Museum Guide
To Inventing Memory

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In memory of Antonie Simcock (1950-2012)

This Museum Guide is intended to be used with the Image Guide and the Exhibition Guide

Museum Guide to Inventing Memory

Abstract

Recognising the unreliability of monuments to resist the fragility of memory within their observers, the “Museum Guide to Inventing Memory” draws on a range of fields including forensics, anamorphism and literary theory to discover a new relationship between architecture and remembering through the invention of memory. The thesis begins by analysing how designers of war memorials use specific techniques to prolong memory, control how memory is invented, and imbue a sense of meaning within the viewer; and the roles the media, political leaders and trauma play in distorting memory. Exploring the emerging field of forensic architecture, I use specific forensic techniques to extract hidden evidence from five Finnish Wartime Photography Archive photos and a historical bomb plot map of central Helsinki. Mnemonic techniques identified in the first half of the thesis are then used to spatially translate the objective forensic evidence into a series of architectural mnemonic devices that become a museum memorialising the Finnish victims of the great Russian bombing raids during World War II.
Thus the museum allows observers to objectively narrate the conflict events with an impersonal neutrality, enabling visitors to form a neutral narrative that does not originate from the distorting forces of the media, political leaders or trauma, allowing them to truly invent their own memories and resist the fragility of remembering. Hence, despite the invention of memory being by nature an individual subjective process, the thesis demonstrates that it is indeed possible for the designer to exercise a degree of control over how observers invent memory.

Introduction

Helsinki Bombed Newsreel

"'I CAN HEAR THE WAIL OF POWER DIVING RUSSIAN BOMBERS OVER THE CAPITAL OF FINLAND. I CAN SEE THE FINNISH PEOPLE RUNNING FOR SHELTER AS MORE PLANES ROLL OVER. I CAN HEAR EXPLOSIONS OF FALLING BOMBS. THEY'RE DROPPING CLOSE BY US NOW. TREMENDOUS EXPLOSIONS ARE SHAKING THE CITY. THE HOUSE WHERE I'M SPEAKING IS TREMBLING.' THAT'S HOW ONE NEWSPAPER MAN DESCRIBED THE SCENE OVER THE TELEPHONE. BUT WHAT HE DIDN'T DESCRIBE WERE THE TEARS OF AGONY AND RAGE THAT A PEOPLE FEEL WHEN THE SOVEREIGN NATION THEY FEEL UNDER IS ATTACKED BY BRUTE FORCE. THE MERE SORROW OF A PEOPLE COWERING AGAINST A WALL FOR SAFETY FROM AERIAL DEATH. DO YOU BELIEVE RUSSIA'S STORY, THAT THE FINNISH ARMY WAS PLANNING TO INVADE INNOCENT AND PEACEFUL RUSSIA? DO YOU BELIEVE THE FINNISH PEOPLE ARE VISCIOUS WAR MONGERS WHO SHOT DOWN A HARMLESS RUSSIAN PLANE OVER HELSINKI? BRUTE FORCE IS ONE WAY OF DOMINATING THE WORLD."[1]

"Western civilisation has shown an extraordinary confidence in the capacity of material objects to resist the decay of memory: that is in the building of war memorials to the dead."[2]

"It has to be said that buildings have been an unreliable means of prolonging memory; all too often the object has survived, but who or what it commemorated has been forgotten…Despite the confidence placed in the power of monuments to resist the fragility of human memory; their record of success has been mediocre."[3]

"The built environment is both the means of violation and a source of evidence that can bear witness to the events that traversed it."[4]

"The field of forensic architecture must now emerge to attempt to transform the built environment from an illustration of alleged violations to a source of knowledge about historical events – or rather, as a complex methodology aimed at narrating histories."[5]

Juxtaposing these four quotations created the initial idea for this thesis. On the one hand, as Adrian Forty explains in the chapter "Memory", the twentieth century has shown an unprecedented confidence in the building of war memorials to "resist the decay of memory", and yet their record of success "to resist the fragility of human memory" within their observers has been "mediocre". Similar to war memorials forensic architecture also negotiates terrains of war. However, unlike war memorials, forensic architecture is not focused on prolonging memory of a historical event, but on allowing members of a court of law to narrate a historical event by forensically examining the built environment to extract "evidence that can bear witness to the events that traversed it", which can then be used to "bypass human testimony" which is "often complicated by trauma".[6] I believe it is this process of translating a historical event using forensic analysis to a narrative that could solve the problem currently posed by war memorials. Rather than using a narrative of a historical event as evidence in a court of law, the historical event could provide evidence which itself becomes the war memorial: no more would observers of war memorials suffer the fragility of remembering, but upon visiting would instantly invent memory.

This gives rise to the primary research question: how can forensics be applied to architecture to reveal evidence that narrates the past in the present, and in doing so allow observers to invent memory that resists the fragility of remembering that is so common to war memorials?

This research question comprises of two stand points; one objective and one subjective. It is objective by using forensic techniques to examine evidence embedded in the built environment, but it is subjective in how memory is invented because naturally this is an individual process. However, despite this subjectivity it is possible to exercise a degree of control over how memory is invented.

This distinction between subjectivity and objectivity informed my approach to answering the research question, which uses two research methods; one in each half of the thesis. Part one explores the historical and contemporary context of memorials and how their designers use specific mnemonic techniques to prolong memory, control how memory is invented, and imbue a sense of meaning within the viewer. Part two of the thesis introduces forensic architecture, and explores how objective forensic examination techniques such as the "God's eye view" and coaxial lighting can be applied to extract evidence from two primary sources that recorded the bombed Helsinki sites of the 1944 first and third great Russian bombing raids – namely five Finnish Wartime Photography Archive photos and a bomb plot map. Identifying problems in this research method, unique solutions are discovered by drawing on other fields such as fractals, anamorphic projection and notions of the "Real" and the "Live".

The research methodology is to apply the mnemonic techniques discovered in part one to the forensic evidence extracted from the two primary sources by spatially translating the evidence into architectural mnemonic devices that become a museum memorialising the Finnish victims. This discovers a theoretical framing for a type of viewing that creates a new relationship between architecture, forensics and memory, enabling observers to invent their own memories that resist the fragility of remembering.

Part 1 // Memorials

1.1 History versus Memory in the Formation of Unity and Identity

The prime importance this paper has from answering the research question can be understood by first realising the difference between memory and history. According to Adrian Forty, "'history' – a nineteenth century science – created distorted versions of events that served the interests of dominant power; 'memory'…was the principal means by which the individual could resist the hegemony of history."[7] "Dominant power" refers most commonly to leaders in totalitarian states that impose a single narrative as the official history which can bear little similarity to people's individual memories. Claudia Koonz, in "Between Memory and Oblivion", describes this atrocity as "organized oblivion" which "leaves average citizens cynical and alienated." Such a single narrative causes events and individuals to "blur into a gray mass of proclamations",[8] causing the unity and identity of individuals in society to fade.[9] In turn, I believe this can cause segregation, prejudice and even racism.

Indeed this is a prevalent problem in Finland today. In the most recent BBC World Service Poll Finland had the highest negative rating of Russia of sixty-five percent.[10] It could be argued that this animosity towards Russia is bizarre. Not only did the last conflict with Russia end just over seventy-one years ago, but the political leaders who assigned the orders to attack Finland are not in power today: the citizens of an entire nation today are being held responsible for the decisions of a few individuals from the early twentieth century. Indeed I must admit that initially I did not feel surprised by the BBC's findings. I have little relations with Russians, am too young to claim to have experienced any hostilities from the Russians during World War II, and yet find myself feeling initially somewhat agreeable with the Finnish consensus. And yet the alternative argument highlights how irrational this animosity is. If this is also the case with you then we must ask ourselves why? Perhaps this animosity is not rooted in individual memories but from the mass media. As Koonz continues to explain, "written texts can be edited or even created, films can recast key narratives, and photos can be airbrushed."[11] One may argue that the narrative from the newsreel at the beginning of the paper (p. 11) may have shifted your perception of Russians? It was traumatic. If so then this serves to reinforce my point that our memories of a conflict event can be significantly shifted by the socially homogenising power of the mass media. Therefore by answering the research question viewers will be able to use the museum to narrate the past with a robustness that allows their memories to resist forces such as the media, trauma or political leaders imposing their history: in doing so a "public memory"[12] of historical events can be created which are the foundations of how a society creates a sense of identity and unity and battles the segregating powers of prejudice and racism.

Thus I felt it was important to situate the museum in a visible, public, easily accessible location: the railway square called Rautatientori in central Helsinki. This is outlined in orange on Figure 1 (opposite). The main form of transport from Helsinki airport is a coach which stops next to Rautatientori (a), making the museum the first site tourists see. In addition, Rautatientori is a very open public space and has remained largely unchanged since at least 1932 as illustrated by Figure 1. This accentuates the realism of the museum by generating the sense of being transported backwards in time for the museum visitor.

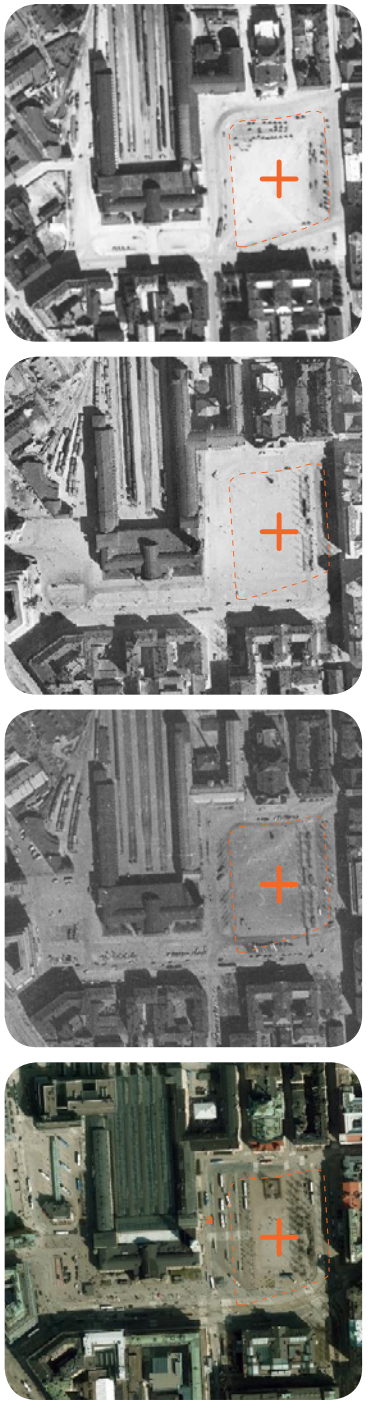


Figure 1 // Rautatientori
Buildings surrounding Rautatientori have remained largely the same since 1932

1.2 From Monuments of Triumph to Memorials of Loss

According to historians, the shift from monuments of triumph to memorials of loss can be traced back to the Napoleonic wars.[13] During this era large citizen armies were used instead of mercenary troops. Mercenary troops were professional soldiers paid to fight, and typically were well versed in warfare. The citizen armies on the other hand were made up of ordinary soldiers, who were members of local communities and townspeople. Their defence of the nation was viewed as a sacrifice, and memorials were seen as a way of paying tribute to this sacrifice.

1.3 Why are Memorials Constructed? // Mnemonic Triggers

War memorials are constructed as a mnemonic device for allowing observers to remember past conflict events. As Michael Rowlands concisely states in "Remembering to Forget", the building of war memorials originates from "the fear that the past no longer constitutes 'facts and events' in the present, that an absolute forgetting has taken place."[14]

In contrast, during the twentieth–century a series of French philosophers believed that memory had an elusive relationship to architecture. Marcel Proust stated in *Swann's Way*, "the past is hidden somewhere outside the realm, beyond the reach of intellect, in some material object…of which we have no inkling. And it depends on chance whether we come upon this object before we ourselves must die."[15] Michel de Certeau in *The Practice of Everyday Life* believed memory was an "unmoored, mobile force" which "comes always from somewhere else";[16] and finally Gaston Bachelard in *The Poetics of Space* explained that since memory was purely mental it "did not lend itself easily to description, let alone physical construction."[17]

However, Francis Yates in *The Art of Memory* draws a connection between memory and architecture. In the ages before printing a trained memory was vitally important. Yates explains that the history of the classical art of memory originated from orators to "enable him to deliver long speeches from memory with unfailing accuracy."[18] The technique was to imagine a series of mental images, each composed of distinct spaces, which in turn contained a selection of specific objects. Upon recital the orator could then use the mental spaces to remember the order of the objects, and the images of the objects would explain the objects themselves.

Fast forwarding to the eighteenth-century, the relationship between memory and architecture could most readily be found in British landscape gardening. For example, the Temple of Liberty (Figure 2) was supposed to evoke memories of Anglo-Saxon liberty.[19] However, a common criticism of the use of mental images and architecture to evoke memories was that they were deemed to "largely restrict aesthetic pleasure to those with the benefits of a liberal education, for only they enjoyed a sufficient stock of memories."[20] In the case of the Temple of Liberty this is certainly true.

Figure 2 // Temple of Liberty // by James Gibbs // Buckinghamshire, England // 1741
Temple's design was supposed to act as a mnemonic trigger for memories of Anglo–Saxon liberty in the viewer

Figure 3 // Newsreel Still of Russian Bombing of Helsinki // 37secs. // Helsinki, Finland // 1939
Still taken when newsreporter says "aerial death"

On the other hand, it may be possible to exercise some degree of control over how architecture is interpreted. For example, what imaginings do the words 'aerial death' conjure in your mind? Now analyse Figure 3 (p.19). The image is a still from the newsreel narrated in the introduction at the precise moment the news reporter says "aerial death". What imaginings do you observe when you re-read the same words? It is interesting that even though we were not in Helsinki on the day of that bombing in 1939, the mind does not remain a void but fires a chain of memories based on what is contained within our existing memory stock. Therefore, to gain a degree of control over this process it is possible to plant a specific image in one's mind which becomes a memory of a material image that is triggered from a specific phrase. In essence this avoids the necessity to possess a "significant stock of memories" because the stock is formed by an intentionally planted image. As Neil Jarman explains in *The Art of Forgetting*, "the images themselves do not function as literal representations but serve as codes or triggers…The classical tradition emphasized the use of mental images, but recent work has drawn attention to the importance of material images in the creation of a collective memory, which can operate in conjunction with, or instead of, textual or verbal expression."[21] Hence whether I am bound to an endless chain of imaginings or one particular memory depends if I was exposed to a material image prior to the 'triggering'; how many of these material images I am exposed to will determine the degree of control I have over what memories the material image in question triggers. Thus even though inventing memory is naturally subjective, it is possible to exercise a degree of control over how memory is invented.

1.4 Why are Memorials Constructed? // Mourning and Meaning

Memorials are constructed to facilitate the process of mourning. In *The Art of Forgetting* Alex King explains that mourning "allowed participants to continue to conduct their search for meaning, and to resist the unspeakable prospect that the pain and loss of war might ultimately have been worthless."[22] King points to the contradiction in war memorials between how they represent the soldier as the idealisation of moral virtues but fail to note the "savagery" and "cruel outrage" that went "against their human instincts."[23] The irony is that "it was precisely in the idealization of the moral experience that a meaning for the suffering which war inflicted was to be sought."[24] If we recall section 1.1 (p.16) I wrote of how "our memories of a conflict event can be significantly shifted by the socially homogenising power of the mass media" or political leaders. This tendency for war memorials to idealise soldiers is no different. Political leaders want us to believe that these soldiers died for a noble cause, to protect their country, and not believe that there may have been a more sinister reason for going to war, such as for resources, secret alliances, or any other exploitative reason which is so often the case. King writes of how on Armistice Day, "the characterization of the dead given in commemoration as morally excellent was far from secure in the public recollection of them, and had to be reasserted constantly."[25] The kind of meaning one gains from such an idealisation is that

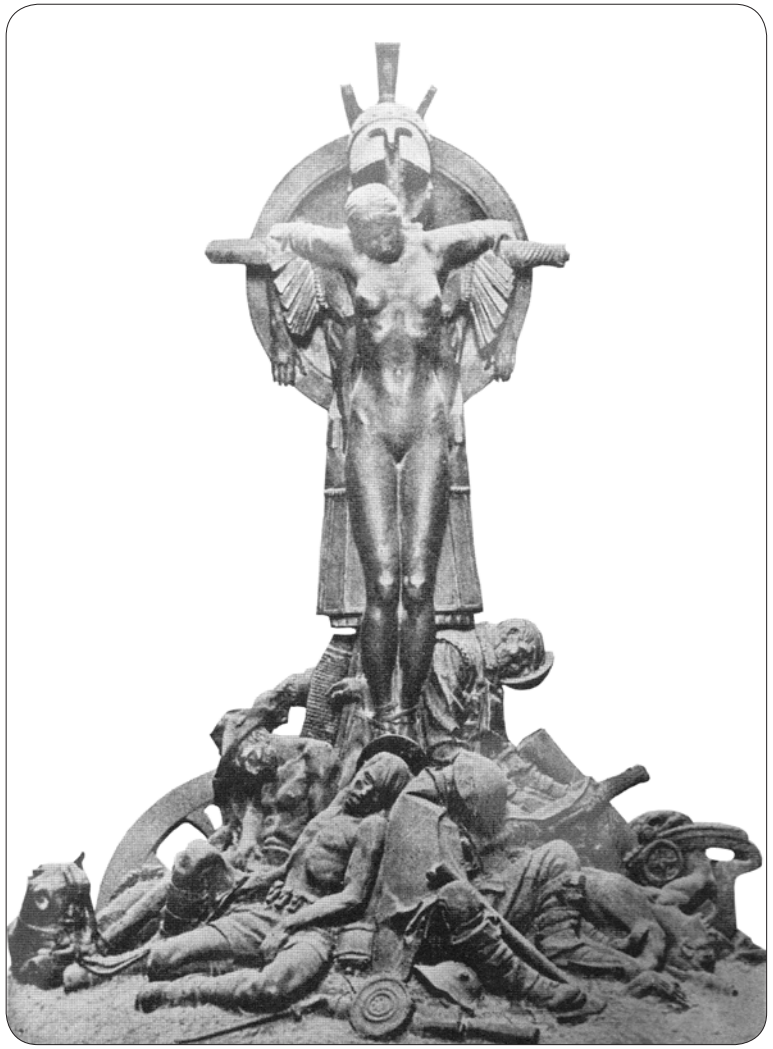


Figure 4 // Rejected Design for Sydney War Memorial // Sydney, Australia
Memorial's design wrongly suggested to the viewer that the nation and not the nation's soldiers had been sacrificed

the soldier in question died in nobility and honour. And yet is this not a lie? The meaning is not being extracted from your memory but from the politically shifted memory. To only accept those moral virtues and deny those other parts which are a part of human nature is essentially rejecting the soldier for who they really were.

In “Remembering to Forget” Michael Rowlands explains that the aim of mourning is to experience an “active process of remembering to forget.” This can be achieved by becoming the dead person, and then mentally “unpicking” this “identification through ambivalence, refusal, jokes and so forth.” The meaning generated by the mourner from this type of monument is one of impossibility; that it is impossible to become the dead person, and that therefore they are truly dead and one should move forward in their lives in the land of the living. This is typically achieved through the figurative depiction of a soldier, who is recognised as having been sacrificed, with the nation being the sacrificer.[26] The original Sydney memorial design failed to adhere to this scheme and was rejected (Figure 4 p.21). Even though the mourner is able to identify the meaning of impossibility through the jumbled corpses of soldiers, the mourner is denied the assertion that the male youth were sacrificed by the nation because the figure of the sacrificed female suggests that it is the nation that has been sacrificed.[27] Whilst I prefer the meaning of impossibility to the meaning of falsehood, for this is more honest, I find the use of figures, and the consequent need to be careful not to portray the sacrificer as the sacrificed too restrictive. I believe meaning should present itself from introspection, and not by a straight-jacketed process of responding to a politically shifted view in the physical and political form of the idealised moral soldier. I believe this is why the Vietnam memorial is so successful.

Unlike the other discussed war memorials, the Vietnam memorial (Figure 5) is not figurative; it is minimalist and expresses a desire to rid itself “of moral burdens in order to tell it as it really was.” As Rowland continues to explain, “the minimalism is in the raw, bureaucratic information given, listing names as ‘one thing after another’ in seeming objectivity and neutrality.”[28] It is precisely in this objective decontextualisation of the dead from moral ideals, by not using figures, that the mourner is denied the meanings of falsehood, impossibility and sacrifice.

However, whilst the memorial denies meaning on a nationalistic scale, it offers meaning on a personal human scale. This is achieved through the use of black granite on which the names are inscribed, which act like a polished mirror, allowing the viewer to see their reflection whilst reading the names. If we take the inscription of the names as the mnemonic trigger, then the memory retrieved by the visitor from their memory stock is not arbitrary but precise; it is themselves: the reflection is individualising. Seeing their reflection the viewer imagines it is them that is one of the dead on the wall. Similar to the Sydney memorial this creates a meaning of impossibility and sacrifice, but it is different in that these meanings emerge from neutral objectivity, not the idealised political form of the moral figure; thus allowing them to form personal, individual, truthful memories that are not skewed by the media, political leaders or trauma.

Figure 5 // Vietnam Memorial // by Maya Lin // Washington, D.C. // 1982

Observer creates meanings of impossibility and sacrifice using memorial’s reflections and objective inscriptions

Part 2 // The Museum

2.1 The David Irving Trial

IRVING YOU DO ACCEPT, DO YOU NOT, THAT THE WHOLE OF THE STORY OF THE 500,000 PEOPLE KILLED IN THAT CHAMBER RISES OR FALLS, RESTS OR FALLS ON THE EXISTENCE OF THOSE HOLES IN THAT ROOF?

VAN PELT NO.

IRVING WE ONLY HAVE THE EYEWITNESS EVIDENCE.

VAN PELT I DISAGREE WITH THAT. THE WHOLE STORY RISES AND FALLS ON THE EVIDENCE THAT THIS ROOM WAS A GAS CHAMBER, WHICH IS A SLIGHTLY DIFFERENT ISSUE.[29]

2.2 From Forensis to Forensic Architecture

forensic

/fə'rɛnsɪk/

noun

plural noun: forensics

1 relating to or denoting the application of scientific methods and techniques to the investigation of crime.
2 relating to courts of law.

The origin of the term forensics is forensis, which is Latin for "pertaining to the forum".[30] The Roman forum which forensics pertained dealt with politics, law and economy. However, over time forensics has matured to embody a very different meaning. The forum is no longer part of the definition of forensics; rather forensics has come to mean the use of science and medicine inside the forum. Furthermore, the forum has shifted from a multidisciplined space to that concerned exclusively with law. It is this stripping down of forensics' meaning that Eyal Weizman argues that a return to forensics is needed to readdress its potential as a political practice.[31] Weizman believes that the pairing of architecture and forensics could achieve this because combined they turn "spatial materialisation" offered by architecture into evidence".[32] Since "spatial materialisation" is constructed of matter, and matter is subject to "deformations and structural failures that micro and macro forces, political and historical processes might reveal themselves" in, then the revealing of these hidden forces embedded in matter becomes the force for reorienting forensics to a political practice. These complex formations undergone by matter is what Weizman summarises as "matter in formation, that is, as information."[33] For clarity when the term information is used in this thesis its meaning is the complex process of deformations that shape matter in response to political and historical forces.

2.3 The Crime Scene

Forensics consists of two sites – namely fields and forums. The field is typically the site of investigation – the crime scene – and the forum is the location where results from the investigation are presented and disputed.[34] Therefore, if we take Helsinki as the field, then the site of the bomb explosions can be viewed as the crime scenes. Normally the first step in a forensic examination is to visit the crime scene to record evidence by collecting samples, photographs and primary observations. However, the damage was erased during the rebuilding of Helsinki, forcing me to rely on primary sources to gather my evidence. ArcGIS, an authoritative resource for historical maps, was able to use the twisted, charred, exploded formations of matter that remained in the bombed sites to recognise that they were indeed the approximate bomb locations. Using this information I was able to compile a bomb plot map of the Russian great raids (Figure 6) within half a kilometre of Rautatientori (a). The cross hairs denote the precise locations of each bomb, and their different shades indicate the bomb type. Google maps then unearthed the specific address for each bomb plot. Entering the street names into the Finnish Wartime Photography Archive (FWPA) revealed a vast range of original photographs taken during the bombing raids, which I distilled into the photos that recorded the deformations of matter at the bomb locations illustrated on the map. These locations are highlighted with an orange crosshair because not all of the bomb sites were photographed. Furthermore, the dates that the photos were taken (detailed in the archive) correspond to the dates of the bomb explosions (detailed in ArcGIS), providing an added layer of proof towards the validity of these photographs. These photos are documented in more detail in the “Image Guide” and a large fold out map, both of which are attached to this thesis and visitors would be provided with to accompany the museum exhibition.

[Mine Bomb]
[Mine Bomb Causing Structural Damage]
[Mine Bomb Causing Structural Damage]
[Incendiary Bomb]
[Incendiary Bomb Causing Fire Damage]
[Combination Bomb Causing Fire Damage]
[Combination Bomb Causing Fire + Structural Damage]
[Bomb Types Unknown]
[Third Great Raid // 25.–27.02.1944]
[Second Great Raid // 16.–17.02.1944]
[First Great Raid // 06.–07.02.1944]
[Dates Unknown]

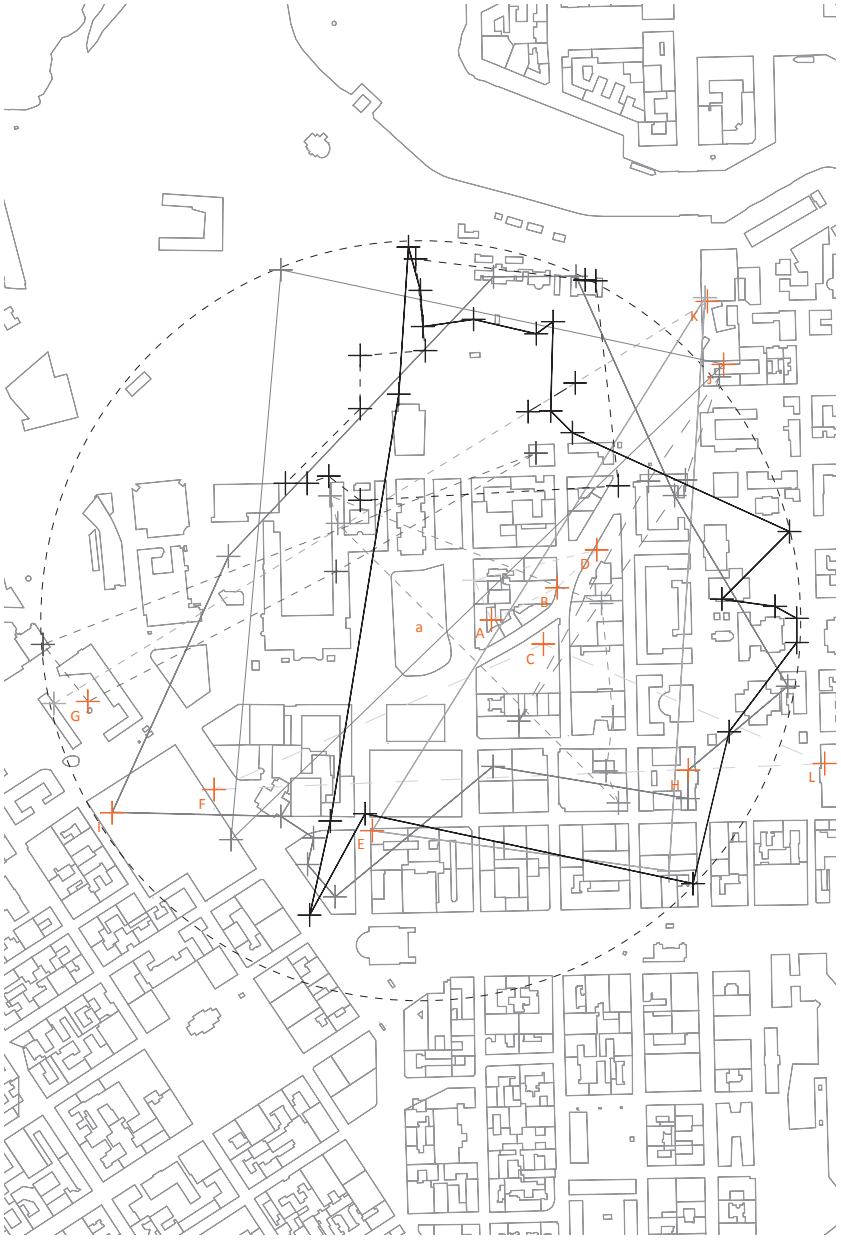


Figure 6 // Bomb Plot Map of 1944 Russian Bombing Raids on Helsinki
Please unfold the map attached to the “Image Guide” to see the full scale bomb plot map and its relationship to all of the FWPA photographs

2.4 The Bomb Plot Map

By compiling a bomb plot map, what we are left with is a constellation of multiple crime scenes which reveals their relationship to a specific time and place. In astrology, constellations are imbued with a sense of meaning: like points in space stars are treated as Cartesian coordinates which can have vectors drawn between them; it is in the arrangement of these vectors that specific information is visualised, and their observers are able to extract a sense of meaning. Similarly, the constellation of the bomb sites may also reveal a meaning. Similar to a forensic investigator cordoning off a crime scene, I drew a series of vectors from one crosshair of a specific bomb type's constellation to another, creating a series of territorial formations. These formations were only made visible by analysing the bomb sites in plan. In a recent exhibition at London's Wellcome Collection titled *Forensics: The anatomy of crime,* the photographs of the French criminologist Alphonse Bertillon were exhibited. Bertillon was famous for pioneering the "God's Eye View", where he would photograph the victims from above using a large tripod (Figure 7). This was pioneering because it visually demonstrated the relationship between the body and its surrounding elements. Similarly, the territorial formations not only establish a relationship between separate crime scenes, but it goes one step further than Bertillon by visualising these relationships in the form of vectors. Through visualising these relationships the viewer is imbued with a visual sense of the chaotic, traumatic, violent force of the raids: lines intersect in a haphazard pattern like planes crisscrossing past one another in all directions throughout the city: nowhere is safe, there is nowhere to hide. Thus the map becomes far more than the unveiling of hidden territorial formations; it evolves into a map embedded with the meaning of trauma. Hence the map becomes a mnemonic trigger that allows its viewer to peer a glimpse into aspects of the spatial, temporal and emotive dimensions of the bombing raids.

Overall, I feel this forensic examination of the bomb plot map has worked well in extracting evidence from the bomb sites. However, an inherent flaw in this research method is by using the scale of the city, the relationship between the viewer and the mnemonic trigger is significantly limited because the mnemonic trigger is only visible in the forensic map. In this sense a mnemonic trigger that was visible at the scale of the site would be more successful.

Figure 7 // "God's Eye View" // by Alphonse Bertillon // Paris, France // 1904
Bertillon devised the "God's Eye View" to measure the relationship between the body and the crime scene

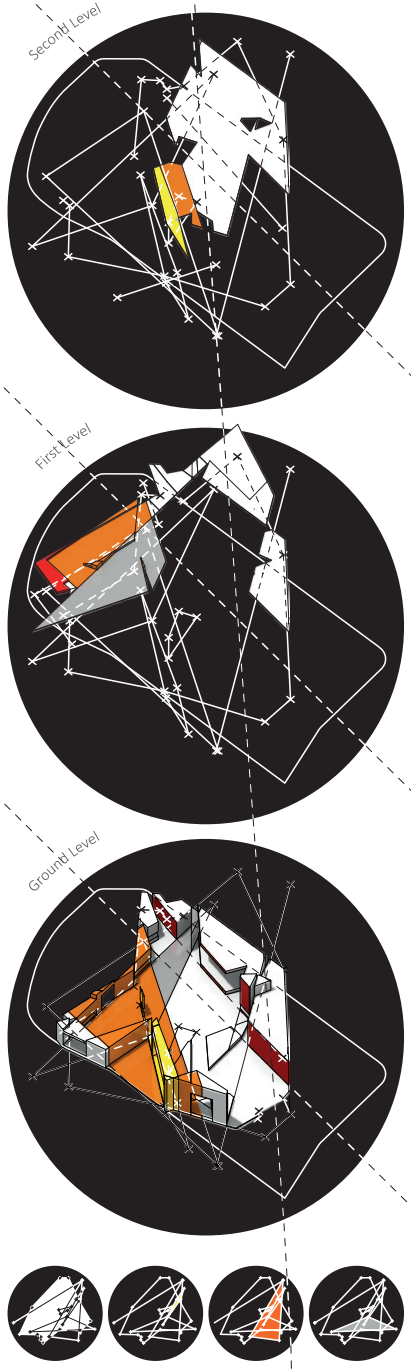
2.5 Mnemonic Fractals

One method of achieving this shift in scale is rooted in the concept of fractals. Carl Bovill, a Professor of Architecture in America, defines fractal geometry as “shapes that display a cascade of never-ending, self-similar, meandering detail as one observes them more closely”, with self-similarity being “small parts of an object [which] are similar to larger parts of the object, which in turn are similar to the whole object.”[35] The strength of this concept is that the “self-similar” shapes each contain the same amount of information, the differences are that the smaller “self-similar” shapes have had to condense their information. Therefore scaling the territorial formations would cause none of the extracted evidence to be lost (Figure 8 overleaf). By then using the vectors of the scaled territorial formations to generate architectural surfaces and extrusions, the forensic evidence extracted from the map, and the memories they trigger, become embedded in the building’s matter: the memory of the city has been condensed onto the site: the forensic evidence has become a mnemonic fractal: the museum has become a mnemonic trigger (Figure 9).

Daniel Libeskind’s Jewish Museum reinforces the relationship between fractals and memory. The form of the building was created by plotting “the addresses of prominent Jewish and German citizens on a map of pre-war Berlin and joining the points”.[36] The joining vectors were then vertically extruded to form the museum’s walls. However, whilst the Jewish Museum and the initial geometry generated from the mnemonic fractal are both effective mnemonic triggers, their ability to trigger specific memories has to be questioned. As was established in section 1.3 (p.18), the designer can exercise a certain degree of control over the triggering of a specific memory in the viewer by intentionally planting specific images into their memory stock. And yet what kind of memories are triggered in a person who has not lived through the Jewish holocaust or the Russian bombings of Helsinki? This highlights a fault line, for by not having experienced these traumatic events, the viewer is robbed of their opportunity to invent their own individual memories and forced to remember those socially homogenising narratives asserted by the media and those in positions of political power. This contradicts the entire premise of this thesis.

Figure 9 // Mnemonic Fractal Geometry (far–right)
I used four of the territorial formations whose bombs damaged the five buildings exhibited to generate the museum’s geometry

Figure 10 // Jewish Museum // by Studio Libeskind // Berlin, Germany // 1999 (right)
Jewish Museum’s design is an extruded fractal drawn using information from pre–war Berlin



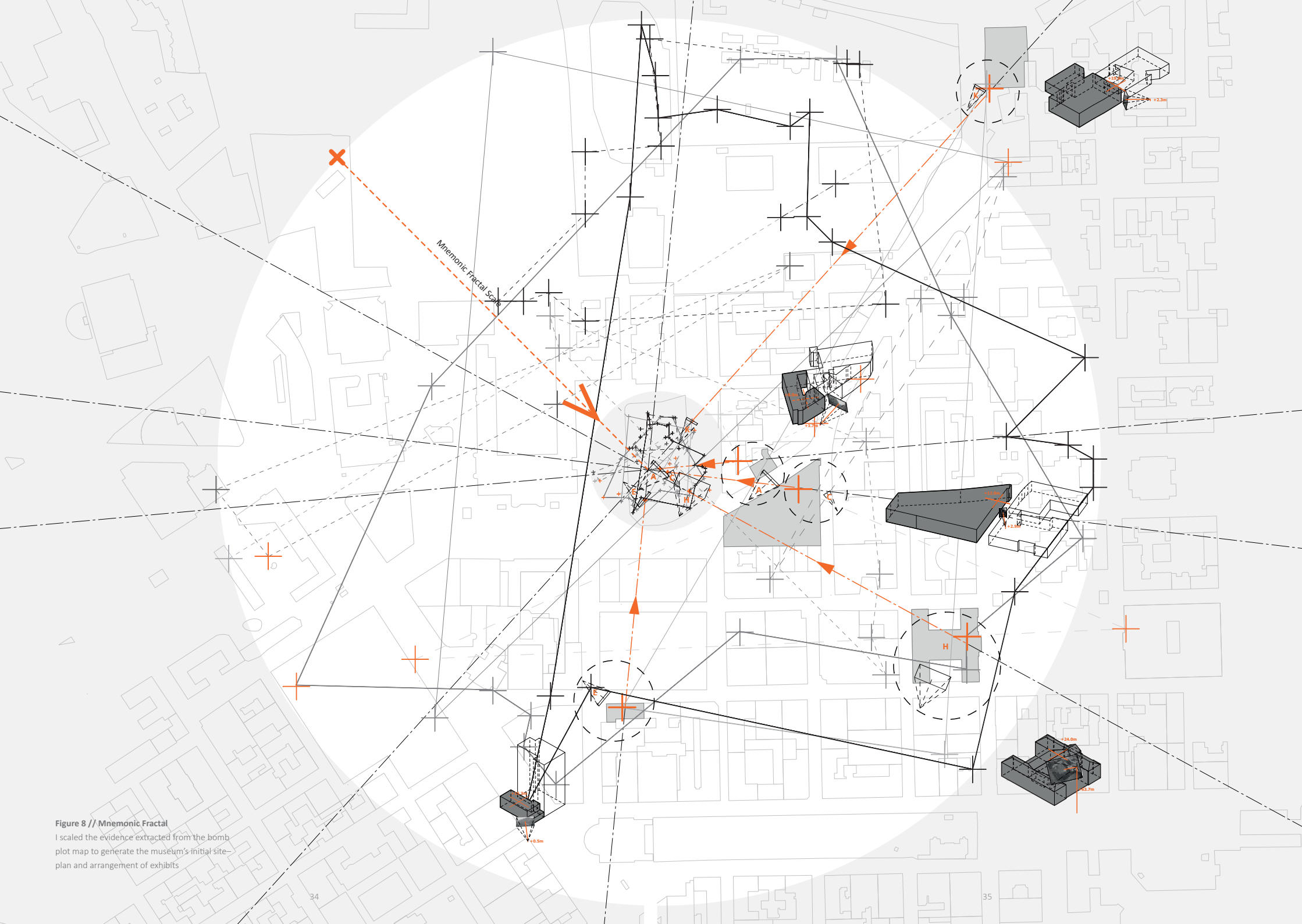


Figure 8 // Mnemonic Fractal
I scaled the evidence extracted from the bomb plot map to generate the museum's initial site–plan and arrangement of exhibits

2.6 The FWPA Photographs

As was established by Neil Jarman towards the end of section 1.3 (p.20), “recent work has drawn attention to the importance of material images in the creation of a collective memory, which can operate in conjunction with, or instead of, textual or verbal expression.”[37] My intention is to use five of the FWPA photos to form the basis of memories which can be recalled from the visitors’ memory stocks upon being triggered by the museum’s mnemonic fractal surfaces and extrusions. These five photographs are used to generate the museum’s five main exhibition spaces, which are described in the “Exhibition Guide” which the visitors will be given to accompany their exploration of the museum. The original photos can also be viewed at a larger scale in the “Image Guide” on pages 15, 28, 50, 67 and 102.

However, unlike the original ArcGIS bomb plot map, the photographs lack the same clarity, and in a sense quantity, of information, making them difficult to forensically examine and extract conclusive evidence from. The reasons for this are twofold. Firstly, if we take a look at Exhibit C for example, the explosive force of the bombing has resulted in an infinitely complex crime scene. Figure 11 is a 1937 photograph which demonstrates the bullet entry and exit points on a dummy. Lines known as trajectories were able to be accurately drawn with millimetre accuracy by the forensic examiner between two connecting bullet wounds, which in turn could “be traced back to the position of the person pulling the trigger”[38] and used as incriminating evidence. In contrast, it is difficult to accurately trace a determinate line between one material deformation to the next in Exhibit C, rather what we are presented with is an explosion that, unlike the linear velocity of a bullet, had radiated its force in multiple directions.

The typical effect of ballistic projectiles is that they leave a hole in the matter they puncture. This gives rise to the second point. Given that a hole can be understood as an absence of matter, or as Weizman states, “nonmatter”,[39] then the absence of nonmatter is what legal theory refers to as “negative evidence”.[40] This “negation compounds two forms of violence: the violence against people and things, and the violence against the evidence that this violence did take place.”[41] The absence of nonmatter was what Irving was using in the David Irving Trial to dismantle the assemblage of evidence to prove the Holocaust (section 2.1 p.26). Whilst the holes elucidated in the damage of Exhibit C prove the existence of nonmatter (highlighted in orange Figure 12), the holes by nature have depth, and any evidence surrounding or buried within these holes remain concealed by the light which failed to escape from the holes into the lens of the camera. The irony is tragic, for unlike the David Irving Trial, the nonmatter are not concealed, and yet they conceal a vast amount of evidence, rendering them in effect as useful as negative evidence.

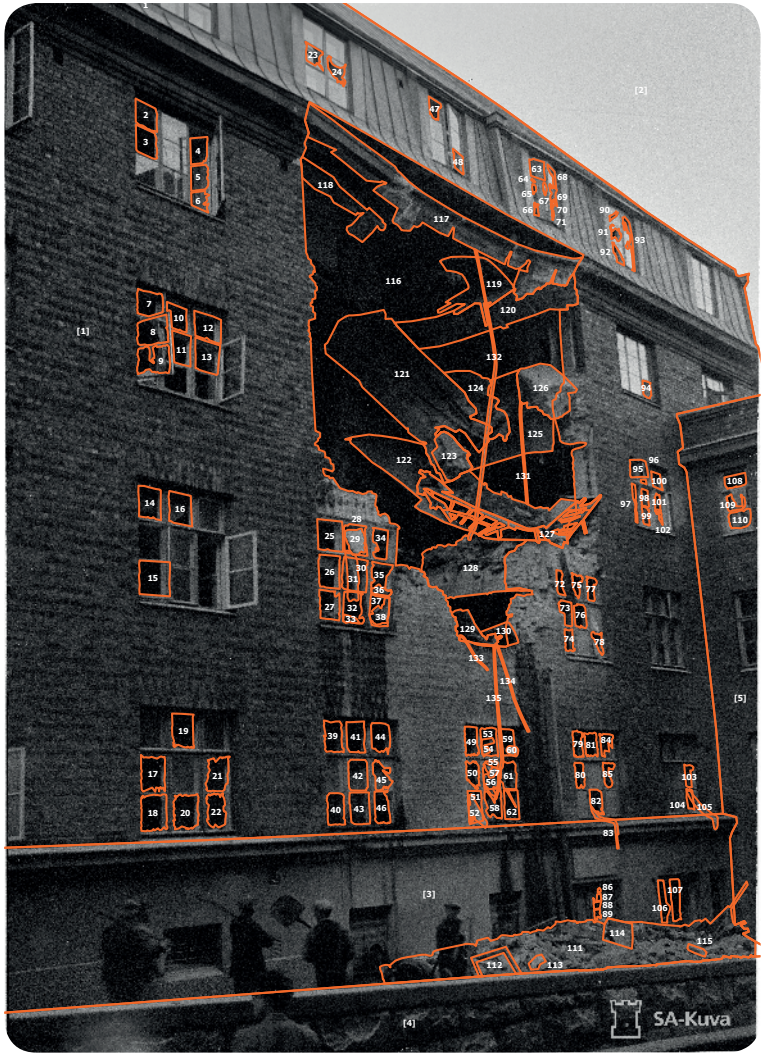


Figure 12 // Extracting Evidence from Exhibit C (above)
The bombing has created an infinitely complex crime scene of matter and nonmatter (highlighted in orange)

Figure 11 // Extracting Evidence // 1937 (right)
Trajectories of fired bullets can be traced using a victim’s entrance and exit wounds

2.7 Coaxial Lighting

Recognising the difficulty holes presented in the capturing of light, Sheldon Hine in 1950 devised a method known as coaxial lighting. Figure 13 is a pistol lit by coaxial lighting. Notice that the interior of the holes in the barrel which would typically appear as a black void have been captured, enabling the weapon to be forensically examined in greater detail. Unfortunately, coaxial lighting cannot be used to reveal the holes' internal sets of information from the five FWPA photos because the evidence was erased during the rebuilding of Helsinki. However, since the problem originates from the holes having depth, for this traps light from reaching the camera lens, the solution could be to invert the holes by extruding them, in effect turning them inside out. Whilst this does not extract additional information from inside the holes, it does delineate the photo into two main categories, nonmatter and matter (Figure 12 p.37) which is beneficial because, according to Ernst Gombrich in *The Art of Forgetting*, simplification allows an image to serve as a more effective mnemonic device.[42] The delineations for all five photos are explained in the "Exhibition Guide".

Figure 13 // Pistol Lit by Coaxial Lighting // by Sheldon Hine // 1950
Coaxial lighting enabled light previously trapped in nonmatter to be captured

2.8 Anamorphic Points of View

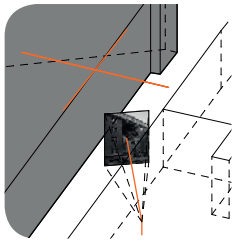
Since the purpose of the photographs is to allow observers to form the basis of memories, it would be beneficial to render the experience of viewing the photographs as real as possible. This could be achieved by constructing an experience as if the viewer was inside the photograph, with the bombings unravelling in front of them. This involves replicating the photographs' original spatial and temporal dimensions. The temporal dimension is easier to achieve, for upon viewing the content of the photographs they automatically transport the viewer backwards in time. The spatial dimension is trickier, but could be created by discovering the original points of view the photographers would have taken the photos from, and then using these points as the positions the photos are viewed from inside the museum. By definition this is anamorphism: "a distorted projection or perspective; especially an image distorted in such a way that it becomes visible only when viewed in a special manner."[43] These distortions could be achieved by extruding the matter and nonmatter discussed in the previous section to the positions the photos are viewed from inside the museum.

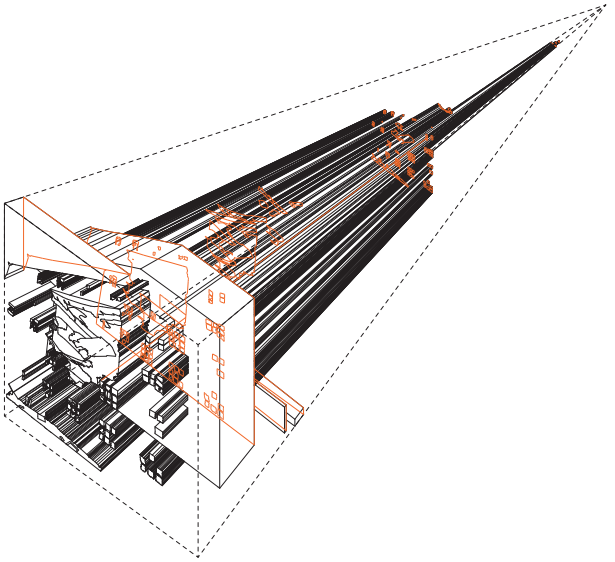
By modelling an exact three-dimensional digital model of the five bomb sites using the five photographs (Figure 14 top–right) I was able to map the precise locations the photographers would have been standing at when they took their photos. For Exhibit C, Figure 15 (middle) reveals that V. Pietinen (the photographer) would have positioned his camera lens at a height of 2.9m from the ground, at an upwards angle of 25˚ from the horizontal. He would have been standing 21.2m from the damaged building, at an angle of 61˚ to the building's façade. This information is plausible as it positions V. Pietinen inside an opposite building, well away from the narrow street which as Figure 12 (p.37) shows was filled with soldiers clearing rubble. Using Figure 12 I was able to extrude the 26 elements of matter, those areas that are undamaged, and 114 elements of nonmatter, the damaged areas, to the anamorphic point of view using the tool "extrude curve to point" in Rhino. Because the extrusions are anamorphic, they can be sliced at any interval and they will still 'fall into place' when viewed from the anamorphic point of view. The nonmatter elements are extruded to a greater distance than the matter elements to create a further delineating hierarchy.

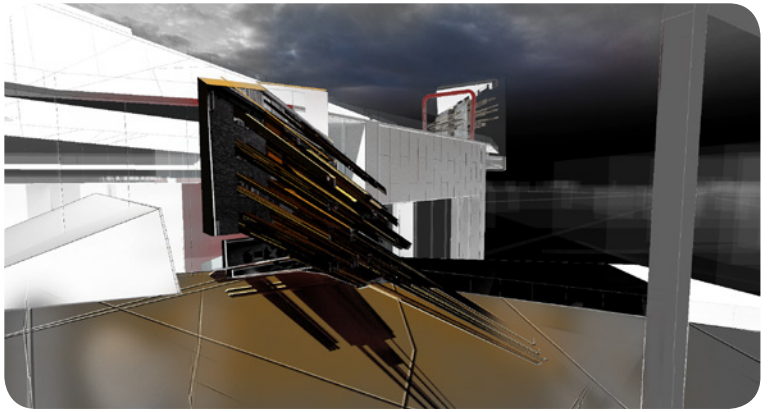
I could then digitally project the original photograph onto the exhibits' front facing surfaces of the extruded elements using a "perspective mapping" in d3, which is a projection and lighting design software program, with the position of the anamorphic point of view being the point in space that the projector projects from (Figure 16 bottom–right).

By repeating this process for three of the four other FWPA photographs (Exhibit A was not anamorphically extruded as it will be used as a lecture hall), and then scaling the positions of the five exhibits using the same scale factor and point of origin as that used to scale the mnemonic fractal (Figure 8 p.34), I determined the exhibits' position and orientation in relation to the museum. The size of the exhibits were kept at a one to one scale, and their heights the same distance as that determined in the Rhino models to accentuate the exhibits' sense of realism.

Figures 14 , 15, 16 //
Anamorphically Extruding Matter and Nonmatter from Exhibit C
The photographer's original camera position when taking the exhibit photos were used as the point to extrude the damaged building elements of matter and nonmatter to





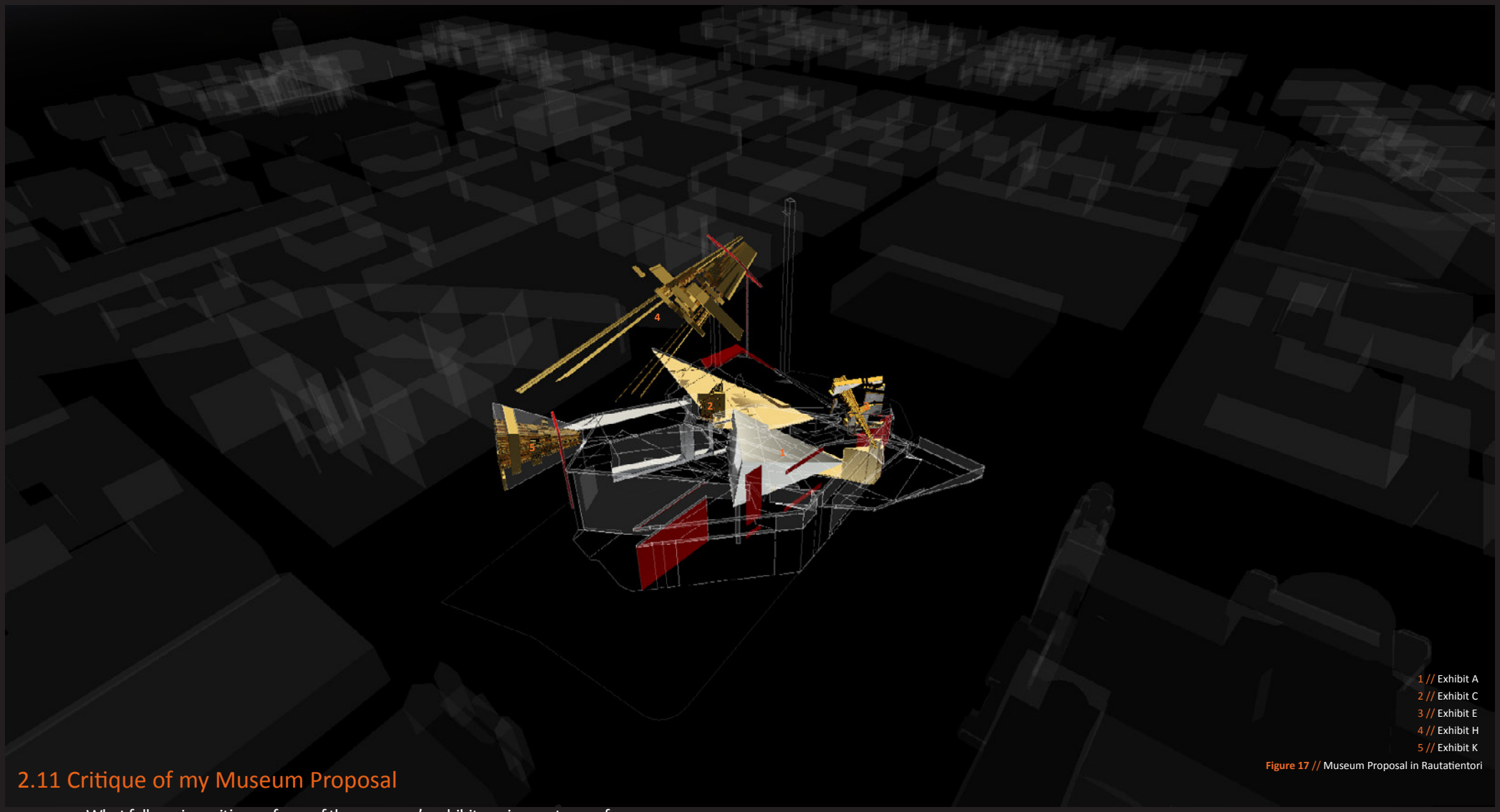


2.9 The Personal Narrative

If the memories generated by the five exhibits are to be truly individual to each viewer, and not influenced by homogenising forces such as the media, then they must 'speak' using a neutral impersonal voice. However, when I observe the photos, I feel as though they possess a personal voice. The words they speak are of the raging fires, the displaced furniture, the cavernous holes of damaged walls and ceilings; this is the language spoken by the photographer through the medium of photography to record that moment in time from his point of view. Emile Benviste discusses that the best method to separate the intervention of the speaker in the narrative is to "exclude every 'autobiographical' linguistic form",[44] with "linguistic form" being the pronouns "I and you".[45] Even if the first person "I", and the second person "you", were excluded, the use of the pronouns "he" or "she" means that the third person becomes the voice of the photo. Only by referring to the photograph as "it" can the photographer's personal voice be detached from the photographs. Whilst this allows the photographs to speak a more neutral impersonal voice, "I" the writer and "you" the reader are forced into a position of power: we become the critics and in doing so replace the voice of the photographer. This contradictory statement presents an interesting problem because it appears to be very difficult to detach the personal dimension from the narrative of an object. Perhaps a solution would be to increase the number of voices spoken through the photographs, and through these multiple voices the viewer may be able to find a neutral impersonal voice.

2.10 The "Real" and the "Live"

This multiplicity of voices speaking simultaneously through a photograph is made evident by what Roland Barthes terms the "Real" and the "Live". Using the example of a photo of a corpse, Barthe explains that the viewer initially believes that the object (the corpse) had been alive in the past, but this belief is contradicted by a "perverse confusion" because the realism of the image in the photograph "surreptitiously induces belief that it is alive, because of that delusion which makes us attribute to Reality an absolutely superior, somehow eternal value". It is only when the corpse's status is correctly shifted to the past that it is finally declared dead.[46] If we apply this concept to the photographs, then the "Live" view becomes what the viewer has come to remember, either through the media or leaders in positions of political power, or from what can be remembered if they experienced the Russian bombing raids first hand; and the "Real" view is the photographs of the damaged bomb sites from the FWPA. The "perverse confusion" would stem from the discrepancy between what the viewer sees in front of them, and what they have been led to believe and store in their memory stocks. Furthermore, the "Live" view could be enhanced by adopting the imagery of the bomb sites as existing today. To this end the visitors will be able to download the "Image Guide" before visiting the museum and use it to visit the museum's bomb locations today. This confusion between two views, the "Real" and the "Live", strips the viewer, "he", of their position of power, for even though they can still critique the photographs, the penultimate voice that shapes meaning to the photographs is the resolution between the two opposing "Real" and "Live" views. It is through this reconciliation that a balanced, neutral, impersonal voice is allowed to naturally emerge. This is what I have been trying to achieve, for now the memories triggered within the viewer are not based on narratives shifted by trauma, the media or leaders in positions of political power, but emerge from a neutral impersonal narrative that is drawn from somewhere in between the "Real" and the "Live", allowing the viewer to truly invent their own individual memories.



1 // Exhibit A
2 // Exhibit C
3 // Exhibit E
4 // Exhibit H
5 // Exhibit K

Figure 17 // Museum Proposal in Rautatientori

2.11 Critique of my Museum Proposal

What follows is a critique of one of the museum's exhibits, using part one of the thesis as a counterpoint for architectural criticism. The criticism uses Benveniste's "linguistic form" to critique the museum from multiple points of view: "I", which is myself the architect, and "he", the museum visitor. Through this duality, similar to the argument posed by the "Real" and the "Live", I hope that "you", the reader, are able to reconcile these

Exhibit E

"I"

Similar to the theory presented in Yates' *The Art of Memory* (section 1.3 p.18) the physical process of walking through the museum allows the viewer to construct new mnemonic spatial arrangements. The exhibits then become the rooms in that arrangement, and the extruded surfaces the objects in those rooms. However, according to Jacques Rouband, objects would reappear in the wrong speeches of orators, "haunting the building or specific rooms with it. When buildings become too cluttered with the ghosts of such objects, they must be abandoned or destroyed."[47]

I find the notion of abandoning objects very interesting because it suggests that the orator must become aware of the memories that are haunting them, to the extent where they can manually remove them from the room. This highlights perhaps the most important point in this thesis' argument: for a person to resist the fragility of remembering from forces such as the media, political leaders, or trauma, they must first become aware of those forces by compartmentalising the "Real" and "Live" objects and then choosing what they wish to remember. The remaining objects then become the structural elements of a new memory.

Furthermore, I have designed the extruded holes to be reflective. Like the Vietnam memorial (Figure 5 p.23), the "Live" sight of the viewer seeing themselves in the bomb extrusions of the "Real" photo creates a meaning of impossibility and sacrifice, allowing a neutral narrative to emerge which the viewer can also use to invent their own memories.

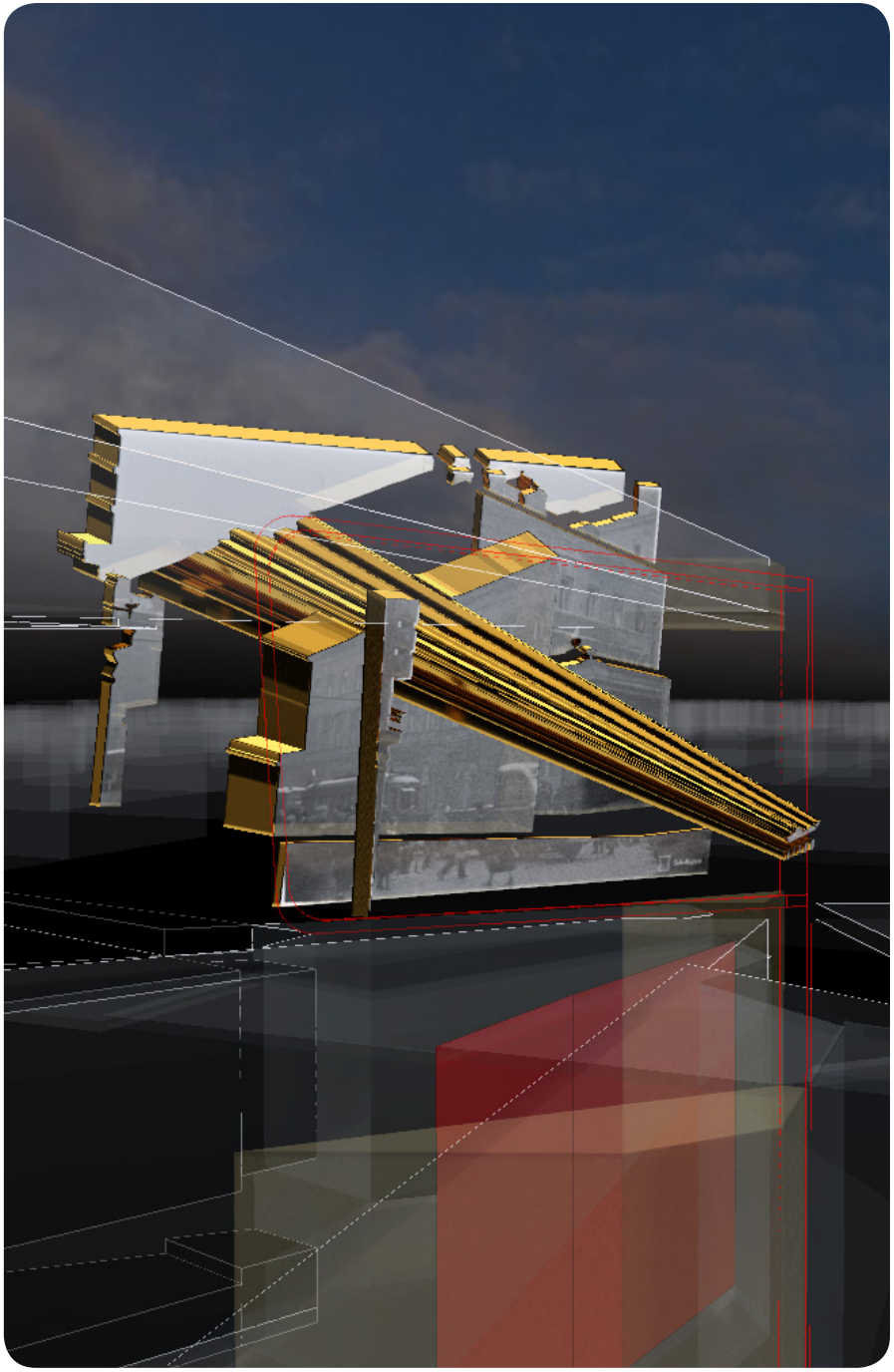


Figure 18 // Viewing Exhibit E from inside the museum

Exhibit E

“He” (Visitor One)

There are dozens of objects that look like flying projectiles frozen in time. As I move the exhibit seems to shift in appearance and I notice that parts of the projected image correspond with each other. I continue walking, until an image appears! It looks familiar but I can’t quite remember why. I notice that only the extruded elements correspond to the damaged areas, and quickly realise that the flat surfaces are like the building I visited earlier today on Aleksanterinkatu using the “Image Guide”. I was shocked at the extent of the damage. Even though I already saw the damage in the “Image Guide” it somehow didn’t sink in; only by seeing the building at its full scale does the dramatic impact of the damage really hit me. It was difficult to find original photos of the bombings in my library and I would usually think of old war movies I’ve watched to try and imagine the conflict… how wrong I was.

Exhibit E

“He” (Visitor Two)

I noticed that none of the people in the photograph had been extruded. I felt a bit annoyed by this, because I felt they deserved recognition for their bravery, but instead they have been ignored. What! I could have sworn one of the figures just moved. A bit shocked I realised it was another visitor; I felt slightly confused, for even though I knew the image wasn’t real, I felt like I was there, where the visitors walking through the exhibit were animating the scene: they were, I was, part of the past: we were inhabiting memory. I imagined I was walking through those debris littered streets, searching for some kind of meaning to justify the chaos in front of me. I start walking through the exhibit, feeling the crunching aggregate breaking under my feet, sliding my hand along the extruded exploded objects; they are cold and glisten from the wet damp air. I catch a glimpse of myself in a reflection; how would I feel if I was one of the dead in the scene? I feel a crushing sensation of sadness in the pit of my stomach, for I am reminded of how I felt when grandma passed away. I feel conflicted, trapped in a place where I know I need to let go of the past but feel such a yearning to stay here, in the silence, consumed by darkness, just myself with my thoughts. *Pitta patta pitta patta*, a light drizzle begins to dance off the glass ceiling above, and the cool breeze of the Helsinki wind awakens me from my moment of reverie. I realise that I am not dead, for this is impossible, that we cannot change what happened in the past, but we can control how we behave in the present, and if any positive memory can be gleaned from this, it is that we should be thankful for their sacrifice.

Conclusion

The research question asked “how can forensics be applied to architecture to reveal evidence that narrates the past in the present, and in doing so allow observers to invent memory that resists the fragility of remembering that is so common to war memorials?” The application of Bertillon’s “God’s eye view” and Hine’s theory on coaxial lighting attempted to forensically examine and extract objective historical information of the bombing raids embedded in the bomb plot map and five FWPA photographs. Encountering difficulties in this research method, solutions were identified in other fields of fractals and anamorphic projection, which helped, with the additional findings of mnemonic techniques from the first half of the thesis, to spatially translate the discovered forensic evidence into mnemonic devices that formed the spatial qualities of the museum and its five exhibits. However, it was discovered that how the mnemonic devices are designed is not only important, but how they are viewed, through the mental confusion between the “Real” and the “Live”, is also vital in allowing the observer to invent memory from a neutral objective narrative, and in doing so resist the fragility of remembering created by forces such as the media, political leaders and trauma. In addition, the critique of the museum revealed the mnemonic mental processes undergone during the periods of mental confusion, and that despite how memory is invented by an individual being a naturally subjective process, for a designer it is indeed possible to exercise a degree of control through the use of specific material images: whether the memories triggered are for example the old war movies from visitor one, or a deceased relative from visitor two, both visitors populated their mental rooms with objects of a similar theme – war, death, mourning – and were then able to become aware of and choose which objects they wanted to keep and invent memory from that was truthful, meaningful and individual to themselves.

Overall I am happy with the argument, design investigation and analyses that I have made. I feel I have discovered a viable connection between forensics, architecture and memory. This allows individuals to invent their own memories, which can be applied to not only memorials to fallen soldiers, but to many other traumatic events such as bereavement. The argument questions how we allow other narratives such as the media and history to shape our own memories, which can be applied to multiple strands in life, from the moment we turn on our televisions, to when we are walking through a street and see an advertisement, to when we go to sleep and reflect and what we saw and read during the day.

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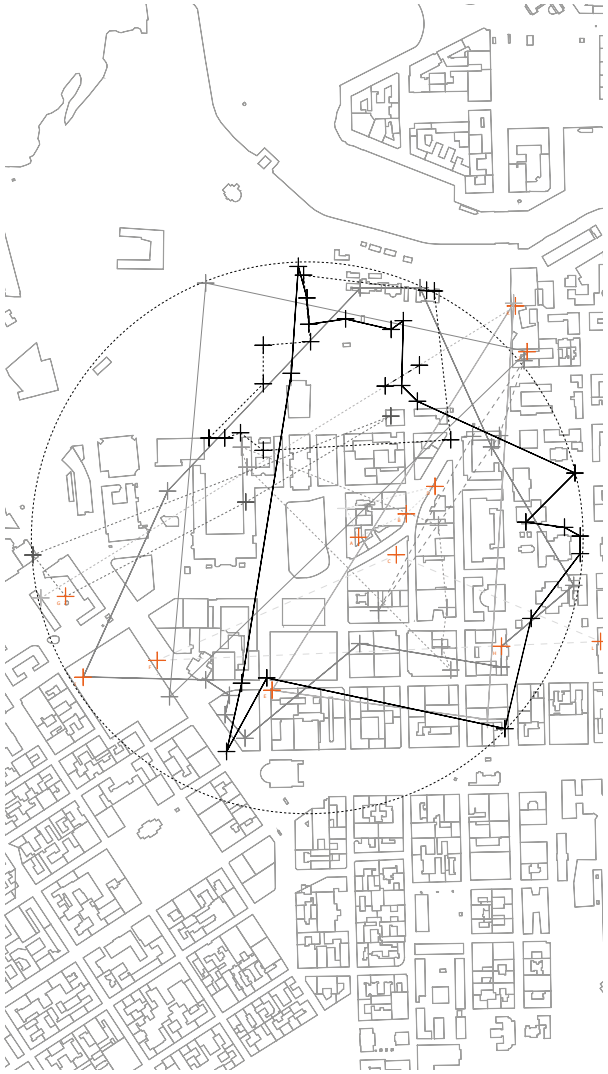
Image Guide

Bomb Plots // Exhibits A–L

This Image Guide is intended to be used with the Museum Guide to Inventing Memory and the Exhibition Guide



[Bomb Plots // 1:4000]

[Mine Bomb]
[Mine Bomb Causing Structural Damage]
[Mine Bomb Causing Structural Damage]
[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]
[Combination Bomb Causing Fire Damage]
[Combination Bomb Causing Fire + Structural Damage]
[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]
[Second Great Raid // 16.–17.02.1944]
[First Great Raid // 06.–07.02.1944]
[Dates Unknown]

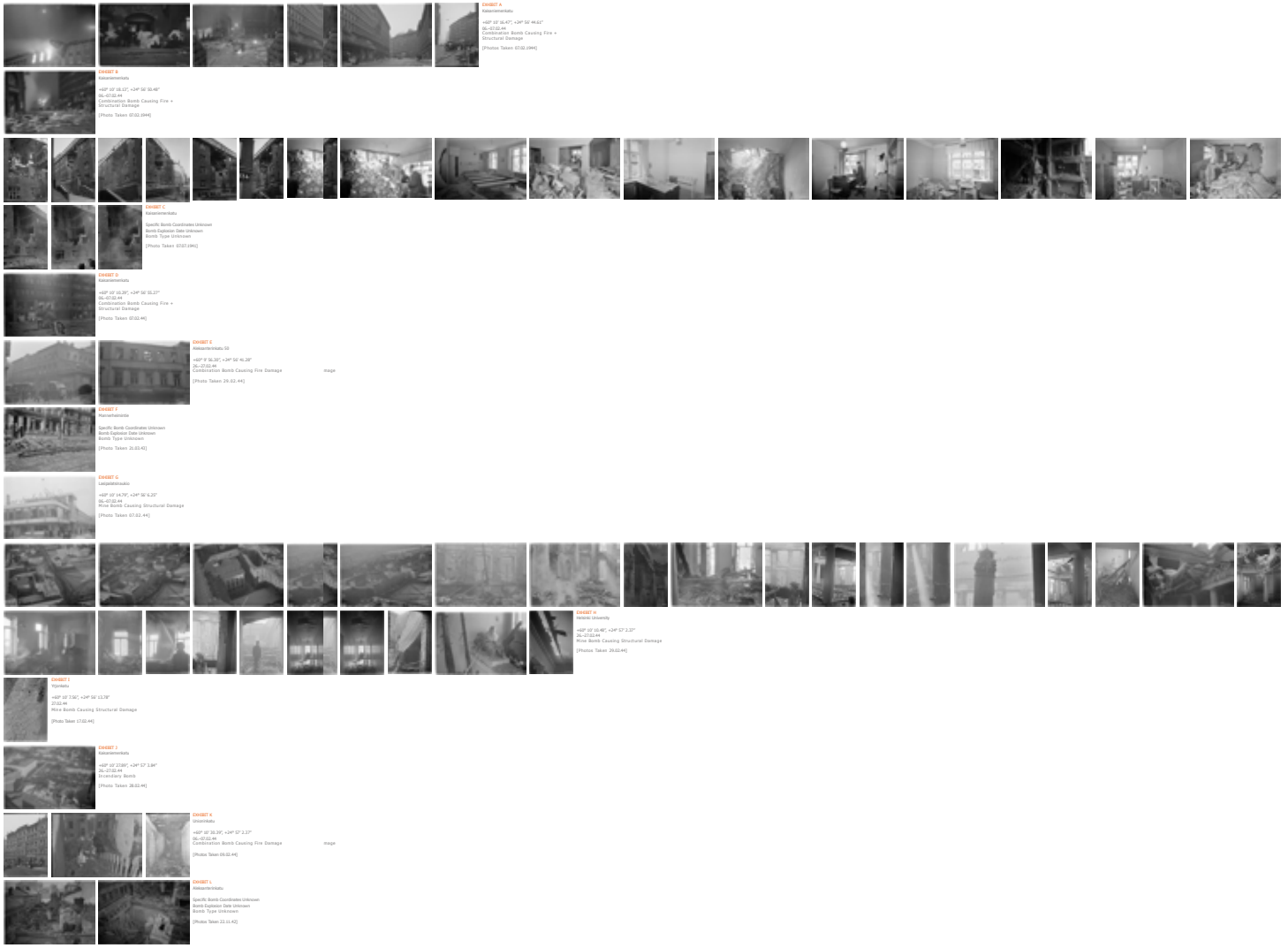


EXHIBIT A
Kaisaniemenkatu

+60° 10' 16.47", +24° 56' 49.61"
06.–07.02.44
Combination Bomb Causing Fire + Structural Damage

[Photos Taken 07.02.1944]

EXHIBIT B
Kaisaniemenkatu

+60° 10' 16.13", +24° 56' 50.48"
06.–07.02.44
Combination Bomb Causing Fire + Structural Damage

[Photo Taken 07.02.1944]

EXHIBIT C
Kaisaniemenkatu

Specific Bomb Coordinates Unknown
Bomb Explosion Date Unknown
Bomb Type Unknown

[Photo Taken 07.07.1941]

EXHIBIT D
Kaisaniemenkatu

+60° 10' 15.29", +24° 56' 51.27"
06.–07.02.44
Combination Bomb Causing Fire + Structural Damage

[Photo Taken 07.02.44]

EXHIBIT E
Aleksanterinkatu 50

+60° 9' 56.39", +24° 56' 46.28"
26.–27.02.44
Combination Bomb Causing Fire Damage image

[Photo Taken 26.02.44]

EXHIBIT F
Hallituskatu

Specific Bomb Coordinates Unknown
Bomb Explosion Date Unknown
Bomb Type Unknown

[Photo Taken 21.03.41]

EXHIBIT G
Laulajatalonkatu

+60° 10' 14.79", +24° 56' 6.25"
06.–07.02.44
Mine Bomb Causing Structural Damage

[Photo Taken 07.02.44]

EXHIBIT H
Helsinki University

+60° 10' 16.48", +24° 57' 2.37"
06.–07.02.44
Mine Bomb Causing Structural Damage

[Photos Taken 29.02.44]

EXHIBIT I
Hjorkatu

+60° 10' 7.56", +24° 56' 13.78"
27.02.44
Mine Bomb Causing Structural Damage

[Photo Taken 17.02.44]

EXHIBIT J
Kaisaniemenkatu

+60° 10' 27.84", +24° 57' 1.84"
26.–27.02.44
Incendiary Bomb

[Photo Taken 28.02.44]

EXHIBIT K
Unioninkatu

+60° 10' 20.39", +24° 57' 2.37"
06.–07.02.44
Combination Bomb Causing Fire Damage image

[Photos Taken 09.02.44]

EXHIBIT L
Aleksanterinkatu

Specific Bomb Coordinates Unknown
Bomb Explosion Date Unknown
Bomb Type Unknown

[Photos Taken 22.11.42]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

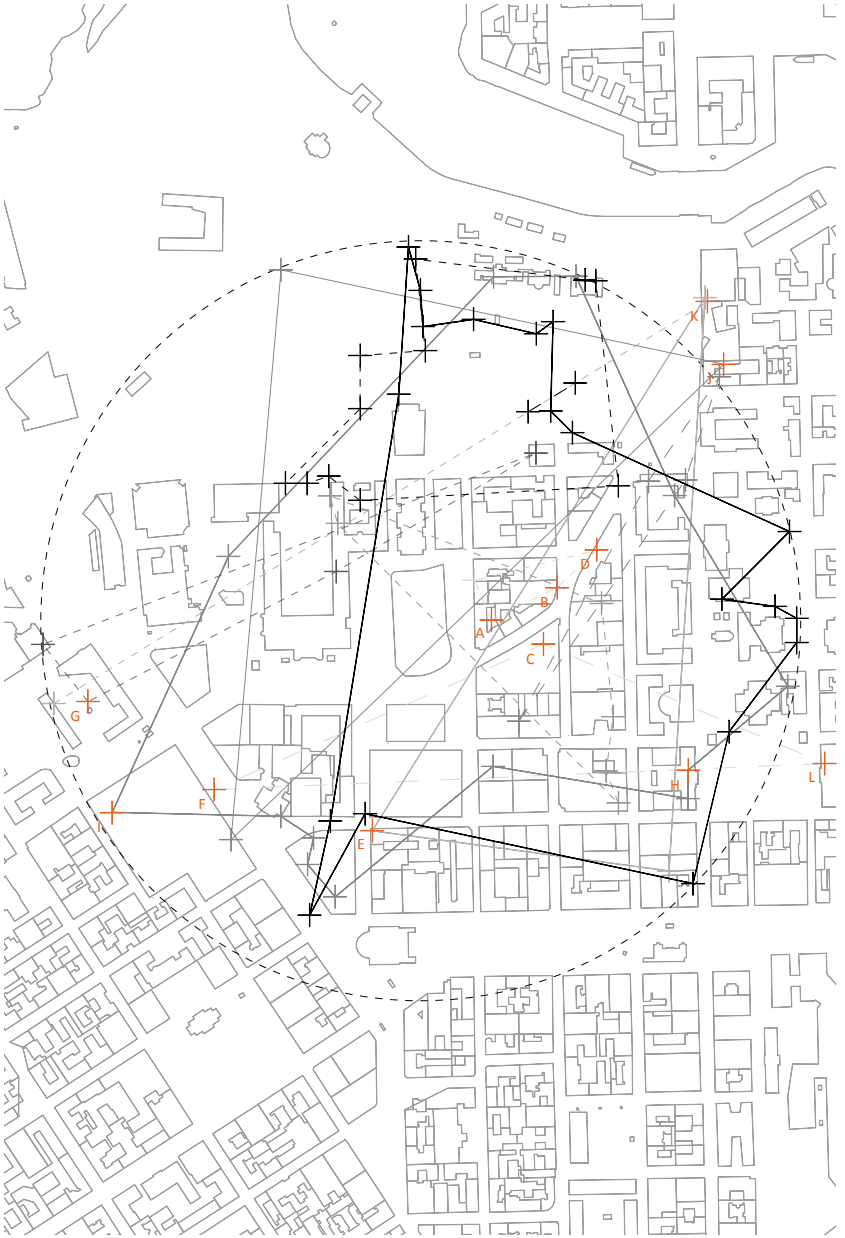
[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]



Bomb Plot Map of Exhibits A–L

EXHIBIT A

Kaisaniemenkatu

+60° 10’ 16.47”, +24° 56’ 44.61”

06.–07.02.44

Combination Bomb Causing Fire + Structural Damage

[Photos Taken 07.02.1944]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 145259

By Kersantti N.Verronen

Image 145321

By Osvald Hedenström

Image 145258

By Kersantti N. Verronen

Image 145260

By Kersantti N. Verronen

Image 145322
By Osvald Hedenström

EXHIBIT B
Kaisaniemenkatu

+60° 10’ 18.13”, +24° 56’ 50.48”
06.–07.02.44
Combination Bomb Causing Fire + Structural Damage

[Photo Taken 07.02.1944]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 145259

By Kersantti N. Verronen

EXHIBIT C

Kaisaniemenkatu

Specific Bomb Coordinates Unknown
Bomb Explosion Date Unknown
Bomb Type Unknown

[Photo Taken 07.07.1941]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 21729
By V. Pietinen

Image 21727
By V. Pietinen

Image 21730
By V. Pietinen

Image 21731
By V. Pietinen

Image 22932
By Neittamo

Image 21726
By V. Pietinen

Image 21812
By V. Pietinen

Image 21806
By V. Pietinen

Image 21804
By V. Pietinen

Image 21809
By V. Pietinen

Image 21810
By V. Pietinen

Image 21808
By V. Pietinen

Image 21811
By V. Pietinen

Image 21808
By V. Pietinen

Image 21807
By V. Pietinen

Image 21815
By V. Pietinen

EXHIBIT D

Kaisaniemenkatu

+60° 10’ 10.29”, +24° 56’ 55.27”

06.–07.02.44

Combination Bomb Causing Fire + Structural Damage

[Photo Taken 07.02.44]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

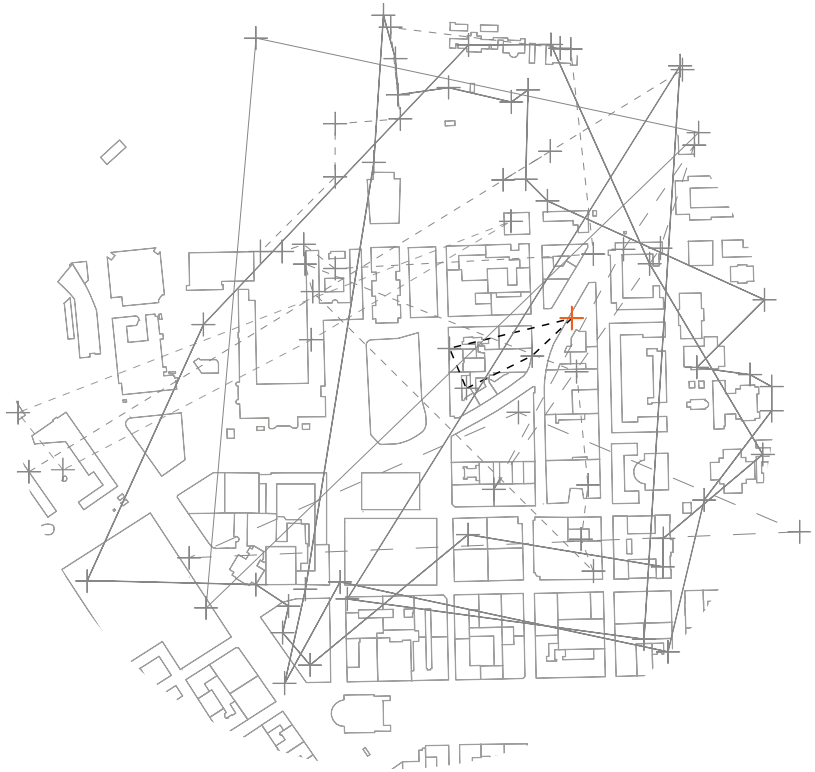


Image 145260
By Kersantti N. Verronen

EXHIBIT E
Aleksanterinkatu 50

+60° 9′ 56.30″, +24° 56′ 41.28″
26.–27.02.44
Combination Bomb Causing Fire Damage

[Photo Taken 29.02.44]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 146965

By Captain Leo Vepsäläinen

Image 146966

By Captain Leo Vepsäläinen

EXHIBIT F

Mannerheimintie

Specific Bomb Coordinates Unknown
Bomb Explosion Date Unknown
Bomb Type Unknown

[Photo Taken 21.03.43]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 124998
By Corporal E. Heinänen

EXHIBIT G
Lasipalatsinaukio

+60° 10’ 14.79”, +24° 56’ 6.25”
06.–07.02.44
Mine Bomb Causing Structural Damage

[Photo Taken 07.02.44]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 145640

By Sot. virk. Esko Manninen

EXHIBIT H

Helsinki University

+60° 10′ 10.48″, +24° 57′ 2.37″

26.–27.02.44

Mine Bomb Causing Structural Damage

[Photos Taken 29.02.44]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 145981

By Sot.virk. Niilo Helander

Image 145977

By Sot. virk. Niilo Helander

Image 145981

By Sot.virk. Niilo Helander

Image 145980

By Sot. virk. Niilo Helander

Image 146981

By Captain Leo Vepsäläinen

Image 146980

By Captain Leo Vepsäläinen

Image 147000

By Captain Leo Vepsäläinen

Image 146998

By Captain Leo Vepsäläinen

Image 146985

By Captain Leo Vepsäläinen

Image 146986

By Captain Leo Vepsäläinen

Image 146984

By Captain Leo Vepsäläinen

Image 146988

By Captain Leo Vepsäläinen

Image 146984

By Captain Leo Vepsäläinen

Image 146988

By Captain Leo Vepsäläinen

Image 146991

By Captain Leo Vepsäläinen

Image 146990

By Captain Leo Vepsäläinen

Image 146989

By Captain Leo Vepsäläinen

Image 147001

By Captain Leo Vepsäläinen

Image 146994

By Captain Leo Vepsäläinen

Image 146993

By Captain Leo Vepsäläinen

Image 146999

By Captain Leo Vepsäläinen

Image 146992

By Captain Leo Vepsäläinen

Image 146979
By Captain Leo Vepsäläinen

Image 146982
By Captain Leo Vepsäläinen

Image 147002

By Captain Leo Vepsäläinen

Image 146987

By Captain Leo Vepsäläinen

EXHIBIT I

Yrjonkatu

+60° 10’ 7.56”, +24° 56’ 13.78”

27.02.44

Mine Bomb Causing Structural Damage

[Photo Taken 17.02.44]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 145767

By Sergeant N.Verronen

EXHIBIT J

Kaisaniemenkatu

+60° 10′ 27.89″, +24° 57′ 3.84″

26.–27.02.44

Incendiary Bomb

[Photo Taken 28.02.44]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

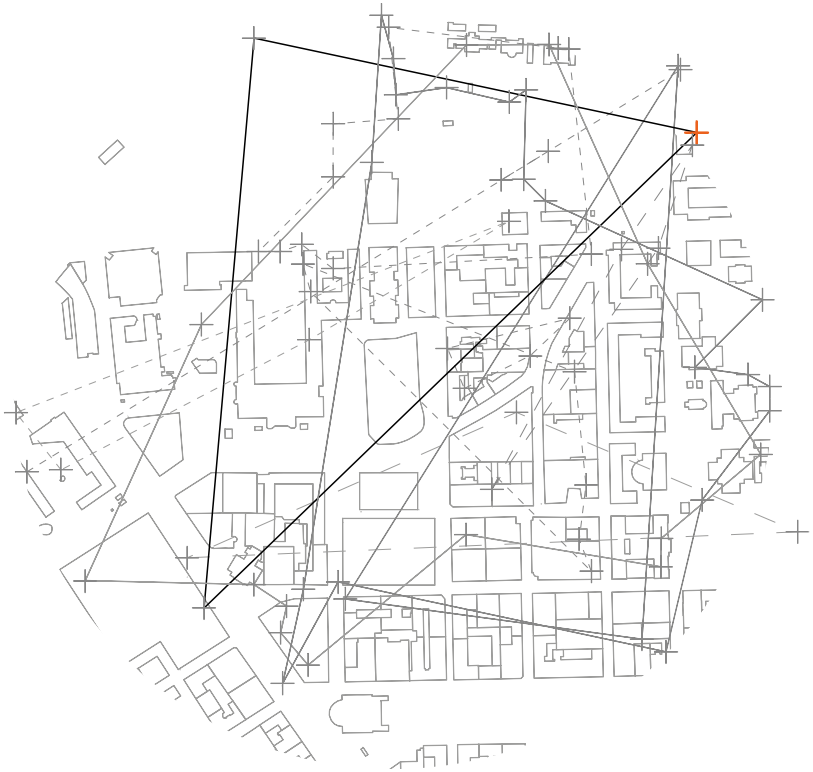


Image 145979
By Sot.virk. Niilo Helander

EXHIBIT K
Unioninkatu

+60° 10’ 30.39”, +24° 57’ 2.37”
06.–07.02.44
Combination Bomb Causing Fire Damage

[Photos Taken 09.02.44]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

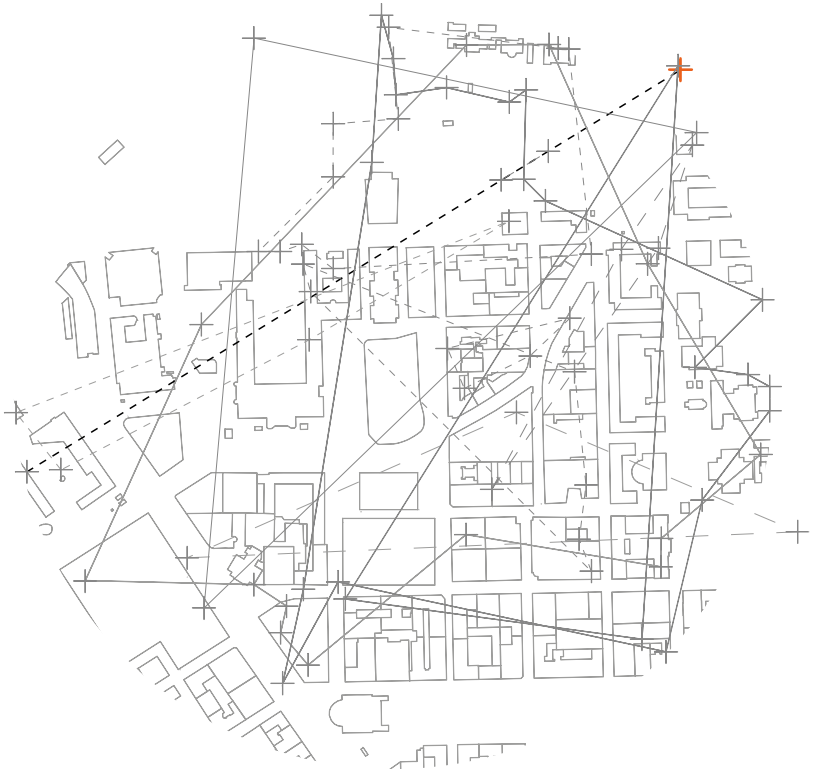


Image 145558
By Sergeant N. Verronen

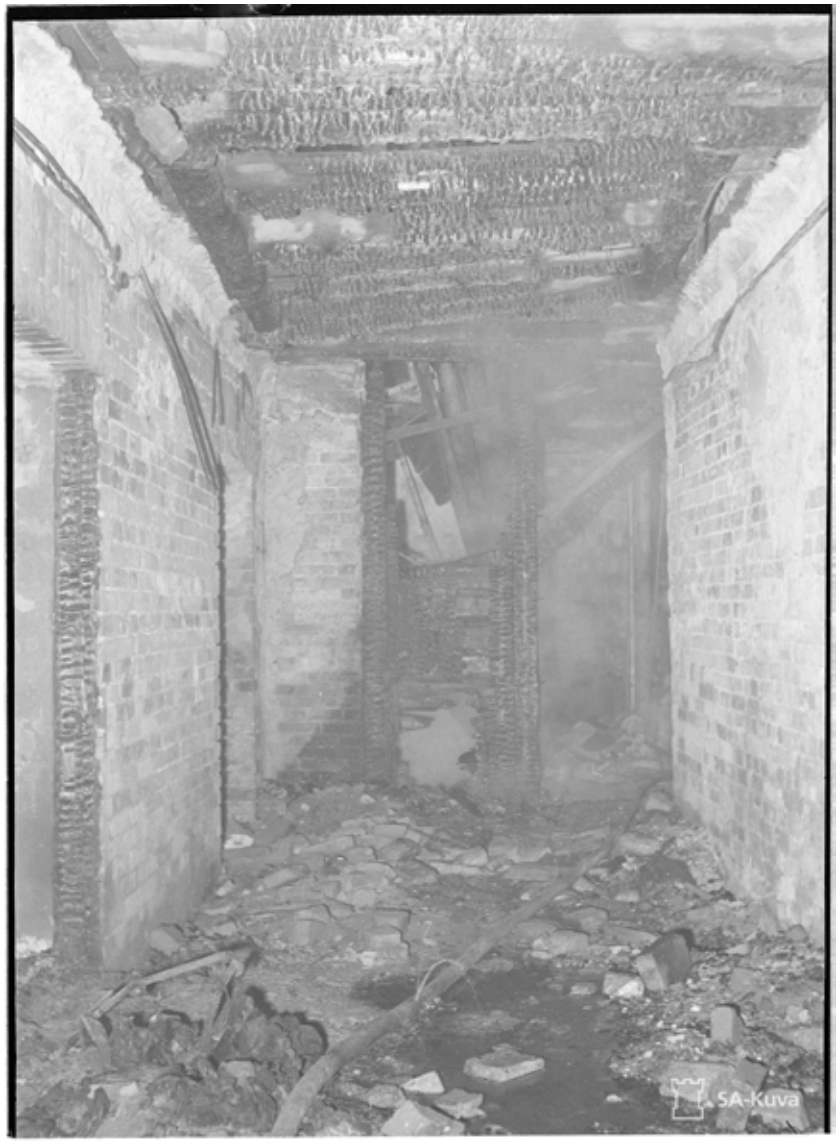


Image 145560
By Sergeant N. Verronen

Image 145559
By Sergeant N. Verronen

EXHIBIT L
Aleksanterinkatu

Specific Bomb Coordinates Unknown
Bomb Explosion Date Unknown
Bomb Type Unknown

[Photos Taken 22.11.42]

[Mine Bomb]

[Mine Bomb Causing Structural Damage]

[Mine Bomb Causing Structural Damage]

[Incendiary Bomb]

[Incendiary Bomb Causing Fire Damage]

[Combination Bomb Causing Fire Damage]

[Combination Bomb Causing Fire + Structural Damage]

[Bomb Types Unknown]

[Third Great Raid // 25.–27.02.1944]

[Second Great Raid // 16.–17.02.1944]

[First Great Raid // 06.–07.02.1944]

[Dates Unknown]

Image 145558

By Corporal E. Heinänen

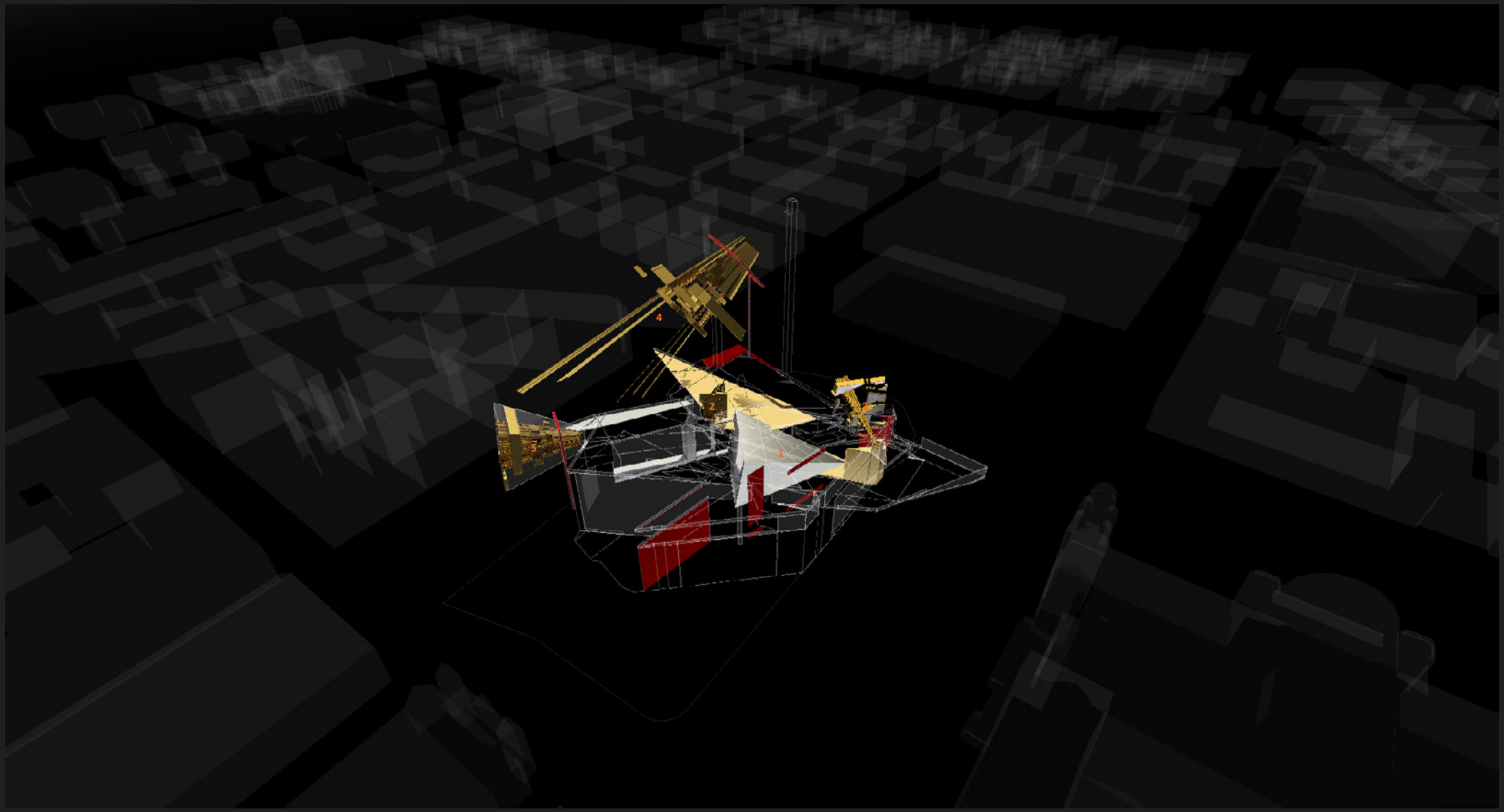
Image 114940

By Corporal E. Heinänen

Exhibition Guide

Exhibits A, C, E, H, K

This Exhibition Guide is intended to be used with the Museum Guide to Inventing Memory and the Image Guide



1 // Exhibit A
2 // Exhibit C
3 // Exhibit E
4 // Exhibit H
5 // Exhibit K

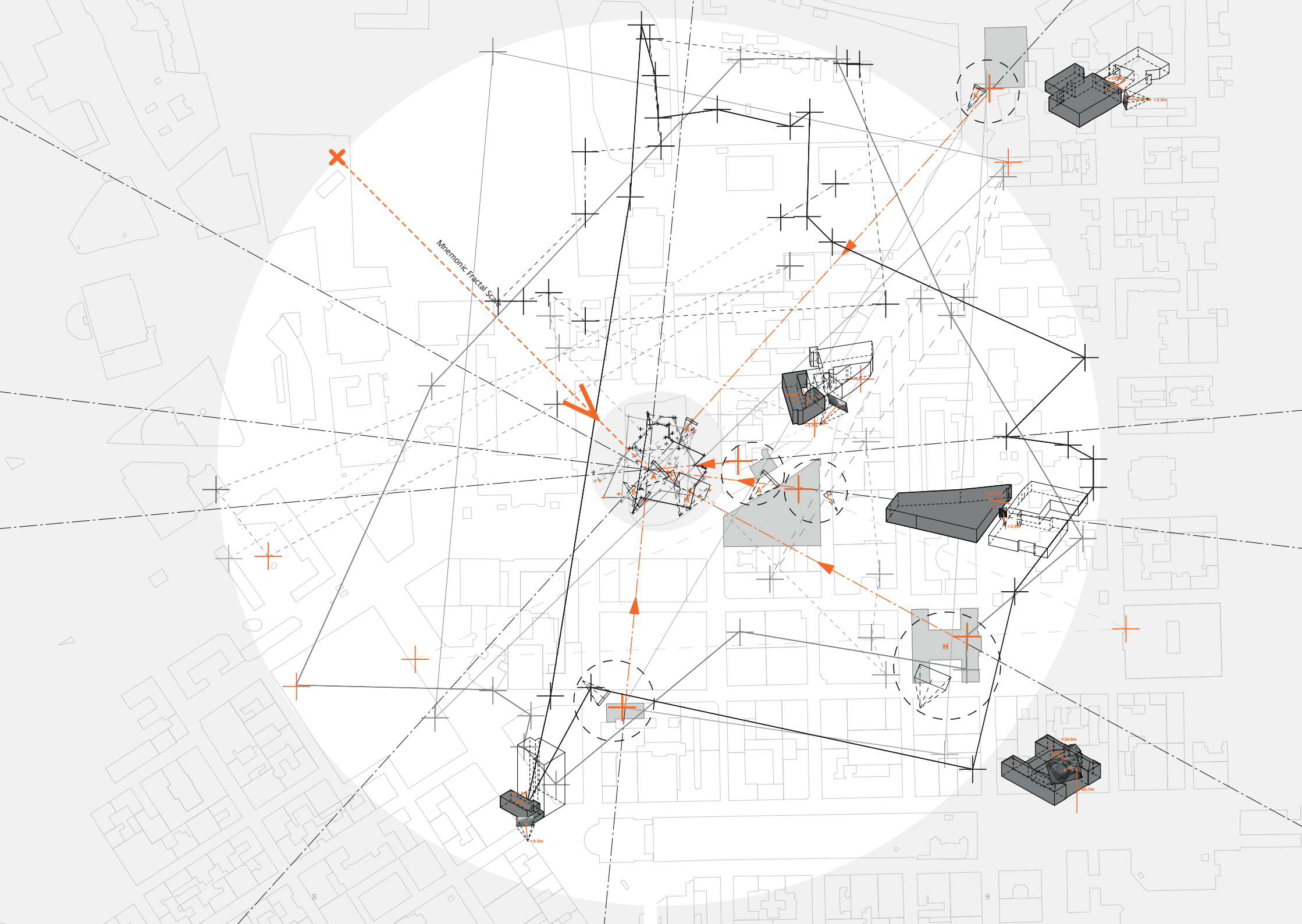

Mnemonic Fractal Scale

EXHIBIT A

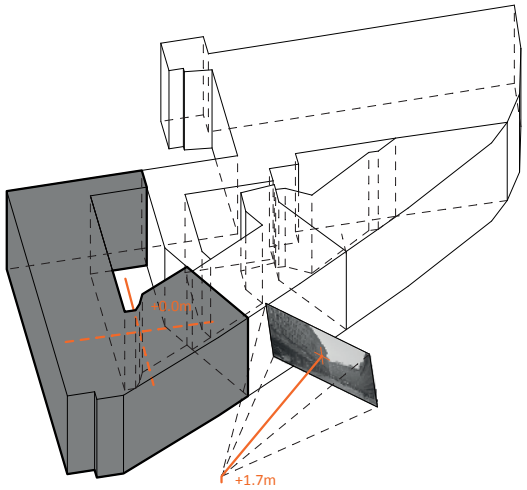
Kaisaniemenkatu

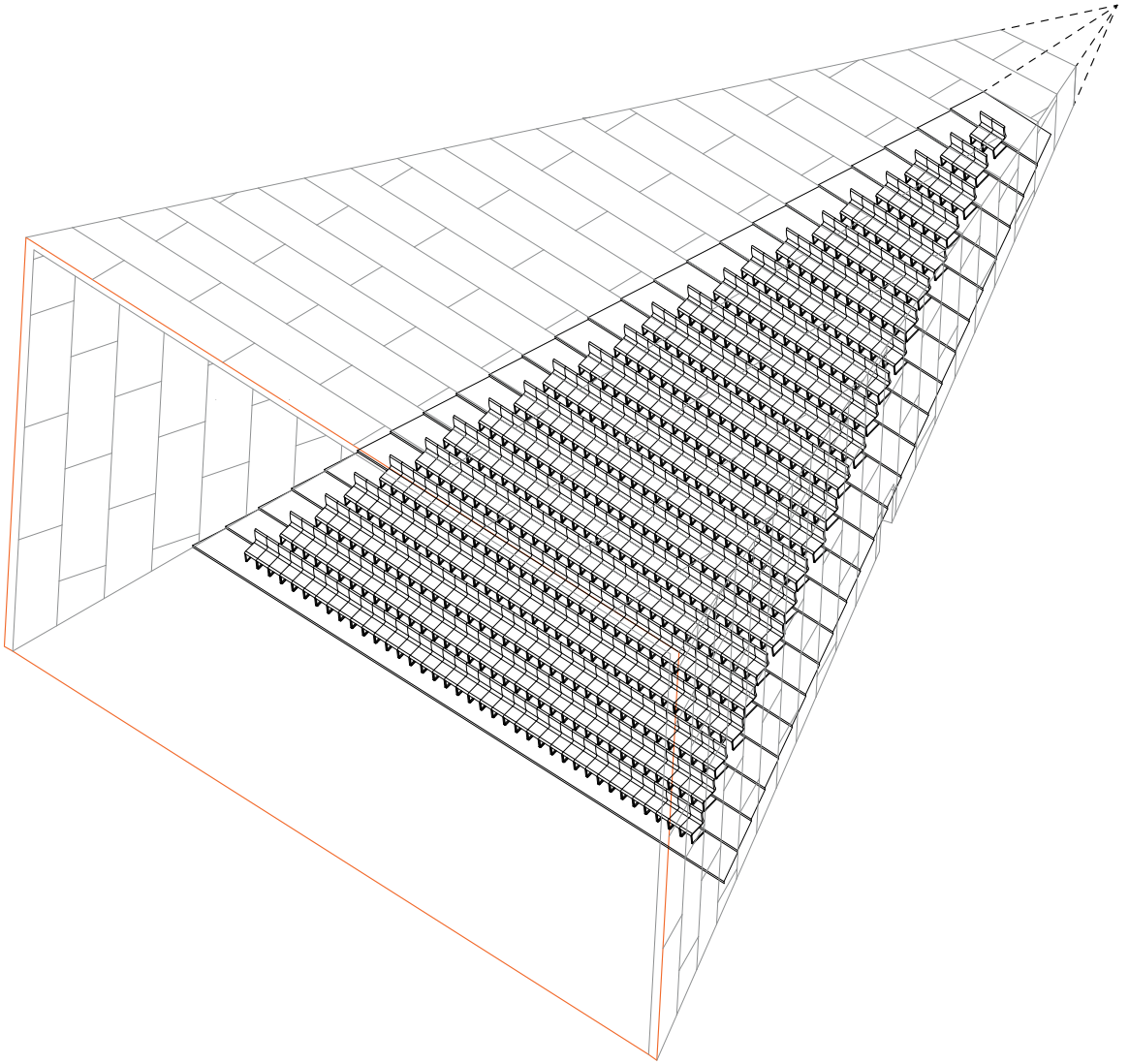
+60° 10’ 16.47”, +24° 56’ 44.61”

06.–07.02.44

Combination Bomb Causing Fire +
Structural Damage

[Photo Taken 07.02.1944 by Osvald Hedenström]





Constructing the Anamorphic Cone

Photographer's camera position, field of view (35mm) and target lens length used to construct anamorphic cone. The exhibit is to be used as a lecture hall and therefore the photo's elements have not been extruded.

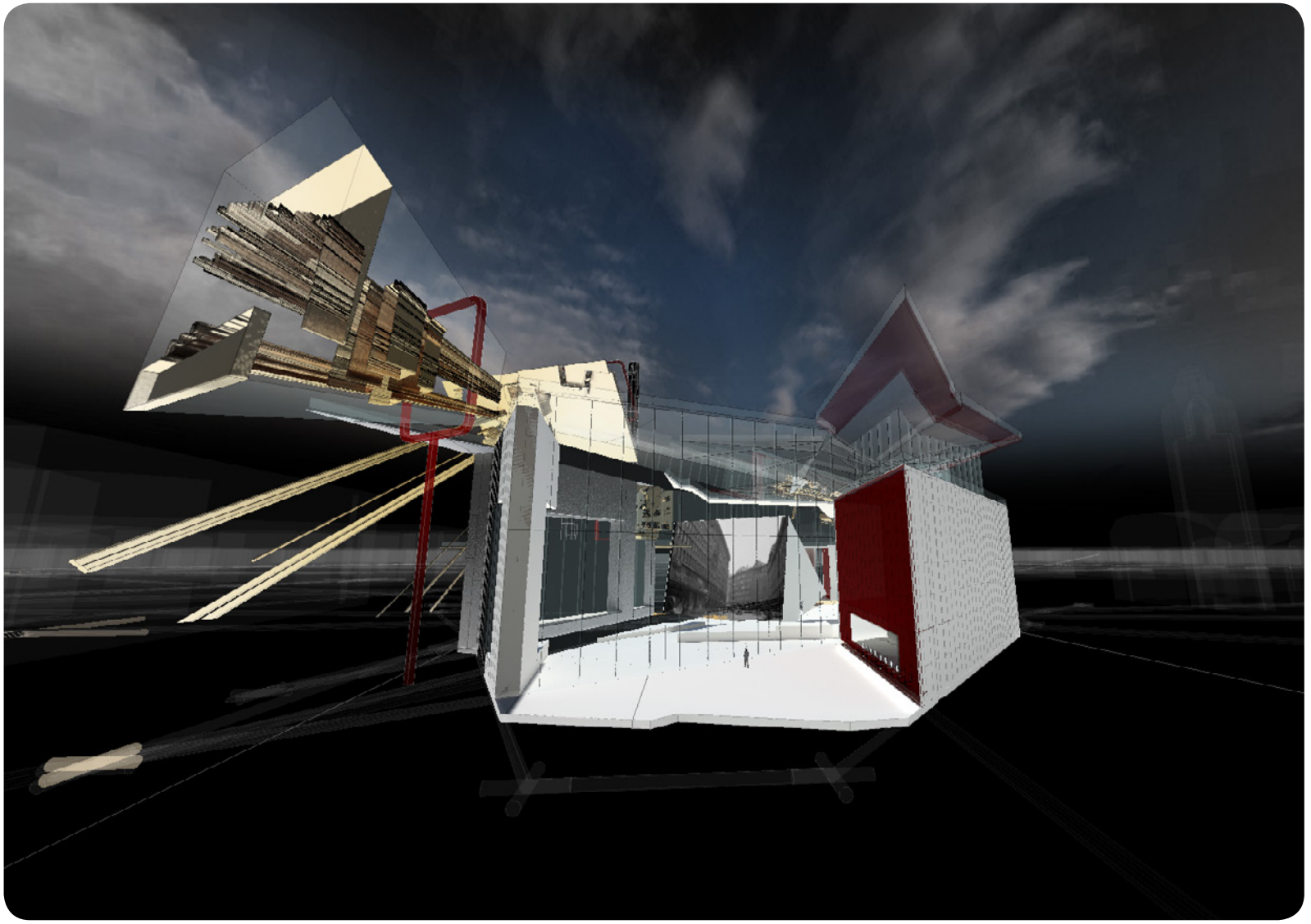


Exhibit A In-Situ

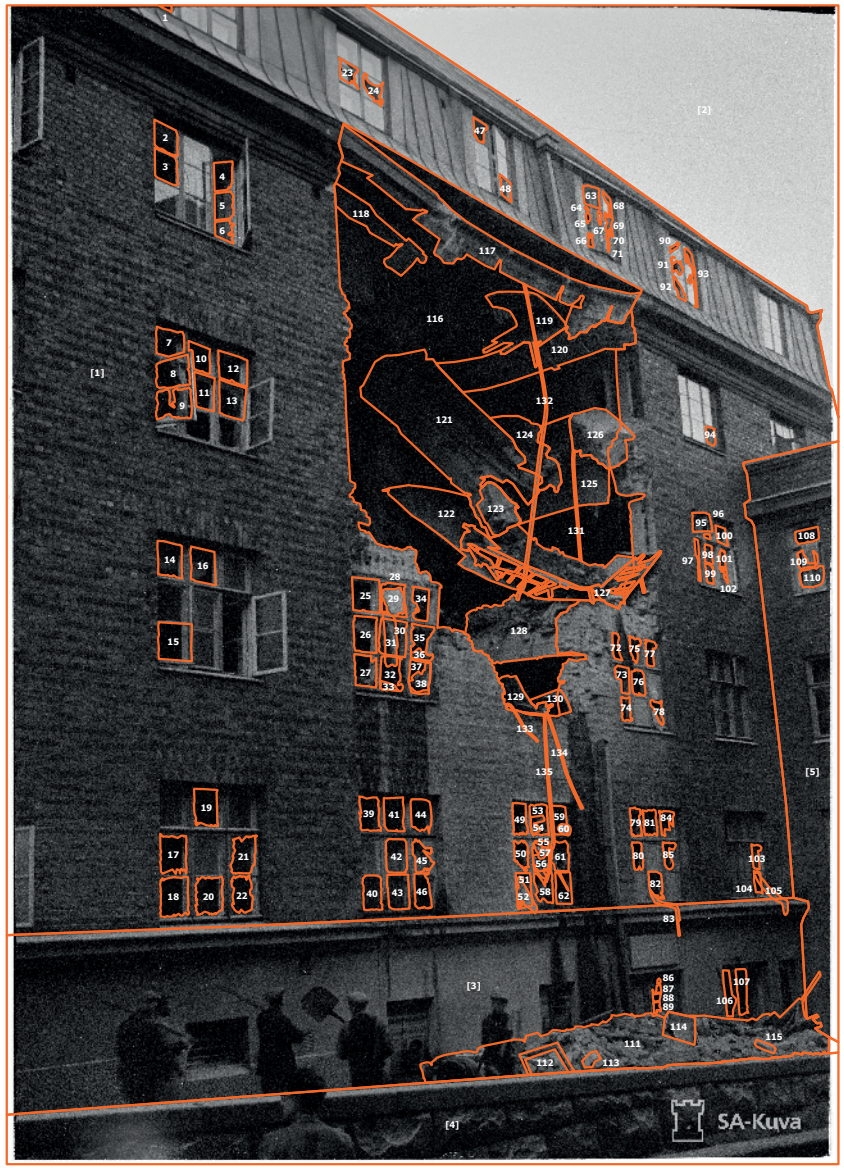
Exhibit A positioned in museum using mnemonic fractal scale (pp. 8-9), original anamorphic cone's dimensions, and at the same height of the bomb explosion

EXHIBIT C

Kaisaniemenkatu

Specific Bomb Coordinates Unknown
Bomb Explosion Date Unknown
Bomb Type Unknown

[Photo Taken 07.07.1941 by V. Pietinen]



Damaged Elements [NonMatter]

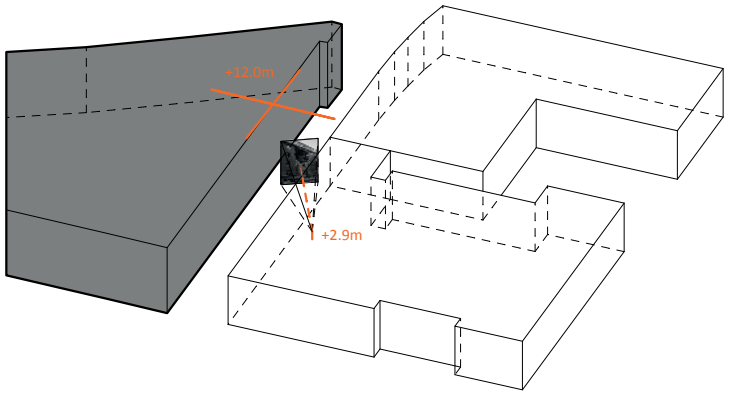
1_Window 1_Pane 1
2_Window 2_Pane 1
3_Window 2_Pane 2
4_Window 2_Pane 3
5_Window 2_Pane 4
6_Window 2_Pane 5
7_Window 3_Pane 1
8_Window 3_Pane 2
9_Window 3_Pane 3
10_Window 3_Pane 4
11_Window 3_Pane 5
12_Window 3_Pane 6
13_Window 3_Pane 7
14_Window 4_Pane 1
15_Window 4_Pane 2
16_Window 4_Pane 3
17_Window 5_Pane 1
18_Window 5_Pane 2
19_Window 5_Pane 3
20_Window 5_Pane 4
21_Window 5_Pane 5
22_Window 5_Pane 6
23_Window 6_Pane 1
24_Window 6_Pane 2
25_Window 7_Pane 1
26_Window 7_Pane 2
27_Window 7_Pane 3
28_Window 7_Pane 4
29_Window 7_Pane 5
30_Window 7_Pane 6
31_Window 7_Curtain*
32_Window 7_Pane 7
33_Window 7_Pane 8
34_Window 7_Pane 9
35_Window 7_Pane 10
36_Window 7_Pane 11
37_Window 7_Pane 12
38_Window 7_Pane 13
39_Window 8_Pane 1
40_Window 8_Pane 2
41_Window 8_Pane 3
42_Window 8_Pane 4
43_Window 8_Pane 5
44_Window 8_Pane 6
45_Window 8_Pane 7
46_Window 8_Pane 8
47_Window 9_Pane 1
48_Window 9_Pane 2
49_Window 10_Pane 1
50_Window 10_Pane 2
51_Window 10_Pane 3
52_Window 10_Pane 4
53_Window 10_Pane 5
54_Window 10_Pane 6
55_Window 10_Pane 7
56_Window 10_Pane 8
57_Window 10_Pane 9
58_Window 10_Pane 10
59_Window 10_Pane 11
60_Window 10_Pane 12
61_Window 10_Pane 13
62_Window 10_Pane 14
63_Window 11_Pane 1
64_Window 11_Pane 2
65_Window 11_Pane 3
66_Window 11_Pane 4
67_Window 11_Pane 5
68_Window 11_Pane 6
69_Window 11_Pane 7
70_Window 11_Pane 8
71_Window 11_Pane 9
72_Window 12_Pane 1
73_Window 12_Pane 2
74_Window 12_Pane 3
75_Window 12_Pane 4
76_Window 12_Pane 5
77_Window 12_Pane 6
78_Window 12_Pane 7
79_Window 13_Pane 1
80_Window 13_Pane 2
81_Window 13_Pane 3
82_Window 13_Pane 4
83_Window 13_Curtain*
84_Window 13_Pane 5
85_Window 13_Pane 6
86_Window 13_Pane 1
87_Window 13_Pane 2
88_Window 14_Pane 3
89_Window 14_Pane 4
90_Window 15_Pane 1
91_Window 15_Pane 2
92_Window 15_Pane 3
93_Window 15_Pane 4
94_Window 16_Pane 1
95_Window 17_Pane 1
96_Window 17_Pane 2
97_Window 17_Pane 3
98_Window 17_Pane 4
99_Window 17_Pane 5
100_Window 17_Pane 6
101_Window 17_Pane 7
102_Window 17_Pane 8
103_Window 18_Pane 1
104_Window 18_Pane 2
105_Window 18_Curtain*
106_Window 19_Pane 1
107_Window 19_Pane 2
108_Window 20_Pane 1
109_Window 20_Pane 2
110_Window 20_Pane 3
111_Fragment 1*
112_Fragment 2*
113_Fragment 3*
114_Fragment 4*
115_Fragment 5*
116_Fragment 6
117_Fragment 7*
118_Fragment 8*
119_Fragment 9*
120_Fragment 10*
121_Fragment 11*
122_Fragment 12*
123_Fragment 13*
124_Fragment 14*
125_Fragment 15*
126_Fragment 16*
127_Fragment 17*
128_Fragment 18*
129_Fragment 19*
130_Fragment 20*
131_Fragment 21*
132_Fragment 22*
133_Fragment 23*
134_Fragment 24*
135_Fragment 25*

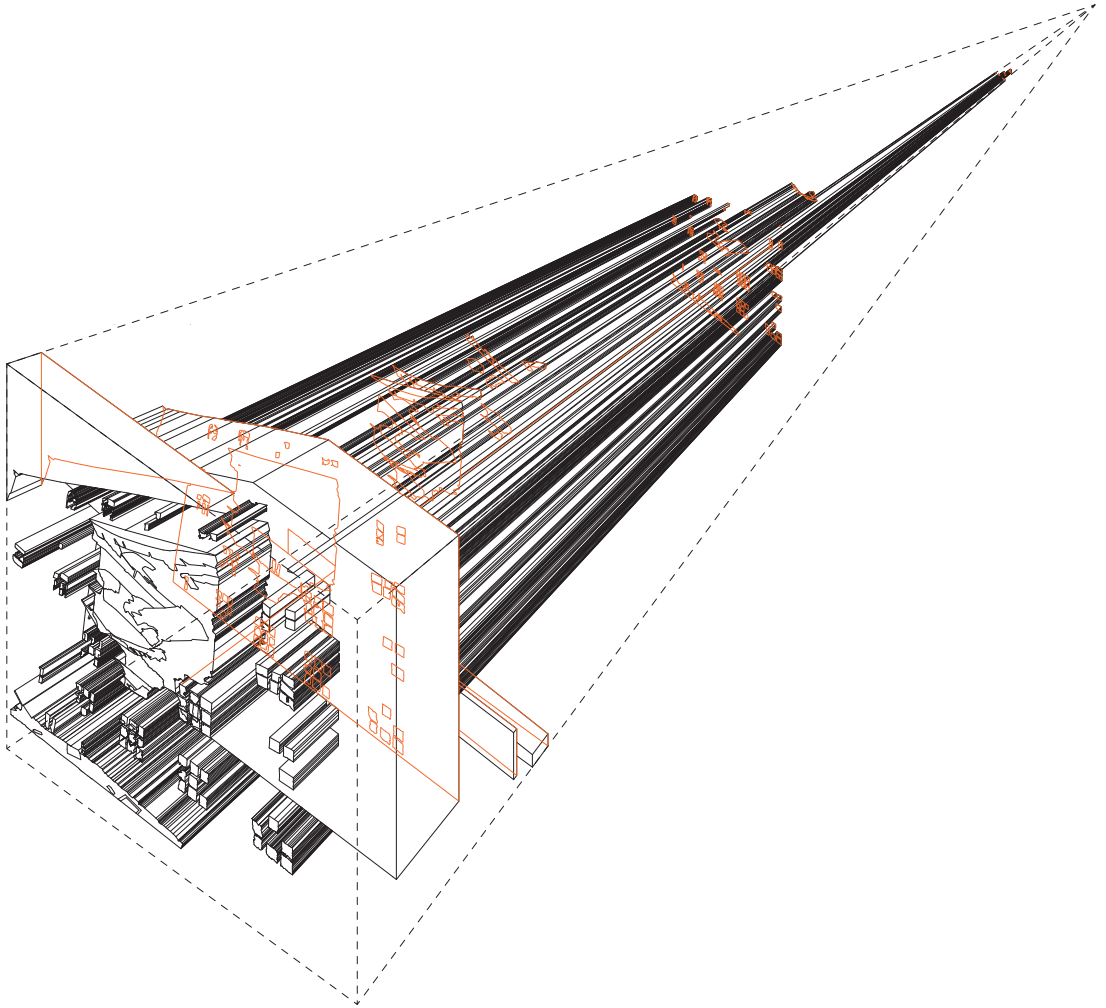
Undamaged Elements [Matter]

[1] Building Outline
[2] Sky
[3] Basement
[4] Stone Wall
[5] Shaft

Extracting Forensic Evidence

Delineating the original photo into matter and nonmatter





Constructing the Anamorphic Cone

Photographer's camera position, field of view (35mm) and target lens length used to construct anamorphic cone

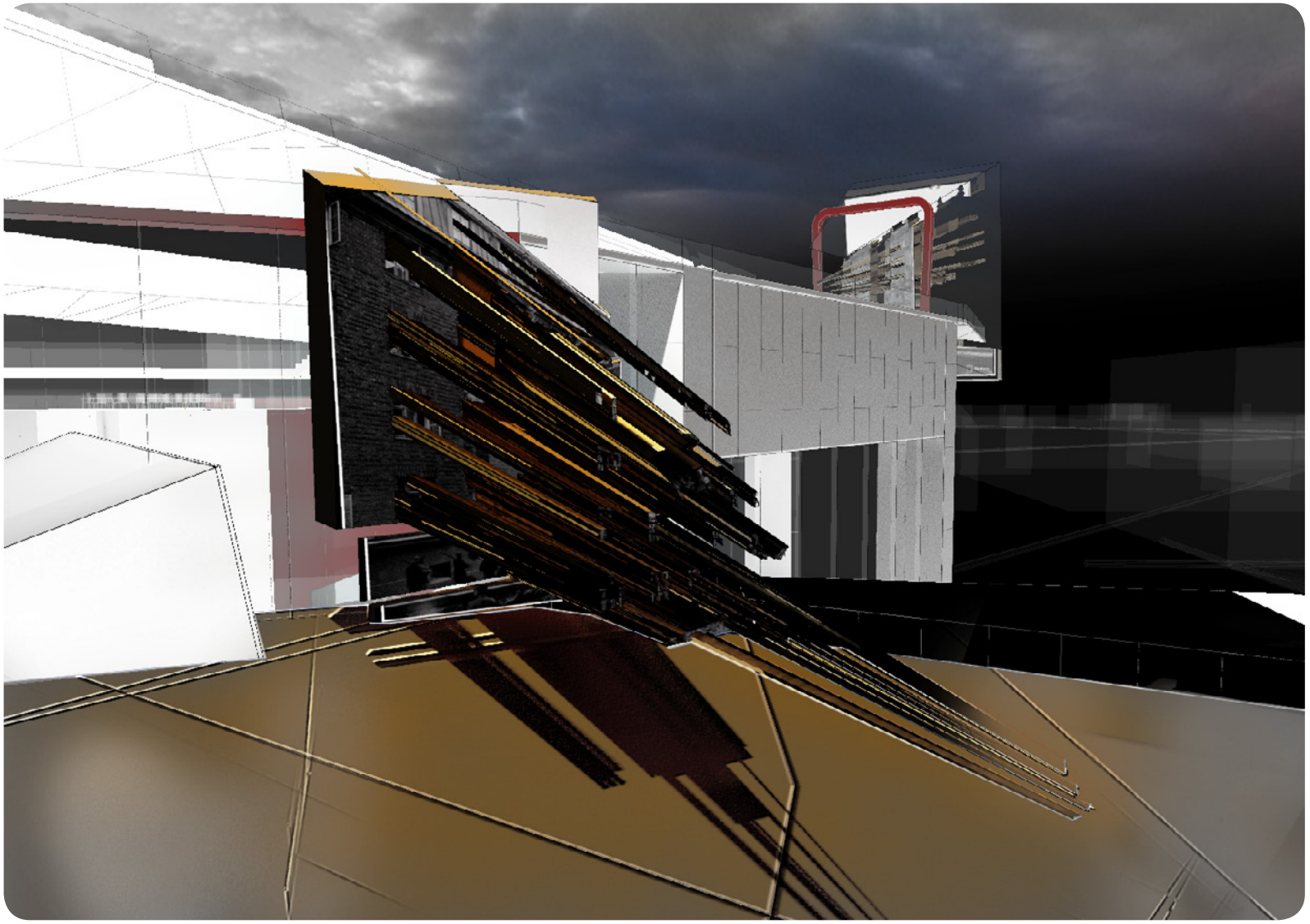


Exhibit C In-Situ

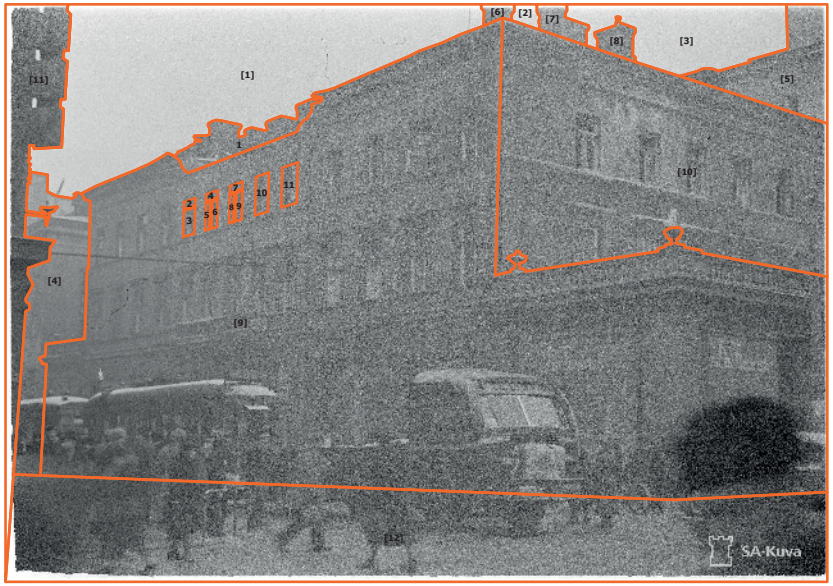
Exhibit C positioned in museum using mnemonic fractal scale (pp. 8-9), original anamorphic cone's dimensions, and at the same height of the bomb explosion

EXHIBIT E

Aleksanterinkatu 50

+60° 9′ 56.30″, +24° 56′ 41.28″
26.–27.02.44
Combination Bomb Causing Fire Damage

[Photo Taken 29.02.44 by Captain Leo Vepsäläinen]



Damaged Elements
[NonMatter]

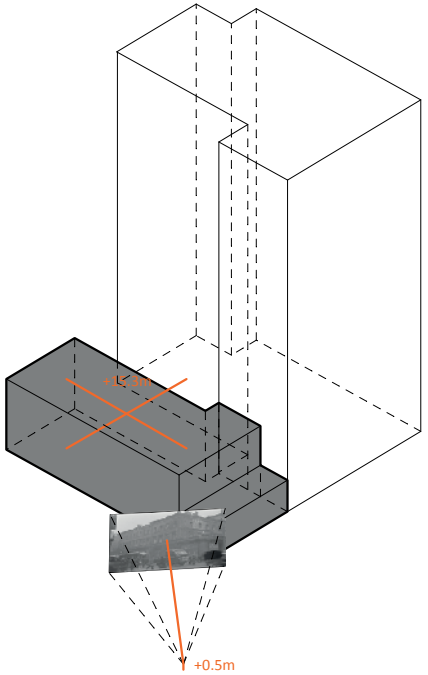
1_Damaged Roof
2_Window 1_Top Pane
3_Window 1_Panes + Frame
4_Window 2_Top Pane
5_Window 2_Left Pane
6_Window 2_Right Pane
7_Window 3_Top Pane
8_Window 3_Left Pane
9_Window 3_Right Pane
10_Window 4_Panes + Frame
11_Window 5_Panes + Frame

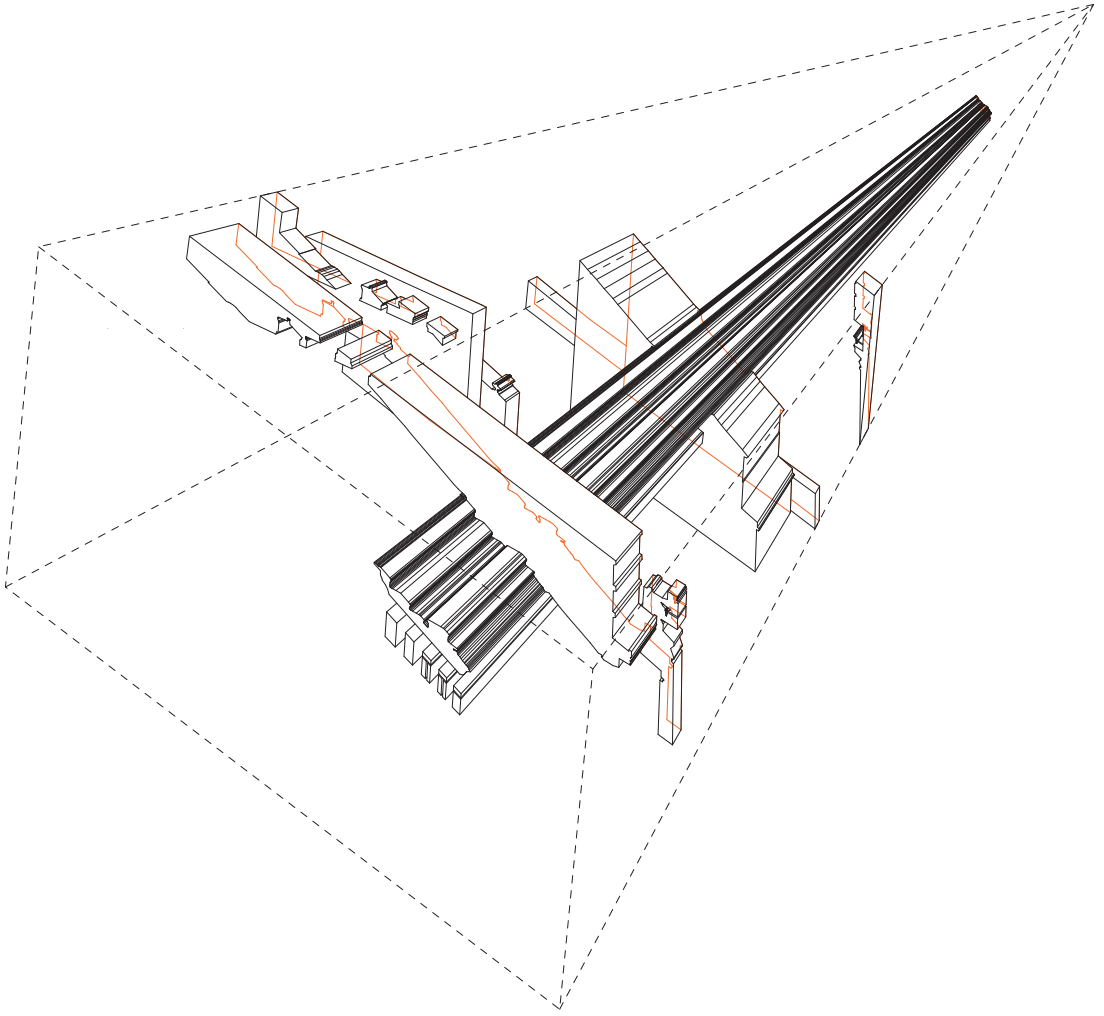
Undamaged Elements
[Matter]

[1] Sky 1
[2] Sky 2
[3] Sky 3
[4] Neighbouring Building 1
[5] Neighbouring Building 2
[6] Left Chimney
[7] Middle Chimney
[8] Right Chimney
[9] North Elevation
[10] West Elevation
[11] Building Corner
[12] Street

Extracting Forensic Evidence

Delineating the original photo into matter and nonmatter





Constructing the Anamorphic Cone

Photographer's camera position, field of view (35mm) and target lens length used to construct anamorphic cone

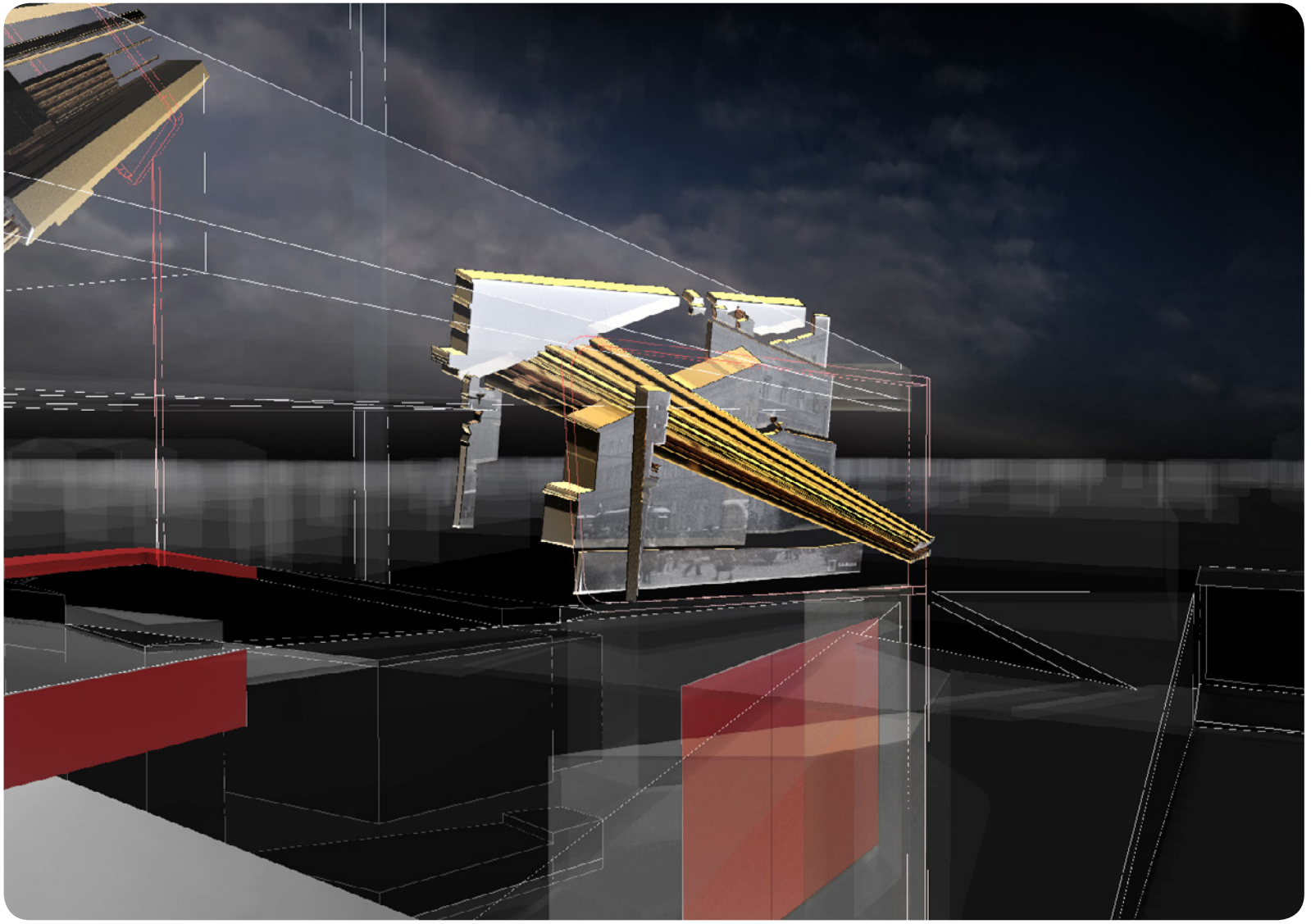


Exhibit E In-Situ

Exhibit E positioned in museum using mnemonic fractal scale (pp. 8-9), original anamorphic cone's dimensions, and at the same height of the bomb explosion

EXHIBIT H

Helsinki University

+60° 10’ 10.48”, +24° 57’ 2.37”

26.–27.02.44

Mine Bomb Causing Structural Damage

[Photo Taken 29.02.44 by Sot. virk. Niilo Helander]

Damaged Elements [NonMatter]

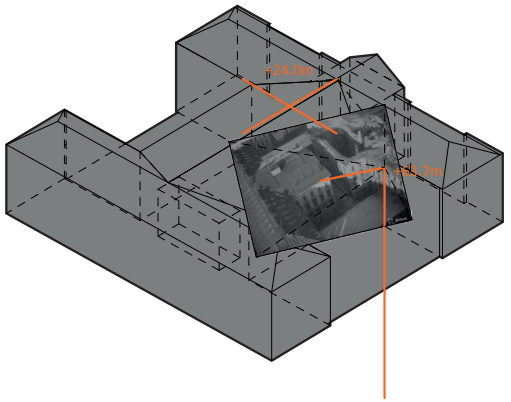
1_Blown Out Window 1
2_Blown Out Window 2
3_Blown Out Window 3
4_Blown Out Window 4
5_Blown Out Window 5
6_Blown Out Window 6
7_Blown Out Window 7
8_Blown Out Window 8
9_Crumpled Roof Whole
10_Crumpled Roof 1
11_Crumpled Roof 2
12_Crumpled Roof 3
13_Crumpled Roof 4
14_Crumpled Roof 5
15_Crumpled Roof 6
16_Crumpled Roof 7
17_Crumpled Roof 8
18_Crumpled Roof 9
19_Crumpled Roof 10
20_Collapsed Void 1
21_Collapsed Void 2
22_Chimney Stack 1
23_Chimney Stack 2
24_Wooden Debris 1
25_Wooden Debris 2
26_Wooden Debris 3
27_Wooden Debris 4
28_Wooden Debris 5
29_Wooden Debris 6
30_Wooden Debris 7
31_Wooden Debris 8
32_Wooden Debris 9
33_Wooden Debris 10
34_Wooden Debris 11
35_Wooden Debris 12
36_Wooden Debris 13
37_Wooden Debris 14
38_Wooden Debris 15
39_Wooden Debris 16
40_Wooden Debris 17
41_Wooden Debris 18
42_Wooden Debris 19
43_Wooden Debris 20
44_Wooden Debris 21
45_Wooden Debris 22

Undamaged Elements [Matter]

[1] Yliopistonkatu
[2] National Library
[3] Senate Square
[4] University South Facade
[5] Small University Building
[6] University Courtyard
[7] Small University Roof 1
[8] Small University Roof 2
[9] University West Facade 1
[10] University West Facade 2
[11] University South Facade 1
[12] University South Facade 2
[13] Main University Roof

Extracting Forensic Evidence

Delineating the original photo into matter and nonmatter



Constructing the Anamorphic Cone

Photographer's camera position, field of view (35mm) and target lens length used to construct anamorphic cone

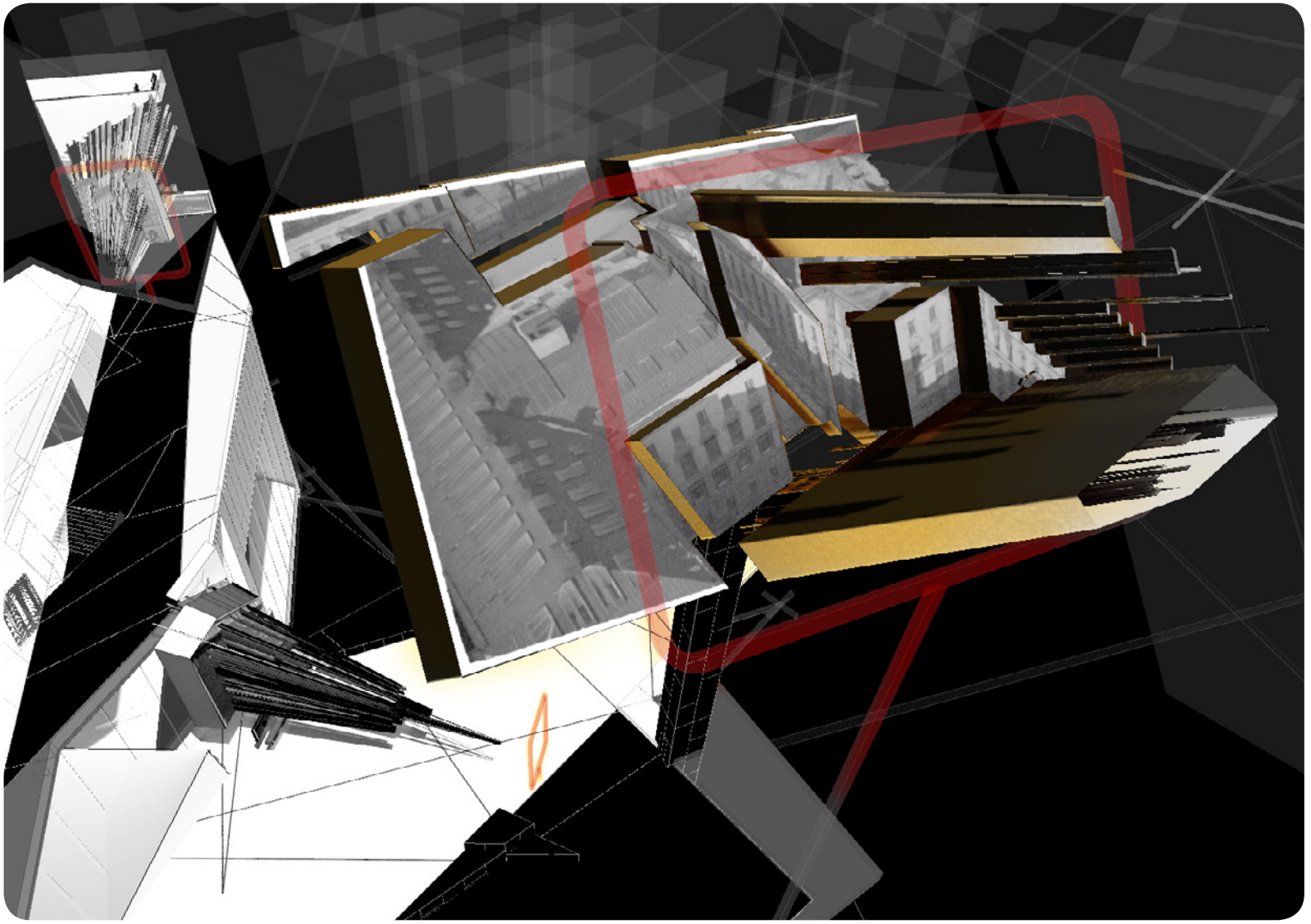


Exhibit H In-Situ

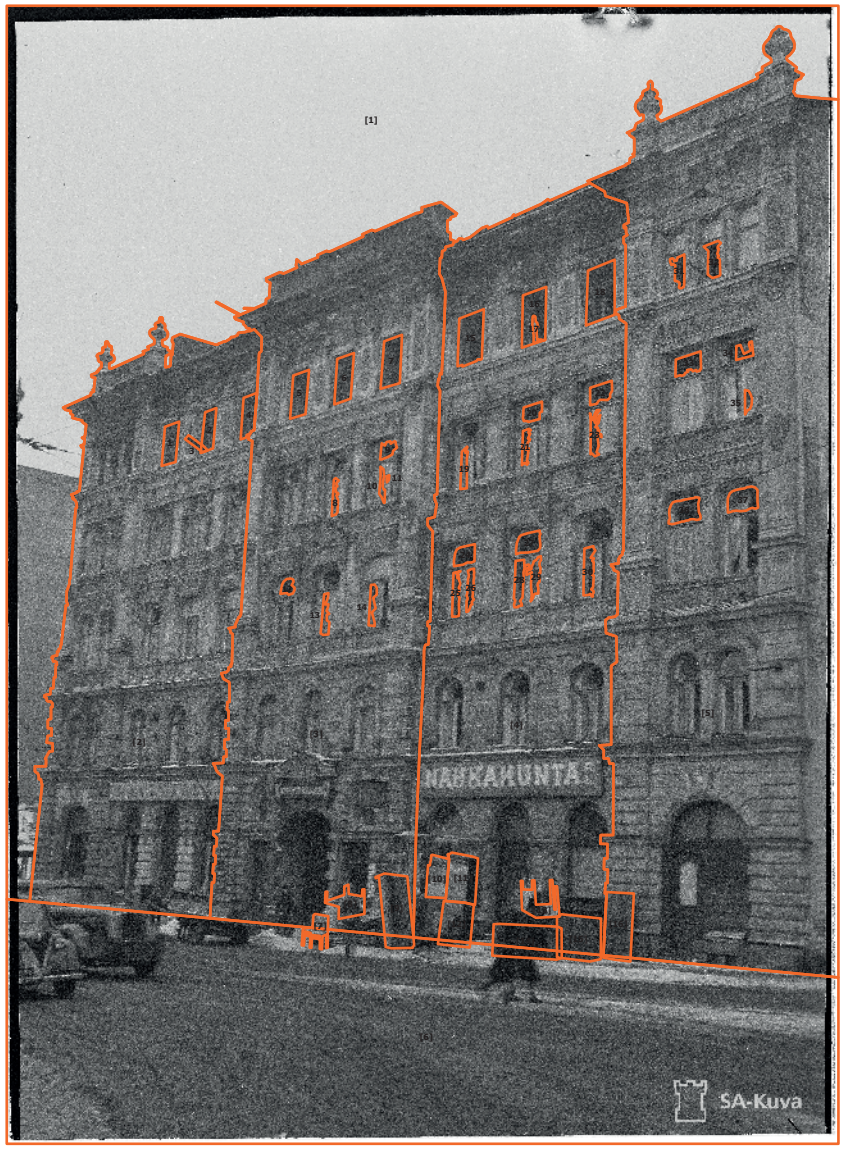
Exhibit H positioned in museum using mnemonic fractal scale (pp. 8-9), original anamorphic cone's dimensions, and at the same height of the bomb explosion

EXHIBIT K

Unioninkatu

+60° 10’ 30.39”, +24° 57’ 2.37”
06.–07.02.44
Combination Bomb Causing Fire Damage

[Photo Taken 09.02.44 by Sergeant N. Verronen]



Damaged Elements
[NonMatter]

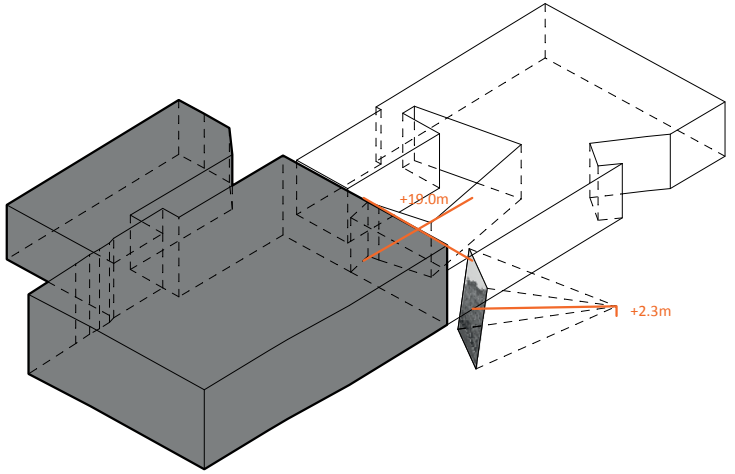
1_Window 1_Panes + Frame
2_Window 2_Panes + Frame
3_Window 3_Frame Peeling
4_Window 4_Panes + Frame
5_Window 5_Panes + Frame
6_Window 6_Panes + Frame
7_Window 7_Panes + Frame
8_Window 8_Left Pane
9_Window 9_Top Pane
10_Window 9_Left Pane
11_Window 9_Frame Chipped
12_Window 10_Top Pane
13_Window 11_Left Pane
14_Window 12_Left Pane
15_Window 13_Panes + Frame
16_Window 14_Panes + Frame
17_Window 14_Frame Cracked
18_Window 15_Panes + Frame
19_Window 16_Left Pane
20_Window 17_North Pane
21_Window 17_Left Pane
22_Window 18_North Pane
23_Window 18_Left Pane
24_Window 19_North Pane
25_Window 19_Left Pane
26_Window 19_Right Pane
27_Window 20_North Pane
28_Window 20_Left Pane
29_Window 20_Right Pane
30_Window 21_Left Pane
31_Window 22_Bottom Pane
32_Window 23_Bottom Pane
33_Window 24_Top Pane
34_Window 25_Top Pane
35_Window 25_Bottom Pane
36_Window 26_Top Pane
37_Window 27_Top Pane

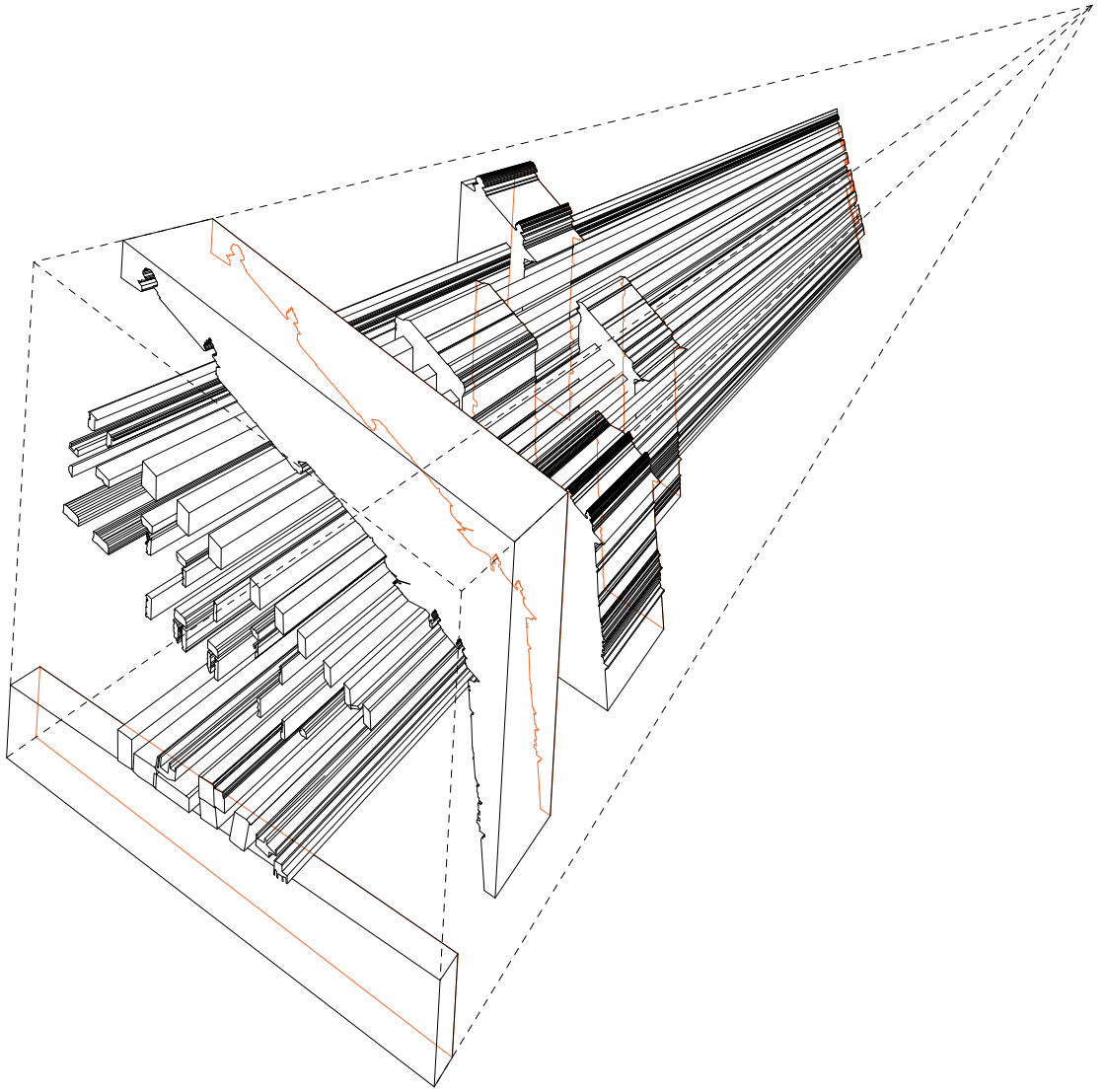
Undamaged Elements
[Matter]

[1] Sky
[2] Building Left
[3] Building Middle Left
[4] Building Middle Right
[5] Building Right
[6] Road
[7] Small Chair
[8] Large Chair
[9] Sofa
[10]_Drawers 1
[11] Drawers 2
[12] Drawers 3
[13] Table
[14] Cupboard
[15] Cabinet
[16] Wardrobe

Extracting Forensic Evidence

Delineating the original photo into matter and nonmatter





Constructing the Anamorphic Cone

Photographer's camera position, field of view (35mm) and target lens length used to construct anamorphic cone

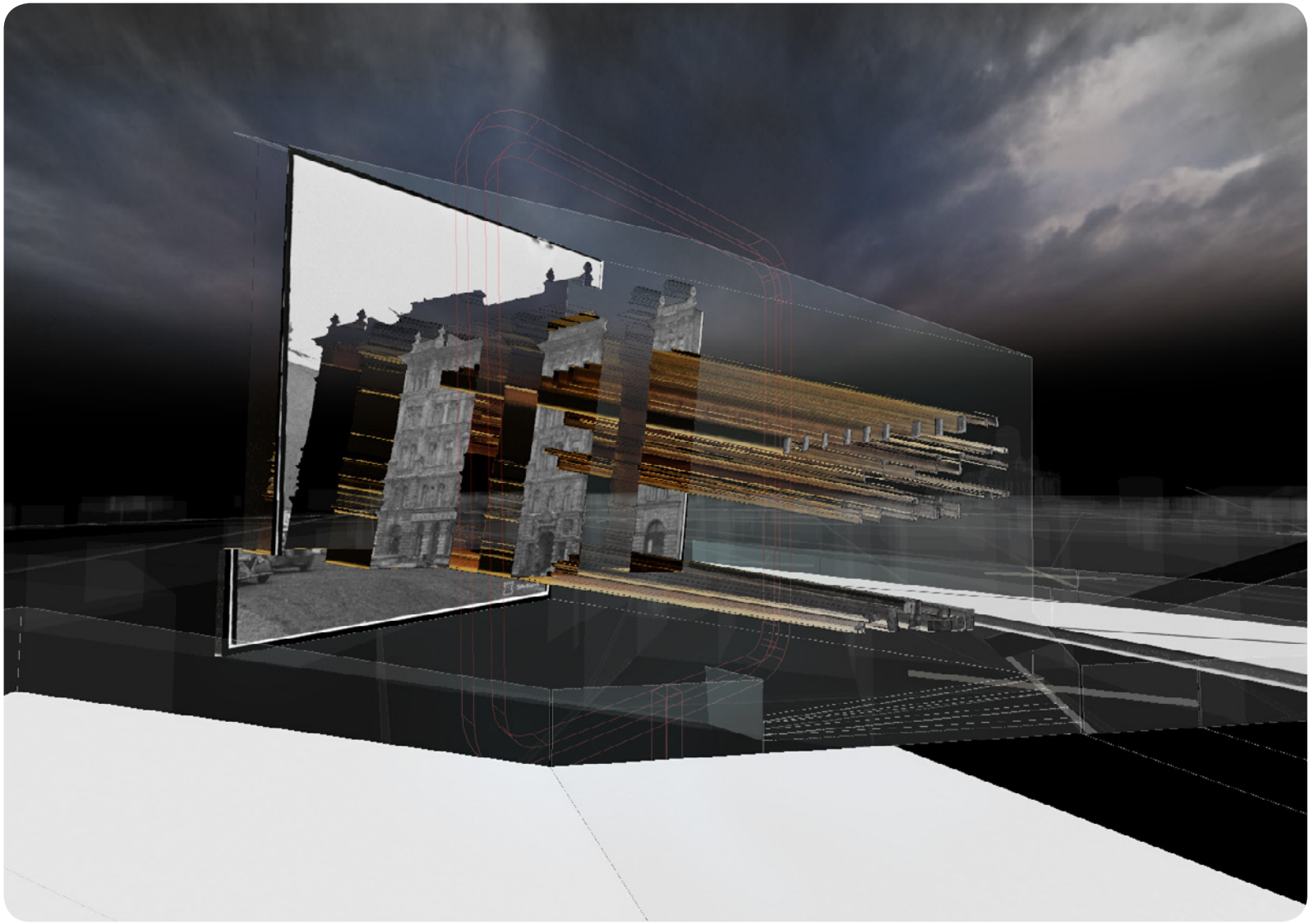


Exhibit K In-Situ

Exhibit K positioned in museum using mnemonic fractal scale (pp. 8-9), original anamorphic cone's dimensions, and at the same height of the bomb explosion