

INDUSTRY OVERVIEW

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SOURCE OF INFORMATION

We have commissioned Frost & Sullivan to conduct market research and analysis on the bridge cable market and prestressed materials industry in China for the period from 2013 to 2022. The market research was completed in December 2018. Frost & Sullivan is an independent global consulting firm founded in 1961 in New York. It offers industry research and market strategies and provides growth consulting and corporate training.

In preparing the report described above, Frost & Sullivan conducted detailed primary research which involved discussions on the status of the selected industries with certain leading industry participants. Frost & Sullivan also conducted secondary research which involved reviewing company reports, independent research reports and data based on its own research database.

Frost & Sullivan obtained the figures for various market size estimates from historical data analysis plotted against macroeconomic data, as well as considered the industry key drivers discussed in the report. Its forecasting methodology integrates several forecasting techniques with its internal analysis of critical market elements investigated in connection with its market research work. These elements include expert-opinion forecasting methodology, integration of market drivers and restraints, integration with the market challenges, integration of market trends and integration of econometric variables.

We were charged RMB0.84 million by Frost & Sullivan in connection with its preparation of the research which we believe reflects market rates for reports of this type. Our payment of such fee is not contingent upon the results of its research and analysis. The research report is based on the following basis and assumptions:

- China's economy is expected to maintain a steady growth during the forecast period;
- China's social, economic, and political environment is expected to remain stable during the forecast period; and
- China's fixed asset investment is expected to maintain a steady growth rate due to key drivers such as urbanisation, the "13th Five Year Plan" and the "Belt and Road" Initiative.

THE BRIDGE CONSTRUCTION INDUSTRY IN CHINA




Types of Bridges

Bridges can be classified by structure or size. Structure refers to the main load-bearing structure of a bridge and size refers to the length of main span of the bridge. Bridges are designed to cater to the functionalities of a bridge, the geographies of the construction site, the amount of available funds, etc. Bridge cables are often used for the construction of long-span bridges. As the bridge span gets longer, the load of the deck is transmitted to the ground through bridge cables. Please refer to "Business — Our Business — Cable Business" for simple illustration of a suspension bridge and cable-stayed bridge.

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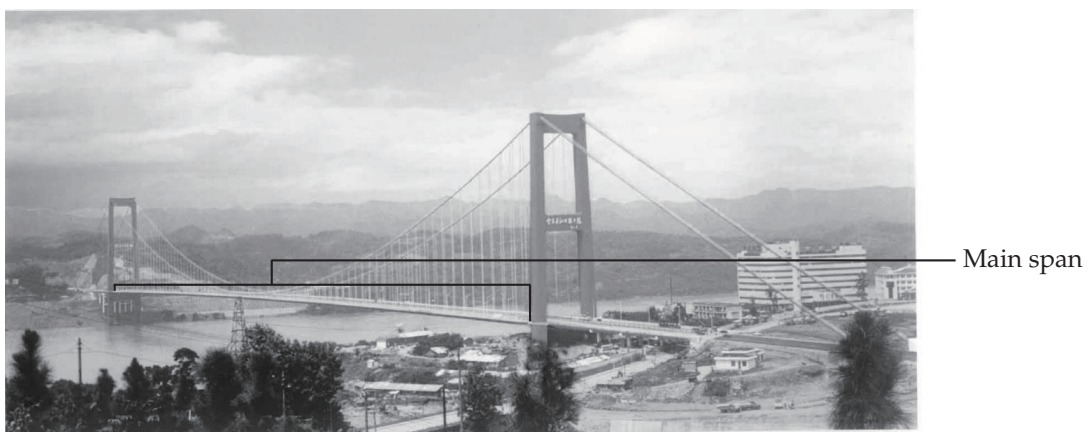
Below set out the description of bridges that our Group supplies to:

By structure

Types	Description	
<ul style="list-style-type: none"> • Arch bridge 	<p>Arch bridges use the arch as the main load-bearing structure and transmit part of the load to the ground through bridge cables.</p>	
<ul style="list-style-type: none"> • Cable-stayed bridge 	<p>Cable-stayed bridges use stay cables to connect the pylons and the deck and this connecting structure forms the main load-bearing structure of the bridge.</p>	
<ul style="list-style-type: none"> • Suspension bridge 	<p>Suspension bridges use main cables and hangers as the main load-bearing structure.</p>	

By Size

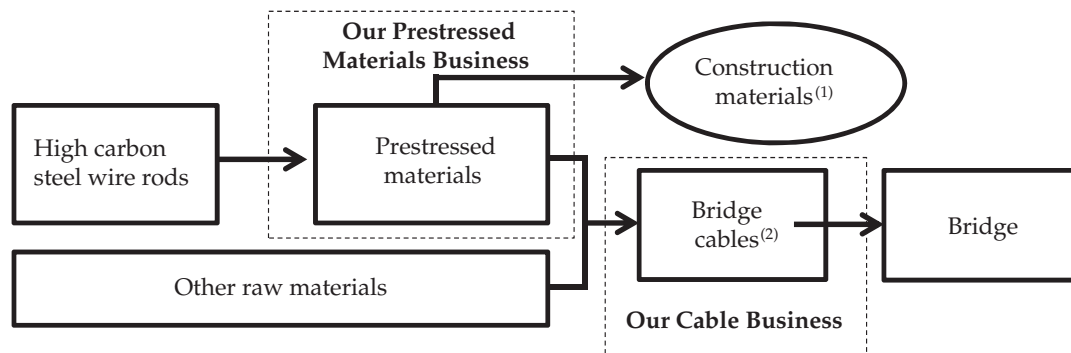
The size of a bridge depends on the length of the main span and main span refers to the longest span of a bridge as illustrated below:



Types	
<ul style="list-style-type: none"> • Super-long-span bridges 	<p>Super-long-span bridges refer to cable-stayed bridges with a main span of 400 m. or above and suspension bridges with a main span of 900 m. or above, which demand high standards of technical skills in its construction and use of materials. As the main span gets longer, the difficulty in its design and construction techniques (including the technological requirements for bridge cables) increases considerably.</p>
<ul style="list-style-type: none"> • Long-span bridges 	<p>Long-span bridges generally refer to all the cable-stayed bridges and suspension bridges that use bridge cables as the main load-bearing structure.</p>
<ul style="list-style-type: none"> • Other bridges 	<p>Other bridges refer to bridges that do not use bridge cables as the main load-bearing structure. They include certain arch bridge, beam bridge, truss bridge and bridges with a short main span. These bridges account for the majority of the bridges constructed in China.</p>

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The Supply Chain for Bridge Cable Manufacturing



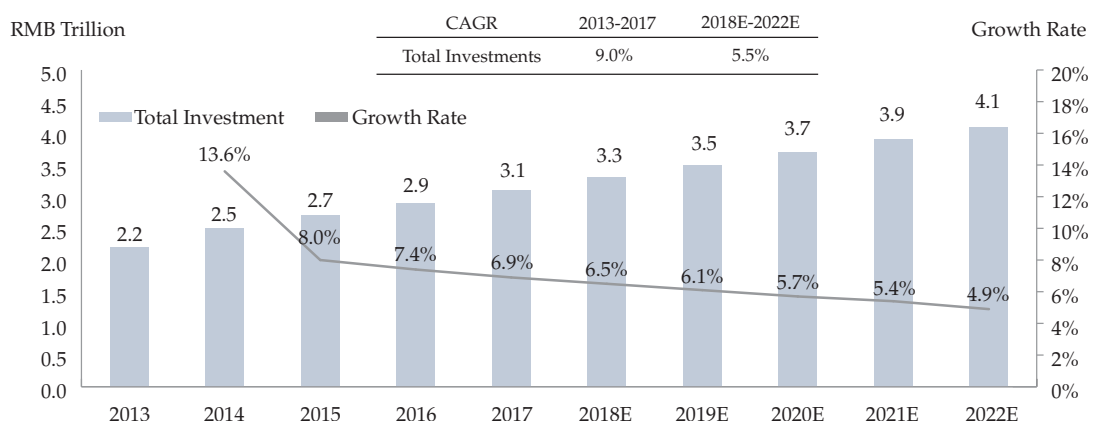
Notes:

- (1) Prestressed materials manufacturers mainly supply prestressed materials as raw materials to construction materials manufacturers to produce pre-cast concrete components or for construction projects such as airports, stadiums, exhibition centres, and oil-drilling platforms.
- (2) Prestressed materials manufacturers mainly supply galvanised prestressed materials to bridge cable manufacturers as raw materials to produce bridge cables.

The Bridge Construction Market in China

The growth of the bridge construction market has been correlated with China’s increasing investment in infrastructure construction pursuant to government’s initiatives in social development and the improvement in bridge construction technology in recent years. During the period between 2013 and 2017, the CAGR of total investments in fixed assets for transportation infrastructure in China was 9.0%. It is expected that with the introduction of various new government policies in relation to infrastructure development, such as the “13th Five Year Plan” and the “Belt and Road” Initiative, more bridges will be built and significant investment will be deployed in the transportation infrastructure sector. According to Frost & Sullivan, the fixed assets investment in transportation infrastructure construction is forecasted to grow at a CAGR of 5.5% between 2018 and 2022 and the total length of highway bridges in China is projected to rise at a CAGR of 6.2% between 2018 and 2022.

Total investments in fixed assets of transportation infrastructure construction in China, 2013-2022E



Source: National Bureau of Statistics of China, Frost & Sullivan

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THE BRIDGE CABLE INDUSTRY MARKET IN CHINA

Bridge cables are an essential component in long-span bridges and they are the main load-bearing or force transmission structure on a bridge. They are mainly used for the construction of long-span bridges including suspension bridges and cable-stayed bridges. Apart from bridge applications, bridge cables are sometimes used for the construction of large architectural structures such as airports and sports stadiums. The history of the construction of long-span bridges in China can be traced back to 1991 when the first Chinese-made cable-stayed super-long-span bridge, Shanghai Nanpu Bridge (南浦大橋) was completed.

Bridge cables can be categorised into suspension cables and stay cables, and they are mainly used for the construction of suspension bridge and cable-stayed bridges.

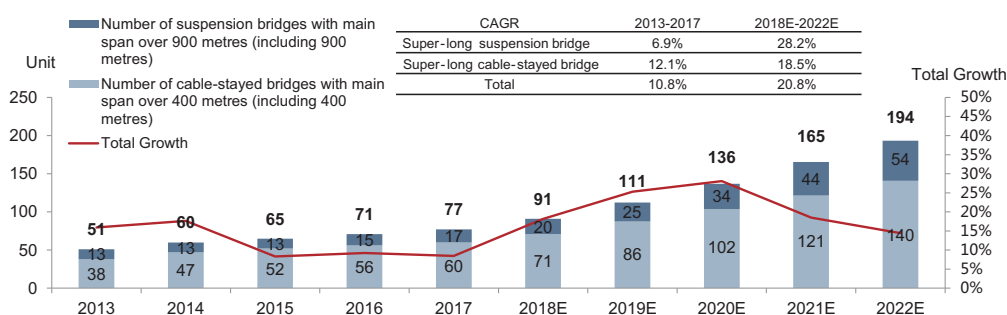
Please refer to the section headed "Business — Our Business — Cable Business — Overview" for the illustrations of the cables used for suspension bridges and cable-stayed bridges.

The Bridge Cable Market in China

The growth of the bridge cable manufacturing industry is largely correlated to the super-long-span bridge construction industry as bridge cables are an essential part of its construction.

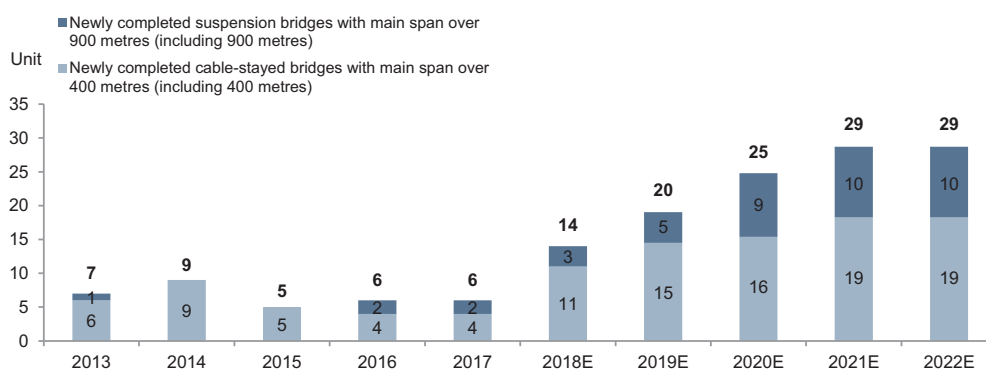
During the period of 2013 to 2017, the number of completed super-long-span bridge increased at a CAGR of 10.8%, from 51 to 77, and the number of completed super-long-span bridges is forecasted to reach 194 in 2022, representing a CAGR of 20.8% between 2018 and 2022. It is expected there will be around 23 newly completed super-long-span bridges in China every year on average between 2018 and 2022.

**Total number of completed super-long-span bridges in use in China
(based on bridges that are open to traffic), 2013-2022E**



Source: Frost & Sullivan

Number of newly completed super-long-span bridges in use in China, 2013-2022E

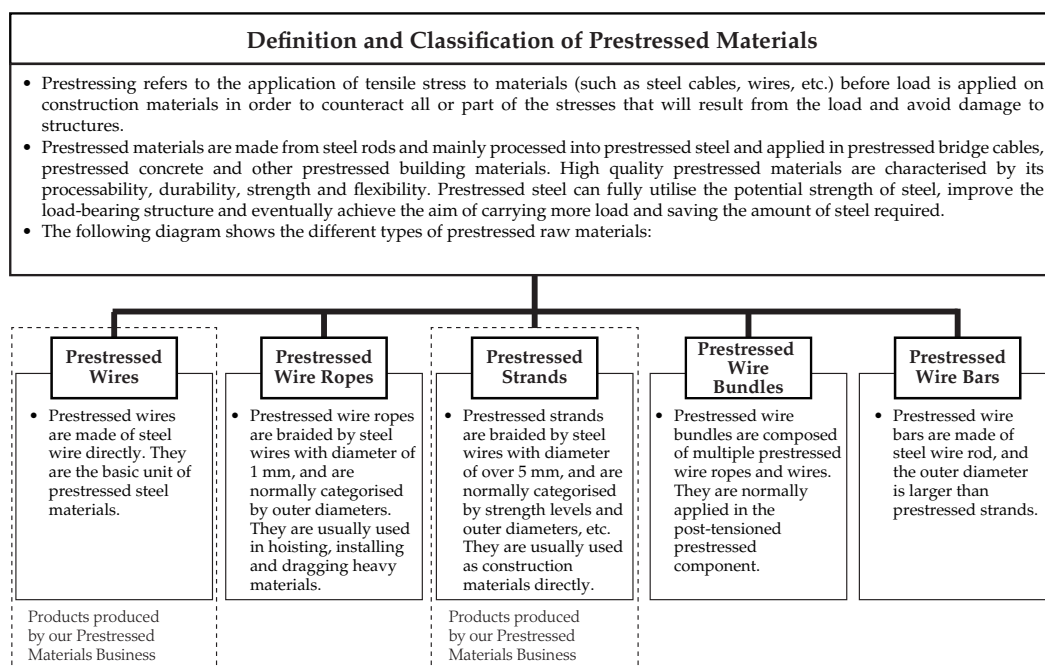


Source: Frost & Sullivan

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PRESTRESSED MATERIALS MANUFACTURING INDUSTRY IN CHINA

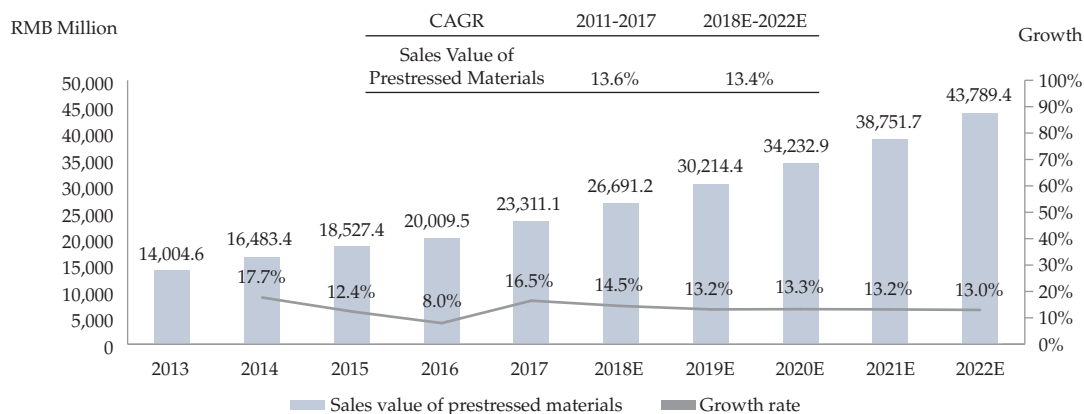
Types of Prestressed Materials



The Prestressed Materials Market in China

The total sales value of prestressed materials in China grew steadily from approximately RMB14,004.6 million in 2013 to approximately RMB23,311.1 million in 2017 at a CAGR of 13.6%, although the growth rate slowed in 2015 and 2016 as the government's "12th Five Year Plan", a government policy concerning the economic and social development implemented in 2010, had come to its final stage. It is forecasted that the market will regain its growth momentum and reach RMB43,789.4 million by 2022, achieving a CAGR of 13.4% between 2018 and 2022, according to Frost & Sullivan. The new "13th Five Year Plan" which began in 2016, is expected to boost the infrastructure investment in China and lead to a higher demand for infrastructure construction raw materials.

Market Size of Prestressed Materials in China, 2013-2022E



Source: Frost & Sullivan

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MARKET ANALYSIS FOR THE BRIDGE CABLE AND PRESTRESSED MATERIALS INDUSTRY

Key Market Drivers and Trends

Key market drivers and trends for the bridge cable industry and prestressed materials industry

Increase in infrastructure investment in China: The PRC government's "13th Five Year Plan", proposed to accelerate and raise economic competitiveness in China and infrastructure construction is named as one of the key development areas within the next five years. In particular, the 13th Five Year Plan for Western Development, approved in January 2017, has pointed out that infrastructure construction in the Western region in China would be a focus in order to boost economic growth within the Western region in China. Therefore, it is expected that substantial resources will be deployed to further develop infrastructure construction projects, including transportation, water conservancy, energy and telecommunications within the next few years.

In addition, the terrain of the Western region in China is mountainous with rivers and valleys, and due to this geographical characteristics, the development of transportation infrastructure will demand for the construction of large bridges. As bridge cables are an inseparable part in long-span bridges, it is expected that bridge cables will play an important role in the development in the Western region of China which in turn will bring positive impact to both the bridge cable market and the prestressed materials market.

Promotion of transportation infrastructure within China's neighbouring countries: The "Belt and Road" Initiative was introduced by the PRC government in 2015, aiming at fostering the economic cooperation, increasing cultural exchanges and broadening trade within the North, Central Asia and Southeast Asia.

Since the implementation of this initiative, as at 31 December 2017, numerous sino-foreign transportation infrastructure projects have commenced, including the Colombo Port City, the China-Maldives Friendship Bridge, Hungary-Serbia railway and the Bangladesh Padma Bridge. With these initiatives, construction of transportation infrastructure is expected to continue to grow which would potentially lead to a growth in the bridge cable manufacturing industry and the prestressed materials industry.

Competitive advantage in Chinese brands over overseas brands: China has been one of the world's largest producers of prestressed materials in terms of production volume over the past decade. Over the past ten years, Chinese prestressed materials manufacturers and bridge cables manufacturers have gained in-depth know-how and technical expertise, benefiting from the large and growing amount of construction and fixed asset investment in China. The advanced quality of bridge cables made in China is a result of increasing and continuous investment in research and development by domestic manufacturers. Chinese cables produced now meet or exceed international quality standards, and have been successfully applied to many bridges internationally, such as the San Francisco Oakland Bay Bridge in the United States, the Bandra-Worli Sea Link in Mumbai of India, and the Hålogaland Bridge in Norway. In addition, with accumulating experience and upgraded manufacturing facilities, Chinese bridge cable manufacturers have successfully managed to control production costs while improving efficiency, which have contributed to price advantages when competing in international markets.

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Key market drivers and trends for the bridge cable industry

Maintenance and replacement of bridge cables in China and overseas market: In addition to the growth in newly constructed bridges, ageing large bridges have also posed opportunities to bridge cables manufacturers. According to Frost & Sullivan, the life span of stay cables are limited and if without proper maintenance, the bridge cable may break and could endanger the users of the bridge. As a result, some of the long-span bridges built in China during the 1990s are entering into a phase of bridge cable replacement, and it is expected this will lead to increasing demand for bridge cables. In the United States, approximately one out of nine bridges were determined to be structurally deficient and many bridges had already reached the end of their life cycle, thus requiring substantial repair, maintenance or replacement, according to a research report dated June 2013 issued by the U.S. Transportation Energy and Technology Alliance.

Key market drivers and trends for the prestressed materials industry

Expansion in the application of prestressed materials: Prestressed materials have a wide application and play a crucial role in infrastructure construction projects, such as the construction of bridges, railway network, hydropower structure, residential and commercial buildings, oil drilling platform and other large architectures. In addition, further expansion of the application of prestressed materials is expected as the performance of prestressed materials in terms of strength and anti-erosion capabilities have been increasing due to technological improvements and production techniques. An increase in fixed assets infrastructure investment would help to promote the demand for the prestressed materials. Under the 13th Five Year Plan, infrastructure construction is one of the key development areas, which would further stimulate the demand for prestressed materials. According to Frost & Sullivan, the total investment in fixed assets of infrastructure construction in China is expected to grow at a CAGR of 11.8% between 2018 and 2022.

Government Initiatives on prestressed materials: In 2006, prestressed materials have been named as a key technology development area in the Catalogue of Chinese New and High-tech Export Products. Following the introduction of this initiative, the government has put in place further policies to enhance the development of the industry. In November 2016, in line with the 13th Five Year Plan, the steel industry announced a five-year industry upgrade proposal (鋼鐵工業調整升級規劃) which proposed an upgrade of industry standard of prestressed materials in China and it is anticipated that this will incentivise prestressed materials manufacturers to further invest in their research and product enhancement.

Consolidation of prestressed materials manufacturers: The prestressed materials manufacturing industry has experienced consolidation and restructuring due to recent consolidation of steel manufacturers. Since 2016, the government has proactively eliminated steel manufacturers that have low product quality standard and could not meet environmental standards in terms of energy-saving, quality, safety and production technology. With local governments having strengthened their supervision of steel manufacturers, the number of steel manufacturers in China is expected to further decrease. Those manufacturers with good quality products and strong research and development capabilities, however, are expected to receive more help from national and local governments. As the prestressed materials manufacturing market is highly fragmented with approximately 600 players, the production capabilities and quality between the large scale and the small scale manufacturers varies. Large scale prestressed materials manufacturers often have established customer relationship with existing large scale steel manufacturers due to their procurement volume and operating history, hence it would be difficult for small scale prestressed materials manufacturers to compete for stable supply of raw materials. It is anticipated more small scale steel manufacturers will not be able to compete and therefore be forced out of the market.

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Key Entry Barriers

Key barriers to entry for bridge cable manufacturers

Track record: As competitive tender is often the procurement method used for selecting suppliers for bridge construction projects, a good track record is often the key area in a tender evaluation. In addition, since bridges concern public safety, our customers for the Cable Business often put strong emphasis on safety and reliability in tender evaluation. As a result, it will be difficult for new entrants to build up a good track record and to win a tender as they generally do not have the necessary experience required to join the bids projects nor have the established relationship with the project companies or contractors.

Capital and production capabilities: Bridge cable manufacturers require considerable capital investment in plant and equipment. In order to produce bridge cables for super-long-span bridges, the manufacturing equipment are required to meet certain standards in order to produce cables which are able to withstand extreme force. In addition to investment in production equipment, considerable amount will be needed to invest in the relevant testing equipment, research and development and employees recruitment. Large bridge projects also require cable manufacturers to have sufficient capacity to ensure supply of the cable, preventing smaller players with insufficient capacity from bidding on larger projects. Apart from fixed capital investment, bridge cable manufacturers are also required to have abundant working capital to bid and participate in projects. In general, bridge construction projects require bidders to provide a specified amount with reference to the tender amount as tender bond (投標保證金), which will be returned to the bidder upon the publication of the results of the tender. Moreover, performance bonds are typically required for performance of a project contract that will be released to the bridge cable manufacturers upon the final delivery of products; and retention money that are withheld for warranty claims will only be released to the bridge cable manufacturers upon expiration of warranty period after the completion of the construction of the bridge, typically one to two years. All of these arrangements could also affect the liquidity and cash flow of a bridge cable manufacturers.

Furthermore, because orders for bridge cables are tailored based on the specifications of the bridge, substantial market experience and technical know-how are necessary to compete.

Limited human resources within industry and capabilities: Since the super-long-span bridge cable market is concentrated with only a few players, there are a limited number of experienced technical experts in the market and it would be difficult for new entrants to build a competitive team which is comparable to the existing market players in a short period of time.

Key barriers to entry for prestressed materials manufacturers

Certification: As prestressed materials are ultimately used for infrastructure construction, public safety is of paramount importance. China's prestressed materials manufacturing industry is therefore under intensive supervision by regulatory authority. In September 2016, the State Administration for Quality Supervision and Inspection and Quarantine issued a regulation to place more stringent requirements to obtain production permit, and this includes technological equipment standard and product quality standard. Only qualified manufacturers who could pass all the assessments will be issued a production permit.

Technology: Due to stronger emphasis by downstream customers requiring higher product specifications such as stress level and anti-erosion performance. Prestressed materials manufacturers must possess sufficient research and development capacity to meet such demand.

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COMPETITIVE LANDSCAPE

Bridge cable market for super-long-span bridges in China

Market share of players by the number of super-long-span suspension bridges with main span of 900 m. or above in China, 1991 to 2017⁽¹⁾

Ranking	Company Name	Number of Bridges ⁽²⁾	Market Share
1	Our Group	9	52.9%
2	Competitor A	8	47.1%
3	Competitor B	2	11.8%

Market share of players by the number of super-long-span cable-stayed bridges with main span of 400 m. or above, in China, 1991 to 2017⁽¹⁾

Ranking	Company Name	Number of Bridges ⁽²⁾	Market Share
1	Our Group	18	30.0%
1	Competitor A	18	30.0%
2	Competitor C	12	20.0%
3	Competitor B	10	16.7%
4	Competitor D	2	3.3%

Notes:

- (1) The first super-long-span bridge was the Nanpu Bridge, which was completed in 1991, therefore the year 1991 is used to start measuring market share.
- (2) As the construction of super-long-span bridges is complex and involves significant workload, in order to meet the scheduled timetable, the construction of a single bridge may require products and services from two or more bridge cable manufacturers. As a result, some bridge projects may be counted in more than one cable manufacturers' portfolio, leading to the aggregated market share of all manufacturers to be greater than 100%.

Source: Frost & Sullivan

Market share of players by the total number of super-long-span bridges, in China, 1991 to 2017

Ranking	Company Name	Number of Bridges	Market Share
1	Our Group	27	35.1%
2	Competitor A	26	33.8%
3	Competitor B	12	15.6%
3	Competitor C	12	15.6%
4	Competitor D	2	2.6%

Note: As the construction of super-long-span bridges is complex and involves significant workload, in order to meet the scheduled timetable, the construction of a single bridge may require products and services from two or more bridge cable manufacturers.

Source: Frost & Sullivan

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The bridge cable manufacturing industry for super-long-span bridges in China is concentrated and there are mainly five bridge cable manufacturers competing in this market. The main reason for the concentration in this market is the high entry barriers, please refer to the section headed “Market Analysis for the Bridge Cable and Prestressed Materials Industry — Key Entry Barriers — Key barriers to entry for bridge cable manufacturers”.

Prestressed materials market in China

The prestressed materials manufacturing industry in China is highly fragmented with approximately 600 players competing in the market, among which the top five manufacturers accounted for approximately 24.8% of the total market share in 2017 in terms of sales value.

The table below sets out the market share of the top five manufacturers in China in terms of sales value:

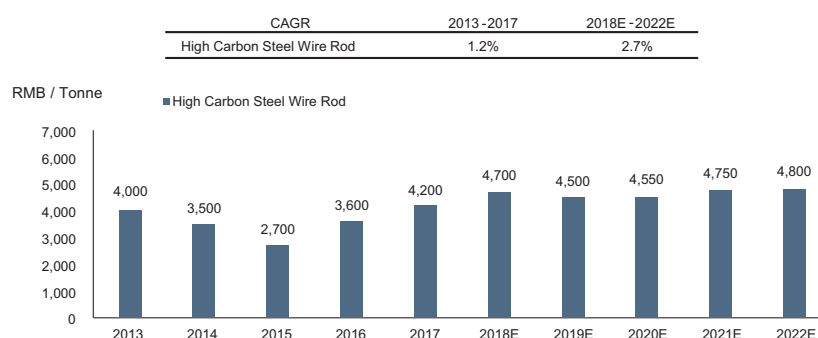
Ranking	Company Name	Sales Value in 2017 (million RMB)	Market Share in 2017
1	Competitor E	1,993.4	8.6%
2	Competitor F	1,786.6	7.7%
3	Our Group	891.9	3.8%
4	Competitor G	730.0	3.1%
5	Competitor D	374.6	1.6%

Source: Frost & Sullivan

PRICING TRENDS FOR RAW MATERIALS

The majority of the raw material cost involved for both the bridge cables and prestressed materials is dependent on price of steel wire rods. The major raw material we use for our Prestressed Materials Business is high carbon steel wire rods which can be further manufactured into galvanised prestressed wires used for our Cable Business. The following table illustrates the historical and forecasted price range of the major raw material used for our Prestressed Materials Business in China:

Average Price of High Carbon Steel Wire Rod in China, 2013-2022E



Source: National Bureau of Statistics of China, Frost & Sullivan

High carbon steel wire rods are the major raw material used for prestressed products. Influenced by changes in the price of steel, the price of wire rods declined from RMB4,000 per tonne in 2013 to RMB2,700 per tonne in 2015, but rebounded back to RMB3,600 per tonne and RMB4,200 per tonne in 2016 and 2017, respectively. Going forward, it is expected that the depreciation of the RMB would lead to increasing exports of wire rods, thereby increasing demand and the price in the short run. In the longer term, it is expected that prices will grow steadily at a CAGR of 2.7% between 2018 and 2020 depending on the changes in the price of steel, according to Frost & Sullivan.