

# China Kang Heating Room Fresh Air into the Indoor Research Facilities

**Hongguo Ren**

*renhongguo@126.com*

*College of Civil and Architecture Engineering*

*Northeast Petroleum University; Daqing*

*Heilongjiang163318; China*

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## Abstract

Based on Chinese fire resistance heating room existing air quality problem, on the basis of investigation and research, detailed arrangement the town heated kang residential air supplement mode, and analyzes the typical example, put forward the improvement fire resistance heating and fresh air into the indoor facilities design scheme, and research into new facilities in rural different forms of heated kang residential application forms.

**Key words:** Fire Resistance, Heating into the Fresh Air.

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## 1. INTRODUCTION

Fire resistance is the earliest human control method of heating, due to its many advantages has been widely used in cold regions of China. Since the reform and opening up, Chinese rapid development of economic construction, the city of multilayer high-rise residential heating basic use central heating, fire resistance thus gradually from city residential gradually retreat, but in city suburbs and the vast rural areas is still widely used<sup>[1]</sup>. The country's present energy conservation, the environmental pollution and most of the village economic income perspective, heated kang housing is still irreplaceable ideal heating mode. China's rural house indoor air quality is mainly by cooking, heating and other consumer life energy impacts, villages and towns use clean fuel or senior less fuel, still in biomass fuel and coal is given priority to. The main fuel and cooking, heating stoves use, to indoor send out a CO, SOX, NOX, such as fine particulate air pests<sup>[2]</sup>. Indoor air pollution (IAP) is a health hazard of the main environmental factor, 4% of the global burden of disease due to indoor air pollution, and tobacco disease burden is quite. In rural areas of indoor air pollution is mainly due to fuel combustion and of generation, especially the incomplete combustion, a large number of pollutants are released into the indoor air, in the winter more serious (twenty times the WHO standard). In China, coal and biological fuel is the main fuel in rural areas, the fuel burns can release particulates (RMP), carbon monoxide, sulfur dioxide, fluoride, aldehydes, etc to the health of human body harmful substances. Developing countries some

monitoring data show that the indoor air fine particulate concentration reaches as high as 1000 to 10000 mg/m<sup>3</sup>, more than the national environmental protection agency standard (100 mg/m<sup>3</sup>) 10-100 times. Developing countries rural areas indoor particulate exposure level in rural areas is the developed countries of seven to 26 times. Indoor air pollutants are because respiratory disease (such as acute respiratory infection and chronic obstructive pulmonary disease) of the main risk factors, especially for women and children's health is more serious damage. Around the world each year 12 million children under the age of five die 20% died of acute lower respiratory tract infection. The World Bank report stressed that IAP in China's poor suburb, rural areas and alpine region women and children lung disease burden is very high, the main reason each year about 150000 children under the age of five die in acute lower respiratory tract infection. Reports estimate, in China each year about excess killed 111000 people, 220000 people, in emergency 4.3 million person-time, ' '3 million campaign is limited, due to indoor air pollution. Indoor air pollutants chronic exposure can also lead to low birth weight, increase the incidence of tuberculosis and cataract. Our rural house interior into the fresh air ventilation system research and development, through the questionnaire survey and field testing combination way. The questionnaire according to the particularity of the small towns, in order to emphasize the indoor into the fresh air. Research shows that: the residential indoor environment; Residents to fresh health and energy consumption in understanding; Residential natural into fresh air condition investigation, Natural into fresh air condition, specific include different seasons of different function room window area, open the window way and window time survey; Mechanical into fresh air condition, specific include toilet, kitchen and bedroom indoor ventilation equipment selection condition survey. At the same time, in order to understand the effect of fresh air into the system, but also for indoor air quality and the indicators of the fresh air volume test<sup>[3]</sup>. Compared with cities, rural house in natural fresh air into a unique advantage. Town of outdoor air quality is better than the city, if can reasonable use of natural into new technology, strengthen interior into fresh air ventilation, small town residents residential indoor environment status will be greatly improved<sup>[4]</sup>.

## **2. FIRE RESISTANCE HEATING AND INTO THE FRESH AIR FACILITIES STATUS**

### **2.1 Town Heated Kang Residential Air Supplement Mode**

Rural house there has always been a winter indoor air quality problems, especially in the national "eleventh five-year plan" project to support science and technology work of the research found that due to the building energy efficiency makes envelop thermal insulation, air performance has been much improved, through the doors and Windows and retaining structure aperture infiltration into building internal outdoor fresh air, lead to reduce indoor air quality deterioration, and building and usually in into the fresh air facilities into consideration is not enough or no consideration, in building energy saving in further today, to pay special attention to residential buildings in cold air into the research, especially in heating season into the problem of indoor air, Otherwise pay a cost to build energy saving building, on the contrary, because indoor air pollution to habitant bring serious harm.

### **(1) Permeability**

Most rural house is breathable, i.e., building shell contains a lot of air inlet and air out of the channel, such as doors and Windows, in and out of the gap, wire around the pipeline gateway, foundation and holes. Outside air into by building insulation shell seal degree, wind speed and the temperature difference between inside and outside and the influence of environmental factors. Due to the building structure and building energy saving technology to promote this way into fresh air is decreasing.

### **(2) Open the door into the wind**

Heated kang housing in the use of time will be DaoYan, shoot, meteor fire (see chart 1), such as the lack of fresh air, leading to the villagers in cooking, burn when kang door are often forced to open, the door into the fresh air is to accelerate the air flow, eliminate indoor pollutants plays a role, but sufficient fuel combustion, human activities on the new requirement is long, and not be able to solve a centralized open, this kind of centralized open but make a lot of heat loss, cause human energy saving failure.



**FIGURE 1:** ChaiZao Meteor Fire Schematic Diagram.

## **2.2 Analysis of the Status of Typical Examples**

The author research by heilongjiang housing and urban and rural construction and French environment and energy control department design of heihe love bright outside the three DaoGou

village close tree village residential use fire resistance heating and indoor air facilities in residential fire resistance (see chart 2). Based on the case of residential closed consideration, chimney is the only foreign empty. Indoor heated kang, ChaiZao use and human activities will lead to internal pressure is reduced, the outside air chimney reverse pressure into indoor, the heated kang house doesn't burn well, indoor air quality bad based on this thinking puts forward the fire resistance heating indoor into fresh air facilities design patterns.

Both fresh air into the facility design is as follows:

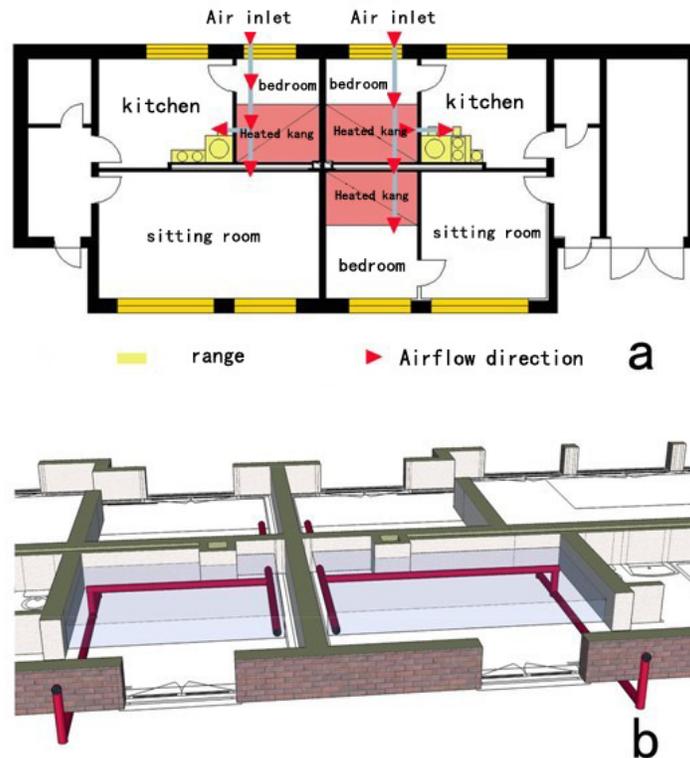


FIGURE 2: a: A Typical Residential Air Facilities Plan b: Fresh Air Facilities Isometric View.

### 2.3 Both Fresh Air Facilities into Problems

The author research the heilongjiang housing and urban and rural construction and French environment and energy control department design of heihe love bright outside the three DaoGou village close tree village residential use fire resistance heating and indoor air facilities in residential fire resistance, design considering the poor residents in use its plugging phenomenon (see chart 3). The reason is that outdoor cold air into the room temperature is too low, too fast, can't control, etc.



**FIGURE 3:** Typical Residential into Fresh Air Facilities Plugging Phenomenon.

### **3 FIRE RESISTANCE HEATING AND INDOOR AIR INTO INFRASTRUCTURE IMPROVEMENT STRATEGY**

#### **3.1 Fire Resistance Heating and Indoor Air into Infrastructure Improvement Goals**

##### **(1) Suitable for fresh air temperature**

The goal is to improve in maintaining the characteristics of the system under the premise of, enables it to achieve the temperature requirements. To meet the People's Daily needs, improve the existing facilities for residents to bring the discomfort.

##### **(2) The fresh air flow control**

Indoor air supplements should have a certain amount of demand, but also can not be too big, To fresh flow control helps regulate the consumption of facilities, and the temperature of the guarantee.

#### **3.2 Fire Resistance Heating and Indoor Air into Infrastructure Improvement Design**

##### **(1) Improve content**

According to the problem of fresh air facilities reconstruction import mode and fire resistance, the combination of the way and the proposed control method.

##### **(2) Improvement Principle**

Based on the fire resistance heating, into the new facility design mode of action principle, in indoor and outdoor with a catheter into the fresh air for connection, and the conduit of the indoor air conveying all through the heated kang preheating, then through oven, kang and chimneys discharge outside. According to the wind tunnel to wind control principle set u-bend. The characteristics of rural house in northeast China, fresh air port work area cooling load is too large, only fresh air through the heat source can essentially solve the problem of fresh air to send. The study found that the disadvantages of fresh air in between each other is not isolated, such as supply air temperature difference, cold load, working blow a cold wind over, but restrict each other, related factors. Several parameters indirectly through the air supply outlet geometric characteristics (size, shape, tuyere type), resistance characteristics and installation parameters

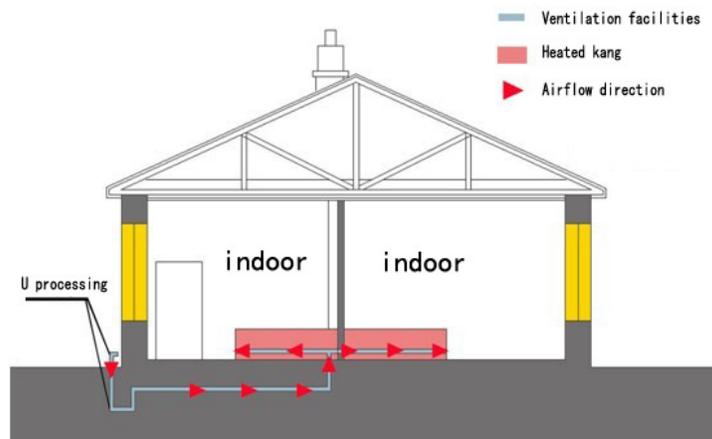
(tuyere installation height, direction, etc.) reflected. The practical application can introduce rural house. In rural house can be through a facility, the outdoor air through the fire resistance heating systematically into indoor, which can overcome the cold region of the facility in a series of new problems. This facility model of the main technical measures is as follows:

### (3) The fresh air tube U design

To effectively avoid the cold wind factors, into the fresh air into the FengKouChu device designed to U (see figure 4), concave to the outer wall. And the fresh air into the mouth at the entrance to the design window screen net block particles. Into the fresh air pipe buried under 900 mm.

### (4) Coil heating

Increasing the length of the tube heated take, set to coil form. The ministry is divided into the fresh air part

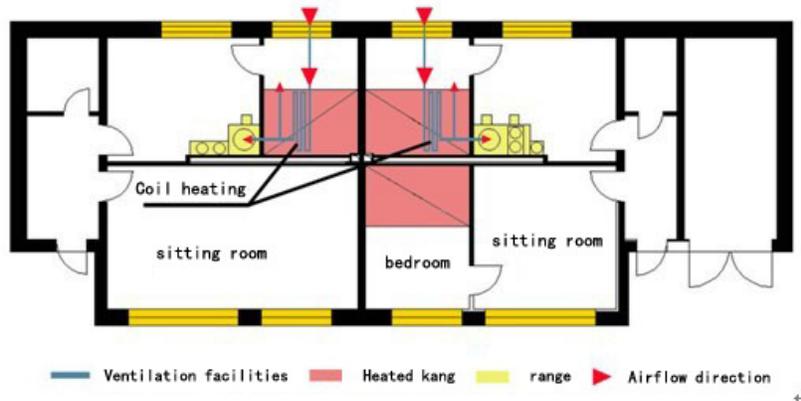


**FIGURE 4:** Typical Residential Ventilation Facilities u-shaped Ventilation Pipe Design.

of the power, temperature ascend, and integration of the important parts of the combination, so this part of the function is diverse, material also generally have all aspects of performance: reference standard JC646-1996 against odd strength index and inspection method has made the detailed provisions, the main consideration into fresh air pipe is thin wall (3 to 8 mm) fitting, and long-term heating use, service life requirements in 30 years, so the mechanical strength is a very important mechanical properties. Second fire resistance, heating pipe for a long time in heating environment use, its mechanical performance not significantly reduce called the nature of fire resistance. Heating pipe using the environment more complex, this requires heating pipe must have good fire resistance. Good toughness is into the fresh air in the pipe installation, maintenance of common problems. In this process, products must be from great impact and pressure, such as foot, hand to touch, the weight of the application, even by the strong impact and sharp (see chart 5).

### (5) Facilities material

Into the fresh air at the entrance to new device with high thermal inertia of the materials, such as PVC, etc.; combined with



**FIGURE 5:** Typical Residential Ventilation Facilities Coil Design.

the fire resistance material selection of refractory material and prevent damage to the facilities.

### (6) Proposed control valve

Control valve installed in the air port room side. But must function sensitive and with their into fresh air system mutual matching, should also be adaptable, easy to use, reliable and accurate, easy to maintain, durable. Among them, one of the key characteristics should be simple to use. Many controllers has many functions, but for town dwellers feel its operation is too complicated. Simple easy to use that can help people understand the operation of the control method and the fresh air system into an understanding.

## 4. FIRE RESISTANCE HEATING AND INDOOR AIR FACILITIES IN APPLIED RESEARCH

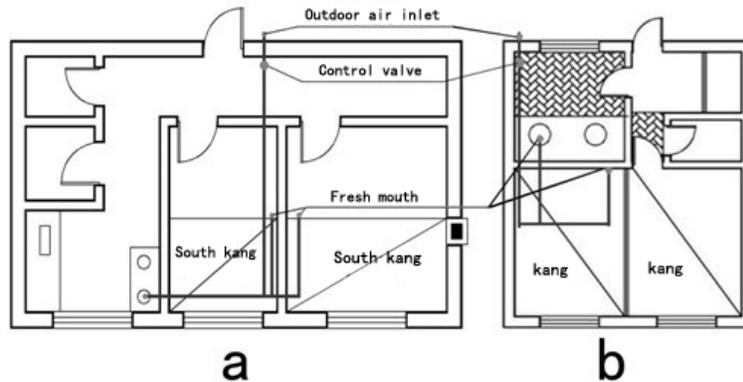
Due to the fire resistance of various shape, into the fresh air facilities in one of the application is also different, this paper illustrates two types of fire resistance application modes for practical reference.

### (1) South kang application mode

Facilities system with this form of fire resistance with facilities (see chart 6 a) shows, air inlet design in side wall, the outlet were set up in the bedroom and kitchen, the corresponding setting control valve, to ensure that fresh air into the many and velocity, and the form of fire resistance combination should pay attention to air inlet aperture Settings, because in winter heating season leading northeast wind for the northwest wind, fresh air is with dust and pollutants, so attention should be paid to set up air inlet to ensure air quality.

## (2) Full PuHang application modes

Facilities system with this form of fire resistance with facilities (see chart 6 b) shows, air inlet design in side wall, the outlet were set up in the bedroom and kitchen, the corresponding setting control valve, to ensure that fresh air into the many and velocity, because the shape of the heated kang area occupied the whole the size of the room, generally the air port Settings in the side wall of the inner edge, the arrangement of the time to try to consider side arrangement so that we can guarantee to avoid air mixing pollution, and the formation of uniform flow field, the bedroom air uniform flow to the sitting room, and then to the kitchen hearth crater, the chimney discharge.



**FIGURE 6:** Into the Fresh Air Facilities in the Fire Resistance of The Application of The Housing.

## 5. CONCLUSION

- (1) The investigation of northeast China's fire resistance heating room indoor new wind, detailed finishing the town heated kang residential air supplement mode, the typical case analysis of the current situation, discusses the new wind facilities both problems.
- (2) Proposes fire resistance heating and indoor into fresh air facilities improvement strategies, including improvement goals and improved design scheme.
- (3) Lists into new facilities and south kang, full PuHang these two types of fire resistance application mode.

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