

Research on the Application of New Waterproof Materials in Engineering

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Abstract: Waterproofing, as one of the important functions in residential buildings, is receiving increasing attention. The quality of waterproofing construction not only directly affects the comfort of the building, but also affects its service life. Currently, there are more and more types of new waterproofing materials. In residential projects, the quality of waterproofing for the garage roof, basement exterior walls, and interior directly determines whether the living environment meets the requirements for comfort. This article elaborates on the construction process of common new waterproofing materials. Based on this, taking actual engineering cases as objects, the practical application of HDPE polymer self-adhesive waterproofing membrane in engineering is analyzed, and the construction process of detailed nodes is discussed in detail.

Keywords: Underground Waterproofing; Pre Laid Anti Sticking; HDPE Polymer Self-adhesive Waterproofing Membrane; Detail Construction

1. Introduction

With the continuous development of material technology and engineering technology, there are more and more types of new waterproof materials. Polyurethane coatings, waterproof mortar, and HDPE polymer waterproofing rolls have been widely used in building waterproofing projects such as residential buildings, water conservancy projects, and underground engineering. Especially the new type of polymer waterproofing membrane is widely used in underground waterproofing structures of residential buildings due to its advantages of no water seepage, single-layer laying, and low base requirements [1]. The polymer self-adhesive roll material adopts the method of pre laying and anti sticking throughout its length. Currently, in the conventional pre laying construction process,

the research on complex node construction technology is not deep enough. According to literature research, quality problems caused by improper node construction account for 13.20% of the total problem occurrence frequency, second only to finished product protection and finished product damage [2]. Therefore, this article conducts a detailed discussion on the construction technology at complex nodes.

2. New Waterproof Material

2.1 Polyurethane Waterproof Coating

In actual engineering projects, the basement side walls and bathroom floors are in a humid environment. Polyurethane waterproof coating has the advantage of good elongation and is commonly used for waterproofing construction in this area. The construction steps are as follows [3]:

Firstly, grassroots treatment. The plastic sleeve for the screw through hole on the exterior wall of the basement is sealed with micro expanded fine aggregate concrete to treat the joint. Before waterproofing the bathroom floor, the sanding area should be treated with a curing agent before construction can begin.

Secondly, detailed processing. First, brush the root of the pipeline, internal and external corners of the wall, and other areas that are prone to leakage, and then apply a large area of paint.

Thirdly, large-scale construction. When the surface of the coating is dry and adhesive free, carry out large-scale waterproof construction. After 8-12 hours of surface drying, apply the second coat of coating, with the direction of the second coat perpendicular to the first coat.

Fourth, acceptance. After the construction is completed, professional quality inspectors will be arranged to conduct quality inspection, checking for layering, hollowing, bubbles, etc. in details and surfaces.

2.2 Waterproof Mortar

In recent years, waterproof mortar has been

increasingly widely used as a new type of waterproof material in engineering waterproofing [4]. The construction steps are as follows:

Firstly, the bottom layer is painted. The main purpose of bottom coating is to improve the adhesion between the coating and the base layer, which is the first step in determining the effectiveness of waterproofing.

Secondly, detailed processing. First, apply a coat of paint to the root of the pipeline, internal and external corners of the wall, and other areas that are prone to leakage.

Thirdly, the first layer of spraying involves large-scale construction. After the detailed treatment is completed, when the coating surface is dry and adhesive free, carry out large-scale waterproofing construction. Spraying can be used to improve construction efficiency and avoid the generation of bubbles during the spraying process.

Fourthly, the large surface needs to be applied twice using a scraper and a roller brush. After 8-12 hours of surface drying, the second coat of coating should be applied, with the direction of coating should be applied, with the direction of the second coat perpendicular to the first coat.

Fifth, third spray. After the second coat of coating dries, start spraying the third coat of coating evenly in a direction perpendicular to the direction of the second coat, taking care to avoid local deposition

Sixth, acceptance. After the construction is completed, check whether the detailed methods meet the requirements and whether there are any layers, hollows, bubbles, etc. on the large surface.

2.3 Asphalt Waterproof Coating

The waterproofing of the top plate in this project consists of one layer of non curing asphalt waterproof coating and one layer of 4-thick SBS modified asphalt root puncture resistant waterproof membrane [5].

Firstly, grassroots treatment. According to the design drawings and specifications, the base treatment should meet certain standards. Before construction, it should be ensured that the surface base is flat, dry, and free from problems such as honeycombing, water damage, and sanding.

Secondly, spray cold primer oil. Spray a uniform layer of cold primer oil on the surface of the base layer. Each part of the grassroots should be sprayed in place and allowed to dry before

entering the scraping process.

Thirdly, apply non curing rubber asphalt waterproof coating by scraping. Non curing asphalt waterproof coating is a waterproof coating, and the thickness of scraping should be strictly controlled according to the drawings and specifications, using a scraper for scraping.

Fourth, lay the roll material. After completing the construction of non curing rubber asphalt waterproof coating, waterproof rolls can be laid, and the principle of laying should be straight, flat, and wrinkle free. Control the overlap width within the range of 50-100mm [6].

Fifth, acceptance. After the construction is completed, arrange professional quality inspectors to conduct quality acceptance.

2.4 Precautions for Waterproof Construction

(1) The quality assurance of raw materials not only affects the quality of the project, but also the duration of the project. Therefore, all types of raw materials must have a qualified factory certificate from a qualified manufacturer and match the physical evidence, and be randomly inspected according to national regulations.

(2) The roll material and its supporting materials must comply with the design and construction specifications. The detailed construction methods of the waterproof layer and its deformation joints, embedded pipe fittings, etc. must comply with the design requirements and construction specifications. The base surface of the waterproof layer of the roll material should be flat and clean, with rounded or obtuse corners at the inside and outside [2]. The base treatment agent should be evenly applied without any omissions.

(3) The base treatment agent should be evenly applied, and the waterproof layer and protective layer of the roll should be firmly bonded, tightly combined, and of uniform thickness. The laying method, overlapping, and finishing of the waterproof layer of the roll material should comply with the specifications, with firm and tight bonding, tightly sealed joints, and no damage.

3. Construction Technology

3.1 Project Overview

The construction of the second section of the Xinfei Jianye Mansion project covers an area of 44385.12 square meters, with a total construction area of 158988.34 square meters.

The underground garage has one floor, as well as two commercial buildings (2 floors) and two distribution rooms (1 floor). The garage floor of this project is constructed using polymer self-adhesive film waterproofing membrane. The bottom plate is 500 mm thick, the base cushion layer is 100 mm thick, and the waterproof level of the basement is Grade I. The concrete strength of the bottom plate is C35, the anti-seepage grade is P8, and a 1.2mm thick pre laid anti adhesive polymer self-adhesive membrane waterproof roll is installed

3.2 Construction Technology

The construction process flow is as follows [7]: cleaning the base layer → marking and positioning the base layer → fixing the internal and external corner adhesive strips → laying the anti adhesive polymer self-adhesive film waterproofing membrane → overlapping the membrane → processing the detailed nodes → self inspection, repair, and acceptance → binding the steel bars → pouring concrete.

3.2.1 Clean up the grassroots

The grassroots must be firm and free from defects such as looseness and sanding. The surface of the base layer is smooth, uniform and consistent. The base surface should have no visible water, but it is allowed to be moist. If there is visible water on the construction surface, it is necessary to carry out leak sealing or drainage treatment in advance.

3.2.2 Grassroots bullet line positioning

On the surface of the processed and dried base layer, leave a lap joint size of 1m according to the width of the roll material, and mark the reference line for laying the roll material, so that the roll material laying construction can be carried out according to this reference line. The starting point for the overlap of the roll material is 600mm from the side wall on the plane, with a long edge overlap width of 80mm and a short edge overlap width of 80mm, and obvious pink lines are popped out.

3.2.3 Fixing of internal and external corner adhesive strips

The adhesive strip for the internal and external corners of the flat facade should be fixed first, and the nail spacing should be strictly controlled to ensure that the adhesive strip is tightly adhered to the base layer.

3.2.4 Laying anti adhesive polymer self-adhesive film waterproofing membrane

(1) Flat laying

1) According to the positioning line, lay the first polymer self-adhesive roll on the base layer.

2) Determine the direction of the coiled material layer. The smooth surface of the coiled material is downward, and the self-adhesive surface of the coiled material is upward. Adjust the position of the coiled material during the laying process, and arrange it reasonably according to the positioning line.

3) When laying the second roll, the overlap width in the long side direction is 100 mm.

4) Long edge overlap: A reserved overlap tape coated with self-adhesive adhesive layer is used for self bonding. The overlap width is 100mm. During construction, it is important to ensure that the overlap edges are tightly pressed and compacted to prevent any leakage of adhesive.

(2) Facade laying

1) Use mechanical fixation method to fix the adhesive strip on the membrane, with the nail fixed at 10-20 mm from the edge of the adhesive strip, ensuring that the upper layer of the coil covers the nail position [8]. The nail fixation points are arranged in a plum blossom shape, with adjacent spacing not exceeding 500 mm.

2) During construction, remove the isolation film on the surface of the self-adhesive overlapping edge reserved in the long direction, and overlap it while ensuring that all nail fixation points are covered by the overlapping edge of adjacent rolls.

3) After overlapping, it should be immediately rolled with a pressure roller to remove excess bubbles, so that the overlapping position is flat, smooth and wrinkle free, ensuring that the overlapping position is sealed and adhered firmly.

4. Construction Technology for Detailed Nodes

4.1 Standard Construction Technology for Internal and External Corners

The specific construction process is: cutting the upper and lower parts of the roll material, using a triangular folding method for the inner corners and lower parts, and using a triangular folding method for the outer corners and upper parts, so as to tightly lay the roll material at the bottom or top of the bearing platform [9]. The specific method is shown in Figure 1 and Figure 2.

4.2 Construction Technology for Three Sided Intersection of Yin and Yang Corners

For the irregular pedestal, its bottom side, upper plane, and upper side belong to the intersection of three sides, which greatly increases the difficulty of laying the roll material due to its complexity. The specific construction process for this part is as follows.

After cutting the upper part of the coil, follow the standard external corner construction process. Cut the roll material at the intersection of the upper plane and the side of the pier, lay it on the side wall of the pier, and use special adhesive tape to splice the two rolls at the junction. The specific method is shown in Figure 3.

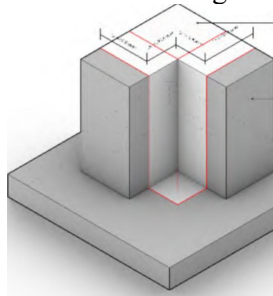


Figure 1. Standard Yin Corner Laying Diagram

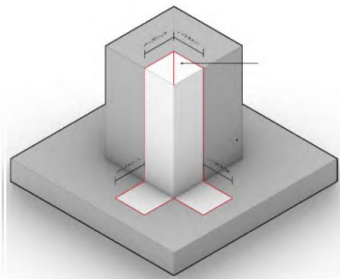


Figure 2. Standard Corner Laying Diagram

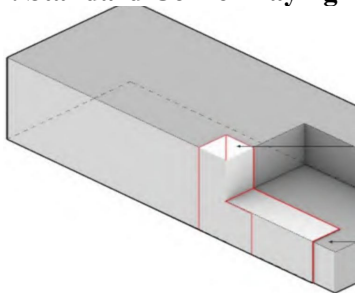


Figure 3. Layout Diagram of Three Intersecting Yin and Yang Corners

4.3 Construction Technology for Internal and External Corners of Slopes

For deeper slope abutments, the specific construction process at this location is as follows.

Firstly, the roll material is laid along the long side of the pier. Cut the rolls in one direction at the junction, and then use specialized tape to splice them together. Use triangular rolls to

repair the gaps at the intersection positions, and use specialized tape to splice the rolls at the intersections. The method is shown in Figure 4.

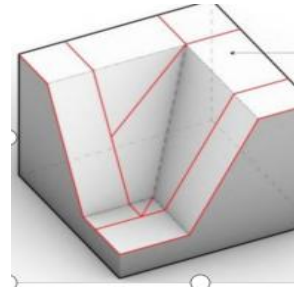


Figure 4. Layout of Slope Internal and External Corners

4.4 Construction Technology of "Pot Bottom" Pile Head

In pile foundations, after the pile head is removed, the actual pile top elevation is lower than the design pile top elevation. For this engineering problem, the pile head needs to be exposed and made into a concave shape, known as the "pot bottom" pile head [4].

1) Apply cement-based permeable crystalline waterproof coating to the surface of the pile head, and cut the roll material into a circular shape that conforms to the size of the "pot bottom".

2) Use specialized tape to stick the roll to the "bottom of the pot", and use single-sided tape to fill in any gaps.

3) After the details are processed, the construction can be carried out according to the standard pile head processing method.

5. Conclusion

Waterproof engineering plays an important role in engineering construction, and it is necessary to strengthen the application of new waterproof materials in the project. At the same time, pre laid anti adhesive polymer self-adhesive film waterproof rolls have the advantages of high laying efficiency and low base requirements. Therefore, it is necessary to strictly control the construction process to reduce costs and increase efficiency. Based on this, the detailed waterproofing practices are discussed, which has reference significance for waterproof engineering construction personnel.

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