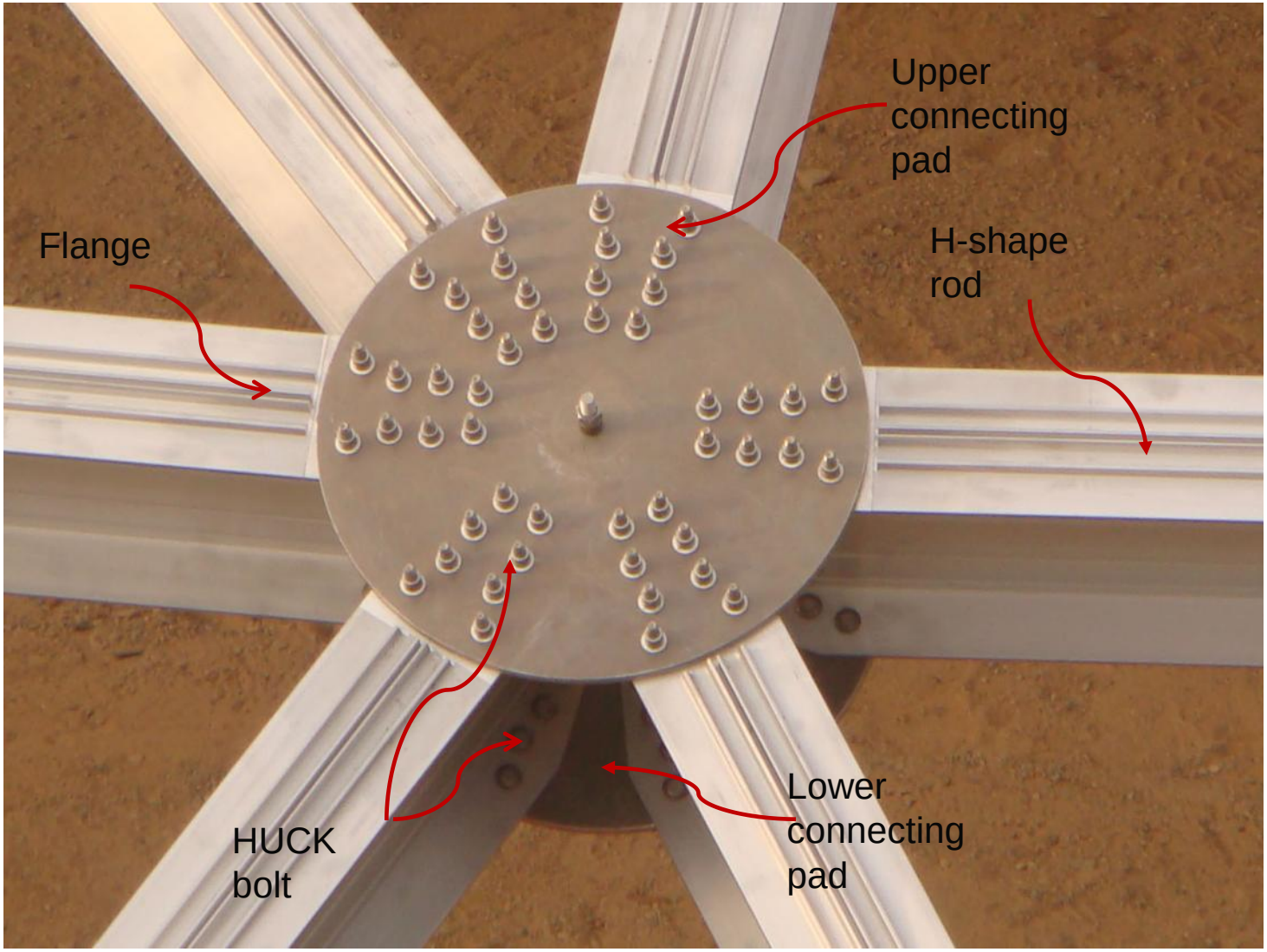
Aluminum Dome

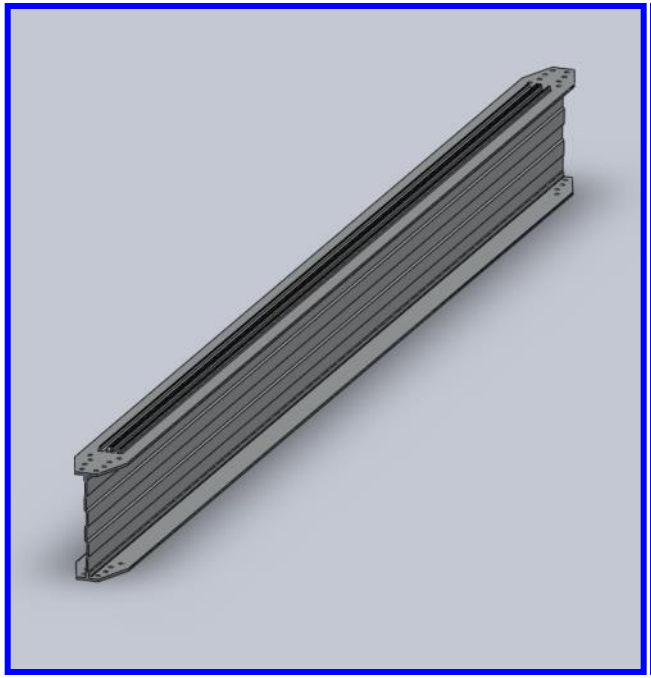
Aluminum dome structure

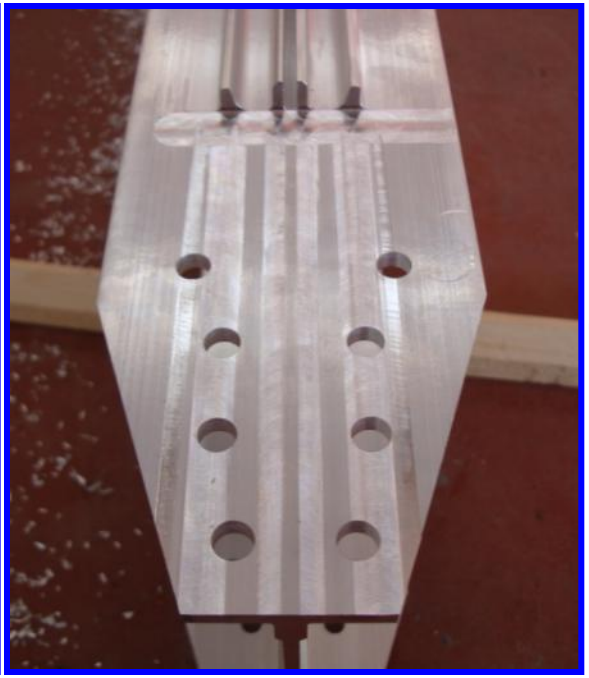
➢ H-shape aluminum connection

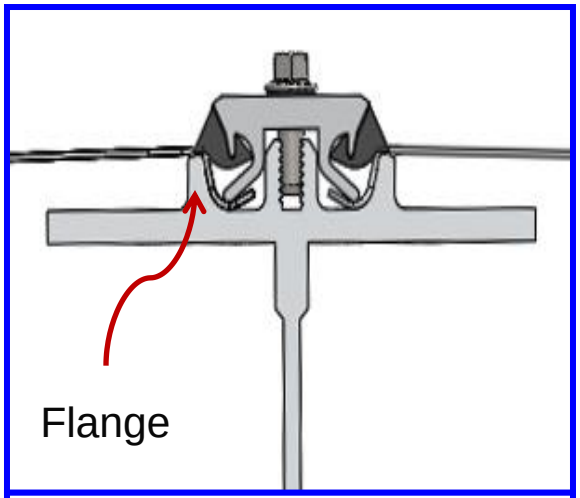


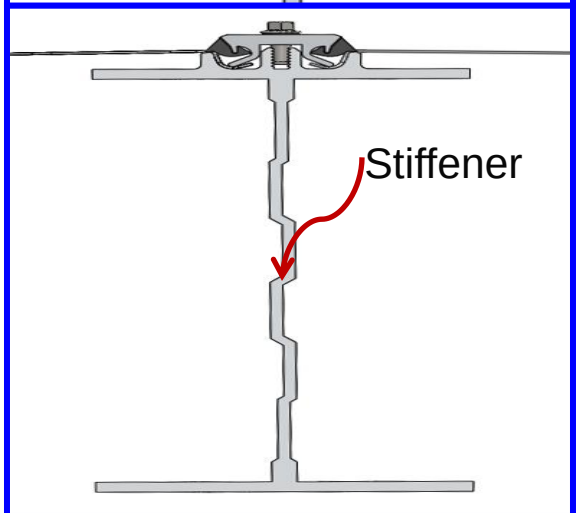
➢ H-shape aluminum connection---H shape rod

The rods of the dome are made of 6061-t6 aluminum alloy and extruded into shape. The rods are used as the main support structure of the dome structure. The rods and the connecting plates are connected together to form the skeleton of the dome structure.



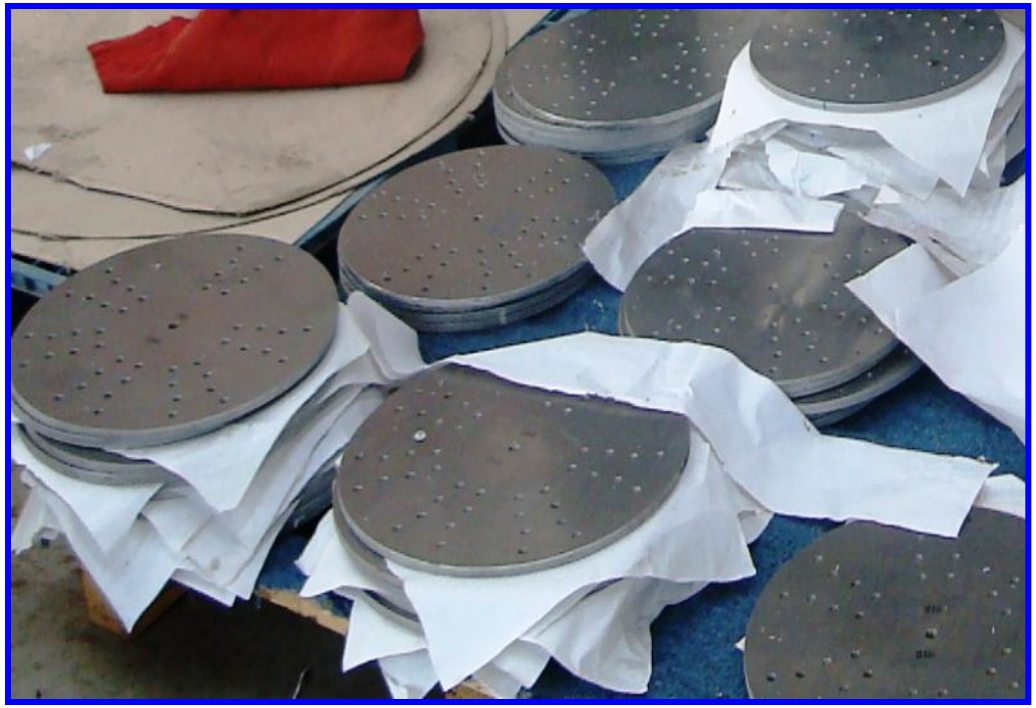






➢ H-shape aluminum connection---connecting pad

The connecting pads are made of aluminum alloy 6061-t6 material. The upper and lower connecting pads are fixed with hooker bolts. The pads are machined with high installation precision, simple installation and high construction efficiency.

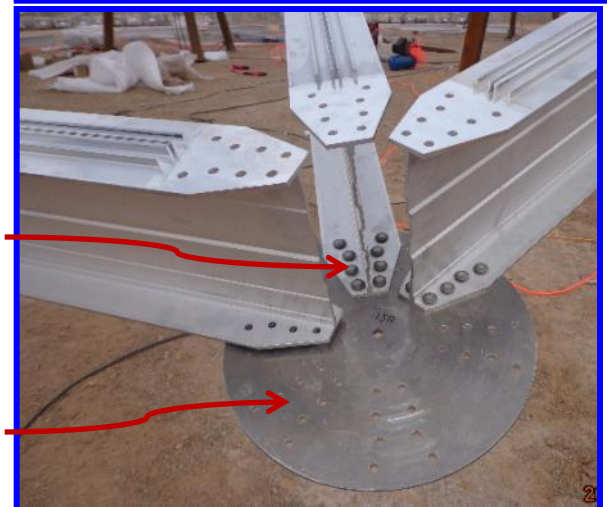


Hooke bolt

Upper connecting pad

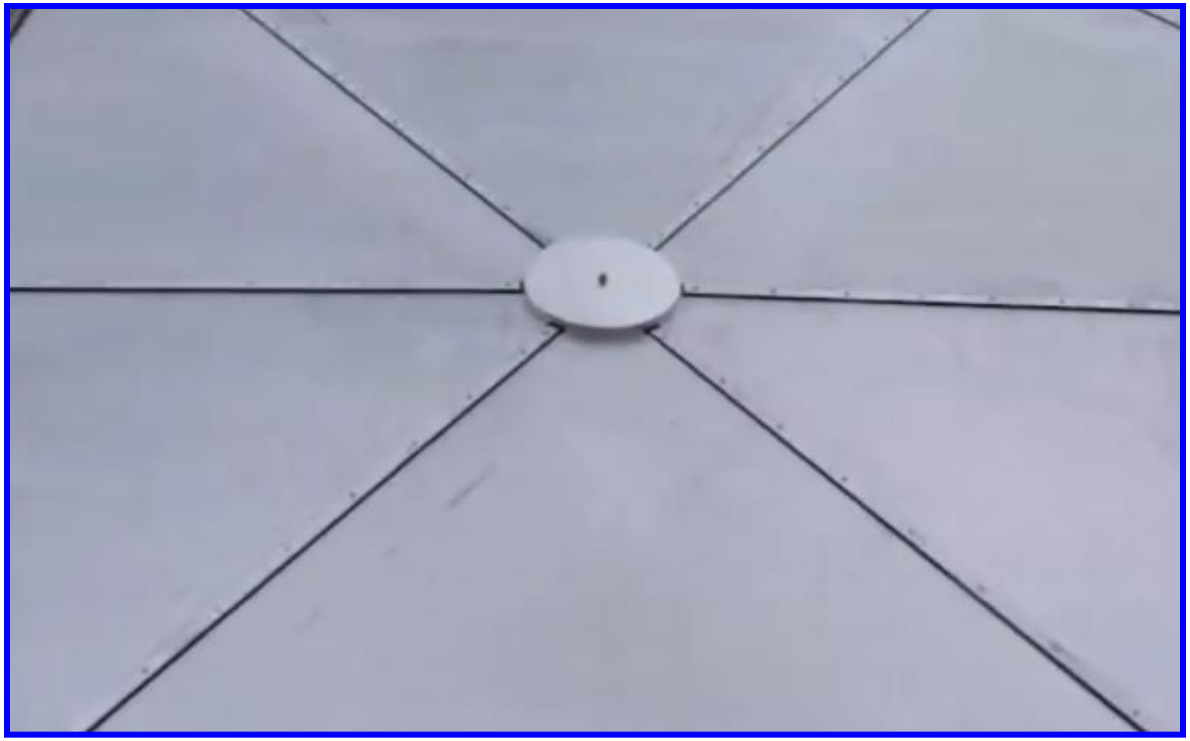
Hooke bolt

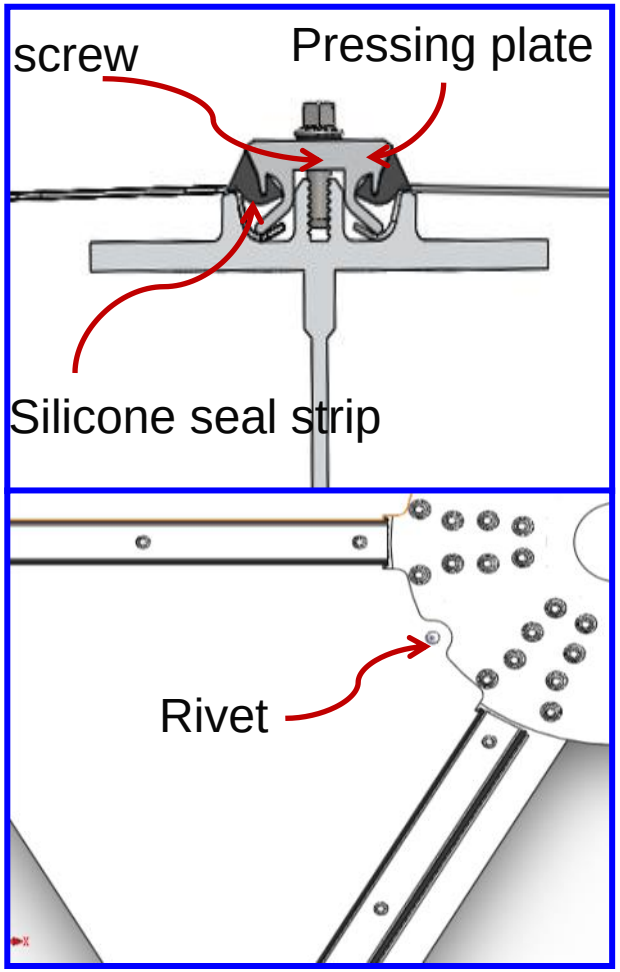
Lower connecting pad



➢ H-shape aluminum connection---covering

The covering uses 3003-h16 aluminium alloy material with a firm pressing plate and no need for drilling. It has no damage on the covering rigidity. The covering sealed by sealing strip which has godd sealing effect.

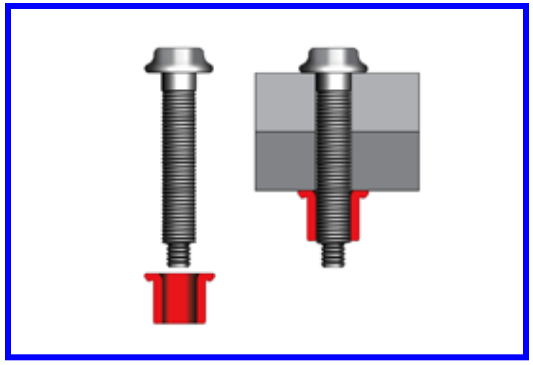




➢ H-shape aluminum connection---HUCK bolt

The rods and connecting pads are fixed with HUCK bolts.

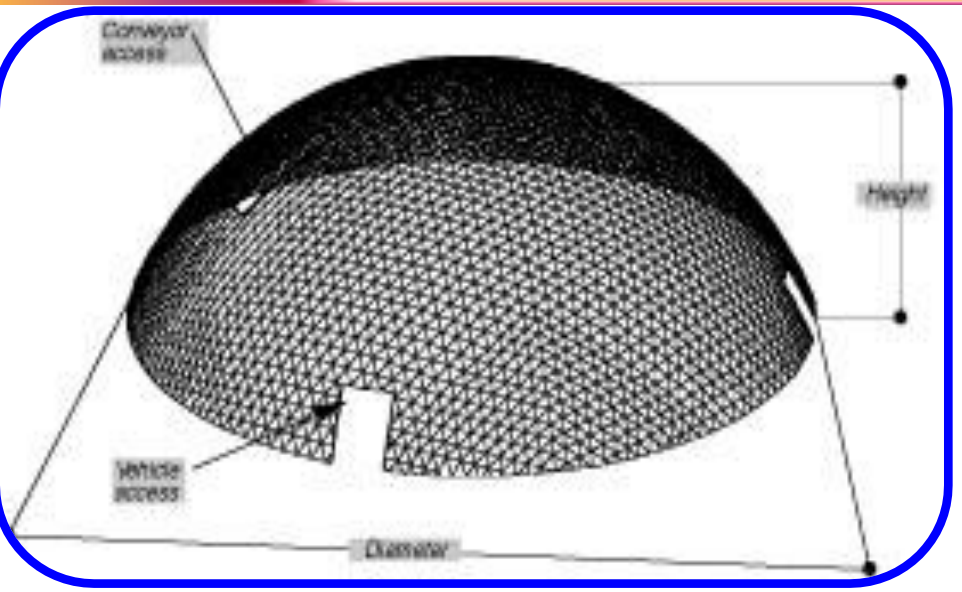
A new generation of HUCK BobTail fasteners are used to hold the connecting discs and bars together. The unique design ensures strong connections, reduces material waste, and provides excellent corrosion protection with minimal installation noise.

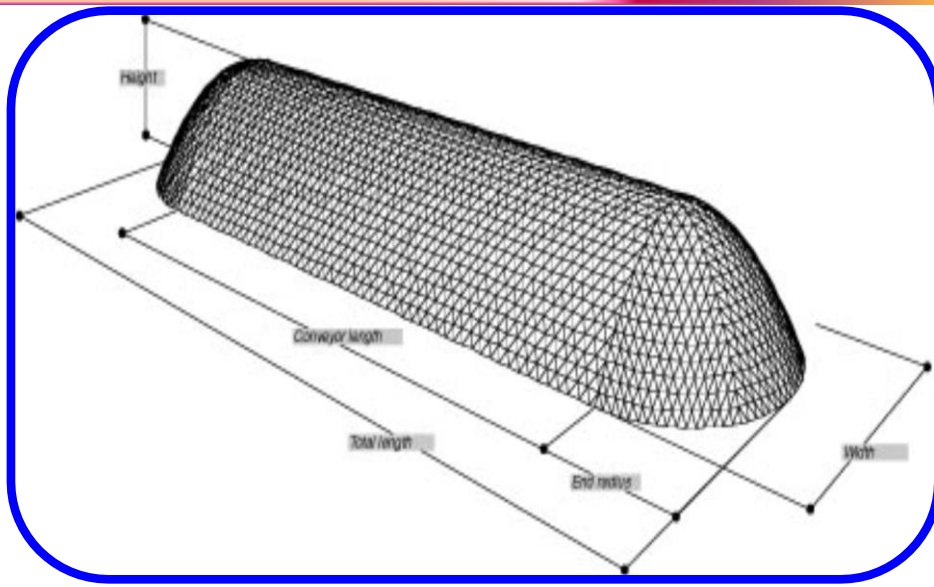


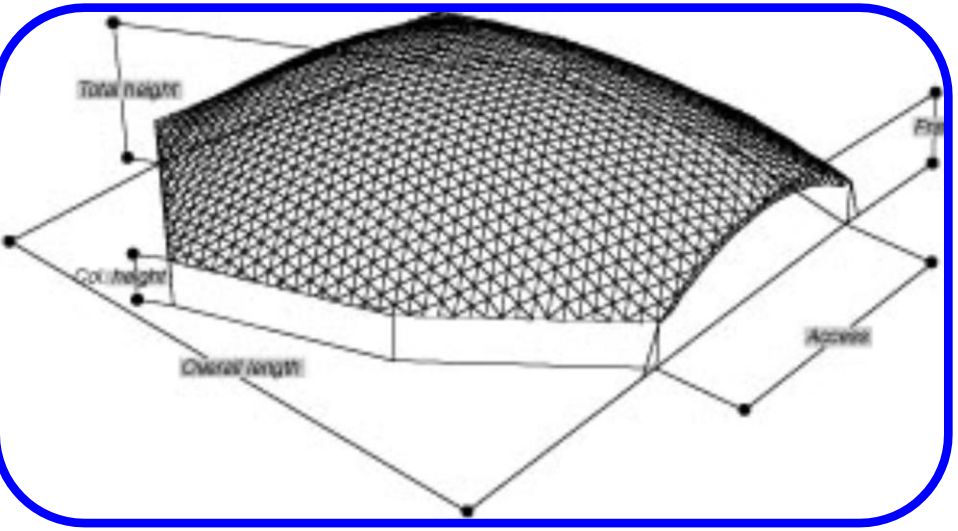
HUCK bolt is fixed with special air gun, which is easy to operate, and can effectively improve working efficiency, reduce construction time and fix strength.

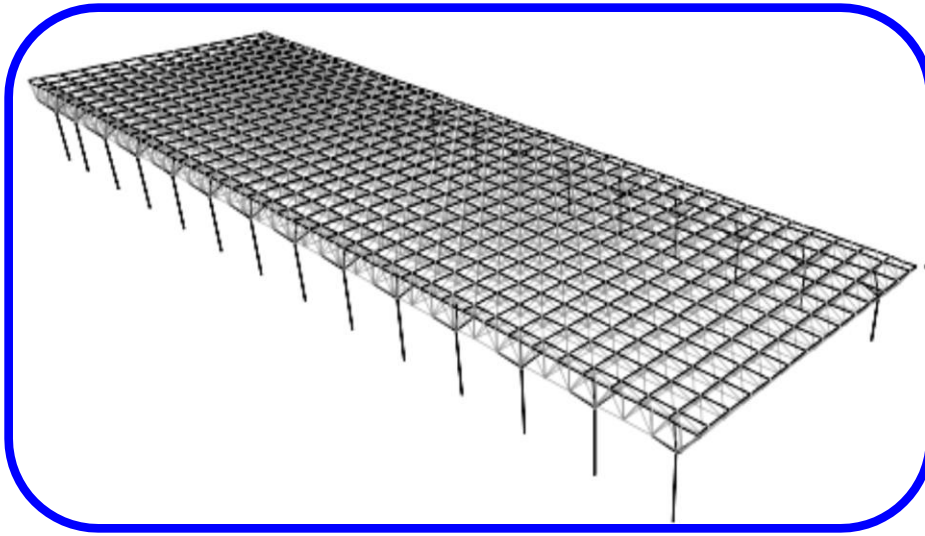
Comparative advantage of aluminum alloy

Multiple structural forms









Closed structure - aluminum dome or steel dome

Aluminum dome

Steel dome

Because of the different materials, the use and maintenance of the steel dome and the aluminum dome structure are quite different.

Steel structure

For different steel structures, there are different requirements according to the durability and service life (such as 20,30,50 or even 100 years). What is important is the complex and frequently changing factors of the industrial environment. ISO 900223 classifies corrosion into 5 grades according to the environment. The table shows the corrosion rate of carbon steel exposed to different grades of corrosion.

Material	Corrosion severity index	Environment	Corrosion rate
Steel structure	C1	Very low corrosion	< 1.3 [micron /year]
	C2	Low corrosion	1.3-25 [micron /year]
	C3(Countries and cities with low so2 and acid pollution)	Moderate corrosion	25-50 [micron /year]
	C4(Moderate sulfur dioxide pollution in urban and industrial areas and low-salt coastal areas)	High corrosion	50-80 [micron /year]
	C5(High humidity and corrosion in industrial areas)	Very high corrosion	80-200 [micron /year]

- Steel structures designed for long service life and for use in 'C3' or higher corrosive grades must have anti-corrosion coatings;
- Persistence is poorer, the result is to let owner suffer bigger economy loss, and need within 3-5 years anticorrosive treatment;
- The fastness of the connection becomes a problem due to the use of bolts at higher elevations in hazardous working conditions.

Aluminum alloy structure

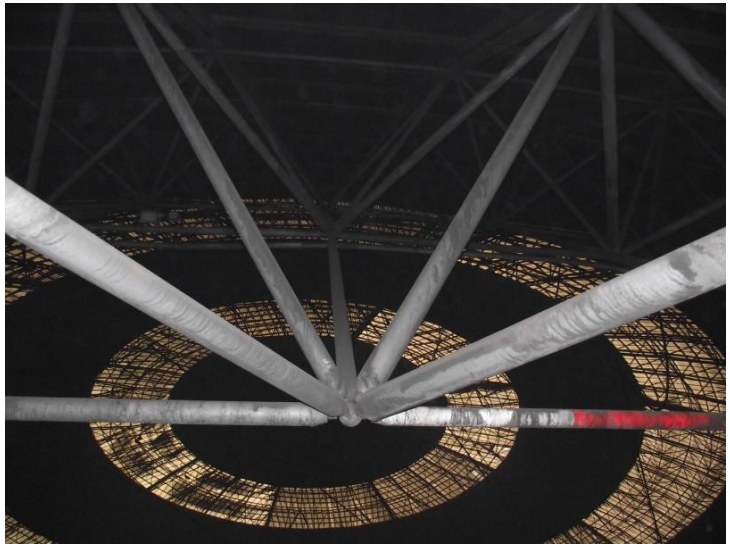
Aluminum is naturally resistant to corrosion. Aluminum naturally oxidizes in the air to form a high-density sealing membrane that ACTS as a barrier against reoxidation and other elements. Alumina is chemically relatively inert, thus enhancing its corrosion resistance. The ASTM reports on exposure to aluminum in multiple locations (industrial, seaside, and rural), showing that the average penetration is 0.00002 inches per year, or 0.01 inch per year for 500 years.

Material	Corrosion severity index	Environment	Corrosion rate
Aluminum alloy	C5(High humidity and corrosion in industrial areas)	Very high corrosion	5 -10[micron /year]

- The corrosion rate of aluminum alloy material in the environment with extremely high corrosion of C5 is also very low, far lower than that of steel structure in the environment of C2 (< 25 micron/year).
- Good durability, structure stability, corrosion resistance, long service life, no need for corrosion treatment, reduce the loss of the owners.

Comparison in dome

Aluminum alloy dome



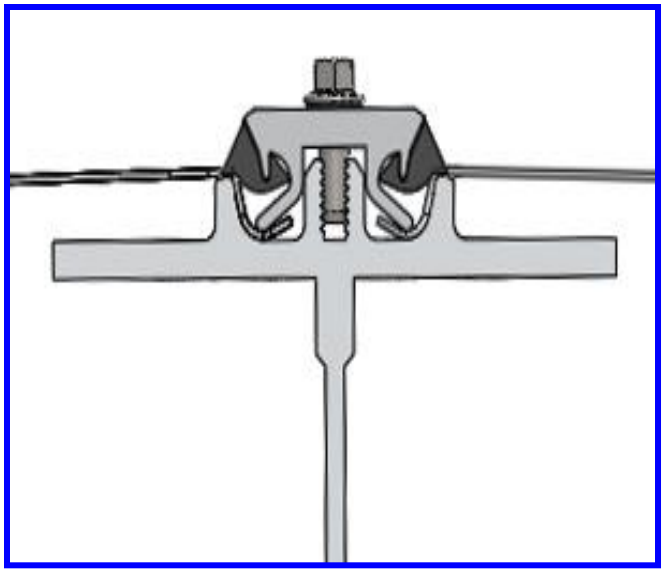
Steel structure dome

★ Corrosion resistance - 50 years maintenance-free

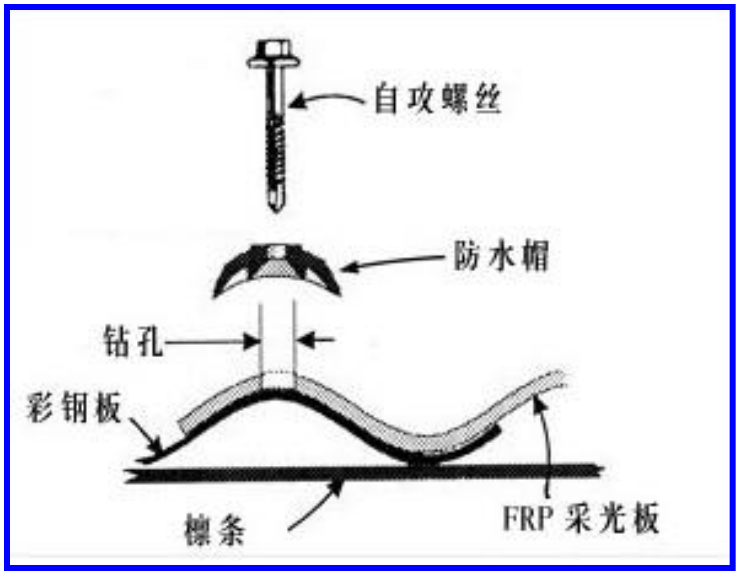
Aluminum alloy surface oxidation is rapid, in the air surface easy to generate a layer of alumina film (about 0.1), the surface after oxidation treatment is very stable, with excellent corrosion resistance. It is difficult to corrode even in the harsher humid air (such as the Marine environment).

Steel structure is easy to be affected by the environment and corrosion, and need regular rust painting anticorrosion work.

Comparison in dome



Aluminum alloy dome



Steel structure dome

★ Corrosion resistance - 50 years maintenance-free

The aluminum dome covering (surface or top cover) is mechanically fixed and sealed by extruded silicone with no screws through the skin that will not damage the skin strength and sealing effect.

The steel dome is connected by welding at each junction and using screws to penetrate the covering. Due to the use of welding, there are corrosion problems even after spraying/painting. Screws through the skin can cause dust problems and exacerbate corrosion.

Comparison in dome

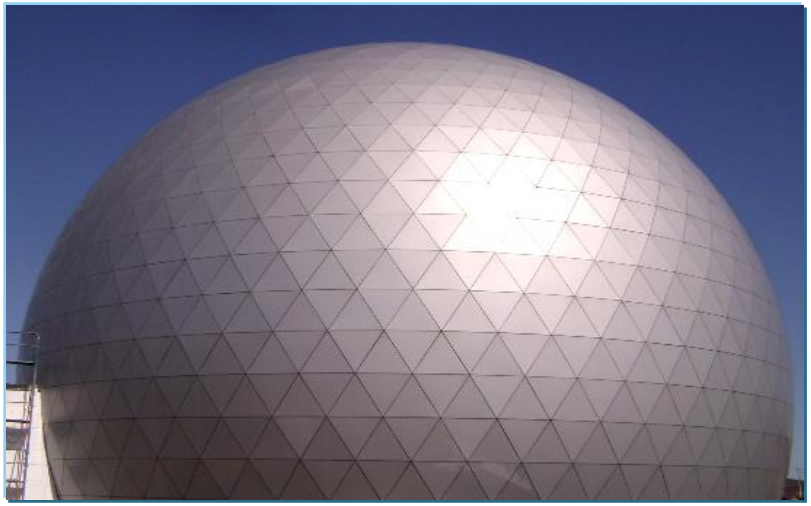
Aluminum alloy dome

Steel structure dome

★ Light weight and high strength

It adopts 6061-t6 aluminum profile, the tensile strength is higher than Q235 steel and close to Q345 steel. The density of aluminum alloy is 2.800kg/m3, only 1/2.8 of that of steel. Aluminum dome is 20 percent lighter than steel dome. Therefore, aluminum alloy material plays an important role in reducing structural weight, constant load and rapid construction, and can also reduce civil engineering investment.

Comparison in dome



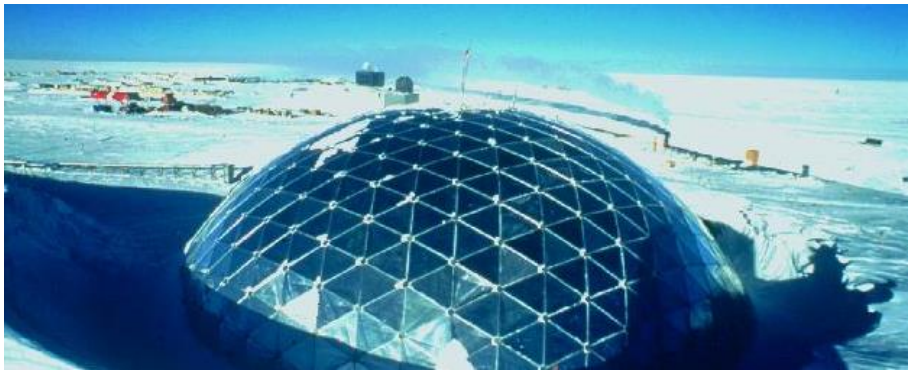
Aluminum alloy dome

Steel structure dome

★ High reflectance - constant inner temperature

Unlike steel, aluminum has a high reflectivity and low emissivity. It reflects most of the infrared or thermal radiation from the sun, so the dome does not store heat. Due to its low emissivity, the heat absorbed is not emitted into the interior of the dome structure, which is a unique and important benefit of aluminum, ensuring constant temperature and lowering the internal temperature.

Comparison in dome



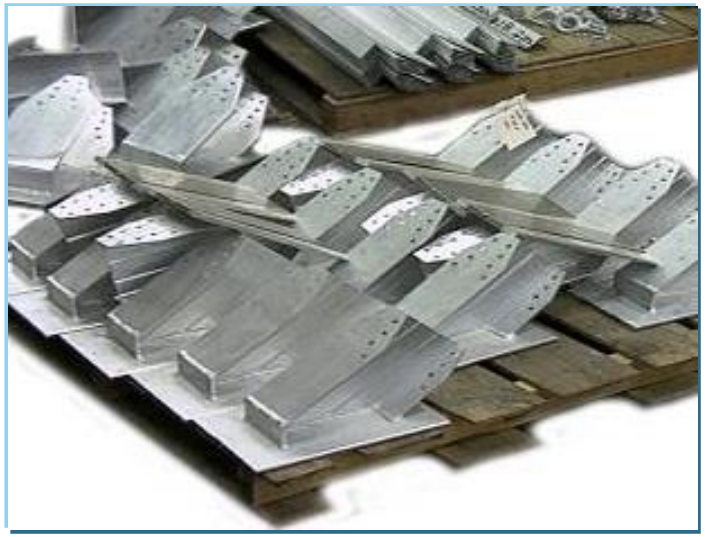
Aluminum alloy dome

Steel structure dome

★ Low temperature brittleness

The mechanical properties of steel structure are affected at low temperature (-15 ℃), so the working performance of steel components is limited, plasticity and toughness are greatly reduced, and the possibility of brittle failure occurs easily. In the former Soviet union, according to statistics, about 70% of the steel structure failure cases are brittle, while in China, there are more brittle fracture and failure accidents. Aluminum alloy has no low temperature cold brittleness, but its strength will be improved.

Comparison in dome



Aluminum alloy

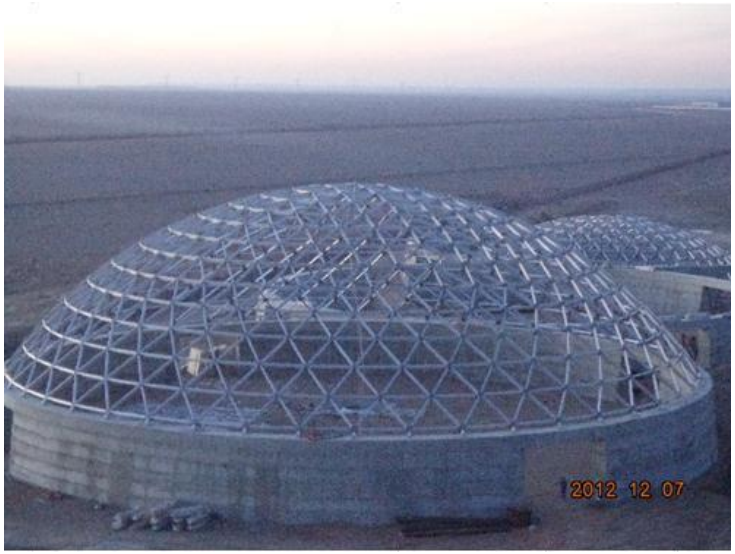
Steel structure

★ High investment efficiency -- high salvage value

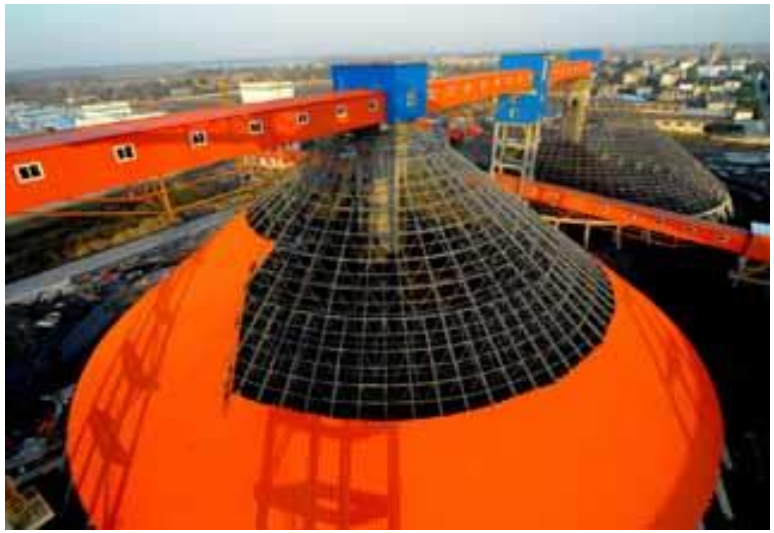
Aluminum material has the advantage of easy recycling, lower post-processing cost, higher utilization rate, higher recycling residual value, more environmental protection.100% aluminum can be recycled.

The steel structure has been corroded and consumed, and the steel grid material is basically worthless after being dismantled. The economic benefits are small.

Comparison in dome



Aluminum alloy



Steel structure

★Green low-carbon concept and social benefits

Aluminum alloy has good appearance, long service life and less maintenance. Compared with the steel dome structure, aluminum dome structure is more natural and beautiful. Protected by a natural oxide film, there is no need for internal or external painting or repainting, which meets the requirements of low carbon emissions.

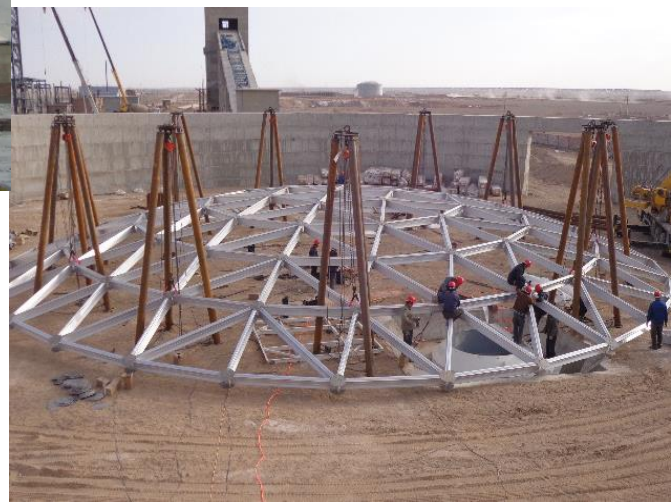
Conclusion of comparison

Items	Aluminum alloy dome	Steel structure dome
Safety	Good corrosion resistance，service life and material stable performance, high structural strength, and is able to withstand hurricane load	The sulfur and phosphorus in coal seriously will corrode the structure and destroy its strength.
Installation	Simple installation, flexible construction work	Installation is relatively complex and takes longer time.
Cost of corrosion protection during use	Service life more than 50 years, no need of corrosion resistant treatment, zero cost, recyclable	The service life is 30 years, the corrosion resistant treatment needs to be done once every 5 years, the cost is nearly 100-120 yuan/square
Maintenance costs during use	The basic structure is made of stainless steel, maintenance free	Inspect the infrastructure and replace damaged rods and colored steel plates in every 5 years
Recycling scrap value	100% recyclable, recyclable value is about 10,000 to 15,000 yuan/ton	No recovery value

➢ Central construction method – whole lifting method of ground construction

Outside installation

➢ Central construction method – whole lifting method of ground construction



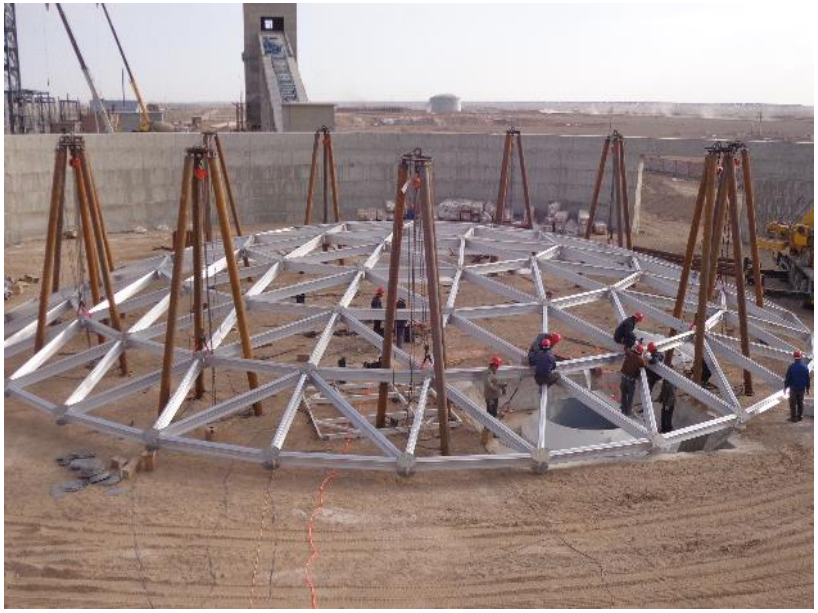
Inside installation

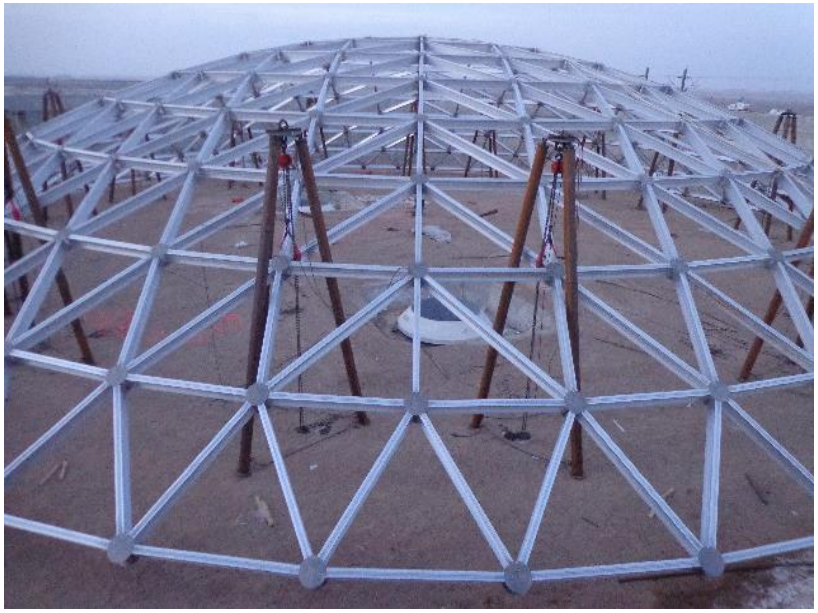
➢ Circumferential construction method – peripheral to central construction method

From the periphery to the center, the assembly of the dome (reticulated shell) structure is relatively easy, and workers can be trained to carry out the construction quickly, and only simple tools and equipment are needed.

Performance

Xinjiang Lihong Yandun Station Logistic Park

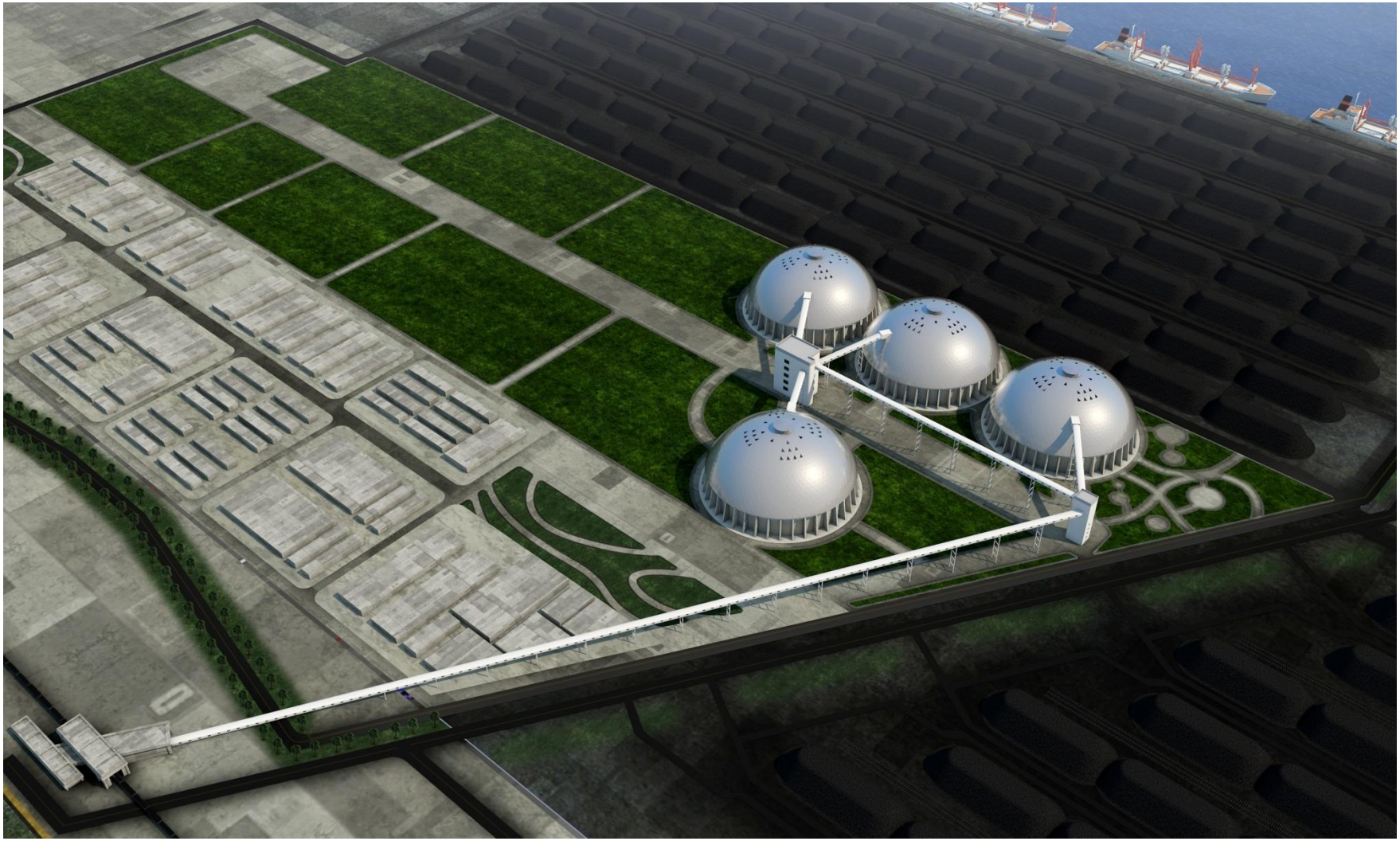




Xinjiang Lihong Yandun Station Logistic Park

Three 60-meter-diameter all-aluminum domes

Kailuan Group Caofeidian Project



Four 125-meter-diameter all-aluminum domes

Performance

No.	Customer	Material	Diameter	Quantity
1	Xinjiang Guanghui Group Baishihu Coal Mine	all-aluminum dome	95 meters	1 set
2	Xinjiang Railways Bureau Hami Lixin Logistic Park	all-aluminum dome	60 meters	3 sets
3	Kailuan Group Caofeidian Project	all-aluminum dome	125 meters	4 sets