



**UCL**

**Architecture for Contemporary Art;  
A configurational Approach to Space and Identity in  
Guggenheim Museums**

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'I, Krisangella Sofía Murillo Camacho, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.'

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*To Sandra*

## Abstract

Besides its architecture, Guggenheim's configuration are characterised for its high qualities of art collections. The meaning of world wide museum also gives to Guggenheim a commercial identity. The Solomon R. Guggenheim New York was to be an ultimate expression of organic and sculptural architecture. It became as a model for Guggenheim's museums designs. The modern architecture on which Guggenheim's organisation is embedded, have shown how buildings besides belongs to a marketplace and besides their displays of fine art, they are more important in a social way; the formation of identity in a modern society.

Over past centuries, science, knowledge and art, were significant. In this way, museums gradually began to exhibit specialised objects. Beside this, the role of a museum started to go beyond the classification of objects. It could be said that museums began to generate their identity through the objects they exhibit, through the social enterprise they represent, and even generate the identity of the objects themselves.

Guggenheim's configuration suggests a museum type based on spatial properties. The cultural intent type defined for Guggenheim Foundation involves two main characteristics; the expansion of business in the field of contemporary arts, and an experimental model for display original expressions of artist. The conception about the functional character of the project is reflected in its circulation system and architectural intent. It could be argue that Guggenheim's genotype is based on controlling spaces allowing visitors of the displays to explore contemporary art on one hand and experiment modern architectural forms on the other.

Keywords:

Identity, Contemporary art, Guggenheim, Architecture, Genotype.

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## Preface

There is a distinction between the architects involved in the Guggenheim network, especially between Frank Lloyd Wright and Frank Gehry. Wright's work makes us see architectural modernity as a variety of natural beauty. On the other hand, the work of Gehry makes us see architectural modernity as an exuberant enterprise. They have created spaces for art and Guggenheim network supports world wide displays of modern art.

I want to approach these museums in relation to the question of society and space and how it would give a "spatial picture" of Museum's configuration. In addition, to explore complex designs of architects using space syntax techniques, space and society could be understood as mutually influenced. According to Hillier (1984) the cultural meaning and social ideas are embedded in spatial forms of buildings. Hence, relations between its parts and to the whole configuration would suggest Guggenheim's identity, on which my personal interests are based on.

## Acknowledgements

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Finally, I also owe a special word of thanks to those not mentioned from Mexico and London, but in one way or another participated on this thesis. I would like to especially thank Sandra Murillo for her support in a more personal way.

Let us see how far we have gone, Thank you.

*“Let each man exercise the art he knows”*  
*- Aristophanes.*

## Chapter 1: Introduction

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The present thesis is a spatial and configurational approach to Guggenheim Network. The framework for the study is the spatial properties of museums layouts as part of an integrated whole. Thus, questions are directed to examine the network in order to understand Guggenheim's spatial characteristics. It will explore its social organisation, accessibility, permeability, depth, integration, visibility within buildings and the narrative they create.

This thesis will investigate spatial properties between the Guggenheim museums. The core of this study is base on theoretical concepts such as configuration of space, museums, genotype models attributes, spatial layout and visual properties. Three questions are set up as main line of research. The first one explores space syntax structures called 'g-models' (Hillier and Leaman, 1974); to what extend there is a common spatial genotype in Guggenheim museums.

The second one studies the formulation of spatial meaning, the non-discursive knowledge embedded through design processes; how the spatial configuration of galleries creates a spatial meaning that would influence Guggenheim's museums role?. The third question looks at the museums as institutions, as a social space; what would be Guggenheim's identity? To what extent it is built in modern art displays and in its architecture or it could be just only a brand creation. In this way, space and society will be investigated to look at how Guggenheim network became so iconic in the built environment.

Space Syntax analysis and techniques will be used to address the lines of inquiry established and examine to what extent findings could help us to understand Guggenheim's spatial properties and identity.



## 1.1 Solomon R. Guggenheim Foundation

Founded in 1937 the Solomon R. Guggenheim Foundation promotes the understanding and appreciation of art, architecture and other manifestations of contemporary visual culture (Ballon, 2009). In addition, it gives support to the preservation of collections and research of art.

The Foundation accomplishes this mission through outstanding exhibitions, educational activities, research programs and publications, trying to inspire and educate a global audience increasingly diverse through a network of museums and cultural partnerships. Guggenheim network consists of five main museums located in Berlin, Bilbao, Venice, New York and one under construction in Abu Dhabi. This one will be finished in 2012.

According to the Guggenheim Foundation, with nearly three million people a year, the Guggenheim and its network of museums are one of the most visited cultural institutions worldwide. Since 1992, the Guggenheim has produced more than 250 significant exhibitions. In the past five years, Guggenheim's displays have been presented in over 80 museums around the world.

## 1.2 The Guggenheim Structure

In theory, the first museum built was The Solomon R. Guggenheim Museum in New York. It is the central part of Guggenheim's configuration. The Museum was inaugurated six months after its architect Frank Lloyd Wright death. Wright's architectural environment thoughts about New York were controversial. He associated the architectural authority of New York with the loss of individuality and a crowd mentality (Ballon, 2009, p.19). The museum was a self-conscious architectural icon, attracting visitors in its own right rather than for the treasures within, as with the Metropolitan Museum of Art (Ballon, 2009, p. 20).

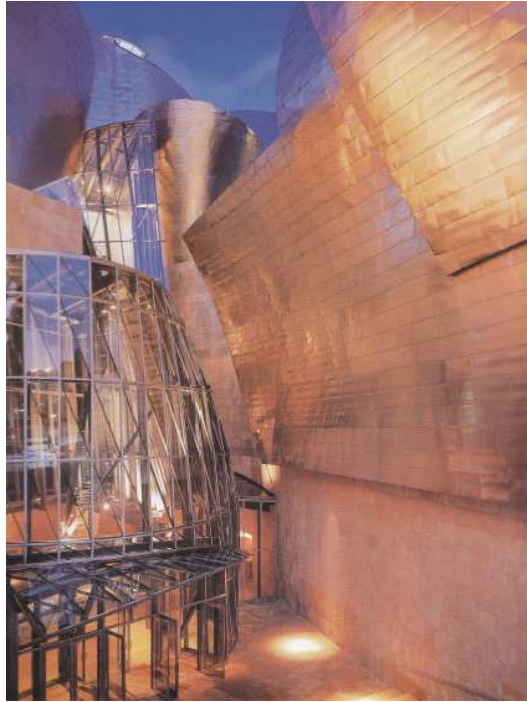
In this way, Guggenheim New York set up the beginning of monumental architectural movement in museums design.

The Solomon R. Guggenheim Museum is typically seen as a structure that goes against the grain of New York, in contrast with its context, the museum is a sculptural object. Yet the tension between the Guggenheim and the vernacular urbanism of New York intensifies the aesthetic impact of Wright's building. It could be said that Wright's realised the basic idea of structural and spatial continuity in the main gallery's "grand ramp" (fig.1.1). Wright saw the Guggenheim's spiral as a cantilever, the form that signified his democratic ideal for modern architecture.



Figure 1.1 Interior view of the grand ramp

Secondly, the Guggenheim Bilbao Museum (fig. 1.2) has been set so far by the Foundation as a second induction place of its displays. Guggenheim Foundation likes museum's characteristics; twisted and curved shapes consisting of a series of volumes interconnected. The building is covered by limestone, and by a metal skin of titanium. These volumes are connected with a glass curtain of walls transparent throughout the building.



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Figure 1.2 Details views from the south-west with the main entry.

The real heart of Bilbao's Museum is the central atrium, over 50 meters high, inundated of light from the windows. The Guggenheim Foundation describes the three levels exhibition space and a total of twenty galleries, with classical proportions and others with a singular irregularity. They refer to the main room designed for the exhibition of works of art as a space with a considerable size. As a whole, Gehry's design creates a dramatic and highly visible structure, achieving a sculptural backdrop of the Puente de La Salve, the river, the buildings of downtown Bilbao and the slopes of Mount Artxanda.

The Deutsche Guggenheim Berlin opened in November of 1997 with collaboration of Unter den Linden, the Deutsche Bank and the Solomon R. Guggenheim Foundation. The Museum is situated on the ground floor of Deutsche Bank. The current displays of four first-rate exhibitions focus upon art of the 20th and 21st century. Comprises of one space of 350 square meters, the

exhibition area is a space for displays of particular themes, individual artist or specific trends.

The spatial characteristics of the exhibition hall are its transformability from one exhibition to another. One exhibition from the Deutsche Bank Collection takes place each year at the gallery. In addition to this, individual artist or themes are also displayed alongside with works on loan from institutions, international museums and private collections. The main interest relays on the presentation of site-specific works commissioned for the exhibition hall.

The Guggenheim Venice Museum is where Peggy's Guggenheim main collection is sheltered. Peggy Guggenheim was an art collector, her entire pieces or art are the core of this museum. The architectural structure is the Palazzo Venier dei Leoni, last home of Peggy Guggenheim. This palazzo is an incomplete building, known as the unfinished palace, begun in 1748 by the architect Lorenzo Boschetti.

On the basis of Guggenheim's expansion, two more conceptual projects were included for this study; Zaha Hadid's Guggenheim Hermitage Museum Vilnius and Enrique Norten's Guggenheim Guadalajara.

### 1.3 Guggenheim Museum's Configuration

#### Atrium

The atrium of Solomon R. Guggenheim Museum New York is constituted by a circular space. This is the main access to entire museum displays (fig. 1.4). It has natural illumination made by an elegant dome. Its interior is painted with colour selection of the original Wright's design. The structure can be seen as uncomplicated. However, this simplicity at first sight makes it more complex in detail, its circularity, going down in circles, creates a viewing experience of all

the galleries. Similarly, the Guggenheim Bilbao's Museum atrium (fig. 1.4), only 50 meters high is naturally illuminated too, but by large glass windows.



Figure 1.3 Guggenheim New York and Bilbao Atrium

In contrast, Guggenheim Venice has a different type of atrium. The sculpture garden is an open space that connects all the exhibitions rooms with each other. The Deutsche Guggenheim is quite different from other museums. It possesses one main space, designed to be used as an atrium, hall and exhibition room. It could be argued that the atrium space serves as a point of entry to other exhibitions rooms, like in New York and Bilbao. In the case of Venice the space is dedicated for recreation of visitors.



Figure 1.4 Deutsche Guggenheim and Venice Atriums

In Berlin it is mainly used as a space for exhibition. In all cases, the atrium is a point of orientation. Although, Guadalajara Guggenheim and Vilnius museum are part of conceptual projects for the network, the atrium are quite different from the other museums. In Guadalajara (fig. 1.6) the atrium is at the whole floor level and it extends through the others floors with high ceiling. In Vilnius (fig. 1.6), the atrium are too narrow but with high height.



Figure 1.5 Guadalajara and Vilnius Atrium

### Movement- Circulation

The movement circulation created by the architects for the museums turns around the atrium space in most of the cases. In New York Guggenheim, Wright's has created a three-dimensional curvilinear space, giving continuity to the displays. Visitors were to ascend via the elevator to the top and walk down the ramp to view the art around its periphery or could start from the bottom and go up. In Guggenheim Bilbao, the movement and circulation of visitors is base on three levels of galleries organised around the central atrium. They are connected by a network of curved walkways suspended from the ceiling, glass elevators and stair towers.

The case of Venice is different; it is only one floor level but with different elevation in each platform. The circulation and movement start on the main hall,

then visitors could move towards first sight gallery or walk around the Nasher Sculpture Garden which connects all galleries. In Berlin, circulation and movement is around the main gallery. It could be said that, in all examples, the architectural intention was to create a pleasant route through all the museum and galleries. In the case of Guadalajara, the circulation is sequential; only communicate one floor to other by the lifts or escalators. In Vilnius, the circulation is made on a sequence of escalators and main corridor.

## Art

Besides its architecture, Guggenheim's network is characterised for its high qualities of art collections. One main permanent collection is the Peggy Guggenheim collection. Futurism, Cubism, European abstraction, Surrealism, Methaphysical painting, American Abstract Expressionism and avant-garde sculpture are the main artistic currents. It holds major works of the 20th century greatest artist. This includes (fig. 1.6) some pieces of Miró, Picasso, Kandinsky and Dalí .



Figure 1.6 Art- Birth of Liquid Desires © Salvador Dalí and Seated Woman II © Successió Miró

Solomon R. Guggenheim New York permanent collection has been developed with master pieces of 20<sup>th</sup> and 21<sup>st</sup> century. Paintings by Robert Delaunay, Rudolf Bauer, László, Rebay and Moholy-Nagy are part of this collection. It holds almost 620 artworks given by donations; this collection is the

core of Guggenheim New York. This ample collection has Vasily Kandinsky's (fig. 1.7) compilation purchased by Solomon Guggenheim. This is a special part of the Guggenheim Founding Collection.



Figure 1.7 Art- Vasily Kandinsky Decisive Rose and Dominant Curve

Bilbao Guggenheim's permanent collection complements his own and other museums. It counts with masterpieces from the second half of 20th century. Modern artist such Richard Serra ( fig. 1.8) , Yves Klein, Eduardo Chillida, Clyfford Still, Willem de Kooning and Andy Warhol are part of this collection. The Deutsche Guggenheim Collection in collaboration with the Deutsche Bank has created a program of contemporary art commissions. On this basis, the Deutsche Guggenheim could involve itself in artistic development. The artists exhibited in this collection are well-known artists and young artists. Their work consists of different kinds of expositions like paintings, photography video or high scale sculptures.



Figure1.8 Art- Empty Construction with Five Curved Malevich Units and The Matter of Time Richard Serra



## Chapter 2: Literature Review

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The following literature review presented brings in the theoretical background on which this case study of Guggenheim's Museums configuration is based.

### 2.1 The Emergence of Modern Museum Type.

Science, knowledge and art were significant over past centuries. Psarra (2009, p. 138) states that in late eighteenth century scientific knowledge was produced through collected works. She says that these objects were brought to the museum for its study and classification. In the early nineteenth century, Museums emerged as public institutions. Later on the twentieth century the temporary exhibitions inspired a new type of exhibition; the loan exhibition.

According to Van Bruggen (1997) firstly, museums conceived to display a number of individual works, they gradually began to exhibit ever larger masses of specialized artefacts. However, Psarra's study (2009) has shown that the role of the museum has gone beyond the classification of objects. They began to develop social behaviour. It could be said that the classification of objects was a way in which Museums began to generate their identity; on the other hand they became a social enterprise. Visitors started to participate in activities that museum had created for them.

Nowadays, museums have become on international venues of displays. On his essays Van Bruggen (1997) emphasises that the exhibitions, temporarily or sent on tour to different cities, assembled according to different standards and ideas. Thus, one of the changes that influenced the transformation of museums has to do with the nature of its procedures. For instance The Guggenheim Foundation was part of this change of institutions under the aegis of the Guggenheim Museum in New York (Van Bruggen, 1997, p.6-7). In Spain, Guggenheim Bilbao becomes as a novel museum's concept, because of the

building itself, for the nature of its displays and operations, and later, for its social role within Bilbao's context.

## 2.1 The Formative Development of the Modern movement in Architecture

The role that the Museum type played, either for contemporary or any other kind of art, in the modern movement of architecture, was not as much important compared with recent times. That role changed gradually. According to Ballon (2009, p. 72) between 1930s and early '40s, museums devoted exclusively to modern and contemporary art, wanted a "form of building" appropriate to their new needs. During these years, Le Corbusier, Ludwig Mies van der Rohe, and Frank Lloyd Wright were the main "form-givers" of modern architecture and participated in this museum process.

*Le Corbusier's Expandability:* In 1929, Le Corbusier produced his first design for a museum for contemporary art in response to a call for "the creation in Paris of a museum of living artists" by the art critic Christian Zervos in his Paris-based avant-garde journal (Ballon, 2009, p 72). In 1931, the Museum of Living Art became Le Corbusier's ideal museum-type. He evokes its architectural style in many of his works.

*Mies's Transparency:* According to Ballon (2009) the Miesian museum was to seem the exact opposite of the Corbusian concept. In 1943 he proposed a museum design based on the idea of big glass walls. It was partially built in the 1950s in Houston Texas. Psarra (2009) says that Mies tried to capture meaning through language and to discover the ineffable in the experience of buildings. Thus, visitors would experiment something more than being inside a building.

*Wright's Sociability:* The Guggenheim was the only museum for Wright and important enough to become the response to a real program and as an ideal solution for art displays (Ballon, 2009). Called "non objective" by Hillay

Rebay, director of the collection and prime mover, the unique collection contains twentieth-century abstract paintings.

It could be thought that museums and architecture started a role in contemporary displays which express society's interest for art. Till (2009) underlines the relation between architects and buildings. He says that buildings are used as symbols for consecutive moments of modernity. He argues that architects are happy to build buildings because they symbolize their identity and their place in the marketplace. Psarra (2009, p.87) states that "Architecture is a thing in so far as it renders itself to be experienced and an activity that deals with the conceptual organization of the parts as a whole". The three main "form-givers" of modern architecture, have shown through their works how buildings besides belonging to a marketplace, they are more important in a social way; the identity they represent and the objects they show.

### 2.3 Configurational and Spatial Structures of Identity in Museums.

Configuration of architecture and urban design in their formal and spatial aspects is the way the parts are put together, from the whole that is more important than any parts taken in isolation (Hillier, 1996, p.1). Hillier (1996) argues that configuration is a 'non-discursive' method which it could be said that is an intuitive technique. In this way, the internal configuration of a museum has to do with its exhibition's arrangements. According to Choi (1997) the relation created between museums structures and with the emerging patterns is directly affected by the spatial structure of the layout. However, architects are talking about discursive role as an element of space taking for granted the non-discursive method.

Beyond the identity of museums as containers of arts, expositional spaces, architectural feature or files of historic legacy, museums also represent different ideologies. From the Symposium organized at the Nevada Museum of Art de Reno, specialists tried to address to the Guggenheim Bilbao and all the social and political factors related to the museum, that it is believed have

shaped the museum “*The museum has become in the new paradigm of the contemporary culture*” (Guask and Zulaika, 2007). Guask and Zulaika (2007) state that the importance of the discursive role of the museum not only relays on the collection shown, but in the space where different discourses convergent relative to the objects.

Though, there is a sense in which differences in social forms are expressed through variation in the form of buildings? Hillier (1996) suggests that a social organisation is formed with a number of roles and relations that can be fully explain without invoking a building. However, there is a link recognized in spatial form; the spatial interfaces. This interfaces establish a sort of minimal spatial message not merely to the building, but to an organisation and consequently to the building (Hillier, 1996, p. 289). Hillier and Hanson (1984, p. 4) state that from a spatial perspective, society varies not only in the physical configuration but also in the ordering of space which leads into an obvious dimension of culture.

A number of studies have been made about spatial configuration of museums and its social structures. For instance, Dursun (2007) exploration of space in buildings scale at galleries suggests that there are an emerging data from the interaction between user and space. He claims that by accepting gallery as context for socialisation, and clarifying implicit aspects of its space and culture could help designers to explain their guiding principles for improving existing built environment and evaluate their proposals in terms of their performance.

Museum space also provides a physical realisation of classificatory principles which are supposed to make the collections accessible to understanding (Choi, 1997). According to Foster (1997) the museum, as a civic catalyst, has suffered a transformation and recently it has assumed a spectacular role in cultural life. He says that the relationship between space, museums and visitor’s experience are one of the main endeavours of the architect. On reflection, architecture would affect the experience of museums and it could be related to the art exhibition. For instance, Tzortzi (2007) explores

the main dimensions of spatial variability in museums layouts and the variability of display strategies.

Psarra et al, (2007) analysis of MoMA in New York, architecture has been used as an extensively to regenerate itself and redefine its identity. They argue that the MoMA defines its new identity through the visual integration of the building and outside of a metaphoric association with the Manhattan location. Psarra et al, (2007) findings also had shown that the display has departed from the linear organization of previous installations towards a multi-layered model of narrative. Thus, configuration of space has been a key for Museums display strategies and architectural experience.

#### 2.4 Spatial cognition and configurational meanings

To illustrate the argument of exploration and wayfinding, one aspect has to do with spatial cognition. Spatial Cognition is to make inferences about the world with information at hand. In this way, spatial meanings related to configuration could be associated with hierarchy, dominance, equivalence, equality, democracy, control, controlled, correspondence and non-correspondence. They represent social characteristics of space.

In understanding the meaning of configuration, significance and signification must be noticed. According to Hillier significance is the relations among things that mean. In a complex these things that mean acquires significance by being comparable to other possible complexes. It could be said that configuration is the relationship between the immediate visual environment and its significance with respect to the whole spatial system.

Gibson argues that "...information about a world that surrounds a point of observation implies the other" (Gibson 1950, p. 75). This is related with how the environment is seen with its parts and as whole. Hillier (1996) argues that in an environment the intelligibility is the relationship between what it could be seen

and what could not be seen. This property could measure what we can see or not and the degree of which a system is connected and integrated as a whole.

## 2.5 Space Syntax Genotype model.

The theories of buildings that arise from the socio spatial relations (Hillier 1996) describe the interfaces between inhabitants and visitors as well as between different groups of inhabitants. The spatial genotypes of the buildings include interfaces. Hillier and Leaman (1974) describe as a stable structure a genotype model, and a variably developed observed form a phenotype- model.

According to Hillier and Leaman these stable structures correspond to what biologist call `genotypes´. The genotypes are unconscious or autonomic operations (Hillier and Leaman, 1974, p. 5). They operate as part of the creative action as well as a basis for interpretation and further understanding of structures. It could be said that g- models interpret the theories of artificial systems on which they have a direct connections. For instance, Hillier and Leaman (1974) argue that in society theories, structures evolved to mediate the artificial, natural and social universe. This has an influence with space and society relation.

Thus, the concept of social organisations seems to hold the idea of building and vice versa. Significantly, the idea of space is associated to these two ideas. Hillier (1996) states that space both gives the form to the social abstractions which buildings are named. In this way, buildings can be studied and compare in terms of categories arrangements and relations between them. It can be also studied the interfaces created between the occupants and visitors inside a building. This analysis could demonstrate how social structures work in a building social system.

## 2.6 Architecture Combinatorial and Generic Function

How we can understand architecture as an infinite creational source of spaces? Why it could be useful? According to Hillier (1994, p.245) there is an aspect called intelligibility which he suggests is a spatial characteristic of what could be seen from its parts and understood in an overall pattern. Intelligibility is a characteristic of how a complex could be navigated by inhabitants and visitors without much trouble. Hence, its function, parts and whole configuration would be understood more easily.

Hillier (1994, p.247) states that function is the way in which a complex accommodates functions in general and therefore different functions, rather than any specific function. In this way, it could be considered human behaviour that occurs in buildings in a generic way in order to examine the emerging patterns. For instance, he says that instead of the purpose or meaning of an activity, its physical and spatial manifestation may be considered, what is the human activity. In space, occupation and movement tend to occur. On this basis, function and form became more important than the form itself.

According to Hillier (1994, p. 247-248) 'occupation' is an activity often static such as conversing, meeting, reading, eating, or an activity in space traced over a period, such as cooking or working at a laboratory bench. On the other hand, 'moment' and occupation could be related activities in space. Notwithstanding, movement is a generator of relations between spaces rather than the spaces and occupation is a way of inhabiting spaces. It could be seen that occupation and movement have different requirements in space. In this way, occupation is convex and movement is linear. Inside museums configuration, occupation occurs inside the galleries, atrium, hall, café and movement is the way that visitors use to precede towards a particular space or spaces.

Taking into account spatial complexes, the relation between occupation and movement is often of adjacency rather than overlaps. This could happen in spaces fully open or fully closed. Movement requires linearity and by designing movement to occur in spaces which pass immediately by rather than through occupation spaces is achieved (Hillier, 1994, p. 250). In order to fully grasp how occupation and movement occurs in a complex, it is necessary to consider the different topological potentials of a complex. For instance, Hillier (1994, p. 250-251) propose a graph model where spaces can be divided in four topological types as follows:

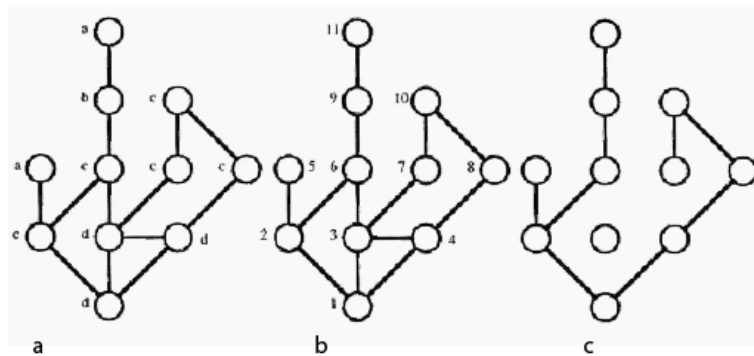


Figure 2.1 Different Topological types “a”, “b”, “c”

The first ones are “a” spaces with a simple link. In these spaces movement is not possible to other spaces but only to and from themselves, these are dead spaces. Thus, topologically occupation- only spaces. The second ones are “b” spaces with more than one link, part of a sub- complex with less links than the number of spaces and on the way to at least one dead-end space. The third are “c” spaces with more than one link and part of a connected sub-complex containing neither type a-nor type b-spaces and with the same number of links as spaces.



The fourth are “d” spaces with more than two links and part of complexes containing neither a-non-b type, with at least two rings which have at least one space in common. He states:

*“In general we can say that the sequencing of spaces normally occurs when (and perhaps only) there are culturally or practically sanctioned functional interdependencies between occupation zones which require movement to be an essential aspect of these interdependencies and therefore to be internalised into a local functional complex of spaces” (Hillier 1994, p. 151).*

How these four topological types reflect on the design process? Hillier (1994, p.258) suggest that the way in these laws govern the relation between generic function and spatial configuration lies in the design’s moves made locally such as eliminating a doorway or making partitions. These changes have effects in the overall pattern of space. He proposed a three series of filters of possible spatial arrangements before they develop into buildings. The function and possible forms of space are related to these filters.

He states that the first filter about generic function has to do with spatial properties of the arrangements and how human beings are able to use this space. The second filter about cultural intent is related to how buildings form culturally defined types. This is that buildings culturally similar could have in a specific time and space at least some common spatial properties. Hillier (1994, p.258) refers to this filter as the cultural genotype. On reflection, this filter is of interest of this thesis. The second filter could give the meaning of a cultural genotype in Guggenheim Network.

The third filter Hillier proposes is about those aspects which are not embedded at the cultural genotype and could be different in a random or structure way. In this way, individual differences in buildings would be notice.

Hence, the three filters are part of an integrated system because they work in succession rather than independently.

## 2.7 Space and Society

The way in which society and space are mutually influenced has been not taken into account enough in social theories. How does buildings could carry meanings?. According to Markus (1987) buildings are primarily social objects; they carry meanings for society in general. He talks about a reproduction of power that is the use of `language´, which is a control mechanism with meaning used by buildings owners or sponsors. Markus (1982, p.469) proposed an analysis based on the experience of buildings with empirical support. For him, the three primary experiences of buildings are those of space, function and form. The way of these three experiences relates to characteristics of buildings are capable of theoretical analysis. He states:

*“The spatial structure can be analysed in terms of depth, the extend to which it is ringly or tree-like , relation of functional labels to specifics positions in the structure and the interface between the zones occupied by the inhabitants of a building (who own or control it) and the visitors to it “*

*(Markus, 1987, p. 469)*

Hillier (2008, p.224) talks about this relation and of a theoretical consequence that is concerned with the agency of spatial transformations in social morphology, and so an independent role in creating the society- space relation between social theory and those who create the built environment. An attempt to turn round the question and re-establish the theoretical links between the spatial and social worlds that had been so influential in setting the foundations of modern social theory (Hillier and Hanson, 1984) began in early 1980s. Putting space first by studding the patterns of real space found in the built environment and asking in what sense these could be seen to be the outcome of social and economic processes (Hillier, 2008). This approach was called `space syntax´ (Hillier, 2008).

## 2.8 Architectural Meanings and Design

The mechanism thought about a building is related with two main ideas; the first one is the social organisation and the second, the image of an exacting form of building (Hillier, 1996, p.288). Yet, form and function relation is more complicated. Hillier (1996) states that a designer's strategy is to create a possible version of the form-function for a certain purpose, but does not mean that the design is for that purpose. The proposal of a relation would be not as precise as the language of building types.

According to Guask and Zulaika (2007) Guggenheim is a worldwide organisation involved in expansion and interested in increase business in the field of visual arts. However, there is an important conception about the contribution in the functional character of the project, in one hand, and to its adaption of the city renewal, on the other. That relationship is settled as one of the main objectives and significance of the configuration.

In practice, the meaning of a building changes depending on its planning, construction, inhabitant and interpretations (Whyte, 2006). He said that there is logic of each agency that shapes the way in which its meaning is created and understood. Therefore, architecture should not be studied for its meaning, but for its meanings. In addition, there is something beyond architecture because it become in a social tool (Koch, 2010). Markus (1993) says that there are three levels to describe two social types of relationships, those with power and those with bonds. Thus, social meaning and spatial structures are expressed in different types of relations.

On design process, a model is a simplified representation of reality (Preciado, 2008). He states that there are three parameters in the representation of architectural design: form, program and construction, all related to each other. Preciado (2008, p. 19) says that through an abstraction, elements and interpretations described quantitative and qualitative information of a real system, which allows studying their behaviour by using analytical

methods. He distinguishes three types of models; the iconic models, a representation of images and drawings. The analogue model represents a system through another and its properties are equivalent. Finally, the symbolic model is an abstract conceptualization through symbols, signs, and numbers.

According to Preciado (2008) in architectural design, the model is part of intuition and logic, considering the scale and proportion. The model could fit within a rational design or to an abstraction. On this regard, space is an open or closed cell production. Its own dimensions and forms are part of a space system, grouped with other cells and in obedience to an operation, came to what it is called functional diagram (Preciado, 2008, p. 19). Hillier and Leaman (1974) look at design as a relatively simple set of operations, in consequence of other more complex structure simplified by theories and models of representation. Their approach suggests that in order to improve the design process, then the environment should be studied at the same level.

The site context has been part of design projects. For instance, Frank Lloyd Wright design concepts refuse of a traditionalist belief and fight against commonly accepted ideas (Treiber, 2008). It is argued that Wright's organicism is not the only thing present on his projects. Treiber (2008) says that the rationalism exposed in Wright's designs links his practice in civil engineering to his pragmatic headmaster Louis Sullivan and to the Chicago school. The line, plane, symmetry, modernism, ornament, the machine and the metaphor are Wright's main architectural concepts. Gehry's approach to design is about to see buildings through semiautomatic drawings and handmade models, directly related to his creative process. Gehry's design process starts with abstract sketches that end with a conceptual project then; he chooses materials and finally puts all the pieces together.

Hillier (1994) and Penn (2005) argue that the design methods and architectural knowledge is about the ideas we think rather than think of. He suggests that any well working system the user must actually become literally embedded. He states that the social nature of architecture is the main distinction between it and other fields of design. "Buildings and cities act

essentially as mechanism for generating and controlling interactions between people” (Penn, 2005). Penn argues that a building is an environment where complex and unforeseen structures will emerge. In this way, Hillier and Hanson (1984) state that primary cells relations generates and modules a systems of encounters by their spatial arrangement.

## 2.9 Space Syntax Museums Studies

In order to understand the role of the museum, the syntactical properties have to be recognised, in that way buildings could be studied. The study of morphology and architectural programme is the intellectual subject through the study of certain building (Psarra, 2009). Though, what is going on inside them? and how the social organisation relates to the space? The space is determined by two kinds of relations; the relations among the occupants and the relations between occupants and outsiders (Hillier and Hanson, 1984, p. 15). According to Peponis (1997) the placement and arrangement of boundaries in buildings, would make space available to experience it, to human activities and intelligible to understanding. The patters of enclosure, contiguity, containment, subdivision, accessibility and visibility are the primary reason for boundaries. Peponis (1997) states:

*“Because interior space is configured according to the shape of the perimeter and subdivided according to the disposition of partitions, we cannot experience buildings in their entirety from any one of their points, except in the simplest cases” (Peponis et al, 1997: 01).*

Movement is vital to the understanding of spatial patterns in buildings. Hiller and Hanson (1984) states that by giving shape and form to our material world, architecture structures the system of space in which we live and move. Psarra (2009) argues how through an embodied experience, architecture and meaning are perceived. She explains how space syntax helps architects to consider the space-society mutual influence and to apply analytical and theoretical knowledge in design. Thus, there is a relation between spatial and narrative code in museums and galleries, the effect that spatial layout has to the exhibition and to the visitors experience is established.

The spatial model established by syntactic research, describes the interaction between the different components for the model and their relation with the display strategies and visitor experience. From the results, it is believed that the main dimensions of variability of spatial layout and display strategies derive from a set of basic principles, given as possibilities to be explored and combine. According to Tzortzi ( 2007, a) by the different usage of these principles it is possible to differentiate between museums intentions and aims, to convey a pre-given meaning and reproduce information, and to create fields of possible meaning and produce a richer spatial structure.

In the spatial environment, the area visible from a location within the space, it is called Isovit (Turner et al, 2001). Isovits could be used to analyze the mutual visibility between locations and a visibility graph is a more general concept of an Isovit. It could be said that visibility graph properties would be related to manifestations of spatial perception (Turner et al, 2001).

Tzortzi (2007) claims that the organisation of viewing spaces in a sequence is a principle intrinsic to museum design and instrumental for the accommodation of visitors movement as well as the arrangement of objects. He studied two museum cases. On one, the findings shown that the grid impossibility the visit in an orderly sequence, but minimises the control that the layout places on the visitor and consequently, maximizes the randomness in the pattern of movement and exploration. On the other example, the single sequence imposed by strong rules in the pattern of movement, and powerfully controls the pattern of exploration since visitors have to go through the same sequence of spaces in the same order with no option of changing the course.

Choi (1997) study of eight museums, explores the relational patterns of spaces, using space syntax techniques. The findings suggest that the configuration of museum layouts provides a structure to the exploration of the collection and buildings by visitors (Choi, 1997). A further consideration of research was made by Peponis (1997). Peponis (1997) findings shown a theory of the intelligibility of shape and spatial structure suggests that it operates not so

much at the level of graph theoretical measures, but rather at the level of recognition of elements and relationships.

On this regard, Space syntax analysis helps to see how different aspects of a museum could be studied in order to understand their social and spatial role. Configuration seemed to be a spatial key to understand spatial properties of buildings. In the case of museums, the spatial arrangements are important for the display of collections.

However, the way that museums have changed has to do with the nature of its operations and the way visitors explore and experienced the space. It could be said that the design process of modern museum developed a new type of museum as well as began to define social behaviours that occurs within.

## Chapter 3: Research Methods and Data

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### 3.1 Description of methodology

The aim of this chapter is to bring in and clarify the research methods that have been used to explore and answer the three questions set out at the beginning of this thesis. Apart from the description of the thesis organisation, this section also presents the main analytic tools along with limitations and clarifications. The research analysis will be divided in different stages and mainly according to the research question addressed.

The first part of the thesis analyses the museums spatial morphology, according to type, while it examines their spatial configuration. The final stage of the analysis discusses the functional aspect of the museums and the likely scenarios by using agents in Depthmap Turner (2001-2011).

### 3.2 Tools for analysis

The original drawings of the buildings will be used as a base for make a more appropriated plans for the analysis. Space syntax techniques will be the main methodology used for the analysis of spatial configurations between museums layouts. This tool would help the understanding of configurational properties and social structures. The syntactic model is appropriated in this study to assist in the comprehension, analysis and interpretation of museums layouts. The next stage is to describe and represent the shape and configuration of Guggenheim network, in the form of space syntax maps, using Depthmap software.

The first one proposed is a convex analysis. The number of convex spaces and step depth would give a result of which is the deepest space in the museum system. Convex maps will be used in order to establish the fewest and fattest convex spaces needed to cover the system. By using this tool, it is expected to find configurational relations of the atrium with the galleries and



with the staff spaces. In this way, the segregation and integration of spaces could be investigated.

The second analysis proposed is based on J-Graphs which gives cells internal structures, individually, and within the whole network. By using this technique it is expected to find out a Guggenheim genotype. The depths, real asymmetry, form and transpatial relations of the cells will be studied.

A third analysis is proposed on axial maps. The axial map used will show the fewest and longest lines needed to cover convex spaces and it will make the connections of permeability between them.

A fourth analysis is proposed to be made by Isovist. The visual information would be studied by this technique. The isovist will be drawn in the intersection of axial lines with higher degree of integration and in spaces with the more axial lines. In this way, an individual isovist represent all areas that are visible from any part of a convex space (Choi, 1997). Thus, a determination of what is visible in the museums will be shown here and how it could relate to the atrium and galleries, especially to permanent collections displays.

A fifth analysis is proposed on VGA. The visibility graph would be used to understand the visual properties of each museum. It would be studied in order to find a correlation between Guggenheim identity and museum displays arrangements. Museum layouts will be explored by different maps and statistical measures. Intelligibility and synergy will be analysed.

In theory, the configurational variables studied such integration; will represent the numbers of spaces that have to be transverse to reach other part of the system. Connectivity will show the spaces that are directly connected to a specific space. Integration and Connectivity could be seen as global and local measures. By studying the convex integration, axiality and visual integration the sequence of spaces and configuration would be understood.

Agents in Depthmap would be used to see the likely movement scenario inside the museums. The agents will be realised from entrance to atrium and permanent collection rooms. The tool of line sight is used as a parameter.

### 3.3 Limitations

In general, the first sight limitation is the complex form of museums layouts. On the other hand, this study would be richer with space syntax observations, in order to have a more complete pattern of movement. However, the agent analysis would provide the likely scenarios. Other aspect, is the fact that Guggenheim Abu Dhabi is not finished yet. Although, it was designed by the same architect of Bilbao's the access to this museum layout is protected by confidentiality aspects until its inauguration.

### 3.4 Clarifications

The first clarification has to do with the Solomon R. Guggenheim New York. The layouts used for the analysis, are the first made by Frank Lloyd Wright to investigate the fundamental purpose of the original space. In general, museum's layouts were made the simple as possible. Finally, two of future Guggenheim museums projects are based on a conceptual design, therefore, under modifications by the Foundation until their completion. It should be added that this is a comparative study between different museums layouts that shape the configuration and their social space.

## Chapter 4: Spatial Analysis of Guggenheim Museums

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### 4.1 Spatial Configuration

#### 4.1.1 Guggenheim Museum Bilbao

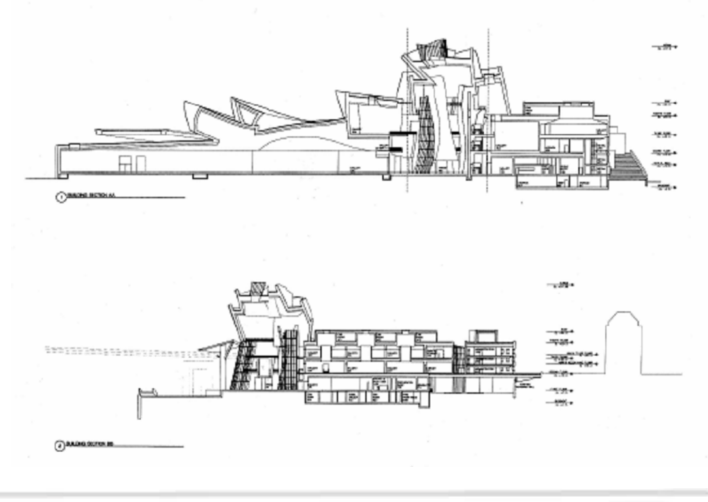


Figure 4.1 Guggenheim Museum Bilbao Section

The Guggenheim Museum Bilbao opened on 1997 as one of central revitalisation plan for Bilbao's city. Since that time, the museum has been a significant tourist attraction, captivating attention of visitors from around the world. On the other hand, the building became a symbolism of modern architecture. The entire permanent collection is exhibited through a variety of displays. In this view, the building is providing spaces for specially commissioned installations as well as flexible galleries for the exhibitions of entire displays.



Figure 4.2 Guggenheim Museum Bilbao principal views

The building consists of a series of interconnected volumes; each orthogonally covered limestone, curved and twisted metal covered by a skin of titanium. These volumes are combined with glass curtain walls that provide transparency throughout the building. The glass curtain walls have been specially processed so that natural light will not damage the work, while the metal panels seemed as a "fish scales". A great deal of the structure is made of titanium half a millimetre thick. As a whole, Gehry's design creates a distinctive structure and highly visible, achieving a sculptural backdrop of the surrounding city.

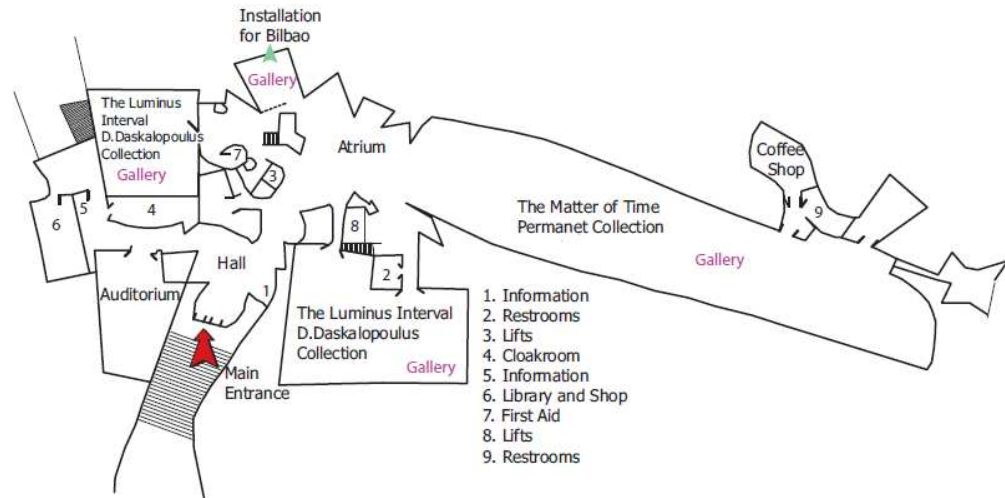


Figure 4.3 Functional Map of Bilbao Floor 1

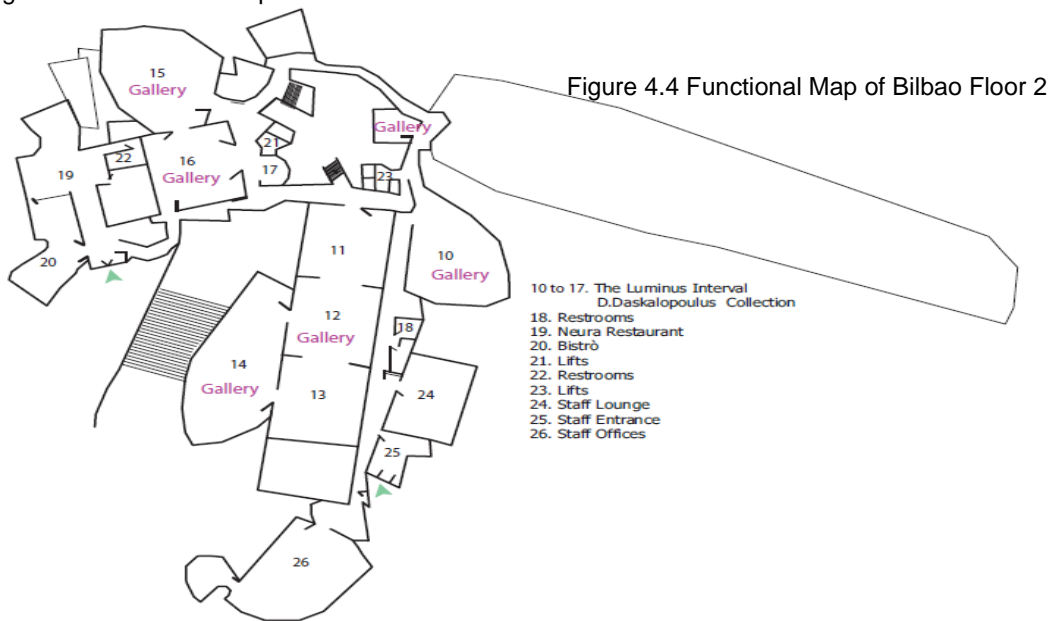


Figure 4.4 Functional Map of Bilbao Floor 2

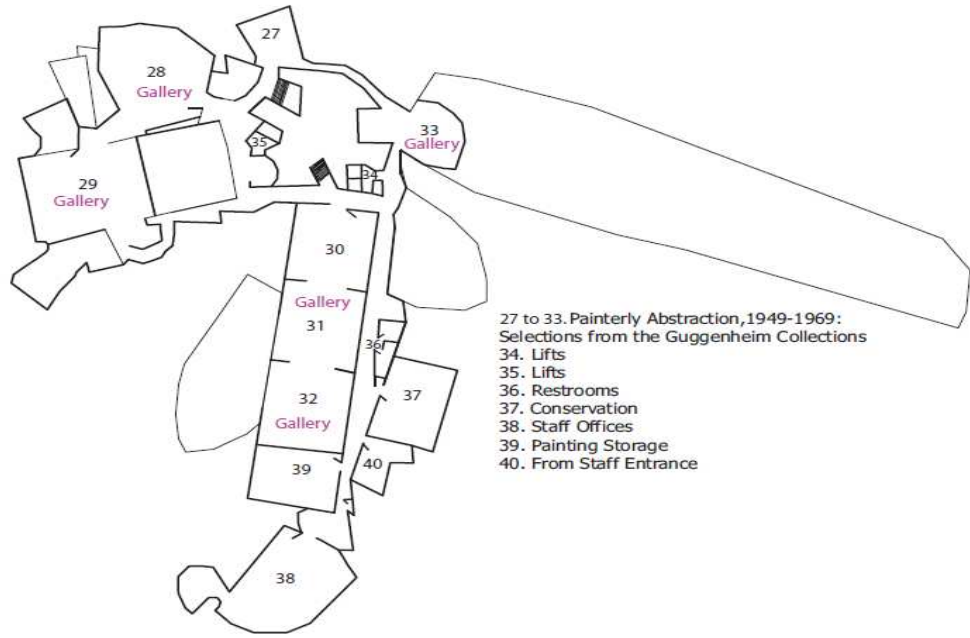


Figure 4.5 Functional Map of Bilbao Floor 3

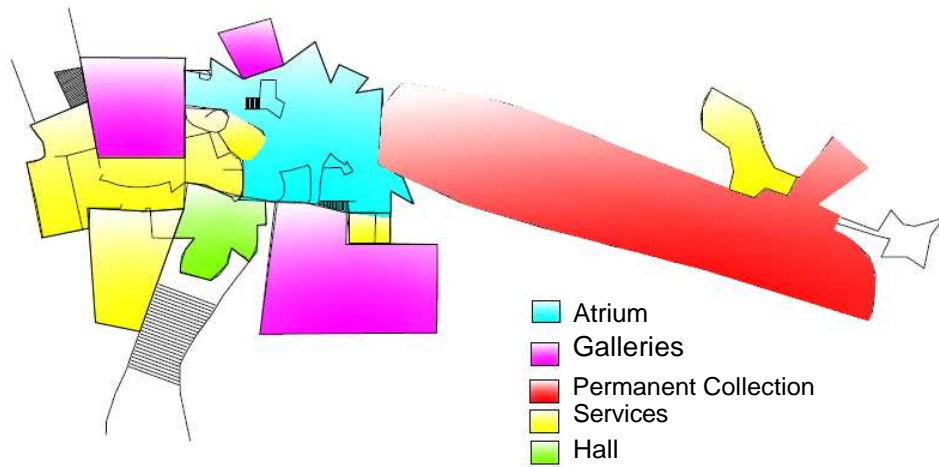


Figure 4.6 Map of Spaces Bilbao Floor 1

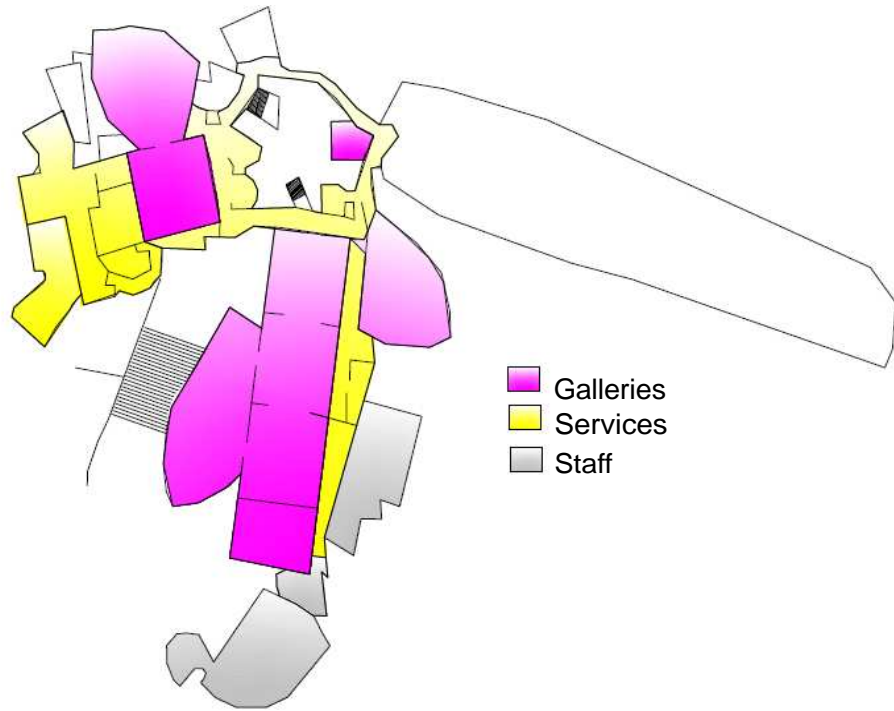


Figure 4.7 Map of Spaces Bilbao Floor 2

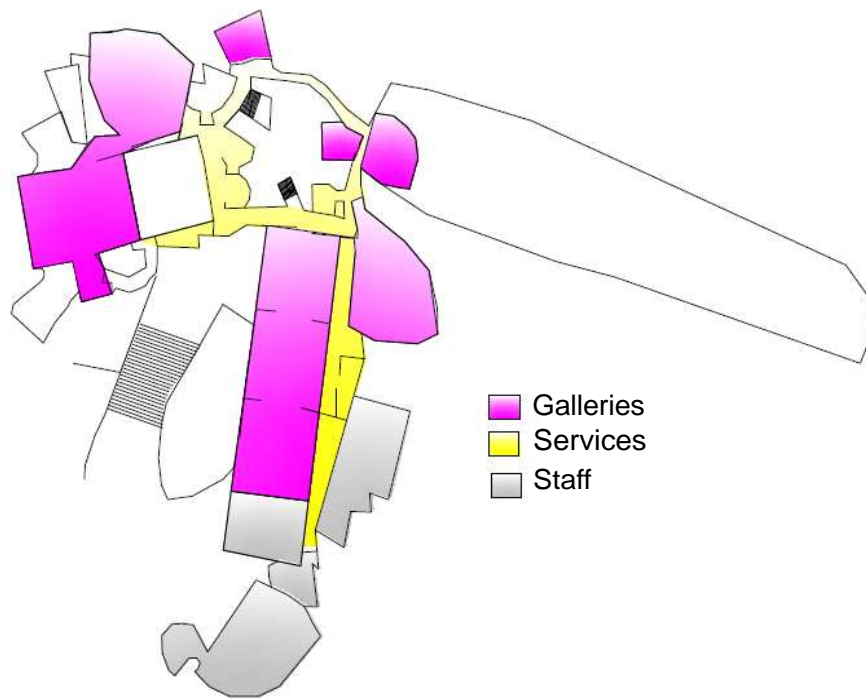


Figure 4.8 Map of Spaces Bilbao Floor 3

#### 4.1.2 Deutsche Guggenheim

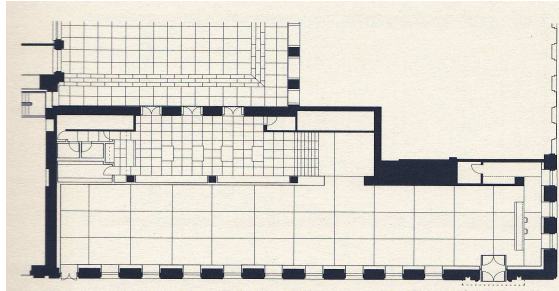


Figure 4.9 Deutsche Guggenheim layout

The Deutsche Guggenheim Berlin opened in November of 1997 with collaboration of Unter den Linden, the Deutsche Bank and the Solomon R. Guggenheim Foundation. It is situated on the ground floor of the Deutsche Bank. The current displays of four first-rate exhibitions focus upon the art of the 20th and 21st century. The Museum comprises of one space of 350 square meters. The spatial characteristics of the exhibition hall are its transformability from one exhibition to another. In addition to this, individual artist or collections are displayed alongside with works on loan from institutions, international and private collections. The main interest relays on the presentation of site-specific works commissioned for the exhibition hall.



Figure 4.10 Deutsche Guggenheim exterior and interior views

The Deutsche Guggenheim Berlin resides on the ground floor of the Berlin headquarters of Deutsche Bank. The building consists of a single exhibition hall and a retail space which in conjunction gives an elegant simplicity to the museum. Simple detailing, careful spatial proportioning, and a restrained palette of materials combine to create an environment of respectful sensitivity for the presentation of art (Gluckman, 2000, p. 221). These characteristics are a constant rule of Guggenheim’s museums.

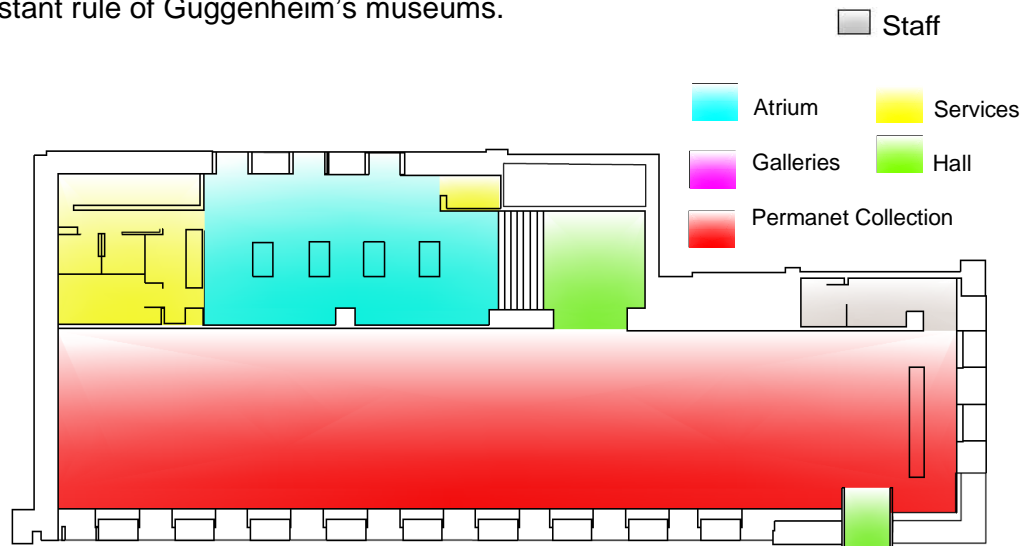


Figure 4.11 Map of Spaces Deutsche Guggenheim

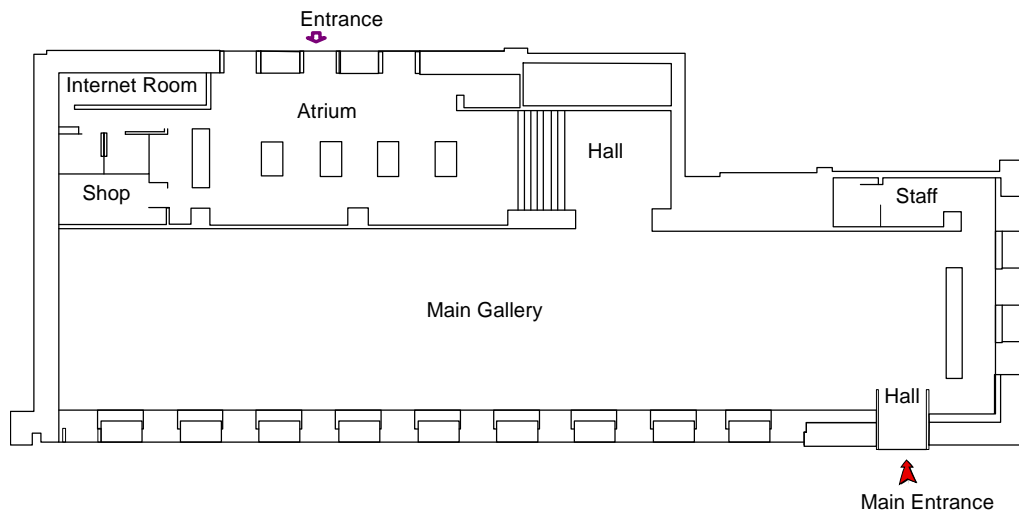


Figure 4.12 Functional Map Deutsche Guggenheim



### 4.1.3 Guggenheim Museum Venice



Figure 4.13 Guggenheim Museum Venice night view

After an exposure to the Venice Biennale and her collection of sculptures and famous paintings, cubist, surrealist and European abstraction, Peggy Guggenheim bought the Palazzo Venier dei Leoni. This place is located in the Gran Canale in Venice, Italy. Guggenheim foundation started to get noticed with Peggy's Guggenheim collection and management.



Figure 4.14 Guggenheim Museum Venice exterior marine view

The building consists of a series of interconnected rectangular rooms. These rooms benefit of natural light and view to the main garden. The arrangement also provides a sequential visit of exhibition rooms. A great deal of the structure is made of regional materials. As a whole, the museums create a quite atmosphere for enjoying of art. It is complete embedded with the surround city.

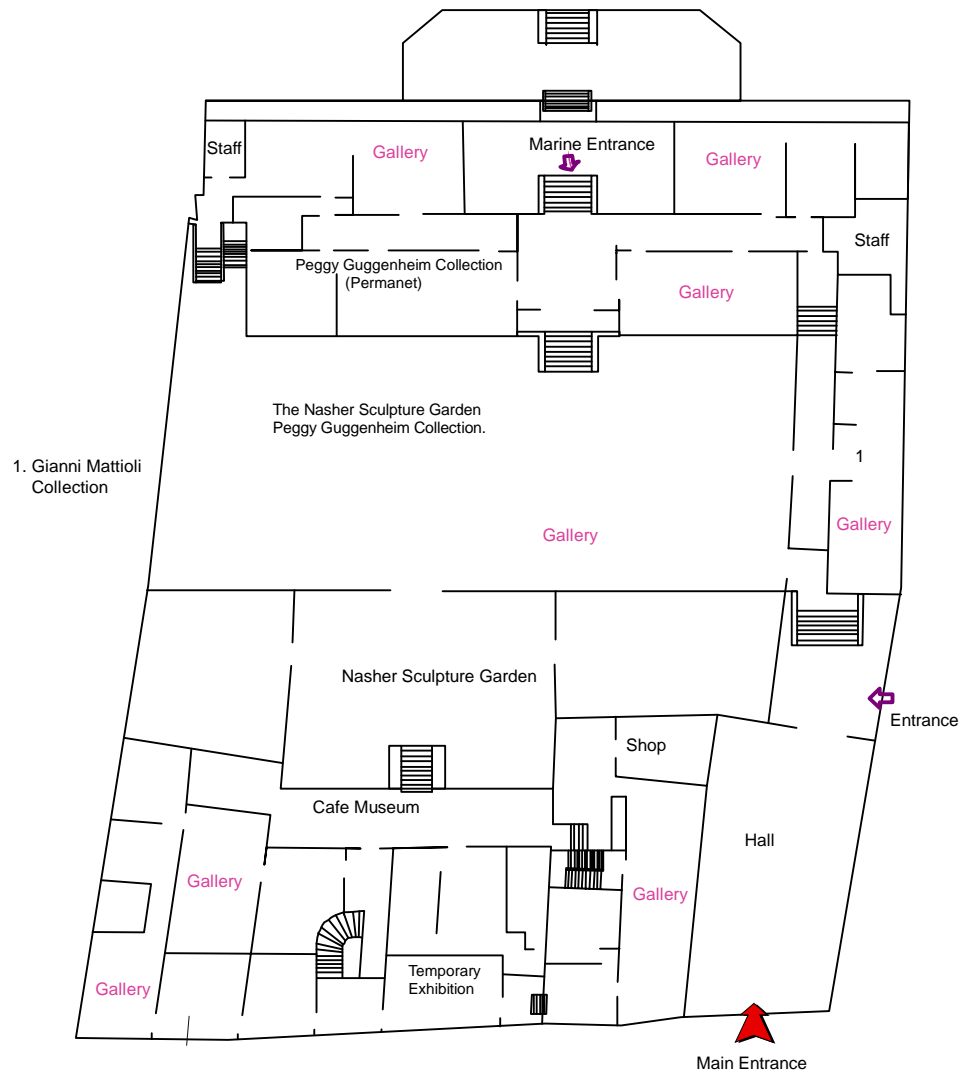


Figure 4.15 Map of Spaces Guggenheim Venice



Figure 4.16 Interior views of galleries Guggenheim Museum Venice

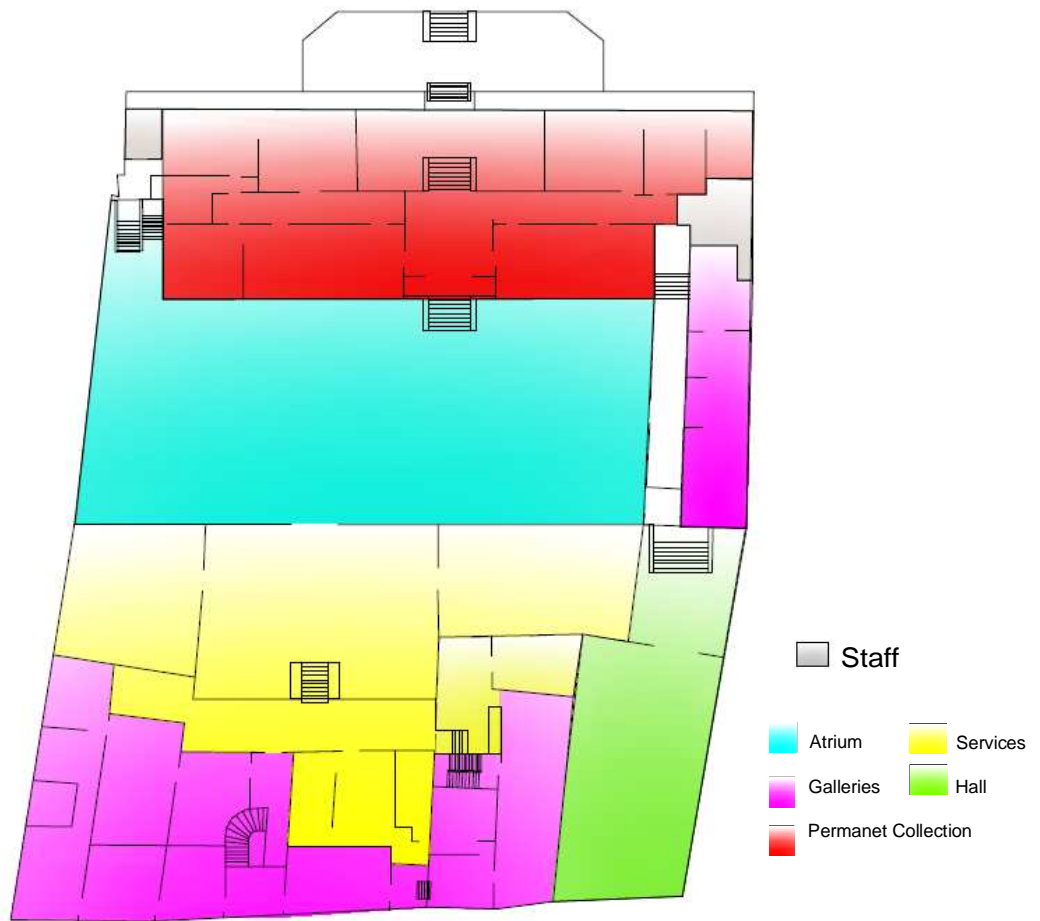


Figure 4.17 Functional Map Guggenheim Museum Venice

#### 4.1.4 Solomon R. Guggenheim New York

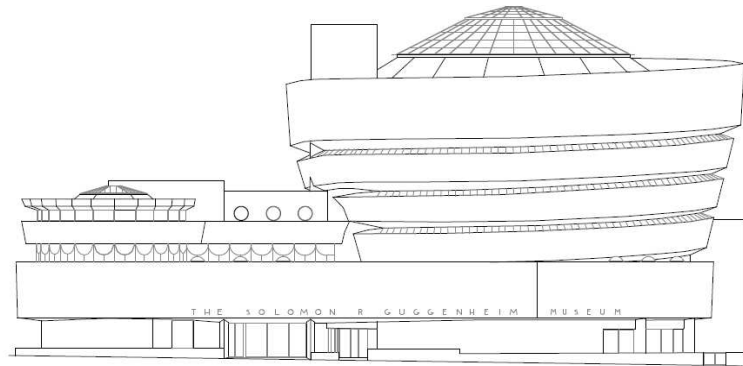


Figure 4.18 Section of Solomon R. Guggenheim New York

The Solomon R. Guggenheim Museum was inaugurated some six months after Wright's death. The building is in what Wright called a city of chaos and congestion with absence of nature and spatial expression (Ballou, 2009, p. 19). The Guggenheim became an architectural icon for the city. It could be said that the museum attracts visitors because of its form rather than for the treasures within.



Figure 4.19 Exterior views of Solomon R. Guggenheim New York

The museum consists on a three-dimensional ramp. Wright´s realised the basic idea of structural and spatial continuity in the main gallery´s “grand ramp”, as he called it. He sought a new type of museum whose curved interior space would enhance visitors awareness of the nonobjective contemporary paintings inside. The outside vistas on the road direct attention to the museum. Its sculptural form clearly contrasts with New York City’s context.

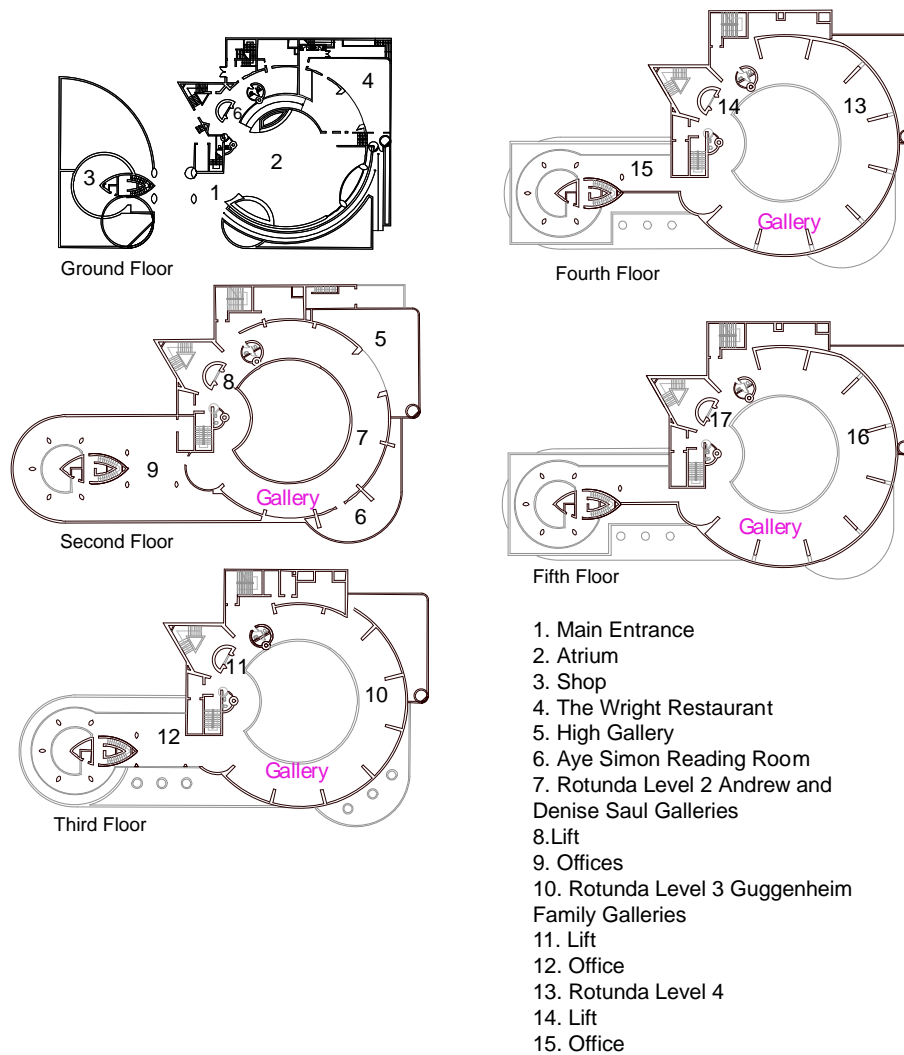
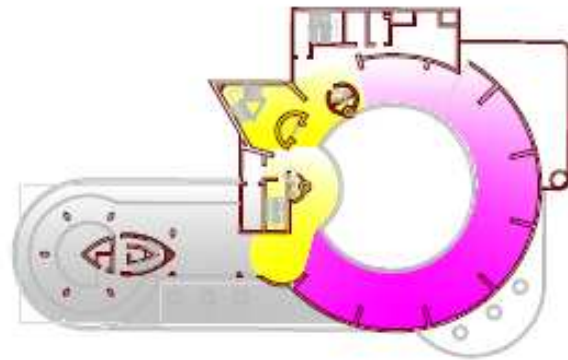
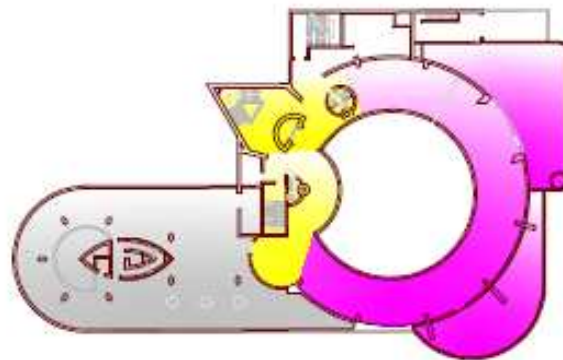


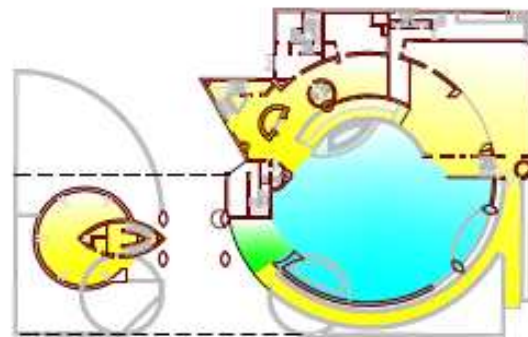
Figure 4.20 Functional Map of Solomon R. Guggenheim New York



Third Floor



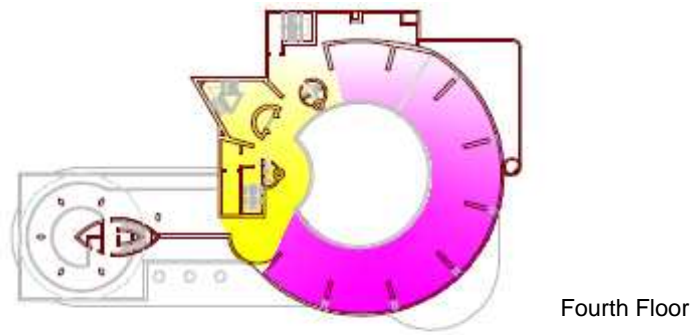
Second Floor



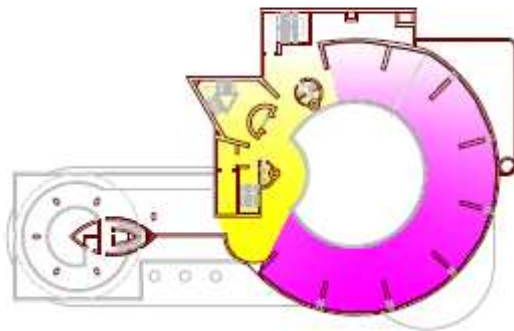
- Staff
- Atrium
- Galleries
- Permanent Collection
- Services
- Hall

Ground Floor

Figure 4.21-a Map of spaces Solomon R. Guggenheim New York



Fourth Floor



Fifth Floor

Figure 4.21-b Map of spaces Solomon R. Guggenheim New York

#### 4.1.5 Guggenheim Guadalajara



Figure 4.22 Guggenheim Museum Guadalajara section

The federal government of Mexico and Guggenheim Foundation announced the creation of Guggenheim museum, in Guadalajara, Mexico. The idea was to promote contemporary art in Latin America. The winner for the international contest was Enrique Norten (TEN Arquitectos). Frank Gehry announced the winner in 2009. The project is a tower over the valley of Barranca in Guadalajara. The radical nature of the project, the distribution of its program and its relationship to the valley makes this project distinctive.



Figure 4.23 Exterior renders of Guggenheim Museum Guadalajara

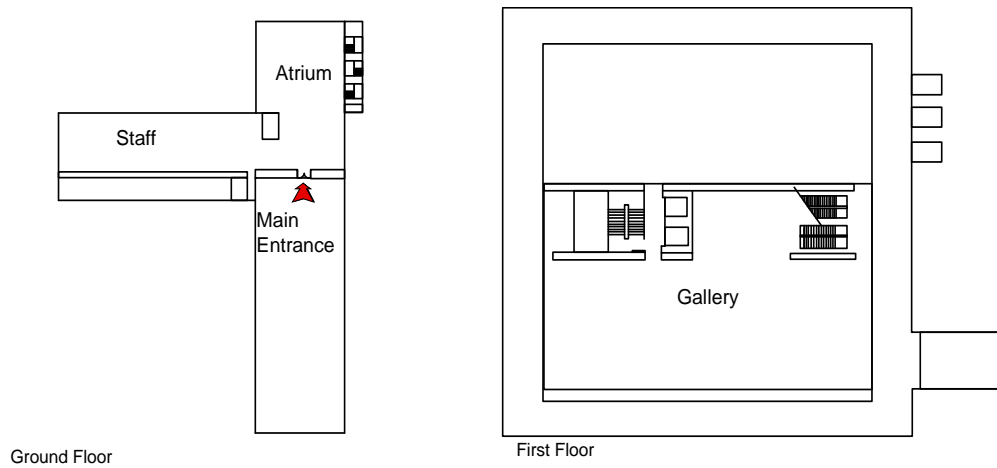


Figure 4.24-a Functional Map of Guggenheim Museum Guadalajara



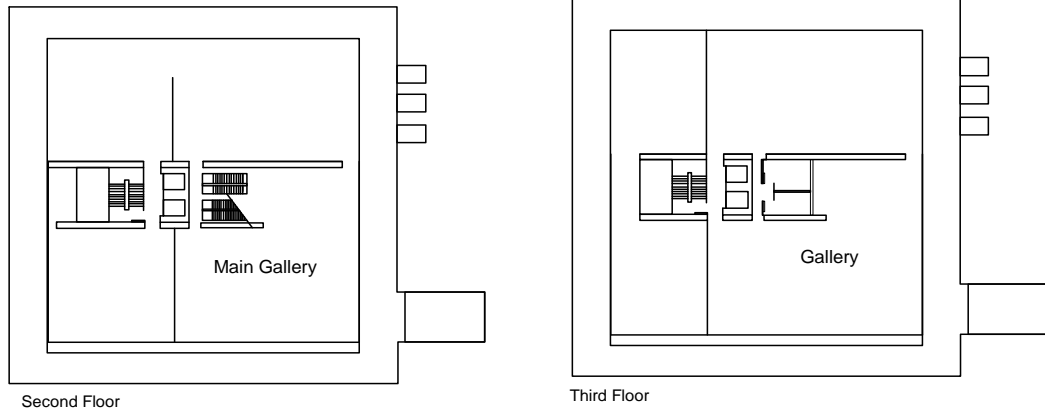


Figure 4.24-b Functional Map of Guggenheim Museum Guadalajara

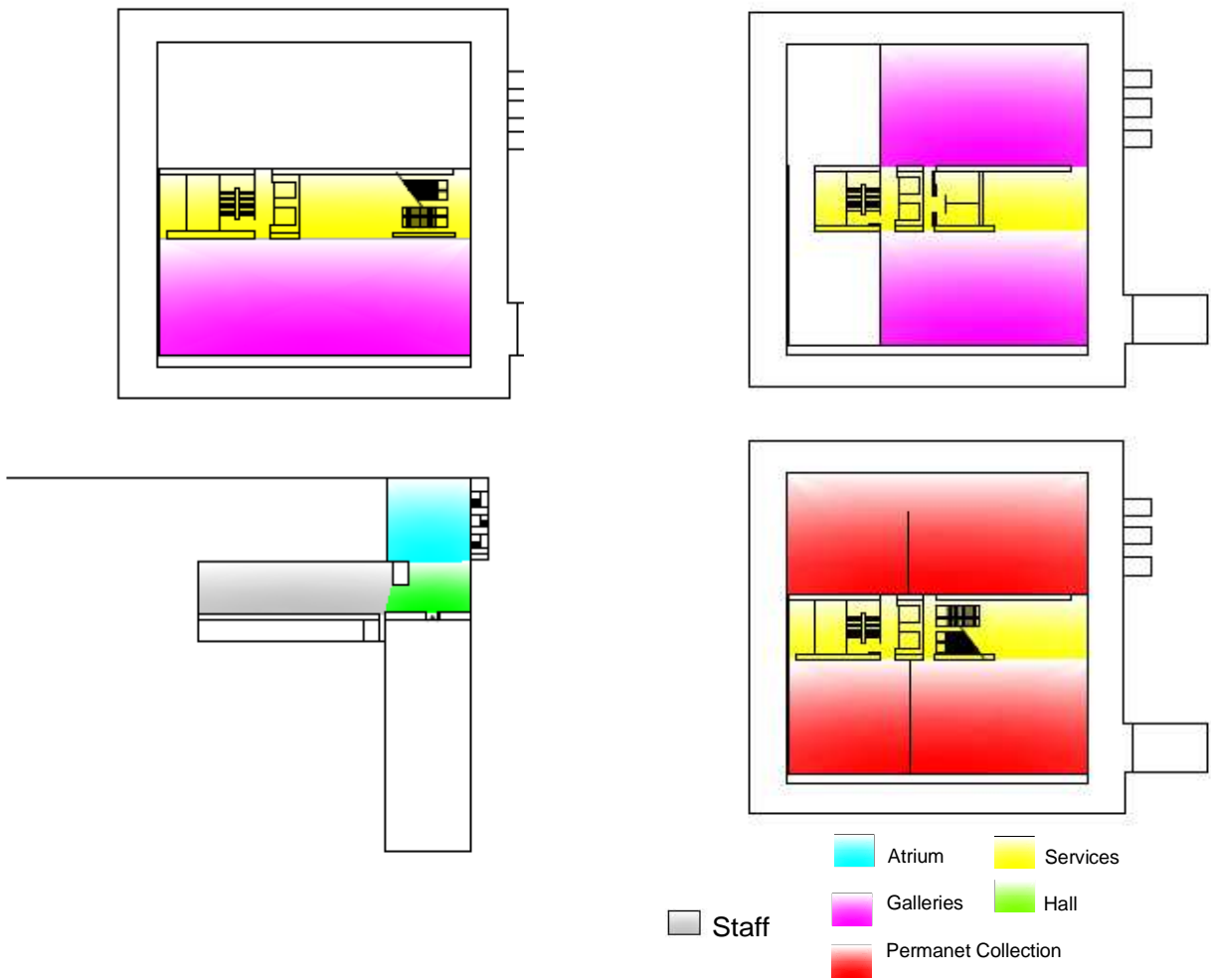


Figure 4.25 Map of Spaces Guggenheim Museum Guadalajara

The building consists of single high tower and it is covered with glass curtain walls that provide transparency throughout the building. The glass curtain walls have been specially processed to natural light will not damage the collection inside. A great deal of the structure is made of steel and glass. As a whole, Norten's design creates a characteristic structure, highly visible and contrasting with the backdrop of surrounding city.

In 2010, the Director of Global Strategy of the Solomon R. Foundation Guggenheim New York reported that the organisation withdrew the projects in Mexico and Brazil and has decided to focus exclusively on Abu Dhabi development.

#### 4.1.5 Guggenheim Hermitage Museum Vilnius



Figure 4.26 Guggenheim Hermitage Vilnius render of site context

Zaha Hadid Architects were the winners for this Museum & Cultural Centre project in Vilnius, Lithuania. "The museum will be a place where you can experiment with the idea of galleries, spatial complexity and movement" Hadid said on the presentation of the project. It is expected to start its construction in 2011.



Figure 4.27 Exterior renders of Guggenheim Hermitage Museum Vilnius

The main concept of the sculptural building of Guggenheim Hermitage Museum is based on lightness and fluidity. The building was designed to mystically seem to float. It comprises of curvilinear rooms and high windows. The Museum's design is part of a futurist architectural language, the latest digital design technology and fabrication methods. Guggenheim Foundation aim is to place this museum as a manifestation of city's new cultural significance.

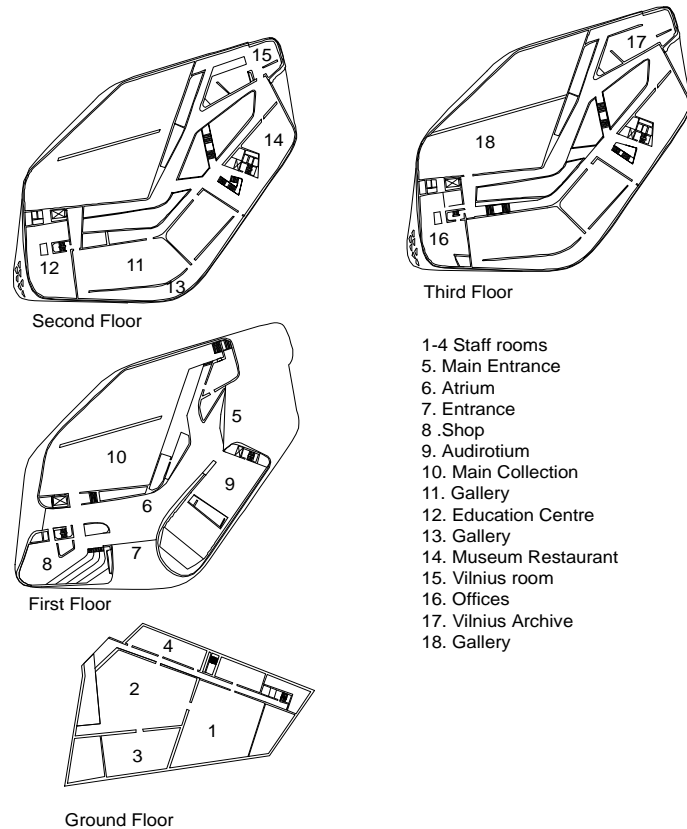


Figure 4.28 Functional Map Guggenheim Hermitage Museum Vilnius

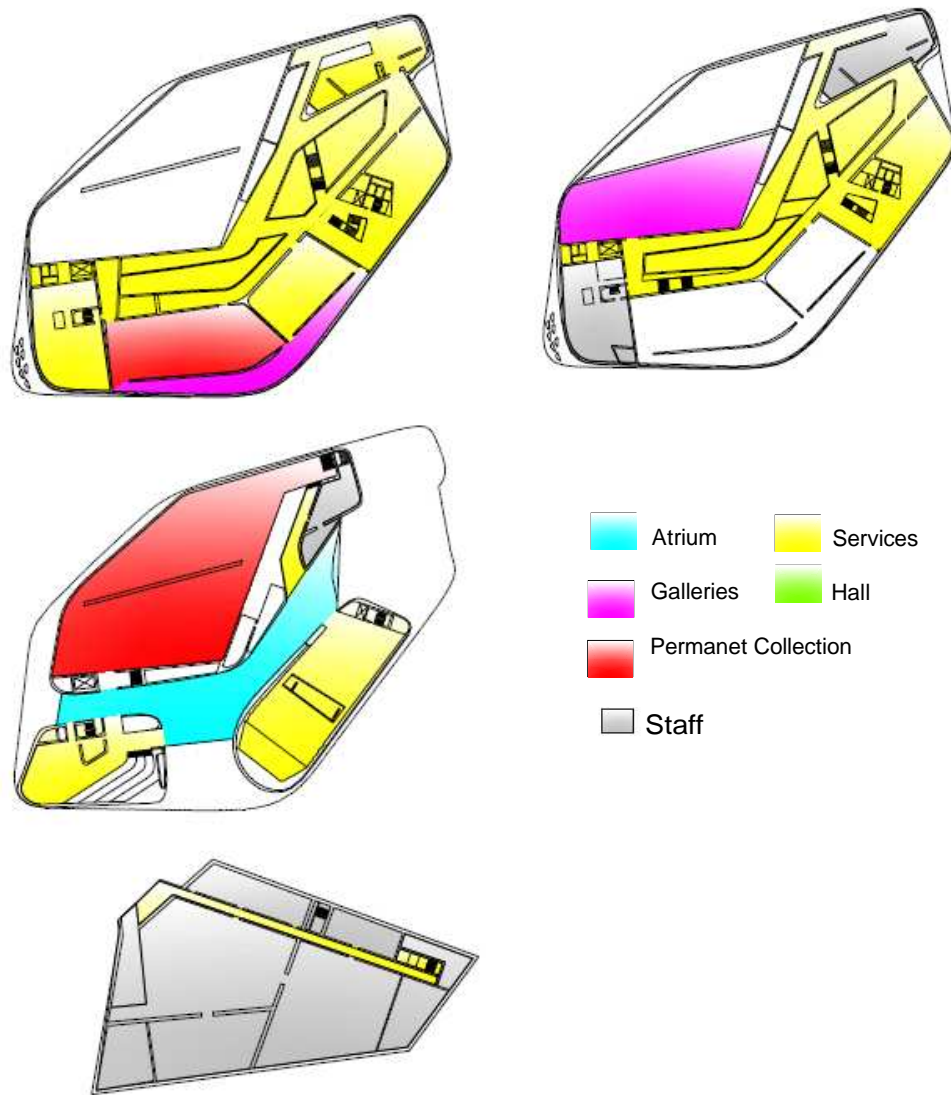


Figure 4.29 Map of spaces Guggenheim Hermitage Museum Vilnius

Museum	Area m2	Numbers of Galleries	Area Permanent Collection	Area Services	Area Atrium	Area Staff
Bilbao	23225	18	1519	410	660	639
Berlin	1700	1	350	110	210	45
Venice	6300	14	1161	566	1426	131
New York	140000	6	34476	2844	4676	6400
Guadalajara	25600	5	2748	350	523	450
Vilnius	13000	5	2400	677	1280	3684

Table 4.1 Area ( m2) of each Guggenheim Museum

## 4.2 Spatial Analysis

Differences in Museums spatial configuration could be identified through the convex organisation. Hillier et al (1987, p. 222) argue that the convex organisation is the degree to which any space of the system extends in two dimensions.

### 4.2.1 Convex Analysis

The following analysis shows the convex map which “is the set of fattest and fewest spaces that covers the system “(Hillier et al, 1987, p 222). The convex analysis of Guggenheim Museums shows what spaces has its pairs of points mutually visible.

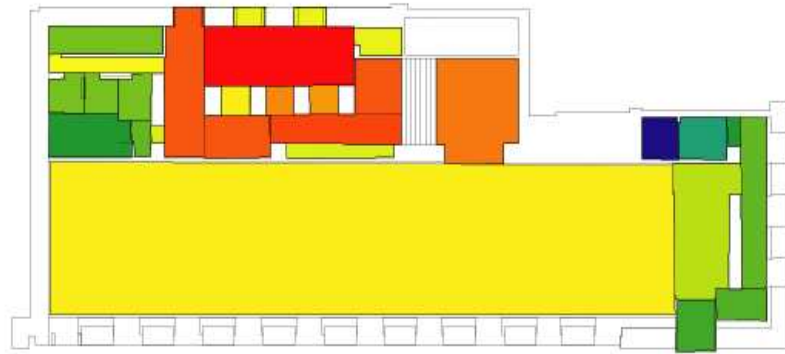
The convex analysis was drawn on each space and taking into account what it could be seen from each space. Guggenheim Bilbao convex break was made for each floor and was connected by a common space of them, in this case was the lifts. Next, the integration analysis was generated for each building. Deutsche Guggenheim has only one floor as well as Guggenheim Venice. In the case of Solomon R. Guggenheim New York, the floors were linked via lifts. Guggenheim Guadalajara and Guggenheim Vilnius were connected via main stars. The intention to link all floors was to see an overall integration measure of the whole building and for each Museum.

Three spaces were highlighted from convex brake; the atrium, staff and permanent collection room. It could be argue that the fattest space is the atrium in the majority of cases. Staff convex spaces are the deepest. This is a repetitive pattern in all museums. However, the fastest space of all is found in Guggenheim Venice.

## Convex Analysis



Figure 4.2.1 Convex Integration map of Guggenheim Bilbao



Deutsche Guggenheim  
(Integration =1.26)



Venice Guggenheim  
(Integration =0.95)

Figure 4.2.2 Convex Integration map of Deutsche and Guggenheim Venice

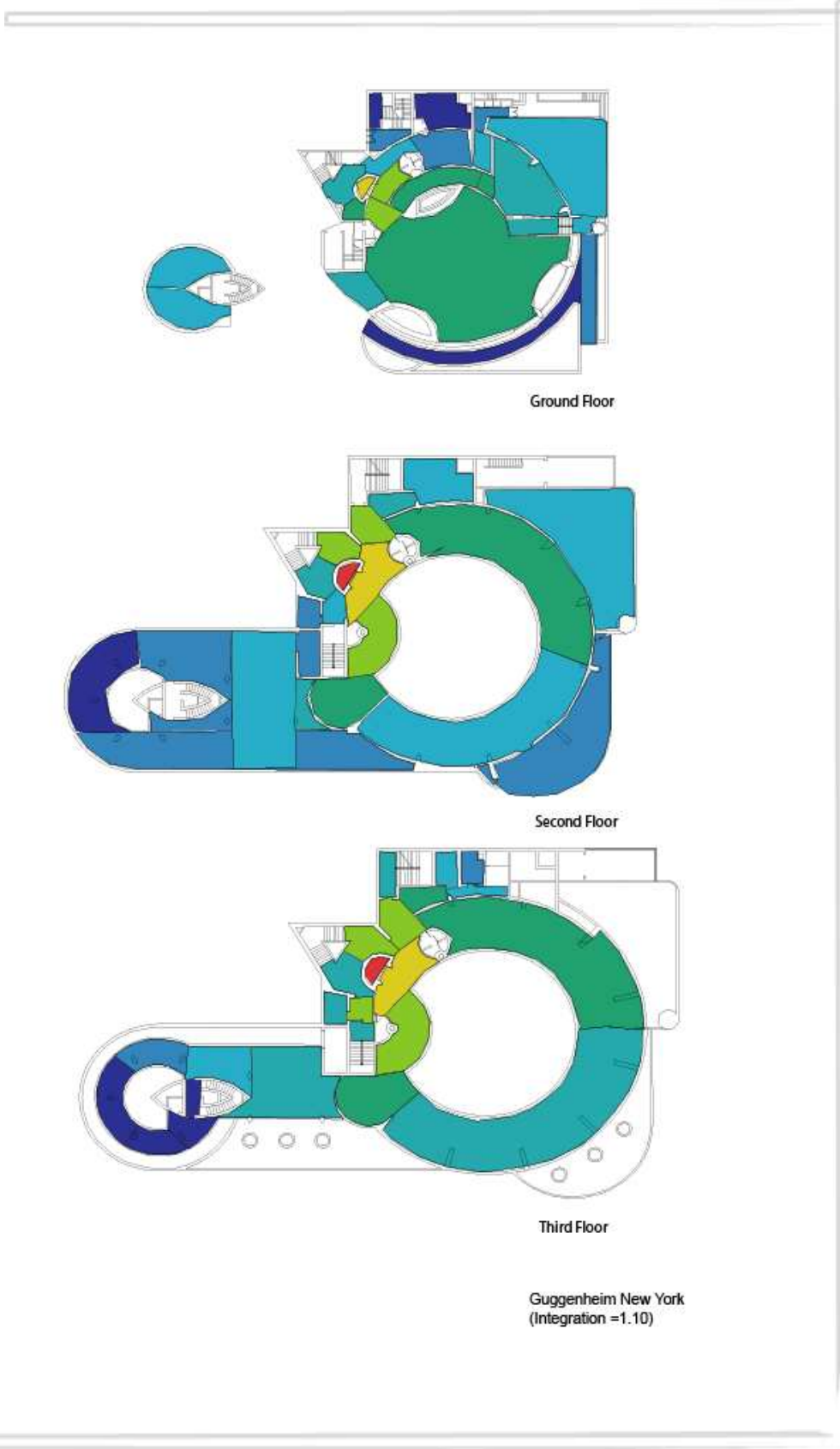


Figure 4.2.3-a Convex Integration map of Solomon R. Guggenheim New York



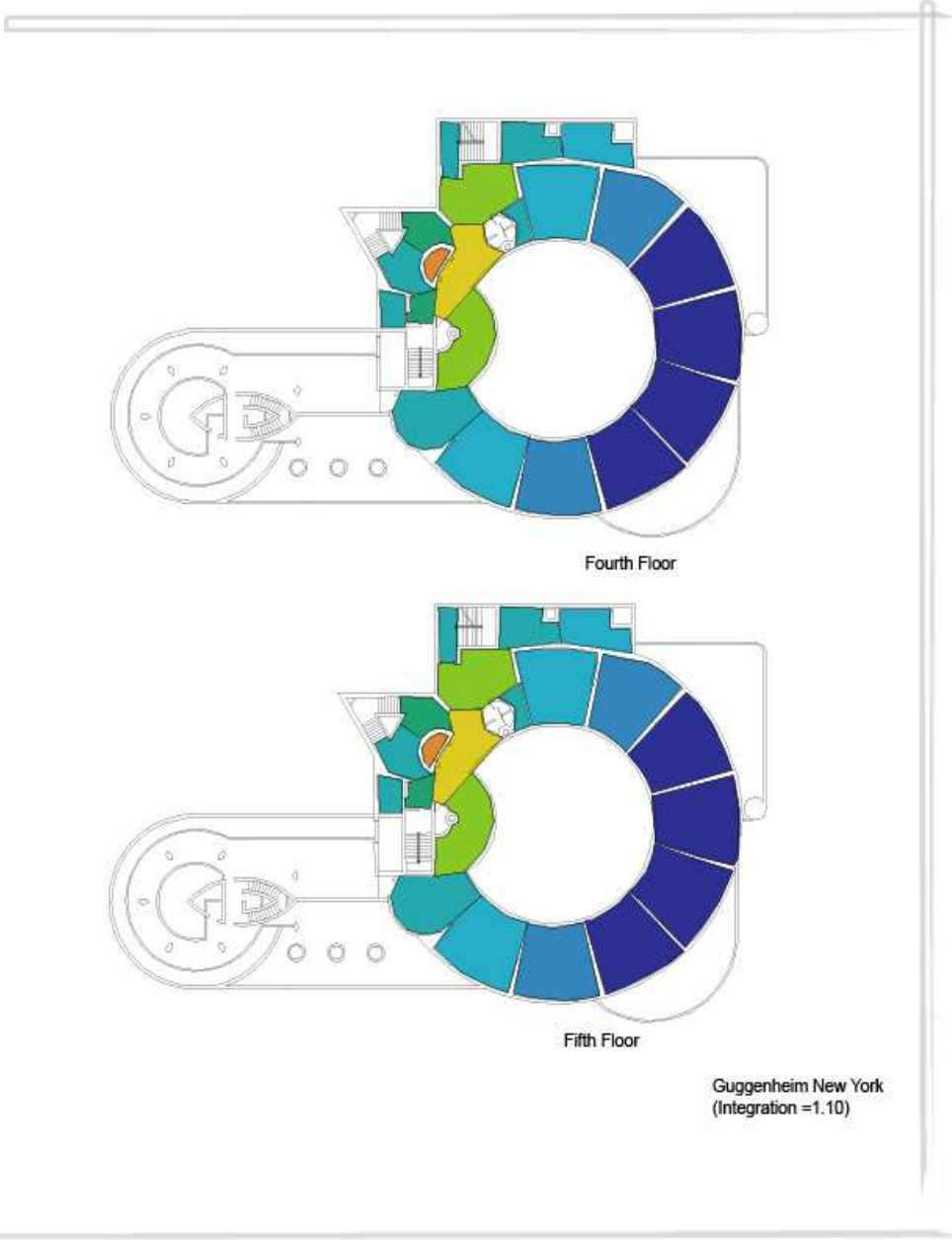


Figure 4.2.3-b Convex Integration map of Solomon R. Guggenheim New York

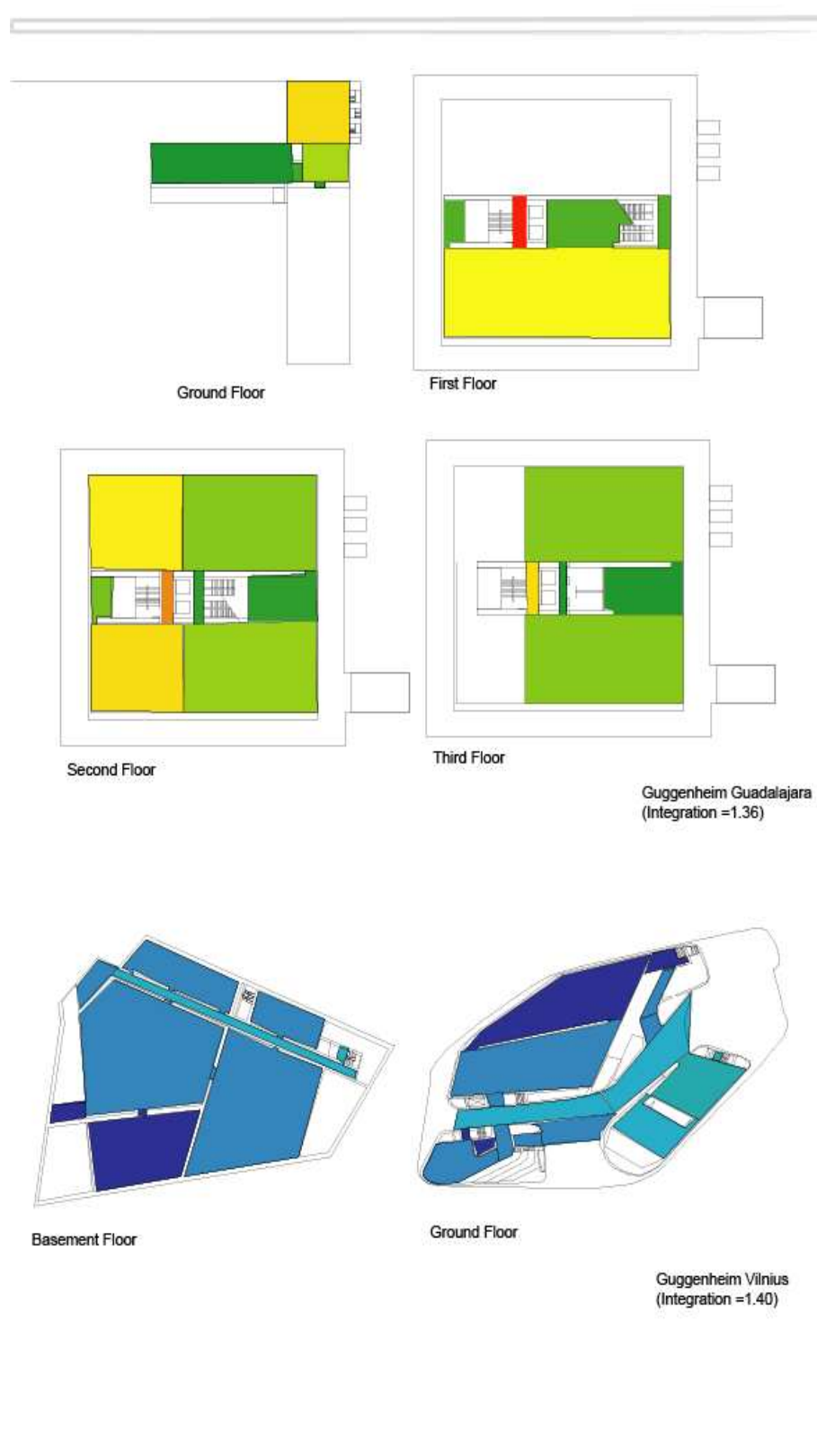


Figure 4.2.4-a Convex Integration map of Guggenheim Guadalajara and Vilnius

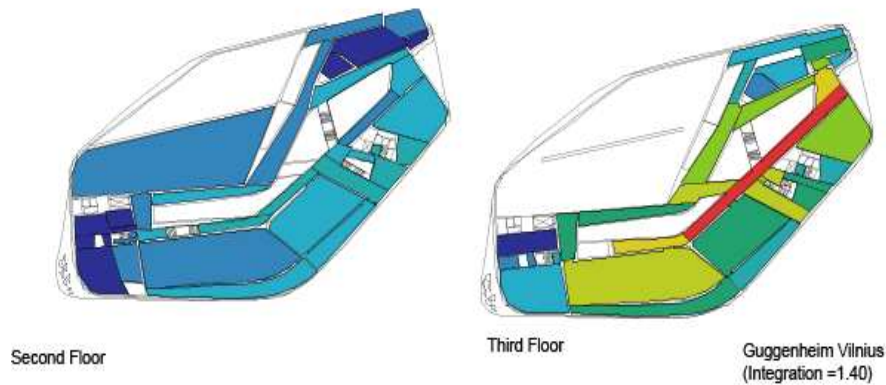
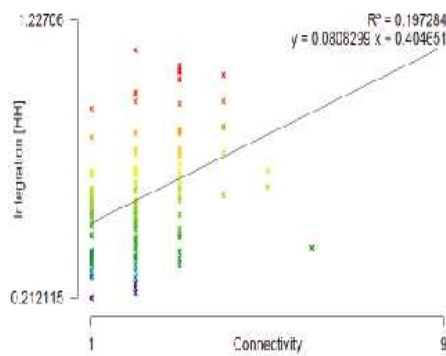


Figure 4.2.4-b Convex Integration map of Guggenheim Guadalajara and Vilnius

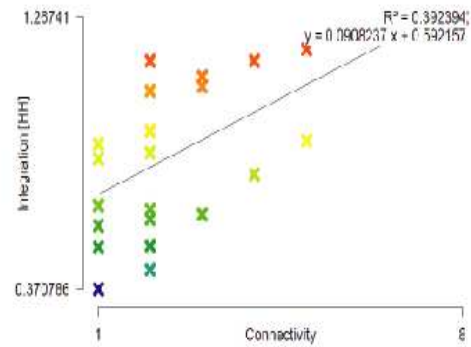
Museum	Area m2	Total Convex Spaces	Maximum Int. (Rn)	Mean Depth (Rn)	Connec. (max)	Total of Convex Spaces from entrance to main gallery
Bilbao	23225	141	1.22	15.14	9	6
Berlin	1700	32	1.26	7.71	8	2
Venice	6300	92	0.95	11.77	6	7
New York	140000	116	1.11	11.61	6	7
Guadalajara	25600	26	1.36	6.43	4	6
Vilnius	13000	99	1.40	13.12	7	3

Table 4.2 Convex Values per Museum

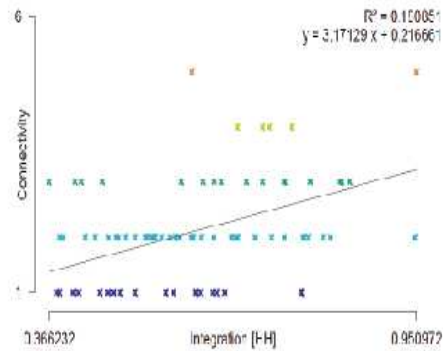
From the map of Guggenheim Bilbao (fig. 4.2.1) it is seen the atrium area highlighted in red colour, this indicates a higher degree of convex integration. In contrast, the second and third floors have staff spaces which show more segregation. Deutsche Guggenheim convex map (fig.4.2.3) explains a different picture from Bilbao. It has one fattest convex space which is the main exhibition room and the foyer as the more integrated space. However, as in Bilbao, staff space is the most segregated space.



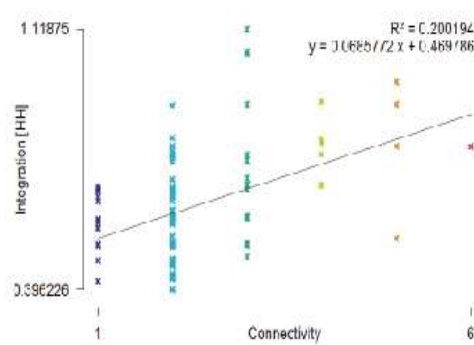
Guggenheim Bilbao



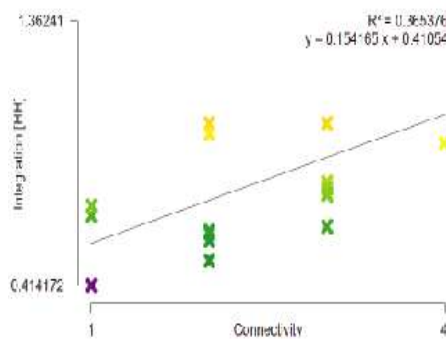
Deutsche Guggenheim



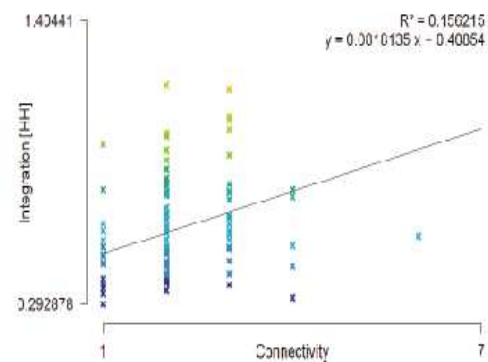
Guggenheim Venice



Solomon R. Guggenheim New York



Guggenheim Guadalajara



Guggenheim Hermitage Vilnius

Table 4.3 Scatter plots of Integration and Connectivity of each Guggenheim Museum

Guggenheim Venice (fig 4.2.2) has a better picture of how convex spaces are in a square layout. It is seen from the map that the fattest convex space in red, is the atrium. Secondly, services spaces such Café Museum and

restaurant are the most integrated spaces. Finally, it is observed Peggy's Guggenheim rooms in an intermediate level of integration. In the case of Solomon R. Guggenheim New York the convex break (fig. 4.2.3-a) indicates low integration value of its atrium and main exhibition galleries. Guggenheim Guadalajara (fig.4.2.4-a) has the fattest spaces in the majority of its floors. The nature of the layout an open plan, make possible to see from one corner to another. However, integration is only shown near the stairs and lifts.

Guggenheim Hermitage Vilnius (fig.4.2.4-b) presents low integration in the main gallery and second floor spaces. In contrast at third level, the most integrated space is the corridor of Museum restaurant and near escalators. In the same way of Bilbao, Berlin, Venice and New York staff rooms are the most segregated space of the building.

The maps illustrate the degree of integration and segregation of the system. Integration value is related to those spaces accessible from everywhere to everywhere else. The atrium seems to be the most integrated convex space of museums. In contrast, staff rooms are less accessible and less integrated spaces. The shallowest spaces tend to be found on last floors. It could be argued that a way of control inside the building is about segregation and integration of certain spaces among others, in this case, the staff rooms in connection with atrium. This is because there is no intention of enlarging interfaces between the visitor and inhabitant of museums.

#### 4.2.2 J- Graph Analysis

In terms of permeability of the building, the j-graph shows accessibility inside the museum and how spaces are connected with other spaces. The depth value made is related on the main entrance of the building. Hillier states (1984, p. 149) that configurational generators could be used to make patterns with the properties of symmetry, asymmetry, distributedness and nondistributedness. Space is arranged based on routes or links, which could connect to others spaces at different levels of the system.

The following J-graphs were made in each space of each building. The values were calculated according to the depth levels of each system.

Guggenheim Bilbao J-Graph (fig.4.2.5) presents 18 level of depth. In this case, staff rooms are the more depth of the system and the atrium with more links in comparison to other spaces. Guggenheim Venice (fig.4.2.6) indicates 25 levels of depth. This is the most depth of all the Guggenheim Museums analysed. The deepest space is the shop and atrium is the space with more links. Deutsche Guggenheim (fig.4.2.6) has 9 levels; this is the shortest one of all the Museums. In this case, exhibition room is at the beginning of the sequence of spaces so it is less depth. Staff rooms have a sequential movement on their arrangements but they are not depth in the system.

Solomon R. Guggenheim New York (fig.4.2.7) shows 10 levels of depth and atrium at the beginning of the organisation. Here, staff rooms are at the last level and a science for explore the galleries is shown. Guggenheim Guadalajara (fig.4.2.7) has 9 levels of depth. In this case, staff and atrium are in the same level. However, in order to get to other spaces is necessary to go back to stairs each occasion. Finally, Guggenheim Hermitage Vilnius (fig.4.2.7) presents more order in its arrangement. It has 11 levels of depth, the atrium is the main connection to other spaces and staff rooms are extended all over the system.

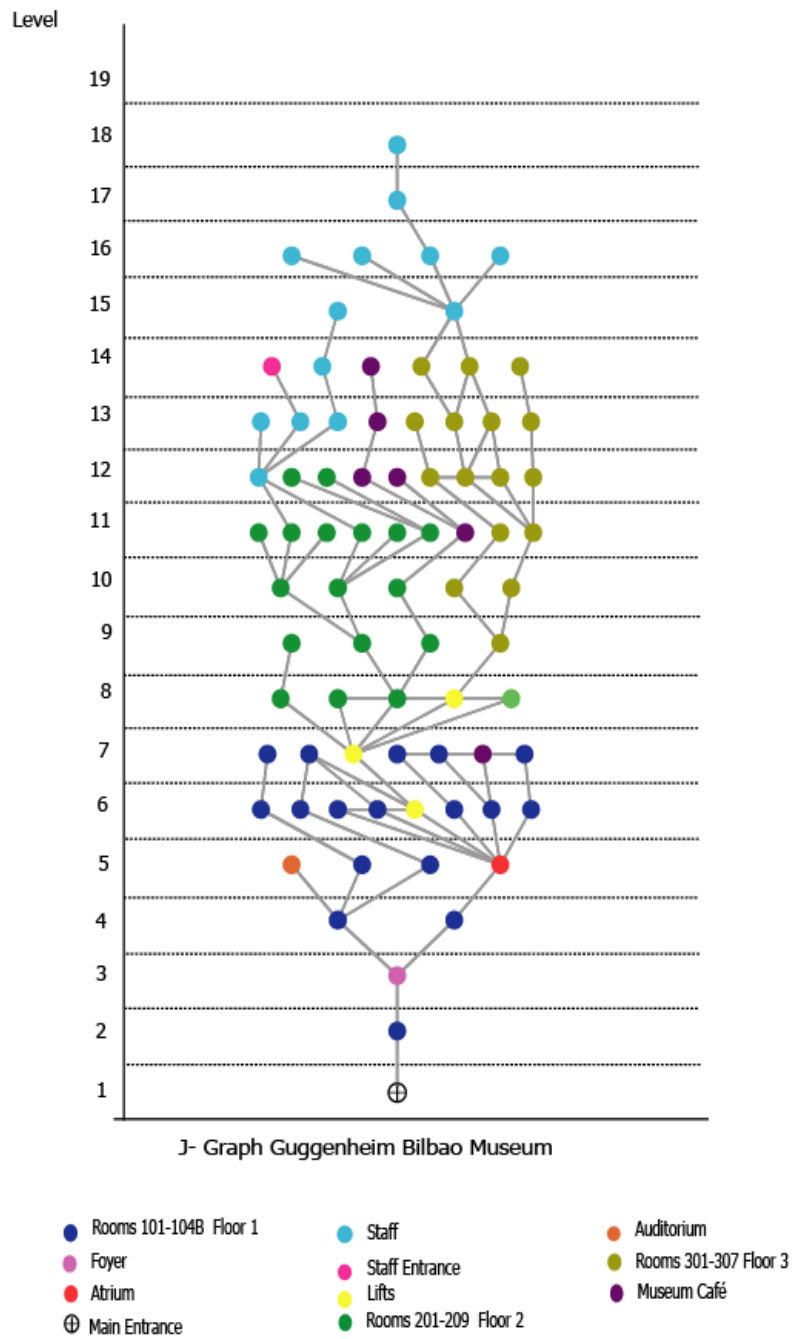


Figure 4.2.5 J-Graph of entire building Guggenheim Bilbao

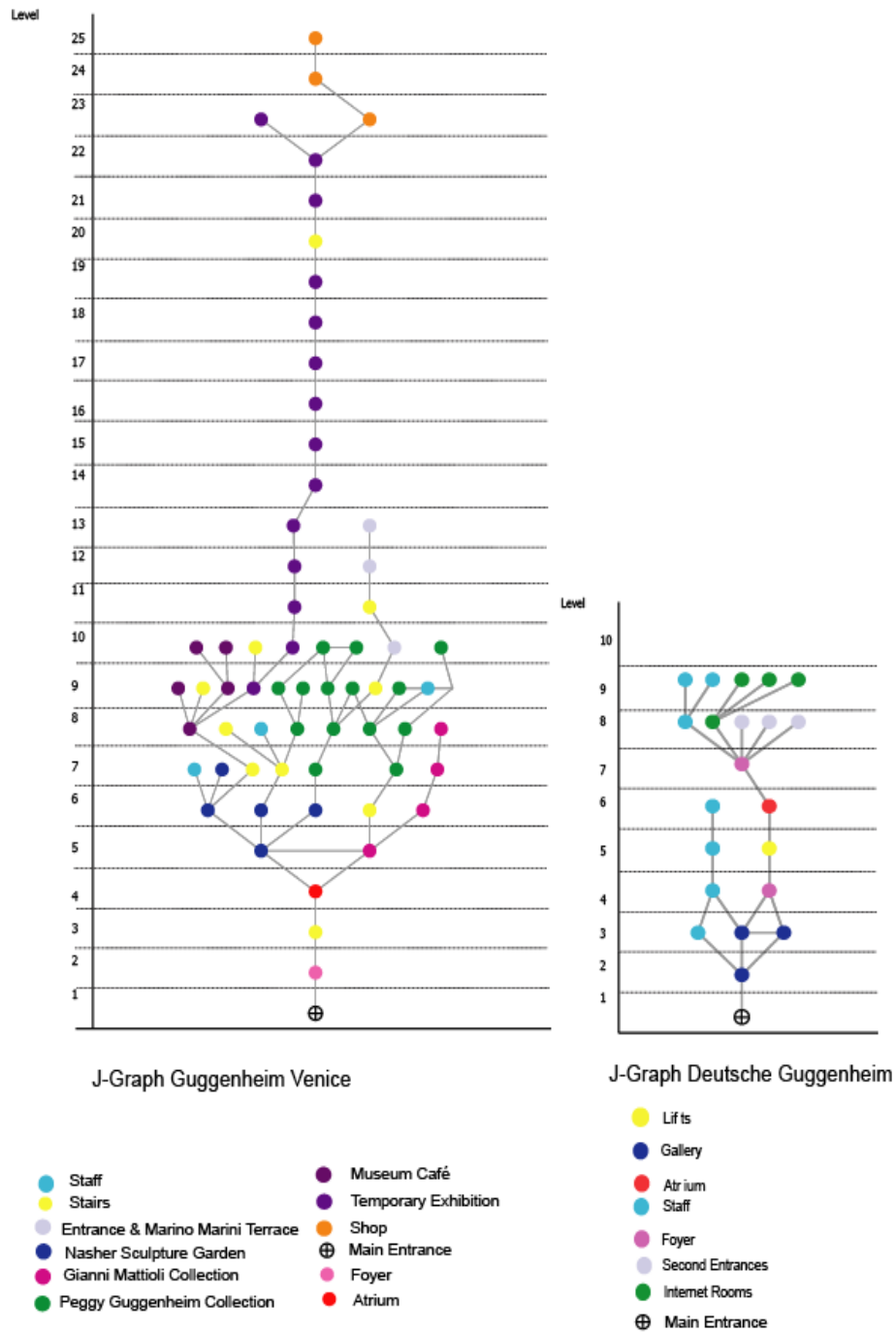
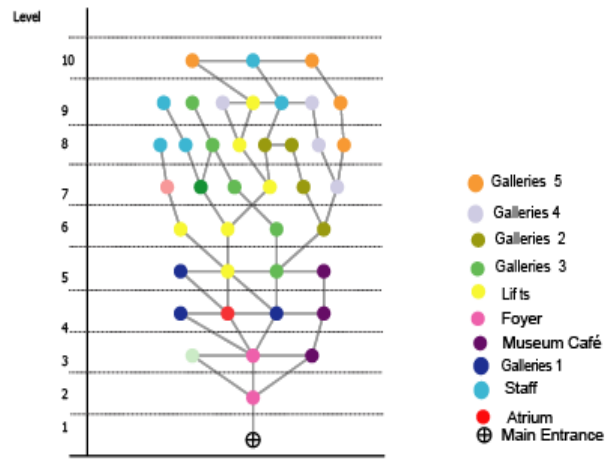
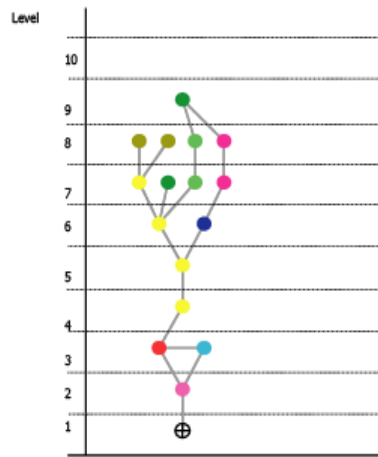


Figure 4.2.6 J-Graph of entire building Deutsche Guggenheim and Venice.

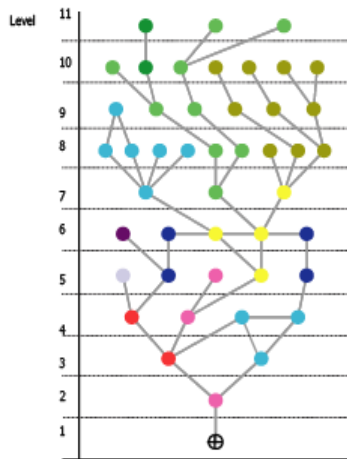




Solomon R. Guggenheim New York



Guggenheim Guadalajara



Guggenheim Vilnius

Figure 4.2.7 J-Graph of entire building Solomon R. Guggenheim, Guadalajara and Vilnius Guggenheim.

The system becomes remarkably deep or asymmetric depending on the graph structure. In the case of Guggenheim Bilbao (fig. 4.2.5), the largest graph of the entire Network, the system is distributed and ringly a tree-like. Thus, in order to get to the last space of the system many spaces have to be traversed. It could be said that from the main entrance the cells has a distributed form. One space became deeper in relation with the atrium and the narrative of the collection is based on this spatial characteristic. The atrium maximises the control and segregation of the adjacent spaces.

Museum	Space	Total Depth	RA	RR
Bilbao	Atrium	4.0	0.15	1.38
	Entrance	0.0	0.21	1.92
	Permanent Collection	5.0	0.17	1.62
	Staff	15.0	0.29	2.73
Mean		6.0	0.20	1.91
Berlin	Atrium	3.0	0.23	1.08
	Entrance	2.0	0.28	1.31
	Permanent Collection	4.0	0.41	1.95
	Staff	3.0	0.33	1.55
Mean		3.0	0.31	1.47
Venice	Atrium	4.0	0.16	1.42
	Entrance	0.0	0.27	2.42
	Permanent Collection	7.0	0.20	1.82
	Staff	8.0	0.25	2.28
Mean		4.75	0.22	1.98
New York	Atrium	3.0	0.14	0.94
	Entrance	2.0	0.19	1.28
	Permanent Collection	3.0	0.17	1.14
	Staff	8.0	0.20	1.37
Mean		4.0	0.17	1.18
Guadalajara	Atrium	2.0	0.32	1.33
	Entrance	1.0	0.42	1.74
	Permanent Collection	7.0	0.35	1.43
	Staff	2.0	0.43	1.77
Mean		3.0	0.38	1.59
Vilnius	Atrium	2.0	0.15	1.13
	Entrance	0.0	0.24	1.71
	Permanent Collection	5.0	0.26	1.90
	Staff	7.0	0.23	1.65
Mean		3.5	0.22	1.59

Table 4.4 J- Graph values of each Guggenheim Museums

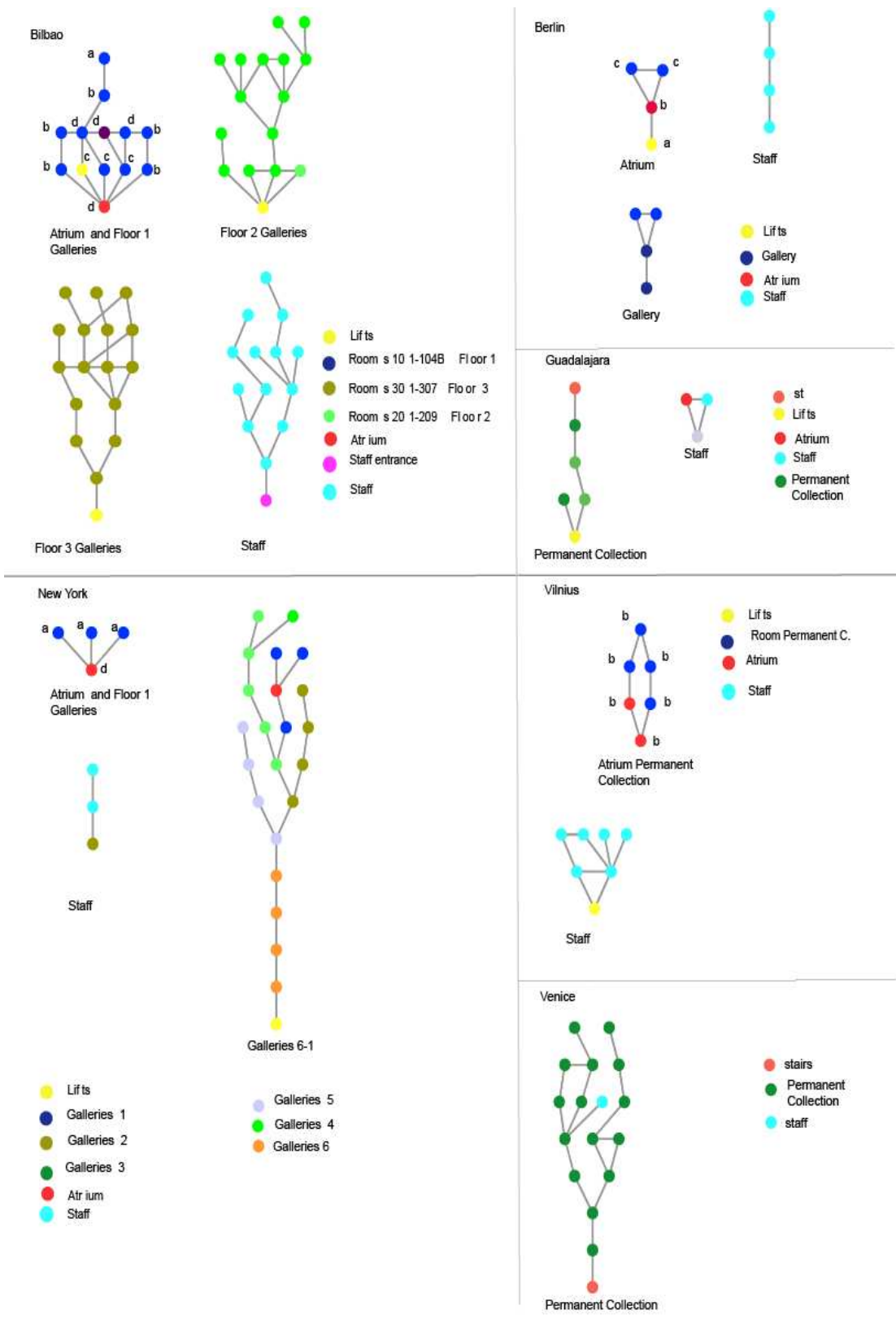


Figure 4.2.8 J-Graph of atrium, staff room and main collection rooms of all Guggenheim Museums

The atrium shows spaces with two and three links, this could increase the possibility of movement through spaces. When is looked at the ultimate levels of the graph, links between spaces decrease. In the case of staff rooms, there is control of movement, shown with a sequential route of space and depth value. Relations of depth necessarily involve the notion of asymmetry, since spaces can only be deep from other spaces to if it necessary to pass through intervening spaces to arrive at them. It is believed that space should be hierarchically arranged through a series of zones from public to private. In the case of Guggenheim's configuration, this characteristic is constantly employed.

Museum	"a" spaces	"b" spaces	"c" spaces	"d" spaces
Bilbao	25	12	6	13
Berlin	6	1	3	0
Venice	10	5	0	1
New York	20	2	3	0
Guadalajara	1	7	1	0
Vilnius	2	8	2	1

Table 4.4-a Topological types "a", "b", "c", "d" of atrium, staff room, main collection room of each Guggenheim Museum.

It could be argue that Guggenheim museums grouping have a transpatial solidarity because they do no depend on spatial proximity but coincide with spatial grouping. Solidarity will be transpatial to the extent that it develops a stronger and more homogeneous interior structuring of space and, in parallel, emphasizes the discreteness of the interior by strong control of the boundary, the boundary refers to the principles of a culture.

Guggenheim museums show globally a strong intern structure of space in atrium, display rooms and staff rooms and a strong control of the boundary. The not physical proximity between visitors and inhabitants create a noncorrespondence relation. In some cases, visitors take no notice of inhabitants.

### 4.2.3 Axial Analysis

In terms of how internal structure relates to movement, the axial maps could help to illustrate this. The characteristic of an axial map is the connection between one convex space with others. According to Hillier and Hanson (1984) an axial map is the potential movement lines in a spatial system constituted by the fewest and longest line of sight that covers the whole system and pass through every convex space.

The following axial analysis was made by each space of each floor and for each building. They axial lines were linked by the largest axial line that passes near lifts or stairs cases. The analysis was produced after all floors were linked; this was in the case of Museums with more than one floor. The intention to link all floors was to see the integration value of all the building. In this analysis the axial map is based on buildings configuration. Each axial study has considered the global ( $R_n$ ) and local ( $R_2$ ) integration values.

Guggenheim Bilbao (fig. 4.2.9) has the larger number of axial lines and the largest line passes through atrium and main gallery. Deutsche Guggenheim (fig.4.2.10) presents the least number of axial lines and the more integrated lines are those in connection with main gallery and foyer. Guggenheim Venice (fig. 4.2.10) has only one large line that crosses all the Nasher Sculpture Garden and indicates low integration value.

Solomon R. Guggenheim New York shows the higher values of integration near the lifts. The axial lines were going on a circular sequence, turning in a twisting spinning fashion. Guggenheim Guadalajara (fig. 4.2.12) shows large axial lines on the majority of its floors and the most integrated near lifts and stairs spaces. Guggenheim Hermitage Vilnius (fig 4.2.12-a), presents larger axial lines in the atrium and the most integrated are located in second and third floor.

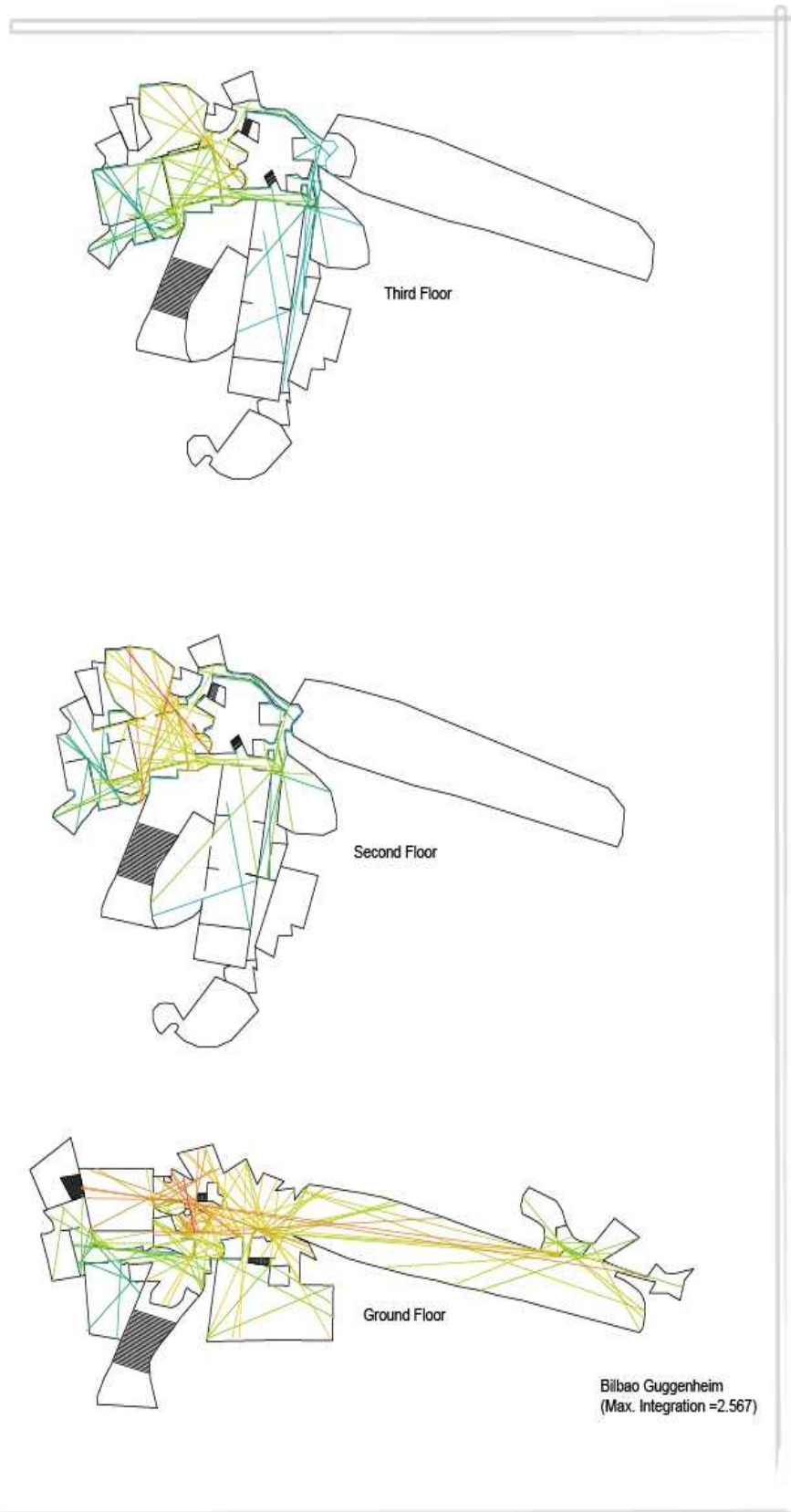
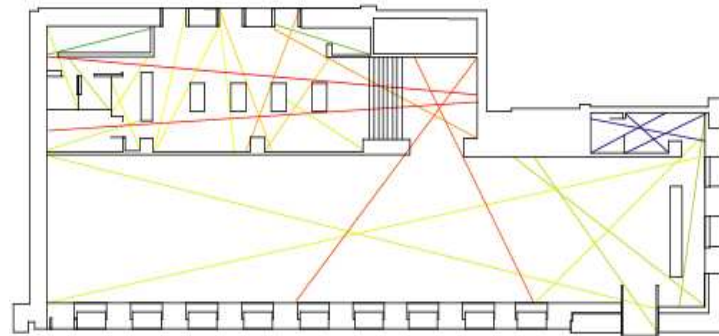
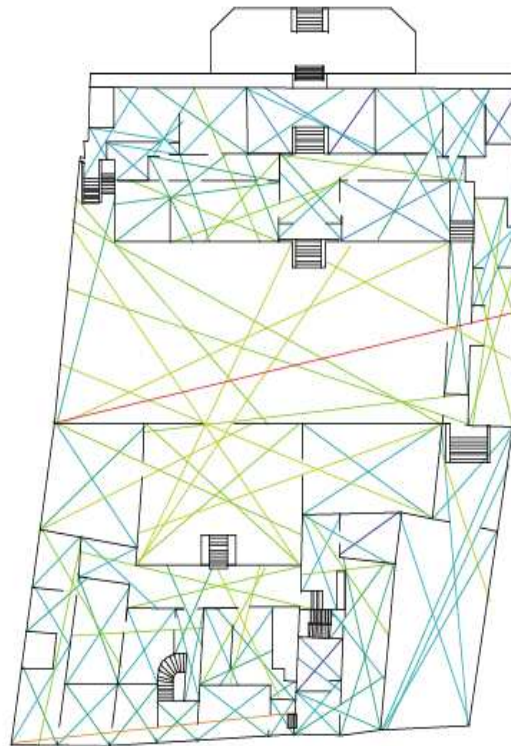


Figure 4.2.9 Axial Integration map of Guggenheim Bilbao



Deutsche Guggenheim  
(Max.Integration =3.24)



Venice Guggenheim  
(Max.Integration =1.96)

Figure 4.2.10 Axial Integration map of Deutsche and Guggenheim Venice

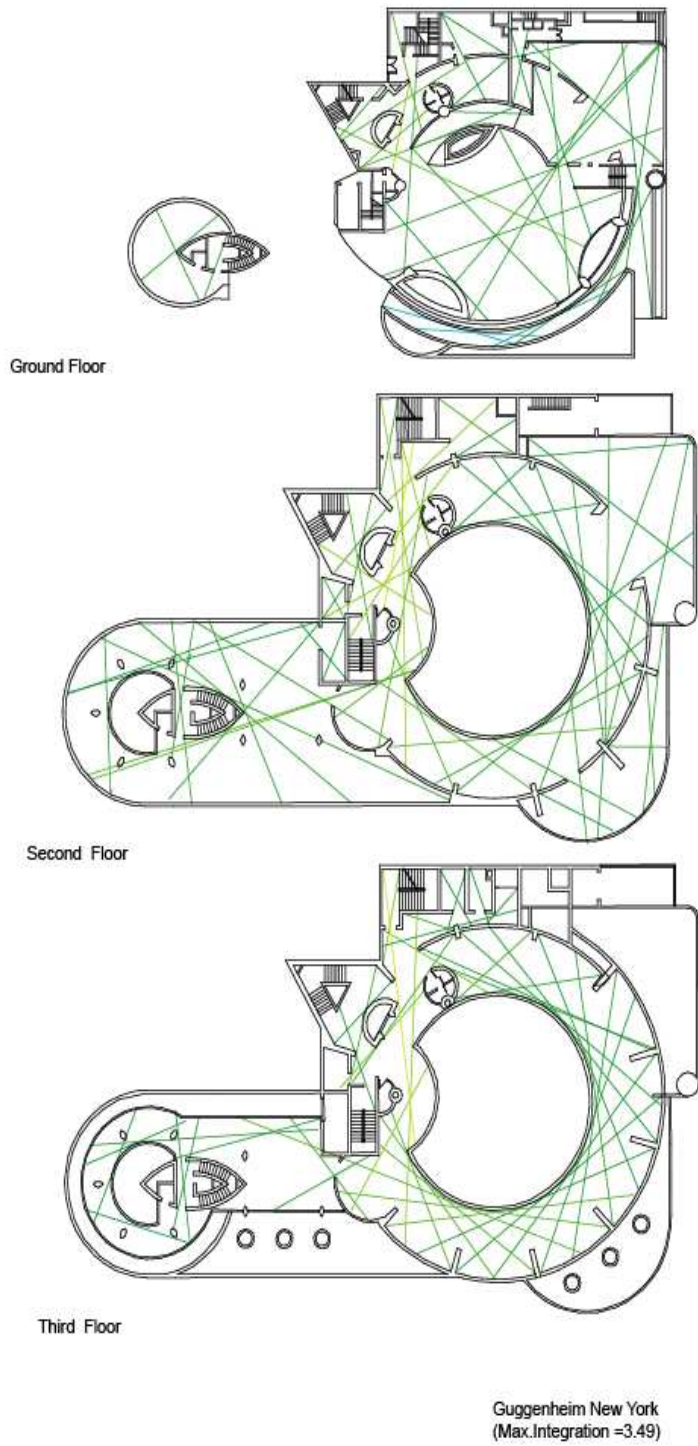
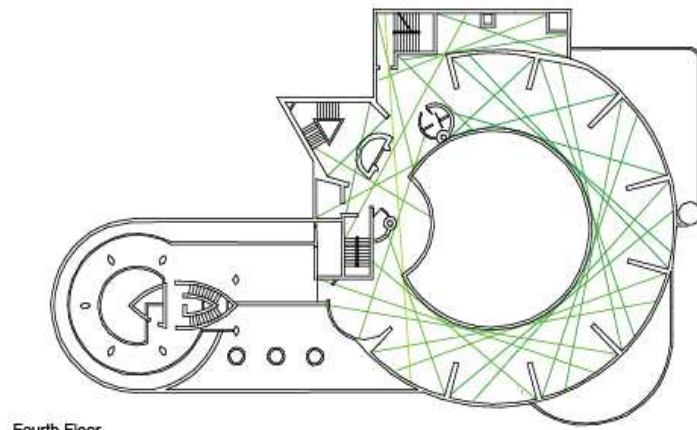
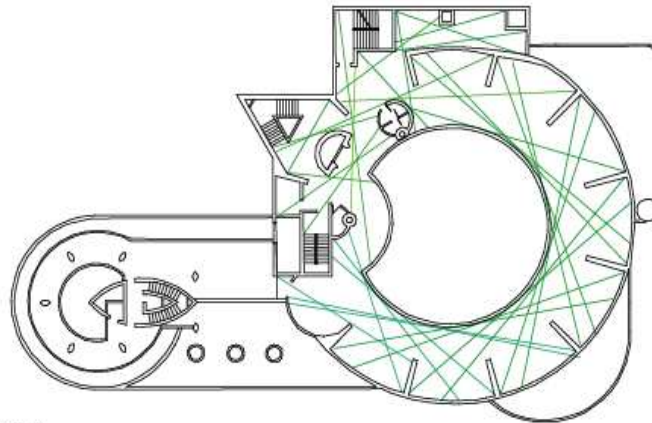


Figure 4.2.11-a Axial Integration map of Solomon R. Guggenheim New York





Fourth Floor



Fifth Floor

Guggenheim New York  
(Max. Integration = 3.49)

Figure 4.2.11-b Axial Integration map of Solomon R. Guggenheim New York

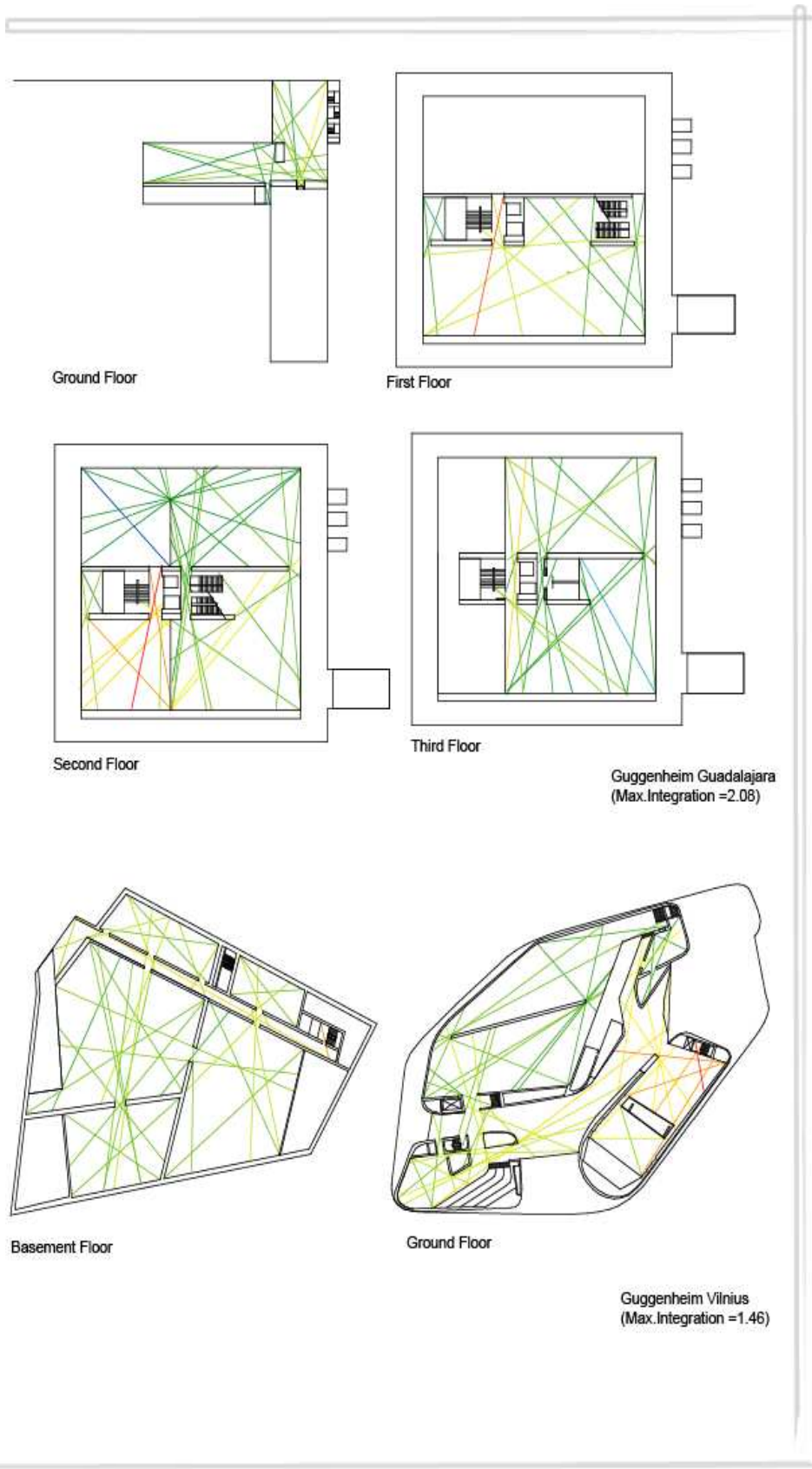


Figure 4.2.12-a Axial Integration map of Guggenheim Guadalajara and Vilnius

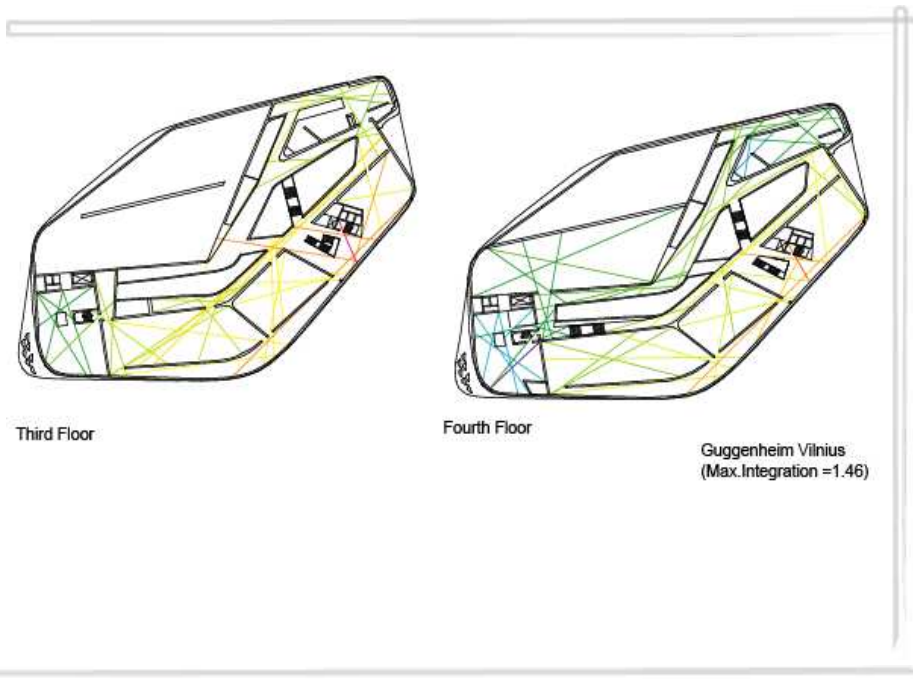
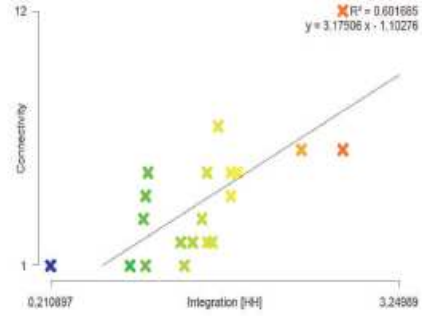
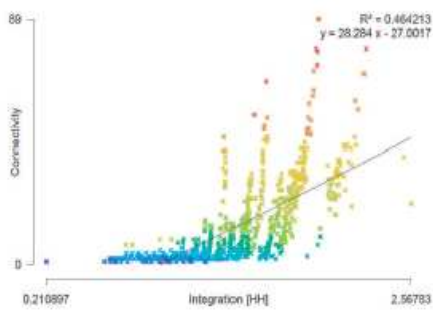


Figure 4.2.12-b Axial Integration map of Guggenheim Guadalajara and Vilnius

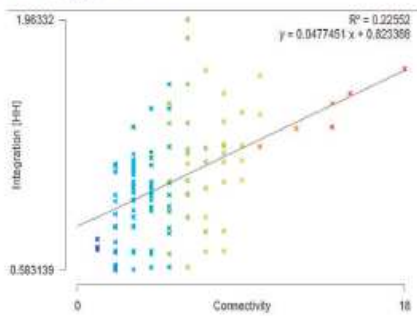
Museum	Area m2	Axial Lines	Maximum Int. (Rn)	Mean Depth (Rn)	Mean Depth (Rn2)	Connec. (max)	Intelligibility (Connec & Int.) global	Synergy (Int. R2 & Int. Rn) global
Bilbao	23225	668	2.567	6.017	2.390	89	0.464	0.749
Berlin	1700	27	3.249	3.541	2.769	12	0.601	0.941
Venice	6300	144	1.963	8.529	2.702	18	0.225	0.384
New York	140000	262	3.490	9.854	2.760	16	0.011	0.094
Guadalajara	25600	93	2.080	6.351	2.507	17	0.027	0.004
Vilnius	13000	177	1.469	11.57	2.687	19	0.051	0.113

Table 4.5 Axial values of each Guggenheim Museum

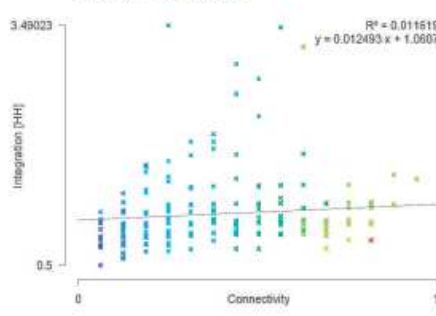
The analysis also shows synergy and intelligibility values (table 4.5). The synergy value is the statistical relationship between local (R2) and global integration (Rn). It provides a description of local accessibility in terms of the entire museums configuration. A good relation between different scales of movement implies high values of synergy therefore an integrated interface. On the other hand, Intelligibility shows the degree of correlation between connectivity and global integration values Rn. This connectivity is with respect of other axial lines and equal to the number of lines intersected by it. The intelligibility illustrates to what extend the overall organisation of the museum can be understood from any position within it.



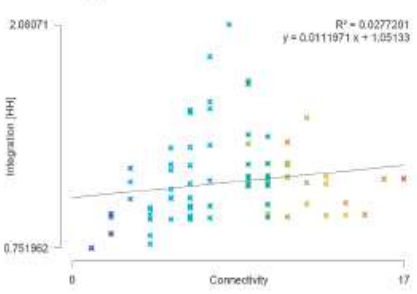
Bilbao Guggenheim



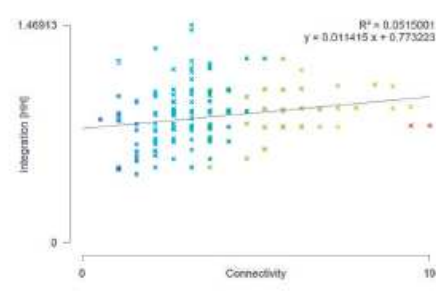
Deutsche Guggenheim



Venice Guggenheim



Solomon R. Guggenheim



Guadalajara Guggenheim

Vilnius Guggenheim

Table 4.6 Scattegrams of Intelligibility of each Guggenheim Museum

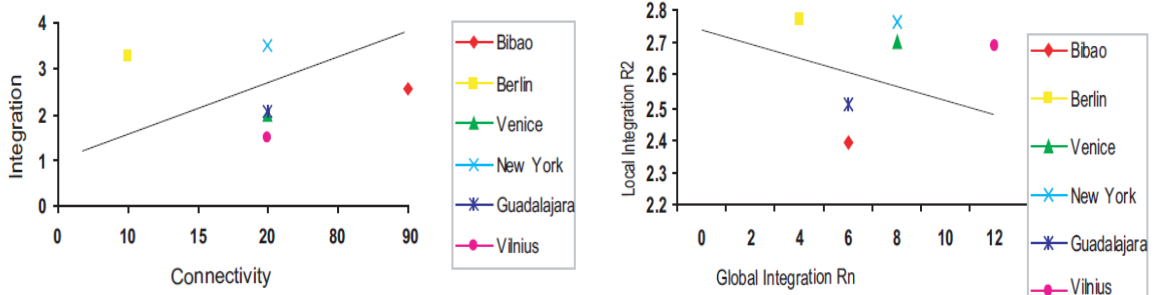


Table 4.7 Synergy and Intelligibility values of Guggenheim Museums

#### 4.2.4 Convex-Axial Analysis

The following convex and axial analysis shows the correlation between a convex maps and axial map. The each convex and axial map of each floor and building were first produced and then overlap. The intention is to see how the axial lines cross each convex space and how it correlates with integration values. In this way, integration and segregation of spaces are seen from the maps, as well as the fattest convex spaces. In some cases the most integrated spaces and fattest convex spaces are main exhibition room and atrium.

Guggenheim Bilbao convex- axial map (fig.4.2.13) presents in the fattest convex space a high number of axial lines as well as the atrium space. Deutsche Guggenheim (fig.4.2.14) shows that axial lines that cross more convex spaces are located at the second entrance. These lines are the connection between the exhibition room and second entrance. Guggenheim Venice (fig. 4.2.14) atrium indicates the largest axial line as well as the more integrated convex space. The atrium or Nasher Sculpture Garden in integrated and the main galleries are on secondary integrated spaces.

Solomon R. Guggenheim New York (fig.4.2.15-a) has around the main ramp a majority of axial lines. This lines cross all convex spaces of the ramp. The ramp is where the main galleries are located. Guggenheim Guadalajara (fig.4.2.16-a) has on second floor the largest number of axial lines this is the space where the main collection is located. In the case of Guggenheim Hermitage Vilnius (fig.4.2.16-b) the largest axial line is situated on third floor and there is a number of axial lines that cross the atrium and the main exhibition gallery.

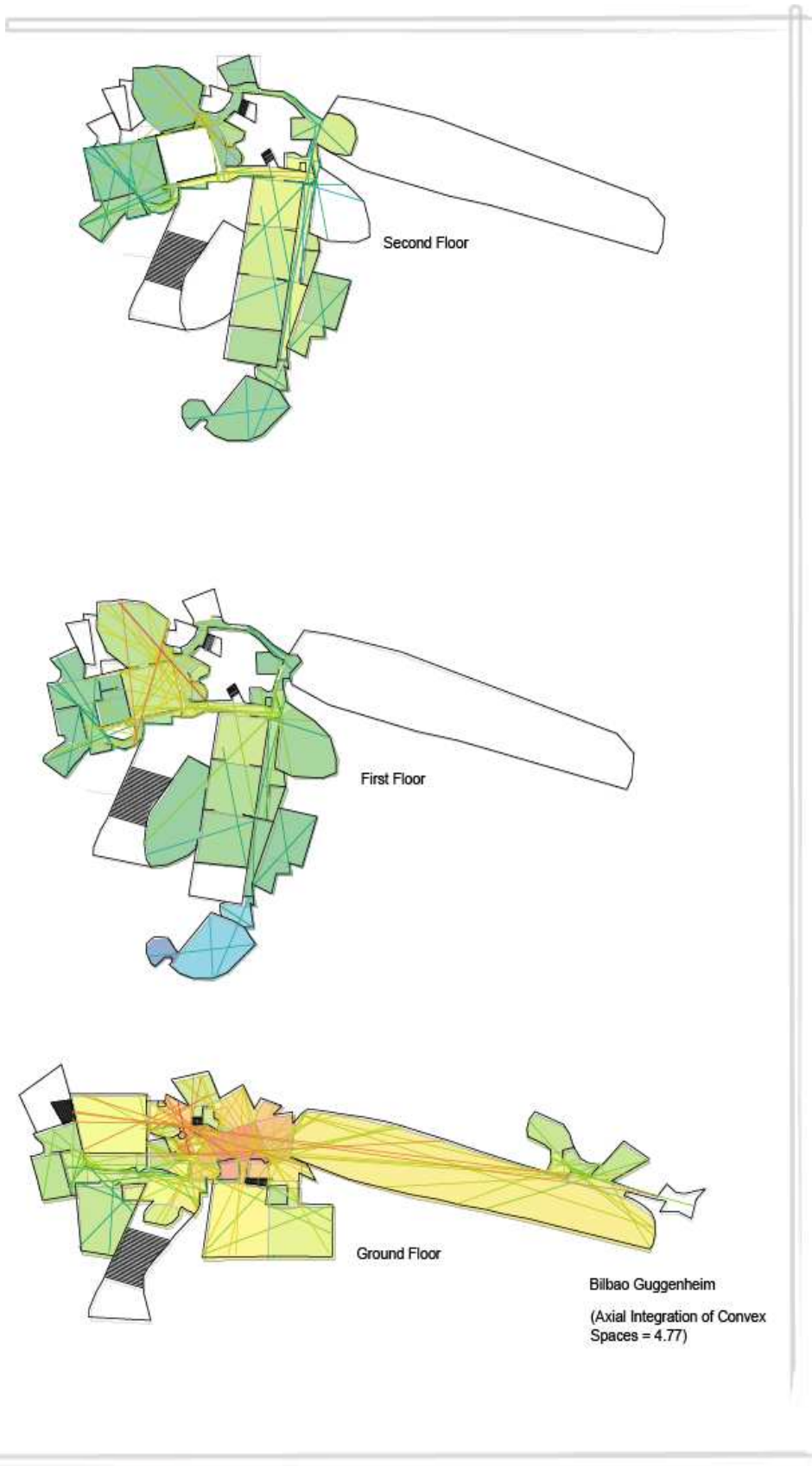
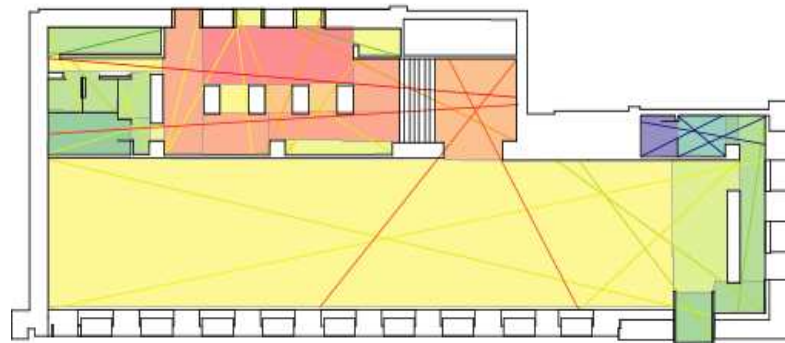


Figure 4.2.13 Convex-axial map of Guggenheim Bilbao



Deutsche Guggenheim  
 (Axial Integration of Convex  
 Spaces = 1.18)



Venice Guggenheim  
 (Axial Integration of Convex  
 Spaces = 1.56)

Figure 4.2.14 Convex-axial map of Deutsche and Venice Guggenheim

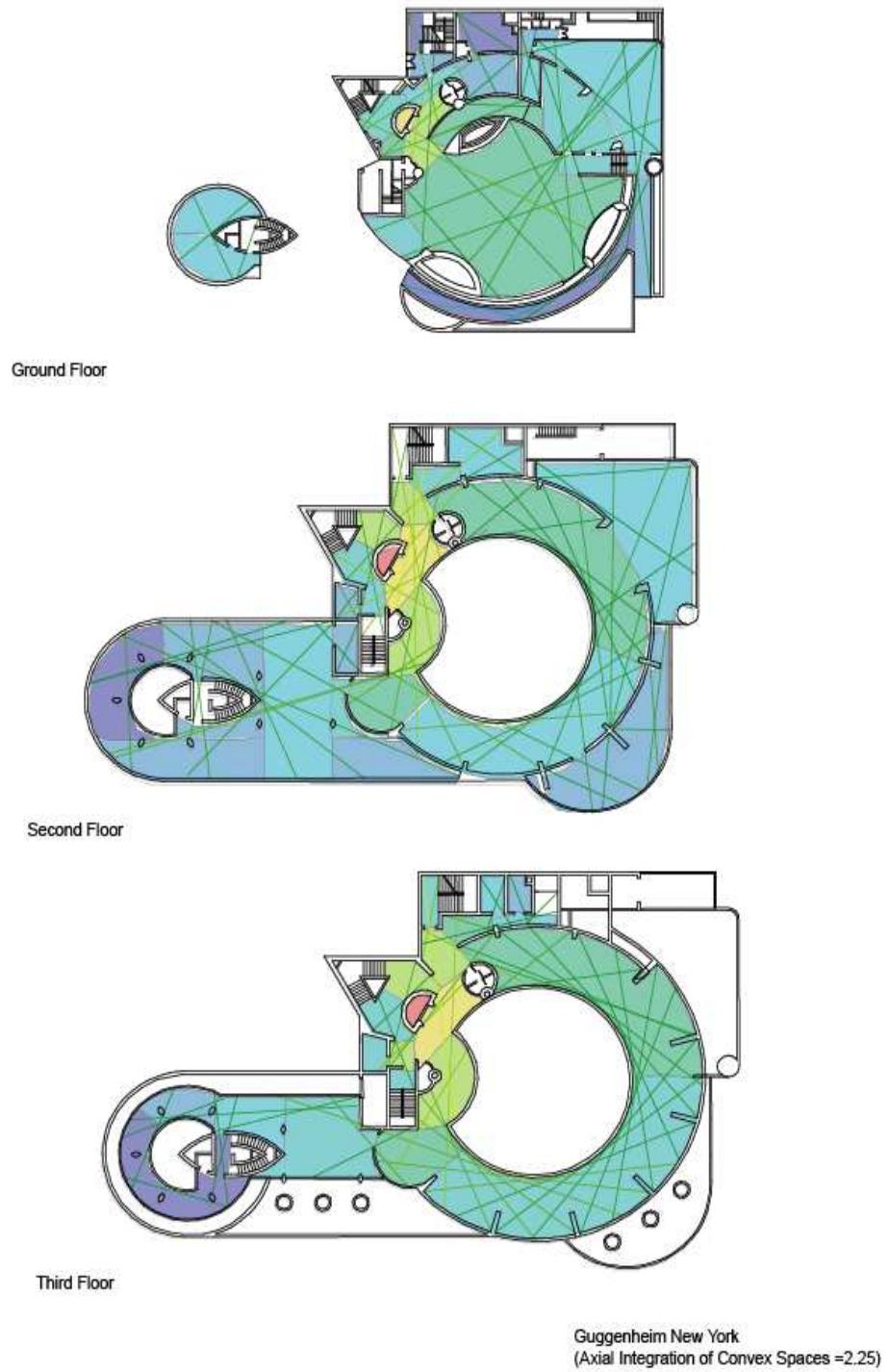
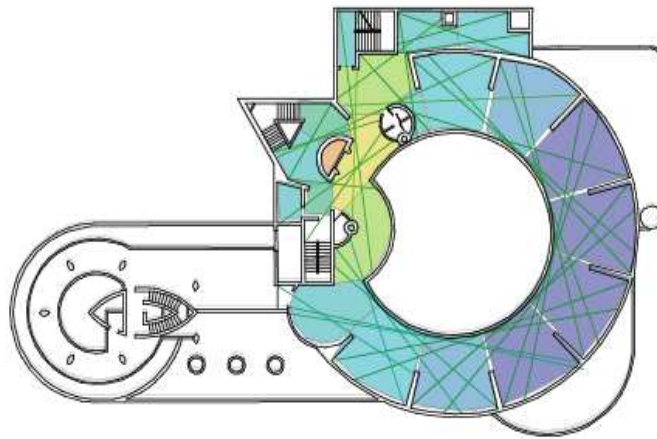
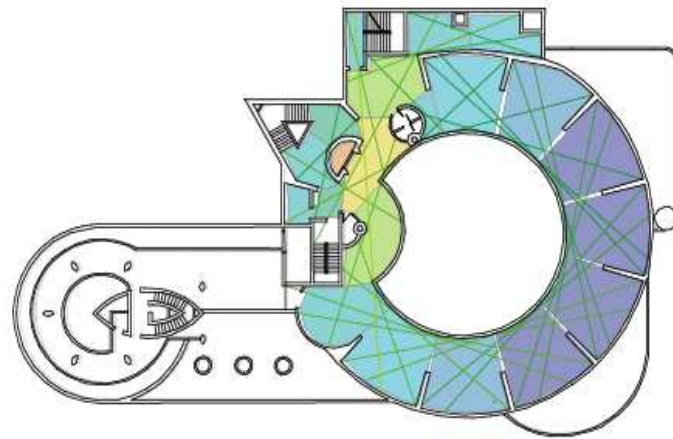


Figure 4.2.15-a Convex-axial map of Solomon R. Guggenheim New York





Guggenheim New York  
(Axial Integration of Convex Spaces =2.25)

Figure 4.2.15-b Convex-axial map of Solomon R. Guggenheim New York

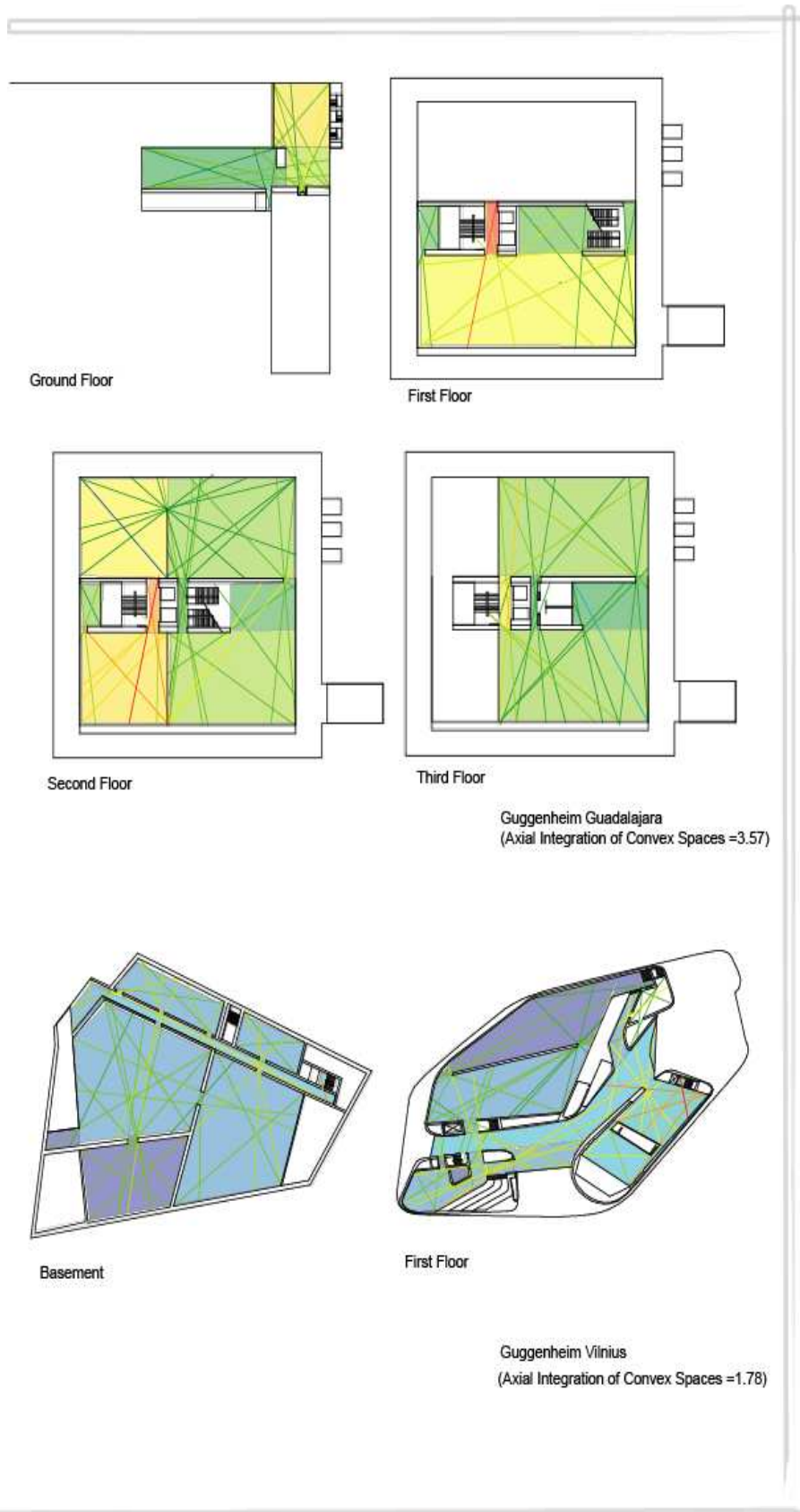


Figure 4.2.16-a Convex-axial map of Guggenheim Guadalajara and Vilnius

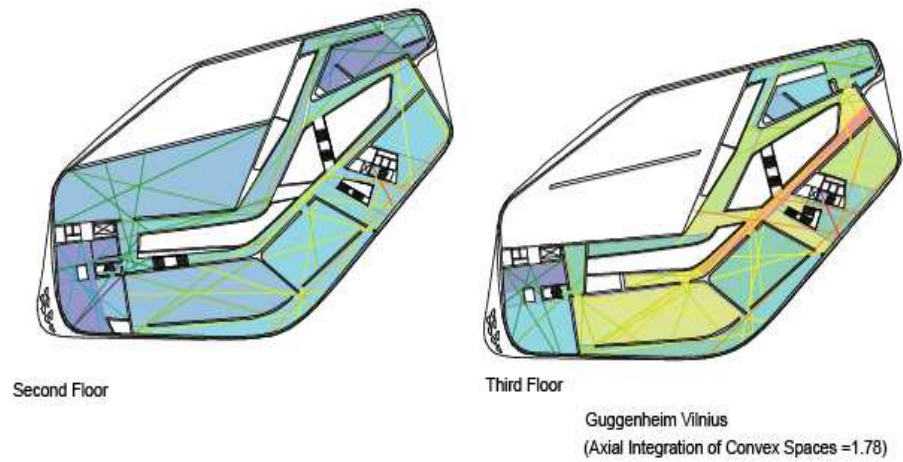


Figure 4.2.16-b Convex-axial map of Guggenheim Guadalajara and Vilnius

The axial integration of convex spaces, which low values indicate a higher degree of axial integration of convex spaces and high values indicates a low degree of axial integration of convex spaces, could be calculated. The formula is as follows:

$$\text{Axial integration of convex spaces} = \frac{\text{number of axial lines}}{\text{number of convex spaces}}$$

Museum	Number of axial lines ( A )	Number of convex spaces ( B )	Total A/B
Bilbao	668	141	4.73
Berlin	27	32	0.84
Venice	144	92	1.56
New York	262	116	2.25
Guadalajara	93	26	3.57
Vilnius	177	99	1.78

Table 4.8 Axial integration of convex spaces of Guggenheim Museums

The only case that has shown low values is Deutsche Guggenheim Berlin ( table 4.8) ; this has to do with its spatial form. It comprises of one fattest convex space. In the other examples the higher values had shown a low axial integration of convex spaces.

#### 4.2.5 Isovist Analysis

In order to exanimate visual characteristic .It is needed to look at isovists of spaces. The environment is defined as a collection of visible real surfaces in space (Benedikt, 1979 a). An Isovists is everything visible regardless a point in space and with respect to an environment.

The following analysis presents isovists of inside Museum spaces. They were drawn in spaces with a high number of axial lines and in the intersection of axial lines with a higher value of integration. In the case of Guggenheim Bilbao ( fig. 4.2.17) these locations are in level one atrium and permanent collection, in floor two from two galleries and in the third floor form one gallery. The permanent collection has the higher isovists area and perimeter in contrast with atrium value. Galleries on floor two and three show less isovists area compared with the permanent collection space. It could be said that the permanent collection is the more visible space from the entire museum.

In the case of Deutsche Guggenheim and Venice (fig. 4.2.18) the largest isovists are found in atrium-permanent collection room. In Solomon R. Guggenheim Museum (fig. 4.2.19-b) the isovists are cyclically constricted, and seemed to be similar in all levels. According to Benedikt (1979, p.63) in Frank Lloyd Wright Museum, as one moves along the helical ramp, the shape and size of the isovist remain virtually unchanged. It could be argued that the helical form of the building gives a fluid way of viewing art.

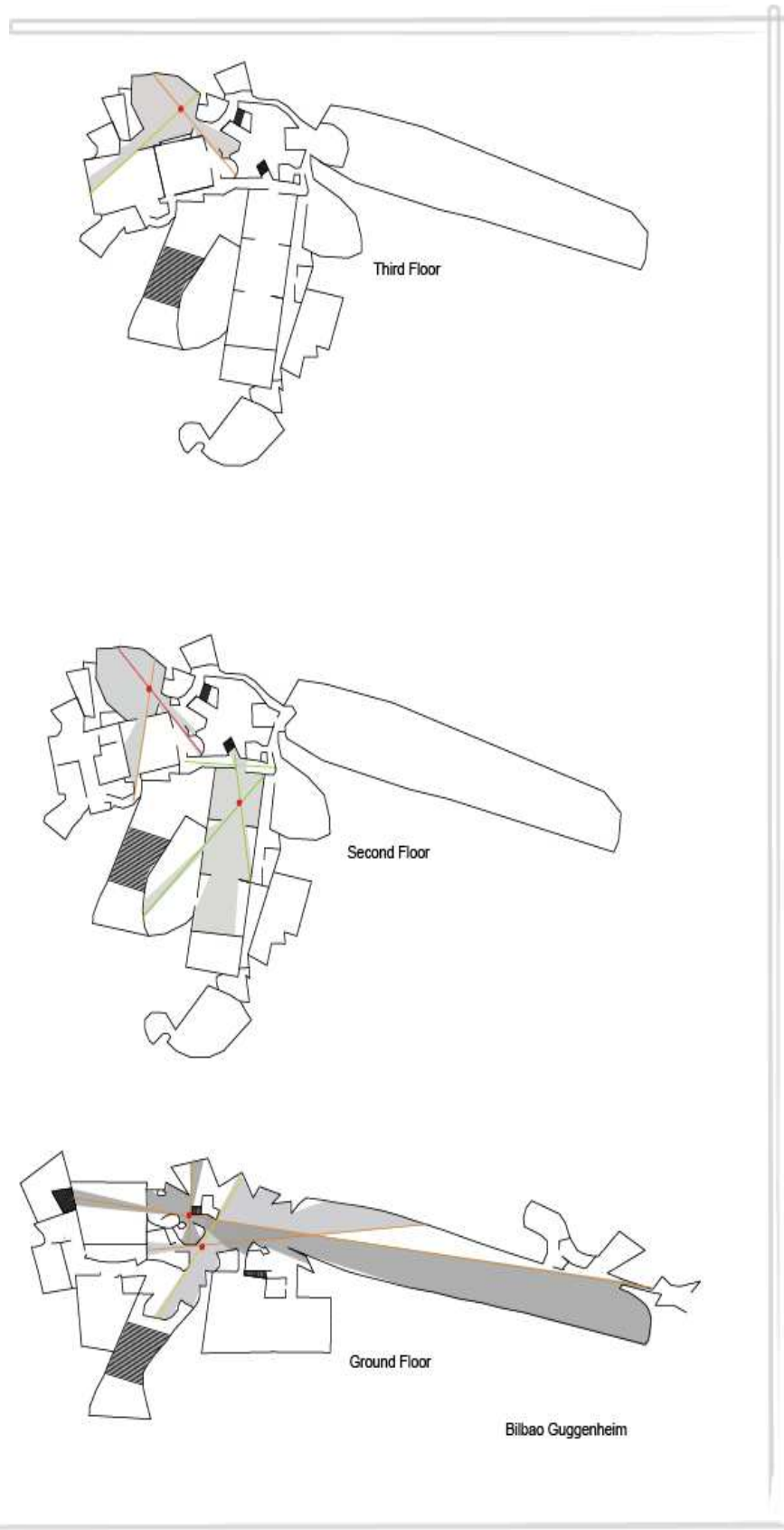
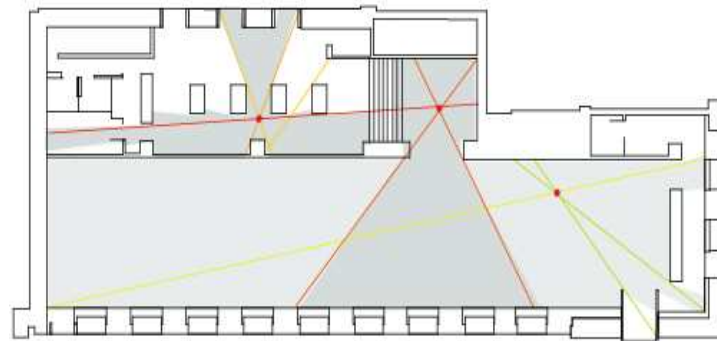
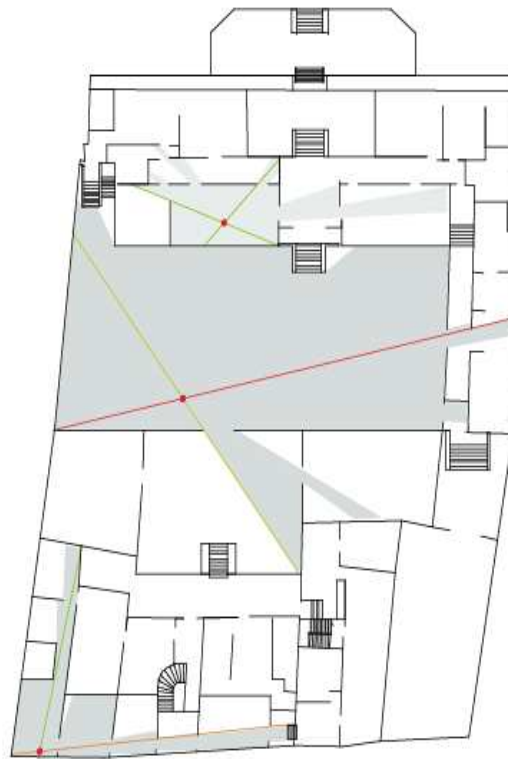


Figure 4.2.17 Isovist drawn of axial map Guggenheim Bilbao



Deutsche Guggenheim



Venice Guggenheim

Figure 4.2.18 Isovist drawn of axial map Deutsche and Venice Guggenheim

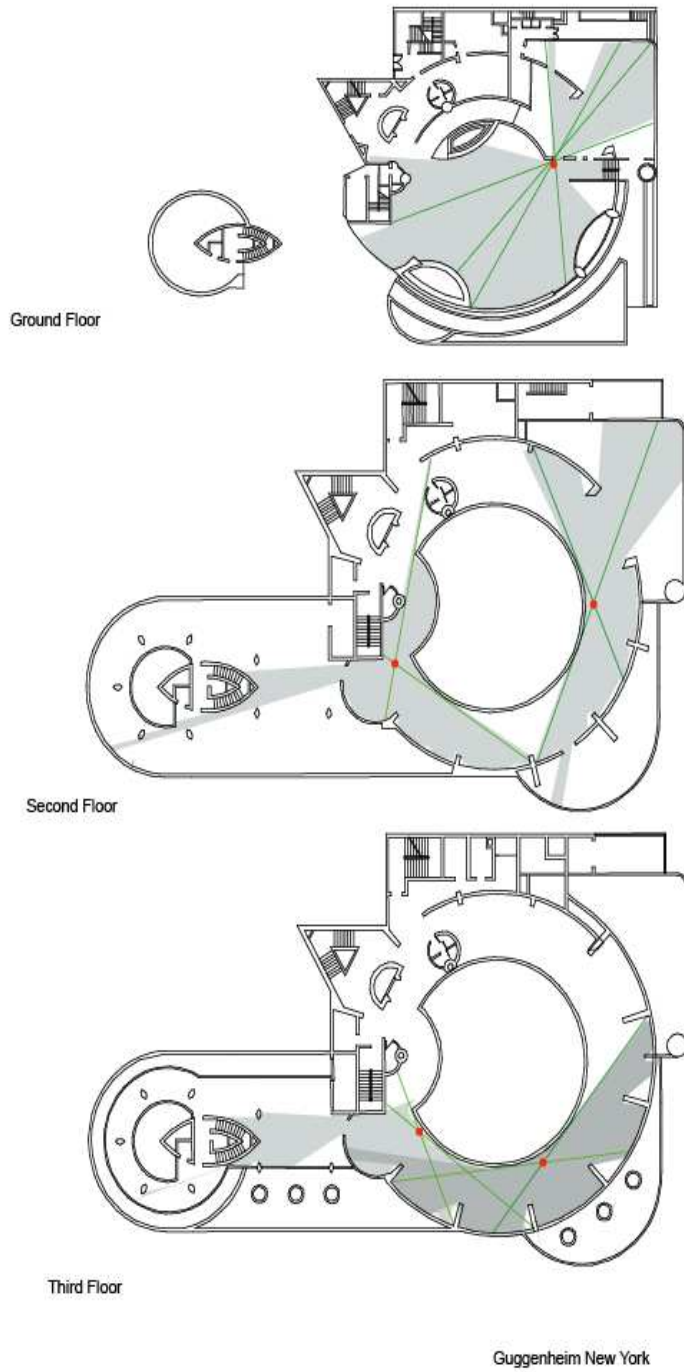
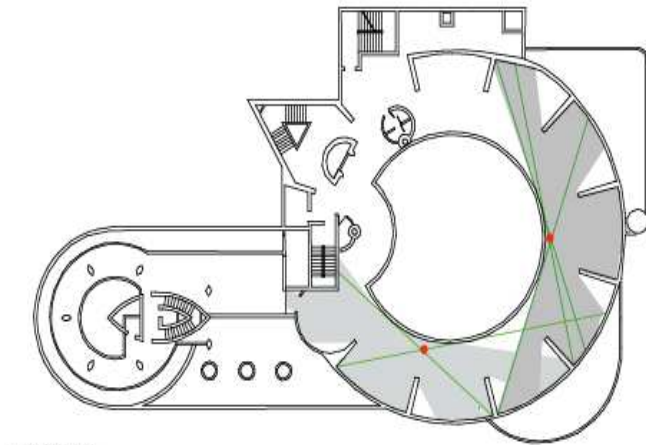
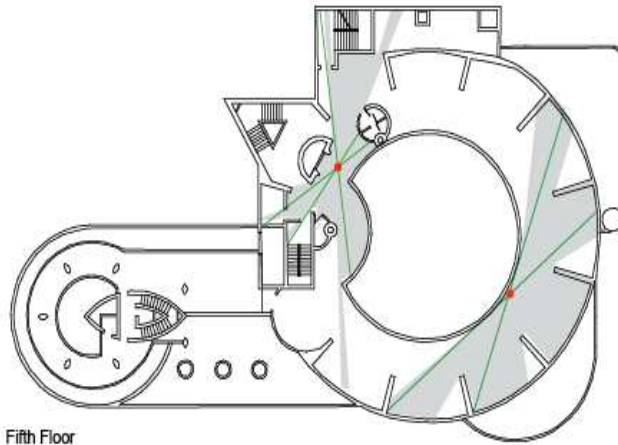


Figure 4.2.19-a Isovist drawn of axial map Solomon R. Guggenheim New York



Fourth Floor



Fifth Floor

Guggenheim New York

Figure 4.2.19-b Isovist drawn of axial map Solomon R. Guggenheim New York



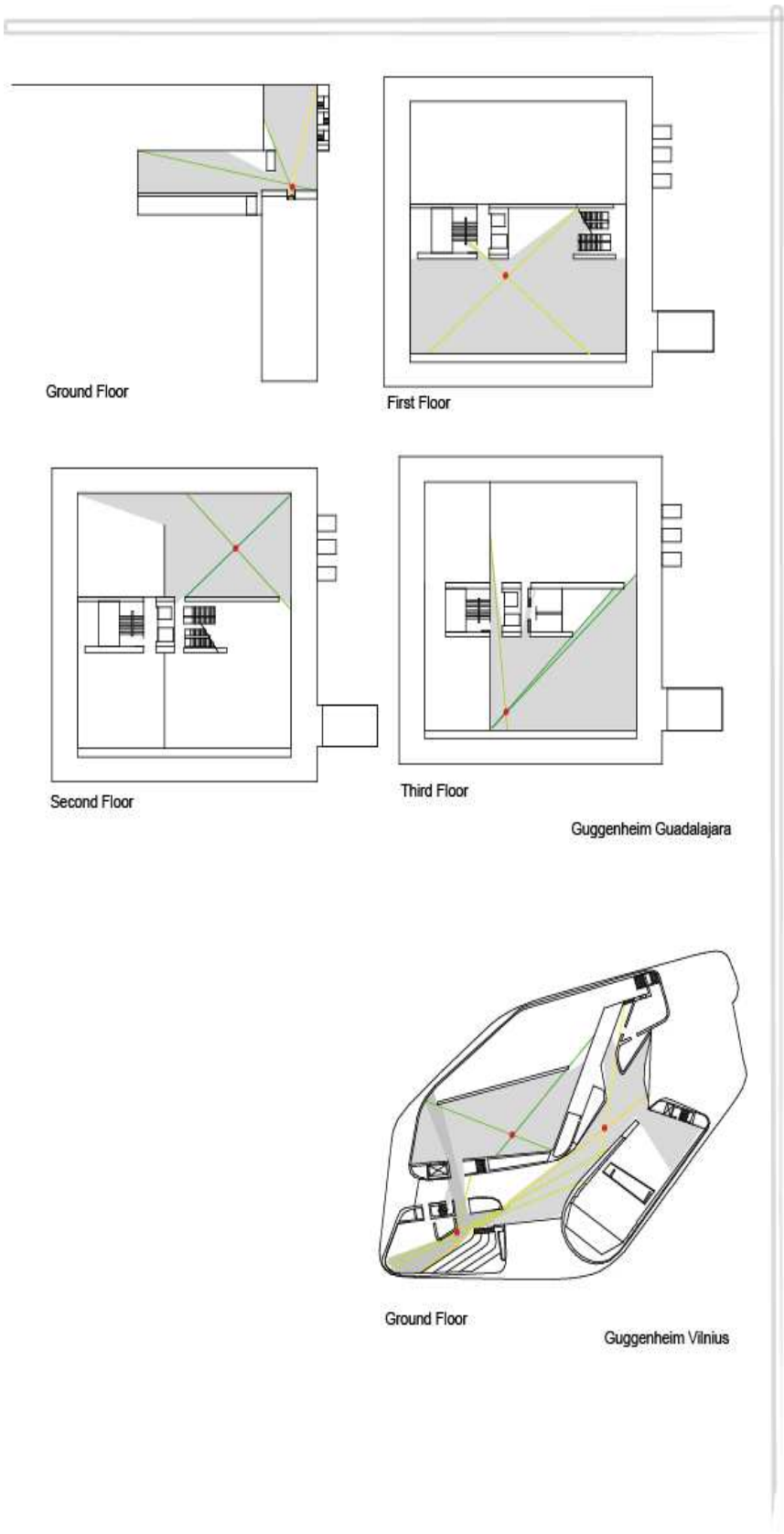


Figure 4.2.20-a Isovist drawn of axial map Guggenheim Guadalajara and Vilnius

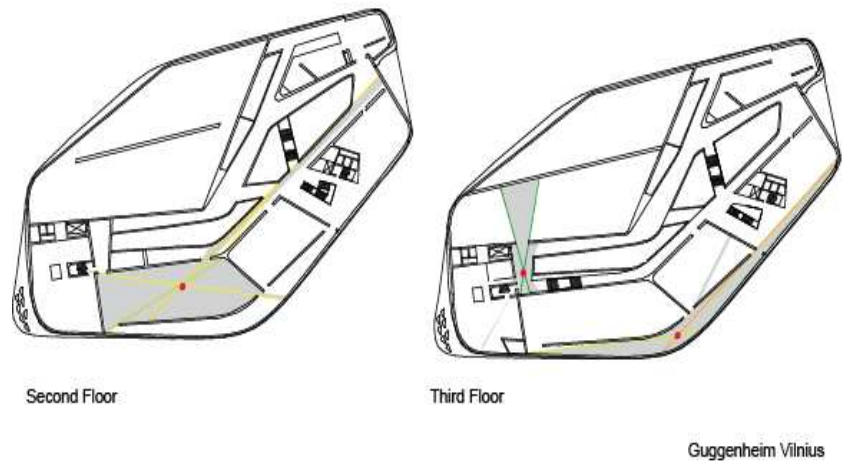


Figure 4.2.20-b Isovist drawn of axial map Guggenheim Guadalajara and Vilnius

Museum	Space	Isovist Area	Isovist Occlusivity	Isovist Perimeter	Isovist Area (min)	Isovist Area (max)
Bilbao	Atrium	469.753	99.173	191.126	268.509	1093.1
	Permanent Collection	1093.1	201.377	342.806		
	Galleries Floor 1	410.552	82.710	161.117		
	Galleries Floor 2	283.255	43.218	116.298		
Berlin	Atrium	5215	185.98	920.277	752.922	5215
	Permanent Collection	5215	185.98	920.277		
	Galleries Floor 1	5215	185.98	920.277		
Venice	Atrium	1626.2	101.811	283.338	236.837	1626.2
	Permanent Collection	236.837	88.725	150.089		
	Galleries 1	214.718	79.257	140.840		
	Galleries 2	239.876	88.271	177.227		
New York	Atrium	4798.6	227.597	494.083	1487.9	4798.6
	Permanent Collection	429.053	209.7	429.053		
	Galleries 1	412.035	197.829	412.035		
	Galleries 2	390.446	172.827	390.446		
Guadalajara	Atrium	401.80	63.991	405.503	401.80	6302
	Permanent Collection	5420	77.225	398.591		
	Galleries 1	6302	166.899	522.182		
	Galleries 2	6302	166.899	522.182		
Vilnius	Atrium	3681.62	150.55	499.550	955.713	4382
	Permanent Collection	4382	140.333	452.904		
	Galleries 1	3252	266.535	577.537		
	Galleries 2	1606	259.129	560.121		

Table 4.9 Isovist values of each Guggenheim Museum

The higher isovist area (table.4.9) of Guggenheim Bilbao is located in permanent collection room. The atrium has a high area of isovist too. Deutsche Guggenheim (table. 4.9) isovist area remains the same in atrium, permanent collection and galleries floor. Venice presents the higher isovist area at atrium () and exhibitions rooms presents nearly the same values. In the case of Solomon R. Guggenheim New York (table 4.9), the atrium is the space with higher isovist area. Guggenheim Guadalajara is a different case (table 4.9) with the biggest isovist in galleries at floor two and three. Guggenheim Vilnius (table 4.9) shows the higher isovist area in permanent collection.

There is a tendency of a higher isovist area (table 4.9) at permanent collection room and atrium. On this basis, atrium and permanent collection are the main focus for museum's displays. These spaces are the more visible spaces. An Isovits is everything visible regardless a point in space and with respect to an environment. Thus, visitors could see more without any barrier.

In this case, the points selected for the isovist give a visual field of what is perceptible for a visitor inside Museum and inside a specific room. It is seen that Guggenheim's Museums significance of modern art and architectural form, is given to the atrium and permanent collection rooms. These spaces are the most important visually.

#### 4.2.6 VGA Analysis

The VGA analysis looks at visibility and accessibility of buildings. Visibility graphs are first-order isovists graphs (Turner et al. 2001, p. 107). The relationship between the locations that are mutually visible would be stronger than if they were not. The integration measure would then be the measure of strength of this relationship with red representing the highest to blue for the least. The following VGA analysis shows the visibility and accessibility of Guggenheim Museums. They permeability measure of the buildings and the ease in which one is able to navigate around through the available field of view at eye level by considering locations with respect to each other location in the system. At the scale of the entire building (radius  $n$ ), it is as expected that the atrium and permanent collection gallery are the most visible spaces.

Guggenheim Bilbao (fig.4.2.21) presents high integration and connectivity values in atrium and permanent collection room. There are higher levels on second and third floor corridor. This is because from these spaces is possible to see to other spaces and move. The more visible space is the permanent collection and it has the higher values of integration. The atrium has to connect other spaces. It could be argue that the permanent collection in relation with other galleries is the more visible space in the museum.

Deutsche Guggenheim (fig. 4.2.22) presents higher visual integration in the main gallery and low visual integration in the second entrance. In the case of Guggenheim Venice (fig. 4.2.22) the higher visual integration is on the Nasher Sculpture Gallery or atrium. Solomon R. Guggenheim New York (fig 4.2.23-a) indicates high visual integration at the atrium and on second floor connection of ramp and office space. From third to fifth floor visual integration is decreasing. Guggenheim Guadalajara (fig 4.2.24-a) visual integration is located in the second floor on the main gallery. Guggenheim Hermitage Vilnius (fig. 4.2.24-b) shows good visual integration at main entrance, second floor and third floor near stairs cases.

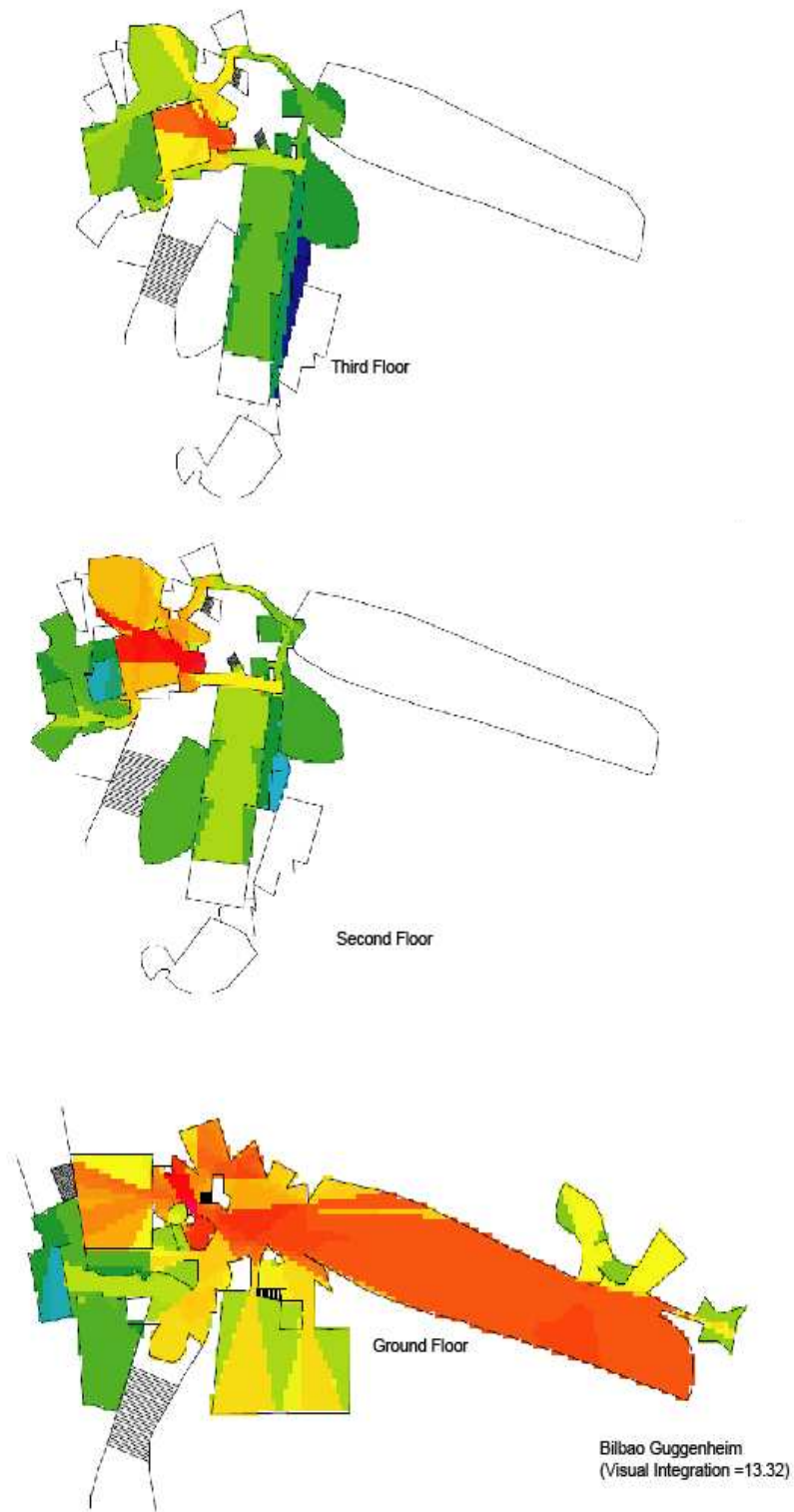
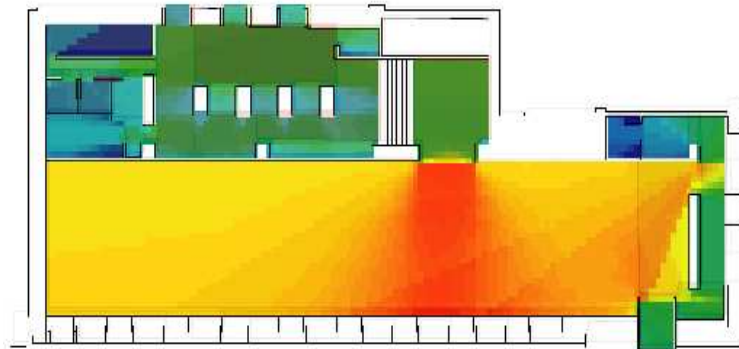
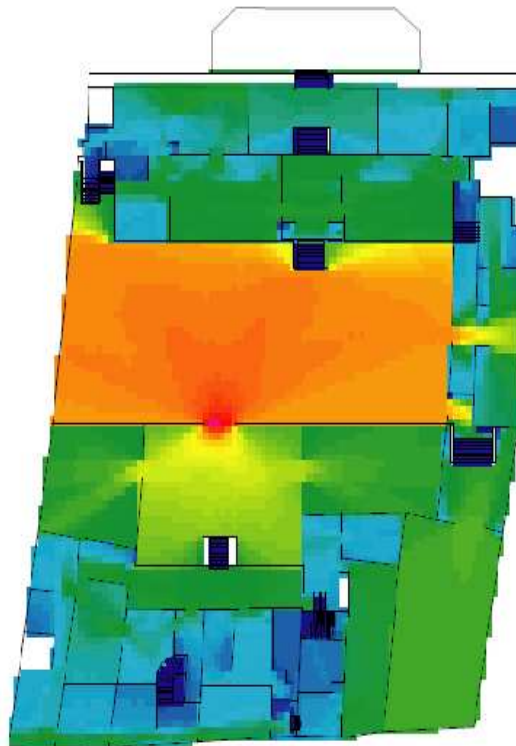


Figure 4.2.21 Visual Integration map of Guggenheim Bilbao



Deutsche Guggenheim  
(Visual Integration =86.86)



Venice Guggenheim

Figure 4.2.22 Visual Integration map Deutsche and Venice Guggenheim

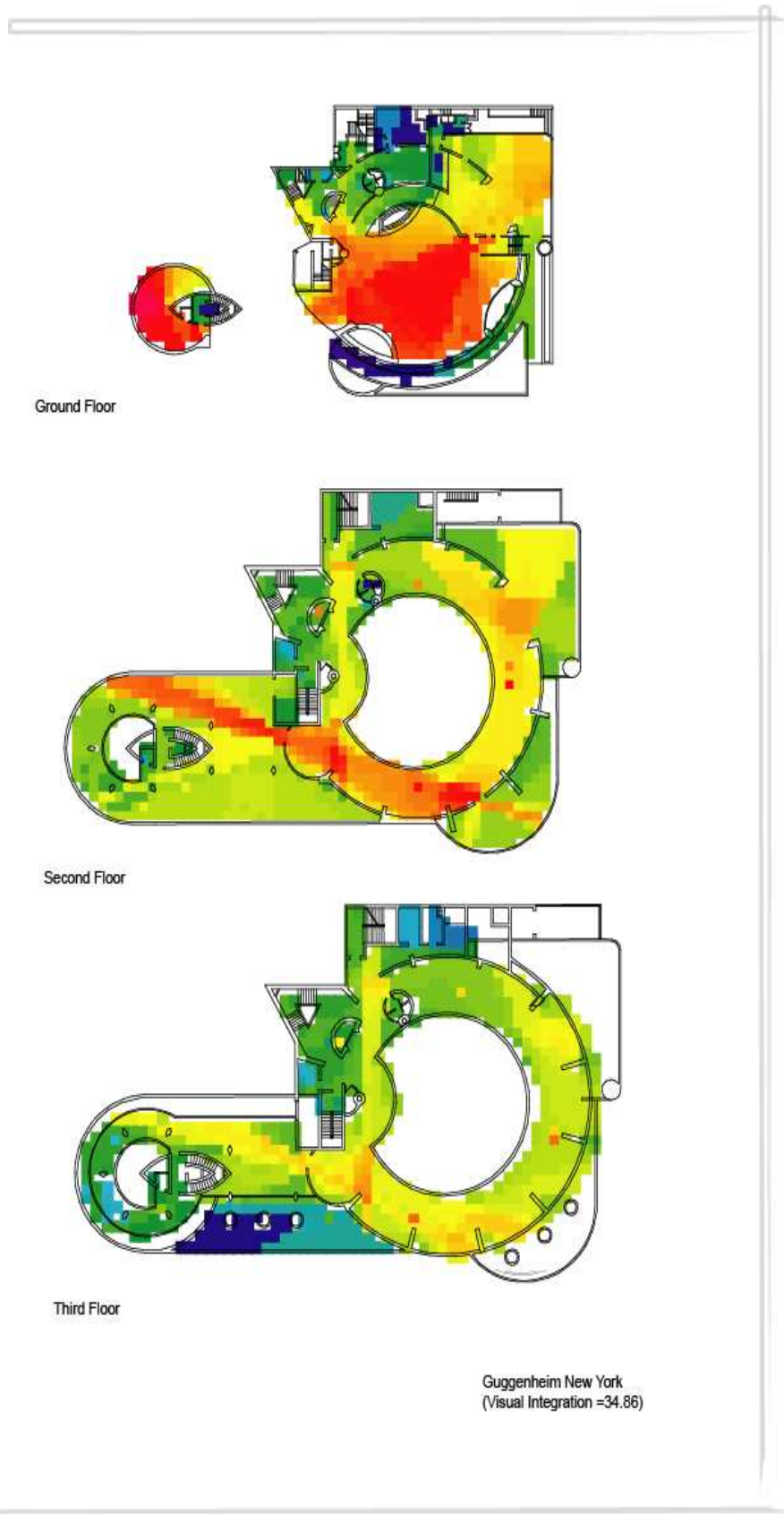
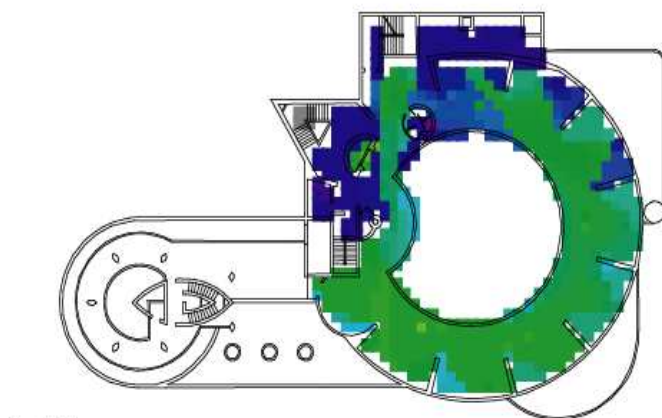
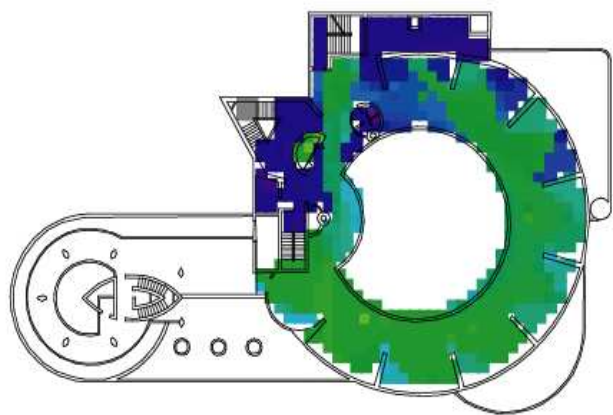


Figure 4.2.23-a Visual Integration map Solomon R. Guggenheim New York



Fourth Floor



Fifth Floor

Guggenheim New York  
(Visual Integration =34.83)

Figure 4.2.23 –b Visual Integration map Solomon R. Guggenheim New York



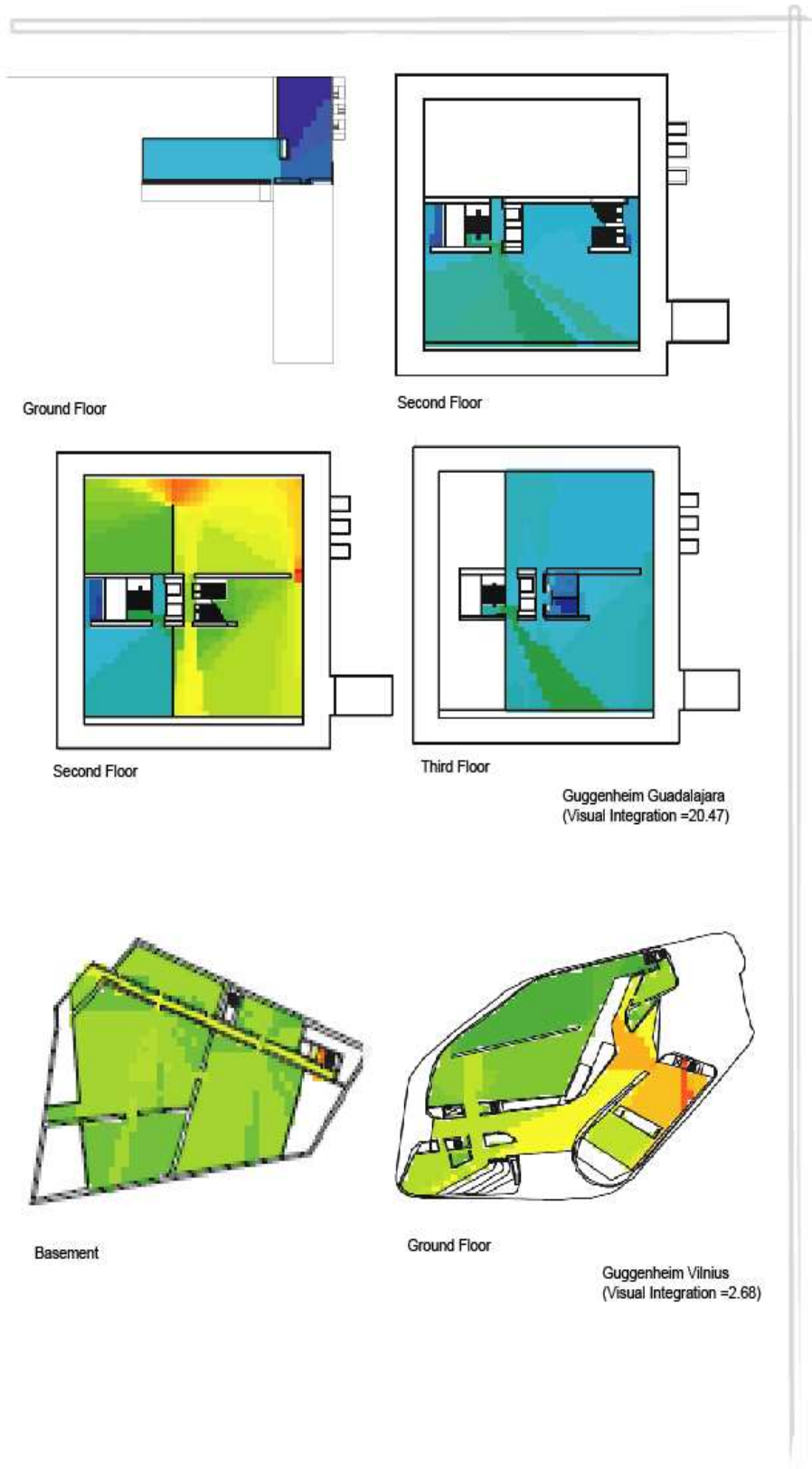


Figure 4.2.24-a Visual Integration map Guggenheim Guadalajara and Vilnius

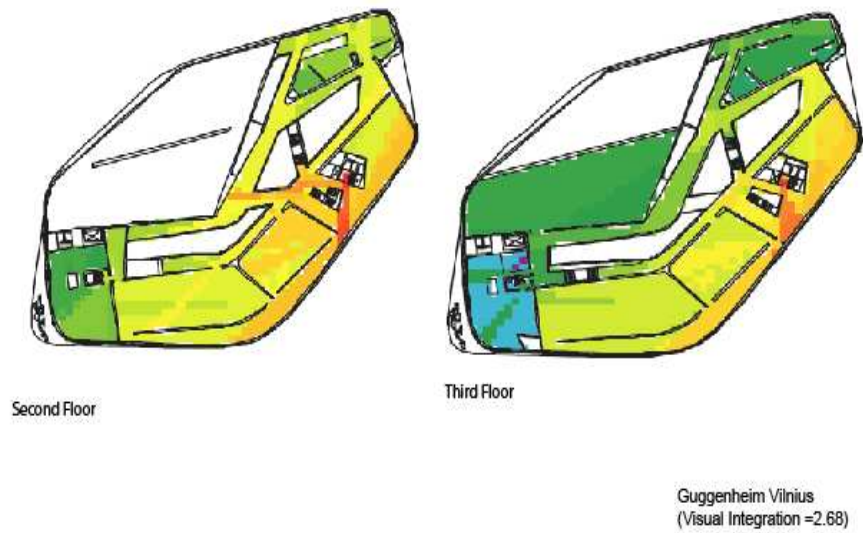
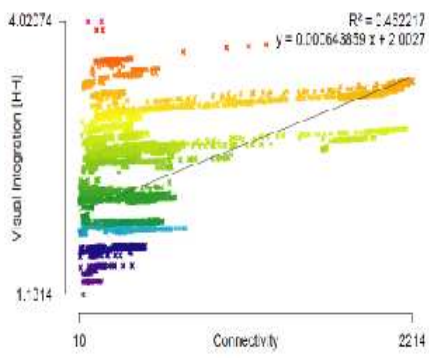


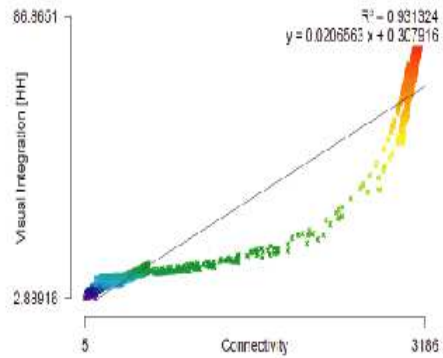
Figure 4.2.24-b Visual Integration map Guggenheim Guadalajara and Vilnius

Museum	Visual Integration (HH)max	Connectivity	Connectivity & Visual Integration
Bilbao	4.020	2214	0.452
Venice	593.2	2499	0.001
Berlin	1.267	8.00	0.392
New York	34.83	317	0.074
Guadalajara	20.47	652	0.004
Vilnius	2.686	422	0.052

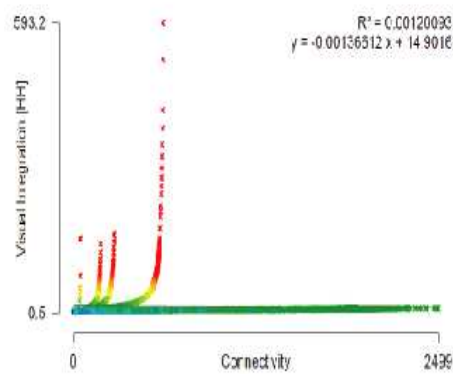
Table 4.10 VGA values of each Guggenheim Museum



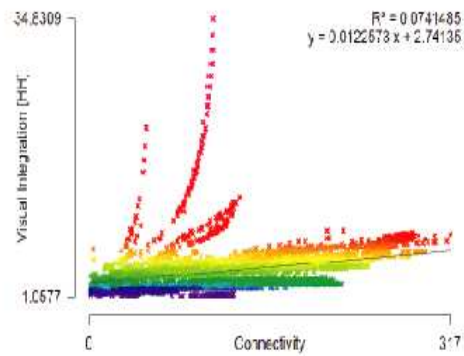
Guggenheim Bilbao



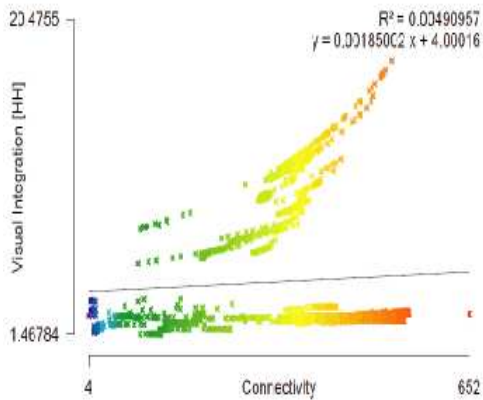
Deutsche Guggenheim



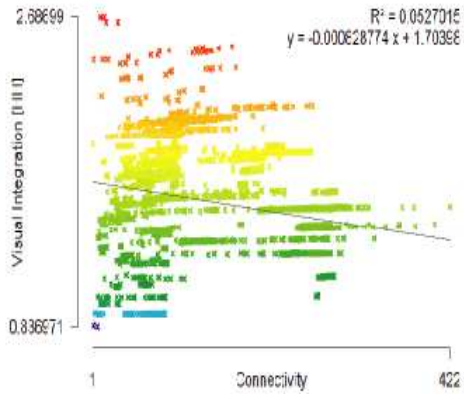
Guggenheim Venice



Solomon R. Guggenheim New York



Guggenheim Guadalajara



Guggenheim Hermitage Vilnius

#### 4.11 Scattergrams of Visual Integration and Connectivity of each Guggenheim Museum

#### 4.2.7 Agent Analysis

One way to study how an experience could be inside a building is with agents in Depthmap. It gives a likely visitor's pattern of movement. The analysis of agents in the museum shows how the visitor (agent) could move through the space. This analysis was made with line of sight length option. This is what the agent can see in space and therefore move to other spaces.

The following agent analysis was made with 25 agents released from the main entrance and gate counts were recorded. The space with more movement is the space where agents could see more. This analysis illustrates a more probable movement through the museum. There is shown a strong path of movement in red and yellow. In Guggenheim Bilbao and Solomon R. Guggenheim New York agents were released at the main entrance. In the cases of Deutsche Guggenheim, Venice, Vilnius and Guadalajara the agents were released at the main gallery room.

It could be argued that main flow relates with museum configuration. Guggenheim Bilbao (fig. 4.2.25) shows a pattern of movement in the main collection room and through all over the atrium. Deutsche Guggenheim (fig.4.2.25) reveals a different pattern. The agent movement occurs through the main gallery and on the second entrance. Guggenheim Venice (fig.4.2.25) shows strong movement in three of the main galleries room and in corridors which connect all rooms.

Solomon R. Guggenheim New York (fig. 4.2.26) shows a pattern of movement between atrium and the Wright Restaurant. Guggenheim Guadalajara (fig. 4.2.26) movement in the main gallery shows that on one room has movement than the others it is the space with escalators. Guggenheim Vilnius (fig. 4.2.26) presents a pattern of movement in the main gallery and in the atrium.

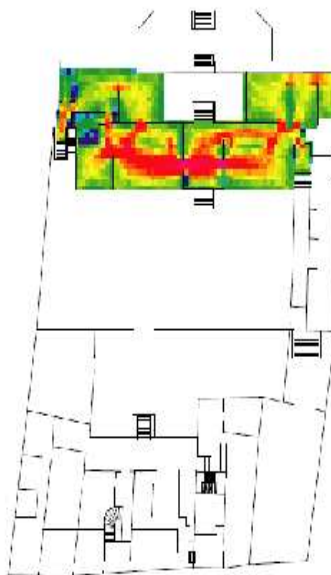
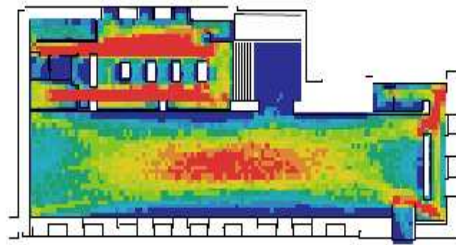
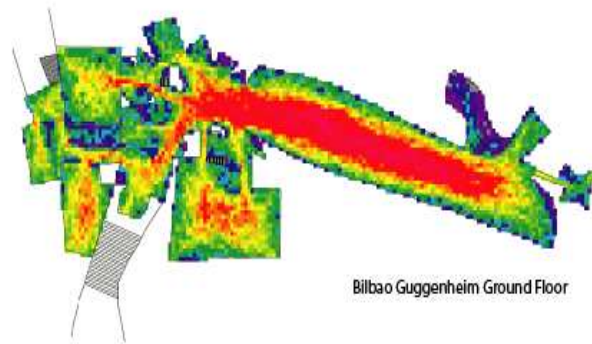


Figure 4.2.25 Agents map of Guggenheim Bilbao, Deutsche and Venice

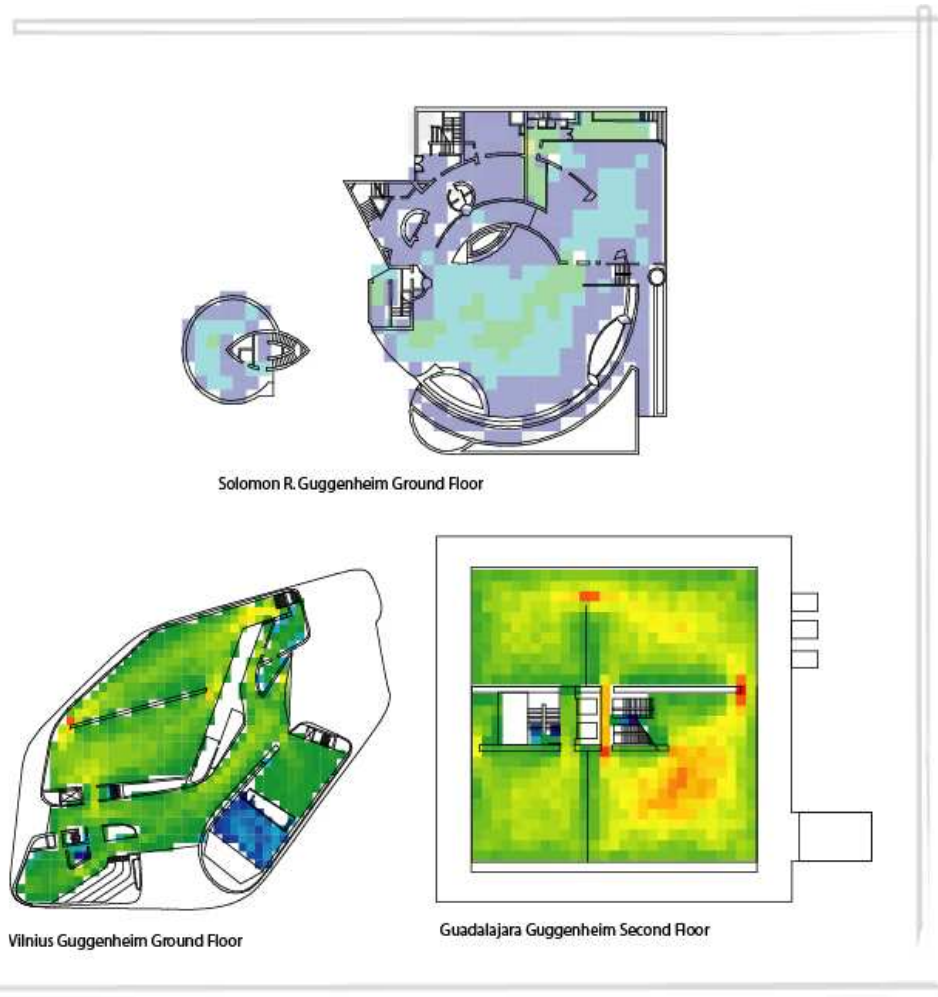


Figure 4.2.26 Agents map of Guggenheim Solomon R., Guadalajara and Vilnius

Museum	R2
Bilbao	0.14
Deutsche	0.084
Venice	0.42
New York	0.21
Guadalajara	0.23
Vilnius	0.35

Table 4. 12 Agents R2 values of each Guggenheim Museum

#### 4.2.8 Boundary Analysis

A boundary map could give a sense of how the paintings on the wall would be visible in the Museums. The following boundary maps were made with the boundary map option. The spaces selected were where the main gallery and permanent collection is situated. It is interesting to see that spaces with the higher integration (red) are where the permanent collection is located.

Museum	Room high visible
Bilbao	Permanent collection and stairs in the atrium
Berlin	Exhibition room
Venice	Nasher Sculpture Garden
New York	Atrium
Guadalajara	Exhibition room
Vilnius	Atrium and exhibition room

Table 4.13 Boundary values of each Guggenheim Museum

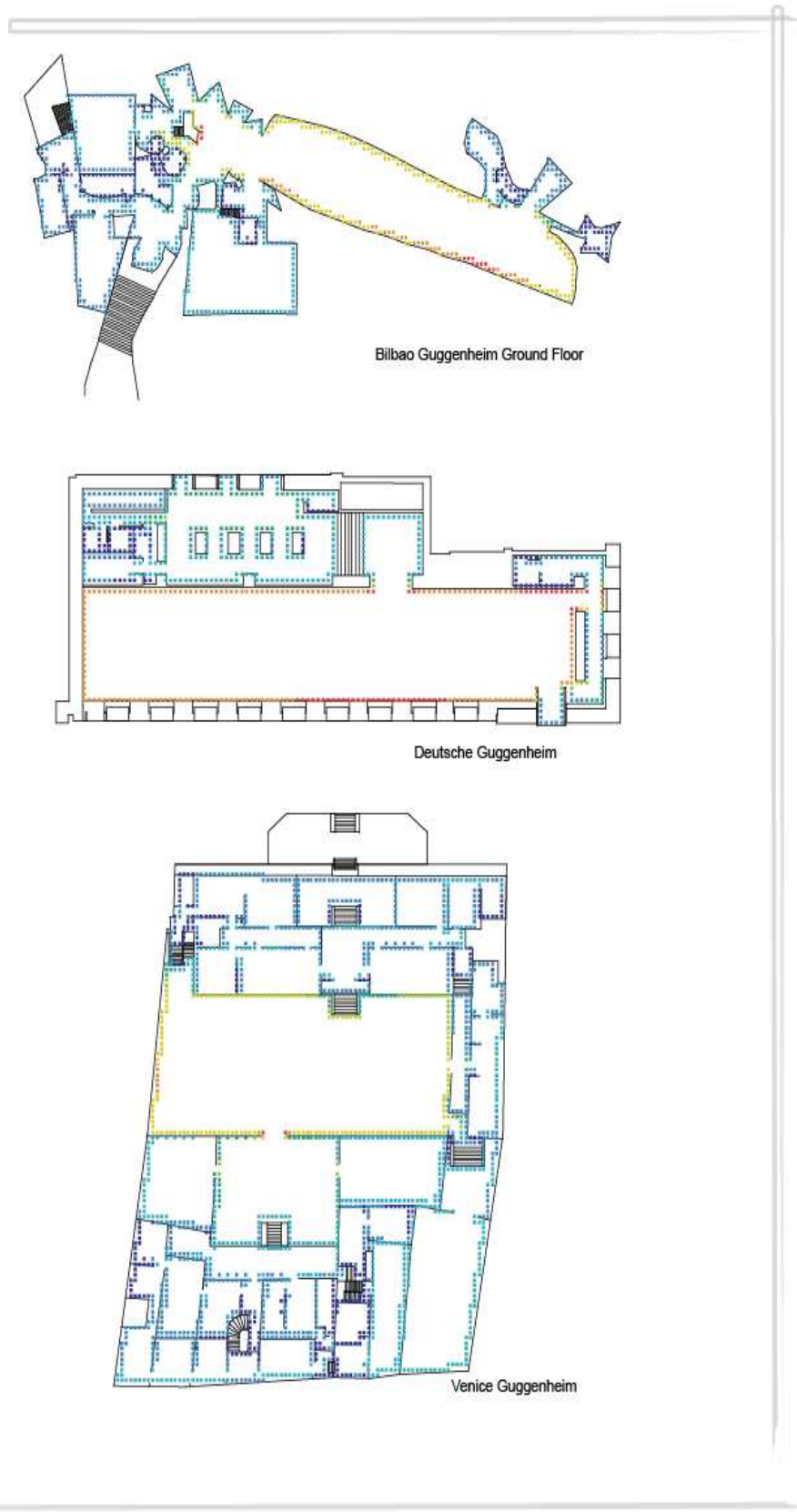


Figure 4.2.27 Boundary map of Guggenheim Bilbao, Deutsche and Venice



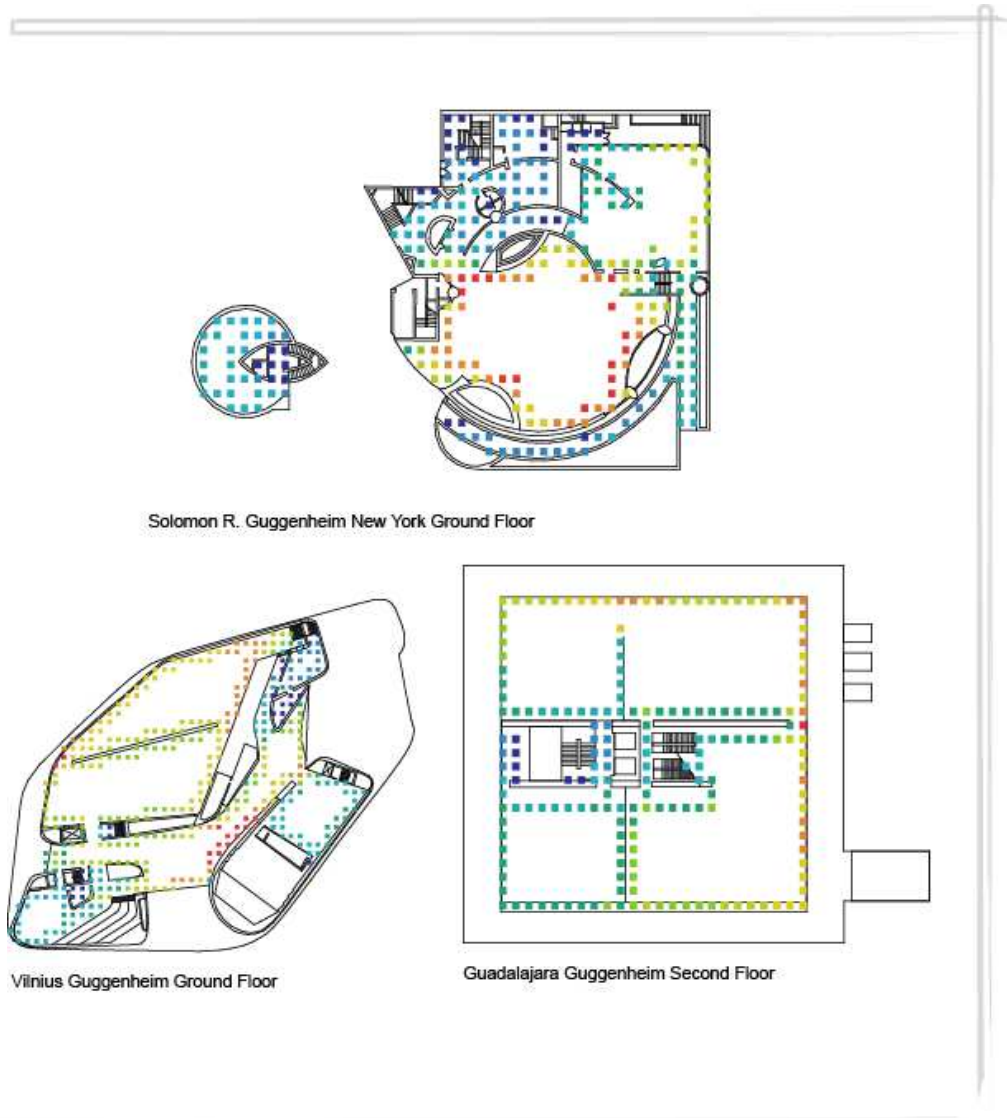


Figure 4.2.28 Boundary map of Guggenheim Solomon R., Guadalajara and Vilnius

To sum up, it could be said that the central points in Guggenheim Museums are permanent collection and atrium spaces. Both spaces have shown integration, visibility and accessibility in relation to the whole configuration. Museums geometrical characteristics, suggest a relation between cases in terms of organisation of the circulation.

On the other hand, there is a common type of J-Graph. The J-Graphs have shown between galleries, atrium and permanent collection, an important link. The genotype model seemed to be embedded between the links of spaces, repetition of form cells and control of spaces among others (fig.4.2.8).

Hillier (1996) argues that in an environment the intelligibility is the relationship between what it could be seen and what could not be seen. This property could be measured by what we can see or not the degree of which a system is connected and integrated as a whole. In the case of Guggenheim network the museums have shown intelligibility in the main rooms.

The isovists analysis has revealed visual characteristics of the permanent collection rooms and atriums. It could be argued that spatial configuration of a Guggenheim museum, specially the atrium and permanent collection, gives Guggenheim identity. In addition, monumental architecture provides the significance of a modern museum type. It is often thought that modern architecture has to be complicated to understand and explore. In this case, Guggenheim architectural complexity lies only on its architectural design and construction. Configurationally speaking, segregation and integration of spaces are made in order to emphasise the main collection.

According to Hillier and Hanson (1984, p. 108) on the basis of visual representations it is possible to see that each space, whether axial or convex (or even a building or boundary) has certain syntactic properties. The aim is to understand complex relational characteristics of spaces and of the system as a whole. Guggenheim network has shown to be asymmetric in the sense of inhabitants control the way visitors explore the museums displays.

## Chapter 5: Discussion

	Bilbao	Berlin	Venice	New York	Guadalajara	Vilnius
Area m2	23225	1700	6300	14000 0	25600	13000
Total Convex spaces	141	32	92	116	26	99
Convex Integration (Max)	1.22	1.26	0.95	1.11	1.36	1.40
J-Graph Depth Space	15.0 Staff	4.0 Permanent Collection	8.0 Staff	8.0 Staff	7.0 Permanent Collection	7.0 Staff
J-Graph Mean	6.0	3.0	4.75	4.0	3.0	3.5
Axial system	668	27	144	262	93	177
Synergy	0.749	0.941	0.384	0.094	0.004	0.113
Intelligibility	0.464	0.601	0.225	0.011	0.027	0.051
Integration Rn	2.567	3.249	1.963	3.490	2.080	1.469
Integration R2	2.390	2.769	2.702	2.760	2.507	2.687
Axial integration of Convex Spaces	4.73	0.84	1.56	2.25	3.57	1.78
Isovist Area ( Max)	1093.1	5215	1626.2	4798. 6	6302	4382
Visual integration	4.020	5.93	1.267	34.83	20.47	2.686
Agents R2	0.14	0.084	0.42	0.21	0.23	0.35
Boundary	Permanent collection and stairs in the atrium	Exhibition room	Nasher Sculpture Garden	Atrium	Exhibition room	Atrium and exhibition room

Table 5.1 Syntactic measures of each Guggenheim Museum.

### 5.1 Genotype

Guggenheim configuration (table 5.1) suggests a Museum type based on spatial properties. The syntactic measure of each Guggenheim Museum (table 5.1) shows a correlation between depth values and staff spaces. At Bilbao is

found the deepest value, in this building more spaces have to be traversed in order to get to staff spaces.

The Museum has been used architecture and contemporary art as a means of define its identity, in addition with site context make Guggenheim's iconic meaning stronger. However, the means of which Guggenheim museums form its spatial relations contribute to a mechanical model. The socio spatial relations (Hillier 1996) describe the interfaces between inhabitants and visitors as well as between different groups of inhabitants. J-Graph's illustrates depth and mean values (table 5.1) and make more evident social forms embedded in Guggenheim Museums. The spatial genotypes of the buildings include interfaces and control of spaces. Guggenheim g- model is made of a sequence of spaces, giving more importance to main collection galleries and segregating staff spaces Accordingly, Guggenheim's genotype is based on a control of spaces allowing visitors to explore contemporary art, experiment modern architectural forms and avoid interfaces with inhabitants of Museums.

The cultural intent defined type for Guggenheim involves, the expansion and interest on increase business in the field of visual art, and on the other hand, the experimental model for display novels expressions of artist and generates an identity for the objects displayed. This is clearer in the case of Deutsche Guggenheim where a main exhibition room is open for experimental art. On this basis,

The Guggenheim foundation has shaped the form of the buildings, as a result of social and political interests, this its cultural genotype. Since Solomon R. Guggenheim in New York, the foundation has been looking at sculptural architecture and a space which fully meets requirements for contemporary and experimental art. In this way, the building has to be monumental and functional.

## 5.2 Spatial Meaning

The Solomon R. Guggenheim Foundation promotes the understanding and appreciation of art, architecture and other manifestations of contemporary visual culture (Ballon, 2009). Syntactic values (table 5.1) demonstrate that there is an existing relation between the spatial and narrative code in Guggenheim's Museums and galleries. The effects that spatial layout has to exhibitions and to visitors experiences are pointed out through Museum's configuration. In all cases, a fundamental aspect is that these museums are characterised by a hierarchal spatial organisation (table 5.1) and with visibility and integration of spaces. Configuration benefits certain galleries with respect to others (table 5.1). Visibility and accessibility are the main means of this tend to occur. In this way, spatial hierarchy tends to correspond to the hierarchy of the works displayed. Another attribute is to emphasise the qualities of architectural space given in the first place by the architecture and subsequently by displays.

Guggenheim's museums configuration have significance in combination with the objects they represent. There is an interaction between space and display. It is seen that Guggenheim's spatial qualities ( table 5.1) such; axiality, hierarchy, and configurational properties as integration, connectivity, convexity are fundamental in the way of spaces are related to each other. In this way the space is used to enhance the impact of objects, to space itself and to retrain their identity. Through the arrangement of spaces and objects architects intention was to control the information. In this way, space is used in a fundamental point of meaning giver. Hillier (2004) states that after all meaning does not exist in advanced, but is created and exist by virtue of the existence of the specific museum and the spatial means is the basis of the aesthetics of space. The function of Guggenheim museums extends beyond the didactic aims and operates through its aesthetic quality.

### 5.3 Identity

The differences between Guggenheim Museums in terms of spatial configuration and the ways in which visitors explore the displays point out to an experienced, interconnected and intelligible message (table 5.1). It is related with the circulation system and with three main spaces; atrium, permanent collection rooms and lifts (a link between floors). The Solomon R. Guggenheim New York was the first formal Museum built by the Foundation. It becomes as model type. Yet, Bilbao, Venice, Berlin and scheme projects of Guadalajara and Vilnius have tried to preserve the idea of “easily reached” and visible rooms.

On the other hand, when art is looked at, the Museums tend to give more importance to some rooms and displays than other. For instance, they are devoted to the permanent collection and in the case of Deutsche Guggenheim, to experimental art. In the case of Guadalajara and Vilnius, experimental art would be the main concept for their displays. It represents for Guggenheim Foundation a gold opportunity to become into an important exporter and precursor of contemporary and experimental art. Guggenheim's recent concept generates a new idea of modern art.

Together, new and old model of Guggenheim museum, have shape its concept of political, social and aesthetic content. Like other museums around the world. The literature review in this thesis has shown that the experience of the building should be a metaphor for the Museum as a whole, and the existence of a narrative message in galleries. On the other hand, underlines the relation between architects and buildings as signs for consecutives moments of modernity and symbolism of identity (Till, 2009). Guggenheim Museums are combining contemporary art and monumental architecture to their agenda, giving a chance to experience architecture and organisations of its parts as a whole.

There is a visual relation of the atrium and the concept of Guggenheim Museum as a dynamic field of circulation routes in the whole system (table 5.1). The arrangement of space seems to have a sequence. Tzortzi (2008, p. 04)

suggests that the organisation of viewing spaces in a sequence, is a principle intrinsic to museum design, and an instrument for the accommodation of visitors movement as well as the arrangement of objects. In this case, the museums have a common pattern of control that the layout places on the visitor globally, but locally, they allow the pattern of movement exploration. On this basis, Guggenheim's configuration imposes the exploration because visitors have to walk the same spaces in a sequential order. There is a regularity to return to the same space in order to move around.

The analysis of the selected museums suggests that the atrium assumes a variety of key functions; they assume a role of reference space in the spatial sequence and provide orientation. Syntactically (table 5.1), the atrium is part of the integration core of the Museums. Therefore, it is the most accessible space. It attracts higher movement and maximises the opportunities for co-presence and encounter. The latter permits movement and empowers visitors of an orderly exploration. The main integration properties of atrium spaces are the generation of social space and production of encounter patterns as a global phenomenon.

Guggenheim's Museums syntactical values (table 5.1) demonstrate that the highest axially value is found in Guggenheim Bilbao. In contrast, Deutsche Berlin only has 27 axial lines (table 5.1). This illustrates how configuration is a key for the arrangement of spaces, inside a Museum this is important to a degree that displays become more accessible to visitors. Subsequently, the building became in a better space to observe art and allows social patterns to emerge.

## Chapter 6: Conclusion

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The aim of this study was to examine Guggenheim Museums through configurational criteria based on their spatial and social characteristics. This thesis has demonstrated that although the spatial Museums analysis is an effective tool for studying different layouts, it seems that political factors are also a social and functional effect. Following the lines of inquiry set up at the beginning of this thesis, the flow of research centred on the findings to the three main research questions.

Concerning the first enquiry about syntactical structures called g-models (Hillier and Leaman); to what extent there is a common spatial genotype in Guggenheim museums:

One spatial genotype has to do with spatial hierarchy; it is closely interwoven with curatorial choices under the influence of Guggenheim Foundation. It means that the hierarchy of access and the division of internal spaces tends to correspond to the importance of the works displayed and to the main Foundation's interests.

Some cases, such in Bilbao and New York, instead of the exhibition maximises the impact of objects, the exhibits are set as to emphasise and bring out the qualities of architectural space. On this basis Guggenheim Museums has dedicated the more integrated and visual spaces to the permanent collection. The message is communicated importantly by a specific concept or argument realised in a spatial form. It also reflect a specific meaning that intends to create fields of more possible meanings. Thus, priority is given to the spatial structure and architectural/ spatial means.



From a spatial point of view, Guggenheim configuration and ordering of spaces lead into an evident dimension of culture and social relations. The genotype structure relates to the social mechanism with the evolution of social forms. Guggenheim Foundation has been employed architecture and contemporary art as a means of define its identity. It is based on controlling spaces allowing visitors to explore contemporary art and experiment modern architectural forms. That is why cultural intent defined genotype for Guggenheim involves; expansion and interest on increase business in the field of visual art and the experimental model to display novels expressions. The conception about functional character of the project is reflected on its circulation and by the architectural intent too.

The second inquiry refers to the formulation of spatial meaning, the non-discursive knowledge embedded through design processes; how the spatial configuration of galleries creates a spatial meaning that would influence Guggenheim's museums role?.

The classification of objects was a way in which museums began to generate they identity; on the other hand, they became a social enterprise, generating visitor's interfaces and social activities. The Peggy's Guggenheim collection was the starting collection of these museums and has been gradually increased by the Foundation.

In terms of spatial characteristics of exhibitions rooms, the transformability of space to one exhibition to another is basic in one specific case such in the Deutsche Guggenheim. Here, the main interest relays on the presentation of site-specific works commissioned for the exhibition hall. While in the rest of Guggenheim Museums art collection has to be adapted to its space and vice versa.

The internal configuration has to do with its exhibitions and influenced by Guggenheim Foundation requirements of monumental architecture to create an

environment full of sensitiveness for the presentation of art. Thus, Guggenheim's configuration makes space available to human activities, accessible to experience it and intelligible to understanding. Guggenheim architectural configuration departed from hierarchical model of narrative of the main collection to a linear organisation of displays in the case of temporary exhibitions.

On the basis of architectural meaning, the concept of plasticity associated with the classical and tradition of international style was the intuitive technique used by Wright. Wright has sought continuity in the spiral ramp as a simultaneously spatial and structural form. A uniquely modern innovation made possible by the new material of steel-reinforced concrete by that time. Guggenheim merges art exhibition and visitor movement along circulation system and creates the narrative by the continuity meaning.

Guggenheim's spatial meanings are related to the association of configuration with hierarchy, equality, democracy, correspondence and non-correspondence. In the understanding of the meaning of configuration, significance and signification must be noticed. The significance of Guggenheim is what visitors could see at hand; sculptural architecture and contemporary art. Accordingly, signification of Guggenheim is the fact that contemporary art has to be display in a sculptural and exuberant enterprise.

In Solomon R. Guggenheim New York (and the core of Guggenheim's organisation) four basic ideas in the spatial concept should be noted. Firstly, the central atrium is a combined vertical axis and universal orientation node, Secondly, the circulation system is settled up as a result in a continuous loop always returning to its point of origin. Third, though the circulation path and gallery space are accessible always to the openness of atrium. It provides constant views across the space to works of art both preceding and succeeding one's own position in the circuit.

The spatial experience starts from the moment of entering an iconic architectural building. The later, the sequence and linkage of spaces and the number of alternative routes to a space endure the spatial experience. In addition, the gallery ramp itself was designed to integrate into a single structural form all requirements of display. Wright said: ... *“After refreshments, the visitor could easily take the elevator up again to come back for more museum”*. This is one of the reasons why Solomon Guggenheim became as a model for other museums, the idea of a Museum that fully engage visitor with art and space.

The Guggenheim Foundation seeks symmetry, modernism, ornament, the machine and the metaphor of Wright's main architectural concepts and recently to non-discursive approach of Gehry's designs. This is directly related to his creative process. He sees buildings through semiautomatic drawings and handmade models. On this basis, Guggenheim's architectural model could fit within a rational design asked by the Foundation and to an abstraction such as architects' intuitive approach. In order to improve the design process, the environment should be studied at the same level.

The third question looks at the museums as institutions, as a social space; what would be Guggenheim's identity? To what extent is it built in modern art displays and in its architecture, or it could be just only a brand creation. In this way, space and society have been investigated.

Beyond the identity of museums as containers of arts, expositional spaces, architectural feature or files of historic legacy, museums also represent different ideologies. It is seen that in Guggenheim Museums social and political factors have shaped their identity along with the change in contemporary culture. Guggenheim architectural enterprise affects the experience of museums and it influences art exhibition. In addition, its architecture becomes iconic in the site where the Museums are located.

It must be noticed that the first concept for the Guggenheim Museums was the Solomon R. Guggenheim Museum in New York. Subsequently, it became a model for the whole network and therefore the core of its identity. It is generally seen as a structure that goes against the city and as a sculptural museum type that contrasts with its context. The former aspect searched by the Guggenheim Foundation is Wright's basic idea of structural and spatial continuity, found in the main New York gallery's "grand ramp". This signified a democratic ideal for modern architecture.

Wright wrote about his concept: *"It is just like the democratic principle that we subscribe to; that is why I have always referred to this as the architecture of democracy: the freedom of the individual becomes the motive for society and government"* (Ballon, 2009, p. 46). For him, the paintings in the Guggenheim New York would be set freely in three-dimensional curvilinear space in a pleasant environment. In this way, architecture is a means for society to express their desires and needs.

Moreover, Guggenheim's structure is characterised for its high qualities of art collections. The meaning of a world-wide museum gives to Guggenheim a commercial identity. Architecture remains one of the main aspects of Guggenheim identity, as a result, the form of its museums has to be iconic.

Another aspect of Guggenheim's identity has to do with control and power arguments. According to Hillier (1996, p. 288) the mechanism thought about a building is related with two main ideas; the first one is the social organisation and the second, the image of an exacting form of building. It is seen that a control mechanism in Guggenheim's Museums is the reproduction of power used by the Foundation and other sponsors.

The worldwide organisation is interested in the contribution of the functional character of the Museum's structure and to their adaptation of city renewal. That relationship is settled up as one of the constant aims of the Guggenheim Foundation. It is proposed that further Guggenheim's Museums should have to

turn in economies of tomorrow. Economy and architecture is an interesting enterprise on which more attention should be made.

The Solomon R. Guggenheim New York was to be an ultimate expression of organic and sculptural architecture. The modern architecture on which Guggenheim Museums are embedded, have shown how buildings besides belongs to a marketplace and besides their displays of fine art, they are more important in a social way; the formation of identity in modern society. Creativity as a cognitive process and innovation in modern Guggenheim's configuration could be subject in future studies.

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