

Research on Innovative Design of Portuguese Pavement's of Macau Campus Landscape

Liang ZHENG^{1,a}, Yile Chen^{1,b,*}

¹Faculty of Humanities and Arts, Macau University of Science and Technology, Macau, China

^a zlanger@163.com, ^b chenyile1996@163.com

*Corresponding Author

Keywords: Landscape design, Macau university landscape, Regional cultural design, Portuguese paving, Macau

Abstract: Macau blends Chinese and Western cultures. The university landscape of Macau has not only Lingnan elements derived from the Cantonese Chinese, but also Portuguese architectural decoration elements passed down for historical reasons. Portuguese paving is a typical regional element. This study takes Portuguese paving as an example, analyzes the application of this element in the current landscape design of Macau colleges and universities, and summarizes the expression methods of regional culture in the landscape design of college campuses, and provides for the application and design of regional cultural elements of the campus landscape in the future Some references.

1. Introduction

Portuguese paving mainly refers to the use of Portuguese-style floor tiles in the urban landscape. It is also commonly called “Portuguese gravel road (Portuguese: Calçada Portuguesa)” or “Portuguese stone road”. Currently in Portugal and the former Portuguese Empire colony (now known as Portuguese-speaking countries), such as Brazil, Angola, Mozambique, Guinea-Bissau, Cape Verde, Sao Tome and Principe, East Timor and other countries, are the most commonly used for paving The traditional way of decorating the pavement of footpaths.

In general, the Portuguese gravel road originated from pavement paving. It was first used as a handicraft from Mesopotamia. The local stone was used as building materials for the interior and exterior of the building. Later, the technology It spread to ancient Greece and ancient Rome. The ancient Romans (Romans, 9th century BC and 8th century BC) built roads with stones in present-day Portugal, and used nearby materials to pave Roman streets. Some techniques were later applied to gravel roads, including roadbeds and paving. . In addition, they also used crushed stones of different colors with a length of about two centimeters to decorate indoor and outdoor floors in the form of mosaics. At the same time, the Moors (11th to 17th centuries) who once occupied the Ibérician Peninsula for a long time also used Arabic geometric patterns as paving decorations, and also used stones to improve the drainage capacity of the ground. . The Portuguese inherited the techniques of ancient Rome and the Moors. In the 14th century, in the construction of roads in Lisbon and Porto, they began to use stones to pave the road.

Because of the historical relationship between Portugal and my country's Macao, the main city squares in the Macao Special Administrative Region (such as the Tap Seac Square of the Macau Peninsula, Gangding Qiandi, Senado Square, Banzhangtang Qiandi, Macao Governor's Palace, A-Ma Temple There are also Portuguese gravel roads in Qiandi, Apo's Well Front, Coloane St. Francis Church, the road pavement in the historical city and even in front of commercial buildings such as the square in front of the famous Lisboa Hotel.



Fig.1 Portuguese Paving At Tap Seac Square in Macau Peninsula

The most important paving of Portuguese paving is made of black and white or beige limestone, which are built into patterns of different marine elements. Common patterns are black and white waves, sailboats, rudders, hands, seahorses, sea cucumbers, whales, Shells, octopus, prawns, etc. Portuguese paving not only has its own decorative features in urban construction, but the gaps between the stones also help drain rainwater from the road. At present, it has become the most widely used pavement design for public squares, urban roads, and buildings in historical urban areas in Macau. The landscape architecture of Macau colleges and universities with a certain history is no exception.

2. A Brief History of the Development of Macao's University Landscape

Since the beginning of the 20th century, a small number of grounds in Macau have adopted black and white gravel roads, but strictly speaking they are not Portuguese gravel roads. It was not until the Portuguese-style restructuring project in front of the Senate Pavilion in 1993 that a true Portuguese gravel road appeared in Macau. In the project that year, the Australian and Portuguese government required the use of real Portuguese gravel roads. The relevant contractor stated that

Macau has no artisans who know how to pave Portuguese gravel roads. Therefore, the contractor hired several artisans from Portugal, and the materials were carefully selected and shipped from Portugal.

Therefore, the true history of these Portuguese gravel roads in Macau is about 20 to 30 years. They have gone through the history of Macau's return to the motherland and carried the urban culture left by the Portuguese [1] [2].

Similarly, university buildings and campus landscape design also carry this urban cultural symbol. According to traditional concepts, the history, ranking, and reputation of Hong Kong schools enjoy a very high status in the world, but the current development of Macao universities is also very rapid. From 1981, the first modern private university of East Asia in Macao was founded. After splitting the University of Macau, City University of Macau, Macau Polytechnic Institute, and then to the

establishment of Macau University of Science and Technology, the University of Macau moved to the new campus of Hengqin Island in Zhuhai, Guangdong (actually within the boundary of the jurisdiction of the Macau Special Administrative Region). Large universities recruit masters and doctoral students from the mainland and abroad, and the University of Macau is ranked 367 in the global Quacquarelli Symonds (QS) World University Rankings, and the Macau University of Science and Technology is ranked 251-300 in the 2020 THE Times World University Rankings. With the vigorous development of higher education in Macau, the construction of buildings and the improvement of the campus landscape are constantly improving, and its Portuguese paving design and continuous style are in the same line with its development history [3] [4]. However, due to the lack of land in Macau and the limited space for running schools, some colleges and universities, such as the Macau Chinese and Western Institute of Innovation and the Macau Institute of Management, have the highest degree-granting authority only for bachelor degrees. Currently, they do not recruit students from the Mainland, and they also have adult education. A certain floor does not have a campus environment, so it is not in the scope of this study. The development history of the architectural landscape of major universities in Macau is shown in Table 1.

Table 1 a Brief History of the Development of the Architectural Landscape of Universities in Macau

University	Year	Design or construction content	Architect or company
Macau Institute of Tourism Wangsha Campus	1978	The Wangsha Hotel was rebuilt after being taken over by the Barracks by the Tourism Department of the Macao and Portuguese Government, and later used as an internship unit in the tourism and hotel industry school	Constructed by the then Portuguese government
City University of Macau (then the campus of the University of Macau)	1981	Dafeng Building was completed, 6 floors high, with offices, classrooms, computer rooms and a garden for students to relax	Hong Kong architect Liu Xiucheng
	1982.9	The 8-storey Wang Kuancheng Building built against the mountain is completed	Local architect Chen Binghua, Hong Kong architect Liu Xiucheng
	1985	The Cultural Center was completed, with a 5-story building, including a theater, exhibition hall, platform, classrooms, drama room and laboratory. The theater can accommodate 701 people, with advanced lighting equipment and sound system, which can be used for various cultural performances	Local architect Chen Binghua
	1985.12	The Hexian Conference Center was completed, 6 floors high, with offices, classrooms, conference halls, lecture halls, etc.	Local architect Chen Binghua, Hong Kong architect Liu Xiucheng
	1990	Cai Jiyou Building was completed, with 8 floors, with classrooms, laboratories, computer rooms and offices	Local architect Chen Binghua, Hong Kong architect Liu Xiucheng
Public sports ground under the jurisdiction of the Government Sports Bureau (then the University of Macau Sports Complex)	1995.1	The sports complex is completed, with an indoor sports field, two tennis courts covered with artificial turf, two squash courts, a fitness room, a dance studio, a sauna room and a climbing field gifted by the country	Portuguese architect Gabinete de Arquitectura Bravo e Sanmarful
Saint Joseph University	1996	Completed and put into use	Organized and constructed by the University of Saint Joseph
City University of Macau (then the campus of the University of Macau)	1997.9	The Sino-Portuguese Building was completed, with 7 floors, with offices, language laboratories, classrooms, lecture halls, computer rooms, platform gardens and parking lots	Portuguese architect Manuel Vicente
	1998.11	Administration building completed	Portuguese architect

			José Diogo, local architect Tan Zhiwei
	1999.9	A five-story library with an area of 15,000 square meters was completed and put into use. It has a unique exterior design. The distant view image is composed of 3 books and 1 CD. It was the largest and most advanced library in Macau at that time.	Famous Portuguese architect Mario Duarte Duque
	2000	Stanley Ho Building was completed, 8 stories high, with classrooms, laboratories and offices	Portuguese architect Eduardo José Vicente Flores
Macau Polytechnic Institute	2003	The Macau Polytechnic Institute Gymnasium opens with a total construction area of 17,339.12 square meters and can accommodate 3,562 spectators	New Ming Fai Construction Engineering Co., Ltd.
	2006	The Jubilee Building was completed and a footbridge connected to the library was built	Local architect Chen Binghua
Macau Institute of Tourism Taipa Campus	2016	The Observation Building was put into use, with a height of 5 floors and an area of about 15,000 square meters, equipped with classrooms, library, conference venue, training center, parking lot and other facilities	Portuguese architect Mario Duarte Duque
Saint Joseph University	2017	The new school buildings and classrooms in Qingzhou were completed and put into use, and the square adopts a Portuguese-style tile design [6] [7]	Youzheng Construction Engineering Co., Ltd.
City University of Macau	2017	The school history museum on the third floor of the Hexian Conference Center was completed, and the carpet decoration continued to use the classic big wave pattern of Portuguese pavement[8]	PLANWISH Tianwei Architects
	2018	The roof space of the administrative building has been remodeled and designed. After the refurbishment, it has become an important activity and exchange place for City University residents	

It is worth mentioning that the terrace gardens of the Dafeng Building and the Sino-Portuguese Building in the City University of Macau won the 2002 European Belgrade Architecture Salon Award. Although the terrace garden is modern construction, it incorporates the architectural style of southern Europe[9], such as curved aqua blue mosaic glass veneer and classic Portuguese pavement design.

At the same time, about three or four years ago, the renovation design project of the City University of Macau also continued the style of Portuguese pavement design. For example, the rooftop space renovation design of the administrative building led by Macau PLANWISH Architects, except for the landscape wall In addition to the classic blue and white Portuguese ceramic tile murals, the ground uses a classic ocean wave pattern Portuguese paving design. The rooftop garden of the City University Administration Building has been refurbished and has become an important activity and exchange place for City University residents.

The History Museum of the City University of Macau, also designed by PLANWISH Architects in Macau, also “smartly adopted” the classic wave pattern Portuguese pavement design carpet on the ground, which is placed indoors, creating a culturally characteristic Macau A space that conforms to modern aesthetics and satisfies exhibition functions. The space uses the combination of Chinese and Portuguese symbols, absorbing the Portuguese Manueine and neoclassical architectural ideas of Macau, setting off an elegant atmosphere and reflecting the cultural heritage.

At the 2016 World Association of Chinese Architects Forum, Architect Dong Zhiwen of Macau PLANWISH Architects shared the design concept and problems encountered in the platform garden renovation project of the City University of Macau, the historical heritage and meticulous care reflected in the design , Which was greatly appreciated by the participating architects. It can be seen that the

Portuguese paving continued in the renewal design of the City University of Macau from 2016 to 2018 has also been recognized by the industry [10].

3. Application Examples and Performance Techniques

According to statistics from the Higher Education Bureau of Macau, Macau currently has 10 higher education institutions, of which 6 are private institutions, namely Macau University of Science and Technology, Macau City University, Saint Joseph University, Macau Jinghu School of Nursing, Macau School of Management, The Chinese and Western Institute of Innovation; 4 are public institutions, namely the University of Macau, Macau Polytechnic Institute, Macau Institute of Tourism, Macau Security Forces Higher Institute [11]. Portuguese paving is a common paving style in Macau universities. This section will give examples of representative schools and graphics with Portuguese paving for specific analysis.

3.1 Graphic Features

The Portuguese paving patterns of the universities in Macau are diverse, often composed of an orderly arrangement of basic patterns such as linear, triangle, and circle. The colors are mainly black and white, and some of them are made up of brown to form specific patterns, which have specific beauty and identity. As shown in Figure 2 and Figure 3, it can be divided into the following categories.

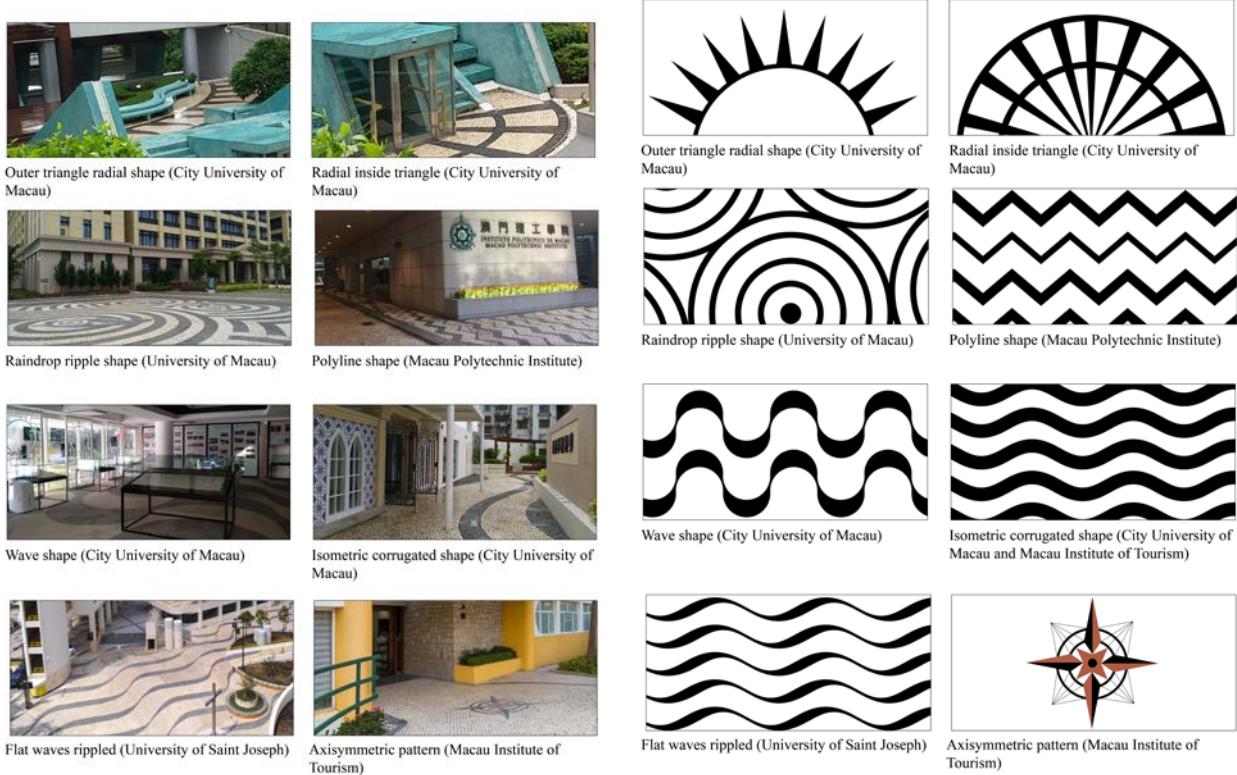


Fig.2 (Left) the Application Status of Portuguese Paving in Macau Universities

Fig.3 (Right) the Plan of Portuguese Paving in Macau Universities

3.1.1 Radial

In the atrium plaza of the headquarters of the Macau City University, two different radioactive patterns appeared, namely the triangular outer radial and the triangular inner radial. The triangular outer

radial pattern is located on the edge of the stage of the square. The outer radial pattern outlines the edge of the stage, emphasizes the space of the stage, and enriches the elements of the stage. The radial pattern inside the triangle is located at the entrance of the vertical elevator and stairs below the stage. The center of radiation is located in the elevator, which has the function of guiding the line of sight, allowing the focus of the surrounding pedestrians to guide the entrance and exit of the elevator. At this time, the elevator is like a passageway for the stage. , People look forward to the things that appear from the entrance and exit, making public facilities also have a certain interesting.

3.1.2 Raindrops Ripple Shape.

The square of the University of Macau is paved with raindrops and corrugated Portuguese paving, just like the ripples on the lake surface when the light rain stops, creating a poetic color of the space. In addition, the raindrop ripple-shaped graphics are rich in dynamics, and the ripples are placed in the static pavement through graphic expression, making the dynamic and static ingeniously combined, enhancing the attractiveness of the site.

3.1.3 Broken Line Shape.

The entrance of the Macau Polytechnic Institute adopts a polyline-shaped Portuguese pavement. The polyline has a stronger sense of movement than a curve, just like the electrocardiogram, amplitude spectrum and trend line. The use of broken-line graphics has a certain promotion effect on pedestrians' walking. Because of its large number of acute angles, it emphasizes the direction and movement trajectory of the site. When pedestrians pass on the site, they will unconsciously speed up their steps, which can effectively evacuate the crowd. , To prevent staying and gathering.

3.1.4 Wave Shape.

The wave wave shape can be divided into two types: regular wave wave shape and flat wave wave shape. It is the most iconic Portuguese paving pattern, which is very common in the historical city of Macau, such as the front of the chamber. The corrugated shape of the waves originated from the memories of the place where the Portuguese sailors were drifting on the sea while gazing at the sea waves at that time, and pinned the crew's feelings towards the sea. Macau, as an island city, fits in with the graphic culture. The wave wave shape is not only laid outdoors in the headquarters of the Macau City University, but also used in the indoor carpet of the school history museum. It can be seen that the wave wave shape has a wide range of applicability. In addition, the new Qingzhou campus of St. Joseph University adopts a flat wave corrugated shape with a gentler wave and a slenderer line. Compared with the conventional "heavy" wave corrugated shape, the flat wave corrugated shape is more "calm", making the wave corrugated shape. The sense of patchwork in time enriches the diversity of such graphics.

3.1.5 Equidistant Corrugated Shape.

The line thickness of the equidistant corrugated shape is more uniform than that of the wave corrugated shape. The regularly arranged corrugated lines make the graphics look neater, cleaner and simpler. A series of graphics are distributed at the entrance of the main campus of the Macau City University. The regular graphics enhance the sense of order in the paving and at the same time have a guiding effect on pedestrians.

3.1.6 Pattern Shape.

The Portuguese pavement at the entrance of the Macau Institute of Tourism is a compass-style pattern, and the colors are black, white and brown, suggesting the orientation of the entrance of the school. Compared with the former abstract figure, the pattern is a figurative figure., Which directly expresses the intention of the designer or Party A. In addition, the pattern is exquisitely designed, using an axisymmetric method, which blurs the directionality of the pattern, and can be comfortably appreciated in any direction, reflecting the designer's ingenuity.

3.2 Other Uses

In addition to the regular use of the Portuguese paving graphics on the paving itself, it can also be extended to design indoor landscape sketches. For example, the public artwork (shown in Figure 4) at the entrance of Wang Kuancheng Building (Block W) of the School of Innovation and Design of the Main Campus of Macau City University uses Portuguese paving graphics on the anthropomorphic bear-shaped sculpture, making the Portuguese paving Dressing in a unique style, like creatures rising from the ground, makes the Portuguese paving culture itself concrete, rich in fun, and can interact with people to a certain extent, no longer stepping on the cold feet Stones are public artworks with a certain temperature. In addition, in the seminar room area on the 2nd floor of the HG Library of the Ho Yin Conference Center of the City University of Macau, black and white cobblestones are used to construct a different Portuguese pavement (as shown in Figure 5 below), which matches the classic Macau street signs, street lights, and Portuguese Style tiles, etc., create contradictory spaces between indoor and outdoor, and enhance the sense of hierarchy and richness of the space.



Fig.4 (Left)Public Art in Portuguese Paving Style

Fig.5 (Right)Interior Sketches in Portuguese Style

4. Conclusion

The Portuguese paving patterns in Macau are rich and widely used in Macau universities. Different patterns have different effects on the perception of space and people. Based on the analysis of Portuguese paving applications and graphics in Macau universities, this article summarizes 6 types of radial, raindrop ripple, polyline, wave ripple, equidistant ripple, and pattern, and analyzes the Portuguese The multiple application scenarios of paving graphics have a certain reference effect on the application of Portuguese paving. In addition, Portuguese paving is one of the urban cultures of Macau. This article shows the possibility of its graphic change and the wide potential of its application, which promotes the continuous promotion and development of Macau culture and the application of Portuguese pavement in campus Has a certain driving effect.

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