

THE LAST LIGHT-WEIGHT STRUCTURAL MATERIAL

TRANSFORM THE WORLD'S CONSTRUCTION AND  
TRANSPORTATION INDUSTRY FROM THE FOUNDATION

# B-CORE SLAB

## BUILD EVERLASTING CIVILIZATION

December 4, 2019



BROAD SUSTAINABLE BUILT  
远大可建科技有限公司



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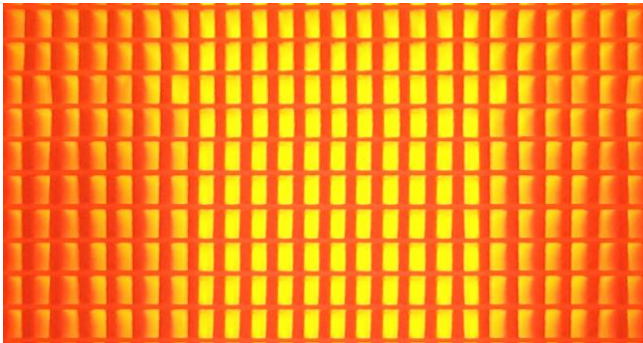
# **1** **DECISION MAKERS' ABSTRACT**



# B-CORE SLAB FEATURES



Core patent: B-CORE Slab Structure



Core technology: 1100°C hot air copper brazing oven. During the past 3 years, BROAD has invested 1000+ R&D employees and underwent 100+ trials for the successful invention of the B-CORE



Historical success: BROAD factory-made steel building was honored by the Council on Tall Buildings & Urban Habitat with the Innovation Award 2013, and was the first winner in China's construction industry.

## 1. B-CORE Slab is as efficient as honeycomb panels used for the outer shell of spacecraft: ULTRA LIGHT AND ULTRA STRONG

- The B-CORE slab is composed of two stainless steel plates held together with an array of extremely thin core tubes through a 1100°C copper brazing process. The mechanical performance of the B-CORE slab is equivalent to that of the honeycomb panel used for spacecraft.
- The space in between the core tubes allows for a hot air copper brazing process that maintains heating uniformly. This permits the brazing of huge-sized panels and a mirror-like surface of the material - flat and smooth. Traditional spacecraft honeycomb panels are air-tight, the brazing can only be achieved by thermal radiation, which is a slow process that does not result in material uniformity. The cost of production is extremely high, so it can only be used in spacecraft but not even in aircraft.
- The B-CORE slab dimensions are 10 times larger and the factory fabrication cost dozens of times lower than that of the honeycomb panels. With this in mind, it is not hard to imagine that the B-CORE slab is set to trigger a global and unprecedented lightweight structural material revolution.

## 2. The founder, Zhang Yue, is an Edison-like inventor and has been recognized by the UN as a "CHAMPION OF THE EARTH"

- Although often referred to as the "modern Da Vinci" or "China's Steve Jobs", Zhang Yue self-identifies more with the inventor Thomas Edison. Both have devoted their work to the creation of new and innovative solutions that respond to the most pressing needs of humanity.
- Zhang Yue patented 466 inventions, covering the whole architecture sector and part of the transportation sector: ranging from equipment to system, from structures to materials, from sensors to AI, from fabrication to installation, etc.
- For 30 years, Zhang Yue has devoted 90% of his time to research and development, which would seem to divert him from his duties as chairman and president, but he believes that substantial investment is the only way for absolute innovation.

## 3. BROAD group is a rare example of a company in China that ONLY WORKS ON ORIGINAL INNOVATIONS

- BROAD, established in 1988, has never copied or borrowed other companies' technologies. It has created and launched six product ranges, and sold hundreds of different products in over 80 countries, for instance: the pressure-free hot water boiler in 1989, the non-electric absorption chiller in 1992, the global internet monitoring system in 1996, the waste heat absorption chiller in 1999, the zero resistance packaged distribution system in 2004, the clean fresh air machine in 2008, the phone-sized PM2.5 (particulate matters at 2.5 microns) detecting air monitor in 2009, the factory-made steel structure building in 2009, the factory-made high rise buildings in 2014, and B-CORE slab and hot air copper brazing technology in 2017.
- All of BROAD's technologies are conceived and driven by a common theme of energy conservation, material conservation, clean purification, durability and AI. All of the products have obtained a level that no other enterprise can even hope to attain. From 1996 on, BROAD's non-electric air conditioning has taken the first place on the global market. The video of 3 floors/day building has amazed the whole world and the video of constructing a 57 - floor building in 19 days has been viewed over 500 million times.
- BROAD has made huge investments on innovation without ever disrupting its financial stability. Since 1995 and the following 20 years, it has had a loan-free operation, and in 2002 the Chinese government announced that BROAD was the No.1 tax payer among all Chinese private companies.

## 4. B-CORE Slab is expected to completely replace building structures, vehicles, ships and aircraft' s outer shells and to become THE BIGGEST INDUSTRY IN THE WORLD

- The stainless steel B-CORE building can be passed down in humanity as a generational legacy, and also eliminates fear of earthquakes
- The stainless steel (or carbon steel) B-CORE bridge is ultra light, allowing the construction of a multi-level bridge with a long span at a low cost, enabling elevated roads to completely replace ground roads.
- B-CORE buildings and bridges are prefabricated to reduce labor work and cost, the construction time is at least 10 times faster than that of traditional construction.
- The outer shell of B-CORE vehicles, aircraft, ships, and wind turbine blades weigh 30~70% lighter than that made of traditional materials. It improves energy efficiency greatly and extends lifespan.
- The B-CORE slab is made by AI manufacturing, the yearly yield per capita is over 8000m<sup>2</sup>. The work efficiency is extremely high, the assembly lines can be reproduced easily and can be fastly expanded globally.
- BROAD B-CORE Slab is going to transform the world's construction and transportation industry from the foundation



## **2 THE PAST AND THE FUTURE**



# 2009-2015, SETTING THE HIGHEST STANDARDS OF CONSTRUCTION IN THE WORLD



Dormitory (prototype) built in 1 day · BROAD Town (Hunan)



Company HQ built in 4 days · Shandong



Urban complex built in 19 days · Hunan



BROAD Pavilion at World Expo built in 1 day · Shanghai



Residential apartment built in 3 days · Hubei



COP16 Pavilion built in 1 day (the President cut the ribbon) · Mexico



Office building built in 9 days · Ningxia



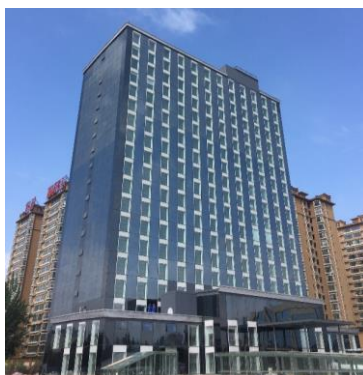
Multi-function building built in 13 days · Shanxi



Business Innovation Center built in 3 days · Fujian



Hotel built in 8 days · Hunan



Hotel built in 7 days (the 58th building) · Shanxi

## BROAD Sustainable Built Co.,Ltd

- BROAD Sustainable Built Co., Ltd is a wholly owned subsidiary of BROAD Group, with invested capital of approximately RMB 7 billion.
- Established in 2009, factory is located in Xiangyin, Hunan.
- Occupies an area of 1.3 km<sup>2</sup>, workshop areas 230,000m<sup>2</sup>, employees 1100.

## Factory-made steel structure building

- In 2009, plagued by the Wenchuan earthquake and climate change deterioration, BROAD was determined to develop the factory-made super energy-efficient steel structure buildings
- From the very beginning, BROAD has formulated 6 standards of sustainable building development : magnitude 9 earthquake resistance, 5 times more energy efficiency, 10 times longer lifespan, 100 times cleaner air, 100% steel structure, only 1% construction waste.
- 58 buildings of various types were successively built, all have met the above-mentioned 6 standards of sustainable buildings, and have widely received praise and recognition.

BSB was listed "the World's Top 25 Eco-Innovators" by FORTUNE, "the 40 Most Exciting Innovations of the Year" by BUSINESS WEEK, "Innovation Award 2013" by CTBUH, and a case study named "BROAD Group: Sustainability in Action" was released by the University of Cambridge. In addition, "BROAD Sustainable Building-Bringing manufacturing principles to the construction of high-rise buildings" became an annual report at the World Economic Forum Davos 2016.

- Due to the high percentage of factory prefabrication, all 58 buildings were built at a rate of almost 3 floors/day, making BSB construction 9 times faster than the second fastest in the world. The videos of BSB construction rocked the whole world, and BSB was crowned by BBC, CNN and other media platforms as "China Speed".
- Within 7 years, BSB developed 5 generations of technologies. The 1st and 2nd generations are of a diagonal bracing style suitable for buildings at 100 meters and below. The 3rd generation is for super high rise building structure of which BSB's 202 floor building (highest in the world) was assessed and approved by China's Super High Rise Building Committee. The 4th and 5th generations are designed and fabricated by streamlining production and transported at a cost effective price.

## The Council on Tall Buildings and Urban Habitat (CTBUH) Jury's comment on BROAD:

"Tall building designers have used prefabrication techniques on discrete elements for years, but never before has an entire prefabricated building system been developed to this degree. It is both a structural and mechanical engineering response to the demands of a rapidly urbanizing world. Integrating a bolted assembly technique with triple glazing, automatic blinds and air filtration systems. The BSB Method is a clear and innovative way of fundamentally rethinking tall building construction and has a great potential for the future."

- In order to accomplish its ultimate mission, BROAD decided to discontinue its business of steel structure buildings and launched the B-CORE slab development in October 2015.





# 2016-2018, INVENTION OF THE LAST STRUCTURAL MATERIAL: B-CORE SLAB



## The making of B-CORE slabs – Inspired by the spacecraft outer shell

December 27, 1996 was a chilly day. In the aircraft city Wichita (USA), the founder of BROAD Group was closely inspecting Learjet's assembly lines. Being the first Chinese to purchase a private jet, Zhang Yue had the honor to be accompanied by the company's president and factory director for a visit.

During his meticulous inspection, Zhang Yue noticed that the outer shell of the aircraft was composed of only glued aluminium alloy honeycomb panel. That worried him, since he knew that the glue would eventually loosen up with age and wear.

Right at that moment, a piece of white and shiny material by the side of the assembly line caught Zhang Yue's attention: "What is that?" The factory director explained that it was the material used for the outer shell of a NASA spacecraft and added, "If you're interested, you can try lifting it." Zhang Yue, taking note of the material size (1.5m x 1.5m, 10 cm thickness) assumed the material to be very heavy so he lifted it up with his two hands, almost straining his back, and exclaimed, "Wow, it's so light!"

The factory director told him that it was stainless steel plates brazed in the form of honeycomb panels. He added that for its mechanical performance, it was the best material in the world. Zhang Yue asked "Why don't we use this material for the outershell of aircraft?" The factory director, with an apologetic voice responded with "it's too expensive, too expensive!" How expensive exactly?" promptly asked Zhang Yue. It was only at dinner time that Zhang Yue got the answer. The Learjet's sales director quietly told him, "USD 30 thousand per m<sup>2</sup>. It certainly can not be used for aircraft construction, you should stop thinking about it."

However, Zhang Yue kept on thinking about it for 19 years. On October 10, 2015, which was close to his 55<sup>th</sup> birthday, Zhang Yue decided that he would do nothing other than reflect on the most critical issues humanity was currently facing. At 4am on that day, he wrote down a plan. His plan was to spend all of his time and energy to develop a more cost effective honeycomb-type panel like those used for spacecraft. He believed that if he dedicated his energy towards one goal, he was bound to find a low priced manufacturing method.

What happened in the following three years could be subject of several books. By looking at some figures, one could imagine the many ordeals BSB had to go through. BSB employed over 1000 employees, spent 3 entire years continuously spending money without making even a cent of profit, and underwent more than 100 failures and losses, one of which costed over ten million RMB in one second.

In October 2018, BROAD successfully developed "B-CORE slab" and the "hot air copper brazing oven" to manufacture B-CORE slabs.

The B-CORE slab and the honeycomb panel of the outer shell of a spacecraft are equally light. What sets B-CORE slab apart is that instead of costing 30 thousand USD per m<sup>2</sup>, it actually costs less than 2000 RMB per m<sup>2</sup>. Interestingly enough, revolutionary technologies and sciences have always shared similarities: for example, the price of a micro chip has been reduced nearly by 100 within two decades.

Zhang Yue keeps thinking that if one day in every corner of the world there would be buildings, bridges, vehicles, aircraft made of B-CORE slabs, he would have to thank the Learjet company for the inspiration.

## Technical difficulty: 1100°C hot air copper brazing, an unprecedented technology

- Research and development for this material was initiated on Oct 10, 2015. BROAD has spent 3 years, employed over 1000 employees and drew from its vast 30 years of experiences in mechanics, vacuum technology, thermal engineering, fluid mechanics, materials, sensors and monitoring devices to create the last structural material.
- BROAD successfully developed the hot air copper brazing technology on April 30, 2017 and later developed the equipment for hot air copper brazing and intelligent monitoring in October 2018.
- From beginning to end, BROAD has tested 5 different models of technology, developed 10 types of brazing ovens, researched and invented over 100 heat resistant materials and overcame more than 100 failures and losses.
- At each failure, while the employees would be discouraged, Zhang Yue would feel optimistic, for him, another wrong path had been eliminated. Having a positive outlook on failures has been BROAD's secret to success for over 30 years.

## Intelligent manufacturing system for B-CORE slab is basically formed, with small batch production capacity.



The hot air copper brazing oven: 36 m<sup>3</sup> of B-CORE slab/oven, yearly yield: 400 thousand to 2 million m<sup>2</sup>; only one technician is needed for each shift. Note: Due to confidentiality, it is not authorized to take pictures of the oven.



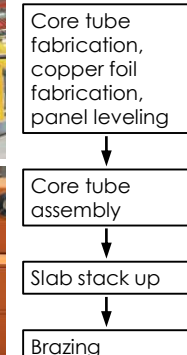
Transportation: B-CORE slab is transported by 40 feet containers, 500m<sup>2</sup>/40HQ, low cost for global transportation



Pre-brazing sheet metal processing line: 800 thousand m<sup>2</sup>/line; intelligent manufacturing; three technicians for each shift.



Sheet metal process:



On June 5, 2018, the first B-CORE building in the world was built in just 1 day.



In August 2018, the first B-CORE bridge in the world was built.

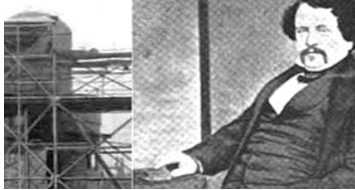
# 2019-2038, LAUNCHING THE WORLD'S B-CORE SLAB REVOLUTION



For the past 150 years, technology has evolved at an astonishing pace, however structural material has not advanced accordingly.

## 1867

The French invented reinforced concrete for building construction. Today this method is still used globally for building construction.



## 1883

New York's Brooklyn Bridge was built with angle steel, steel channel, I steel and thick steel plates. Today this method is still used globally for bridge construction.



## 1908

Ford manufactured the T type vehicle using pressurized steel for its outer shell. Today this method is still used globally for car manufacturing.



## 1912

The United Kingdom built the Titanic using thick steel plates for its outer shell. Today this method is still used globally for ship construction.



## 1931

The Soviets manufactured the first fiber glass spiral wind turbine in the world. Today this method is still used globally for wind turbine fabrication.



## 1958

The Boeing 707 was created, its shell and wing were made by using a combination of a metal keel structure and aluminum alloy honeycomb panels. Today, this method is still used globally for aircraft production.



In the coming 20 years, BROAD will launch global B-CORE slab revolutions together with leaders in various industries

⇒ B-CORE Building Revolution - Prevents cities from falling into decay, turns buildings into **generational legacy** ⇒

⇒ B-CORE Road & Bridge Revolution - Lowers the cost of bridge, turns roads into **bridges** ⇒

⇒ B-CORE Vehicle Revolution - Makes cars as light as planes, reduces **transport pollution** ⇒

⇒ B-CORE Marine Revolution - Builds unsinkable ships, permits large ships to **navigate inland rivers** ⇒

⇒ B-CORE Power Revolution - Erects wind turbines on mountains and in the countryside, bids farewell to **coal consumption** ⇒

⇒ B-CORE Aviation Revolution - Builds lighter and stronger aircraft, ensures **low carbon and safe flights** ⇒

2023	Annual productivity Market share	2028	Annual productivity Market share	2038	Annual productivity Market share
20 million m <sup>2</sup> /		200 million m <sup>2</sup> 5%		2 billion m <sup>2</sup> 50%	
200 km /		2,000 km 5%		20,000 km 50%	
10,000 vehicles /		500,000 vehicles 1%		10 million vehicles 20%	
200,000 DWT /		5 million DWT 7%		50 million DWT 70%	
50 MW /		10,000 MW 5%		100,000 MW 50%	
Test flight (large aircraft) /		10 aircraft 1%		300 aircraft 30%	





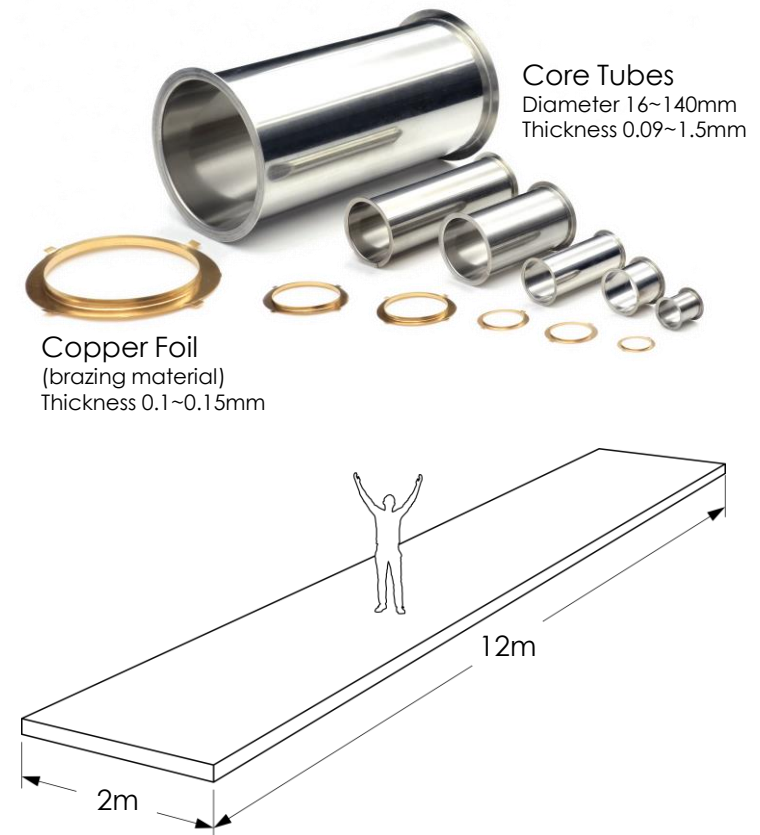
# **3 B-CORE SLAB TECHNOLOGY**

# THE B-CORE SLAB STRUCTURE



**The origin of the B-CORE slab can be traced back to the law of the universe: structures in mechanics must be circular for ultimate resilience**

- The B-CORE slab is a integral and solid structure composed of two top and bottom steel plates brazed together with an array of thin core tubes by a procedure of copper brazing.
- The circle is the ultimate shape in mechanics. As such, core tubes, of circular shape, can be extremely thin and light.
- The B-CORE slab structure seems to be overly simple, but it has fulfilled humanity's wish for material optimization (making the best use of everything). Indeed BSB has successfully managed to use the least amount of material to achieve the maximum strength. This reflects the mantra of Albert Einstein,  $E=mc^2$ 's founder : "science is simple."



**Superior brazing performance, huge dimension allowance: a simple but important innovation**

- The ends of B-CORE tubes are flanged, making the brazing surface 10 times larger to fuse B-CORE slabs and plates solidly, so that even if a tube snaps, the brazed parts do not separate.
- Most importantly, the space between the B-CORE tubes allows for the hot air to melt the copper during the brazing process.
- Declared on October 31, 2016 as a PCT international patent, the B-CORE slab, seemingly the simplest of innovations, has nonetheless the potential to be a milestone in the course of the world's inventions.



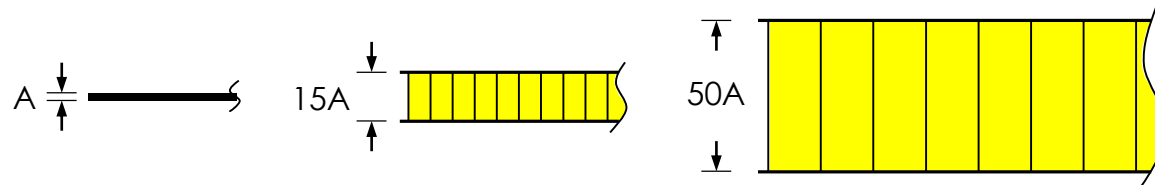
# STRUCTURAL STRENGTH COMPARISON



When placed 12 metres on stilts, the B-CORE slab barely bends under the weight of 20 adults (real shot of B-CORE slab A1.5)

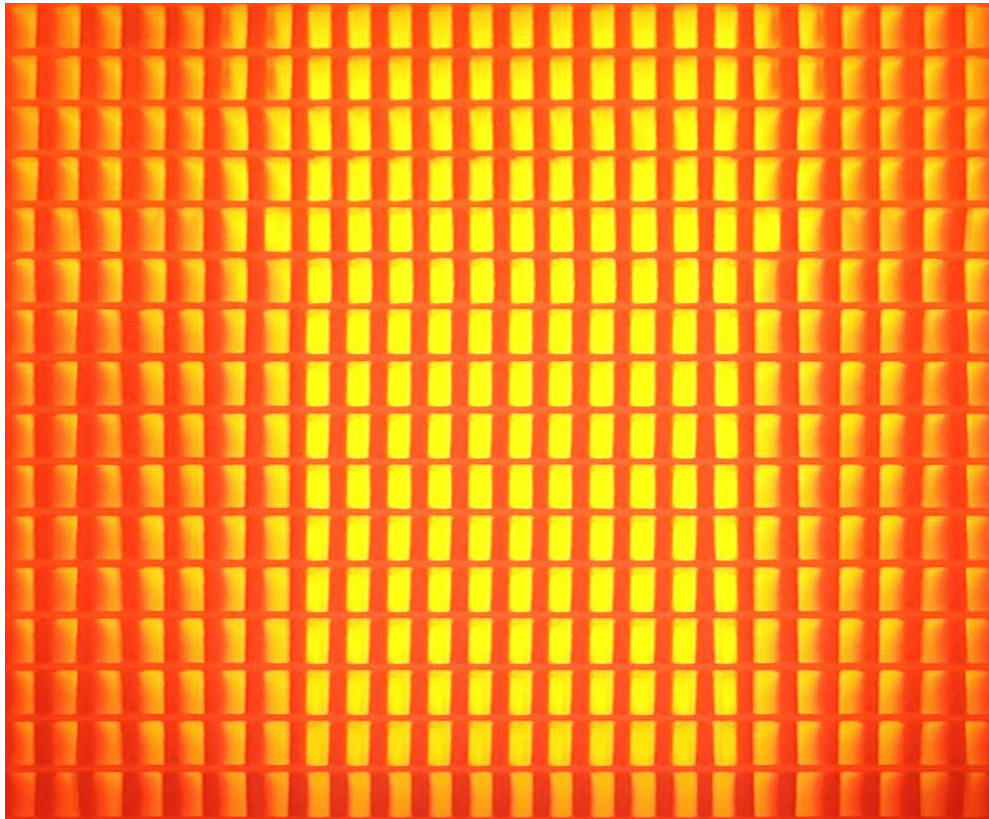


## Comparison with steel plates



Weight:	1	1.16	1.29
Rigidity (structural strength):	1	630	7350

# CORE TECHNOLOGY: COPPER BRAZING



B-CORE slab brazing technology: two steel plates are fused to each other by an array of extremely thin core tubes with copper foil at a 1100°C brazing process.

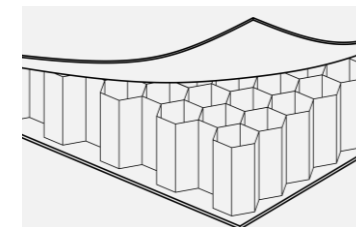


- The B-CORE slab copper brazing's uniqueness is its hot air treatment, rather than thermal radiation used in conventional brazing.
- The core tubes are disposed in a way that leaves gaps in between them. The blower blows hot air into the oven at an extremely high speed to heat the B-CORE slabs evenly.
- As they are heated evenly, the brazed B-CORE slabs are manufactured as huge mirror like plates – flat and smooth, preventing stress deformation from ever occurring.

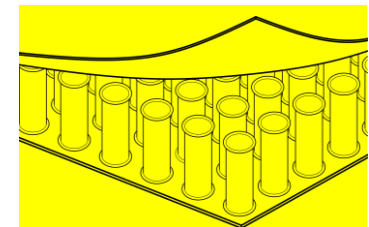
## Comparison of Different Brazings

Compared Item:	Brazing Method	Brazing Piece Dimensions	Oven Capacity	Brazing Time (estimated)	Brazing Cost (estimated)
Conventional honeycomb panel:	1100 °C Heat Radiation	Length/Width < 1.5 m	< 2 m <sup>2</sup>	> 12 hours	> 100 RMB/kg
B-CORE Slab:	1100 °C Hot Air	Lenght 12 m, Width 2 m	≥ 240 m <sup>2</sup>	≤ 4 hours	< 5 RMB/kg

Note: Brazing refers to a brazing process in which the melting point of the brazing material is lower than that of base material. For example, for the B-CORE slab, the melting point of its brazing material (copper) is 1,083 °C whereas the melting point of base material (steel) is 1454~1600°C.



Traditional honeycomb Slab



B-CORE Slab



# WHY IS B-CORE SLAB THE “LAST STRUCTURAL MATERIAL” ?

Type	Traditional Material	
Building	Reinforced steel and concrete structure	<ol style="list-style-type: none"> <li>1. Reinforced concrete has poor seismic resistance performance, resulting 69,000 people perished during the Wenchuan earthquake in 2008.</li> <li>2. Reinforced steel rusts easily, the building lifespan is less than 60 years, and what was supposed to be a legacy for future generation becomes a pile of rubbish, resulting in cities to fall into decay.</li> </ol>
	Reinforced structure	<ol style="list-style-type: none"> <li>1. Uses angle steel, channel steel, I steel, pipes and other heavy materials, high consumption of steel.</li> <li>2. Manual welding, high construction cost.</li> <li>3. Extra materials and labor resources needed.</li> </ol>
	Foaming materials Wall insulation	<ol style="list-style-type: none"> <li>1. Inflammable, can not be used for 6 floors and above.</li> <li>2. Organic material has a lifespan of less than 60 years and becomes toxic waste after being discarded.</li> <li>3. Small dimensions, easily cracks and leaks.</li> </ol>
	Rock wool for wall insulation	Need to cover with a metal plate, high processing cost, troublesome construction
Bridge	Reinforced concrete bridge	<ol style="list-style-type: none"> <li>1. Heavy weight, high construction cost, long construction period, poor seismic resistance</li> <li>2. Reinforced steel rusts, its service life is short and building maintenance becomes a problem at the end of its lifespan. In 2018 in Genoa, Italy, a 51 year old bridge collapsed, over 50 people perished.</li> </ol>
	Full-reinforced bridge	<ol style="list-style-type: none"> <li>1. Usage of structural steel and thick steel plate for bridge structure, high steel consumption and long construction period</li> <li>2. Reinforced concrete bridge deck, heavy weight</li> </ol>
	Lightweight suspension bridge deck	Usage of steel instead of reinforced concrete to lower the bridge's weight, usage of I steel and channel steel stuck to steel plates to solidify the bridge. Due to one side brazing, the bridge is susceptible to fatigue, over 3000 bridges in China unweld every 1 to 3 years.
Light-weight Casing for Aircraft and Vehicle	Stainless steel honeycomb panel	<ol style="list-style-type: none"> <li>1. Good mechanical property, but thermal radiation copper brazing is extremely costly</li> <li>2. Small dimensions, high splicing cost</li> </ol>
	Aluminium honeycomb panel	<ol style="list-style-type: none"> <li>1. The ductability of high-strength aluminium alloy is less than 5% ; not resistant to impact or fatigue</li> <li>2. Only adhesive glue can be used which is not sturdy, not durable and is affected by moisture</li> </ol>
	Carbon fibre plate	<ol style="list-style-type: none"> <li>1. Carbon fibre's ductibility is close to zero ; cracks occur when impacted ; need higher safe coefficient ; heavy weight</li> <li>2. Only adhesive glue can be used</li> </ol>
Ship	Carbon steel plate for ship hull	<ol style="list-style-type: none"> <li>1. The ship will sink if the hull is heavily damaged or if the ship capsizes</li> <li>2. Carbon steel has a low tolerance of corrosion and a short lifespan, corrosion prevention is costly</li> <li>3. The ship hull is composed of heavy steel plates and thick reinforcement, resulting in heavy weight, high energy consumption and deep draft during transportation (a 100,000 DWT ship has a draught above 5 meters, making it impossible to navigate inland rivers)</li> </ol>
Wind Turbine	Fiberglass blade	<ol style="list-style-type: none"> <li>1. The fiberglass shell needs to be supported by a steel truss, resulting in heavy blade</li> <li>2. The blades as a whole has a very large dimension, for a 5MW wind turbine, the length of its blade could be as long as 90m. The transportation cost is extremely high, and it can not be transported up mountains (however the mountain top has the strongest wind)</li> <li>3. Fiberglass easily ages and breaks, its life span is less than 30 years. After being discarded, it becomes toxic waste. Due to its short life, some wind turbines have to retire before realizing carbon balance</li> </ol>

B-CORE Slab	
Stainless steel B-CORE slab structure	<ol style="list-style-type: none"> <li>1. B-CORE slab is ultra light, its elongation is more than 40% and will not collapse in an earthquake</li> <li>2. The life span of stainless steel can be tens of thousands of years (the corrosion rate of 304 stainless steel is 0.005, while that of carbon steel is 1.18, a difference of 236 times)</li> </ol>
Carbon steel B-CORE slab structure	<ol style="list-style-type: none"> <li>1. The mechanics of the B-CORE slab are superior, reducing the consumption of steel by 30~60% from the traditional structure</li> <li>2. 100% made in factory, low construction cost, 10 times faster in terms of construction period</li> <li>3. The surface of the B-CORE slab is smooth and flat, no need for additional modifications</li> </ol>
B-CORE slab thermal insulation wall	<ol style="list-style-type: none"> <li>1. B-CORE slab is filled with rock wool, which has an extremely long lifespan and a low thermal conductivity (approximately 1/20 of that of concrete)</li> <li>2. Huge size with little seam. Weatherproof silicone gel is applied at the seam for weather fastness</li> <li>3. Prefabricated in factory, easy for installation</li> <li>4. Suitable for new buildings and energy-saving retrofitting of existing buildings</li> </ol>
Carbon steel or stainless steel B-CORE bridge	<ol style="list-style-type: none"> <li>1. Stainless steel B-CORE bridge has a similar cost as traditional for bridge, while carbon steel B-CORE bridge costs much less than that of traditional bridge.</li> <li>2. The prefabrication in factory reduces the time of construction (10 times quicker), and has little disturbance to surroundings</li> <li>3. Metal material has a high tenacity. In case of earthquake or subsidence, it will only deform, not collapse.</li> <li>4. The weight is extremely light due to the lack of concrete usage, making it easy to make multi-level bridges. Its large span allows a 120m-interval between piers in a double deck bridge, bringing the possibility to replace ground roads by elevated road to protect land and environment</li> </ol>
B-CORE Bridge Deck	<ol style="list-style-type: none"> <li>1. Copper brazing is applied for B-CORE slab and the brazing surface is 10 times bigger than that of the base material so that it won't break apart even if the core tubes are damaged</li> <li>2. The B-CORE slab is ultra strong, a 6-meter span bridge has been tested with a 36-ton single-wheel load (two times higher than the international standard) and showed no sign of plastic deformation</li> </ol>
Stainless Steel B-CORE Slab	<ol style="list-style-type: none"> <li>1. The mechanics of the B-CORE slab are similar to that of the honeycomb panel, while the brazing cost of the former is 20 times lower.</li> <li>2. Huge dimension leads to low splicing cost.</li> </ol>
Stainless Steel B-CORE Slab	<ol style="list-style-type: none"> <li>1. The B-CORE slab can be directly used for structures without keel, realizing the ultimate goal for lightweight</li> <li>2. The elongation of the B-CORE slab is more than 40% and will only be deformed under impact without breaking.</li> <li>3. The seam is electrically brazed, which makes it as strong and durable as the base material</li> <li>4. Its cost is only 10~20% of copper fiber.</li> </ol>
B-CORE Slab for Ship Hull	<ol style="list-style-type: none"> <li>1. The density of the B-CORE slab is less than half of water's, its weight is 15 times lighter than steel, and it won't sink even in case of capsizing</li> <li>2. The ship hull is made of stainless steel which guarantees an extremely long lifespan</li> <li>3. The superior mechanics of the B-CORE slab makes it possible to consume less steel and even if the ship is made with stainless steel, the cost will not be higher than that of conventional carbon steel ship</li> <li>4. Due to its light weight, the ship has a shallow draft, which can expand the navigation scope to inland rivers and drastically reduce energy consumption</li> </ol>
Stainless Steel B-CORE Slab Blade	<ol style="list-style-type: none"> <li>1. The light weight of the B-CORE slab allows for energy production with a light wind, which could significantly increase annual electricity generation.</li> <li>2. As B-CORE slab is a composite structure itself, each joint has an identical strength, which makes it possible for blades split transportation and on-site bolted installation. This leads to a low cost wind turbine transportation and easy transportation up to mountains</li> <li>3. Stainless steel has an almost infinite life span and can be applied in power demand terminals with poor wind power, achieving excellent return on investment and huge carbon reduction. It has the potential to be the ultimate solution for the protection of the environment</li> </ol>

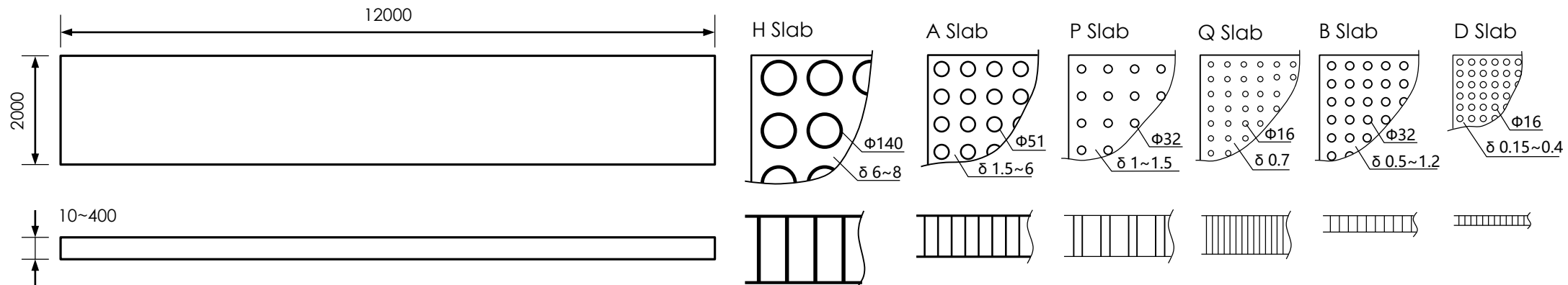
# SPECIFICATIONS OF B-CORE SLAB

Unit: mm

Key Application	Code	Core Tube	Tube Qty/m <sup>2</sup>	Plate Thickness	Slab Thickness	Weight kg/m <sup>2</sup>
Building column, crossbeam, floor slab	A	Φ 51×0.3/0.5	100	1.5、2.5、4、6	100、150	31~108.6
Insulated exterior structural wall	P	Φ 32×0.22	100	1、1.5	150	20~27.7
Insulated exterior wall	Q	Φ 16×0.09	208	0.7	150	13.71
Outer shell of large vehicle and aircraft, building interior wall	B	Φ 32×0.22	275	0.5、0.7、1、1.2	40~100	10.3~22.3
Outer shell of car and aircraft	D	Φ 16×0.09	1033	0.15~0.4	10~80	3.71~10.9
Bridge, large ship	H	Φ 140×1.5	20	6、8	150~400	118~183

Note: stainless steel code SUS304L is the default material. Other non-standard material can also be customized

## Standard B-CORE slab size



Note: 1. Size for B-CORE slab with a thickness less than 40mm: 4880mmx1220mm  
2. Non-standard size can be customized as required





## **4 APPLICATION PROSPECTS**

# THE B-CORE BUILDING



Rendering for The Sound of Nature (300F)



Completed Office Building



Sky Garden Rendering



## Prevents cities from falling into decay, turns buildings into generational legacy

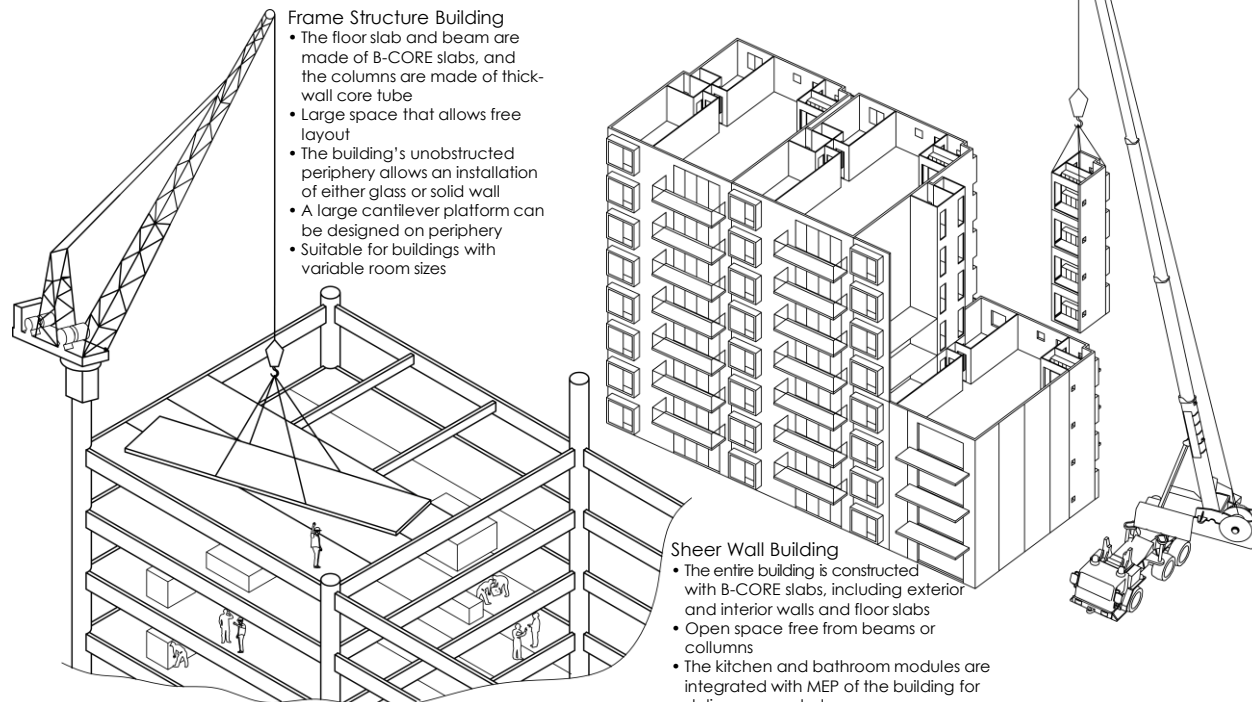
- Buildings will be as light and solid as aircraft, able to withstand stress, and resistant to earthquakes.
- Buildings will be prefabricated in factory as cars with high quality, and built at a speed of 3 floors per day.
- Buildings will be everlasting treasures like value-added jewelry that can be passed down to future generations.
- The walls are stuffed with rock wool, whose thermal insulation is 20 times more efficient than that of reinforced concrete, saving a considerable amount of energy.
- Possibility to lower the construction cost of highrise buildings and huge cantilever platforms, realizing the architects' life-long dream.

## B-CORE Building Structure System

Structure	Recommended Building Height	Exterior wall (K value 0.5)	Interior Wall	Beam Feature	Column Feature	Floor Slab	Application
Shear wall structure	≤192m	B-CORE slab bearing wall thickness: 150mm	B-CORE slab bearing wall thickness: 60mm	No beam	No column exterior and interior walls bearing the load	B-CORE floor slab thickness: 60-150mm	Residential Apartment Hotel /Hospital
Frame structure	≤900m	Non-bearing wall	Non-bearing wall	B-CORE slab beam	Circular column, square column outer diameter 950mm	B-CORE floor slab Thickness: 150mm	Office building School Conference room Shopping mall
Spire structure	≤1500m	As above two types	As above two types	Hybrid	Giant column	As above two types	Mixed function
Hybrid structure	/	/	/	/	/	/	/

### Frame Structure Building

- The floor slab and beam are made of B-CORE slabs, and the columns are made of thick-wall core tube
- Large space that allows free layout
- The building's unobstructed periphery allows an installation of either glass or solid wall
- A large cantilever platform can be designed on periphery
- Suitable for buildings with variable room sizes



### Shear Wall Building

- The entire building is constructed with B-CORE slabs, including exterior and interior walls and floor slabs
- Open space free from beams or columns
- The kitchen and bathroom modules are integrated with MEP of the building for delivery as a whole
- Suitable for buildings with fixed room sizes



# THE B-CORE BRIDGE



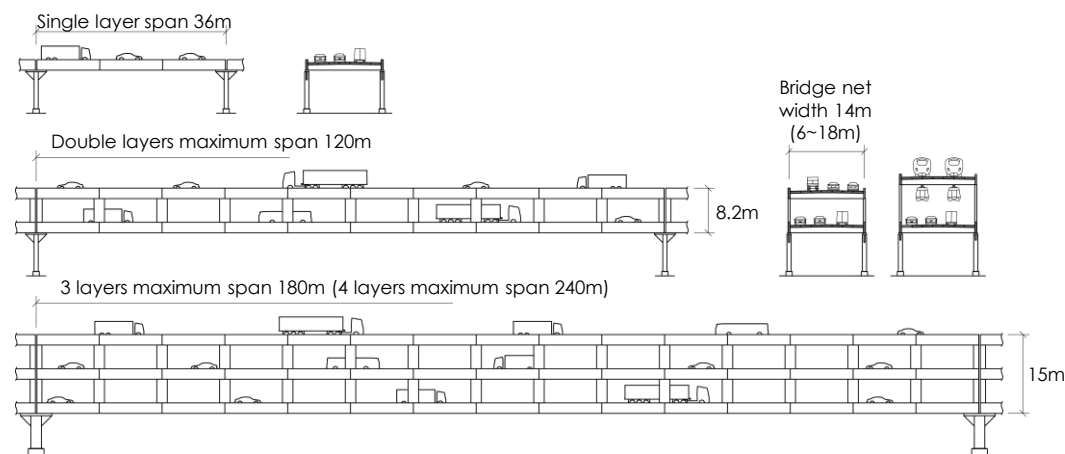
## Lowers the cost of bridge, turns roads into bridges

- Low cost: the cost of carbon steel B-CORE bridge is 30~60% lower than that of traditional bridges, and is expected to fully replace ground roads and protect the environment.
- Long lifespan: stainless steel B-CORE slab has an extremely long lifespan, with no need for rust-proof maintenance.
- Light weight: bridge body weighs 0.4~0.5t/m<sup>2</sup>, only 10~20% of the traditional concrete bridge weight.
- Short construction period: factory prefabricated bridge components and on-site robot trolley welding makes construction period 10 times shorter.
- Anti-overload : B-CORE bridge remains intact when ran through by 150-ton overloaded trucks
- Multi-layer possibility : the light weight of the bridge allows for a multi-layered bridge structure and post-construction build (if needed), which can be performed during the night to avoid interfering with traffic and hopefully solves the worldwide problem of road congestion.

## Design Selection Recommendation Form

Unit: mm

Code	Bridge	Lanes	36m Standard Span Pier	Bridge Deck Thickness	Main Girder (height x thickness)	Secondary Girder (height x thickness)	Secondary Girder Span	Structure Dead Load (calculated by deck area)
Q10	Single layer 10m	One-way two lanes	Φ800x16	400	2000x300	500x150	6000	0.48t/m <sup>2</sup>
Q10-2	Double layers 10m	Top and bottom each two lanes	Φ800x16					0.46t/m <sup>2</sup>
Q10-3	Three layers 10m	Top, middle and bottom each two lanes	Φ800x20					0.42t/m <sup>2</sup>
Q14	Single layer 14m	One-way three lanes	Φ1000x16	400	2000x300	800x300	6000	0.48t/m <sup>2</sup>
Q14-2	Double layers 14m	Top and bottom each three lanes	Φ1000x20					0.40t/m <sup>2</sup>
Q14-3	Three layers 14m	Top, middle and bottom each three lanes	Φ1000x30					0.36t/m <sup>2</sup>



## Technology Standards

- Applied standards: designed, constructed and approved according to local standards.
- Road grade: express way, first-grade highway.
- Seismic resistance grade: designed to resist 9 magnitude earthquakes.
- Overload test: sustains 36t single wheel, 150t vehicle.
- Turns and ascents: designed according to local codes and site feasibility.
- Hoisting method: traditional cantilever will be equipped with an electric wheel that proceed to push forward the already existing bridge. The bridge slabs do not contact the ground during the entire hoisting procedure.
- Construction method: factory prefabrication and on-site robot trolley welding enables all work to be performed on the deck

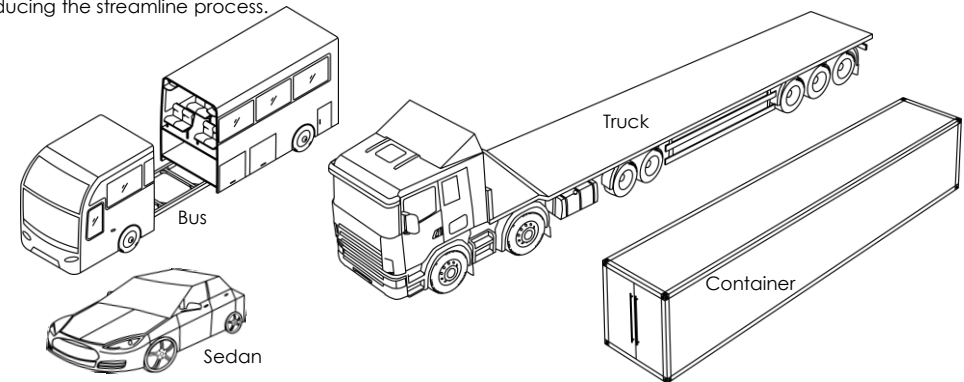


# THE B-CORE VEHICLE



## Makes cars as light as planes, reduces transport pollution

- Light weighting: the vehicle's body is made of stainless steel B-CORE slab, which is expected to be 40~60% lighter than traditional car body, greatly saves energy.
- Stable driving: the light weight of the car body lowers car's gravity centre, making it more stable and safer than traditional cars.
- Non-transformative car doors: the B-CORE slab is fabricated at a 1100°C temperature (whereas traditional car doors are cold pressed), car doors will not be deformed and will stay sealed.
- Durable and reduces waste: the car's body is made of rust-free stainless steel and thus reduces automobile waste on a global scale.
- Low cost of fabrication: the B-CORE slab do not require keel, lining or molding for reinforcement, significantly reducing the streamline process.



Note: BROAD will only serve as a material supplier, providing B-CORE slabs for vehicle manufacturers



# THE B-CORE SHIP



A Panamax container ship  
composed of 4 modules



A 25,000 DWT ship

## Builds unsinkable ships, permits large ships to navigate inland rivers

- Safe: the density of the B-CORE slab is less than half that of water, the weight is 15 times lighter than steel, so it won't sink even in case of capsizing.
- Durable: the ship hull is made of stainless steel, which has a low maintenance cost and guarantees an extremely long lifespan.
- Low price: the superior mechanics of the B-CORE slab makes it possible to consume less steel and even if built with stainless steel, its cost will not be higher than that of a conventional carbon steel ship.
- Light weight: the ship has a light weight and flat bottom, its shallow draft expands the navigation scope to inland rivers and drastically lowers energy consumption.
- Expansion: permits a large number of ships to gather and form a large offshore platform (a truss is to be erected on the platform for rigidity purposes)

## Modular Ship Main Statistics

Dimension	Length 182m, width 24.6m, height 10m	Ship hull material	Sea water contacting material: 2304, others 304
Draft	6 m (maximum 7m, no lower limit)	Speed	≤20 knots (depending on supplied power)
Rated load	25,000 t	Panamax ship	Composed of 4 modular ships, length 364m, width 49.2 m, height 10 m, deadweight 100,000 t
Ship weight	2430 t		



A 2912m x 394m marine mobile city composed of  
256 modular ships, covering an area of 1.15km<sup>2</sup>

Note: BROAD will only serve as a material supplier, providing B-CORE slabs for ship manufacturers



# THE B-CORE WIND TURBINE

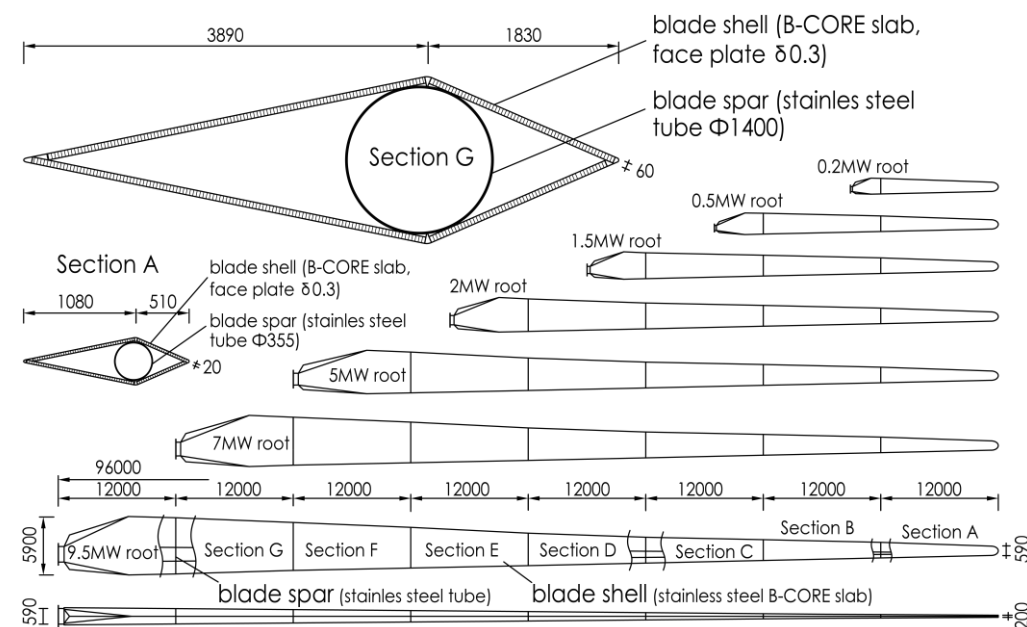


**Erects wind turbines on mountains and in the countryside,  
bids farewell to coal**

- Wide application: the split transportation of blades reduces transportation cost drastically, and makes it easy up to mountains.
- Resistant to bird collisions: B-CORE slab has an extremely high tenacity (elongation  $\geq 40\%$ ), and is hard to be damaged in case of strong wind or bird collisions.
- Light wind power generation: B-CORE slab is expected to be twice as light as fiberglass, which makes light wind power generation possible, greatly extends generation hours, and doubles annual energy output.
- Ultimate carbon reduction: since stainless steel's lifespan is almost limitless, wind power generation will no longer need to be in the sea or in the desert to be cost efficient, and even in areas with light wind such as rural or hilly areas, it can still reduce carbon emission considerably. It has the potential to become the ultimate solution for the protection of the environment.

Parameter table of stainless steel B-CORE wind turbine blade

Model	9.5MW	7MW	5MW	2MW	1.5MW	500kW	200kW
Rated Power	9500kW	7000kW	5000kW	2000kW	1500kW	500kW	200kW
Rated Speed	11.5rpm	10.5rpm	11rpm	13.2rpm	17.5rpm	27rpm	42rpm
Blade Diameter	196m	172m	148m	115m	86m	59m	29m
Blade Length	96m	84m	72m	56m	42m	29m	14m
Max. Chord Length	5.9m	5.22m	4.43m	3.62m	2.82m	1.99m	1.14m
Blade Weight	16.7t	11.8t	7.9t	4.2t	2.1t	0.84t	0.2t
Weight of traditional fiberglass blade	52.9t	35t	23.6t	12.3t	6.7t	2t	0.7t



Note: BROAD will only serve as a material supplier, providing B-CORE slabs or B-CORE blades for wind turbine manufacturers



# THE B-CORE AIRCRAFT



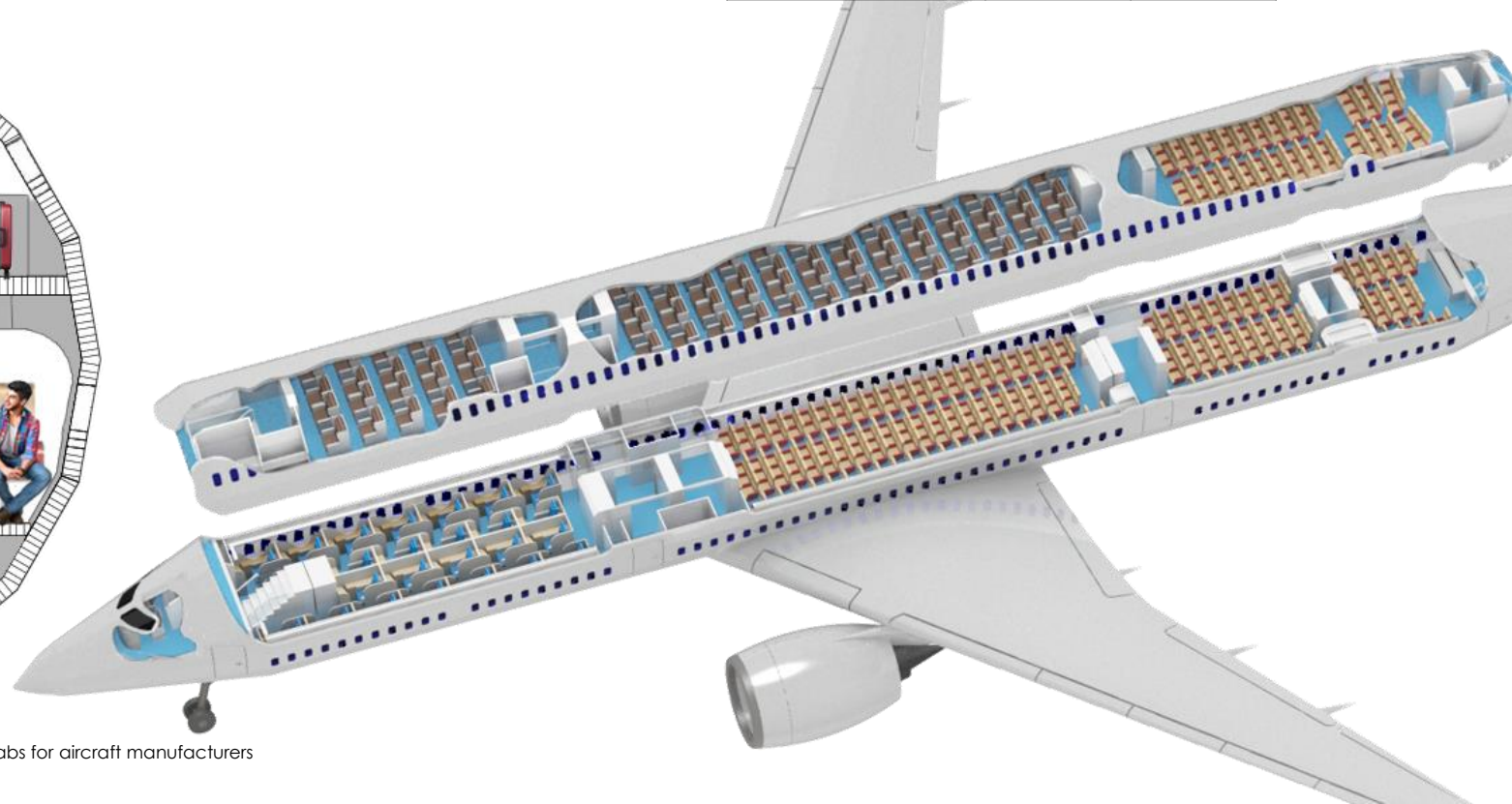
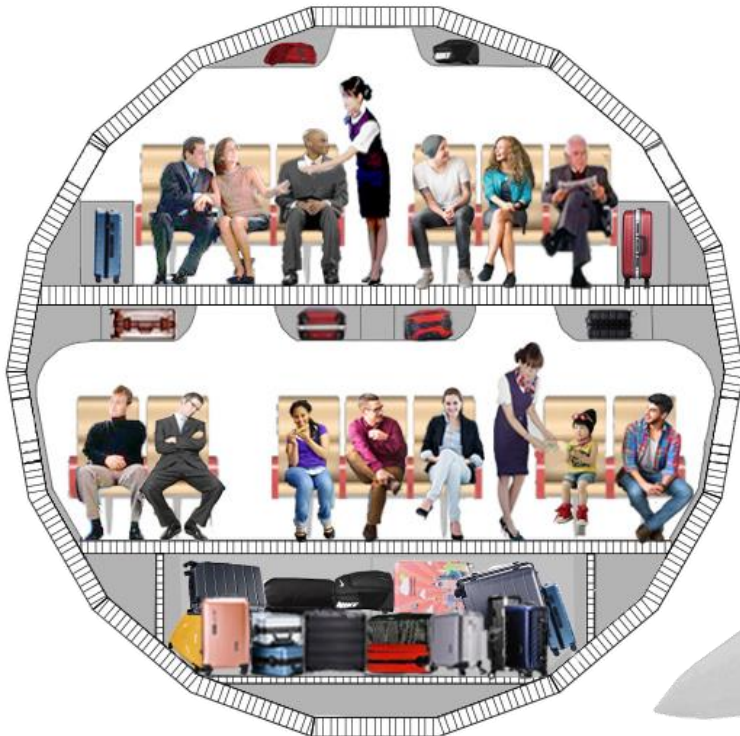
## Builds lighter and stronger aircraft , ensures low carbon and safe flights

- Lighter: B-CORE slab is directly used for the aircraft's body and wing without adding extra metal frame or keel. It is expected to achieve extreme light weight, and to reduce energy consumption by several times.
- Stronger: B-CORE slab yield strength rate is more than 40%, at least 8 times higher than high-strength aluminum alloy and carbon fiber. It is impact and fatigue resistant.

Example: Comparison on Boeing 787-10 (estimated)

Item	Existing Technology	B-CORE Slab
Empty Weight	119 tons	82 tons
Passenger Capacity	330 people	500 people
Total Capacity of Passenger and Cargo	28 tons	65 tons
Oil Capacity	107 tons	107 tons
Maximum Take-off Weight	254 tons	254 tons

Note: Aircraft trial-fabrication has not started yet, and the content of this page is only a theoretical analysis, tests are yet to be conducted.



# THE BENEFITS OF B-CORE SLAB



## Technological Benefits

1. Optimal mechanical structure
2. Huge size
3. Low cost fabrication makes B-CORE slab the last light-weight structural material

## Social Benefits

1. Can be passed down as a generational legacy
2. Superb seismic performance for buildings, roads & bridges. Ultra safe vehicles, ships and aircraft.
3. Transforming the world's construction & transportation industry from the foundation

BUILD  
EVERLASTING  
CIVILIZATION

## Investment Benefits

1. Inviolable B-CORE patents
2. Brazing equipment under long-term strict confidentiality management
3. The world's biggest market shares (refers to equity investment & industry circle investment)

## Environment Benefits

1. Annual carbon reduction of building: 90kg/m<sup>2</sup>, equivalent to planting 5 trees
2. Vehicles, ships and aircraft to save energy exponentially
3. Extremely durable wind turbines may popularize renewable energy