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A THESIS

in

Historic Preservation

Presented to the Faculties of the University of Pennsylvania in Partial Fulfillment of the Requirements of the Degree of

MASTER OF SCIENCE IN HISTORIC PRESERVATION

2022

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ACKNOWLEDGEMENTS

I would like to first thank my advisor, Andrew Fearon, for introducing me to this project and continuing to provide guidance, encouragement, and gracious edits throughout the research process. I am also extremely grateful to Myron Stachiw, who’s expertise on Ukrainian heritage, provided translations, and continued support were invaluable. Both Andrew and Myron’s passion for this work is contagious and inspiring.

I am indebted to the work completed by faculty and students at the Lviv Polytechnic National University’s Department of Architecture and Conservation. Without their preliminary documentation, this thesis would not have been possible.

Lastly, thank you to all of my classmates, friends, and family, who served as my pillars of support throughout my graduate studies—I feel so lucky to be surrounded by the most talented, kind-hearted, and supportive crew.
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1.0 Introduction

In January 2020, a multi-year project was initiated to survey, assess, and develop a conservation plan for the Church of the Exaltation of the Holy Cross (CEHC), a historic wooden church in Western Ukraine. Erected in 1613, the church’s structural design and decorative schemes serve as testament to the historically vibrant religious practices and craftmanship within the region. However, at the time the project began in 2020, the church’s doors had remained closed to the public for sixty years prior. Like much of Ukraine’s sacral wooden architecture, the history of CEHC’s construction, stewardship, and later vacancy has been shaped a complex series of socio-political factors and conservation challenges. The structures which remain today are thus doubly significant as expressions of Ukrainian cultural identity and as representatives of a larger vernacular wooden heritage of the Carpathian Mountain region.

In recognition of these values, the initiative to preserve CEHC intends to engage an interdisciplinary team of scholars and practitioners to assess the condition of the site and execute measures to ensure its longevity. As documentation of current conditions at CEHC began, it became clear one of the main conservation challenges would be addressing the polychrome paintings found on the walls and ceilings. The icons and motifs used in the religious liturgy were painted directly onto the structural timbers, creating a structural-decorative composite. Before any conservation work can be completed, it is vital to fully understand the ramifications of this relationship. The

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1 The project to conserve CEHC is funded by a private donor, fiscally managed by the Foundation to Preserve Ukraine’s Sacral Arts (FTPUSA) and the Nahirny fund. The main preservation consultant is the Department of Architecture and Conservation of the Lviv Polytechnic University in L’viv, Ukraine. The initiative is managed by Myron Stachiw, a US based architectural historian and Executive Secretary of the FTPUSA, and Yurii Yanchyshyn, a senior conservator in the US and past Fulbright scholar at the Department of Architecture and Conservation at L’viv Polytechnic University.
following thesis is merely at the beginning of a long-term effort to identify methods of best practice for the conservation of the painted timbers at CEHC, and the larger typology.

From the launch of the initiative, Ukraine has faced tremendous hardship beginning with the Covid-19 pandemic and followed by the Russian invasion in February of 2022. These factors continue to endanger the people of Ukraine and result in the destruction of cultural heritage across the country. The extent of damage inflicted to Ukraine’s built heritage remains unknown at the time this thesis was written. Our global community is still processing the evidence of the shocking atrocities against human rights currently being documented by international governance. In light of these circumstances, conservation work of CEHC has been indefinitely postponed. Although the future of CEHC remains unclear, this thesis aims to illuminate the significance of this site and larger heritage typology with looming vulnerabilities—both inherent and imposed. In addition to addressing the complexities of the structural-decorative composite, the methodological framework presented further hopes to serve as a springboard for further studies and a much-needed survey of the typology throughout Ukraine as response and recovery efforts will likely continue for decades to come.

1.1 Site Geography and Description

The Church of the Exaltation of the Holy Cross (CEHC) is located in Drohobych, a city in the Western region of Lviv Oblast, Ukraine with a population of approximately 75,000 residents. As a part of the Carpathian Mountain range, Drohobych shares a geographic

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and cultural history with parts of Western Ukraine, Poland, Slovakia, and Romania.
Within the region, Drohobych developed as a small trade and administrative center for its salt production from the 12th to 19th century and remains a light industrial city today.³

The property of CEHC is bounded to the east by Zvarytska Street, to the north by the local fire department, and to the southwest by residential properties. Together with a belltower on the northeast corner of the site, the church creates an ensemble which is architecturally distinct from its modern surroundings (Fig. 1).

![Figure 1: View of North Elevation of CEHC. (Source: Mykola Bevz. Department of Architecture and Conservation, Lviv Polytechnic National University, 2021)](image)

CEHC is a two-story horizontal log-structure measuring 20.98 x 8.36 meters in plan. The walls are constructed with hewn timbers which rest on a stone foundation. The

horizontal log members are notch-joined at the corners to form corbeled brackets at the exterior. Spatially, the church follows a traditional tri-partite plan aligned west-east. From the western side, the nave is connected to the narthex (4.42 x 4.65 m) and upper choir loft (4.42 x 6.89 m). From the eastern side, the square nave (7.02 x 7.16 m) is adjoined to an octagonal apse (4.77 x 5.18 m). Adjacent to the northern wall of the apse is a rectangular niche-sacristy (4.5x 0.85 m).

The pyramidal roof and two-tiered lantern above the nave dominate the building’s profile. The central roof is flanked by a gabled tent roof over the apse and a lower pyramidal roof with a lantern above the narthex. A secondary wide-pent roof connects the first tier of the apse with the nave. The roofs and walls above the first-tier of the exterior are covered with wood shingles, leaving only the timbers on the first-tier and arcade exposed.

The massive carved doorframe on the western façade of the narthex serves as the main entrance. By the northern wall of the narthex, a steep stairway leads to the covered arcade on the second story where a secondary entrance leads to the upper choir loft. On the interior, the narthex opens into the nave with an uninterrupted view of the central tower. The monumentality of the interior is highlighted by polychromatic wall paintings throughout the building as well as lighting provided by irregular fenestration. As a part of liturgical requirements, the nave is separated from the apse by an ornate iconostasis.

CEHC served its community for a long period of time before it was closed to religious services in 1961. The property was subsequently granted national significance as a Monument of Architecture and Historical Museum in 1971. CEHC is currently under
the ownership of the State Museum of Local Lore in Drohobych, which also manages the Church of St. George in Drohobych, a World Heritage site.  

1.2 Objectives

This thesis proposes to develop a methodology for the conservation of the structural-decorative composite timbers at CEHC in order to help resource managers prioritize the site-specific needs of the church. The research aims to illustrate the relationship of the wood substrate and iconographic paintings which necessitates their joint conservation. This relationship is contextualized by the heritage values of the larger typology, potential deterioration factors, and regional conservation discourse. Through these analyses, the presented methodology pursues sympathetic and sustainable practices for the future conservation management of CEHC.

1.3 Scope of Work

In order to develop a comprehensive methodology for the conservation of the structural-decorative composite at CEHC, four (4) stages of analyses were completed: (1) evaluation of the cultural and religious significance of CEHC and the larger typology, (2) synthesis of site-specific conditions, (3) technical research on regional agents of deterioration and conservation challenges, and (4) a comparative literature review of relevant painted-wood conservation publications.

(1) The cultural and religious significance of CEHC is explored by placing the church within a larger regional typology, connecting CEHC to established

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heritage values and character defining elements. As an abbreviated historical overview, the section highlights the major events and factors which have contributed to the development of the defined religious communities and their sacred architecture.

(2) The site-specific conditions are assessed through interpretation of provided documentation and environmental inventories. As a remote study, the following assessment is limited to existing documentation of the site. The building chronology and treatment history is addressed through a 2016 State of Inspection report. The report also provides a general understanding of the building’s structure, which is confirmed through architectural drawings with photogrammetry produced in 2020. The detailed photogrammetry is then compared with recent reference photographs of the site in order to identify patterns of potential deterioration. Lastly, the climate conditions were provided through HOBO dataloggers installed on the interior and exterior of CEHC. These findings were placed within the context of local climate inventories for reference.

(3) The technical research stage presents an analysis on the agents of deterioration within the Carpathian Mountain Region. Building off universal deterioration agents for painted wood, specific biotic and abiotic factors within the region are identified. This identification is supported by an array of scientific articles, ranging from mycology studies to forest conservation. The conservation challenge presented by the structural-decorative composite is then explored through addressing the potential ramifications of these likely mechanisms of
deterioration. Specific areas of concern at CEHC are highlighted through cross-referencing this technical research with the existing documentation. (4) The comparative literature review is divided into three sections regarding painted wood: the history of painted wood conservation, international charters for best practice, and regional discourse of tservka wall painting conservation. The literature review aims to inform future work at CEHC through historical and regional precedent. The scope of conservation science sources includes international charters, conference proceedings, journal articles, and reference manuals.

Lastly, a methodology for the conservation of the structural-decorative composite timbers at CEHC is proposed. Through a phased timeline, the site-specific needs of the church will be considered as part of an evolving effort of heritage management of the larger typology.
2.0 Defining Significance

CEHC is reflective of a rich log construction heritage within the Ukraine. Due to the abundance of wood resources, timber was historically the primary building material of Ukrainian architecture, from humble houses to massive defensive structures. The development of wooden religious architecture dates as early as the 15th century. Today, these houses of worship (churches, belfries, and synagogues) are cited as the most commonly preserved wooden heritage in Ukraine. Among these, there exists a typology of ecclesiastical structures built by Greek Catholic and Eastern Orthodox communities throughout central Europe, colloquially called “tserkvas” in Ukrainian. Wooden tserkvas developed between the 16th and 18th century and merged early Byzantine influence with local vernacular style to create a unique architectural language. The resulting structural solutions and decorative schemes reflect the communities’ spiritual values, response to their environment, and high mastery of materials. In defining the significance of CEHC, it is thus essential to understand the larger typology’s cultural context and architectural form.

2.1 Brief Overview of Cultural and Religious Context

Christianity was first introduced to the region of modern-day Ukraine in 988 CE by Prince Volodymyr. As the ruler of the Kievan Rus from 978-1015 CE, Volodymyr enforced Christianity as a state religion “through fire and sword,” destroying pagan temples and forcing the renunciation of local pagan communities. Christianity was used

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to sanction the political authority of the ruling classes and strengthen the relationship with the Kievan Rus to the Byzantine Empire. The newly established church of Rus-Ukraine was linked to the Patriarchate of Constantinople as the Metropolitan See of Kiev.\textsuperscript{7}

As Christianity developed through the region, several geopolitical factors began to shape the formation of multiple Christian communities. The Great Schism of the 11\textsuperscript{th} century separated the patriarchate of Rome from the four patriarchates of the East, resulting in the formation of the Roman Catholic church and the Eastern Orthodox church. Although the Church of Rus’ remained under the supervision of the Patriarchate of Constantinople, communities in the south wished to be re-united with Rome and follow the authority of the Roman Catholic Church. As a result, the Union of Brest of 1596 established the Ukrainian Greek Catholic church.\textsuperscript{8} Shortly after in 1620, the Patriarchate of Jerusalem consecrated a new Ukrainian hierarchy and established the Ukrainian Orthodox Church.\textsuperscript{9} While liturgical practices and administration diverged by the early seventeenth century, it is important to note the sacred architectural forms remained interchangeable between both the Ukrainian Orthodox and the Greek Catholic communities.\textsuperscript{10}

Since its founding, the history of Christianity in Ukraine has been deeply tied to the politics of its statehood. As properties of cultural heritage, tserkvas were subject to denationalization attempts and religious persecution. After the fall of the Kievan Rus in


\textsuperscript{8} Also referred to as the Uniate Church

\textsuperscript{9} Hewyrk, \textit{Masterpieces in Wood}, 11.

\textsuperscript{10}Ibid.
1340 CE, Western Ukraine fell primarily under the control of Poland (1340-1772; 1919-1939) and the Austro-Hungarian Empire (1772-1919).\(^\text{11}\) Within the Roman Catholic rule of Poland and Austria-Hungary, the religious communities in Western Ukraine were granted greater religious freedoms than the Russian controlled East and South. Although communities were able to form and practice these beliefs separate from the Roman Catholic church, they were not free of state enforced restrictions. An edict in 1278 in the Hungarian empire forbade the construction of Orthodox churches in stone, and required they be built outside of the town center.\(^\text{12}\) This edict was still upheld by the time of incorporation of Western Ukraine into the Austro-Hungarian empire in 1772. The specifications for materials and locality were clear attempts to undermine the permanence of these structures and religious communities.

When the Austro-Hungarian Empire was defeated at the end of World War 1, Western Ukraine declared its independence, fostering a strong sense of national pride in the west. This independence was shortly ended when Western Ukraine was annexed by the Soviet Union in 1939.\(^\text{13}\) Under Soviet control, both the Greek Catholic and Ukrainian Orthodox church were oppressed through multiple campaigns of forced assimilation with the Russian Orthodox Church and the frequent arrest of church leaders for crimes of conspiracy.\(^\text{14}\) One source reports the number of registered church societies in the Ukraine-SSR between the 1950s-1960s to cataclysmically drop from 8,537 to 4,540.\(^\text{15}\)

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\(^{11}\) Hans Rainer Schneider, "Community Involvement in the Preservation of World Heritage Sites: The Case of the Ukrainian Carpathian Wooden Churches." (PhD diss., Texas A&M University, 2013), 21.

\(^{12}\) Ibid., 22.

\(^{13}\) Ibid., 23.

\(^{14}\) Hewyrk, Masterpieces in Wood, 11. See also: Peter Kardash and Michael L Lawriwsky, Ukraine: Its History and Its Arts, 16-29.

\(^{15}\) Schneider, “Community Involvement,” 28.
Before the assimilation of Western Ukraine, a series of legislative bans from Russia had established a climate of hostility towards tserkvas and their congregations throughout the rest of the country. In 1803, the Synod of the Russian Orthodox Church banned the construction of Ukrainian-type timber churches to halt what was thought to be undesirable schismatic manifestations. As a result, several tserkvas were modified, repurposed, or destroyed. The craft traditions foundational to tservka construction were further hurt when the Ukrainian guild system was banned in the Left Bank in 1785 and the Right Bank in 1840.\textsuperscript{16}

Despite these harsh conditions, several preservation efforts for Ukraine’s tserkvas were completed beginning as early as the second half of the 19th century. While landmark preservation policies existed at the time Western Ukraine was incorporated into the Soviet Union, it was often individuals and cultural institutions who addressed the structures’ survival. Full freedom for these religious communities was not restored until Ukraine declared independence in 1991, therefore many tserkvas were separated from their congregations. Viewed as vanishing expressions of local art and architecture, tserkvas were surveyed, icons were moved to museums, and some tserkvas were even relocated to open-air museums.\textsuperscript{17} The churches of the Carpathian Mountain range largely survived because of their remote location and longer history of governance with religious tolerance. Today, approximately 2,500 wooden tserkvas are preserved throughout Ukraine in different states of conservation.\textsuperscript{18} As architectural forms which have

\textsuperscript{16} Hewryk, Masterpieces in Wood, 86.
\textsuperscript{17} Hewryk, Masterpieces in Wood, 86-90.
persevered through the centuries, wooden tserkvas are commonly associated with the cultural identity of Ukraine.

In 2010, sixteen wooden tserkvas of the Carpathian Mountain region, eight from Poland and eight from Ukraine, were nominated to the United Nations Educational, Scientific and Cultural Organization’s (UNESCO) World Heritage List. Under the World Heritage List criteria, the nomination recognizes the structures as having outstanding universal value for their:

i. representativeness in the architectural, artistic, devotional and cultural contexts for this part of Central Europe
ii. connection of the properties with important ideas and meanings concerning intellectual activity and historical reflection – in an individual and national capacity
iii. the durability of their form and function, their historical and contemporary role and enduring contribution to shaping national and cultural identity

The joint nomination increased the visibility these structure’s preservation to an international level and set the stage for future efforts.

2.2 Architecture of Wooden Tserkvas

Intended to be viewed as artworks from any vantage point, tserkvas are symmetrical and ornate in design. Although relatively small in size, their sculpted form lends an air of monumentality. As vernacular structures, tserkvas were commissioned by villages and completed by master craftsman. The shared knowledge and proportional relationships used by these craftsmen resulted in a distinctive building style with key character defining features.

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2.2.1 Construction Techniques and Form

The construction of wooden tserkvas draws on the log-building traditions of Eastern Europe, also known as blockwork construction. This solid, layered timber technique is achieved by stacking members horizontally on top of each other. More specifically, in Ukraine, Romania, and Poland, timbers are often squared on all sides. These structural timbers are joined approximately every 1 to 1 ½ meters with 4x4 cm wedges of hardwood. Additional support is provided through joinery; individual logs on the corners of the structure extend beyond the intersection of the two walls forming corbeled brackets (also called consoles). Corbeled brackets serve not only as support for the structure and overhanging eaves but have also become one of the identifying decorative elements of the typology. On closer inspection of the walls, the typical structural member is between 15-18 cm wide at the base, and gradually decreases in size going upwards to create a natural inclination of the walls towards the center of the church. Due to the inherent stability provided by these various building solutions, the walls of tservkas span heights upwards of thirty feet while rarely utilizing vertical braces for support.  

The basic plans for tservkas consist of either three-square compartments in a linear tripartite arrangement, or five square units in a cruciform arrangement. It is debated if these early plans were influenced by pagan prototypes, regional residential architecture, or Byzantine influences. Likely drawing from a myriad of references, these two arrangements were firmly established in tservka construction and served as the baseline for future modifications. In more elaborate plans, the linear tripartite and cruciform base

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21 Hewryk, Masterpieces in Wood, 13.
22 Hewryk, Masterpieces in Wood, 17-21.
evolved into seven and nine partite plans. Yet, even in expansion, tservka plans retained their tripartite or cruciform base. Modifications were also driven by the tserkvas’ highly emphasized symmetry: If an element was enlarged or removed, the corresponding unit was adjusted accordingly. During the second half of the 16th century, octagonal shaped plans were introduced from baroque influences.\textsuperscript{23} Polygonal forms which broke away from the traditional square shapes first appeared in the sanctuary, however, were later adapted interchangeably to the nave and narthex. Octagonal plans increased the area of the church and strengthened the horizontal log construction, making it an ideal addition. Between the two basic plans and new octagonal compartments, various additional polygonal arrangements developed.

The roofing of tservkas is another compositional feature which speaks to the structural solutions of Western Ukraine. The simplest and oldest design is the pyramidal roof on a square frame. A wide geographic distribution of this design suggests its form as the primary historical precedent.\textsuperscript{24} As builders sought more elaborate designs, a serrated profile of alternating vertical and inclined sections of the traditional pyramidal roof was developed. This innovation known as zalom (or breaks), rose to prominence during the fifteenth century as a defining characteristic in Ukrainian architecture. The second major development in roofing was the addition of octagonal roofing features. As polygonal forms became popularized in the sixteenth century, octagonal drums (vos’meryk in Ukrainian) were superimposed over the original rectangular frames. Over time, the techniques of transitioning from a square to octagonal base became more refined and

\textsuperscript{23} Ibid, 21.
\textsuperscript{24} Ibid, 22.
used corbeling to achieve a wooden equivalent of masonry domes. These solutions are cited as unique to the tservka typology and are found predominantly in the Carpathian Mountain region. By the 17th century, pyramidal roofs with cupolas and lanterns were widely used. 

The roofing systems of tserkvas are further characterized by shingles of different shapes, textures, and colors. While decorative, shingles serve an important role in shielding the structure from the elements. Weatherproofing is also accomplished by overhanging skirt roofs which are covered in shingles and vary in length depending on the level of regional precipitation. The overhanging eaves (*piddashshia* in Ukrainian) created by the skirt roofs create a continuous coverage of external walks around the tservka. Sometimes, the eaves (*piddashshia*) are supported by arcades (*opasannia* in Ukrainian) creating a covered porch-like space.

As new innovations in wooden construction developed, substyles of tserkva architecture were created. Sub-typologies include Halych, Podillia, Volyn, and Slobozhanschyna wooden church types. Later developed sub-typologies of Boyko, Lemko and Hutsul wooden church type appeared in the separated valleys among the Carpathian Mountain Range. CEHC is representative of the Halych sub-typology, which is identified by its square, linear tripartite plan and profile created by a dominant roof over the nave. Old Halych styles feature the square base and pyramidal roofs, while New Halych styles begin to incorporate octagonal plans and lanterns. CEHC is an

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26 Ibid.
28 Schneider, “Community Involvement,” 33-34.
example of the transitional period between Old Halych and New Halych, where a square base is present, but some octagonal elements are added above the narthex or as lanterns.

2.2.1 The Structural Timber and Painted Finish Composite

In addition to their aesthetic significance, tserkvas are imbued with the spiritual values practiced by the communities of Greek Catholic and Ukrainian Orthodox faiths. Similar to other variations of Christian architecture, this can be interpreted in structural components like the celestial representation of domes or in the liturgical roles of building elements such as the iconostasis. Within the wooden tserkvas of Western Ukraine, it is common for the interiors to be finished with expansive mural paintings. The artistic depiction of religious scenes and icons are greatly significant for the liturgical practices of the congregation. In Eastern Christianity, icons are viewed as connected to the spiritual figures they depict. Therefore, they can be seen as mediators between spiritual figures and the religious practices of the worshiper. Religious iconography is also intended to be didactic, or “the literature of the illiterate.”

Not only a show of wealth, wall murals increased the accessibility of spiritual teachings to the general public and would have greatly improved the spiritual practices of the congregations.

Mural wall-paintings in wooden tserkvas were historically completed by local guild members and craftsman who drew upon iconographic canons and patterns of practice. In contrast to wood panel paintings, mural wall-paintings are designed as permanent fixtures of architecture. Historic paintings were executed with tempera paints and applied directly on wood, interstitial canvas, or even plastered wood. The tradition of

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painting directly onto wood or plastered wood is known as fresco secco, or dry fresco. Fresco secco was used as a more economical and faster method to traditional frescos painted in wet plaster. Historical treatises offer two techniques for fresco secco. The first technique soaks the wall with limewater and then paints using a mixture of ground pigment, water, and limewater while the wall is still wet. The second applies the ground pigment with a binder such as casein or egg.

Due to the nature of their application, these artworks are retained in-situ as integral architectural features. Within the form of their construction and decoration, the wall paintings which characterize many wooden tserkvas are inherently imbued with a multitude of religious, aesthetic, and historic values. Today, wooden tserkvas span national geographic boundaries in the Carpathian Mountain range and the surviving structural-decorative composites serve as rare and highly important representations of the historic craftsmanship and religious traditions of the region.

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31 The primary treatise on fresco secco painting are: *De diversis artibus* by Theophilus from the 12th century and *Il libro dell’arte* by Cennino Cennini in the late fourteenth/early fifteenth century.
3.0 The Conservation Challenge Presented by the Structural and Decorative Composite

Every heritage site presents specific contexts and conditions which its conservation must consider. As a structural-decorative composite, the painted timbers at CEHC necessitate a holistic comprehension of wood conservation, architectural finishes, and their integral relationship. Through review of documentation and regional research, the following chapter offers a primer of site-specific conditions and potential agents of deterioration for the painted timbers at CEHC. The resulting analysis outlines potential challenges presented in their conservation.

3.1 Overview of Existing Documentation

Since the beginning of the initiative to preserve CEHC, the Lviv Polytechnic National University’s Department of Architecture and Conservation has served as the primary heritage consultant on site. As a part of their documentation efforts, architectural drawings and orthorectified photography were completed in September 2021. The documentation includes a floor plan, exterior and interior elevations, and photographs. In order to monitor climate conditions, HOBO dataloggers were installed in seven locations along the interior and exterior of the church in June 2021.33

In 2016, a State of Inspection of Technical Condition was performed at CEHC as a part of its status as a Monument of Architecture of National Significance. Pending access to further archival research, the document serves as the primary source for understanding the building’s evolution. Notably, the report chronicles the documentary

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record and restoration campaigns.³⁴ Lastly, four historical photographs depict CEHC in 1914, 1930, 1980, and 2007. The latter two depict the north elevation, and the former two depict the south elevation respectively.³⁵

3.1.1 Summary of Past Assessments and Documentation

Evidence gathered from historical records, architectural surveys, and clues within the physical fabric suggest an extensive history of maintenance. Using the existing documentation described, the following building chronology is understood:

1400-1700 CE: Establishment

The first documentation of CEHC is recorded in archival records from 1496. However, this structure was burned down during the Tatar attack of Drohobych in 1499. The church was subsequently rebuilt in 1613, dated by an inscription on a log of the nave. Originally, the church was a one-story building. The current two-story form was completed in 1661, when the emporium above the narthex and upper chapel of the Nativity of St. Ivan the Forerunner was added. At the same time, the lantern over the nave was raised in order to establish a more dominant central tower, creating the double-tiered lantern seen today. The tempera-based murals on the interior have been approximately dated to different times within the 17\textsuperscript{th} century: those in the altar before 1636, those in the nave from 1661, and those in the chapel/choir loft from 1675.³⁶

1700-1900 CE: Expansion and Renovation

According to a carved inscription in the beams of the gallery, the emporium was restored

in 1715. This restoration was followed by a series of interior alterations in the mid-1700’s. The Chapel of the Nativity of St. Ivan the Forerunner was converted into a choir loft. The prior choir loft at the western wall of the nave was dismantled, creating an uninterrupted view of the nave. In 1780, a local priest painted the upper row of apostles of the iconostasis, which dates to the early 17th century.\textsuperscript{37} In 1823, the stone foundation was replaced, and vertical braces referred to as “foxes” were fastened to the inside and outside of the log walls for support.\textsuperscript{38}

**1900-Present: Documentation and Maintenance**

According to the 2016 report, no additional repairs were recorded between 1823 and 1961 when the church was closed to the public. However, the record compiles a history of documentation activities that infer a history of maintenance. The church is reported to be first measured in the 1880s by students of the Lviv Polytechnic University. At the turn of the 20th century, the church was additionally researched and described separately by K. Moklovsy and two architects, O. Lushpinsky and M. Dragan. Photographs from the site in 1914 and 1930 depict drastically different conditions of the roof tiles on the North elevation, suggesting a replacement campaign between that timeframe.\textsuperscript{39} In July 1949, CEHC was inspected under the Department of Architecture at the Council of Ministers of the USSR. The roof was noted to be in unsatisfactory condition. The paintings were also noted as deteriorated with areas of delamination and described as having been ‘turned black from soot.’\textsuperscript{40}

\textsuperscript{37} The painter is identified as Father Petro Metelsky, a priest of St. Parakeva.
\textsuperscript{38} R. Yatsiv et al., “Monument of Architecture,” 9-11.
\textsuperscript{39} Gromyk, “Church of the Exaltation.”
\textsuperscript{40} R. Yatsiv et al., “Monument of Architecture,” 9-11.
closed to the public in 1961. The report also references a restoration of the interior and exterior completed in 1972, though the details of the renovation remain unclear. When the architectural survey was completed in 2016, the documentation team found the general technical condition of CEHC to be unsatisfactory. They state that the roof shingles require replacement and describe the lantern above the narthex as “deformed and inclined.”

3.1.2 Visual Survey of Conditions

The present-day condition of CEHC cannot be determined until a more comprehensive assessment is conducted encompassing a detailed schedule of on-site examinations and testing. As a remote study, a visual survey was conducted through the review of the documentation from 2021. This assessment is not diagnostic, but aims to analyze visual patterns of conditions within the current documentation to identify a scope of work for future investigation.

On the exterior, the presence of black and green discoloration on the roof shingles is indicative of a combination of atmospheric soiling and biogrowth. This discoloration is differentiated from wood’s original brown hues which are still visible on shingles in covered areas. The wood shingles and exposed timber members on the first-tier also appear grey, as result of natural weathering. In comparison to the south façade, the north façade shows greater signs of weathering; a larger portion of the shingles are grey and there are large patches of biogrowth across the elevation. On the south elevation, a majority of the shingles on the narthex retain un-weathered brown hues of the wood. These patterns of deterioration may be the result of different repair campaigns in addition

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41 Ibid, 10.
to differential weathering. A baseline of typical weathering patterns on other examples of wooden exteriors found in the immediate vicinity may clarify the observed phenomena.

The structural timbers exposed on the first elevation exhibit signs of mechanical stress—likely related to hygroscopic fluctuations. From the photographs, a distinct pattern of surface checking and cracks can be seen on the surfaces of the roof members, and more commonly in the wall members and corner joists. Evidence of displacement of structural members can also be seen in the lintels above the two doorways of the narthex. In both, the lintel has shifted away from the door post, creating a noticeable gap approximately 4 cm wide. Although not uncommon in historic timber, the presence checks, gaps, and cracks should be the subject of a survey and larger structural assessment to ensure the stability of CEHC.

Additionally, the 2021 architectural drawings note the removal of a former vertical brace on the eastern wall of the apse. In its place, there is dimensional loss which spans eight horizontal members directly adjacent to the corbelled bracket (Fig. 2). The presence of such large wood loss warrants further testing to determine the type of deterioration present in these timbers. Although this zone of deterioration does not appear to occur in any other location, small vertically-aligned holes (approximately 3 cm in diameter) appear throughout exposed timbers on the first elevation, suggesting additional vertical braces (permanent or temporary) were removed. A survey and documentation of removed braces can benefit both a fuller understanding of the building’s evolution and identify potentially vulnerable areas to wood deterioration.
Figure 2: Area of deterioration on the eastern wall of the apse. (Source: Mykola Bevz, Department of Architecture and Conservation, Lviv Polytechnic National University, 2021.)
The wall paintings on the exterior are in poor condition. The partial image of icons on the door surround and adjacent walls of the main entrance appear to suffer ultraviolet damage and are flaking, leaving only traces of the whole visible (Fig. 3). Documentation and analysis of the composition of the exterior finishes should be completed in order to record the limited integrity of the current finishes and provide a basepoint for future paint studies of the interior finishes.

On the interior, polychromatic paintings directly cover a large percentage of the walls and ceiling. A chalky appearance on the surface of the murals may indicate binder loss or similar degradation of the paint layers. The paintings show signs of flaking and delamination, but to a much smaller degree than the exterior. The loss of paint appears to be largely concentrated at horizontal joint lines of the stacked log members. In the nave,

Figure 3: View of Narthex Entrance (Source: Mykola Bevz, Department of Architecture and Conservation, Lviv Polytechnic National University, 2021.)
the wall paintings only extend to the first story, and a field of white non-decorative paint extends to the second story. This white finish is also visible on the western wall of the nave, however its appearance on all elevations maintains a chalky appearance and extensive areas of paint loss. Paint analysis of the interior finishes is strongly recommended in order to assess current conditions and recommend necessary treatments.

On the north wall of the nave, a water stain from previous water infiltration extends from the lower-west of the central window. On the five horizontal timbers directly below the window, there are also prevalent patches of black discoloration, likely the presence of fungi. The lower elevation features a section of a horizontal timber which appears to be a redder color and different texture, possibly containing a later fill material. Overall, the location of staining and infiltration along the north wall clearly corresponds with the concentration of weathering conditions on the exterior. In response, investigating potential sources of water infiltration on the north elevation should be prioritized in future studies.

Based upon a review of documentation, CEHC appears to retain a high-level of integrity regarding materials and condition. The wood structural members exposed on the first tier and on the interior do not show major signs of mechanical or biological deterioration. On the interior, the murals are legible and largely in-tact. However, the observations noted above require further investigation and diagnostics in order to fully assess the structural stability and condition of the wood and painted finishes.

3.1.3 Assessing the Microclimate

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42 For reference, photography of the north elevation interior can be seen in the architectural drawings provided by the Lviv Polytechnic National University’s Department of Architecture and Conservation in Appendix 1a.
In an effort to evaluate the environmental climate of CEHC, one exterior and six interior HOBO dataloggers were installed in June 2021 at the following locations: upper east wall of the apse, lower north wall of the apse, south wall of the nave, north wall of the nave, upper west wall of choir loft, and the railing on the south wall of the choir loft. The dataloggers were set to measure the relative humidity and temperature every three minutes. To date, the Lviv Polytechnic University’s Department of Architecture and Conservation has compiled the data from June 8th to December 16th, 2021 for analysis (Appendix 1b).

Over the six-month span, the datalogger located on the exterior of CEHC recorded a maximum air temperature of 31.6°C (88.9°F), and a minimum air temperature of -6.5°C (20.3°F). The relative humidity ranged from a minimum of 43.7 % to a maximum of 93.3%, maintaining an average over 70% for the later five months. In general, temperatures decreased from July to December while relative humidity increased. From this data, the microclimate of CEHC can be characterized as temperately warm with high levels of humidity which correspond to lower temperatures.

The climate recorded on the interior strongly correlates with the external data, showing marginal deviations as seen in Figure 4. Likewise, there is little variation between the six different interior locations. As a relatively open wood structure, CEHC has limited capacity for heat storage and is subject to fast air-exchange from the exterior to the interior. The finding from the HOBO dataloggers confirm the interior climate is strongly governed by the climatic conditions outside. The sustained average relative humidity over 70% on the interior necessitates further study of sustainable conditions.
Figure 4: Air temperature and relative humidity recorded by HOBO dataloggers located on the exterior (top) and choir loft (bottom) of CEHC from November 12th-December 17th 2021
3.2 Factors of Deterioration within the Carpathian Mountain Range

The Carpathian Mountain region spans seven European countries and covers an area of approximately 210,000 square kilometers. The following interdisciplinary research identifies specific environmental conditions and agents of deterioration for wooden built-heritage sites within the region in order to provide a baseline for future studies at CEHC.

3.2.1 Climate

Due to its geographical position and orographic effects, the climate of the Carpathian Mountain region (CMR) is characterized by localized patterns of weather. The Carpathians serve as a climatically transitional region between major atmospheric source areas of the Atlantic Ocean, Mediterranean Sea, and continental Europe. A study of synthesized data collection across the CMR from 1966 to 2010 defines the CMR as a temperate climate, more humid than the surrounding lowlands. The average annual precipitation amounts for the CMR registers about 700-800 mm in the western parts, 350-400mm in the south, and 1000-1200 mm in the mountain area.44

Within the Ukraine, mean summer temperatures (May to August) range from approximately 18°C to 22°C and mean winter (December to March) temperatures range from -4.8°C to 2°C. Precipitation falls predominately in summer to fall months, with June and July typically experiencing the highest rainfall of 67 mm. 45

Lviv Oblast, where CEHC is located, is one of the coldest regions in Ukraine with a daily high temperature of only 14°C on average. The climate offers varied seasons with

44 Ibid, 86.
deep winters and warm summers. The relative humidity in Lviv is high, ranging from 70% in the summer months to 90% in the winter months.\textsuperscript{46}

3.2.2 Wood Species

Identifying the wood species in construction is vital in determining the physical and chemical properties of the timber and can predict structural performance and susceptibility to different forms of deterioration. The Ukrainian Carpathians (UC) contain the largest areas of old growth forests in Eastern Europe. Today, the UC consists of heavily forested (~40%) mountain ranges, covering an area of approximately 24,000 km.\textsuperscript{2}

According to a survey of old growth forests in the UC from 2010 to 2019, the predominant wood species are beech (\textit{Fagus sylvatica L.}), Norway spruce (\textit{Picea abies L. H. karst}), and Mountain pine (\textit{Pinus mugo turra}). Beech is the most dominant at 49% of the total recorded, followed by spruce (37.2 %) and pine (6.4%). Other species include Sessile oak (\textit{Quercus robor L}) and Pendunculate oak (\textit{Quercus petraea}). In comparison, the forests within the larger territory of Ukraine are reported as 33.6% pine (mainly \textit{Pinus silvestris}), 24.4 % oak (mainly \textit{Quercus robur L.}), and 7.4 % beech (\textit{Fagus silvatika L.}).\textsuperscript{47}

The modern characterization of forests correlates to the historical records of wood species used in timber ecclesiastical structures; the foundation of wooden tserkvas typically utilized oak logs, while pine was used for the walls.\textsuperscript{48}

3.2.3 Biotic Agents of Deterioration in the Carpathian Mountain Region

Agents of deterioration for wooden cultural heritage include a multitude of fungi, insects,
and microorganisms among other living species. Due to the climate in the CMR, the surrounding built heritage is continuously exposed to high thresholds of relative humidity and are therefore naturally susceptible to multiple forms of biodeterioration. Fungi are the most commonly identified biotic agent in conservation literature of the region. As agents of deterioration, fungi digest, stain, and weaken wood, attract insect pests, and can pose a health risk to human occupants. One study identified fungi species involved in the deterioration of five wooden churches in Romania observed between July and August 2018. Through multi-level characterization of microbial consortia, fungi belonging to the Ascomycota phylum and Basidiomycetes were found in contributing to the wood degradation in the churches. Another study from 2008, summarizes the biological examination of over 300 wooden churches within Romania, specifically sampling from wall paintings. Four species of micro-fungi were detected belonging to the Rhyzopus, Penicillium, and Aspergillus genuses. On the painted elements, the most frequent macro-fungi included:

- Coniophora puteana
- Fibroporia vaillanti
- Phellinus cryptarum
- Phellinus contiguous
- Dacrymyces stillatus
- Hyphodontia breviseta
- Fomitopsis rosea
- Gloeophyllum abietinum
- Gloeophyllum sepiarium
- Schizopora paradoxa
- Grandinia arguta
- Hyphoderma puberum
- Vesiculomyces citrinus

In addition to fungi, insects inflict risks to cultural heritage in the CMR. The main wood destroying insects of the region are wood boring beetles. The larvae feed on wood, leaving circular tunnels ranging from 1 mm to 10 mm in diameter. The house longhorn beetle (*Hylotrupes bajulus*), Violet beetle (*Callidium violaceum*), common house borer (*Anobium punctatum*), and *Hadrobregmus pertinax* are all identified species within the region.

### 3.2.4 Abiotic Agents of Deterioration in the Carpathian Mountain Region

Abiotic forms of deterioration which are universal for wood structures include UV photodegradation, thermal decomposition, chemical decomposition, and erosion. In addition to normal rates of these processes, heritage buildings within the CMR currently face higher than average vulnerabilities to air pollution, fire, and vandalism.

The Western Carpathian region is subject to strong, though gradually decreasing, contamination from sulfur dioxide, nitrogen oxides, and dusts. Cities with manufacturing industries-- like Drohobych-- are noted at risk of higher concentrations of harmful substances and dust in the atmosphere. Resulting soiling can cause a layer of black soot on the wood and finishes.

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As wooden construction, tserkvas also carry a higher risk of fire damage. Additionally, the specific nature of the open structure, limited times of occupancy, and common liturgical use of candles predisposes religious structures of the region make fire protection a high priority.

In addition to inherent regional factors, the current Russian invasion of Ukraine which began in February 2022 has placed the country’s cultural heritage in imminent danger of destruction. During conflict, heritage sites become targets to indirect or direct damage including fire, shrapnel, looting, and vandalism. As of June 23, 2022, UNESCO has confirmed 152 Ukrainian cultural heritage sites have been damaged, including 70 religious sites, 12 museums, 30 historic buildings, 18 cultural centers, 15 monuments, and 7 libraries.\textsuperscript{54} Several more yet remain in danger as the conflict continues.

3.3 Potential Challenges in Conserving the Painted Timber at CEHC

The current documentation reports the painted finishes at CEHC to be applied directly on to the structural wood—aligning with the historical practices of fresco secco painting in the region. The use of structural wood as a surface for paint creates a composite that is not only physically and chemically joined together but is the sole layer of the building’s envelope. Before any future conservation work is to be completed, one must recognize the complexities of this relationship which may pose both benefits and risks for CEHC.

The performance of wood as a surface for paint application is contingent on a range of material properties which affect the mechanical and chemical behavior of the

composite, including wood density, the cut of the wood grain, and wood extractives. As a composite, the properties of each component directly affect the other. The relationship between wood and paint has been described as symbiotic; Where the paint film depends on the stability of the wood surface, the wood relies on the paint film to mitigate the sorption of moisture and degradation of ultraviolet light. However, this interconnectedness is not always beneficial. For example, conifers have resin canals which may bleed through certain paints, possibly resulting in darkened or yellowish dots.

In addition to intrinsic factors, environmental conditions impact the rate of deterioration of painted wood. Dimensional stresses caused from the wood’s response to air moisture content or chemical degradation from ultraviolet light exposure each affect the adhesion between the paint and wood. The extent of these factors is dependent on the local climate or climate control systems on site and may even vary greatly across a singular structure. Because the painted timbers at CEHC also constitute the envelope as a singular structural assembly, they serve as the primary barrier against exterior weathering elements—furthering the susceptibility to environmental stresses on the materials.

When deterioration reaches a point where intervention is deemed necessary, both the wood and paint must be evaluated in tandem. In review of the agents of deterioration within the region, water infiltration and attacks from fungi and beetles are likely. Where typically a structural timber that has reached a point of failure may be replaced with in-kind material, doing so at CEHC would result in the loss of the invaluable interior painted

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56 Ibid.
icons. Similarly, any treatments or testing on the finishes will need to be completed in-situ. Application of treatments including consolidants or insecticides also necessitates sensitivity to both materials. In summary, the nature of the structural-decorative composite not only faces inherent vulnerabilities through design, but demands a more nuanced approach to conservation dependent on creative problem-solving, flexibility, and a holistic understanding of the site.
4.0 Comparative Literature Review

To inform future work at CEHC, this chapter provides a literature review of historical and regional precedent. Key references on painted wood conservation are first explored, providing broad view of themes and challenges in the development of painted wood conservation practices. These findings are then placed in the framework of modern international charters for best practice. Finally, the literature review takes a regional focus to more closely examine discourse on ecclesiastical wall-paintings within the Carpathian Mountain Range.

4.1 Painted Wood: Defining Resources

From totem poles in the American Southwest to Ancient Egyptian coffins, there is a wealth of subject matter and resulting scholarship on painted wood to review. In 1998, the Getty Conservation Institute released two volumes regarding painted wood which wrangle these interdisciplinary conversations into key reference materials: *The Structural Conservation of Panel Paintings* and *Painted Wood: History and Conservation*. Both volumes include a rigorous scientific analysis of materials, conservation techniques, and interpretive philosophies. In doing so, they have continued to serve multiple heritage professionals involved in the care of painted wooden objects--including conservators, art historians, and curators.  

Even though the former focuses on panel paintings, the methodologies discussed are certainly applicable to a broader scope of cultural resources. In fact, from these

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58Paintings created on wood supports were common in Europe from the 12th to 16th century.
foundational publications in the late-twentieth century, panel paintings have remained central to published literature on painted wood. Leading this discourse is the decade-long Panel Paintings Initiative held from 2008 to 2020 by the Getty Conservation Institute, the Getty Foundation, and the Getty Museum. On one hand, the initiative acted as an update to the 1998 publication, incorporating recent research and trends in a culminating publication, *Facing the Challenges of Panel Paintings Conservation*. The largest shift in practice noted is the consideration of the wood substrate in conservation efforts. Instead of a disposable canvas, the inclusion of non-destructive testing and theatrical models regard the wood substrate with more sensitivity. The challenge of prioritizing heritage values between the wood substrate and painted finishes during conservation interventions is of particular note for the structural-decorative composite of wall-paintings.

Secondly, the initiative conducted a Needs Assessment Survey of practitioners within the field. The findings confirmed a scarcity of panel painting experts-particularly incoming professionals. In response, the initiative spurred several networking opportunities and outreach-oriented resources to encourage knowledge dissemination on the subject. Such efforts even reached the extent of European professionals through the work of the Ruks Museum and the Netherlands Organization for Scientific Research (NOW). In 2011, NOW and the Ruks Museum convened an international meeting of experts, developed working study-groups, and published an additional guide in coordination with the Panel Painting Initiative. In addition to accumulated research from the study-groups, the guide included a wider range of accessible resources including: a glossary of key terms; bibliographic references for relevant journals, bulletins, websites, and related materials; and a wealth of future research questions and recommendations for
each topic explored in the study-groups. A similar approach to resource sharing was taken through a 2006 study on polychrome wooden altarpieces. From shared conservation challenges, a series of recommendations for management and intervention were shaped into a concise methodology. The document also includes a working bibliography based on established criteria. Despite the variability of subject matter in painted wood conservation literature, these key references respond to needs of field practice by increasing the accessibility of interdisciplinary research.

4.2 International Charters: Considering a Framework for Best Practices

CEHC and the wooden tservka typology should be placed within the context of charters by the International Council of Monuments and Sites (ICOMOS). Ukraine has held full membership within ICOMOS since 1994, and currently reports eighty affiliated specialists within the organization. Although not representative of specific preservation challenges or regional variabilities, ICOMOS charters represent an international consensus on best principles and practices. Principles for the Conservation of Wooden Built Heritage (2017) is perhaps the most pertinent to this study. Due to the nature of CEHC, the Charter of Built Vernacular Heritage (1999) and The Principles for the Preservation and Conservation-Restoration of Wall Paintings (2003) are also of note. All three charters underline the basic conservation standards set forth through previous


charters\textsuperscript{62}, noting the importance of documentation, minimal intervention, and preferred use of traditional materials/techniques. In addition, the following charters establish guidelines for more specific consideration.

The Principles for the Conservation of Wooden Built Heritage was adopted by the 19\textsuperscript{th} ICOMOS General Assembly as continuation of a previous charter, Principles for the Preservation of Historic Timber Structures (1999). The core of the charter recognizes the often-contrasting view of historic authenticity and the impermanent nature of wood as a building material. In response, the outlined principles of wood conservation incorporate considerations beyond the material and include the associated traditions of craftsmanship and wood technology. The resulting methodology utilizes these principles to outline general strategies for the conservation of the building, including inspection, survey, analysis, interventions, documentation, monitoring/maintenance, and education/training.

Under the Charter of Built Vernacular Heritage, CEHC and the larger wooden tserkva typology qualifies as an example of vernacular built heritage which has “recognizable local or regional character responsive to the environment” and is an “effective application of traditional construction systems and crafts.” Because vernacular heritage is so strongly linked to cultural diversity and local pride, the charter firmly establishes the importance of community involvement and intangible associations in preserving historic character. Often utilitarian structures, the protection of vernacular heritage is cited to depend on local stakeholders for continuous use and maintenance. This desire to incorporate broader participation alongside conservation principles is

\textsuperscript{62} Historic charters of note include the Venice Charter (1964), The Burra Charter (1979), and the Nara Document on Authenticity (1994).
addressed through the recommendation of community training programs related to maintenance and public-oriented information programs. The charter also asserts vernacular heritage is best represented by preserving groups of related structures within a region. Regional networks to facilitate expertise exchange are encouraged, yet few other solutions are discussed.

Recognizing the intrinsic values of wall paintings as components of historic monuments, the Principles for the Preservation and Conservation-Restoration of Wall Paintings (2003) provides specific insight for their management. As this thesis explores both the significance of the wood and decorative finishes of CEHC, the addition of this charter underlines the concept of integrated conservation and elevates the value of architectural finishes as equally important considerations. Unfortunately, the Wall Paintings Charter excludes wall paintings on organic supports including wood, canvas, and paper. Despite this delimitation, the methodology for conservation maintains a high degree of relevance for the monumental paintings within the wooden tserkva typology. In essence, any intervention should be completed only after investigation of the fabric of the structure, values of the painting, past alterations, and decay mechanisms. For religious components, the text asserts, “…special efforts must be made through the co-operation of various authorities to accommodate and respect the cult function of religious paintings without compromising their authenticity.”

64 Ibid.
Secondly, the charter highlights the interdependent relationship between the finishes and its architectural structure; Any interventions on the mural paintings should consider the larger conservation of the structure and vice versa. Therefore, preventive conservation measures which seek to create favorable conditions minimizing decay (for the finishes and structure) are strongly encouraged.

Together, the three charters begin to shape a nuanced framework for conservation where decisions are informed by both the materiality and intangible heritage. In doing so, the charters advocate for the engagement of a broad range of stakeholders in order to identify and uplift a diverse and living heritage.

4.3 Regional Discourse:

On a regional level, discourse regarding the preservation of wooden tserkvas dates back to the 19th century in response to the recognized vulnerabilities of these sacred spaces. Through the twentieth century, preservation was greatly limited by the socio-political climate and lack of resources. It was not until the independence of Ukraine, and later 21st century revolutions, that a passion to identify Ukraine cultural identity reignited a wave of re-assessment and conservation of these wooden religious structures. Simultaneously, conservation discourse on wooden heritage has developed within Ukraine’s neighbors in the Carpathian Mountain Region—primarily including Poland, Romania, and the Czech Republic. Within the last decade, numerous studies have been published, ranging from microbial studies to community maintenance manuals. These studies serve as the first wave of investigation for numerous heritage sites, and are often characterized by shared challenges. Limited sustainable funding for preservation efforts, the loss of historic craftsmanship knowledge, and debates over best practices are unanimously highlighted.
and create a sense of urgency through the text. Yet beyond these shared concerns, the published literature bubbles with a common exhilaration of discovery. Several articles report the use of new technology to document sites, others offer the first findings from in-situ testing. As CEHC begins its initial stages of assessment, it will benefit from an awareness of past and ongoing work.

One consistent thread through the regional literature is the study of climate conditions in pursuit of preventive conservation. Due to the potentially detrimental effects to the wood and paint from unsuitable conditions of temperature and humidity, ensuring a proper microclimate is essential in the longevity of the wall-paintings. Today, researchers of the region are interested in quantitively analyzing the microclimate of wooden tserkvas. For example, a recent study on the wooden church Archangels Michail and Gavril in Draghia, Romania utilized data provided by the local weather station and data loggers installed at the site. The findings revealed an unsuitable natural environment for the wooden tservka and mural paintings.\(^65\) Simultaneously, other studies address a shared dilemma of wooden tserkvas actively open to the public-- how to balance human comfort without adversely affecting the wall paintings. A study from 2019 observed two churches (Saint Catherine’s, Cracow, and Saint Michaels Archangel, Szalowa) to assess the IR-heating’s effect on the natural ventilation rate.\(^66\) As more studies are completed, it is likely a new wave of research will begin to further explore the addition of climate


control systems and their ability to create microclimates that protect the wall paintings and address human comfort levels.

A point of divergence held throughout regional discourse is the use of intervention techniques to address the polychrome interiors. The studies universally advocate for preventive conservation measures and the use of traditional building materials dissuading the application of modern materials including aluminum siding or bituminous coatings which are found to be incompatible with the existing fabric. However, there is a range of differing approaches once deterioration has necessitated intervention. In part, this may be due to the range of problems presented by the composite as well as theoretical differences in approaches to conservation. Some publications openly embrace the experimentation of new technologies. One of many includes a petrindu wooden church in Salaj County, Romania. Using laser scanning technology, the painted wooden gates were digitalized into an interactive 3D model that allows virtual visitors the ability to see the gates digitally restored.  

Other methods recommend for the transfer of the paint layers and then layer of substrate to a new grounding, which was proposed for the orthodox church in Miekisz Stary, Poland. Once treatments are completed, the transferred elements are fastened “anew” to the original place via wooden pegs. Due to the recent nature of publications on wooden tserkvas, there exists little to no analysis monitoring interventions on the wall-paintings and assessing their efficacy.

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As research continues to develop, re-assessment and comparison of different approaches will be key.

Lastly, arising from the studies is a noticeable gap in collaboration. While almost every publication begins with a contextual overview of the religious and architectural history, this context is disconnected from the present conversation. There is limited work which surveys the conservation efforts taken by sites on a national or regional level, creating a siloed effect to many research projects. Beginning to address this need for mutual exchange and data collection, several universities launched the project, “Rescuing the Hidden European Wooden Church Heritage” to create a database for restoration projects on wooden churches. Participants from Poland, Ukraine, Czech Republic, and the Slovak Republic aimed to prepare a database of wooden heritage sites and submit research on current practices for conservation.\textsuperscript{69} Date of construction, architectural typology, religious affiliation, structural failures/deterioration of materials, and interventions/restoration are all listed as fields for inclusion in the database.\textsuperscript{70} At this time, it is unclear if a database was developed or made accessible to the public, however the resulting publication posits the question of incorporating the multiplicity of wooden ecclesiastical heritage in central Europe into digestible metrics. In turn, how would this information best be presented and shared to encourage discourse across conservation efforts.

\textsuperscript{69} Eva Krai’ova and Ivana Lisicka, “Rescuing the Hidden Slovakian Wooden Church Heritage from the Viewpoint of the Authentic Materials and Techniques,” \textit{In Rescuing the Hidden European Wooden Churches Heritage}, 2006.

\textsuperscript{70} Ibid.
The recent Russian invasion of Ukraine will undoubtably have a lasting effect on conservation efforts for wooden tserkvas across Ukraine and the larger diaspora. From a preservation climate already defined by scarcity, the active endangerment of these sites jeopardizes the survival of the typology. However, the momentum of studies over the past decade advocating for the importance of these sites is pivotal in engaging international stakeholders in providing aid. Organizations such as ICOMOS and ICCROM have initiated conversations on response and recovery efforts to identify immediate needs and coordinate recovery planning of cultural heritage. In part of these efforts, preservationists were invited to give a presentation to the UN Security Council entitled, “The Destruction of Cultural Heritage as a Consequence of Russian Aggression against Ukraine.” Now, more than ever, it is vital to recognize conservation efforts and build upon them for the collective preservation of these sacred sites.

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5.0 Charting a Path Forwards: A Methodology for Conservation

For the conservation of CEHC, the most critical next steps will be the identification and implementation of a timeline for future work. Any steps forward will need to consider the coordination of funding, staffing capacity, and site accessibility. In order to maximize resources and impact, this chapter offers a methodology for the conservation of the structural-decorative composite informed by site conditions, heritage values of the typology, and an understanding of regional discourse. While specific needs will undoubtedly arise as initial assessments are completed, a set of guiding preservation principles and recommendations are provided to help navigate future conversations regarding the painted timbers of CEHC and related sites.

5.1 Guiding Preservation Principles

As illustrated throughout the previous analyses, the painted wood timbers at CEHC should be understood as a composite, comprised of structural and artistic elements--both imbued with heritage values. By approaching any future work with a resource-guided philosophy, it is hoped the most sympathetic and sustainable practices will be undertaken in the conservation of the structural-decorative composite. Following the framework of international charters, the following set of guiding principles for the conservation of painted timbers at CEHC were developed:

- A multi-disciplinary team in active collaboration is necessitated by the varied needs of the composite. The team should draw upon experts with conservation knowledge in wood science and architectural finishes as well as experts in regional specialties concerning Ukraine’s history, religious communities, and historic building traditions.
• A stance of minimal intervention should be taken, with any interventions justified through thorough investigation and testing in order to ensure all actions and materials are compatible with both the wood and finishes as well as the site’s values, current conditions, and future needs.

• Rigorous documentation should be completed for all interventions, including monitoring post-intervention. Documentation should be accessible and readily disseminated to heritage professionals and the public.

• Preventive conservation should be prioritized through regular maintenance and monitoring of conditions. Preventive conservation also necessitates emergency planning considerations.

5.2 Priority Actions & Recommendations

In lieu of the current circumstances, it is understood that not all necessary recommendations and maintenance for CEHC can be carried out immediately. The safety of all persons should be prioritized before conservation plans may once again be considered. Any steps forward will necessitate both an understanding of on-site conditions and the vulnerabilities inherent of the typology. In response to expected challenges in the conservation of the painted timbers, the following recommendations outline priority actions in order to assess and stabilize CEHC.

• **Assess and Document Current Conditions**

Due to the indeterminate pause in conservation activities since Spring of 2022, any conservation efforts will first need to assess the current condition of CEHC. It is recommended to survey and document the site using the completed documentation of
CEHC highlighted through this study as a base reference point. All alterations or damage to the property should be photographically recorded and annotated.

Based on the visual survey of completed documentation, several avenues of further research were suggested. In order to ensure the safety of future work and general soundness of CEHC, a structural analysis by a licensed building professional should be prioritized. The second emphasis of studies should ensure the building is watertight. Water infiltration poses one of the largest threats to both the wood and finishes. Inspection of the roofing, fenestration, and drainage systems should be completed promptly to prevent any imminent water damage concerns. Lastly, a full conditions assessment of the wood and finishes should be completed by corresponding specialists. A conditions report will identify:

1) active agents of deterioration on site  
2) the integrity of the wood and architectural finishes  
3) composition of the wood/finishes (i.e. wood species, paint pigments, paint binder)  
4) recommended treatment/intervention

Testing may include but is not limited to: wood sampling and identification, probing, resistography, moisture-content mapping, paint sampling, infrared thermography, and UV light analysis. The completed reports will provide a much-needed assessment of CEHC and detail next steps for treatment or intervention based on their findings. The process will also identify and begin to form relationships with a range of building professionals who will become vital assets throughout the long-term conservation process.

- **Develop and Implement Emergency Planning**

Emergency planning is a vital aspect of historic site management, and takes account of all risks which may jeopardize the longevity of a cultural resource. It is recommended to develop an emergency response plan as soon as possible. This is particularly urgent at a
site like CEHC where there is not a continuous on-site for monitoring. In alignment with the guiding principles, all interventions should be minimally invasive and sensitive to the historic fabric. Emergency planning should address topics including security against vandalism, emergency building funds, and an emergency contact plan.

Fire damage is recognized regionally as a prevalent natural disaster, and should be prioritized in planning. Implementing fire detection systems and extinguishers are strongly recommended first steps. For fire detection systems, it is important to consider the placement and sensitivity of detectors in order to ensure early detection—particularly in relation to the open structure of the building. For fire suppression, many cultural site stewards advocate for systems which are sensitive to historic building fabric (for example water-mist or gas-based systems). Other considerations could review past exterior topical treatments and explore new technological advancements of fire retardants appropriate for wooden heritage or alternative barriers such as fire blankets. It is recommended that a variety of fire preventive and response measures are taken to ensure a rapid response to any such emergency.

5.3 Future Actions & Recommendations
As a heritage resource, CEHC is uniquely positioned to join—and lead—conversations regarding conservation practices for the larger typology and model how to thoughtfully balance the complexities of painted wood conservation within ecclesiastical architecture. Once the condition of CEHC is assessed and stabilized, several aspects of planning and collaboration will need to be explored for the long-term sustainability of the site.

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• **Develop a conservation plan**

After the completion of an initial assessment, a conservation management plan should be completed for CEHC. The Heritage Lottery Fund defines a conservation plan as:

“A document which sets out the significance of a heritage asset, and how that significance will be retained in any future use, management, alteration or repair.” 73

Ideally, the planning process will involve a team of heritage professionals which will act as an advisory council. The final product should result in a working document which provides guidance and specific policies for the long-term management of CEHC. The conservation plan should be shared with the larger public as well as any future heritage professionals working at CEHC.

• **Shift from reactive to preventive conservation**

The initial conservation work done at CEHC will need to account for deferred maintenance and inactive use. Once the condition of the painted timbers at CEHC is stabilized, it will be important to shift from a reactive to preventive approach to conservation. Routine conservation and stabilization will assist in reducing the future possibility for expensive and intensive interventions. With secured staff and funding capacity, there should be an established system for cyclical maintenance and cleaning including dusting, landscaping, and minor repairs. Regular maintenance will both address the risk of atmospheric soiling and prevent water infiltration through improper drainage/landscaping. Another major step is maintaining a suitable interior environment through the monitoring of air temperature and relative humidity. Analysis of the interior climate may necessitate further inquiry into a humidification control. Lastly, continuing

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additional research and studies on site will provide invaluable source of knowledge for the site and larger typology. Future topics could include building evolution, analysis of the religious icons, or a testing methodology of paint/wood treatments.

- **Identify and engage stakeholders in the conservation process**

One of the continuous themes found through international charters for the conservation of wood heritage and vernacular heritage is the importance of community involvement. CEHC has remained vacant for over half-a century, and therefore does not possess an active congregation. However, this does not mean CEHC is without community. A diverse range of stakeholders located regionally and internationally can serve as key internal assets for CEHC. Building and leveraging these relationships can serve as a highly valuable source of guidance as well as a network of connectors for particular strategies and tasks.

Spatially, CEHC is connected to the greater community of Drohobych. Located within proximity to CEHC is St. George, a World Heritage listed tserkva, and the former saltworks cultural landscape. Both St. George and CEHC are currently managed by the same state museum entity. Together, all three sites create a historically rich campus which is ripe for interpretation and could offer a range of programmatic activities.

Training and regional knowledge-sharing opportunities could be held at CEHC, engaging local universities, professionals, and the general public. Workshops on local craft traditions could assist in the transfer of historic building skills as well as assist in the ongoing maintenance of CEHC. The Lviv Polytechnic Institute are already established fruitful partners in educational programming on the site, and can continue to connect
CEHC with students, faculty, and the Fulbright Scholarship program. Other relationships could be explored with regional and international universities or cultural institutions.

On an international level, CEHC is tied to a diverse heritage community as an example of the wooden tserkvas typology. Because the typology is not bounded to modern geographic boundaries, the discourse on the conservation of tserkvas also spans a range of European countries. Interest has already been expressed in adding CEHC to the World Heritage nomination of “The Wooden Tserkvas of the Carpathian Region in Poland and Ukraine.” Successful nomination to the World Heritage list would increase the protection and funding resources for CEHC and place the site in more direct conversation with the sixteen currently listed properties.

- **Create Shared Resources**

In addition to nomination for World Heritage, it is recommended to explore approaches of engaging with the larger typology through the production and accumulation of shared resources. With a regional conservation discourse shaped by scarcity, collaborative materials offer a unique opportunity to break away from siloed projects and utilize a broader range of expertise. As response and recovery efforts for Ukraine’s cultural heritage are actively being developed, accessibility of accumulated data will be vital in decision making and advocacy.

One promising idea is the creation of a database of wooden tserkvas with painted interiors. A central, living repository of sites would hopefully encourage professionals and the general public to visit, study, and preserve these sacred spaces. Across the diversity of architectural forms of the sub-typologies, polychromatic wall paintings are common features and offer a shared point of collaboration. Furthermore, the topic of wall
paintings addresses both the structural and decorative components—offering insights into the core the site’s conservation. A database which documents tested treatments and monitored results would greatly inform conservation decisions for the collective.

Other tools to facilitate conversation could include a multi-lingual reference of building terminology and a bibliography of publications related to tserkvas. The wooden tserkva typology is represented by a rich lexicon of architectural features. A document solidifying common terminology in the various regional languages could greatly aid in the international exchange of research and practice. Like the resources on painted wood published by the Getty, compiling a bibliography of relevant references and ongoing research.

Perhaps most importantly, any shared resources will necessitate active partnerships between sites, institutions, and countries. The formation of a scientific committee or research working groups within an existing organization will likely be the easiest method to connect people and places. While conferences or events will greatly assist in knowledge dissemination, an active group which meets regularly will be necessary to maintain such tools and keep them up-to-date.

5.4 Conclusion

It is without doubt that CEHC is a heritage resource of great architectural, religious, and artistic significance. As conservation of the site is pursued, the richness of the work will be dependent on the incorporation of the multiple heritage values held by the site. Perhaps no component of this work is more representative of these values than the painted timbers which speak to the rich lexicon of building traditions and religious history of the region. Likewise, the challenges presented in the conservation of the
painted timbers necessitates a comprehensive understanding of the site from the microscopic material properties to the macroscopic building pathologies. As a case-study of the larger typology, CEHC possesses the opportunity to lead in advocacy for the significance of wooden tserkvas and continue to generate conversation regarding best practices for integral-interior finishes. It is the hope that this thesis will help to provide a foundation for the evolving heritage conservation management plan for CEHC. Through an understanding of the specific values and pathology of the structural-decorative composite, further research and efforts should follow ensuring the retention and sustainability of a globally significant typology and embodiment of Ukrainian national identity.
Bibliography


Gromyk, Victor. “Church of the Exaltation of the Holy Cross 1613,” *Wooden Churches*


Neamtu, Calin et al. “Multidisciplinary Investigation of the Imperial Gates of the 17 the


Appendix 1: Provided Site Documentation
Appendix 1a: Provided Site Documentation

Drawings produced by the Department of Architecture and Conservation, Lviv Polytechnic National University as a part of documentation efforts in 2021. The Key to Drawings is translated by Myron Stachiw.

Key to Drawings of the Church of the Exaltation of the Holy Cross, Drohobych, Ukraine

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<td>Exterior, West elevation</td>
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<td>Exterior, North elevation</td>
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<td>Exterior, South elevation</td>
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<td>Interior, Section 2-2, looking South</td>
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<td>Interior, Section 3-3, looking east</td>
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<td>Interior, Section 5-5, looking east at iconostasis</td>
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<td>71</td>
<td>Interior, Section 6-6, looking west in apse</td>
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<td>Interior, Fragment of east wall of the narthex</td>
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<td>Interior, fragment of the corner wedge wall in the tower over the narthex, Evangelist John</td>
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<tr>
<td>75</td>
<td>Interior, fragment of the corner wedge wall in the tower over the narthex, Evangelist Matthew</td>
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<td>Interior, fragment of the corner wedge wall in the tower over the narthex, Evangelist</td>
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<td>77</td>
<td>Interior, fragment of the corner wedge wall in the tower over the narthex, Evangelist</td>
</tr>
<tr>
<td>78</td>
<td>Interior, sections of vault in the apse</td>
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<tr>
<td>79</td>
<td>Interior, detail of section of vault in the apse</td>
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<td>82</td>
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<td>83</td>
<td>Interior, detail of section of vault in the apse</td>
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Appendix 1b: Table of Temperature and Relative Humidity

Church of the Exaltation of the Holy Cross, Drohobych, (ONSET Dataloggers MX1101)

Produced by Lviv Polytechnic National University’s Department of Architecture and Conservation
Start date of measurements: 8 JUNE, 2021

<table>
<thead>
<tr>
<th>Data Logger</th>
<th>North wall of Apse</th>
<th>№1</th>
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<th>№3</th>
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<td></td>
<td>T, °C</td>
<td>RH, %</td>
<td>T, °C</td>
<td>RH, %</td>
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<td>RH, %</td>
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<td>RH, %</td>
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<td>North wall</td>
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<td>57.5</td>
<td>22.2</td>
<td>42.1</td>
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<td>21.2</td>
<td>47.5</td>
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<td>47.5</td>
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</tbody>
</table>

Average readings: 2021
Appendix 2: Wood Sampling Proposal
The following text outlines a suggested proposal for requesting wood samples, followed by labeled drawings:

In continuation of our research regarding the Church of the Exaltation of the Holy Cross in Drohobych, Ukraine, we would like to formally request samples from the site for further examination. Through sampling, we intend to perform wood identification which will aid in determining the wood members’ structural properties, physical parameters, and potential degradation patterns. We believe this analysis will be vital to ongoing conservation efforts led by the Foundation to Preserve Ukraine’s Sacral Arts. Attached is a PDF drawing of the locations we are requesting wood samples from for the purpose of our study. Also included is a sample schedule which details our request below:

**Documentation**

Before samples are taken, place a piece of blue tape (approximately 2 in. wide) with the corresponding item number written in thick marker next to each sample location. The tape should be written on before it is adhered to the wall, ensuring there is no marker residue transferred onto the wood. The item number should be legible from a distance. Once labeling is completed, take a photograph of the sample site, with a tape measure extended in the frame as a reference scale. After extraction, take another photograph of the sample site including the tape measure once again.

**Extraction**

In order to ensure the least damage to the structure, all samples should be taken on the exterior away from joinery or any significant architectural feature. When possible, samples should start from the lowest member on the elevation and be staggered in order to organically disguise the sample locations.

Using a 10-15 mm chisel, make two cuts at an approximately a 30-degree angle. Each cut should be 10 mm deep, 15 mm wide, and 40 mm long. The cuts should be oriented horizontally, following the grain. A drawing is attached for reference.

**Labeling and Packaging**

After the samples are extracted and the site is photographed once more, the samples are ready to be packaged. Wrap the blue tape corresponding to each sample location around the sample and place it in an individual Ziplock bag. Write the item number on the exterior of each Ziplock bag.

All ten individual bags can then be added to one large Ziplock bag and placed in a small cardboard box with packing. The package should be shipped to:
Sample Extraction Locations-East Facade (Not to Scale)

Sample Item Numbers:
E.1
E.2
E.3
E.4
Sample Extraction Locations - South Elevation (Not to Scale)

Sample Item Numbers:
S.1  S.5
S.2  S.6
S.3
S.4
Sample Extraction Illustration
(Not to scale)
Appendix 3: Regional Discourse Bibliography


Cheval, Sorin, Marius-Victor Birsan, and Alexandru Dumitrescu. “Climate Variability in


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