

**DIGEST OF  
A PERFORMANCE AUDIT OF THE  
RESEARCH AND DEVELOPMENT SECTION  
OF THE  
UTAH DEPARTMENT OF TRANSPORTATION**

The Utah Department of Transportation's research and development program has not been as effective as it should be in conducting advanced transportation research and in controlling the use of unproven road construction materials. The Research and Development Section within the Division of Materials and Research is staffed with engineers who do not have sufficient expertise for many of the specialized research assignments given them. In addition, some research projects have been poorly managed and some research conclusions have not been substantiated with objective data. Finally, new products are being used on construction and maintenance projects before they have undergone the required preliminary tests.

Much of the information in this report requires the department to reevaluate the future direction of its research program. Over the past decade, the research budget and staff have declined at the same time the department has been faced with a variety of complex new materials and highway designs. The skills of the research staff have not kept pace with the technical demands of the research projects they have been asked to conduct. Research staff would be more effective if they were limited to subjects in which they have demonstrated competence. If the department needs to conduct original research requiring a high level of expertise, it should contract the work to outside experts.

The following summaries describe the most significant findings of the audit:

**More Expertise is Needed For Highly Technical Research.** Both the Federal Highway Administration and our audit concludes that UDOT research staff do not have sufficient expertise for highly technical research project. Vacant research positions are usually filled by construction or design engineers from within the department without sufficient experience or training in the area being researched. In addition, frequent staff turnover has also made it difficult for the Research and Development Section to maintain a well trained and experienced research staff. Most of the studies completed within the last few years have experienced turnover in the principal investigator position. Both the lack of expertise and high turnover among research staff have resulted in some research projects not achieving their objectives and others not providing sufficient evidence to support the research conclusions.

Other states have had greater success conducting the same kinds of research projects as UDOT by contracting out the research to local university experts. We determined that two recent research projects which were assigned to in-house staff, could have been done by local university experts at a lower cost than UDOT. However, the universities within the state have relatively weak programs in transportation engineering and have only a few professors with expertise in fields related to transportation. For this reason, the department may not be able to rely on local university experts for all the research it needs to conduct.

►In the future, the Research and Development Section can be more effective if in-house research is limited to subjects for which the research staff are qualified. For example, in-house research staff are capable of performing studies of department construction practices, the implementation of another state's research results and the oversight of outside research consultants. If highly specialized research is needed, it should be conducted by outside experts.

**Research Projects Can Be Better Managed.** More needs to be done to improve the management of research projects and to focus research on important department needs. On average, research projects have been completed 23 months behind schedule and some have failed to meet their research objectives. There are a variety of different causes for these delays, and many were beyond the department's control. For example, most projects have been disrupted because the principal investigator left the division before the project was completed. However, we have identified several things the department can do to make sure projects are completed in a timely manner: (1) reduce the number of minor assignments given to the principal investigators of major research projects, (2) replace several unneeded support staff positions with research engineer positions, and (3) expand the use of outside research consultants.

To make sure that research projects are focused on the needs of the department, the Research and Development Section should solicit more research proposals from the department's operating entities. In the past, few requests for research have come from the department's regular operating entities who are supposed to be served by the Research and Development Section. Instead, most research proposals come from the UDOT research staff and university professors. The research program might also be more responsive to department needs if the Utah Transportation Research Advisory Council had a larger representation from the department's operating units.

The Research and Development Section needs to take better advantage of the developments by other research programs. Implementing the developments of other research programs is the most cost effective way to benefit from new technology and is an activity which the existing research staff are qualified to perform. Research staff and local university professors, however, prefer to conduct original research into the same technologies which are already being researched by other well-endowed research institutions. We recommend that the Research and Development Section avoid such projects and focus on transportation problems unique to Utah and on implementing the developments of other research institutions.

The objectives of outside research contracts need to be more clearly defined. University faculty who have conducted research for the department have told us that the UDOT research staff generally provide them with a vague description of the research problem and then leave it up to them to decide what the scope of their research project should be. To help outside researchers be more effective in meeting the department's needs, research staff must clearly explain the research problem, the scope and objectives for each project offered to outside consultant researchers.

**Some New Products Still Bypass Testing Procedures.** More needs to be done to ensure new products are appropriately tested before they are used. In a previous audit of the department,

we determined that the required new product tests had not been conducted on a product called Syn Crete before it was used on a major construction project. In response to our audit, the department committed itself to following its new product testing procedures. However, the Maintenance Division and local districts are still using untested products before they have been properly tested. In addition, because districts have not maintained adequate records when they have used new products, the department has not been able to evaluate their effectiveness. This practice has not been consistent with department policies which require that all new products be referred to the Research and Development Section for testing. It should be noted, however, that none of the new products identified in this report resulted in a significant loss of funds due to UDOT's failure to comply with its testing procedures.

There have also been a few products which failed after years of successful use because vendors made modifications to the product's formulation. In the cases we observed, we found that the vendor covered the cost of labor and materials to replace each product failure. However, in each case the vendor was allowed to use a replace the failed product with another product which had also not been tested. To a certain extent, this problem has been caused by the lack of a clear policy defining what a new product is and the circumstances in which a modified product should be retested. We recommend that the Division of Materials and Research be given the authority to decide when a modified product should be tested as a new product.

This report shows that the Department of Transportation needs tighter controls over the products which are used to construct and maintain the state highway system. In order to protect the state from products which do not meet UDOT's performance requirements and to assure that product vendors are treated fairly, we recommend that the department avoid using any products which have not been formally tested by the Research and Development Section.