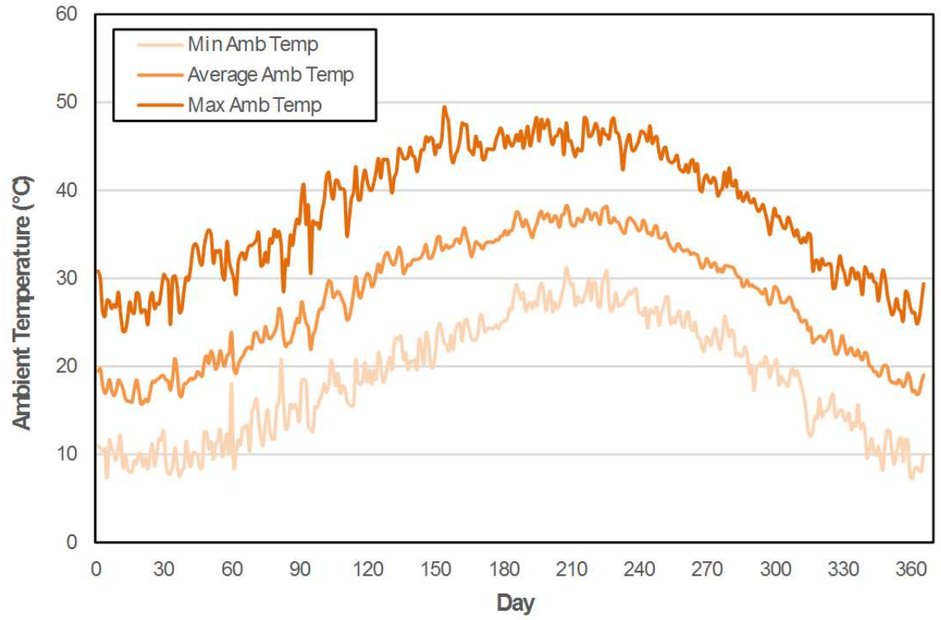

IMAGE 1 : ANNUAL TEMPERATURE PROFILE MBR SOLAR PARK

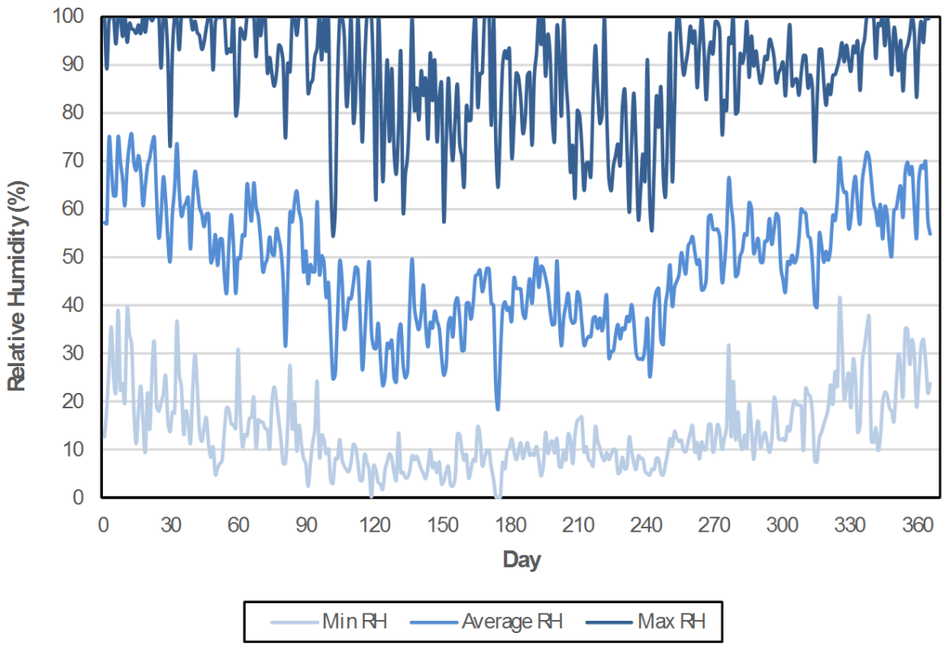

IMAGE 2 : ANNUAL RELATIVE HUMIDITY PROFILE MBR SOLAR PARK

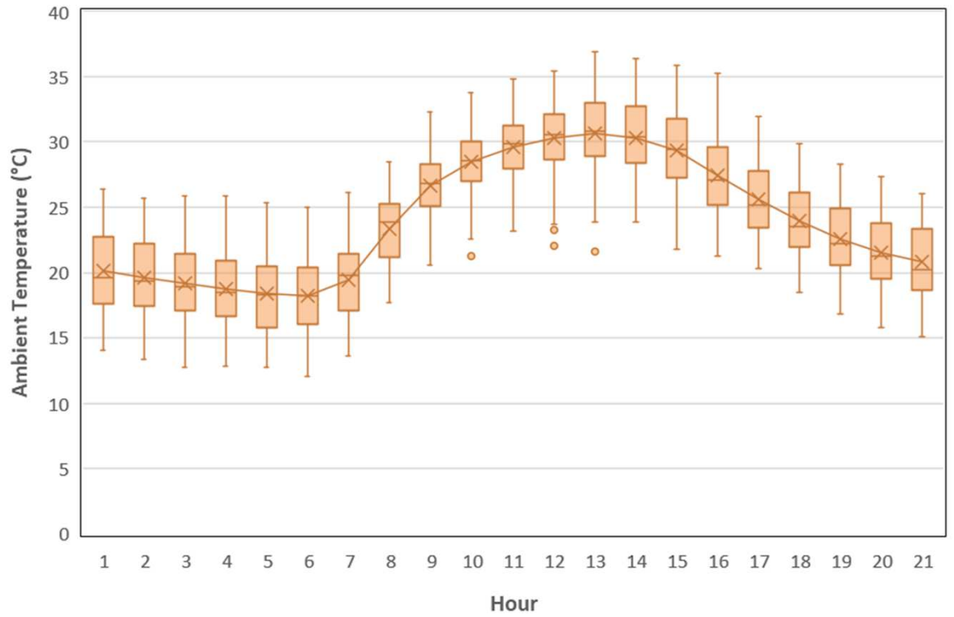

IMAGE 3 : NOVEMBER TEMPERATURE PROFILE MBR SOLAR PARK

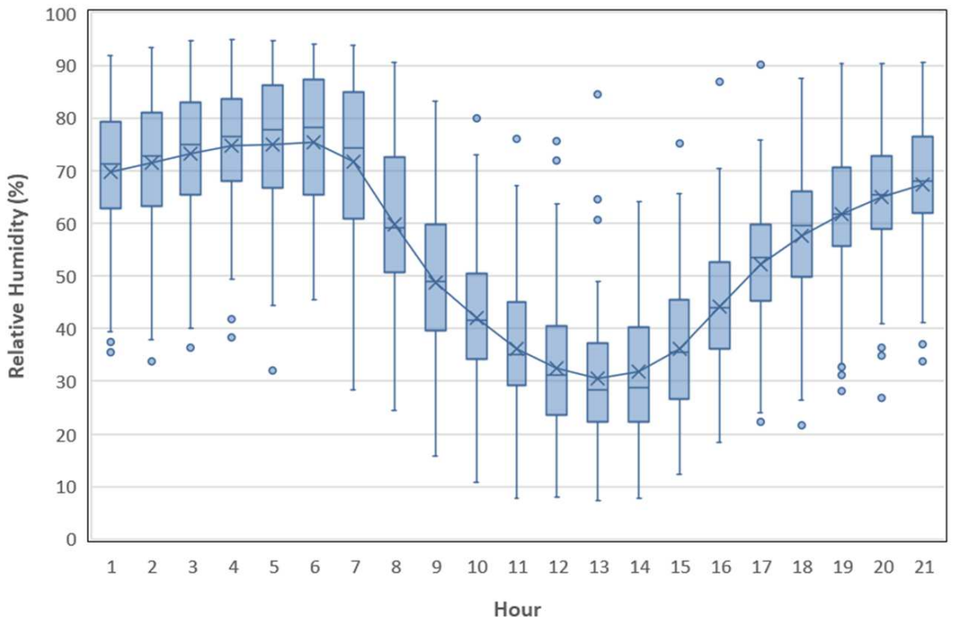

IMAGE 4 : NOVEMBER RELATIVE HUMIDITY PROFILE MBR SOLAR PARK

NOTES

DUBAI IS DOMINATED BY HIGH AMBIENT TEMPERATURES AND HIGH RELATIVE HUMIDITY. DURING THE COMPETITION PERIOD IN NOVEMEBER THE AVERAGE DAILY TEMPERATURES REACH OVER 30 DEGREES CELCIUS AND CAN DIP AS LOW AS 17 DEGREES DURING THE NIGHT. DURING THIS PERIOD THE HUMIDITY RATIO VARIES BETWEEN 75% DURING THE EVENINGS AND 30% DURING THE DAY. PASSIVE STRATEGIES WILL NEED TO ADDRESS THESE CLIMATIC CONDITIONS WITH A FOCUS ON COOLING AND DEHUMIDIFYING.

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SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

AMENDMENTS				
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LOT	# M
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CHECKED	C.MCDOWELL
DATE	20 February, 2018
SCALE	@ A3

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LOCAL CLIMATE ANALYSIS

BA-001

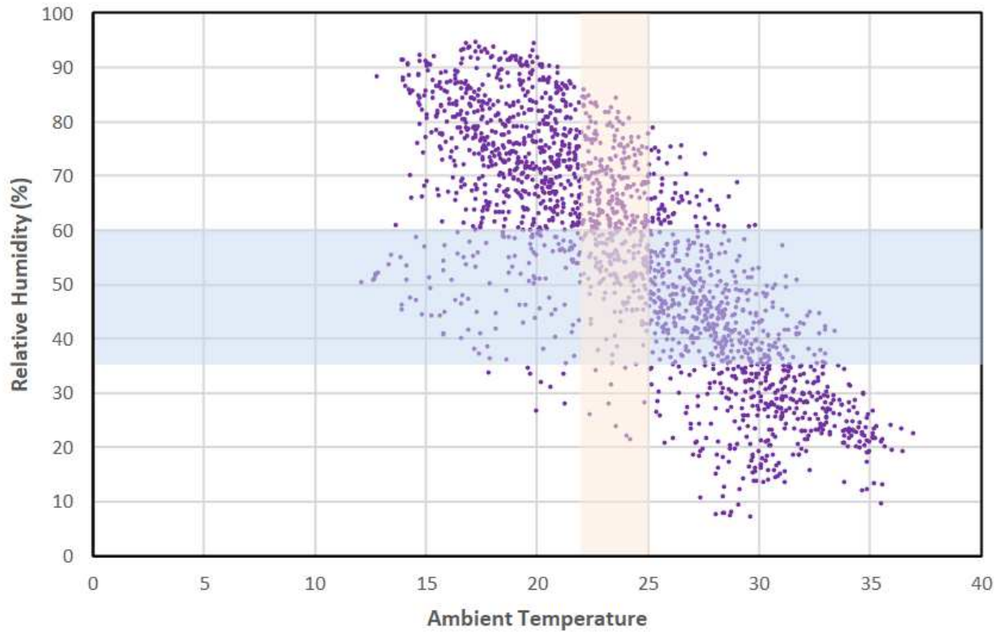

IMAGE 5 : NOVEMBER TEMPERATURE AND RELATIVE HUMIDITY PROFILE WITH COMFIORT CONDITIONS SHOWN IN SHADING FOR MBR SOLAR PARK

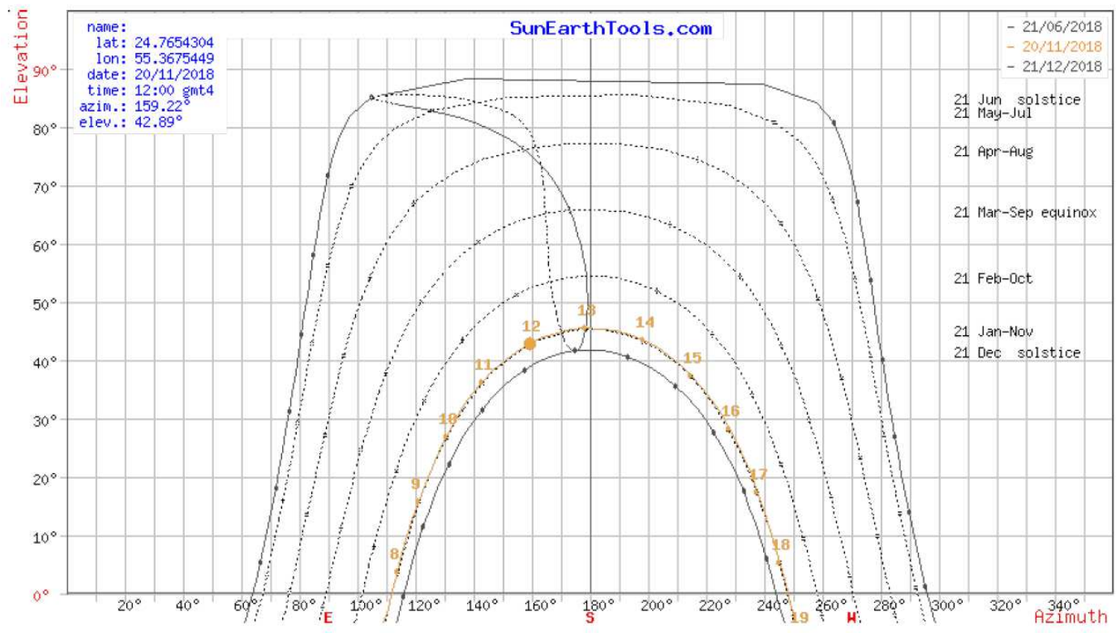

IMAGE 6 : SUN PATH DIAGRAM 1 FOR MBR SOLAR PARK

NOTES

A SIMPLE CLIMATE ANALYSIS INVESTIGATING THE NATURAL HOURS THAT MEET THE REQUIREMENTS OF A TEMPERATURE BAND OF BETWEEN 23 AND 25 DEGREES CELCIUS AND 35 AND 60 PERCENT RELATIVE HUMIDITY WAS UNDERTAKEN SEE IMAGE 5. WITHOUT INCLUDING THE BUILDING PROPERTIES AND THERMAL LOADS, LESS THAN 6% OF THE NOVEMBER HOURS WERE FOUND SUITABLE FOR NATURAL VENTILATION.

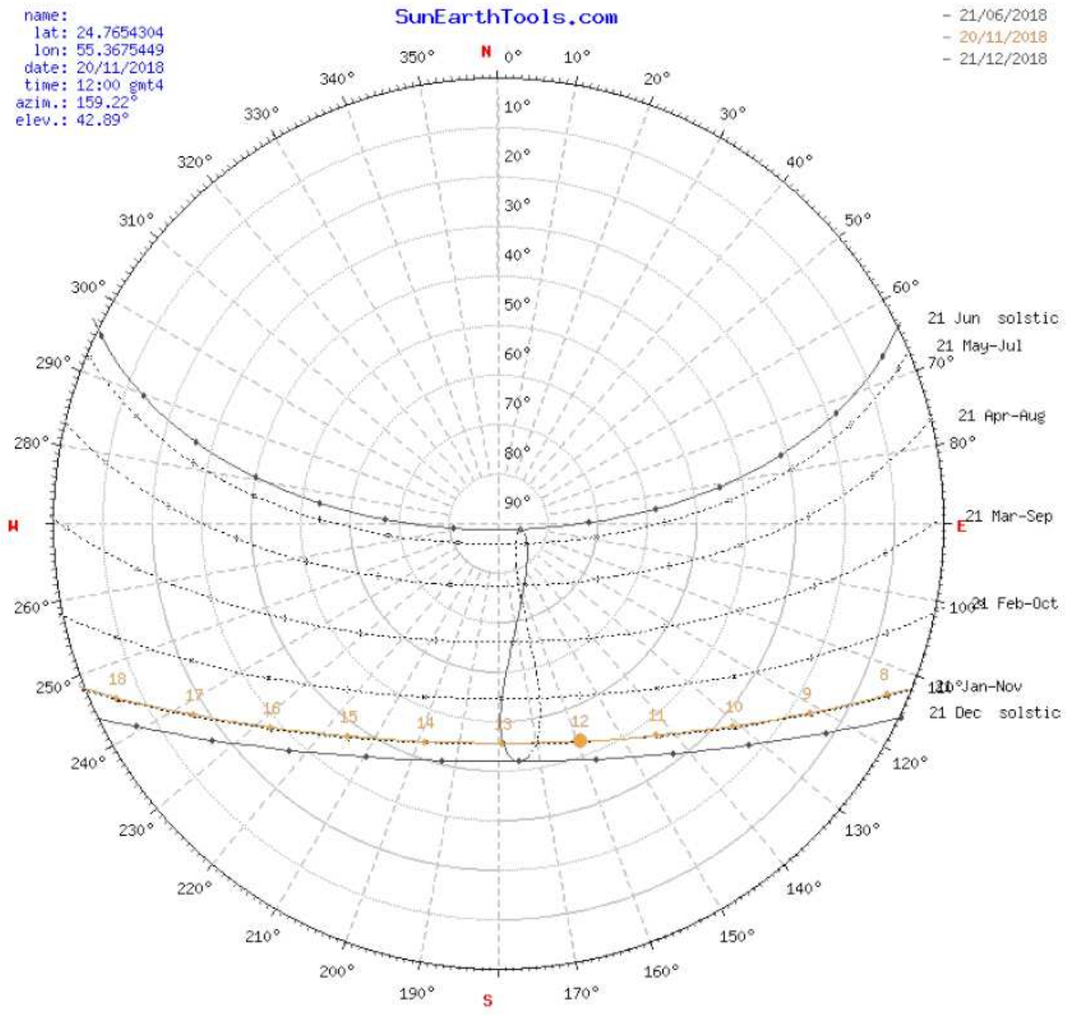

IMAGE 7 : SUNPATH DIAGRAM 2 FOR MBR SOLAR PARK

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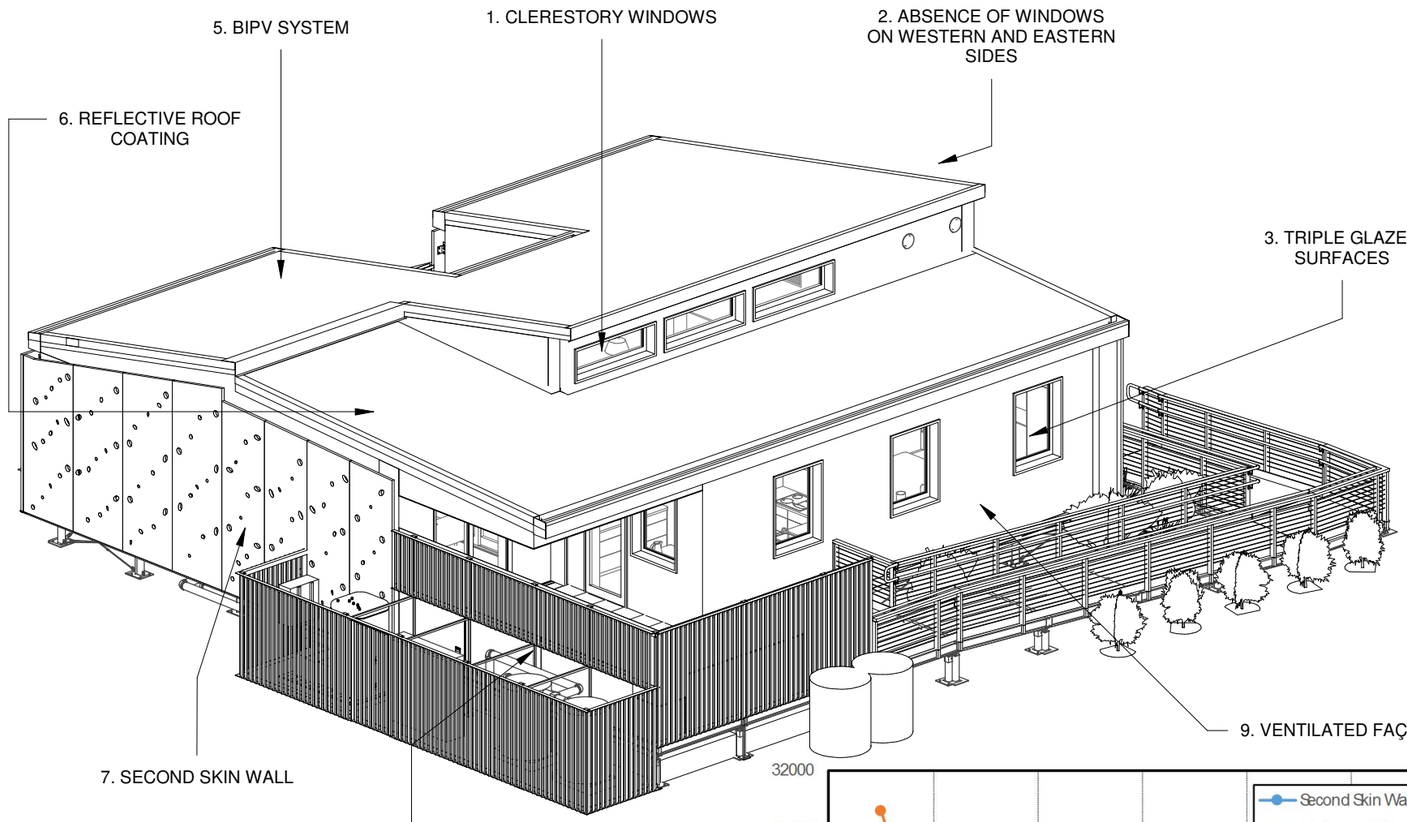

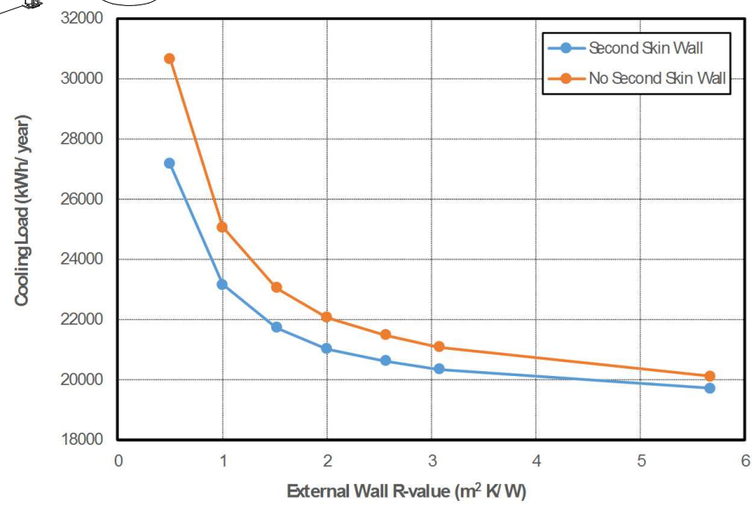

IMAGE 8 : ANNUAL COOLING DEMAND FOR VARIOUS WALL INSULATION LEVELS AND WITH AND WITHOUT SECOND SKIN WALL

NOTES

PLEASE REFER TO SIMULATION ANALYSIS AND DISCUSSION REPORT IN THE PROJECT MANUAL FOR FURTHER DETAILS ON CLIMATIC ANALYSIS AND JUSTIFICATION ON PASSIVE DESIGN STRATEGIES.

A SEASONAL ANALYSIS HAS BEEN UNDERTAKEN IN THE ABOVE REPORT, HOWEVER, DUBAI'S CLIMATE CONDITIONS REMAIN HOT AND HUMID FOR THE MAJORITY OF THE YEAR SO PASSIVE STRATEGIES ARE TARGETED AT REDUCING SOLAR HEAT GAINS AND HEAT TRANSFER THROUGH THE BUILDING ENVELOPE.

AN ENERGY + MODEL OF THE HOUSE WAS CREATED AND AN ANALYSIS WAS UNDERTAKEN ON THE EFFECTS OF THE SECOND SKIN WALL AND INSULATION VALUE OF THE WALLS. AN EXCERPT OF THE RESULTS ARE SHOWN IN IMAGE 8. THE SECOND SKIN WALL WAS FOUND TO HAVE A LARGER IMPACT WITH LOWER LEVELS OF INSULATION BUT DIMINISHING RETURNS THE HIGHER THE R VALUE OF THE WALLS.

OTHER PASSIVE STRATEGIES INCLUDE TRIPPLE GLAZED WINDOWS WITH THE MAJORITY OF GLAZING UNITS FACING AWAY FROM DIRECT SUNLIGHT. GLAZING UNITS WHICH RECEIVE DIRECT SUNLIGHT HAVE BEEN INTEGRATED WITH MICROSHADE MS-A ON THE FIRST LAYER OF GLASS. THIS PROVIDES A SHADING EFFECT AND REDUCES THE SHGC WHILST ALLOWING LIGHT TO PASS THROUGH. CLERESTORY WINDOWS ARE PROVIDED IN THE LIVING SPACE TO ALLOW LIGHT TO PENETRATE DEEP WITHIN THE SPACE. GLAZING HAS NOT BEEN PROVIDED ON THE PRIMARY EASTERN AND WESTERN WALLS TO REDUCE SOLAR HEAT GAINS AND PROVIDE THE OPPORTUNITY TO INCREASE THE DENSIFICATION WITH DESERT ROSE HOUSES CONNECTED ON EITHER SIDE.

A BIPVT SYSTEM IS INTEGRATED ON THE SOUTHERN ROOF. THIS SYSTEM PROVIDES SOLAR ELECTRICITY, HOT WATER AND ACTS AS AN INSULATION BARRIER. ON THE NORTHERN SIDE OF THE ROOF A HIGHLY REFLECTIVE STEEL SHEETING IS INSTALLED TO REDUCE SOLAR HEAT GAINS.

GREEN WALLS ARE INSTALLED IN BOTH COURTYARDS TO PROVIDE LOCAL MICRO CLIMATES.

1 Passive Design Strategies

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1	Updated Plans, Detailing and Template Adjustments	01/02/18	JR	VP

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LOCAL CLIMATE ANALYSIS

BA-001

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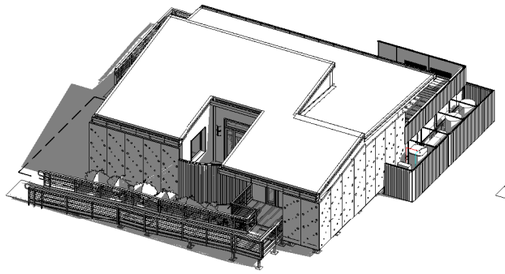
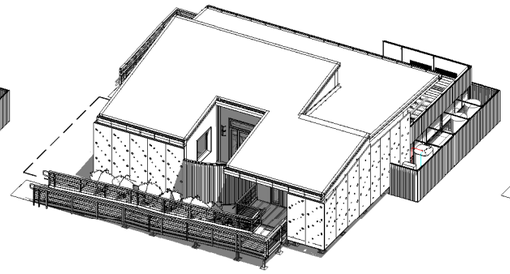
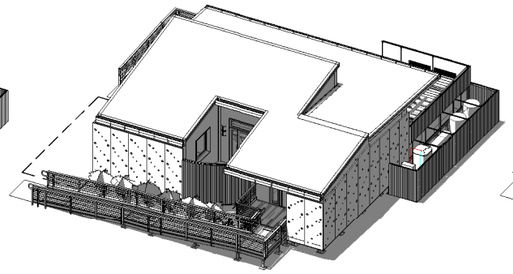
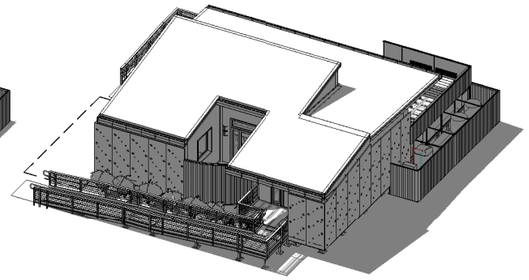
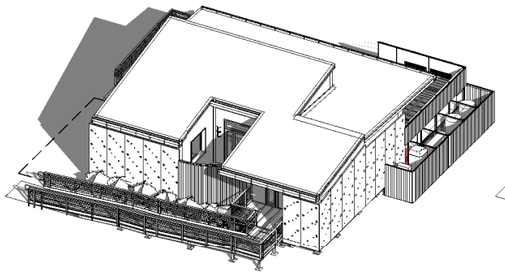
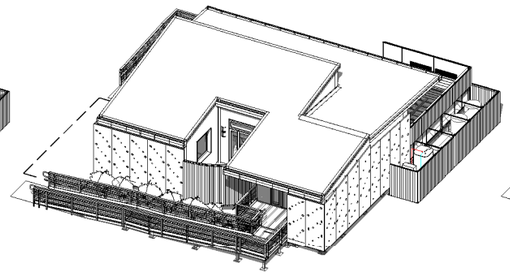
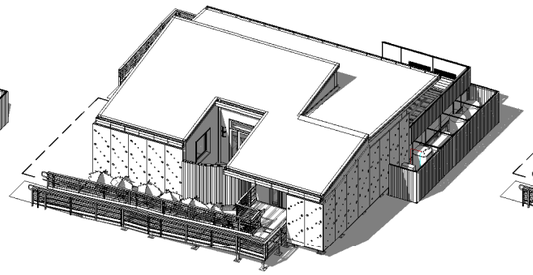
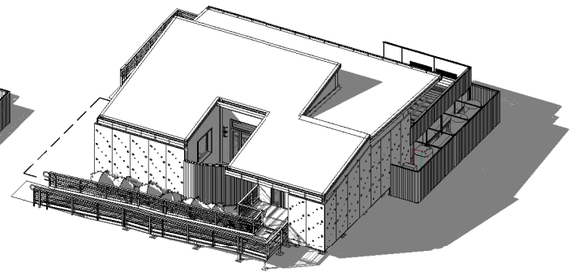
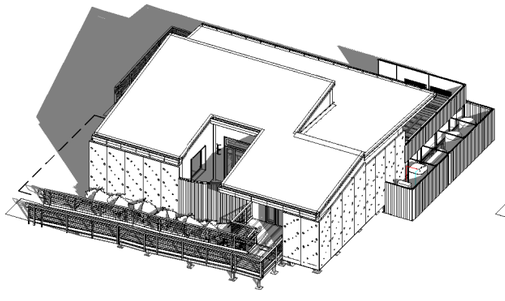
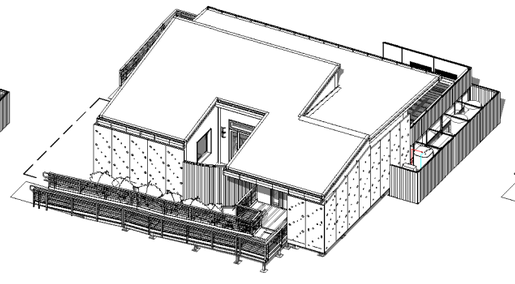
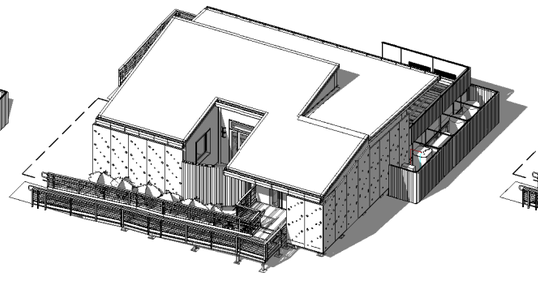
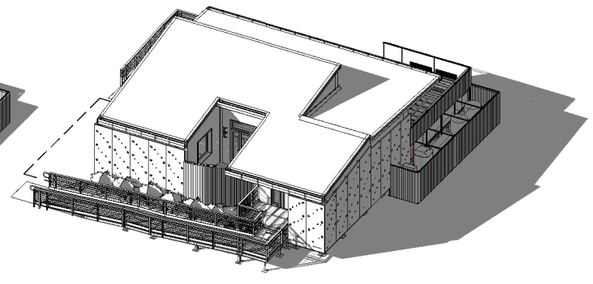
JUNE (SUMMER)				
NOVEMBER (SDME COMPETITION)				
DECEMBER (WINTER)				

1 Shading Analysis

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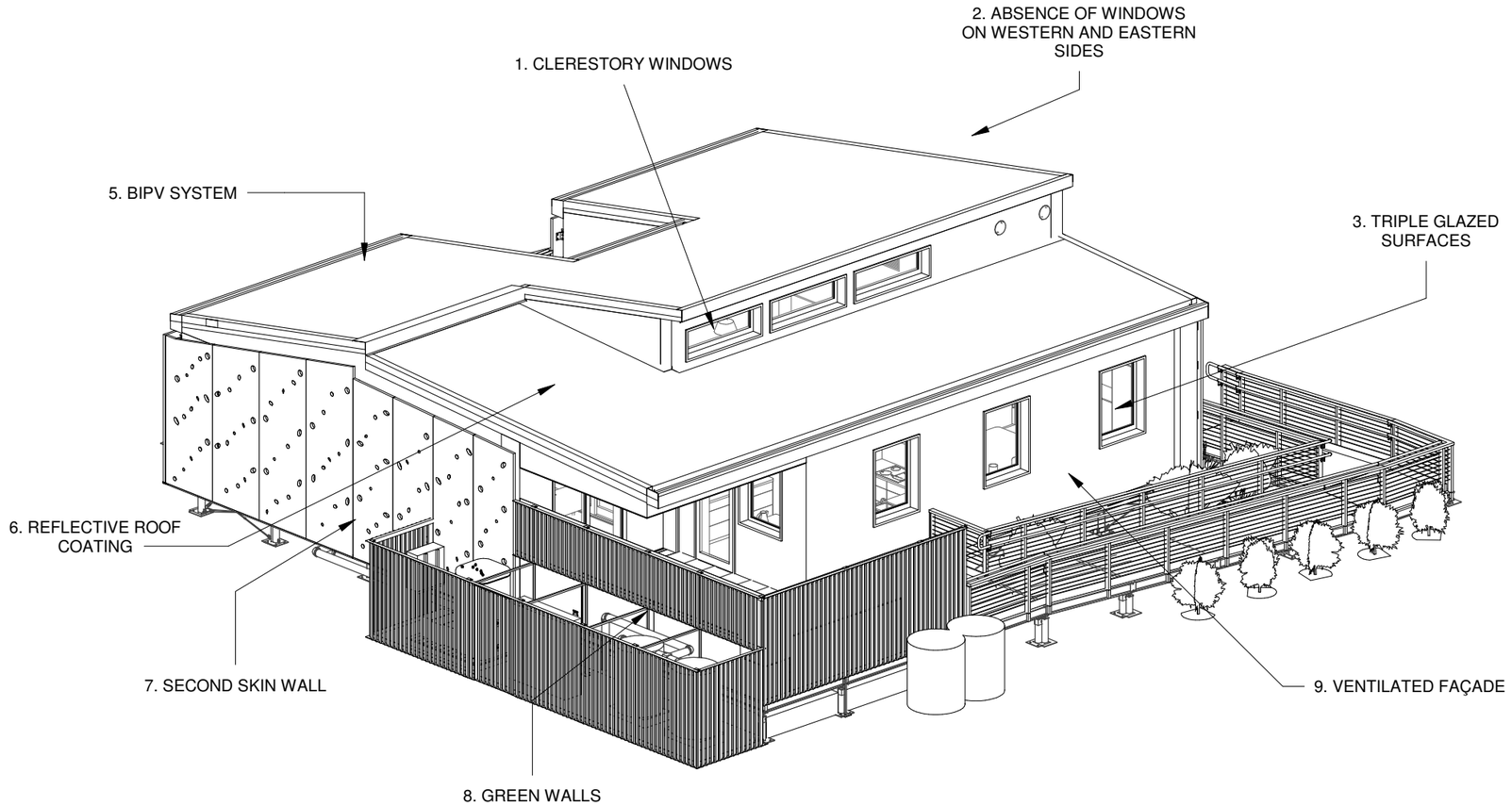
SHADING ANALYSIS

BA-002



Passive & Hybrid Design Strategies

1

PASSIVE DESIGN STRATEGIES

1. CLERESTORY WINDOWS: NORTH POSITIONED WINDOWS WILL MAXIMISE NATURAL DAY-LIGHT AND MINIMISE SOLAR HEAT GAINS. THESE WINDOWS WILL BE SHADED AT ALL TIMES.

2. ABSENCE OF WINDOWS ON WESTERN AND EASTERN SIDES OF THE HOUSE. THIS STRATEGY ALLOWS FOR MINIMISATION OF SOLAR HEAT GAINS.

3. TRIPLE GLAZED SURFACES: TRIPLE GLAZED WINDOWS AND DOORS WILL INCREASE THE BUILDING'S ENERGY EFFICIENCY, REDUCING HEAT GAINS FROM THE HARSH CLIMATE.

4. MICROSHADE: "MICROSHADE" TECHNOLOGY IS A PASSIVE AND HIGHLY EFFECTIVE SHADING ELEMENT FULLY INTEGRATED INTO THE TRIPLE PANE INSULATING GLAZING UNIT. IT WILL BE STRATEGICALLY ADOPTED WITHIN THE GLAZING SURFACES MOST AFFECTED BY THE SUN.

5. BIPV SYSTEM: THE “TRACTILE” VENTILATED ROOF SYSTEM PROVIDES A 4-IN-1 COMBINATION OF ROOF, INSULATION, ELECRICITY AND HOT WATER. ENGINEERED TO WITHSTAND EXTREME WEATHER CONDITIONS OFFERING LONGEVITY WITH LOW MAINTENANCE. THE ROOF SYSTEM WILL FACE SOUTH, MAXIMISING SOLAR EFFICIENCY.

6. REFLECTIVE ROOF COATING: THE NORTH FACING ROOF WILL BE VENTILATED TO FACILITATE THE ELIMINATION OF EXCESS HEAT IN THE BUILDING'S INTERIOR. THE ROOF SHEETS WILL BE COATED WITH REFLECTIVE COLOUR TO FURTHER DECREASE SOLAR HEAT GAINS.

7. SECOND SKIN WALL: INNOVATIVE LIGHTWEIGHT FOAMED CONCRETE WALL, IT WILL PERFORM AS SHADING TO THE HOUSE REDUCING SOLAR HEAT GAINS. IT IS POSITIONED STRATEGICALLY ALONG THE SIDES OF THE HOUSE MOST AFFECTED BY THE SUN.

8. GREEN WALLS: PROVIDE SHADING AND PASSIVE COOLING TO THE TWO OUTDOOR AREAS BY CREATING A MICRO CLIMATE.

9. VENTILATED FAÇADE: CONTRIBUTES TO REDUCING THERMAL LOADS AND ENERGY CONSUMPTION, FAVOURING AIR FLOW.

10. HIGHLY INSULATED ENVELOPE: HIGH LEVELS OF INSULATION WILL REDUCE THERMAL GAINS AND INCREASE THE BUILDING'S ENERGY EFFICIENCY.

10. COLOUR SELECTION: EXTERNAL MATERIALS HAVE HIGH LIGHT REFLECTANCE VALUES.

HYBRID DESIGN STRATEGIES

MIXED-MODE VENTILATION: NATURAL VENTILATION WILL BE FAVOURED BY CLERESTORY WINDOWS. FORCED MECHANICAL VENTILATION CAN ALSO BE ADOPTED TO LIMIT HEAT GAINS IN THE BUILDING'S INTERIOR AREAS.

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PASSIVE & HYBRID DESIGN STRATEGIES

BA-011