

On the SeVAMH survey protocol for safety and safeguard of artistic assets. Overview and validation at the Monumental complex of Santa Chiara in Naples

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Abstract

The availability of data concerning cultural heritage is a key condition for the preservation and enhancement of valuable assets, particularly when they are exposed to relevant hazards, and needs to be improved when safety evaluation, like those associated with the Artistic Limit State (ALS) of heritage structures and assets, are required. This task can be supported by Information and Communication Technology (ICT) that can provide easy-to-manage and efficient tools capable to properly describe the current conditions of cultural heritage components in a comprehensive way. Hierarchical and structured information can be collected and managed in the form of databases made of heterogeneous data, including pictures and sketches. In such a context, one of the main aspects of the process is the correlation between movable and immovable assets and their potential interactions under exceptional actions.

Parole chiave

Architectural heritage, documentation, conservation, seismic risk, SeVAMH survey form.

Introduction

Valuable assets with unique characteristics and peculiarities are widespread worldwide, they are part of our cultural heritage and consist of all movable and immovable elements that have acquired over time historical, artistic, and archaeological value. Therefore, this heritage must be protected to ensure its duration over time and facilitate its knowledge and dissemination to the present and future generations (ICOMOS, 1964; UNESCO, 1972; Legislative Decree n 42, 2004). The safety and safeguarding of cultural heritage are ensured through specific actions following a complex and multifaceted design process. The complexity of this preserving actions design process is due to not only the several typologies and peculiarities affecting the cultural heritage but, above all, to the exposure to anthropic and natural hazards, among which emerges the seismic one. Italian Guidelines (Directive, 2011; NTC, 2018) and international recommendations (ICOMOS, 2003), as well as a significant number of studies (Lourenço, 2006; Masciotta et al., 2016; Ramos et al., 2018; Marra et al., 2021), outline a multidisci-



plinary approach to face these issues and to encourage the implementation of proper protection and safety actions. This design of the interventions involves different expertise that provides a contribution identifying both the most adequate methodological choice for the investigations and analyses, and the suitable interventions to ensure the safety and safeguard of cultural heritage.

In such a context, the availability of data about the artefact associated with its present and past state represents a key condition to define both technical and critical evaluations of the actions able to increase the preservation of the relevant architectural and artistic heritage including safety issues associated with natural hazardous events, like the earthquakes.

Based on the ability of novel techniques and opportunities coming from the world of the Information and Communication Technology (ICT), it is clear that a technical effort to establish and standardise the specifications of effective and reliable management tools capable of supporting the identification, knowledge, documentation, characterization, and valorisation of the artistic heritage. Moreover, these tools need a common language, based on a unified vocabulary, so that the cooperation and exchange of information between the different experts involved in the processes of cultural heritage can be ensured.

This is the background of the study presented in the present paper, which summarises the main features of an original survey protocol aimed at collecting typological and formal data about the historical heritage in a perspective of 'container' and 'content', namely the architectural artefact and artistic assets exposed in it, with particular attention to the Artistic Limit State (ALS) identified by national regulations (Directive, 2011).

The Seismic Vulnerability Assessment of Movable Heritage (SeVAMH) protocol described here represents an interoperable guideline that provides a comprehensive knowledge regarding different typologies of artworks and starting from dimensional and state of conservation surveys. Moreover, the SeVAMH survey protocol enables the identification of the possible effects of a seismic event; as a consequence, the protocol is useful to identify proper safeguarding measures and to assess the safety of cultural heritage.

In the following, after a review of the methodological approaches and tools adopted for restoration and risk mitigation assessments and the description of the SeVAMH protocol key aspects, its validation by means of a pilot application to some of the artistic heritage located in the monumental complex of Santa Chiara in Naples is documented.

Complex of Santa Chiara in Naples: general view of the basilica and general view of the cloister (photo: authors).

Current tools for the knowledge and assessment of cultural heritage

The knowledge of the formal and cultural features of the valuable assets worth being preserved is pursued, within multidisciplinary processes of documentation and analysis of the built heritage, through cataloguing tools shared at the national level characterised by different levels of complexity and detail. These tools are designed to facilitate the acquisition of relevant information about cultural assets through specific catalogue forms developed for heterogeneous classes, recurring to shared and unified terminological codes (Miele, 2011; ICR, 2018). Catalogue forms acquire specific technical and descriptive data for different types of cultural property by collecting information in an organized manner within sections concerning several aspects of the catalogued object. An increasing level of detail, starting from the inventory level and ending with the cataloguing level, is achieved according to the number of fields compiled.

Moreover, specific tools such as the AeDES forms (Baggio et al., 2007) have been developed to acquire information on the typological characteristics of the built heritage and for evaluating the state of damage, to define the usability of the structures in the emergency phase following an earthquake. The features of artistic heritage are considered marginally within the AeDES forms, and for a correct assessment of the state of preservation and the level of damage of the artworks, it is necessary to refer to the Movable Heritage Damage Survey Form (Papa and Di Pasquale, 2013) and emergency management forms defined by the High Institute for Conservation and Restoration (ICR) (ICR, 2021). The damage detection, rapid intervention, and usability form (AeDES) and the emergency intervention one focus on specific issues and the level of knowledge acquired is, therefore, limited and not comprehensive.

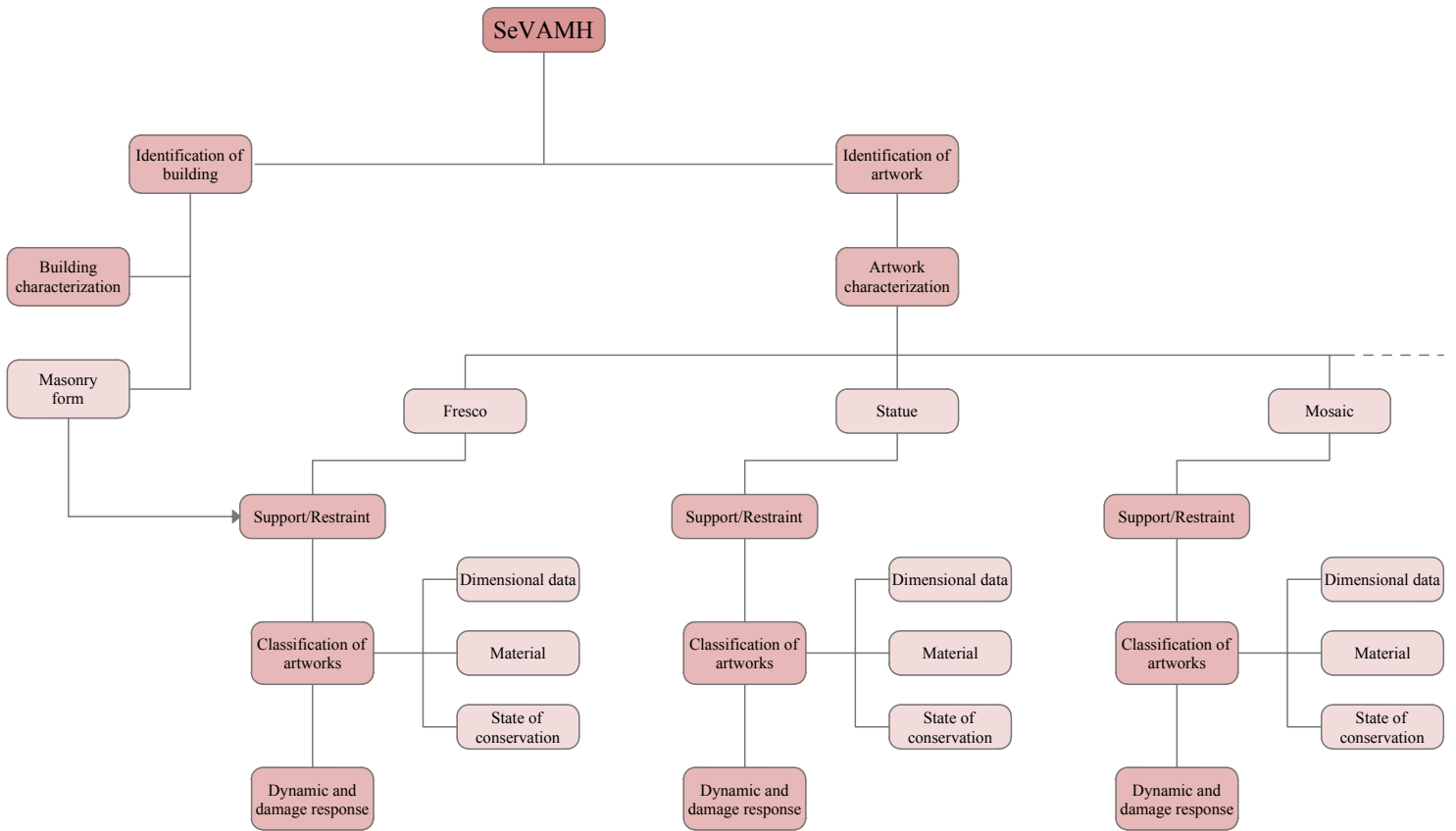
At the same time, the ICR has developed a territorial information system, the 'SIT MARIS' (Accardo et al., 2005), able to investigate and process the information on the possible risks affecting the cultural heritage starting from different databases. This system assumes the single architectural or archaeological asset as a georeferenced element, considering all the movable assets in connection with the immovable asset, the 'container'. Therefore, the SIT MARIS system is aimed at estimating the risk, natural and anthropic, to which the architectural and archaeological heritage is exposed by using a statistical approach that relates the damage that an event produces on a particular object and the probability that the event occurs.

The seismic risk mitigation of artworks displayed in museum have been investigated in the development of a procedure and tool – MUSEUM – to protect artworks (ENEA, 2009; Ciampoli and Augusti, 2000). However, the knowledge of artistic assets, and their current state, is not explicitly considered in the procedure. The knowledge phase of immovable assets is also neglected in the methodology developed for assessing the vulnerability of medium and large statues, or objects, displayed in museums (Borri and De Maria, 2013).

The SeVAMH survey protocol

The critical analysis of the approaches and tools available for the conservation of cultural heritage highlights the need to define a rapid tool that can correlate movable and immovable assets in a relationship of container and content, on the one hand, and assists the knowledge and documentation phase and the qualitative assessment of the valuable assets' state of conservation, on the other.

Based on these issues, the Seismic Vulnerability Assessment of Movable Heritage



(SeVAMH) protocol has been designed to systematically collect information concerning the typological, structural, material, and dimensional features, and the level of possible damage of artistic assets (Marra et al., 2014; Fabbrocino and Marra, 2018). Therefore, this tool aims to support the knowledge and identification of degradation forms and the possible damage mechanisms induced by earthquakes. The acquisition of this information enables the identification of actions to mitigate the risks associated with seismic vulnerability in line with that proposed by Ciampoli and Augusti (2000) and the MUSEUM project (ENEA, 2009).

Fig. 1
SeVAMH flowchart (graphic: authors).

The SeVAMH form is organized in a sequence of modules and sub-modules (Fig. 1) designed in order to achieve a comprehensive knowledge of the asset. The form provides a guided path for the information gathering that allows retracing the history of the asset analysed, starting from the study of the building until the identification and analysis of artworks. The different modules within the protocol permit to investigate the building and the artwork according to the path of knowledge outlined in the guidelines released to guide the application of the renewed operational framework of the structural assessment of constructions, and then to identify the relationships between container and content since the safety and vulnerability assessment of art assets requires the analysis and study of the seismic response of the building itself (Directive, 2011).

Based on the information concerning the location, material, and dimensional features of the artwork, it is possible to recognize its state of preservation and the susceptibility to damage, as well as to collect the information on the location of the complex, consisting of the building and the artwork.

Each module of the protocol identifies a group of information that can be grouped in two specific sections: 'Identification of the artefact' and 'Characterization of the artefact'. In the first section, "identification of the artefact", the issues concerning the building and the artwork are analysed to provide all the data that permit the asset recognition in its history and its geographical and cultural context. In this first phase, particular attention is paid to the building's location, which is crucial for identifying artefacts located in areas exposed to significant risks, and the relationship of the building with the surrounding urban environment and artistic asset. The correct location of the building on the territory gives the possibility to assess its susceptibility to particular risks, facilitating its identification at the territorial and national level (Directive, 2011). In fact, in the first module, in addition to the *ID* field identifying the building inside the database, there are the fields that locate the building with respect to the *Region*, *Province* and *Municipality*, as well as the field concerning the *geographical coordinates* of the building, which relate the form to existing cartographic systems. The last field of the first module contains the *name of the building*, enabling the understanding and identification of the use of the building and its real value.

The second module within this section is specific to the building and contains information regarding its typological, constructive, and structural characteristics. In line with the information provided by the AeDES forms (Baggio et al., 2007), the data concerning the *position* of the building within the architectural complex, or structural aggregate, are reported to point out the relationship of connection or contact with neighbouring buildings. In the following fields are stored the metric data (*Number of floors* and *Average storey height*), the period of construction and interventions carried out on the building, also describing the type of these, according to the ones defined by the Cultural Heritage Code, i.e. *Prevention*, *Maintenance*, *Restoration*, *Seismic Adaptation*, *Seismic Improvement*, *Other* (Legislative Decree n. 42, 2004). Finally, the last fields of the building knowledge module concern the construction characteristics of the main load-bearing elements, i.e. vertical, horizontal and roof structures, according to the classification and descriptions of the AeDES form, widely shared at the national level.

The last module of the 'Identification of the Artwork' section is specific for the artworks located within the container asset. This module includes general and specific information, such as the author and a brief description of the subject. The fields that define this module have been developed according to the cataloguing standards of the National Institute for Cataloguing and Documentation (Mancinelli et al., 2018) and the rapid intervention forms drawn up by the ICR (2021). These are the fields devoted to achieving a high level of knowledge of the asset of interest and at providing a critical analysis that will be useful for reconstructing its history and understanding all the relevant issues that contributed to the transformation of the artwork or that facilitated the conditions for the occurrence of degradation phenomena. Therefore, it is necessary to compile the fields *Object*, *Subject* and *Author*, as well as to provide information about the date of artwork in the field of the *Chronology* and *Cultural Context*. This phase is supported by historical-bibliographic research (*Main bibliographic references*), or by possible diagnostic investigations, aimed at the characterization of materials, identification of degrada-

tions and their causes. These analyses allow understanding if significant interventions have been carried out (*Previous restorations*), specifying if these are documented and the type of intervention carried out (*Renovation/Additions*). In this phase are also collected the data concerning the location of the artistic assets with respect to the building, *Location* and *Specific Location*, to identify the movable heritage within the building analysed in the first section, and to understand the possible interaction between the “container” and the “content” in the case of a seismic event.

The section on ‘Characterization of the artefact’ provides a high level of knowledge of the asset. Indeed, the section collects information regarding the state of conservation and the features that represent a vulnerability for the container and the content. It allows the definition of possible interventions to be carried out to ensure the conservation of the asset itself. Therefore, this section is made of different fields considering the building and the artistic asset.

In the section on the building, all the information concerning the resistant system of masonry buildings is collected. The several fields collect data on the vulnerability elements of masonry structures, the component materials, and their dimensions, as well as all those elements that make the texture of good quality (Curti et al., 2008; Borri and De Maria, 2015).

In the section of artistic heritage, the asset is identified from a typological point of view, defining the dimension, material, and state of conservation of all its elements. Indeed, the proper typological identification of the artwork enables its classification according to peculiar characteristics, with the aim to correctly formulate criteria and measures to its safeguard and enhance. Therefore, it is necessary to specify the geometry of each element of the artistic asset (Support Structures, Support and Finishing), reporting data such as height, depth, width, and diameter, to understand the relationship between it and the environment. Data concerning materials, the quality, and the state of conservation of single artwork elements are collected, providing all the information useful to identify direct and indirect damage observed.

The proper characterization of ‘container’ and ‘content’ allows understanding the relationship among them, the behaviour in case of a seismic event, and to assess the level of safety of the artefact, in its whole and single elements. The study of Ciampoli and Augusti (2000) identifies different categories of artworks related to simplified model both of dynamic response and of the possible damage mechanisms. The correlation between this information with the other of the survey protocol provides for a technical evaluation useful to identify the safeguarding actions for the preservation of artistic assets and the risks mitigation (Marra et al., 2020). Therefore, the specific fields of the ‘Dynamic and damage response of artistic assets’ module enable collecting relevant information according to the object’s typology previously identified. In such a way, the actions ensuring the safety and safeguard of the artistic artefact can be identified starting from the comprehensive knowledge of the asset reached through the SeVAMH form.

The SeVAMH survey protocol is divided into two different phases aimed at identifying and characterizing the building, where the artistic asset is located, and the artwork. The data collected are of a qualitative and quantitative type and this allows to complete the protocol in distinct, but not necessarily disjointed, phases. Indeed, the data collected derive from several sources, some written and bibliographical, others deduced directly in situ through the reading of material or through the implementation of diagnostic investigation, therefore with a greater level of detail and accuracy.

It is worth noting that the proposed SeVAMH survey protocol offers the opportunity to achieve a high level of knowledge and the evaluation of seismic effects on artworks. Therefore, the data surveyed and collected make this protocol a useful tool for knowledge and valorisation of cultural heritage (Trizio et al., 2019), as well as a support for non-destructive diagnostics (Marra et al., in press).

SeVAMH implementation and validation: the Santa Chiara museum in Naples

The section reports the illustrative application of the SeVAMH protocol aimed at validating the survey tool in the field. The monastic complex of Santa Chiara in Naples, South Italy, with its basilica, monastery, and museum, has been selected because of its relevant historical and cultural value and the peculiarities and different typologies of artistic assets housed in the complex. Indeed, the Santa Chiara complex is characterized by the presence of large, frescoed surfaces, furniture and historical artefacts that have an invaluable historical and cultural value and must be adequately protected and enhanced.

*opposite page
above*

Fig. 2
The building module of the SeVAMH form.

below

Fig. 3
SeVAMH form: frescoes of the south walkway.

The complex of Santa Chiara in Naples was studied by several researchers, due to its historical and cultural relevance (Dell'Aja, 1980; Gallino, 1963; Dell'Aja, 1992; Pane, 1954; Bruzelius, 1995; Alabiso, 1995; Giles, 2018). The many published sources and the survey activities carried out in 2013, during the restoration works to mitigate the damage observed in the cloister due to water infiltration from the upper loggia (Marra, 2015), provided the basis for the implementation of the SeVAMH form.

The information on the characterisation and identification of the building (Fig. 2) was acquired from the published sources that trace the construction and evolution of the complex, also providing significant information on the materials used. The study of the building, i.e. the study of its location in areas at risk and its development history, is crucial for the analysis of the effects that catastrophic events such as earthquakes may have on artistic heritage. Indeed, between container and content exists an interaction that affects the level of safety of the asset, as demonstrated by technical and scientific literature (Directive, 2011; Lagomarsino et al., 2011).

The SeVAMH form fields, on the characterisation and identification of the art assets, were compiled based on the in-situ surveys carried out on the complex. Particular attention was paid to the artworks located in the cloister, interesting for their historical and artistic value, and to some of the works exhibited in the Museo dell'Opera di Santa Chiara, selected to assess the effective benefit of the protocol in the combined analysis of 'content-container' both for their cultural value, and also for their location and supports. The walls around the cloister are fully covered by frescoes painting carried out in the first half of the Seventeenth century by an unknown artist influenced by the manner of Bellisario Corenzio, a Greek artist that had a strong influence on Neapolitan artists. The decoration along the walls is divided into three distinct parts. Only on the south wall, due to the presence of large single a Gothic lancet window, the frescoes are divided into two sequences. These frescoes are different from the others also for the iconography: the saints in the lower part, allegories, and virtues in the upper one. However, on the other walls, there are scenes depicting episodes from the Old Testament, except for an area on the north side with the 'Death of a nun' realized in correspondence with the ancient cemetery of the Poor Clare Nuns. The frescoes have several degradation forms due to ageing and moisture phenomena. The surface finish (plaster) shows in some points signs of salt efflorescence and colour loss due to the presence of water inside the wall surfaces (Fig. 3).

NA_SCH_01	Italy-Campania	NA	Naples	Name Museum Complex of Sta. Chiara
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Building

<u>Position of building</u>	<u>No of floors</u>	<u>Average storey height</u>	<u>Construction/Renovation Age</u>	<u>Type of intervention</u>
Isolated	2	350	1310	2001
<u>Structural system</u>	<u>Horizontal structures</u>		<u>Roof structures</u>	
Masonry	Vault in stone without tie		Thrusting behaviour, hea	

Masonry structures

<u>Constitutive Elements</u>				<u>Mortar</u>		
Tuff	Cut blocks	Medium (15-25 c)	Good	Hydraulic lime	Adhesive	Mortar base
<u>Texture facing</u>				<u>Transversal section</u>		
Horizontal	Horizontal/Vertica	Absent		Single facing		
<u>Angolate</u>		<u>Martelli</u>		<u>Plaster</u>		<u>Interventions to masonry</u>
Regular alternatio	Similar to masonr		Efficient connecti	Present	Deteriorated	Indending in ston Tie rods

Artwork

No

<u>Object</u>	Fresco	<u>Subject</u>	Scenes from the Old Testament; Saints; Allegorie	<u>Author</u>	Unknown
<u>Cultural context</u>	Bellissario Corenzio School	<u>Year</u>	1600	<u>Century</u>	XVII
<u>Main biblio references</u>	Dell'Aja, 1980 and 1992; Gallino, 1963; Pane, 1954; Bruzelius, 1995				
<u>Previous restoration</u>	Interventions documented	<u>Note</u>	The frescoes have undergone two significant in		
<u>Renovation-Addition</u>	Stucco	<u>Note</u>	With the interventions carried out between 19		
<u>Location</u>	Outdoor spaces	<u>Specific Location</u>	Wall (r)		
<u>Typology</u>	Immovable	<u>Typological classification</u>	Frescoes		

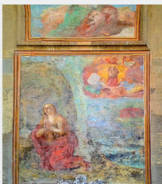
Support structures

<u>Material</u>	<u>Type of Support</u>	<u>Auxiliary Structures</u>
Plaster/Masonry	Fixed	Masonry base
<u>Measure</u>		
850	800	
<u>State of conservation</u>	Good	
<u>Degradation form</u>	Detachment	Loss
	Salt efflorescence	Cracks

Support

<u>Integral to the support or part of it</u>	<input checked="" type="checkbox"/>	<u>Material</u>	Paint
<u>Rigidly constrained</u>	<input type="checkbox"/>	<u>Auxiliary Structures</u>	Masonry base
<u>Measure</u>			
850	800		
<u>State of conservation</u>	Good		
<u>Degradation form</u>	Salt efflorescence	Cracks	

Finishing

<u>Preparatory layers</u>	Plaster	<u>Paint film</u>	Tempera paintings
<u>State of conservation</u>	Good		
<u>Degradation form</u>	Colour loss	Biological patina	Detachment in du
			

Dynamic and damages response of artistic assets

<u>Typological categories</u>	T6-Others		
<u>T1 Support/restraint:</u>	<u>T2 Support/restraint:</u>	<u>T3 Support/restraint:</u>	
<u>T4 Support/restraint:</u>	<u>T5 Support/restraint:</u>	<u>T6 Support/restraint:</u>	
		D-Other	
<u>A Dynamic and damage mode</u>	<u>B Dynamic and damage mode</u>		
<u>C Dynamic and damage mode</u>	<u>D Dynamic and damage mode</u>		
	R1-Stick motion_Excessive stress		

Fig. 4
SeVAMH form: seats in majolica.

opposite page

SeVAMH form:

Fig. 5a

The Justice, unknown Neapolitan sculptor.

Fig. 5b

Relief with a coat of arms, Neapolitan artists.

Fig. 5c

Pulpit: marble lions, Neapolitan sculptor.

Photo: authors.

These phenomena can also be detected near the integrations carried out during the previous restorations. Based on the potential mechanisms affecting the seismic response and damage (Augusti and Ciampoli, 2000), the frescoes could suffer overturning mechanisms and excessive local stresses because these are fixed to the retaining wall.

The seats of the cloister designed by Domenico Antonio Vaccaro and realized by Neapolitan craftsmen are covered with colourful majolica tiles decorated with scenes of the city and country life in the eighteenth century. The seats were restored during the 1998/2000 interventions, which involved the cloister enabling the recovery of majolica tiles damaged by rising damp. Salt efflorescence and detachment of finishes was detected on the seats during the compiling of the SeVAMH form (Fig. 4). In addition to the detachments and lacks, moisture stains were observed on the finishing. In case of seismic events, the majolica tiles could crack due to the excessive stress that could be produced by the earthquake since the elements are fixed to the support.

Finally, the form was applied to the artworks exhibited in the Museum of Santa Chiara (Alabiso, 1995). The Museum houses the finds discovered during the archaeological area's investigation of the thermal building (MIBACT, 2020), as well as the remains of the sculptural furniture, everyday objects and sacred art recovered from the Angevin church (fourteenth century), from its cloister and monastery and survived to the fire that destroyed the complex in 1943.


The SeVAMH protocol was applied to five different objects selected according to the typology and type of support to verify the feasibility and reliability of the tool implemented.

A marble statue representing the Justice (Fig. 5a) is located on a wooden shelf in the last exhibiting room (the Room of Marbles). The statue by an unknown author dates back to the fourteenth century and was restored during the 1998/2000 works. The state of conservation is good, although it has some lacks. The statue is supported by the shelf and has no supporting components or anti-seismic devices. Therefore, in case of an earthquake, the artwork would be susceptible to possible oscillations and overturning mechanisms. A fragment belonging to a balustrade of the Poor Clare nuns' cells is exhibited on the pillars of the arcades that divide the room of Marble. The relief depicting a coat of arms, by Neapolitan craftsmen, is dated between the sixteenth and seventeenth centuries (Fig. 5b). The object is connected to the wall surface by wooden supports so that the expected behaviour in case of a seismic event would be combined with the structure of support; therefore, the object would be susceptible to overturning and/or failure due to excessive stress. The state of preservation after the restoration work carried out in 1998/2000 is good, even if the surface has slightly deteriorated. Sculptures in marble, depicting lions, and originally belonged to a fourteenth-century pulpit are located on a wooden table placed on the floor in the room of marbles. The lions have a good state of conservation although the presence of lacks and cracks caused by 1943 incendiary bombs and repaired with the previous restoration works (Fig. 5c).


According to their typology, configuration and location, the sculptures could undergo sliding motion or secondary damages. The last could be caused by the collapse of the upper timber structures that define another exhibiting space.

In the third exhibiting space (room of Remains), a marble capital and two statues in wood are exhibited among the several artworks. The capital is a remain of the ciborium dating back to the thirteenth century. The object shows some lacks and erosion due to the damage caused by the bombing of the Second World War. The capital is placed on a wooden pedestal without particular fixing structures. Therefore, the support could be susceptible to oscillations and the capital could overturn (Fig. 6a).


Artwork				No.	8
Object	Marble statue	Subject	The Justice	Author	Unknown Neapolitan sculptor
Cultural context		Year		Century	XIV
Main bibliography references	Dell'Aja, 1980 and 1992; Gallino, 1963; Pane, 1954; Bruzelius, 1995				
Previous restoration	Interventions documented	Note	Restored during the new organization of the ex		
Restoration-Addition		Note			
Location	Museum room	Specific Location	Wall (v)		
Typology	Moveable	Typological classification	Altars/Statues		
Support structures			Support		
Material	Type of Support	Auxiliary Structures	Integral to the support or part of it <input type="checkbox"/> Material <input type="checkbox"/> Other <input type="checkbox"/>		
Wood	Shelf	Masonry base	Rigidly constrained <input type="checkbox"/> Auxiliary Structures <input type="checkbox"/>		
Measures			Measures		
H	5	De	45	L	35
		Di	H2		110
State of conservation			State of conservation		
Degradation form			Degradation form		
			Good		
			Lack		
Dynamic and damages response of artistic assets					
Typological categories					
T3 Statues, sculptures and large vases					
T1 Support/restraint		T2 Support/restraint		T3 Support/restraint	
A2_Object on a pedes					
T4 Support/restraint		T5 Support/restraint		T6 Support/restraint	
A_Dynamic and damage mode		B_Dynamic and damage mode		R4-Oscillation_Overturning	
C_Dynamic and damage mode		D_Dynamic and damage mode			



Artwork				No.	9
Object	Marble statue	Subject	Pulpit - Lions	Author	Unknown Neapolitan sculptor
Cultural context		Year	1345	Century	XIV
Main bibliography references	Dell'Aja, 1980 and 1992; Gallino, 1963; Pane, 1954; Bruzelius, 1995				
Previous restoration	Interventions documented	Note	Restored during the new organization of the ex		
Restoration-Addition	Stacco	Note			
Location	Museum room	Specific Location	Other		
Typology	Moveable	Typological classification	Altars/Statues		
Support structures			Support		
Material	Type of Support	Auxiliary Structures	Integral to the support or part of it <input type="checkbox"/> Material <input type="checkbox"/> Inlaid <input type="checkbox"/>		
Wood	Moveable		Rigidly constrained <input type="checkbox"/> Auxiliary Structures <input type="checkbox"/>		
Measures			Measures		
H	5	De	40	L	81
		Di	H2		
State of conservation			State of conservation		
Degradation form			Degradation form		
			Good		
			Lack		
			Cracks		
Dynamic and damages response of artistic assets					
Typological categories					
T3 Statues, sculptures and large vases					
T1 Support/restraint		T2 Support/restraint		T3 Support/restraint	
A1_Object on the floor					
T4 Support/restraint		T5 Support/restraint		T6 Support/restraint	
A_Dynamic and damage mode		B_Dynamic and damage mode		R2-Sliding motion_ Excessive displa	
C_Dynamic and damage mode		D_Dynamic and damage mode			



Artwork				No.	5
Object	Fragment of marble relief of terrace of nun	Subject	Relief with coat of arms	Author	Unknown Neapolitan craftsmen
Cultural context		Year		Century	XVI-XVII
Main bibliography references	Dell'Aja, 1980 and 1992; Gallino, 1963; Pane, 1954; Bruzelius, 1995				
Previous restoration	Interventions documented	Note	Restored during the new organization of the ex		
Restoration-Addition	Brackets	Note			
Location	Museum room	Specific Location	Wall (f)		
Typology	Moveable	Fragments	Typological classification		
Support structures			Support		
Material	Type of Support	Auxiliary Structures	Integral to the support or part of it <input type="checkbox"/> Material <input type="checkbox"/> Other <input type="checkbox"/>		
Metal	Shelf	Masonry base	Rigidly constrained <input type="checkbox"/> Auxiliary Structures <input type="checkbox"/> Bracket <input type="checkbox"/>		
Measures			Measures		
H	130	De	50	L	35
		Di	H2		110
State of conservation			State of conservation		
Degradation form			Degradation form		
			Good		
			Lack		
			Erosion		
Dynamic and damages response of artistic assets					
Typological categories					
T3 Statues, sculptures and large vases					
T1 Support/restraint		T2 Support/restraint		T3 Support/restraint	
A2_Object on a pedes					
T4 Support/restraint		T5 Support/restraint		T6 Support/restraint	
A_Dynamic and damage mode		B_Dynamic and damage mode		R4-Oscillation_Overturning	
C_Dynamic and damage mode		D_Dynamic and damage mode			



Artwork			
Object	Fragment of the columns of the ciborium:	Subject	Female heads and eagles with spread wings
Cultural context		Year	1240
Main bibliography references	De'Ala, 1980 and 1992; Gallino, 1963; Pane, 1954; Bruzzelius, 1995		
Previous restoration	Interventions documented	Note	Restored during the new organization of the ex.
Restoration-Addition		Note	
Location	Museum room	Specific location	Other
Typology	Movable	Typological classification	Altars/Status

Support structures		Support	
Material	Wood	Integral to the support or part of it	<input type="checkbox"/> Material
Type of Support	Pedestal	Rigidly constrained	<input type="checkbox"/> Auxiliary Structures
Auxiliary Structures		Measures	
Measures		H	120
State of conservation		L	35
Degradation form		Di	H2
		State of conservation	
		Good	
		Degradation form	
		Erosion	
		Lack	



Dynamic and damages response of artistic assets			
Typological categories			
T3-Statues, sculptures and large vases			
T1_Support/restraint	T2_Support/restraint	T3_Support/restraint	A2_Object on a pedestal
T4_Support/restraint	T5_Support/restraint	T6_Support/restraint	
A_Dynamic and damage mode		B_Dynamic and damage mode	
R4-Oscillation_Overturning			
C_Dynamic and damage mode		D_Dynamic and damage mode	

SeVAMH form:

Fig. 6a

Remain of the columns of the ciborium: capital, unknown sculptor.

Fig. 6b


Wood carvings, unknown Neapolitan craftsman.

Photo: authors.

Artwork			
Object	Wooden statues	Subject	Ecce Homo and S. Giovanni Evangelista
Cultural context		Year	
Main bibliography references	De'Ala, 1980 and 1992; Gallino, 1963; Pane, 1954; Bruzzelius, 1995		
Previous restoration	Interventions documented	Note	Restored during the new organization of the ex.
Restoration-Addition	Plastering	Note	
Location	Museum room	Specific location	Other
Typology	Movable	Typological classification	Altars/Status

Support structures		Support	
Material	Wood	Integral to the support or part of it	<input type="checkbox"/> Material
Type of Support	Pedestal	Rigidly constrained	<input type="checkbox"/> Auxiliary Structures
Auxiliary Structures		Measures	
Measures		H	111
State of conservation		L	60
Degradation form		Di	93
		State of conservation	
		Good	
		Degradation form	
		Lack (mutilations)	

Finishing			
Preparatory layer	Paint film	Oil paintings	
State of conservation			
Good			
Degradation form			
Colour loss			
Lack			
Integration			



Dynamic and damages response of artistic assets			
Typological categories			
T3-Statues, sculptures and large vases			
T1_Support/restraint	T2_Support/restraint	T3_Support/restraint	A2_Object on a pedestal
T4_Support/restraint	T5_Support/restraint	T6_Support/restraint	
A_Dynamic and damage mode		B_Dynamic and damage mode	
R4-Oscillation_Overturning			
C_Dynamic and damage mode		D_Dynamic and damage mode	

The two wooden statues are of an unknown Neapolitan craftsman and date back to the eighteenth – nineteenth century. The artworks, which represent an Ecce Homo and Saint Joanne Evangelist (Fig. 6b), have a good state of conservation despite the defects (mutilations) in the support and the lack of colour of the finishing layer, where can be observed also the integrations realized during the 1999/2000 restoration works. Both the artworks are located on a cubic wooden pedestal (size 111 x 60 x 93 cm) and have not constraint or restraint elements. Therefore, the statues during a seismic event could be subject to excessive displacement or overturning.

Final remarks

The safeguard of artistic assets and the proper management of their maintenance and safety are the background of the present paper, whose main objective consisted of the

presentation of a novel survey protocol, identified herein as SeVAMH. It has been designed to accomplish the task of assessing the main features of the movable assets in compliance with the renewed vision of structural and non-structural performance evaluation in seismic areas and with the needs for technical knowledge for a comprehensive and rational definition of the Artistic Limit State (ALS). It is easy to recognise that such an objective can be achieved only by assuring a fruitful combination of different expertise, primarily those associated with restoration and conservation.

The survey protocol illustrated in the paper aims at achieving a comprehensive knowledge of artistic assets, considering their history, state of conservation and damage mechanisms of these valuable elements so that data functional to the seismic protection and active conservation can be collected.

SeVAMH protocol, indeed, can be addressed as a support tool both for preventive diagnosis and periodic inspection as well as for monitoring after repair interventions or damage prevention.

The capacity of the survey tool to guide the operator in the acquisition of quantitative data, such as geometric data or number of assets, and qualitative ones, concerning the useful information to identify the asset and its state of conservation, has been also confirmed during the real application to the assets housed in the complex of Santa Chiara in Naples, South Italy.

The results described herein confirm the reliability of the SeVAMH survey protocol and its capacity to drive the collection of relevant data and to populate a comprehensive and multidisciplinary digital database aimed at offer information and data for structural analyses, research, and valorisation of heritage, but also as a reference for the development of maintenance and restoration interventions.

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Author Contributions

Although the authors conceived the paper jointly, ADRIANA MARRA developed the SeVAMH survey protocol, performed historical research and the artistic assets survey and wrote sections 2, 3 and 4; GIOVANNI FABBROCINO supervised the research and defined the requirements of the survey related to the seismic Artistic Limit State (ALS) assessment. Both authors wrote sections 1 and 5.

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