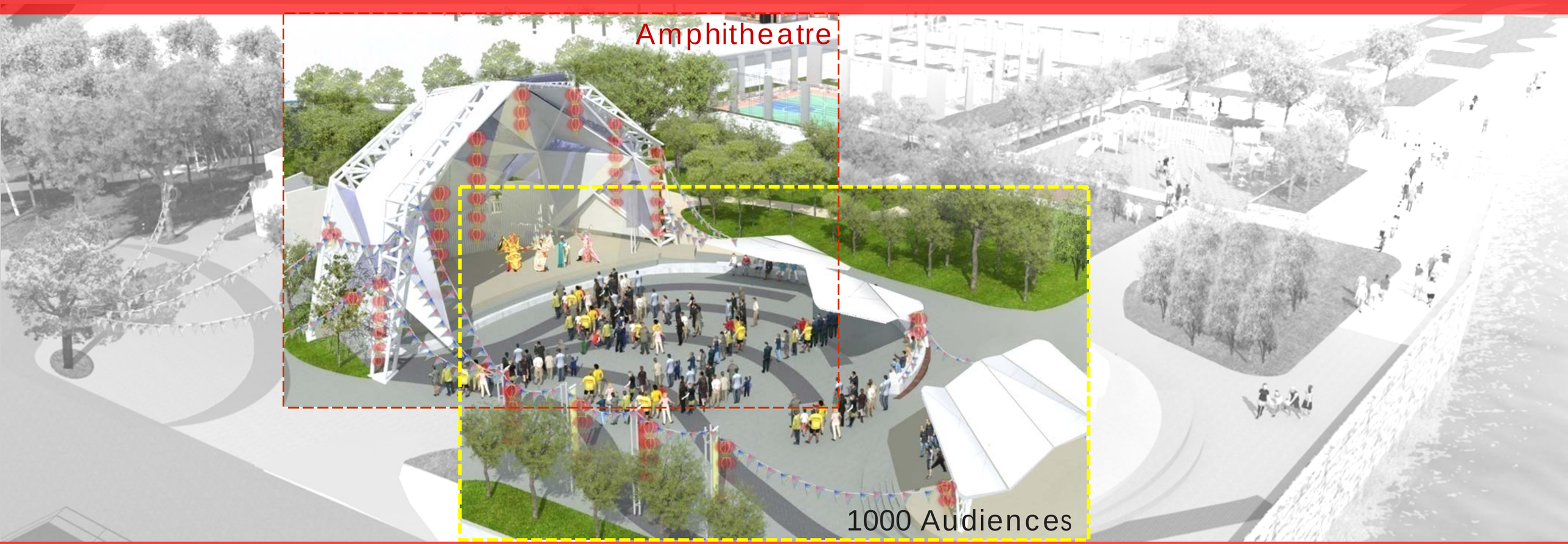
Eastern District Cultural Square
- The Optimization of a Shelter Design

Helen Wong

Project Architect
Architectural Services Department

To Build an Outdoor Performance Stage with Canopy for 1000 Audiences



Eastern District Cultural Square

Sheu Kei Wan Typhoon Shelter

Site Area = 4740 sqm
Amphitheatre Area = 225 sqm

Sheu Kei Wan MTR Station

Noise Sensitive Receivers

Some existing outdoor amphitheatres cannot prevent noise from disturbing the neighbourhood

School

Housing

Tam Kung Temple & School

100m

110m

130m

130m

School

Housing

50m!!

Amphitheatre

were identified

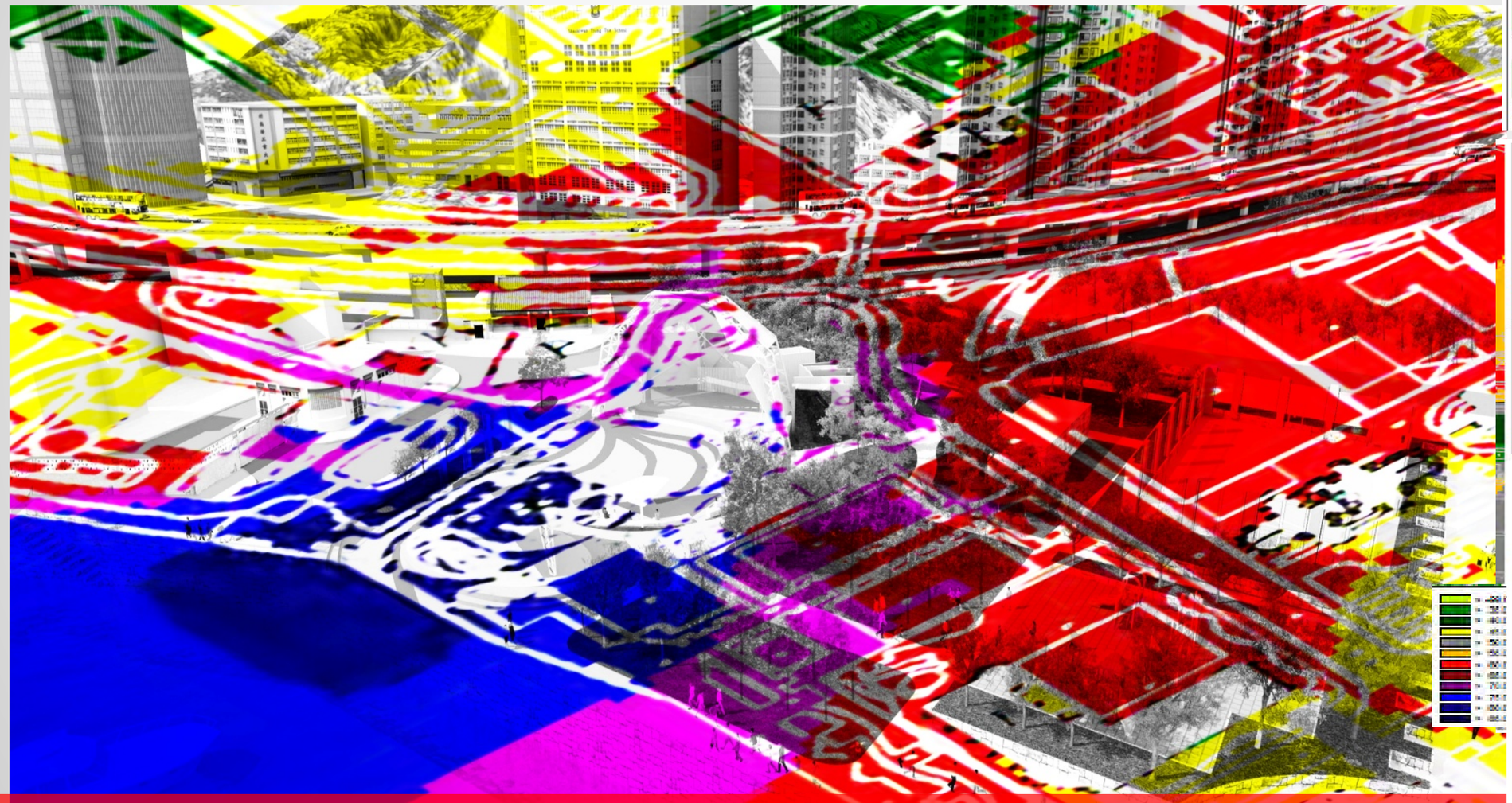
Challenge : Optimize the Shelter Design

-To design an effective noise barrier for neighborhood and
- good sound quality performance stage for the audience,
- Buildable and meet the budget

Optimizing Sound and Vision

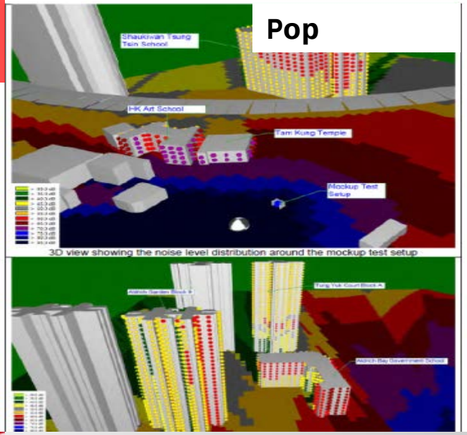
Noise Mapping Output from **CadnaA**

noise level distribution at noise sensitive receivers.



Different types of music

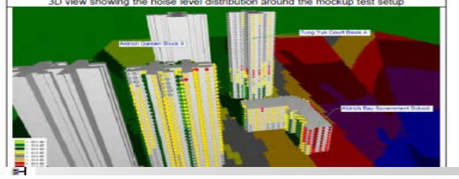
Pop



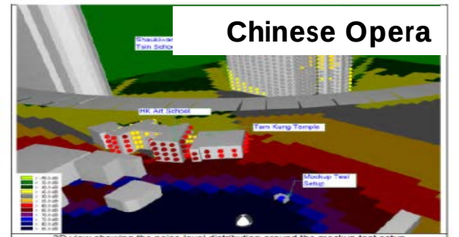
3D view showing the noise level distribution around the mockup test setup

Jazz

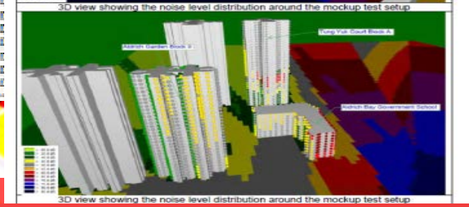
3D view showing the noise level distribution around the mockup test setup



Chinese Opera



3D view showing the noise level distribution around the mockup test setup

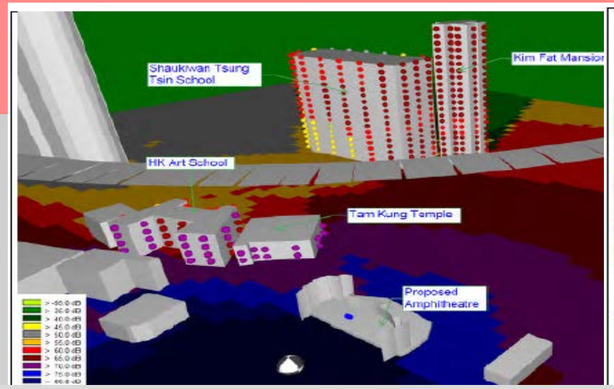


3D view showing the noise level distribution around the mockup test setup

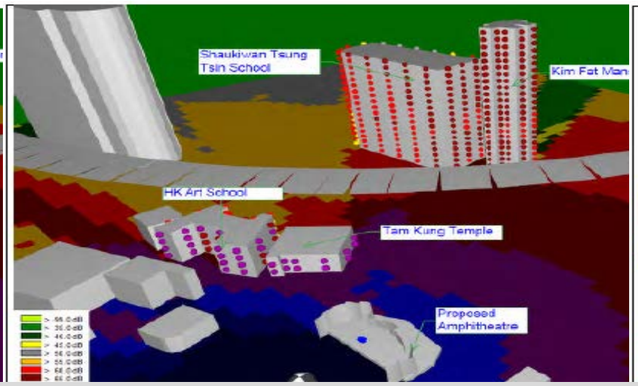
BIM is a guide for project Team to selecting the types of music suitable for this cultural square.

Acoustic Performance vs. Building Form Design

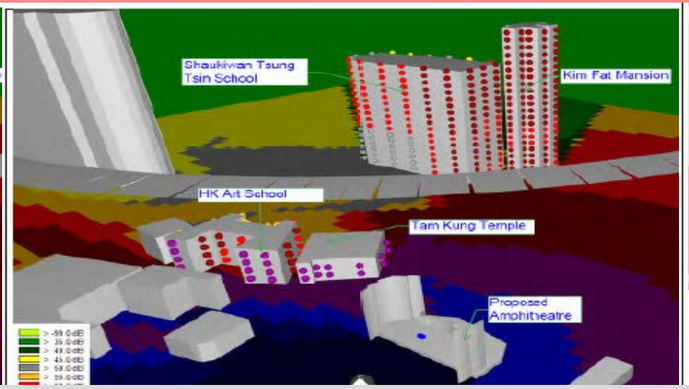
Acoustic Consultant tested for sound distribution mapping for different building forms



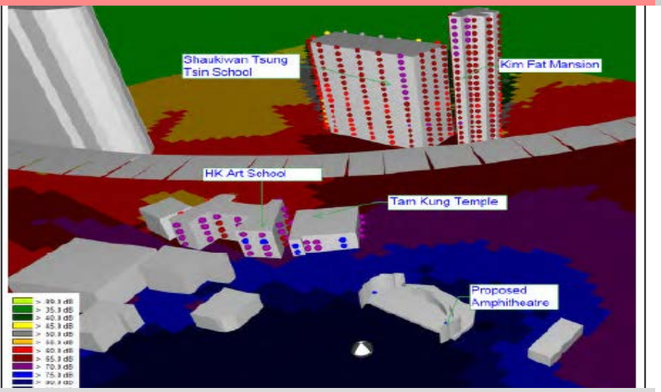
8 m (Height) Noise Barrier



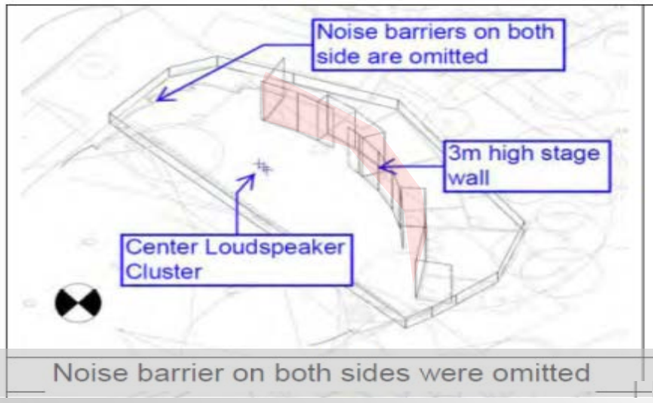
10 m (Height) Noise Barrier



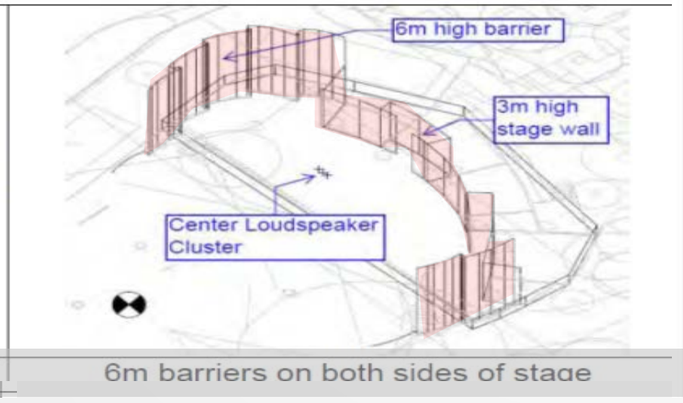
14 m (Height) Noise Barrier



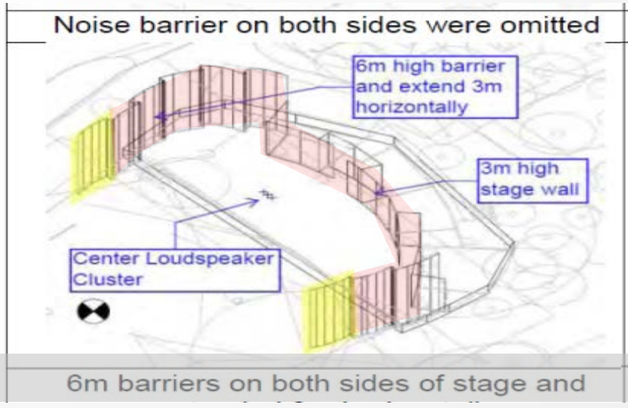
6 m (Height) Noise Barrier and roof



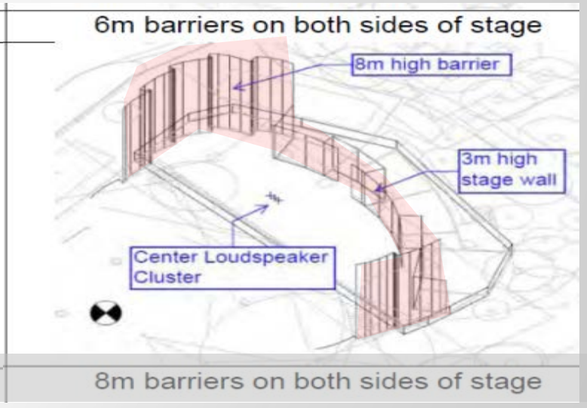
Noise barrier on both sides were omitted



6m barriers on both sides of stage



6m barriers on both sides of stage and



8m barriers on both sides of stage

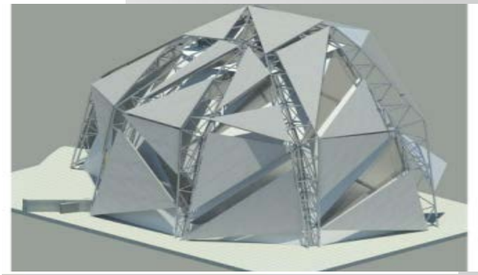
BIM as a communication tool to collaborate building forms and acoustic performance between Multi- disciplines.

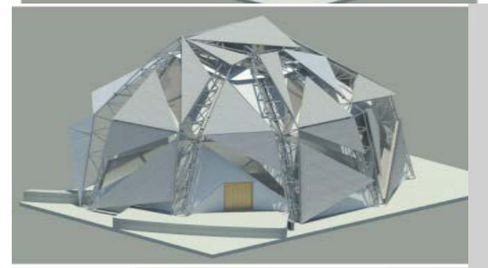
Acoustic Performance vs. Building Form Design

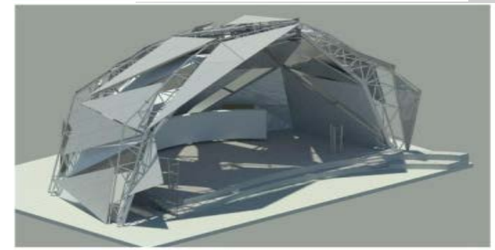
Collaborated Design Form

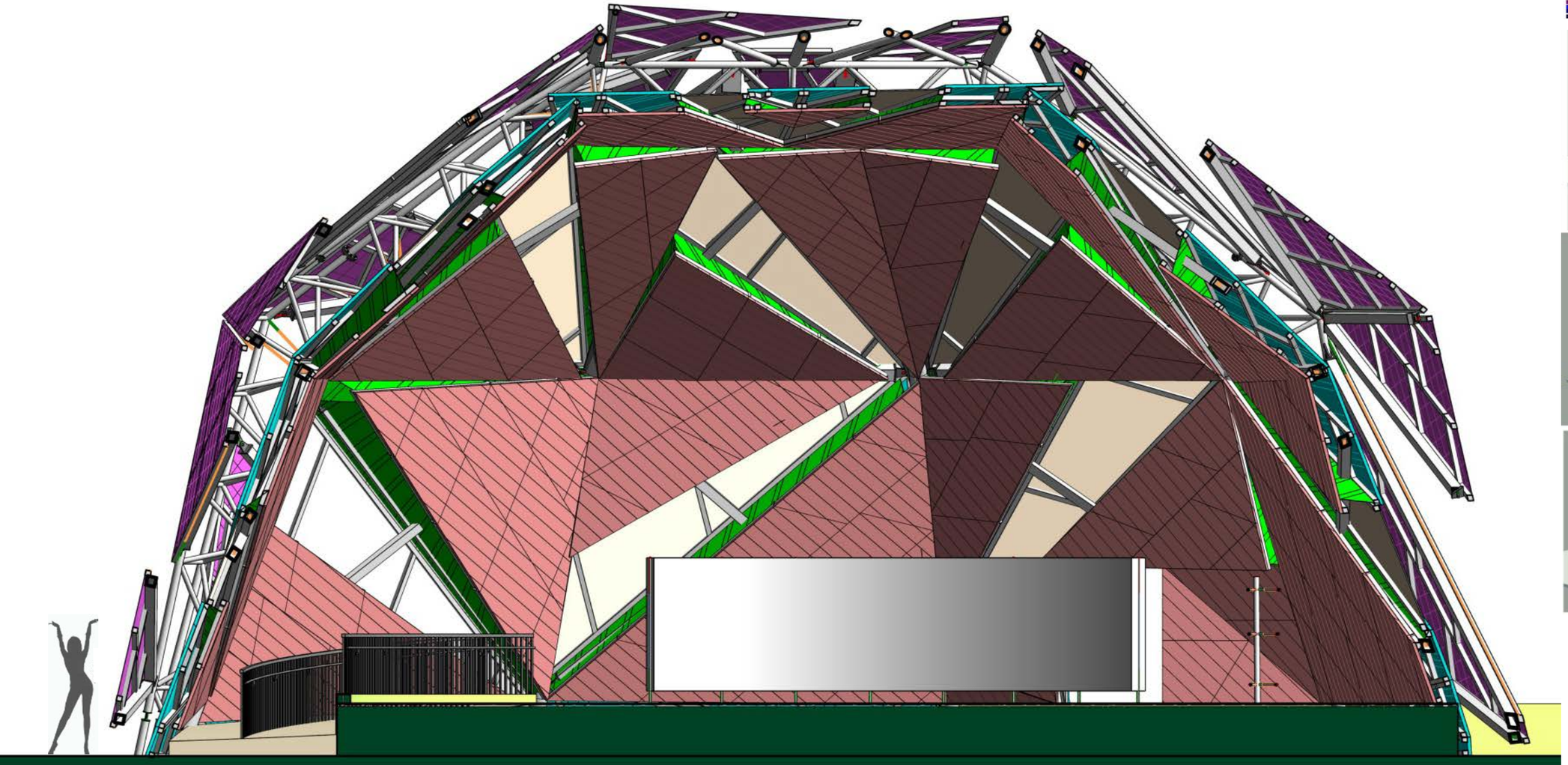
-**Combining different heights** of noise barrier and roof design
-Based on **computer simulation analysis**
-Use of **Steel Structure to minimise building bulk**

-To achieve the **Most Efficient Noise Barrier Performance**

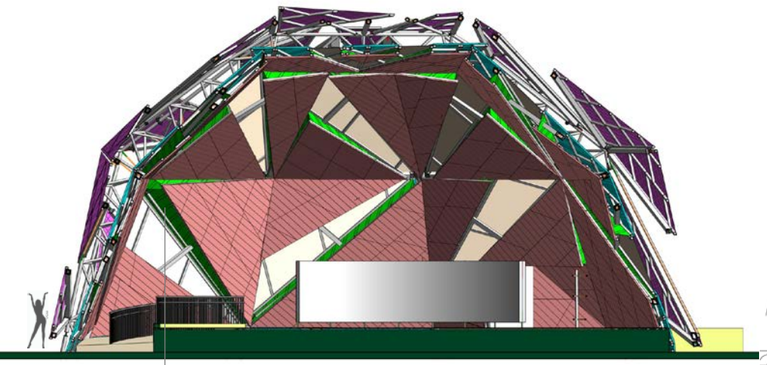


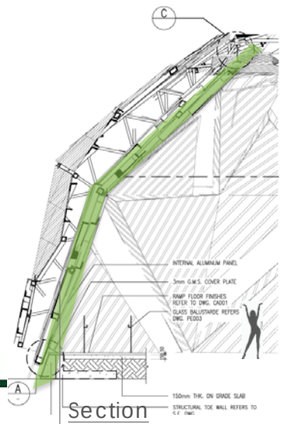






BIM Copes with Complex Shape - Cladding



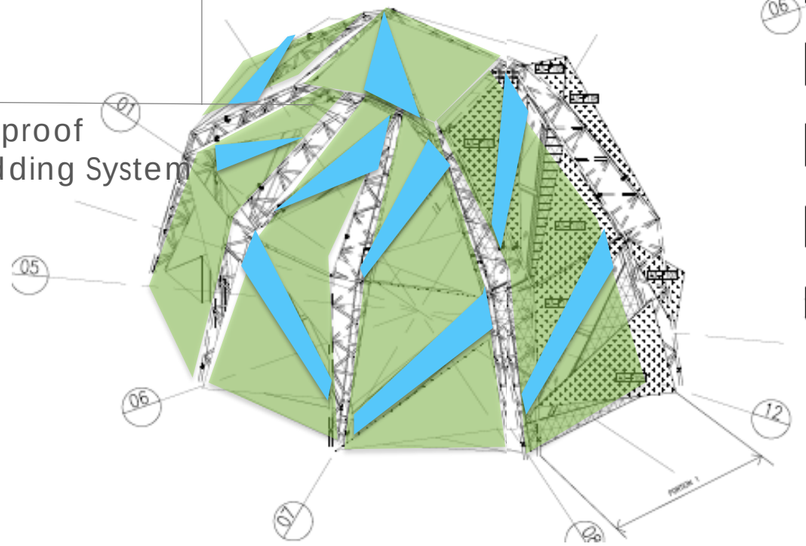


Section

Middle Layer

Function : Acoustic Barrier & Waterproof

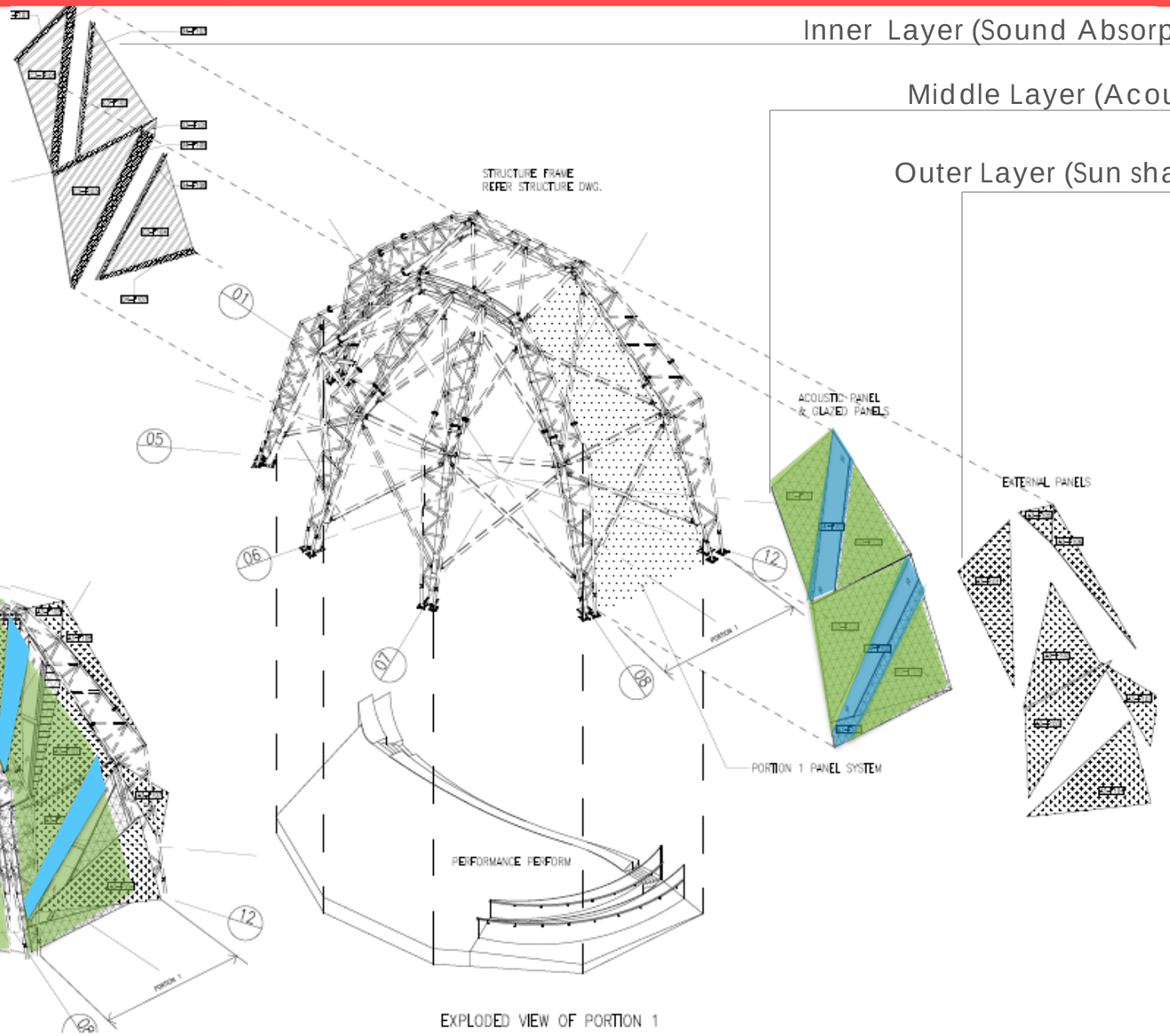
Material : Acoustic aluminium Cladding System



Inner Layer (Sound Absorption)

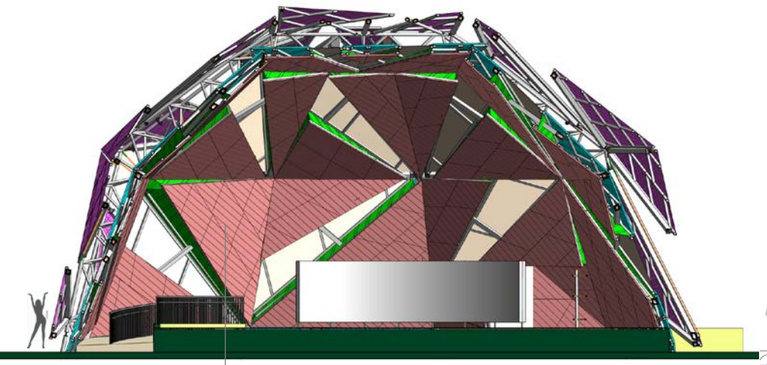
Middle Layer (Acoustic)

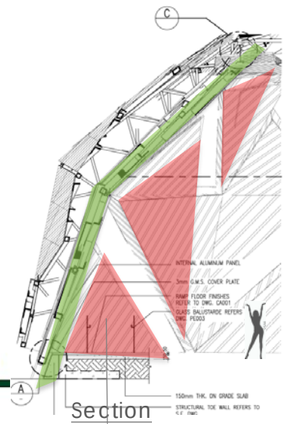
Outer Layer (Sun shading)



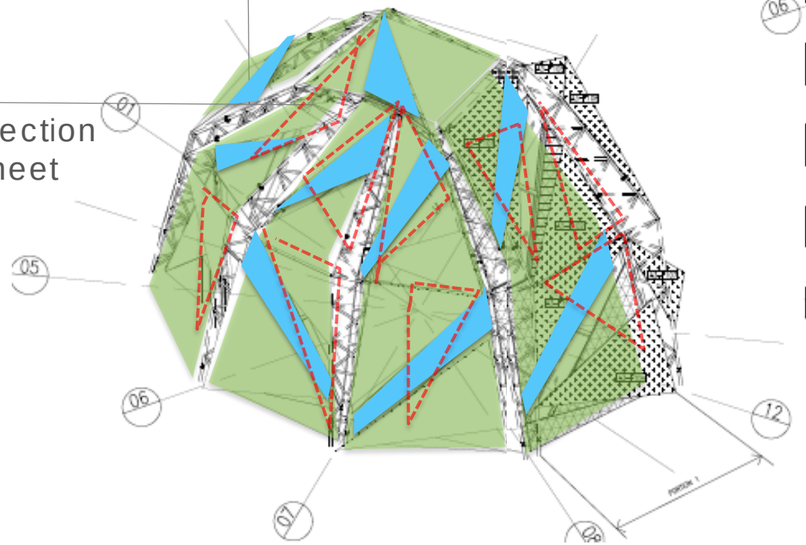
EXPLODED VIEW OF PORTION 1

BIM Copes with Complex Shape - Cladding





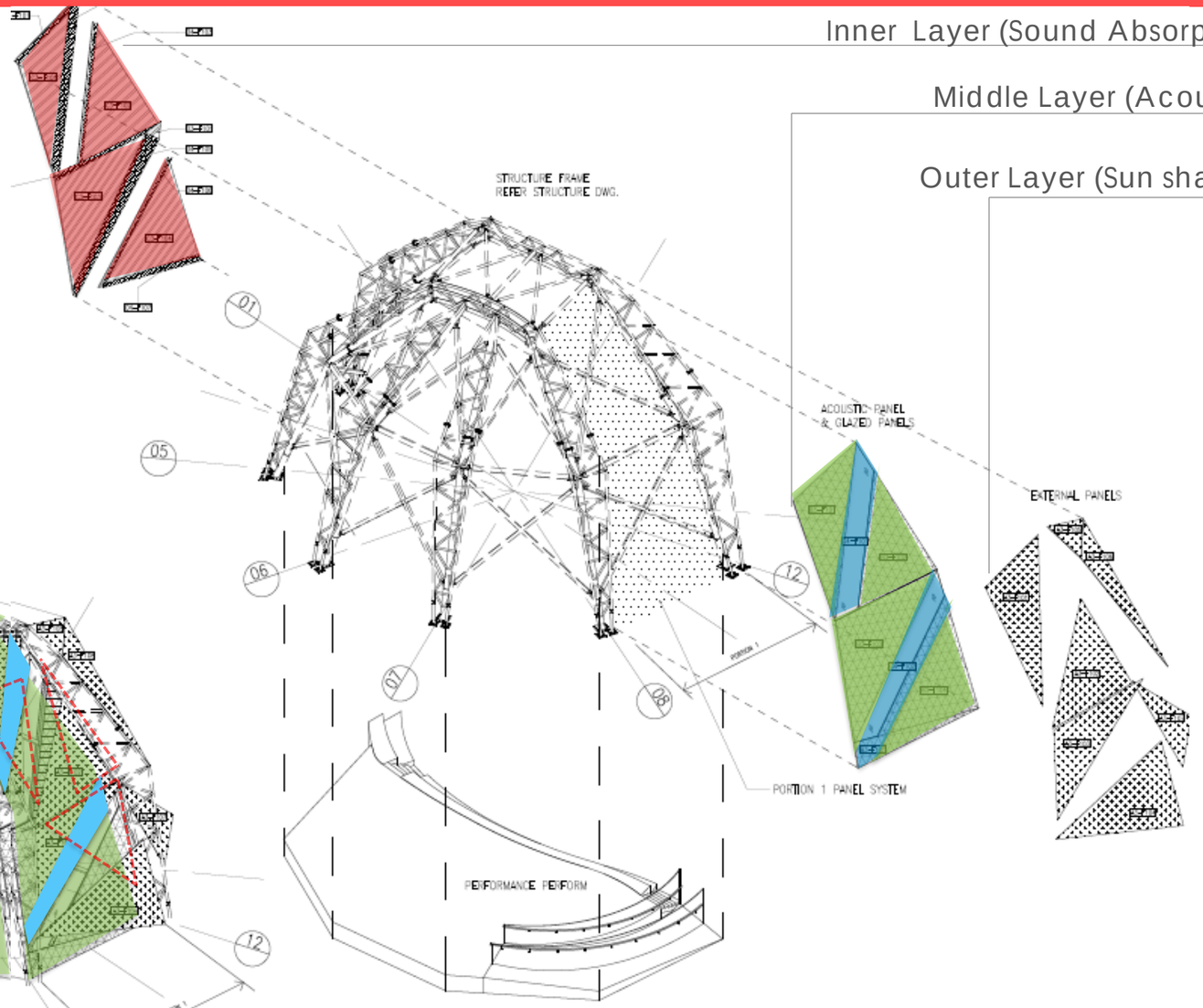
Inner Layer
Function : Sound Absorption & Reflection
Material : Aluminium Perforated Sheet



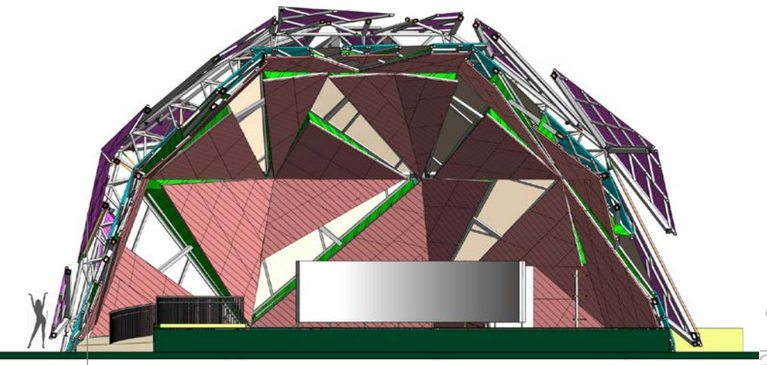
Inner Layer (Sound Absorption)

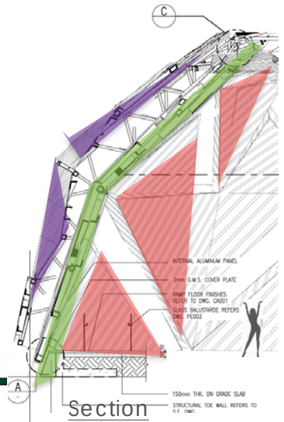
Middle Layer (Acoustic)

Outer Layer (Sun shading)

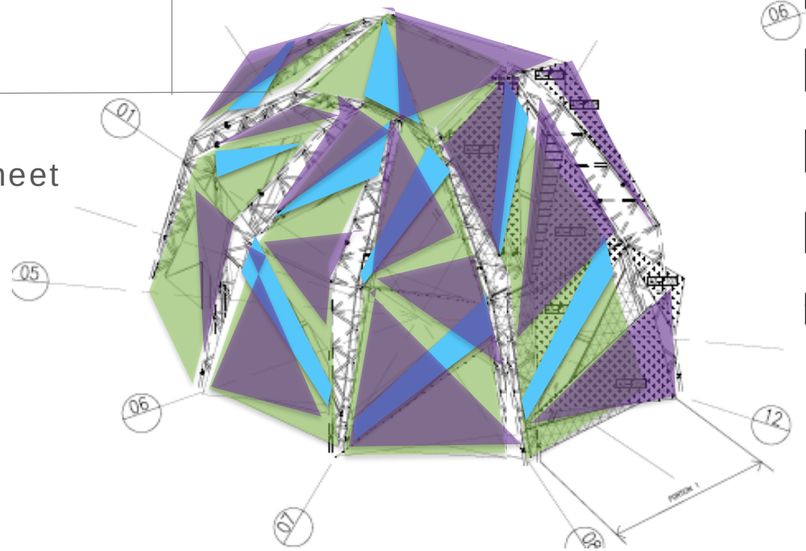


BIM Copes with Complex Shape - Cladding





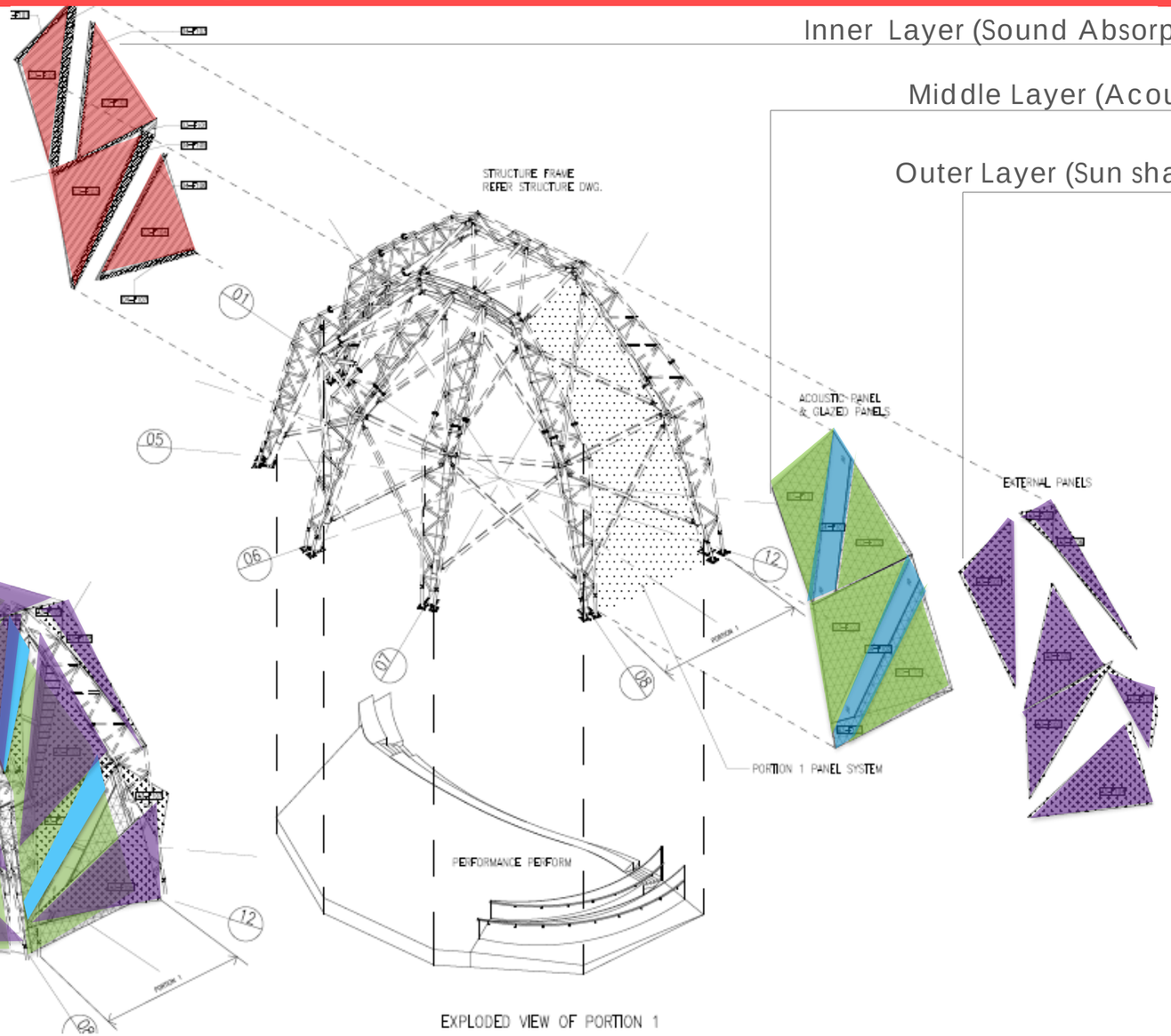
Outer Layer
Function : Sun shading
Material : Aluminium Perforated Sheet



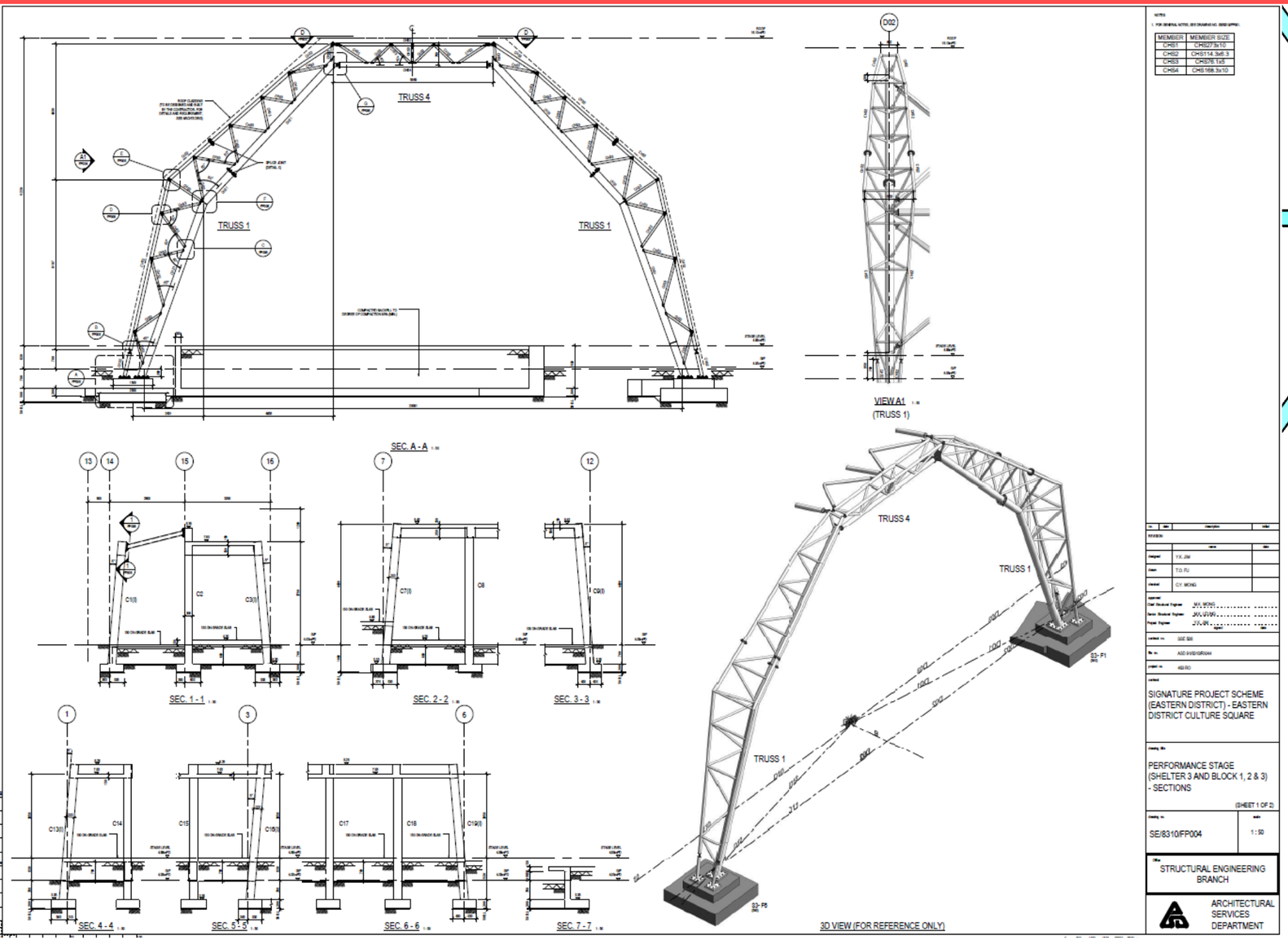
Inner Layer (Sound Absorption)

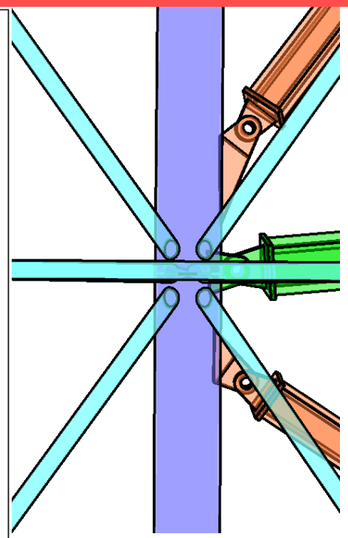
Middle Layer (Acoustic)

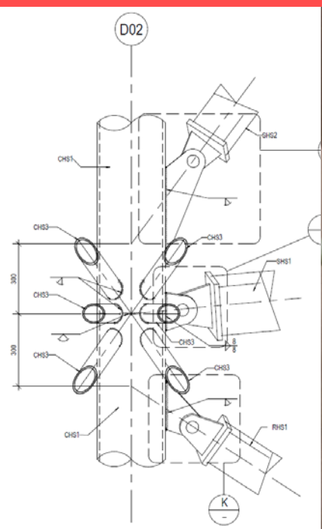
Outer Layer (Sun shading)

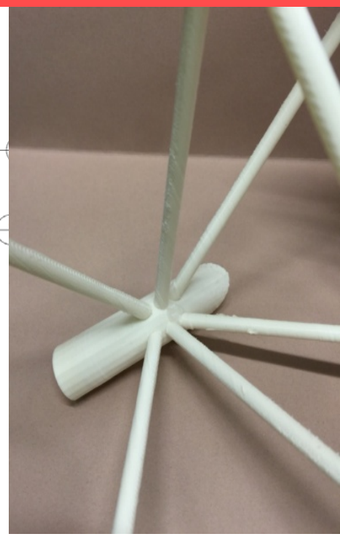


BIM Copes with Complex Shape – Structural Details

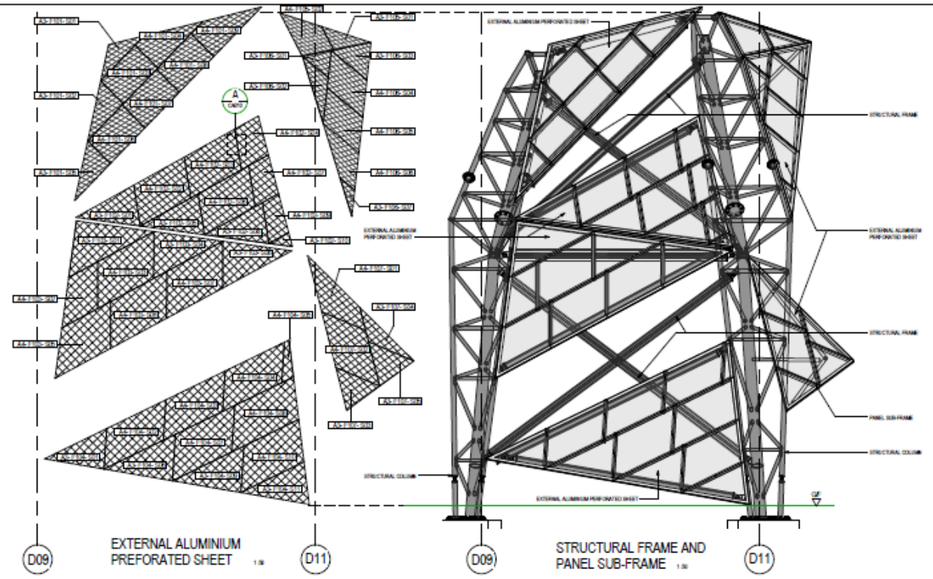








Effective Costing with BIM



3 SIDED EXTERNAL ALUMINIUM PERFORATED SHEET SCHEDULE IN PORTION 1

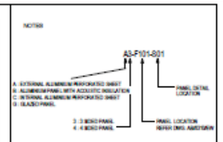
PANEL NAME	PANEL TYPE
A3-F101-S01	3145
A3-F101-S02	3035
A3-F101-S05	3035
A3-F102-S01	3003
A3-F102-S05	3003
A3-F102-S10	3058
A3-F103-S01	3003
A3-F103-S04	3025
A3-F103-S08	3025
A3-F104-S01	3164
A3-F104-S06	3038
A3-F104-S09	3039
A3-F104-S11	3175
A3-F105-S01	3148
A3-F106-S01	3116
A3-F106-S02	3160
A3-F106-S03	3170
A3-F106-S07	3078
A3-F107-S03	3146
A3-F107-S04	3128
A3-F107-S05	3150

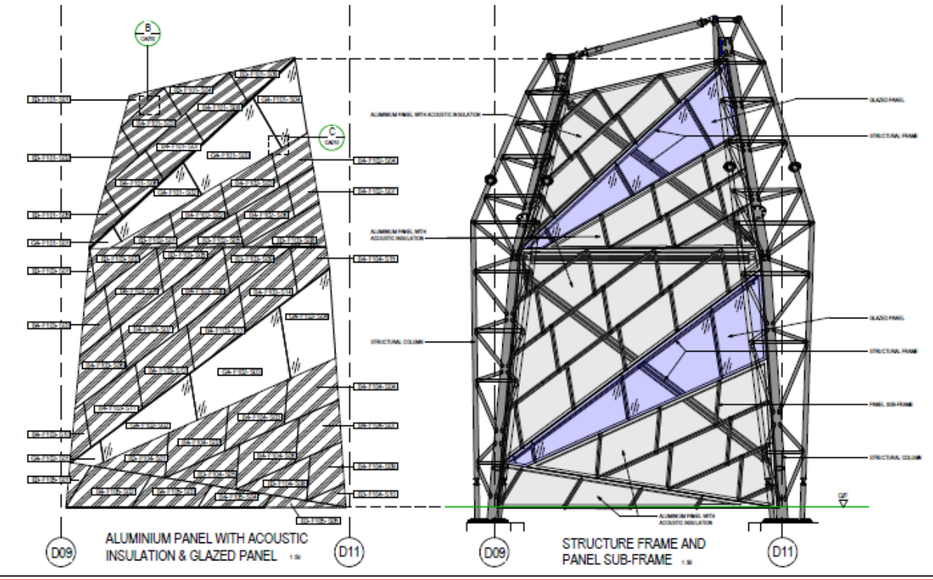
TOTAL NO OF PANELS: 22

4 SIDED EXTERNAL ALUMINIUM PERFORATED SHEET SCHEDULE IN PORTION 1

PANEL NAME	PANEL TYPE
A4-F101-S03	4001
A4-F101-S04	4143
A4-F101-S06	4001
A4-F101-S07	4001
A4-F101-S08	4001
A4-F101-S09	4160
A4-F102-S02	4001
A4-F102-S03	4001
A4-F102-S04	4053
A4-F102-S06	4001
A4-F102-S07	4041
A4-F102-S09	4026
A4-F103-S02	4074
A4-F103-S03	4001
A4-F103-S05	4178
A4-F103-S06	4001
A4-F103-S07	4001
A4-F104-S02	4165
A4-F104-S03	4166
A4-F104-S04	4167
A4-F104-S05	4011
A4-F104-S07	4001
A4-F104-S08	4206
A4-F104-S10	4200
A4-F105-S02	4166
A4-F106-S04	4001
A4-F106-S05	4008
A4-F106-S06	4115
A4-F107-S01	4119
A4-F107-S02	4001

TOTAL NO OF PANELS: 30





3 SIDED ALUMINIUM PANEL WITH ACOUSTIC INSULATION SCHEDULE IN PORTION 1

PANEL NAME	PANEL TYPE
B3-F101-S01	3120
B3-F101-S02	3033
B3-F101-S04	3037
B3-F101-S05	3033
B3-F101-S09	3037
B3-F102-S01	3003
B3-F102-S05	3003
B3-F103-S01	3069
B3-F103-S02	3194
B3-F103-S05	3036
B3-F103-S08	3205
B3-F103-S09	3036
B3-F104-S01	3026
B3-F104-S05	3026
B3-F104-S08	3026
B3-F104-S10	3082
B3-F105-S01	3085
B3-F105-S05	3088

TOTAL NO OF PANELS: 18

4 SIDED ALUMINIUM PANEL WITH ACOUSTIC INSULATION SCHEDULE IN PORTION 1

PANEL NAME	PANEL TYPE
B4-F101-S03	4207
B4-F101-S06	4001
B4-F101-S07	4001
B4-F101-S08	4211
B4-F102-S02	4001
B4-F102-S03	4001
B4-F102-S04	4106
B4-F102-S06	4001
B4-F102-S07	4051
B4-F103-S03	4054
B4-F103-S04	4001
B4-F103-S06	4171
B4-F103-S07	4001
B4-F103-S08	4001
B4-F103-S10	4019
B4-F103-S11	4001
B4-F103-S12	4001
B4-F103-S13	4001
B4-F103-S14	4001
B4-F104-S02	4001
B4-F104-S03	4001
B4-F104-S04	4158
B4-F104-S06	4001
B4-F104-S07	4121
B4-F104-S09	4073
B4-F104-S15	4049
B4-F105-S02	4179
B4-F105-S03	4198
B4-F105-S04	4042

TOTAL NO OF PANELS: 29

4 SIDED GLAZED GLASS PANEL SCHEDULE IN PORTION 1

PANEL NAME	PANEL TYPE
G4-F101-S01	2000
G4-F101-S02	2001
G4-F101-S03	2002
G4-F101-S04	2019
G4-F102-S01	2005
G4-F102-S02	2001
G4-F102-S03	2002
G4-F102-S04	2022

TOTAL NO OF PANELS: 8

SIGNATURE PROJECT SCHEME (EASTERN DISTRICT) - EASTERN DISTRICT CULTURAL SQUARE

SCHEDULE OF EXTERNAL ALUM. PERFORATED SHEET, ALUM. PANEL W/O ACOUSTIC INSULATION & GLAZED PANEL AT SHELTER 3 IN PORTION 1

AB/8310/CA020 | 1:50

ARCHITECTURAL BRANCH

ARCHITECTURAL SERVICES DEPARTMENT

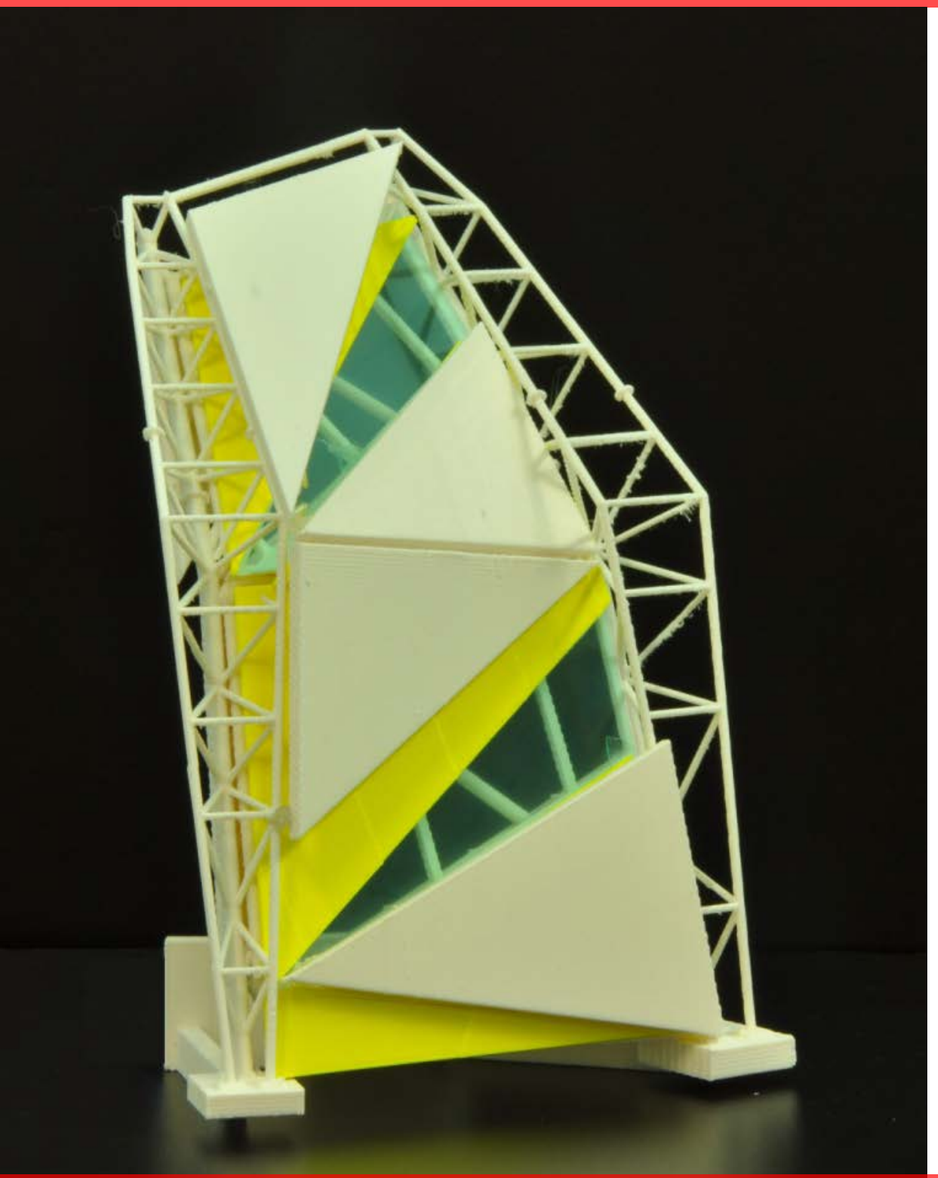
Structural Framing Schedule

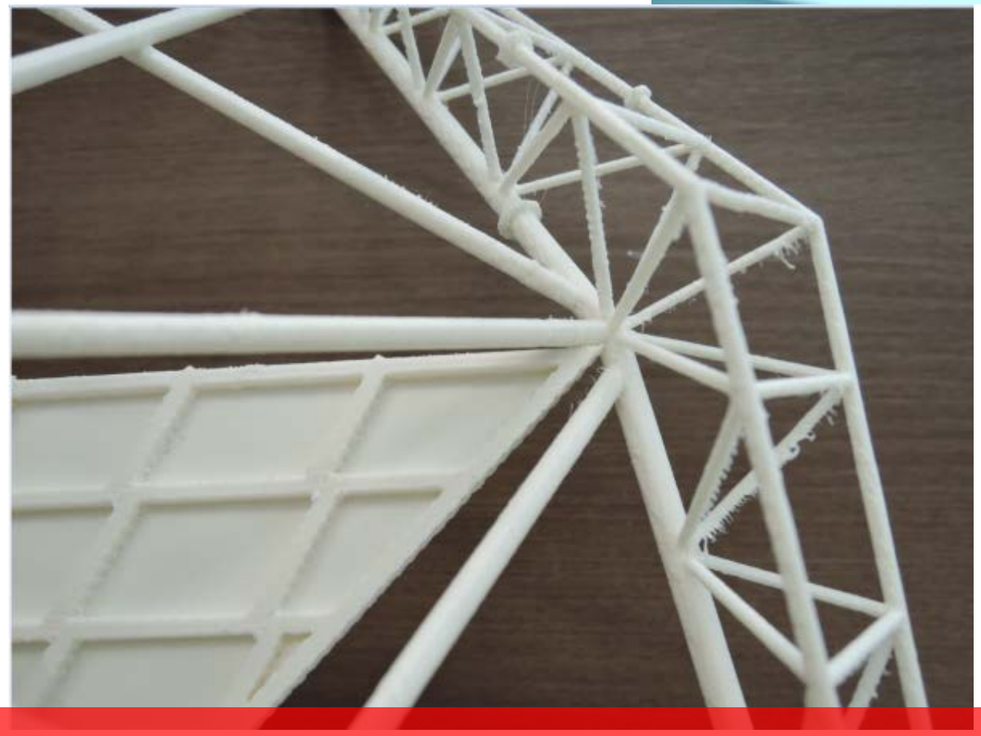
Family and Type	Type Mark	Mark	Length (mm)	Cut Length (mm)	Total weight (kg)	Unit Rate ($/kg)	Total amount ($)
UB-Universal Beams: UB254x146x31	UB1	UB2	1,886.00	1,973.00			
UB-Universal Beams: UB254x146x31	UB1	UB3	1,467.00	1,547.00			
UB-Universal Beams: UB254x146x31	UB1	UB6	998.00	1,081.00			
UB-Universal Beams: UB254x146x31	UB1	UB7	443.00	541.00	*31 kg/m*	($/kg)	($)
			19,156.00	20,566.00	*593.84*	40	23,753.44
UB-Universal Beams_Tapered: UB254x146x31			2,047.00	2,018.00			
UB-Universal Beams_Tapered: UB254x146x31			1,087.00	1,086.00			
UB-Universal Beams_Tapered: UB254x146x31			1,590.00	1,590.00			
UB-Universal Beams_Tapered: UB254x146x31			568.00	568.00			
UB-Universal Beams_Tapered: UB254x146x31			2,047.00	2,048.00			
UB-Universal Beams_Tapered: UB254x146x31			1,087.00	988.00			
UB-Universal Beams_Tapered: UB254x146x31			1,590.00	1,590.00			
UB-Universal Beams_Tapered: UB254x146x31			568.00	568.00			
UB-Universal Beams_Tapered: UB254x146x31			2,047.00	2,018.00			
UB-Universal Beams_Tapered: UB254x146x31			1,087.00	1,086.00			
UB-Universal Beams_Tapered: UB254x146x31			1,590.00	1,590.00			
UB-Universal Beams_Tapered: UB254x146x31			568.00	568.00			
UB-Universal Beams_Tapered: UB254x146x31	UB1		2,047.00	2,018.00			
UB-Universal Beams_Tapered: UB254x146x31	UB4		1,590.00	1,590.00			
UB-Universal Beams_Tapered: UB254x146x31	UB5		1,087.00	1,086.00			
UB-Universal Beams_Tapered: UB254x146x31	UB8		568.00	568.00	*31 kg/m*	($/kg)	($)
			21,168.00	20,978.00	*656.21*	40	26,248.32
UC-Universal Columns152x30: UC203x203x86	UC1	S1	2,745.00	2,692.00			
UC-Universal Columns152x30: UC203x203x86	UC1	S1	1,846.00	1,818.00			
UC-Universal Columns152x30: UC203x203x86	UC1	S1	2,284.00	2,242.00			
UC-Universal Columns152x30: UC203x203x86	UC1	S1	2,902.00	2,878.00			
UC-Universal Columns152x30: UC203x203x86	UC1	S1	3,387.00	3,335.00			
UC-Universal Columns152x30: UC203x203x86	UC1	S1	3,875.00	3,850.00	*86 kg/m*	($/kg)	($)
			17,089.00	16,815.00	*1,465.35*	40	58,614.16
UC-Universal Columns: UC152x152x30	UC2	S1	2,497.00	2,495.00			
UC-Universal Columns: UC152x152x30	UC2	S1	2,497.00	2,497.00	*30 kg/m*	($/kg)	($)
			4,994.00	4,992.00	*149.82*	40	5,992.80
Grand total: 710			1,447,121.00	1,362,127.00			
						Total Amount ($):	*1,555,626.58*

SHELTER 3 4 SIDED ALUMINIUM PANELS TYPE SCHEDULE

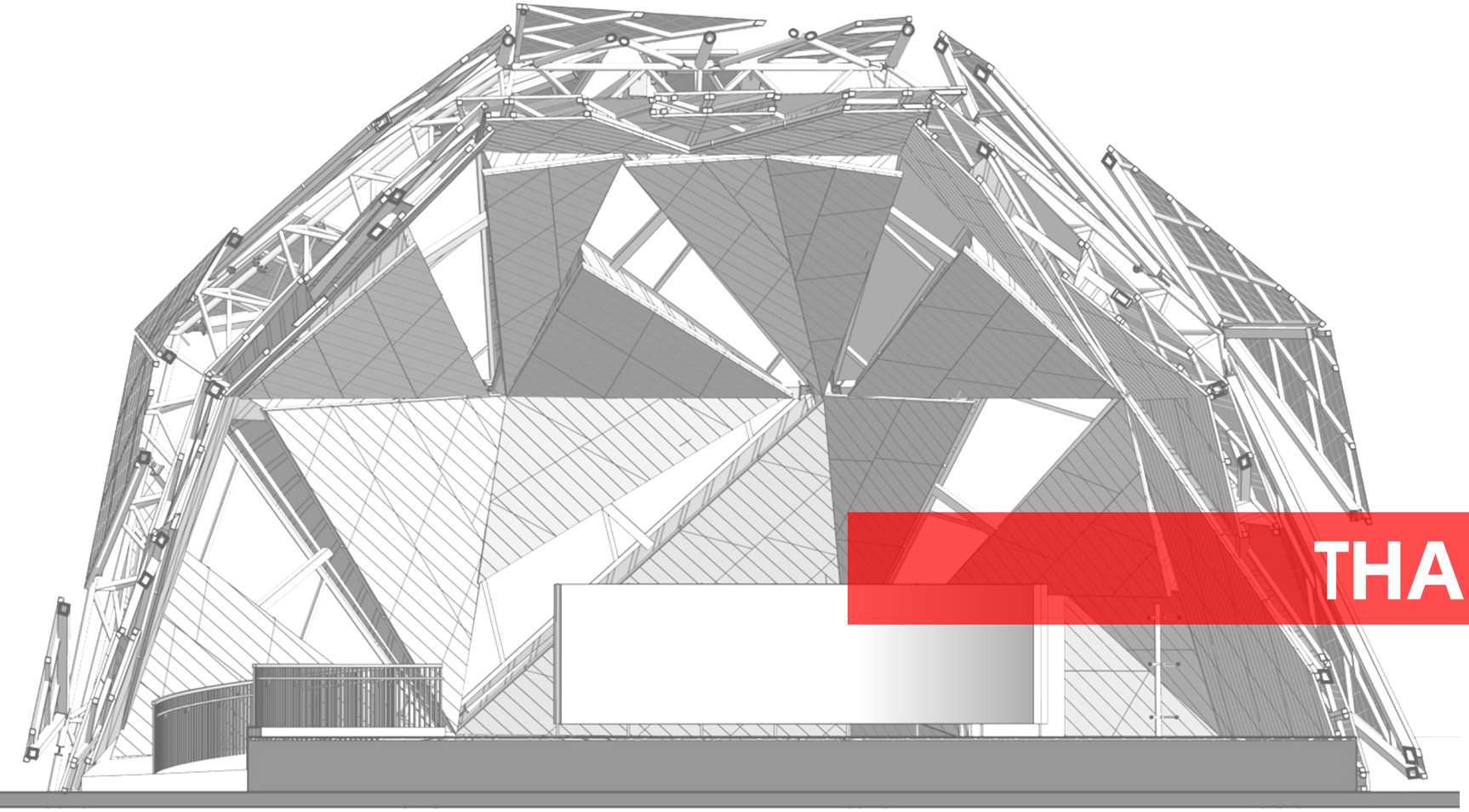
PANEL TYPE	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	DIGONAL (mm)	MATERIAL HEIGHT	MATERIAL LENGTH	PANEL AREA (m²)	Count
4001	1155	1600	1155	1600	2396	1000	2177	1.600	173
4002	1155	466	1308	201	1445	1000	1044	0.334	1
4003	1388	428	1600	1155	1430	1386	1155	1.097	2
4004	1155	571	1600	1155	1430	1386	1155	1.199	2
4005	1155	1225	1155	1225	1991	1000	1225	1.225	2
4007	1155	1508	1155	1508	1366	1000	1508	1.508	2
4008	1155	1524	1155	1524	2327	1000	1155	1.524	2
4009	1159	1675	1155	1667	1479	1000	2235	1.685	2

Constructability & Visualization






VIDEO



THANK YOU