Optimization and Upgrading of Testing Method of Surface Wear Resistance of Glazed Brick

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Abstract. According to the latest version of the standard content, a new testing method is provided, which can be fast and efficient and fully meet the abrasion resistance test of glazed brick surface. The optimization and upgrading of the test method of glazed brick surface wear resistance will be the overall optimization of glazed brick test method, through the process combination optimization to achieve the systematization of the test process, and convenient operation, simple, shorten the test time, improve the test efficiency, high test accuracy, small error, high work efficiency, wide range of application. The experimental time is shortened but the experimental results are accurate and the efficiency is greatly improved.

Keywords: Glazed tile; Ceramic brick; Wear resistance; Test method.

1 Introduction

The surface wear resistance of glazed brick shall be tested according to GB/T3810.7-2016 ceramic brick test method Part 7 "Determination of Surface Wear resistance of glazed brick", international standard ISO10545-7:1996 and other standards. The same 8 samples were tested for visual evaluation, and each group of glazed brick samples needed to grind the 8 revolutions of 100, 150, 600, 750, 1500, 2100, 6000 and 12000 [2], and then cleaned and dried for observation. The difference of brick enamel surface after grinding with different revolutions required at least three observations. If the mass detection of water absorption rate is less than 0.5% of the surface wear resistance test of glazed brick will waste a lot of time and energy in low speed grinding tile, abrasive filling ratio, chemical cleaning, so we need to pre-judge the quality of glazed brick, optimize the test program, reasonable allocation of test methods and steps, do orderly.

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2 Test process optimization and upgrading

2.1 specimen preparation

The standard said that "the size of the sample is generally 100mm×100mm", because the test process has small ball, abrasive, and distilled water added, especially after the end of the grinding to remove the sample and fixture in the process of easy to produce small ball scattered, so the sample production process can be according to the equipment support disk size appropriate cut larger, It is recommended to cut the sample size of 110mm×110mm, and most of the glazed tiles can be cut 5 pieces per batch of samples. The reasons will be explained later.

2.2 Experimental procedures are optimized and upgraded

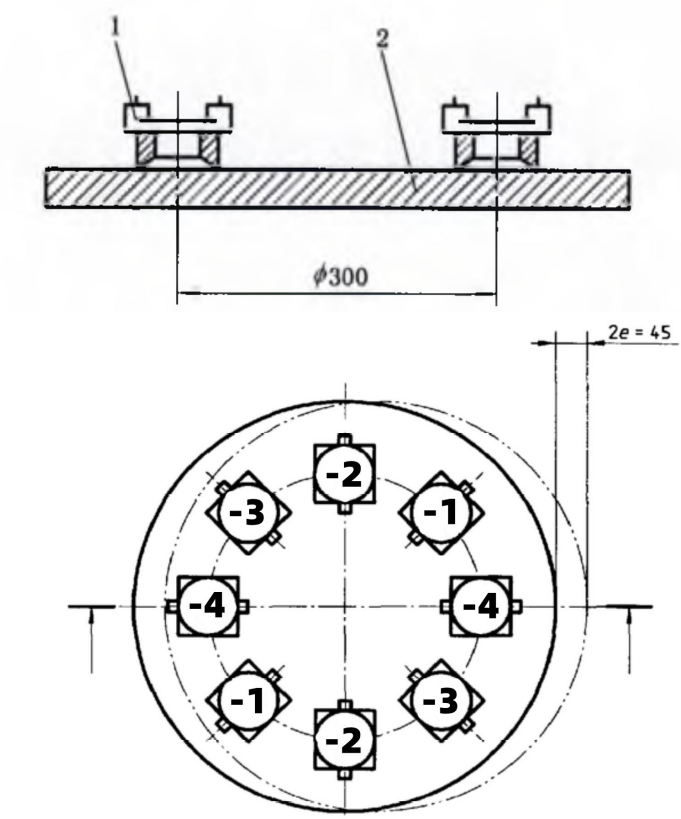
The existing equipment on the market is equipped with a support plate capable of holding the same 8 samples according to the standard of "100, 150, 600, 750, 1500, 2100, 6000 and 12000 revolutions of the sample". However, according to the continuous increase and follow-up of the sampling and testing of ceramic tiles in the market in recent 10 years, the quality of glazed tiles for floor paving, especially porcelain tiles with water absorption rate less than 0.5%, is constantly improved by various manufacturers, and the wear-resistant grade keeps a higher revolution grade year by year [3].

According to the quality of the cut sample on the hand and the observation of the glaze coating, we can have a pre-judgment of the enamel brick, that is, poor quality, good quality, excellent quality. According to the results of sampling and testing in recent years, most of the glazed tiles in the market are in the range of good quality, that is, they meet the four revolution grades of 600, 750, 1500 and 2100 revolutions.

As shown in Figure 1，according to the details in the above standard, 5 tiles of 110×110mm are cut in each 2 batches of glazed brick samples, and the sides of the tiles are marked with pencils as "-1, -2, -3, -4, -5", among which the "-5" sample is taken as an unpolished sample and put aside for comparison. The two groups of samples labeled "-1" and "-1" are placed opposite on the disc, and the samples "-2" and "-2", "-3" and "-3", "-4" and "-4" are placed on the disc in the form of directly opposite, respectively. Just 8 samples are placed on the whole supporting disc of the equipment. Then install and tighten the fixture for each sample in turn, pour a small steel ball with a good ratio and 3g corundum powder with a particle size of F80 into each sample fixture, and then import 20ml distilled water in turn, and finally tighten the fixture for each sample to prevent the loosening of the sample fixture in the process of equipment rotation. [4]

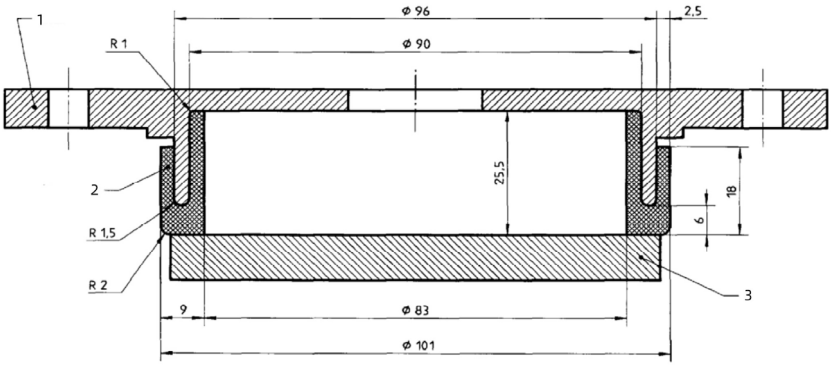
For 2 batches of enamel tiles with good quality, the first revolution of the equipment is set to rotate from 600 revolutions, and the supporting disk runs at a speed of 300r/min. After about 2min, it stops. As shown in Figure 2，at this time, the "-1" and "-1" samples and fixtures of the 2 batches of opposite samples are taken down and put into the wash basin with screen and basin. At the same time, set the equipment to rotate again by 150 and transfer the remaining sample to continue rotating on the support plate. The removed sample was held with a cotton strip with tweezers and dipped in 10% dilute hydrochloric acid solution to scrub the polished marks on the surface of the

tile, and then repeatedly rinsed the surface of the tile after hydrochloric acid scrubbing with running water. Finally, the two samples were put into the open oven for drying. In this process, the equipment with a rotation of 150 revolutions stops running, and the two samples labeled "-2" and "-2" and the fixture on the opposite side of the actual revolution of 600+150=750 revolutions are taken off and put into the washing basin with screen and basin for cleaning and put into the oven. At the same time, the equipment is continued to be set and then rotated by 750 to transfer the remaining samples to continue rotating on the support plate. After about 2.5 minutes, the equipment stopped running, and the actual revolution was 750+750=1500 revolution. The two samples and fixtures labeled "-3" and "-3" were put into the washing basin with screen and basin for cleaning and put into the oven. At the same time, the equipment was set and then rotated by 600 to transfer the remaining samples to continue rotating on the support plate. After about 2.5 minutes, the equipment stops running. Take off the two samples and fixtures labeled "-4" and "-4" on the opposite side of the actual revolution of 1500+600=2100 revolution, and put them into the washing basin with screen and basin for cleaning and put them into the oven.[6][7][8]



1-testing apparatus, 2-supporting disk

Fig. 1. abrasion machine



pressing plate, 2-rubber blanket, 3-brick

Fig. 2. sample fixture

As shown in Figure 3，put into the oven after thorough drying of 4 pieces of samples into the observation box around the corresponding batch "-5" no. Do not do any polishing of the sample, "-1" "-2", "-3" "-4" in turn on the "-5" sample on the left, right, left and right are placed. "Box color temperature 6000K ~ 6500K fluorescent lamp vertical placed on the surface of the observation brick, illuminance is about 300lx, box size is 61cm×61cm×61cm, the box brush with natural gray, observation should avoid direct light source irradiation." [1]

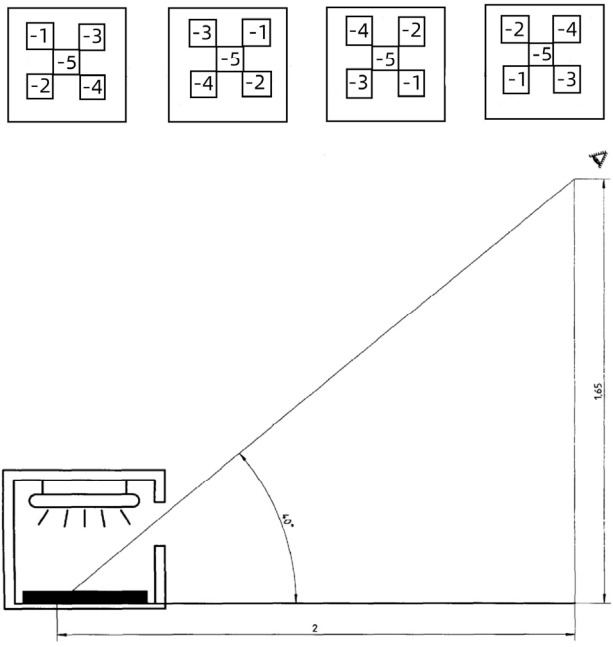


Fig. 3. Equipment for visual evaluation

In order to avoid the observation error caused by the observation of samples in different positions under the light of each batch, "-1", "-2", "-3" and "-4" should be placed in the four directions around "-5" to correct the deviation. After observation in several directions, it is found that the aperture of the surface of the brick after grinding, cleaning and drying is visible and not visible. If the four directions of the unpolished sample are the brick "visible and not visible", it will be taken out. Therefore, the wear-resistant registration of the glazed brick of this batch of samples refers to this brick. "-1" is 600 revolutions at level 2, "-2" is 750 revolutions at level 3, "-3" is 1500 revolutions at level 3, and "-4" is 2100 revolutions at level 4, as shown in Table 1.

Table 1. Classification of wear resistance of glazed ceramic Tile [1]

Grinding revolutions of visible wear	classification
100	0
150	1
600	2
750、1500	3
2100、6000、12000	4
＞12000[1)]	5
[1)] After passing the 12000 transfer test, pollution resistance test should be done according to GB/T3810.14-2016.	

Special cases: for pure white glaze brick and pure black glaze brick must pay special attention.[5] The wear resistance grade of pure white glazed face brick is generally very high. In addition to the four revolution grades of 600, 750, 1500 and 2100, it is necessary to do the two revolution grades of 6000 and 12000 separately. All the revolution grades should be observed and compared. The wear-resisting grade of pure black glazed brick will generally be particularly low. In addition to the four revolution grades of 600, 750, 1500 and 2100, it is necessary to do the two revolution grades of 100 and 150 separately. All the revolution grades should be observed and compared. [9][10]

3 Conclusion

There are many kinds of chemical reagents in the test, complicated test process, long test period and messy judgment basis. This test is easy to cause confused sense of blind following to the detection personnel. By optimizing the test steps and methods, ceramic bricks are divided into two categories: unglazed brick and glazed brick, and then the test steps are optimized according to the different test methods of unglazed brick and glazed brick respectively. In particular, the reasonable planning of glazed brick can not only save the test sample, but also efficiently save the test time. The application of overall planning makes the test simple and the judgment results become clear. Reduce the chance of test error.

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