Missouri Department of Transportation

Construction and Materials Division

MoDOT Transportation Library

Information and Research Services for Management, Professional and Technical Staff

CONTACT INFORMATION

Renée McHenry, Librarian
MoDOT Transportation Library
600 W. Main St.
P.O. Box 387
Jefferson City, MO 65102-0387

Monday-Tuesday
Hours: 7:30am-4:00pm
Office: Central Lab (CM Research Section, 2nd floor)
Phone: 573.522.1948
Email: renee.mchenry@modot.mo.gov*

Wednesday-Friday
Hours: 7:30am-4:30pm
Office: State Library (Reference Services Division, 2nd floor)
Phone: 573.751.3075
Email: renee.mchenry@sos.mo.gov*

*Use either email address. Both accounts are monitored.

Library websites
Intranet - http://sharepoint/systemdelivery/CM/research/SitePages/MoDOT%20Library.aspx
External - http://guides.libraryconnectivity.org/modotlibrary

**Desktop electronic access**
to journals, newspapers and more

**Timely information**
delivered by e-mail

**In-depth research**
assistance provided by dedicated information professionals

**Literature searches**
that summarize data and help you avoid information overload

**Networked connections**
to other DOTs and library partners.

**Resource sharing**
enables access to needed resources not owned by the library.
Our Mission

The MoDOT Library delivers quality, actionable information to support informed decision making by the agency’s managers, professional and technical staff; provides access to the best transportation knowledge resources and tools; and disseminates MoDOT research innovations

Collection

The MoDOT Library collection is located on the second floor of the Missouri Secretary of State’s Office in the James L. Kirkpatrick Building in Jefferson City. We have over 10,000 print, media and digital items, including books, research reports from MoDOT, other state DOTs, UTCs and federal DOT agencies. In addition, we have over 100 print journals and many TRB publications.

Most online resources are accessible via the library website on the intranet [Sharepoint > CM Division > Research > Useful Links > MoDOT Library]. More information is available on the library’s external web page at http://guides.libraryconnectivity.org/modotlibrary

Services

The Missouri Department of Transportation Research Library offers the following services to support your work for the benefit and safety of the citizens of Missouri.

INTERLIBRARY LOAN – Request articles and books not available through MOBIUS from libraries across the United States and worldwide.


INNOVATION LIBRARY – View and search full-text MoDOT research publications such as newsletters and technical reports, both current and historical. http://www.modot.org/services/OR/byDate.htm

DIGITAL COLLECTIONS – View additional MoDOT full-text publications such as selected reports from the Historic Preservation Section or publications on MoDOT’s early history. http://bit.ly/1q9avSG

MTKN – Member of the Midwest Transportation Knowledge Network, which coordinates community efforts and implements a wide variety of projects to improve access to transportation information. http://www.mtkn.org

LIBRARY CATALOG – Search for, check out and request unique publications from the MoDOT library collection of 10,000+ items. http://arthur.searchmobius.org/search~S7

MOBIUS – Borrow books from many Missouri colleges, universities and other specialized libraries. The MOBIUS union catalog contains 23 million items available for patron request. http://searchmobius.org


RESEARCH ASSISTANCE – Locate and provide requested facts, data and other information. Conduct in-depth topical literature searches that summarize research findings.

SPECIALIZED SERVICES – Create custom information products that meet your specialized needs, such as a daily or weekly news alert or clipping service or custom bibliographies.
Field Use of the iPad in Highway Construction, Inspection and Maintenance

Prepared by Renée McHenry, Transportation Librarian
Prepared for Dave Ahlvers, State Construction & Materials Engineer, Central Division

April 15, 2013

**Background:** On behalf of Dave Ahlvers, Bill Stone asked what research had been conducted on the field use of iPads (or other tablet PCs) in highway construction, inspection and maintenance. Back in July 2012, AJ Million had prepared a literature search for Karen Miller on “Mobile Technologies & Virtual Offices” for maintenance workers in the field. In this instance, Dave is interested more in how other state DOTs are using iPads for construction or inspection.

**Conclusion:** Only a few state DOTs have trialled or adopted iPads or tablet PCs for regular use in highway construction, inspection or maintenance activities. The best documented examples for construction projects are from Nevada DOT and Pennsylvania DOT (see discussion below). Other state DOTs have used iPads or tablet PCs as bridge inspection tools (see Caltrans, Massachusetts DOT and Baltimore County, MD in discussion below).

**Discussion:** Construction companies and project management firms are rapidly adopting iPads and tablet PCs in the field for their employees. Although workers find them more user-friendly, companies still need to consider other factors such as developing a clear mobile strategy, need to develop customized apps, training employees on how to use software, and providing for technical support for a successful implementation. Tablets can offer ways to “speed up communication, obtain client approvals, complete inspections, arrange logistics and manage other complications in a [construction] industry that is highly mobile.” [1] [15]

A 2011 Model Metrics survey of business stakeholders and IT personnel found that 22% of their companies had already deployed iPads or other tablets to their workers while 78% planned to have tablets deployed by the end of 2013. As part of their deployment, 83% of the companies planned to use iPads while 34% planned to use Android-based tablets. [9]

Research in progress

iPads and other mobile computers are being evaluated for use in highway construction projects as part of two ongoing projects at the University of Puerto Rico-Mayagüez. Other than the project descriptions, there are no updates or reports available yet.
• Automating the Reporting and Progress Monitoring Process using Mobile Computers for Highway Construction Projects (10/1/12-9/30/13) [13]
• Using Mobile Computers to Automate the Inspection Process for Highway Construction Projects (3/1/12-6/30/13) [14]

Usage by State DOTs

AASHTO conducted a survey in November 2011 asking which technologies departments were using to streamline the construction project management process. See Results [4] and Summary [5].

Caltrans [7]
• In a demonstration project, Caltrans created a proof-of-concept Mobile Bridge Inspection Tool which was used to assess bridge damage in the field after a disaster with real-time posting of data and viewing using a tablet PC installed with a mobile GIS service.

Massachusetts DOT [9]
• An implementation is underway to build a “secure Citrix-based server connection to a bridge inspection database that will allow bridge inspection personnel to access and enter data in real-time directly from field locations.”
• Bridge inspection forms can be completed on the iPad using a finger or stylus. The inspector in the field can take pictures with the built-in camera, create dictation notes (if needed) and access past inspection data and reference materials (such as bridge drawings) in the field.

Michigan DOT [5]
• According to the AASHTO survey, although Palm devices were tested in 2006-2007, personnel are now back to using laptops to transfer data from the managing office to the field.

Ohio DOT [7]
• According to the company tsaADVET, Ohio DOT and its other clients are using tablets and other mobile devices combined with Google Maps, Google Earth and GIS applications to access engineering drawings and other documents that are secured by their document management technologies.

Nevada DOT [3] [5]
• iPads were used to “view data generated by roadside assets, including cameras, flow meters, and weather detection equipment” for a construction contract in 2011.
• Construction inspectors participated in a pilot where they used “rugged tablets in the field for filling out and filing inspection reports related to outside contractor performance during road construction.”
• The department is now looking for a “permanent mobile solution to replace paper inspection forms and manual data entry.” Filing contract compliance reports electronically from the field would improve efficiency and save money on the back end.
**Pennsylvania DOT [6]**

- PADOT conducted a study of the use of iPads and other tablet computers by inspectors on transportation construction projects.
- Using these devices “reduced the amount of time the inspector typically needed for the document research task, which included looking up information to reply to the contractor’s queries and determining adherence to specifications … [It] allows inspectors to remain on the jobsite where they can perform their primary duties.”
- “Inspectors found that the devices offered them a significantly more convenient way to store and access project documents, in addition to being easy to use.”

**Wisconsin DOT**

- After a 2003 field trial, WisDOT found that the tablet PC was a “viable and adoptable tool for collecting bridge inspection data in the field.” In addition to potential cost savings over time, the use of handwriting recognition technology in particular had the potential for more inspection details to be captured accurately and consistently. The report made several recommendations including use of convertible tablet PCs, use of active digitizer input for handwriting technology, use of LCD screens optimized for outdoor and indoor viewing as well as better technology training for inspectors. [1]
- A handheld implementation program conducted in the past was not successful. No further details are available. [5]

**Other (City/County)**

**Baltimore County (MD) [11] [12]**

- A new integrated inspection and management software system was adopted by the county of Baltimore for inspecting bridges. It was “designed to provide more efficient and less error prone on-site collection and entry of inspection data.” The new electronic process has “improve[d] their analysis and accuracy of inspection data compared to the past [paper-based] approaches.” The field/standalone inspection version which runs on tablet or laptop computers is used by inspectors at the bridge site.

**New York City DOT [17]**

- “City transportation workers in charge of inspecting street construction projects use tablet PCs to access and review construction permits. If they discover problems, they can issue violation notices and other requests on the fly.”
- The Department specifically developed the “web-based street construction inspection app called DASH that allows inspectors at construction sites to use the city’s private cellular wireless network to transmit their reports and retrieve new assignments.”
### Sources Consulted

| Library Catalogs       | ARTHUR  
<table>
<thead>
<tr>
<th>MOBIUS</th>
<th>WorldCAT</th>
</tr>
</thead>
</table>
| Library Databases      | ASCE Digital Library 
| Compendex               | EBSCO Academic Search Premier 
| EBSCO Business Search Premier | TRID |
| Websites               | AASHTO  
| Field Technologies Online | Journal of Information Technology in Construction 
| State DOT Custom Search Engine |

### Bibliography


TRID Facts

- In 2011, TRB released TRID, the TRIS and ITRD Database. TRID combines TRB’s Transportation Research Information Services (TRIS) Database and the International Transport Research Documentation (ITRD) Database, offering users the world’s largest and most comprehensive resource on published and on-going transportation research.

- In Fall 2012, ARRB Group’s Australian Transport Index (ATRI) Database was added to TRID adding content from Australia and New Zealand.

- The TRIS Database is produced and maintained by the Transportation Research Board (TRB) at the U.S. National Academy of Sciences; ITRD is produced by ITRD member countries under JTRC at OECD.

- TRID contains over 1,002,000 records of published and ongoing research. Approximately 90,000 records have links to full text documents.

- TRID covers all modes and disciplines of transportation. Efforts have been made to increase coverage on the various transportation modes and in the areas of planning, environment, and human factors.

- The Research in Progress (RiP) records in TRID are available as a separate searchable database at rip.trb.org. The RiP Database includes international research projects and university research.

- Records in TRID are indexed with standardized vocabulary from the Transportation Research Thesaurus (TRT) or the ITRD Thesaurus.

- Published transportation reports or documents for inclusion in TRID may be submitted at trid.trb.org/about or emailed to tris-trb@nas.edu.

For information about TRID or other TRB Databases contact:
Lisa Loyo
Manager, Information Services
202 334 2990
lloyo@nas.edu

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

January 2013
SEARCH TIPS FOR TRID - the TRIS and ITRD Database

Search Hints

- TRID searches for all terms in a query. To search for a phrase, enclose the phrase within quotes. Example: “traffic signals”.
- TRID does not automatically search singular and plural forms of a word. To search for word variations, use an asterisk (*) after a partial word. Example: sign* retrieves sign, signs, signals, signalization.
- To combine words in a search, use OR, AND, or NOT between words or phrases.
- To search multiple terms, a nested search can be performed by enclosing a search within parentheses. Example: (plow* or salt*) and “snow removal”.

Keyword Search

- This field searches all of the indexed TRID fields. These includes: title, abstract, notes, index terms, subject areas, authors, project managers, or principal investigators, serial, corporate authors, publishers, and funding or performing organizations.

Advanced Search

- The advanced search allows searching of specific fields including title, persons, agencies or publishers, serial or conference, index term, or subject areas.
- When searching for a person, enter the last/family name and the first/given name or initial if known.
- Entering terms in multiple fields automatically searches for all terms in the query.
- Searches can be limited by date, language, or source.
- Enter an index term. If the term is from the Transportation Research Thesaurus (TRT), matching terms will appear in a drop down list from which you can select terms. More than one term may be selected; in this case the default Boolean operator is OR. Uncontrolled terms and ITRD Thesaurus terms do not appear in the drop down list but are still searchable in this field. To search uncontrolled terms or ITRD thesaurus terms, simply enter the terms on which you wish to search and press Enter. To use Boolean logic and/or wildcards, simply enter the query without selecting any terms from the drop down list.

Search Results

- Users may modify a query from the search results page by using the options on the right side of the screen.
- Search results can be shared using tools and social networking options directly from the TRID interface.
- Subscriptions to RSS feeds of updates of searches are available.

More detailed information on searching TRID and explanation of fields is available at trid.trb.org/help.aspx.

For information about TRID or other TRB Databases contact:
Lisa Loyo
Manager, Information Services
202 334 2990 (Desk)
lloyo@nas.edu
The ASCE Library provides a comprehensive online tool for locating articles of interest across all disciplines of civil engineering. It's where civil engineering experts around the world publish their ideas, opinions, and research. It's how practicing engineers can stay connected to the latest developments in the civil engineering field.

Online Resources

The ASCE Library gives you access to an enormous collection of technical and practical information.

► 33 ASCE journals (1983 to the present);
► 190 volumes of conference proceedings (2000 to the present);
► More than 80,000 journal articles and proceedings papers; and
► More than 690,000 pages of content.

The ASCE Library also gives access to manuscript previews, journal articles have been accepted but not yet published in print.

At Your Fingertips

The ASCE Library contains searchable abstracts that can be accessed at no charge. You can also

- Browse journals by title, table of contents, or publication date.
- Browse proceedings by title, area of interest, or publication date.
- Search the entire ASCE Library by any word or name.
- Search inside a particular journal or proceedings by any word or name.

Finding Full-Text Content

If you need to locate the full-text of an article from the ASCE Digital Library,

- Search for the ASCE journal title in the Missouri State Library Journal Finder. Many ASCE journal content is available full-text back to the mid-1990s but may lack recent content (last 12 months) due to publisher restrictions.
- If full-text content is not available through a library database, e-mail the citation (see red circle for an example) to the MoDOT Librarian in order to obtain the full-text or request the item through interlibrary loan.
Search Tips

If you have a single search term, enter it into the search box. “Anywhere” searches all metadata fields, plus all XML and searchable PDF text.

A specific field search gives you a more targeted search result. You have a choice of searching your term in any of the following fields: Authors, Title, Abstract, Keywords, and Author affiliations.

To limit your search, you can select certain ASCE publications by clicking add/remove link. It gives you the list of all journal titles and proceedings. For example, if you are interested only in journal articles, you can select all journals or some of the journals.

You can further limit your search by selecting year range.

If you have multiple search terms, click Add another search term link.

You will be given the choice of Boolean Operators: AND, OR, NOT.

- **AND** searches all your terms. By using AND operator, you’ve narrowed your search.
- **OR** searches any of your terms. You should get more returns because it broadens the search.
- **NOT** will exclude your terms from the search.

Operators will be interpreted in the order they appear.

- **Phrase search** -- if you want to search an exact phrase, put double quotes around a set of words, e.g. “soil strength.” Without the double quotes, you may get results with both terms appearing somewhere in the text, but not together as one term.
- **Wild card** * -- Right truncation with * allows you to search for a root term that might have different endings, e.g. sand* will search for sand, sands, sandy, sandwich …
Why Use an Information Professional?

With today’s search tools, looking for information seems easy to do with a quick search of the Internet. However, the volume of the search return often yields enormous numbers of results. How do you know which is the most authoritative source? Which are the most relevant documents? Finding the most accurate information that best fits your need can indeed be a challenge.

According to a 2004 Elsevier survey, the mainstream and multi-disciplinary search tools – half of all the exclusive search tools in the fields of science – provide many more results. Finding accurate and relevant information in this deluge is nearly impossible. Resources do not always stick around either. Two respected science search engines, Scirus.com and Scitopia.org, have bitten the proverbial digital dust.

The number of search results for transportation-specific sites is less overwhelming. Even a more general keyword search can result in some useful documents. As an example, the following table shows the number of results obtained when using various online search tools that are commonly used by transportation professionals to search for information on the topic of bridge maintenance.

<table>
<thead>
<tr>
<th>TOPIC: BRIDGE MAINTENANCE</th>
<th>CATEGORY</th>
<th>ONLINE RESOURCE</th>
<th>KEYWORD SEARCH RESULTS</th>
<th>PHRASE (QUOTES) RESULTS</th>
<th>CONTROLLED VOCABULARY RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General</td>
<td>Google</td>
<td>235,000,000</td>
<td>373,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>General (Scholarly)</td>
<td>Google Scholar</td>
<td>1,930,000</td>
<td>10,500</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Science (Scholarly)</td>
<td>ScienceResearch.com</td>
<td>6,865 top results from at least 485,671</td>
<td>1,908 top results from at least 23,142</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Technical</td>
<td>NTIS--National Technical Information Service</td>
<td>500+</td>
<td>281</td>
<td>212^2</td>
</tr>
<tr>
<td></td>
<td>Engineering</td>
<td>Compendex (About)</td>
<td>7,355</td>
<td>2,706</td>
<td>2,550</td>
</tr>
<tr>
<td></td>
<td>Civil Engineering</td>
<td>ASCE Digital Library</td>
<td>10,379</td>
<td>458</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>Transportation</td>
<td>Transportation Meta Search</td>
<td>38,200,000</td>
<td>64,100</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Transportation</td>
<td>National Transportation Library (NTL) Digital Repository</td>
<td>3,974</td>
<td>253</td>
<td>348</td>
</tr>
<tr>
<td></td>
<td>Transportation</td>
<td>TRID</td>
<td>2,500</td>
<td>2,264</td>
<td>2,500</td>
</tr>
<tr>
<td></td>
<td>Highways</td>
<td>FHWA websites</td>
<td>2,380</td>
<td>649</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Librarians and information professionals are trained to search for, access, evaluate, and organize information resources. They are able to help a customer narrow and define their specific interests, making it easier to find more relevant materials. They understand how to structure a search using controlled vocabulary, to find resources, either freely available or via paid subscription, that are both pertinent to the topic and from reliable sources. If the needed documents are not available in-house or online, they can be borrowed from another library – often from Transportation Knowledge Network (TKN) partners, who have developed collaborative relationships within their organizations.

To learn more about how to conduct effective searches and identify the most relevant search results for the information you need, contact your librarian.

Renée McHenry, MoDOT Librarian, 573.522.1948, renee.mchenry@modot.mo.gov

---

1 LibraryConnect Newsletter June 2004
2 Controlled vocabulary is a standardized set of terms used by a database to categorize items based on their content.
3 Search feature available only in subscribed database.