USING THE LIBRARY FOR RESEARCH IN THE BUILDING SCIENCES

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ABSTRACT

In your research and daily life, you may have primarily relied on Google as your primary search engine. This general search tool may have successfully fulfilled your information needs thus far. However, as you advance through your studies, you reach a stage in your education at which you are expected to find and report on substantive, scholarly research conducted by professionals in a field, and Google no longer suffices. The sources for this type of scholarly information are peer-reviewed journals, books published by academic and university presses, and formal reports issued by government agencies. But these are *not* the type of sources that are accessed in a basic Google search. Therefore, search engines like Google are usually inadequate for the tasks you will be expected to accomplish. So, if you can't "just Google it," how do you conduct research at this new level? One answer is the library!

KEYWORDS

libraries, research, databases, search strategies

RESEARCH: HOW DO I START?

The Campus Library—or Libraries

Many universities have several libraries on their campus—usually a main, general library and often several smaller specialized libraries devoted to specialized subjects like architecture or engineering. When you begin your research, make sure you are using the library most appropriate to your studies.

Libraries are increasingly becoming spaces where students go to meet to collaborate and use new, multi-media rooms and resources. In fact, some libraries are moving books to offsite locations to free up space for collaborative work. Such a move acknowledges that the way people learn and the way they conduct research has fundamentally changed. The future is digital. However, that doesn't mean the physical library doesn't have much to offer the student-researcher apart from being the place where you can find a librarian and work with them in person.

First, if your library has books and journals on site—and most do—you may need these physical documents. For example, if a journal has not digitized its complete archives, you may need to go to the library to access the physical copy of that journal.

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Second, most libraries have interlibrary loan agreements with other university libraries or even shared collections housed in an off-site repository. In such cases, it is possible that you would visit your campus library to pick up the research material you requested. Alternatively, some libraries offer a "scan and deliver" service for you to obtain digital copies of print only materials owned by your institution. Usually, articles are scanned within 24 hours and delivered to you via email. Ask your librarian if this is something they offer to facilitate easier access to resources.

Third, libraries often offer workshops, tutorials, or one-on-one support that covers all areas of research, beyond finding books and articles. Many libraries have specialists to assist with data management and data visualization including GIS support, knowledge synthesis and comprehensive literature reviews, citation management and research impact, and publishing and copyright.

Fourth, some libraries lend equipment like laptops, cameras, and VR headsets and you may need this equipment for your research project. Larger campus libraries likely include some sort of makerspace with 3D printers, and provide access to specialized computer software for design, GIS analysis and mapping, or data visualization, for example.

Fourth, many libraries have exhibition space in which they showcase highlights from their collection (sometimes rare materials from special collections) or display artwork, and these displays can enhance the library experience.

The Library Website

The most important resource for navigating the library and working with electronic resources is your college or university's library website. You will need to become proficient in not only conducting research online—which means learning how to find sources electronically—but also evaluating them for their suitability for your project before you even begin to write.

On the university library website, you will find all the information about library resources and services, including the electronic databases that you need to conduct your research. This raises two important issues: First, these databases have been curated for academic work based on the expertise of librarians and input from researchers at the university. Therefore, they are your best bet for finding good resources. Second, these databases are subscription-based, which means they are not free to access. Luckily, your library holds the subscriptions on behalf of the students and faculty, and the links to these databases are housed on the library's website. As a student at the college or university, you have free access to these databases when you access them through your library's website. If you tried to access them directly (without going through the link on your library's webpage), you would hit a paywall.

And Finally … Librarians

Even though we will be concentrating on a wide range of electronic databases that you can access from off campus, don't forget about librarians! Librarians are trained in the art of research and their help will always improve your research efforts. Look for information on the library website about booking a research consultation, which most librarians offer in-person or virtually. Online help is also available via emails or real-time chat sessions. That being said, keep a reasonable timeline in mind when consulting a librarian. Librarians do not work on a fast-food model. Research takes time and thought, and therefore you can't just show up—in person or virtually—and expect to get the information you need in a matter of minutes.

But there isn't only one type of librarian; there are many types of librarians and people who work in libraries as part of the research enterprise. Therefore, if you seek the help of librarians, it would be useful to understand the range of assistance possibly available at your college or university. What follows is a list of the types of librarians possibly available at your home institution:

- General librarian
- Subject specialist librarian
- Media specialist
- Data specialist

Additionally, it is possible that these librarians post "Research Guides" on the library website that might help you in your work. What follows is a list of possible guides:

- Lists of the most relevant databases for conducting research in your field or subgenres of the building sciences.
- Research guides designed for specific courses. In this case, the librarian will have worked with the course instructor to develop materials that will aid students in research projects for that *specific course*.

WHAT IS A DATABASE?

A database is a collection of information (data) stored electronically. There are many different databases that collect information on wide range of topics. Research databases are collections of citations of scholarly works (journal articles, books, technical reports, conference proceedings, videos and images, for example) about all areas of the building sciences.

There are not only general, multi-disciplinary databases, but also specialized databases for the different disciplines of engineering, construction, and architecture. Moreover, there are even super-specialized databases. For example, within civil engineering alone, you will find databases that address specific areas of civil engineering like transportation engineering, geotechnical engineering, or structural engineering. Examples 1 and 2 illustrate the different levels of specificity—from most general to most specific-possible for searching for information on transportation engineering and architectural details.

Example 1:

> **General Engineering Database: Compendex**
>
> Catalogs resources for *all engineering disciplines*

OR

> **Specialized Engineering Database: ASCE Library**
>
> Catalogs resources related to *civil engineering only*

OR

> **Super-Specialized Engineering Database: TRID (Transportation Research Institute Database)**
>
> Catalogs resources related to *transportation engineering only*

Example 2:

General Architecture Database: Art and Architecture Source

Catalogs resources for *all areas related to art and architecture*

OR

Specialized Architecture Database: Avery Index to Architectural Periodicals

Catalogs resources related to *architecture only*

OR

Super-Specialized Architecture Database: DETAIL Inspiration

Catalogs images and product documents for *architecture and construction details only*

Your job when doing research is to find the databases that collect the information most relevant to your research so you can efficiently access the scholarly material that will be most useful to you. The more specific the database you choose, the narrower the search results will be, and this can be a positive because it means the more efficient your search will be. To demonstrate what we mean by "efficient," look at Example 3. You will you see how much more useful the results get as the databases become more specialized.

Example 3:

Say you are studying transportation engineering and want to learn about roundabouts (also known as "traffic circles"), which are roadway alternatives to intersections. Table 1 shows the results when we used the search terms "roundabout design" in the three different databases mentioned in Example 1. Results are reported for the first five entries in each of the successively specialized databases.

This is not to imply that general engineering databases are not useful. In fact, if we just modify the search strategy to include the terms "road roundabout design" the *Compendex results give us five relevant citations*. However, when more specialized databases exist, they will be more efficient for your search because your search terms don't have to be highly specific to get meaningful results.

The next section explains how to find the databases that are appropriate for your research needs when in engineering alone there are several hundred databases that range from the general to the highly specific.

WHAT ARE THE BEST DATABASES TO USE?

What follows is a list of general databases for architecture, building, and engineering. After that, lists of databases for the different disciplines and, in some cases, sub-disciplines, are provided. These lists will not necessarily reflect all the databases that your college or university subscribes to. Also note that the databases listed below are primarily textual databases, but your library likely has additional databases of images, videos, and other multi-media objects.

They are meant to serve as a starting point for your research and will give you an idea of the kind and range of resources that exist electronically. Some of these databases provide an

TABLE 1. Search results for "roundabout design."

DATABASE	SEARCH RESULTS
General Engineering Database: Compendex	*The first three entries had <u>nothing</u> to do with roundabout design. They provided citations on material fatigue, deviations from standard processes, and microwave dryers!* *Entries 4 and 5 did, indeed, relate to road roundabouts.*
Specialized Civil Engineering Database: ASCE	*Four out of the five first entries were on road roundabouts. However, one entry was on the vibrations of the cables on a "Roundabout Flyover," which refers to structural engineering, not transportation engineering.*
Super-specialized Transportation Engineering Database:	*All five entries (in fact, the first 10 entries) were directly and specifically about roundabout design.*
Transportation Research Institute Database (TRID)	

abstract and index only and you have to request the document; some give you direct access to the document.

General Architecture and Building Databases

1. Art and Architecture Source
2. JSTOR
3. Scopus

Architecture

    Art and Architecture Source

    Avery Index to Architectural Periodicals

    Building Types Online

    DAAI: Design and Applied Arts Index

Building Construction

    Civil Engineering Database (ASCE)

    ASM Handbooks Online

    Construction Criteria Base

    DETAIL Inspiration

    ICONDA

    Smart Building Index

Building Codes
    ASTM Compass

    MADCAD

Green Building
    Building Green

    GreenFILE

General Engineering Databases

1. Engineering Village
2. Web of Science
3. Compendex
4. Scopus
5. IEEE Explore

Civil Engineering
    Civil Engineering Database (ASCE)

    TRID

    GeoRef

    GreenFILE

Mechanical Engineering
    ASME Library

    Inspec

    Knovel

    ASM Handbook

Materials Science and Engineering
    Materials Science and Engineering Database

Aerospace Engineering
    Aerospace Database

    AIAA

Biomedical Engineering
    BIOSIS

    MEDLINE

    PubMed

Systems Engineering
    INFORMS Pubs Online

    Computer Source

Electrical Engineering
    Inspec
    NTIS

Chemical Engineering
    SciFinder
    Knovel
    Springer Materials

DATABASE SEARCH STRATEGIES

Navigating the library databases efficiently requires use of search techniques, different from what you might use in your typical Google search. While Google uses algorithms to search keywords, sometimes favoring some websites over others, library databases apply search terms more scientifically. In other words, the search terms you put into a library database, are the search terms you will get in your results, and nothing else. Therefore, powerful search tools like Boolean operators—AND, OR, and NOT—will ensure you are getting the best search results.

When you use the AND operator between two words, the search engine will only return documents that contain both words. For example, "architecture AND sustainability" will yield results where both terms are present. This narrows down your search and is particularly useful when you're looking for resources that intersect two different concepts.

The OR operator broadens your search by returning documents that contain either of the words it separates. For instance, "modern OR contemporary architecture" will pull up resources that mention either term. This is beneficial when there are multiple terms or synonyms for a concept.

The NOT operator excludes documents that contain the word following it. If you search for "architecture NOT gothic," you'll get resources on architecture that do not include the term 'gothic'. This is helpful when you want to avoid a certain topic.

Remember, Boolean operators must be capitalized to work correctly in most databases. Also, consider using quotation marks for exact phrases, and asterisks for variations of a word. For instance, "sustain*" will search for sustain, sustainable, sustainability, etc. The symbols used in each database are slightly different, so be sure to check the database help page to find out more.

By mastering these strategies, you can make your database search more precise, efficient, and effective, saving you valuable time and effort in your academic journey.

EXAMPLE ASSIGNMENT

Included below are two example assignments that are designed to teach the fundamentals of writing and research for engineering and architecture students. In these assignments, students need to consult specialized databases to learn about high-speed rail, and also consult databases on politics and social science to learn about community responses. Finally, they need to consult the databases for contemporary news outlets to accurately report on the current status of the project.

California High-Speed Rail Project Engineering Report

The California high-speed rail is a proposed north-south rail system designed to link major cities in California (via the Central Valley) by means of high-speed rail service. The proposed rail project is highly controversial and will impact local and regional economies, communities, and environments in a variety of positive and negative ways.

Write a short (3-page) report on the proposed construction of the California high-speed rail project.

The objectives of this assignment are the following:

- To become familiar with standard technical report format
- To practice synthesizing information from multiple sources
- To practice documenting electronic sources in a written document
- To introduce the concept of being responsive/non-responsive

Report Instructions:

1. Title the document.
2. Do not write more than three pages, double-spaced and 11pt font, excluding the References page.
3. Include the headings below in the following order:
   - Background of The California High-Speed Rail Project
   - Proposed Functional Characteristics of the High-Speed Rail
   - Arguments in Favor of the California High-Speed Rail
   - Arguments Against the California High-Speed Rail
   - Status of the California High-Speed Rail Project
4. You can create sub-headings under any of the headings listed above. Subheadings should be visually distinguishable from major headings and the text.
5. Follow standard ASCE documentation style, including a list of References.

California High-Speed Rail Project Architecture Design Project

The California High-Speed Rail (HSR) project presents a unique opportunity to explore how architecture, transportation infrastructure, and urban design can converge to reshape cities and communities. In this design project, you will conceptualize a major station or rail segment, considering urban integration, sustainability, and user experience. The project requires you to draw upon academic sources, architectural precedents, and case studies from library resources to inform your design decisions.

Develop a conceptual design for a key station or section of the California High-Speed Rail system.

The objectives of this assignment are the following:
- To utilize academic sources to support the design concept
- To incorporate sustainable design principles and innovative architectural solutions
- To consider the role of the design within the larger urban fabric
- To create a design that is functional, accessible, and aesthetically pleasing

Design Instructions:

1. Design a station in Los Angeles with attention to how it fits into the urban environment and incorporates sustainable features.
2. Cite five academic sources that support your design decision, such as sustainability strategies or urban design concepts.
3. Include a one-page precedent study of an existing rail station that inspires and substantiates your design.
4. Include the following design deliverables:
   - Concept sketches
   - One detailed floor plan, elevation, and section
   - Show how your design incorporates sustainable building practices supported by your research
5. Include the following written rationale:
   - A one-paragraph summary of how your academic research informed your design choices
   - A list of references in APA format

RESEARCH IN YOUR POST-COLLEGE YEARS

Your access to the wide range of databases is one of the many advantages of being a student. However, since these databases are subscription only, it is likely that you will no longer have access after you graduate, and most engineering and architecture firms do not subscribe to all these databases. But practitioners must still do research, and here are some ways they access the literature:

1. Firms often maintain subscriptions to specific journals, not entire databases. As an employee of that company, you can access the literature from those specific journals.
2. Government resources are publicly available for anyone to reference and can often be found on the government department websites. Some examples include the Department of Energy, Department of Housing and Urban Development, Department of Transportation, Federal Emergency Management Agency (FEMA), and General Services Agency. Related departments in Canada include the Canada Mortgage and Housing Corporation and Housing, Infrastructure, and Communities Canada
3. Local resources like city archives provide vast amounts of information such as building plans and historic photographs.
4. When you join a professional society, you will have access to any resources that it provides to members.
5. Some university libraries offer alumni access for an annual fee. Usually this gives you access to all the print collections and databases licensed for alumni use. Inquire with your librarian if this option is available and what it includes.