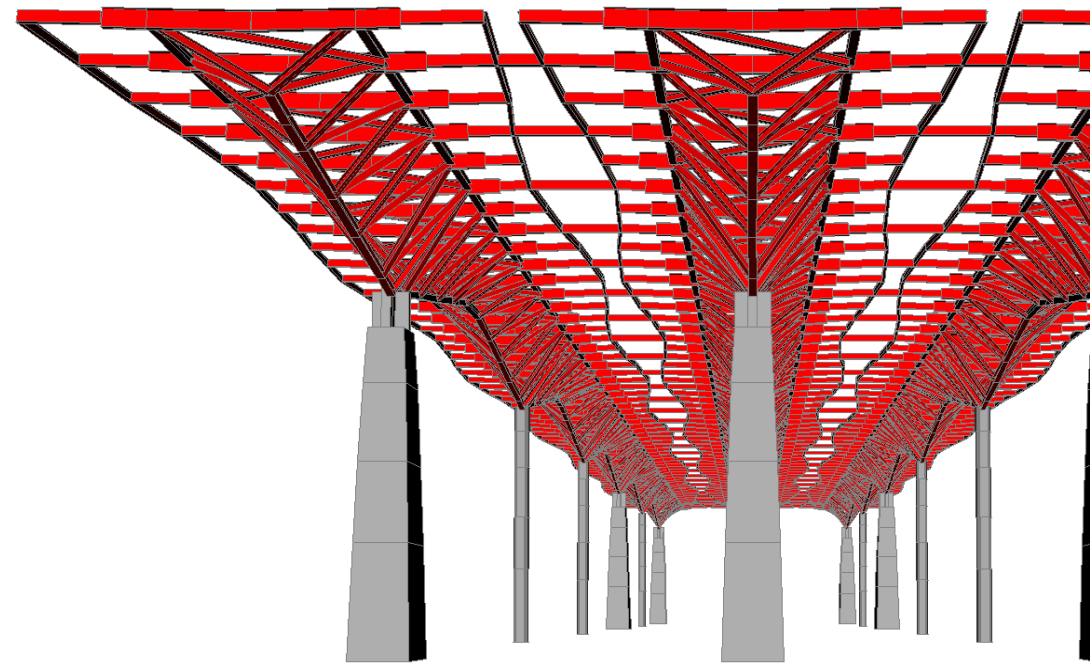
PLAN



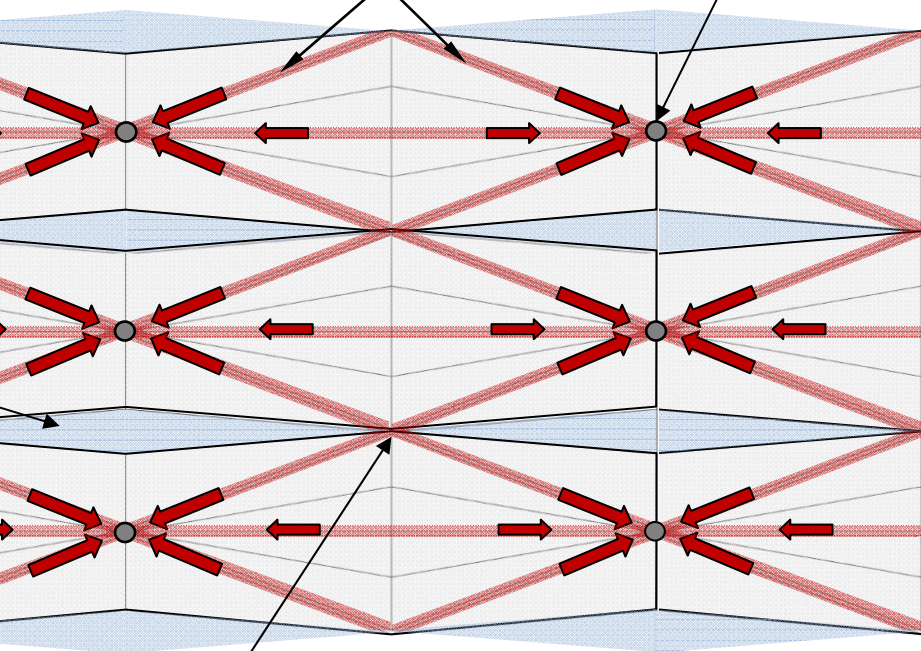
- Low structural steel piece count.
- Stabilising link beams across roof-lights can be utilised as supports for I

DISADVANTAGES

- Limited diaphragm action over global roof plane.
- Discrete column connection requires link beams for stability.
- Requires additional secondary steel to achieve soffit geometry.
- Multiple stability link beams required across roof lights.

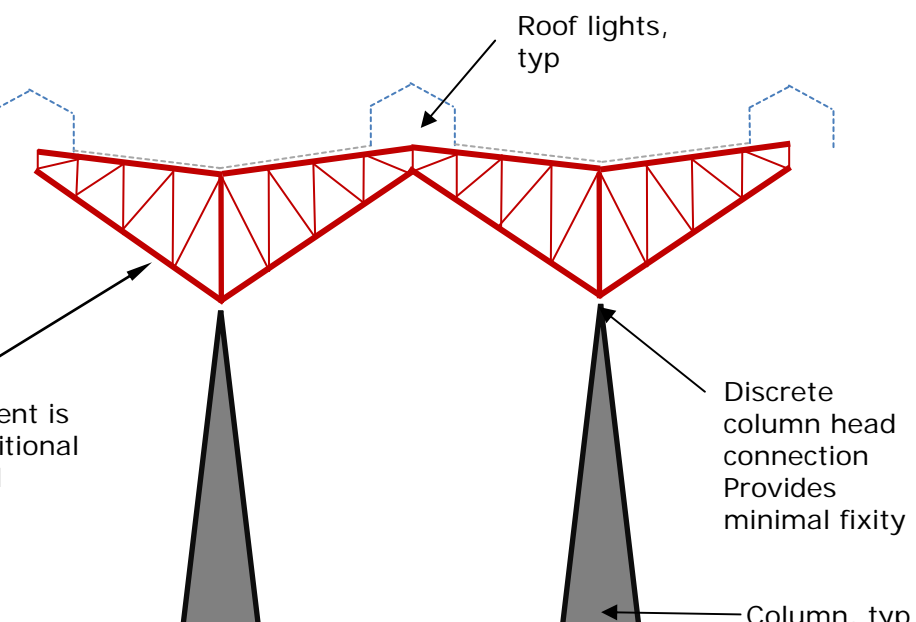


ISOMETRIC VIEW



Diagonal truss
Crosses rooflight
at single point

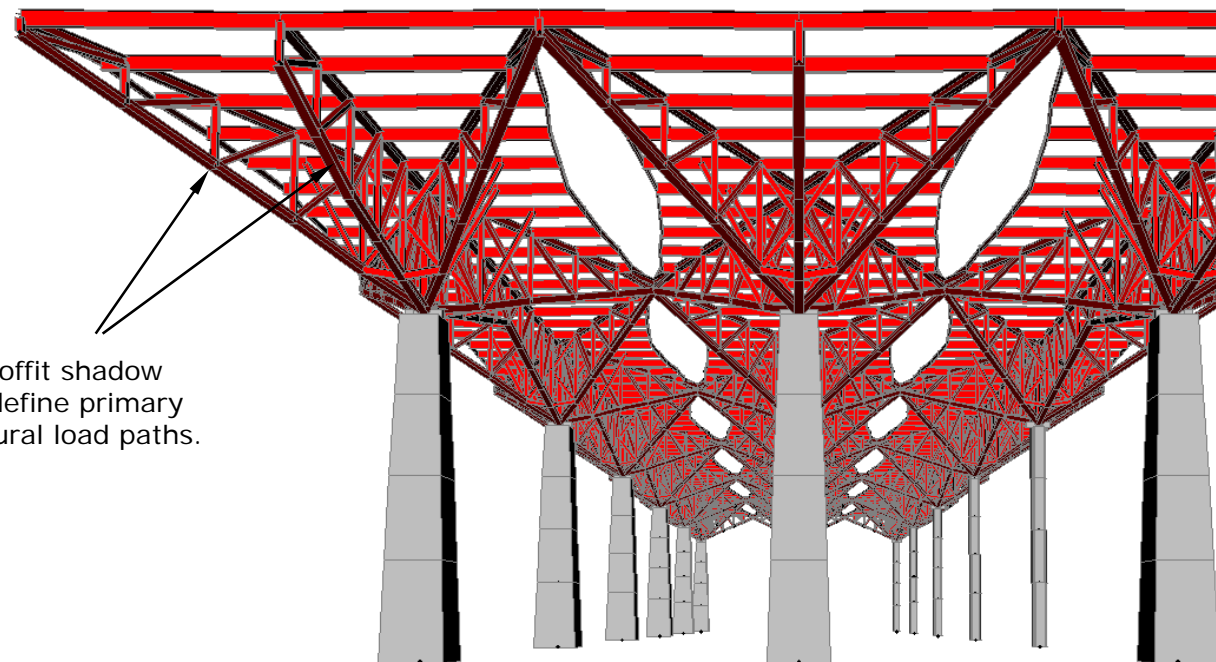
PLAN

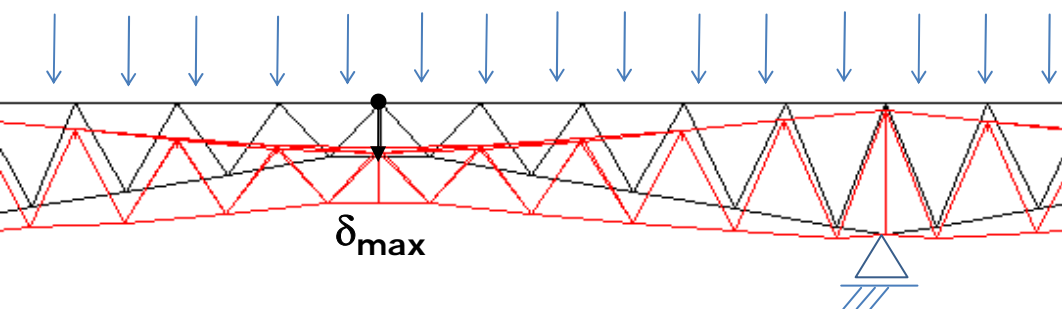
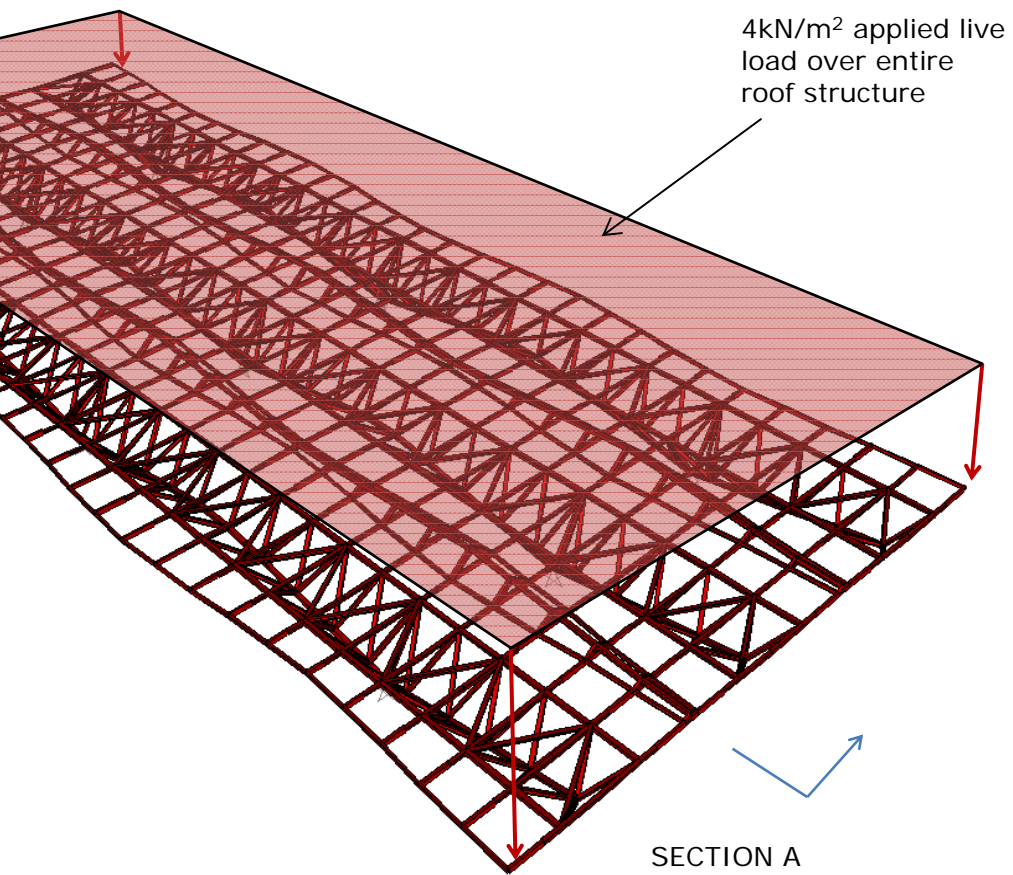


- Trusses conform closely to soffit geometry reducing secondary steelwork required.
- Minimal structural steel obstruction to roof lights.

DISADVANTAGES

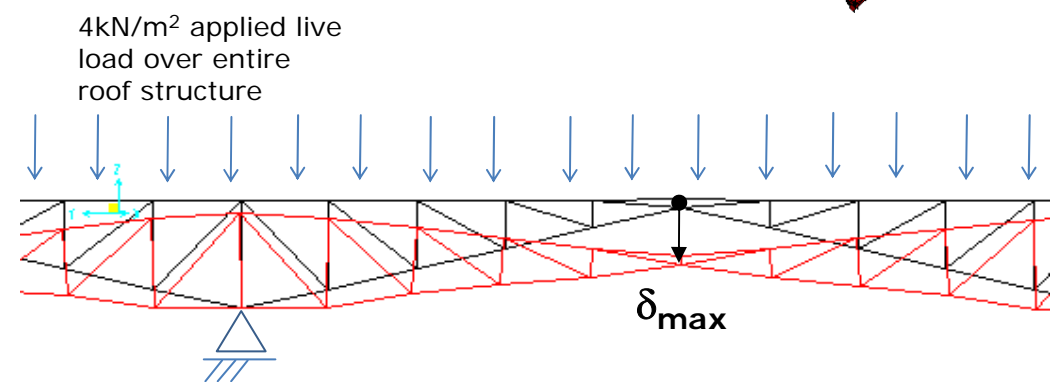
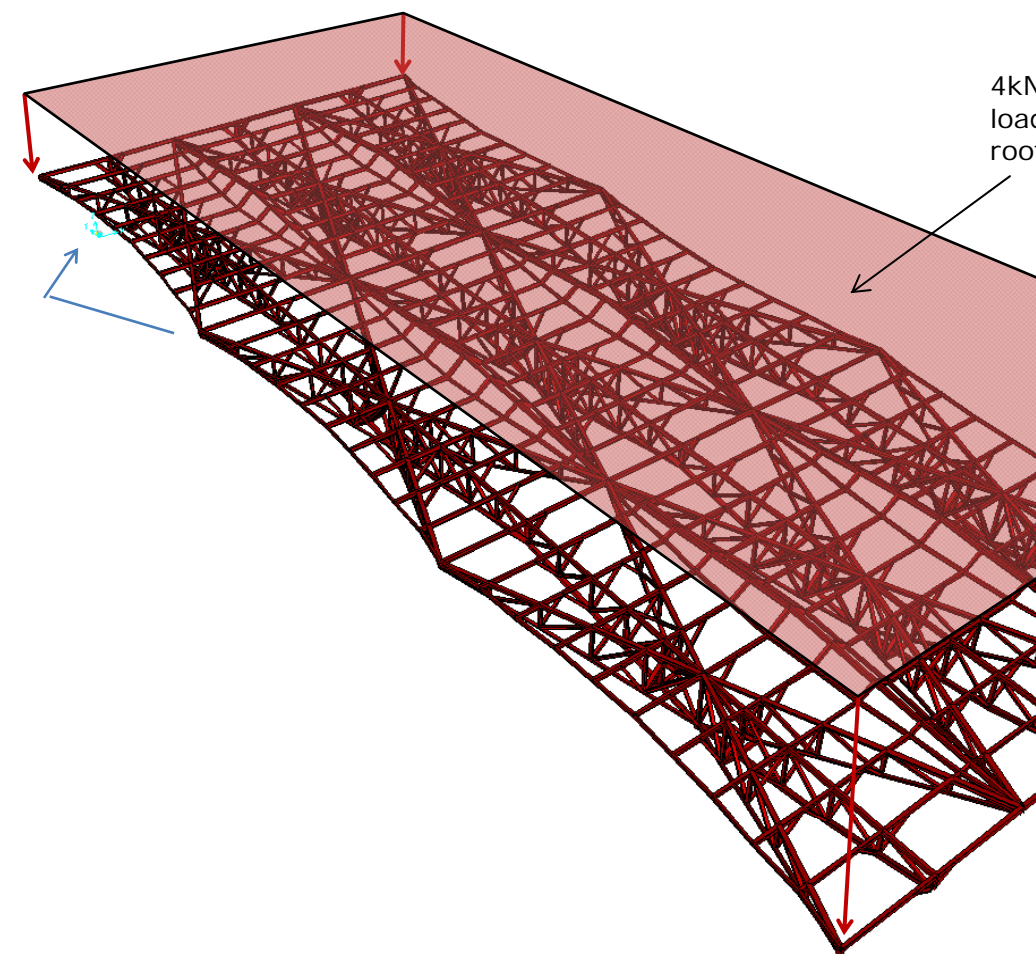
- Higher structural steel piece count.
- Planar trusses require additional restraint for compression members.
- Primary diagonal trusses cross roof-lights at oblique angle – complex to resist.





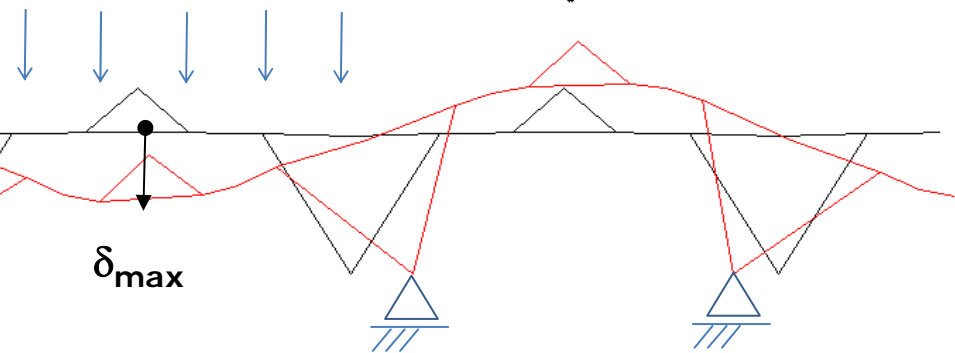
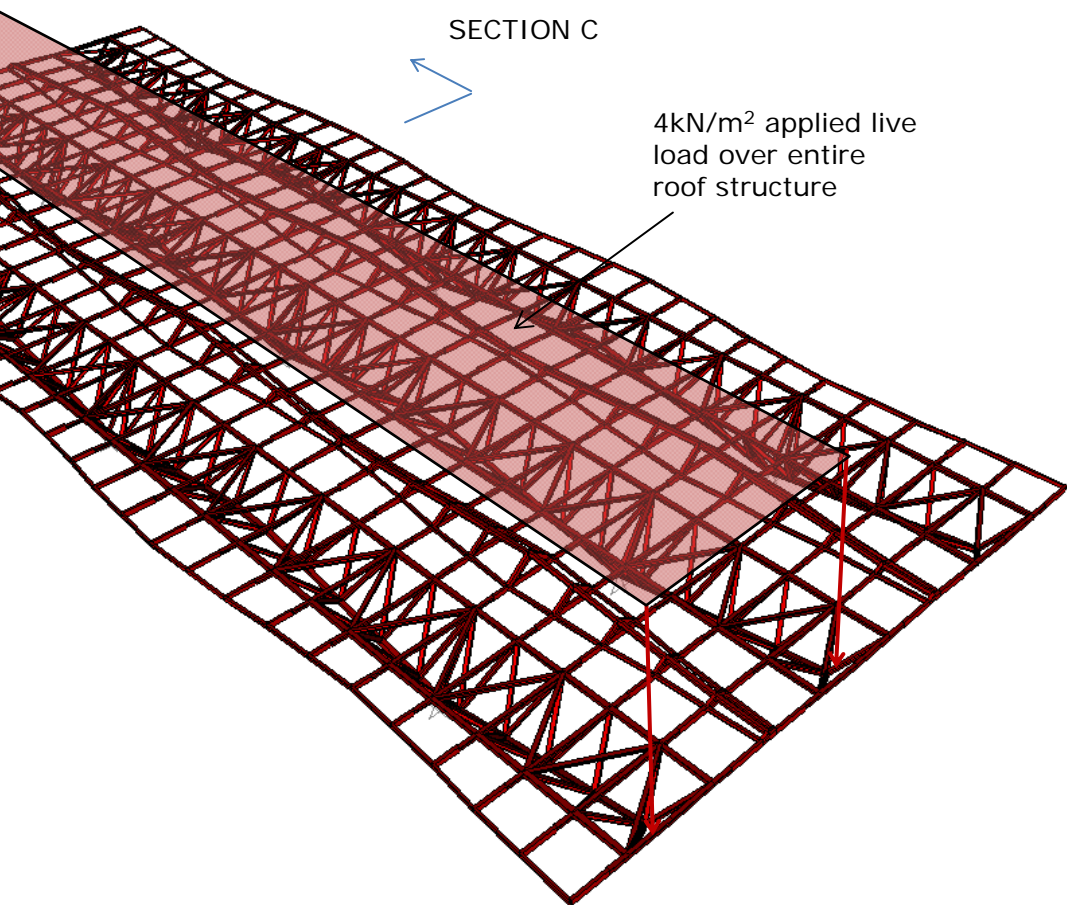
SECTION A

DEFLECTION UNDER BLANKET LIVE LOAD -



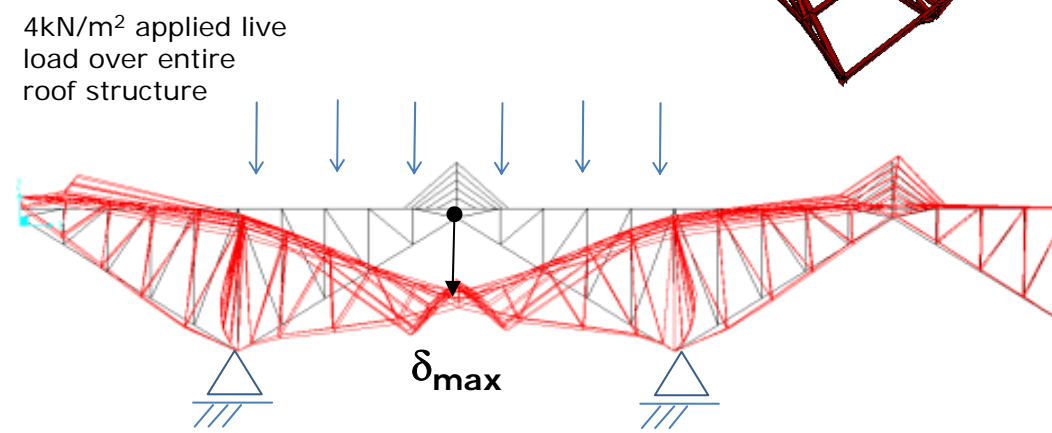
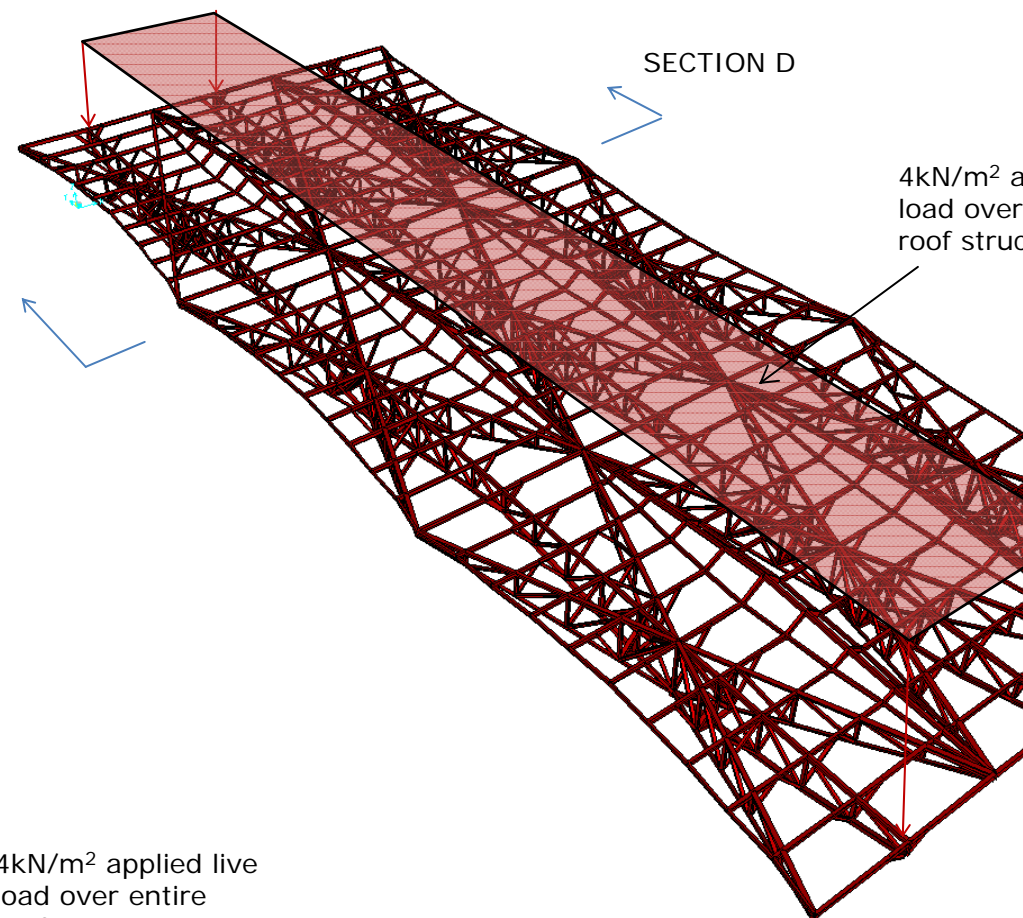
SECTION B

PEAK DEFLECTION UNDER BLANKET LIVE I



SECTION C

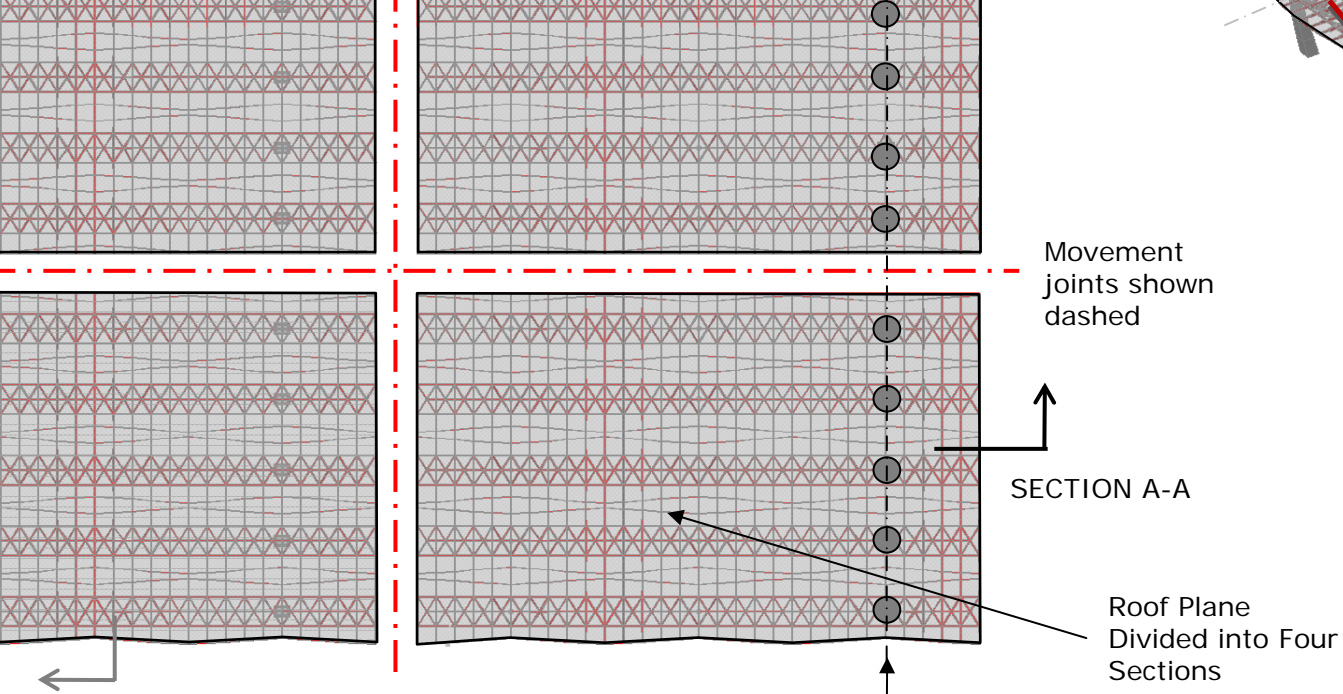
PEAK DEFLECTION UNDER PATTERN LOAD –



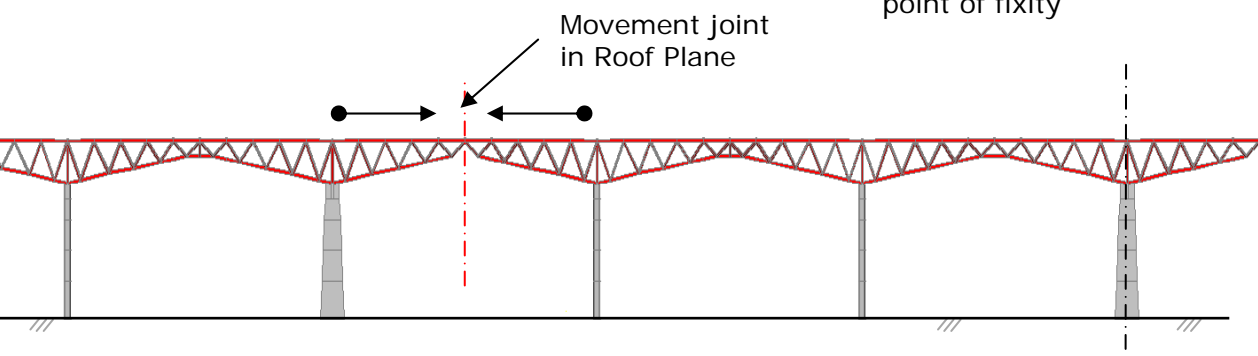
SECTION D

PEAK DEFLECTION UNDER PATTERN LOAD

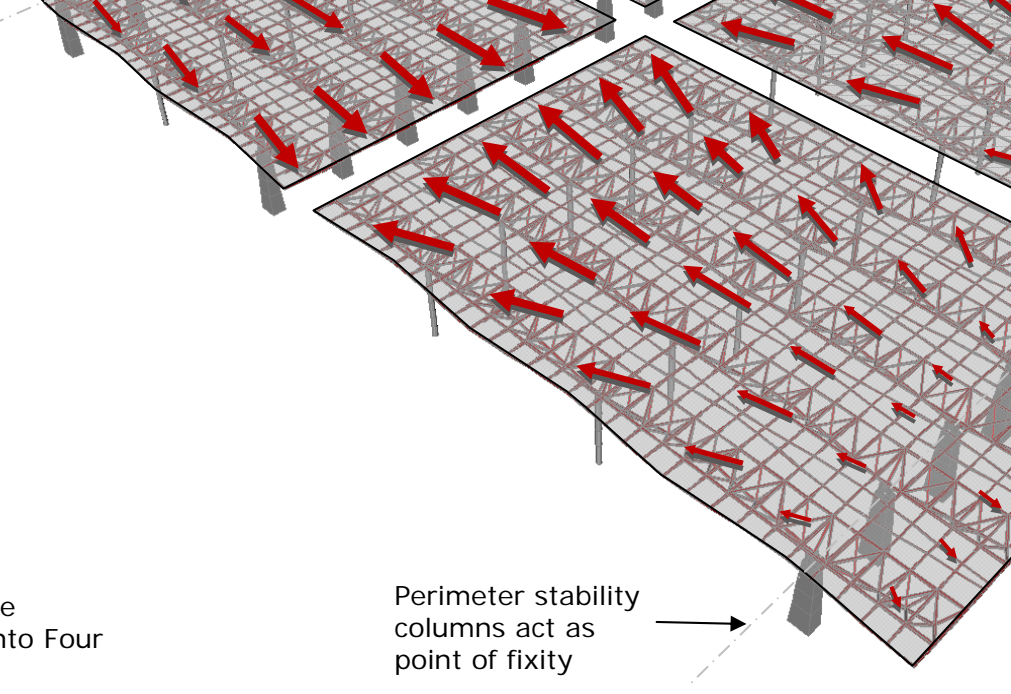
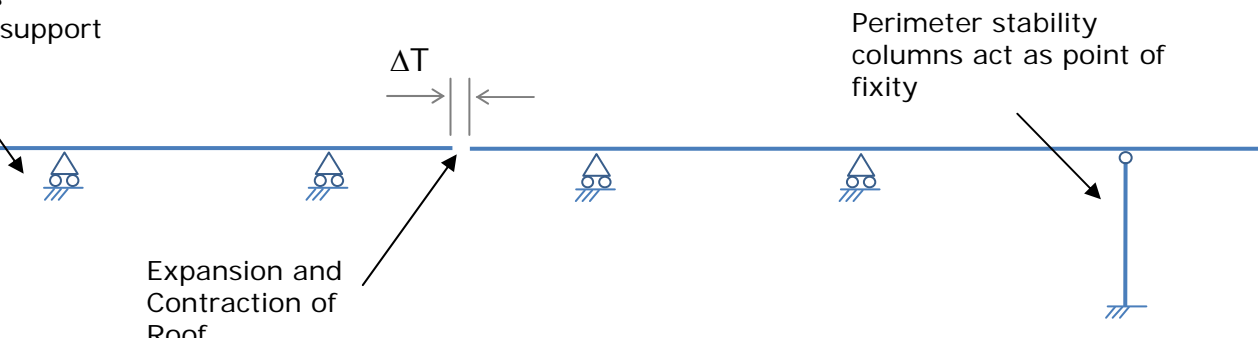




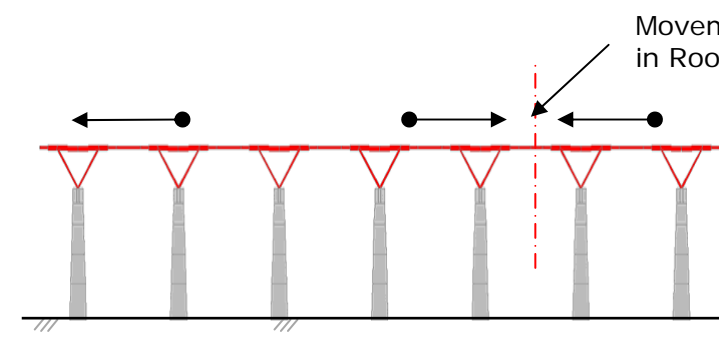
PLAN



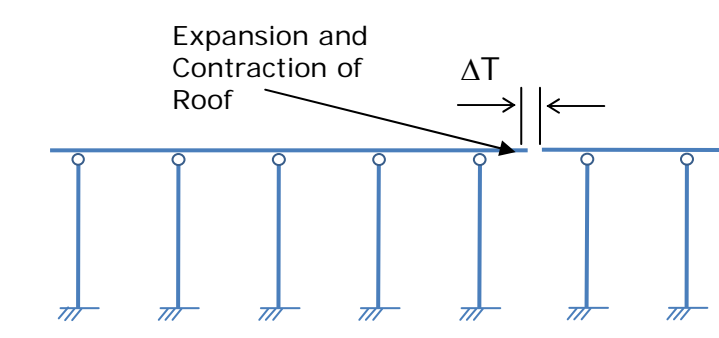
SECTION A-A

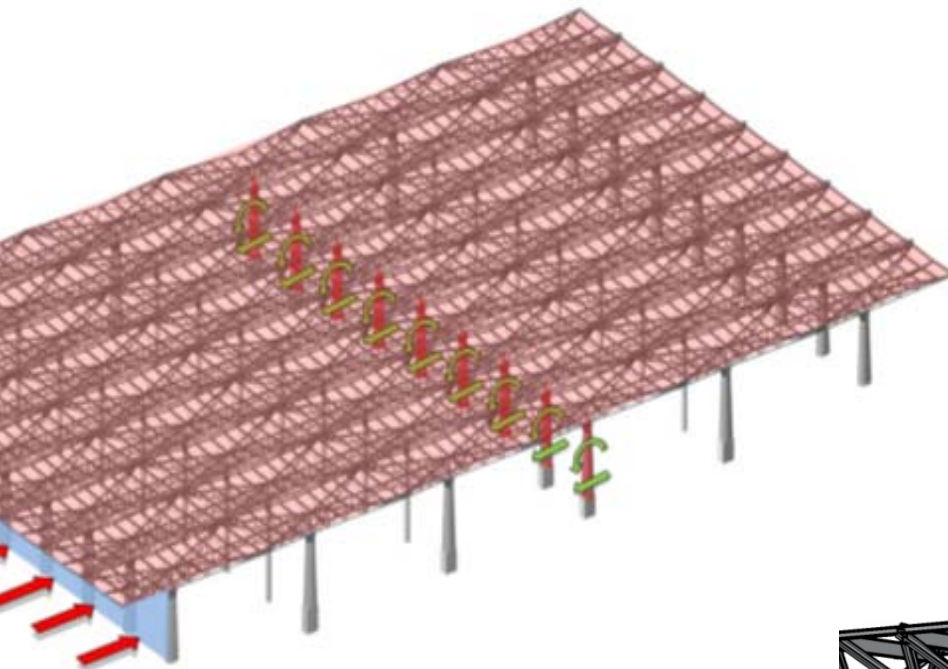
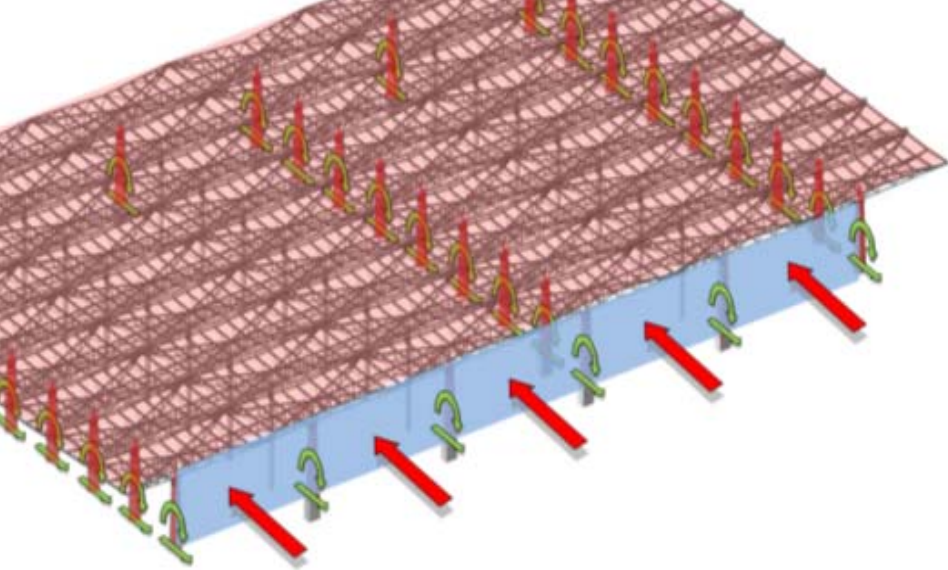


ISOMETRIC VIEW



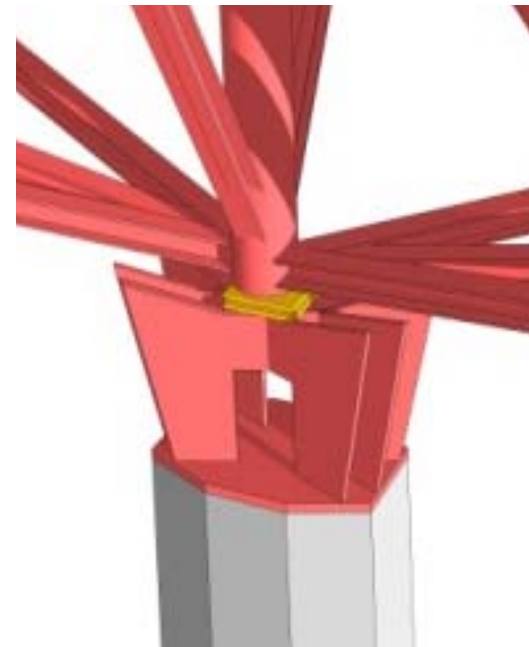
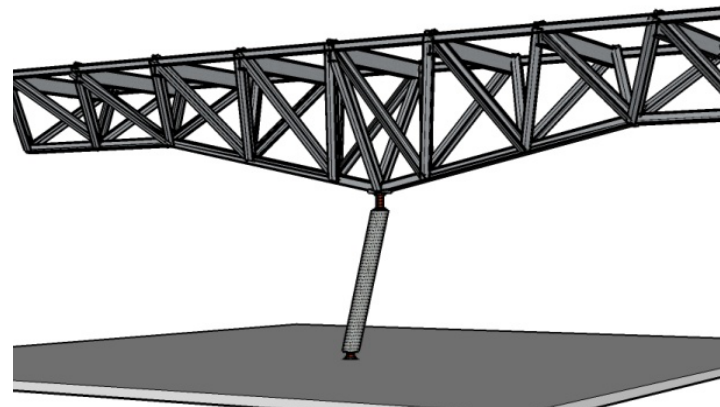
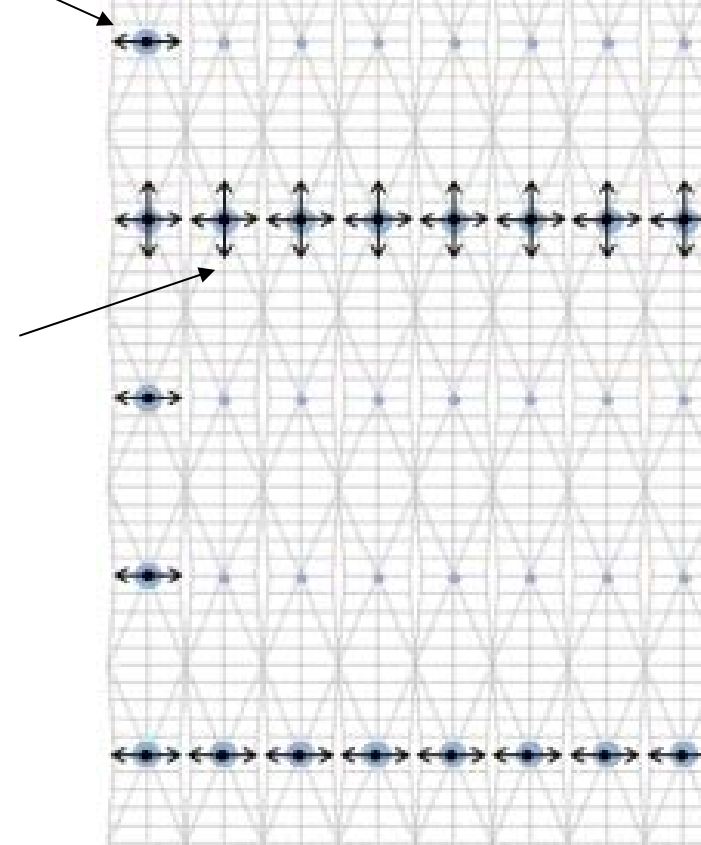
SECTION B-B

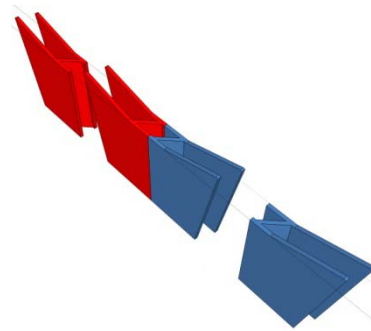
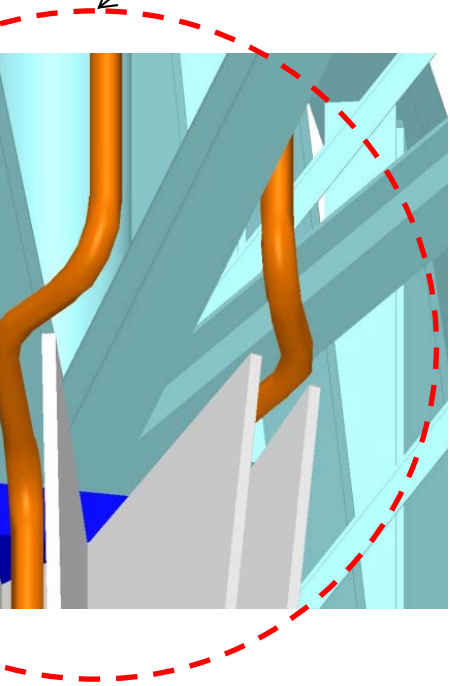
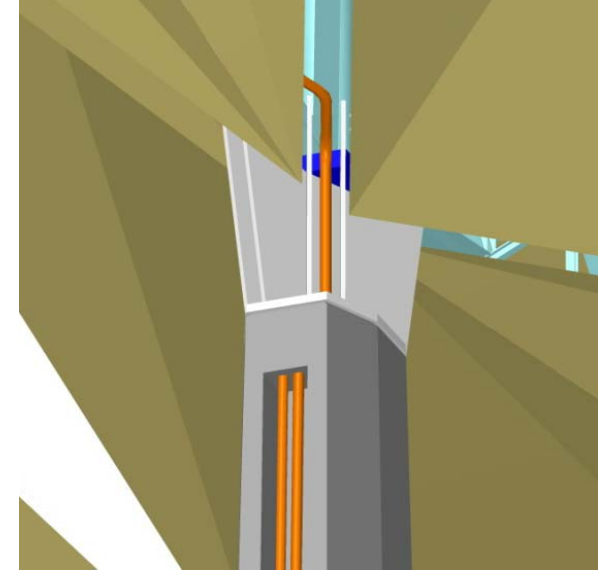
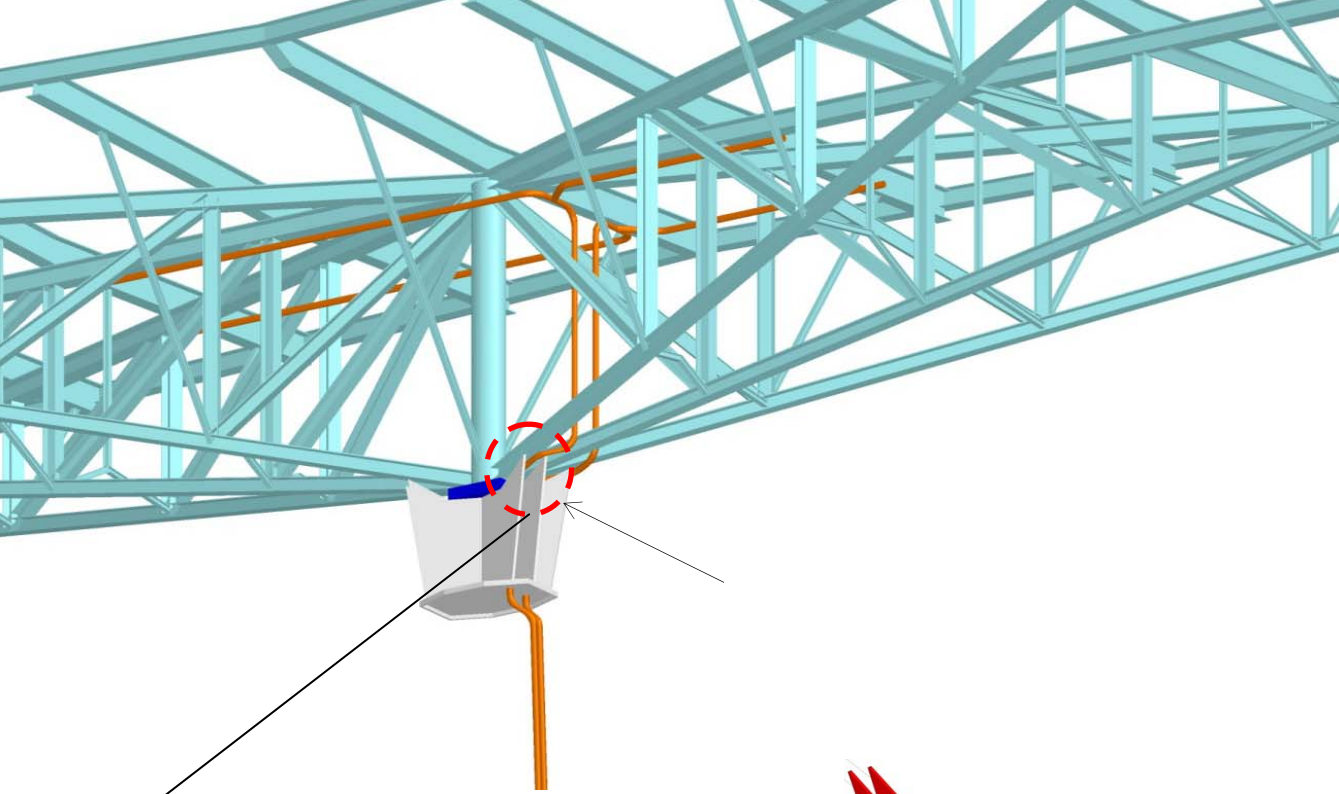




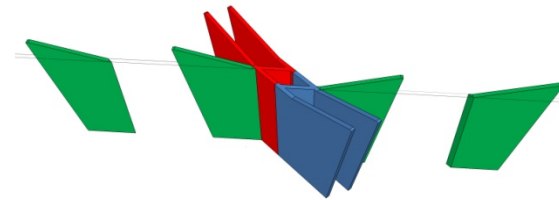
load path

Columns along baggage void provide lateral stability in both directions

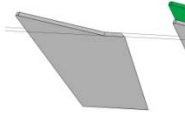




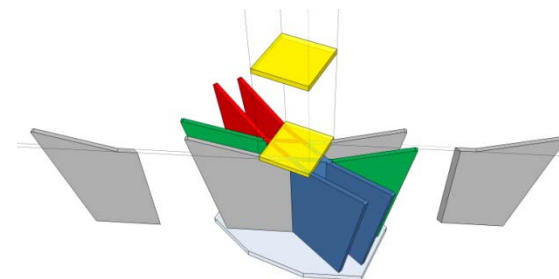
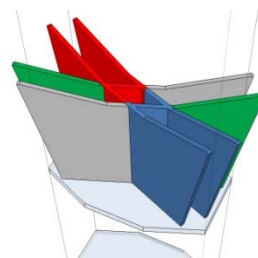
**EXPLODED VIEW
(STAGE 1 & 2)**

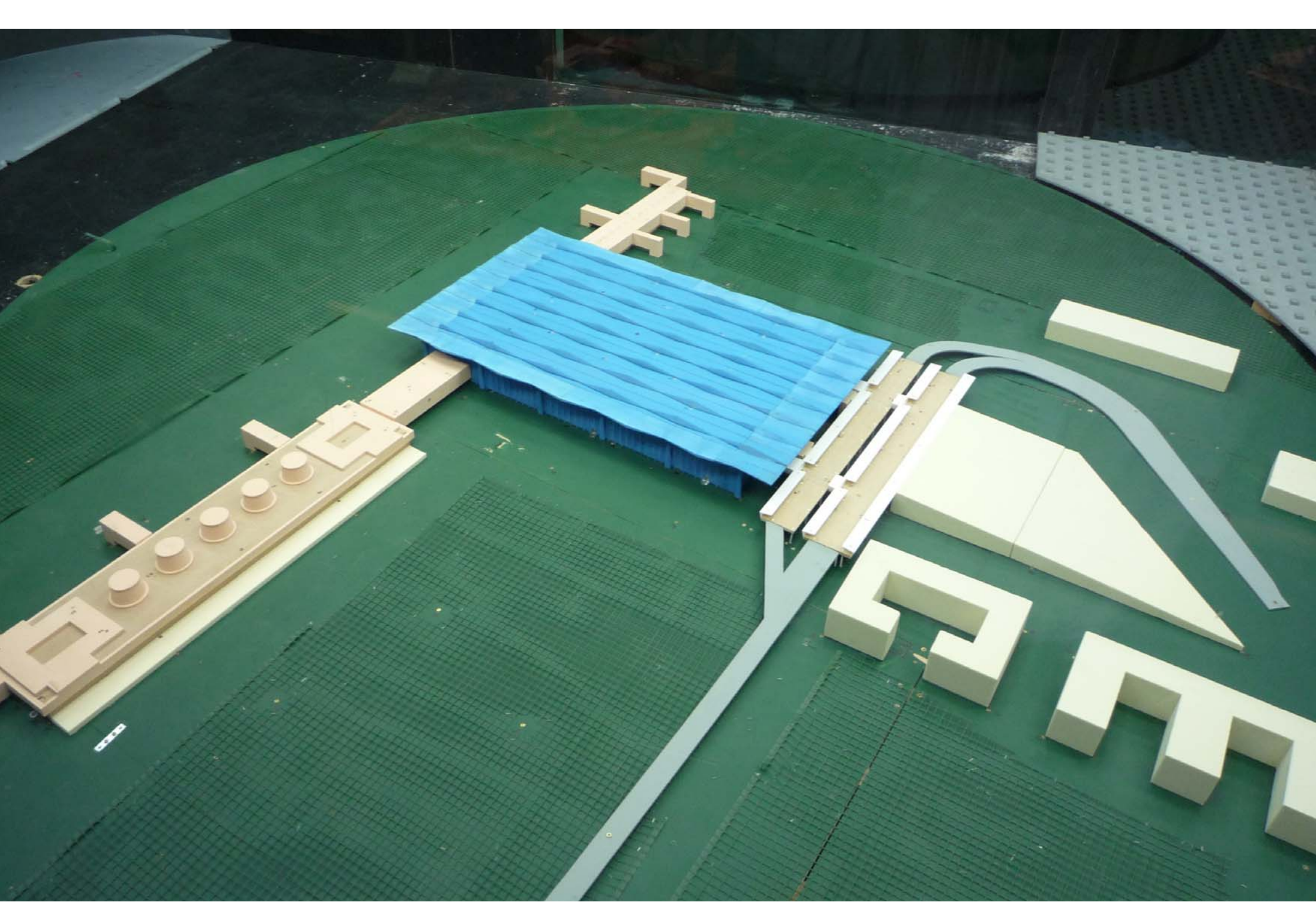


**EXPLODED VIEW
(STAGE 3)**



**EXPLODED VIEW
(STAGE 4)**

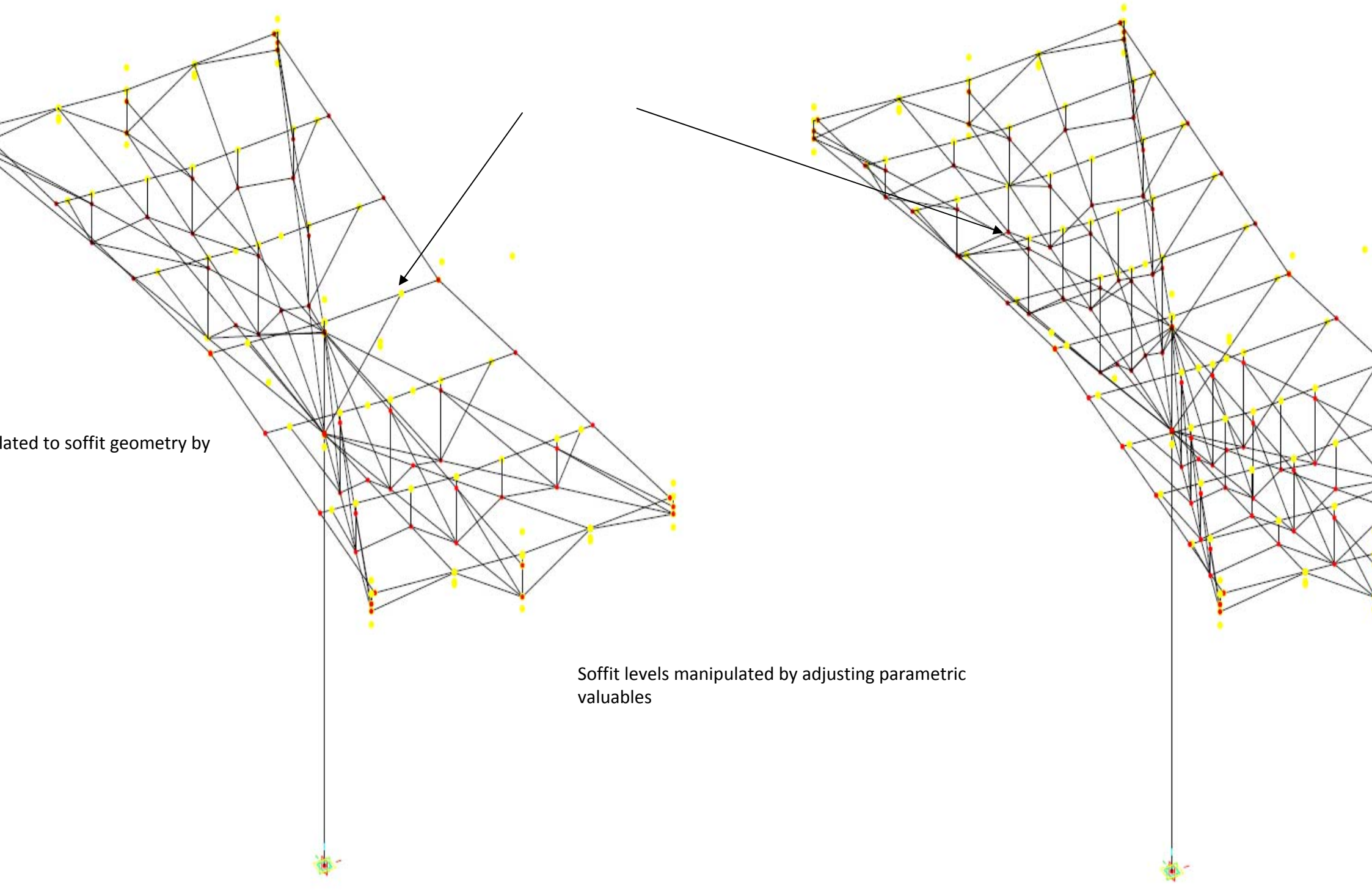


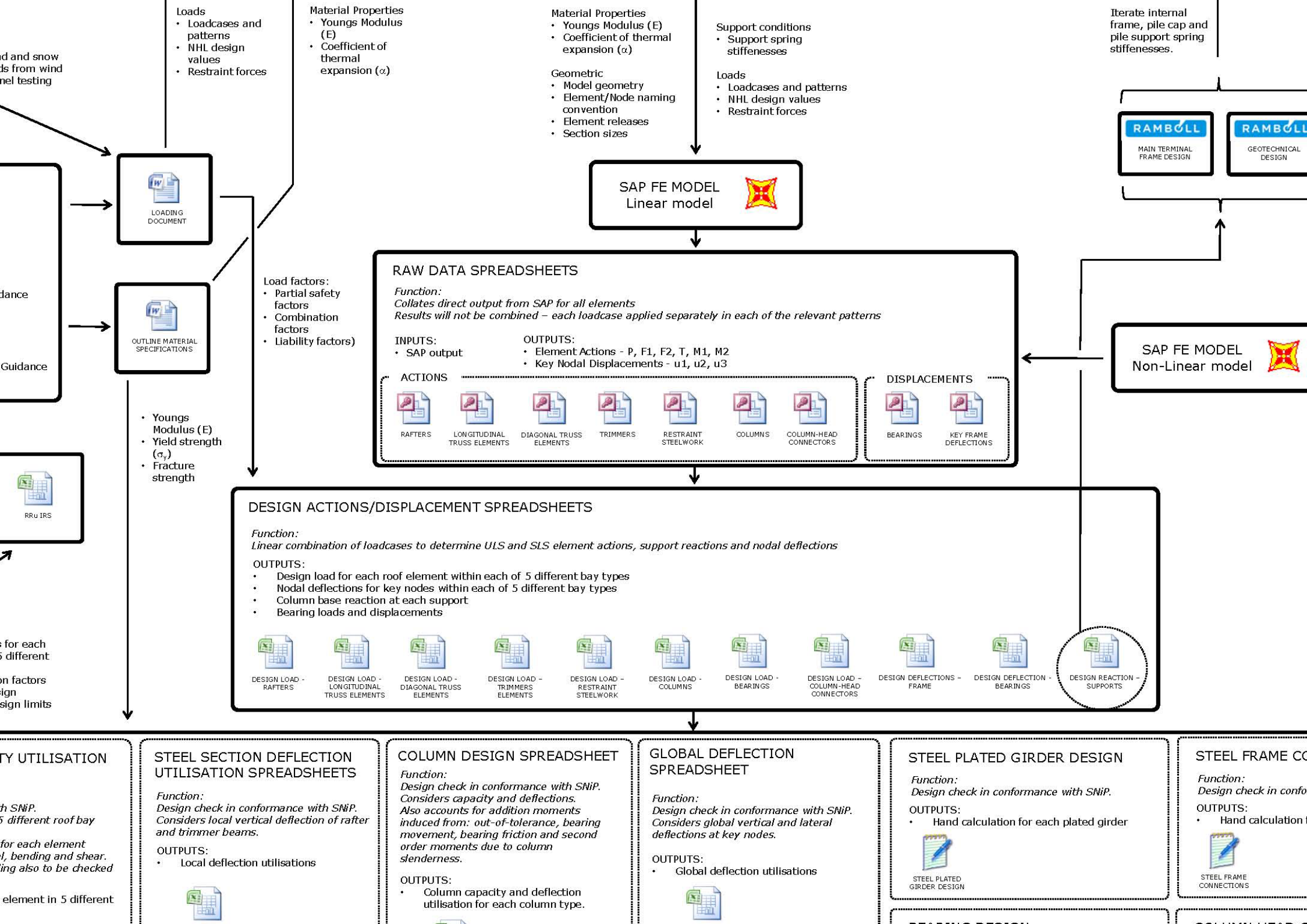


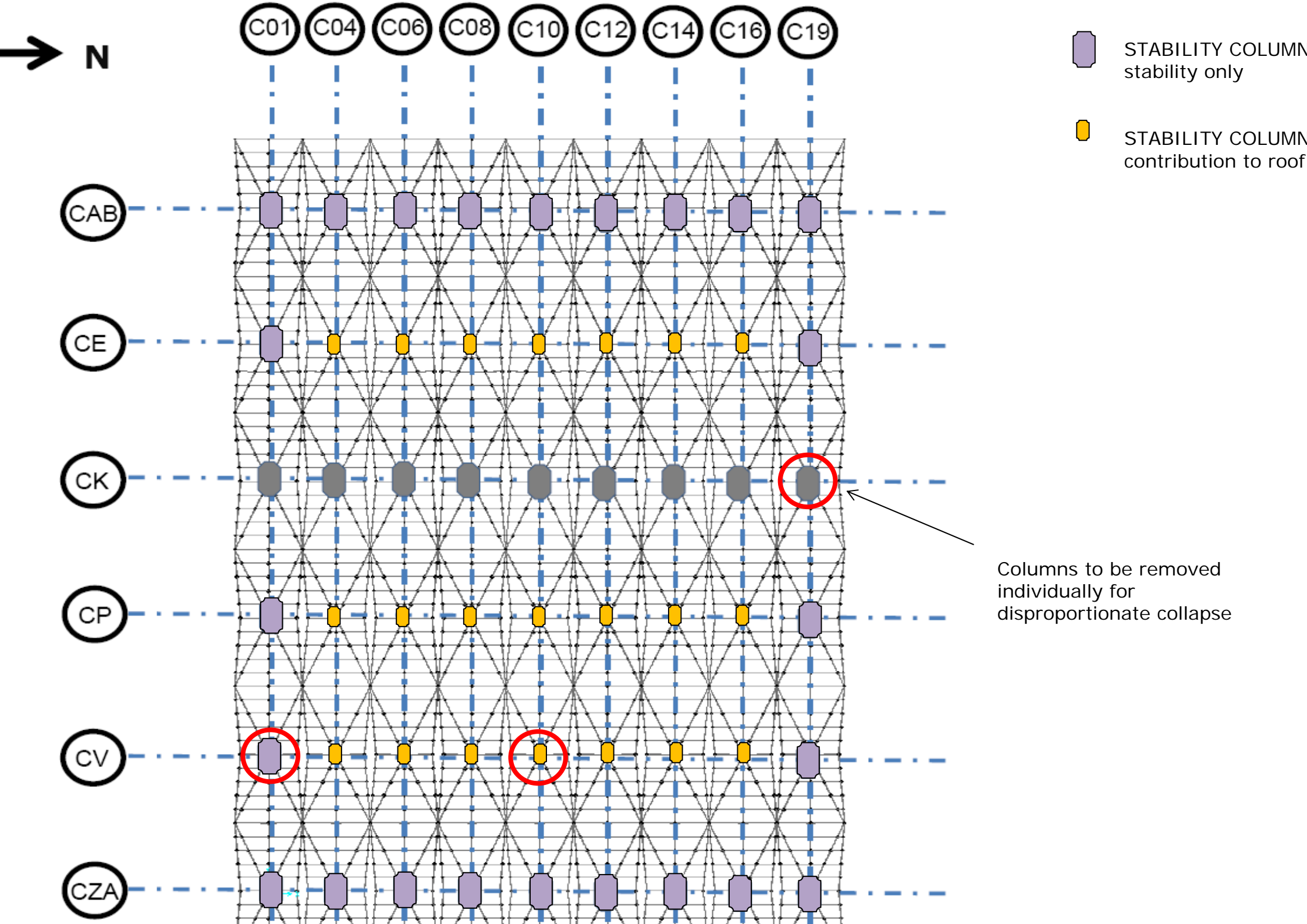
Rafter spacing set as variable

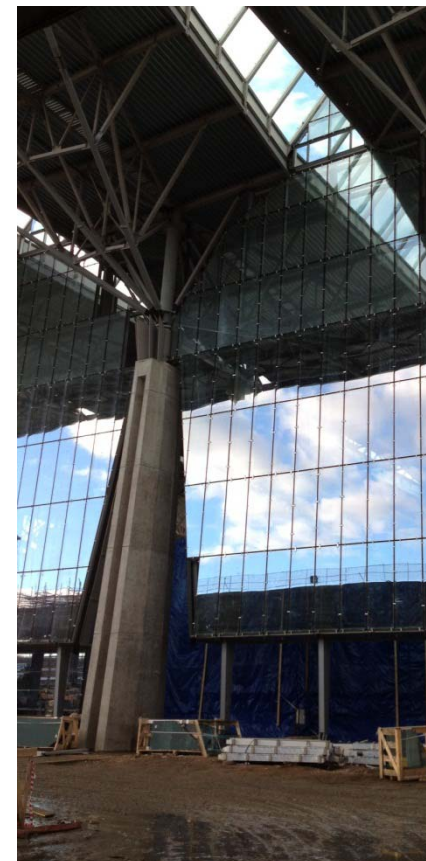
lated to soffit geometry by

Soffit levels manipulated by adjusting parametric
valuables









Thank you!