

Common Faults Prevention of Autoclaved Aerated Concrete Block Masonry

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Abstract. Autoclaved aerated concrete block (AACB) is a new kind of green, environmental protection and economical wall material. Its production process can absorb a large amount of industrial waste residue, and the ratio of raw materials can reach more than 70%. However, in the actual construction situation, crack problems such as wall cracking and plaster layer falling off, as well as quality problems such as insufficient strength and easy cracking occur from time to time in the masonry which using AACB. In this paper, the common faults and causes of AACB masonry are summarized and analyzed, moreover, the related prevention and solving measures are put forward for reference in the masonry engineering. This paper can provide reference for the construction specification and quality acceptance of masonry engineering.

Keywords: Autoclaved Aerated Concrete Block, Faults Prevention, Masonry Cracking.

1. Introduction

Construction of energy-saving society is a necessary measure in the process of economic construction in all countries. With the continuous development of circular economy, clay brick is gradually being phased out because it destroys a lot of valuable land resources. As a new type of material, AACB uses wastes of the industrial production activities in the construction industry as raw material for secondary processing and utilization, and its performance is also much better than that of the traditional sintered clay brick [1]. Moreover, it has shown a broad application prospect in the field of construction engineering. AACBs are more and more widely used, and ensuring the quality of AACB and the masonry composed of it is the primary goal at the present stage. However, due to construction problems, for example, some people still use AACBs according to the way of clay bricks in accordance with the habitual thinking [2], and the characteristics of the material itself, resulting in a lot of common quality problems of AACB masonry. The appearance of common quality faults cannot be ignored, as they will not only affect the appearance of the house but also have a serious negative impact on the stability of the structure. And the safety of people's life and property may be threatened [1]. Therefore, it is necessary to study the common faults prevention of the masonry composed of AACB.

2. Theoretical basis of AACB

2.1 Overview of AACB

AACB refers to the product which proportions calcium materials such as lime, cement (mainly containing $[\text{CaO}]$) with siliceous materials such as fly ash and sand (mainly containing $[\text{SiO}_2]$) and building materials such as gypsum and slag. And then suitable amount of gasifier (mainly metal aluminum powder), regulator, stabilizer, and a moderate amount of water are added into it. After stirring, pouring, and static stop, it will undergo gas expansion. After a period of warm curing cutting the sample block, finally high-pressure steam is adopted for curing to form porous silicate blocks [3]. The production process of autoclaved aerated concrete products including AACB is shown in Figure 1.

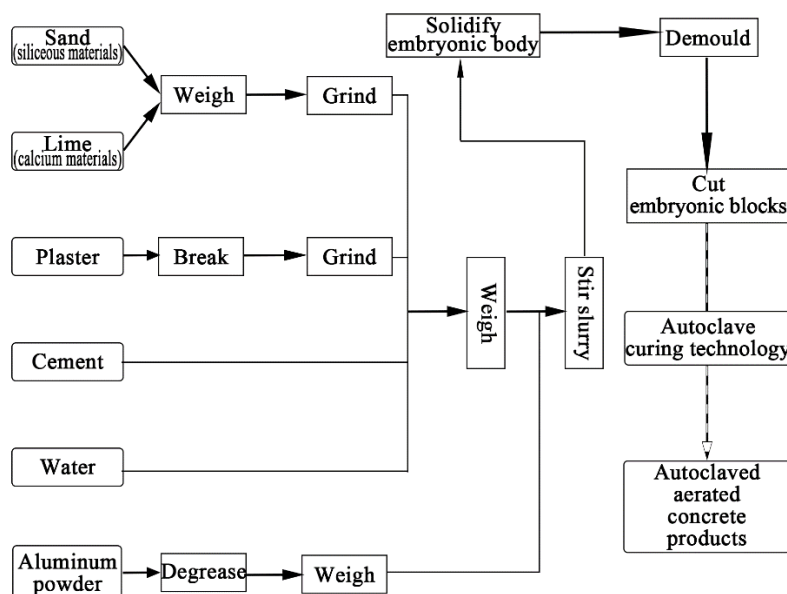


Figure 1. Production process of autoclaved aerated concrete products

AACB is mainly used for load-bearing wall of low-rise building, partition wall of multi-storey building and infilled wall of high-rise frame structure building. It can also be used for enclosure wall of general industrial building and for composite wallboard and roof structure as thermal insulation material. Strength of AACB products comes from the reaction between Ca(OH)_2 and the surface of siliceous material particles to produce hydration products [3], so as to bond the unreacted siliceous material core together to form the overall strength. The hydration products generated by the reaction between Ca(OH)_2 and the surface of siliceous material particles are shown schematically in Figure 2.

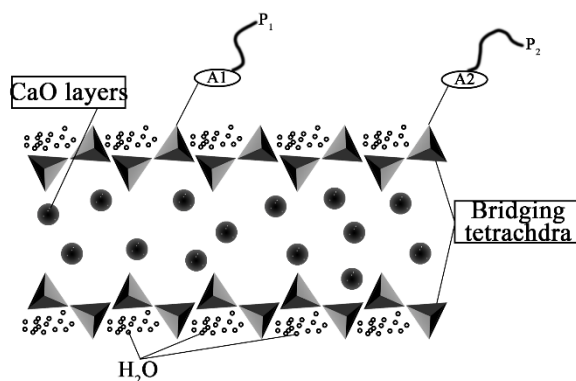


Figure 2. Diagrammatic sketch of hydration products

2.2 Material characteristics of AACB

The characteristics of AACB material are mainly reflected in the following points, from the perspective of its common faults.

(1) Light: The absolute dry weight of AACB is 500-700kg/m³ [5], As wall filling material, and compared with the traditional clay brick can reduce the weight of the wall by 50%-70%. It can also effectively reduce the weight of building, the foundation and structure investment, and even the labor intensity of construction.

(2) Good heat and sound insulation performance: In the manufacturing process of AACB, tiny pores are formed inside. These pores form an air layer in the block, greatly improve the thermal insulation effect of the wall and make AACBs have good sound absorption and sound insulation performance.

(3) Flexible: There are many tiny pores inside AACB, which makes it hollow, so that it has superior flexibility. Most of buildings are supported by reinforced concrete structure, with bricks only filling in. When the earthquake occurs, the reinforced concrete structure will therefore be deformed, if it is solid brick, the deformation backlog of reinforced concrete structure will not expand, and the building will burst and collapse [4]. Correspondingly, AACB can leave good expansion space for reinforced concrete structure, therefore, AACB is also the first choice of filling brick for high-rise buildings at this stage.

(4) High water absorption: There is a strong interaction between water, steam, and pores in AACB. In the dry state, the pores are empty. If put AACB in a high humidity environment, the moisture will be transferred in the pores by diffusion. In the case of contact it with liquid water, capillary suction is the main mode of water transfer through pores. These factors may decrease the water absorption rate of AACB but increase its water absorption at the same time, which may result in the increase of the dry shrinkage value of the block [6].

(5) Low failure coefficient: AACB widely used in high-rise buildings have large volume and low strength at present, low tensile strength and shear strength, small elastic modulus, and high brittleness [5]. All these various reasons lead to easy deformation of blocks, resulting in poor integrity of masonry structure.

2.3 Research status of faults prevention of AACB

Under the circumstance of increasingly severe environmental problems, green, ecological and energy-saving building materials are the focus of national planning and support. Although AACB with ecological and energy-saving characteristics has a good application prospect as a building material, its utilization rate still is not high. This is not only related to people's lack of sufficient understanding and confidence in the preparation technology and performance of AACB, but also associated with the lack of systematic process in construction [8]. In addition, the performance requirements of building materials are becoming higher and higher. Therefore, the solution of the common quality problems of AACB masonry in the future should rely on solving the lack of research in some aspects of the industry and the perfection of rules. In view of this, the author believes that the research on strengthening the related aspects of AACB can be carried out from three directions: aeration mechanism, coordination of raw-preparation(materials)-environment and development of technical standards.

The purpose of this paper is to analyze the natural and material properties of AACB, and point out the common fault generation principle of AACB masonry. The prevention and control methods of common quality faults of AACB are came up with. Finally, a systematic common fault prevention system of masonry composed of AACB is formed, to summarize the research on common faults of AACB masonry. It also provides a reference direction for the systematic inductive statements made by the existing such directions.

3. Analysis of common faults

3.1 Cracking of AACB masonry

The occurrence of cracks in AACB infilled wall masonry is predictable. The pertinent literature summarizes that the cracks in the infilled wall masonry composed of AACBs mainly appear in the following parts [7]: (1) the joint of infilled wall and reinforced concrete frame beam, slab, column, and shear wall; (2) 45-degree inclined crack of infilled wall in the frame, corner of door and window, and construction parts; (3) around the power distribution box and embedded pipeline.

As mentioned above, the overall failure coefficient of AACB masonry is low, the tensile strength of the structure composed of AACB is poor, and it is quite different from the raw material thermal expansion coefficient and shrinkage deformation of traditional reinforced concrete structure [8]. Therefore, under the influence of temperature, humidity and environmental change, cracks in infilled wall or floated coat will appear stably.

The crack width of the floated coat of AACB masonry is about 3mm [8]. The self-quality defects and masonry construction quality defects are the main reasons for large cracks in the floating layer of the wall, while the inaccuracy of the structural system is the main reason for cracks in the masonry filled by AACB. Like the masonry composed of traditional clay blocks, the cracks in AACB masonry are also mainly caused by the long-term or short-term bending of the structure [9]. All the cracks produced by the bending force of AACB masonry can be divided into the following forms according to the performance.

(1) Vertical through crack: Vertical through cracks mostly occur in the bottom layer of buildings. They are mainly caused by the lack of AACB masonry support, insufficient setting of structural columns, failure to set tie bars according to the specification requirements, etc.

(2) Oblique crack: Oblique cracks occur at the junction of beams and columns, the junction of primary and secondary beams and the opening of doors and windows. The width and length of the cracks are large, and basically run through all the walls. The main reasons are when sufficient stress is concentrated at the junction of windowsill and wall. Due to the objective conditions of masonry shrinkage and the influence of many pores and hollowness of AACBs, the forces in different directions are accompanied by relatively small moments. This makes the AACB not enough to collapse on the structural foundation but produce inclined cracks along the direction of the resultant force.

(3) Vertical crack: Vertical cracks mostly appear in the middle of the wall, the connection between infilled wall, frame column and other masonry, and the head and the tail of the crack relate to the mortar joint or the junction of blocks. The main reasons for this are that the quality of AACB is poor, its own strength is low, and its dry shrinkage value is high. When the dry shrinkage deformation of the block is too large, the mortar bonding strength between the deformed blocks turns higher than the tensile strength of the block, which will cause the block to crack and generate vertical cracks.

(4) Shrinkage crack: Shrinkage cracks appear at the top of the building, 500 mm below the panel beam. It is characterized by crisscross and is much more serious indoors than outdoors. The main reason is, AACB has high flexibility and is easy to deform with temperature. At the same time, on the effect of the temperature difference, the roof and wall produce different heat inflation and springy transformation. Because the thermal expansion deformation of the roof is greater than that of the wall, the roof structure will produce horizontal thrust on the wall, resulting in differently distributed shrinkage cracks in the wall [9].

(5) Horizontal penetrating crack: Horizontal penetrating cracks appear in the middle of the infilled wall, the joint between the top of the infilled wall and the beam, and even below the lintel of the door and window opening. At the same time, most horizontal cracks can penetrate the whole infilled wall along the thickness and length direction. The main reason is that during the masonry process, the plumpness of mortar in the floated coat is not enough or the speed of masonry is too fast. These result in that the mortar and the semi-solid form which did not solidify in time in the floated coat sink and shrink under the pressure caused by the weight of the upper blocks after the wall is formed. As a result, there are extensive horizontal cracks in the masonry wall, which are combined into horizontal penetrating cracks.

(6) Mortar joint crack: The problem of mortar joint is mainly reflected in the fact that the mortar joint is not dense enough due to the improper masonry at the top of the wall. The main reason is that there is a problem in the early brick arrangement and there is no reasonable planning, resulting in too many blocks on the top. This contributes to the loose seal of the wall, and then the secondary filling can only be used to remedy the hole. On the premise that the brick is AACB which is easy to be deformed by environmental factors, the mortar joints between blocks are relatively easy to generate cracks.

To sum up, there are many causes of cracks in AACB masonry, involving many aspects, mainly including material, design, and construction.

3.2 Water seepage of AACB

In the rainy areas of southern China, the problem of water seepage often occurs in AACB masonry. In addition, the overall water seepage of masonry will cause shrinkage deformation and fracture, even in serious cases, will cause hollowing or falling off of cement mortar. Freeze injury will appear in AACB masonry at low-temperature areas. There are many modes of water seepage in AACB and its masonry [10]:

(1) Mortar joint is the main way of masonry water seepage.

(2) Dry shrinkage and other reasons can lead to the cracking of blocks and the formation of water seepage channels. This cycle repeats itself ad infinitum. The channels become larger and larger, and the water seepage effect becomes more and more distinct.

(3) The connection between AACB and other materials (masonry part composed of concrete or brick, etc.) is not consistent, resulting in continuous water seepage.

(4) A sufficiently large flow of water seepage is caused by the unstable connection or mismatch between infilled wall blocks and components at the bottom of the beam.

(5) Defects in the production and use of AACBs lead to a large amount of water seepage in the masonry. For example, in the process of block production, iron bars are often inserted into the block blank to understand the gas generation of semifinished blocks, so as to leave through holes in the blocks.

The actual cause may be that the capillary pressure and even wind pressure inside the AACB are the driving force to promote water to enter. Like traditional sintered brick block, the closed micropores in AACB generally do not have capillary effect, but AACB is added with a large amount of water in the production process, which leaves many connected pores after evaporation. They are the source of capillary force. The force balance of fluid interface is the main research content of capillary system, and the force balance at the interface of capillary system is generally described by Laplace equation:

$$\Delta P = P(\theta) = \frac{\gamma}{\pi} \int_0^{2\pi} \frac{1}{R(\theta)} d\theta \quad (1)$$

$$\Delta P = \gamma \left(\frac{1}{R_1} + \frac{1}{R_2} \right) \quad (2)$$

In these two formulas, ΔP is the pressure difference acting on both sides of the interface, that is, the additional pressure or Laplace pressure, and γ is the interfacial tension coefficient of the liquid film. Formula (1) is the general expression of interfacial force balance in capillary system. θ is the angle between the tension at a point on the interface and the curvature vector at the point and $R(\theta)$ is the radius of curvature in the θ direction. Formula (2) is the expression of Laplace equation, R_1 and R_2 are random two orthogonal radius of curvature of a point on the surface under the action of additional pressure, the determination of the sign of curvature radius shall be consistent with the position of determining the pressure difference.

According to the formulas, the smaller the radius of curvature, the greater the pressure difference on both sides of the surface. The connecting pores formed in AABC are thin and long, the curvature of the liquid interface inside is very large. Therefore, the radius of curvature is very small, and the pressure difference on both sides is very large. Therefore, the capillary force of water in AABC is very large, and the block itself is prone to water seepage.

At the same time, the bonding quality of mortar and block affects the impermeability of the masonry. The influence of the bonding quality of mortar and block on the impermeability of AACB masonry is reflected in two aspects, that is, the increase or decrease of the transverse expansion constraint of masonry and the increase or decrease of the longitudinal bearing capacity of masonry. Expansion or drying shrinkage of AACB caused by moisture leads masonry to produce defects, and then water seepage appears. No matter what process is used to produce AACBs, the main gelling composition is hydrated calcium silicate gel. The formation process of the gel is shown in Figure 3. It can be seen that the gel has the characteristics of large specific surface area, amorphous and possessing large dry shrinkage value [10]. The block will dry shrinkage as it is used, resulting in

shrinkage stress. The fracture of AACB with low strength under the action of shrinkage stress or the cracking between mortar and block will lead to masonry water seepage.

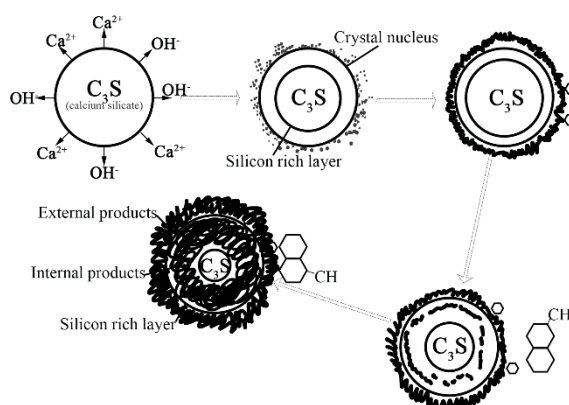


Figure 3. Formation process from Portland cement to gel

3.3 Hollowing of AACB masonry

The hollowing of AACB masonry is often limited to floated coat. The hollowing of the floated coat of AACB masonry is basically accompanied by cracking, what's more, the hollowing area is large, the crack direction is irregular and usually presents mesh. Chisel the mortar cover at the crack position and to find that the block itself is not cracked [12], which is mainly due to the cracking of the internal floated coat, resulting in hollowing of the whole masonry. The direct cause of hollowing of AACB masonry is the change of plastering mortar in the floated coat, as follows:

(1) Cracking caused by self-shrinkage of plastering mortar: Cracks caused by shrinkage of plastering mortar is one of the most common factors for hollowing of AACB masonry. It mainly includes chemical shrinkage, drying shrinkage, self-contraction, thermal shrinkage, and plastic shrinkage [12]. Plastering mortar is prone to this shrinkage, which will inevitably engender tensile stress. When the tensile stress exceeds the tensile strength of overall plastering mortar, cracks will appear in masonry.

(2) The water retention of plastering mortar cannot be satisfied with the water absorption requirements of AACB [11].

(3) The difference of thermal conductivity and linear expansion coefficient between plastering mortar and AACB wall is too large [11].

(4) The strength of plastering mortar is quite different from that of AACB: The stress deformation difference between AACB and ordinary plastering mortar is large. The cement mortar in the floated coat has high strength. The thicker the floated coat, the greater the rigidity, and the more unsuitable it is to the deformation characteristics of AACB. On the contrary, the thinner the floated coat, the lower the strength, at this time, the adhesion performance of mortar can only be sacrificed to adapt to the deformation of AACB.

However, it cannot be ignored and easily confused that the hollowing phenomenon is fundamentally due to the problems existing on the surface of AACB [13-16]:

(1) AACB is cut and machined by steel wire when the block has no strength just after aeration, and its cutting surface has a layer of loose powder particles aggregates with corrugation like fish scales brought out by steel wire. These powder particles aggregates will play a certain isolation role in the facing and affect the adhesion of the facing.

(2) Because AACB has large water content, slow dehumidification, and poor frost resistance, it is easy to appear hollowing on its surface.

(3) The low strength of AACB, large deviation of some external dimensions of it, unqualified masonry quality and other problems will lead to different width of mortar joint of masonry, uneven thickness of floated coat and different shrinkage deformation, resulting in hollowing of floated coat.

(4) Block stacking conditions, climate, watering, delivery time, construction cycle and other reasons make the water content of AACB vary greatly. At the same time, the density of AACB is also different. These two factors will lead to the large difference of AACB deformation and hollowing masonry.

4. Analysis based prevention

4.1 Prevention directed against the causes of cracking of AACB masonry

The preventive measures for different forms of cracks caused by bending force on AACB masonry are shown below.

(1) Prevention of vertical through cracks: The windowsill shall be provided with reinforced concrete strips which are not less than 60mm thick along the full length of the masonry, equipped with two longitudinal bars with a diameter of 10mm and distribution bars with a diameter of 6mm, and poured with high-strength concrete to resist deformation.

(2) Prevention of oblique cracks: The reinforced concrete strip and the lintel which are not connected shall be placed at the junction of block and concrete where cracks are likely to occur or be placed at the stress concentration.

(3) Prevention of vertical cracks: When the infilled wall is built with AACBs, the blocks shall be flexibly connected with columns and shear walls. The wall with the free end at the top shall be provided with a ring beam penetrating along the full length of the wall.

(4) Prevention of shrinkage cracks: The thickness of building insulation layer shall be increase or efficient insulation materials shall be selected.

(5) Prevention of horizontal penetration cracks: The plumpness of mortar joint in the AACB masonry shall be strictly control.

(6) Prevention of mortar joint cracks: The masonry must be removed, and the masonry construction must be carried out again.

On the other hand, for the cracking problem of AACB masonry, general measures shall be taken from three aspects, as shown in Table.1.

Table.1. General measures for cracking of AACB masonry

Period Ways	Before masonry	In masonry	After masonry
Material	Compliance	No mixing	Neat stack
Designing	Thermal calculation	Matching of strength grade	Calculation verification
Construction	Guarantee acceptance	Control speed	Mortar joint saturation

Based on Table 1, specific practices can be extended:

(1) AACB shall be delivered in accordance with the relevant provisions of relevant standards for the concrete block. For example, the concrete block can be used on the wall only after being placed out of the pool for 28 days. Different types of cement shall not be mixed. AACB shall be stacked neatly according to varieties and specifications after mobilization [17].

(2) The thermal insulation design of the building shall be stood up through thermal calculation [18], especially considering the extreme situation of large indoor and outdoor temperature difference. The overhead thermal insulation layer on the roof shall be preferentially set to reduce the temperature difference between indoor and outdoor and prevent the cracks of AACBs on the top floor due to temperature changes. II. The strength design of masonry mortar and plastering mortar shall match the strength grade of AACB, and the grade difference shall not be too far. For masonry with special performance requirements, special masonry mortar and plastering mortar shall be used [10]. III. In

order to prevent the windowsill at the lower part of the window opening from water seepage, the design shall adopt reinforced concrete windowsill or high-strength concrete windowsill.

(3) After AACBs enter the construction site, the material acceptance system shall be strictly implemented, the inspection of the discharge date of the blocks shall be focused on, and the premature use of the blocks shall be prevented. The masonry height of the wall shall be controlled within 1.8m every day, and it cannot be built to the bottom of reinforced concrete beam and slab at one time, and a certain gap shall be left. After the masonry is settled and stable for 2 weeks, it shall be repaired. The supplementary masonry shall be compacted by oblique masonry, with an inclination of about 60-75 degrees, and the fullness of masonry mortar must be high. Masonry mortar joints shall be uniform, full, and dense. The thickness of horizontal mortar joint shall be controlled within 15mm, the width of vertical mortar joint shall be controlled within 20mm, and the ratio of fullness of mortar joint shall not be less than 80% [11].

4.2 Prevention directed against the causes of water seepage of AACB

The preventive measures for water seepage of AACB masonry are as follows:

- (1) The bonding effect between mortar and AACB interface shall be improved.
- (2) The mortar with good water retention shall be adopted and an appropriate amount of early strength agent shall be added to promote the rapid hardening of mortar.
- (3) The mortar joints of the masonry composed by AACB shall be kept full.
- (4) The middle between AACB and plastering mortar layer shall be roughened.

4.3 Prevention directed against the causes of hollowing of AACB masonry

The preventive measures for hollowing of AACB masonry are as follows:

- (1) The powder surface shall be brushed with steel wire brush, anchor sprayed, and then plastered [19].
- (2) When building walls with AACBs, sintered ordinary bricks or perforated bricks or ordinary concrete small hollow blocks or cast-in-situ concrete sill shall be built at the bottom of the wall.
- (3) AACB is a kind of small hollow block of lightweight aggregate concrete and shall not be mixed with other blocks.
- (4) When the infilled wall is built close to the beam bottom and slab bottom, a certain gap shall be left. After the infilled wall is built and the interval is 15 days, it can be filled and compacted. When patching, the vertical joints on both sides shall be filled with high-strength cement mortar.
- (5) The masonry structure shall be plastered at least 60 days after the completion of masonry, and sufficient cooling time shall be given.

5. Conclusions

This paper mainly summarizes the prevention and solution measures of AACB masonry quality common faults. To sum up, it can be considered that the prevention of common problems of AACB belongs to a systematic project, the influencing factors causing common quality problems are relevant. The prevention of common quality problems requires coordination and cooperation of all aspects. Therefore, the control of each process must be strengthened. The common problems of AACB masonry must be controlled within the allowable range in accordance with the construction and quality acceptance specifications of masonry engineering.

From the perspective of development, it solves the ready-made common problems of AACB masonry, helps to promote the research and development of AACB masonry, and fundamentally grasps and controls this new material deeper. On this basis, the study of its sustainability and other outstanding aspects can be carried out, such as adding fiber or even plant fiber to AACB to strengthen its property of the structure, which is not only a breakthrough in the research direction of environmental coordination, but also an effective means to prevent common faults of AACB masonry.

References

- [1] Huang Weixin. Analysis of common Quality Defects of Autoclaved Aerated Concrete (ALC) partition board construction and Prevention Countermeasures [J]. R, 2021 (33): 169-171.
- [2] Shi Jiquan. Common Faults and Preventive Measures of Autoclaved Sand Aerated Concrete Strip Construction [C]. Proceedings of the 7th National Steel Structure Engineering Technology Exchange Conference, 2018: 418-419.
- [3] Hess, JA. Ergonomic evaluation of masons laying concrete masonry units and autoclaved aerated concrete. Clarivate Analytics Web of Science, VR 1.0, PT J.
- [4] Sun Weimin. Construction Quality Control of Autoclaved Aerated Concrete Block Wall [J]. Fujian Building Materials, 2017 (02): 47-48.
- [5] Li Maorong. Technical characteristics and prevention of common quality defects of autoclaved aerated concrete products [J]. Fujian Construction Material, 2005 (03): 54-56.
- [6] Xiao Liguang, Hu Hongliang. Journal of jilin institute of civil engineering and architecture. 2009, 26(03): 1-6.
- [7] Zhang Dashuo. Prevention and treatment of common quality defects of autoclaved fly ash aerated concrete blocks [J]. Management and Technology of Small and Medium-sized Enterprises (Next ten day), 2011 (08): 144.
- [8] Li Guangjun. Causes and Prevention of cracks in Autoclaved aerated Concrete Blocks [A]. Shanxi Architecture, 2015 (41): 20.
- [9] Ungkoon, Y. Analysis of microstructure and properties of autoclaved aerated concrete wall construction materials. Clarivate Analytics Web of Science, VR 1.0, PT J.
- [10] Yue, JW, Ma, C, Zhao, LM, Kong, QM, Xu, XC, Wang, ZF, Chen, Y. Study on Deterioration of Gray Brick with Different Moisture Contents under Freeze-Thaw Environment. Clarivate Analytics Web of Science, VR 1.0, PT J, EI 1996-1944.
- [11] Zhu, Junming, Chertow, Marian R. Greening Industrial Production through Waste Recovery: "AuComprehensive Utilization of Resources" "A È in China. American Chemical Society, SN 0013-936X, UR <https://doi.org/10.1021/acs.est.5b05098>.
- [12] Yuan Zhuang, Liu Jiajia. Analysis of the Role of High precision Autoclaved Aerated Concrete Block Thin Layer Masonry Method in prevention and Treatment of masonry Engineering Quality Defects [J]. Chinese and Foreign Architecture, 2020 (03): 205-206.
- [13] TENG Y M. Study on basic mechanical properties of autoclaved aerated concrete block [D]. Shihezi University, 2015.
- [14] Zhao Chengwen, Wu Di, Gao Lianyu. Journal of shenyang jianzhu university (natural science edition). 2013, 29(02): 243-250.
- [15] Xu Chunyi, Zhao Huan, Xu Chunlei. Experimental study on shear performance of aerated concrete block with glass fiber grating [J]. Sichuan building science research, 2017, 43(02): 1-4.
- [16] Pang, Chuan, Y. Military training-related abdominal injuries and diseases: Common types, prevention, and treatment. Clarivate Analytics Web of Science, VR 1.0, PT J, AN 35331607.
- [17] Shen Jianfei. Analysis on thin layer plastering technology of autoclaved aerated concrete block [J]. Wall material innovation and building energy conservation, 2019 (10): 38-41.
- [18] Qin Shihong, Dong Bowen, Lu Ji, Cheng Guping. Experimental study on seismic performance of autoclaved aerated concrete masonry wall. 2011 International Conference on Electric Technology and Civil Engineering (ICETCE), 2011, PP 2223-2226, DOI 10.1109, ICETCE 2011.5775268.
- [19] Huang Haifeng, Shu Kai, Ye Danmei, Jiao Qiao. Development status of special mortar for autoclaved aerated concrete products and application prospect of dry construction [J]. Wall material innovation and building energy conservation, 2019, (06): 17-19.