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# An Analysis of the Archaeological Potential of Venetian Church Floors

An Interdisciplinary Qualifying Project
Submitted to the faculty of
Worcester Polytechnic Institute
in partial fulfillment of the requirements for the
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# Abstract

The purpose of this project was to identify churches in Venice that present the greatest archaeological opportunity and present our findings to our sponsor Luigi Fozzati and the *Soprintendenza all' Archeologia*. We conducted a condition assessment on the church floors and catalogued the inscriptions on the artifacts in 26 churches in the *sestieri* of *Santa Croce*, *San Polo*, *San Marco*, and *Dorsoduro*. We created GIS map layers using the program MapInfo to map the locations of artifacts and display floor conditions and heights. This information was used to speculate as to the causes to floor damage. Our group also created a comprehensive, coherent, and maintainable database to archive the information. Finally, we extracted historical information in an effort to preserve the historical record that is contained within the churches of Venice.

# Authorship

Each of the group members contributed equally to the writing and editing of this document.

# Executive Summary

The history of a city is one of its greatest treasures. That history can be passed down through the generations in a number of different ways, including oral traditions, written word, and in the form of art. Art can include sculpture and architecture, paintings and drawings, or anything that captures a city's uniqueness and preserves it for future generations.

In Venice, Italy, one of the most important means of conveyance for its history is through a combination of art and written word. Imbedded in many of the floors of the churches are plaques, tombs, markers, and other such treasures that detail an important event, or mark the final resting place of an important person. The reason churches are such a remarkable means of preservation is that they have a "staying power" unlike any other building. The ground that churches are built on is often considered sacred, and once a church is built upon it, that ground remains church property for centuries at a time. It is this fact that allows for the safe-keeping of these artifacts found in the floors.

Naturally, any building that stands for centuries will require some type of restoration or renovation, and herein lies the problem. For any number of reasons, church floors need to be rebuilt on occasion. Flooding has been blamed for much of the damage, but certainly pedestrian traffic and general wear and tear contribute to the damage. When they are rebuilt, to combat the rising flood waters, Venetian church floors are often built on top of the existing floors. This leaves many of the historically valued artifacts buried beneath two and three layers of floor, and their information is lost.

This loss was unknown until post WWII, when the Church of San Lorenzo was damaged in a bombing raid. While rebuilding the church, workers discovered many artifacts buried in the different floor levels. The *Soprintendenza all'Archeologia* took note of this, and turned the church into an archaeological site. Since that discovery, the *Soprintendenza* has looked to other churches as a resource for historical value.

The goal of this project is to aid the *Soprintendenza all'Archeologia* in their search for archaeological information by determining which churches contain artifacts buried under their existing floors. Our project is a continuation of projects done in 2002 and 2003 by teams of WPI students, all aimed toward the same goal. The past groups have completed 44 churches in Venice, and made recommendations to the *Soprintendenza* about which churches to look to for valuable historical information. These groups performed analysis of the floor condition and height, as well as the artifact condition in each of the churches they visited.

Our project continues where the 2003 project left off. By analyzing floor damage and height, as well as artifact damage, our team was able to select a few churches that we can say with confidence contain historical information buried in artifacts beneath their floors. We developed two different analysis scales for the churches: a Restoration Potential Index, and an Archaeological Potential Index. It is the combination of the two that yields the Excavation Opportunity; that is, a church with a damaged floor and a high probability of having artifacts under it presents a great opportunity for the *Soprintendenza all'Archeologia* to excavate it.

In order to facilitate the preservation of the data currently at surface level, our team created a database showing each artifact found in the churches we visited, and vital information about it including the inscription found on it, its size and location, and current condition. In addition to the database, the team created maps using GIS software that display the damage on artifacts and on floors, to present a visual representation of the Excavation Opportunity.

Finally, our team began the lengthy process of extracting the historical information from the artifact inscriptions. With the help of our on-site liaison we made an initial pass through the inscriptions to find information such as names, dates, occupations, and ages.

# 1. Introduction

In their ongoing study of the history of humanity, archeologists are continually searching for reliable sources of historical information. This task however proves more difficult in today's world where constant destruction and rebuilding have destroyed many artifacts. Yet, churches have escaped this cycle due to their holy status, which makes the ground upon which they sit virtually undisturbed. At other times, church floors will be occasionally affected by restorations or retrofits, thus simultaneously providing free archaeological opportunities while potentially destroying some of the wealth of information that has been kept safe for centuries. The historical information contained within and beneath the floors of churches has great potential and the collection of this information is an opportunity that should not be lost.

The city of Venice, Italy has 123 churches, some dating back a thousand years and their floors have the potential to contain a wealth of historical information. This information is an important part of Venice's cultural heritage, but it is in danger of being lost to both human and environmental factors. In response to the rising tides, the floors of many churches have been raised to avoid *acqua alta*. Many artifacts have been buried in the process and others damaged. This threat to the artifacts in the floors of the churches has only gotten more serious since the increase in tide activity seen after the great flood of 1966. Due to the archaeological richness of Venetian churches and the inconvenience of attempting to restore a church that has buried artifacts, some priests refurbish floors without the knowledge of the *Soprintendenza all'Archeologia* and thus destroy a potential opportunity for discovery. Therefore, a significant part of the history of Venice has possibly been concealed beneath the current floors and foundations of its churches.

Over the past two years, the *Soprintendenza all'Archeologia* and students of Worcester Polytechnic Institute have conducted research concerning the condition of church floors and the artifacts contained within them. Before we began, information had been collected cataloguing the condition of churches located in the *Cannaregio*, *Dorsoduro*, *San Polo*, and *Castello sestieri*. The previous groups have included artifact condition, location in designated quadrant in church, and damage assessment for all artifacts found. Finally, they hypothesized as to causes of damage. The remaining churches to be studied are in the *sestieri* of *Santa Croce*, *San Marco* and on the island of *Giudecca*. There are also some churches in the *sestieri* of *Cannaregio*, *Dorsoduro*, *San Polo*, and *Castello* that have not been completed. Therefore, a complete catalogue of all the church floor and artifact conditions in the city still does not exist. The database that currently exists also lacks the ability to be easily manipulated and the existing analysis of the information collected does not fully capture its significance.

The goal of this year's project was to improve and expand upon the previous projects' database by surveying and analyzing the remaining churches, concentrating on *Dorsoduro*, *Santa Croce*, *San Polo*, and *San Marco*. Our team recorded the floor conditions and heights as well as the artifact conditions and their inscriptions. From these inscriptions, the group extracted their historical information. We conducted an analysis of this information and produced visual records of damage conditions of both the floors and artifacts within the churches as well as flood maps of the floors. Our group performed a final analysis that classified each church by its potential for future excavation. The analysis and cataloguing of these artifacts will prove invaluable to researchers, historians, genealogists, biographers, and the future generations of Venice and of the world.

## 2. Background Information

Throughout world history, archaeology has played a key role in the development of both historical ideas and historical fact[1]. Without archaeology, much current knowledge of the past would have gone undiscovered. Often much of the information gathered about the past can be found in churches because of their high concentration of ancient relics and antiquities.

According to a team of experts performing excavation work on the Church of San Luca, "Most parish churches show some evidence of changes in design, structure and fabric which reflect the development of Christianity in the community. The church and its churchyard will often represent a unique source of information in which the history of architecture, craftsmanship, social change and worship are inseparable. In a sense, archaeological remains are a kind of local document not yet fully understood, and which should therefore be preserved in *situ* for further study wherever possible".[3]

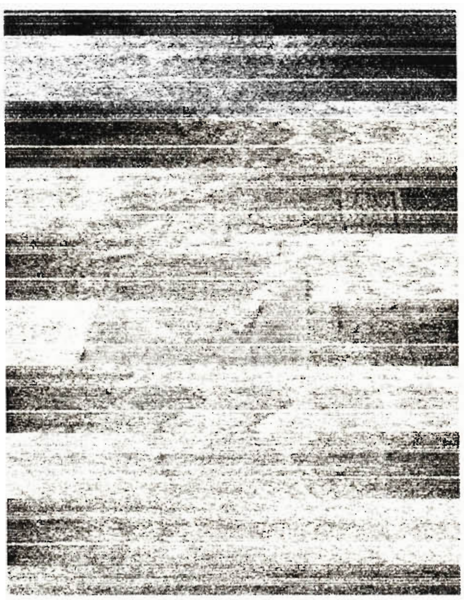

Figure 1: Damaged Floor[2]

In Venice in particular, there is a vast amount of archaeological evidence located in and beneath church floors. This evidence often takes the form of gravestones and plaques, which are unfortunately covered over by new layers of flooring. Because of this it is important that archaeological research be done to discover and new information that may be presented on these antiquities. In the past research conducted in Italy and other parts of the world proved most beneficial as a large quanity of information was discovered[4]. In San Luca "the removal of the surface layer 20-30 cm. thick, has revealed the presence of floors' remains, mortar preparatory layers, walls, vaults, *dating back to a time span between XIIIth and XVIIIth* century.[5]"

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[1] Your Church and Its Archaeology, http://www.leicester.anglican.org/Note%201.pdf
[2] The First Excavation Campaign In The Area Of San Luca's Church In Lucca, http://www.sns.it/html/Groups/Archeo/S.Luca/Archy.html
[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*

## 2.1. Church Construction

Venetian historian and scholar John Ruskin describes the architecture of churches as architecture of protection.[6] In his book, Stones of Venice, he explains that the term architecture of protection can be applied to any structure that is designed to protect men or their treasures from an outside force, be it men or weather. There are three aspects of a building to consider when designing it for protection: the walls, the roof, and the doors[7]. Curiously, left out of this list is the pavement of the building. Often times the floor design was left to a local carpenter, and in some cases even left to the priests of the churches.[8] The buildings were not designed with much attention paid to the pavements. This makes sense, because the actual floor serves little structural or defensive purpose, but is merely aesthetic.

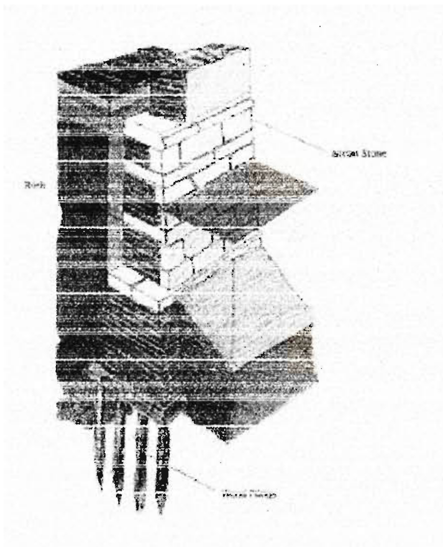

Figure 2: Wall Construction[9]

It was common practice in Venice to build by driving large tree trunks into the soft mud to strengthen the ground that the building will sit on, which is also true of Venetian churches. In Figure 2 the wooden pilings can be seen driven into the ground, with the thick base of the wall built on top of them. Even in this figure the relative unimportance of the floor is evident. It is shown, but not noted, since it is not part of the structure. It is evident that not much attention was paid to floor construction.

[6] Ruskin, John. Stones of Venice. New York: John Riley and Sons, 1884. P 59
[7] Salvadore, Antonio. 101 buildings to see in Venice. Translated from the Italian by Brenda Balich. New York: Harper and Row [1972, c1969]
[8] Ruskin, John. Stones of Venice. New York: John Riley and Sons, 1884. P 60
[9] Hayes, Hilary Lohnes, James Liu, Christian A Salini, and Alexis Steinhart. *An Archaeological and Analytical Study Of Venetian Church Floors.* An Interactive Qualifying Project for Worcester Polytechnic Institute, 2003.

## 2.2. Church Floor Plans

Each church in Venice has a specific and distinct floor layout that determines the areas for worship, congregation, and locations of tombs and plaques. However, almost all Roman Catholic churches have a layout that is based on the traditional historic floor plan[11]. The church is generally in the shape of cross, and divided into three main sections of floor. The narthex is the entrance to the church. It is at particularly high risk for damage it has that largest amount of foot traffic. The largest section is the nave, the area in which the congregation sits and kneels during a service. The nave is the most accessible to the general public, thus making it susceptible to floor damage. The area that contains many of the most significant and precious artifacts is the sanctuary, located at the front of the church. It is usually separated from the nave by several steps, which make it less likely to be damaged by high waters and tourists. The sanctuary includes the lectern, pulpit, apse and altar. The altar serves as the boundary between the laymen and the priests and deacons and is located in the center of the sanctuary. Often altars were the tombs of martyrs, therefore may be nearby engravings and inscriptions[12]. The apse is the wall of the church located at the back of the sanctuary.

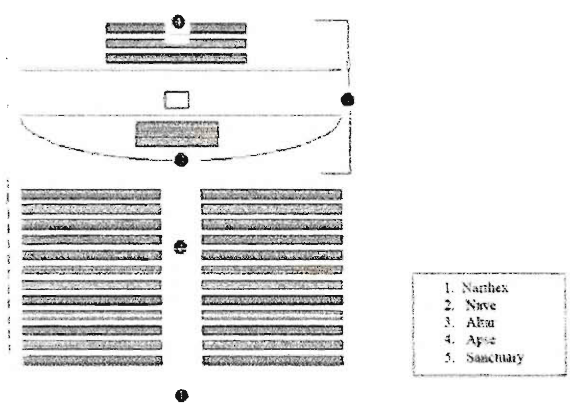


Figure 3: Historic Floor Plan[10]

## 2.3. Burial Practices

Originally, Christian burials within the church were forbidden, therefore most burials took place in family vaults and public catacombs. The only people that were exempt from this and could be buried within the church's walls were members of the clergy and martyrs[13]. However, this changed when the Catholic Church began allowing Roman emperors to be buried inside the church. Eventually this exception expanded to include distinguished persons who possessed both

[10] Interior of a Church Floor Building: Historic Floor Plan http://www.kencollins.com/glossary/plan-1.htm
[11] Interior of a Church: www.kencollins.com
[12] Concina, Ennio. A History of Venetian Architecture. Cambridge University Press: New York, 1998.
[13] http://www.newadvent.org/cathen/03705a.htm

power and riches and it became a status symbol for many religious and governmental figures. In Venice, the privilege of a church burial was extended the rich and powerful Venetians as well as members of the clergy.

Those important Venetians that received the privilege of a church burial were usually members of one of the numerous guilds of workers in Venice, many of which had their own specific tomb in a church that was reserved for the burial of any guild member or one of his immediate family members. The inscriptions on these tombs often contain important historical information about the individual or guild. Figure 5 shows a tomb with such historical information and

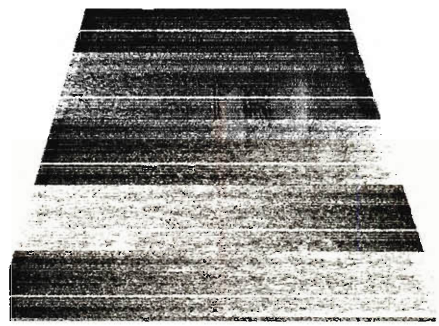

Figure 4: Tombstone Inscription[14]

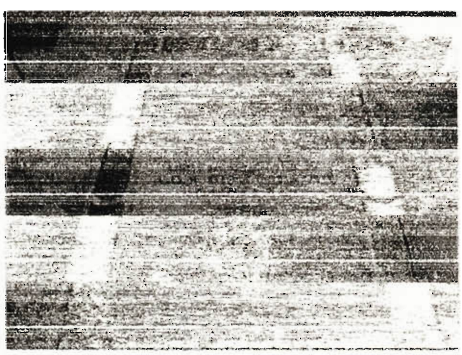

Figure 5: Tombstone with Historical Information

Figure 4 shows an example of a guild's tomb. This figure shows the tomb of the *Scuola Grande dei San Rocco* which can be found in the church of S. Rocco in the S. Polo *sestiere* of Venice. With so few tombs per guild and very scarce burial room in Venice, it was obvious that the tombs would fill very fast. Thus, the Republic of Venice passed a law that ordered the replacement of the sealed bottoms of the tombs with a layer of wooden planks, each separated by at least 3cm, in order to allow water to enter the tombs and flush out the remains so that the space could be reused for ensuing burials.

The practice of burials within the churches however, was halted by an edict that Napoleon issued upon his arrival in Venice at the beginning of the nineteenth century. He outlawed burials within the church walls but instead established the island of S. Michele as Venice's primary public cemetery.[15] This is crucial to our project because after this point in history the tombs were not raised when the floors were raised and therefore it is unlikely that any tombs after the early nineteenth century will be found. It is also very likely that there will be many tombs buried under

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[14] Hayes, Hilary Lohnes, *An Archaeological Study Of Venetian Church Floors*.
15 Plant, Margaret. *Venice Fragile City*. New Haven & London: Yale University Press, 2002.

newer floors, which is a key factor in our determination of which churches have the greatest archaeological potential[16].

16 Curran, J.J. Cemeteries" Catholic Encyclopedia <http://www.newadvent.org/cathen/03504a.htm>

# 3. Methodology

The goal of this project was to aid in the preservation of an important part of Venetian archaeological heritage by compiling a comprehensive catalogue of Venice's church floors, their artifacts, their historical information, and by determining which churches have the highest likelihood of containing more artifacts beneath their floors.

To fulfill this mission, we completed the following four objectives:

- Determined the sources of damage to Venetian church floors and artifacts
- Preserved information contained on artifacts in Venetian churches
- Provided an easily maintainable and modifiable record of information
- Provided the *Soprintendenza all'Archeologia* with suggestions for future excavation.

The rest of this chapter will be devoted to the following, and divided in the following manner:

**Section 3.1** - Defines terms used in the context of this project

**Section 3.2** - Shows the area studied during the project

**Section 3.3** - Explains how we gained access to churches

**Section 3.4** - Explains the structure of the database

**Section 3.5** - Explains the work that had to be done prior to in church data collection

**Section 3.6** - Explains the methods used for gathering and analyzing church floor data

**Section 3.7** - Explains the methods used for gathering and analyzing artifact data

**Section 3.8** - Explains the conversion of 2002 data to the 2004 format

## 3.1. Domain of Inquiry and Definitions

Church: For our project, a church was defined only as a Catholic Church. Churches and places of worship of other religions were not considered in our study.

Floor: The floor included the nave, the sanctuary and any chapels that may have been located to the side of the church and directly accessible from the main floor.

Nave: The architectural term for where the congregation gathers.

Sanctuary: The front part of the church where service is conducted and is usually elevated.

Chapels: An alcove within the church which contains an altar. The chapel performs the same function as the church, but in a smaller scale.

Artifact: An artifact is any kind of artwork or other work of human craftsmanship such as a plaque, tombstone, or other engravings which is separated from the design of the floor. Artifacts must be contained in a floor.

## 3.2. Study Area

Two previous projects have already collected data from churches in the *sestieri* of *Castello*, *Cannaregio*, *San Polo* and *Dorsoduro*. However, not all of the churches in there *sestieri* have been completed. Therefore our group decided to finish the remaining churches in the *sestieri* of *San Polo* and *Dorsoduro* before moving on to new areas of the city. The churches in *Dorsoduro* and *San Polo* can be seen in the maps below. Our group completed the churches colored in red.


Figure 6: Dorsoduro Study Area

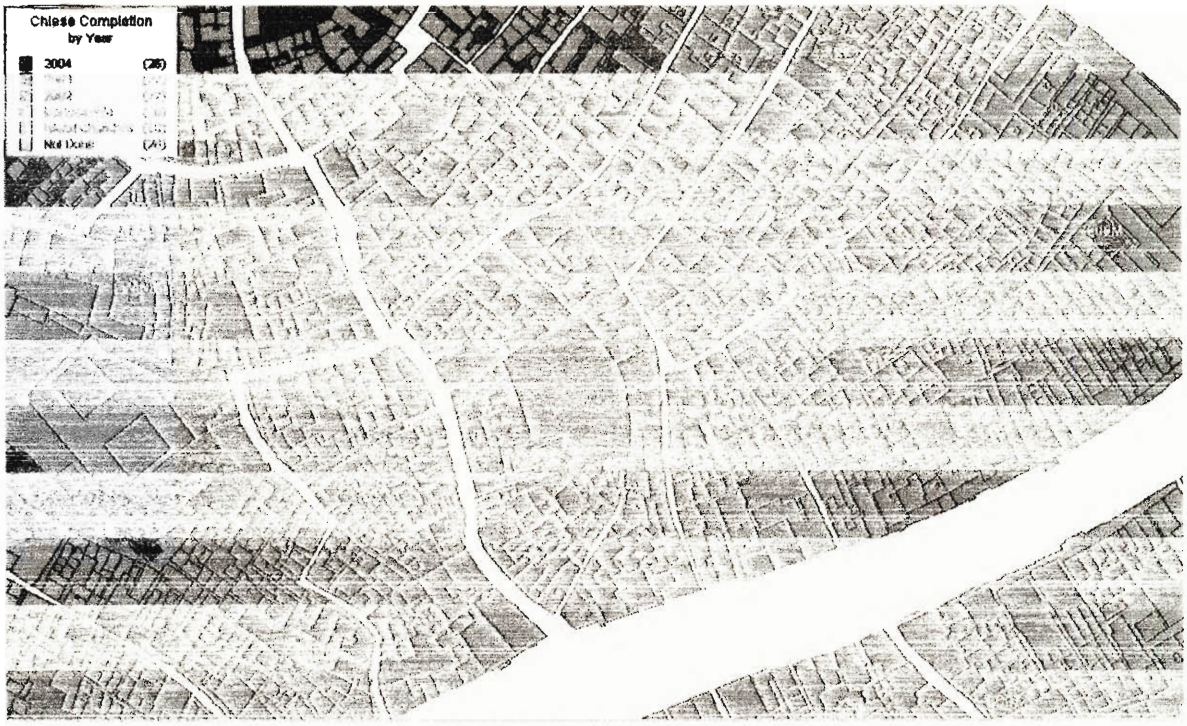


Figure 7: San Polo Study Area

After completing the accessible churches in *San Polo* and *Dorsoduro*, our group focused its efforts on the *sestieri* of *Santa Croce* and *San Marco* because they had yet to be studied. The churches our group completed can be seen in red in the two maps below. A full list of these churches can be found in Appendix B: List of Churches.

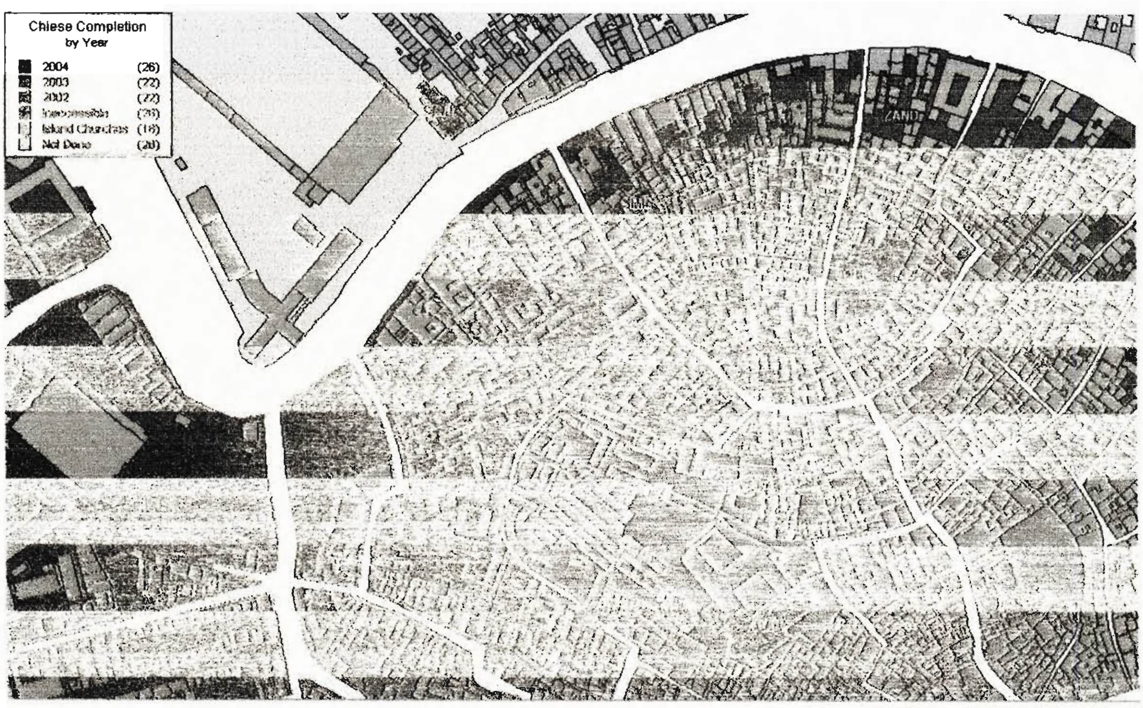


Figure 8: Santa Croce Study Area


Figure 9: San Marco Study Area

## 3.3. *Gaining Access to Churches*

Within the first week of arriving in Venice, the group visited all of the churches that had not been completed in the *sestieri* we were considering to determine their accessibility and compile a list of the opening times of each church. Once we had been to every church and compiled a list of all the churches we intended to study, we handed the list to the *Soprintendenza all'Archeologia* and received a letter from our sponsor, Dott. Luigi Fozzati that we could give to the priest at each church. This letter detailed what we would be doing and kindly asked the priest to allow us to work in his church. In most cases this letter was adequate, yet there were some priests who wanted additional permission from the church hierarchy. Therefore we got in contact with Don Aldo Marongoni, a high ranking church official, who was able to write a letter for us that gave us his permission to carry out our work in the churches of Venice. With these two letters we proceeded to go to churches and perform our data collection. Copies of these letters can be seen in the appendices.

Upon arriving at each church, we found the priest and presented him with our letters and explained what we intended to do. In the event that the priest was not in the church, we rang the bell to his house or looked for a nearby church run school or nursery in order to find someone who had the authority to allow us to work. In the event that only a caretaker was present, we set up a time at which we could return in order to talk to the priest.

Often times the priest of a church wanted to contact the local *parroco* before allowing us into the church. The *parroco* is a priest that is in charge of a few churches in addition to his own. This delayed entry into a few churches, since the *parroco* was not always available when the group was in the church. The letter we had from Don Aldo was addressed to the *parroco*, and not to the individual priests, which was the reason a few of the priests wanted to speak with their superior before allowing us access to the church.

## 3.4. *2004 Database Description*

In order to effectively accomplish the objectives mentioned in the introduction, the team added to and improved upon the database left by the previous two project groups. The database is organized into several tables to effectively catalogue the information. The first table, ***Chiese,*** includes such information as the four letter code used to refer to the church known from this point forward as the *codice*, the local and formal names of the church, its location, phone number, a brief history of the church, and a picture of the facade.

The ***Età di Chiese*** table contains the church ages recorded from various sources to be used for dating. It is intended to be used with the related query to find min and max church dates.

The ***Parroci*** table contains information about the priest and parish of the church. It also contains the current owner of the church, as well as the caretaker and the open hours and mass times. Finally, it contains the information taken from priest forms.

The next table, which is known as ***Pavimenti***, contains information about the floor of the church. For each quadrant, it contains the height, presence of chapel or altars, number of steps to said altars, and floor style if different from main floor

The ***Reperti*** table displays information about artifact location and size. The table shows artifact length and width, the geographic orientation relative to the entrance of the church, and location relative to 2 of the 4 sides of the church, which ever are more convenient. It also describes the shape and type of artifact, as well as the primary, secondary materials and latches. In addition, the table contains a copy of the inscription on the artifact, and a description of the art found on the artifact. Finally, it contains the extracted historical information which is *Nome* (indicates presence of name on artifact) first, middle, and last name, date, month and year of death, and place and profession.

The remaining two tables provide information about the condition of both the artifacts and the floors. The ***Condizione Valutazione dei Pavimenti*** describes the condition of the floors based on a number of criteria including cracks, joint gaps, holes, floor replacement, and floor detachment. The ***Condizione Valutazione dei Reperti*** describes the condition of the artifacts based on the same criteria, but adds the readability of the inscription found on the artifact.

The database also contains a set of useful queries to aid in the organizing of information. There are separate queries for each years' floor and artifact information. There is also a combined artifact damage assessment, a combined floor damage assessment, and averages for each church for floor quadrants and artifacts. Extracted and un-extracted inscriptions can be found with two queries. We created another query that finds the church min and max age and corresponding source. There is also a query that assesses the flood vulnerability of each church. There is also a query to calculate the artifact area of a church, used to calculate archaeological potential. There is also a query that contains the artifact readability score. Finally, there are three queries that calculate the archaeological and restoration potential, and the excavation opportunity.

The database also contains data entry forms to facilitate ease of use. The ***Pavimenti*** and ***Reperti*** forms aid in artifact and floor information entry. ***Inscrizione*** and ***Informazione Storichi*** facilitate artifact transcription and historical information extraction. Finally, the ***Chiese*** form shows a convenient way to view all collected information.

## 3.5. Preparation for Data Collection

Before the data collection process could take place in the church, some preparation was required. Prior to arriving at the church, the building floor plan needed to be mapped onto the corresponding church in the GIS program, MapInfo. The building floor plan was mapped in using Raster images of all the *pianni tipi* of Venice from the Ministry of Public Works in Venice. This allowed us to have a picture of interior of the church that showed such things as columns and other structural features. An example of a church floor plan can be seen in Figure 10.

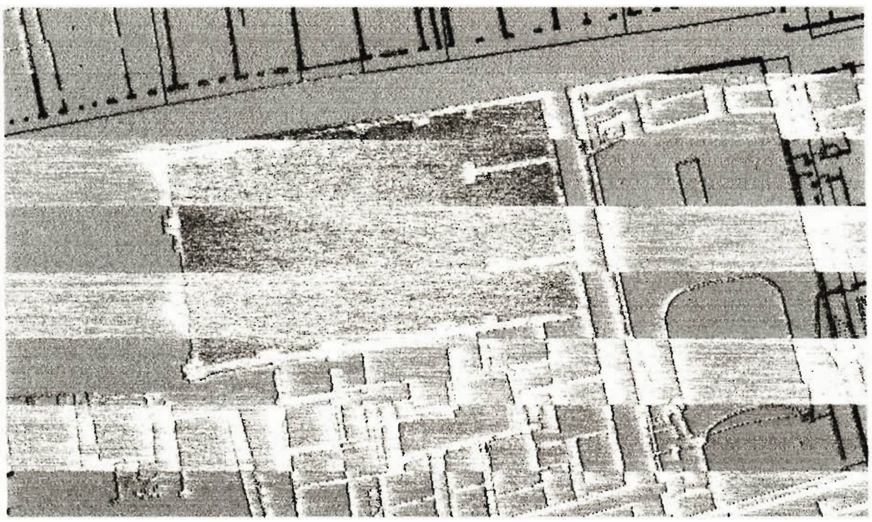

Figure 10: Example of a Raster Image used for Floor Plans

Once the group arrived at the church, this image of the inside of the church helped us to divide the church into smaller areas of study called quadrants. Quadrants are divisions of a church floor used to assist the data collection and cataloguing process. They allowed for a smaller area of analysis, which improved the accuracy of measurements. We used large immovable and easily recognizable objects to separate quadrants. These were mainly the columns and walls of the church that could be found on our floor plans. This allowed us to accurately draw the quadrants used in the church in MapInfo. The number of quadrants varied depending on the size and shape of each church such that each quadrant was a manageable size for assessment. Areas of the church not contained in the nave were generally given their own quadrant, regardless of shape or

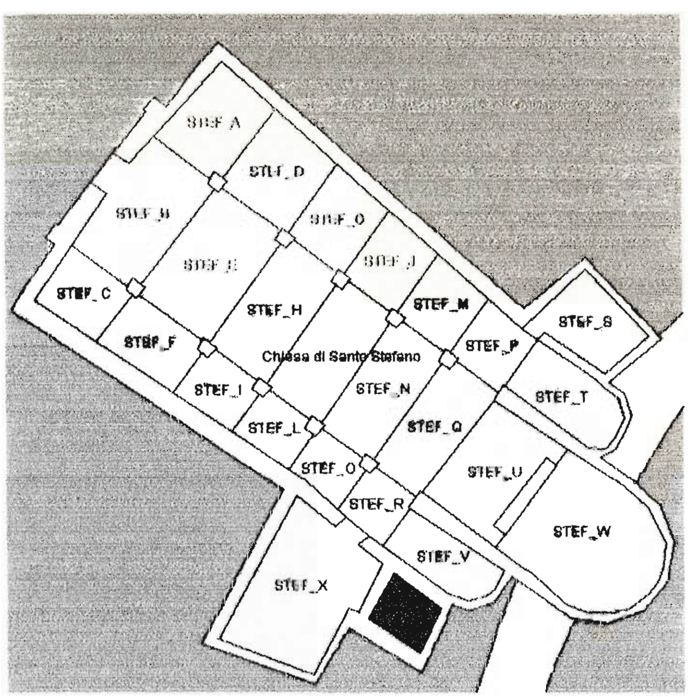


Figure 11: Church Floor Quadrants

size. Once quadrants were drawn, they were then named in the following fashion. Upon entering the church, the group proceeded as far left as possible, and named that quadrant A. The name given to the quadrant was "Codice_A." The *codice* is a code given to each church and the *codice* represented in Figure 11 is "STEF". The quadrants were then named by ascending letters going parallel to the main entrance from left to right and advancing toward the main altar. The main floor was named first and then side chapels were named in the same fashion. After quadrant "Codice_Z" the next quadrant would be named "Codice_AA", "Codice_AB" and so on if needed. An example of this naming system can be seen in Table 1 and an example of quadrant demarcation can be seen in Figure 11.

We also devised a systematic method of artifact naming. In each quadrant, the artifact closest to the back of church, and farthest left was numbered artifact one. In Figure 12 this is ZULI_A1. Proceeding forward towards the main altar, any artifact encountered on the same centerline as artifact one was numbered artifact two, and so on. Once the front of a quadrant was reached, we proceeded right to the next artifact, and again started at the back of the church and proceeded forward. See Figure 12 for a visual representation of the artifact naming method.

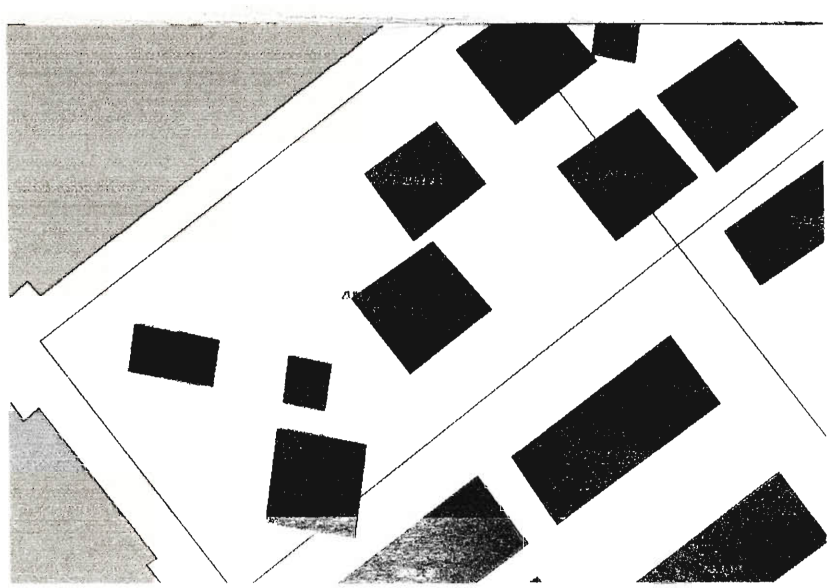

Figure 12: Artifact Naming within Chiesa di San Zulian (ZULI)

### 3.5.1 Naming

Naming for artifacts and pictures uses a similar format to the quadrant naming. Naming allowed us to organize data in our database in a logical manner and allowed for portability of data between Access and MapInfo. The table below shows how the naming for quadrants, artifacts and pictures was done.

| | | | | |
|---|---|---|---|---|
| Church Code | Codice | STEF | | All codes are in capitals |
| Quadrant Code | Codice_Letter | STEF _A | | |
| Artifact Code | Codice_LetterNumber | STEF _A1 | Letter of Quadrant | Number of Artifact |
| Artifact Picture Code | Codice_LetterNumber | STEF _A1 | Letter of Quadrant | Number of Artifact |
| Façade Picture Code | Codice | STEF | | All pictures for a church are placed in a folder titled with the church's codice |
| Main Floor Picture Code | Codice_Main | STEF _MAIN | | See note above |
| Floor Quadrant Picture Code | Codice_Quadrant | STEF _A | Letter of Quadrant | See note above |
| Complete Floor Picture Code | Codice_Complete | STEF_COMPLETE | | See note above |

Table 1: Naming System for Data Collection

Once the preparatory work was completed for each church, actual data collection in the churches could take place.

## 3.6. Collecting Data about Church Floors

Data collection fell into three main categories, the first being Art, Designs, and Materials. The second involved all the measurements taken within the churches and the third was the actual evaluation of the conditions of the floor. The following section also includes an explanation of our overall assessment formula for each quadrant as well as an example of the data entry forms used.

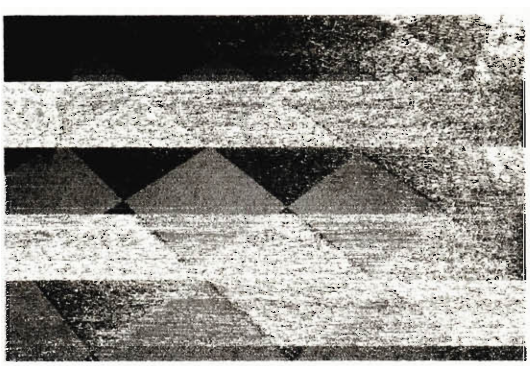

Figure 14: Standard Venetian Floor Pattern

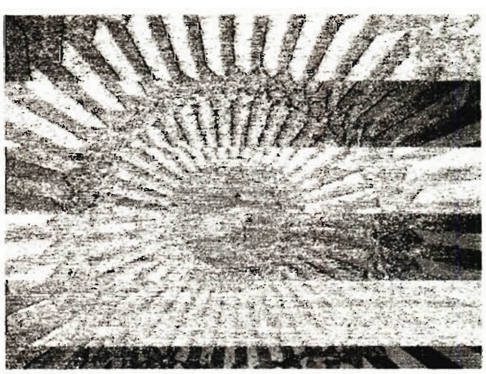

Figure 13: Intricate Floor Design in San Salvador

### 3.6.1. Art, Designs, and Materials

The team recorded the general design of each floor, as well as the primary and secondary materials it was constructed from. The percentage of the floor that was covered in carpeting was also recorded.

### 3.6.2 Elevation Measurements

The team measured the area of each quadrant as well as the height of the floor at the center of the quadrant. The floor heights were determined using a laser level positioned at a place of known height and it was shone onto a metric measuring tape at the desired position. The height of the desired spot at which the laser struck the measuring tape was determined by taking the difference between the height of the laser and the height recorded on the measuring tape. That difference was then added to the known height to determine the height of the desired location; as shown in Figure 15.

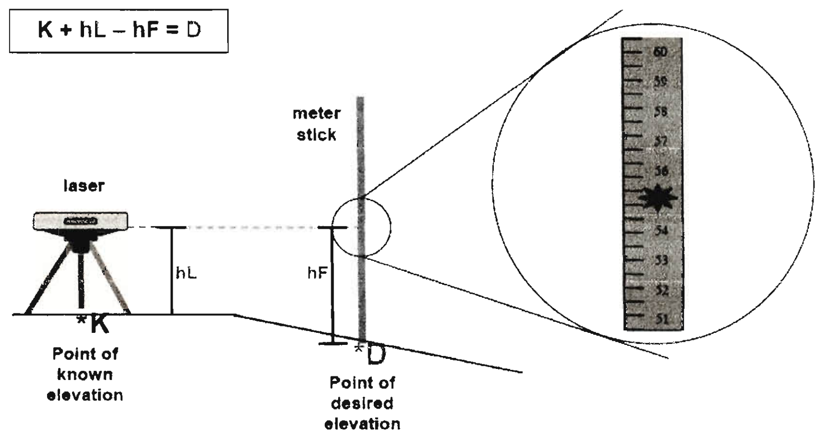


Figure 15: Measurement and calculation of the elevation of a floor quadrant.[17]

### 3.6.3 Floor Conditions

Floor damage was collected in two categories: structural and surface damage. Structural damage was collected in three categories: Cracks, Holes, and Joint Gaps. Each of these categories was judged on a five point scale of severity, from 0 – 4, where 0 is perfect and 4 is the most severe case of its kind. Surface Damage was collected using three criteria: Wearing and Fading, Pitting, and Water Damage. Each of these categories was also judged on a five point scale of severity. For a detailed description of the criteria used to rank each type of damage, see Appendix C: Damage Assessment Tables.

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[17] *Ibid.*

### 3.6.4 Quadrant Assessment Formula

The 2003 project developed a standard damage assessment formula that gave equal weight to four factors they felt represented the damage conditions of the floors and artifacts. The four factors included in the formula were surface damage, holes, cracks and joint gaps. These factors encompass both surface and structural problems and thus give the most complete view of the condition of each quadrant. Each factor was given an equal weight by the previous group based on recommendations they received from civil engineers.

In each quadrant, the worst part of the floor in each category received the worst case score and the percentage of the quadrant that had this worst case score was estimated. Then the remaining portion of the quadrant was given an average score in each category. The worst case score and average score in each category were then combined in the manner shown in Figure 16. The final score was a number between 0 and 4, thus compatible with the other damage ratings, where 0 indicated a floor with no damage and a 4 signified the highest severity of damage over 100% of the floor in every category. Using both a worst case score and an average score allows the formula to take into account both the severity and the frequency of the damage. This formula allowed us to directly compare each floor surveyed.

This year's group furthered the development of the formula by adding different weights to the damage categories. Based upon our analysis, we determined that surface damage was the most important factor in artifact and floor damage. Surface damage was therefore given a weight of .5, or fifty percent of the total damage score. We felt that cracks and joint gaps were equally important to the structural damage of the tile or artifact, but less important than surface damage. Based on that, those two categories were each given a rating of .2, or twenty percent of the total damage score.

Holes, while important to the structure of the tile or artifact, were very rare. Giving the holes a high percentage of the total damage score would often yield low total damage scores for quadrants or artifacts.

$$\left[\underbrace{(.5)\begin{pmatrix}(X)(WCS)\\+\\(1-X)(S)\end{pmatrix}}_{\text{Surface Damage}} + \underbrace{(.2)\begin{pmatrix}(X)(WCS)\\+\\(1-X)(S)\end{pmatrix}}_{\text{Cracks}} + \underbrace{(.2)\begin{pmatrix}(X)(WCS)\\+\\(1-X)(S)\end{pmatrix}}_{\text{Joint Gaps}} + \underbrace{(.1)\begin{pmatrix}(X)(WCS)\\+\\(1-X)(S)\end{pmatrix}}_{\text{Holes}}\right]$$

WCS = **Worst Case Score**
X = **Percent of Worst Case**
S = **Average Score**

Figure 16: The standard assessment formula used on the floor quadrants and the artifacts[18]

[18] *Ibid.*

Therefore, the category of holes was given a low percentage of only ten percent of the total damage score.

The formula that we used can be seen in Figure 16.

### 3.6.5 Floor Data Entry Forms

Floor data was entered directly into the Access database using data entry forms created by the group. Examples of these forms can be seen in the figures below.


Figure 17: Floor Data Entry Form 1

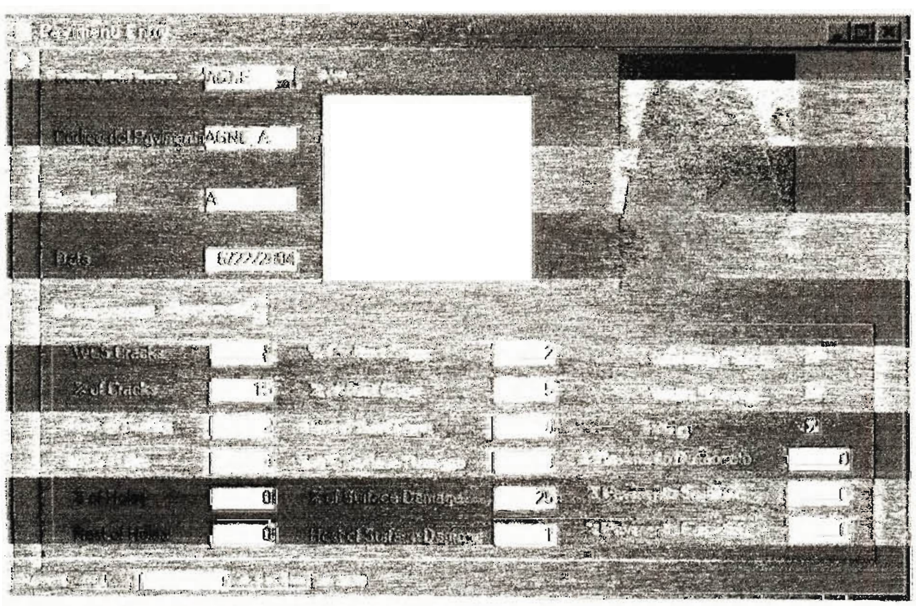



Figure 18: Floor Data Entry Form 2

## 3.7. *Collecting Data about Artifacts on Church Floors*

Data collection fell into three main categories, the first being artifact measurements. The second describes the condition assessment of the artifacts and the third discusses the information extracted from the artifacts.

### 3.7.1. Measurements

The team measured the X and Y coordinates of the artifact relative to the outer walls of the church. This measurement allowed for proper placement of the artifact onto a MapInfo layer. Most often the X-coordinate was measure from the left wall, and the Y-coordinate was measured from the back wall. This was done because artifact data collection began in quadrant "A" and measuring from the same point was easier than measuring from all four walls. The length and width (or diameter for circular artifacts) of each artifact

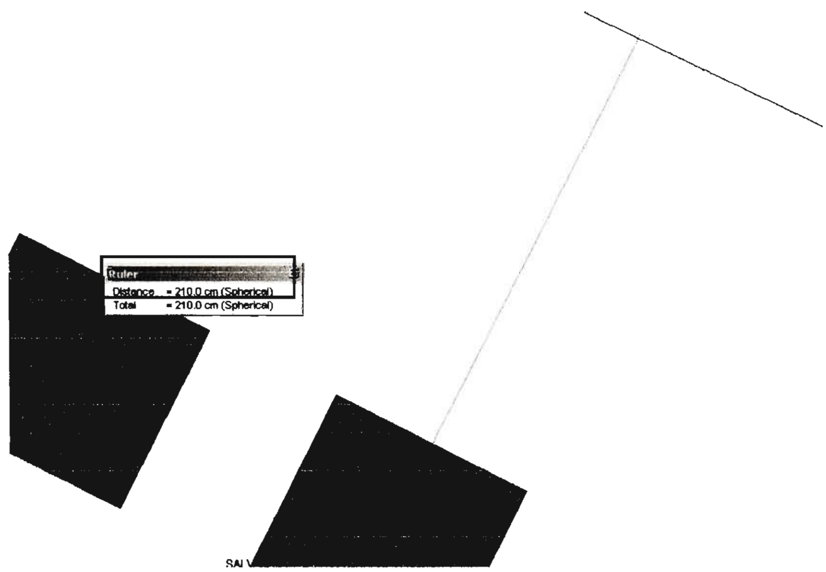



Figure 19: Artifact X and Y Coordinates in MapInfo

was also recorded. This allowed for a proper representation of the artifact in a MapInfo layer. A visual example of this measuring and MapInfo placement can be seen in Figure 19.

### 3.7.2 Artifact Conditions

The conditions of the artifacts were evaluated on exactly the same criteria used to evaluate the church floors, namely cracks, joint gaps, holes, surface damage, and the overall evaluation formula.

### 3.7.3 Extracting Inscription Information

There are three types of data that were collected regarding the information content of an artifact. The primary and secondary materials were recorded. A short description of the design and any distinguishing features was also recorded. Finally, the text of the artifact was recorded, using a text readability assessment developed by previous projects. We recorded easily distinguishable letters of the inscriptions as is, and for all other special cases we used the symbols shown in Table 2.

| Symbol | Denotation |
|---|---|
| [ ] | Missing or illegible letters |
| [ ANNO ] | Missing or illegible letters guessed to be 'ANNO' |
| "A" | 'A' is damaged but legible |
| ( Coat of Arms ) | A coat of arms symbol is located in between text |
| A (^C) | 'A' followed by a superscript 'C' |
| A (ˇC) | 'A' followed by a subscript 'C' |

Table 2: Text Symbols[19]

While the inscriptions were being recorded, each letter was given a readability grading. The letters were rated as perfect, damaged, or unreadable. Figure 20 shows an example of a tomb inscription with perfect letters underlined in blue, damaged letters underlined in red, and unreadable letters underlined in green. The numbers are then weighted by 3 for unreadable, 2 for damaged, and 1 for perfect, and then multiplied to achieve a final readability score. Figure 21 shows the readability equation and weightings used to calculate the readability score.

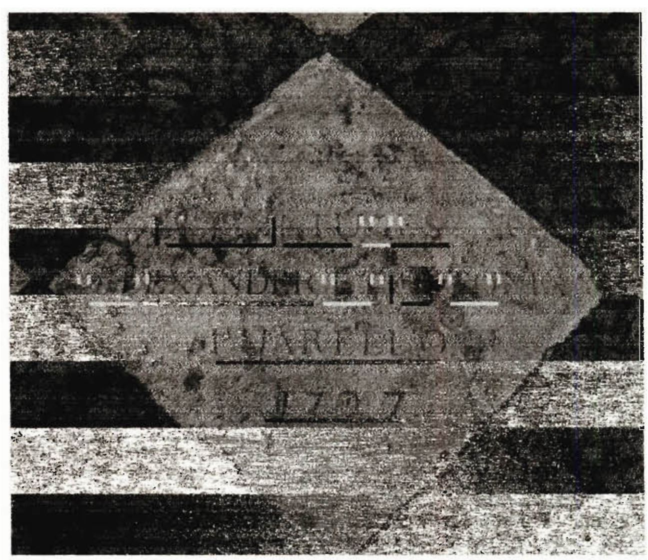


Figure 20: Readability Example

[19] *Ibid.*

**Multiply Percent Perfect by 1** 25/38 * 1=65.78

**Multiply Percent Damaged by 2** /38 *2 = 36.8

**Multiply Percent Unreadable by 3** 6/38 *3 = 47.37

**Add all three to get the readability score from 100 to 300**

65.78 + 36.8 + 47.37 = 150

Figure 21: Readability Assessment

### 3.7.4 Artifact Data Entry Forms

Artifact Data was entered directly into the Access database using data entry forms created by the group. Examples of these forms can be seen in the figures below.

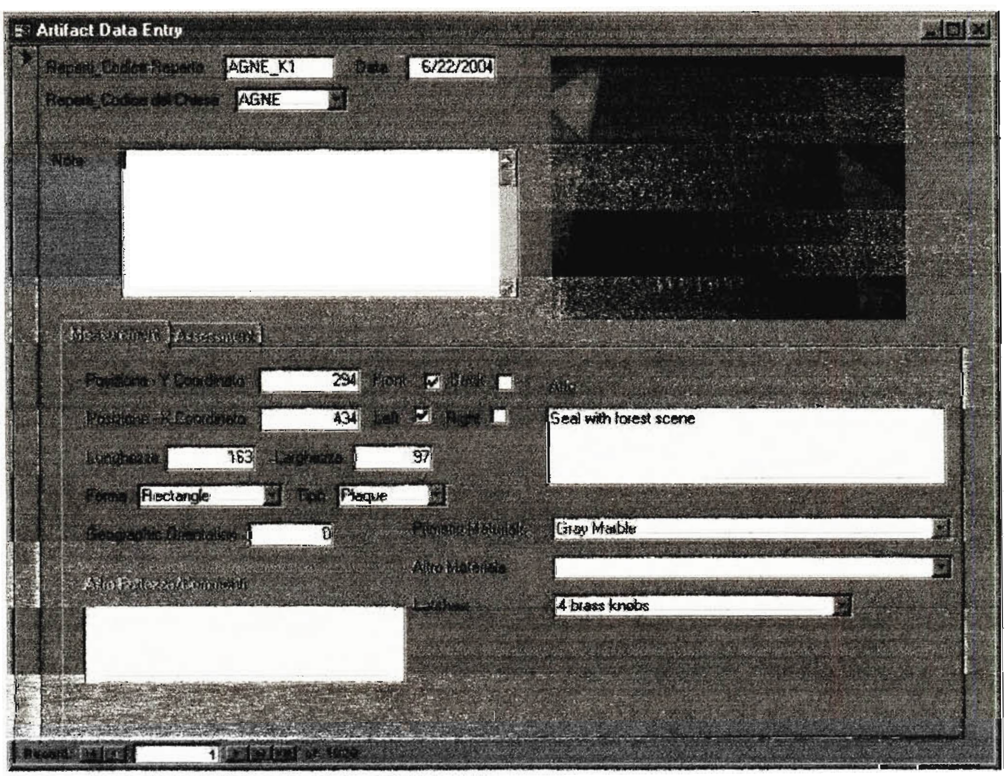



Figure 22: Artifact Data Entry Form 1

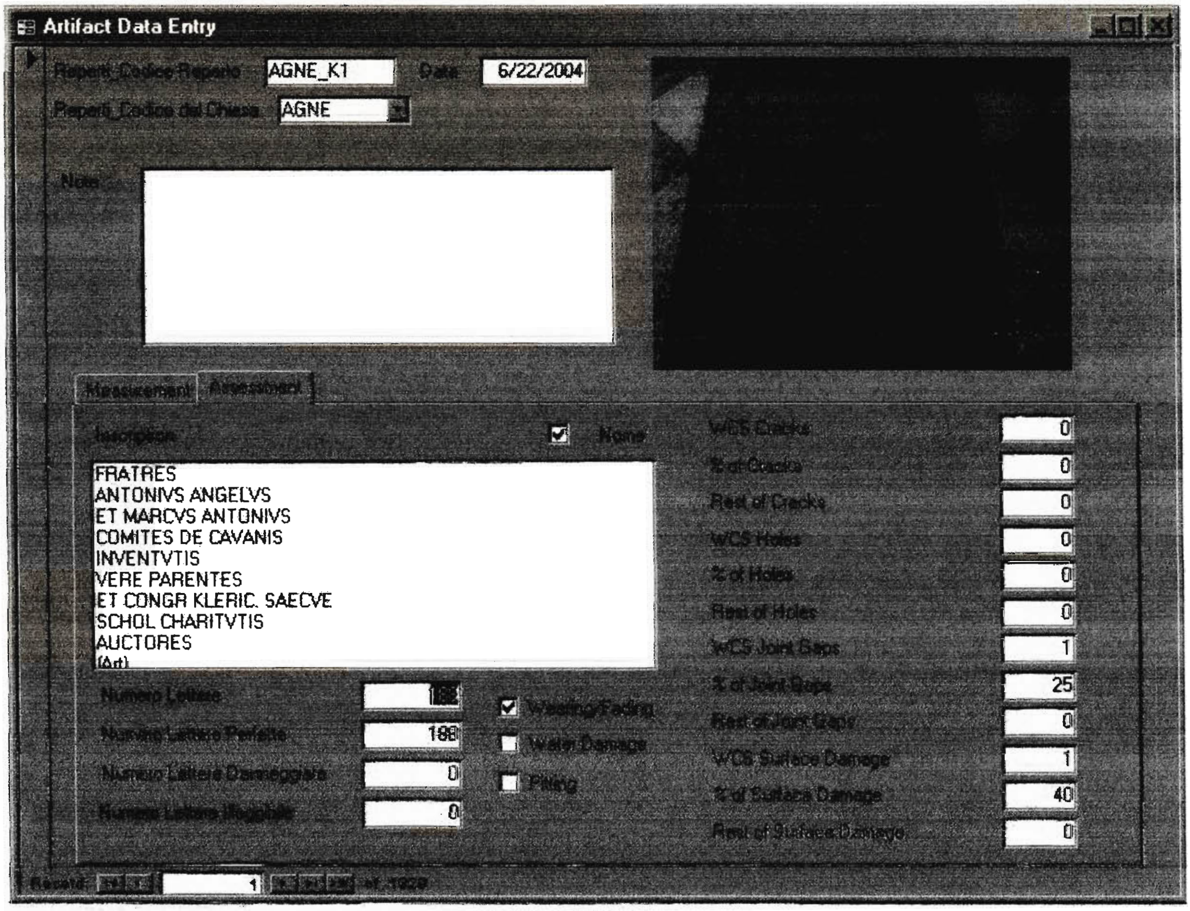



Figure 23: Artifact Data Entry Form 2

## 3.8. Data Conversion from 2002 to 2004 Format

The 2002 project team collected data on floor conditions in a different method than that of the past two projects. To solve this problem we converted their data to match our own by using a method based upon certain trends that we observed while conducting field research. These conversions apply to both artifact and floor data.

### 3.8.1 Floor Data Conversion

The 2002 project collected crack data in three different categories: total number of problem cracks, total length of problem cracks, and percentage of quadrant covered by problem cracks. We converted this information to match our data using the following steps:

- We found a Crack Severity (C.S.) score by dividing the "Total Length of Problem Cracks" by "Total Number of Problem Cracks"
- We then averaged the C.S. and all numbers above average received a score of 4 for WCS. All numbers below average received a score of 3 for WCS.
- The percentage of WCS for "4" values will be 15% for "X" and for "3" will be 10% for "X".
- We then took the surface crack percentage and applied the following scores for "S"

  >20% received "2" for S

  <20% received "1" for S

  0% received "0" for S

- We then applied the overall values to our formula

  [(WCS)(X) + (1-X)(S)]

From our research on floors, we discovered that if a crack appeared on an artifact or section of floor, it almost always fell into a damage category of three or four. For this reason, the decision was made to exclude a damage rating of one and two for the purposes of data conversion.

Our research also showed us that cracks most often covered either 10 or 15% of the quadrant or artifact. This was a rounded number used to estimate the percent of worst case.

The "Total Length of Problem Cracks" category used by the 2002 group is somewhat synonymous with our "Percent of Worst Case" category. Since that data is used while converting the data, it plays a part in determining if the crack score comes out to a three or four. For this reason, we decided that any crack receiving a score of 3 would cover 10% of the item, and a score of 4 would cover 15% of the item.

The 2002 project collected hole data simply in the number of holes found. We converted this information to match our data using the following steps:

- If there is one hole, we gave it a WCS score of "3", or if there was more than that it was given a WCS of "4".
- If there is one hole, we gave it a % score of "5", or if there was more than that it was given a % of "10".

- Everything was given a Rest score of 0.
- We then applied the overall values to our formula

$$[(WCS)(X) + (1-X)(S)]$$

From our experience in the field and the data collected, the 2002 methodology only categorized very severe holes as holes. Thus, what they considered as holes were only what we considered 3 or 4 holes. Our research also showed us that holes most often covered a very small percentage of the area, so are either 10 or 15% of the quadrant or artifact. This was a rounded number used to estimate the percent of worst case. Since they only considered very severe holes, we did not convert any scores of "1" or "2".

The 2002 project collected Surface Damage differently for floors and artifacts. Floor surface damage was collected simply as the area of surface damage. We converted this information to match our data using the following steps:

- If the percentage of surface damage is greater than 75%, then it was given a "4" for a worst case, and if it is less than that it was converted to a sliding scale using a formula (SD – 75)/18.5.
- % was given "100" and Rest was given a score of "0"

The floor damage was interpreted this way because the 2002 methodology recorded increasing amounts of damage as higher numbers, therefore a higher percentage of damage recorded corresponds to a higher overall number in our formula. We used 100% and 0 for Rest so to make the WCS the determining characteristic of the surface damage.

### 3.8.2 Artifact Data Conversion

Artifact surface damage was collected in two ways. Firstly they gave a simple percentage which we assume is mainly pitting due to their collection of wearing and fading in a different manner. Secondly they collected wearing and fading on a 0-4 scale in which they percentage of each category of damage was recorded. We converted this information to match our data using the following steps:

- We applied a score of 4 to anything above 50% otherwise we applied a sliding scale of 0-3
- We then averaged this number with their 0-4 score for wearing and fading

The artifact damage was interpreted this way because the 2002 methodology recorded increasing amounts of pitting as higher percentages, therefore a higher percentage of damage recorded corresponds to a higher overall number in our formula. After averaging this number with their 0-4 score for wearing and fading we gave this new number for 100% of the WCS and a 0 for the rest in our formula.

The 2002 project collected Joint Gaps differently for artifacts. There was no Joint Gap information collected for floors, so "0"s were recorded for those categories in our data. Artifact Joint Gaps were collected as an area of gaps. We converted this information to match our data using the following steps:

- If the area of joint gaps is greater than 50, then it was given a "4" for a worst case, and if it is less than that is was converted to a sliding scale using a formula JG/12.5.
- % was given "100" and Rest was given a score of "0"

Artifact joint gaps were interpreted this way because the 2002 methodology recorded increasing amounts of damage as higher numbers, therefore a higher percentage of damage recorded corresponds to a higher overall number in our formula. We used 100% and 0 for Rest so to make the WCS the determining characteristic of the surface damage.

The floor detachment and floor replacement data that was recorded for the floor was kept as is.

# 4. Results

The group visited 46 churches in the *sestieri* of *Dorsoduro*, *Santa Croce*, *San Polo*, and *San Marco* and of these churches collected data from 25. The other 21 churches were deemed inaccessible and a list of these churches with reasons for inaccessibility can be found in Appendix B: List of Churches. There were a total of 770 artifacts and 308 floor quadrants surveyed. After collecting all of the necessary data from the churches, the team entered it into the database, and generated useful graphs to display the data. In this section, the data is displayed in its purest form, with no analysis done to it. For ease of viewing, the data is displayed in ascending order of damage were applicable.

## *4.1. Quadrant Damage*

Quadrant damage information was collected and entered as described in the methodology section. Once collected, the data was entered into the assessment formula to attain numbers on the 0-4 scale. The damage scores for all of the quadrants of a church were averaged to obtain the numbers shown here.

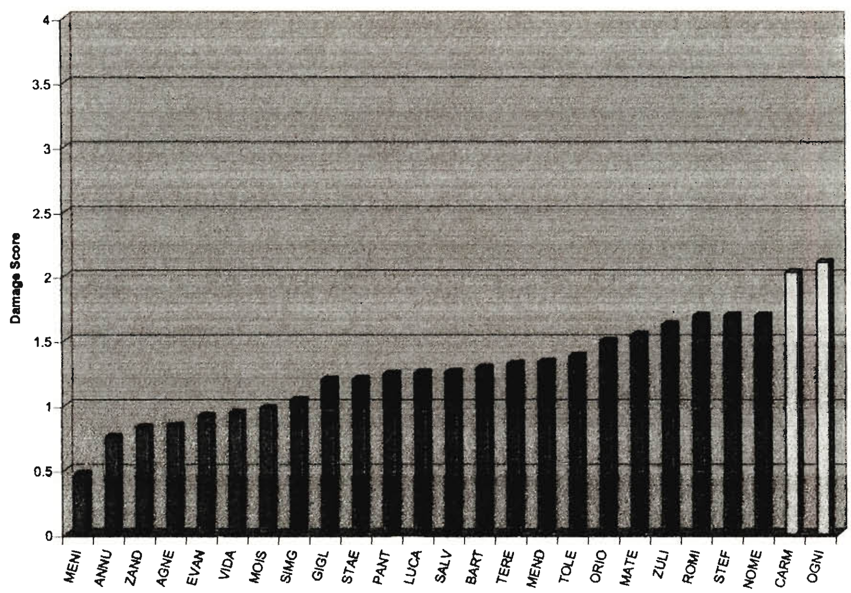
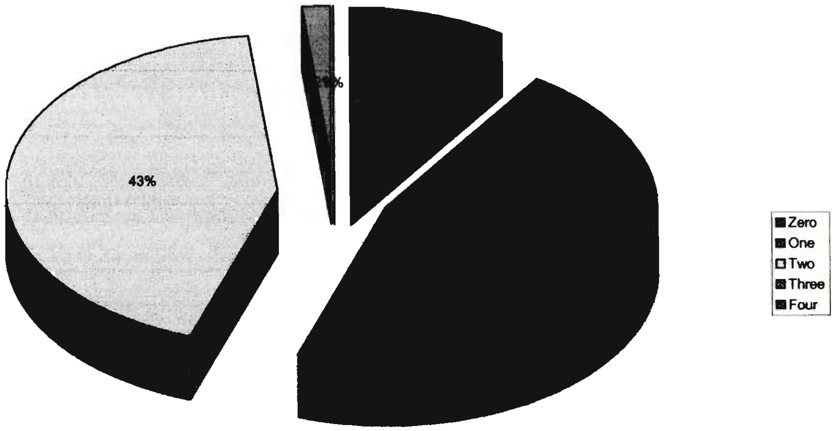



**Figure 24: Average Quadrant Damage**

The following pie chart displays the number of floor quadrants whose damage score falls into each of the five categories on the 0-4 scale. The assessment formula was used to generate the values shown here.




Fiaure 25: Quadrant Damaae on 0-4 Scale

This map displays the average floor damage by church on the 0-4 scale. These scores were taken by averaging the overall floor damage scores for each quadrant in each church and rounding them to the nearest number on the 0-4 scale.


Figure 26: Map of Overall Floor Damage by Church

## 4.2. Floor Quadrant Heights

In addition to quadrant damage information, the team collected information about floor quadrant height. The quadrant heights for each church were averaged and are displayed here in a bar graph.

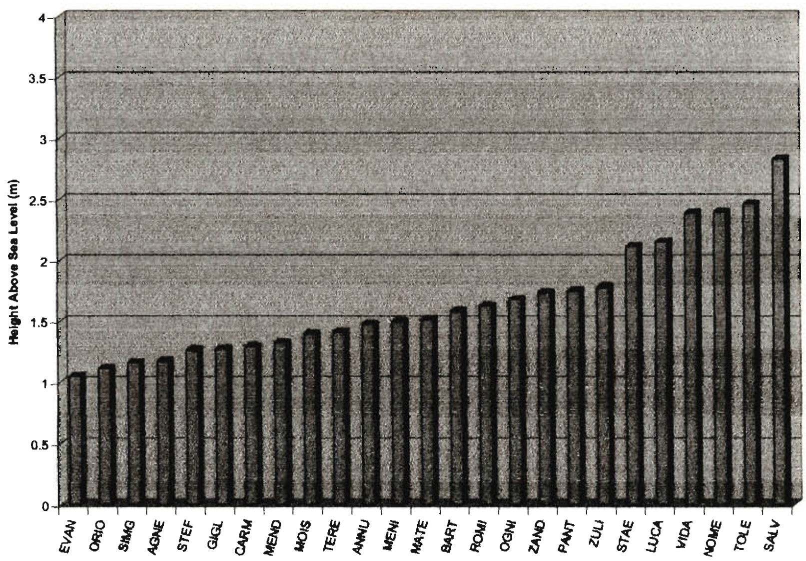



Figure 27: Average Floor Heights

Quadrant height information was also categorized and broken down into three groups according to the *aqua alta* alarm levels. These alarm levels correspond to water heights of 110cm, and above 140cm. At these heights the warning alarm sounds to notify citizens. The pie chart below shows the percentage of floor quadrants whose heights fall into the three flood level categories.

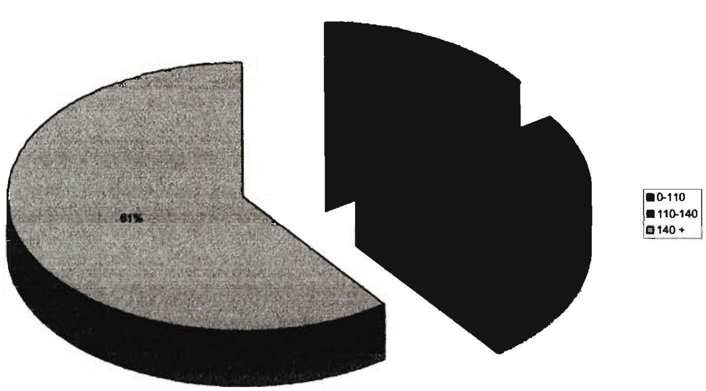



Figure 28: Quadrant Heights on Aqua Alta Scale

This map displays the average floor height by church above Venice's zero-marker. These scores were obtained by averaging the floor quadrant heights in each church.


Figure 29: Map of Average Height by Church

## 4.3. Quadrant Damage for Individual Churches

The group also chose to display quadrant data on a church-by-church basis. Figure 30 is a MapInfo capture of quadrant damage from Chiesa di San Zulian. The data was collected and created in a similar manner to the artifact scores, and the assessment formula was used.

Again similarly to the artifact damage, only one church will be included in this section for the sake of space. The remaining graphs for the rest of the churches visited by the group can be found in the appendices.

Figure 31 is a MapInfo capture of floor heights in San Zulian. Similar images for each of the other churches surveyed by our group can be found in the appendices.

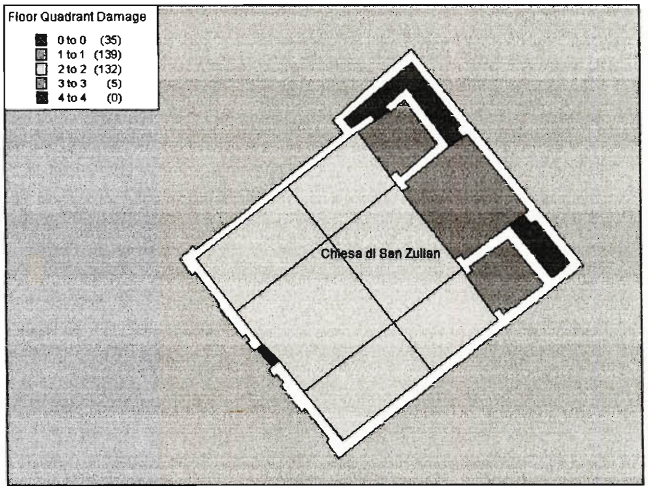



Figure 30: Floor Damage Assessment in San Zulian

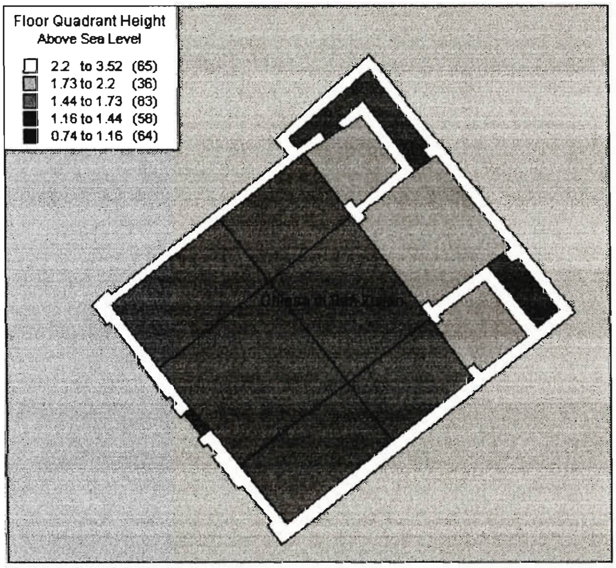



Figure 31: Quadrant Height in San Zulian

## 4.4. Artifact Damage

The first graph shows average artifact damage organized by church. This graph utilizes the group's assessment formula to generate a final score between 0 and 4 for each artifact. The scores are then averaged for each church, and the average is displayed as the height of a bar.

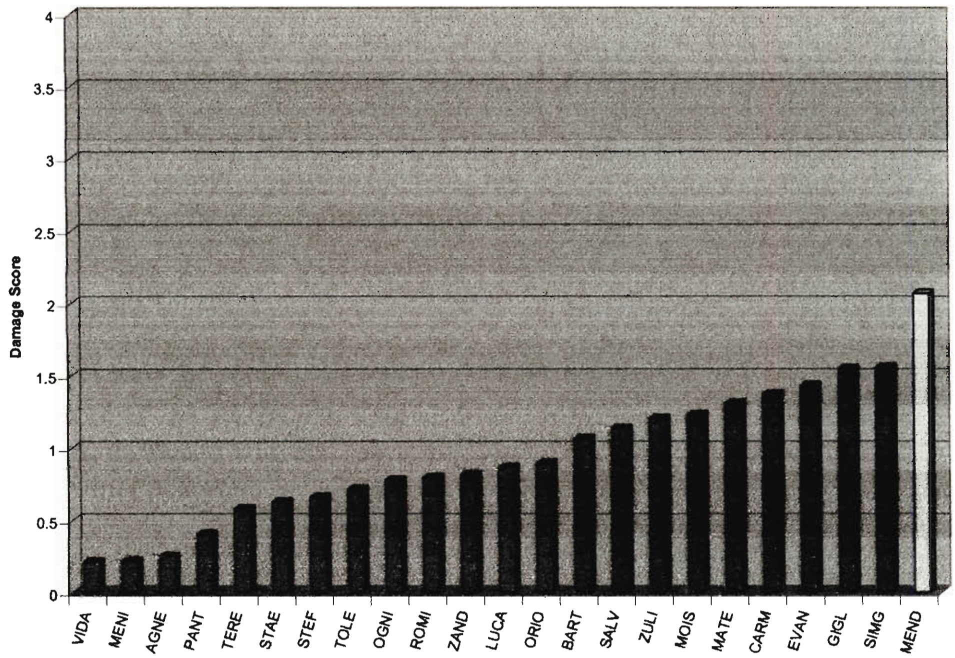



Figure 32: Average Artifact Damage

The second graph is a pie chart that displays the number of artifacts whose damage score falls into each of the five categories on the 0-4 scale. Again, the assessment formula was used to generate the numbers.

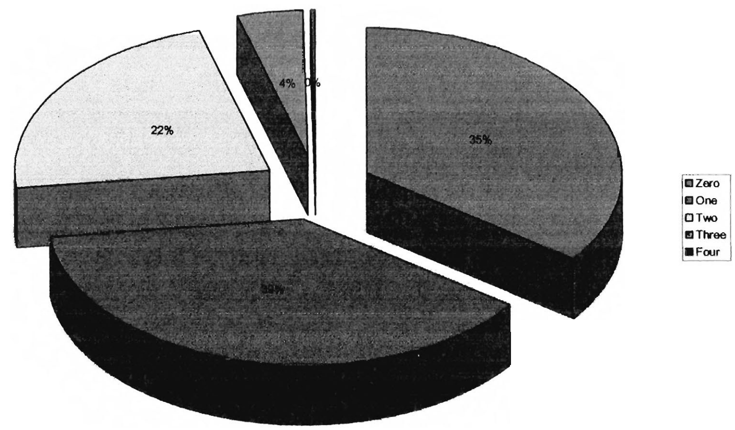



Figure 33: Artifact Damage on 0-4 Scale

This map displays the average artifact damage by church on the 0-4 scale. These averages were taken by averaging the artifact damage scores in each church and rounding them to the nearest number on the 0-4 scale.

## 4.5. Artifact Text Readability

After using the text readability formula to calculate a score for each artifact, the scores for all of the artifacts in each church were normalized onto the 0-4 scale. This graph displays the average scores for each church.

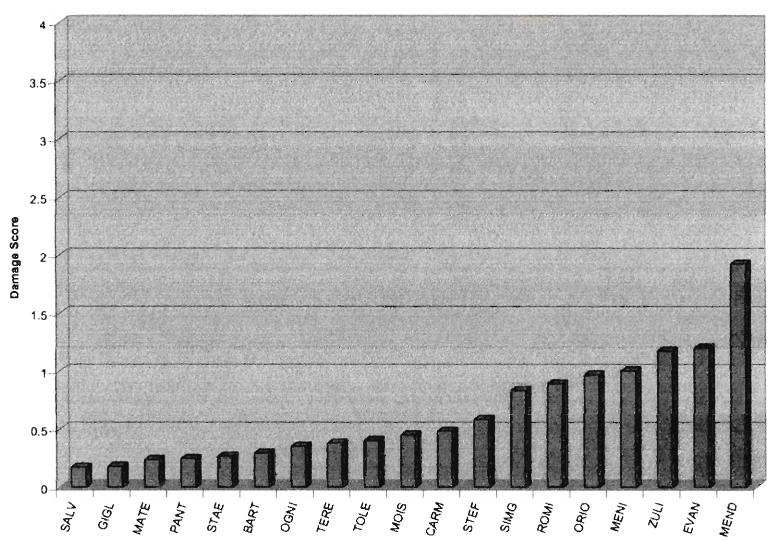



Figure 34: Text Readability Averages


Figure 35: Map of Overall Artifact Damage by Church

The following pie chart shows the number of total artifacts whose readability score falls into each of the five categories in the 0-4 scale. This graph is not an average of church scores, but done on a per-artifact basis. Again, the text readability formula was used to calculate the values which are displayed here, which were then normalized onto the 0-4 scale.

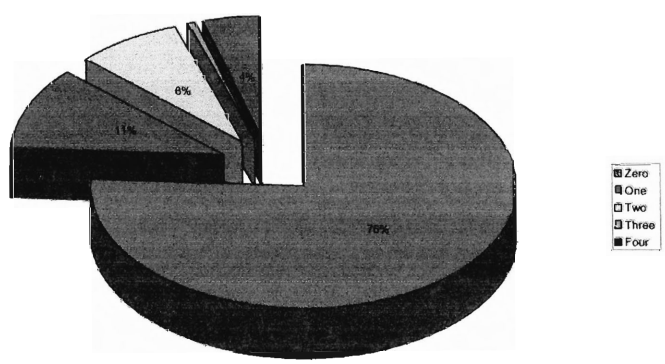



Figure 36: Text Readability on 0-4 Scale

This map displays the overall artifact readability by church on the 0-4 scale. These scores were taken by averaging the text readability scores for each artifact in each church and rounding them to the nearest number on the 0-4 scale.


Figure 37: Map of Overall Artifact Readability by Church

## 4.6. Artifact Damage for Individual Churches

In addition to displaying artifact damage for all of the churches collectively, we displayed the information for each artifact in each church individually. Displayed here is a MapInfo capture from Chiesa di San Zulian. The artifact information was collected and the assessment formula was used to determine the damage score on the 0-4 scale.

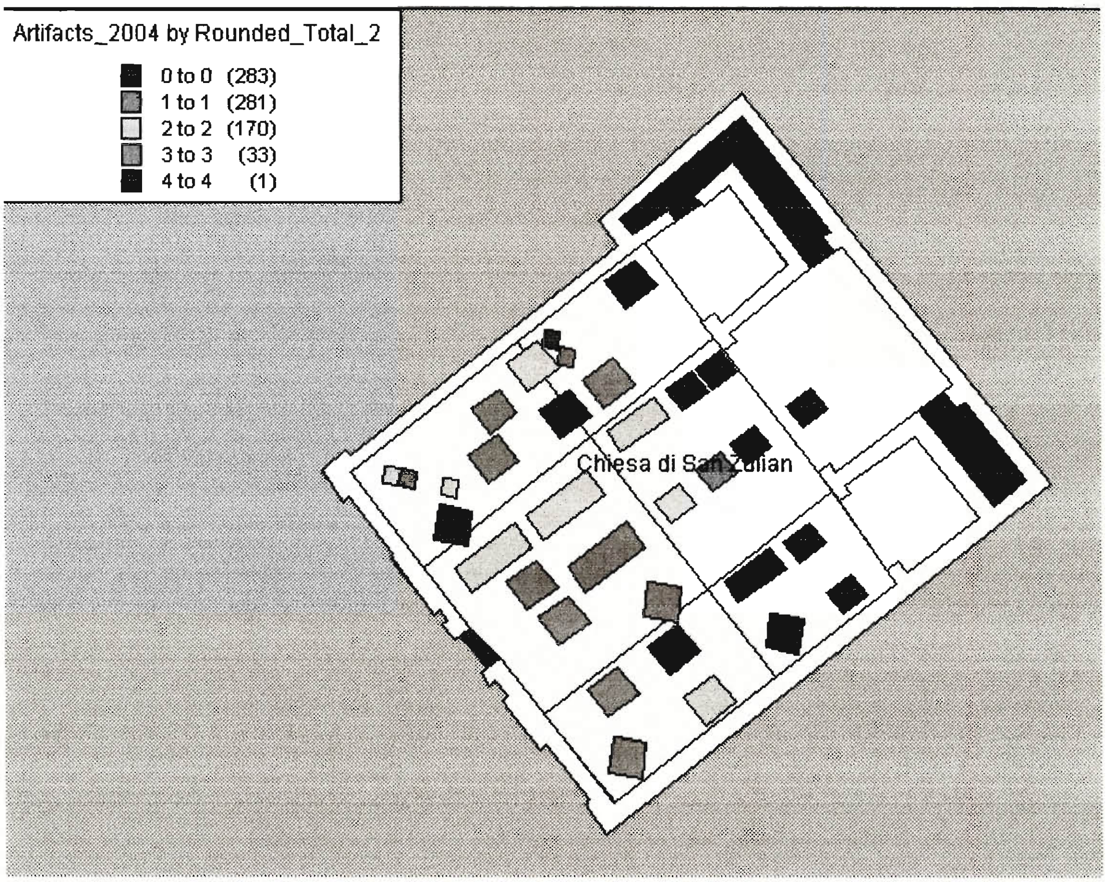


Figure 38: San Zulian Artifact Condition Assessment

For convenience sake, only one church will be included in this section, but similar graphs for each of the other churches visited by the group can be found in Appendix E: Church Information.

# 5. Analysis

## 5.1. Analysis of Artifact Inscriptions

The text of each artifact was transcribed using the method and codes shown in the above methodology. In addition, we began to extract useful historical information from the artifact inscriptions. We identified artifacts that have names and appear to be tombstones, and with some help, extracted the first, middle, and last names, date of death, age at death, and profession, if the information was available. See the database for the complete list of translations.

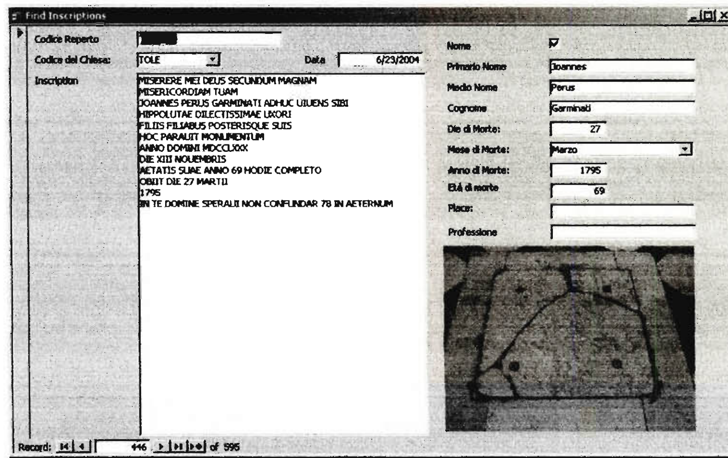



Figure 39: Artifact Information Extraction

## 5.2. Flood Vulnerability

For a church to be vulnerable to flooding, it needs to have water flow through the door to the outside or to have water come up through the lowest part of the floor.

Figure 40 shows a graph of the churches of Venice organized by door height and lowest quadrant height to show water entry, and average floor height to indicate the point at which most of the floor would be flooded. The dark blue indicates the lowest quadrant height, the yellow indicated the average height of the door, and

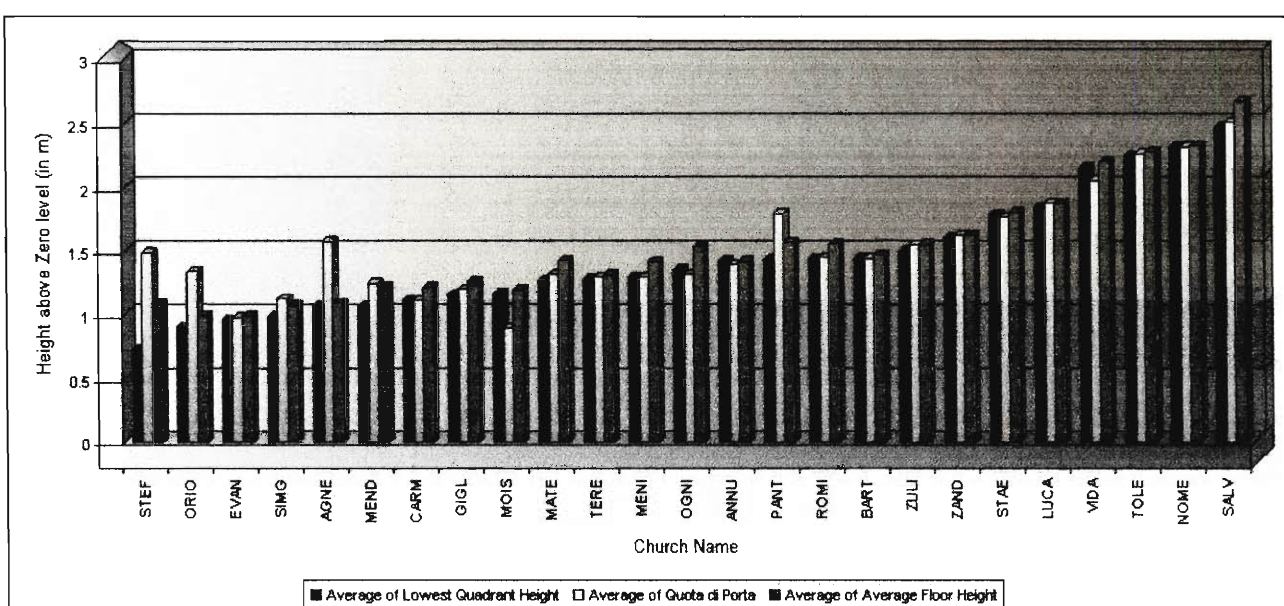



Figure 40: Flood Vulnerability

the light blue indicated the average floor height.

Correlation between Quadrant Conditions and Entranceways

The first correlation we looked for was one between floor damage and the presence of entranceways. We expected that since the entrances of churches see the most foot traffic, they would be the most damaged section of the main floor. The bottleneck created by doorways, we supposed, would funnel traffic into the same spot which would eventually wear down the floor.

To visually see if there was a correlation, we graphed the average damage scores, for each church, of quadrants with entrances against the averages of quadrants without entrances. Figure 41 shows this result.

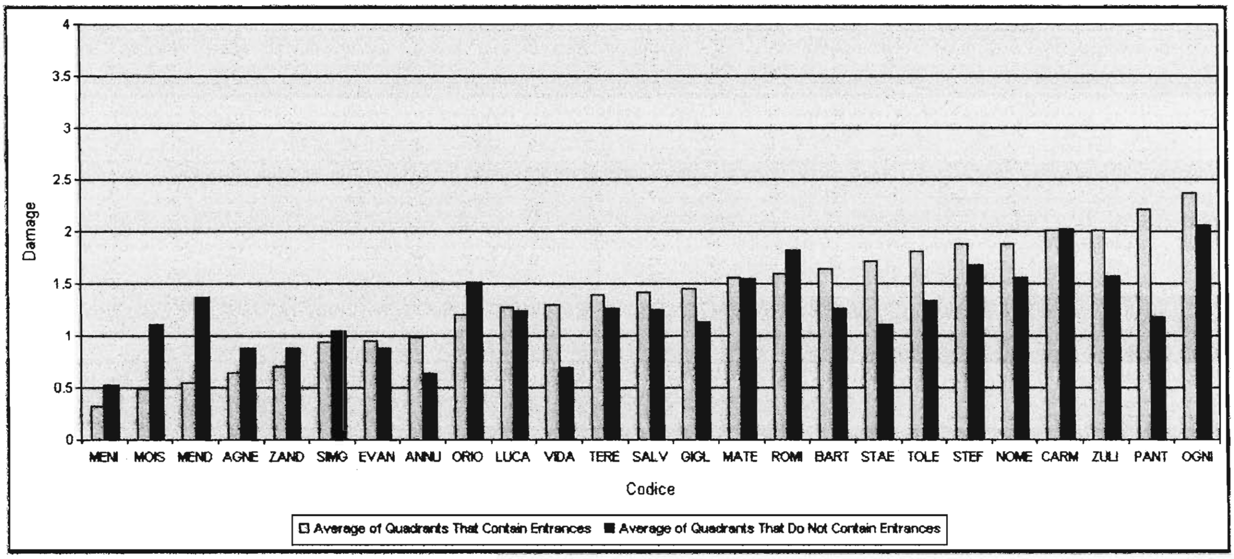



Figure 41: Quadrant Damage vs. Entrances

The following pie chart, Figure 42, shows the percentage of floor quadrants that have average damage scores that are higher than the same church's average. 64% of the churches our group surveyed have average quadrant damage in quadrants that contain entranceways that is higher than the quadrants that do not contain entrances. Analysis done shows a strong correlation between entranceways and floor damage.

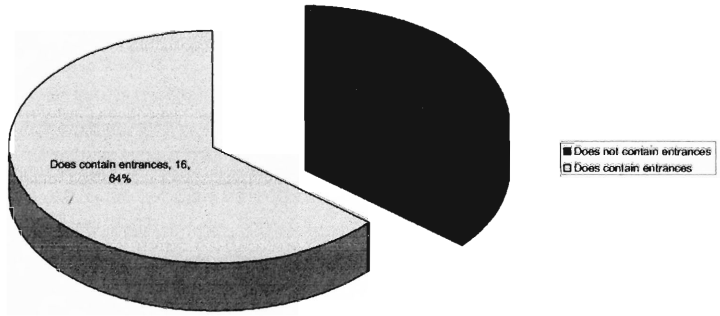



Figure 42: Percentages of Entrances

## 5.3. Correlation between Quadrant Conditions and Artifacts

Another supposed cause of damage was the presence of artifacts. We considered that since most artifact are tombstones, quadrants that contain artifacts normally have large holes under the floor, which is a structural issue that could manifest itself in the form of joint gaps and floor displacement. We also thought that since artifacts were normally placed in the floor after it was built, parts of the floor would need to be removed or cut into to place the artifact, which could further damage the floor.

On the other hand, we thought that since artifacts are tombstones, they may be considered sacred by the parishioners, and they may be avoided in the general walking path. Figure 43 shows the average damage scores of quadrants that contain artifacts compared to the averages of those quadrants that do not contain artifacts.

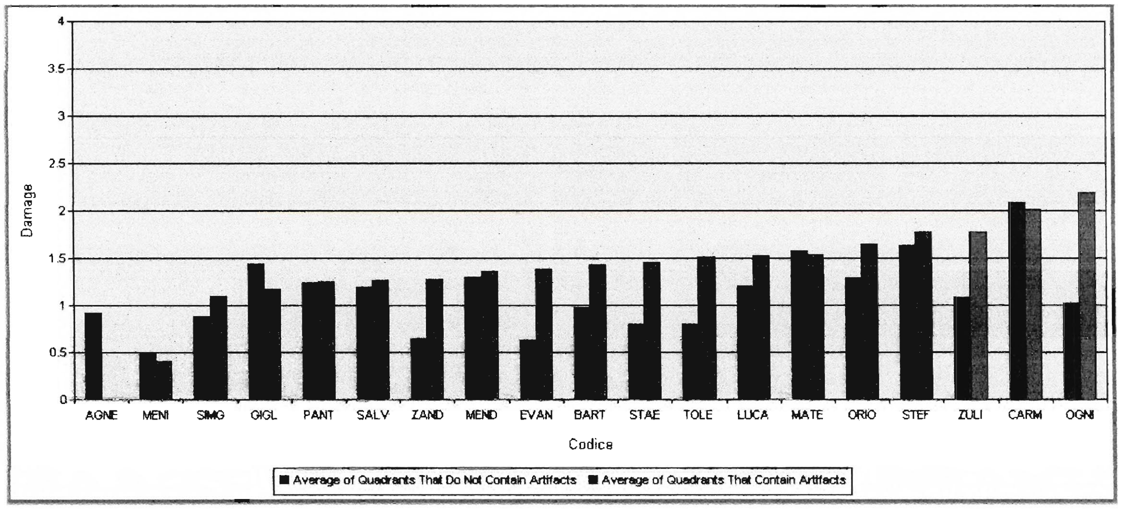



Figure 43: Quadrant Damage vs. Artifacts

Figure 44 is a pie chart that shows the percentage of churches whose quadrants that contain artifacts have a higher average damage score than those that do not. 75% of the churches our group surveyed have average quadrant damage in quadrants that contain artifacts that is higher than the quadrants that do not contain artifacts. Our analysis supports a strong correlation between the presence of artifacts and quadrant damage.

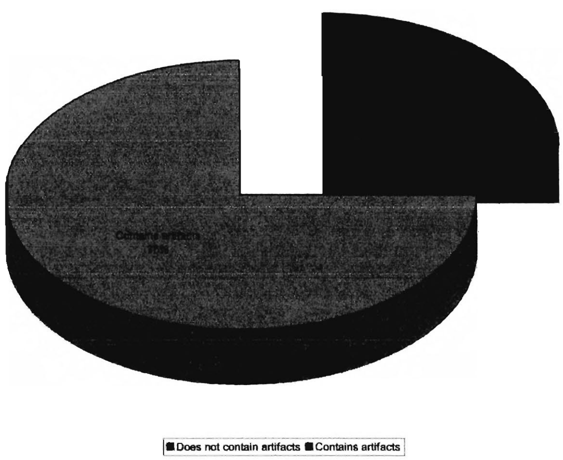



Figure 44: Percentage of damage based on artifacts

## 5.4. Correlation between Quadrant Damage and Pew Placement

Our group also supposed that there could be a correlation between pew placement and quadrant damage. We thought, based on information from past groups as well as recommendations from experts, that the rubbing of pews on the floor and the high traffic that quadrants with pews would see, that they would have higher damage than quadrants without pews.

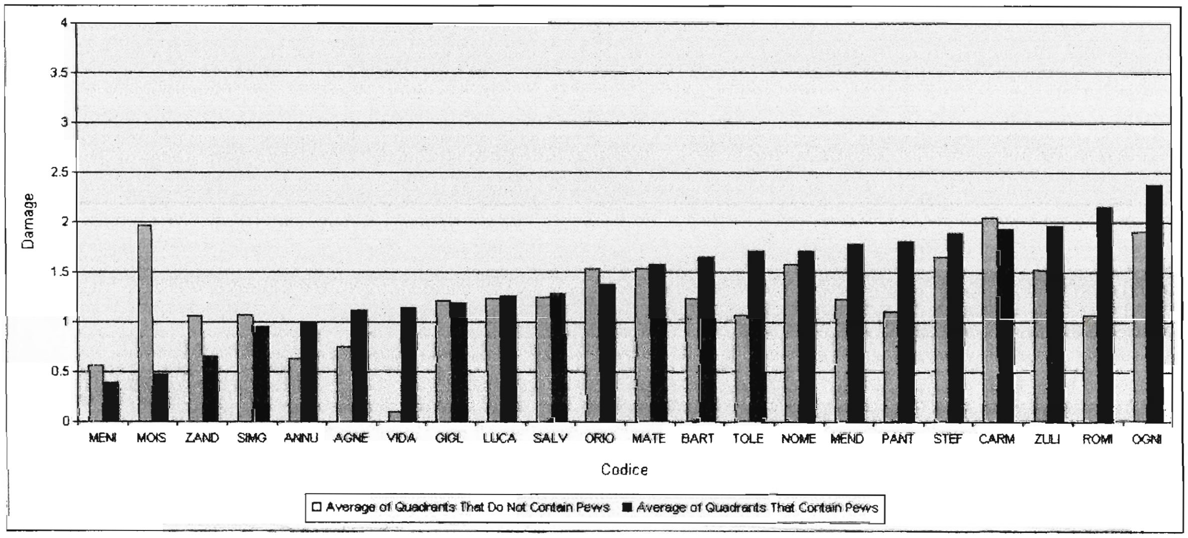



Figure 45: Quadrant Damage vs. Pews

We found that there was a strong correlation between damage and presence of pews. Figure 45 is a bar graph that shows the average damage of quadrants that contain pews compared to the averages of those that do not.

Figure 46 is a pie chart that shows the percentage of churches that have average quadrant damage of quadrants that contain pews that is higher than those that do not. 68% of the churches our group surveyed have average quadrant damage in quadrants that contain pews that is higher than the quadrants that do not contain pews. We concluded from this analysis that there is a correlation between pew placement and quadrant damage.

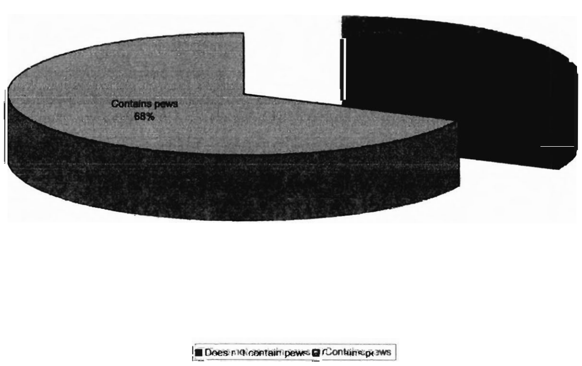





Figure 46: Percentages of damage based on pews

An example of this correlation can be seen in Figure 47.

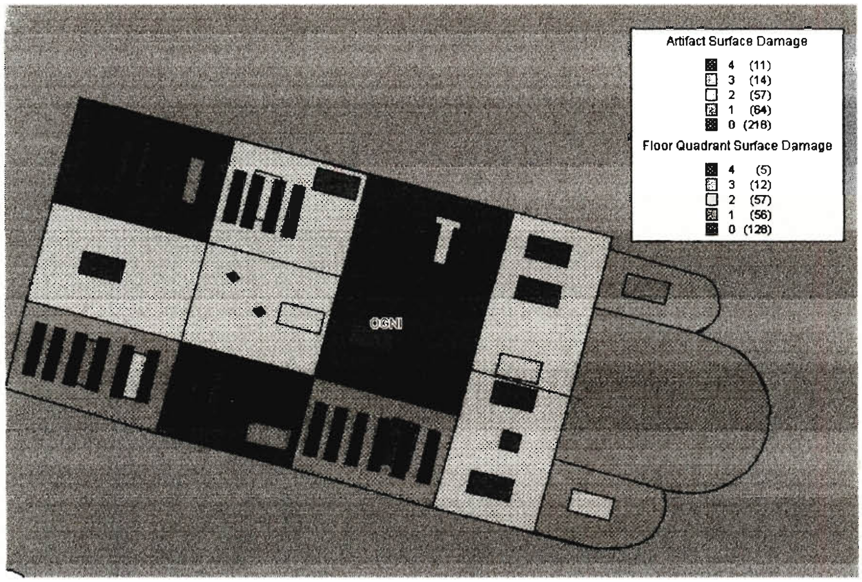



Figure 47: Damage in Ognisanti

## 5.5. Correlation between Quadrant Damage and Chapels

The last correlation we looked for was one between chapels and quadrant damage. Similar to artifacts, we had arguments both for and against this correlation. On the one hand, chapels are not as visited as the nave or the narthex of the church, and they are considered sacred, so we expected that any visitors to them would be more careful than they would be on a regular floor. In many cases, the chapels were gated or roped off, meaning that foot traffic in them was very restricted.

On the other hand, since the chapels are physically detached from the main floor of the church, they may be left untouched during minor restoration work to the church. They tiles in them would then be older than the majority of the floor, which would afford them more time to become damaged. Another factor we considered was that since the side chapels might be used more often for prayer than a main altar, the tiles and kneelers in them could be more damaged due to use over time.

Figure 48 is a bar graph that shows the average damage of quadrants that contain chapels compared to those that do not.

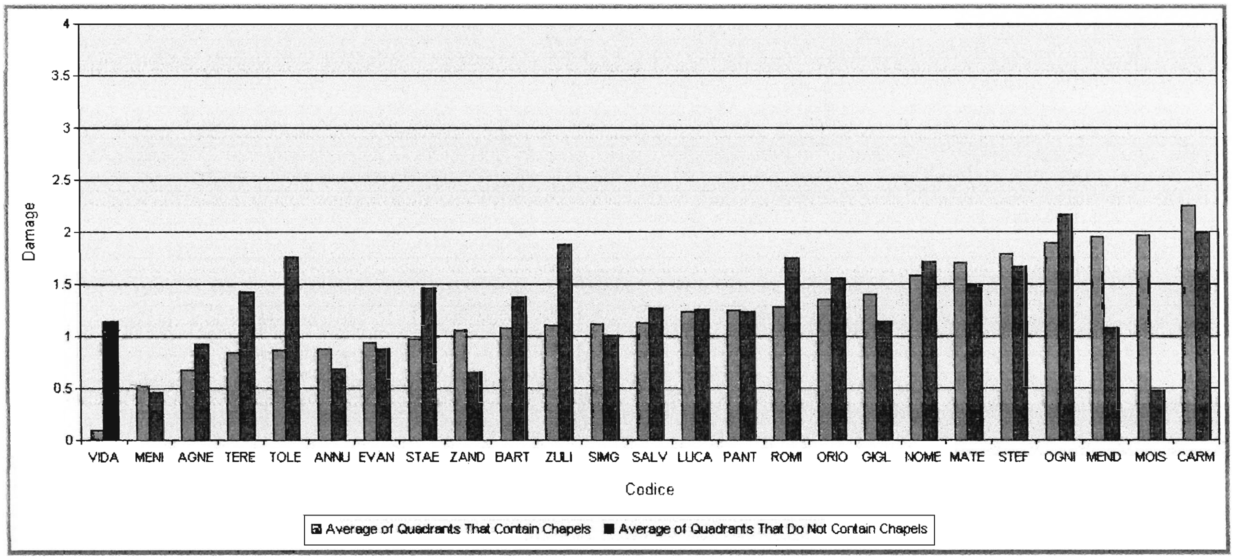



Figure 48: Quadrant Damage vs. Chapels

Figure 49 is a pie chart that shows the percentage of churches that have higher average quadrant damage in quadrants that contain chapels compared to those that do not. 48% of the churches our group surveyed have average quadrant damage in quadrants that are chapels that is higher than the quadrants that are not chapels. Our analysis does not support a correlation between chapels and damage.

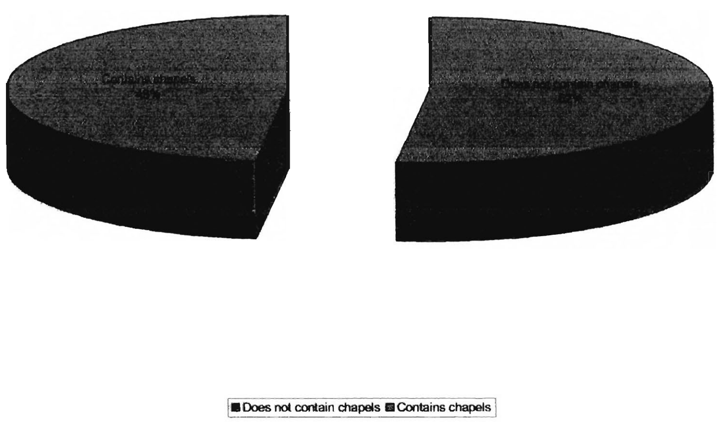



Figure 49: Percentages of damage based on chapels

## 5.6. Correlation between Quadrant Conditions and Quadrant Height

In order to determine if flooding played any role in the damage conditions seen in the floors of the churches our group studied, we compared the overall damage scores per quadrant on a height basis. In the event that flooding played a large role in creating damage, we expected to see a trend in our graph where as the quadrant heights increased, the overall damage would decrease. However, when the quadrant heights and damage conditions where directly compared, no such trend was seen. This can be seen Figure 50.

This discredits flooding as *the* main source of damage since the flooding would effect the lower floors first and more often, yet this is not reflected in the damage scores. Therefore, we do not consider flooding to be a critical source of damage to church floors although it is recognized as a contributing source.

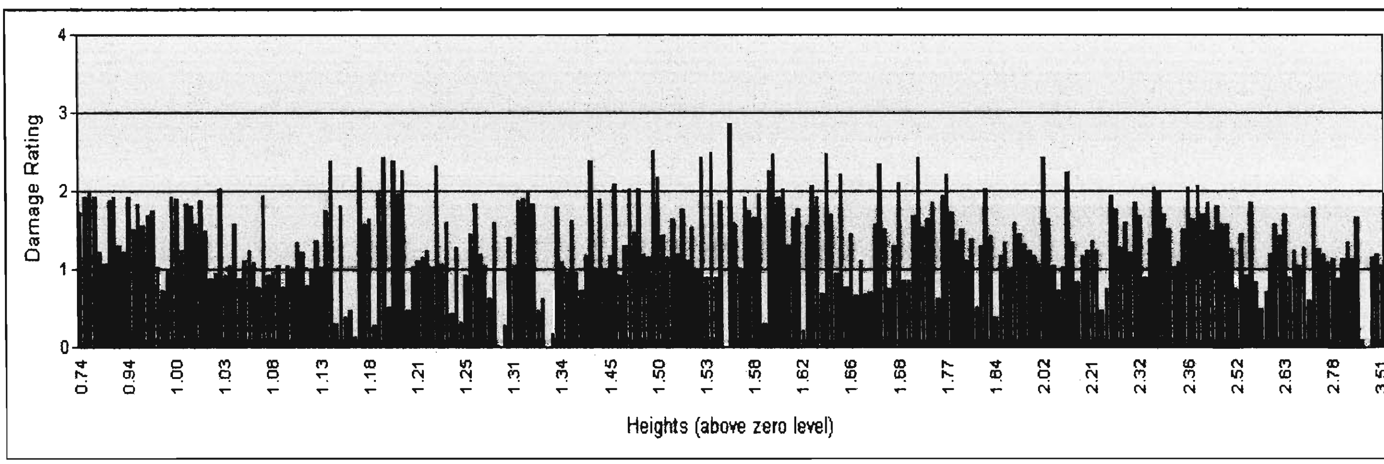



Figure 50: Floor Height vs. Damage

## 5.7. Excavation Opportunity

One of the main objectives of our project and the one most interesting to the *Soprintendenza all'Archeologia* was to determine which churches had the greatest probability for future archaeological excavation. In order to accomplish this we analyzed each church to determine the likelihood of artifacts being found beneath its floors. However, a floor cannot be dug up simply on probability; therefore, we also analyzed the possibility of each church's need for restoration. A church floor undergoing restoration is already in the process of being dug up and therefore archaeologists can gain access to these sites. For that reason, we looked not only at a church's likelihood of containing artifacts but also at its likelihood for future renovation so that the *Soprintendenza all'Archeologia* can see where their greatest opportunities are.

### 5.9.1 Archaeological Potential

Through our field research, we learned of several churches that had had their floors restored and raised without raising the previous floor's artifacts. These churches were *Chiesa di Sant' Agnese*, *Catecumeni*, *Chiesa di San Bartolomeo*, and *Chiesa di San Luca*. We also learned that *Chiesa di San Salvador* had had its floor raised but that most of the artifacts had been raised along with it. Using the information gained from these churches as well as from the rest of our research and study we identified the factors we felt best indicated the presence of artifacts below the current church floor. Each of the following factors is based on the knowledge we gained from studying the aforementioned churches as well as other field operations. Each of the factors was then be placed on a 0 – 4 scale based on the range of values for each factor with 4 representing the value indicating the greatest potential for finding artifacts beneath the floors.

Artifact Density

By dividing the area of the artifacts in each church by the total area, the percentage of the floor that is covered by artifacts can be determined. We feel that this is a good indicator of whether artifacts have been raised or not based upon our field research. For example in the *Chiesa di San Salvador*, most of the artifacts have been raised and the artifacts cover a relatively high percentage of the floor and this can be seen in Figure 51. On the other hand, in the *Chiesa di Sant' Agnese* in the 1830's a man by the name of Cicogna recorded 50 inscriptions from artifacts in the church. A simulated church image with 50 artifacts can be seen in Figure 52 for comparative purposes.

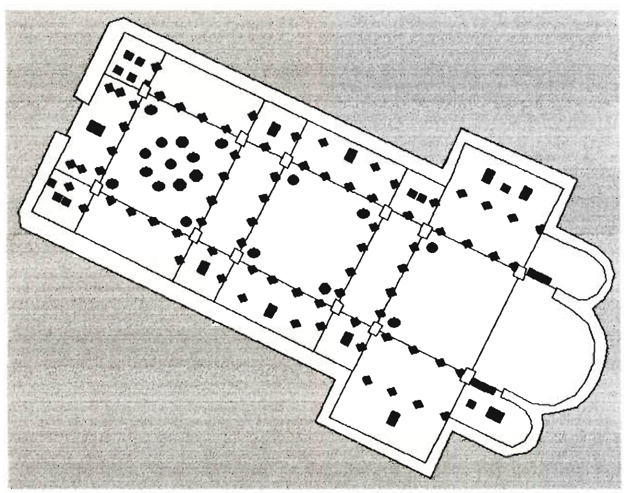


Figure 51: Artifact Density in San Salvador

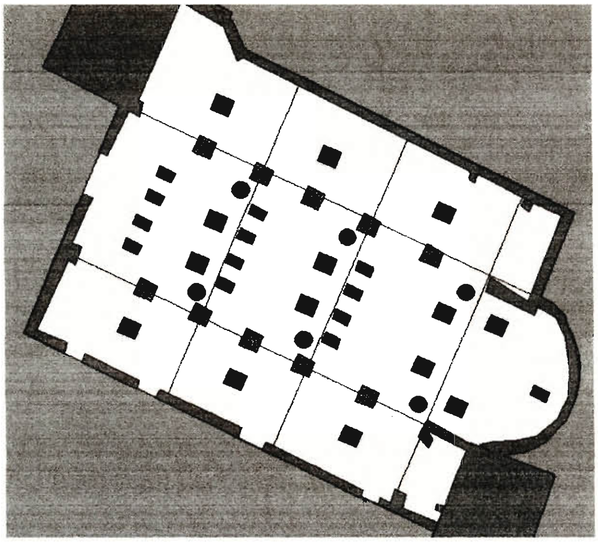


Figure 52: Simulated Artifact Density in Sant'Agnese

However, a new floor was built in 1938 and all but one artifact behind the altar was covered. An actual image of the artifact in the church today can be seen in Figure 53. Therefore, the artifact density of the church today is very low, indicating that the previous artifacts had not been raised.

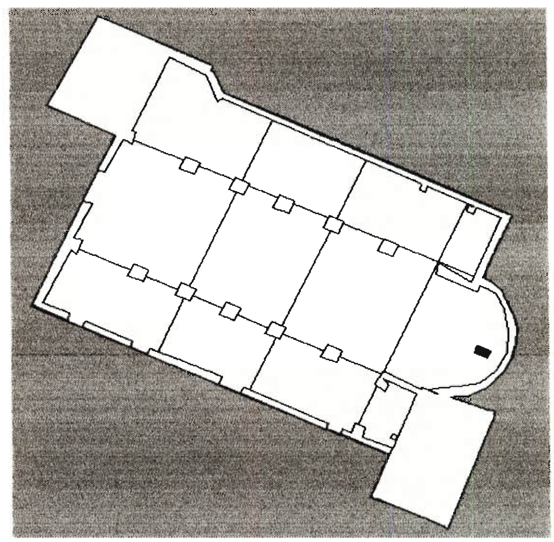


Figure 53: Artifact Density in Sant'Agnese today

This factor is based on the assumption that all churches in Venice constructed before Napoleon's edict banning burial within the church contained artifacts. According the extents of our research, this has thus far held true. If the percentage of the floor covered by artifacts is high, there is a very low probability that there are more artifacts underneath. A percentage of zero indicates the best scenario for artifacts being found beneath the floor and a percentage of thirty indicates the worst-case scenario for finding artifacts beneath the floor. All these numbers were scaled onto a 0 – 4 scale to match the data we collected and be compatible in our formula. A 4 was given to the best scenario and a 0 to the worst scenario.

Age of the original church on the site of the current church

The age of the original church on the site of the current church indicates the total time span over which artifacts could have been put into the floors. If a church was reconstructed, it was usually rebuilt over the foundations of the previous church and therefore the artifacts of the previous church are still buried under the floor of the previous church. Therefore, the older the church, the greater the potential for is containing artifacts under its floors. In the event that the church has never been reconstructed, there is still a good chance that the older it is, the more times its floor has been rebuilt and the greater the chance that artifacts will be found beneath its floors. The archaeological cross section of the *Chiesa di San Samuel* in

Figure 54 shows how there are multiple floor layers and foundations beneath many churches. The older the age of the original founding of the church on that site, the greater the possibility for such multiple floor layers and buried artifacts to be found under the current church. The best scenario is reserved for the older churches will a lower limit being placed at 600 A.D. that corresponded to a value of 4 on our scale. The worst-case scenario is reserved for more recent churches, which was given a value of 0 on our scale, with the cut off being placed at 1800 A.D. due to Napoleon's edict banning burials in churches when he took control of Venice in 1797. Churches built after this date have no archaeological potential.

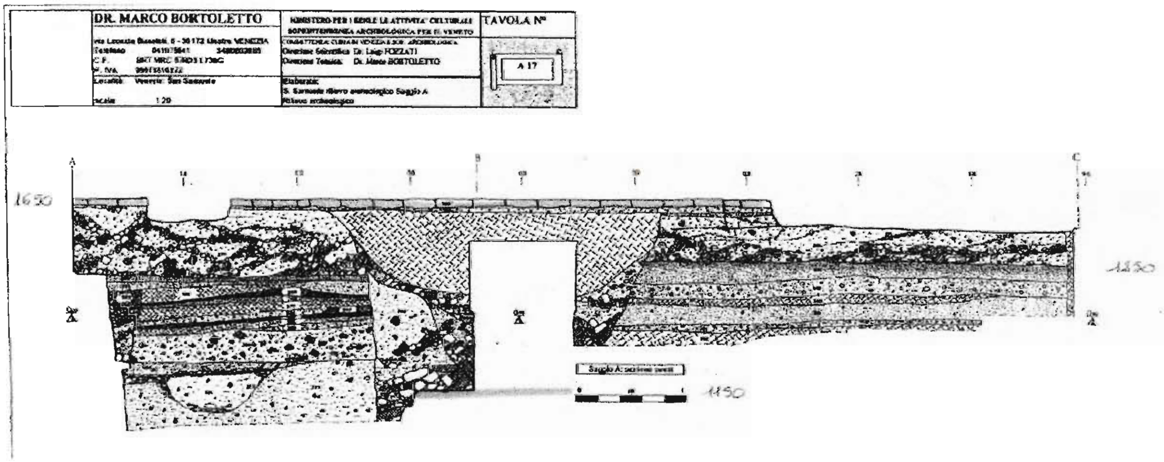



Figure 54: Cross-section of San Samuel

Absolute heights

The average absolute height of the church above the mean sea level indicates the amount of ground in which there is a potential for artifacts to be found. The average absolute height of the *Chiesa di San Samuel*

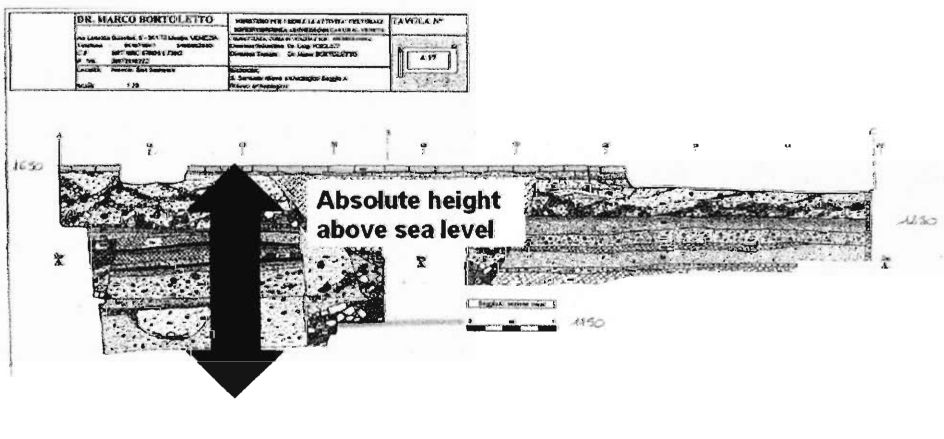



Figure 55: Absolute height of San Samuel

can be placed on its archaeological cross section to show this as seen in Figure 55. The higher the church, the lower the original floor could have been and the greater the range of space in which artifacts could be found. Therefore, a higher absolute height indicates a higher potential for artifacts being found and is therefore the best scenario with an upper value of four meters that was given a 4 in our scale. The worst scenario was an absolute height of zero meters which will be given a value of 0 in our scale.

Relative Heights

The relative height is the difference between the door height and the average height of the floor. Most of the older churches in Venice were built such that you have to step down into them upon entering. An example of this difference can be seen in the *Chiesa di San Stefano* in Figure 56. This caused many problems with flooding since it was difficult to drain the churches due to the door being above the floor. Therefore, if the floor had been raised at any point, the relative height between the door and the floor would have decreased. The closer this gap is to zero, the higher the likelihood that the floor has been raised and a difference of zero was given a 4 in our scale while a difference of one meter was given a 0. Yet only churches built before 1500 A.D. will be considered in this category due to changes in church construction after this point where the floors were generally built even with the door. This category will be an extra bonus for these older churches because it is only an indicator for them.

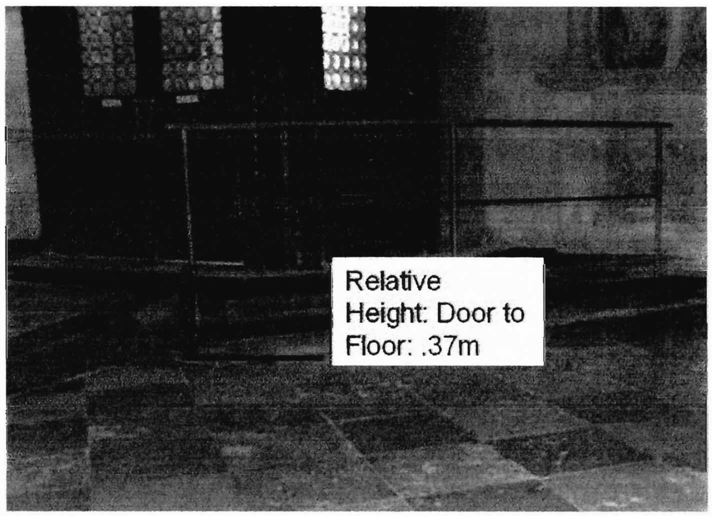



Figure 56: Relative height of San Stefano

Average Overall Floor Damage

The newer the floor the better the condition it should be in, therefore the overall floor damage is another important factor indicating floor replacement. An example of a new, undamaged floor compared with an older, damaged floor can be seen in Figure 57. The churches we studied that we knew contained artifacts beneath their floors all had floors in good condition because of the fact that a new floor was built on top of the old floor containing the artifacts. The floor damage was already in our 0 – 4 scale but a score of 0 was the best scenario and for the rest of our formula, 4 has represented the best scenario, therefore the floor damage numbers will be reversed from their usual meaning, such that a 0 became a 4 for our formula

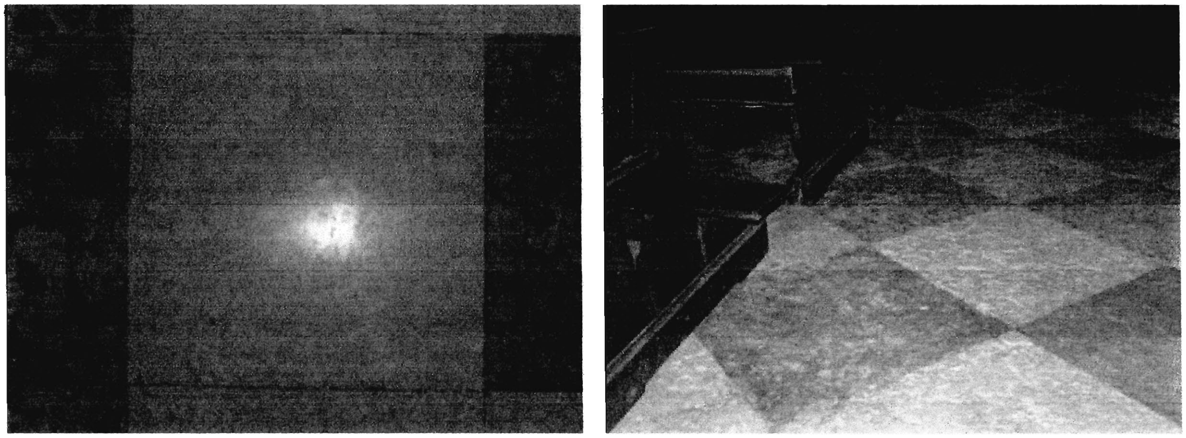


Figure 57: Floor Damage Comparison: New vs. Damaged

Archaeological Potential Formula

In order to accurately create a quantitative way to classify the churches of Venice by their archaeological potential, a regression analysis would have had to be performed in order to determine the proper weights of each of our factors. However, a regression analysis requires a knowledge of the answers that we would hope to obtain from our formula. The only way to obtain these answers would be to actually excavate a number of churches in order to have a representative dataset with which to work. Yet we do not have that luxury. Therefore we came up with a relative predictive formula based on the above factors we felt contributed the most to the churches that we know have artifacts beneath their floors. The ranking of the factors in order is the artifact density, the original church age, the absolute height, and overall floor damage and the relative height.

Artifact density was deemed more important than both the original age and the absolute height, because while both the age and the height give information about the possibility of floor layers, they do not lend any insight as to whether or not the artifacts have been raised. Therefore, the density becomes the most important factor because it tells us whether there are artifacts on the surface of the floor if the density is high or whether the artifacts are in the layers that the age and height tell us about if the density is low. The floor height was given slightly lesser importance than the church age because some churches start higher than others and this variation makes the height slightly less indicative than the age. The overall floor damage was given the same importance as the height because it indicates how new the current floor is. However, floors damage at much different rates and there are many variables involved in how they are constructed and how they wear. Therefore, due to the variability, this factor was not given a higher importance. The relative floor height was given the lowest importance because it is only a supplementary value for churches built before

1500. The weights given to each factor below were given based on the relative rankings of each factor mentioned above. Therefore, the weights given below are not by any means absolute but they allow us to generate a relative ranking of the archaeological potential of each church that permits us to group the churches by their potential.

**AD***(.35) + **OCA***(.25) + **AH***(.20) + **RH***(.15) + **OFD***(.20) = Archaeological Potential

**AD**: Artifact Density
**OCA**: Original Church Age
**AH**: Absolute Height
**RH**: Relative Height (Only for churches before 1500)
**OFD**: Overall Floor Damage

Archaeological Potential Results

The results of the above formula can be seen in bar graph form below. The range of values is not very extensive and from this we concluded that there is an immense probability that most of the churches in Venice built before the 1800s do contain artifacts beneath their floors. We concluded this because the majority of the floors have been rebuilt at least once at some point and many churches have gone through multiple versions on the same foundations. The graph of the archaeological potential can be seen in Figure 58. Therefore, the restoration potential becomes the most important factor because any church that the *Soprintendenza all'Archeologia* can gain access to will yield archaeological information.

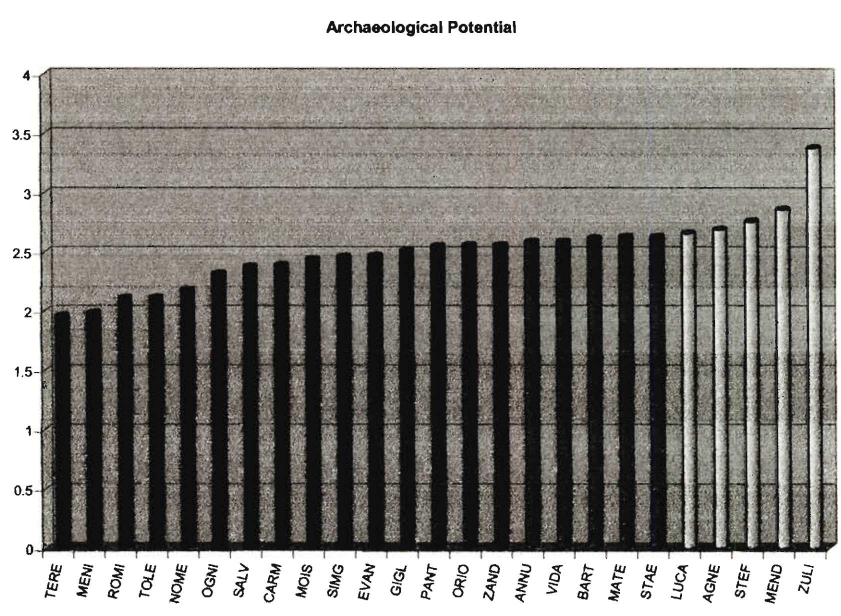



**Figure 58: Archaeological Potential by Church**

### 5.9.2 Restoration Potential

In order for the *Soprintendenza all'Archeologia* to be able to excavate a church, they need to find a church that is in need of restoration and wait until it undergoes restoration in order to be able to go into that church and do excavation while the floor is being reconstructed. The need for floor restoration is primarily based on how damaged the floor is. Therefore, there are three damage indicators that contribute to our analysis of the risk to the floor needing restoration. The floor damage factors carry the most importance as the condition of the floor is the main reason for a renovation but the condition of the artifacts in the floor is also important to floor integrity. Each factor is an average value for each church and they are discussed below.

Overall Floor Damage

The overall floor damage indicates how damaged the floor is in both structural and surface categories. Therefore, it is a good overall indicator of the damage of the floor and its need to be fixed. The floor damage is already in a 0 – 4 scale and a four indicates the worst damage which is the best scenario and therefore will remain a four for our formula. This factor will be given a weight of 45 percent.

Floor Surface Damage

Surface damage is the most visible type of damage on a church floor and often the best indicator of how damaged the floor is and will probably be the strongest factor considered when the church decides to rebuild its floor. Although it is already included in the overall damage, it is important enough to be put into the formula again on its own. Like above, it is already on a 0 – 4 scale and will be used as is with 4 representing the best case scenario. The factor will also be given a weight of 45 percent.

Overall Artifact Damage

The overall artifact damage indicates how damaged the artifacts are and perhaps the need to either fix them or cover them with a new floor such to avoid the problems they pose to the floor. However, the structural threats posed by artifacts in the floor is minimal and therefore this factor was given the smallest importance. The damage is already on our 0 – 4 scale with 4 corresponding to the best case scenario for our formula. This factor will be given a weight of 10 percent.

Restoration Potential Formula

This formula attempts to predict which churches will be of most need for restoration in the near future. The values generated by this formula mainly indicate the condition of the floor in the same fashion and on the same scale that we collected damage conditions. Therefore, each church can be compared to one another and those churches with the highest values can be singled out by the *Soprintendenza all'Archeologia* as churches they can watch for restorations that will allow them access beneath the floor.

**OFD***(.45) + **FSD***(.45) + **OAD***(.10) = Restoration Potential

**OFD**: Overall Floor Damage
**FSD**: Floor Surface Damage
**OAD**: Overall Artifact Damage

Restoration Potential Results

The results from the restoration potential formula can be seen in Figure 59. The top five churches most in need of restoration are colored in red. These are the churches that we recommend the *Soprintendenza all'Archeologia* watch so that when they do get restored, they can be excavated at the same time.

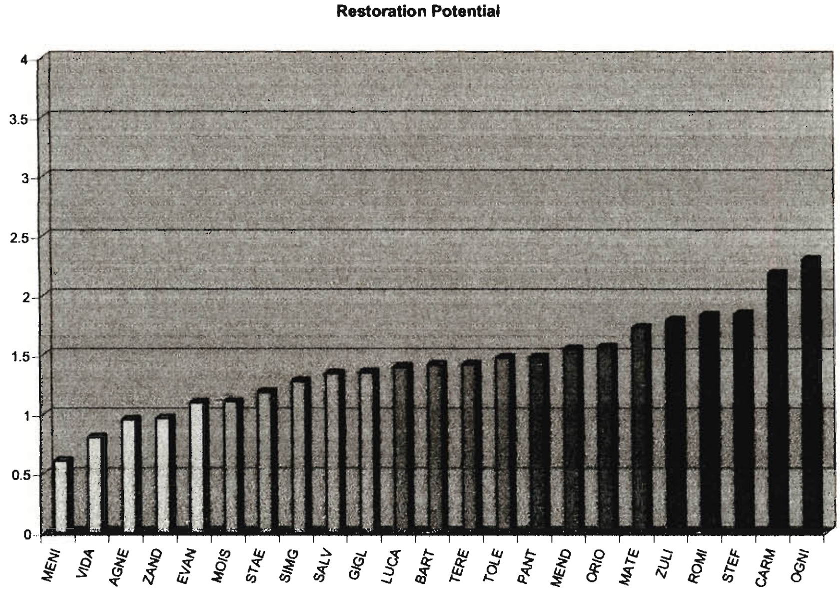



Figure 59: Restoration Potential by Church

### 5.9.3 Excavation Opportunity Results

This is a graph of the archaeological potential and restoration potential, which combine to form the excavation opportunity. The graph is sorted by the restoration potential because we feel that it is the most important factor since only churches that are being restored have the ability to be excavated. The churches with a low restoration potential and high archaeological potential that can be seen on the left side of the graph are lost archaeological opportunities. These churches have artifacts beneath their floors but they also have relatively new floors in good condition that do not have a very good chance of being restored in the near future. The churches on the right side of the graph are the churches we are recommending that the *Soprintendenza all'Archeologia* pay attention to for excavation opportunities. A map of the top five churches can be seen in Figure 61. The five churches that we recommend that the *Soprintendenza all'Archeologia* monitor are *Ognisanti*, *Santa Maria dei Carmini*, *San Stefano*, *San Zulian*, and *Eremitane*.

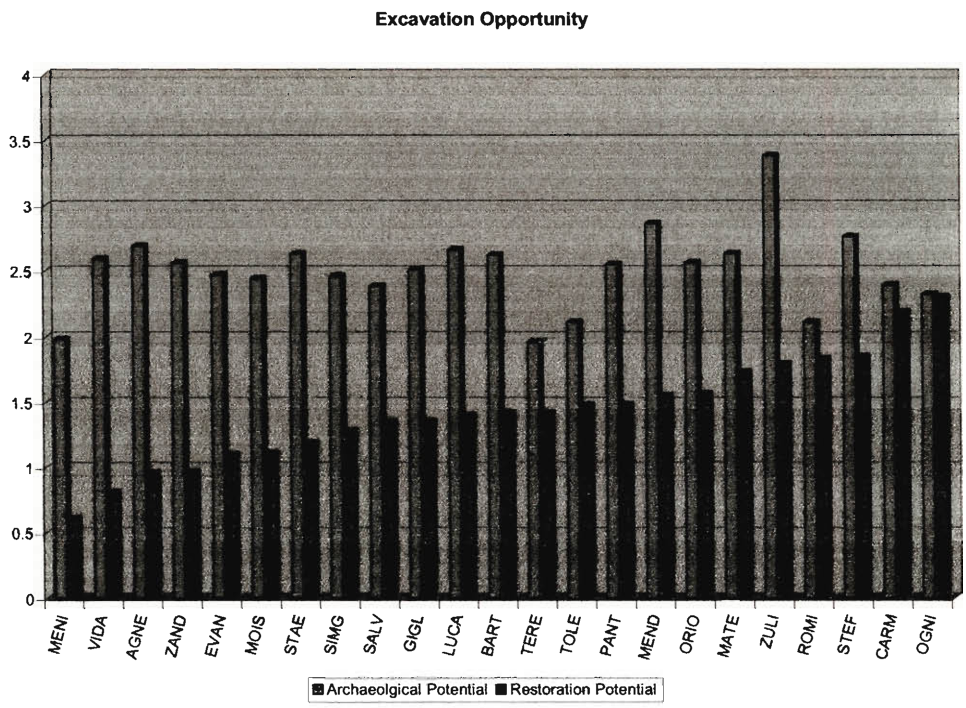



Figure 60: Archaeological Potential

Figure 61: Map of top 5 churches

# 6. Conclusions and Recommendations

Our suggestions to the *Soprintendenza all'Archeologia* of the excavation opportunity of the churches of Venice is important because it does not just indicate the opportunity of there being artifacts beneath the floors but more importantly indicates the risk to these artifacts and their information. After studying the factors that contribute to the archaeological potential of each church we determined that the difference in range of the relative values we generated was very small, leading us to believe that every church in Venice has substantial archaeological opportunity. Since every church in Venice has substantial archaeological opportunity, any church that the *Soprintendenza all'Archeologia* would be able to gain access to and excavate would be very rewarding and would contribute greatly to the knowledge of Venetian history. Therefore, the determining factor in our suggestions to the *Soprintendenza all'Archeologia* was the restoration potential because they can only gain excavation access to churches that are in the process of having their floors reconstructed. However, the restoration potential is only a potential in the event that the *Soprintendenza all'Archeologia* is alert to its possibility. In all other events it can be equally thought of as a risk, the risk that the floor will be restored or rebuilt and that the information contained underneath it will be buried even deeper and will remain inaccessible for a much longer time to come. When this happens there is an archaeological loss, a loss that prevents a complete Venetian historical record from ever being compiled. Our goal was to provide information to try and combat this loss by providing the *Soprintendenza all'Archeologia* with not only a list of churches with high archaeological potential but also bring to their attention the churches with the floors most likely to be restored in the near future so that they can prevent the loss of information. However, there are still many churches in Venice yet to be studied and the information contained in all these churches is also at risk. Not only can the risk of renovation not be assessed, but the inscriptions on the current artifacts in the floor will only get more damaged over time and their information will eventually become illegible. We were able to catalogue and preserve this information in the churches we studied, but in those remaining to be studied it is only a matter of time before that information is lost. We therefore find it imperative to continue this project in the future to preserve and extract the historical information of those artifacts still accessible. It is of paramount importance to continue presenting the *Soprintendenza all'Archeologia* with the churches most at risk of archaeological loss through renovation and retrofits so that someday a complete historical record of Venice will one day exist for future generations to come.

## 6.1. Recommendations for Future Projects

Although our project was completed to the best of our ability during our stay in Venice, time did not allow for all possible planned applications of our project. Below are some recommendations for continued follow up of our project.

- At the close of this project, there still remained 52 churches left to be completed in the *sestieri* of Venice itself and 18 more churches outside of Venice in the lagoon. Twenty-six of these churches have currently been deemed inaccessible, but either in time or with the proper authorization, they could once again become accessible. Therefore there are 70 churches in Venice and its lagoon that have yet to be studied. Most likely, many of these churches have artifacts in their floors and it is important that their information be recorded in order to contribute to Venice's historical record.
- To facilitate analysis of the entire data set, we converted the 2002 data to our 2004 format. It was not completely successful because of some holes in information gathered at that time, so for a complete analysis of the churches of Venice, the data from those churches will need to be re-gathered.
- A first pass was made this year to extract historical information from artifact inscriptions. The data structure used to store the information could be refined to handle more types of inscriptions, such as guilds or tombs for multiple people, or inscriptions detailing restorations of the church.
- Data on topics such as presence of heating, proximity to tourist areas, and number of parishioners could be gathered to allow more analysis of causes of damage. Perhaps through peeling away more layers of causes the root problem behind some of the damage in the floors may be found.
- In the 1830s a man by the name of Cicogna gathered data on every inscription found in every church in Venice. He began publishing his work in the 1840s, but died before he could finish publishing it. Our group discovered this during the final weeks of our project, and did not have time to do anything useful with the data. We did, however, come up with a few ideas of how the data can be used. We obtained a small part of the data, and it appears in Appendix D: .
    - The first and most obvious use of this data is to validate the claims we make regarding artifacts being buried in church floors. *Chiesa di Sant'Agnese* for example, is a church that we claim would have artifact buried under it. In our research, there was 1 artifact in the floor, but Cicogna recorded 40 inscriptions in the church. This verifies our claim that more artifacts exist and are buried under the floor.
    - Another probable use of Cicogna's work would be to assess legibility of inscriptions over a span of nearly 200 years. Since his recordings were done far in advance of ours, it would be possible to see deterioration of text over a given span of time.

## 7. Works Cited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Concina, Ennio. A History of Venetian Architecture. Cambridge University Press: New York, 1998.

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Ken Collin's Website, www.kencollins.com

Plant, Margaret. Venice Fragile City. New Haven & London: Yale University Press, 2002.

Ruskin, John. Stones of Venice. New York: John Riley and Sons, 1884.

Salvadore, Antonio. 101 buildings to see in Venice. Translated from the Italian by Brenda Balich. New York: Harper and Row [1972, c1969]

The First Excavation campaign In The Area Of San Luca's Church In Lucca, http://www.sns.it/html/Groups/Archeo/S.Luca/Archy.html

Your Church and Its Archaeology http://www.leicester.anglican.org/Note%201.pdf

# Appendix A: Annotated Bibliography


## Archaeology

Ackerman, James. Art and Archaeology. New Jersey: Prentice-Hall, 1963
This book is of great importance. Contains much information of archaeology and how the research is done. This will be of great use to learn a simple background of this type of study. Very relevant to our project.

Brown, Patricia Fortini. Venice and Antiquity. New Haven & London: Yale University Press, 1996.
This source has many examples of tombstones and plaques as well as information about doges. (Found by initial search of Title: +Venice)

Concina, Ennio. A History of Venetian Architecture. Cambridge University Press: New York, 1998.
This source has many examples of tombstones and plaques as well as information construction, in particular a chapter that has floor plans of churches. (Found by visual search)

Paine, Ralph. The Book of Buried Treasure. New York: Sturgis and Walton Company, 1911.

This book is of absolutely no help. This book contains history of ancient treasures found and buried in and throughout the Mediterranean see by pirates and exiles.

http://www.sns.it/html/Groups/Archeo/S.Luca/Archy.html

Site contains useful information regarding research similar to our project that was conducted in Tuscany. The research that was conducted is almost identical to what we will be doing.

http://www.cornwall.gov.uk/history/cau/alive9/arc12.htm

Site contains information about excavations and research done beneath church floors and some of the methods that were used to conduct the research.

http://www.leicester.anglican.org/Note%201.pdf

This is a very useful PDF file that contains information on the research, preservation, and conservation of relics that are contained in church floors in Britain. It presents some very similar ideas and goals to that of our own project.

## Churches

Brown, Robert. Significance of the Church. Philadelphia: Westminster Press, 1956

This book is of little help. It contains a little useful information on Catholic belief on the importance of the church and what it stands for. Could be used to gain knowledge of public reaction to our presence and research of their churches.

Howard, Deborah. The Architectural History of Venice. New Haven: Yale University Press, c2002
This book is already on reserve in the library, so it has been pre-identified as a prominent source for architectural information in Venice. It has a lot of information on churches specifically and the construction and theory behind their design.

Courtenay, Lynn T. The Engineering of Medieval Cathedrals. Burlington, VT: Ashgate Publishing Limited, 1995.
This source has a small bit of information on archaeology and layers of floors. (Found by initial search of Title: +Churches +Archaeology)

Muraro, Michelangelo. Venice : The Church of St. Mark's, the treasure of St. Mark's, the Ducal Palace, the Gallerie dell'accademia, the architecture and monuments of Venice / text by Michelangelo Muraro and André Grabar. New York : Portland House : Distributed by Crown Publishers, 1987, c1986.

This book details the Church of St. Mark's, and has a section focusing on the floor of the building. It may provide insight into how other large churches were built. Unfortunately, the artifacts in St Mark's have been catalogued by previous projects, so this will be of no direct interest to us, but may lead us in the right direction.

Albert Needham. How to Study an Old Church. (London, New York, B. T. Batsford [1948])

This is not specific to Venice, or even European churches. But the book does detail some archaeological practices and methods for safely and accurately cataloguing a church and the objects and artifacts found in it. It has sections specifically on church decoration. It can be assumed that these will be useful, since many of the artifacts and objects to be catalogued were originally for decorative purposes.

Ruskin, John. Stones of Venice. New York: John Riley and Sons, 1884.

This source has a very detailed account of construction techniques used in early Venice. (Found by visual search)

Salvadore, Antonio. 101 buildings to see in Venice. Translated from the Italian by Brenda Balich. New York: Harper and Row [1972, c1969]

This book contains the archaeological background of many churches in Venice. It can help the group to determine when the churches were built, and how they were constructed. Using this information we should be on track to determining how old we should expect the objects we'll find to be, and where specifically in the church they are

http://www.invenicetoday.com/art-tour/churches/sest_castello.htm

This site is very useful as it gives information about churches in the Castello region in Venice. It has a useful map of the locations of the churches in this region.

http://www.invenicetoday.com/art-tour/churches/churches.htm

Site contains a very useful map of all of Venice with the locations of its churches. It offers a point and click option that allows to pick a region of Venice and zoom in for better views and information.

http://www.invenicetoday.com/art-tour/churches/sest_dorsoduro.htm

This site is very useful as it gives information about churches in the Dorsoduro region in Venice. It has a useful map of the locations of the churches in this region.

http://www.invenicetoday.com/art-tour/churches/sest_spolo.htm

This site is very useful as it gives information about churches in the S. Polo region in Venice. It has a useful map of the locations of the churches in this region.

**Venice**

Pemble, John. Venice Rediscovered. Oxford: Clarendon Press, 1995.
This source has some historical information, but most notably recent restoration efforts. (Found by initial search of Title: +Venice)

Plant, Margaret. Venice Fragile City. New Haven & London: Yale University Press, 2002.
This source has a small bit of information current restoration attempts.
(Found by initial search of Title: +Venice)

Ravera, Oscar. The Lagoon of Venice: the result of both natural factors and human influence. Insituto Italiano di Idrobiologia, 2000.

This paper addresses the problems concerning the lagoons, and speaks of the threats that the high tides impose on Venice. It discusses the rising sea level and some effects on the buildings, but nothing specifically on churches.

**Tides and Preservation**

United Nations Educational, Scientific and Cultural Organization website. n.d. <http://www.unesco.org/> (27 March 2003).

This website is the home page of one of our sponsors: UNESCO (UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION). It is extremely helpful as it provides names, phone numbers, email addresses, and other contact information for professors, scientists, and historians.

Monastersky, Richard. "Science News: Against the Tide." (Venice, Italy). 24 July 1999. Science News. 18 Mar. 2002 <http://www.findarticles.com/cf_dls/m1200/4_156/55553310/print.jhtml>.

This article was used by last years group. It discusses the various studies conducted to determine the effects the rising water levels have on the city. The article mentions the flood gates that are implemented to protect the city. The article has useful tide information about how the city is affected, but not specifically the churches.

The TIDE project (European Union funded research project on Venice's lagoon)

<http://www.sciam.com/article.cfm?articleID=0008313B-E17E-1D5B-90FB809EC5880000>

This website provided some information about one of our sponsors NAUSICAA (the Veneto Superintendency for Archaeology) and their current projects. It was very general and not specific enough for our purposes.

## Appendix B: List of Churches

| Codice Chiesa | Local Nome della Chiesa | Vecchio Codice del Chiesa | Sestiere | Notes |
|---|---|---|---|---|
| AGNE | S. Agnese | AGNE | Dorsoduro | |
| ANDR | La Zirada | ANDR | Santa Croce | Under restoration as of 2004. |
| ANNU | Oratorio dell'Annunciata | ANNU | San Marco | |
| APON | S. Aponal | APON | San Polo | Closed |
| BART | S. Bartolomeo | BART | San Marco | |
| BASI | S. Marco | BASI | San Marco | Not applicable to the scope of our project |
| BASS | S. Basso | BASS | San Marco | Closed |
| BENE | S. Benedetto | BENE | San Marco | Closed |
| CARI | La Carità | CARI | Dorsoduro | Now part of the Accademia Art museum. It has a completely redone floor. |
| CARM | I Carmini | CARM | Dorsoduro | |
| CROA | Santa Croce | CROC | San Marco | Closed |
| EVAN | S. Giovanni Evangelista | EVAN | San Polo | |
| FANT | S. Fantin | FANT | San Marco | Closed |
| GALL | S. Gallo | GALL | San Marco | Closed |
| GEOR | St. Georges Church | GEOR | Dorsoduro | Not a Catholic Church |
| GIGL | S. Maria Zobenigo | GIGL | San Marco | |
| LUCA | S. Luca | LUCA | San Marco | |
| MAGG | S. Maria Maggiore | MAGG | Santa Croce | Under restoration as of 2004, also part of a prison |
| MARG | S. Margherita | MARG | Dorsoduro | Now part of the university. |
| MATE | S. Maria Mater Domini | MATE | Santa Croce | |
| MAUR | S. Maurizio | MAUR | San Marco | Closed and padlocked |
| MEND | S. Nicolò dei Mendicoli | MEND | Castello | |
| MENI | I Catecumeni | MENI | Dorsoduro | |
| MOIS | S. Moisè | MOIS | San Marco | |
| NOME | Nome di Gesu | NOME | Santa Croce | |
| OGNI | Ognisanti | OGNI | Dorsoduro | |
| ORIO | S. Giacomo dell'Orio | ORIO | Santa Croce | |
| PANT | S. Pantalon | PANT | Dorsoduro | |
| RAFF | L'Anzolo Rafael | RAFF | Dorsoduro | Under restoration as of 2004. |
| ROMI | Le Romite | ROMI | Dorsoduro | |
| SALV | S. Salvador | SALV | San Marco | |
| SIMG | S. Simeon Grando | GRAN | Santa Croce | |
| SIMP | S. Simeon Piccolo | PICC | Santa Croce | Under restoration as of 2004. |
| SMAR | S. Marta | SMAR | Dorsoduro | Under restoration as of 2004. |
| SPIR | Spirito Santo | SPIR | Dorsoduro | Under restoration as of 2004. |
| STAE | S. Stae | STAE | Santa Croce | |
| STEF | S. Stefano | STEF | San Marco | |
| TERE | Le Teresa | TERE | Dorsoduro | |

| | | | | |
|---|---|---|---|---|
| TODA | S. Teodoro | TODA | San Marco | Not applicable to the scope of our project |
| TOLE | I Tolentini | TOLE | Santa Croce | |
| TOMA | S. Tommaso | TOMA | San Polo | Floor completely covered with felt. Impossible to assess in it's current condition |
| VIDA | S. Vidal | VIDA | San Marco | |
| VITO | S. Vito e Modesto | VITO | Dorsoduro | Now a private dwelling. |
| ZAND | S. Zandegola | ZAND | Santa Croce | |
| ZULI | S. Zulian | ZULI | San Marco | |

## Appendix C: Damage Assessment Tables

**Cracks**

Cracks can be telling signs of problems beneath the floor and high traffic areas. These cracks indicate weaknesses in the floor and could be future sites for floor detachment. Our team judged the cracks based on their size and whether or not we considered them problematic. Cracks that are over 2 mm wide and cut into the floor material were considered problematic. Cracks smaller than this and surface cracks were considered smaller cracks. The following table shows the 0-4 point scale on which the severity of the cracks was measured.

| Scale | Description |
|---|---|
| 0 | Minimal or no cracks present |
| 1 | Low severity of cracks<br>Low level of cracks, none are considered problematic |
| 2 | Intermediate level of cracks<br>Either some problem cracks present or many small cracks present |
| 3 | High level of cracks<br>Significant number of problem cracks and many small cracks present |
| 4 | Severe level of cracks<br>High frequency of problem cracks and small cracks |

To illustrate the progression of this scale, a picture for each severity level is shown below. This will serve as an example for the progression of all the other categories of damage shown.

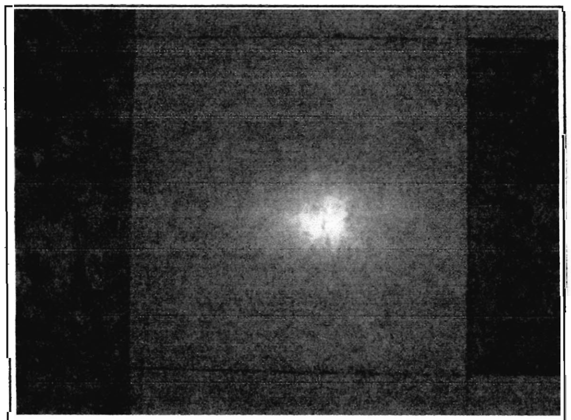

Figure 63: Crack severity 0

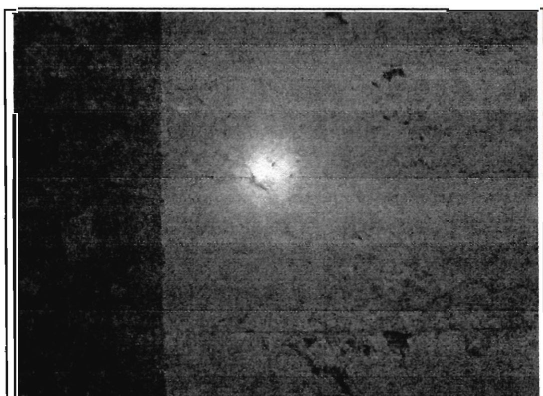

Figure 62: Crack Severity 1

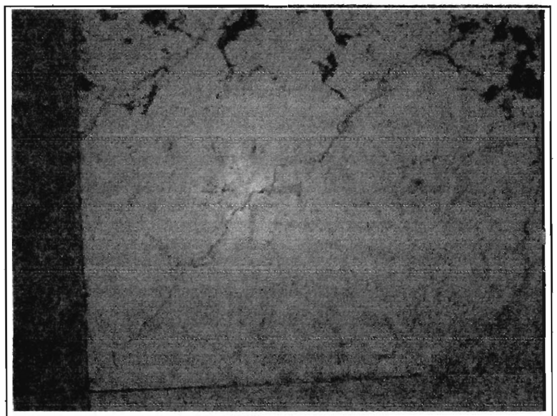

Figure 64: Crack severity 2

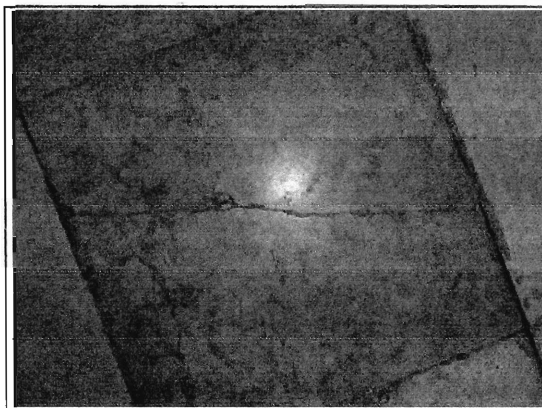

Figure 65: Crack severity 3

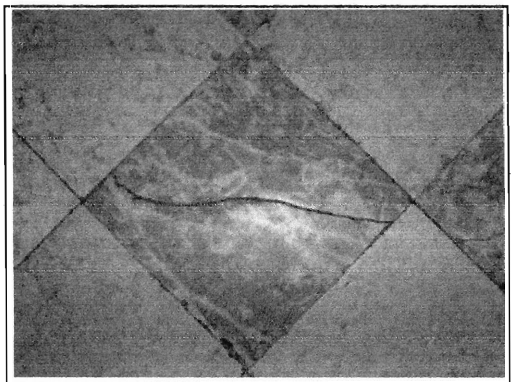

Figure 66: Crack severity 4

**Joint Gaps**

Joint gaps are larger than usual separations between floor tiles, either vertically or horizontally. The following table shows the 0-4 point scale on which the severity of the joint gaps were measured.

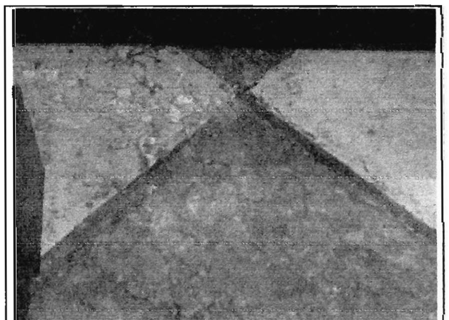

Figure 67: Example of a Joint Gap

| Scale | Description |
|---|---|
| 0 | Minimal or no joint gaps present |
| 1 | Low severity of joint gaps<br>Few joint gaps that present no danger to the floor structure |
| 2 | Intermediate level of joint gaps<br>Multiple joint gaps potentially endangering the floor structure |
| 3 | High level of joint gaps<br>Many joint gaps that threaten damage to the floor structure |
| 4 | Severe level of joint gaps |

| | |
|---|---|
| | Majority or area contains joint gaps damaging the floor structure |

**Holes**

Holes are considered as an area of missing floor at least 1.5 cm deep. The following table shows the 0-4 point scale on which the severity of the holes was measured.

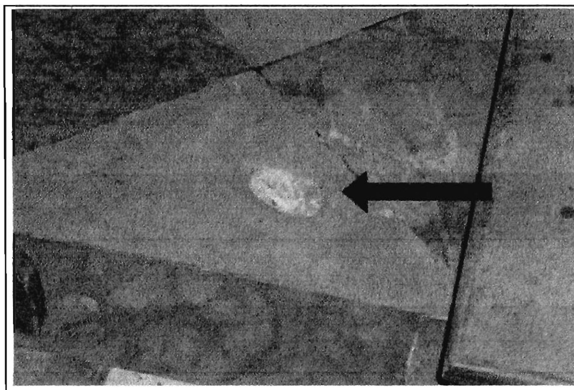

Figure 68: Example of a Hole

| Scale | Description |
|---|---|
| 0 | Minimal or no holes present |
| 1 | Low severity of holes<br>Few holes that present no danger to the floor structure |
| 2 | Intermediate level of holes<br>Multiple holes potentially endangering the floor structure |
| 3 | High level of holes<br>Many holes that threaten damage to the floor structure |
| 4 | Severe level of holes<br>Majority or area contains holes damaging the floor structure |

**Floor Detachment**

Floor detachment is considered as any piece of a tile missing or an entire tile itself. The team recorded the percentage of each floor quadrant suffering from detachment.

Figure 69: Example of Floor Detachment

**Floor Replacement**

Floor replacement is considered when any part of the floor has been replaced with new tiles or other new materials. The team recorded the percentage of each floor quadrant suffering from replacement.

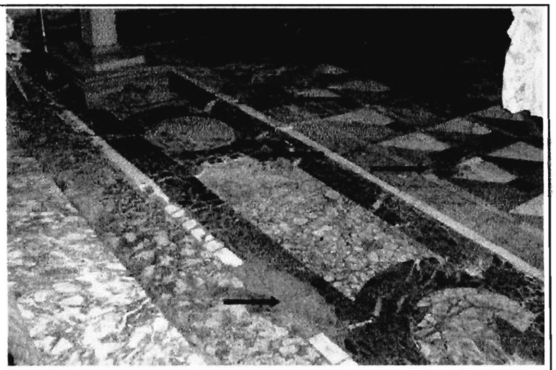

Figure 70: Example of Floor Replacement

**Surface Damage**

Surface damage has many causes ranging from foot traffic, flooding, and pews rubbing the floors among other things. The three types of surface damage that our team inspected for are wearing and fading, pitting, and discoloration. The following table shows the 0-4 point scale on which the severity of the surface damage was measured.

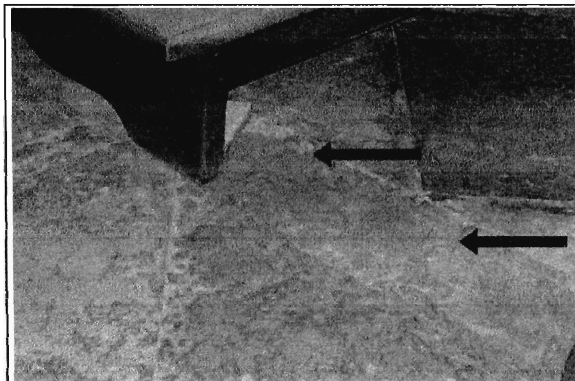

Figure 71: Example of Surface Damage

| Scale | Description |
|---|---|
| 0 | Good condition<br>No signs of fading, wear, pitting or discoloration |
| 1 | Slightly worn but color and/or design is still visible<br>Noticeable wear, slight pitting, or small areas are discolored |
| 2 | Moderately worn and color and/or design is not entirely visible<br>Noticeable wear, moderate pitting, or medium areas are discolored |
| 3 | Heavily worn and color and/or design is barely visible<br>Noticeable wear, significant pitting, large areas are discolored |
| 4 | Severely worn and color and/or design not visible<br>Noticeable wear, severe pitting, majority of area is discolored |

## Appendix D: Table of Abbreviations

The following is table of abbreviations used on artifacts obtained from the work of Cicogna. We felt that this may be useful to future groups studying church floors.

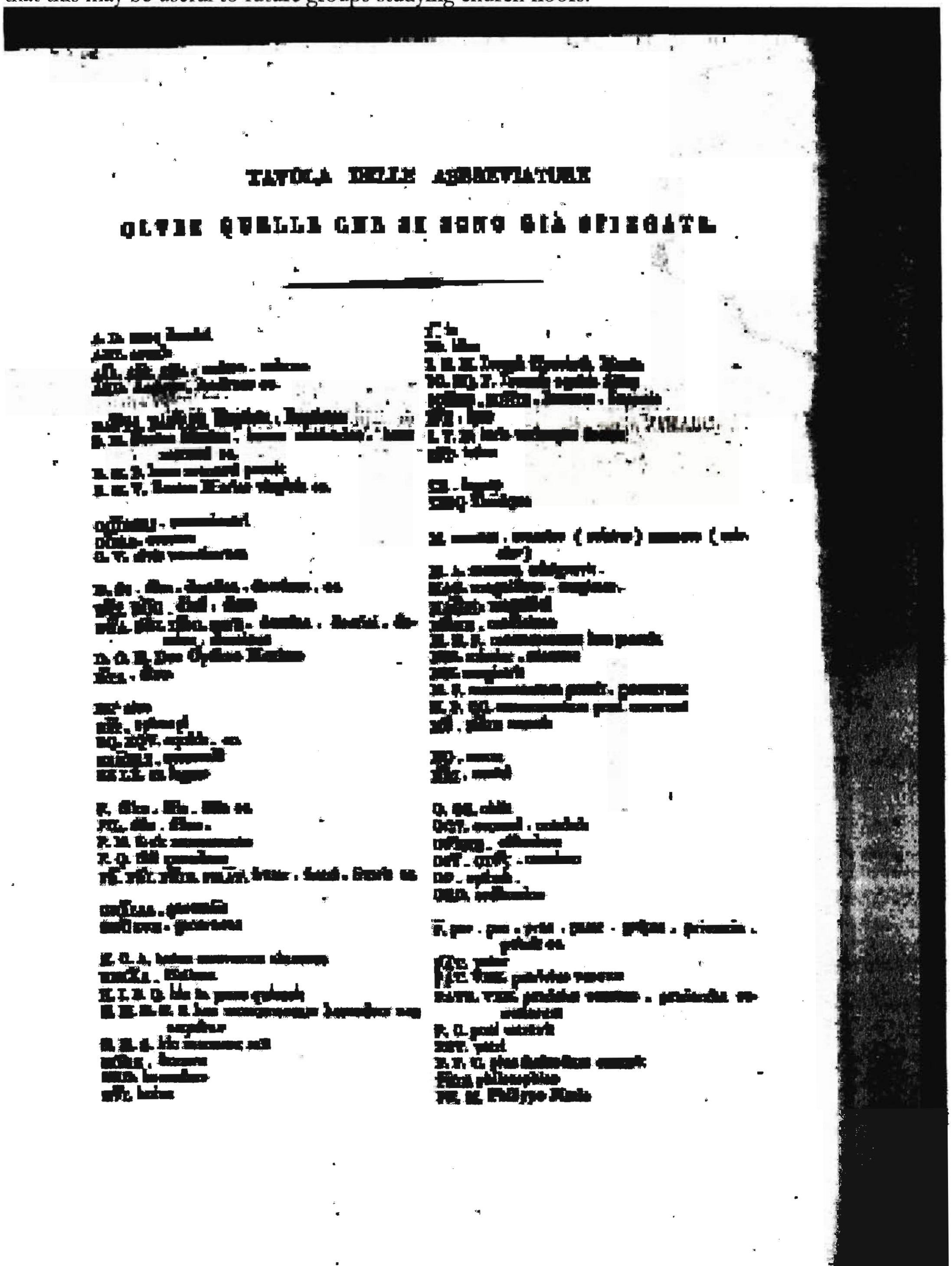

TAVOLA DELLE ABBREVIATURE

OLTRE QUELLE CHE SI SONO GIÀ SPIEGATE

## Appendix E: Letter from Don Aldo

The following is the letter we received from Don Aldo Marangoni that allowed us to gain access to churches.

CURIA PATRIARCALE DI VENEZIA
UFFICIO BENI CULTURALI
Sezione Beni Ambientali e Architettonici

Ai Rev.mi Parroci interessati
Loro sedi

**Oggetto: incarico di sopralluogo.**

Questo Ufficio BB.CC. EE. del Patriarcato di Venezia, Sezione Conservazione, nella persona del suo Direttore don Aldo Marangoni autorizza le persone latrici di questo messaggio ad eseguire, sempre previo consenso e appuntamento con il Parroco, le ricerche richieste da parte della Soprintendenza ai Beni Archeologici "NAUSICAA".

Distinti saluti.

Il Direttore

UFFICIO BENI CULTURALI ECCLESIASTICI
SEZIONE BENI AMBIENTALI E ARCHITETTONICI
IL DIRETTORE
Don Aldo Marangoni

7 LUG. 2004

VENEZIA

San Marco, 320/A - 30124 VENEZIA - Tel. 041.2702454-468
E-mail: ufficiochiese@patriarcato.venezia.it

## Appendix F: Letter from the Soprintendenza all'Archeologia

The following is a sample of the letters we recieved from Dott Luigi Fozzati that aided in our attempt to gain access to churches.

*Ministero per i Beni e le Attività Culturali*
*Soprintendenza per i Beni Archeologici del Veneto*
*NAUSICAA*
*Nucleo Archeologia Umida Subacquea*
*Italia Centro Alto Adriatico*
Cannaregio 5031 30121 VENEZIA
Tel 0415200201 Fax 0415200419

**VENEZIA** 16 GIU. 2004

Molto Rev.do Parroco
della chiesa di San Nicolò dei Mendicoli
Dorsoduro
30135 VENEZIA

Prot. N° 1620 Allegati ______

**OGGETTO**: VENEZIA, città e laguna; PROGETTO MIR (Progetto Monasteri e Insediamenti Religiosi in Venezia e laguna), sottoprogetto di studio e ricerca sui pavimenti delle chiese.

Molto Rev.do Don Aldo MARANGONI
Direttore Sezione Beni Ambientali
Architettonici Ecclesiastici
CURIA PATRIARCALE - S. Marco 320
30124 VENEZIA
fax 041/2702420

Egr. Prof. Fabio CARRERA
*Venice Project Center*
100 Institute Road WORCESTER MA - USA
Fax 041/2419344

L'Ufficio Scrivente – d'intesa con il Direttore della Sezione Beni Ambientali Architettonici Ecclesiastici della Curia Patriarcale di Venezia – promuove nell'ambito dell'archeologia urbana di Venezia una ricerca relativa al restauro di pavimenti di chiese, restauro che ovviamente presenta o può presentare evidenti riflessi sul patrimonio archeologico. Al fine di ricostruire le vicende relative alla storia, manutenzione, restauro dei pavimenti delle chiese veneziane e, di conseguenza, al fine di mettere a punto una specifica metodologia di studio, si avvia una fase sperimentale di ricerca grazie alla collaborazione del Venice Project Center di Worcester (USA) diretto dal Prof. Fabio Carrera.

Si richiede pertanto al titolare di Codesta Chiesa di voler agevolare gli studenti del Venice Project Center per la compilazione della scheda di catalogo che Le verrà successivamente inviata ufficialmente in copia per il Suo Archivio.

L'équipe di ricerca è composta dai seguenti studenti: Scott Blanchard, Jeff Caputo, Matt Regan e Matt Shaw; nonché dai docenti Prof. Fabio Carrera e Prof. H.J. Manzari e dal Direttore del Progetto MIR Dott. Marco Bortoletto.

Per qualsiasi delucidazione in merito al progetto su esposto, si prega di contattare la Segreteria di questo Ufficio al seguente numero: 041-5200201.

Distinti saluti.

IL DIRETTORE DI NAUSICAA
Dott. Luigi FOZZATI

# Appendix E: Church Information

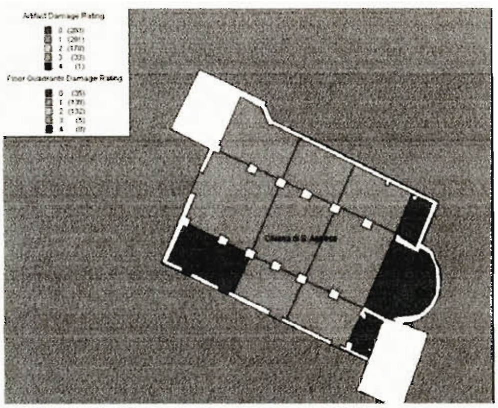

Figure 72: AGNE Artifact and Floor Damage

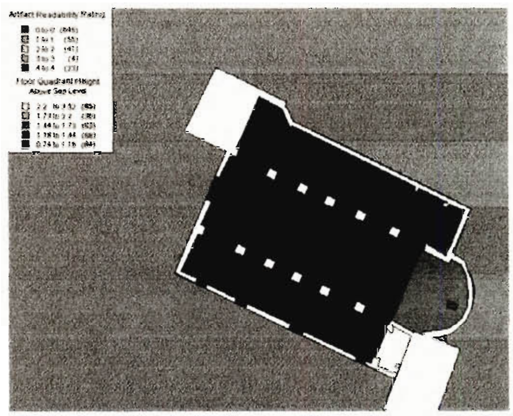

Figure 73: AGNE Text Readability Floor Quadrant Height

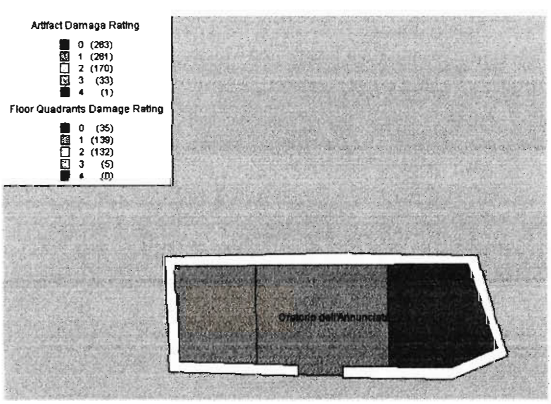


Figure 75: ANNU Artifact and Floor Damage

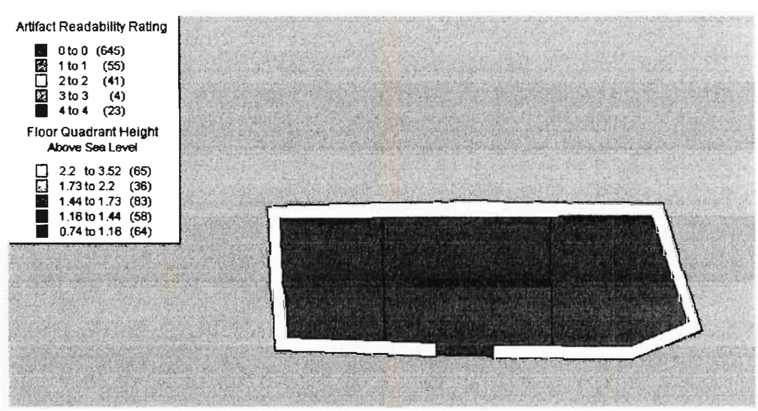


Figure 74: ANNU Artifact Readability and Floor Quadrant Height

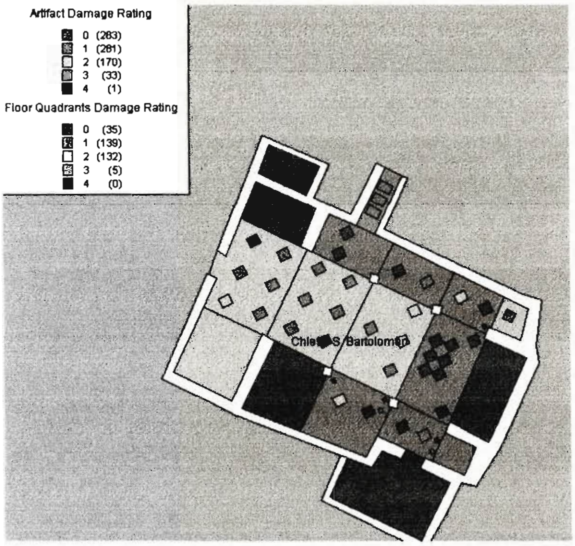


Figure 77: BART Artifact and Floor Damage

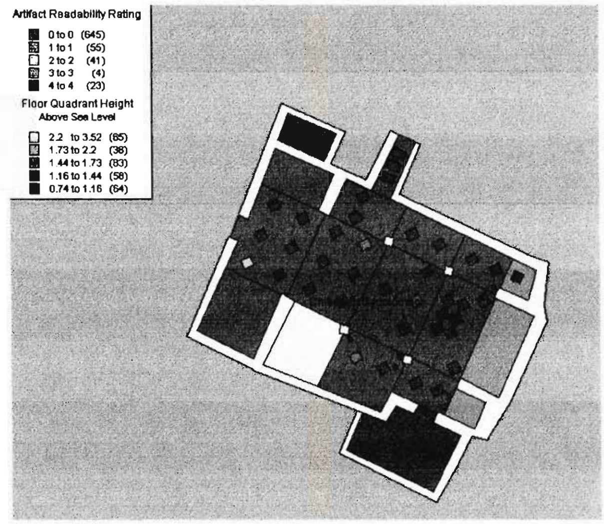


Figure 76: BART Artifact Readability and Floor Quadrant Height

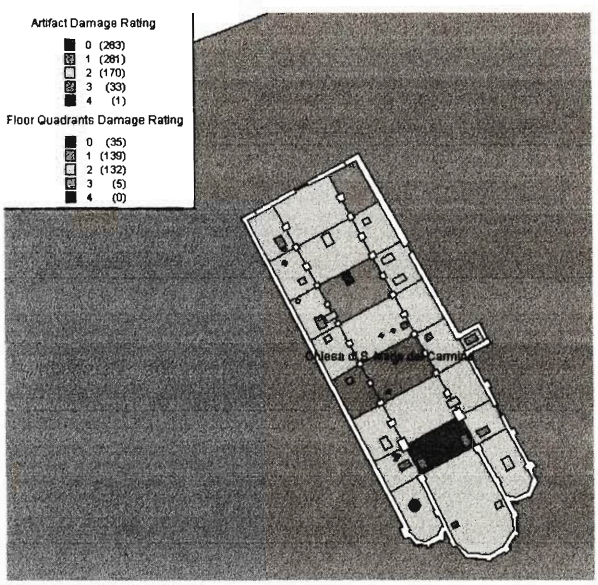


Figure 78: CARM Artifact and Floor Damage

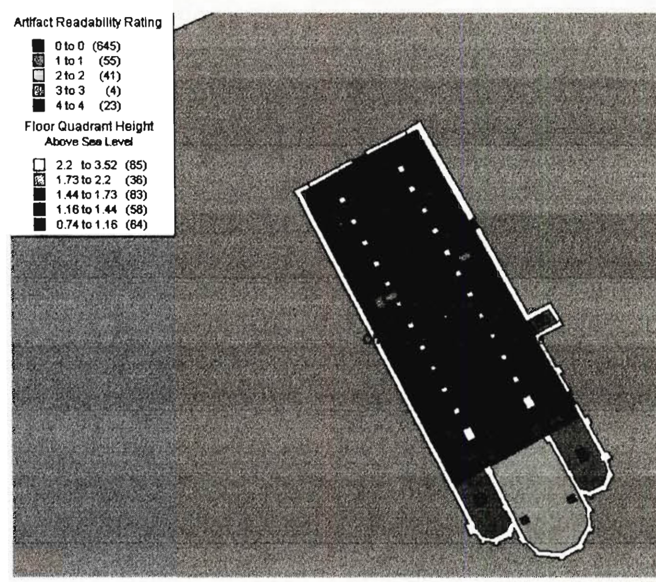


Figure 79: CARM Artifact Readability and Floor Quadrant Height

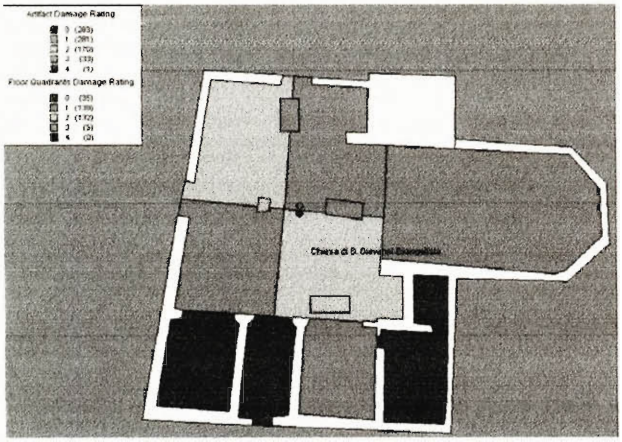

Figure 80: EVAN Artifact and Floor Damage

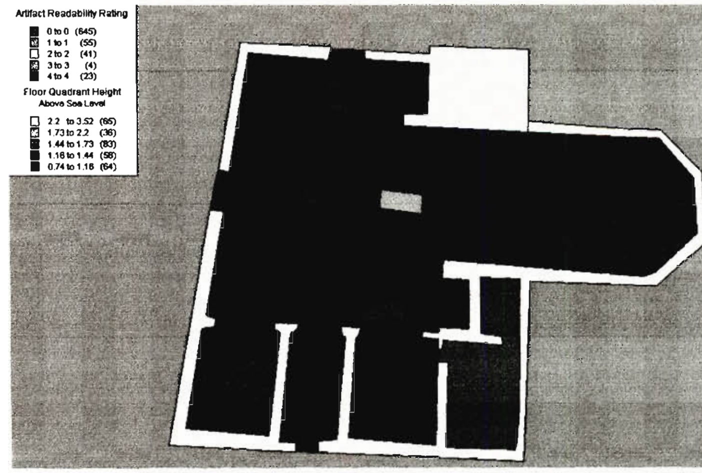


Figure 81: EVAN Artifact Readability and Floor Quadrant Height

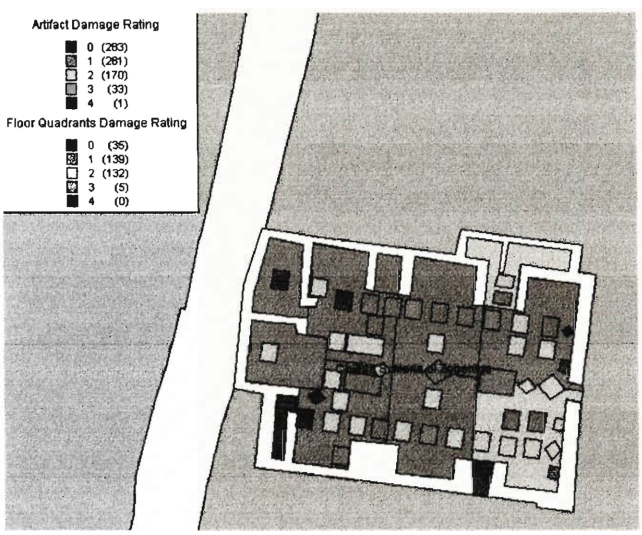


Figure 83: GIGL Artifact and Floor Damage

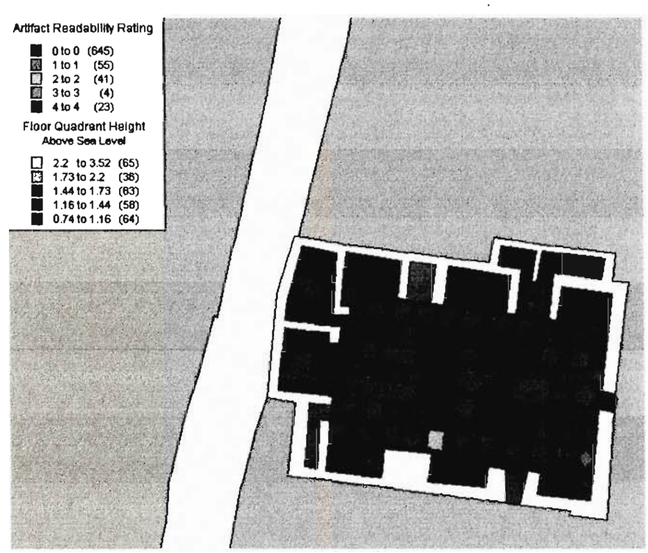


Figure 82: GIGL Artifact Readability and Floor Quadrant Height

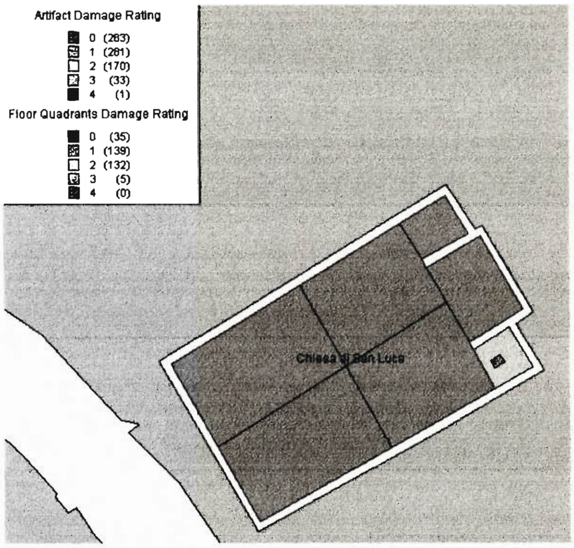


Figure 85: LUCA Artifact and Floor Damage

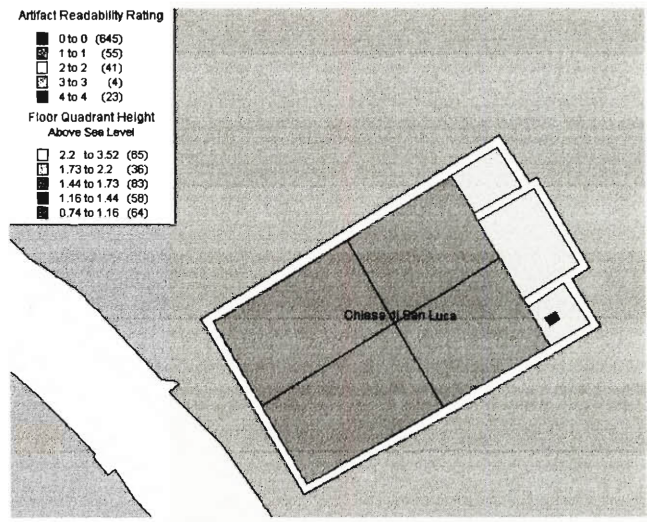


Figure 84: LUCA Artifact Readability and Floor Quadrant Height

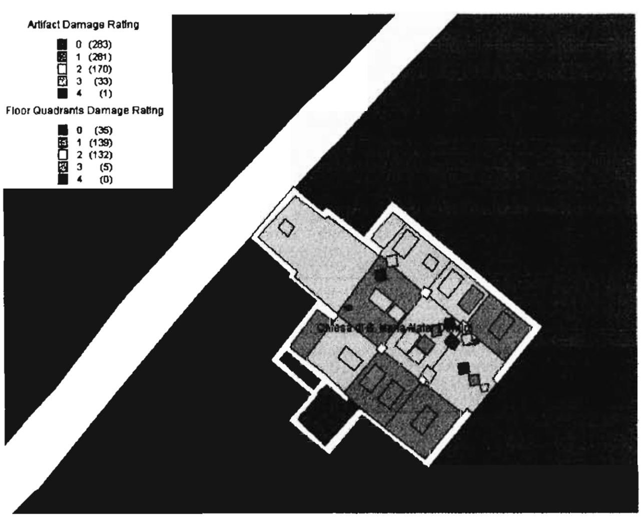


Figure 86: MATE Artifact and Floor Damage

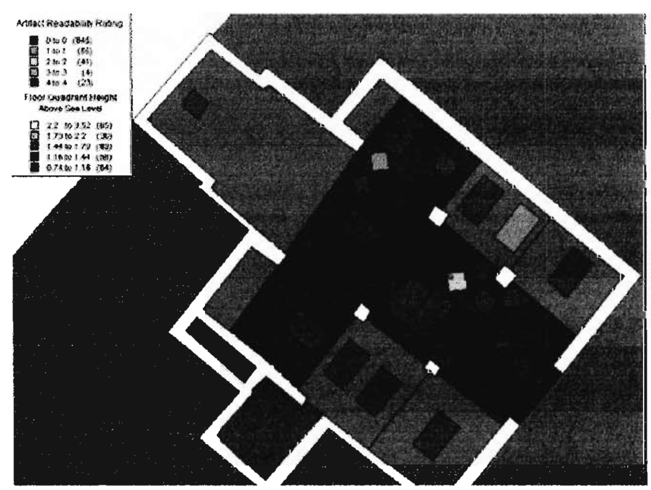

Figure 87: MATE Artifact Readability and Floor Quadrant Height

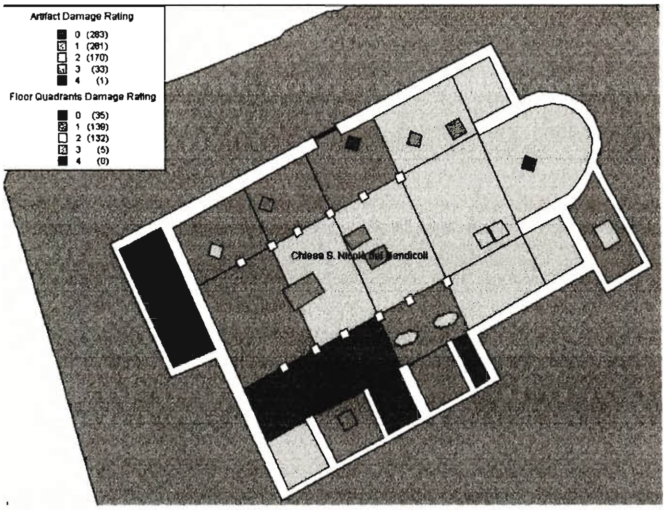


Figure 89: MEND Artifact and Floor Damage

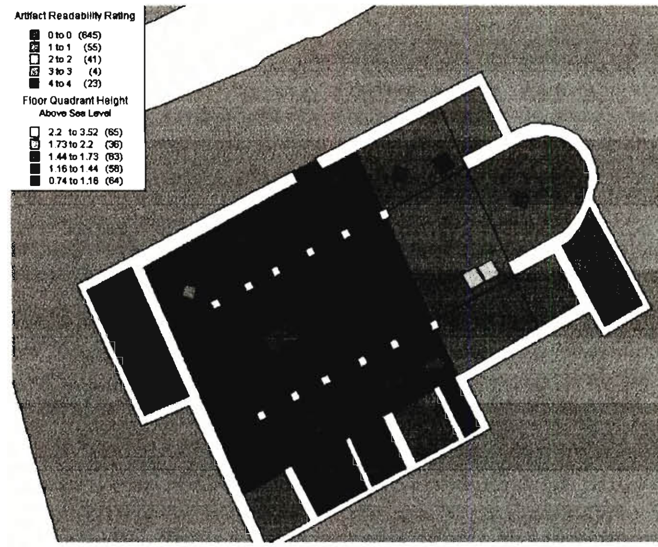


Figure 88: MEND Artifact Readability and Floor Quadrant Height

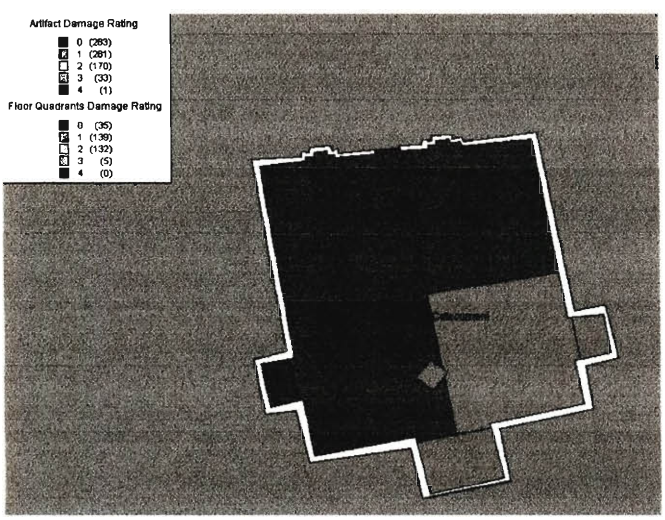


Figure 91: MENI Artifact and Floor Damage

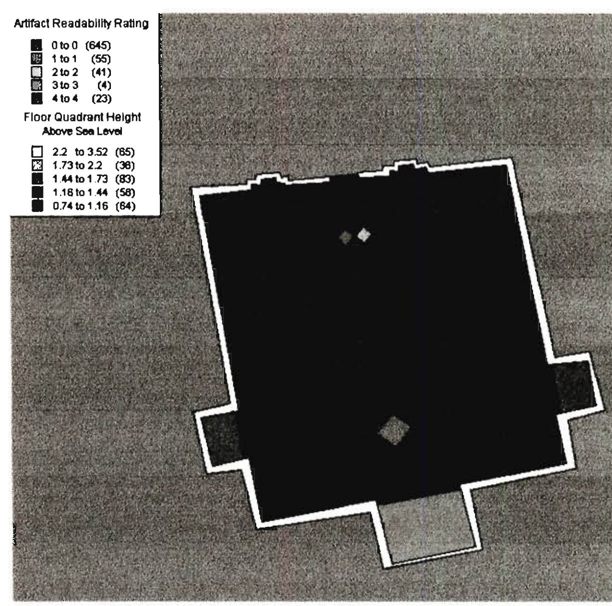


Figure 90: MENI Artifact Readability and Floor Quadrant Height

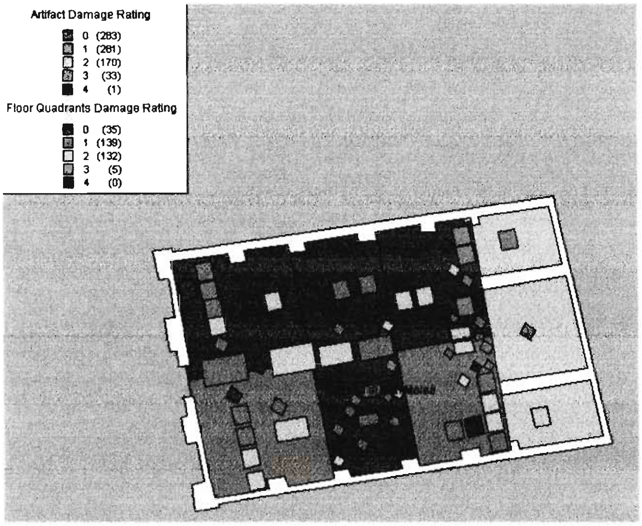


Figure 92: MOIS Artifact and Floor Damage

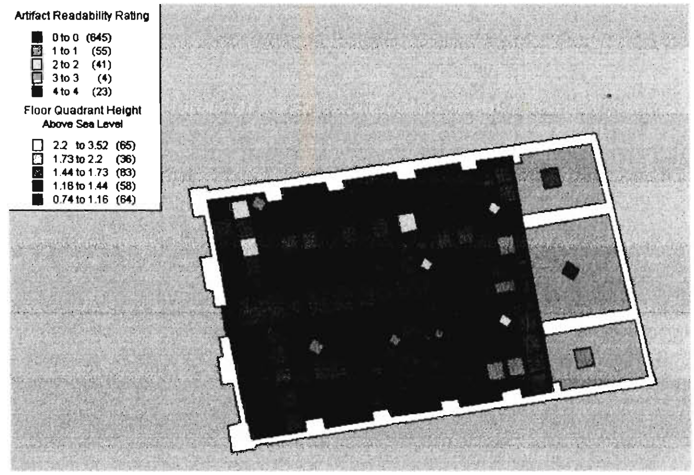


Figure 93: MOIS Artifact Readability and Floor Quadrant Height

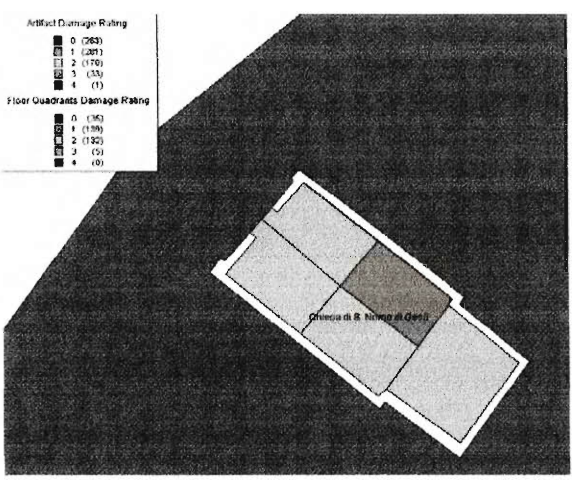


Figure 95: NOME Artifact and Floor Damage


Figure 94: NOME Artifact Readability and Floor Quadrant Height

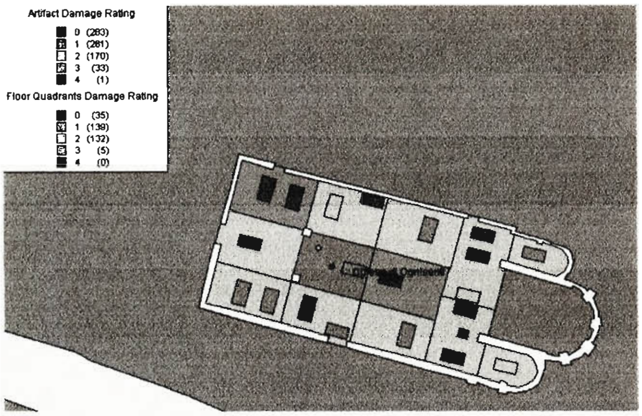


Figure 96: OGNI Artifact and Floor Damage

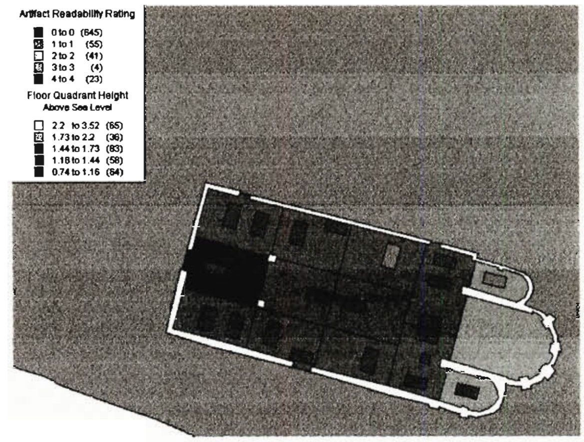


Figure 97: OGNI Artifact Readability and Floor Quadrant Height

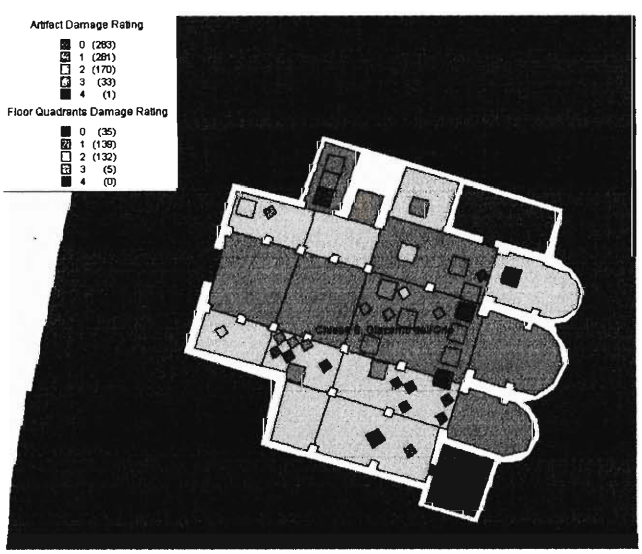


Figure 98: ORIO Artifact and Floor Damage


Figure 99: ORIO Artifact Readability and Floor Quadrant Height

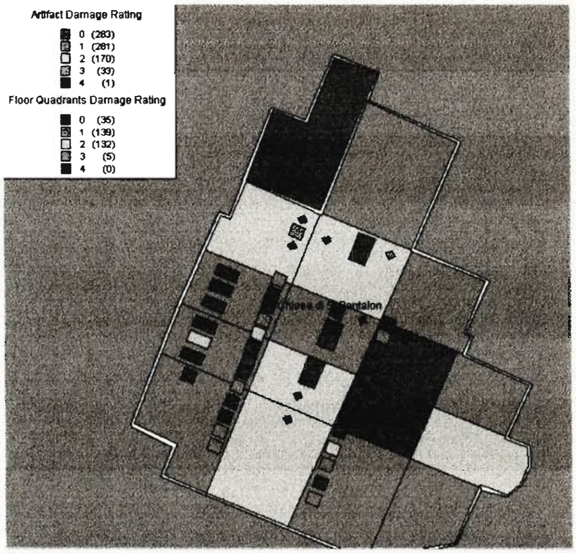


Figure 100: PANT Artifact and Floor Damage

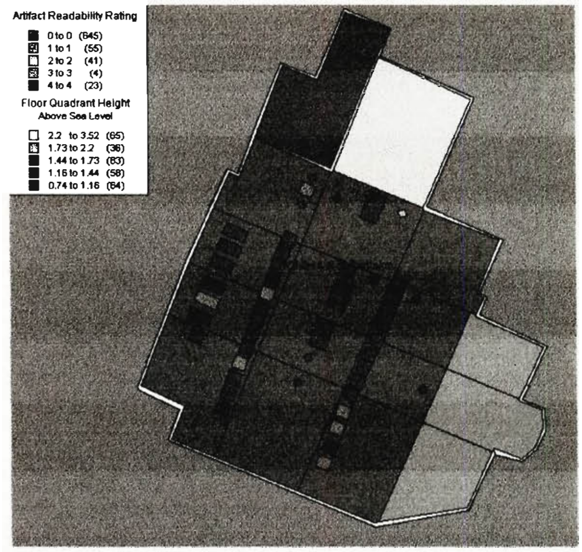


Figure 101: PANT Artifact Readability and Floor Quadrant Height

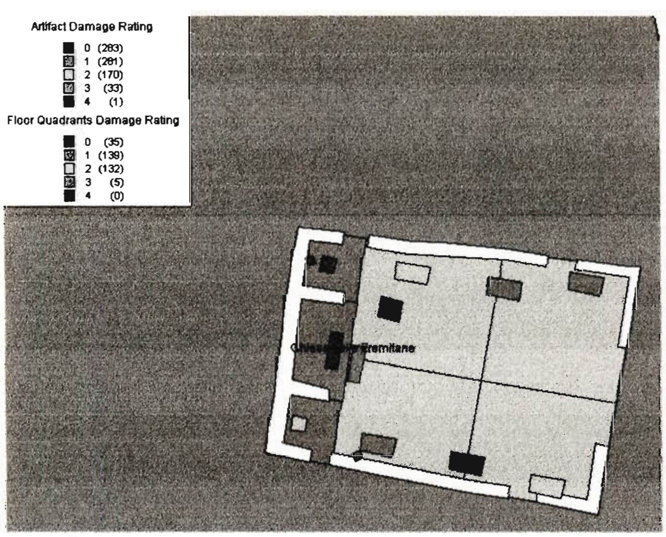


Figure 102: ROMI Artifact and Floor Damage

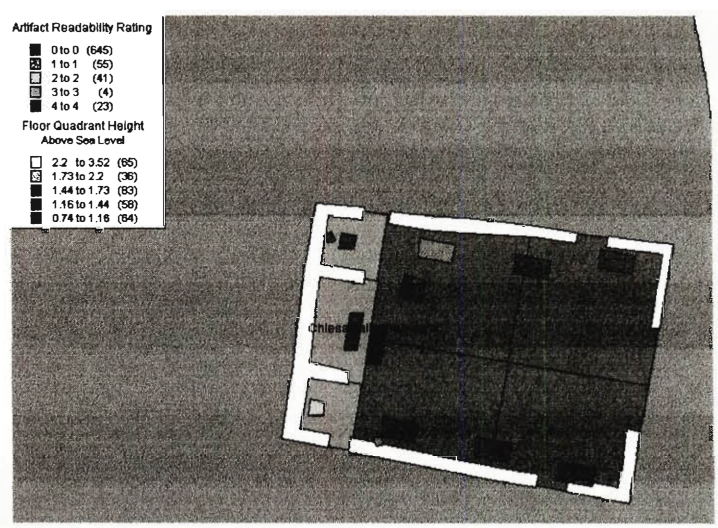


Figure 103: ROMI Artifact Readability and Floor Quadrant Height

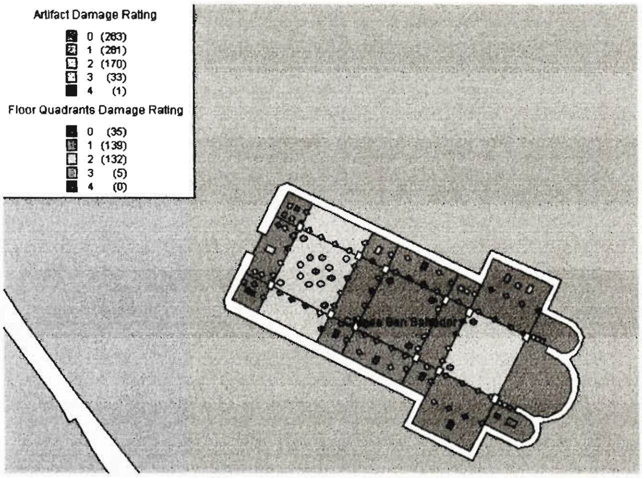


Figure 104: SALV Artifact and Floor Damage

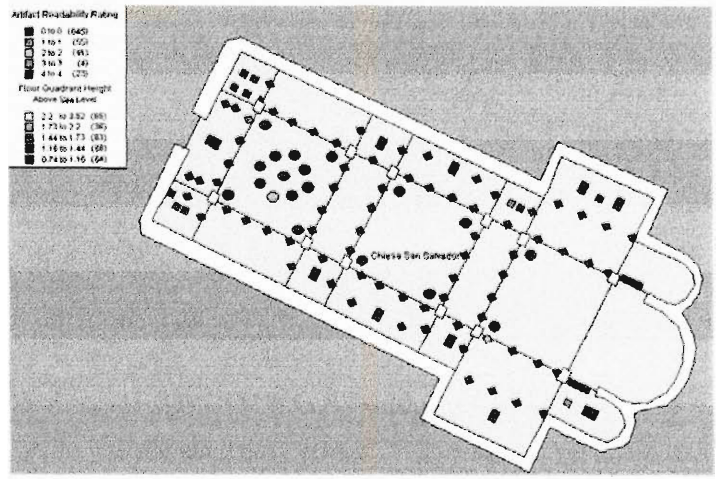

Figure 105: SALV Artifact Readability and Floor Quadrant Height

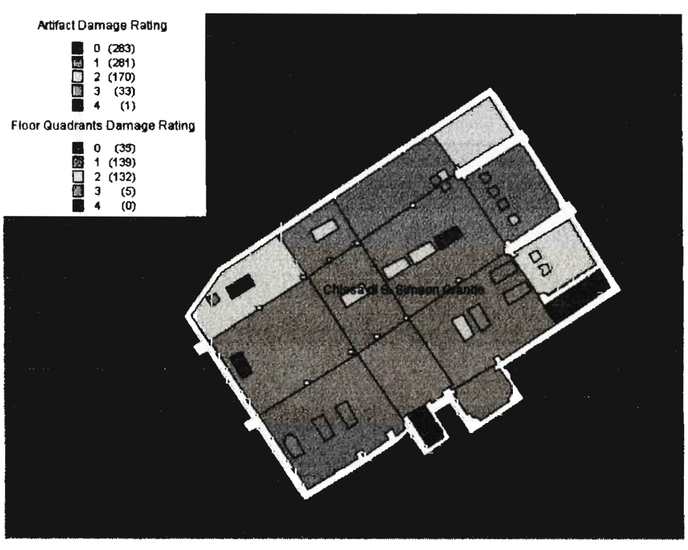


Figure 106: SIMG Artifact and Floor Damage

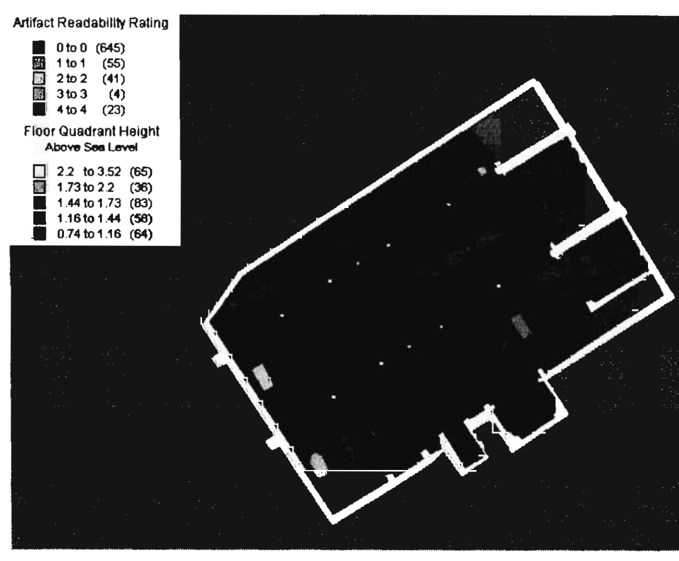


Figure 107: SIMG Artifact Readability and Floor Quadrant Height

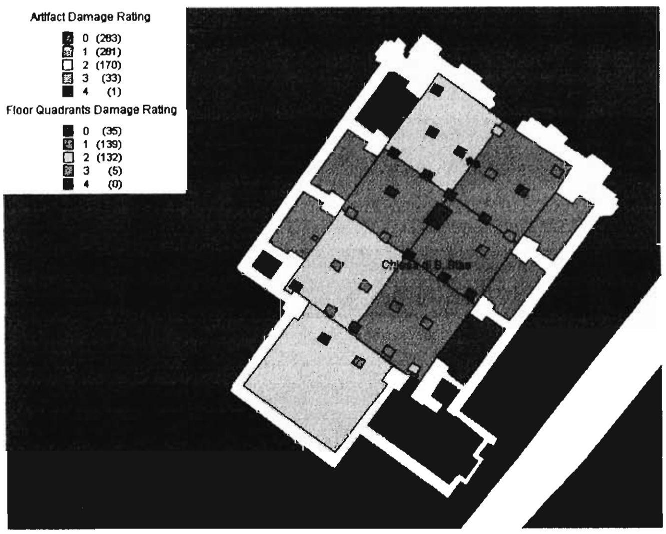


Figure 109: STAE Artifact and Floor Damage

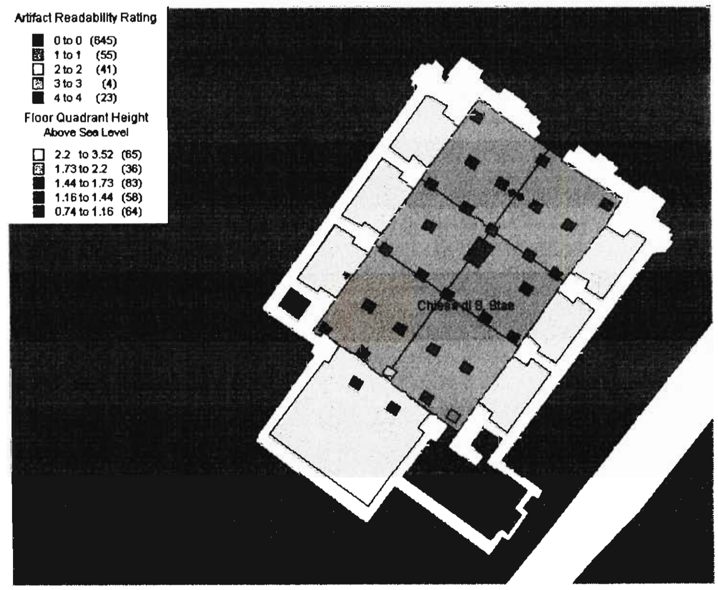


Figure 108: STAE Artifact Readability and Floor Quadrant Height

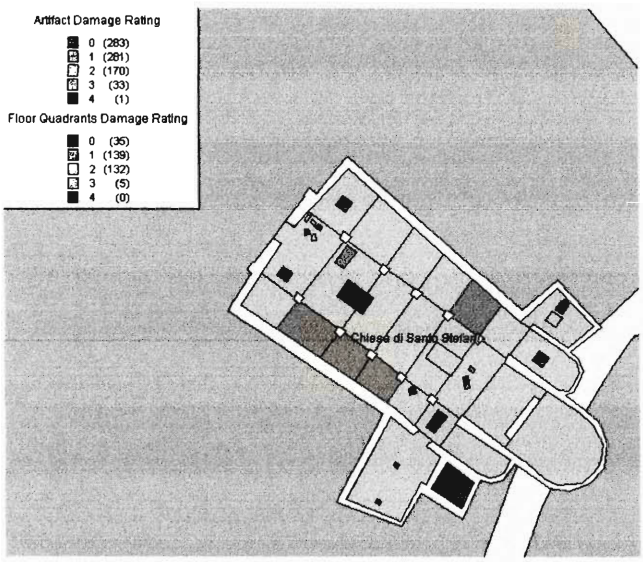

Figure 110: STEF Artifact and Floor Damage

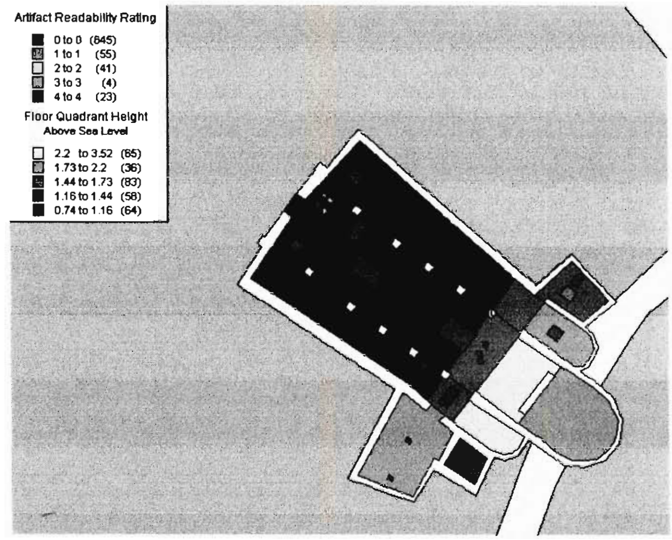

Figure 111: STEF Artifact Readability and Floor Quadrant Height

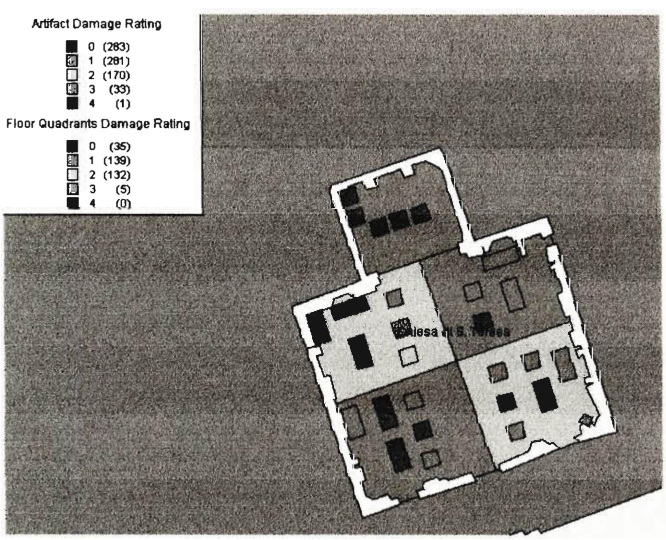

Figure 113: TERE Artifact and Floor Damage

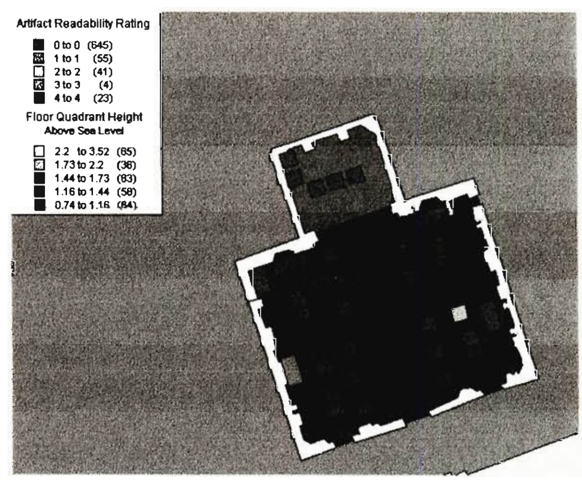

Figure 112: TERE Artifact Readability and Floor Quadrant Height


Figure 115: TOLE Artifact and Floor Damage

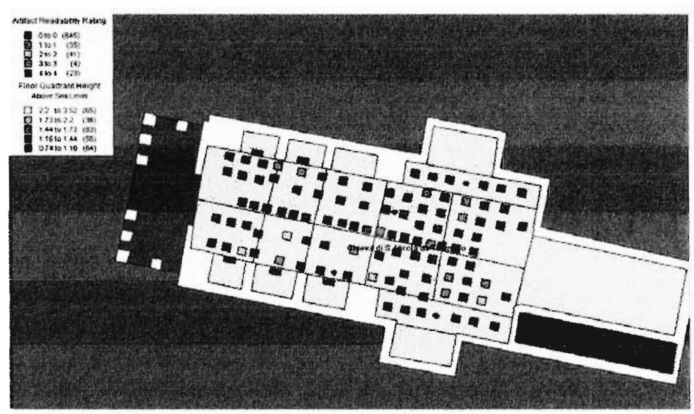

Figure 114: TOLE Artifact Readability and Floor Quadrant Height

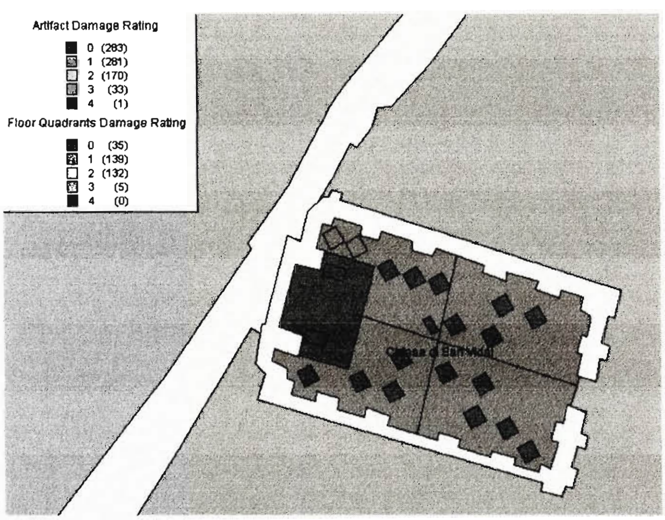


Figure 117: VIDA Artifact and Floor Damage

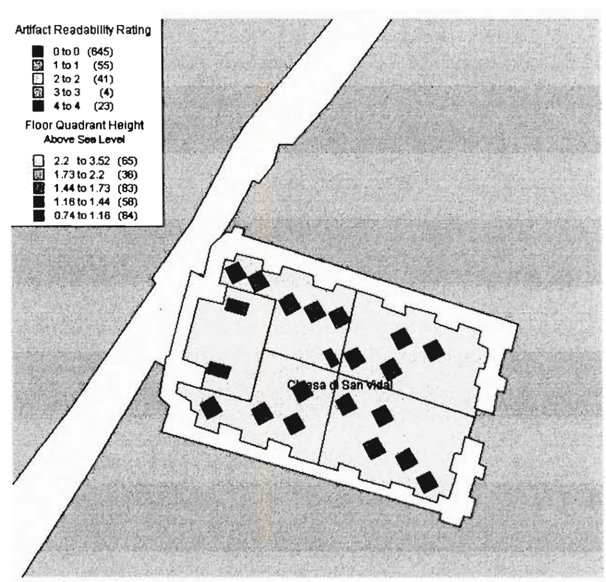


Figure 116: VIDA Artifact Readability and Floor Quadrant Height

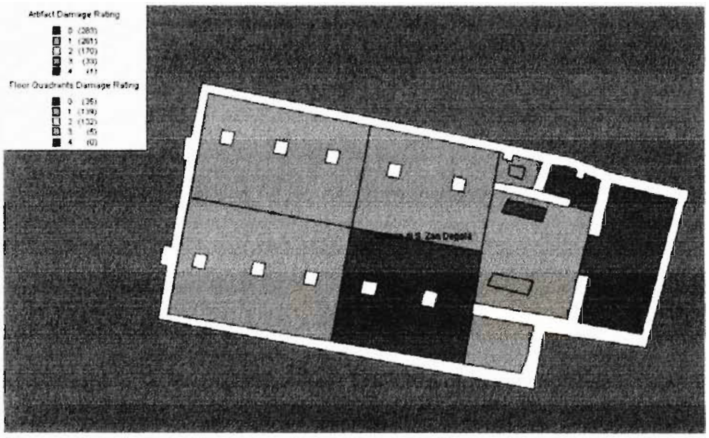

Figure 118: ZAND Artifact and Floor Damage

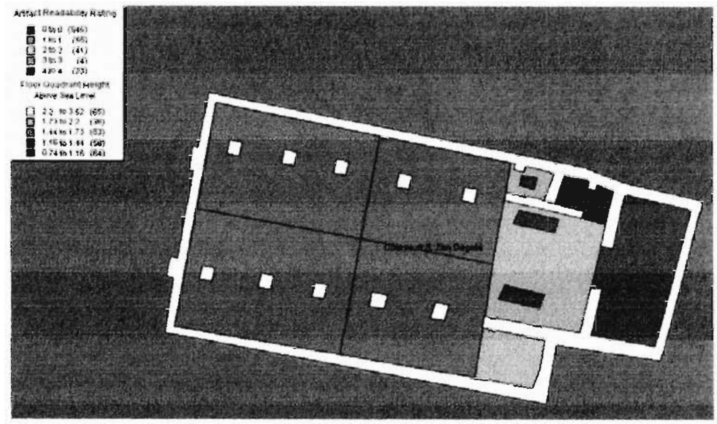

Figure 119: ZAND Artifact Readability and Floor Quadrant Height

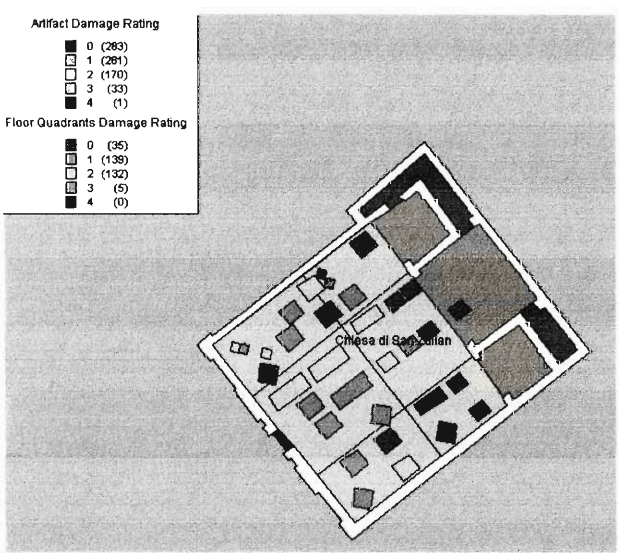


Figure 120: ZULI Artifact and Floor Damage

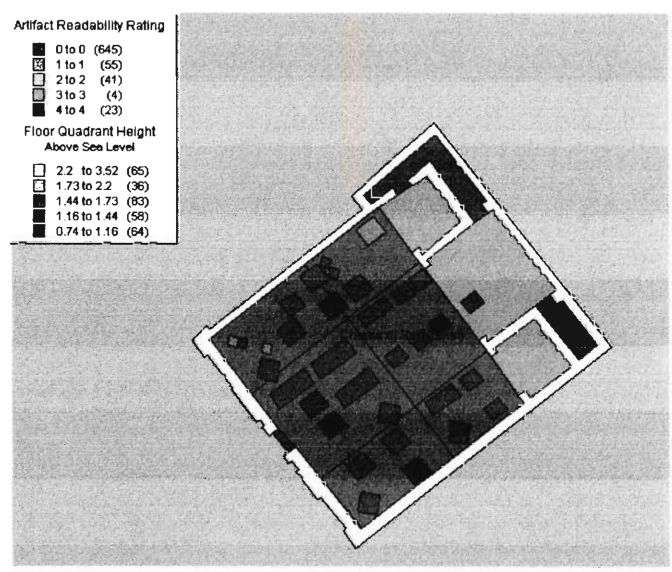


Figure 121: ZULI Artifact Readability and Floor Quadrant Height