

# Introduction of Terrazzo from Italy to the United States

**Dingyi Zhang**

*Graduate School of Architecture, Planning and Preservation, Columbia University, New York, USA*

**Abstract:** *From the standpoint of the relationship between history and modernity of the building material, this article will analyze the American architectural struggle to be progressive and accepted, exceptional and customary, and to simultaneously capture the future and the past. Terrazzo is the research object of this article. As a very important building material in a specific period, its historical and cultural value cannot be ignored, especially its role in the transition of American culture that cannot be ignored. The question of it will help us discern the terms of engagement between architecture and other disciplines over time, such as: preservation, planning, politics, health, ecology, sociology, and philosophy. By considering terrazzo's successes and failures in relation to these multidisciplinary realities, this article will illustrate a richer sense of the historical characteristics that have informed its evolving nature beginning from the introduction of it from Italy.*

**Keywords:** *materiality, terrazzo, cultural transition, historic significance*

## 1. Introduction

Despite its modern origins in Italy, terrazzo flooring is now extensively utilized domestically and internationally. The term "terrazzo" is derived from the Italian word for terrace, since the product was initially applied on outdoor terraces in Venice in the 15th century. As a composite material, terrazzo is usually composed of marble or other natural stone chips or fragments, and mixed with binders such as cement or epoxy resin. Other materials such as glass, metal, plastic, etc. are often seen as additives to increase color and texture. This mixture is crushed and polished to create a smooth, long-lasting surface after being set into concrete or similar solid basis. And these methods were not introduced to the United States by Italian craftsmen until the late 19th century. The transfer of skills and knowledge, the process of ethnic migration, and the value and impact created for society are all worthy of attention. Its rise was also related to the rising hygiene movement in the United States at that time<sup>[1]</sup>. Throughout the 1920s and 1930s, with the rise of Art Deco movement, terrazzo served as a popular decorative flooring material for public buildings such as schools, hospitals, and government offices in the United States. Its popularity dropped in the middle of the 20th century but has lately rebounded in both residential and commercial settings. The article mainly argues the popularity of terrazzo from the late 19th century to the mid-20th century, the migration and upgrading of labor and technology by Italian craftsmen, the nature and application places of terrazzo itself, the social background and market environment of different periods in the United States, and emphasizes the irreplaceable role played by terrazzo. Archival materials, books, articles and the interview with National Terrazzo and Mosaic Association will serve as sources of evidence for analyzing terrazzo use<sup>[2]</sup>.

## 2. Historical Value of Terrazzo

Terrazzo is an immensely enriched historical component of the American construction heritage. This section is mainly focusing on its historical particulars, including the historical importance of terrazzo, the way it was introduced into the construction industry in the United States, and its contribution to American life's cultural transformation. This section also discusses the people and organizations that have historically been involved in incorporating terrazzo, the goals that motivated their efforts, and some of the changes that have been required in mainstream construction to accommodate the incorporation of terrazzo as part of American construction.

## 2.1 The Initial History of Terrazzo

The origins of terrazzo can be traced back to primordial civilizations, giving it a rich and intriguing past. Ancient Egyptians were the first to use the material, a mixture of pulverized limestone and other natural substances used to create decorative surfaces. Later, the Greeks and Romans used terrazzo in their structures and public spaces to create intricate mosaics and designs. After the collapse of the Roman Empire, terrazzo's prominence declined, but it experienced a revival during the Italian Renaissance. Italian artists enhanced the technique by incorporating marble and other organic materials to create more intricate and elaborate designs. Terrazzo was extensively used in the palaces, cathedrals, and public structures of the era and became a symbol of elegance and sophistication in Italy almost immediately<sup>[3]</sup>.

## 2.2 The Historic Trajectory on How Terrazzo Became Associated with American Construction Industry

Although terrazzo had been used in the United States as early as George Washington's Mount Vernon estate in the late 18th century, it did not gain significant attention in the American market until the late 19th century. Terrazzo produced elaborate patterns and designs in both commercial and residential settings as a so-called brand-new flooring material. It combined the strength of genuine stone with the versatility of concrete. Before the introduction of terrazzo, slate, marble, and other flooring materials were commonly utilized in huge blocks or tiles that required expert work to install. Terrazzo provided a more economical and effective option as it could be poured-in-place or inlay method and was made of smaller stone chips, which were more frequently available and less expensive than massive blocks of genuine stone. Furthermore, terrazzo flooring offered more color and pattern customization options than stone floors<sup>[4]</sup>. These reasons indirectly prompted Italian immigrants to bring terrazzo technology from Italy to the United States, who had immediate success using it in the construction sector. Vanderbilt Massion on Fifth Avenue, New York, built in 1890, is considered to be one of the first engineering cases by Italian craftsmen. According to research findings, 500 craftsmen were engaged in the construction, reflecting the large amount of labor required for the initial terrazzo installation due to technical immaturity.<sup>3</sup>

Architects and designers soon recognized the material's strength and adaptability, and it was utilized to make flooring, walls, and decorative components in public buildings including courts, schools, and government structures. The Figure 1 below shows the the American terrazzo industry benefited from the Art Deco movement's popularity in the 1920s and 1930s. The substance was widely employed in newly constructed skyscrapers as well as in the lobbies and common areas of department shops, hotels, and other commercial structures.<sup>4</sup> Due to high demand, this was also a period of mixed coexistence of pouring and inlaid terrazzo. And at this time, terrazzo became an important medium for the art deco movement, spreading to various parts of the world. Taking Shanghai as an example, the terrazzo process was quickly learned by local craftsmen and developed terrazzo patterns with Chinese characteristics (Figure 2). And behind this, it was driven by many American construction companies investing in Shanghai.<sup>5</sup> At this time, terrazzo became a symbol of American culture, even though it originated in Italy. To some extent, it promotes the integration of various cultures<sup>[5]</sup>.



Figure 1: The Application of Terrazzo in New York Public Buildings in the Early 20th Century. Trade catalogs from Manhattan Terrazzo Brass Strip Co., Inc, 1939.



*Figure 2: The Application of Terrazzo in Shanghai in the Early 20th Century. Photo by Lidong Ge.*

The post-war period ushered in a new wave of terrazzo, and the rise of suburbanization at that time promoted the linkage between a number of new public buildings and terrazzo, especially the rise of shopping malls. Famous journalist Malcolm Gladwell once praised the functions and advantages of terrazzo and used Terrazzo Jungle to describe the grand occasion of terrazzo at that time.<sup>6</sup>

In the 1970s and 1980s, rival materials such as carpet and vinyl surpassed terrazzo in popularity. Largely due to ease of installation and low cost, but in the past decade or so, terrazzo has experienced a new wave, possibly due to its retro sentiment, as well as its strong and durable nature and environmental protection characteristics. And also thanks to the development and application of 3D printing technology, the filling of terrazzo patterns can be completed by relying on a robotic arm, which has broad development space (Figure 3)<sup>[6]</sup>.



*Figure 3: 3D Printing Technology Assisted Terrazzo Pattern Generation.*

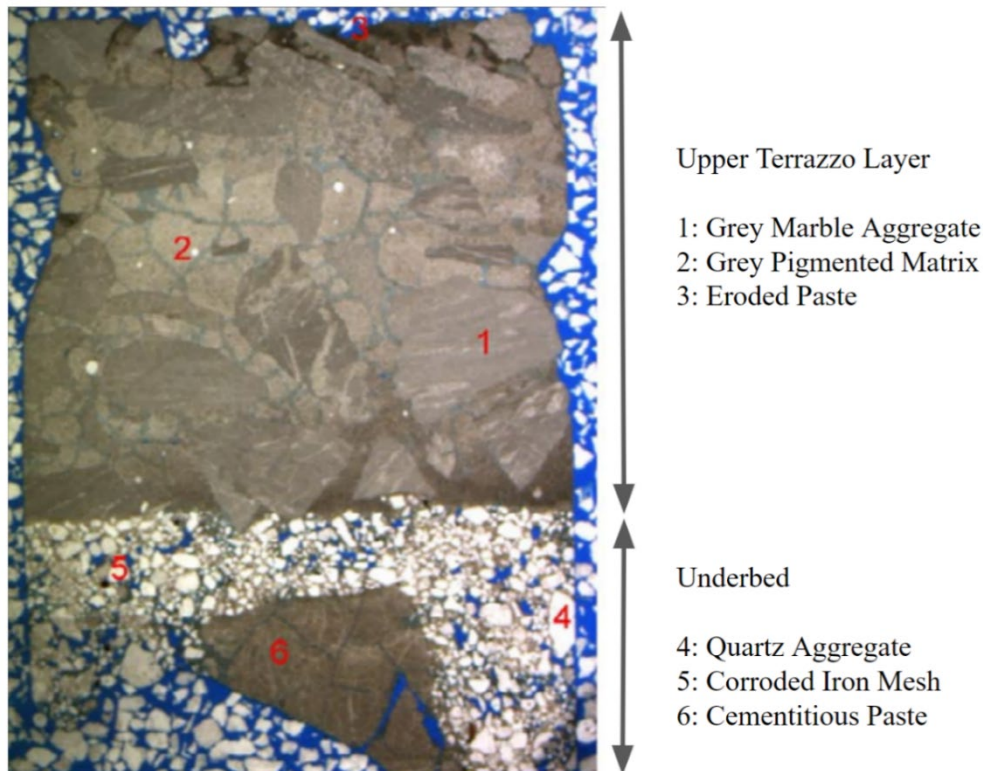


Figure 4: Plain terrazzo and underbed. Adapted by the author from Chabbi's paper, 36.

Courtesy of Aectual B.V. The company is committed to reducing carbon emissions by 80% throughout the entire lifecycle of building materials, which is also a testament to the broad prospects of terrazzo as a material supported by new technologies<sup>[7]</sup>.

The figure 4 below shows the basic component of plain terrazzo and underbed, which is the earliest type of terrazzo introduced into the United States. The upper layer of this terrazzo is composed of a large area of grey marble aggregate, which plays a decisive role in determining the final form of the terrazzo.<sup>7</sup> The gaps in between are filled with a pigmented matrix, which usually serves as decoration. But the upper layer can sometimes be accompanied by eroded paste, often related to moisture, acidic cleaners, or improper installation<sup>[8]</sup>. Underneath the upper layer is the underbed layer of the terrazzo, typically made of crushed quartz in loose pieces, which are then mixed with a binding material such as epoxy resin or cement to create a strong, durable material.<sup>8</sup> Additionally, iron mesh is often used as a material to increase hardness and durability, but its downside is its susceptibility to rust<sup>[9]</sup>.

### 3. Skills and Installation

Terrazzo flooring installation is a labor-intensive and time-consuming operation requiring trained staff due to the skills, labor and resources required. Orange line in the figure 5A marks the strip divider of terrazzo, which is used for pattern segmentation to enrich the decoration and reduce friction during use (Figure 5B&5C). The strip provider can be regarded as the core of terrazzo because it creates patterns to meet the role of architectural decoration and the aesthetic needs of the Art Deco era. It is also an important reason why the terrazzo imported from Italy could gain access to the American market<sup>[10]</sup>.

The terrazzo in the picture is a poured terrazzo, which can create more flexible colors and patterns. Adapted by the author from trade catalogs named Manhattan Terrazzo Brass Strip Co., Inc, 1939.

Poured terrazzo usually required manual labor, including mixing, pouring, levelling, grinding, and polishing. The three most commonly encountered are monolithic terrazzo, bonded terrazzo, and sand cushion terrazzo (also known as unbonded terrazzo) (see Figure 6 below). Monolithic terrazzo's surface is poured as a single, continuous layer without expansion joints or seams on the concrete slab. However, bonded terrazzo adds an intermediate underbed layer to this premise. Both types could be constructed and manufactured on-site and were popularized in the Art Deco era but gained prominence in the post-war period. In recent years, unbonded terrazzo has become popular, which is built on the basis method of bonded terrazzo. It is necessary to prefabricate and make certain sized terrazzo blocks in the factory,



then paste them on special sand mats, and finally carry out on-site pasting and paving. The added layer of sand cushion can absorb any movement or bending of the subfloor and keep the terrazzo surface from breaking<sup>[11]</sup>.

Another way to install terrazzo is through embedded installation. There are many methods for embedding inset terrazzo, and the following figure 7 shows one of them. The bottom of plastic cuts is somewhat hollow, and they are riveted to metal strip dividers. The dividers continue over the terrazzo layer and into the terrazzo underbed, where they are attached by a metal (often steel) rivet to an anchor. Each anchor binds the inset-metal divider system to the terrazzo layer above and prevents it from shifting.

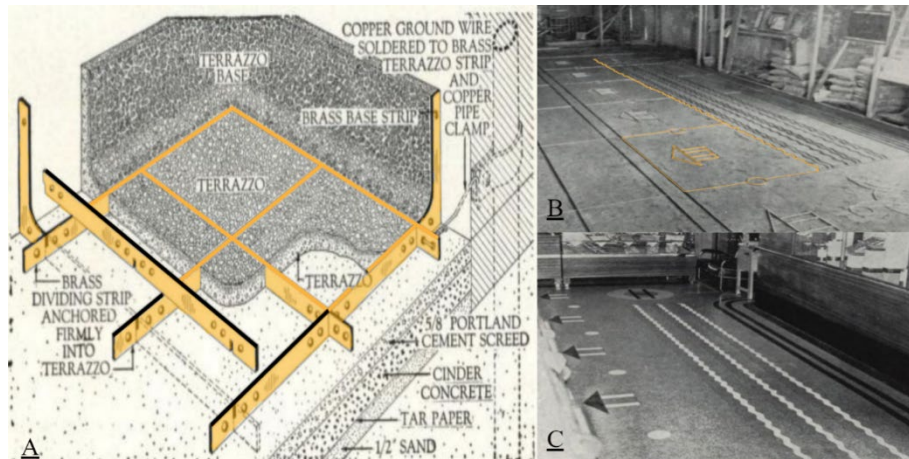


Figure 5: Structure of Terrazzo Strip Divider and Its Actual Engineering Photos.

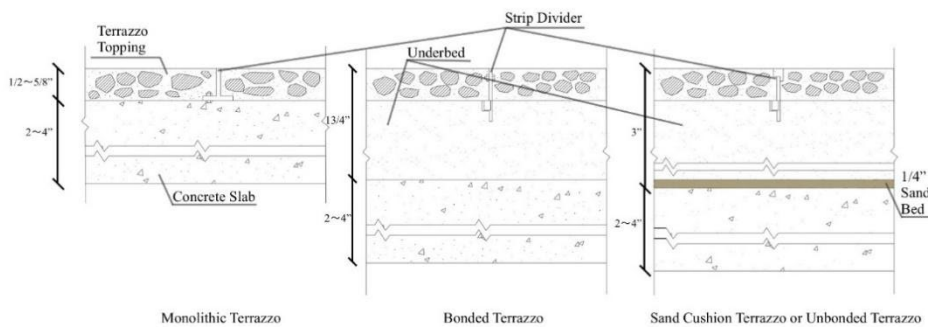


Figure 6: Three Major Types of Poured Terrazzo Installation. Adapted by the author from NTMA.

Terrazzo flooring installation still requires expert work in modern times, and some specialized contractors focus on producing unique terrazzo flooring installations. Workers involved in these stages were divided into several groups according to skill level, gender, race, and ethnicity.<sup>9</sup>The author believes that this classification did increase efficiency in practical engineering, but to some extent, it also created certain inequalities. For example, racial segregation exacerbated the monopoly position of the terrazzo industry among Italian craftsmen, which had a negative impact in the long run<sup>[12]</sup>. The explanation of monopoly will be mentioned in subsequent chapters.

Specialized tools and equipment had to be used during the installation procedure, which raised the cost of labor even more. However, these devices often underwent several update iterations during the development and maturity stage of terrazzo applications to meet the requirements of higher efficiency. As an example, "Galeras" are widely used to grind and polish terrazzo flooring after it has been poured and allowed to dry.<sup>10</sup>Typically, this is the last stage in the installation procedure. Galeras facilitates the creation of a smooth, uniform, and highly polished surface that is both durable and aesthetically pleasing. The figure 8 below shows the different styles of galeras tools used by Italian migrant workers before and after the Art Deco period in Terrazzo. The shift from manual to electric illustrates the adaptation and evolution of Italian grinding technology after its introduction to the United States. The emergence of electric galeras further illustrates that the increased demand for terrazzo bred the birth of new technologies, which reduced the labor-intensiveness of the installation process<sup>[13]</sup>.

By ethnicity, this is a typical group of Italian immigrants. (The left image shows the manual galeras in 1890-1920, and the right two image shows the electric galeras after 1920). Source: Courtesy of NTMA

and University of Florida - Library Documents Department.

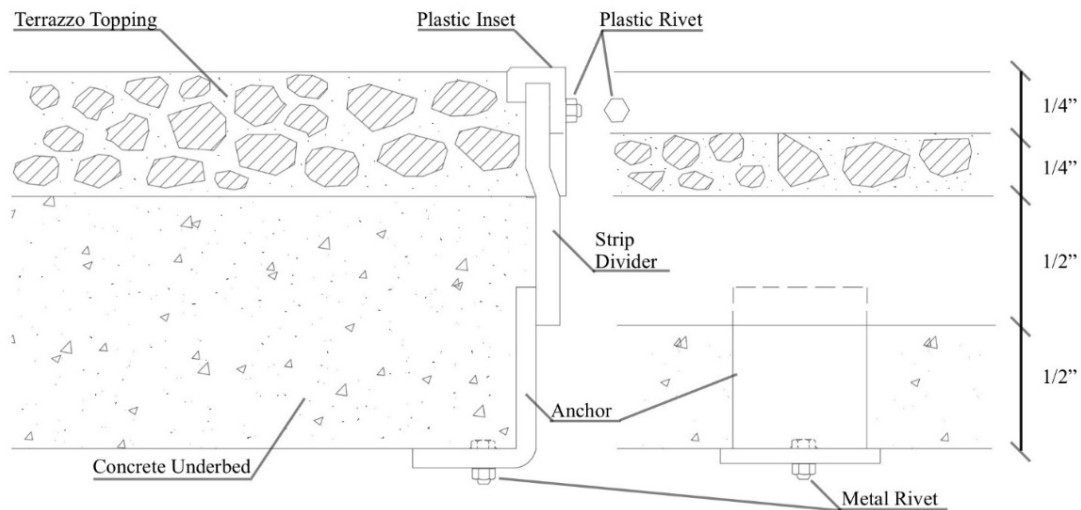


Figure 7: Cross Section and Side View of Inset System of Terrazzo. Adapted by the author from Chabbi's paper.

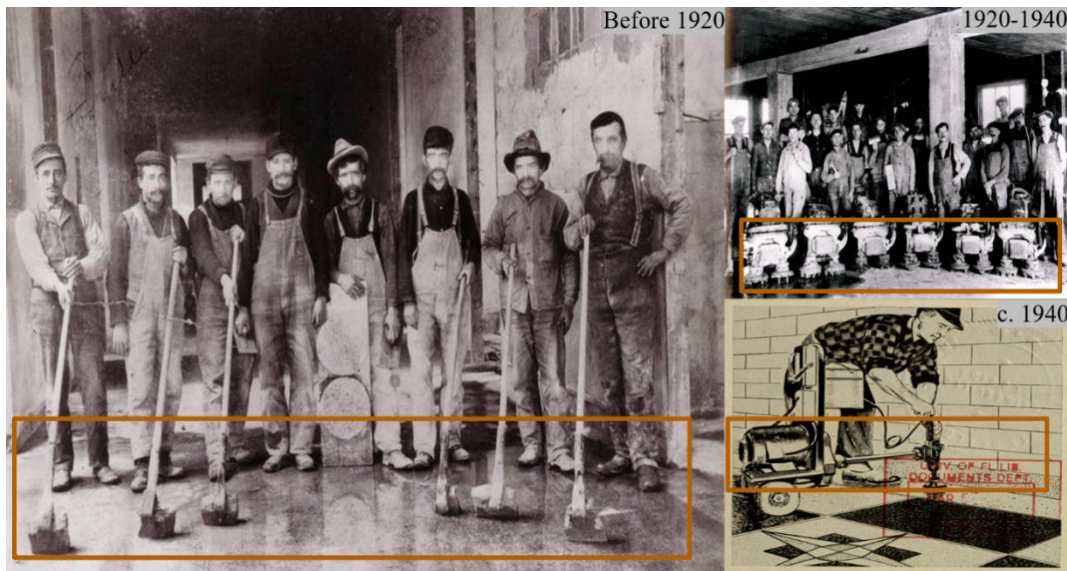


Figure 8: Workers with grinders called "Galeras".

### 3. Other Characteristics and Values of Terrazzo

In a circular economy, concepts of reuse and recycling are applied to ensure that the by-products of the production and consumption process have been refined to regenerate them into forms from which value can be derived.<sup>11</sup> Therefore, terrazzo is a component of sustainability value addition generated by optimising construction inputs to generate more utility. One factor that makes terrazzo flooring an environmentally friendly solution is the use of waste materials in its construction.<sup>12</sup> Terrazzo flooring contributes to waste reduction and resource conservation by using materials that could otherwise wind up in a landfill. Since terrazzo flooring is so strong and long-lasting, less frequent replacements are required, lessening the environmental impact. Chips made of marble and granite are frequently obtained from leftovers from the production of stone slabs or from structures constructed of marble or granite but have since been demolished. On the other hand, the glass chips come from post-industrial and post-consumer waste sources, including recovered glass bottles and glass from demolished structures<sup>[14]</sup>.

Terrazzo is understood to be a sustainable component with the capability to bestow construction structures with durable attributes.<sup>13</sup> Reports verify that one of the earliest terrazzo-like floors constructed in the Middle-Eastern regions of the world around 10 000 years ago still exist in the modern-day.<sup>14</sup> The

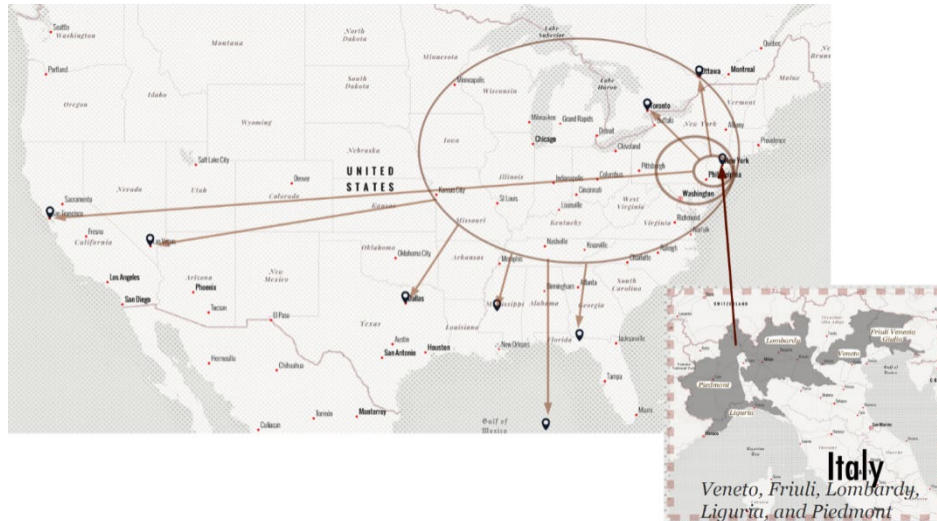
durability attributes are credited to the immense strength of the construction material constituting terrazzo. For example, experts indicate that terrazzo floors have a strength of up to 4800 pounds per square inch.<sup>15</sup> This aspect of strength allows the floor to withstand pressure from objects and the trampling human feet, hence remaining durable for extensive periods after construction. In an economic perspective, Terrazzo-reinforced floors and walls are solid and long-lasting, meaning fewer costs are likely to be incurred in repair and maintenance. Such cost-effectiveness benefits are part of the economic significance of incorporating terrazzo in construction.

#### **4. Important Factors for the Popularization of Terrazzo in the United States**

##### ***4.1 Terrazzo and Labor Migration in United States***

The installation required immense labor, creating severe labor problems that hindered the use and expansion of the material initially. However, the arrival of the Italian immigrants significantly influenced the introduction and widespread use of Terrazzo flooring in the United States. These craftsmen mainly from the north part of Italy continued to move to New York from 1890 onwards.<sup>16</sup> In 1911, the Immigration Commission pointed out that this group of Italian immigrants preferred the American market over other European markets because they believed that the former could provide more direct economic income and better prospects for future upgrades than the latter.<sup>17</sup> Therefore, the Italian workers brought their technical knowledge and abilities to the country, which enabled them to establish a niche market for terrazzo installation. The emergence of Italian craftsmen who generally possessed excellent terrazzo skills broke the stereotype that Italians were low-level labor workers, and they became an irreplaceable group of people in the labor force. The labor movement added to developing and preserving the technical knowledge needed for Terrazzo installation. However, changes in the labor market and shifting consumer preferences impacted the industry's expansion.<sup>18</sup> Bringing terrazzo flooring to the United States required a multi-step process that brought together industry, labor migration, and cultural interchange.<sup>19</sup>

The craftsmanship and knowledge of working with stone and concrete that these Italian immigrants brought allowed them to produce beautiful patterns and motifs in public and private places. Urban areas like New York City, Chicago, and Philadelphia were home to most Italian immigrants, who were experts in terrazzo flooring. Taking the Manhattan area of New York as an example, according to the census data at the end of the 20th century, most of the terrazzo workers who immigrated from Italy gathered between East 23rd and 38th streets, which is a significant difference from other Italian immigrants living in Lower Manhattan, possibly due to the commuting time with the terrazzo company. The workers started their enterprises or employed themselves at already-established organizations with flooring installation expertise. But it also means that this group needed to blend in with people of other races, especially given the language barriers. As a result, the workers put in a lot of labor and endured prejudice and exploitation, but they managed to develop a specific market for their skills. This migration of the labor force in Manhattan continued until the popularity of terrazzo during the Art Deco era. In the 1920s and 1930s, this group gradually spread to the entire 18 and 21 wards, although some of them were not engaged in the terrazzo industry but just members of the terrazzo workers' families. To some extent, national identity contributed to this phenomenon and will continue to affect labor migration in the form of families to other regions of the United States (especially the Midwest) to obtain more employment opportunities (Figure 9)<sup>[15]</sup>.



*Figure 9: The Transfer Process of Labor Force and Terrazzo Market in the Early 20th Century. Diagram by the author; Data from NTMA and related research paper.*

The labor migration also influenced the development of terrazzo flooring installation. Italian workers in the terrazzo business have access to apprenticeships and training programs thanks to unions like the Bricklayers and Allied Craftworkers Union. Besides, these initiatives improved the working conditions and pay for terrazzo workers and developed and preserved the specific skills required for terrazzo installation. Yet, changes in the labor market impacted the expansion of terrazzo flooring installation. Following World War II, as the need for flooring installation increased, new, less expensive, simpler-to-install flooring options like vinyl and carpeting began competing with terrazzo. The labor market for terrazzo workers was disrupted by the reduction in demand for terrazzo installation brought on by the availability of new materials and shifting consumer tastes<sup>[16]</sup>.

#### **4.2 The Link between Terrazzo and the Growth of the Cement Industry**

The rise of terrazzo in the early 20th century was also related to the rise of cement, especially Portland cement, which was one of the most common material at that time. The author argues that the availability of talented migrant workers from Italy with experience making intricate and beautiful flooring, as well as the expansion of the Portland cement industry in the United States, led to the development of terrazzo flooring and its widespread use in the country.

Terrazzo is produced using Portland cement as the binding agent. In general, the terrazzo matrix is composed of two parts marble (or other grains) aggregate and one part Portland cement. Portland cement is also the binding component of the terrazzo concrete underbed. To guarantee that the concrete bed and terrazzo finish are homogeneous, Portland cement is brushed as a grout over the concrete underbed before the terrazzo topping is applied.

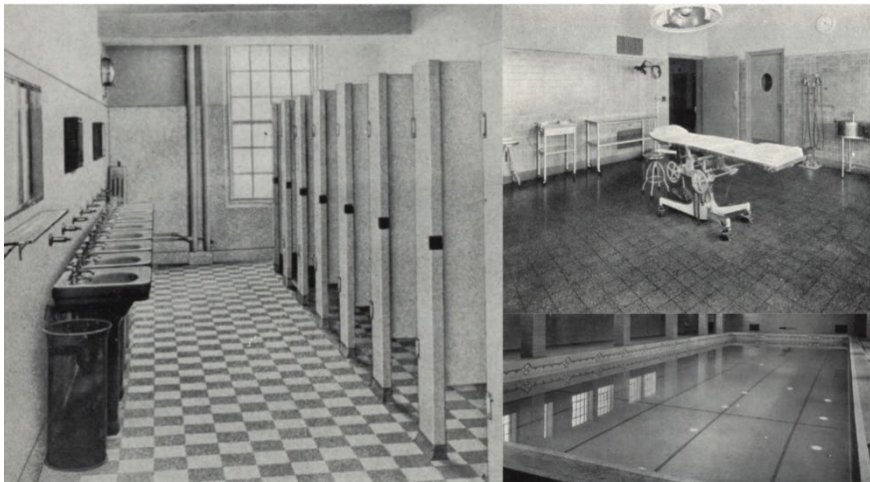
Portland cement is a chemical combination comprising lime, silica, alumina, and iron oxide, along with a few insignificant components. It consists of crushed rock (limestone), shells, chalk, or marl, in addition to shale, clay, slate, or blast furnace slag. These raw materials are crushed, combined in proportion, and placed in a kiln. These gigantic revolving kilns, in which the temperature is raised to 2,700 degrees Fahrenheit, turn this mixture into "clinker" by generating marble-sized particles. When the "clinker" has cooled, it is pulverized in a machine and gypsum is added to control the setting time of the finished product.

In the production of terrazzo, there are typically two kinds of cement, white Portland cement and gray Portland cement. White Portland cement has a little quicker initial setting tendency than gray Portland cement, but it has the same qualities and achieves the same ultimate hardness and durability in all other aspects. It conforms to the same ASTM standards as gray Portland cement. Portland cement is the rare material used in building construction that does not decay over time. In fact, as it matures, it becomes tougher and more resilient. White Portland Cement Terrazzo Flooring and other white cement Terrazzo projects always have a clean, shiny, and new look and are easy to maintain.



#### **4.3 Terrazzo Significance for the American Culture of Environmental Protection**

The hygiene movement in the late 19th century reflects the increasing concept of urbanization and modernization among people. During this campaign, the importance of cleanliness and sanitation in preventing the spread of disease became more acknowledged, reflecting the awareness of science and technology. This aided the importation of terrazzo from Italy, which was prized for its durability, stain resistance, and ease of cleaning. It was easier to maintain a clean environment owing to the surface's resistance to the collection of dirt and bacteria. As a result, terrazzo's properties with cleanliness and sanitation contributed to its rise in popularity as a material for modern architecture and interior design, especially in places with high cleanliness requirements (Figure 10).



*Figure 10: Application of Terrazzo in High Requirement Clean Environment during Hygiene Movements in the Late 19th Century, Source: Trade Literature at the American History Museum Library and Smithsonian Libraries Trade Literature Collections.*

Terrazzo's significance in the United States' ethos of environmental protection is tied to its resistance and durability. With proper care and upkeep, terrazzo floors may last for decades, reducing the need for replacement and, ultimately, the amount of waste generated by the construction industry. Meanwhile, the author argues that the application of terrazzo in construction enhances American society's social-cultural values of environmental protection. Terrazzo-constructed floors in the sanitation sector have been culturally attributed in American society to generate quality air conditions indoors. For example, Americans prefer to keep moist floors clean and free from microbial activities that otherwise harm indoor air quality. Americans also culturally value hygiene and maintain such standards by eradicating stains on sensitive sections of their structural buildings, such as the sanitation section. Some local codes also mention that environmental maintenance, cleanliness, and indoor air quality are very important factors<sup>[17]</sup>.

#### **4.4 Parties Historically Involved and their Promoting Actions**

The National Terrazzo and Mosaic Contractors Association (NTMCA) (renamed The National Terrazzo and Mosaic Association and allowed the involvement of supplies members in 1929) has been instrumental in the development of terrazzo in the American construction industry. As a trade association, it provides contractors, architects, and engineers with guide specifications and information that is widely used in the industry. The majority of these guidelines are based on experience and industry standards. The organization was founded by 27 contractors in 1923 to promote the use of terrazzo and mosaic in public constructions, as well as to teach and help artisans and contractors in the field. However, after two years, the number of contractors rapidly increased to 60, which distributed in various states in the United States, forming a unique terrazzo market in the region. More than two-thirds of them were controlled by Italian immigrants, and formed a family-style business model, and in some regions even relying on the authority of the association to monopolize.<sup>21</sup> Early on, the NTMCA worked closely with architects and designers to promote the use of terrazzo in public buildings. The organization generated technical guides and installation requirements for terrazzo, as well as industry events and exhibits. The NTMA and the government worked together to offer training for World War II veterans coming home. Veterans may study how to become terrazzo artisans at the Terrazzo Training Center in Chicago, which was founded by the association<sup>[18]</sup>.



*Figure 11: Apprentices who have completed their training receive Certificates of Completion of Apprenticeship from the State apprenticeship agency or the Federal Committee on Apprenticeship in states where no such agency exists. National Terrazzo Workers Joint Apprenticeship Committee, (Bureau of Apprenticeship: Washington, 1948) , 12.*

After the war, the NTMA persevered in promoting the use of terrazzo and mosaic in public facilities and in training and assisting artisans and contractors (Figure 11). The group aimed to establish industry standards and promote the use of high-quality materials and labor. At the same time, under the leadership of the Apprenticeship Bureau of the United States Department of Labor, the National Terrazzo Workers Joint Apprenticeship Committee was established in 1948 and related books were published.<sup>22</sup> Behind this was the intervention of trade unions, such as the Bricklayers', Masons', and Plasterers' International Union of America mentioned earlier, although the trade union did not directly participate in the design and construction of terrazzo; however, it assisted NTMA in formulating relevant national standards for terrazzo apprentices, protected the rights and interests of industry workers, fulfilled its obligations as a union, and promoted the standardization of terrazzo.<sup>23</sup> Throughout the 1960s and 1970s, the NTMA expanded its mandate to include industrial research and the development of innovative materials and processes. The group endeavored to develop innovative terrazzo materials, such as epoxy terrazzo, which offered more flexibility and durability than cement-based terrazzo. What worth mentioned is that NTMA also had a strategic cooperation relationship with the Portland Cement Association. As mentioned earlier, Portland cement almost completely occupied the cement application in terrazzo. NTMA even offered relevant courses on Portland cement for contractors and suppliers to learn. At the same time, the two had close communication and cooperation in multiple fields such as market promotion, technical support, standard formulation, and so on<sup>[19]</sup>.

## 5. Conclusion

This article reviews the profound impact of the introduction of terrazzo from Italy in the late 19th century on the American construction industry. Its dissemination, popularity, retreat, and revival are inseparable from historical, cultural, and social background in the process of American modernization. As a material with aesthetic significance, its technical aspect is also elaborated through production and installation elements. Terrazzo is not an isolated individual; it is not only related to other materials, such as cement, but also to people. Behind it is the collision and fusion between consumers and manufacturers, workers and unions, and different material companies.

## References

- [1] Binggeli, Corky. *Materials for interior environments*. John Wiley & Sons, 2008.
- [2] Chabbi, Amel. "Restoring a 20th century terrazzo pavement: a conservation study of the floor map of the New York State Pavilion, Queens, New York." *Theses (Historic Preservation)* (2004): 46.
- [3] Civjan, Scott A., Michael J. Mitchell, David Fortin, and Ray Mann. "Deterioration of terrazzo." *Journal of architectural engineering* 17, no. 2 (2011): 51-58.
- [4] Clay, Cassius. "Life." 1<sup>st</sup> Edition. (2010): 13.
- [5] Concord Terrazzo Company. "Art Deco Terrazzo in 1920s United States." *Terrazzoco Brand Products*. (2023). <https://terrazzoco.com/art-deco-terrazzo/>
- [6] Gladwell, Malcolm. "The Terrazzo Jungle." *The New Yorker*. March 15, 2004.
- [7] Grossutti, Javier P. "Chapter Seven "In The Hands Of The Italians": Friulian Mosaic And Terrazzo Workers." *The Friulian Language: Identity, Migration, Culture* (2014): 103.
- [8] Grossutti, Javier P. "From guild artisans to entrepreneurs: the long path of Italian marble mosaic and terrazzo craftsmen (16th c. Venice–20th c. New York City)." *International Labor and Working-Class History* 100 (2021): 60-86.
- [9] Guman, Olga and Wegner-Kozlova, Ekaterina. "Waste management based on circular economy principles." *ES3 Web of Conferences*, 177, (04014). (2020): 1-10.
- [10] Harbster, Jennifer. "Terrazzo: Beauty Under our Feet." (2011)
- [11] Howe, Katherine S. *Herter Brothers: Furniture and Interiors for a Gilded Age*, (Harry N. Abrams, New York, 1994)
- [12] Immigration Commission. *Reports of the Immigration Commission. Emigration Conditions in Europe*, 60-65.
- [13] Johnson, Walker C. "Terrazzo" in *Twentieth Century Building Materials: History and Conservation*, ( McGrawHill, Washington, D.C., 1995.)
- [14] Koskoff, Sharon. *Art deco of the palm beaches*. Arcadia Publishing, 2007.
- [15] Master Terrazzo. "Benefits" (2023). <https://masterterrazzo.com/terrazzo/benefits/>
- [16] NTMA. "The History of the NTMA." (2023). <https://ntma.com/history-of-ntma/>
- [17] Pai, Divya. "Decomania: A Comparative Visual Analysis of Art Deco Architecture in Chicago and Mumbai (1920-1940)." PhD diss., School of the Art Institute of Chicago, 2020.
- [18] Ronan, Alex. "How Terrazzo Moved Out from Under Our Feet to Absolutely Everywhere." *Vogue*. (2019). <https://www.vogue.com/article/how-terrazzo-moved-out-from-under-our-feet-to-absolutely-everywhere>
- [19] Terrazzo Masters. "History of Terrazzo." (2023). <http://www.terrazzomasters.com/why-terrazzo/history-of-terrazzo/>