

**SOCIETY OF AMERICAN ARCHIVISTS
CAD/BIM TASKFORCE**

DRAFT BIBLIOGRAPHY ON STUDIES DEALING WITH LEGAL, TECHNICAL, AND CURATORIAL ISSUES RELATED TO BORN-DIGITAL ARCHITECTURAL RECORDS (prepared by Aliza Leventhal and Inés Zalduendo, SAA CAD/BIM Taskforce, Blizzard 2013).

1. GAUDI Programme. "Governance Architecture Urbanism Democracy Interaction (GAUDI) Programme." *European Union*. 2003-2004. <http://gaudi-programme.net/index.html>.
2. Art Institute of Chicago. "Collecting, Archiving, and Exhibiting Digital Design Data." *Art Institute of Chicago / Kristine Fallon Associates*, 2003-2004. <http://kfa-inc.com/kfa12/collecting-archiving-and-exhibiting-digital-design-data>
3. Arts and Humanities Data Service. "Preservation Handbook, Computer Aided Design (CAD)." *Arts and Humanities Data Service*, UK, July 19, 2005. <http://www.ahds.ac.uk/preservation/cad-preservation-handbook.pdf>
4. International Organization for Standardization. "ISO 82045-5:2005 /IEC 82045." *International Organization for Standardization (ISO)*, 2005. http://www.iso.org/iso/catalogue_detail.htm?csnumber=34952
5. Oxford Archaeology. "Open Archaeology." *Oxford Archaeology*, 2007-ongoing. <http://www.openarchaeology.net/>
6. Massachusetts Institute of Technology. "FACADE: Future-proofing Architectural Computer-Aided Design." *Massachusetts Institute of Technology*, February 16, 2010. <http://facade.mit.edu/>
7. Digital Preservation Coalition. "Designed to Last: Preserving Computer Aided Design." *Digital Preservation Coalition*, July 16, 2010. <http://dpconline.org/events/previous-events/625-designed-to-last-preserving-computer-aided-design?q=designed+last>
8. U.S. Geological Survey. "Archive and records management—Fiscal year 2010 offline archive media trade study: U.S. Geological Survey Open-File Report 2010–1222." *U.S. Geological Survey (USGS)*, 2010. <http://eros.usgs.gov/government/records/media/FY10MediaTradeStudy.pdf>
9. National Archives and Records Administration. "Data Preservation and Reconstruction, and Model-based Engineering, manufacturing and Sustainment." *National Archives and Records Administration*, June 6, 2011. <http://isda.ncsa.uiuc.edu/CompTradeoffs/>, <http://www.pdesinc.org/timeline.html>
10. Library of Congress. "Geospatial Multistate Archive and Preservation Partnership (GeoMAPP)." *Library of Congress, National Digital Information Infrastructure and Preservation Program (NDIIPP)*, 2011. <http://www.geomapp.net/>
11. Library of Congress. "Sustainability of Digital Formats. Planning for Library of Congress Collections." *Library of Congress, US*, 2011-ongoing. <http://www.digitalpreservation.gov/formats/index.shtml>
12. Harvard University and Massachusetts Institute of Technology. "FACADE2." *Harvard University and Massachusetts Institute of Technology*, 2012-ongoing. <http://osc.hul.harvard.edu/liblab/proj/facade2>
13. European Union. "DuraArK (Durable Architectural Knowledge)." *European Union*, 2013-ongoing. http://duraark.eu/?page_id=4

ADDENDA. July 2013

1

GAUDI Programme. "Governance Architecture Urbanism Democracy Interaction (GAUDI) Programme." *European Union*. 2003-2004. <http://gaudi-programme.net/index.html>.

Funding / Date

EU funding initiative, within the context of Culture 2000; 2003-2004.

Participants

Collaboration amongst CIVA (Centre International pour la ville, l'Architecture et le Paysage), Belgium; MFA (Museum of Finnish Architecture), Finland; DAM (Deutsches Architektur-Museum), Germany; NAI (Nederlands Architectuurinstituut), Netherlands; RIBA (Royal Board of British Architects), England; Accademia di architettura di Mendrisio, Switzerland; IUAV (Istituto universitario di architetture di Venezia), Italy; OARP (Ordine degli architetti di Roma e provincia), Italy.

Author/Point Person

David Peycere from Cite d'Architecture in Paris /Institut Français d'Architecture

Overview / Abstract

The proposed agreement seeks to promote the co-operation of a number of European institutions. One of the projects (A2) is to merge and develop archival collections on architecture and urban development. This project aims at allowing the broader audience to locate architectural archives and at helping architects in the management and devolution of their archives. The intention is that the websites of each participating institution shall provide information chiefly limited to a list of archives ("fonds") and a few catalogs. The intention is that GAUDI's website will be a portal covering the main sites related to the architectural archives in the partners' countries, and that it help architects in practice to handle their archives. GAUDI made provisions for a survey of the situation and for the writing of specifications: establishing contact with the professionals in order to improve public access to their archival collections is a first step for the definition of criteria to deal on a European base with digital documents.

Mode of Operation / Process

First, set up the working group and carry out an inquiry with archivists and users, dealing with methodology and the expectations for future products. Second, devote time for local investigation parties and meeting for debriefing and analysis of local fieldwork. Third, synthesis of reports and analyses; as well as writing of handbooks and specifications.

Anticipated Results / Product

Significant progress in the development of a common European approach to architecture and its incorporation into the environment is the expected result. The agreement has been designed to be a lasting one and thus will extend well beyond the three years of the program presented within the context of Culture 2000. Education and dissemination to the general public are primary goals, as is the intent to strengthen the network of European institutions. Several Publications highlighting the synthesized information collected over the three-year period of the project can be found at: <http://gaudi-programme.net/publications/index.html>

2

Art Institute of Chicago. "Collecting, Archiving, and Exhibiting Digital Design Data." *Art Institute of Chicago / Kristine Fallon Associates*, 2003-2004. <http://kfa-inc.com/kfa12/collecting-archiving-and-exhibiting-digital-design-data>

Funding / Date

The Art Institute of Chicago, Curatorial Department of Architecture; 2003-2004.

Participants

Art Institute of Chicago and architectural firms of different size (from single practitioners to larger corporate architectural offices).

Author / Point Person

Kristine Fallon Associates

Overview / Abstract

Identifying similarities and differences between treatment of born-digital and digitized collections of design records. Analyze existing technologies, and theoretical frameworks to address issues related to computer-aided facility management (CAFM) solutions, CAFM system conversion, customization and migration research and recommendations for long-term preservation of digital data, software solution development for digital archives.

Mode of Operation / Process

Conducted research project on preparing, collecting, cataloging, storing, preserving and presenting electronic archives of born-digital data created by architects and industrial designers. Surveyed cultural institutions, design and construction, and technology industries.

Anticipated Results / Product

Provided recommendations for cultural institutions managing CAD and digitized design records. Provided comprehensive recommendations on technology, standards and work processes for digitizing the existing paper-based collection and maintaining such digital archives. Addressed data format issues, image resolution and color management topics that are applicable to any organization that creates or utilizes digital data, needs to use it over time and wants to make it accessible to a variety of users. Summarized results in the Report to the Art Institute of Chicago, including immediate recommendations.

3

Arts and Humanities Data Service. "Preservation Handbook, Computer Aided Design (CAD)." *Arts and Humanities Data Service*, UK, July 19, 2005. <http://www.ahds.ac.uk/preservation/cad-preservation-handbook.pdf>

Funding / Date

Arts and Humanities Data Service (AHDS), Joint Information Systems Committee (JISC); 2005.

Author / Point Person

Keith Westcott

Overview / Abstract

Provide best practice guidance for active repositories collecting CAD materials. Produced *AHDS Preservation Handbook for CAD*, that includes: Definition, Technical Environment, Ingest Checklist, Preservation (characteristics, technique, data validation, problems & issues). Concerned with the feasibility for repositories to preserve CAD files sustainably.

Mode of Operation / Process

General guidance: formats, metadata, and minimum requirements.

Anticipated Results / Product

Ingest Checklist (essential, preferred & best practice), Minimum preservation efforts. Provides a plethora of links to additional information: CAD: A Guide to Good Practice (AHDS); CSA CAD Guide for Archaeologists and Architectural Historians (CSANET); SAT Save File Format (astronomy.swin.edu.au); AutoCad R13/R14/R2000 DWG File Specification (opendeisng.com); Determining the version of a DWG or DXF file (usa.autodesk.com);

Bentley's OpenDGN Initiative (bentley.com); IGES Project (nist.gov); OpenHSF Initiative (openhsf.org); STEP Overview (steptools.com)

4

International Organization for Standardization. "ISO 82045-5:2005 /IEC 82045." *International Organization for Standardization (ISO)*, 2005. http://www.iso.org/iso/catalogue_detail.htm?csnumber=34952

Funding / Date

International Organization for Standardization (ISO); 2005.

Participants

International Electrotechnical Commission. The specific application domain for ISO 82045-5:2005 is the AEC (architecture, engineering and construction) and FM (facility management) sectors.

Overview / Abstract

Application of metadata for the construction and facility management sector. Concerned with feasibility for repositories to preserve CAD files sustainably. Goal to provide best practice guidance for active repositories collecting CAD materials.

Mode of Operation / Process

The standard specifies metadata elements and methods for sharing and exchanging management data (metadata) for documents, to be used with electronic or paper-based document management systems. The document concept, which includes CAD files and all other information entities that need to be managed, is defined in IEC 82045-1.

Anticipated Results / Product

International metadata guidelines, that will be updated in accordance to the practices of the general ISO and IEC practices. Resource: <http://ebookbrowse.com/iso-82045-5-2005-pdf-d317968414>
[Standard must be purchased to view in its entirety]

5

Oxford Archaeology. "Open Archaeology." *Oxford Archaeology*, 2007-ongoing.
<http://www.openarchaeology.net/>

Funding / Date

None identified; 2007- ongoing

Participants

Numerous (community-wide effort); code writers, advocates for open access, archaeology community.

Overview / Abstract

Oxford Archaeology continues to work on digital preservation via their strategic commitment to openness. The Open Archaeology program <http://openarchaeology.net> in which much of their digital preservation work takes place has developed over the years, with progression in each strand. The Open Standards strand has seen promotion of the ISO26300 (OpenDocument) file formats and related activities. They have also joined the OpenDWG Alliance to gain access to software libraries that enable reading and writing of AutoCAD files, an ever-moving target. Additionally, they have completed the move of Archives into the Information Systems division, and will be recruiting digital archivists. Open Source has also seen developments, with the launching of an umbrella site dedicated to developing archaeology open source software.

Mode of Operation / Process

Open Archaeology has 3 primary strands: open data, open standards and open source. The initial code contributions came from Oxford Archaeology as part of that organization's commitment to the Open Archaeology philosophy; there are many more people and organizations interested in participating. Open Archaeology's commitment is to adopting and developing standards, and making archaeological knowledge access free. Concerned mainly with Information sharing, finding ways to work collaboratively for the greatest benefit to the largest community.

Anticipated Results / Product

Over 15 related projects. Example: "Open Context" provides an easy to use, yet powerful, common framework for exploring, searching and analyzing excavation results, survey data and museum collections. Because of sophisticated approaches toward data integration, Open Context makes museum collections and field research easier to find, explore, understand and reuse. The site is used to release all the software developed internally as well as collaborate on larger projects - other heritage-related projects are also joining, such as the Alexandria Archive Institute's Open Context. **Resources:** some software and some databases, all available online: <http://openarchaeology.net/contents/about>; <https://launchpad.net/openarchaeology>; <https://launchpad.net/opencontext>.

6

Massachusetts Institute of Technology. "FACADE: Future-proofing Architectural Computer-Aided Dsign." *Massachusetts Institute of Technology*, February 16, 2010. <http://facade.mit.edu/>

Funding / Date

Institute of Museum and Library Services (IMLS); 2006-2009

Participants: Massachusetts Institute of Technology Library; Institute of Museum and Library Services (IMLS)

Author / Point Person

MacKenzie Smith

Overview / Abstract

Determine metadata (data export) using the Standard for the Exchange of Product Model Data (STEP) and the Project Information Model (PIM) for emulation and overcoming proprietary dependency; Software Identification, Migration, Emulation.

Mode of Operation / Process

First analyze, identify and describe native digital formats produced by top CAD software used by architects. Then analyze, design and implement native CAD file ingestion, management, preservation and dissemination practices, and develop the necessary modules for the DSpace digital archive system. Use this information to analyze and make recommendations for related process documentation (relationships between various CAD files and versions, and between CAD files and other project communication and documentation), and related to annotation of CAD files for important related information, such as non-graphical files related to materials used.

Anticipated Results / Product

Document, train, outreach and disseminate results to the digital library, digital preservation, and DSpace user communities. Share report and recommendations for repositories and the general Architecture, Engineering and Construction (AEC) Industry for the preservation of computer-aided design generated drawings. Developed PIM Metadata, RDF graph, 3D model derivatives (web-render-able file) in 3D PDF - not requiring proprietary software. Resources: FACADE Wiki, PIM ontology. Final Report: <http://facade.mit.edu/files/FACADEFinalReport.pdf>

7

Digital Preservation Coalition. "Designed to Last: Preserving Computer Aided Design." *Digital Preservation Coalition*, July 16, 2010. <http://dpconline.org/events/previous-events/625-designed-to-last-preserving-computer-aided-design?q=designed+last>

Funding / Date

Digital Preservation Coalition; July 16, 2010.

Participants

British Library Centre of Conservation; Repository managers, archivists, librarians, and information specialists to manage/expect to manage CAD data and data derived from related technologies such as GIS, VR, or laser scanning.

Overview / Abstract

Conference based on presentations and conversations on specific issues and the broader topics of "the nature of the problem," and emerging practices and standards.

Mode of Operation / Process

Discussion among different communities on Use of CAD, Emerging Standards, and Emerging & Changing Professional Practices.

Anticipated Results / Product

Sharing knowledge and efforts. Building a community and discuss future of practices and challenges.

8

U.S. Geological Survey. "Archive and records management—Fiscal year 2010 offline archive media trade study: U.S. Geological Survey Open-File Report 2010–1222." *U.S. Geological Survey (USGS)*, 2010. <http://eros.usgs.gov/government/records/media/FY10MediaTradeStudy.pdf>

Funding / Date

Archive and Records Management; Offline Archive Media Trade Study; 2004-ongoing. (The link is for the report of FY 2010).

Participants

U.S. Geological Survey (USGS) Technology and Libraries; Stinger Ghaffarian Technologies, Inc. (SGT)

Authors / Point Person

Tom Bodoh, Ken Boettcher, Ken Gacke, Cheryl Greenhagen, and Al Engelbrecht.

Overview / Abstract

Study intended for USGS and other government archives concerned with complex digital technology. Concerned with metadata (data export), STEP (Standard for the Exchange of Product Data), emulation, overcome proprietary dependency. Assess the options for the next generation of offline digital archive storage technology to be used for the digital archives of the USGS. The selected technology must be capable of safely retaining data until space, cost, and performance considerations drive the next media migration. Data Integrity Data must be migrated before integrity degrades.

Mode of Operation / Process

A trade study comparing offline digital archive storage technologies; comparing and assessing several technologies and recommends which technologies could be deployed as the next generation standard for the

U.S. Geological Survey (USGS). Archives must regularly migrate to the next generation of digital archive technology, and the technology selected must maintain data integrity until the next migration.

Anticipated Results / Product

Provide up-to-date information about best technology for migrating USGS digital records. Analyze several courses of action and to provide the necessary information for the sponsor to reach a conclusion, or revalidate an ongoing course of action. This information allows the USGS to make the final decision regarding which criteria to use and the relative weighting of the criteria to make formal recommendations for the next 2-3-year cycle. The survey and analysis of technologies will be repeated to provide updated report for next scheduled migration of USGS digital records. Resources: Report, includes conclusions and recommendations. The document is for the fiscal year 2010 (FY10); and is a revision of a study completed in FY01 and revised in FY03, FY04, FY06, and FY08.

9

National Archives and Records Administration. "Data Preservation and Reconstruction, and Model-based Engineering, manufacturing and Sustainment." *National Archives and Records Administration*, June 6, 2011. <http://isda.ncsa.uiuc.edu/CompTradeoffs/>, <http://www.pdesinc.org/timeline.html>

Funding / Date

National Archives and Records Administration; 2008-2011.

Participants

NARA's Center for Advanced Systems and Technologies (NCASST); Image Spatial Data Analysis Group, National Center for Supercomputing Applications (NCSA).

Author / Point Person

Sang-Chul Lee, Rob Kooper, Peter Bajcsy

Overview / Abstract

Support archivists empirical examination of the tradeoffs related to the questions: what should be preserved; how should the data be gathered, stored, and retrieved; how should the decision-making processes be reproduced; and what questions will researchers be able to answer using the reproduced information. Concerned with feasibility for repositories to preserve CAD files sustainably.

Mode of Operation / Process

The problem is stated as information gathering about decision processes using geospatial electronic records. The work addresses the tradeoffs of electronic information preservation in terms of file format, data volumes and computational requirements. Study of file formats: Are the 3D formats well formed? Can we identify a minimal set of information to preserve? Is there an optimal format to convert to? Can we quantify 3D noise introduced during conversions? Can we quantify differences in renderings?

Anticipated Results / Product

Established international metadata guidelines. Continuing work on trade-off studies related to encryption, compression, storage file format, information gathering mechanisms and meta-data organization. Expand the simulation framework by semi-automated generation of reports documenting the decision processes. Resources: "An Overview of 3D Data Content, File Formats and Viewers" <http://www.archives.gov/applied-research/ncsa/8-an-overview-of-3d-data-content-file-formats-and-viewers.pdf>, and "Key Aspects in 3D File Format Conversions" <http://www2.archivists.org/sites/all/files/PeterBajcsy-SAA-ResearchForum2009.pdf>

10

Library of Congress. "Geospatial Multistate Archive and Preservation Partnership (GeoMAPP)." *Library of Congress, National Digital Information Infrastructure and Preservation Program (NDIIPP)*, 2011.

<http://www.geomapp.net/>

Funding / Year

States of Kentucky, Utah and North Carolina; 2007-2011.

Participants

Library of Congress, National Digital Information Infrastructure and Preservation Program (NDIIPP) and State GIS archives

Overview / Abstract

Conference for identifying, preserving and providing long-term access to temporally significant geospatial content in state and local government. Develop open access programmatic strategy to track and document benefits over time to demonstrate success.

Mode of Operation / Process

Explore advanced methods to provide access to and ensure the long-term preservation of archived geospatial content. Develop business planning tools and documentation to support the creation of materials to solicit or maintain sustainable funding for geo-archiving programs. Continue outreach to local, state, and federal geospatial data creators and national GIS and archives bodies and industry to highlight the issues of data preservation. Concerned with Data Discovery and Inventory, Records Retention Schedules, Metadata, File Formats and Data Conversion, Archival Ingest Process and Data Validation, Business Cases, and Data in Motion.

Anticipated Results / Product

Providing public access to archival GIS records. Continue documenting best practices and lessons learned from technical explorations and outreach efforts. Resources: Final Report 2007-2011

http://www.geomapp.net/docs/GeoMAPP_FinalReport_final_20111231.pdf

11

Library of Congress. "Sustainability of Digital Formats. Planning for Library of Congress Collections." *Library of Congress, US*, 2011-ongoing. <http://www.digitalpreservation.gov/formats/index.shtml>

Funding / Date

Library of Congress; 2004 – ongoing.

Author / Point Person

Caroline R. Arms and Carl Fleischhauer

Overview / Abstract

The Digital Formats Web site provides information about digital content formats. An initial offering was placed online in 2004 and expanded and updated analyses and resources have been added regularly. Digital formats will continue to evolve in the coming years and this or a successor site will also evolve to keep pace. Its purpose is to support strategic planning regarding digital content formats, in order to ensure the long-term preservation of digital content by the Library of Congress.

Mode of Operation / Process

The site is devoted to the analysis of the technical aspects of digital formats. The analysis will inevitably have implications for policy matters, most significantly collection policies within the Library of Congress.

Anticipated Results / Product

Continued update of the site. More information:

http://www.digitalpreservation.gov/formats/intro/format_eval_rel.shtml; (http://memory.loc.gov/ammem/techdocs/digform/DigForm_Intro_v04.pdf); and <http://www.digitalpreservation.gov/formats/intro/papers.shtml>

12

Harvard University and Massachusetts Institute of Technology. "FACADE2." *Harvard University and Massachusetts Institute of Technology*, 2012-ongoing. <http://osc.hul.harvard.edu/liblab/proj/facade2>

Funding / Date

Harvard University Library Lab (Office for Scholarly Communication); 2011-ongoing

Participants

Collaboration Harvard-MIT. Harvard University (Frances Loeb Library); Massachusetts Institute of Technology Library.

Author / Point Person: Deb Morley, Ann Whiteside, Richard Rodgers, Jolene de Verges, Inés Zalduendo

Overview / Abstract

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. [Link to PDF of Project Proposal at bottom of webpage]:

<http://osc.hul.harvard.edu/sites/default/files/FACADE%20Library%20Lab%20Proposal%20FINAL2.pdf>

Mode of Operation / Process

Conducted a technical review of FACADE's existing Curator's Workbench (CWB). Reviewed the workflow improvements document of the original FACADE research project, which contains a list of target areas that could use further development; and drafted a list of enhancements. Began discussions with institutional legal counsel re: gift / license agreement. Obtained one set of building data for testing in the CWB. Reviewed and expanded vocabularies for CWB description tabs (disciplines, document types, project stages/phases, project divisions). Worked towards setting up a demo of the original CWB with test data for (Berkman Center) developers. Handed over BIM to developers to update the CWB ontology.

Anticipated Results / Product

The immediate result is the further development of the CWB (for the capture and description of records). The long-term view is the development of a tool for the capture and description of architectural records in all format files that may enable their future preservation. A rescue repository is being developed by the Harvard Library Lab in parallel to this project.

13

European Union. "DuraArk (Durable Architectural Knowledge)." *European Union*, 2013-ongoing.

http://duraark.eu/?page_id=4

Funding

European Union; 2013 - ongoing

Participants

Leibniz Universität Hannover, LUH, Germany; University Bonn – Institute of Computer Science, UBO, Germany; Fraunhofer Austria Research GmbH, FhA, Austria; Eindhoven University of Technology, TUE, Netherlands; Center for Information Technology and Architecture, CITA, Denmark; Luleå University of Technology, LTU, Sweden; Catenda, Norway.

Overview / Abstract

The DuraArk project will tackle the challenge of long-term preservation of new types of data generated by the shift in architecture and construction from analog 2D plans and scale models to digital 3D building models. Develop long-term preservation tools that will be tailored to the domain of architectural 3D content. It will exploit state of the art semantic web technologies to ensure consistency, reliability, and future-proof reusability of archived data. Additionally, it will be the first to cover and exploit the complete spectrum of representations used for architectural information, ranging from low-level 3D point clouds up to highly annotated 3D BIM models and semantic metadata.

[Kick-off meeting in Hannover, Germany, March 2013]

ADDENDA / July 2013

As this *Bibliography* was being submitted to the SAA Architectural Records Roundtable as part of the CAD/BIM's Taskforce 2013 Annual Report, we learned of the Digital Preservation Coalition's (DPC) latest Technology Watch Reports: **Preserving Computer-Aided Design (CAD)**. Written by Alex Ball, and published electronically, it can be accessed here: <http://www.dpconline.org/events/details/64-preserving-computer-aided-design-cad?xref=70>. As they describe it "this report provides a comprehensive overview of the development of CAD technologies, the threat caused by its own innovative application, and its vendors' drive to add ever more features which can render valuable and strategically vital information unusable." It is worth the read. For other related sources by DPC, see number 7 of this bibliography.