ISSN: 1813-4890

Study on the Treatment Technology of Soft Soil Foundation in Super Large Area and Super Thick Sandy Soil Area

Tingyu Liu[a], Shuaifeng Fang[b], Xuanzhong Luo[c], Xing Gao[d], and Huizhou Ni[e]

China Construction Fourth Engineering Bureau Co., Ltd, China

[a]994182025@qq.com, [b]3491961985@qq.com, [c]575166370@qq.com, [d]gaoxing@cscec.com, [e]893902474@qq.com

Abstract

With the steady progress of the 14th Five Year Plan development strategy, China's exhibition industry is showing a vigorous development trend, and the exhibition pattern is expanding from the first tier cities to the second and third tier cities. In the actual construction process of building projects, soft soil foundation problems are common, which affect the reliability of construction quality, aggravate the construction difficulty, and it is difficult to achieve the initial construction goals. In the actual construction process of soft soil foundation, it is necessary to fully combine the actual situation of the site, select reasonable treatment construction technology, and do a good job in the construction quality management of each link. Based on this, this paper analyzes the soft soil foundation treatment technology in the super thick sandy soil area of the construction project in combination with the Hangzhou Grand Convention and Exhibition Center (Phase I) project.

Keywords

Soft Soil Foundation; Earthworks; Sandy Soil; Exhibition Hall System.

1. Introduction

With the steady progress of the 14th Five Year Plan development strategy, China's exhibition industry is showing a vigorous development trend, and the exhibition pattern is expanding from the first tier cities to the second and third tier cities. The construction of the convention and exhibition system has been put on the national agenda and has gradually become a booster and new highlight of the national economy. The accompanying scientific and technological innovation of the convention and exhibition system construction needs to be improved. Looking at China, the development of the convention and exhibition industry is growing rapidly and the level continues to improve. Large international convention and exhibition centers such as Shanghai National Convention and Exhibition Center and Shenzhen International Convention and Exhibition Center have been put into operation. In the past three years, the ranking of Hangzhou exhibition area in the country has steadily increased. Hangzhou Grand Convention and Exhibition Center came into being. In order to meet the needs of the actual construction of this project, the first phase of the Hangzhou Convention and Exhibition will be completed faster and better in the province, It also provides reference and reference for the construction of large-span exhibition structures in the future. It is planned to rely on this project to carry out research on the treatment technology of super large area and super thick sandy concrete soft soil foundation, and update and explore the construction technology and project management of key items of large-span structures.

Based on the actual situation of Hangzhou Grand Exhibition Project, through full demonstration and construction practice, this topic provides the basis for solving the actual problems in the project, improving the integration ability of the general contractor, reasonably controlling the

ISSN: 1813-4890

project cost, improving the construction efficiency, strengthening the construction management, realizing the digital and intelligent construction concept, and improving the corporate image. And through refining and summarizing, make it standardized and standardized, and provide reference for the construction of domestic large-span exhibition halls.

2. Project Overview

Hangzhou Grand Convention and Exhibition Center Project is located in Xiaoshan and Qiantangjiang New District, with a total floor area of 800000 m2, including 600000 m2 of exhibition area, 200000 m2 of supporting area and 300000 m2 of underground area. It is considered to be constructed in two parts, Phase I and Phase II. Phase I includes 8 exhibition halls, login halls and some outdoor exhibition halls.

The project area is located at the south bank of the Qiantang River, which belongs to the modern Qiantang River beach landform. It underpasses Hangzhou Metro Line 1, which has been put into operation. The construction plan is large, and the hydrogeological conditions are complex, which brings certain difficulties and challenges to the construction.

2.1. Hydrogeological Overview

The groundwater closely related to the Project is mainly shallow phreatic groundwater.

Phreatic layer:

The burial depth is 0.7~2.7m under the current surface, which is equivalent to 2.78~5.24m of the 1985 national elevation datum. It is mainly composed of fill layer and sandy silt. The annual variation range of groundwater level is about 1.0~2.0m, and the phreatic water in this layer is mainly supplied by atmospheric precipitation and surface water.

Bedrock fissure water:

Bedrock fissure water has little impact on the Project.

Climatic characteristics:

The rainfall is mainly concentrated in April to June (rainy season in plum) and July to September (rainy season in typhoon).

2.2. Overview of Geological Survey.

According to the relevant national and Zhejiang mandatory standards and relevant specifications, the requirements of the construction unit and the design unit, in view of the characteristics of the proposed buildings, deep foundation pits, foundation forms and site foundation soil layers, and in combination with the geological data of the site area and the site investigation, it is determined that the engineering exploration work mainly adopts the method of combining mechanical drilling exploration and site testing. While taking the undisturbed soil samples, A comprehensive exploration method combining in-situ test exploration methods such as standard penetration test, heavy cone dynamic penetration test, static penetration test and wave velocity test is adopted. In addition to conventional indoor soil tests, soil tests also include particle analysis test, permeability test, simple analysis and inspection of water quality.

The area where the Project is located is mainly the Quaternary accumulation area of Qiantang River delta alluvial marine plain, which was formed in the late Middle Pleistocene. Since the late Middle Pleistocene, the area has been in a relatively slow decline process. Due to the peneplain transgression, it has become a river and lake marine accumulation environment, and is affected by the geographical environment and the alternating cold and warm paleoclimate. Therefore, the genetic type of Quaternary strata in this area is complex. The upper part is Holocene flood plain facies alluvial deposit, the middle part is Late Pleistocene marine facies and fluvial lacustrine facies sedimentary stratum, and the lower part is Middle Late Pleistocene fluvial

ISSN: 1813-4890

facies alluvial stratum. In the vertical direction, multiple sedimentary cycles are formed, with soft and hard facies alternating. The underlying bedrock of the proposed site is mainly Cretaceous siltstone.

2.3. Overview of Control Study.

According to the characteristics of the Project, 0-28m of the site is alluvial silty soil layer, rich in groundwater, which is accumulated in modern river beach and cannot be used as the bearing stratum. 28-35m is the muddy soil layer deposited by coastal facies, with poor properties. 35-65m is the clay layer of lacustrine sedimentation. Muddy soil has the characteristics of soft plasticity and instability. When its structure is disturbed and destroyed, its strength will decrease dramatically, which will greatly affect the local stability of foundation pit excavation. In view of the characteristics of the super thick sandy soil area in this project, the soft soil foundation treatment technology in the super thick sandy soil area is mainly studied.

3. Study on the Construction Scheme of Temporary Roads in Sandy Soil Areas

The current surface layer of the project site of Hangzhou Grand Convention and Exhibition Center (Phase I) is 0-28m alluvial silty soil layer, rich in groundwater, which is a modern beach deposit and cannot be used as a bearing stratum. 28-35m is the muddy soil layer deposited by coastal facies, with poor properties. 35-65m is the clay layer of lacustrine sedimentation. Sandy soil has the characteristics of soft plasticity and instability. When its structure is disturbed and damaged, its strength will be drastically reduced, which has a great impact on the stability and bearing strength of temporary road construction. The thickness of the consolidated soil of sandy sludge is generally 2.0m-3.0m, and the deepest part is about 3.5m. The consolidated soil of hydraulic fill sandy sludge is an underconsolidated soil with high water content, large void ratio and low strength. It is easy to produce sedimentation and liquefaction under dynamic action. Most of the elevation of the solidified soil of sandy sludge is 4.5m-5m higher than the design elevation. At present, the solidified soil of sandy sludge cannot be piled up for slope modeling and cannot meet the requirements of bearing capacity for temporary road laying. As the construction period of the construction unit is tight, the solidified soil has no time to continue to be solidified, so more than 95% of the sandy sludge on the site needs to be solidified by precipitation and paved after the gravel is recycled. According to the collection of the estimated bearing capacity of the site construction vehicles, most of the temporary construction roads will be built on the original housing foundation, avoiding the original farmland, ponds and other locations, so as to save the use of basic materials and reduce costs.

4. Study on Excavation Stability in Sandy Soil Area

In order to ensure that the deformation of the foundation pit and the surrounding geological environment are within the controllable range during the excavation of the foundation pit and the construction of the main structure, and in case of any abnormal situation, it can be handled in a timely manner to ensure the safety of the foundation pit and surrounding buildings, according to the excavation scale of the foundation pit, the characteristics of the supporting structure, the surrounding environment and the corresponding foundation pit support specifications, the following monitoring contents are mainly set: ① the horizontal displacement of the pile top; ② Lateral displacement of pile; ③ Settlement of surrounding surface; ④ Groundwater level; ⑤ Layout of support axial force and foundation pit plane monitoring points.

Before earthwork excavation, dewatering well construction shall be carried out first, and earthwork excavation shall be carried out after dewatering is completed; The earth excavation

ISSN: 1813-4890

is divided into two major areas: the south area and the north area, and two earthwork construction units are arranged for construction.

4.1. Earth Excavation in Non Reserved Area

For the earth excavation in non reserved areas, the north and south areas shall be excavated backwards from one side to the other, the south area shall be excavated from north to south, and the north area shall be excavated from south to north. PC200 large excavator shall be used for excavation. 30cm soil reserved at the bottom layer shall be cleared manually. Meanwhile, PC120 small excavator shall be used for excavation in the pit area.

4.1.1. Technical Control Measures

1) Bench excavation: when excavating by steps, the space between the upper and lower steps is 5m. The side slope of the step shall reach 1:2, and no steep slope shall be left to prevent the earth sliding in the pit from affecting the supporting pile, engineering pile and supporting beam.

2) Earth stacking: The excavated earthwork shall be transported away as soon as it is excavated. It is strictly prohibited to stack soil around the foundation pit, and the soil shall be stacked at a slope greater than 1:2. The earthwork stacked on the side of the support beam shall not be squeezed or slipped, causing damage to the support beam.

3) Protection of engineering piles and tower crane piles: pay attention to the hanging bars of engineering piles during excavation, and cut them in time. During earthwork excavation, the pile positions within the excavation scope shall be marked in advance, and colored flags shall be placed at the pile positions that do not expose the soil surface, so as to avoid the machinery directly impacting the pile head or pile body. After the pile shafts of engineering piles and tower crane piles are exposed, the soil between piles and the earthwork outside the piles shall be excavated synchronously and symmetrically to prevent the earthwork height difference from being squeezed laterally, causing damage or deformation to the piles. The soil between piles shall be trimmed with a small excavator, and the soil around the piles shall be kept with appropriate thickness, and the piles shall be repaired manually. After the pile head is exposed, the pile shall be chiseled in time to avoid collision and damage of the excavator.

In order to prevent the engineering piles at the bottom of the pit from being collided by the traveling excavator, 1 m thick soil shall be reserved at the bottom of the foundation pit, which shall be excavated back to the outlet by the excavator.

4) Protection of undisturbed soil at the base: over excavation is strictly prohibited. For the excavation of soil layer close to the base depth, the excavation depth shall be controlled by special technicians. The mechanical excavation shall reach 200-300mm above the design elevation of the structure. The remaining soil shall be excavated manually. The soil repair of the lower overturning beam cushion cap shall be completed manually, and the flow construction shall be carried out. The cushion concrete construction must be completed within 4h after the completion of repair and excavation, and the brick mold masonry must be carried out to shorten the exposure time of the base soil layer.

4.1.2. Control Measures for Pit Side Load

During earthwork excavation, it shall be noted that the excavation machinery shall not damage the supporting structure, etc. It is prohibited to pile soil, load or stop machines and tools within 2m around the foundation pit, and it is not allowed to roll on the top plate of the pile wall. The excavated earthwork shall be transported away in time and shall not be stacked near the foundation pit. During earthwork excavation and underground structure construction, it is strictly forbidden to pile up a large amount of loads around the foundation pit, transport vehicles are strictly prohibited to run around the foundation pit, and the construction channel should be more than 2m away from the pit edge. Protective railings shall be set around the foundation pit for protection, and the ground overload shall be controlled within 15kPa. During

ISSN: 1813-4890

construction, the ground load around the foundation pit shall be strictly controlled to be less than 20Kpa, and special personnel shall be arranged to inspect and patrol, and problems found shall be handled in a timely manner.

4.2. Earth Excavation in the Land Conservation Area

The natural ground elevation of the soil conservation area is -2.8m, and the excavation depth of the foundation pit is 4.9m. It is layered in the sandy soil map area. A horizontal reinforced concrete support is arranged, and the calculated earthwork excavation volume is about 160,000m3. The foundation pit is divided into three large blocks, namely, the north soil conservation area, the south soil conservation area, and the connecting passage. Among them, the north soil conservation area is divided into 6 small foundation pits (A-1~A-6), and the south soil conservation area is divided into 8 small foundation pits (B-1~B-8, in which B-8 is divided into B-8 and B-9). There are 3 small foundation pits T2 connected to the passage.

4.2.1. Overall Construction Process

The construction sequence of the foundation pit shall meet the design conditions of the foundation pit, and the general requirements are as follows: ① The first layer of soil of all small foundation pits can be excavated after the pile foundation and enclosure construction are completed and the curing time is met, and the supporting construction can be completed within 48h after the excavation to the elevation of the support bottom; ② The second batch of earthwork excavation will be carried out after the completion of the first batch of underground structure construction; ③ In the small foundation pit, soft pit division shall be carried out according to the three-axis (areas a and b). Priority shall be given to the excavation of the second layer of soil in area a, and the second layer of soil in area b can be excavated when the construction strength of the bottom plate in area a reaches 80%; ④ After the construction of the underground structure of the second batch of land conservation area is completed, the earth excavation of the connecting passage shall be carried out, and the support construction shall be completed within 36 hours after the first layer of soil is excavated to the elevation; ⑤ The bottom plate construction shall be completed within 3 days after the earth excavation from the connecting passage to the second floor reaches the design elevation.

Excavation process: the first layer of soil is excavated to the bottom elevation of the support cushion → support construction → the second layer of soil is excavated to the bottom elevation of the bottom cushion → local deep pit excavation → cushion pouring → pile foundation acceptance → underground structure construction.

4.2.2. Metro Protection Measures

Serial No	Measures
1	The excavation sequence of the foundation pit shall be organized according to the pit: the excavation of the subway protection area, the excavation of the first layer of earthwork shall be carried out from the middle to both sides, and the supporting construction shall be carried out immediately after the excavation is completed. When the second layer of earthwork is excavated, the principle of "symmetrical" excavation shall be followed, and the excavation of the reserved areas in the south and north areas shall be started after the underground chamber roof and support replacement construction in the subway protection area are completed, The excavation method is from the middle of the foundation pit to the side of the foundation pit; The pit division construction can effectively stabilize the soil around the subway and protect the subway; Ensure the stability of the foundation pit and the safety of the subway.

ISSN: 1813-4890

2	In the process of underground excavation, a "commando team" shall be established to quickly complete the construction of support and base plate, and a production manager shall be arranged to be on duty at night every night during the whole operation period to be responsible for the construction and safety at night and make every effort to ensure the safety of foundation pit and subway.
3	During the excavation of foundation pit, the earthwork shall be transported out in time. The temporary stacking load outside the foundation pit shall not exceed 20Kpa. It is strictly forbidden for the transport vehicle to run around the foundation pit. The site construction road shall be 10m away from the pit.
4	Foundation pit in subway control protection area: the one-time excavation length along the retaining wall shall be less than 20m during earthwork excavation; After the excavation to the elevation, the time of cushion form shall be less than 12h, the time of foundation slab formation shall be less than 10d, and after the excavation to the elevation, the time of concrete support construction shall be less than 60h;
5	Construction of connecting channel foundation pit above the special protection area: during earthwork excavation, the one-time excavation length along the retaining wall shall be less than 15m; After excavation to elevation, the time of cushion form shall be less than 8h, the time of foundation slab formation shall be less than 7d, and after excavation to elevation, the time of concrete support construction shall be less than 48h;
6	Only after the reinforced concrete support reaches 80% of the design strength can the earth excavation below the support be carried out.
7	The excavation of foundation pit shall be carried out while excavating, chiseling, paving, pouring and masonry to ensure that the foundation pit soil is not exposed for a long time and that the foundation pit is stable and safe.
8	During excavation, it must be ensured that the on-site monitors are not damaged and in good condition. During excavation, special personnel shall be assigned to observe the settlement of the foundation pit, surrounding roads and buildings, and report in time if there is an early warning.
9	Before earthwork excavation, the water level in the dewatering well shall be analyzed, and the construction can be started only when the water level is normal. During earthwork excavation, the groundwater level must be kept below the earthwork excavation surface.
10	During earthwork excavation, the principle of layering, blocking and symmetry shall be adopted. The excavation shall be carried out within a time limit and supported while excavating to reduce the exposure time of the foundation pit.
11	The early strength concrete shall be used for the support construction near the subway, which can make the strength of the support concrete reach the design strength as soon as possible, and ensure the stability of the foundation pit and the continuous excavation of earthwork.
12	Plastic, linoleum and other materials are used as the supporting lower cushion to speed up the supporting construction;
13	After the earthwork is excavated to the pit bottom elevation, the cushion concrete shall be poured in time to shorten the exposure time of the foundation pit and enhance the ability of the pit bottom to resist uplift and deformation. If necessary, the reinforced cushion can be used.
14	In the single layer earthwork excavation, the diagonal bracing position at the corner shall be excavated first, and the supporting structure shall be constructed

ISSN: 1813-4890

immediately after the completion, and it must be ensured that the earthwork excavation of the next layer can be started only after all the supports of the layer are completed.

5. Study on Stability of Excavated Slope in Sandy Soil Area

According to the requirements of site conditions, the basement foundation slab of Hangzhou Grand Convention and Exhibition Center (Phase I) Project is connected with the west tunnel floor. Considering the actual construction influence factors, the slope earthwork in the south of the foundation pit needs to be re excavated to meet the construction needs of the foundation and floor in the north and south areas and the land conservation area. See Chapter III for the scope of re excavation earthwork; Due to the need to excavate the earthwork on the side slope of the foundation pit section by sections, the Hangzhou Grand Convention and Exhibition Center (Phase I) project has been divided into three parts, namely, the north-south area and the land conservation area. As the east-west distance of the venue is too large, and the main access road directly to Gate 4 is located on Metro Line 1, which has been opened to traffic, the progress of earthwork excavation for the foundation of the construction venues has been affected, Therefore, an auxiliary road is set at the junction of the non reserved areas of the land conservation area to facilitate the excavation, and the excavation ramps and simple lanes are excavated between 2 # and 3 # venues, 6 # and 7 # venues. The foundation earthwork in the north and south areas and the earthwork excavated subsequently from the slope of the land conservation area are transported out of the foundation pit through the excavation ramps.

5.1. Slope Earthwork Excavation and Others

Before excavation, the top line of the new slope shall be set out and the slope gradient shall be determined. The excavator shall be used for large-scale excavation, and then the slope shall be repaired manually before the shotcrete and anchor construction for slope protection. As the foundation pit slope is filled with earth bags after treatment, all the earth bags shall be removed by excavator first, and then the earthwork of the slope shall be excavated according to the slope top line and gradient. It is advisable to excavate from the top of the slope to the toe of the slope, and from the east to the west. It is strictly forbidden to cut the earthwork at the toe of the slope first; In order to ensure the stability of the east side slope, the earthwork near the east corner should be excavated in layers (about 1.5m in one layer). One layer should be excavated to make one layer of slope protection shotcrete and anchor, and both sides of the corner should be made of slope protection shotcrete and anchor; The earthwork of other parts can be excavated in place before slope protection shotcrete and anchor construction.

The excavated soil bags and earthwork shall be stacked at the foot of the slope on the west side as much as possible. Some of them shall be used to build the excavation ramp, and others shall be transported outside the excavation ramp and temporary simple lane; Dump trucks are used to transport spoil outside. Dump trucks can only enter the municipal roads after being washed by the car washing tank at the gate of the temporary passage.

Intercepting ditch shall be built again on the top of the excavated slope to intercept surface water, mainly rainwater, so that it does not flow into the foundation pit; The drainage ditch shall also be built again at the slope toe, and a water collecting well shall be set again at the southeast corner of the slope. At the same time, a submersible pump shall be equipped to pump water intermittently. Net size of water collecting well 1.2 × one point two ×. 2.0 (depth) m, lime sand brick masonry, shaft wall thickness of 240 mm, shaft bottom thickness of 120 mm, 20 thick 1:2.5 cement mortar finishing; Sectional net size of intercepting ditch and drainage ditch: 0.3 × 0.4m, drainage slope 0.2%, lime sand brick masonry, 120 thick ditch wall and bottom, plastered with 1:2.5 cement mortar for finishing.

ISSN: 1813-4890

5.2. Construction Cooperation

1) Cooperation with the shotcrete and anchor construction of slope protection: to ensure the stability of the slope, the earthwork should be excavated in layers, and one layer should be excavated to make one layer of shotcrete and anchor for slope protection; The earthwork of other parts can be excavated in place before slope protection shotcrete and anchor construction. Shotcrete and anchor construction of slope protection will not be carried out for the slope within the scope of the excavated ramp temporarily. The slope of the excavated ramp is within 12 °, which is already large-scale sloping, and will not affect the stability of the slope; After the two sides of the excavated ramp are greatly sloped, soil bags are stacked for slope reinforcement. See the attached figure for the scope and practice.

2) Coordination of foundation earthwork excavation: the earth bags and earthwork excavated from the slope are stacked at the foot of the slope near the reserved area, so as not to affect the foundation construction in the non reserved area as much as possible; At the same time, enough working faces shall be reserved for the excavator to excavate, and no other operation shall be carried out within the turning radius of the excavator.

5.3. Quality Safety Technical Measures

1) In order to ensure the stability of the east side slope, the soil mass near the east corner should be excavated in layers (about 1.5m in one layer). One layer should be excavated to make a layer of slope protection shotcrete and anchor, and both sides of the corner should be made a layer of slope protection shotcrete and anchor.

2) When excavating the soil on the side slope opposite to the reserved area, the excavator shall not collide with the original slope protection shotcrete and anchor on the east side slope, nor shall it be damaged at will; When digging against the soil bag and soil mass on one side of the reserved area, the soil bag on the west side slope shall not be damaged.

3) Enough working faces shall be reserved for the excavator to dig the soil bag and soil mass of the slope, and the soil can be transported by rotation. No other operations shall be carried out within the rotation radius of the excavator.

4) Due to the instability of the southern slope, when excavating the soil bag and soil mass of the slope, pay attention to the change of the soil mass above it to prevent collapse and safety accidents.

5) Due to the rainy season construction, safety supervision must be strengthened to ensure the stability and safety of the slope.

6) The safety protective railings at the top of the slope shall be reset, 1.2 m high, and fully hung with dense mesh safety nets.

7) Before the shotcrete and anchor for slope protection reach the design strength, large-scale machinery shall not be allowed to pass through the slope top.

6. Research on Construction Support and Protection Measures in Sandy Soil Area

The project adopts concrete support as enclosure support, and one support is set at the elevation of -3.65m. When the earthwork excavation reaches the bottom elevation of the support, the support construction shall be started. The specific arrangement of supports is as follows:

ISSN: 1813-4890

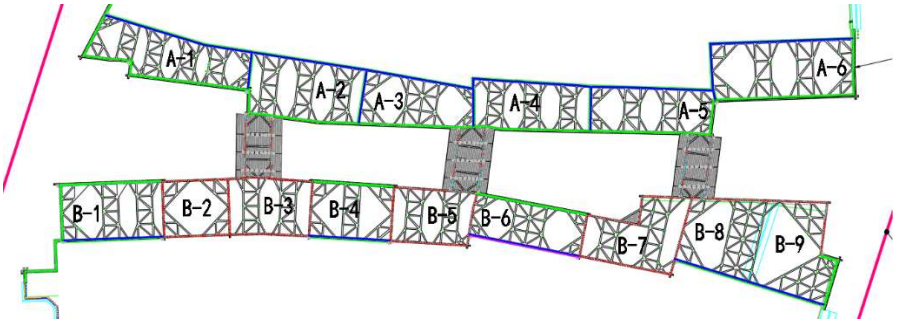

Figure 1. Layout plan of support

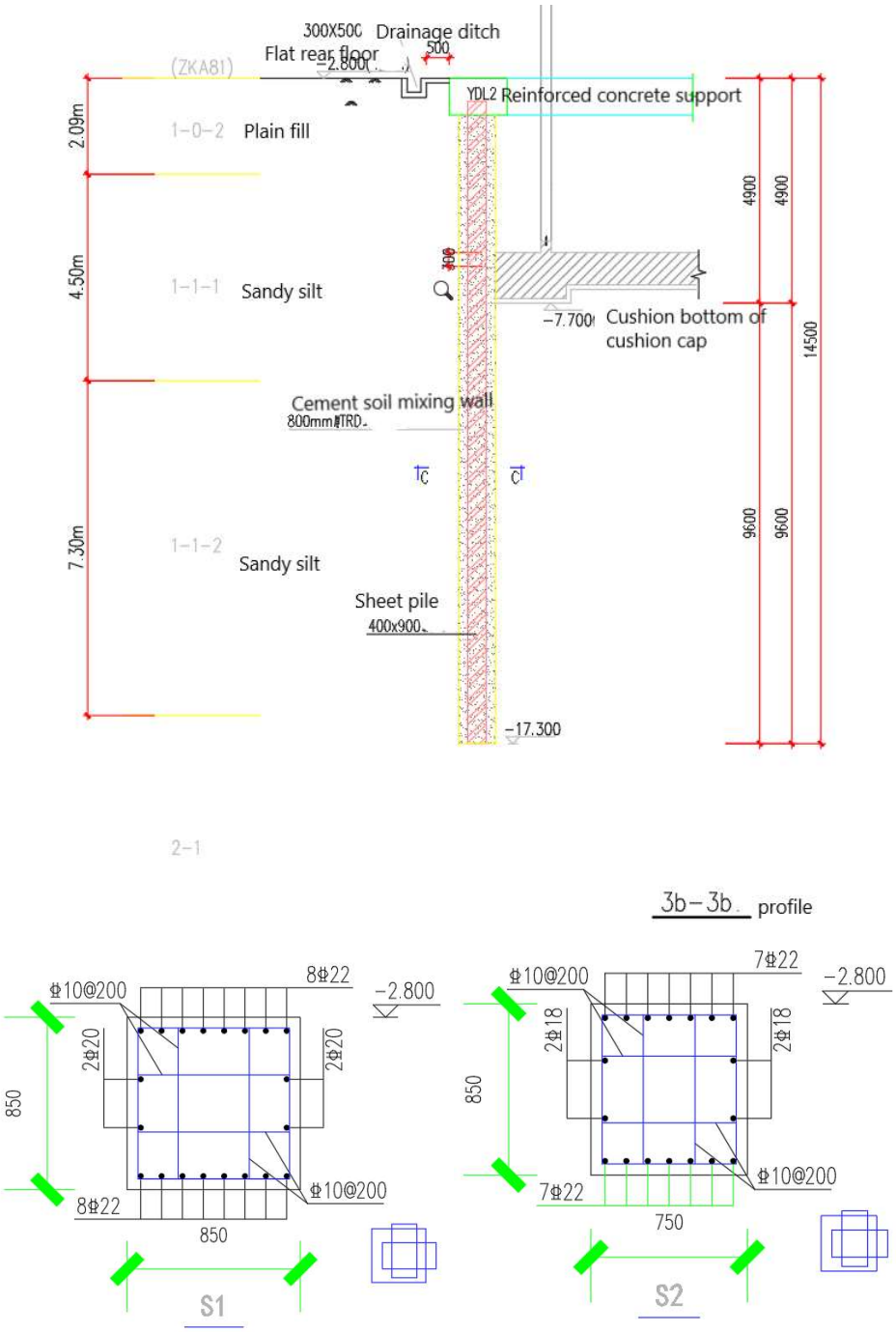

Figure 2. Support section and reinforcement drawing

ISSN: 1813-4890

6.1. Concrete Support Construction

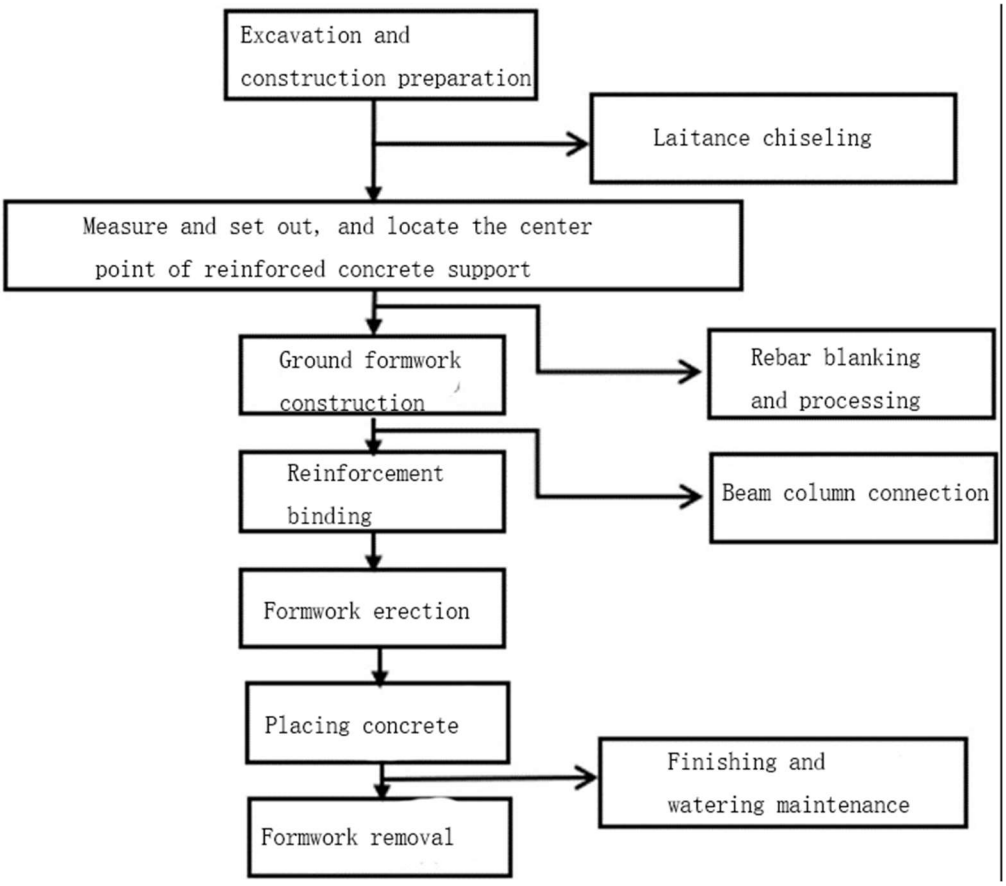

Figure 3. Construction process

The axis and elevation of the support must be accurate. The axis is projected with a total station. First, the axis of the main support is projected, then the node is projected, and then each node is connected to determine the auxiliary support and connecting rod. Determine the side line and control line of formwork support by the axis; For the horizontal elevation, the support control points can be respectively placed on the firmly fixed small wooden piles (elevation and plane position) and fully protected. Then, the elevation points (small wooden piles) can be gradually densified with a level as the basis for leveling the pouring cushion, and the cushion elevation can be controlled, so as to ensure that the axis node and horizontal plane of each supporting truss are accurate.

6.2. Formwork Construction

After the excavation reaches the bottom elevation of the concrete support, the ash line shall be located and set out on site according to the size of the design drawing. Pour and tamp 100 thick C20 plain concrete cushion at the bottom of the concrete support position, pave a layer of asphalt felt isolation layer on it, and the cushion on each side is 100 wider than the support. And the elevation is consistent, the surface is flat, and the soil layer below is dense. 15 plywood formwork is used for concrete support side formwork, ϕ 14@450 The split bolt is fixed.

6.3. Concrete Construction

The supporting concrete of this project is poured by truck pump.

The support construction shall fully follow the earthwork excavation degree, and the area division shall be consistent with the earthwork excavation. When there is a certain working

face, the support construction shall be carried out in a timely manner. Among them, the construction shall be carried out in blocks without stress, which can fully meet the requirements of construction in blocks after excavation, and complete the bracing within 36~48 hours after excavation. The construction shall be carried out in strict accordance with the requirements to ensure the connection between the newly poured support and the original support.

When pouring a batch of supports and purlins, each batch of supports and purlins must be poured according to the standard of 1 group/100m3, so as to master the standard, so as to master the 28 day compressive strength; Two groups of test blocks shall be added for 3d and 7d strength tests. After the results show that the concrete reaches 80% of the design strength, the lower layer earthwork excavation can be carried out.

The reinforced concrete support system (and the surrounding purlin) shall be integrally cast in the same plane, the support and the support intersect, and the intersection of the support and the surrounding purlin shall be haunched to form a rigid node; The support construction adopts the method of grooving pouring, and the bottom formwork and side timbers are laid; The connection between the reinforced concrete support and the column will be strictly in accordance with the construction drawings.

Concealed acceptance plan: reinforcement, embedded parts, etc. shall be divided into blocks according to the construction flow chart. When an item is completed, it shall be checked and accepted in time. If it is not checked and accepted, the construction of the next procedure is strictly prohibited.

7. Project Effect and Application

During the construction of the machine room foundation pit of the Hangzhou Grand Convention and Exhibition Center (Phase I) project, the super large area of super thick sandy concrete soft soil and the treatment technology were successfully applied to the actual project. By taking advantage of the technical advantages and combining the geographical characteristics of the project site, the technical difficulties in technology, construction, mechanical excavation and earthwork transfer were overcome, and the time limit of the tight schedule task was overcome, At the same time, the transportation restrictions of subway maintenance and opening and earthwork transfer have been solved, and good results have been achieved in project construction progress, environmental protection, social benefits, etc., making the application of large-area super thick sandy concrete soft land and treatment technology in exhibition and large-area construction area an exploratory step.

Acknowledgments

Thanks for the project funding support of CSCEC4B-2021-KTB-31) Foundation Research on the Underground Structure of the Super long, Super large Area and Long span Exhibition Hall in the extra thick sandy soil.

References

[1] Zhonglong Zhang . Technical Analysis of Soft Soil Foundation Construction of Building Engineering [J]. Research on Engineering Technology 2021,6(24).

[2] JGJ79-2012, Technical Code for Building Foundation Treatment [S]. Beijing: China Construction Industry Press, 2012.

[3] Hongxin Luo . Construction Technology of Punched Cast in place Pile Foundation of Building Engineering [J]. Jiangxi Building Materials. 2017 (09).

[4] Renyu Xu . Study on pore pressure law of sandy soil [D]. Qingdao University of Technology. 2021.

ISSN: 1813-4890

[5] Xiaoliang Wang . Study on failure mode and design calculation method of membrane sand bag embankment slope on soft soil foundation [D]. South China University of Technology 2020.

[6] GB50007-2011, Code for Design of Building Foundation [S]. Beijing: China Building Industry Press, 2011.

[7] JGJ120-2012, Technical Code for Building Foundation Treatment [S]. Beijing: China Construction Industry Press, 2012.

[8] GB50202-2018, Acceptance Standard for Construction Quality of Building Foundation Engineering [S]. Beijing: China Building Industry Press, 2018.

[9] DB33/T1128-2016, Technical Specification for Durability of Concrete Structures [S]. Zhejiang: Zhejiang University Press, 2017.

[10] Linjian Dai .Application of Soft Soil Foundation Treatment Technology in Building Engineering Construction [J]. Housing and Real Estate. 2020 (30).