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Reuse of Traditional Wisdom in Fire Prevention: Analysis of Fire Safety Problems and Exploration of Fire Prevention Strategies in Ancient Minority Villages in Yunnan

-- Based on the Investigation of Three Typical Fire Events in Yunnan

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Abstract: As one of the important cultural heritages of the Chinese nation for five thousand years, the ancient minority villages in Yunnan have diversified values of society, science, history, culture and art, etc. These are the basic resources to revitalize the rural economy and realize the great rejuvenation of the Chinese nation. Once the fire destroys, it will be an irreversible loss. Therefore, based on the investigation of typical ancient village fire events in Yunnan province, this study reflected on the common causes of ancient village fires, discussed the fire prevention strategies of ancient villages from the perspective of traditional fire prevention wisdom reuse, and proposed fire protection measures for ancient minority villages in Yunnan, providing certain reference for the fire protection work of ancient minority villages in Yunnan province.

Keywords: Ancient Minority Villages; Fire Safety; Fire Prevention Strategy; Traditional Fire Prevention Wisdom.

1. Introduction

Ancient villages refer to villages formed earlier, with rich cultural and natural resources, and with high historical, cultural, scientific, artistic, economic and social values, which should be protected. Ancient villages contain rich historical information and cultural landscape, which is the biggest heritage left by China's farming civilization.

Since 2012, the Ministry of Housing and Urban-Rural Development, the Ministry of Culture, and the Ministry of Finance have publicized the list of ancient villages in China in five batches, and 6,819 ancient villages in China have been included in the list of ancient villages in China, of which 5 provinces in southwest China account for 28%, and Yunnan accounts for 10.38%, second only to Guizhou. At the same time, the ethnic minorities in Yunnan Province are in the first place in the country, and the ethnic culture shows the characteristics of diversity and richness, and the ethnic culture has become the core of the ancient villages in Yunnan. For example, the ancient village of Wengding, as an ancient village that has stepped from primitive society into socialist society, has witnessed the cultural process of the Wa people for more than 4,000 years.

Fig 1. Division of main communities in Dukezong Ancient City

However, the ancient village fire has a high incidence, once it occurs, it will cause irreversible destruction. On February 14, 2021, a fire reduced the ancient village to ruins. In fact, in the long course of human development, we always continue to find a way to live in harmony with nature, and sum up various disaster prevention wisdom, such as: the ancient Hakka village in western Fujian opened waterways for both transportation and fire protection isolation, Anhui traditional houses set up horse-head walls for fire protection isolation, and some houses set fire prevention pools or water tanks in the yard.

The purpose of this study is to investigate the destruction of cultural heritage caused by three fires in Dukezong Ancient City, Wengding Ancient Village and Lijiang Ancient City, analyze the causes and problems of the fires, and explore the fire prevention strategies of ancient minority villages in Yunnan from the perspectives of "prevention" and "eradication". Meanwhile, in this study, the combination of the old and the new was adopted, and the reuse of traditional fire prevention wisdom was emphasized, and some modern fire protection facilities with strong adaptability were combined to solve the incompatibility of the current modern fire protection facilities for the fire protection work of ancient villages in Yunnan and reduce fire losses. More importantly, this study can provide a protection for the fire prevention and build up a good basis for the development of ancient villages in Yunnan.

2. Typical Cases of Fire in Ancient Minority Villages in Yunnan

2.1. Case of Dukezong Ancient City Fire

2.1.1. Brief Introduction of Dukezong Ancient City

Dukezong ancient City of Shangri-La was built in the Tang Dynasty, more than 1,300 years ago, the ancient city of

Dukezong road radiates from the center, like a spider web, the center of which is Dagui Mountain.

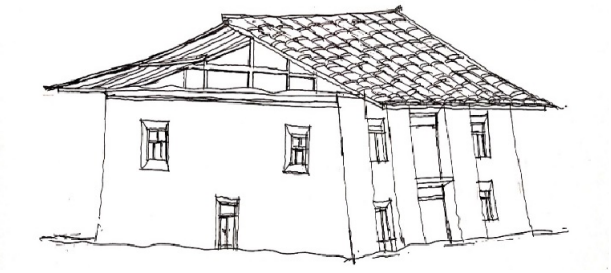

Fig 2. Forms of residential houses in Dukezong

Dukezong ancient city is mainly divided into Warehouse, North gate, Jinlong three street communities (Fig.1) and other historical and cultural streets, with rich space and perfect preservation.

2.1.1.1 Folk House Form

Dukezong's residential form is called "shanpian house" (House with wood block tile.). The construction of the house combines the local terrain environment and climate characteristics, based on the local unique construction materials, and integrates the production and life style of residents, local characteristics and culture as well as the advantages of other ethnic architecture. It mainly has the following characteristics (Fig.2):

Table 1. Features of the "Shanpian" house

"Shanpian" house	Trait
Plane layout	The one-line layout is composed to form a courtyard
Outer wall	Thick rammed earth walls, drawing upward
Window	Small number, small opening, "trumpet" type, large inside and small outside
Roofing	Double slope roof, gentle slope
Interlayer	It is composed of the slope roof and the flat roof of the second floor, which is dry and ventilated, storing grass and debris, and has a multi-functional utilization space

2.1.1.2 Fire Infrastructure Overview

Table 2. Fire Infrastructure Overview

Fire infrastructure	Construction situation
Fire spacing	Adjacent to each other, no firewall, staggered, no fire spacing
Fire protection zone	Undivided
Fire escape	The road is narrow, only 2-4m, mostly for people and horses
Fire pool	Late transformation, the layout is not appropriate
Fire hydrant	Insufficient quantity, insufficient water supply pressure

2.1.2. Basic Situation of Dukezong Fire

2.1.2.1 Accident Course

Table 3. Accident Course

Occurrence time	Location	Locations	Fire condition	End time
January 11, 2014, 1:37 a.m	Shangri-la County Dukezong ancient city	Warehouse community, "Ruyi Inn" operator's home	Spread of fire	January 11, 2014 at 10:50 a.m

2.1.2.2 Accident Cause

Table 4. Accident Cause

Direct cause	Improper use of the heater
Indirect cause	The temperature is below zero and the wind is strong
	The fire hydrant does not have specific anti-freezing measures, and the pipeline is not laid under the frozen soil, resulting in the normal water discharge of the fire hydrant
	The self-contained fire engine does not have enough water
	The passage in the ancient city is narrow, and large fire trucks cannot enter the operation
	The ancient city "shanpian house" is mostly wood material, and the fire resistance grade is very low
	The water pressure of municipal fire water supply network is insufficient
	Fire linkage is weak, ignoring traditional fire wisdom

2.2. Case of Wengding Village Fire

2.2.1. A Brief Introduction to Wengding Village

Weng Ding Village, back to the mountain and near the water, the ancient banyan tree, which is regarded as a sacred tree by the villagers, is surrounded by the village, the whole village is shaped like a chair, and the road is like an eight diagram. The traditional folk customs, festival activities, sacrificial rites, dialect costumes and other characteristics of the history and culture of the Wa people took root here. Here, the traditional architecture of the Wa people, shala house (A public space for conversations and leisure.), granary house, wooden drum house, walled gate, etc. are preserved, perfectly integrated with the natural ecological environment.

Fig 3. Forms of dwelling houses in Wengding village

2.2.1.1 Folk House Form

Table 5. Folk House Form

Stilt style architecture of the Wa people	Trait
Structural form	Structural form made of grass and wood
Spatial structure	The bottom structure uses wooden pillars to carry weight at the same time; The roof structure adopts "herringbone" frame
Spatial form	The dwelling houses have two floors: 1) The ground floor is used for stacking firewood and raising poultry; 2) The upper layer is used for the daily living of villagers
Roof form	1) Awl-shaped cage type; 2) East Asian hip-and-gable roof type; 3) Half square and half round "Kongming hat" type

2.2.1.2 Fire Infrastructure Overview

Table 6. Fire Infrastructure Overview

Fire infrastructure	Construction situation
Fire spacing	3 ~ 6m, and continuous layout of buildings
Fire protection zone	Undivided
Fire escape	Narrow
Fire pool	Two
Fire hydrant	Twenty-four

2.2.2. Basic Situation of Fire in Wengding Village

2.2.2.1 Accident Course

Table 7. Accident Course

Occurrence time	Location	Locations	Fire condition	End time
At 17:40 on February 14, 2021	Cangyuan Wa autonomous County Mengjiao nationality township	Inside the Wengding village	Fire spread	February 14, 2021, 23:15

2.2.2.2 Accident Cause

Table 8. Accident Cause

Direct cause	Not applicable
Indirect cause	Windy
	Ancient village buildings are all grass, wood, bamboo and other flammable materials
	There is a large amount of firewood accumulation at the bottom of ancient village buildings
	Firefighting facilities in the ancient village are not perfect, only each household is equipped with a fire extinguisher
	Serious deficiency of fire supervising and control
	The location of the ancient village is remote, and the external fire aid is delayed
	The hidden danger of separating people from villages is great, and traditional fire prevention wisdom is ignored

2.3. Case of Old Town of Lijiang fire

2.3.1. Introduction of Lijiang Ancient Town

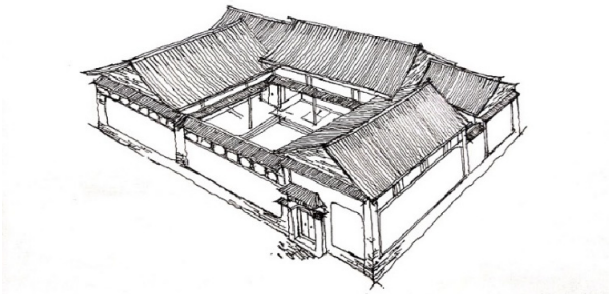

Fig 4. Forms of residential houses in the old town of Lijiang

The Old town of Lijiang is not only a famous historical and cultural city in China, but also a world cultural heritage. It is also a historic building with a long history of local culture and ethnic characteristics. With water as the core, the building forms a spatial layout facing south, integrating the characteristics of mountain city and water town, and the elegance of Naxi, Bai, Yi and other ethnic groups, creating a unique historical civilization with the collision of diverse cultures.

2.3.1.1 Folk House Form

Table 9. Folk House Form

Lijiang traditional residence	Trait
Layout planning	By the mountains and by the water, along the streets, orderly
Space form	1) Chinese style courtyard form; 2)"three houses and one screen wall facing a house"(The most basic and common type of Dali Bai folk houses. It consists of three houses and a screen wall to form a courtyard.) and "four houses and five courtyards" residential forms (The most basic and common type of Dali Bai folk houses. The four houses are enclosed to form five courtyards.)
Gate tower	1) Brick arch type; 2) Wooden beam flat arch type; 3) Wooden frame type
Building component	Hanging fish, wooden windows, courtyard walls, gatehouses, pillars, pendant lanterns, patio paving, etc.
A screen wall facing a house	Three drops type, "一" font flat type (Chinese character of one), and it's located at the oncoming entrance
Door and window partition	It has elaborate wood carving patterns

2.3.1.2 Fire Infrastructure Overview

Table 10. Fire Infrastructure Overview

Fire infrastructure	Construction situation
Fire spacing	The group arrangement of traditional residential buildings does not meet the requirements of fire spacing
Fire protection zone	Undivided
Fire escape	Most of the streets are narrow and tortuous, and do not meet the needs of fire vehicles
Fire pool	None, but with some natural fire supply water source (stream)
Fire hydrant	The municipal fire hydrant is a branch pipe network, and the water supply is unstable

2.3.2. Basic Situation of Fire in the Old Town of Lijiang

2.3.2.1 Accident Course

Table 11. Accident Course (1)

Occurrence time	Location	Locations	Fire condition	End time
March 11, 2013 at about 20:30	The ancient city of Lijiang	Guang Yi Street Xian Wen Lane No. 41, a camel bell shop, the northeast bedroom on the second floor	The fire spread and was put out for three hours	March 11, 2013 at 23:47

2.3.2.2 Accident Cause

Table 12. Accident Cause (2)

Direct cause	Burning handicraft lines ignites combustibles
Indirect cause	The river water in the ancient city does not meet the fire water supply
	The streets of the ancient city are narrow and the fire rescue is difficult

2.4. Damage Caused by Fire

The non-renewability of the ancient minority villages in Yunnan determines their value. Once they are attacked by fire, the loss value in the aspects of society, science, history, culture and art is incalculable.

2.4.1. Fire Loss in Dukezong Ancient City

2.4.1.1 Dukezong Ancient City Fire - Affected Area

The materials of the local buildings are all derived from nature. The industrious and intelligent Tibetan people made full use of the local natural resources and created the "shanpian house" of wooden structure. The roof made of shingle "shanpian" reflects the strong characteristics of Tibetan residential houses, but some of the "shanpian house" has disappeared forever in the raging fire.

In the Jan. 11 Dukezong Ancient City fire incident, the buildings in the core area of the ancient city, six main streets and the central square were burned down, which not only brought great losses to the people's economic property, but also caused great damage to the historical and cultural

heritage of the ancient city and the national style.

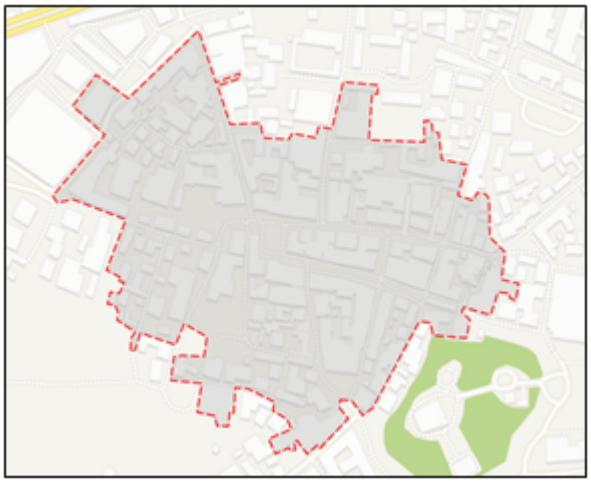

Fig 5. Fire damage area of Dukezong Ancient City

Fig 6. Comparison of Dukezong Ancient City before and after the disaster

2.4.1.2 Dukezong Ancient City Fire - Historical and Cultural Street Damage

The streets and alleys of Dukezong ancient City are important public spaces for local villagers' life and social communication. The ground of the street is paved with a large number of slabs, which is convenient for people to travel and also conducive to the evacuation of precipitation. The ancient city houses are reasonably spaced and the streets are well-proportioned. However, a fire has destroyed the historical style of the streets that have been preserved for hundreds of years, and lost the original heritage, which is difficult to be restored. Including streets named after "Lun", "Lang" and "Dogu".

2.4.1.3 Dukezong Ancient City Fire - Damage to Historical and Cultural Sites

The market space in the ancient city of Dukezong is an important occasion for people to socialize and trade. From the most primitive barter exchange place to the prosperous commercial square where modern trade can be carried out, the business culture has been constantly renewed. This precious cultural wealth has driven the rapid development of the economy and promoted the inheritance of culture. However, a small spark breaks all this, and the historic commercial district is gone with the fire. The commercial neighbourhoods that burned down included one Taraka and two Shenla, totaling three market Spaces.

2.4.1.4 Dukezong Ancient City Fire - Jinlong Street Ancient Building Group Damage

Jinlong Street is the second batch of state level cultural relics protection units, built from the Qing Dynasty to the Republic of China, consisting of Chen Yingguan Mansion, Chen Yingguan ancestral house, Huang's old house, Bina's old house, Yang's shop, Yimu's old house, etc., which retains the style of traditional houses in the ancient city of Dukezong and has very high historical and cultural value.

2.4.1.5 Dukezong Ancient City Fire - Economic Loss

In addition to cultural losses, the ancient city also suffered huge economic losses.

Table 13. The economic loss of the ancient city

Loss situation	The burned area of the building is 98.56 acres, and the burned area is 59980.66m^2, a total of 242 buildings
	The direct loss was 89,839,300 yuan

2.4.2. Fire damage in Wengding Ancient Village

2.4.2.1 Wengding Ancient Village Fire - Extent of Damage

Wengding Ancient Village has preserved the traces of life of the Wa people, containing a unique spiritual culture, but a fire destroyed the "symbol of historical memory" which of more than 400 years, destroyed almost all the thatched houses, and the Wa Township inherited from generation to generation suffered irreversible destruction.

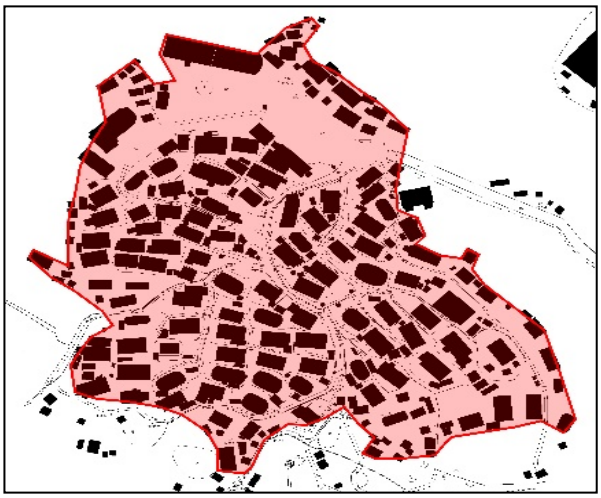

Fig 7. Fire disaster area in Wengding Village

Fig 8. Comparison of Wengding village before and after the disaster

2.4.2.2 Wengding Ancient Village Fire - House Damage

Table 14. The burning of houses in the Wengding Village

Loss situation	104 houses were burned down, including two walled gates and four latrines

2.4.3. Fire Loss in the Old Town of Lijiang

2.4.3.1 Lijiang Old Town Fire - Affected Area

The streets and alleys in the ancient city of Lijiang are narrow and the folk houses are closely linked. The March 11 fire destroyed Xianwen Lane and a large number of residential buildings.

Fig 9. Fire disaster area in the old town of Lijiang

2.4.3.2 Lijiang Old Town fire - Street, Building Damage

The streets and traditional houses in the old town of Lijiang contain precious memories of villagers and tourists over the years, and leave traces of people's lives. But the fire destroyed the streets and traditional houses, and destroyed the historical appearance of the old town of Lijiang.

2.4.3.3 Fire in the Old town of Lijiang - Economic Losses

In addition to cultural losses, the ancient city also suffered huge economic losses.

Table 15. Economic losses

Loss situation	The building was burned to 2,243.46 m^2 and 107 houses were destroyed
	Direct economic losses amounted to more than 9 million yuan

3. The Factors That Caused the Ancient Village Fire

3.1. Neglect The Use of Traditional Fire Protection Wisdom

In the old days, due to technical reasons, the ancient village buildings had certain safety risks in the structure. Now, the development of modern science and technology allows people to use better ways and materials to transform the original buildings. For example, the “shanpian” roof structure of the ancient city of Dukezong in Yunnan Province was originally fixed by the gravity of stones. Considering the safety problems caused by high local wind speed and wind pressure, the “shanpian” is now fixed directly on the roof with nails.

In addition, the separation of people and villages is a deadly cause of fire hazards. With the continuous development of the society, villagers moved to other places in pursuit of a better life, resulting in the "hollowing out" of the village. The important role played by the original residents in the fire fighting of the ancient village was abandoned, resulting in the new managers of the ancient village ignoring the application of traditional fire protection wisdom in the fire fighting of the ancient village. For example, the fire control strategy of Wengding ancient village has been self-established in the historical development and has strong applicability, but due to the separation of people and villages, and the neglect of the traditional fire prevention wisdom that still works, resulting in the fire tragedy.

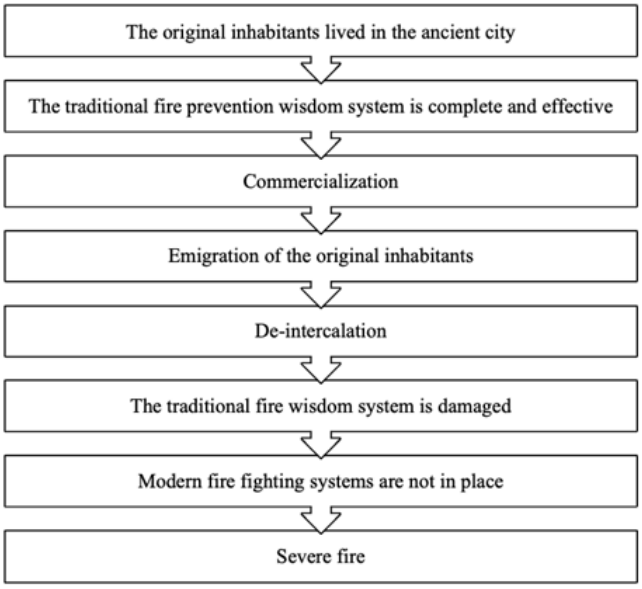

Fig 10. Schematic diagram of the evolution of traditional fire prevention wisdom in ancient villages

It can be seen that it is obviously impractical to completely abandon traditional fire protection wisdom and apply modern fire protection measures to the fire safety work of ancient villages.

3.2. Weak Fire Awareness

The indigenous people live self-sufficient, have limited education, and have weak awareness of fire and electricity safety. Most villagers have not received fire safety training and exercises, lack relevant knowledge, and cannot properly use modern fire fighting facilities.

Due to the development of the local economy and the release of relevant policies such as relocation, old residents have moved into the new resettlement area. However, most of the new residents in the ancient villages are foreign tradesman or foreigners, and the new residents do not know the living habits of the indigenous people, the reasons for the formation of architectural structures and the ways of fire prevention and disaster prevention of ancient buildings, and there are certain cultural gaps and cognitive differences in the use of architectural functions. They retrofit the existing buildings in order to achieve greater economic benefits and improve the quality of life.

Table 16. Fire protection in ancient villages is backward

Weak condition	There is no established full-time fire brigade in ancient villages to implement the fire patrol standby system
	There is no mass prevention and control, and the joint liability system is implemented
	No attention is paid to fire protection in specific seasons

3.3. Early Fire Warning Facilities are Inadequate

The "empty nest" ancient village characterized by "people go and the house is empty" or the left-behind old people has become a significant feature of the evolution of historical and cultural settlements. Nowadays, the problem of "hollowing out" of ancient villages in Yunnan is obvious. If a fire occurs in a certain area, no alarm device is installed and no personnel

find the fire, resulting in the rapid spread of the fire, affecting the connected wooden structure buildings, resulting in a larger scale burning, and the fire spread fiercely. However, A large number of combustible materials in front of and behind the house usually block the fire evacuation channel, and once these flammable materials begin to burn, the crowd is difficult to evacuate, and the fire rescue is difficult to carry out. Especially in the case that foreign tourists do not know the local environment and traditional fire fighting methods, it is easy to cause large-scale casualties.

3.4. Fire Protection Measures are not Perfect

In the analysis of the above three typical cases, the fire occurred from January to March, when the climate is dry and cold and the wind is strong, and the fire risk is great. At the same time, most of the ancient minority villages in Yunnan are a structural form made of grass and wood or soil and wood, and the fire protection performance is very low. In addition, fire protection and other issues were not considered in the development process of ancient villages, and fire hazards were fundamentally buried, but the traditional buildings of ancient villages have not implemented corresponding fire prevention measures.

Table 17. Condition of fire protection

Condition of fire protection	Traditional building wood structure does not take fire retardant coatings to enhance fire performance
	There is no fire barrier to prevent the spread of fire and other related measures
	There is no additional fire water storage tank, reservoir and other facilities to increase fire water consumption

3.5. Fire Protection Facilities are Not Targeted to Ancient Villages

Due to historical reasons, the layout of fire fighting facilities was not considered in the planning of ancient villages, and the public fire water supply network was lacking. Some ancient villages still do not pay attention to the establishment of fire water sources and fire hydrants when they are renovated and expanded, and due to special geographical environment and water source problems, some fire hydrants are only symbolic decorations, and the pipeline has little water storage and low water pressure. In addition, because some ancient villages are located in high altitude areas, the night temperature is too low, the frozen soil layer is deep, and the water pipes are easy to freeze and crack in winter, so the fire pipe has a periodic water cut period, and the fire water supply cannot be guaranteed.

Most of the ancient minority villages in Yunnan are far away from the towns, and it is difficult for the fire brigade to reach them in time and quickly, and the fire will spread quickly. Most of the main roads in ancient villages are narrow, and there are obstacles such as steps and thresholds, which makes it difficult for fire trucks to directly enter the fire fighting, villagers are difficult to save themselves, and rescue personnel can not go deep into the interior for rescue.

4. Fire Fighting Strategies of Ancient Villages

Ethnic minority ancient villages are mostly concentrated in mountainous areas, with low traffic accessibility and weak infrastructure. Ethnic minority residents live in the mountains all year round, are self-sufficient, have little contact with the outside world, and are closed-minded. In view of this situation, the importance of fire safety in ancient villages still needs to be improved. We should implement "one village one policy", carry out special implementation, and formulate fire prevention strategies to meet the special fire prevention needs of ancient villages according to local conditions.

4.1. Strengthen the Reuse of Traditional Fire Prevention Wisdom

Human behavior has a direct impact on fire. The use of traditional fire prevention wisdom should be integrated with modern fire prevention technology. Traditional fire protection wisdom has been passed down from generation to generation in the production and life of local residents for many years, mainly reflected in the rational use of building materials and the continuous improvement of building structure and construction technology.

4.1.1. Traditional Fire Wisdom - Building

4.1.1.1 Building Structure

In view of the flammability of the building materials of ancient villages in Yunnan, the design of building structure can be used to prevent the spread of fire. For example, the use of rammed earth walls to wrap wooden columns to prevent fire from spreading and destroying the columns; For example, when a fire occurs in a building shaped like a "shanpian house" in Dukezong, the flash roof is quickly removed or moved away from the fire source to prevent the expansion of the fire and cause a series of fires, and this method can also be used in the "thatched house" in Wengding Ancient Village.

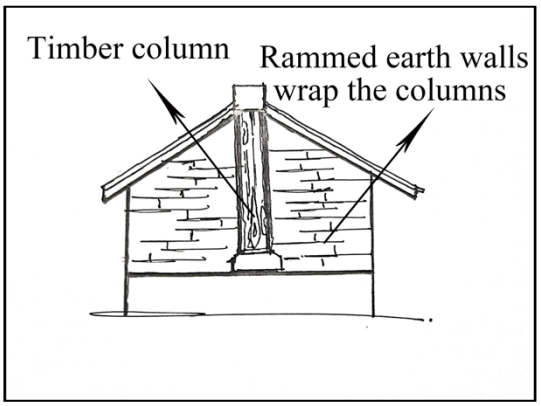

Fig 11. Schematic diagram of fire prevention on rammed earth wall of traditional building

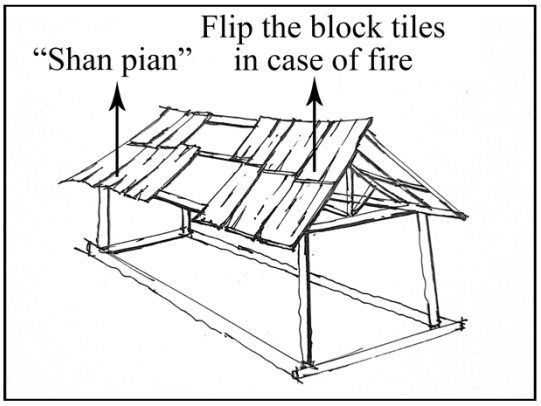

Fig 12. Schematic diagram of fire prevention of "shanpian house"

4.1.1.2 Building Material

Some ancient villages will add a second fire defense line

on the basis of dealing with the fire protection structure of the roof. For example, the Dukezong ancient City "shanpian house" will also cover the mezzanine space with a layer of 20cm thick raw soil to prevent the fire from spreading to the lower space.

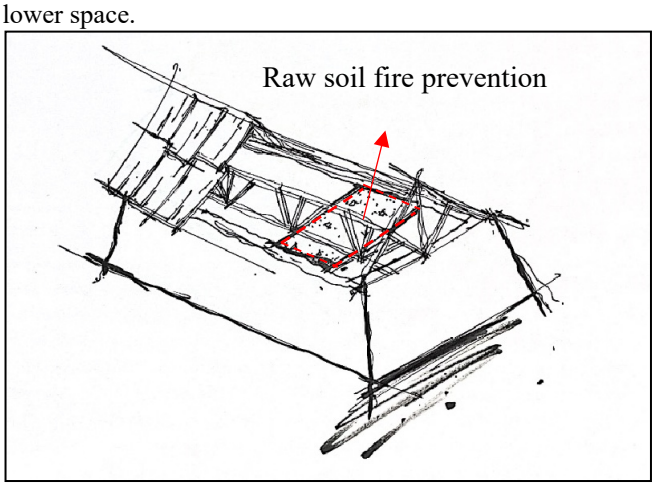

Fig 13. Schematic diagram of fire prevention in raw soil

4.1.2. Traditional Fire Wisdom - Planning

4.1.2.1 Water System Planning

Water is not only an important medium for fire fighting in ancient villages, but also an important source of domestic water. Water system planning plays an important role in fire fighting in ancient villages, which is mainly divided into surface waters and current waters. For example, the pond in front of the “Girding dragon house” in Hakka in southern Fujian and the linear water area in the old town of Lijiang

In the event of a fire, the village fire brigade can get water nearby to extinguish the fire.

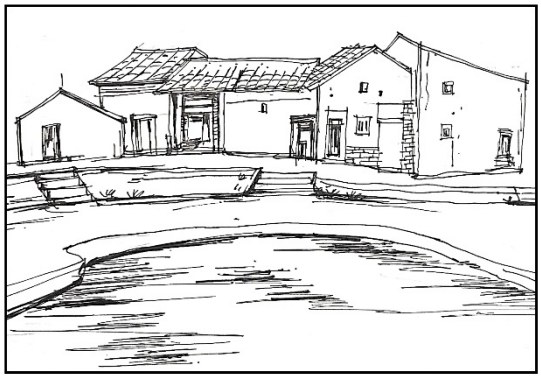

Fig 14. Planar water area planning

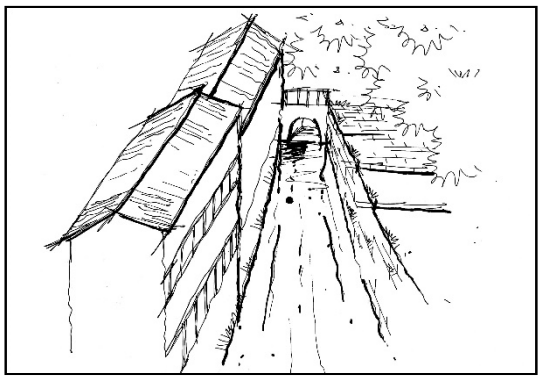

Fig 15. Linear water area planning

4.1.2.2 Spatial Planning

When carrying out the new planning of ancient villages, the spacing of buildings should be set aside as fire lanes and fire evacuation passages, and open areas should be built as emergency places for villagers to dry crops.

When the fire occurs, it can effectively prevent the rapid spread of the fire and provide sufficient time for the later fire rescue.

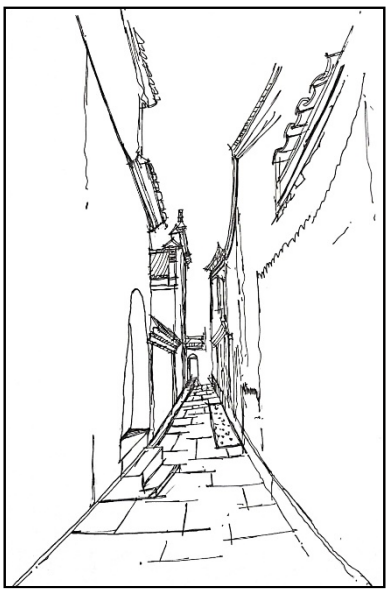

Fig 16. Fireproof lane

4.1.3. Traditional Fire Wisdom - Water Storage Facilities, Equipment

The dam was built in the suitable height of the ancient village as a fireproof water storage, and the water channel was introduced into the village to play the dual role of irrigation and fire protection. At the same time, as an important source of domestic water, water storage tanks, bamboo and so on are placed in their own homes, as direct water sources for fire suppression, in both.

4.1.4. Traditional Fire Wisdom - Civil Air Defense Mechanism

Fire prevention in ancient villages not only depends on the traditional fire wisdom itself, but also needs the full use of villagers to ensure its role. In addition, the ancient village should also have a certain civil air defense mechanism, such as the ancient village fire protection system, the ancient village fire team and so on.

The fire fighting team in the village as a unit also plays a great fire wisdom, and the fire fighting team formed by the villagers in the village has been trained and guided, and usually engaged in rural production, and quickly organized fire fighting in the event of a fire to achieve a rapid response to the fire fighting action.

4.2. Improve the Fire Protection of Ancient Villages by Modern Fire Protection Means

4.2.1. Strengthen Fire Awareness and Fire Control

4.2.1.1 Strengthen Fire Awareness

The publicity and popularization of traditional fire prevention knowledge is very important, and it is necessary to conduct regular fire safety education for residents and fire prevention persons, standardize fire behavior and fire fighting methods, and improve the fire prevention awareness of villagers.

Design and formulate scientific and efficient fire emergency measures, and carry out fire evacuation drills in a planned way. On the one hand, strengthen the public's awareness of fire safety prevention and fire handling ability,

so that the public can learn the correct use of fire equipment, enhance the public's awareness and participation in fire safety, and create a good atmosphere for fire prevention. On the other hand, the fire department can investigate the fire hazards in the building, check the safety and availability of fire prevention equipment, more clearly find the problems in fire prevention and timely improvement, and improve the level of fire management.

4.2.1.2 Strengthen Fire Control

Ethnic minorities have different cultures and different landforms of residence, so they need to adapt to local conditions and be realistic, so "one village one policy" should be implemented.

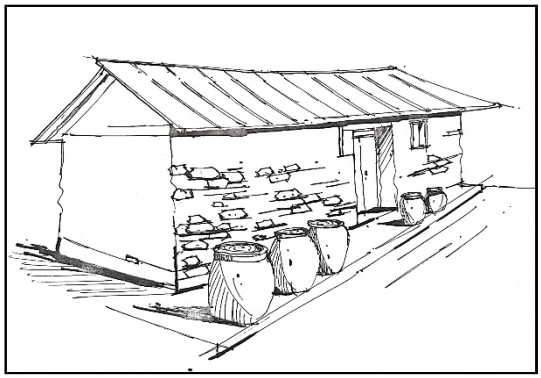

Fig 17. Water tank is set in front of the room

The building groups are closely linked to each other and face natural and man-made disasters together. Once the fire spread fiercely, it will be difficult to control. In such a building group must establish a " mass prevention and mass management " system, a number of fire groups (Fig. 18), mutual supervision, reminder and help, to achieve a fire, everyone in the pattern.

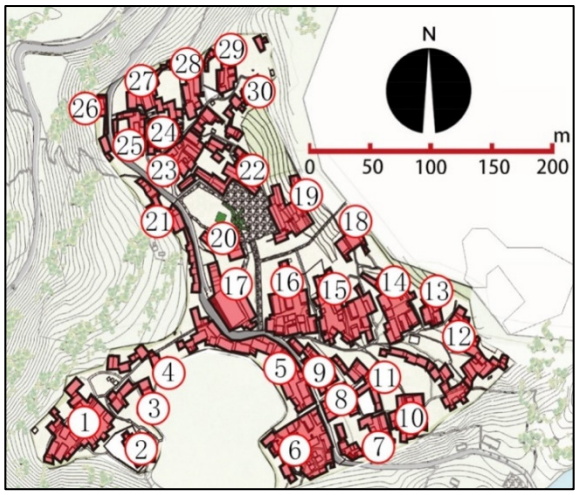

Fig 18. Example of "mass prevention and mass treatment"

On the basis of realizing the "mass prevention and mass management" of fire control in ancient villages, the joint liability system should be implemented, the fire control linkage of residents in ancient villages should be strengthened, and the efficiency of fire control should be improved. Give full play to the functions of relevant local departments, implement the personal responsibility system, extensively mobilize local villagers to form voluntary fire brigades, and strengthen fire control in an all-round way.

Table 18. Mass prevention and treatment of fire fighting

	Fire protection liability system
Determine village safety managers and organize fire fighting work	Define the first person responsible for the fire control work of each village group
Regular fire inspection, rectification and elimination of fire hazards	Responsible for the leadership of fire control work in the area of responsibility
Mutual inspection and supervision of fire control work should be carried out	Self-inspection of fire safety within the scope of responsibility
Implement a multi-household joint fire control system	Perform their duties according to law and be held accountable for dereliction of duty

4.2.2. Strengthen Fire Warning

Fire risk monitoring and early warning facilities should meet the special fire protection needs of ancient village buildings on the basis of convenience and beauty. When the fire occurs, the fire alarm will be sent to the residents, the village fire defense team, and the mobile phone and computer end of the fire rescue. Fire risk monitoring and early warning technology is used to realize intelligent supervision and early warning of fire risks (Fig.19). The work flow of the fire risk intelligent monitoring and early warning system is as follows:

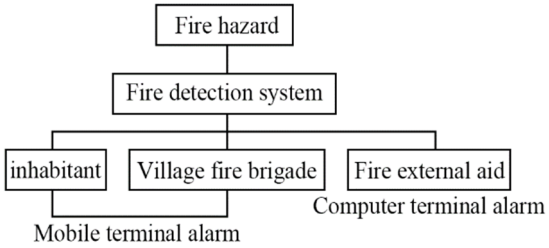

Fig 19. Schematic diagram of fire monitoring system

This fire risk monitoring system facilitates timely fire detection, efficient management and prompt fire disposal.

4.2.3. Rational Use of Modern Fire Fighting Means

Table 19. Four lines of defense

First line of defense	Efficient dry powder fire extinguisher, instantly extinguish the initial fire source
Second line of defense	Special water mist cart to reach areas inaccessible to traditional fire extinguishers
Third line of defense	The mobile water mist firewall sprays upward to form a 10m high water mist isolation belt to solve the shortcomings of the lack of fire spacing and fire separation in ancient villages
Fourth line of defense	Powerful fine mist turbofan cannon can reach as far as 45-60m for three-dimensional packaging range to achieve efficient cooling and fire extinguishing, and solve the shortage of fire water supply in ancient villages

In view of the lack of fire fighting infrastructure in ancient villages, modern fire fighting means are fully utilized, such as setting up fire pipes and fire hydrants, rationally arranging fire extinguishers and ensuring access at any time, setting up fire

water cannons and water mist systems in areas inconvenient for personnel to enter, and constructing "four lines of defense".

5. Summary

Ancient villages should follow the "ancient village road", avoid completely implanting modern fire protection methods that are not suitable for ancient villages, and refocus on traditional fire protection wisdom. Although the traditional fire prevention wisdom is "ancient", it can play an important role in the current fire prevention of ancient villages. Starting from the perspective of fire prevention in ancient villages, we can explore the inheritance and evolution of traditional wisdom and the life and production mode of ordinary villagers, which is an important part of exploring how to solve the current fire safety problems in ancient villages, and should also be the first guidance for the current fire prevention strategy in ancient villages. To sum up, for ethnic minority areas in Yunnan, the combination of "new" and "old" in ancient village fire protection is particularly important, and "old" has become the leading force of fire prevention in ancient villages in Yunnan, while "new" is the core force of fire suppression in ancient villages in Yunnan.

Finally, fire safety should be taken as the core basis for the continuation of the development of ancient village civilization. This paper studies the fire safety of ancient villages from a new perspective, with a view to preserving the "form" and "soul"("Form" : refers to the material heritage such as village location environment, spatial pattern and architectural texture; "Soul" : refers to the villagers' way of life and production, village rules and folk customs and other village culture.) of ancient minority villages in Yunnan as completely as possible, spreading the Chinese context permanently, and realizing the great rejuvenation of the Chinese nation.

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