

Research on Temperature Reduction Formwork of Mass Concrete

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Abstract: Temperature reduction formwork for mass concrete cooling water pipe is divided vertically into two layers by dividing the formwork partition, which drives the fixed outer spiral rotation of the radiator pipe by turning the handle. Fix the longitudinal and transverse radiator tubes to the radiator tubes by rotating the outer screw. Open the control valve and inject cooling water into the intake pipe. Rotate the handle by hand. Rotate the lever by turning the handle and drive the connecting piece to turn at the same time. When the water outlet in the connecting piece is horizontal, stop turning. Cooling water enters the longitudinal and transverse radiator pipes to take away the heat radiated from concrete. Cooling water is discharged through the outlet pipe. The template is practical, convenient and has good heat dissipation effect. It has good economic value.

Keywords: Mass concrete; Cooling water pipe; Temperature reducing; formwork

I. INTRODUCTION

Temperature stress in large volume concrete is one of the most common reasons for cracking of concrete itself. Especially during construction period of large volume concrete, large amount of heat is generated by hydration of concrete. If it can not effectively dissipate heat evenly, large temperature stress will be formed, causing cracking of concrete and causing quality accidents. Therefore, the quality of temperature control of mass concrete directly affects the construction quality of mass concrete and is the focus of quality control of mass concrete construction. Especially for mass concrete under load, such as high arch dam with thin wall, temperature control of concrete is the primary task. At present, it is widely used in the industry to bury cooling water pipes inside large volume concrete to divert heat generated by concrete hydration. Because the construction process is complicated due to the embedded cooling water pipe, it is of great significance to study the cooling formwork of mass concrete cooling water pipe in order to simplify the embedded cooling water pipe and improve the construction efficiency.

II. TEMPERATURE REDUCING FORMWORK DESIGN FOR LARGE VOLUME CONCRETE COOLING WATER PIPE

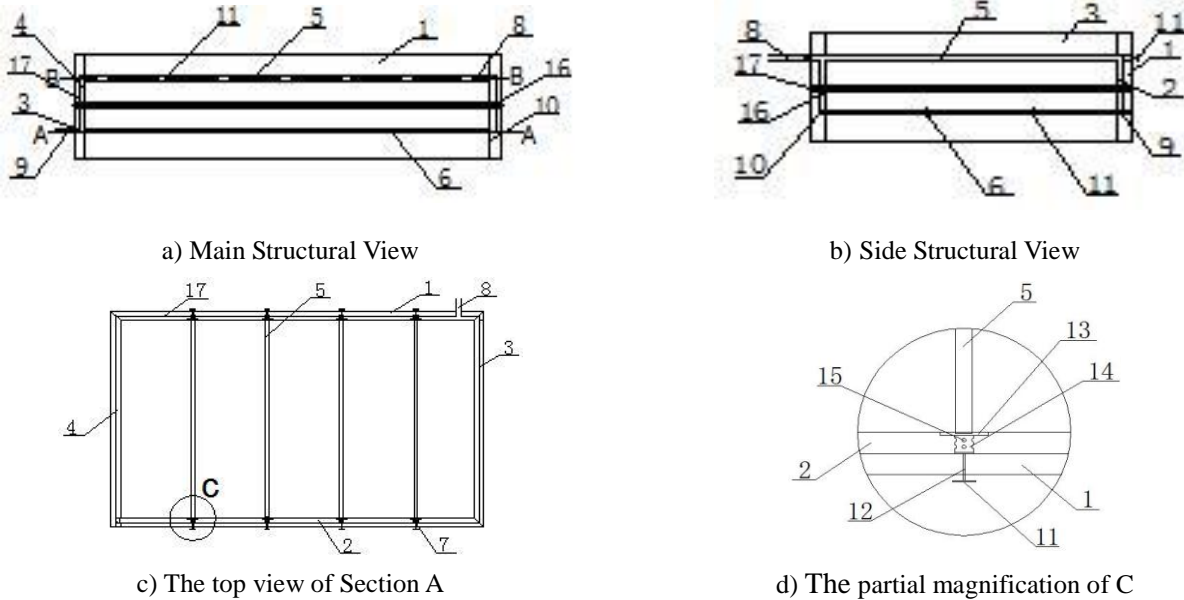
Temperature reduction formwork for mass concrete cooling water pipe includes formwork system, water pipe system and control valve system, and formwork system includes transverse outer formwork, transverse inner formwork, longitudinal inner formwork, formwork partition and formwork inner bulkhead; Water pipe system includes longitudinal radiator pipe, transverse radiator pipe, intake pipe, outlet pipe and vertical drain pipe. Control valve system includes control valve, rotary handle, rotary lever, radiator pipe fixed outer screw, connection piece and water outlet. The transverse outer template is located

on the outside of the transverse inner template, the transverse outer template and the transverse inner template are connected by the inner template bulkhead, the longitudinal outer template and the longitudinal inner template are connected by the inner template bulkhead, the middle position of the transverse inner template and the longitudinal inner template is the template bulkhead, and the longitudinal radiator pipe is installed between the transverse inner template and the transverse inner template. A transverse radiator pipe is installed between the longitudinal inner template and the longitudinal inner template. The longitudinal radiator pipe and the transverse radiator pipe are connected with the transverse outer template and the transverse inner template, the longitudinal outer template and the longitudinal inner template through the control valve. The intake pipe is installed at the upper end of the transverse outer template, the vertical drain pipe is installed at the upper end of the longitudinal inner template, and the outlet pipe is installed at the bottom of the longitudinal inner template diagonally with the intake pipe.

In the control valve, the radiator pipe fixes the inner side of the outer helix to the longitudinal and transverse radiator pipes, the outer side of the radiator pipe fixes to the connecting piece, the other side of the connecting piece to the rotary lever, and the other end of the rotary lever to the rotary handle. The connection piece is a hollow cylindrical structure with two rows and four water drain holes evenly distributed on the surface of the cylinder. The diameter of the water drain holes is 10mm. The fixed outer screw width of the radiator pipe plus the width of the connecting piece is the same as that of the transverse inner template or the longitudinal inner template. The length of the rotating rod is 1.5 times the width of the transverse outer template or the longitudinal outer template and the diameter of the rotating handle is 100mm. The diameter of longitudinal and transverse radiator pipes is 50mm steel pipe. External screw buckles are set at both ends of the pipe. The outer screw of the radiator pipe is fixed as a hollow cylinder member. The inner screw buckle is on the inner surface of the hollow cylinder. The inner screw buckle works with the outer screw buckle of the steel pipe. The structure of the temperature reduction formwork of mass concrete as shown in figure 1.

III. WORKING PRINCIPLE

Open the control valve, inject cooling water into the intake pipe, rotate the handle by hand, drive the rotary lever to rotate by rotating the handle, and drive the connecting piece to rotate at the same time. When the water outlet in the connecting piece is horizontal, the rotation stops. Cooling water enters the longitudinal and transverse radiator pipes and takes away the heat from concrete. Cooling water is discharged through the outlet pipe.



1. transverse outer template, 2. transverse inner template, 3. longitudinal outer template, 4. longitudinal inner template, 5. longitudinal radiator pipe, 6. transverse radiator pipe, 7. control valve, 8. intake pipe, 9. outlet pipe, 10. vertical drain pipe, 11. rotary handle, 12. rotary lever, 13. radiator pipe fixed outer screw, 14. connection piece, 15. drain port, 16. template spacer, 17. template inner spacer

Figure1 The structure of the temperature reduction formwork of mass concrete

CONCLUSION

Mass concrete cooling water pipe cooling formwork dissipates heat in concrete by setting longitudinal and transverse heat sinks, and intelligently controls flow control of cooling water injection by setting control valves. The formwork is convenient to operate, has good heat dissipation effect and has good economic value.

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References

- [1] Zhang Yunlong, Research on Construction Technology of Large Volume Concrete Structure in Construction Engineering, *Sichuan Building Materials*, 2022, 48(10): 118-120.
- [2] Guan Lufei, Analysis of construction Technology of Large volume Concrete Structure in construction Engineering, *China Residential Facilities*, 2022, 03: 7-9.
- [3] Zhou Shuhang, Analysis of Construction Technology of Bulk Concrete Structure, *Bulk Cement*, 2021, 04: 84-86.
- [4] Liu Baohua, Construction Technology of Mass Concrete Structure in Construction Engineering. *China Construction Engineering*, 2021, 01:117-118.