OUGAN GROUP

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OUGAN GROUP

Super Cell Loading to Success!

- Planning on loading test
- Manufacturing of Super Cells
- Installation of Super Cells, telltales and strain gauges
- Data-collection on site and test result analysis on carry capacity

·Quality ·Service ·Innovation

www.super-cell.com

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OUGAN GROUP

Company profile

Ougan Technology is a member of Ougan Group and is the leading Chinese-based provider of bi-directional load cells, accessories and field service for bi-directional loading tests. The patented load cell-Super Cells feature reliability, loading precision and cost-effectiveness.

Ougan Technology provides a wide range of products and services, including:

- Preparation of load test Method Statement
- Supply and Installation of Super Cell
- Acquisition of data in the field
- Analysis of result of loading test result

Situated in Hangzhou, China, Ougan has been actively participating in R&D of Super Cells since 2005, and has been since providing bi-directional load testing equipment and services in and out of China, based on business guide lines of quality, service, and innovation. Manufacturing at over 3000 sets of Super Cells annually, having an ISO9001 certified private manufacturing plant, and a patented CE certified product design separates Ougan from other load cell providers.

In China, Ougan Technology has established presence in the load testing industry as a director in bi-directional load testing procedures. Having been on the executive team of co-editors of Technical Specifications for 12 Chinese provinces allows for our input on how testing should be conducted.

Over the course of years since our establishment, Ougan has set up sole or joint-ventures in Singapore ,Canada, and Indonesia. In order to better service more loading test projects around the world with Super Cells, more branch offices and affiliated companies are in the processes of being established.

Certification

Registered patent

Registered patent

Registered patent

Technical codes for bi-directional static load test

CE certification

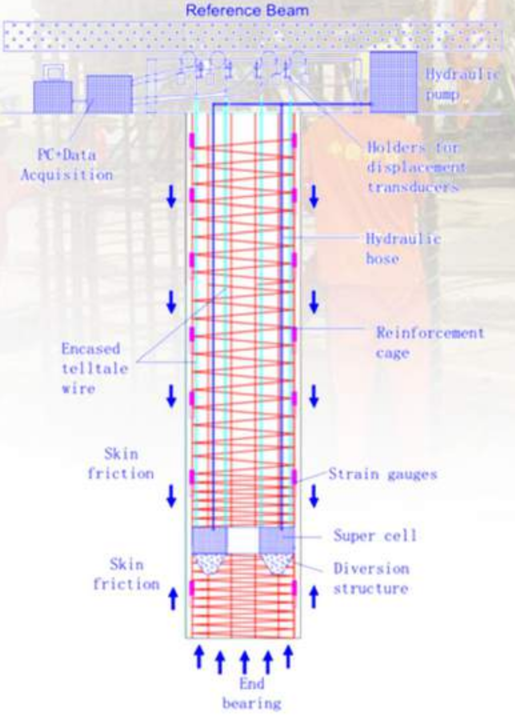
ISO9001 certification

Office and factory

What's Bi-directional static load test?

Bi-directional static load test utilizes the hydraulically operated load cells, embedded inside pile shaft for test on pile loading capacity. Before installing the foundation piles, the optimal location for load cell installation will need to be determined based on purpose of test, soil conditions and other factors. The embedded load cells are specially designed with built-in hydraulic jacks. Hydraulic pressure is applied to the load cells by hydraulic pumps on the ground, through hydraulic hoses pre-connected with the load cells. The pressure in the load cell is measured by pressure gauges (pressure sensors); the displacements of the upper/lower parts of the pile shaft are measured by displacement transducers, which are connected to the load cell by embedded telltale rods.

When loaded, the load cell expands, pushing the upper shaft upwards and the lower shaft downwards, which would mobilize the side friction and end bearing of the upper and lower lengths of the pile. Based on the relationship between the displacement, load and time, the loading capacities of both upper and lower portion of the pile may be determined. The combination of the side resistance of upper and lower parts of pile shaft and the end bearing makes up the bearing capacity of the complete pile.



Bi-directional static load test advantages

In comparison with traditional loading test methods such as kentledge or anchor reaction, bi-directional loading test is a relatively new method that requires load cells and other apparatus to conduct the testing process.

The following advantages separate bi-directional loading test from conventional static loading tests:

Unlimited test load

Test load is no longer limited by reaction load anymore. Theoretically, in bi-directional loading test, load cells may produce enough force to crush the concrete, hence, the max test load to be applied would be limited by strength of concrete, instead of load cells.

Improved safety

The reaction load of bi-directional loading test is built up by load cells embedded inside the test piles. Therefore, there is no need to set up any reaction force on the ground, by preparing exterior anchor structure or concrete blocks as dead load, eliminating the safety risks of collapsing structures, which may result in serious consequences.

Limited work area required

Testing may be conducted next to existing buildings, under passageways, highway median strips, and even offshore. Testing apparatus is set next to the pile, with a reference beam six times the pile diameter. Testing tents may be set up quickly, and requires much less space compared to conventional static load tests.

Time-saving

A considerable amount of time can be saved, without the work needed to prepare dead load or anchor piles for reaction.

The Ougan Advantages

Ougan has continued to research and innovate bi-directional methods to improve the reliability and accuracy. We offer Super Cells (patented load cells developed by Ougan), and related technical support and testing services to tens of thousands of test piles, both domestically and abroad. In addition, Ougan is proud to contribute to many projects of huge challenges, including world's longest cross-sea bridge, longest highway-railway bridge, project in highest altitude, etc.

Ougan has over a dozen years of experience, with establishment of a professional R&D team, international joint-ventures in the US, Canada, Singapore, Dubai, and an office in Canada. We believe in keeping pace with the industry development on a worldwide level.

Operated on international standards, Ougan is the first one in China to obtain CE certification of load cells, with manufacturing base certified in ISO9001:2015 standards. In addition, Ougan has been actively involved in co-editing the technical specifications for the use of bi-directional load cells in more than ten of Chinese provinces, and plays the role as chief technical advisor to Research of large-sized bored pile bearing capacity done by Chinese National Institute of Architecture Science.

Ougan developed numerous inventions for bi-directional loading test, including the patented load cells to replace sealed hydraulic jacks, the flow-guiding mechanism to flush out sediments, the combination of embedded load cells which eliminate the usage of thick steel plates on top and bottom of load cells.

By the year 2017, Ougan manufacturers up to 4,000 load cells annually, and each Super Cell is pressure-tested and calibrated before delivery to clients.

Calibration device


浙江省计量科学研究院

校准证书

Calibration certificate

Apparatus and accessories for Bi-directional Loading Test

Hydraulically loading system

To produce loading force, hydraulic pressure is applied with water or oil as option of fluid. The loading system consists of:

- Super Cell load cells
- hydraulic pump
- hydraulic hoses

hydraulic hoses

Displacement measuring system

Upwards and downwards movement of the pile is measured after loading pressure is applied. Displacement measuring system consists of:

- telltale rods
- telltale tubes/casing
- automatic displacement data log

telltale rods

Strain gauge measuring system (optional for investigating distribution of load force)

The distribution of load force may be measured, by taking the readout of strain gauges pre-installed onto the reinforcement cage.

Donut-shaped Super Cell

Multiple Super Cell

Solid Super Cell

Hydraulic pump

Automatic displacement data log

Strain gauge

Features of Ougan Super Cells

The revolutionary patented Super Cell, enjoys high acknowledgement and reputation, and distinguishes Ougan from any other load cell providers in the industry.

Low Risk of hydraulic failure

Super Cells are designed to work in a 'safe' range of pressure, usually under 40Mpa, by adopting large hydraulic area for loading. This greatly reduce the risk of failure of hydraulic pumps, hoses, fittings and the load cell itself in process of loading.

Concrete-casting guide mechanism

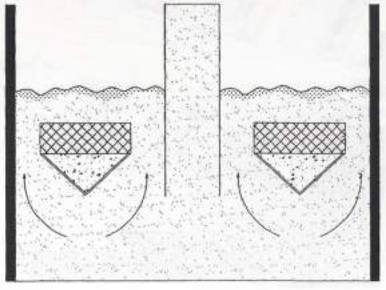
Ougan Super cells are designed to be complete with cone-shape attachments that function to guide the flow of concrete in process of casting. This cone-shaped attachment enables the sediments that sit on pile bottom to be flushed out through load cells easily with the concrete. The removal of the sediments help ensure the accuracy of pile testing results and the quality of the pile itself.

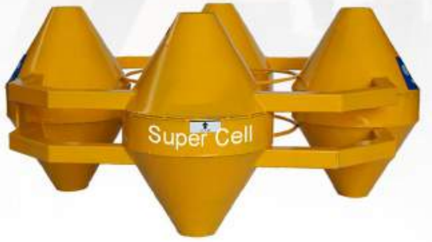
Predictable gap for grouting after test

Super cells are designed in the way to produce a continuous and predictable gap after test, which is important to assure the quality of the pile to be used as a working pile after test. The gap produced by the expanded Super Cells may be fully filled with grout, and the area with filled grout is approx half the pile section, in proportion with the half load that is transferred from the top of the pile.

Operation-friendliness, with compact size and light weight

In comparison with conventional load cells consisting of group of hydraulic jacks and thick steel plates, Super Cells are built in compact size and light weight and produce higher load.





Procedures to conduct a bi-directional loading test

1. Method Statement to be prepared based on purpose of test, existing soil investigation report and analysis.

2. Choose of right size and type of Super Cell, and appropriate level to install load cells.

3. Preparation of Super Cell, displacement transducers and accessories to be pre-installed into the pile.

4. Field work to install instruments onto re-bar, and completion of concrete casting.

5. Preparation of testing platform after curing of concrete.

6. Loading Super Cells and acquire data with data logger.

7. Analysis of test results.

8. Grouting to fill up gaps (in case the pile to be used as working pile).


Precast of flow guides


Weld Super Cell to the cage


Install instruments

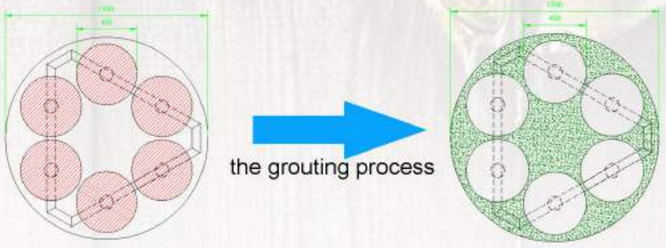

Lift the cage with Super Cell


Install the rebar cage

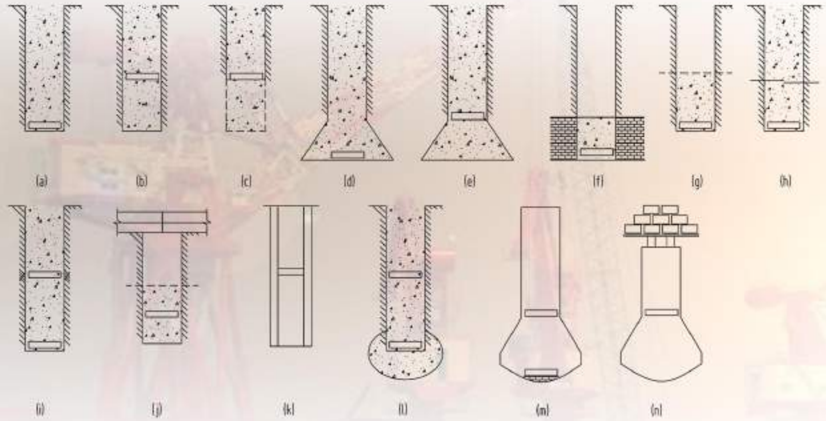

Set up the reference beam


The windproof tent for testing


Read the data



Extensive applications of Bi-directional static load test



Bi-directional Static Load Test with Super Cell may be applicable in a wide variety of sce-narios: (Pic a-n)

Explanations:

(a) To place Super Cell on bottom of pile, after paving pile bottom to be even. This method is applicable to projects in which the maximum skin friction approximately equals end bear-ing, or to test max skin friction in case there is enough end bearing as reaction.

(b) To place the Super Cell on a specific level of pile, so the upper friction approximately equals the lower friction plus end bearing.

(c) To over-drill pile shaft and place super cell at the originally designed pile depth. This is purposed to measure uplift capacity of the pile, in case the original end bearing is not large enough to be used as reaction against skin friction.

(d) To test uplifting capacity of pile with enlarged bottom, the Super Cell is placed on the bottom of the enlarged pile toe.

(e) In case skin friction is larger than end bearing, an expansion of pile toe may be built, to produce more reaction from lower part of super cell.

(f) Concrete may just be casted in rock socket, so the super cell embedded may be utilized just to measure the skin friction and end bearing of socketed rock section.

(g) In case the cut off level is lower than the ground level (e.g., the High rise building with multi-storey basement), bi-directional test with super cells may still be conducted, with the extension of telltale rods and hydraulic hoses.

(h) In case there is need to test the skin friction of 2 or more soil layers, concrete may be casted in several phases, i.e., to cast the first part of the pile, and test skin friction of the casted part of the pile with super cell, then proceed to cast the second part of the pile, and test the skin friction of another part.

(i) To install multiple Super Cells at different levels and make sure each section of pile is always fully motivated, after loaded enough reaction.

(j) BI-directional loading test with super cells may be easily applied in basement.

(k) By installing super cells in pre-fabricated piles ahead of piling, bi-directional loading test is appli-cable to drive piles too.

(l) With one super cell installed on pile bottom, and the other installed at the level where upper reaction approx equals lower reaction, the loading tests before and after grouting inside the pile may help tell the difference the grouting process would make on skin friction and end bearing.

(m) Two super cells may be utilized for different test purposes. The upper Super Cell only functions to test the pile skin friction of straight pile shaft and the Super Cell placed on pile bottom functions to test the end bearing.

(n) In case there is no enough skin friction provided above super cell, dead load may be added on pile head as extra reaction.

List of project references of Bi-directional loading tests with Super Cells

Project	Year	Max test load		Pile Dia.		No of Pile
		kN	kip	m	inch	pc
Foreign project						
Maple Crest Apartment Building, Canada	2017	3,000	670	1.3	51.2	1
Meikarta Project, Indonesia	2017	11,000/6,000	2,470/1,350	1.0/0.6	39.4/23.6	≥700
MRT Line 7, Philippines	2017	7,200/4,000/9,000	1,620/900/2,020	1.5/1.0	59.1/39.4	3
Country Garden Forest City Project, SJER, Malaysia	2017	19,200/15,800/27,200/15,800/12,800	4,320/3,550/6,120/3,550/2,880	1.0/0.9/1.2/0.9/0.8	39.4/35.4/47.2/35.4/31.5	5
Sky Sancturary project, Malaysia	2017	33,260/43,424/31,800	7,480/9,760/7,150	1.35/1.5/1.5	53/59/59	3
Improvement to Sungei Pandan Kechil, Singapore	2017	7,000/6,500/11,600/9,550	1,570/1,460/2,600/2,150	0.8	31.5	4
Erection of A 5 Storey Apartment Block, Singapore	2016	7,540	1,700	0.8	31.5	1
Upgrading of Leng Kee Community Club, Singapore	2016	15,080	3,390	0.8	31.5	1
Administration Building project at the University of Hail, K.S.A	2016	6,750	1,520	1.2	47.2	4
Sahiba Gökçen International Airport, Turkey	2016	25,000	5,620	1.0	39.4	2
A 5-Storey Building at No.231A Pandan Loop, Singapore	2015	14,250	3,200	0.9	35.4	1
A new 4-storey at No.79 JOO KOON CIRCLENo.79 Joo Koon Circle, Singapore	2015	11,600/14,200	2,610/3,190	1.0/1.1	39.4/43.3	2
A 3-Storey Factory Extension at NO.5 Tuas Lane, Singapore	2015	13,660/13,340	3,070/3,000	1.0/1.2	39.4/47.2	2
Catholic High School At Bishan St22, Singapore	2014	6,500/ 5,800	1,460/1,300	0.8/1.0	31.5/39.4	3
Macao Hengqin Island University of Macau new campus subsea tunnel	2012	6,300/13,000/5,100 (Tension pile)	1,420/2,920/1,150 (Tesion pile)	1.2/1.5/1.2	47.2/59.1/47.2	6
Hong Kong-Zhuhai-Macao Bridge	2011	14,0000/11,0000	31,470/24,730	2.2/2.0	86.6/78.7	4
Internal project						
Yushan Bridge, Zhejiang, China	2017	70,000/120,000/70,000/120,000	15,740/26,980/15,740/26,980	3.4/3.8/4.0/4.0	134/150/158/158	4
Qidu Bridge Project, Zhejiang, China	2017	44,590	10,020	2.5	98.4	1
South Ningbo Train Station, Zhejiang, China	2016	13,000/8,000	2,920/1,800	1.0/0.8	39.4/31.5	9
Yaojiang Bridge Ningbo Airport Road, Zhejiang, China	2016	39,000	8,770	1.5	59.1	2
Zhenxiong Jiutian Huidu Dragon City, Yunnan, China	2016	16,000	3,600	1.2	47.2	8
Nieshui Viaduct Project, Qinghai, China	2016	8,000/14,000	1,800/3,150	1.2/1.6	47.2/63.0	2
Lanxi Jinjiao Bridge, Zhejiang, China	2015	28,000/37,000	6,290/8,320	1.5/2.0	59.0/78.8	3
Tianjin Haihe Bascule Bridge, China	2015	22,000/7,000	4,950/1,570	1.8/1.0	70.9/39.4	3
Tianjin Binhai Airport, China	2015	5,500/25,000/44,000	1,240/5,620/9,890	0.8/2.2/2.2	31.5/86.6/86.6	7
Zhoushan Xiaogan 2ND Bridge,Zhejiang, China	2014	14,000/32,000/80,000	3,150/7,190/17,980	1.2/1.8/2.5	47.2/70.9/98.4	3
Shandong Jinan Viaduct on Second ring east road, China	2010	23,000	5,170	1.5	59.1	5
Hubei Province Danjiangkou Han River Grand Bridge, China	2010	57,000	12,810	1.8	70.9	1
Jiashao Bridge, Zhejiang, China	2009	205,000	46,090	3.8	149.6	1
Beijing Ministry of Railways Command and Control center, China	2009	40,000	8,990	2.0	78.7	3
75908 troops high-rise building in Guangxi, China	2009	10,500	2,360	1.2	47.2	3
Highway-Railway Bridge over Yellow River in Zhengzhou, China	2006	42,000	9,440	1.5	59.1	4
Guangxi Nanning East Railway Station, China	2006	40,000	8,990	1.4	55.1	4
Hangzhou Bay Bridge, Zhejiang, China	2005	70,000	15,740	2.2	86.6	1

Project reference

Meikarta project, Indonesia

The Meikarta Project is a whole new city built on the outskirts of Jakarta, that will house up to 8 million people once finished. This city is developed and invested by the Indonesian real estate giant Lippo Group. The total value of the project is over 278 trillion Rupiah ($20.9 billion USD). The project involves the construction of world-class infrastructure and facilities that will include seven shopping malls, ten five star hotels, libraries, theaters, art center, schools, three international universities, an international exhibition center, and what is being dubbed as 'Indonesia's Silicon Valley'.

This project is expected to consume more than 700 sets of Super Cells.
Single Pile Testing Load: 11,000kN/6,000kN (2,473kip/1,349kip)
Pile diameter: 1.0m/0.6m (39.4/23.6in)





Livestock wharf of Ibrahim, Sudan

Sudan livestock wharf is located near the Red Sea, the north side of Sudan.

In 2015, two piles were tested utilizing Ougan Technology's Super Cell solution, providing the Sudan Livestock Wharf an easier and reliable method for foundation load test and load capacity test.

Single Pile Testing Load: 8,000kN/10,000kN (1,798kip/2,248kip)
Pile diameter: 1.2m/1.5m (47.2in/59.0in)






Administration Building at University of Hail, Kingdom of Saudi Arabia

University of Hail is a university located in the city of Hail in the country of Saudi Arabia.

The new Administration Building of this university began construction in 2015, and the bi-directional static load test (otherwise named Osterberg test or O-cell test) was conducted by Ougan Technology with patented load cell (Super Cell) at the end of that year.

Single Pile Testing Load: 6,750kN (1,517kip)
Pile diameter: 1.2m (47.24 in)

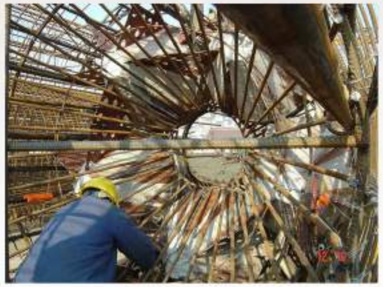



The Hangzhou Bay Bridge

The construction of Hangzhou Bay Bridge commenced on November 14, 2003, and was completed on June 26, 2007. Shortly after on May 1, 2008, the bridge connecting municipalities of Jiaxing and Ningbo in Zhejiang province was open to the public. The bridge stretches 36 km (22 mi) in length, and held the longest bridge in the world at the time of its completion. Even up to this day, the Hangzhou Bay Bridge ranks third in length, after American Lake Pontchartrain Causeway and Qingdao Jiaozhou Bay Bridge.

In 2005, Ougan Technology provided solutions with our patented Super Cell technology and infield service to one bi-directional load test for the bridge's pile capacity and load test.

Single Pile Testing Load: 70,000kN (15,736kip)
Pile diameter: 2.2m (86.6in)



Jiashao Bridge

Jiashao Bridge is the longest and widest multi-pylon cable-stayed bridges in the world at present.

It is another bridge that crosses the Hangzhou Bay after the Hangzhou Bay bridge.
Jiashao Bridge connects the Jiaxing city and Shaoxing city (two cities of Zhejiang Province, China).
The construction of this bridge started on December 14, 2008, and completed on February 03, 2013, then it was opened to traffic on July 19, 2013.

The overall length of Jiashao Bridge is 10.137 kilometers, width is 40.5meter, 8 lanes in tow side. The designed speed is 100km/h.

The bi-directional static load test of this bridge is also conducted by Ougan patented Super Cell.

Single Pile Testing Load: 205,000kN (46,100kip)
Pile diameter: 3.8m (150in)

Liuzhou Emperor International Fortune Center

On March 28th, 2009, Liuzhou Emperor International Center finally began to break ground. With projected height reaching over 300 meters and total floor area of over 500,000m2, this ¥4 billion ($588 million USD) investment made by Hong Kong International Corporation is truly ground-breaking.

In 2011, three piles were tested by Guangxi Province Institute of Loading Test with Ougan's bi-directional load test (static load test) , utilizing our patented Super Cell technology.

Single Pile Testing Load: 98,000kN (22,031kip)
Pile diameter: 2.5m (98.4in)




Lalin Railway

Lalin railway connects the municipalities of Lhasa and Nyingchi. This project initiated in June 2015, and will become the third operational way in Tibet. Due to terrains, high altitudes, and other geographic complications of up to 3500m (11,500ft), this railway project is widely considered as a milestone and miracle in the worldwide railway construction history.

This project remains one of Ougan's proudest accomplishments, for introducing static and pile load test in areas that were not able to otherwise. This proves our attitude to strive for the best, and take on projects that others seem incapable of.

During 2015 and 2016, a total of 21 piles were tested by China National Institute of Architecture Engineering Quality Inspection utilizing Ougan Technology's patented Super Cell technology.

Single Pile Testing Load: 25,000kN/40,000kN(5,620kip/8,992kip)
Pile diameter: 1.25m/1.5m (49.2in/59.0in)