

Workshop Topic 2

QUALITY STANDARDS

The quality standards that have evolved for highway design, materials, and construction have reached their present state via a path that has been almost completely independent of energy considerations. The introduction of this new factor has an extremely disquieting effect. It is forcing us to examine those standards in minute detail, to develop better quantitative justification for the quality levels that are imposed, and to show relations to functional requirements during the life cycle of the system or subsystem. This is at best a difficult task and frequently an impossible task with currently available data as the only resource.

In the past we have sought excellence in highway design and construction and have not been overly concerned with the question, How good is good enough? except as prescribed by general design and by specification considerations dictated by level of service. The industry has done an excellent job according to the rules that have been in effect; but we now have new rules, not all of which are yet written. This is a dilemma but also an opportunity. We should focus on the opportunity because it gives us a chance to write the rules—and all who discussed this topic think that we should.

No one who participated in the discussions, and certainly not I, would suggest that realistic quality standards be abandoned or compromised. It was evident, however, that the introduction of the energy factor has catalyzed, and is bringing to an end point, a reaction that has been in process for several years. We recognize that "first energy" like "first cost" is, indeed, only the first step and that reduction of quality in initial design, materials selection, and construction standards may well result in life-cycle costs of all sorts—energy, money, and service—that are below optimum. However, phrases like "sacred cows in the specification book" and "gold-plated but meaningless requirements" repeatedly emerged in the discussion. A pervasive theme relating to research needs on quality standards could be identified:

All states should be urged to review critically all of their geometric and structural design, materials, and construction standards and specifications to see whether there can be revision or elimination of those provisions that are unnecessary but consumptive of materials and energy.

This is research and not bookkeeping because we are asking ourselves to relate quantitative requirements with quality, life-cycle cost, performance, and energy and to justify the level demanded of the first in terms of what should be expected of the rest.

The details elaborating this theme consumed more than 9 hours of discussion and are not unimportant, but they are impossible to relate in a brief presentation. The following is a noninclusive list of some of these that may serve to illustrate the main point.

1. Materials specifications are too often applied on a statewide basis without recognition of real differences in availability. More flexible specifications coupled with design alternatives could be more economical in terms of monetary and energy expenditures.

2. The experience and initiative of the contractor must play a larger role in highway construction. Many examples of outstanding current practice in this area can be cited. End-result specifications head in this direction and need further development.

3. Several specific quality standards (design, materials, and construction) should be examined (or have been examined) because of the promise shown in reducing energy requirements. These include

- a. Reduction in mixing temperature for asphalt mixtures;
- b. Use of the drum drier;
- c. Requirement of an aggregate blend that calls for the least volume of asphalt per unit of mixture;
- d. Modification of thickness design requirement for full-depth asphalt pavement based on lower expected moisture content of the subgrade;
- e. Use of plain concrete instead of reinforced concrete; and
- f. Critical examination of energy spent on the cosmetic aspects of the roadside.

Safety and environmental quality are no doubt more sacred and have been subject to less quantitative justification than, for example, the minimum compressive strength of concrete. Since we are in a new ball game, let us examine all of the players in terms of the new rules. It is not beyond belief that some requirements that are relative to these aspects of highway design, construction, and operation and were developed in a system unconstrained by financial and energy consumption considerations are not consonant with current reality and need modification. If we are going to look at sacred cows, let us round up the whole herd.

The area of quality standards appears to have great if not the greatest potential for energy savings. Examination of standards might also have side effects that equal or exceed the energy conservation benefits.