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Architectural and Social Isolation:

Quarantine Buildings from the 12th-19th Centuries

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Let us strive together.

Abstract

This study focusses on the emergence, development, and institutionalization of quarantine architecture, aiming to understand how buildings have played a pivotal role in epidemic governance. The selection of this theme stems from contemporary society's renewed exposure of spatial requirements and vulnerabilities during pandemics, as well as the profound differences in how various societies in the past perceived and confronted contagious disease. This thesis first outlines the major epidemic contexts from the 12th to the 19th centuries, examining diachronically how origins and transmission were perceived, and their social and political consequences. It demonstrates that these perceptions directly influenced the emergence of isolation spaces and the evolution of architectural forms. Research indicates that quarantine architecture was not a passive by-product of medical knowledge advancement, but rather a spatial response shaped by the intricate interplay of fear, mobility, and order. Whether leprosarium grounded in religious symbolism, Lazaretto centered on isolation practices, or the standardized, permanent quarantine stations within nineteenth-century imperial networks, their spatial layouts, boundary configurations, and circulation systems all embodied societal imaginations and responses to risk and governance. These structures have gradually evolved from temporary emergency facilities into institutionalized, replicable public health infrastructure. This study contends that isolation architecture not only safeguarded cities during crises but also propelled the formation of modern urban governance systems and public health

infrastructure. Re-examining this architectural typology helps to fill gaps in architectural history and deepens our understanding of how buildings regulate social order during crises.

Keywords: quarantine architecture, isolation, epidemic, spatial mechanism, institutionalization

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Chapter 1. Introduction

Every epoch, in fact, not only dreams the one to follow but, in dreaming, precipitates its awakening.

—Walter Benjamin

(The Arcades Project, p. 13, 2002 ed.)

1.1 Research Background and Problem Statement

Every era foreshadows the next era. Throughout human history, infectious diseases have not only changed the medical knowledge system, but also profoundly shaped architecture and urban space. In times of crisis, society rebuilds order, and architecture often becomes the material form in which this order can be expressed. Architecture is not only a place for disease prevention, but also a tool for society to divide people and build a reasonable spatial order in the face of disease and fear(Parsons 2010).

From the Middle Ages to modern times, isolation gradually evolved from a religious ritual to an administrative and technical mechanism(The fifteenth century XII: society in an age of plague 2013). This transformation makes architecture a key medium for the development of epidemiological control systems. The construction of isolation buildings is not only to treat diseases, but also to respond to the changing social needs and concepts in different eras and contexts.

However, architectural history and medical history have long developed independently, and the connection between the two is often ignored in

interdisciplinary research. Architectural history usually focuses on the analysis of forms and types, while ignoring how diseases drive the formation of architectural types and spatial logic(Johnson 2013). At the same time, the history of medicine focuses on the evolution of institutions and policies, but rarely explores how these systems are implemented through physical space. As a result, there has been little integrated analysis of the "spatial mechanisms" connecting the two (Harrison 1994). This research therefore takes shape within this academic gap, aiming to re-examine, through the intersection of architectural and medical history, how epidemic spaces were created and gradually institutionalized.

The period from the twelfth to the nineteenth century is chosen because it witnessed a structural transformation in the practice of isolation—one that was both continuous and progressive. It moved from faith-based religious exclusion, to administrative quarantine focused on urban governance, and finally to the normalization of quarantine as part of a global public health system(Mitchell 2003).

The Mediterranean–Red Sea region serves as the main focus of this study because it was both the birthplace of quarantine systems and a meeting point of diverse religious, political, and economic structures (Horden and Purcell 2013). In this region, quarantine architecture became a concrete expression of cross-cultural interaction and the exercise of power.

However, in the history of quarantine architecture caused by the global epidemic, there are still many urgent issues to be discussed.

What role does architecture play in disease control(Buckingham 1992)?

Is it just a passive container for accommodating, isolating and controlling the human body?

When ‘isolation’ changes from religious rituals to administrative practice, does the meaning of isolation buildings also change?

When architecture defines the distance between people, does it also redefine social boundaries?

When architecture is given the responsibility of ‘defense’, does it also create the concept of ‘danger’?

More broadly, how does architecture shape people's cognition and behavior(Goodman 1985)?

These questions together form the starting point of this research: during major epidemics in history, how did the demand for spaces of isolation gradually deepen, and how did the resulting building types respond to changes in both medical knowledge and social thought?

In this study, I approach these issues through the combined perspectives of architectural history and social history. It examines how quarantine buildings developed as prototypes of ‘governance space’—how they were normalized and institutionalized by society, and how, over time, architecture continued to shape human ideas of order, risk, and community.

1.2 Research Aims and Significance

My initial interest in so-called quarantine architecture did not arise from its recognized importance in architectural history, but rather from the fact that it is rarely discussed.

Among the familiar categories of urban buildings, hospitals, care homes, and sanatoriums have often been studied and redesigned. They reflect ideals of health and well-being and represent forms of social care(Blue et al. 2024; Loftness et al. 2007). In contrast, buildings specifically designed for quarantine, prevention, and isolation have remained on the margins. They are often seen as temporary, peripheral, or even dark spaces that appear only in moments of crisis. Because of fear or rejection, people tend to keep their distance from them. As a result, these buildings occupy a vague place in our architectural memory—we lack both a clear understanding of their formal characteristics and of their institutional continuity.

This absence has puzzled me. If hospitals represent society's positive response to health, then do quarantine buildings represent its spatial reaction to danger? Through reading works on public health and social history, I came to realize that the history of isolation is far more complex than I had imagined(Mitropoulos 2020). From the religious exclusions of the Middle Ages, to early modern systems of urban quarantine, and finally to the imperial networks of the nineteenth century, architecture was deeply involved at every stage. Yet in most architectural histories, these buildings are still treated as mere by-products of policy (Harrison 1994).

I began to see that the value of quarantine architecture lies not only in its form or style, but in the way it makes social fear, order, and control visible. Architecture here is not simply a spatial container; it is material evidence of how social psychology and systems of governance take physical form(Martin 2020).

Therefore, the goal of my research is not to retell the history of epidemics, but to trace how architecture, within that history, has continuously been given new meanings.

I tried to rediscover a neglected type of architecture - those built on the edge of the city, on port islands, or along the imperial road. I examine how these spaces have changed from religious symbols to governing tools. Behind this transformation is not only the progress of construction technology, but also the change in social concepts: health and safety are no longer regarded as just medical issues, but have become the common language of architecture and politics.(Rawcliffe 2006).

The leper hospitals first built in the twelfth century embodied spatial exclusion under a religious order (Rawcliffe 2006; Schindler 2015). The Lazzaretto of ports such as Venice and Ragusa demonstrated how cities institutionalized epidemic control (Horden and Purcell 2013). By the nineteenth century, imperial quarantine stations had turned isolation into part of a transregional administrative system. These buildings did not evolve in a linear sequence; rather, they reflected a continuing relationship between ideas and spatial logic. Through these examples, I aim to show how architecture gained new functions and meanings during moments of social crisis

and how, through institutionalization, it reshaped our understanding of what architecture can be.

For me, the significance of this research lies first of all in its contribution to methodology. Architectural history studies usually focus on form, style and author, while social history and medical history focus on policy and population. There is often a lack of a perspective between the two - a perspective that reveals ‘how space works’(Burkle 2006). I hope that through the study of quarantine buildings, the architecture can be reintroduced into the discussion of epidemiological history, so that it is no longer a passive background, but a positive component in the construction of social order. If we regard architecture as part of a broader social mechanism, can it also help us understand how human beings create order in times of crisis?

This is exactly the reason why I chose " quarantine buildings " as the research topic. Although it is not magnificent, it clearly records the multiple roles of architecture in the face of fear, control and hope.

1.3 Methodology and Sources

Before starting this study, the first challenge I faced was that quarantine buildings were different from churches or theaters. They did not have complete remnant forms or systematic documentation. Some quarantine buildings are built as temporary facilities, while others - built as permanent facilities - are usually located on the edge of the city, in ports or on outer islands. Over time and the improvement of

the public health system, many of these buildings have been rebuilt, abandoned or disappeared.

Therefore, this study is not a traditional ‘building investigation’, but a process of finding clues in the fragments. I must repeatedly consult between historical records, drawings, maps, decrees and written narratives to piece together the existence of these buildings at the institutional, spatial and experiential levels(Stieber 2003).

This research method requires interdisciplinary research. I learned from the traditions of architectural history, social history and public health history. The study of architectural history helps me understand the evolution of architectural types and spatial logic, while the materials of social history and medical history reveal how system, power and social cognition provide the background for the formation of architecture. My research focus is not on the style or author of a single building, but on the way the building operates: how layout, boundaries, dynamic lines and visibility organize space and human behavior, and how these buildings express institutional significance in cities and administrative systems.

At the literature level, my research is mainly based on two types of data. The first category is raw materials, including port regulations, quarantine decrees, administrative archives, local choreographies and traveler's accounts, as well as existing items, original architectural drawings and relevant data from the epidemic period. Through this information, I can trace the formation of the quarantine buildings system and its functional role.

The second type of materials is the second-hand research of scholars in the fields of architectural history, social history and medical history. These studies include Harrison's analysis of the British public health system, Rawcliffe's study of medieval leprosy hospitals, and Cipolla's exploration of early modern isolation mechanisms. These studies together provide important references for understanding the multiple meanings of "isolation" in institutional and spatial development.

In terms of research methods, I have adopted a combination of typological analysis and spatial mechanism analysis.

The typological study here does not only focus on formal similarity, but also on a historical comparison method. By examining the common structural characteristics in different cases, and how the local geographical environment, social policies and historical background shape their differences, I aim to reveal how quarantine buildings have been constantly reinterpreted and rebuilt in the long history. I regard the leprosy hospital, Lazzaretto (British royal isolation station) and the imperial isolation station as three historical manifestations of the same space mechanism in different periods.

On the other hand, the 'spatial mechanism analysis' focuses on 'how buildings work': the relationship between spatial division, flow control, ventilation and vision, and how these building functions reflect society's perception of 'cleanliness' and 'danger'.

Throughout the research process, I try to avoid judging the past from a modern

perspective. My goal is not only to understand the functional logic of these buildings, but also to understand their social significance in their respective historical contexts. In order to balance the institutional history at the macro level and the architectural history at the micro level, I divide the analysis into three dimensions:

The first dimension is the institutional level, which examines how social conditions and urban characteristics shape the needs of epidemic control;

The second dimension is the ‘architecture level’, which studies the evolution of building types, layouts and construction methods;

The third dimension is the ‘experience level’, which explores how these spaces are perceived and used.

This hierarchical research method enables me to link the system with the spatial form while avoiding the limitations of a single perspective.

In addition, since the geographical scope of this study covers the Mediterranean and Red Sea regions, differences between architectural cases are inevitable. When dealing with information from different cultures and political systems, I always maintain an open and comparative attitude. I do not seek direct formal inheritance, but focus on the evolution of institutional theory and the shared spatial strategy behind it. This cross-regional comparison helps to reveal the general logic of quarantine buildings as a space for disease control, and also highlights how it adapts to different social backgrounds and administrative needs.

For me, the significance of the method is not only to ensure the reliability of

the argument, but also to shape my understanding of the architecture itself.

Through the study of these neglected spaces, I gradually understand that architecture is not only an extension of the institutional system, but also an expression of social attitudes. Although many buildings have lost their original functions, they still remain in the form of spatial traces and written memories - reminding us that the history of architecture is not only the history of form, but also the history of social structure and human experience.

1.4 Chapter Outline

With the gradual clarification of my research direction, the overall structure of this project is also gradually clear. It is not a study by type of architecture, but a historical investigation of how social isolation is built. Each chapter and each section correspond to a specific turning point - from religion to system, from city to empire, from function to mechanism. Together, these changes show how quarantine buildings have been gradually institutionalized over the centuries and become a part of social governance.

The second chapter focuses on the social and institutional background of this process. From a broader perspective, I first examine the relationship between disease and urban governance, explore how society understands disease, and finally realizes that epidemic control requires the dual support of space and institutional system. This chapter follows the chronological order: from the religious isolation embodied in the

medieval leprosy hospital, to the urban isolation during the plague in the 14th to 17th centuries, and finally to the imperial health system established in response to cholera in the 19th century.

By tracing these critical moments in the history of epidemics, I aim to build a concept, system and spatial logic for readers. This chapter adopts a social and institutional historical perspective to reveal how the concept of isolation has evolved from a moral and religious interpretation to a political discourse closely related to biology, architecture and technological development. This chapter also lays the institutional foundation for understanding how architecture embodies and practices these concepts.

The third chapter is the core of this paper. It focuses on the spatial mechanism of separating buildings from the 12th to 19th centuries, and examines how buildings can be realized in the governance system. This chapter is no longer organized in exact chronological order, but follows the logic of institutional development - from ‘formation’ to ‘systematization’ and finally to ‘permanence’. The focus of this chapter is not on the architectural style or specific details, but on the spatial mechanism - how architecture works. I will analyze the design methods of quarantine stations and quarantine stations in ports such as Venice, Marseille, Ancona, Malta, Alexandria, and El Tor, focusing on their spatial organization, flow control, regional division and visibility. This chapter aims to reposition architecture from the passive ‘background’ to the positive ‘subject’ in practice. It focuses on how the operating logic of

architecture makes it a key component of governance, showing the dynamism of architecture as a part of administrative practice, not just a place of passive control.

Chapter Four is both a conclusion and a reflection, returning to the core issue of this study: since architecture has always been used to define health and danger (whether indoors or outdoors), can we also understand how social mechanisms shape the type of architecture and its meaning? This chapter summarizes the main research results and discusses the status of quarantine buildings in architectural history and social history. Through these discussions, I hope to reveal another trajectory of architectural history - a trajectory shaped by crisis and order, fear and governance, and the spatial logic that connects them.

Therefore, the structure of this paper starts from the social system, transitions to the architectural mechanism, and finally returns to theoretical reflection, forming a continuous process centered on ‘isolated architecturalization’. Through this research, I hope readers can understand the meaning of quarantine architecture from multiple levels: as a product of the historical system, as a reflection of social psychology, and as evidence of how architecture responds to human seeking order in times of crisis.

Chapter 2. Epidemic Perception and Institutional Evolution

In the spring of the fourteenth century, the port of Venice was plunged into panic by a major outbreak of the plague. For the first time, people realized that disease was no longer a divine punishment, but an inherent part of the city's very fabric(McNeill 2010). In the history of urban life, epidemics were often the first events to broke the established order. The prayers of priests and the blocking method of officials failed alike—neither can it soothe the soul, nor prevent death. The city began to reflect: when prayer was no longer sufficient, what could society rely upon to protect itself(Davies 1890)? It was amid this imbalance that “isolation” was invented and operated.

The initial reaction of the city was instinctive: expelling patients, closing the city gates, and burning property. However, with the recurrence of diseases, these measures gradually evolve into institutionalized practices, eventually forming a replicable spatial order. Religion, administration and architecture are intertwined here: people's beliefs give it meaning, the government provides it with form, and architects give it form. Since then, isolation is no longer just a means of resisting disease, but has become a way for society to reorganize itself.

The key to this historical period is not the speed of disease transmission, but the society's understanding of itself.

How can cities define purity and filth through space? How can the political body maintain power and security through construction? How can a community

shrouded in fear rebuild order?

Therefore, "isolation" has become a mirror, reflecting how society understands itself in times of crisis. When patients were seen as a threat, cities began to set up borders to control different groups.

Walls, trenches, signal towers and other spatial facilities are not just epidemic prevention measures; they mainly reflect a social position: in times of crisis, society decides who can stay and who must be isolated. Therefore, "isolation" has never been a purely medical act; it is more like a social language - using space to express order and using distance to define identity(Cipolla 1976).

The next chapter will follow this clue: from the leprosy expulsion model in the 12th century, to the establishment of the port quarantine system during the plague, to the perfect public health system under the supervision of the empire during the cholera. The narrative does not focus on a single type of disease, but examines people's understanding of disease, the logic of spatial order, and the interaction between social powers.

By examining how different cultural, political and social structures understand and respond to the epidemic at different stages of the epidemic, with the transformation of disease patterns and the advancement of the times, and how this process has given rise to the need for ‘spatial isolation’, the previous analysis is to discuss the emergence of the quarantine building system and its impact on the epidemic in the next chapter. The response of characteristics and social attitudes

provides an explanatory basis(Butcher 2020; Paliga 2020). This maintains the reader within the historical logic spanning perceptual cognition, institutional formation, and spatial implementation.

2.1 Leprosy and Religious Exclusion (12th–14th c.)

At dusk in winter, a sick man clad in a tattered cloak was led outside the city gates. The bishop and several clergymen formed a circle around him to perform a ‘burial rite for the living’. Holy water was sprinkled upon his head as they recited the rites of the Requiem Mass. A bell and a wooden staff were then placed in his hands. From that moment, this leper belonged neither to the city nor to society. Declared a "living dead", he was commanded to depart the city walls for the leper colony beyond the suburbs—a place far removed from the altar, the bustling streets, and the embrace of family.

This is not an isolated event, but a common scene in medieval Europe. From the 12th to the 14th centuries, leprosy spread rapidly and became one of the most symbolic diseases at that time. It not only represents the decay of the body, but also symbolizes a profound threat to moral and spiritual order(Organization 2020).

In the medieval Christian world, leprosy has both medical and moral significance. The earliest form of isolation architecture was born for this purpose(Browne 1970). In the medieval Christian world, leprosy had both medical and moral significance, and the earliest isolated architectural form was also specially

built to deal with this disease. Leprosy hospitals are usually built on wasteland outside the boundaries of towns and are often adjacent to cemeteries, emphasizing the physical and symbolic isolation from the mainstream of society(Rawcliffe 2006). Their architectural layout featured secluded chapels, enclosed courtyards, and strictly controlled access points. Here, the purification of hygiene and the punishment of theology were enacted in tandem, while also constituting a fundamental public health measure(Verkaaik 2013).

From the standpoint of modern medicine, leprosy—known today as “Hansen’s disease”—is a chronic infectious illness caused by “Mycobacterium leprae”, transmitted primarily through prolonged respiratory contact rather than the medieval belief that “touching the skin” could cause contagion. Its infectiousness is extremely low, and its progression remarkably slow. Since the introduction of multidrug therapy (MDT) in the mid-twentieth century, leprosy has become both curable and rapidly non-contagious(Eichman 1999). In other words, the disease has never possessed, at a biological level, the capacity to justify the magnitude of “social fear” it once provoked.

However, precisely because pathological and bacteriological knowledge was absent in the Middle Ages, people interpreted its symptoms through religious and moral frameworks: the corruption of the body was seen as the outward sign of a decayed soul(Lewis 1987). For society, “isolation” did not arise from medical rationality but rather from the spatial projection of religious order.

Therefore, within the framework of this study, leprosy holds a foundational significance. It reveals how religious societies constructed boundaries between ‘order’ and ‘impurity’ through the human body, and how such notions laid the groundwork for later epidemic architecture. The siting, form, and ritualized spatial practices of leprosaria provided early prototypes for subsequent plague hospitals, port quarantine stations, and imperial public health buildings.

In the following sections, this chapter will examine three interrelated dimensions—the symbolic meanings of the leprous body, the religious power and institutional order, and the everyday life of the afflicted—to explore how leprosy, between the twelfth and fourteenth centuries, was gradually transformed into an architectural regime of isolation, giving rise to the earliest forms of ‘epidemic space’.

2.1.1 Sinful Bodies

Leprosy (Hansen's disease) is a debilitating chronic disease. It is caused by the bacterium Mycobacterium leprae and mainly attacks the skin, peripheral nerves and mucous membranes, leading to progressive disfigurement and disability.

Figure 1: The back of a patient with leprosy. World Health Organization/National Library of Medicine.

Leprosy is more dreadful than other infectious diseases in that it disfigures and even cripples its victims, rendering them "hideous". Common external symptoms include bright red patches covering the body, loss of hair, limb atrophy, and the appearance of oedema or nodules. The infected person became “neither human nor

ghost," an existence that evoked both fear and repulsion among the healthy(Castano et al. 2011; Mitchell 2004).

Leprosy was regarded as divine punishment for worldly sin; the visible lesions of the disease were interpreted as evidence of the leper's moral corruption(Schamberg 1899). Specific ecclesiastical regulations required that lepers use separate seats and holy-water fonts (stoups) within churches, and in some cases, special "leper windows" or narrow wall openings were installed so that they could watch the Mass without contaminating the congregation or the sacred rites. The sufferers' pain was so intense and so visibly manifest that contemporaries believed the disease to be highly contagious. To isolate, control, and pacify these "unclean bodies," leprosaria were established throughout Europe, becoming one of the earliest architectural types in human history designed specifically to address epidemic disease.

In reality, however, leprosy was a slow and protracted disease, seldom immediately fatal. Patients often lingered for years, forced to "survive in disgrace" while bearing the unmistakable marks of their illness. They were called the "living dead," treated as if already deceased from the moment of diagnosis(Demaitre 2007).

2.1.2 Moral Contamination and Religious Exclusion

In medieval European society, illness was never understood as a mere physiological anomaly, but was imbued with theological significance(Irvine 2011). Leprosy, in particular, epitomized this integration. It was regarded as a "visible

manifestation of spiritual impurity," and the authority to determine what was "impure" or "pure" rested firmly in the hands of the clergy. During the historical phase of leprosy, systems of isolation were religious rather than medical. The Church functioned simultaneously as the diagnostician and as the architect of spatial order. Grounded in Scripture and enacted through ritual, it transformed "disease" into a moral judgment. As recorded in the Book of Leviticus: "When a man shall have in the skin of his flesh a rising, a scab, or a bright spot, then the priest shall look on him, and pronounce him unclean". Through liturgical acts and public declarations, the clergy endowed illness with moral meaning and, in so doing, defined who belonged to the "City of God" and who was to be expelled beyond its bounds.

Yet exclusion did not necessarily entail total abandonment. Although lepers were driven out of ordinary society, their existence was not conceived as an absolute curse.

Historically, leprosy had been recorded since antiquity, but its widespread dissemination across Europe began in the eleventh and twelfth centuries. According to medical historian Luke Demaitre, its true "period of social explosion" was closely linked to the Crusades (1096–1291). As Christian knights, pilgrims, and merchants traveled along Mediterranean routes to and from the Holy Land, the disease moved with them, spreading through the channels of population and commerce into the European continent.

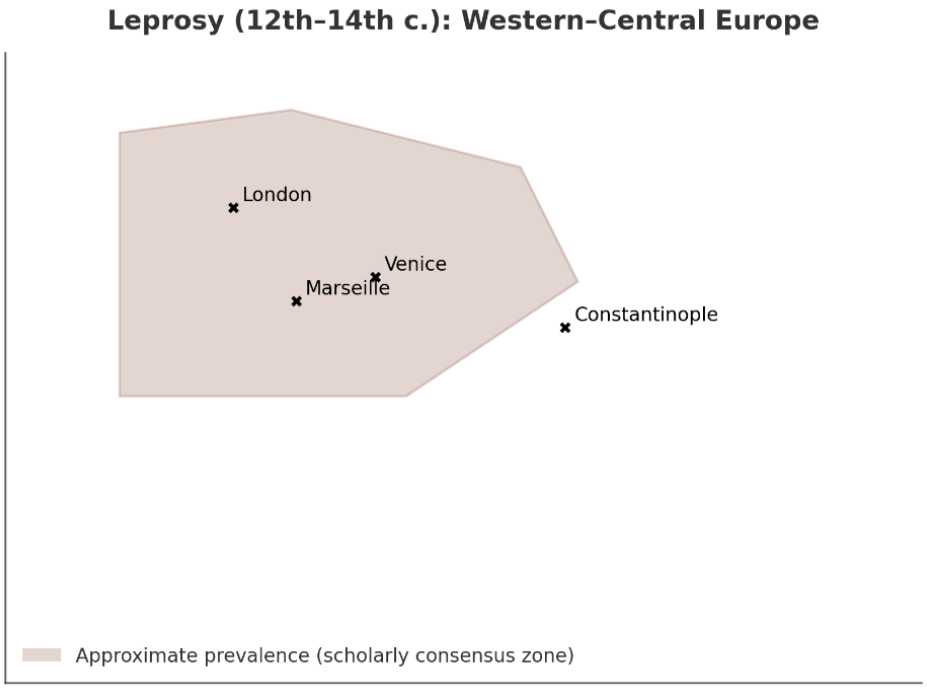

Figure 2: The primary areas affected by leprosy in the Mediterranean region during the 12th to 14th centuries. As mapped by the author.

At the heart of the Crusader Kingdoms—Jerusalem—ruled a young monarch afflicted by the disease. Baldwin IV, the only historically verified "leper king," governed the Holy City between 1174 and 1185, maintaining a precarious balance between bodily decay and royal authority. Although the symptoms of leprosy had already appeared when he ascended the throne, Baldwin actively led military campaigns against Saladin and, in 1177, achieved a decisive victory at the Battle of Montgisard. This victory led him to be regarded at the time as a "miracle of divine favor"(Brundage 1969).

His existence became a both side thing, Leprosy was thus profoundly understood: he was a king chosen by God, yet marked by a fatal disease; his body decayed, yet his soul was deemed pure and graced by divine favor. Therefore, the leprosy has changed from a completely unclean symbol to a sufferer who embodies both justice and suffering.

Against this background, the church exercises dual authority: both the mediator of spiritual redemption and the adjudicator of social exclusion.

Cardinal Jacques de Vitry (about 1160-1240) asserted: "Since lepers suffer more in this world than in purgatory, if they devote their lives to spiritual well-being, they will receive heavenly rewards (Welch & Brown, 2016, p. 55).” Christina Welch and Rohan Brown, in their exploration of medieval vernacular literature and theology, further characterize lepers as “both sinners and redeemers, granted an unprecedented opportunity to repay the debt of Purgatory in this life rather than the next.”

The <Pontificale Romanum> of the twelfth and thirteenth centuries records that, during the expulsion of a leper, the bishop was to sprinkle holy water, recite the words “Thou art dead to the world but alive again in the Lord,” and present the bell, staff, and cloak as “signs of separation”. This ritual symbolized the completion of the leper’s “social death,” while simultaneously reaffirming, within the ritual space of the Church, the moral boundary of the “community of the pure.”

Figure 3: (Detail) A crippled leper, seated, with a bell. British Library, Lansdowne MS 451, f.127 (Pontifical manuscript, c. 1400).

Carole Rawcliffe (2006) notes that such ceremonies functioned as acts of *moral purification*: they legitimized exclusion while conferring religious meaning upon the leper's suffering ((Rawcliffe, 2006, p. 59–64). François-Olivier Touati (1998), through his study of the liturgical manuscripts of the Diocese of Rouen, further demonstrates that the expulsion rites for lepers, although varying slightly in

form across regions, followed a consistent logic—the reinforcement of social structure through religious performance ((Touati, 1998, p. 186–193).

In the clergy's sermon, the suffering of lepers is interpreted as an opportunity to atone for sins - "experience the purification of the soul through the pain of broken body". Under the pressure of this theological interpretation, the life of the leper is like an endless night - full of groping, obedience and patience - they try to strengthen their faith in suffering and show the will to redeem themselves(Caner 2018). The following chapters will discuss their daily life patterns and living conditions.

The very existence of these rituals endowed exclusion with a sacred formality, transforming social rejection from an act of violence into an “execution of divine will.” This ritualized exclusion gradually became institutionalized, incorporated into the legal framework of the Church during the twelfth and thirteenth centuries. In this way, leprosy became a paradigmatic case of religious expulsion and social isolation.

2.1.3 Peripheral Lives

Lepers were prohibited from entering churches, markets, mills or baths(Brundage, 1969, p. 312-316); Their dwellings were required to be located beyond the edges of the city and were marked by special designation in civic records. Thus emerged the *leprosarium*—an institution that provided care and lodging for those afflicted with leprosy, established under the authority of a parish or a religious order, and whose statutes were approved by the bishop (Touati, 1998, p. 195–201).

From the perspective of architectural history, the medieval *leprosarium* represents the earliest institutionalized form of “architecture of isolation.” This “architectural segregation” was a direct spatial projection of ecclesiastical power. Unlike later hospitals or quarantine stations, its purpose was not healing but rather isolation and penitence. Once the church makes a judgment - that is, the church declares someone "unclean" - the exclusion act does not end, but actually begins. The body of a leper must be kept outside the life of citizens, but still within their sight(Foucault 1971). At the spatial level, these institutions transform the relationship between disease and architecture into a social practice: cleanliness is defined by distance and order is maintained by isolation.

These buildings are usually located on the outskirts of the city, on the banks of the river, or by the pilgrimage route. They constitute a "social external", which only maintains the minimum connection with urban life to receive alms and food, but is firmly isolated from the field of daily life(Rawcliffe, 2006, p. 80–90). Their architectural layout usually includes a secluded chapel, a closed courtyard, a public dormitory, a cemetery and a strictly managed entrance - reflecting the dual logic of "purification" and "exclusion" in the Middle Ages. The design of such buildings regards distance as a moral principle and uses spatial partitions to establish the order of faith.

Under this spatial order, leprosy patients are forced to abide by a set of strict visibility norms. Worship manuals and parish regulations require them to carry bells

or sticks so that others can hear and avoid them; when they go out, they must wear cloaks and gloves to prevent direct contact with the "cleaner"(Rawcliffe 2006). During religious ceremonies, they can only stand on the porch or outside the window and catch a glimpse of the altar through the narrow gap - this symbolic form of participation has always been limited by exclusion. This state, which is both visible and untouchable, makes leprosy patients "visible invisible people". They are constantly monitored by society, but are deprived of the right to participate in social interaction. The phrase “vivus mortuus” (the living dead), which recurs frequently in medieval chronicles, perfectly captures this existential paradox: they were institutionally acknowledged as ‘alive’, yet socially and symbolically already buried.

However, society is often unwilling to admit its indifference. The leprosy hospital is often packaged as a charity and accepts bequests, donations and alms. Urban elites, congs and pilgrims donate to these institutions to ensure that souls are saved and receive symbolic merit through devout behavior (Touati, 1998, p. 213–220). This ‘charitable economy’, while outwardly an expression of compassion, in fact reinforced structural exclusion. As R. I. Moore has argued, in the process of forming the “persecuting society’, devil Europe often incorporated undesirable groups into systems of orderly exclusion under the guise of religious charity (Moore 2007).

The life in the leprosy hospital is also full of duality. Leprosy patients are not completely autonomous individuals, but live in a highly regulated environment. The charters of each leprosy hospital stipulate strict daily routines: praying several times a

day, collective silent meals, no going out without permission, and the access of visitors and donors also requires the approval of the dean. After the death of the patient, he will be buried in the hospital, and their companions and inpatient monks will pray for them (Rawcliffe, 2006, p. 70–76; Touati, 1998, p. 195–201). The leprosarium thus assumed a semi-monastic structure—at once a place of refuge and charity, and a site of discipline and segregation.

Despite the strict system, leprosy patients still seek self-affirmation in the gap of discipline. Historical records show that they formed a small network of mutual assistance - sharing food, weaving clothes, caring for the weak, and organizing prayers and singing on festivals. Rawcliffe pointed out that the formation of this "micro-society" maintains a trace of fragile humanity in the institutionalized world that was originally strictly controlled(Rawcliffe 2006).

The leprosy hospital constitutes the cultural and institutional origin of the isolation of buildings in later generations. The chapel is usually located on the central axis of the courtyard, facing the cemetery, thus forming a spiritual axis of "redemption and death". This spatial syntax presents the theological sequence of ‘sin-repentance-death’ in the form of architecture, making the leprosy hospital a social visual device: it shows the boundaries of order to the city and the scene of charity to the believers. Symbolically speaking, these buildings foreshadow the transformation of buildings from the medium of ‘shelter and redemption’ to the medium of ‘governance and

control’. They became the prototype of public health and isolation buildings in later generations.

From a critical point of view, the leprosy hospital is an architectural response of medieval society to its own fear. As Michel Foucault observed, “to organize order through space and maintain control through distance” (Foucault 1995) found an early realization here. A tacit understanding has been formed between the church and the municipal authorities: the church claims to have the moral legitimacy to control the patient, while the city benefits from public order and health. This structure made the leprosy hospital a pioneer of the concept of later epidemiological institutions. From these marginal facilities to later port quarantine stations and isolation hospitals, architecture has always played the role of a material extension of the social exclusion mechanism - transforming ‘fear" into ‘order’ and ‘exclusion’ into ‘structure’.

However, we should also see that these spaces are not completely ‘outside the society’ They exist in the gap between indifference and charity, exclusion and redemption, forming a complex layer of social memory. The ruins and archives of the leprosy hospital show that the lower level of medieval society is not a blank, but an extension of another order. It is in these abandoned spaces that architecture assumes the dual function of governance and morality for the first time. They are not only a place of punishment, but also a refuge of conscience - a place where fear and faith coexist. The spatial logic of the leprosy hospital thus became the basic model of later quarantine buildings: walls, regional division, observation, distance and symbols. All

of these marginal elements were later recoded by modern countries to form a unified language of health and disease prevention. They reveal a deeper truth: isolation has never been just a technical means, but also a response to the needs of order and faith(Moore 2007).

2.2 The Plague and Civic Quarantine (15th–17th c.)

If the isolation practiced during the era of leprosy embodied a religiously motivated “expulsion”, using ritualized spatial boundaries to exclude the afflicted from the city, then by the mid-fourteenth century, the arrival of the plague compelled cities to reinterpret the relationship between disease and space in entirely novel ways.

From a modern medical perspective, the plague is caused by Yersinia pestis, primarily transmitted through flea bites and rodents. Medieval European port cities provided the ideal habitat for these vectors (Benedictow 2008). From 1347, it rapidly spread along Mediterranean trade routes, engulfing virtually all of Europe within months. Modern epidemiological research indicates that plague outbreaks were closely linked to port cargoes, maritime trade, and densely populated urban environments—it was a disease deeply embedded within the urban system(Green 2015).

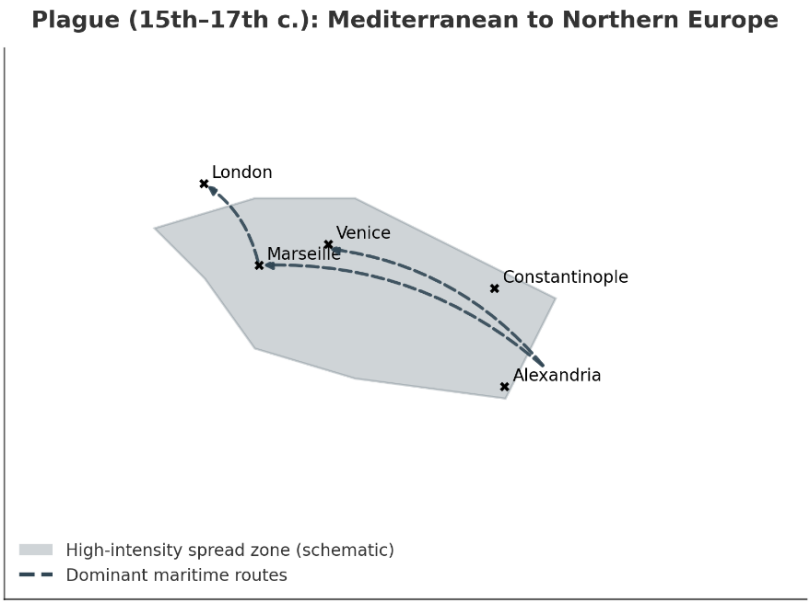

Figure 4: The primary areas affected by the plague in the Mediterranean region during the 15th to 17th centuries. As mapped by the author.

However, in the general understanding of society at that time, the plague was not regarded as a biological infectious disease, but was understood as the transmission of polluted air - miasma. The plague spreads much faster than any previous disease. Fear spread rapidly between cities; this fear stems from the spread of the plague: the disease is no longer limited to individuals, but shows a spatial spread(Chiu 2019). What people ‘see’ are the neighborhoods where the dead are rampant, the sealed ports, and the houses that have been razed to the ground(Moore 1992). Plague is no longer just interpreted as God's punishment, but is gradually understood as an ‘infectious disease’ that can be controlled by space and administrative measures. People's response has also shifted from religious confession and prayer to administrative control and management.

It was in this transition process that the concept of ‘isolation’ was born, marking the inclusion of isolation measures in the urban governance framework for the first time: the urban authorities began to institutionalize the flow of managers and goods in an attempt to block the spread of the disease through spatial isolation and time delay.

The city government has tried various new measures, from the blockade of ports to the construction of special epidemic isolation facilities, transforming quarantine from emergency eviction into a governance practice with organizational structure and spatial order. Unlike the ‘exclusion’ space of early leprosy hospitals, the isolation facilities in the 15th century presented a functional form of integration into urban governance: a disease prevention logic applicable to all citizens. It replaces religious rituals with institutional frameworks, rules and regulations and supervision mechanisms, and has become an administrative practice to maintain the vitality of the city.

2.2.1 Arrival of the Plague

In the autumn of 1347, a merchant vessel from the Black Sea coast slowly entered the port of Messina on the island of Sicily, Italy. Its holds were laden with goods from ports along the Silk Road—furs, grain, spices—items that once symbolized prosperity and trade, yet now carried an invisible death. Many crew members had already fallen ill, their bodies festering with pus and blood oozing from

their wounds. By the time local officials urgently ordered the vessel's expulsion, the disease had already crossed the harbor’s boundaries, spreading along trade routes and through correspondence to Genoa, Venice, and Marseille. Within a few short months, the entire Mediterranean world was plunged into the shadow of the plague(Barnes 2019).

Trade routes became pathways for disease, prosperous sea lanes turned into death's passageways.

This marked the beginning of the plague's entry into Europe's urban systems via trade networks. Fourteenth-century Europe was undergoing an unprecedented expansion of transport and commerce. Ports, warehouses, churches, inns and marketplaces collectively formed a vast circulation network. The wealth of the Venetian Republic was built upon the extension of these sea routes, which simultaneously carried the seeds of disaster into the city. Scholar Monica Green observes that the plague's rapid spread was directly linked to the high density of rodents within port warehousing systems(Green 2015) . In other words, the city's economic strength lay in its “openness” – a quality that proved its fatal weakness. The plague ravaged the land through the economic system formed by the exchange of goods. Viewed thus, the plague was not merely an "external force" invading the city, but a disease bred by the city's own structure—embedded within the logic of trade and propagated through connectivity.

At the beginning of the spread of the plague, officials tried to close ports, ban markets and ban gatherings. However, these measures are always too late; the spread of the plague far exceeds the speed of enforcement of administrative decrees(Seager 2008). Cities in the fourteenth century showed an unprecedented sense of powerlessness: the more complex the spatial structure, the more difficult it is to control. Unlike the effective ‘isolation’ measures taken against leprosy, the outbreak of the plague forced cities to face the problem of "how to manage population flow" for the first time - a challenge not only to morality or faith, but also to administrative management and spatial organization.

The archives of Venice and Genoa preserve the earliest emergency decrees: merchant ships were required to anchor off the coast for a few days, foreign merchants were prohibited from entering the city, and houses that accommodated the sick must be marked with a red cross. Although these measures are still rudimentary, they provide a new way of governance: the self-repair of cities no longer depends on praying for forgiveness from the gods, but on artificial control of time and order(Carmichael 1983).

Literature also has its own imaginings of this social experience. In the prologue to The Decameron, Boccaccio wrote: "Even breathing carried death between the houses and streets" (Boccaccio and McWilliam 2003). His Florence resembled a sealed vessel, its citizens torn between flight and self-preservation. Centuries later, Camus captured this experience in The Plague: "The city's lockdown rendered every

soul a prisoner, imposing a uniform chill. Yet it was precisely within this confinement that they began to grasp the meaning of community. There was no longer an individual fate, only a collective destiny(Camus et al. 2002)."

The plague is not merely a biological event, but also a fresh challenge to social relations and spatial order. In a certain sense, it is the most democratic of events, where all souls are rendered equal.

2.2.2 Institutionalizing Quarantine

Among all the port cities in the Mediterranean world, Venice is undoubtedly the earliest and most systematic city to practice the quarantine system. Venice was chosen as the object of analysis not because of its uniqueness as a quarantine city, but because it developed a traceable, quantifiable and institutionally sustainable epidemic prevention system between the 14th and 17th centuries. Venice's highly bureaucratic political structure and economic dependence on maritime trade make its fragile openness very vulnerable to the threat of infectious diseases, thus forcing it to take early administrative responses (Cipolla 1976; Tognotti 2013). Consequently, Venice stands not merely as the origin of quarantine systems but as a quintessential example of the conceptual shift towards "public health as an administrative matter".

With the rampant spread of the plague and the sudden exposure of urban vulnerability, society has gradually shifted from a fragmented emergency response to an institutionalized governance framework(Wallace 2007). In 1377, the Republic of

Ragusa (now Dubrovnik, Croatia) issued a quarantine decree requiring travelers, sailors and goods from the epidemic area to be quarantined on offshore islands for 30 to 40 days before entering the city. This measure is considered to be the earliest official quarantine system in Europe, and its core logic is to block the spread of disease through time delay and spatial isolation.

The Republic of Venice in the 15th century was a maritime trade center, and it realized that its economic lifeline depended on the movement of people, ships and goods - which were precisely the ways of epidemic invasion. Therefore, during this period, the city authorities sought to incorporate regulatory measures such as "mobile control", "quarantine" and "registration" into their regulations, thus transforming public health into a controllable administrative matter.

Specifically, in 1423, the Senate of Venice ordered the establishment of a quarantine zone on a small island in the lagoon, which was later known as Lazzaretto Vecchio, to receive suspected infected people and suspicious goods. This constitutes the world's first permanent isolation island, marking the transition of isolation measures from religious deportation to formal quarantine measures with specialized facilities and administrative systems (Crawshaw 2021).

Venice's quarantine system has been gradually improved, and the twin-island model has been adopted. In 1468, the New Island Quarantine Station (Lazzaretto Nuovo) was established on another island not far from the old island. The facility is dedicated to receiving overseas ships and goods, and implementing observation and

fumigation procedures. The regulation of “quarantine" (Italian for "quarantena" means "forty days") is officially established as a mandatory procedure for ships and personnel entering Venice: arrivals and their goods must stay in the designated area and must not immediately enter the city. According to historian Tognotti, the number "forty" not only comes from empirical considerations - the time required to observe the patient's symptoms - but also inherits the symbolic meaning of "forty days of purification" in the Bible, formally integrating religious ethics with administrative regulations (Tognotti 2013).

This system of recording, verifying, and tracking "movement" provided the city with an operational language of governance: any "outsider" entering the city—be it goods, persons, or vessels—could be temporarily "frozen," registered, and subject to delayed clearance. This practice did not stem from a scientific medical understanding of disease transmission, as bacteria and infectious pathways remained unknown at the time, but rather from the city's accumulated administrative and commercial experience.

At the same time, the early Lazzaretto Vecchio was dedicated to the treatment of confirmed patients. The former is the first line of defense, and the latter is the final isolation point. Together, the two form a "space order sequence", from suspicion to diagnosis, from observation, diagnosis and treatment, thus realizing the proceduralization, phased and isolation of disease management (Crawshaw 2021; Tognotti 2013).

By the late fifteenth century, Venice established a permanent Sanitary Magistrate (Magistrato alla Sanità). This consolidated the administrative status of early epidemic control measures, embedding the quarantine system within the urban governance framework.

Despite the unprecedented threat and mortality of the plague, economic interdependence remains the lifeblood of urban vitality and is inseparable. In terms of urban governance, cities show a ‘double movement’: on the one hand, continuous blockade, blockade and expulsion; on the other hand, trade, communication and politics force cities to remain open. The rhythmic ‘breathing’ of the closure and reopening of the city gate, and the suspension and restart of the market emerged from this. For the first time, the plague revealed the physiological structure of the city - like a living organism, it must seek survival through contraction and expansion(Carmichael 1991).

The long-term implementation of these epidemic control measures has gradually given rise to a new spatial awareness within the city: ports and borders have become key nodes in the ‘body’ of the city. The openness of trade and the risk of disease are seen as the two poles of the same system. Institutional isolation not only regulates trade flows, but also shapes the concept of ‘collective health’ in social consciousness.

2.2.3 Shared Responsibility

In Venice in the 14th and 16th centuries, the Lazzaretto represented a governance model that symbolized order, delay and security. From the perspective of social history, the establishment of the segregation system has changed urban residents' understanding of public affairs. Personal health is no longer regarded as a private matter, but a common responsibility to maintain the survival of the city (Tognotti 2013). Unlike the ad hoc panic of earlier plague outbreaks, citizens began to conceptualize disease and space through institutionalized frameworks. Merchants, sailors, artisans, religious organizations, and government officials were all integrated into a shared epidemic prevention network, forming an early "sanitary community" (Crawshaw 2021). This sense of community provided a governance paradigm for later European cities: the management of disease relied not only on scientific diagnosis, but also on political policies and societal compliance(Eckstein 2021).

Firstly, the establishment of the quarantine system altered the rhythm of life and social structure for urban residents. The Venetian government decreed that all vessels and passengers entering the port must undergo a forty-day observation period; local inhabitants wishing to interact with outsiders were required to report to the health authorities. Markets and workshops were closed periodically by statute, with goods stored in quarantine warehouses and subjected to fumigation and disinfection. Citizens were instructed to self-isolate at home; if a household member fell ill, the whole family was registered and placed under quarantine with their doors sealed

(Crawshaw 2021). This institutionalized system renders 'compliance' a daily norm—while residents execute administrative directives, they implicitly endorse the city's collective security. The city thus becomes a community of shared destiny sustained through unified health management(Cohn and Alfani 2007). This community is founded not on emotional bonds, but on administrative procedures and mutual surveillance—a nascent form of modern governance centered on “hygiene”.

However, this 'shared responsibility' was not an equal one. The enforcement of quarantine involved a strict division of labor within society. Officials from the health authorities, shipping supervisors, clergy, artisans, and dock laborers collectively formed distinct tiers within the epidemic prevention network. Merchants were required to declare the origins of their goods and bear the costs of disinfection; port workers were responsible for handling and burning contaminated items; while artisans manufactured fumigation furnaces and lime powder for purification purposes (Palmer 2022). Cities were demarcated into clearly delineated "clean zones" and "risk zones," with visible oversight. Power subtly governed urban operations throughout the city.

This general impact is not simply manifested as suppression. Long-term isolated cities have nurtured a deep sense of loneliness and social indifference in the hearts of their residents. However, it is in this atmosphere that some residents have shown a high sense of social responsibility and humanitarian care. In Venice, the epidemic prevention work is highly dependent on a wide range of social cooperation:

religious charities provide relief for patients, culls organize funds to repair isolation facilities, and workers spontaneously clean the streets.

The plague came without warning, without fairness or logic, and life and death became random and chaotic. In the face of this absurdity, the ‘actors’ recorded in history - whether monks, doctors or ordinary craftsmen - have shown a moral position that transcends survival instincts: only action can resist this absurdity. They ensured that the city could maintain the most basic social structure when it was on the verge of collapse. Some people sacrifice for mercy, and some people survive for fear (Boccaccio and McWilliam 2003). Social engagement gave birth to new forms of solidarity amidst terror. As Crawshaw observes, quarantine systems compelled urban dwellers to contemplate their relationship to the collective for the first time as “citizens”—not subjects of God, but integral parts of the city's body politic (Cohn 2018; Crawshaw 2021).

The quarantine system fostered trust in the institution itself through mutual observation, documentation, and oversight. Urban cohesion no longer stemmed from religious rituals but from a shared pursuit of “safety”. It was within this institutional consensus that urban spaces developed a self-awareness of governance—neighborhoods, ports, thoroughfares, and warehousing districts were perceived as manageable, adaptable organisms. As historian Carlo Cipolla observes, the Black Death not only catalyzed the emergence of modern medicine but compelled cities to adopt bureaucratic approaches to bodily health and disease, thereby laying the

foundations for the modern public health administration system (Cipolla 1976). Urban spaces were thus reimagined as governable diagrams, a prerequisite for the emergence of quarantine architecture(Whyte 2006).

Venice's quarantine regime established “hygiene” as a central concern of urban governance, providing an institutional model for subsequent European ports. Nevertheless, this system remained localized and experiential: it depended on the administrative execution of specific ports and traditions of urban autonomy, lacking any coordinated mechanism across regions.

2.3 Cholera and Imperial Order (18th–19th c.)

On a very hot summer afternoon, vessels queued before customs at the port of a coastal city, with cargo, passengers and mail all forced to remain confined within their holds, waiting for the quarantine officer’s approval. Meanwhile, far inland, fear spread through the city streets: people went from healthy to dead in just a few hours, alleys were washed with lime water, and bodies were buried in haste.

As the eighteenth century began, the growth of global trade and the movement of more people showed how weak local quarantine systems were, especially against new diseases like cholera(Lu 2025). If quarantine during the plague had once shown the start of city control, then in the nineteenth century, cholera was no longer just a city’s problem. Spreading along trade routes and colonial shipping lanes, it became a global phenomenon for the first time, transforming quarantine from an urban

emergency measure into a permanent imperial system. Nations began experimenting with more systematic approaches to managing circulation and risk, shifting quarantine from a municipal affair into an instrument of imperial and national governance (Snowden 2019).

From a modern medical point of view, cholera is caused by *Vibrio cholerae* and mainly spreads through dirty or polluted water(Rosenberger et al. 2012). First emerging in the Ganges basin of India in 1817, cholera subsequently spread along colonial shipping routes and trade networks to every corner of the globe, becoming the first truly global infectious disease in history (Harrison 2013). Nearly all major port cities of the nineteenth century suffered from this crisis (Inì 2024). With the rapid expansion of maritime trade and the substantial increase in population movement, the spread of disease had long since transcended former national boundaries, undermining the administrative order of empires.

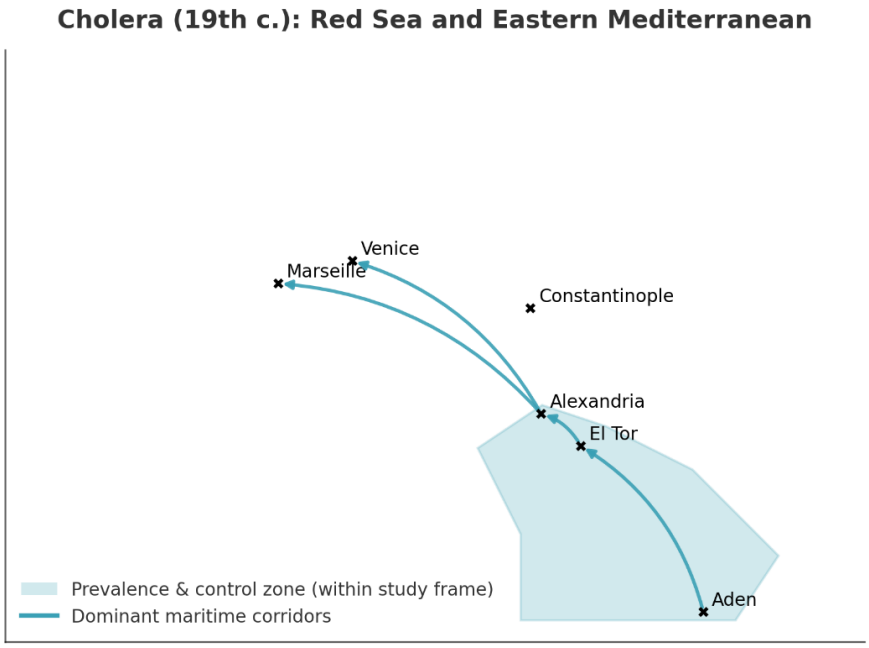

Figure 5: The primary areas affected by cholera in the Mediterranean region during the 19th century. As mapped by the author.

Faced with this 'mobile threat', governments were compelled to rethink the boundaries between health and sovereignty (Howland 2016). Quarantine ceased to be a temporary epidemic control measure and became institutionalized as a continuously operating administrative mechanism. The establishment of international conferences, port conventions and health commissions transformed quarantine into a nexus of diplomacy, commerce and politics. Concurrently, medical statistics, population censuses and the construction of public infrastructure rendered 'health' a symbol of governance modernization. Architectural forms such as port isolation wards, observation stations, disinfection chambers, and health offices were systematically replicated and standardized across imperial port networks.

It is in this global geographical pattern of disease that the significance of quarantine buildings is redefined. These buildings are no longer just epidemic prevention facilities, but become the basic units for the exercise of power. Through port observation stations, isolation camps and health offices, the Empire was able to achieve its visibility and controllability.

Therefore, cholera marks a key turning point in this research framework: isolation has changed from an urban practice to a global institutional network, and architecture has evolved from emergency epidemic prevention facilities to a spatial carrier of administrative order. A modern epidemic control model with the control of people flow and maintaining order as the core has been born.

2.3.1 Legacy of the Plague System

By the eighteenth century, Europe's plague crises had largely subsided, yet the “plague system” with quarantine persisted as a core. Instead, it became part of everyday administration and trade, turning into a normal part of how the city worked. During this period, the quarantine system went through a slow but important change: it shifted from an emergency action to a regular procedure, and from a religious practice to a form of government control.

In Venice and its former ports, the Magistrato alla Sanità (Health Office) continued to operate. Every ship that entered the port had to show a health certificate (fede di sanità), which recorded its place of departure, route, and whether it had been

checked for quarantine on the way. Crew members and cargo are classified according to established rules, and health personnel, suspected cases and infected people are placed in different areas. The old quarantine area building is still in use, but its use has quietly changed: emergency isolation has been replaced by warehousing, ventilation and cleaning. These buildings are no longer just scary places, but have become part of the trade network. In this way, quarantine is no longer a sign of panic or lockdown, but an administrative routine - a ‘pause’ integrated into the rhythm of urban life(Carmichael 1998).

The continuation of this system has also changed the relationship between cities and their residents. In the port of the 18th century, residents had long been accustomed to all kinds of controlled sounds and signs: the ringing of ship bells, the raising of flags, and the patrols of officials had become part of daily life. The boundary between disease control and normal life is beginning to blur. Sweeping the streets, cleaning houses and burning garbage are no longer regarded as crisis response measures, but as part of the daily management of the city. Therefore, urban governance has formed a ‘isolation rhythm’ to maintain order through continuous attention and silent supervision. In order to protect public health, observing and classifying people has gradually become a routine practice.

However, this ‘plague system’ had obvious limitations at that time. Its way of fighting disease is still based on observable and controllable factors in a closed space - removing visible sources of infection through isolation, lockdown and cleaning. This

method was effective in controlling the plague, but when cholera spread along trade routes in the early 19th century, it appeared too slow and fragile. Cholera will not stay in objects or ports; it will spread with water and the flow of people. This ‘invisible transmission’ is beyond the understanding and control of traditional isolation measures. Therefore, the old plague system must be reshaped, and the scope of disease control must be extended from cities and ports to the imperial and global levels.

Therefore, the isolation system in the 18th century can be regarded as a turning point. It is not only the legacy of plague prevention, but also the beginning of modern public health. It retains the early spatial logic and administrative tools, and also lays the foundation for the later large-scale health system. Therefore, the plague system is not an immutable legacy, but an ever-changing living system that links disease control to the expansion of the empire and global ties.

2.3.2 Cholera and Invisible Mobilities

At the beginning of the nineteenth century, the spread of cholera made Europe and the Mediterranean world rethink the link between disease and movement. Unlike leprosy, which showed clear signs of body decay, or the plague, which appeared through visible symptoms in people and streets, cholera’s attacks were sudden and hidden. Its danger was hidden in the most ordinary things—water and air—both completely invisible to people at the time. Modern medical research has shown that

the bacterium Vibrio cholerae, which causes cholera, originated in the Ganges Delta and first broke out in Bengal in 1817. It then spread along trade and sea routes to the Middle East, Europe, and North Africa (Harrison 2013; Snowden 2019). During this process, pilgrimages, military movements, and labor migration became key channels of transmission, turning the spread of disease into a social problem.

The “plague system” left from the eighteenth century still assumed that diseases were visible and could be blocked—ships could be stopped and ports could be cleaned. However, cholera’s pattern of spreading completely broke this logic. Cities could no longer rely on sight, smell, or local geography to tell what was safe or polluted. As Hamlin pointed out, the horror of cholera was not just its high death rate, but the fact that it was “everywhere and invisible” (Hamlin 2009). Faced with such an unseen threat, traditional quarantine systems had to shift toward managing movement itself.

Since then, the focus of epidemic prevention and control is no longer a closed space, but on the classification of people. With the expansion of steam shipping and trade routes, ports along the Mediterranean coast are connected to ports along the Red Sea and Indian Oceans. The quarantine system, which was once limited to the urban level, has gradually become part of the imperial health network across Eurasia. The port health department has begun to regard certain mobile groups - pilgrims, travelers, workers and soldiers - as potential disease carriers. These people must present a health certificate, undergo a physical examination, or be placed in a temporary quarantine

area(Barnes 2014). Case statistics, population registration and movement tracking have replaced the judgment of the appearance of the human body. In order to control the large number of people going to Mecca, the Ottoman Empire and European powers set up quarantine camps and diversion ports along the Red Sea coast to prevent infected people from bringing the disease back to Europe (Low 2008a).

This governance of 'invisible carriers' reflects a new risk logic: epidemic prevention no longer depends on visible symptoms, but on statistics, data and administrative classification. The building space is redefined in it, and the quarantine camp, health station and temporary isolation warehouse become the nodes for controlling the flow, not the closed defense line. Through these nodes, the health network is geographically extended from urban boundaries to a transoceanic system, and politically transformed from epidemic prevention practice to an imperial governance mechanism.

At the city level, this shift also changed the structure of public space. Sewers, water systems, and housing density became the new focus of health authorities. Street cleaning and waste removal turned into regular municipal duties. Public health became a continuous effort of "making things visible": through maps, reports, and population data, invisible diseases were transformed into forms that could be observed and managed (Latour and Latour 1993).

Cholera forced cities to stop relying on sight, smell, or geography to sense danger and instead to use systems, testing, and statistics to "create visibility." Thus,

nineteenth-century quarantine and sanitation practices became a spatial battle against an “invisible enemy.” They relied on buildings and rules to turn disease into something that could be prevented and governed—reshaping the boundaries of safety in a world defined by movement.

2.3.3 Permanent Quarantine and Imperial Architecture

Since the nineteenth century, there have been several global outbreaks of cholera. These repeated epidemics pushed the disease control systems of the nineteenth century to move from short-term emergency responses to permanent institutions.

In the frequent outbreaks of the early decades, port health offices relied on temporary camps and transit stations to control the movement of people. However, this flexible network soon proved unable to meet the needs of imperial administration(Low 2008b). Governments—whether Ottoman, French, or British—began to realize that long-term health management required stable, physical spaces. As Snowden pointed out, cholera “forced states to build a new form of administrative continuity,” expressed through the “architecturalization of basic health infrastructure” (Snowden, 2019, p. 237–239). From then on, buildings were no longer only defensive walls in times of crisis but became everyday tools of governance—spatial devices used to maintain order and exercise authority.

After cholera, states began to treat public health as a lasting administrative concern rather than an exceptional crisis (Foucault 1995). By the mid-nineteenth century, this “architectural administration” gradually took shape across the Mediterranean and its connected sea routes(Prevalence of disease: In insular possessions 1914). Port quarantine buildings were no longer limited to cholera prevention. They evolved into permanent institutions designed to manage all potential infectious risks.

In France, the Lazaret de Frioul was rebuilt on the Frioul Islands near Marseille, transforming the old plague defenses into a long-term quarantine station for port operations (Les lazarets de Marseille, Univ-AMU). At El Tor, the gateway to the Red Sea, the Ottoman Empire and European powers jointly carried out regular inspections of pilgrimage ships, making health control over travelers a new form of inter-imperial cooperation (Low 2008a). In Alexandria at the eastern end of the Mediterranean, the Conseil Sanitaire Maritime et Quarantine became institutionalized by the late nineteenth century, forming a permanent health administration system covering the Suez Canal routes (Tsiamis, Hatzara, and Vrioni 2022). All these buildings and institutions shared the same purpose: to fix mobile risks into physical space, using the constant operation of architecture and facilities to maintain administrative continuity (Markus 2013).

This “permanent quarantine” represented more than a medical strategy—it was a visible expression of imperial order. Port quarantine stations often combined

medical, customs, police, and diplomatic roles, exercising administrative power under the name of public health. As Bashford argued, nineteenth-century public health became “part of the technology of empire” (Bashford, 2004, p. 18–20). The isolation facility is both a medical tool and an entity symbol of political boundaries. Therefore, the building plays a dual role: on the one hand, it is still a medical space for disinfection, isolation and examination; on the other hand, it becomes a point of control and surveillance, symbolizing the authority of the empire in an increasingly interconnected world.

At the spatial level, epidemic prevention buildings have begun to show a new institutional order: zoning, symmetry, purification and registration have become its basic principles. Standardized layouts and repetitive procedures have turned local isolation stations into replicable administrative models. Bashford described it as a ‘preventive building’ - an infrastructure that continues to exercise power through space. From Marseille to El Tor, from Alexandria to Trieste, sanitary buildings form an imperial network. They are both medical posts and administrative checkpoints. Unlike the early religious isolation buildings, these spaces belong to a world of bureaucratic rationality and scientific management. As Latur observed, the power of modern public health lies not in the defensive wall, but in the tracking systems established between buildings and documents. In these spaces, the flow of data, patients and goods is recorded, classified and archived, thus forming a traceable governance network (Latour & Latour, 1993, p. 29–31).

Therefore, the permanent isolation system during the cholera period not only continued the old port defense system, but also established a modern health management model(Lownds 1882). Disease control is no longer a passive response to crises, but a continuous administrative management; buildings are no longer just shelters against diseases, but a daily tool of imperial authority. In this sense, cholera has not only changed the history of medicine, but also the history of architecture. It marks the final evolution of the concept of "isolation" - expulsion from religion, through urban space control, and eventually develops into a permanent institutional order. Segregated architecture thus became one of the most symbolic political spaces of the nineteenth century: through walls and windows, archives and forms, it permanently linked life, health and governance.

2.4 Summary and Conclusion

Looking back over these centuries, the forms of isolation have constantly changed, yet they have always pointed to the same question — how can a society maintain order in the face of fear(Bettcher and Lee 2002).

From the expulsion rituals of leprosy, to the port defenses of the plague, and later to the imperial quarantine systems after cholera, isolation became more than just a medical measure. It gradually turned into a deeper social language. It taught cities to use space to express control and safety during times of crisis, to use architecture to create visible order. When religious rituals could no longer define what was pure and

impure, administration and architecture took over that role: the former shaped it through laws and systems, while the latter made it real through structure and movement. In this way, the city learned to draw itself through fear—building closed ports, isolated hospitals, and divided streets that together formed an image of rational order.

In the world where leprosy is rampant, isolation means exile; in the world where plague is rampant, isolation means defense; and in the world where cholera is rampant, isolation becomes management. As diseases become less obvious, society no longer judges health by physical condition, but relies on systems, data and spatial design to track down invisible dangers. Port quarantine stations, urban health bureaus, laboratories and archives together form a new type of network. Walls are no longer just to block strangers - they keep the city running through continuous monitoring. Construction has changed from a shell of defense to a tool of governance, and from crisis response to daily infrastructure. The meaning of isolation has also quietly changed: it is no longer an exception, but a normality; it no longer defines security through closure, but through circulation and control.

This transformation does not eliminate fear - it only makes fear more organized. When power enters society in the form of architecture, ‘health’ becomes a political term, and ‘safety’ is transformed into a spatial logic, every breath of the city is measured by an administrative rhythm. Perhaps the real meaning of isolation lies not in the disease itself, but in how society can protect itself in times of crisis. When

the boundaries of the crisis are embodied, and when epidemic control becomes the language of daily management, the way the city survives begins to change.

The rise of quarantine buildings is not a natural result of technological progress, but the product of society's continuous reshaping of power, morality and spatial order under the threat of disease. It is not only a response to the epidemic, but also a way for human beings to build order between fear and faith. The next chapter will discuss this transformation and raise the following questions: Once isolation becomes a system, how are these buildings activated, used and replicated? How did their spatial layout, dynamic lines and line of sight evolve into a silent governance technology?

Chapter 3. Architecture of Quarantine

In the preceding chapter, we traced the conceptual shift of quarantine from religious expulsion to administrative governance, charting the institutional and social evolution of the notion of 'isolation'. Each stage reveals that the formation of the epidemic prevention and control system not only stems from the accumulation of medical knowledge, but also from the society's instinct to protect itself through order in times of crisis. These systems do not only exist in laws and regulations; in the end, they need to be put into practice in a visible and touchable form. Therefore, quarantine buildings were born - these buildings became the places where the system was rooted, and the fear was embodied(Baydar 2004). The next discussion will shift the focus from ‘why’ these buildings are built to ‘how’ they work.

The second chapter discusses how society can gradually evolve its understanding of diseases and prevention and control measures through continuous epidemics. This process is from the germination of experience knowledge to continuous iterative improvement and consolidation, and finally condenses into an institutionalized isolation system. This series of changes prompts us to re-examine: what role does architecture play when ‘isolation’ is no longer an act of exclusion, but a daily means of maintaining order? Therefore, the third chapter discusses how these experience systems are ‘built’ and the specific functions of quarantine buildings of various types and periods.

The chapter's focus shifts from institutional history to architectural history, moving from the level of legislation and governance to that of space and form, examining how isolation is realized through architecture. Buildings cease to be mere backdrops for institutions and instead become the medium through which they operate: power, fear, and hygiene are given spatial form within architecture(Katyal 2002). Disease has, invisibly, shaped the spatial logic of the modern city.

It is worth noting that the ‘spatial mechanism’ referred to in this study denotes the operational structure formed by architecture when organizing the flow of people, goods, air and information. It functions both as a design logic and a social technology. Through the division of space, circulation routes and arrangements of visibility, architecture not only implements systems of isolation but also serves as the perception and practice of social order.

3.1 The Birth of Lazzaretto as a Spatial Prototype

In Discipline and Punish, Foucault observed: "The exercise of modern power no longer relies on visible punishment, but on the continuous surveillance of invisible processes." In its development and formation, the modern health system responded to the ‘invisibility’ of disease through the ‘form’ of quarantine architecture(Foucault 1995).

The emergence of the Lazzaretto in fifteenth-century Venice marked a turning point in the history of epidemic prevention architecture. As Europe's earliest state-

level public health infrastructure, it differed fundamentally from earlier temporary quarantine facilities. It signified the first instance of governments integrating disease control into administrative and urban management systems, thereby pioneering the "quarantine system" for posterity.

Historically, it is located at the intersection of two worlds, which not only retains the religious logic of the medieval leprosy hospital - isolation space - but also has perfect institutional rules that define spatial functions. Religious beliefs symbolizing ‘purity and sin’ have been transformed into more pragmatic bureaucratic policies of ‘health and risk’. Architecture is no longer just a means of isolation, but a medium for the operation of the system - including the isolation of patients, the inspection of passengers and goods, and the observation of potential virus carriers.

Lazzaretto Vecchio of Venice was built in 1423 and is considered the world's first permanent isolated island (Crawshaw 2021). It is located on an isolated lagoon island, with a layout including walls, a central church and a separate courtyard composed of several buildings. Patients, cargo and crew are quarantined according to different risk levels, and the facility is dedicated to the treatment of confirmed plague patients. The topography, surrounding waters and walls of the island naturally isolate it from the city. On this basis, the Lazzaretto Nuovo (new isolation area) established in 1468 was built with a storage courtyard, a fumigation corridor and a surveillance passage. It monitors those who enter the country and have not been diagnosed during the prescribed observation period, and cooperates with the Lazzaretto Vecchio (old

isolation area) to control the spread of the epidemic(Flavel and Franklin 2021). Their construction methods and architectural styles provided the basic prototypes for the later quarantine buildings system.

Figure 6: The Lazzaretti highlighted in Bordone's famous "Isolario". Book by Benedetto Bordone discussing all the islands in the world, 1528.

Therefore, this section analyzes Lazzaretto as the ‘spatial prototype of quarantine buildings’ and explores how human beings gradually develop from the early religious interpretation of isolation to the use of architectural and institutional frameworks to control the spread of diseases, so as to deal with infection in a more scientific and rational way. Disease epidemic. Through typological comparison, this section further reveals the architectural evolution of isolation practice in different

historical periods. This transformation and later the concept of "epidemic space" laid the foundation for architecture.

3.1.1 From Religious Exclusion to Architectural Governance

In the previous chapter, the leprosy hospital was established as the earliest isolated architectural form, representing the response of medieval society to the ‘filth body’. However, the spatial logic of these buildings is still fundamentally rooted in the religious order. The patient was expelled from the city and forced to live outside the city wall, across the river or in the wasteland. This geographical marginalization symbolizes their ‘death’ in society. Its spatial layout is usually centered on a core chapel, which is both a religious place and a place where the patient lives. Another form is that the ward is surrounded by a chapel, and the cemetery and garden together form a self-cointegrated small religious world(Roffey 2020).

Figure 7: Exterior perspective of the Magdalen Hospital near Winchester. The main chapel structure is visible at the right, with auxiliary buildings attached. Vetusta Monumenta, Vol. III, Plate III, 1790.

However, as we have seen before, this model exposed its limitations in the plague crisis of the fourteenth century. The Black Death swept through Europe, forcing people to realize that the threat of disease no longer comes from the "sins" of individuals, but from the movement of air, goods and people(Wallis 2006). Religious rituals could not stop the spread of infectious diseases, and prayers and repentance could not stop the spread of the plague. Therefore, the meaning of disease has changed from ‘sin’ to ‘risk', and the focus of society has also shifted from purifying the soul to protecting the body. Both the studies of Cipolla (1976) and Harrison (1994) show that during this period, health governance has gradually left the

theocratic system and become an integral part of municipal and state power. In other words, space no longer symbolizes the order of faith, but begins to play the role of operational order.

Quarantine facilities have evolved from abstract religious roles to institutional spaces with governance functions. As mentioned in the previous chapter, in 1423, the Senate of Venice set up Lazzaretto Vecchio on a small island in the southeast lagoon of Venice. This marks the establishment of the first permanent public health isolation facility in human history(Crawshaw 2016). It is known as one of the starting points of the modern public health system, marking the first time that the isolation system has been institutionalized and permanently integrated into the urban governance framework.

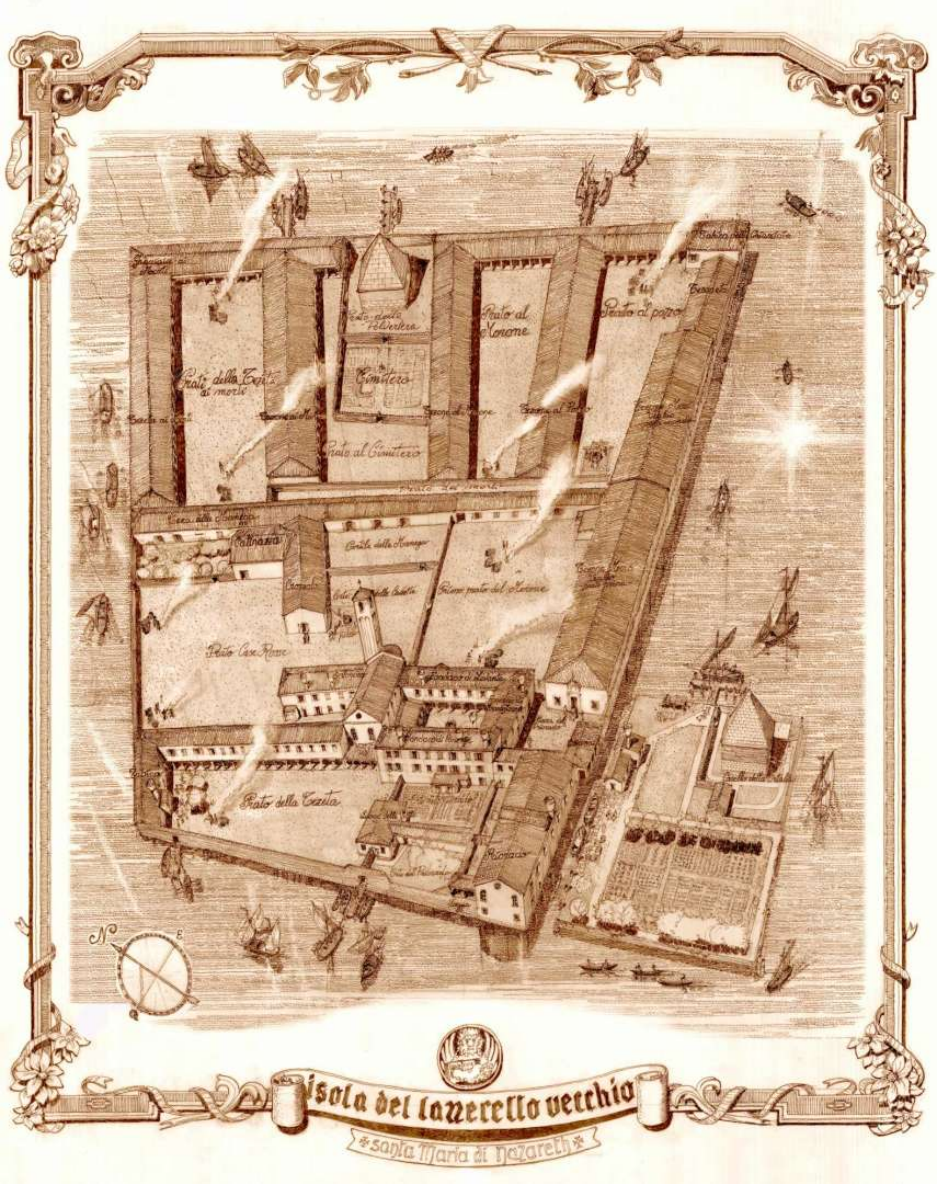

Figure 8: Structure of the Lazzaretto Vecchio during the Venetian Republic period (15th–18th centuries). Reconstructed by G. Fazzini and G. Barletta.

Unlike the religious symbolism of the leprosy hospital, the spatial layout of Lazaretto is completely dominated by administrative rationality. Its geographical location not only ensures isolation, but also maintains a controlled connection with the city's trade routes - a classic spatial compromise, both exclusion and connection.

The building layout draws clear boundaries through walls, and the internal space is zoned according to the risk of infection: people, confirmed patients, crew members and goods that are still under observation and may carry the virus are placed separately, forming a "hierarchical spatial order"(Markus 2013). This subdivision logic spatially reflects the early consciousness of ‘life politics’ - maintaining social security by controlling the flow of people, goods and air.

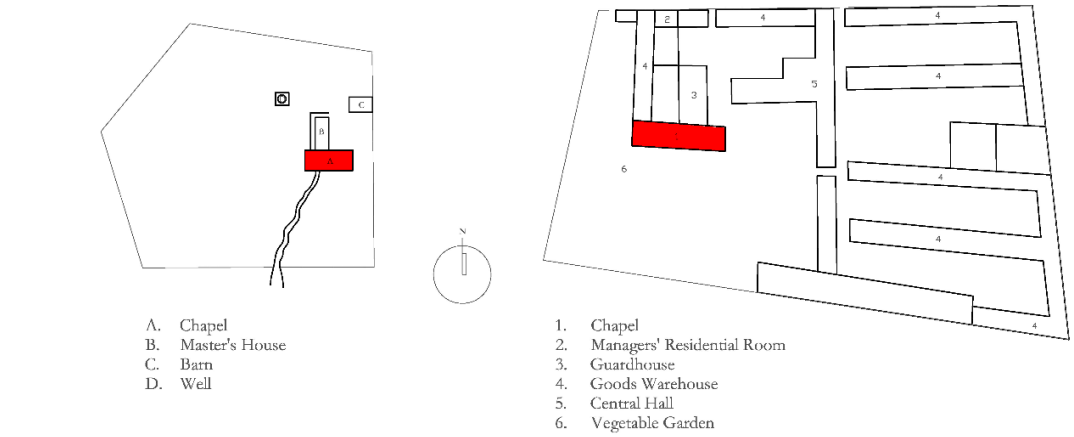

Figure 9: Diagram illustrating the spatial logic transformation of leprosarium and Lazzaretto (The chapel is in red). Author's drawing.

As shown in the upper figure, the spatial composition of the leprosy hospital and Lazaretto shows a kind of "continuity in fracture". The former is centered on the central chapel, and the ward is integrated into it. Its spatial structure is designed to serve religious ceremonies and spiritual purification. Although the latter retains the orderly axis composition centered on the chapel, its functional logic has undergone a fundamental change. Lazaretto’s center is no longer centered on the sacred intention

of religion, but gives priority to administrative control and surveillance. The regional division of the building complex is no longer based on religious hierarchy, but on the risk of infection and the logistics path. Therefore, the spatial geometric order is redefined as the governance order(Flavel and Franklin 2021). As a result, isolation has evolved from a religious ritual to an institutionalized building mechanism, and the building itself has become a tool for social epidemic control.

3.1.2 The Plan of the Lazzaretto in Venice

In the plague prevention and control system of the Mediterranean, the Lazzaretto is of foundational significance. Venice in the 15th century was the core hub of its trading empire, and merchant ships to and from the Eastern Mediterranean Sea constantly brought the risk of plague. In order to control the epidemic without interrupting trade, Venice designed quarantine stations, thus forming a system that is inseparable from its buildings. This section will take the quarantine station in Venice as an example to analyze the layout of its architectural functions and the reasons for its formation.

The two quarantine stations in Venice - the Lazzaretto Vecchio built in 1423 and the Lazzaretto Nuovo built in 1468 - together constitute the prototype framework of this building system. After the ship arrives in Venice, the plague doctor will check the ship before it enters the lagoon. If infected people are found on board, these

people will be sent to Vecchio, while the ship, cargo, crew and passengers will be transferred to Nuovo(Horner 1974).

The two facilities complemented each other, forming a dual-island structure for "medical care and observation": the former treated confirmed or severely ill patients, combining therapeutic and burial functions; the latter served as a transit point for observation and quarantine, housing and monitoring crew members and cargo not yet showing symptoms, while implementing fumigation and ventilation. Together, they fulfilled a dual-tiered epidemic prevention strategy: one addressing the disease itself, the other managing latent risks. It was through this layered mechanism that Venice achieved, for the first time on an urban scale, an ‘internal coherence of governance’(Crawshaw 2016).

The Lazzaretto Vecchio, situated at the southeastern tip of the lagoon, was originally monastic grounds. The complex exhibits a clear plan-level order, with the central church positioned along the central axis. Spatial hierarchy is controlled through functional zoning from west to east, while courtyards organize functional levels. The regional division system is designed according to the progression of the disease, from west to east: entrance and religious purification areas, isolation and treatment areas, and storage and logistics areas. The surrounding farmland and courtyards surround these functional areas. This layout not only reflects the gradual management logic, but also implies the symbolic meaning of the ‘purification’ process. The flow of people follows the one-way principle - starting from the west

entrance wharf, passing through the inspection area, quarantine area and clean area - to form a continuous and irreversible spatial sequence. The scheme is not only convenient for management, but also visualizes the order through construction, making the epidemic control process procedurally clear and transparent (Evans, 1987).

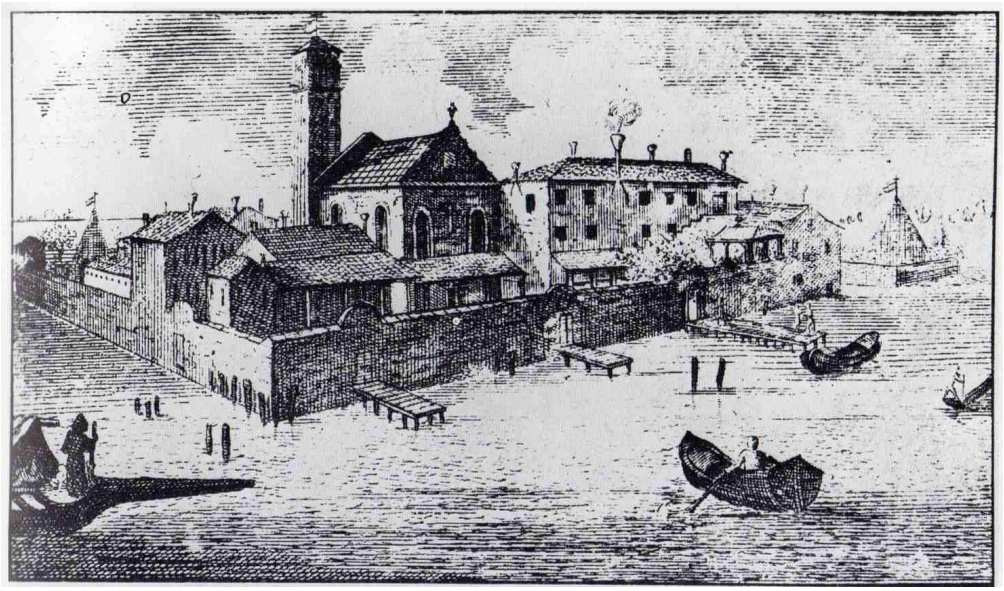

Figure 10: Lazzaretto Vecchio engraving. Maspez created on 15 February 2024.

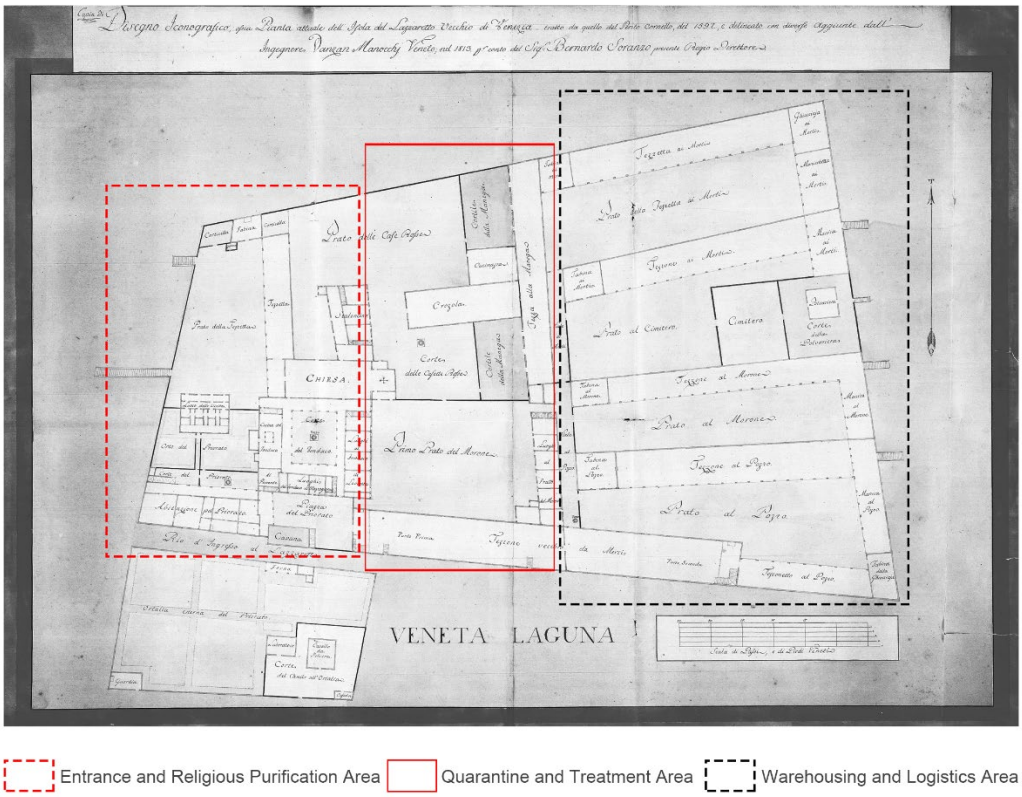

Figure 11: Plan of the Old Lazzaretto. Redrawn by the author from ASVe, Maritime Health Authority, Lazzaretti, drawings, 1813, Vanzan Manocchi, b. 60.

The Lazzaretto Nuovo, located at the northern end of the Lazaretto Lake, adopts a more systematic functional design. Its layout consists of a central rectangular courtyard and a storage gallery surrounding the courtyard, presenting a regular and symmetrical structure. The layout of the building volume follows the principles of wind direction and ventilation to form an interconnected ventilation network. The cargo unloading area, fumigation corridor and inspection room are arranged along the island axis, so that the airflow, light and human flow patterns together constitute the material conditions required for the isolation mechanism. The expanded courtyard

scale, the unified proportion of corridors and the precise calculation of the architectural orientation reflect the pursuit of ‘technical order’ - space is no longer a religious symbol, but a place of governance. Compared with the Vecchio, the geometric layout of the new isolation area shows higher rationality, changing from a centralized axis organization to a networked homogeneous layout. This transformation marks the transition from religious heritage to administrative technology in quarantine buildings.

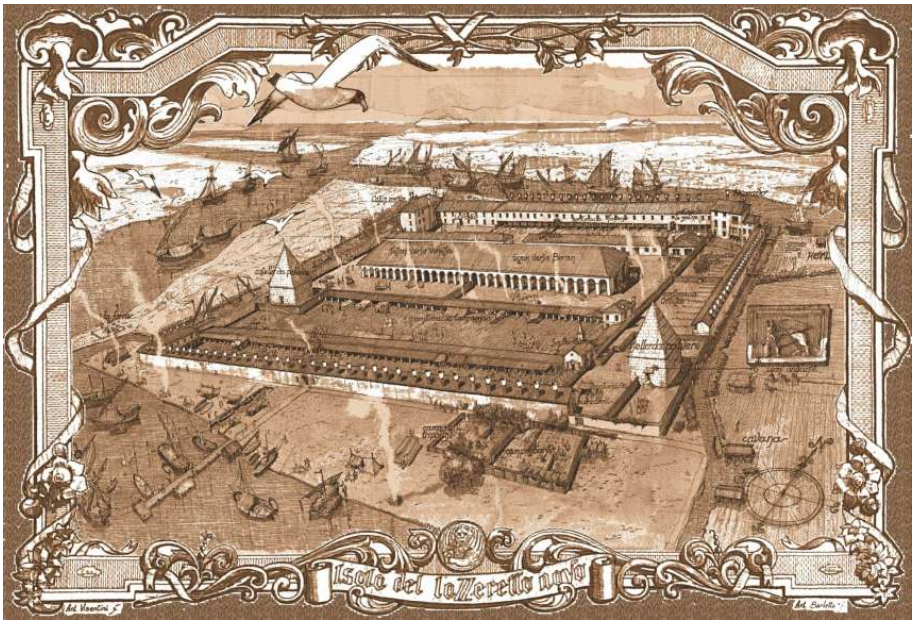

Figure 12: Map of the Lazzaretto Nuovo in the 'Teson Grando'.

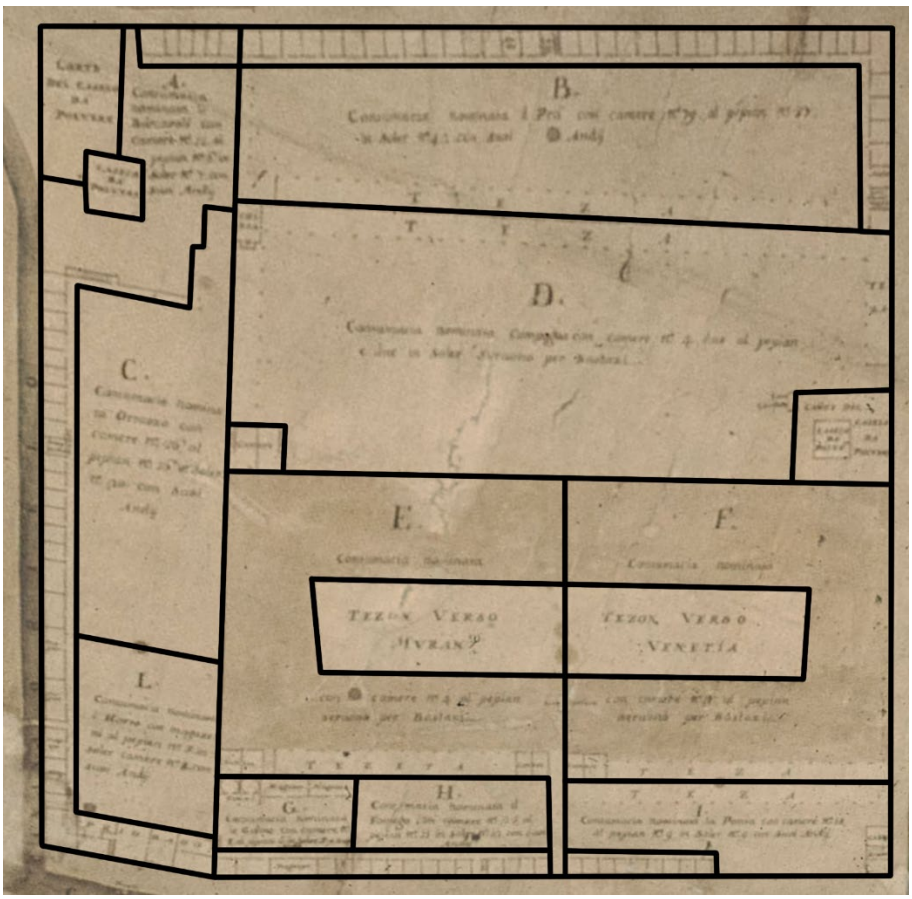

Figure 13: Plan of the Lazzaretto Nuovo. Redrawn by the author from Andrea Cornello, 1687.

If the old isolation institute represents the spatial prototype of the institutional framework, the new isolation institute realizes the isolation mechanism in a more structured way. The analysis of the planar layout mechanism of the old isolation station and the new isolation station shows that the ‘typological core’ of the isolation building does not lie in its formal characteristics, but in the operation logic of its internal space: a governance model that establishes order through regional division, human flow routes and visibility. As observed by Marcus (1993), the emergence of

modern architecture does not come from formal innovation, but from its ability to organize and behavior - and the isolation institute is an early model of this ability. This logic was then copied, adjusted and institutionalized in different geographical environments and contexts, and eventually became the basic grammar of global epidemic control architecture.

3.1.3 The Boundary

In the isolated architectural system of Venice, islands, high walls and colonnades can be collectively called ‘borders’. They establish a reliable order through geometric shapes and scales - not only as a barrier, but also as a spatial structure to visualize differences, classify risks, and effectively control the epidemic(Evans 1992).

As the main boundary layer of quarantine buildings, the geographical location of the island itself gives them the meaning of marginality. Venice built isolation buildings on the edge of the lagoon, which not only ensures close ties with the city, but also maintains the necessary isolation. This gives the island a ‘middle’ status, providing a natural space buffer for isolation. Therefore, during the epidemic, the urban economy can continue to operate, and the risk of disease is effectively controlled within the ‘restricted area’ on the edge of the lagoon. This marginal positioning transforms isolation from an internal urban burden into an external mechanism shaped by geographical and political factors, giving epidemic prevention

and control activities spatial autonomy and self-management ability. As natural isolation areas, these islands effectively constituted Venice's earliest ‘health space’ and became the main medium for the city to establish its spatial governance system to deal with the epidemic (Braudel, 1972).

Figure 14: Lazzaretto Nuovo (far right), just off the north-west coast of Sant’Erasmo. Lazzaretto Vecchio (far left), the other plague island, just north of the Lido. www.imagesofvenice.com

Figure 15: View from Lazzaretto Nuovo Island. Photographed by the author in May 2025.

The wall further enhances the visual effect of the island boundary, and its architectural elements highlight the boundary between risk and cleanliness. In the layout of Lazaretto, the wall not only plays a closed role, but also a crucial structure, which organizes the flow of people, regulates the airflow and divides the level. The continuous geometric form of the wall divides large islands into several relatively independent courtyard units, which can accommodate people, goods and air in spaces of different levels. The substantial function of the wall is to embody the abstract concept of ‘hygiene’ and control the epidemic through specific parameters such as wall thickness, window size and opening position.

Figure 16: One side of the boundary wall of the Lazzaretto Nuovo. Photographed by the author in May 2025.

The portico constituted a pivotal control point within the boundary structure, serving as the most tangible manifestation of 'how quarantine unfolds spatially'. Upon entering the Lazzaretto from the city or vessels, individuals first traversed this zone.

Neither fully enclosed nor entirely exposed, the portico presented a covered semi-open space. Its length, lighting, and degree of openness prevent swift passage, compelling individuals to undergo necessary inspections and receive instructions here. Thus it functions as a 'transition zone' linking the urban world to the world of isolation. Those moving beneath its roof remain constantly within sight, allowing staff to observe their behavior at any moment. This extended period of 'observation' is the very precondition for the quarantine system to unfold.

Figure 17: Entrance of the Lazzaretto Nuovo. Photographed by the author in May 2025.

Figure 18: Lazzaretto Nuovo Internal Corridor. Photographed by the author in May 2025.

Through the interplay of islands, walls and porticos, the Lazzaretto established a boundary model characterized by 'islands isolating the exterior, walls partitioning spaces, and porticos controlling inspections'. Venice's architectural model for plague control thus became an institutionalized architectural template, where boundaries

were rationally employed to reconfigure human-object relations, regulate risks, organize actions, and articulate power.

The Lazzaretto system in Venice provided the city with an unprecedented model of governance. If the Lazzaretto was conceived as a form of order, it was only through its daily use that order became operative.

In the early days of the 15th-century Lazzaretto, initial usage records reveal that the activities of patients, medical officers and clergy continually 'tested' this order. Flow lines were provisionally adjusted, rooms sealed or opened, while ventilation and prayer spaces underwent reconfiguration. In other words, architecture is reconfigured in use, and the process of quarantine involves the joint participation of immaterial institutional regulations and physical structures(Kirby 1993).

By the mid-sixteenth century, this practical experience had crystallized into the routine mechanisms of quarantine, forming a 'architectural governance template' widely adopted across the Mediterranean. At this juncture, quarantine had crystallized into an established concept. How, then, was it activated in practice? How did the architectural layout orchestrate the movement of people, goods, circulation routes, and air to implement the quarantine system?

Subsequent sections turn to the 'operational phase' of this model, examining how quarantine architecture in the Mediterranean region became institutionalized through zoning, circulation patterns, and ventilation mechanisms, gradually maturing into a fully functional system.

3.2 Operating Logics of Quarantine Space

By the 16th century, Lazzaretto had evolved from an emergency facility to a manageable, replicable and transformable space model. Its zoning system, flow control and ventilation devices have been repeatedly tested and improved in subsequent Mediterranean ports, thus establishing a stable ‘isolation space mechanism’. This section focuses on the spatial operation at this stage and discusses how to institutionalize isolation in architecture.

In the previous discussion, we have deconstructed the prototype, planar structure and boundary mechanism of the quarantine buildings one by one: from the emergence of the isolated area as a new type of building, to the circulation layout of its functional space, to the multi-level boundary composed of the ‘island-wall-porch’ structure. This reveals how the isolation procedure is transformed from an invisible institutional regulation to a spatial form. However, the value of the quarantine buildings is much more than its form. The key to truly integrating it into the public health system lies in the actual operation of these spaces.

In other words, the quarantine buildings is not a static ‘container’, but a ‘running mechanism’. In daily operations, people, goods and even air are organized, filtered, diverted and monitored. Space units do not exist in isolation, but interact in carefully arranged circular routes. How to separate and isolate personnel, how to purify and ventilate goods, how to guide and filter air, and how to supervise the entire

isolation system through vision and circulation mode - these constitute routine challenges that isolation buildings must meet in their daily operation.

Quarantine buildings can only truly fulfill their public health functions through practical operation. Therefore, this section will re-examine the internal structure of the quarantine buildings from the perspective of operation. By analyzing the physical conditions of regional division and circulation, health and disease, as well as the visibility and monitoring system, this section reveals how the Venice isolation area achieves ‘risk management’ on the architectural scale. These mechanisms not only explain the validity of the Venetian system, but also constitute the basic principles of modern public health architecture. In the following sections, we will step by step show how these mechanisms are spatially organized, how they are strengthened in practical use, and how they promote isolation buildings to institutional maturity.

3.2.1 Segregation and Circulation

The spatial order of quarantine buildings is mainly achieved through the planning of regional division and flow routes. The architectural layout of the Lazaretto has been discussed above. Now we will examine the scope of activities of personnel in the layout, the transportation of materials, air circulation, and how the staff maintain order through channels and observation points. These seemingly simple operations constitute the core mechanism of isolation buildings, transforming

epidemic management from fragmented emergency measures into replicable institutionalized processes.

Within the Lazaretto Vecchio, people are quarantined mainly according to the severity of the symptoms. The courtyards and buildings on the island are not simple accommodation units, but constitute a hierarchical structure for disease management. Critically ill patients were placed in isolation areas near the edge of the island. Suspected cases lived in the inner hospital, while convalescents lived in buildings near the central church. The courtyards are connected by short passages or arches to form a clear stepped path, which can not only isolate people in different situations, but also conveniently check. The activities of patients on the island are strictly restricted, while staff can continuously monitor them along the connected corridors. Therefore, the location of patients in medical facilities not only reflects their physical condition, but also determines the frequency of observation and the duration of isolation. As observed by(Crawshaw 2016), Venice's isolation system does not rely on medical intervention, but ‘manages time through space’, and regional division is the main means to achieve this goal.

Figure 19: Aerial view of the old Lazzaretto Island in 2024. Venetian Lazzaretti.

Figure 20: Lazzaretto Vecchio Staff Quarters (centre) and Noble Hospital (right).

www.imagesofvenice.com.

Figure 21: Inside one of the corridors of the old lazaretto. www.imagesofvenice.com.

Crawshaw pointed out that the essence of Venice isolation is not only isolation, but also the transformation of the observation process into a "continuous process" through spatial distribution. Therefore, regional division not only constitutes medical classification, but also a spatial governance model.

The focus of Vecchio is on patient management, while the circulation model of Nuovo emphasizes the diversion and classification of goods. In the new quarantine area, the cargo unloading point, temporary storage area and handling area are arranged in a clear direction. This ensures that each batch of goods follows a stable process from entry, inspection, processing and exit. The movement routes of

personnel and goods are strictly separated: goods are transported along the continuous route of the internal corridor, while the staff travel along the external patrol route. Independent entrances, passages and exits form multiple non-intersecting streamlined lines, so that the ‘irreversible processing process’ can be maintained through the relationship between the building structure and its internal and external space. The layout of Nuovo shows that when planning the actual flow route, the space configuration of the building should give priority to the needs of human use.

The ‘zoning-flow’ structure pioneered in Venice was quickly proven not only suitable for the lagoon environment, but also adapted to different political and economic conditions. With the expansion of trade, the quarantine mechanism has become increasingly complex. By the 17th and 18th centuries, this method was verified in the wider Mediterranean region.

For example, Lazaret in Marseille strengthened the separation between the flow of people and the flow of goods when handling large quantities of goods from the Eastern Mediterranean. The quarantine station in Marseille draws on the model of Venice, divides the personnel area, the cargo area and the observation area, and uses narrow corridors and multiple entrances to prevent contact between different entities. As observed by Beauvieux, Marseille did not change the basic principles of Lazaret, but transformed them into an institutionalized system that could operate in a larger-scale trade network(Beauvieux 2021).

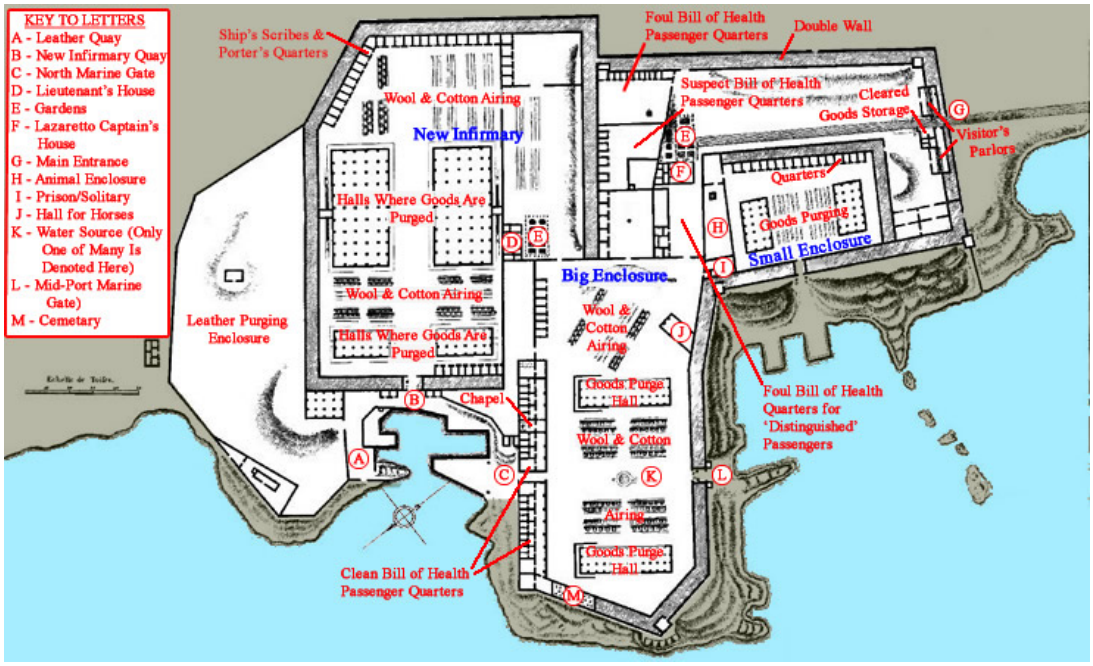

Figure 22: Plans of the Lazaret d'Arenc, From An Account of the Principal Lazarettos in Europe. By John Howard, (1789).

The Lazzaretto in Ancona in the 18th century showed another approach to regional division and flow of people after the specialization of architecture. The building was designed in 1732. It is pentagonal, with a five-pointed star symbolizing health. The central chapel is both a place of healing and the geometric core of the entire quarantine station. There is a well in the church to pray against the plague. The surrounding buildings form a closed courtyard, connecting all areas of the site, and the passage of people and goods is clearly planned in the building structure. Connect different areas by minimizing contact points to ensure clear inspection routes, fixed dynamic line modes and stable regional division(Beauvieux 2021). Conti (2001) pointed out that Ancona's quarantine station no longer relies on empirical layout, but

provides a "controlled flow" architectural model, indicating that quarantine buildings have developed from the empirical stage to the design comprehensive stage(C. Mezzetti、G. Bucciarelli、F. Pignaloni 1978).

Figure 23: Lazzaretto of Ancona. Map by Giorgio Eusebio Petetti, Personal work.

In a word, regional division and streamlined mode constitute the most basic operating logic of quarantine buildings. The location, path and relationship between patients and goods in the building structure are not formed randomly, but are carefully organized into an orderly system by the architectural designer, which can be designed, evaluated and supervised under the requirements of the system. It is through these spatial layouts that quarantine buildings have changed from simple isolation facilities to administrative institutions that can actively manage risks. With this operation logic

being continuously tested and strengthened in the practice of various ports, the isolation building has gradually entered the stage of ‘mechanism maturity’. Subsequently, by constantly adapting to the changes of the times, it gradually moved towards institutionalization and standardization.

3.2.2 Disease, Hygiene and Ventilation

In the early modern concept of hygiene, diseases were generally regarded as harmful gases transmitted in the air. Although this view is based on limited medical knowledge, it directly promotes the technological development of quarantine buildings, making ventilation, drying and purification the key goals of spatial design. How to manage air, moisture and pollutants through the building itself; how to transform space into sanitary facilities through walls, openings, courtyards and corridors - with the institutionalization and improvement of quarantine buildings, these problems are constantly thought about and purposefully designed(Burge 2004; McCabe, Pond, and Helmers 1952). It is through this process that the building has evolved from a closed isolation unit to a ‘technical space’ that can actively adjust its own environment.

This ‘air management’ is most fully reflected in the Lazzaretto Nuovo. The core space of the new quarantine area - the narrow warehouse arcade (tezon) surrounding the courtyard - is the main place for cargo handling. After the goods were unloaded from the ship, they were scattered and placed in the arcade. Through long-

term exposure, exposure and inspection, it is believed that potential pollutants will gradually decrease as they spread into the air. Tezon leads to the inner courtyard, so that air can circulate throughout the space and produce "natural ventilation" effect through high windows. Tognotti (2013) pointed out that the spatial layout of Nuovo deliberately emphasizes the principles of "air exchange" and "separation of goods and logistics". Its architectural logic does not come from the understanding of bacteriology, but from the concept that ‘air itself has natural purification ability’, and the function of architecture is to ensure that the air has enough time and space for this ‘purification’.

Figure 24: Tezon grande in the lazaretto nuovo， Photographed by the author in May 2025.

Figure 25: High-set windows within the Lazzaretto Nuovo. Photographed by the author in May 2025.

The form of the courtyard also plays an important role in the health mechanism. In the two isolation courtyards in Venice, the courtyard is not just an open space in the layout, but is regarded as the respiratory system of the whole building. Trees, lawns, dirt and open sky together form a key interface for air exchange, allowing humid air to rise and dissipate. The colonnade and openings surrounding the courtyard allow air to circulate freely in multiple directions, forming slow and continuous natural ventilation. In the era of the lack of modern machinery, this air organization based on courtyards and colonnades became the core of the integrity of the hygiene of the isolated space. Crawshaw pointed out that courtyards are widely used in quarantine buildings, not only to provide light, but also because they

constitute the most basic method and place to ‘maintain hygiene through natural forces’.

Figure 26: Lazzaretto Nuovo Central Court yard. Photographed by the author in May 2025.

At a time when people's understanding of disease was still limited to sensory indicators such as smell, humidity and decay, fumigation was born as a key sanitation technique. The operating records of the Marseille Quarantine Hospital in the 17th and 18th centuries repeatedly emphasized that the fumigation chamber, fumigation furnace and special chimney system were necessary components for purification goods, textiles and rooms. The fumigation furnace is usually located in the auxiliary room connected to the cargo passage(les lazarets de marseille n.d.). Smoke is introduced into a closed space through the flue, and ‘artificial gas’ (smog, steam,

fragrant air) is used to offset, dilute, dispel or neutralize the ‘natural gas’ (miasma, rotten air, damp steam) that is considered to carry bacteria. This process can neutralize potential polluting gases. In other words, fumigation is not only a disinfection method, but also a hygiene ritual. It emphasizes the process of pollutant treatment, which is closely related to the logic of the evolving quarantine system, that is, to deal with diseases through intervention rather than just observation or prayer.

Between Venice and Marseille, the Mediterranean world has developed another air- and sunlight-centered sanitary building practice, and Manoel Island Lazzaretto in Malta is a model. This quarantine station is located on an island in a strong wind zone, and has systematically used natural wind pressure since the 17th century. The buildings are arranged along the coastline, so that the dominant wind can blow directly through the courtyards and corridors. Its opening size is much larger than that of inland ports, thus promoting faster air circulation. Many sunny platforms in the building complex are convenient for the spread of textiles and goods, integrating sunlight into hygiene maintenance and upgrading. According to the Malta Archives, British and Italian health officials once described Manoel Island as "the cleanest air quarantine area" (Dal Pozzo, 1786, citing local historical records), which shows that its ventilation strategy was a regional model at that time. Unlike the internal corridor ventilation system of Nuovo Island, Manoel Island makes full use of its coastal location. Large arched openings facing the sea, spacious floor-to-ceiling windows, open-air platforms and other out-facing building ventilation structures

create a more open and direct air exchange environment. This forms a unique ‘external air exchange’ health mechanism(Galea 1966).

Figure 27: Former military hospital on Manoel Island (Malta). HHSB filmed in April 2016.

These architectural examples show that in the isolation system from the 17th to the 18th centuries, air was not a passive background, but was seen as a substance that needed to be managed. The building uses elements such as courtyards, corridors, windows and flues to build complex air purification paths. These functional designs not only reflect people's understanding of disease at that time, but also reflect the increasing technical characteristics of isolation buildings with the maturity of the isolation mechanism. When the air is guided inside the building, when the space can prolong or accelerate air exchange, and when the disease management plan is verified

through time-tested practice, the isolation building is no longer a static container, but a continuous operation and self-regulating sanitary machine.

From the perspective of spatial governance, it is these disease- and health-centered technologies that transform the isolation camp from a simple isolation place to a type of building with self-regulation. It does not need to rely on modern disinfection equipment, and can adapt to the environment and reduce risks through comprehensive spatial design methods. In the process, the building becomes the air treatment machine and the material basis for the operation of the public health system. As these technologies were repeatedly applied in other Mediterranean ports, they gradually evolved from local practices to regional consensus, laying the crucial foundation for the standardization of quarantine regulations in the 19th century.

3.2.3 Visibility and Discipline

In the first two sections, the operation of the isolation building is mainly understood as the control of the movement of people and air. People and goods are guided and separated, and the air is guided and purified. However, the operation of these mechanisms is based on a more hidden premise: who is seen, who is hidden, which actions are made public, and which actions are excluded from public supervision. That is to say, quarantine buildings not only organize the flow of people and ventilation, but also organize the line of sight. Visibility and invisibility are not the natural result, but the carefully arranged order of the building. This visibility has a

double meaning: on the one hand, it has the function of monitoring and control given by authority, exposing personnel, goods and operational processes to supervision; on the other hand, it maintains the superficial stability of urban social and political order by covering certain scenes and restricting certain lines of sight.

In Discipline and Punish, Foucault used the concept of "panoramic prison" to reveal how modern society organizes sight through spatial layout, so that power no longer depends on continuous surveillance, but on the ‘possibility of being seen’. If the panoramic prison represents the surveillance system of modern society, then the isolation building constitutes its epidemiological pioneer. Here, visibility and isolation are not independent strategies, but integrated into a unified governance logic in the architectural space(Cottell and Mueller 2020). It is this ability to manage risks through vision and establish order through space that makes quarantine buildings the prototype of the modern public health system.

As early as the era of leprosy, considerations of visibility were already evident in the architectural layout of leprosarium. At Saint Mary Magdalen Leprosarium outside Winchester, England, the northern gallery was structurally elevated and separated from the surrounding space. Historical records suggest this was likely designed to allow observation of Mass by highly contagious patients or external visitors without disrupting liturgical order.

Figure 28: The structural drawing of the gallery on the chapel's north side. Vetusta Monumenta, Vol. III, Plate III, 1790

In the transition of disease management from theological superstition to institutional governance, this visible relationship underwent corresponding architectural alterations as building functional requirements evolved. The earlier zoning organization and air management had already laid the groundwork for this visible structure: pathways were simplified, room orientations standardized, and

courtyards kept open, naturally directing the building's structural framework towards a spatial order that was ‘observable, inspectable, and verifiable’.

The two Lazzaretto in Venice offer the earliest exemplars. Whether in the main courtyard of the Vecchio or the colonnades and storage areas of the Nuovo, spaces were deliberately designed as open-plan, enabling staff to observe different levels of isolation zones from fixed patrol routes. The courtyard environment was unobstructed, leaving patients' movements fully visible. These design elements concerning visibility were not supplementary functions but an observational logic embedded within the building's plan from inception. They reduced contact risks while ensuring every action remained within sight.

On the contrary, these buildings also deliberately visually block the city. The exterior walls of the Vecchio and Nuovo buildings facing the lagoon are relatively closed. They are located on the island and keep a certain distance from the city center, making it difficult for urban residents to directly observe patients or specific isolation measures. Here, architecture plays a double role: both an observer and a curtain. On the one hand, it enables managers to understand everything inside and control and manage crises through transparency. On the other hand, it helps cities ‘not see’ the disease itself, thus alleviating the psychological panic of the people. This selective visibility maintains the normal operation of the city and maintains the self-image of the city. Crawshaw pointed out that Venice deliberately limited infections and deaths to specific areas during the epidemic in order to maintain the city's symbolic safe and

livable image(Crawshaw 2016). From this perspective, the Lazzaretto not only isolates patients, but also makes the plague scene disappear from the sight of city residents.

In the Mediterranean region, the quarantine station in Marseille emphasizes the spatial level of ‘who can see’, which is reflected not only in the relationship between the plane layout, but also in the difference in vertical height. The towers and sentries facing the port have distinct landmark features; their height and location ensure that ships entering the port can immediately identify the presence of quarantine institutions. Functionally, they provide a favorable location overlooking the entire area, allowing a small number of staff to monitor the vast courtyards and corridors. In a symbolic sense, their eye-catching shapes break the uniformity of the roof lines, constantly reminding everyone present that there are eyes watching above.

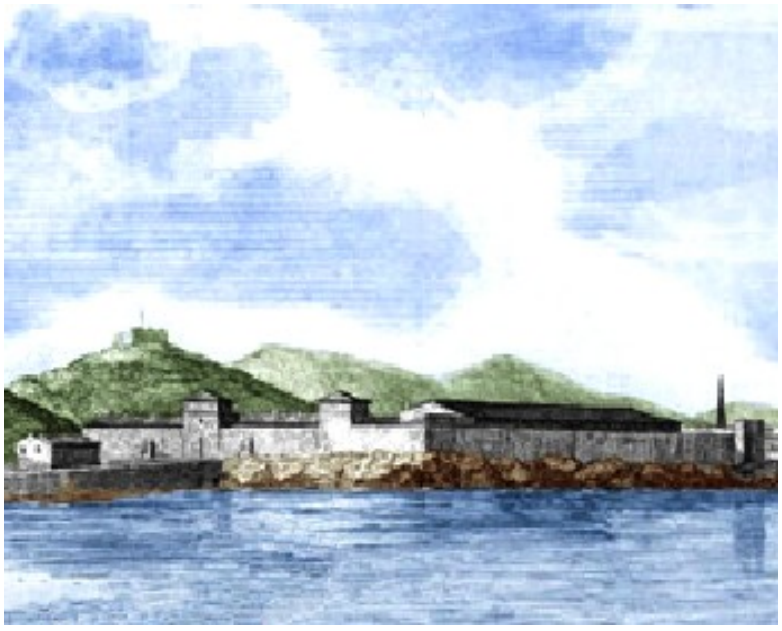

Figure 29: Marseille's Lazaret d'Arenc (1848), perched upon towering rocks on the outskirts of the city.

This architectural form of ‘standing at a high places’ solidifies the observation behavior into a directly perceived physical language, so that discipline is no longer enforced only through clear instructions, but realized through the clear display of architectural forms. Markus pointed out that the high space inside the building is often not to enhance the visibility itself, but to strengthen the psychological hint of someone is watching. This argument also applies to isolation buildings: the existence of sentries and watchtowers puts the quarantined person under perceptual surveillance even before the formal inspection.

This arrangement of external "showing existence" and internal "hiding details" makes the quarantine buildings both a symbol of authority and a social buffer. In this sense, surveillance in the isolation building is not a punishment, but a means of risk control. When discussing the visibility and discipline in such buildings, we should not simply advocate higher transparency or higher openness equals modernity. On the contrary, the key is how to regulate and limit the view. By arranging activities in a verifiable space, architectural design effectively reduces the possibility of chaotic behavior and minimizes the risk of mixing people and goods during quarantine. Visibility and invisibility are not opposites; therefore, visibility itself has become an indispensable part of architectural design.

3.3 Expansion and Standardization of the Quarantine System

Early quarantine facilities often have obvious temporary characteristics. They are usually built only when the epidemic breaks out suddenly, with the aim of quickly providing space to isolate patients, placing crew members or handling goods. In this case, these buildings are usually composed of hastily built rooms, courtyards and walls. They are simple in structure and lack the facilities required for long-term use. However, since the second half of the 18th century, with the expansion of maritime trade and the intensification of cross-regional movements, the spread of disease is no longer seen as an incidental but a persistent risk. The quarantine system limited to a single port can no longer meet the risk control needs at the imperial level. Therefore, quarantine buildings have evolved from isolated and local building complexes to networked systems covering ports and sea areas. Its significance has also expanded from simply dealing with the sudden outbreak of the plague to a permanent facility to maintain the imperial order.

The prominent features of this stage are not architectural innovation, but reproducibility and adaptability. Ports across the empire need a spatial prototype that can adapt to different geographical environments, climates and administrative structures to ensure the consistency of the quarantine regulations of the ports of the Mediterranean Trade Network. Therefore, buildings are no longer just emergency facilities, but have become an indispensable part of the social system. This requires a fixed partition structure, clear dynamic line logic and standardized functional

modules. The quarantine station has gradually evolved from a temporary annex building on the edge of the port to a permanent infrastructure within the administrative framework.

At the same time, medical knowledge, navigational technology and colonial rule in the 18th and 19th centuries strengthened the demand for standardized sanitary space(Tulchinsky and Varavikova 2014). Governments have begun to stipulate the size, room proportions, moving lines and monitoring points of quarantine stations through blueprints, regulations, construction manuals and administrative instructions, so as to give buildings standardization and uniformity. This not only improves the efficiency of the quarantine system, but also strengthens the empire's understanding and control of risk and space.

Therefore, this section will discuss how quarantine buildings have changed during this period, evolving from local practices to institutional templates.

3.3.1From Emergency Facility to Permanent Infrastructure

The quarantine station in Marseille has undergone a remarkable transformation. According to the study of Beauvieux (2021), before the Great Plague of 1720, the quarantine station in Marseille was more like a set of emergency facilities, and its size and layout depended on the urgency of the epidemic at that time. After the plague in 1720, Marseille began to continue to expand its quarantine station. The newly built courtyards, warehouses, dormitories and administrative offices are no

longer used for short-term isolation, but for long-term use throughout the year(Mason 1901). The wall was heighted, the entrance was redesigned to adapt to long-term personnel management, and administrative spaces such as archives were added inside. The existence of these new buildings shows that quarantine stations are no longer just temporary isolation places for diseases, but are integrated into the daily administrative system of the port. These changes mark the beginning of the station to perform its long-term functions.

Similar trends have occurred in ports along the southern Mediterranean coast, such as Alexandria, as well as ports along the Red Sea and the Suez Canal(Egypt: suspect plague on steamship persia at suez 1906). These ports are located at the intersection of shipping routes connecting Europe, North Africa and the Indian Ocean. Ship traffic is busy, and health risks are increasing and unpredictable. By the beginning of the 19th century, most of the quarantine stations in these ports had formed a fixed layout, including special inspection areas, isolation courtyards, cargo loading and unloading areas, and offices for permanent administrators. These buildings are not only sanitary facilities, but also administrative agencies responsible for ship registration, passenger verification, document management and the implementation of various quarantine regulations. This administrative function establishes a stable connection between quarantine stations and port authorities, customs and other agencies, transforming it from an isolated public health facility to a comprehensive institution.

The El Tor Quarantine Station on the Sinai Peninsula of Egypt is a typical example of this transformation. The El Tor Quarantine Station was originally designed to cope with short-term health risks during the Muslim pilgrimage season(Mukerjee 1964). It is limited in size and relatively simple in structure. However, with the growth of passenger flow, the port has gradually incorporated long-term facilities including hospitals, dormitories, kitchens, warehouses, bathrooms and sewage treatment areas. The relationship between docks, roads and buildings has also become fixed, with permanent checkpoints at the entrance instead of seasonal facilities. With the permanent presence of staff and military police, the El Tor quarantine station has gradually developed from an emergency quarantine point to an important part of the port system management of cross-regional traffic, and a stable operating framework has been established(Long 1902).

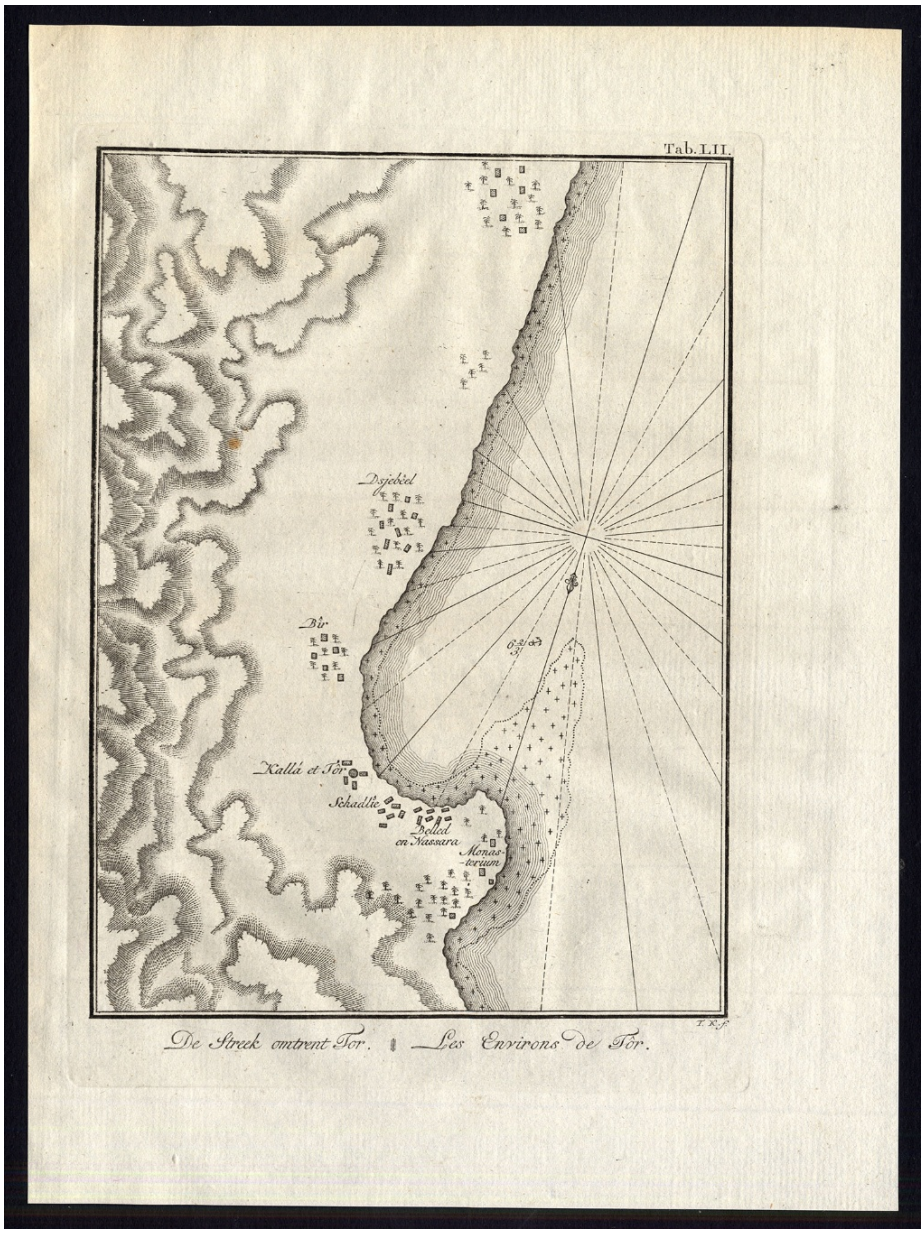

Figure 30: Antique Map-EL TOR-SINAI PENINSULA-EGYPT-Niebuhr-Koning-1776.

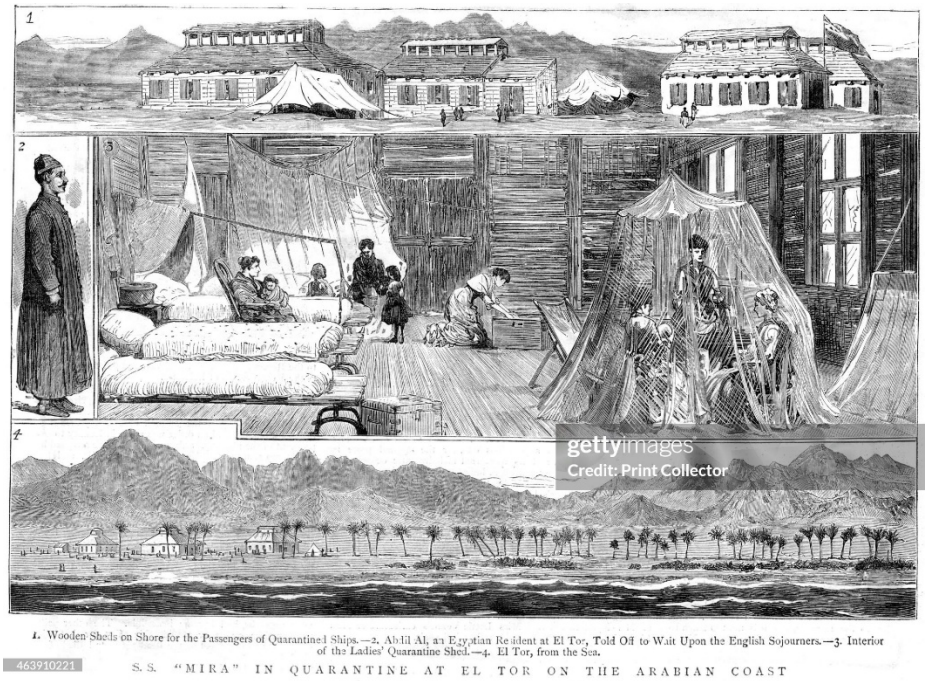

Figure 31: Europeans in a smallpox quarantine camp at El Tor, North Africa, 1884. From The Graphic, (London, 19 July 1884). (Photo by Oxford Science Archive/Print Collector/Getty Images).

These examples show that the establishment of permanent quarantine facilities means not only the expansion of scale, but also a fundamental shift in the scope of function and management. Such buildings are no longer temporary facilities opened only during disease outbreaks, but have become an integral part of the daily public administration of the port area. They have stable inspection, recording and supervision responsibilities, so they need a more comprehensive room layout, clearer regional division and facilities that can be maintained for a long time. Compared with the early temporary quarantine stations, its architectural layout is clearer, the

courtyard layout is clearer, and the design of entrances and walls is also more permanent(The egyptian quarantine station 1892).

The permanence has also changed the location of quarantine buildings in the port complex. Many quarantine stations are located in prominent positions on the inbound route, enabling ships to quickly identify relevant facilities before entering the port. The shape, scale and wall height of these buildings are usually symbolic. In addition to performing specific health management functions, they also convey to the outside world the port's ability to control risks(Markus 2013). Therefore, with the permanent establishment of quarantine stations, they gradually take on a dual role: they are both operational administrative facilities and symbols of the city's projecting order to the ocean.

In short, the permanent establishment of quarantine buildings, whether in Marseille, Alexandria or El Tor, has transformed these buildings from a ‘temporary disease control space’ to a ‘permanent sentinel within the framework of urban governance’. This transformation to the expansion of the quarantine system has laid the foundation and further accelerated the integration of such building functions and forms. This trend will be discussed in more detail in the following chapters.

3.3.2 Standardization of quarantine buildings

As the quarantine station becomes a permanent facility of the port, its architectural design increasingly needs to be integrated into a wider administrative network. Against the background of health reform and trade expansion in the 18th and 19th centuries, countries recognized that consistent quarantine efficiency in various ports could not be maintained without standardized management procedures and clear functional layouts. Therefore, a replicable architectural language began to appear. Quarantine buildings are no longer just temporary buildings adapted to local conditions, but gradually present duplicate layouts, fixed proportions and clear functional modules(Lacey 1995). Space organization is distilled from local experience to form a typological model, which can be disseminated, standardized and popularized through drawings and regulations.

This kind of standardization is first reflected in the standardization of the floor plan. Many quarantine stations have adopted a similar principle of regional division: entrances are used for initial registration, quarantine courtyards are stratified according to the stay time required by different groups of people, cargo loading and unloading areas are located in well-ventilated peripheral areas, while hospitals and observation rooms are located in the central area of the building complex. Although the climatic conditions and administrative systems vary from place to place, the above-mentioned functional configuration and layout characteristics have repeatedly appeared in most quarantine buildings, gradually forming a common spatial model.

For example, during the expansion in the 19th century, many Mediterranean ports adopted a combination of multi-courtyards and stratified isolation; this layout is not only convenient for controlling the movement of people, but also can achieve clear hierarchical zoning in the complex.

At the same time, administrative manuals and health regulations have begun to directly affect architectural design. Many countries established the Central Health Commission in the 19th century, requiring port quarantine stations to submit standardized blueprints and adjusting room sizes, vents, courtyard proportions and drainage systems according to official norms. In order to standardize the management of goods, similar storage ratios, window sizes and ventilation corridor widths have been adopted in various places. These regulations force architects to follow fixed design templates when planning quarantine facilities and no longer rely on personal judgment. Architectural design gradually shifted from experiential construction to construction according to regulations(Vaughan 2018b).

The standardization of spatial streamlines is also of great significance. Initially, the quarantine route depends on local customs or the experience of managers. However, with the advancement of the institutionalization process, the quarantine process is gradually divided into relatively fixed stages: registration, inspection, isolation, ventilation and release. Many countries have begun to require the facilities of quarantine stations to reflect this order in physical structure, so that the process has clear direction and spatial recognition. For example, the layout of the

entrance hall-registration room-inspection corridor-isolation courtyard became a common feature of many quarantine facilities in the 19th century. Therefore, buildings play the role of a spatial flowchart, using physical structures to guide the movement of people and ensure that quarantine procedures in different ports can be carried out with similar efficiency and methods(Hay 1900).

These regulations not only stipulate the functional proportion of the building, but also require the port to uniformly archive the drawings for review by higher departments. This improves the construction efficiency and ensures the functional consistency of each quarantine station, which is convenient for centralized management. Therefore, architecture has become an indispensable part of the administrative system. While strictly abiding by the regulations, it also undertakes various operational tasks. With the replication of these norms, the construction of quarantine stations has gradually broken away from local traditions and evolved into a cross-regional and institutionalized type of sanitary building.

In general, the standardization of quarantine buildings gives them unprecedented reproducibility. Quarantine facilities are no longer limited to a single port, but become the common language in transnational trade networks. Whether on the Mediterranean coast, the Red Sea coast or the Indian Ocean coast, these buildings show similar layouts and operating procedures. This uniformity not only improves the efficiency of quarantine, but also enables the stable expansion of public health

governance through construction. The construction enables quarantine standards to cross ports and oceans, maintaining their ability to control risks in global flows.

3.4 Summarizing the evolution of quarantine space

The formation and evolution of quarantine buildings is a long process spanning centuries. From the origin of isolation derived from religious and moral meaning, to the mature institutional space, which eventually developed into a cross-regional network system, the history of quarantine buildings reflects how society continuously responds to its understanding of risk, safety and mobility through architecture. It represents the transformation of the early modern social governance mode. This chapter traces the three key stages of the evolution of quarantine buildings: the emergence of prototypes, the consolidation of the operating mechanism, and the logical development of the global isolation network. This framework helps to understand how quarantine buildings have evolved from local practices to governance tools in the global maritime network.

The history of quarantine buildings depicts an evolutionary trajectory of how space intervenes in disease management, mobility control and order construction. Through the discussion of prototypes, mechanisms and institutionalization, this chapter shows that quarantine buildings are not just a technical space driven by the needs of disease prevention. On the contrary, it plays multiple roles at different stages: organizing behavior, expressing power and governing society. Its evolution is not only

reflected in the change of architectural form or function, but also in the historical process of orderly construction.

In the early days, quarantine buildings were mainly conceived as a space that could control risks. Through isolation, zoning and urban marginalization, quarantine buildings separate diseases from citizens' lives, and for the first time, the epidemic is within a controllable range. This spatial prototype transforms isolation from religious interpretation into manageable practice, marking the introduction of building intervention in public health into urban governance.

As practical experience accumulated, quarantine buildings developed a spatial layout centered near ports, capable of integrating personnel and goods inspection, air treatment, and disease treatment. At this stage, architecture not only segregated people and goods but also prescribed how they should move, linger, and be observed. The Foucauldian notion of "organizing behavior through space" is particularly evident here: by restricting movement paths, lines of sight, and daily operations, quarantine architecture transformed intangible institutional norms into a physical order directly experienced by the body(Foucault 1995). Architecture thus served not merely as an epidemic control tool, but as a medium for governing order(Kowaleski 2014).

As quarantine became an established institution, architecture assumed an increasingly vital role within this system. To accommodate prolonged operation, cross-regional trade, and perpetual human movement, quarantine structures underwent continuous adaptation and expansion, crystallizing into relatively stable components:

fixed entry points, tiered isolation zones, goods processing areas, observation and ventilation facilities, administrative spaces, and so forth. In this process, the architectural focus shifted from 'how to isolate' to 'how to sustain long-term operation'. As part of the institutional framework, these structures became stabilizing nodes within port and urban administrative systems.

Ultimately, as interregional connections strengthened, quarantine architecture refined its design standards and protocols, converging towards global uniformity. Different ports began adopting similar models when formulating regulations, blueprints, and construction requirements, rendering quarantine architecture a distinct typology with recognizable characteristics across regions. Its replicability and scalability demonstrate that such structures were no longer merely products of local experience but were regarded as essential public infrastructure, maintaining uniform standards and operational capacity across diverse contexts.

Chapter 4. Conclusion

Looking back on the previous chapters, from leprosy to cholera, isolation teaches cities how to fight fear through architecture and transform architecture into the language of governance. This not only includes the history of medicine, but also the process of social self-reshaping. With the gradual decline of the visibility of the disease, the role of architecture and institutions has become more and more prominent. Society began to reshape visibility through spatial and institutional means. New visibility mechanisms such as isolation, ventilation, observation and statistical recording were born, replacing the previous physiological symptoms.

Therefore, architecture assumes the role of transforming invisible threats into controllable order. In this chapter, I will further synthesize the main findings of this study and give theoretical answers to the questions raised at the beginning.

4.1 Summary of Key Findings

The research in Chapters two and three shows that the evolution of isolation buildings - from medieval leprosy hospitals to modern imperial isolation systems - is not a simple development process that comes with the progress of medical knowledge. On the contrary, it is a response to the social situation and institutional framework in previous epidemic crises, and has gone through the process of prototype germination, adaptation and institutionalization(Vaughan 2018a). Tracing these historical stages, it can be clearly seen that architecture is not a passive by-product of

disease control, but an indispensable part of the governance structure itself(Serfling 1952).

The earliest isolation space was the expression of religious beliefs, using symbolic exclusion and purification order to deal with the fear of disease. During this period, the location of the leprosy hospital outside the city was not based on medical judgment, but to divide the boundary between social normality and danger through spatial isolation. It is in this sense that architecture assumes the function of ‘defining danger’ for the first time, not just as a container for the human body(Hulls 2019).

With the emergence of early pandemics and the increased mobility of population and goods between cities, the increasing threat of contagious epidemics has also intensified, and diseases are no longer simply interpreted as religious punishment. Quarantine has evolved into a model managed by local authorities, and buildings regulate people's behavior. Venice's Lazzaretto system marked the critical moment of this transformation and gave rise to the concept of ‘isolation’. The spatial layout of islands, city walls, colonnades, courtyards and buildings transforms abstract concepts - dangerous human bodies, suspicious items, observation periods - into supervised, recordable and optimizable procedures(Loeckx and Heynen 2020). Architecture no longer only serves symbolism, but directly intervenes in the logic of governance itself. The disease was controlled at the spatial level for the first time. This shows that architecture not only executes the system, but also actively participates in the construction of the system.

By the 18th and 19th centuries, with the expansion of cross-regional trade and imperial rule, the isolated space originally derived from local experience could no longer meet the needs of society. They have evolved into replicable institutional templates, suitable for different regions and social backgrounds. Quarantine buildings were incorporated into the administrative system and replicated on a large scale in the imperial network through blueprints, regulations and standardized spatial prototypes. Architecture has evolved from a single-purpose temporary site to a multifunctional and composite container, which is more inclusive and integrates modern construction technology. Therefore, isolation has become a permanent space mechanism, not a temporary measure to deal with the crisis. It can also be understood that architecture transforms the disease control process into a long-term social capacity.

This constitutes the key finding of this study: the institutionalization of isolation space does not stem from the progress of medical knowledge, but from the social response to the threat of disease - defining its boundaries through architecture to stabilize social order.

Architecture plays a dual role in this process: on the one hand, it alleviates the fear of external society by internalizing risks within spatial restrictions; on the other hand, it uses spatial layout to clarify how society views risks, who is considered dangerous elements, and which groups are excluded from cities.

Therefore, quarantine buildings are not only the product of defense, but also the generator of the concept of ‘danger’. It transforms abstract fear and vague risks

into concrete group classification, action control and boundary division through spatial means. Isolated buildings have thus become the prototype of urban 'governance space'. Its potential logic - through building risk management and social standardization through space - is still the implicit principle of modern urban governance(Whyte 2006).

4.2 Theoretical Reflections

Looking back on the full text, I gradually realized that I chose to study quarantine buildings not only because of their long history and long-term neglected by architectural narratives, but also because these buildings happen to be at the intersection of architecture and society, technology and system, order and medicine. From medieval leprosy hospitals to modern isolation islands, to the standardized isolation system during the expansion of the empire, these spaces have always discussed the same fundamental question in their own unique ways: how should society deal with contemporary crises? How can architecture respond to social needs through its form and function?

For me, re-examining these buildings means re-examining how society seeks comfort in fear.

Previous studies often regard isolation as an accessory of medical knowledge, and only regard architecture as a physical carrier of the system. However, as I gradually sorted out the archives, studied the blueprint and deeply explored the

history of quarantine buildings, I found a deeper reciprocity relationship: the isolation practice is not waiting for the building to accommodate it; it itself is generated through architecture. On the contrary, architecture is not a silent container. It actively shapes the public's understanding of disease, danger and treatment through boundaries, paths, scales and locations.

In this sense, architecture is not only coping with diseases, but also building a governance logic with diseases. What really supports the isolation measures is never the wall itself as a closed structure, but the social imagination stimulated by the existence of the wall(Edmond 1997).

This research is of great significance to me, partly because it forces me to break out of the inherent logic of traditional architectural history. It requires an understanding of the background of the times before examining how architecture can cope with the dilemma of the times as a social mechanism. Space is a place for action; its construction is by no means for no reason. It is used, selected and standardized. When dealing with the scattered and incomplete documents of these quarantine buildings, I found myself playing multiple roles of historians, architectural scholars and social observers at the same time, constantly asking: why should a building adopt this specific layout? What problem is it trying to solve? How is it used?

This research made me realize that architectural history is not only concerned with the innovation of architectural forms across the ages. On the contrary, it is those marginal buildings, temporary facilities and forgotten spaces that record the most real

and direct life experiences of society. The isolated building is an excellent example of this. These simple buildings are neither magnificent nor elegant. They reveal the governance measures taken by society in the face of a crisis.

Therefore, this paper ultimately does not aim to emphasize the importance of any specific type of architecture, but returns to the most basic understanding of architecture: it represents one of the most instinctive and direct responses of society to crisis.

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