Hawassa University Journals - Ethiopia
Ethiopian Journal of Engineering and Technology (EJET)
Volume – 4, 2025, Pages 73 – 111. https://doi.org/10.82127/t2gmh769

Investigation of Conservation and Restoration Practices for Historical Buildings in Arada Sub-City, Addis Ababa, Ethiopia

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Abstract

Ethiopia, renowned for its rich history and cultural diversity, possesses a wealth of tangible and intangible heritage that reflects the nation's socio-economic, political, and spiritual legacy. Among these, historical buildings stand out as irreplaceable cultural assets that preserve architectural and artistic traditions while serving as enduring symbols of collective memory and identity. Conservation and restoration practices in Ethiopia remain in their infancy and are constrained by inadequate resources, insufficient expertise, weak policy frameworks, poor documentation, and limited financial allocation. These challenges are material obsolescence, lack of proper maintenance tools, unavailability of original materials, and ineffective administrative systems, including unclear contractor selection criteria. This study investigates conservation and restoration practices in Arada Sub-City, Addis Ababa, with a focus on processes, professional roles, and the challenges associated with selected historical buildings. Four significant sites were purposively selected for analysis: St. Taeka Nigist Be'ata Le Mariam Church, Dejazmach Kebede Tassama's Residence, Teshome Berhe's Residence, and Addis Ababa Library, Archives, and Information Center. A mixed-methods approach was employed, combining surveys, interviews, questionnaires, personal observations, and case studies. The findings indicate that while adequate planning and information gathering were undertaken during the planning stage, the implementation and execution phases encountered substantial obstacles. Preservation strategies were formulated, and contractors were selected through shortlisting, negotiation, and open bidding methods. Professionals involved included conservation architects, historians, archaeologists, structural engineers, conservation specialists, and heritage managers, whose expertise was critical for the interventions. However, issues such as insufficient funding, limited

technical capacity, and incompatible materials hampered progress. The research underscores the importance of integrating international standards with local practices to ensure the authenticity and functional integrity of heritage structures.The study emphasizes the need for multidisciplinary collaboration among stakeholders, targeted training programs for professionals, and policy reforms to strengthen heritage management. It further recommends leveraging modern technologies, adopting adaptive reuse strategies, and ensuring regular maintenance and sustainable utilization of heritage buildings. By addressing these challenges, conservation practices can be enhanced to safeguard Ethiopia's cultural legacy, promote tourism, and support socio-economic development.

Keywords: Heritage Conservation; Historical Buildings; Restoration Processes and Practices; Cultural Heritage Management; Ethiopia.

1. Introduction

Historical buildings stand as irreplaceable witnesses to the cultural, social, and technological evolution of civilizations, serving as tangible connections between past and present societies (Jokilehto, 2017). Their conservation represents a complex interplay of architectural integrity, material science, and cultural preservation, requiring methodologies that respect authenticity while addressing contemporary structural demands (ICOMOS, 2017a). Historical buildings constitute tangible embodiments of a community's identity, collective memory, and architectural legacy. Globally, their conservation is vital not only for cultural continuity but also as drivers of tourism, education, and sustainable urban identity. Heritage conservation has become a sophisticated global discipline. It combines scientific analysis, traditional craftsmanship, and community involvement (Wang, 2021). Foundational documents like the Venice Charter (1964) and the Nara Document on Authenticity (1994) set ethical rules. They emphasize minimal intervention and respect for original materials. More recent guidelines, such as China's Principles for the Conservation of Heritage Sites (2015), address climate resilience and sustainable urban development (Li, 2020).

These standards stress multidisciplinary approaches. Architects, engineers, material scientists, and local communities must work together to preserve heritage structures (Taylor & Altenburg, 2006). Conservation actions can include preservation, restoration, rehabilitation, or reconstruction. The choice depends on historical value, physical condition, and intended use (Feilden, 2003). Core principles, minimal intervention, authenticity, and full documentation, are embedded in the Venice Charter (1964) and ICOMOS guidelines (2005). In Ethiopia, a country renowned for its ancient civilizations and architectural heritage, the conservation of historical buildings faces significant challenges, including rapid urbanization, inadequate policy enforcement, and a critical shortage of skilled conservation professionals (Giorgis, 2020; Tesfaye & Molla, 2021).

Addis Ababa, the nation's capital, exemplifies these challenges, with its rich collection of historical structures increasingly threatened by neglect and unregulated development. Despite housing over 440 registered historical buildings, nearly 80 have been lost over the past fifty years, representing an alarming erosion of cultural heritage (Ayalew et al., 2022; Kahsay, 2018).

In Addis Ababa, the Arada and Piazza zones host hundreds of registered heritage structures dating from the Menelik Zewditu era; yet decades of rapid urbanization have led to their fragmentation or demolition, with nearly 80 such buildings lost in the last half-century (Feilden, 2003; ICOMOS, 2005).

Advanced technologies now include digital twins. These are high-fidelity virtual models linked with IoT sensors and AI analytics. They allow real-time monitoring, predictive maintenance, and simulation of environmental effects on structures (Ni, 2023; Palomeque Gonzalez, 2025; Pasupuleti, 2025). For example, at Löfstad Castle in Sweden, parametric digital twins with sensors on multiple floors provided data-driven climate control recommendations (Ni et al., 2024). These systems shift conservation from reactive repair to proactive, data-driven management. Ethiopia’s conservation context is very different. Legal protections exist through Proclamation No. 209/2000, but implementation is inconsistent. Challenges include fragmented governance, limited funding, and frequent use of incompatible modern materials (Dereje, 2021; Fasil, 2019). The restoration of Fasil Ghebbi’s 17th-century palaces in Gondar illustrates the risks. Using cement-based mortars caused faster deterioration of historic masonry (Giorgis, 2020; Zerihun, 2022). These issues are common in the Global South. Heritage sites often suffer due to competing development priorities and weak institutional capacity (Ikudayisi & Ojo, 2022; Ndoro & Wijesuriya, 2015).

The conservation challenges in Ethiopia's historical buildings are multifaceted, yet existing research has failed to provide comprehensive solutions. Previous studies have tended to focus on isolated aspects of heritage preservation, such as Selam's (2019) examination of heritage tourism potential or Dereje's (2021) analysis of policy implementation gaps. A critical lacuna in the current literature is the absence of systematic research examining the roles and interactions of various professionals involved in conservation projects, including architects, structural engineers, and contractors. This knowledge gap has significant practical implications, as poor coordination among stakeholders frequently leads to interventions that compromise historical authenticity and structural integrity. The controversial 2020 restoration of Menelik II's Palace illustrates this problem, where the inappropriate use of steel reinforcements not only altered the building's historical character but also reduced its seismic resilience (Aheavens, 2021; Tadesse, 2023). International best practices in contractor selection for heritage projects emphasize specialized expertise and strict adherence to conservation ethics (Bausys et al., 2020), yet Ethiopia lacks

standardized protocols for qualifying and monitoring conservation contractors, often resulting in decisions driven by short-term cost considerations rather than long-term preservation objectives (Mekonnen, 2022).

This research uses both international conservation principles and Ethiopian contexts to understand heritage preservation challenges. International theories stress maintaining authenticity through minimal intervention and compatible materials (Stubbs, 2019). The Burra Charter (2013) adds that 'cultural significance' should guide conservation approaches. Recent studies also call for integrating traditional knowledge with modern conservation science (Chirikure et al., 2018). In Ethiopia, these principles face practical limits. Traditional materials are often scarce. Skilled conservation specialists are few. Urban development adds further pressure (Fasil, 2021). Historic buildings in Addis Ababa are diverse, with styles ranging from traditional Ethiopian to European-inspired designs of the Menelik and Haile Selassie eras (Bishaw, 2020). This diversity requires tailored strategies. Each building's history must be respected while addressing common problems like material decay and structural instability (Giorgis, 2022). Recent studies on traditional Ethiopian techniques offer useful insights. Analysis of historic lime mortars in Aksumite structures (Tekle, 2023) and studies on the seismic performance of vernacular stone masonry (Asrat et al., 2022) can guide more sensitive conservation if applied in practice.

The current state of conservation practice in Ethiopia reveals significant disparities between policy frameworks and on-the-ground implementation. While the country has established institutional structures for heritage protection, including the Authority for Research and Conservation of Cultural Heritage (ARCCH) and regional culture bureaus, these entities often lack the technical capacity and financial resources to effectively oversee conservation projects (Culture & Tourism, 2021). A 2022 assessment of conservation projects in Addis Ababa found that fewer than 30% complied fully with national heritage guidelines, with common deviations including the use of non-compatible materials and inadequate documentation of pre-intervention conditions (Ayalew & Teshome, 2023). These implementation gaps are exacerbated by broader systemic issues, including rapid urban expansion that places heritage sites in competition with development projects, insufficient public awareness of heritage values, and the absence of comprehensive maintenance programs for historic buildings (Fenta & Abebe, 2022). The case of the recently demolished Ras Mekonnen Hall, a significant early 20th-century building, illustrates the consequences of these systemic failures, where lack of proper documentation and emergency stabilization measures led to the irreversible loss of an important architectural landmark (Habtemariam, 2023). International experience suggests that successful conservation programs require robust legal protections, adequate funding mechanisms, and meaningful community engagement (UNESCO, 2019), elements that remain underdeveloped in Ethiopia's current heritage management system. Despite legal frameworks like Proclamation No. 209/2000 and the establishment of the Ethiopian Heritage Authority (EHA) in 2023, implementation remains inconsistent. Mekonnen et al. (2022) found that in North Shoa, heritage sites suffer from a lack of management, inadequate stakeholder engagement, funding deficits, climate vulnerability, and

professional neglect. In Addis Ababa, large-scale urban projects such as the City Corridor Project and Beautifying Sheger have catalyzed the demolition of historic properties without meaningful conservation protocols.

Although awareness and policy-level research are growing, there is a lack of empirical documentation of live conservation processes step-by-step workflows, professional collaboration, and technical decision-making within active Addis Ababa heritage projects. Furthermore, the challenges faced, both technical and managerial, as well as institutional, are not systematically analyzed, nor are the potential for integrating low-cost digital tools explored at the micro-level. This study focuses on four significant historical buildings in Addis Ababa's Arada Sub-City St. Taeka Nigist Be'ata Le Mariam Church, Dejazmach Kebede Tassamas Residence, Teshome Berhe Residence, and Addis Ababa Library, Archives, and Information Center to critically examine current conservation practices, identify systemic shortcomings, and propose solutions aligned with international best practices. This study makes several significant contributions to both academic knowledge and practical conservation efforts. First, it provides the most comprehensive analysis to date of conservation practices in Addis Ababa's Arada Sub-City, systematically documenting current approaches and identifying critical gaps in professional expertise, material use, and regulatory oversight. Secondly, the study offers specific policy recommendations to strengthen Ethiopia's heritage protection system, including proposals for improved contractor certification processes, enhanced training programs for conservation professionals, and more effective mechanisms for inter-institutional coordination. These contributions align with global efforts to promote sustainable heritage management, particularly the United Nations Sustainable Development Goal 11.4, which calls for strengthened efforts to protect and safeguard the world's cultural and natural heritage (UNESCO, 2021).

2. Methodology

This study used a mixed-methods design to examine conservation and restoration of historic buildings in Arada Sub City, Addis Ababa, Ethiopia. Both qualitative and quantitative approaches were used to capture multiple perspectives (Creswell & Creswell, 2018). The research followed sequential phases, starting with problem identification and ending with data analysis and validation. This ensured methodological rigor. The first phase included archival review, research, and informal discussions with heritage professionals and officials (Yin, 2009). This helped define research objectives and select suitable data collection methods. Arada Sub City was chosen for its high concentration of historic buildings. The city’s heritage database lists 89 registered structures (Addis Ababa City Administration Cultural and Tourism Bureau, 2008). This area illustrates both the challenges and opportunities of urban heritage conservation in developing countries (Bandarin & Van Oers, 2012).

For data collection, the study employed a purposive sampling technique to select four historical buildings undergoing active restoration: St. Taeka Nigist Be'ata Le Mariam Church, Dejazmach Kebede Tassamas Residence, Teshome Berhe Residence, and Addis Ababa Library, Archives, and Information Center (Patton, 2015). These cases were chosen based on their

representation of different conservation statuses (well-maintained, needing maintenance, dilapidated) and their architectural significance within the urban fabric of Addis Ababa (Jokilehto, 2017). The sample selection process considered recommendations from local heritage experts and availability of conservation documentation. Primary data collection methods included structured questionnaires, in-depth interviews, and systematic field observations. The questionnaire instrument, consisting of 24 items divided into five thematic sections, was distributed to 28 respondents comprising conservation experts (researchers, planners, conservators, heritage specialists) from Addis Ababa City Administration Culture and Tourism Bureau and Arada Sub City Culture and Tourism Bureau, as well as contractors involved in restoration projects (Dillman et al., 2014). The questionnaire design incorporated both closed-ended questions using Likert scales and open-ended questions to capture quantitative and qualitative data simultaneously (Bryman, 2016).

Semi-structured interviews were conducted with building owners, users, and conservation practitioners to gather detailed insights about conservation processes, challenges, and stakeholder roles (Kvale & Brinkmann, 2009). These interviews, conducted in both Amharic and English, provided rich contextual data about the socio-cultural dimensions of heritage conservation in the Ethiopian context (Smith, 2006). Field observations were systematically recorded using photographic documentation and field notes, enabling triangulation of data from different sources (Yin, 2018). The observational data focused particularly on material conditions, conservation techniques employed, and the relationship between buildings and their urban context. Secondary data were collected through extensive review of academic literature, government reports, conservation guidelines, and heritage inventories (Denzin & Lincoln, 2018). This documentary analysis helped establish the theoretical framework for the study and provided comparative data from other heritage conservation contexts (ICOMOS, 1964). Special attention was given to international conservation charters and their applicability to the Ethiopian context, particularly the Venice Charter and Burra Charter (Australia ICOMOS, 2013).

Quantitative data analysis was performed using SPSS (Version 20), employing various statistical techniques appropriate for the nature of the data (Field, 2018). Descriptive statistics, including frequency distributions and percentage calculations, were used to analyze questionnaire responses.

The Likert scale data were analyzed by calculating mean scores using the formula in equation 1 as follows:

$$MS = \frac{\sum f \times S}{N} \qquad Equ \ldots 1$$

Where f represents frequency of responses, S represents the score, and N represents the total number of responses (Jamieson, 2004).

Spearman's rank correlation coefficient (rs) was calculated to examine relationships between different variables and assess consensus among respondent groups, using the formula in equation 2:

$$rs = 1 - \left[\frac{(6\sum d^2)}{n(n^2-1))}\right] \qquad \text{Equ ... 2}$$

Where d represents the difference between ranks and n represents the number of cases (Pallant, 2020).

Qualitative data from interviews and field observations were analyzed using thematic analysis (Braun & Clarke, 2006). Interview transcripts were coded to identify recurring themes about conservation practices, challenges, and stakeholder views (Saldaña, 2021). Case studies used content analysis, organizing information according to research objectives (Stake, 1995). The analysis focused on factors affecting outcomes, such as institutional frameworks, technical capacity, and community involvement (Waterton & Smith, 2010). To ensure validity and reliability, several strategies were used. Content validity was checked through expert review and pilot testing (Haynes et al., 1995). Internal consistency of questionnaires was measured using Cronbach's alpha, showing high reliability ($\alpha > 0.7$) (Tavakol & Dennick, 2011). Methodological triangulation combined multiple data sources and collection methods, increasing credibility (Denzin, 2012). Ethical standards, including informed consent and confidentiality, were followed (Israel & Hay, 2006). The methodology addressed potential limitations like sampling and data access issues common in heritage research (Pickard, 2007). A mixed-methods approach captured both technical aspects of conservation and socio-cultural dimensions of heritage management (Teddlie & Tashakkori, 2009). This approach provided a strong foundation for analyzing conservation practices in Arada Sub City and for recommending better heritage management strategies.

3. Results and Discussions

This section presents the analysis and discussion of four historic buildings undergoing conservation. The buildings have different ownership types: one private (foreign owner), two government-owned (a public school and a public library), and one owned by the Ethiopian Orthodox Church. Key stakeholders, including building owners, project directors, and institutional representatives, were interviewed. Additionally, 28 questionnaires were given to professionals, including conservation experts and contractor staff. Twenty-seven were completed and returned, giving a high response rate of 96.4%.

The demographic and professional profiles of the respondents are summarized in Table 1. The majority of respondents were male (70.4%), while females accounted for 29.6%. Professionally, 74.1% were conservation experts and 25.9% were contractor staff. Educationally, 85.2% of participants held a first degree (undergraduate), while 14.8% had completed postgraduate studies. The educational level of respondents suggests a solid academic background, which is vital for effective engagement in the technical and contextual demands of heritage restoration projects

(Feilden, 2003). Experience levels among conservation experts were also noteworthy: 15% had less than two years of relevant experience, 60% had two to five years, and 25% had between five and ten years of experience. This reflects a reasonably experienced workforce, which is consistent with international recommendations emphasizing the importance of employing qualified and experienced professionals for the proper execution of conservation work (Jokilehto, 2006).

However, the contractor staff showed a contrasting trend, with only 42.9% having prior experience in similar projects, while 57.1% had none. This reveals a potential skills gap that could hinder the quality and consistency of restoration efforts. According to the Burra Charter (Australia ICOMOS, 2013), successful conservation requires not only interdisciplinary collaboration but also the involvement of practitioners with demonstrated competency in heritage practice. The higher proportion of inexperienced contractor staff may therefore affect project outcomes unless mitigated through training or expert supervision. Moreover, as noted by Avrami et al. (2000), the sustainability of heritage conservation efforts largely depends on the integration of knowledgeable professionals who understand both the material and cultural dimensions of historical sites.

In summary, the findings demonstrate that while conservation experts involved in the projects generally possess the appropriate academic qualifications and relevant experience, a significant portion of contractor personnel lack previous exposure to heritage conservation work. This imbalance underscores the need for more targeted capacity-building and training initiatives to ensure the success and sustainability of restoration efforts in Ethiopia's historical buildings.

Table 1. Distribution of the respondent profile

Respondent category	Frequency	Percentage
Gender distribution of the respondents		
Male	19	70.4
Female	8	29.6
Categories of respondents		
Conservation expert	20	74.1
Contractor staff	7	25.9
Educational status of the respondent		
University undergraduate	23	85.2
University postgraduate	4	14.8
Conservation experts have work experience on a similar project.		
<2 years	3	15
2-5 years	12	60
5-10 years	5	25
Contractors' staff work experience on a similar project		
Yes	3	42.9
No	4	57.1

3.1. General Awareness of Respondents on the Conservation and Restoration Work

Buildings, whether ordinary or historical, inherently have a limited service life, and over time, they are prone to multiple forms of deterioration, including structural weakening, material decay, functional inefficiency, and aesthetic loss. Such problems may arise from natural causes, including aging and weathering, or from human-induced factors such as improper use, lack of regular maintenance, or unsympathetic alterations (Jokilehto, 2017). Heritage buildings are particularly vulnerable because they often utilize traditional construction techniques and materials that are less resilient to modern environmental stresses. The quality and longevity of every building can therefore be guaranteed only through carefully planned and timely maintenance activities.

In this study, the general awareness of respondents regarding conservation and restoration work on historical buildings was evaluated using questionnaires, interviews, and personal observation. Out of the 27 respondents, 74.1% were conservation experts, while the remaining 25.9% were contractor staff directly involved in historical building projects. Interviews were conducted with building owners and users to complement the quantitative data, while site visits provided firsthand insight into the status and restoration processes of selected heritage structures.

3.1.1. Types of Maintenance

Respondents were asked about the type of maintenance they believed should be applied to historical buildings. The data in Table 2 indicate that a majority of respondents (85.2%) support preventive maintenance strategies, either regular or periodic, over reactive maintenance approaches. Preventive maintenance involves routine inspection, cleaning, and repair of minor defects before they evolve into major issues. This is essential for heritage buildings, where improper interventions or delayed repairs may result in irreversible loss of original materials, structural integrity, and historical authenticity.

Table 2. Type of Maintenance

Maintenance Type	Frequency	Percentage
Regular maintenance	14	51.9%
Periodic maintenance	9	33.3%
Maintenance only when a problem occurs	4	14.8%

The preference for preventive maintenance aligns with established conservation principles. Straub (2012) and Feilden (2003) emphasize that preventive measures not only extend the life of historical structures but also reduce the cost and scale of restoration projects. For example, in the Teshome Berhe Residence project, early identification of roof leaks and timber decay enabled timely intervention, preserving much of the original structure while avoiding total reconstruction. Similarly, at the Addis Ababa Library Archives & Information Center, preventive maintenance on roof slabs and masonry walls helped maintain structural and aesthetic integrity despite environmental exposure.

Respondents were asked to compare the maintenance of historical buildings with ordinary buildings. 88.9% of respondents reported that historical building maintenance is more difficult, whereas 11.1% considered it easier. None considered it equivalent. The high percentage (88.9%) reflects the consensus that heritage buildings pose unique challenges. The age of the building, the need to preserve historical authenticity, the use of outdated materials, and traditional construction methods all contribute to the complexity of maintenance tasks. Historical buildings cannot be treated like modern structures because interventions must avoid compromising their cultural, architectural, and historical significance (Jokilehto, 2017). Case studies illustrate this clearly: at Dejazmach Kebede Tassamas Residence, the owner's desire to modify the building required careful negotiation to ensure that restoration preserved the original stone walls and roof design. Similarly, the St. Taeka Nigist Be'ata Le Mariam Church required meticulous attention to detail to maintain the original religious architecture while addressing structural decay.

3.1.2 Factors Making Maintenance Difficult

Respondents were asked to rate the significance of factors that make historical building maintenance challenging. The results, summarized in Table 3, show that historic value and age of the building are the most critical factors, followed closely by construction materials and methods.

Table 3. Factors that make historical building maintenance difficult

Parameter	Very High (%)	High (%)	Neutral (%)	Low (%)	Very Low (%)
Historic value	70.4	18.5	11.1	–	–
Material used	63.0	22.2	11.1	3.7	–
Construction method	63.0	22.2	11.1	3.7	–
Life span	70.4	18.5	11.1	–	–

The findings underscore that the historical and cultural significance of a building is not merely an abstract concern; it directly affects maintenance strategy. High-value heritage buildings require interventions that respect original materials and construction techniques, which are often difficult to source or replicate. For example, at Teshome Berhe Residence, the contractor had difficulty obtaining original roof sheets with the correct thickness in the market. In the Addis Ababa Library project, external floor finishes had to be replaced with materials that were visually similar but slightly different due to market limitations. Material and method considerations are similarly critical in the restoration of heritage buildings. Many historical buildings employ stone, mud, lime, timber, and traditional masonry techniques that demand specialized knowledge and careful handling of old buildings (ICOMOS, 2021). Failure to use the original material is one of the factors that can lead to accelerated decay or loss of authenticity (Feilden, 2003; Matero, 2000).

The results of this study indicate that preventive maintenance is the preferred strategy for historical buildings, with 85.2% of respondents favoring regular or periodic interventions. Preventive maintenance is critical in mitigating both structural and aesthetic deterioration in

heritage buildings conservation and restoration practice (Feilden, 2003). Early identification and repair of defects not only prolongs the life of historic structures but also minimizes financial and material costs associated with large-scale restoration. Jokilehto (2017) underscores that heritage buildings are particularly vulnerable to environmental and human-induced degradation due to their age, material composition, and historical construction methods. These factors often render standard maintenance techniques insufficient, necessitating tailored conservation strategies. This perspective resonates with the responses from conservation experts in this study, who highlighted historic value and life span as the most significant factors complicating maintenance efforts. The observation that 88.9% of respondents consider historical building maintenance more difficult than ordinary buildings reflects this consensus.

Material sourcing and specialized construction techniques are major challenges in heritage projects. Case studies show that authentic materials are often scarce, costly, or need special skills (Matero, 2000). In Addis Ababa, obtaining historically accurate roof sheets or floor finishes is difficult. This reflects a global challenge in heritage preservation. Material adaptation must balance historical accuracy with practical limits (Feilden, 2003; Matero, 2000).

Professional capacity is critical. Multidisciplinary collaboration among architects, engineers, conservators, and skilled artisans is essential for successful restoration (Avrami et al., 2000). The Addis Ababa case studies confirm this. Conservation experts, contractors, and consultants work together to preserve historical integrity while addressing structural needs. Preventive maintenance supports long-term sustainability. Systematic preventive interventions reduce the risk of major failures and protect both cultural value and building function (Straub, 2012). Respondents preferred regular maintenance and staged restoration. For example, roof repairs at Teshome Berhe Residence and wall cleaning at Addis Ababa Library prevented irreversible damage. Community involvement also matters. Local understanding and commitment improve conservation outcomes (Howard, 2003). Including building owners and contractor staff in surveys shows the practical importance of engagement. In the Dejazmach Kebede Tassamas Residence, owners' cooperation ensured restoration respected historical authenticity.

3.1.3. Process of Conservation and Restoration Work on Historical Buildings

The process of conservation and restoration of historical buildings is inherently multi-phased. It requires meticulous planning, careful implementation, and precise execution to safeguard both the structural integrity and cultural significance of heritage structures. In line with established conservation frameworks (Duguay, 1992; Jokilehto, 2017). This study investigates the practices adopted in historical building projects within Arada Sub City, Addis Ababa, with particular emphasis on how each stage of the process is operationalized in real-world contexts.

3.1.3.1. Planning Stage

The planning stage is recognized as the foundation for the conservation and restoration process. This demands that all interventions are systematic, evidence-based, and historically accurate (Duguay, 1992; Jokilehto, 2017). It encompasses activities such as gathering proper

information on historical buildings, defining the scope of work, preparing detailed intervention plans, and establishing criteria for contractor selection. The survey results indicate a unanimous recognition among conservation experts of the importance of having a structured plan before initiating restoration work. According to the current study results, 80% of respondents strongly agreed, and 20% agreed that a plan is essential. Personal observations of the four selected historical building projects confirmed that all projects possessed comprehensive written plans detailing procedures for problem identification, contractor selection, and restoration inspection. The importance of gathering information on historical buildings before restoration was also assessed. The study result depicts 92.6% of respondents strongly agreed on its importance, while 7.4% agreed, demonstrating uniform professional acknowledgment of evidence-based planning.

Contractor staff were asked to report the amount of information collected before commencing restoration work. The findings indicate that 28.6% of respondents collected a very high amount, 57.1% collected a high amount, and 14.3% initially perceived the information as sufficient but later realized it was inadequate. Conservation experts reported that 85% of the gathered information was applied effectively during the restoration process, while 15% were neutral regarding its use. These results are summarized in Table 4.

Table 4. Amount and use of information collected

Indicator	Very high (%)	High (%)	Neutral (%)	Low (%)	Very low (%)
Amount of information collected by contractor staff	28.6	57.1	0.0	14.3	0.0
Use of collected information by conservation experts	85.0	0.0	15.0	0.0	0.0

The purpose of the information collected was also examined to understand its application. As shown in Table 5, 11.1% of respondents used the information for material selection, 29.6% for preserving historical value, and 59.3% for both purposes, reflecting the dual objective of practical restoration and heritage preservation.

Table 5. Use of collecting information in conservation and restoration work

Purpose	Percentage (%)
For the selection of material	11.1
To keep the historical value	29.6
For both	59.3

Different methods of data collection were also ranked according to the amount of information obtained. Direct observation was rated “very high” by 65% of respondents, structural analysis and research by 60%, previous documents by 55%, and specific tests by 45%, as shown in Table 6.

Table 6. Data collection methods used for restoration work

Method	Very High (%)	High (%)	Neutral (%)	Low (%)	Very Low (%)
Direct observation	65	35	–	–	–
Specific test	45	35	5	15	–
Previous document	55	45	–	–	–
Structural analysis	60	40	–	–	–
Conducting research	60	30	–	10	–

The results of the study underscore the centrality of evidence-based planning in the conservation and restoration of historical buildings. The unanimous agreement among conservation experts regarding the importance of structured planning and comprehensive information gathering reflects a professional consensus that meticulous preparation is crucial for successful interventions. Direct observation emerged as the most relied-upon method, highlighting the emphasis on hands-on, on-site assessment to detect visible deterioration, assess structural integrity, and identify the extent of damage before commencing any restorative work. Evidence based planning ensures that subsequent interventions are grounded in the real conditions of the building rather than assumptions of information or incomplete data.

The dual purpose of gathering information for both material selection and preservation of historical value demonstrates a holistic understanding of conservation principles to keep its originality. Professionals are not merely focused on technical restoration but are equally committed to maintaining the authenticity, cultural significance, and historical integrity of heritage structures (ICOMOS, 2013).

The variation in information gathered by contractor staff shows the need for continuous monitoring and feedback at the planning stage. Experts reported that 85% of the collected data was used. This proves planning is not a static document but a living guide for decision-making. Strong planning helps anticipate challenges, reduce errors, and protect historical value. It also lowers financial and time risks. Ashworth (2011) stresses that careful planning based on research prevents errors and preserves authenticity. Rodwell (2020) notes that evidence-based planning supports sustainable conservation. The Venice Charter (ICOMOS, 2013) calls for detailed study and documentation before any work begins. Structural analysis, archival research, and testing improve planning reliability.

They guide material choice and restoration techniques. In Ethiopia, Yared and Getachew (2021) found that adaptive planning improves success in Addis Ababa projects. This study confirms the same in Arada Sub City. Projects here combine technical needs with cultural values. Weak planning often causes failure. Errors in materials or sequencing can lead to damage (Duguay, 1992; Jokilehto, 2017). In this study, the high use of collected data shows risks were reduced. Both

technical and cultural factors were addressed together. This creates a model for context-sensitive planning in Ethiopian heritage projects.

3.1.3.2. Implementation Stage

The implementation stage represents the second critical phase of the conservation and restoration process, translating the detailed plans developed during the planning stage into actionable interventions. According to Duguay (1992), this stage encompasses activities such as preparing preservation strategies, developing working drawings and specifications, conducting research, and providing recommendations on preservation briefs. It is during this phase that theoretical planning is operationalized, and the effectiveness of prior information gathering is tested through actual intervention practices.

In this study, conservation experts were asked to rate the extent to which various implementation-stage activities were performed in current historical building projects in Arada Sub City. The results, summarized in Table 7, indicate that preparing preservation strategies was highly implemented by 100% of respondents, with 70% rating it as very high and 30% as high. Giving recommendations on preservation briefs and conducting research were also reported as highly implemented activities by 95% of respondents, illustrating the emphasis placed on professional guidance and investigative analysis. The impact of interventions was highly illustrated, according to 90% of respondents, and the preparation of drawings and specifications was rated as highly performed by 85% of respondents.

Table 7. Level of performed activities in the implementation stage

Activities on the implementation stage	Very high (%)	High (%)	Neutral (%)	Low (%)	Very low (%)	Rank
Preparing preservation strategies	70	30	–	–	–	1
Giving recommendations on the preservation brief	40	55	5	–	–	2
Illustrate the impact of the intervention	40	50	5	5	–	3
Preparing drawings and specifications	45	40	5	10	–	4
Conducting research	45	50	–	5	–	2

The calculated effect size using Cramer's V for these activities ranges from 0.85 to 1.0, indicating strong agreement among respondents regarding the extent to which these implementation activities were executed. The high effect sizes demonstrate the consistency and uniformity of performance across the selected historical building projects, reflecting a well-organized implementation process. The study also highlights the relative prioritization of activities. Preparing preservation strategies emerged as the most consistently performed activity, suggesting that all projects place foundational emphasis on defining actionable conservation measures. Giving

recommendations on preservation briefs and conducting research were closely ranked, reflecting the dual focus on informed decision-making and evidence-based intervention.

Strong performance in preparing preservation strategies and conducting research shows that conservation experts focus on both technical and historical integrity before the execution stage. This matches leading international practices. Evidence-based methods, proper documentation, and strict analysis are vital. They reduce risks such as material mismatch, structural failure, or false historical representation (Ashworth, 2011; Rodwell, 2020).

The implementation stage requires a clear translation of plans into operational work. This stage demands both technical accuracy and respect for heritage authenticity (Ashworth, 2011). High-quality documentation is essential. Working drawings and research reports are key tools for sustainable heritage management (Rodwell, 2020). Intervention strategies must be grounded in evidence. They should be carefully planned and monitored during execution. This protects the historical and cultural value of buildings (ICOMOS, 2013, 2017b). Research in Ethiopia supports this view. Yared and Getachew (2021) highlight the importance of strong implementation frameworks in urban heritage conservation. In Addis Ababa, restoration projects succeed when research, preservation strategies, and technical documentation are fully integrated and prioritized. The current study confirms this. It quantifies the relative performance of these activities. It also shows strong professional agreement on what defines an effective implementation stage.

3.1.3.3. Execution Stage

The execution stage represents the final and decisive phase of the conservation and restoration process. This stage is focused on contractor selection, construction activities, and commissioning, translating planning and implementation efforts into tangible outcomes. The success of this phase is critical, as improper execution can compromise structural integrity, historical authenticity, and overall project quality. According to Duguay (1992), the execution stage ensures that restoration interventions are operationalized effectively, with clear adherence to technical, financial, and heritage standards.

Table 8. Most commonly used bidding methods and bidding methods used on selected projects

Category	Open Bidding Method (%)	Short List Bidding Method (%)	Negotiation Bidding Method (%)
Most commonly used bidding method by conservation experts	60	15	25
Bidding method used to select contractors on selected projects	71.4	28.6	–

Contractor selection is a foundational activity in the execution stage. Conservation experts were asked to identify the most commonly used bidding methods for selecting contractors in historical building projects. As presented in Table 8, 60% of conservation experts reported that

open bidding was the most common method, 25% favored negotiation bidding, and 15% cited short-listed bidding. Contractor staff were asked which method was used for their assignment in current projects, with 71.4% reporting open bidding and 28.6% short-listed bidding.

Chi-square analysis revealed χ^2 (2, N=20) = 7.2, $p < 0.05$, indicating a statistically significant preference for open bidding, with a moderate effect size (Cramer's V = 0.6). This demonstrates that transparency and fairness are prioritized in contractor selection, reducing potential bias in project allocation and supporting professional and ethical practices.

Contractor selection criteria play a pivotal role in determining the quality and effectiveness of restoration execution. Respondents rated the importance of various criteria, as summarized in the Table 9, which combines level of importance and rank:

Table 9. Contractor Selection Criteria with Importance Level and Rank

Selection Criterion	Very Important (%)	Important (%)	Neutral (%)	Less Important (%)	Not Important (%)	Rank
Related experience (past performance)	85.9	14.8	–	–	–	1
Value of total contracts	44.4	51.9	3.7	–	–	2
Financial strength	48.1	44.4	3.7	3.7	–	3
Management capability	44.4	40.7	7.4	7.4	–	4
Relationship with subcontractors	29.6	25.9	14.8	29.6	–	5

The chi-square test for the importance of contractor selection criteria produced χ^2 (4, N=27) = 19.6, $p < 0.001$, with Cramer's V = 0.82, demonstrating a strong consensus among respondents regarding the prioritization of technical competence, prior experience, and financial capability in contractor evaluation. Personal observation reinforced these findings, indicating that technical expertise accounted for 70% of contractor evaluation weight, while financial strength represented 30%. Other criteria included proposed work methodology, availability of skilled staff (e.g., masons, carpenters), and professional project management staff. Notably, one religious building project restricted selection to contractors affiliated with the Orthodox Church, highlighting context-specific adaptations in contractor selection.

The results from the execution stage showed that contractor selection is the most important factor for project success. Technical experience, past performance, and financial capacity are consistently ranked as top priorities. These factors directly affect structural integrity and the historical authenticity of restoration work. Open bidding is the most common method. It increases transparency and reduces conflict. It also ensures fair opportunities and promotes competitive

quality. The use of weighted evaluation criteria shows a balanced approach. Technical skills receive the highest weight. Financial and management capacity are also essential. They provide the resources and oversight needed for efficient project execution. The study also showed that context can influence selection. For example, religious affiliation can shape selection rules in specific projects. This does not, however, compromise the conservation goals. The chi-square results with high effect sizes indicate strong agreement among professionals. This confirms that the execution stage is well aligned with planning and implementation. Restoration interventions are not only technically sound but also ethical and culturally appropriate.

Ashworth (2011) states that technical competence is the most reliable predictor of quality in conservation projects. Rodwell (2020) highlights that contractor expertise ensures structural safety, compliance with design, and protection of authenticity. The Venice Charter (ICOMOS, 2013) also stresses the need for competent and ethically guided teams. These are essential for effective heritage interventions. Yared and Getachew (2021) found similar results in Addis Ababa. Projects that prioritized technical skills, experience, and strict evaluation criteria had fewer execution errors. They also achieved higher conservation standards. The current study builds on this evidence. It quantifies professional consensus on contractor selection. The results show strong alignment between international best practices and local project realities.

3.2. Professional Involvement in Selected Conservation–Restoration Projects

The conservation and restoration of historical old buildings is an inherently interdisciplinary process. Demands the integration of technical, historical, architectural, and scientific expertise before deciding on the maintenance. No single professional discipline can comprehensively address the multifaceted challenges inherent in restoring historic structures because of its complexity (Zancheti, 2014). Similarly, ICOMOS (2005) stresses that effective conservation relies on a coordinated effort among architects, engineers, conservation specialists, historians, archaeologists, and planners, ensuring both the structural stability and cultural authenticity of heritage buildings. The study first identified the professional backgrounds of respondents participating in the selected projects. Data were collected through structured questionnaires, and the frequencies of professionals involved are summarized in Table 10.

Table 10. Professionals Involved in Selected Historical Building Projects

Professionals	Frequency
Project Manager	2
Conservation Specialist	4
Architect	4
Engineer	7
Historian	5
Archaeologist	5
Total	27

Engineers represented the largest proportion of professionals (25.9%), followed by historians and archaeologists (18.5% each), architects and conservation specialists (14.8% each), and project managers (7.4%). These distributions highlight a focus on technical and structural expertise, consistent with the need to ensure structural stability during restoration activities. Nevertheless, the notable presence of historians and archaeologists demonstrates recognition of the importance of cultural and historical considerations in maintaining authenticity.

Professional diversity facilitates effective communication among different experts, ensures scientific and evidence-based approaches to restoration, maintains the historical and material integrity of structures, and enables precise diagnosis of structural problems prior to intervention. Multidisciplinary input enhances decision-making quality and minimizes risks of damage during conservation (Zancheti, 2014). Personal observation confirmed that the availability of professional staff was a key criterion for selecting contractors in restoration work. Contractors were chosen based in part on their capacity to assemble multidisciplinary teams, including architects, engineers, masons, and archaeologists, reflecting a commitment to best international practice.

Survey respondents were asked whether conservation and restoration could be effectively carried out by a single professional. The majority (63%) strongly disagreed, and 18.5% disagreed, with only 14.8% strongly agreeing, and 3.7% neutral. This indicates that 81.5% of participants rejected the single-professional model. Chi-square analysis revealed this distribution was significantly different from a uniform expectation (χ^2 (3) = 19.42, $p < 0.001$), with a strong effect size (Cramer's V = 0.62). This reinforces the notion that conservation is intrinsically collaborative, requiring complementary skills to address structural, aesthetic, and historical dimensions simultaneously (ICOMOS, 2005; Stubbs, 2009).

The study also explored perceptions of nonprofessional involvement. A substantial 96.3% of respondents reported that nonprofessionals cannot adequately conduct conservation work, highlighting the risks of compromising historical authenticity. Correspondingly, 96.3% identified a high likelihood of historical value loss if nonprofessionals perform restoration, with only 3.7% considering the risk low. Chi-square tests confirmed statistical significance (χ^2 (1) = 22.26, $p < 0.001$) with a very strong effect size (Phi = 0.91), indicating almost unanimous consensus. These findings align with UNESCO (2021), which emphasizes that inappropriate interventions by untrained personnel can cause irreversible damage to heritage structures.

Respondents were asked to rate the importance of specific professional groups in restoration work, with results summarized in Table 11.

Architects are considered the most critical professionals, with nearly 89% rating their contribution as "very high," followed by engineers at 70.4%. Historians and planners also received high ratings, reflecting the recognition of their roles in preserving historical accuracy. Archaeologists were rated very high by 44.4% of respondents, but opinions were more varied, suggesting that their importance may be context-dependent based on the nature of the Historical building to be restored or the specific intervention.

Table 11. Perceived Importance of Professionals in Conservation and Restoration

Profession	Very High (%)	High (%)	Neutral (%)	Low (%)
Architect	88.9	11.1	–	–
Engineer	70.4	29.6	–	–
Planner	63.0	25.9	11.1	–
Historian	63.0	29.6	7.4	–
Archaeologist	44.4	14.8	37.1	3.7

The findings depict the critical importance of multidisciplinary professional involvement in conservation and restoration projects. Engineers are particularly critical in diagnosing structural deterioration, evaluating load-bearing capacities, and designing interventions that maintain both the building's stability and heritage value. Architects, on the other hand, play a central role in maintaining aesthetic authenticity, ensuring that restoration efforts are aligned with the original design intent and architectural heritage of the structures. The high representation and perceived importance of planners, historians, and archaeologists further emphasize the multidimensional nature of heritage conservation. Planners contribute to the strategic coordination of resources, scheduling of tasks, and adherence to regulatory frameworks, which are critical for smooth execution. Historians provide contextual understanding of cultural, historical, and social significance, which informs decisions about which features to preserve, reconstruct, or replace. Archaeologists contribute to accurate material and construction documentation, especially in cases where buildings have significant subsurface or hidden elements. This combination of technical and cultural expertise ensures that interventions are both scientifically sound and historically respectful.

The consensus against single-professional or nonprofessional involvement highlights the complexity of the conservation process. With 81.5% of respondents rejecting the single-professional approach, and 96.3% emphasizing the risk of historical value loss when nonprofessionals are involved, the data underscore the inherent risks of limited expertise. Chi-square tests confirmed statistically significant patterns with moderate to strong effect sizes, reinforcing the importance of structured, collaborative teams. These results suggest that failure to incorporate multiple expert perspectives could compromise not only structural integrity but also the cultural and historical authenticity of the buildings. The study shows variation in how professionals are valued. Architects and engineers are almost always rated as "very high" in importance. Archaeologists, however, show more mixed ratings. This means the role of each professional depends on the context. The type of building, the intervention required, and the project goal all influence this. For example, religious buildings often need architects and engineers for structural reasons. Historical or archaeological sites need more input from historians and archaeologists.

Conservation and restoration are not only technical tasks. They are interdisciplinary and depend on context. Structural, aesthetic, historical, and social factors must be considered. Involving different professionals supports evidence-based decisions. It reduces risks and helps follow international standards. Matero (2000) stresses that collaboration is essential. No single professional can deal with material decay, authenticity, and structural needs at the same time. Jokilehto (2017) also identifies architects and engineers as key actors. At the same time, he shows the vital role of historians and archaeologists in protecting cultural meaning.

Ndoro (2006) observes a challenge in African heritage projects. A lack of professional diversity often leads to technical solutions that ignore cultural or historical aspects. This creates incomplete or unsuitable restorations. In Arada Sub City, however, this study found progress. Historians, archaeologists, and planners are now included in teams. This shows an effort to align local practice with global standards. ICOMOS (2005) and UNESCO (2021) both call for structured, multidisciplinary approaches. They combine technical, historical, and cultural expertise. The results of this study support these recommendations. Collaboration improves decisions, increases preservation quality, and lowers the risk of damaging historical integrity. Including planners is also new in Ethiopia. It shows growing awareness of the need for coordination and systematic documentation.

The study also adds to debates on professional roles. Engineers and architects still dominate. Yet cultural and historical experts are gaining more recognition. This signals a shift toward holistic conservation. Stubbs (2009) argues that technical, historical, and social expertise must be combined. This ensures conservation is both durable and meaningful. The findings confirm this. Professional diversity is not just helpful; it is necessary. This study adds new evidence from a developing country. It shows that balanced, multidisciplinary teams improve both process and results. It also adds a strong methodological contribution. The use of chi-square and effect size provides a statistical approach. This complements the mostly qualitative literature on heritage conservation.

3.3. Challenges of Conservation and Restoration Work on Selected Projects

Conservation and restoration work on historical buildings is inherently complex, facing a multitude of technical, managerial, financial, and social challenges. As Abdulrahman et al. (2008) categorize these challenges include technical problems, management and administrative difficulties, financial constraints, unavailability of skilled manpower, human behavior and attitude issues, spare parts availability, and lack of institutional and training facilities. Understanding these challenges is critical to developing effective strategies that ensure both structural integrity and historical authenticity. In this study, the challenges were analyzed through a questionnaire administered to conservation experts and contractors, supplemented by interviews with building owners and users. The survey included 15 specific challenges grouped into six categories, with respondents rating the severity on a scale of 0 to 4. Table 12 presents the mean scores (MS) of each category for both conservation experts and contractors, alongside the weighted average (WA) to identify overall priorities.

Table 12. Challenges of Conservation and Restoration Work

Challenges in the conservation and restoration work	MS Conservation Expert	Rank	MS Contractors	Rank	WA MS	Rank
A. Technical Problems						
Usage of new material instead of the original material	2.55	2	3.00	6	2.77	9
Poor quality control	2.75	1	3.29	4	3.02	6
Unavailability or poorly written operation and maintenance manual	2.45	5	3.14	5	2.79	8
B. Management and Administrative Problems						
Planning and organization problem	2.20	8	2.43	10	2.31	15
Performance and execution of the maintenance task problem	2.30	7	2.57	9	2.43	13
Lack of a method for the classification of maintenance contractors	2.40	6	2.57	9	2.48	12
Lack of uniform specifications, codes, and a uniform maintenance contract	2.60	2	3.57	3	3.08	4
Financial Problems	2.50	4	3.57	3	3.03	5
Unavailability of Skilled Manpower	2.55	3	3.29	4	2.92	7
Human Behavior and Attitudes						
Lack of public awareness about maintenance	2.50	4	2.57	9	2.53	11
Misuse of facilities after completion	2.60	2	2.86	7	2.73	10
Spare Parts Problems						
Unavailability of original material and tools in the local market	2.75	1	3.71	2	3.23	2
Obsolescence of original materials	2.75	1	3.86	1	3.30	1
Lack of proper tools to perform maintenance work	2.75	1	3.75	3	3.25	3
Lack of Institutional and Training Facilities	2.10	9	2.71	8	2.40	14

Analysis of the data reveals several patterns. For conservation experts, technical problems related to poor quality control and spare parts (including obsolescence and unavailability) are ranked highest with a mean score of 2.75. Following closely are misuse of facilities and lack of uniform specifications, indicating that both technical and human factors play substantial roles in creating challenges. Unavailability of skilled manpower was ranked third (MS = 2.55), reflecting moderate concern. Contractors, on the other hand, identified spare parts issues as their most significant challenges.

Obsolescence of original materials (MS = 3.86), lack of proper tools (MS = 3.75), and unavailability of original materials in the local market (MS = 3.71) emerged as the top three constraints. Financial and technical issues also ranked high, confirming the interdependence of resource availability, funding, and material quality. When weighted across both respondent categories, the top three challenges for the projects overall remain within the spare parts category, followed by poor quality control and financial problems. The lowest-ranked challenges are planning and organization issues, lack of institutional training, and execution of maintenance tasks, suggesting that procedural problems are secondary to material and technical constraints.

A chi-square test was performed to examine the distribution of challenge rankings between conservation experts and contractors. The result was statistically significant ($\chi^2(14) = 26.84$, $p < 0.05$) with a Cramer's V effect size of 0.34, indicating a moderate association between professional role and perception of challenges. This finding highlights that while both groups recognize the importance of spare parts and material issues, the prioritization of challenges differs slightly depending on their operational role and responsibilities. Interviews with building owners and users showed that long delays in getting permits and weak inspection systems often turn small maintenance problems into bigger structural damage.

The shortage of original materials and spare parts was identified as the biggest challenge, directly affecting the quality and authenticity of restoration work. Financial problems, though not ranked the highest, still slow down material procurement, limit skilled labor, and reduce quality control. The statistical results (χ^2 (14) = 26.84, $p < 0.05$; Cramer's V = 0.34; $r_s = 0.789$) also showed some differences in how experts and contractors view the problems: experts focus more on technical standards, while contractors worry more about the availability of tools and materials. This means better coordination and teamwork are needed to bridge these perspectives and improve project outcomes.

The findings are consistent with international studies but also highlight local conditions in Arada Sub City. Previous research, such as Abdulrahman et al. (2008) and Ndoro (2006), pointed to similar issues of material shortages, financial limits, and bureaucratic delays in Africa. Matero (2000) and Jokilehto (2017) stressed that collaboration and careful planning are key, which this study also confirms. Likewise, Sutherland (2010) and Zancheti (2014) emphasized the need for authentic materials and multidisciplinary teamwork, matching the results here. Overall, the study shows that successful conservation depends on addressing three linked areas: reliable material supply, strong technical expertise, and efficient administration. Focusing on these together can

help preserve both the structure and the historical value of buildings. The analysis of challenges in conservation and restoration projects, as presented in Table 13, revealed differences in the perception of severity between conservation experts and contractor staff. While both groups agreed that spare parts issues are the most significant challenges, the ranking of other categories, such as technical, financial, and administrative problems differed. To quantify the degree of agreement between these two respondent groups, the Spearman's rank correlation coefficient (rs) was employed.

Spearman's correlation coefficient is a non-parametric measure of statistical dependence between two ranked variables, making it suitable for ordinal data such as the rankings of challenges in this study. The null hypothesis (H_0) assumes that there is no significant agreement between the rankings provided by conservation experts and contractors, while the alternative hypothesis (H_1) assumes that there is a significant agreement between the two respondent groups. The rankings of the 15 identified challenges from each respondent category were analyzed, and the Spearman's correlation coefficient was computed using equation 3.2 from the methodology chapter. The results were also cross-validated using SPSS version 20 for accuracy.

Table 13. Spearman's correlation coefficients among respondents

Respondent's Category with Respective Correlation Coefficients		**Conservation Expert**	**Contractor Staff**
Conservation Expert	Correlation Coefficient	1.000	0.789
	Number of challenges	15	15
Contractor Staff	Correlation Coefficient	0.789	1.000
	Number of challenges	15	15

Correlation is significant at the 0.01 level (1-tailed).

The calculated Spearman's correlation coefficient ($r_s = 0.789$) indicates a strong positive correlation between the rankings of conservation experts and contractor staff. Since the critical value of r_s for 15 observations at $\alpha = 0.01$ is 0.645, the calculated value exceeds this threshold, confirming that the agreement between the two groups is statistically significant. The analysis of challenges faced in conservation and restoration work on selected historical building projects reveals a complex interplay between material, technical, administrative, and human factors. The quantitative findings from the questionnaire (Table 4.8) indicate that spare parts problems—specifically the obsolescence of original materials, unavailability of tools, and difficulty in sourcing authentic historical materials—are perceived as the most critical challenges by both conservation experts and contractors.

This is reinforced by the calculated weight averages (WA MS) of 3.30, 3.25, and 3.23, respectively, which place these issues at the top of the overall challenge ranking. The Spearman rank correlation coefficient ($rs = 0.789$, $p < 0.01$) demonstrates a statistically significant strong positive agreement between conservation experts and contractors. This implies that across

professional perspectives, there is consistency in identifying the major obstacles affecting conservation and restoration work. The moderate-to-strong effect size (Cramer's V = 0.56) further indicates that these challenges are not only statistically significant but also practically meaningful in the local context.

The interpretation of these findings highlights several critical insights. First, the predominance of material-related issues suggests that logistical and procurement planning is a central determinant of project success. While financial constraints and unavailability of skilled manpower are often emphasized in international studies, the data from Arada Sub City show that technical and material challenges outweigh financial constraints, pointing to a contextual specificity in the Ethiopian setting.

The study found a strong positive correlation between respondents' perceptions. Multi-disciplinary collaboration is crucial in identifying and prioritizing conservation challenges. Both experts and contractors highlighted the same top problems, confirming that integrated teams can achieve consensus across professional boundaries. Interviews with building owners and users reinforced these findings. The interview revealed that bureaucratic delays and weak inspection practices intensify material procurement issues, leading to cascading project delays and risks to historical integrity. These results indicate that overcoming conservation challenges requires not only technical expertise but also regulatory and administrative reforms of concerned bodies.

3.4. Analysis and discussion of case studies

The case studies were conducted on four historical building projects currently undergoing active conservation and restoration, all located in Arada Sub-city. The selected buildings include St. Taeka Nigist Be'ata Le Mariam Church, Teshome Berhe Residence, Dejazmach Kebede Tassamas Residence, and the Addis Ababa Library, Archives & Information Center. The information in this section is organized under several subheadings: building description, conservation and restoration process, technical analysis, and major challenges encountered during restoration. The restoration works for all four projects are discussed in detail as follows:

3.4 1. St. Taeka Nigist Be'ata Le Mariam church

St. Taeka Nigist Be'ata Le Mariam Church is the first circular-plan church in Ethiopia, constructed around 1900 over the tomb of Emperor Menelik II as a mausoleum (Addis Ababa City Administration Cultural and Tourism Bureau, 2008). In 1920 EC, during Emperor Haile Selassie's reign, a large addition with European-style architectural elements was added under the supervision of the German architect Carl Haertel (Alamy Stock Photo, 2020). The church also holds historical significance as the site where the Patriarch of Alexandria visited in 1922 EC for the first ordination in Ethiopian Orthodox Church history. Located in Arada Sub City, Kebele 15, along Itegue Menen Street in Addis Ababa, the church is fully owned and maintained by the Ethiopian Orthodox Church. Architecturally, the building features a symmetrical exterior, four entrances with historical symbols, eight copper lion monuments, and a basement museum containing church treasures as well as the tombs of Emperor Menelik II and Emperor Zewditu (Alamy Stock Photo, 2020). Minor

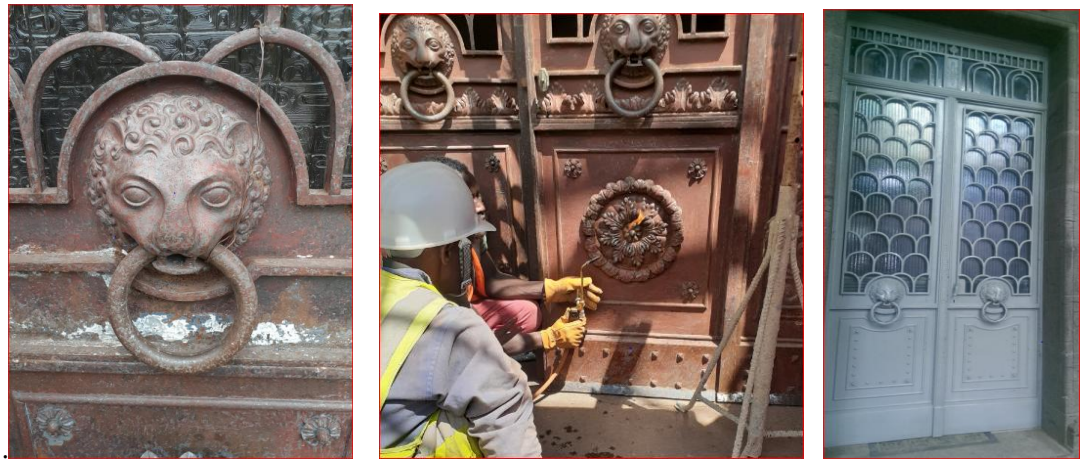
maintenance work was conducted on the roof 15 years ago, and the church was recorded as well-maintained in 2008 EC (Addis Ababa City Administration Cultural and Tourism Bureau, 2008). However, starting from 2010 EC, the church faced serious drainage problems, which caused water infiltration during the rainy season, leading to damp walls, growth of algae, and damage to materials in the basement museum (Alamy Stock Photo, 2020).

Restoration work began at the end of 2011 EC with a contract amount of 16.7 million ETB, involving Misac General Contractor, Fasil Giorgis Consultant, the Ethiopian Orthodox Church, and supervision by Addis Ababa City Administration Culture & Tourism Bureau. The restoration process involved cleaning and repainting walls, maintaining 16 steel-alloy doors, and covering broken windows with canvas paintings due to unavailability of original glass (Alamy Stock Photo, 2020). For example, the eight copper lion monuments and their supporting masonry walls were cleaned to remove corrosion, salt efflorescence, and fungal colonies, while cracks in the masonry were plastered, preserving their historical and cultural value. External and internal staircases were cleaned and repaired due to algae, fungi, and smoke damage. The top structures of the church, including the cross, crown, and cast-iron pillars, were heavily corroded because of poor drainage, requiring full restoration, welding, and repainting (Alamy Stock Photo, 2020).

Several major challenges were faced during the restoration. The restoration contract was awarded before the building investigation was fully completed, causing delays as new structural problems and material deterioration were discovered. Tests on original materials, especially the pillars, revealed altered properties, making it difficult to select suitable replacement materials. Additionally, original materials were unavailable in the local market, and funding the restoration was challenging, as the Ethiopian Orthodox Church relies on contributions from followers. Physical constraints, such as confined spaces and high winds on the top of the building, made maintenance work particularly difficult. These challenges required careful coordination between the contractor, consultant, and cultural bureau to preserve the historical and religious value of the church. Figures 1 to 5 illustrate the external and internal views of the church, basement museum, door and window restorations, lion monuments, staircases, and the top structures before and after restoration.

A) External part of the church B) Internal part of the church

Figure 1. St. Taeka Nigist Be'ata Le Mariam church (Source; Alamy stock photo, 2020)



A) Rusted door B) Firing process C) Painted door

Figure 2. The status of the door of the building before, during and after restoration work

A) Lion monument before restoration work B) Lion monument after restoration work

Figure 3. The status Lion monument with its support masonry wall

A) Algae and fungi colony on external staircase B) cleaning work on external staircase

Figure 4. The status of the external staircase

A) Deteriorated cross surface B) painted cross surface

Figure 5. Upper cross before and after restoration work

3.4.2. Teshome Berhe residence

Teshome Berhe Residence, located in Arada Sub City, Kebele 11 along Adawa Street, was constructed in the 1930s and is currently owned by the government, serving as Htsanalem Public School (Addis Ababa City Administration Cultural and Tourism Bureau, 2008). The building features a small tower with a decorative roof and small pane windows. Over time, structural deterioration due to aging, weathering, termite activity, and poor drainage put the building at risk, prompting a full restoration. The pre-restoration process, including investigation, documentation, and contractor selection, lasted nearly one year, after which the restoration began with a total contract value of 3.5 million ETB, involving Tewolde and Brhane Construction Work Partnership as the contractor, the Addis Ababa City Administration Cultural and Tourism Bureau as consultant, and Htsanalem Public School as the owner.

The conservation and restoration process involved a detailed assessment, which revealed severe deterioration of walls, roof, and flooring, while doors, windows, and window frames required minor maintenance. The walls, made of mud and wood, exhibited cracks and decay, particularly in the wooden ties. Restoration included replacing severely damaged wood, treating partially decayed wood with protective oil, and using a fermented mixture of red soil and lime to retain historical authenticity. Doors and windows were smoothed, painted, and had some locks replaced. The veranda guardrail, originally timber and glass, was restored with new timber while broken glass was removed but not replaced. The roof, including attic and pane windows, had corroded sheets and damaged timber trusses; restoration involved replacing roofing sheets, repairing trusses and attic walls, fixing the drainage system, and repainting the roof. Timber floors and external staircases were repaired or replaced and treated with protective oil, while the internal steel-and-timber staircase required only minor maintenance. Ceilings made of abujede were partially replaced and painted, lighting fixtures were restored, and historical bathroom fixtures

were cleaned and preserved to maintain authenticity. Several major challenges were encountered during the restoration. The unavailability of original materials, particularly thick roofing sheets, made it difficult to match historical specifications. Financial constraints affected the project, including delayed contractor payments and issues with additional work costs. Additionally, incomplete drawings and specifications posed difficulties during restoration, requiring careful judgment to maintain the building's historical and structural integrity. Despite these challenges, the project successfully preserved the originality and historical value of the residence, as illustrated in Figures 6 to 8, which show the building before and after restoration.

A) External part of the building before restoration B) External part of the building after

Figure 6. The status of Teshome Berhe Residence

A) Well Maintained door B) well-maintained window

Figure 7. Doors and windows of the building after restoration work

A) Deteriorated floor finish B) Well-maintained floor finish

Figure 8. Timber floor finish before and after restoration work

3.4.3. Dejazmach Kebede Tassamas residence

Dejazmach Kebede Tassamas Residence, built in the early 1930s, is located in Arada Sub City, Kebele 13. The house, entirely constructed of stone, features multi-glazed windows, wide rooms, and a skylight in the salon, with roof decoration similar to Tafari Mekonen School. Until 2010 EC, the residence was occupied by descendants of Kebede Tassamas, after which it was sold to an Italian citizen, Maria Luisa Frezza (Addis Ababa City Administration Cultural and Tourism Bureau, 2008). By 2008 EC, the building was categorized as needing maintenance in the Addis Ababa urban heritage database. Restoration work began in early 2012 EC, with a total contract amount of 2.7 million ETB, involving Misac General Contractor as the contractor, Fasil Giorgis Consultant as the consultant, and the owner overseeing the project. Conservation experts from the Addis Ababa City Administration Culture & Tourism Bureau also supervised and approved the contractor's work.

The restoration process started with detailed investigation and research to identify the root causes of deterioration. The stone walls, affected by aging and algae/fungi growth, were partially reconstructed, cleaned with detergent, and treated with Sikagard chemical to improve water resistance and stain protection. Wooden doors and window frames, deteriorated due to dampness, aging, and insect activity, were repaired or replaced, and broken glass was substituted with new panes. The roof sheets were corroded and replaced to prevent water infiltration, and the brick-and-mortar chimney, which had developed cracks, was reconstructed and plastered (Figures 9–11).

The major challenge in this project was not financial, as the owner funded the restoration. Instead, the primary difficulty arose from the owner's desire to make changes to the building during restoration, which conflicted with the conservation principle of maintaining historical authenticity. Conservation experts faced the challenge of persuading the owner to approve restoration work that preserved the historic value and original materials.

Figure 9. The upper part of the external wall during restoration work

A) Wall surface before restoration B) painted wall surface C) Sikagard chemical

Figure 10. Status of the external wall and Sikagard chemical

A) Deteriorated window frames B) Windows of the building after maintenance

Figure 11. Windows of the building before and after maintenance

3.4.4. Addis Ababa Library Archives & Information Center

Addis Ababa Library, Archives & Information Center is one of the earliest libraries in the capital, constructed at the end of the 19th century. It is located in Arada Sub-city, Wereda 06, around Sadist Kilo, between the Blind Association and Yekatit 12 Hospital. Currently owned by the Addis Ababa City Administration Culture & Tourism Bureau, the building serves as a public library and information center (Addis Ababa City Administration Cultural and Tourism Bureau, 2008). The G+1 structure has a rectangular plan and is entirely made of stone, featuring attractive slab roofs, balconies, and verandas. Over time, the building experienced significant deterioration due to man-made and environmental factors, including water leakage, loss of masonry, damaged slabs, and general wear. Restoration began in early 2012 EC with a total contract amount of 2.5 million ETB, involving Tewolde and Brhane Construction Work Partnership as the contractor, ARCCH as the consultant, and the city administration as the owner.

The restoration process included a comprehensive investigation and documentation by conservation experts from ARCCH. The walls, damaged by algae, fungi, missing render, efflorescence, and minor cracks, were cleaned, repaired, and repointed. Internal walls affected by roof leakage were dismantled, re-plastered with gypsum, and painted. Metal and wooden doors and windows, deteriorated due to aging, dampness, and insect activity, were repaired or replaced, and broken glass and missing locks were restored. External stone staircases affected by algae growth and minor cracks were washed and repointed. The slab roof, a major source of internal dampness, underwent extensive restoration: damaged tiles were removed, a waterproof membrane applied, and tiles reinstalled. Internal timber and marble floors, damaged due to uneven load distribution, were replaced or repaired, while external floor finishes on balconies and verandas were entirely replaced with nearly identical materials (Figures 12–16).

A) Front view of the building B) Side view of the building

Figure 12. Addis Ababa library archives & information center

A) Efflorescence effect on the surface of the wall B) Algae colony on external wall surface

Figure 13. Deteriorated external wall surface

A). Deteriorated window of the building B) Deteriorated doors of the building

Figure 14. Windows and doors of the building before restoration

A) Deteriorated Steps of the building B) Deteriorated guard wall

Figure 15. Deteriorated external staircase

A) Growth of plants on the roof slab B) Damaged tiles, floor finish on verandas

Figure 16. Damaged roof slab and tile floor finish on verandas

Two major challenges were observed during the restoration. First, although the project was government-funded, financial delays due to bureaucratic procedures caused interruptions in the contractor's payments, slowing progress. Second, the unavailability of original materials, particularly for the external floor finishes, required the contractor to use substitute materials that were not identical to the original but closely matched in appearance (Addis Ababa City Administration Cultural and Tourism Bureau, 2008). Despite these challenges, the restoration successfully preserved the historical, architectural, and functional value of the building.

4. Conclusion

The research revealed that the conservation of heritage buildings in the area is characterized by a reactive rather than a preventive approach. Maintenance interventions are generally carried out only after significant deterioration has occurred, leading to more complex interventions that sometimes compromise authenticity. For instance, in some cases, inappropriate material substitutions or partial demolitions were undertaken due to the unavailability of authentic components, which ultimately undermined the cultural integrity of the structures. This finding aligns with broader global experiences, where reactive conservation has consistently proven to be more costly and less effective compared to preventive approaches.

The findings further highlighted that conservation and restoration in Arada Sub-City are structured into three main phases: planning, implementation, and execution. The planning stage is of paramount importance, as it provides the foundation for all subsequent activities. Through historical research, architectural surveys, and direct observation, planners establish the basis for appropriate interventions. In the absence of strong planning, projects tend to suffer from poor documentation, inadequate designs, and inconsistencies between intended and actual interventions. The implementation phase, while often carried out with diligence, was observed to be inconsistent in applying systematic documentation, impact assessments, and monitoring

mechanisms. Similarly, the execution phase—typically awarded through open bidding—was found to be vulnerable to poor supervision, which affected both the quality and authenticity of the final outputs.

A key outcome of the research is the recognition that conservation and restoration are inherently interdisciplinary endeavors. They require the combined expertise of architects, engineers, historians, archaeologists, conservation specialists, and project managers. However, the study found that in Arada Sub-City, engineers and architects dominate the professional landscape, while specialists such as conservation experts, project managers, and heritage economists are underrepresented. This imbalance weakens the interdisciplinary synergy that is essential for holistic heritage conservation and often results in projects that prioritize structural stability over cultural authenticity.

The challenges facing conservation in the study area were found to be multifaceted and interlinked. Material scarcity emerged as the most pressing issue, with the obsolescence of original building materials, the unavailability of spare parts in the local market, and the absence of specialized tools consistently identified as major barriers. These material-related challenges are compounded by financial limitations, inadequate planning, poor supervision, and bureaucratic inefficiencies. Statistical analysis confirmed the strong agreement between experts and contractors on the primacy of material-related issues, underscoring the universality of the problem. Case studies also demonstrated that structural and environmental problems, such as termite infestation, roof leakages, and corrosion, are recurrent issues, while interviews with owners revealed additional concerns such as bureaucratic delays and limited awareness.

Overall, the study concludes that despite the existence of trained professionals and growing institutional recognition of the importance of heritage conservation, systemic weaknesses undermine the sector's effectiveness. Ethiopia continues to face skill shortages, scarcity of authentic materials, limited funding, weak planning and monitoring systems, and insufficient community participation. Unless these gaps are addressed, the risks of cultural heritage loss, diminished authenticity, and irreversible structural deterioration remain high.

Funding

No Funding has been received.

Competing Interests

The authors declare no competing interests.

Concerns to Publish

All the authors concern to the publication of this article.

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