

# Collaborative Preservation Efforts of CAD/BIM Files

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## Abstract

*The issues of preservation and curation of architectural records have been further exacerbated by the technological advancements of architects' tools, namely Computer-Aided-Design (CAD) and Building-Information Modeling (BIM) software programs. The mammoth size of the issue of saving CAD/BIM files requires a multi-step plan that effectively, but gradually, addresses the layers of complications this effort will unfurl. The first step is to create an inclusive bibliography of past, current and scheduled future projects that address the legal, technical and curatorial complexities of CAD/BIM files. Recognizing the complexity and wide-reaching nature of born-digital architectural records, the Society of American Archivists (SAA) Architectural Records Roundtable created a CAD/BIM Taskforce in August 2012, at the SAA's Annual Conference. This paper will discuss the motivation and formation of the creation of the CAD/BIM Taskforce, report on the preparation of the bibliography of CAD/BIM file projects and research, and make note of the Taskforce's future activities and goals.*

## Introduction

Neither art nor manuscript by tradition, architectural records have always been a difficult medium for archivists to preserve and curate. The diversity of classification practices within libraries, archives and museums leaves these materials in a seemingly precarious position. While these repositories have similar missions of preserving and making information and materials accessible, they differ in description practice, creating an additional obstacle to overcome in addressing architectural records as a collective. In addition to the general complexities of the umbrella category of architectural records, each analog and digital technological advancement has introduced further challenges to preservation and description. While the issues of preservation, description and access for analog architectural records, including a variety of paper forms and three-dimensional models, have been more thoroughly discussed; it is the development of Computer-Aided-Design (CAD) and Building-Information Modeling (BIM) software files that requires further study.

## History Of The Issue

By 1958, early versions of computer-aided design were developed. In 1973, only seven years prior to the first iteration of AutoCAD and over 100 years after the first academic architecture program in the United States was established (Massachusetts Institute of Technology, 1865), the first archival-based initiative to specifically address architectural records was founded. The Cooperative/Committee Preservation of Architectural Records (COPAR) was a grassroots interdisciplinary and regional organization first formed in New York City that quickly sprouted branch organizations in about a dozen cities within ten years of its existence. The mission of each regional COPAR was focused on identifying where architectural records were located (both in and

outside of the archives and libraries) and raise awareness of the value of architectural records. Regional COPARs focused on providing comprehensive resources, such as indexes of all architectural records repositories, active architecture firms, and housing and preservation practices of repositories and professionals with collections of architectural records. While there was a strong archival presence in COPARs, archivists were equal members with historians, architects, librarians, and lawyers, demonstrating the shared concern between these professions about the future of architectural records. These volunteer-based organizations served a need, and provided a venue for diverse professions to discuss the complex issues of architectural records from their unique perspectives.

As the strength and active engagement of each regional COPAR grew throughout the 1980s, the Society of American Archivists (SAA), which shared some members with these COPARs, began to appreciate the need for a national venue for discussion about architectural records. In the late 1980s the SAA provided such a forum for professionals working with architectural records within the established Visual Materials Roundtable; and as momentum for this topic continued to grow, the SAA Architectural Records Roundtable (SAA-ARR) was formally established in 1990. The SAA-ARR's mission is "to provide a forum for members to discuss issues related to access and management of architectural records and related fields... in the spirit of the COPAR." [<http://www.archivists.org/saagroups/archtec/>]

In the 1980s, Alan Lathrop of the University of Minnesota and Nancy Carlson Schrock of Mass COPAR offered articles on copyright, provenance, preservation, documentation and filing strategies. The American Institute of Architects Foundation assembled the proceedings of the 1984 conference *Toward Standards for Architectural Archives*, which helped point out some of the difficulties of curating architectural records, which was followed a few years later by a Mass COPAR *Symposium on the Appraisal of Architectural Records* in 1987. SAA published thirteen papers on architectural records appraisal in 1996 and Eleanore Kissel and Erin Vigneau's monograph, *Architectural Photoreproductions: A Manual for Identification and Care*, provided additional guidance for archival practitioners in 1998. In 2000, Maygene Daniels and David Peyceré, produced, *A Guide to the Archival Care of Architectural Records: 19<sup>th</sup>-20<sup>th</sup> Centuries for the International Council on Archives*, and Waverly Lowell and Kelcy Shepherd developed their *Standard Series for Architecture and Landscape Design Records* that same year. But it wasn't until 2006, sixteen years after the roundtable's establishment, that the first seminal text on the history, preservation, storage, appraisal, conservation, arrangement, and description problems inherent in the specialized records of analog architectural materials including CAD records was published by the SAA (Waverly B. Lowell and Tawny Ryan Nelb. *Architectural Records: Managing Design and Construction Records*, 2006). Lois Olcott Price's 2010 work *Line, Shade, and Shadow: The Fabrication and Preservation of*

*Architectural Drawings* offered another foundational text for analog records. While such texts proved invaluable to the profession, the rising presence of digital materials in archives could not be overlooked, and at its 2012 annual conference the SAA-AAR established a CAD/BIM Taskforce. This taskforce has been charged with the task of studying the preservation and management practices of the volatile records produced by CAD and BIM software programs within a broader collaborative process to provide recommendations for the next steps and potential best practices for preserving and managing CAD/BIM files.

### **Cad/Bim Records**

Proprietary CAD/BIM software programs have been a part of architectural profession for over 30 years. The same robust functionality that makes these programs desirable for the architectural field also makes this technology significantly difficult to manage and preserve. This proprietary status additionally complicates efforts to implement familiar emulation or migration software systems that are already challenging due to the sophisticated nature of CAD/BIM programs. Like their analog counterparts, digital architectural records have a unique combination of preservation, curatorial, and legal issues. The archival profession has acknowledged the impending danger and difficulty of preserving these complex records since their creation. The delayed matriculation of these materials into repositories and the cautious, yet ever-changing, development of digital preservation recommendations have prevented CAD/BIM preservation techniques from being broadly accepted.

Although born-digital media have become ubiquitous in our daily lives, even the most widely used born-digital media (i.e. Microsoft Suite) have only in the past decade or so begun to regularly appear in archives. Although slow to find their way into archives, the massive size has quickly turned born-digital materials from an anomaly to an overwhelming burden. Similarly, CAD/BIM programs have become commonly used in the architectural and other design fields, however current professionals have yet to consistently donate their materials to archives, making the accessioning of CAD/BIM files a recent phenomenon. This postponement has allowed for an inordinate backlog of CAD/BIM records to develop that, like all overwhelmingly large digital collections, will require intense review to assess the damage of years of “benign neglect”; in addition to obsolete digital formats, media storage degradation, and often-difficult intellectual appraisal issues from inconsistent or missing mnemonic naming strategies also make evaluation and preservation difficult. Due to the size of these digital collections, some automation component will be necessary to make their curation process feasible.

It is important to note that it has been a constant struggle for cultural heritage institutions to collect and preserve architectural records, one that has not been alleviated by new design technologies. In addition to taking on the challenges of collecting architectural records, institutions must also overcome the architectural profession’s lack of long-term vision for their personal papers, to convince them of the necessity to donate their materials. The inverse of this is architects’ rising awareness of the value cultural heritage institutions place on these collections, and are expecting to receive an added value for their records; however, purchasing architectural records is far from standard procedure for

archives, due to the incredible costs associated with the preservation of these materials. The potential further cost of acquiring collections is another variable that must be taken into consideration in the complex experiment of future collecting of architectural records.

### **Current Initiatives**

While there here has not been a united effort to address CAD/BIM records by the archival community, they have been in the profession’s purview since the early 1980s, resulting in several independent efforts to address the issues of this medium. Through these significant studies, and discussions within the SAA-ARR, the profession has arrived at the realization that more collective efforts would be widely beneficial. In order to begin its community-wide initiative to address the numerous issues of born-digital architectural records, the taskforce will identify and review the existing preservation and management efforts. Following their COPAR predecessor’s model, the taskforce aims to provide an inclusive and thorough resource to the archival community. It has decided it will do so by addressing the technological, curatorial and legal components as individual and overlapping elements of preserving architectural records.

The first step in producing this resource was the solicitation of the SAA’s Architectural Records Roundtable for information about studies, papers, project, or reports that have taken place around the issue of born-digital architectural files from 2000 up to the moment. This cutoff date is necessary due to the significant technological advancements in both CAD/BIM programs and digital preservation efforts, making pre-2000 efforts less applicable. This information, was compiled into a single detailed bibliographic list. This foundational list demonstrates the breadth of initiatives by the archival community that ranges from conversations about curatorial practice (that have continued since the mid-1980s), to metadata standards (i.e. ISO 82045-5:2005, metadata for the construction and facility management sector), to designing emulation software (i.e. Harvard-MIT FACADE2 project).

Throughout all of these projects there has been an underlying sentiment that the design and archives professions are limited in the extent they will be able to preserve CAD/BIM files unilaterally. This limitation reinforces the need for thorough discussion about the selection and appraisal of these multifaceted files to determine which parts should be preserved. The inability to maintain the functionality of all of the abundant attributes of these programs raises questions of how these records are expected to be used by future researchers, as well as properly reflect the significance of this design medium to the architecture profession. These are intimidating issues that archival and cultural heritage institutions recognize they cannot properly address without the input and assistance from government, technology and business communities creating these records.

### **Collaboration**

The bibliographic resource allows the archival community to gain intellectual control over the profession’s landscape of digital architectural record preservation and management and helps to raise awareness of the major concerns identified through those projects. The taskforce aims to use this resource to facilitate

analytical conversations about which current initiatives and projects are beneficial, need further study, and identify where there are gaps in the community's approach to CAD/BIM files. These critical conversations prepare the taskforce to broaden its scope and invite other fields to engage in the discussion about these complex records.

This expansion is necessary, as the taskforce is a subordinate body to the SAA, and has limited authoritative scope within the archival profession. In recognizing this limitation at its impetus, the taskforce has committed itself to collaborative efforts outside of the American archival field, and is following its COPAR predecessor's model of engaging as many concerned parties as possible. The professions that have been identified as having a vested interest in the future of CAD/BIM file preservation and management include but are not limited to: designers, computer scientists/programmers, lawyers, archivists, and librarians, as well as other fields using three-dimensional design software (i.e. Geographic Information Systems). These professional communities have their own organizations that will be used as the points of contact to ensure the widest net has been cast and the largest tangentially related communities are engaged. By including such a diverse group of professions, as well as their international counterparts, the taskforce aspires to comprehensively address the three main issues of CAD/BIM files (legality, curation, and technology), and ensure that the preservation of architectural records is treated as a universal issue. The universal concern of preserving complicated three-dimensional design software files looms over all repositories currently collecting, or planning to collect, such materials, thus supporting the taskforce's desired collaborative approach to this issue.

## Future

Once the taskforce has collected information about the broader community partners' work, a more comprehensive and critical resource will be developed. This resource will identify overlapping and diverging efforts amongst all industries, as well as how archival projects fit into the larger environment addressing born-digital architectural records. By involving less permanency-focused industries, such as computer software programmers, the taskforce believes it will understand the broader CAD/BIM topic better, providing new perspectives on CAD/BIM files that the archival community has yet to consider or attempt. With all of this information eventually incorporated into the original bibliographic resource, the taskforce will be able to facilitate a collaborative process that would include the legal and architecture communities to offer recommendations for next steps and fundamental care for CAD/BIM records. Due to the constantly evolving iterations of CAD/BIM programs and digital preservation and curation theories, each with their own intricacies, the taskforce has charged itself not with providing concrete preservation and management practices for this medium, but rather to create a foundation for knowledgeable conversations that will inspire future research efforts, and eventually produce authoritative, easily implementable and readily acceptable best practice guidelines for the design industry and the ever-widening community of CAD/BIM file users.

## Sample of Bibliographic Resource

As of December 2012: **NAME OF PROJECT** / Sponsor or Institution / Date / Summary

**Governance Architecture Urbanism Democracy Interaction (GAUDI) Programme** / EU Funding (8 specific nations) / 2000-2005 / Provide access to researchers, scholars, as well as owners and occupants of historical buildings, to data concerning their buildings and the respective architects. It also service to architects who are concerned with the future of their documents, and to archivists and to professionals working in the field of maintenance and restoration.

**Offline Archive Media Trade Study** / United State Geological Survey (USGS) / 2004- ongoing / A trade study comparing and assessing offline digital archive storage technologies to recommend which technologies could used for as the next generation standard for the USGS. Takes into consideration the archives' need to regularly migrate records to the next generation of digital archive technology, and that the technology selected must maintain data integrity until the next migration.

**Collecting, Archiving, and Exhibiting Digital Design Data** / The Art Institute of Chicago / 2004 / Conducted an international research project on preparing, collecting, cataloging, storing, preserving and presenting electronic archives of born-digital data created by architects and industrial designers. Addressed data format issues, image resolution and color management topics that are applicable to any organization that creates or utilizes digital data, or needs to use it over time and to make it accessible to a variety of users.

**Preservation Handbook, Computer Aided Design (CAD)** / Arts and Humanities Data Service / 2005 / Provide best practice guidance at three levels (essential, preferred and best practice), including an ingest checklist and minimum preservation efforts, for active repositories collecting CAD materials as of 2005.

**ISO 82045-5:2005 / IEC 82045** / International Organization for Standardization (ISO) Document Management / 2005 / Provide best practice guidance for application of metadata for the construction and facility management sector for repositories actively collecting CAD materials.

**Software Emulation through Applications of STEP code (STandard for the Exchange of Product model data)** / National Archives and Records Administration and private sector partners / 2009 – ongoing / Developing software that address questions about 3D formats, their key components, optimal conversion formats, and quantify differences in renderings.

**FACADE** / Massachusetts Institute of Technology (MIT) / 2009 / Analytical study to determine the target audience of CAD/BIM file archives, as well as the expected functionality, the exact object of preservation, and the minimum acceptable format of CAD/BIM files for archives. Developed an ontological model for the capture of architectural drawings, and a tool for their description by curators.

**Conference - 'Designed to Last: Preserving Computer Aided Design'** / Digital Preservation Coalition (UK) / 2010 / Facilitated presentations and conversations on specific issues and the broader topics of "the nature of the problem" and the emerging practices and standards around CAD/BIM programs and files.

**Open Archaeology** / Oxford Archaeology Unit, Oxford University / 2010 / Provides a superb example of collaborative efforts within a broader field to produce feasible resources and raise awareness of issues and access to tangible resources.

**Geospatial Multistate Archive and Preservation Partnership (GeoMAPP)** /

States of Kentucky, Utah and North Carolina / 2011-ongoing / Develop an open access programmatic strategy to track and document benefits of providing long-term access to significant geospatial content held by state and local governments over time.

**FACADE2** / Harvard-MIT / 2011-ongoing / Based on the 2009 study by MIT, this project consists in further updating the ontological model for the capture of born-digital architectural records in a diversity of digital formats, and in a more in-depth development of the CWB (Curator's Workbench) based on specific vocabularies for the description of these records. The project is utilizing open source coding, so that the results may be shared with the larger archival community.

### **Author Biography**

*Aliza Leventhal received her BA from Smith College, and is finishing up the MSLIS/MA Archives Management program at Simmons College in Boston (May 2013 graduation). Her work has focused on the preservation and curation of architectural records, both analog and digital, within archives and the larger cultural heritage professional community. She is a co-chair of the newly formed Society of American Archivists' Architectural Records Roundtables' CAD/BIM Taskforce, and the 2012-2013 co-chair of the Student Chapter of the Society of American Archivists at Simmons College.*