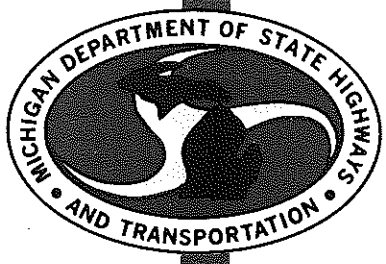
REPORT ON COMMISSION AUDITOR'S
RECOMMENDATIONS NOS. 25, 27, 28



TESTING AND RESEARCH DIVISION
RESEARCH LABORATORY SECTION

SUMMARY STATEMENT

The Committee found that because of the diverse types and styles of research activity engaged in by the Laboratory, a simple effective response to each recommendation was not possible. This was particularly true, for example, in the area of literature research standards. Laboratory research fields can be so narrow that there exists little or no supporting literature. On the other hand, heavily researched fields such as accident analysis provide a wealth of background material which behooves a thorough search by potential project leaders. Hence, we were not able to recommend simple implementations such as assembling all project materials physically in the same central file. We did, however, provide guidelines which, while not interfering with research efficiency, should satisfy the Commission Auditor's concerns.

L. F. Holbrook

Standards be issued for determining prior or current research related to proposed projects.

The literature search process can be likened to sleuthing because it is usually not known where relevant material will be found. Therefore, the best strategy is to start by examining general indices or utilizing research information services such as the Highway Research Information Service (HRIS) or the National Technical Information Service (NTIS). In the highway research field, these services, used jointly, should provide an initial bibliography from which the investigative effort can expand from reference to reference. Narrow and highly specialized fields probably would not be accessible through the more general categories of the information retrieval services. In these cases, individual knowledge, or consultation of the Research Laboratory and Transportation Library card catalogues would probably be superior initial choices.

The process of discovering important, seminal resource material may be spoken of as a "literature search tree." From general information retrieval sources, an increasingly relevant and germane bibliography emerges through cross-referencing. If traced on paper, a literature search tree would serve as an organizer for the development of good proposal bibliographies and provide others, including the Engineer of Research, with insight into the literature search process. This is particularly important when one recognizes the disparate search strategies required by the several fields investigated by the Laboratory. Thus, the literature search tree should make evident those sources which produce results for each field. Subsequently, a kind of literature search strategy feedback develops which should enhance future proposal formulation.

> Committee Recommendation 25.1 - Research proposals should contain a literature search section which graphically traces the procedure by which source materials were discovered during the course of the literature search. From among the list of initial indices and services provided by the Laboratory, the project leader will select one or more and indicate accordingly on the literature search tree, or diagram. References generated at this stage can then be noted at their point of emergence in the investigation. The procedure can be conveniently displayed in the form attached. It is recommended that a form such as this be adopted for inclusion in each research proposal.

The literature search tree specifies sources used and how they lead to one another. It does not indicate the state of the literature insofar as content is concerned. Content must necessarily be handled as a brief review of pertinent findings in the proposed research area.

Committee Recommendation 25.2 - A narrative should be included in the research literature section of each proposal. Several paragraphs in length, the narrative should summarize salient materials derived from sources indicated in the second and following stages of the literature search tree. Ordinarily, a brief history, followed by current research status including similar research in progress should suffice. Thus, the narrative could be divided into three sections:

1) problem history,
2) current status of knowledge,
3) current research in progress.

Often good sources of highly specialized resource material are known to research engineers and scientists who have worked in, or close to, the area under study. Therefore, suggestions from other laboratory personnel or researchers outside the Laboratory could be helpful in developing the literature search.

Committee Recommendation 25.3 - Prior to the completion of the research proposal, the Engineer of Research should announce at the staff meeting the proposed research effort and solicit comments on available pertinent literature. Any suggestions would be transmitted to the project leader via unit supervision.

COMMISSION AUDITOR'S RECOMMENDATION 27

Standards be issued for identifying, accumulating, and organizing project work papers.

At the project's completion, the project leader should attempt an aggregation of all data. This is often impractical because of the numerous data forms which are used in modern research. Computer printout, cards, tape, and disk files, recorder traces and tabulation sheets are often best stored in special repositories rather than a single file folder. To the extent possible, however, the project leader should collate data materials in the Group File. When this is not practical, he should provide some means to enable data location.

Committee Recommendation 27.1 - The project leader will be responsible for the data assembly in the Group Files. This assembly, whenever possible, should be in chronological order. All data not included in the Group File should be locatable by means of the proper designation found in the project's Group File folder. The method of designation is covered in Committee Recommendation 28.3.

Each project work paper, data sheet, graph, and computer printout should be identified as to project number, date, and investigator unless,

as in the case of computer printout, there is a natural binding of several sheets. If tabulation papers can be assembled into a binding (not loose leaf) it should not be necessary to identify each separate sheet.

Committee Recommendation 27.2 - Project number, date, and investigator's name should appear on each work sheet or graph unless logical groups either occur naturally or are bindable, in which case the identification should be placed in the upper right hand corner of the first sheet.

COMMISSION AUDITOR'S RECOMMENDATION 28

Project files be combined and centralized after project completion.

The committee observed that the variety of data sources such as computer printout, magnetic tape, recorder traces, tabulation sheets, etc., would render the single file approach to project material centralization impractical in many instances. Further, some projects require the assembly of considerable quantities of data resource material. For example, there are projects which alone would fill a file drawer with computer printout. Therefore, the committee took a different approach to file centralization than merely the assembly of materials in a single repository. The method chosen is built around a project summary sheet to be located in the Section File folder and designating the location(s) of the project's component data groups.

Committee Recommendation 28.1 - The Laboratory Section File for each project contains a project summary sheet such as the one presented in this report. This sheet is to be filled out in part at the project's inception by the Engineer of Research and project leader. Such matters as project origin and funding would be entered on the summary sheet at this time.

As the project continues, other entries on the summary sheet may be made as correspondence, etc., develops during the course of research. At the time of project completion, the summary sheet is completed by the project leader. At this time the semi-permanent location of the various data repositories will be known. A sample summary sheet and explanation are attached.

Research projects have differing ideal data repositories depending on the type and quantity of work embodied in the research project. Therefore, not all projects will locate data resources in the same physical place or organizational level. However, the committee considered that some common structure was feasible.

Committee Recommendation 28.2 - The Section File must contain at least the following:

a) project summary sheet,
b) initiating and subsequent correspondence,
c) any interim or final reports,
d) follow-up and implementation correspondence,
e) project proposal.

The Unit File may contain duplicates of items under 28.2 as well as remaining project material. However, data materials would in probability result in too much bulk. Moreover, closed projects are often reopened insofar as data is used in connection with follow-up requests or allied research efforts. This might not be practical if all materials resided at the Unit File level.

Data sheets, computer printout, tabulations, etc., would in most instances be ideally placed in the Group Files. This is the 'working' level of the organization and is the logical place for data storage both during and after completion of a research project. After completion of a research project, the project leader will need to assemble and order all data sheets, printout, etc., and deposit same in the Group Files. This should be the lowest order of official file organization rather than having completed project data sheets, etc., residing in personal files maintained by individual workers associated with the project.

It should be possible for any person not associated with the project to examine any data by consulting first the Section File which in turn refers to either the Unit or Group File. Thus, provisions of the Michigan Freedom of Information Act are facilitated since it should be possible for the Testing and Research Engineer or his designee to track down any requested material on the basis of directions provided by the project summary sheet.

Coordination of materials at the Group level is often difficult because of a natural dispersion of various data types. However, the committee thought that minimal standards for files at this level were possible.

Committee Recommendation 28.3 - File folders at the Group level may or may not contain copies of proposals, correspondence, etc., found in the Section File. However, Group Files should be designated as repositories of data in whatever form required by the project. Thus the Group File may consist of boxes of computer printout, canisters of magnetic tape, boxes of computer cards, rolls of instrument recording paper, etc. To coordinate these diverse materials, the Group File should include an organizing folder which designates on the inside cover the following:

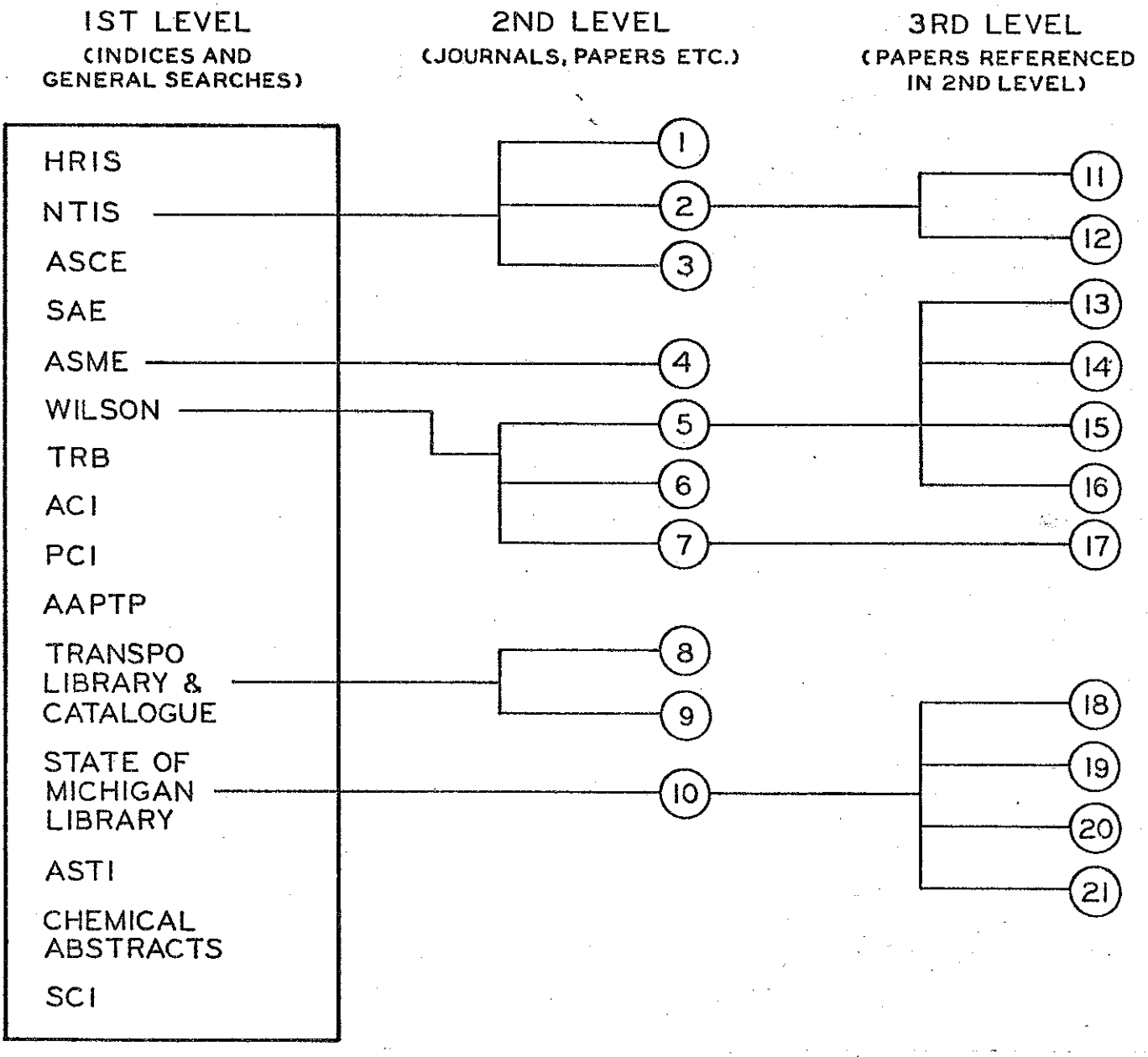
a) project number and name,
b) project leader,

c) names of other technical personnel associated with the project,
d) descriptions of project data and their location.

It may not always be possible to implement 28.3.d until the project is completed.

LITERATURE SEARCH TREE
AND PROJECT SUMMARY SHEET
DESCRIPTIONS

LITERATURE SEARCH TREE *



* See following page for identifying legend.

LEGEND FOR LITERATURE SEARCH TREE

SCI	Science Citation Index
ASTI*	Applied Science and Technology Index
HRIS	Highway Research Information Service (not very current but good on background)
NTIS	National Technical Information Service
ASCE	American Society of Civil Engineers (Cumulative Indices, Publication Indices, Annex Indices, Publication Abstracts)
ASME	American Society of Mechanical Engineers
SAE	Society of Automotive Engineers (Yearbook)
TRB*	Transportation Research Board (somewhat behind; use monthly abstracts)
ACI*	American Concrete Institute (index)
PCI*	Portland Cement Association (index)
AAPTP*	Association of Asphalt Paving Technologists Proceedings

* Available in Research Laboratory Library.

NOTES:

1) Highway Research in Progress Abstracts were discontinued July 1975. Superceding index has titles only.

2) Current Awareness Service of HRIS is a good preliminary source; has short abstracts.

3) The Transportation Library has all Departmental publications.

4) The State of Michigan Library should have many State of Michigan documents as well as some from other states.

5) NTIS for a fee will provide a literature search of all Federally sponsored documents. A more reasonable fee is charged for copies of literature searches already conducted; a list of which is available. The NTIS emphasis is on new material; i.e., 1960 and later.

PROJECT SUMMARY SHEET

Items 1 - 3 to be filled in by the Engineer of Research

Items 4 - 14 to be filled in by the Project Leader

1. Research Project No. _____ HP&R DEPT CAT 1 CAT 2 DEMO

2. Project Leader _____ Assigned ___ /___ /_____

3. Experimental Features Committee Assigned ___ / ___ / ___

_____ Design Division
_____ Construction Division
_____ Other

4. Initiation By

Engineering Operations Committee (EOC) | New Materials Committee (NMC) | Bituminous Advisory Committee (BAC)

Other _____
Memo Included

5. Related Projects _____ _____ _____

6. Starting Date _____

7. Completion Date ___/___/___ Estimated ___/___/___ Actual ___/___/___

8. Proposal or Experimental Work Plan Status

Experimental Features Committee
EFC App. ___ /___ /___
Eng. Res. App. ___ /___ /___
EOC App. ___ /___ /___
FHWA App. ___ /___ /___

9. Correspondence

Department | Suppliers
FHWA | Others

10. Procedures

Test and analyses not in proposal or in greater detail.

11. Data Location Reference

Form:		Location
	Computer Tape	_____
	Computer Printout	_____
	Instrument Traces	_____
	Laboratory Notes	_____
	Other	_____

12. Reports

Preliminary
Progress
Final

13. Follow-Up

Requests
Implementation

14. Literature Search Sheet

Summary Sheet Explanation

The purpose of the Project Summary Sheet is to assure rational, thorough, and efficient execution of research assignments in addition to summarizing all information gathered in the course of the project. Items 1 through 7 are complete when appropriately filled out on the Work Sheet. The remaining items (8 through 14) will consist of separate sections in the project file and are to contain the information listed on the Summary Sheet.

Items 1 through 3: These items are to be filled in by the Engineer of Research when the project is first assigned, in accordance with Department Regulation 6010.03 concerning Category 2 projects.

Items 4 through 14 are the responsibility of the Project Leader.

Item 4: List the individual or committee who requested the study. A memorandum or committee minutes should also be included to provide the intended purpose, scope, or importance of the study.

Item 5: List any other research studies found to provide pertinent information. Also, list the construction projects involved, by control section and job numbers as given in the Contract Documents.

Item 6: Enter as the Starting Date the day you actually begin working on the project.

Item 7: A completion date should be estimated at the start of the project and the actual completion date should also be entered at the close of the project.

Item 8: This item traces the work plan or research proposal through various approvals and will assure compliance with Category 2 requirements.

Item 9: All correspondence pertaining to this project is to be placed in this section of the project file under an appropriate heading and in chronological order within headings.

Item 10: In this section of the project file describe or list any test or analysis procedures which were used but may not have been included in the proposal. State in what part of the study the procedure was used and name the procedure. For example, a computer program for slope stability analysis may have been used; state the program, where it and its documentation are available. Include the documentation, if possible.

Item 11: This item should tell where all data collected in the course of the study are located and what form they are in.

Item 12: Place all reports which have been prepared in this section including memorandum reports.

Item 13: In this section place any implementation documents adopted as a result of this study, such as Departmental Directives, Supplemental Specifications, Special Provisions, or revisions of the Standard Specifications.

Also, place any requests from other Departments, agencies, or states for information or reports.

Item 14: On the Literature Search Sheet check each of the reference sources which you consulted in the course of your literature search. Also, enter any sources of information not listed, which you found helpful in conducting this study.