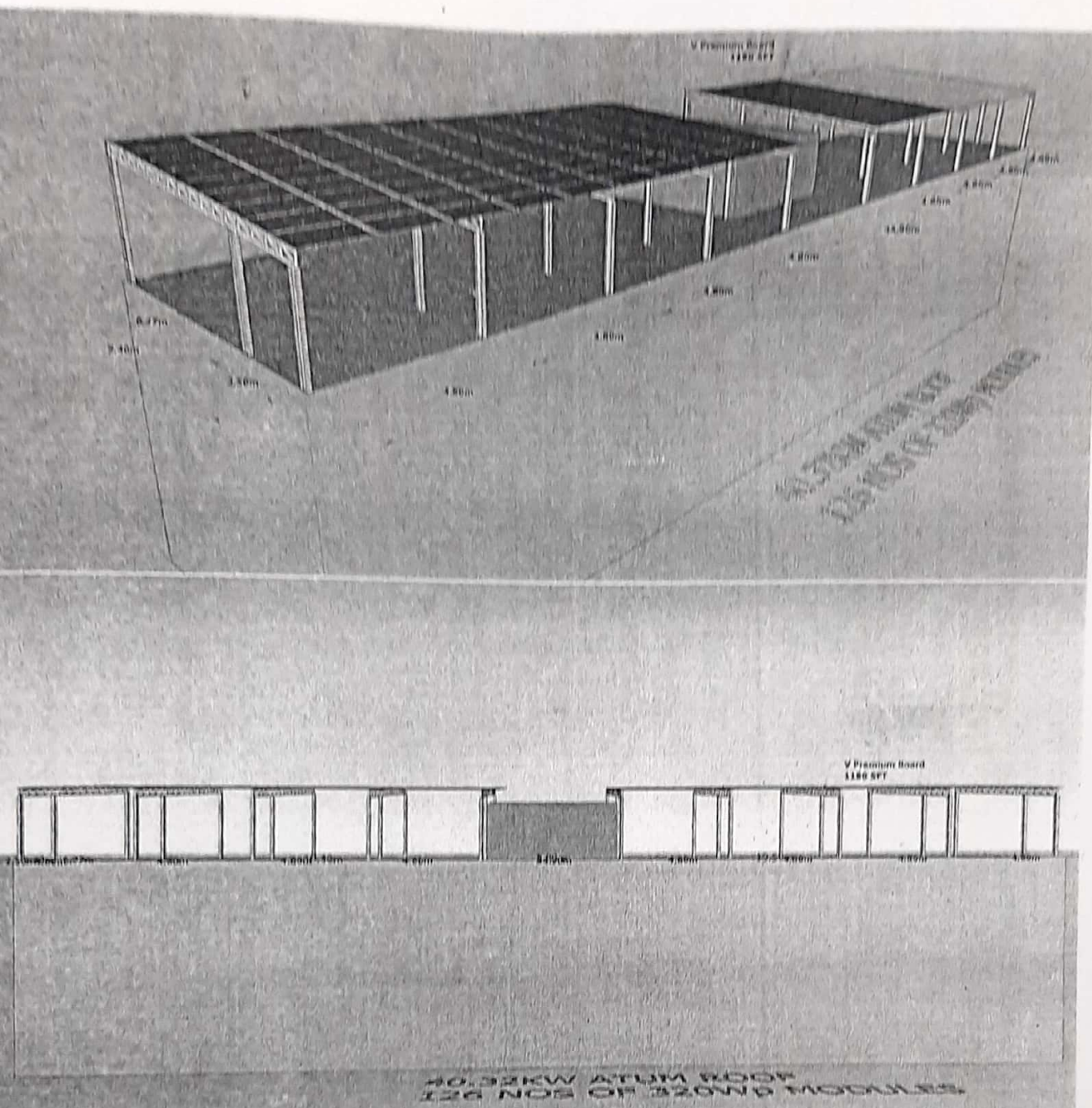


PROPOSAL

Installation of ATUM Powered Shed

For: Mr Praveen Kumar reddy
Version 1.0
Date: Oct 11 th 2019
Author: Raghuveer

A T O M
THE ELECTRIC ROOF



Dimensions mentioned are not specific to this project. Diagram is representative only.

Visaka Industries Ltd, believes there is a great need to optimize solar roofing systems and find ATUM to be a best fit solution for developing solar car ports. In this regard Visaka Industries approached TATA Smart Grid Lab to evaluate ATUM as a better alternative for their upcoming car port installations. In reference to the meeting held between 7th August 2019 at TATA Smart Lab, New Delhi, Visaka Industries has shared detailed technical specifications and comparative advantage of ATUM along with the relevant certifications. Further a quotation with detailed technical specifications is being provided with this document to evaluate the available opportunity.

Detailed Project Specifications

Total Project Capacity	40.32 kW
Number of ATUM Panels	126
Each Panel Wattage	320 Wp
Orientation	Portrait/landscape
Panel Configuration	landscape
Available Area	Shadow Free
Foundation	Anchor Bolt (Assuming the concrete pillar at site)
Type of Shed	Single Slope

Scope of Work:

Completion Date	Task	Scope
QI/PO Date	Design of Structure	Visaka
	Design of Solar Power Plant	Visaka
	Approvals for Solar Power Plant Installation	Visaka
Day 0	Supply of Structure	Visaka
	Erection of Structure	Client / Local Fabricator
Day 1	Supply of Solar Roofing Panel- ATUM	Visaka
Day 1	Supply of Solar Panel Jointing Accessories	Visaka
Day 10	Installation of ATUM Panels and Leakproof Installation	Client / Local Fabricator
	Supply of Cement Fibre Boards (To Cover Extra Spaces)	Visaka
	Installation of Cement Fibre Boards (To Cover Extra Spaces)	Visaka at Extra Charge Not Included in Quote
Day 12	Supply of all electrical equipment (cables, connectors, inverters etc) required for installation of solar power plant	Visaka at Extra Charge Not Included in Quote
Day 22	Installation & Commissioning of the Plant by Connecting to Nearest LT Panel in the same building only.	Visaka
4 Weeks after commissioning	Supply and Installation of Net meter	Supply and Installation by DISCOM (coordinated by Visaka) In case of unavailability of meters with DISCOM and requirement to source meters from market there will be additional expense at actual to be reimbursed
Day 25	CEIG Inspection	Coordinated by Visaka

Bill of Materials

Item Description	Bill of Material	
	Capacity/Specifications	Remarks
Solar Panels		
a) Module Capacity in Wp	320 Watt Peak	ATUM Solar Roofing Panels, - A Solar Panel Integrated into Cement Fibre Board which acts as leak proof roof giving you additional capacity and real estate, with superior mechanical properties of over 300kmph wind loading, 500kg per sqft UDL loading. Can withstand hail storms, Resist fire due to hot spots. PID degradation of less than 2.5% TUV Certified
b) Make	Visaka Atum	
c) No of Modules	As required	
d) Type of Module	poly crystalline	
e)Module Accessories Jointing	AL- T Profile, PU Sealant & Self drilling screws	Aluminium Profiles, SS Self drilling screws, Polyurethane Sealant 3M Make 504 grade with working temperature range of - 40 to 90. Industry grade sealant to ensure leak proofing for a life time
Inverter		
a) Capacity in KW	50KW	ABB/Delta/ Sungrow/Solis/Huawei
b) No. of Inverters	As required	
b) type of Inverter	3-phase 440V String Inverter	
DC System		
a) DC cables Size & Make	1C x 4 Sq. mm DC cable (Red & Black)	Polycab
b) DC cable quantity	Considered as mentioned in remarks	
c) DC Connectors	MC4 connectors	Considered make- Leoni/ Kaco
d) DCDB	JB's 9 NOS	Considered make- Siemens

AC System		
a) AC cables Size & make	4 Core 25 Sq mm XLPE CU Cable, 4 Core 10 Sq mm XLPE CU Cable, 2 Runs X 3.5C 185 Sq mm XLPE Al Ar Cable, 3.5C 70 Sq mm XLPE Al Ar Cable & Polycab/havells	
b) AC cable quantity	50 Mtrs for each block is considered	
c) AC distribution Panel Board	3 NOS. IP-54 rated enclosure with all switchgears. Siemens make	Separate ACDB for Each Block with superior make of components as prescribed.
d) Earthing	Cu plate 300X300 -2 No's	1 Early Steamer Lightning Arrester for the Entire Plant
e) Lightning Protection system	1 NOS. Early Steamer 107 Meters Radius. Make- DEHNGUARD	
Module Installation	Fixing the Panel on Roof grid	Panel fixing includes, unloading movement to the roof, laying of panels and installing with special sealant guns, drilling equipment for making the leak proof installation. The cost is higher than normal as it requires skilled workforce. Unlike normal panel installation.
Approvals		
Netmeters & CEIG	Visaka scope	
a) Netmeters Make	Net Meter will be supplied by DISCOM Make- Secure, L&T, HPL whichever is approved by DISCOM	
Hardware Accessories	Fire extinguishers, Sand buckets, Danger Boards, Canopy for SMB, Inverter & ACDB, Radium sticker for marking at Inverter/LT Panel/ACDB/Cable Tray/Earthing Points, Waterproof Tapes, Electrical Tapes	

Electrical Characteristics at Standard Test Conditions (STC)

Module Type	VIL-320P
Maximum Power -Pmpp(W)	320
Positive Power Tolerance	0-2.5%
Open Circuit Voltage -Voc(V)	46.18
Short Circuit Current -Isc(A)	9.06
Maximum Power Voltage -Vmpp(V)	37.2
Maximum Power Current -Impp(A)	8.61
Module Efficiency	16.00%-17.00%

Temperature Characteristics

Voltage Temperature Coefficient	$-0.300 \pm 0.024\%/^{\circ}\text{C}$
Current Temperature Coefficient	$0.059 \pm 0.007\%/^{\circ}\text{C}$
Power Temperature Coefficient	$-0.342 \pm 0.004\%/^{\circ}\text{C}$

Maximum Ratings

Maximum System Voltage(V)	1000
Series Fuse Rating(A)	15
Reverse Current Overload(A)	20

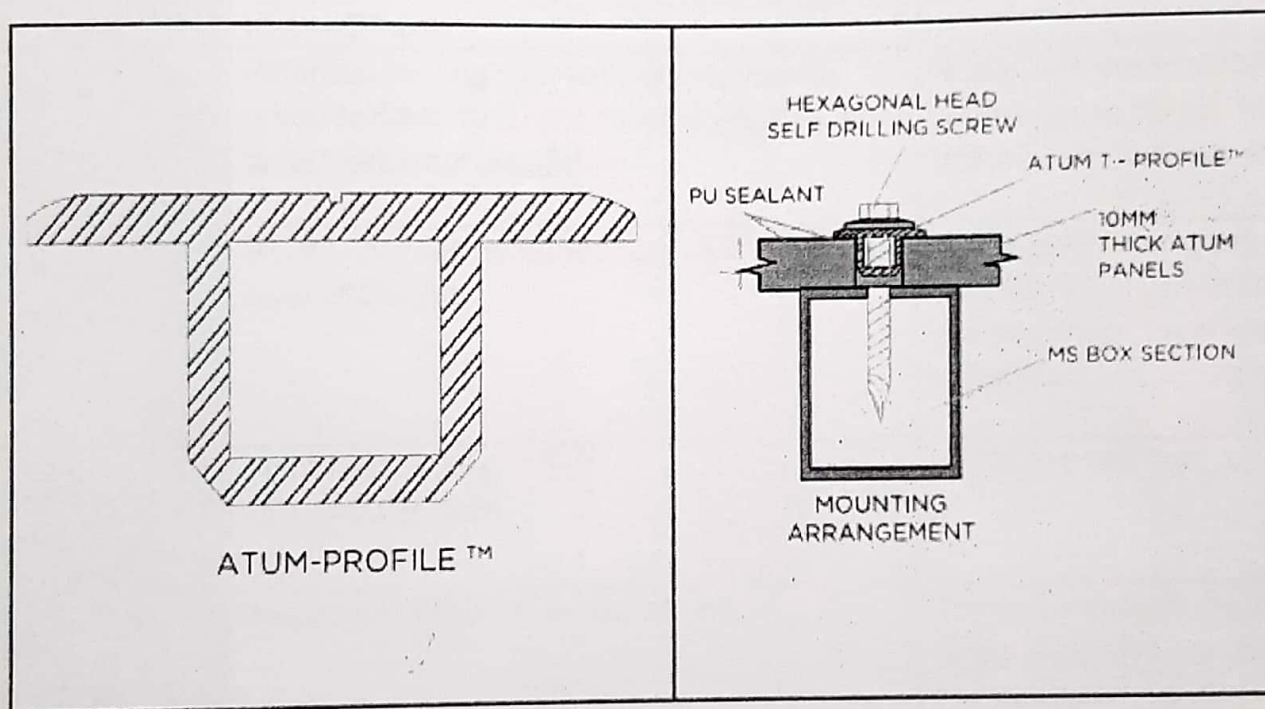
System Design

Temperature Range	-40°C to $+85^{\circ}\text{C}$
Hail	Max diameter of 25mm with 23m/s impact speed
Maximum CapacityS	now 5400 Pa, wind 2400 Pa
Application Class	A
Safety Class	II

Mechanical Characteristics

Dimensions	1980 x 1010 x 10mm (Board Thickness)
Weight	45.0Kg
Frame	Frame Less
Cells	6x12 polycrystalline solar cells (5BB 156.75x156.75mm)
Junction Box	Rated current $\geq 15A$, IP ≥ 67 , TUV&UL
Cable	length 1000mm/x4mm ²
Connector	C4/compatible with MC4

Jointing Mechanism:



Sealant Specifications:

3M PU 540

Technical Data

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Properties	3M™ 500-Series Polyurethane Products:				
	525	540	550FC	551	560
Tack-Free Time @ 73°F and 50% Relative Humidity	90 - 150 minutes	60 - 90 minutes	50 - 90 minutes	2 - 3 hours	50 - 60 minutes
Rate of Cure @ 73°F and 50% Relative Humidity	1/8" (3 mm) per 24 hour	1/8" (3 mm) per 24 hour	3/16" (4 mm) per 24 hour	3/16" (4 mm) per 24 hour	3/16" (4 mm) per 24 hour
Shore A Hardness (ASTM C861)	25	40	45	45	55
Tensile Strength (ASTM D412)	400 psi (2.6 MPa)	300 psi (2.1 MPa)	450 psi (3.1 MPa)	450 psi (3.1 MPa)	580 psi (4 MPa)
Elongation at Break (ASTM D412)	>600%	>600%	>600%	>600%	>300%
100% Modulus (ASTM D412)	75 psi (0.5 MPa)	125 psi (0.9 MPa)	150 psi (1.0 MPa)	190 psi (1.3 MPa)	145 psi (1.0 MPa)
Service Temperature	-22°F - 178°F (-30°C - 80°C)	-40°F - 194°F (-40°C - 90°C)	-40°F - 194°F (-40°C - 90°C)	-40°F - 194°F (-40°C - 90°C)	-40°F - 194°F (-40°C - 90°C)
Specific Gravity	1.17	1.17	1.17	1.17	1.17
Consistency	Medium paste	Medium paste	Medium paste	Medium paste	Medium paste
VOC Content	35.1 g/l	53.7 g/l	29.0 g/l	36.5 g/l	58.0 g/l

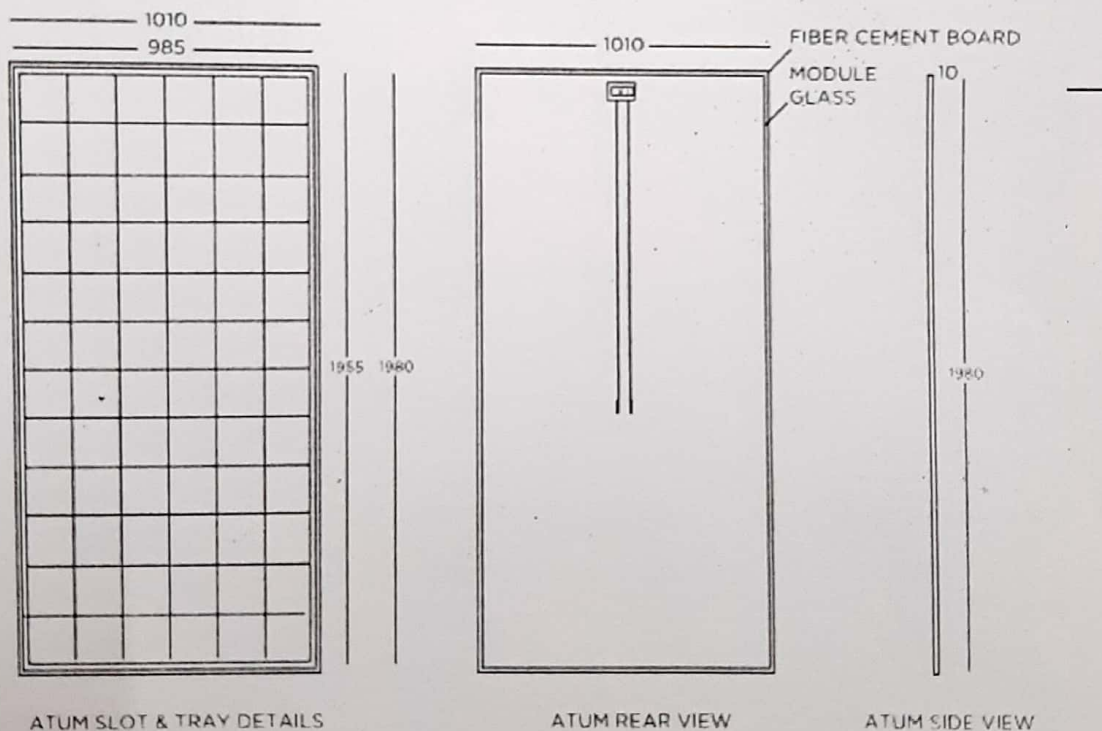
Feature	Specification	Test and Certification
Solar Power Generation	IEC Standards	BIS Certified
Solar Cell	Any solar cell can be integrated into roofing material making the product technology agnostic	Mono PERC has also been manufactured and testing awaited
Potentiality Reduced Degradation	ATUM modules underwent very low degradation after every PID test cycle, overall degradation allowed is 5% after 3 PID test cycles and ATUM modules degraded by less than 2.5% only	TUV Certified
Leakproof Installation	Patented jointing technique with industrial grade sealants to ensure running and stagnant water leakproof installation.	Water Tightness test has been conducted as per ASTM standards, and it is certified leak proof.
Wind Load	ATUM Roof can withstand high wind speeds of upto 200km/hr.	Leanmaestro Campbell Corporation certified. Final certificate under drafting stage. Experimentation completed.
Load Bearing Capacity	Point Load: 300kg/ 2 Sqft UDL= 400 kg/ Sqm	ASTM Witness Test
Fire Resistance	Resists spreading of fire upto 45 min.	This is the property of cement fibre board. Attached are the fire resistance testing details of the Vboards attached.
Micro Cracks	ATUM does not vibrate in windy conditions, hence no micro cracks in the Solar cells and therefore giving better generation for a lifetime	Lean Maestro Certified
Non-Corrosive	Can withstand industrial fumes and is non-corrosive	This property flows from the base cement fibre board which is certified to be non-corrosive.

Quotation

Item	Description	Price /Watt
ATUM Solar Roof	320 Wp	30.23
Balance of Systems	As per above mentioned BOM	16.70
	Installation and Commissioning	4.38
	V Board roof cost	2.93
	Transportation	0.37
	Total/Wp	54.61
	Project Cost for 30.72 Kilo Watt in Rs	22,01,875 /-

Cost of Structure fabrication will be extra at actuals. GST is Extra as applicable. Transportation is included in the above quote

Technical Specifications of ATUM Panel



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Background of Visaka Industries Ltd

Founded by Dr. G Vivekanand in 1983, Visaka Industries Limited has multiple product portfolios ranging from corrugated cement sheets, fiber cement boards, hybrid solar roofs and manmade fiber yarn. Under his able leadership, Visaka has been at the forefront developing sustainable products, meeting the demands from both domestic and international markets. With its transformed product portfolio under Vnext, today Visaka is enabling various consultants, builders, architects and applicators to emphasize more on sustainable architecture and build the future®. Our V boards are designed to provide strength, stability and fit seamlessly within the architecture offering an aesthetic solution. V premium planks, a specialty grade product offering from Visaka today have become the choice of many consultants, engineers, builders, contractors and tested to survive in any extreme outdoor applications.

WHAT WE HAVE ACHIEVED OVER THE LAST 35 YEARS..

More than 35 years of legacy



Listed on the Stock Exchange



13 Manufacturing Plants



4000+ Employees



1000 crores + in Revenue



Visaka also manufactures and supplies their wonder yarn worldwide, a manmade yarn that carved a niche for various fabric applications across apparels, furnishings, automotive fabrics and other technical textiles. With a world class manufacturing set up, Visaka is known as the largest murata twinning jet spun yarn technology facility under one roof. To address the energy demands in a sustainable way, Visaka has launched a path breaking hybrid roof top solar product called ATUM - the first of its kind in India. With its superior techno functional capabilities, Atum is thermally efficient and generates 20% more revenue when compared conventional solar panels. With unmatched durability Atum is the

only renewable energy solution that comprises of a roof and a solar panel, designed to meet the consistent energy demands and can be managed on your phone.

With 12 manufacturing units, 13 marketing offices and a PAN India distribution channel of over 7000 dealer outlets, Visaka Industries limited has emerged as a sustainable business enterprise and a GreenPro certified (IGBC) organization. Our corporate philosophy and business interactions made us retain all our customers since its inception and it's the testimony of our commitment to all stakeholders. Corporate governance and the professional way of managing company affairs to keep Visaka on steady growth path with consistent dividend payouts to all the shareholders has been well appreciated. Driven by Values, Our Visaka charitable trust has been in operation and serving the society, long before CSR regulations were promulgated.

VISAKA INDUSTRIES OPERATES IN THE FOLLOWING BUSINESSES



Fibre cement boards

India's largest player (192000 MT/ PA)



Textiles

The largest Twin Airjet spinner in the country



ATUM

India's first electric roof



Cement Roofing Sheets

India's 2nd largest player

Introduction to ATUM – An Electric Roof

ATUM is India's first solar roof. In simple language it is a solar panel integrated with a roof. ATUM's solar cement substrate makes it a versatile solution with numerous applications and gives 20%-40% higher installed capacity than the conventional solar panel mounting. This eliminates the need for galvalume sheeting on the PEB structure, you can directly mount the ATUM roof joined together with a patented technology. The major fear of punching holes into the roof is eliminated and has many more added advantages as mentioned below:

ATUM – Features, Advantages & Benefits:

- It is an integrated product which works as a roof and a solar panel
- It is a leak proof application.
- Water, fire, termite, & shock resistant
- A minimum of 20% extra power generation than traditional solar in the same space
- Roof lifetime of 45-50 years, solar power generation for 25 years to the extent of 80%
- More than 4 times return on your investment over 25 years
- Great Aesthetics & thermal resistance