

# Quality Control in Highway Construction Programs

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•IN any engineered construction project, there are usually three, and sometimes more, parties involved. First, there is the engineer or designer, who determines and lays out in detail the work that is to be done. Second, there is the owner who is prepared to pay for having this work done, and who enters into a formal agreement with a contractor to do the work. And third, there is the contractor who undertakes to do the work, either by himself or through subcontractors. Beyond this little circle of people who stand in direct contractual relationship to each other are others—manufacturers, shippers, materialmen—whose contractual connection with the principal parties is more indirect, but whose activities must be coordinated in order to carry out the project.

Each of these parties—and I have intentionally oversimplified the list for purposes of illustration—has responsibilities to those with whom he has an immediate and direct contractual relationship, and, under certain circumstances, he may have responsibilities to others in this group. The important point is that these responsibilities are determined primarily by the terms of the parties' written contracts. And so, in these matters, the lawyer finds that the answers to most of his questions must be sought in the terms of contracts—designer-owner contracts, owner-construction company contracts, or construction company contracts.

In the eyes of the law, highway construction is no different from any other type of construction as far as the legal relationship of the parties to one another is concerned. There is, of course, some difference in the position of the parties where a state highway department is involved. In this instance, the state is both the owner of the land where the construction is to occur, and the employer of the engineer who designs the project. The highway department is in the normal position of the owner who contracts with a builder or construction company; and it also furnishes the plans for the project, and makes sure, through inspectors or supervising engineers, that the contractor performs the work in accordance with the intent of the contract and specifications.

## RESPONSIBILITY FOR CONTROL OF QUALITY

The matter of assuring that construction is performed according to acceptable standards of quality is customarily covered by contract and certain doctrines of law. To visualize the basic legal responsibility of the contractor one might take the possible, although not common, situation in which the owner agrees to furnish the materials needed for a project. In this case, the duty of quality control is laid upon him to the extent that the materials must be suitable for the intended use. To a great extent, his guaranty of suitability for use is like a sales warranty of merchantability or suitability for use.<sup>1</sup> Suitability, in this case, means more than mere technical conformity to specifications, and requires that the material be reasonably workable or suitable in every respect to the uses the construction company or contractor will make of it.<sup>2</sup>

If the owner fails to meet these standards of quality, the contractor has the right to require the owner to supply material conforming to these standards. Where defects

<sup>1</sup> *Warneke v. U.S.*, 156 Ct.Cl. 684 (1962).

<sup>2</sup> *Topkis Bros. Co. v. U.S.*, 297 Fed.2d 536; rehearing denied, 299 Fed.2d 952 (1962).

are latent, and the material is used in the project without the defect being noticed, the owner must accept the defective work or give the contractor an adjustment for correcting it.<sup>3</sup>

I have mentioned this unusual situation of the owner supplying the materials for the contractor in order to make a particular point. Here, presumably, is a case where there can be little or no question of having the correct materials for the job. Certainly if anyone ought to know what materials are wanted, it is the owner whose engineers have designed the project. But the usual case is one in which the contractor selects the materials after studying the highway department's specifications, and this introduces an initial difficulty to quality control. To minimize this difficulty attorneys representing state highway departments must use great care to draw the contract between the state and the contractor so that it clearly refers the parties to complete and workable specifications which will be binding on the work done and understood by the parties.

### IMPORTANCE OF SPECIFICATIONS IN HIGHWAY PROJECTS

By and large, the state highway departments have comprehensive and workable standard specifications, and suitable plans and special provisions for individual projects. That this is true is evidenced by the large dollar volume of contract work completed each year—work that is acceptable to the state highway departments, and more or less profitable to the contractors. We recognize, however, that our specifications are not perfect, and that in its actual operation the process of contract administration often varies markedly from the way it is conceived in theory. If this theoretical perfection existed in fact, we would have specifications which were incapable of misinterpretation by any of the parties involved with them. To be realistic, we are forced to admit that in contract administration we are no closer to mathematical perfection than we are in right-of-way acquisition when we seek to determine market value. And perhaps we cannot expect to attain this perfection, for, as one of our Supreme Court justices said many years ago, in discussing the definition of market value:

The brief seems to desire that courts shall reduce this question of market value and its application to the certainty of a mathematical demonstration. Until the human mind is cleared of the many infirmities that enshroud it, this consummation is impossible.<sup>4</sup>

In the drafting and administration of highway construction contracts, therefore, we must make the best of an imperfect world.

### SPECIFICATIONS FOR QUALITY CONTROL

The legal responsibility of contractors for quality control is one of the most important subjects to be covered in highway contracts. This responsibility will be determined by the terms of the contract document. It is obvious that, at least initially, quality control rests almost entirely with the contractor. This is so because, for the consideration stated in the contract, he has agreed to furnish the materials and services required by the contract in accordance with the state's specifications, which generally are incorporated by reference in the contract.

Most state and Federal-aid highway construction contract specifications are based on the Standard Specifications, Plans, and Special Provisions based on guidelines developed by the American Association of State Highway Officials. In these AASHO Guide

<sup>3</sup> Penn. Needle Art Co., WBCA 426; 2 CCF 1 (1944). Longwear, Inc., ASBCA 3607; 57-1 BCA par. 1269 (1957).

<sup>4</sup> Denver R. R. Company v. Howe, 49 Colo. 256, 112 Pac. 779.



Specifications, subsection 104.01 is particularly pertinent to our present discussion, and states:

The intent of the contract is to provide for the construction and completion in every detail of the work described. The contractor shall furnish all labor, materials, equipment, tools, transportation and supplies required to complete the work in accordance with the plans, specifications and terms of the contract.

This not only helps define quality as it should be understood by the parties, but also helps mark out the area of the contractor's legal responsibility for quality. He is responsible for the quality of materials, equipment and the like purchased by him from suppliers and manufacturers; and he is responsible for the quality of work performed by his subcontractors.

#### THE CRITERIA OF QUALITY: THE CONCEPT OF EQUALITY

Effective quality control cannot be achieved without a workable definition of "quality." In this regard highway construction standards are interpreted by reference to the plans and specifications for the project. These specifications may be either wholly descriptive or refer, in turn, to quality designations established by AASHTO or the American Society for Testing Materials. Where brand names are particularly well known in the trade and supplied by several manufacturers, the brand name "or equivalent" product may be called for. Where this latter style is used, an equivalent product is not understood to mean one that is identical with the brand name item,<sup>5</sup> but only that the item shall be as suitable to the actual needs of the project as is the brand name item.<sup>6</sup>

The significance of this concept of equality to our present discussion is that in practice it tends to divide the control of quality between the engineer-designer and the contractor, while technically under the law the final decision on acceptance rests with the former. Differences of opinion over the equivalence of materials will inevitably occur, and must be resolved. They will be resolved in a manner satisfactory to the highway department's supervising engineer whose standards shall be those of a reasonable person<sup>7</sup> rather than his personal preference.<sup>8</sup> Under these circumstances the contractor is free to select and use equivalent materials without destroying the effectiveness of the project's quality control.

#### THE CRITERIA OF QUALITY: TRADE PRACTICES

Application of quality control to the interpretation of specifications also necessarily involves recognition of accepted trade practices. A retaining wall that is specified to be "plumb," "true," or "vertical" is not required to meet the same tolerances required of, say, the launching structure for a space vehicle.

For example, in the construction of a hospital in New York, an inspector required the brickmason to use an engineer's level in leveling the bed joints, in plumbing the vertical joints, and maintaining the concave joints at uniform depth.<sup>9</sup> The court here held that these requirements exceeded the fair intent of the building specifications, and the quality required by the brickmason was to be determined by the accepted trade practice in laying bricks under similar specifications.

Trade practice would clearly have to be used as a reference for interpreting such a requirement as Oregon's specification that "the methods of delivering and handling... concrete shall be such as will facilitate placing with a minimum of rehandling and without damage to the structure of the concrete."<sup>10</sup>

<sup>5</sup> 38 Comp.Gen. 291.

<sup>6</sup> Comp. Gen. Dec. B 153452 (26 March 1964), unpublished.

<sup>7</sup> Fielding & Shepley, Inc. v. Dow, 163 p.2d. 908 (1945).

<sup>8</sup> Rockwood Mfg. Co. v. Mason Regulator Co., 66 N.E. 420 (1903).

<sup>9</sup> Arc Engineering Corp. v. State, 40 N.Y.S.2d 354; aff'd, 293 N.Y. 819 (1944).

<sup>10</sup> Oregon State Hwy. Comm'n., Standard Specifications for Highway Construction (Salem, 1964), p. 263.

## QUALITY CONTROL—TIME OF ACCEPTANCE

Questions will arise regarding the point or place of acceptance of materials. Obviously, it would not be practical to accept aggregate or cement after it has become part of the hardened concrete. Similarly, acceptance of these materials as they leave the manufacturer's hands involves the risk of deterioration of quality before they are actually used. Normally it is state practice to make the contractor responsible for aggregate and cement up to the time it enters the concrete mixer, even though these materials may have been provisionally accepted at the manufacturing plant.

The state's specifications should, and normally do, clearly state the time for acceptance for various materials. In addition, places of inspection pending acceptance are usually specified and must be adhered to in the inspection-acceptance procedure. As between the preliminary inspections at the plant, or those made at other times, and the official inspection provided for in the contract, the latter is the one that legally obligates the inspecting party and determines acceptance.<sup>11</sup>

## QUALITY CONTROL: STORAGE AND HANDLING OF MATERIALS

The specifications incorporated in the construction contract apply to the state's acceptance of the contractor's work, but they do not solve all of the problems of this sort which may arise during construction. From the contractor's viewpoint a whole series of vexing questions may arise when materials undergo changes in their quality during shipment, handling and storage between the time of manufacture and the time of use in construction. It is clear that the highway department may hold the contractor responsible at the time of use in the construction process, but where should this risk of loss ultimately be placed? The contractor, the supplier, and the manufacturer all are possible targets. In the last analysis, allocation of this risk is determined by the contracts they make among themselves.

To some extent the state can help clarify this question of liability by the guidelines set forth in its specifications. Subsection 106.01 of the AASHTO Guide Specifications for Highway Construction states: "At the option of the Engineer, materials may be approved at the source of supply before delivery is started." Thus, even though it is understood that the highway department has the right to retest all materials prior to incorporation into a project, such previous testing may aid in assigning responsibility for an item subsequently found unsuitable.

As with many legal problems, however, the best solution to questions of liability for quality changes may be to prevent the question from occurring. Consider, for example, the case of aggregates which are particularly susceptible to "degrading"—that is, breakdown or deterioration into smaller pieces during hauling, handling, or exposure during storage out of doors. In this case, it is essential to have a definite point and time specified and to provide for early and periodic inspections. With these checks on quality, the amount of degradation may be anticipated and allowance made by the manufacturer or supplier for acceptance by the state's inspector at a certain time and place in the future. In other cases, the contractor may be able to allow for degradation during his screening and crushing operations.

The important point is that while the state highway department cannot completely relieve the contractor from the risk of quality deterioration during storage and handling, it can aid the contractor and the materialman in achieving a smoothly working arrangement under the contracts they have with each other.

## QUALITY CONTROL: INSPECTION PROCEDURE

While the highway department can accomplish much through careful drafting of contracts and substantive specifications, the ultimate success of quality control is likely to depend on good inspections.

<sup>11</sup> J.C. Decker, Inc. v. U.S., 117 Ct.Cl. 703; 93 F.Supp. 631 (1950); B.H. Deacon Co., Inc. v. U.S., 189 F.Supp. 146 (E.D. Pa. 1960).



Inspection procedure should be, and normally is, prescribed explicitly in the state's specifications. Where specifications are open to several interpretations, inspection and testing must be in accordance with accepted trade practices, and the burden is on the contractor to demonstrate that a disputed inspection technique in any particular instance is inaccurate or inappropriate.<sup>12</sup> The inspection must be reasonable, and defects found under an unreasonable inspection will not justify rejection of an item.

Most disputes in connection with inspection procedures arise out of cursory or haphazard inspection,<sup>13</sup> resulting in erroneous rejection of tendered items,<sup>14</sup> or overly strict inspection,<sup>15</sup> or tests beyond the requirements of the contract.<sup>16</sup> This type of dispute will inevitably arise in construction programs of such massive proportions as the current highway program. Procedural rules for state highway projects normally provide steps for settling them satisfactorily. To make such procedures work, however, the contractor must preserve his rights by protesting in a timely manner,<sup>17</sup> and all parties must cooperate in preparing and preserving accurate, complete records of the action that has occurred.

### QUALITY CONTROL: ADJUSTMENT PROCEDURES

A well-founded protest regarding an improper inspection, correction of an error due to defective design, modification of applicable specifications after work has commenced, or various other circumstances may be reason for adjustment in the contract price. Perhaps most common of all causes, however, are the variations in quality which materials exhibit, and the problems associated with material which is slightly "out-of-specs," or the occasional "test out of specs." Recognizing these problems, the AASHO Guide Specifications provide that:

All work performed and all materials furnished shall be in reasonable conformity with the lines, grades, cross sections, dimensions and material requirements including tolerances, shown on the plans or indicated in the specifications.

In the event the Engineer finds the materials or the finished product in which the materials are used not within reasonably close conformity with the plans or specifications, but that reasonably acceptable work has been produced, he shall then make a determination if the work shall be accepted and remain in place. In this event, the Engineer will document the basis of acceptance by contract modification which will provide for an appropriate adjustment in the contract price for such work or materials as he deems necessary to conform to his determination based on engineering judgment.

This provision is extremely important to both the contractor and the highway department since it provides an alternative to outright rejection of nonconforming work and materials. Like many other procedures for handling deviations from the usual performance of administrative functions, however, this one requires a certain amount of formality and "paperwork"—modification of formal documents, and documentation of the reasons therefor. And here, of course, is a point where it is vulnerable, since engineers and contractors often have less patience—or apparent fondness for—paperwork than do administrators. Faced with the necessity of keeping a construction job on schedule, they will prefer to do whatever is necessary on the spot, rather than halt work until the necessary modifications can be processed through administrative channels for approval.

<sup>12</sup> Appeal of Smith & Nephey, ASBCA, 1487 (1953).

<sup>13</sup> Wabash Valley Packing Co. v. U.S., 63 Ct.Cls. 344 (1927).

<sup>14</sup> Standard Fish and Product Co. v. U.S., 74 Ct.Cls. 623 (1932).

<sup>15</sup> Thomas C. Edward v. U.S., 80 Ct.Cls. 118 (1934).

<sup>16</sup> Appeal of Stubnitz-Green Spring Corp., ASBCA 2608 and 3651 56-2 BCA Par. 1034 (1956).

<sup>17</sup> Woodcraft Corp. v. U.S., 146 Ct.Cls. 101; 173 F.Supp. 613 (1959).

One can easily understand these feelings. It would seem that here is an aspect of contract administration for which lawyers should be able to devise a procedure which is more realistic with respect to construction needs.

Another aspect of the contract adjustment process which merits study by lawyers is suggested by the question, often heard from contractors: "Why are we always wrong and the engineer always right?" One answer to this question—and perhaps the most straightforward one—is "Because it is in the specifications." Specifically, subsection 105.01 of the AASHTO Guide Specifications states:

The Engineer will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed, and as to the rate of progress of the work; all questions which may arise as to the interpretation of the plans and specifications; all questions as to the acceptable fulfillment of the Contract on the part of the Contractor.

It is evident, however, that disputed claims are not always resolved by the engineer acting under this section of the specifications. Where they are not, the contractor may take the matter through channels to the engineer's superiors in the highway department, or to an appropriate committee of his contractors' association. Ultimately, of course, he may go to court. In Colorado, we feel that channels are relatively clear for the contractor to state his case first with the project engineer, then the district construction engineer, the district engineer, and the assistant chief engineer for operations. In practice recourse to this channel of administrative review and appeal has resulted in successfully adjusting the vast majority of claims arising from deviation from quality control standards in this state.

Elsewhere this problem may be more critical. Where this is the case, there may be merit in considering the establishment of a body within the framework of the state government to perform for the state's highway program the same functions that the Armed Services Board of Contract Appeals performs for the nation's massive military procurement program. I do not suggest what the details of this solution would be; I suggest it merely to urge highway lawyers and administrators to observe what is happening in other public programs involving large-scale contractual arrangements, and adapt from these programs whatever may be appropriate to the construction of highways.

Cooperative efforts to prevent the occurrence of disputes are, of course, as important as settling them. In this regard, the Colorado Department of Highways was the first to establish a Joint Cooperative Committee with the state contractors' association.<sup>18</sup> This committee affords an opportunity for contractors' association representatives to present problems to representatives of the highway department and vice versa. The joint efforts of this committee have been successful in achieving mutually satisfactory solutions to problems regarding specifications requirements and policies of the department regarding their interpretation and enforcement. On the national level somewhat similar cooperative efforts are carried on by a joint committee of representatives of the American Association of State Highway Officials and the American Road Builders' Association.

## THE ROLE OF RESEARCH IN HIGHWAY CONTRACT ADMINISTRATION

The contract law that highway departments and construction contractors are concerned with is largely administrative law. By that I mean that in most cases contract problems are handled and settled by administrators applying engineering judgment within the framework of legal rules and standards set forth in the state's construction specifications and contracts. In this respect it differs from right-of-way acquisition which generally is carried on through the judicial process. Whereas the law of eminent domain is worked out under the rigorous supervision of courts, much of the law

<sup>18</sup> This committee is composed of sixteen members—seven from the highway department, appointed by the Chief Engineer; and nine from the state contractors' association.

of contracts continues to be evolved through the more loosely controlled processes of administrators and engineers by their accommodation of the terms of contracts and formal specifications to the realities of construction practice. In such circumstances, it is inevitable that the law on the books sometimes bears little resemblance to the law in action.

There is obvious danger in letting the law in the lawbooks grow too far out of harmony with the law in action. This is amply documented by the investigations of the Blatnik subcommittee. This danger can be substantially reduced by highway lawyers if they will use their efforts in preventive measures.

If the states' procedures for quality control are so unrealistic that supervising engineers and contractors feel they cannot take the time to comply with them as they were originally intended, these rules should be made workable.

If the concept of privity of contract acts as a curtain hiding the problems of the materialman or subcontractor from view when in reality these problems have an important bearing on the successful performance of the prime contractor's agreement with the highway department, the modern application of this legal concept should be re-examined.

In short, if we are to improve contract administration, there must be some new and searching study of the legal framework of this function, and a thorough analysis of the factors that affect it and the public policies it serves.

Sound research on these problems will have to be the product of pooling the talents of lawyers, engineers, administrators and contractors. In this respect, I would like to call attention to an NCHRP Report, "Development of Guidelines for Practical and Realistic Construction Standards."<sup>19</sup> It is a report on the definition of work and materials, the basis for acceptance or rejection of contractors' performance, and a philosophy for modernizing the preparation of construction specifications. It is a valuable addition to highway research as it now stands, but it could have been made a much more significant contribution if the legal aspects of this subject had been given the major attention they deserve. As written, this report contains more than 100 pages, in which only two paragraphs comprised of 291 words are devoted to the legal requirements of contract specifications. I submit this report could have been made much more valuable if the legal context of this problem had been treated by the researchers.

As the Interstate Highway System program moves from the stage where right-of-way acquisition has top priority into the stage where construction efforts are the primary concern, I hope that highway administrators will accept this challenge of the times and call for research on the various problems of contract administration. When they do, I hope such research will give adequate treatment of the legal context of contract administration.

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<sup>19</sup> Highway Research Board. Development of Guidelines for Practical and Realistic Construction Specifications, NCHRP Report 17, 1965.