

STATING SEED REQUIREMENTS IN SPECIFICATIONS

By

Dr. John Monteith, Jr.
Civil Aeronautics Administration

In turf seeding contracts the cost of seed usually represents the largest single item of expense. The success of the whole project usually depends largely on the kind and quality of the seed. Nevertheless, the seed requirements as stated in the seed or seeding specifications are sometimes so indefinite that they actually encourage the use of low quality seed.

For some highway work as well as for other public works, seed is bought directly by the public agency and used by the regular staffs on projects or furnished to contractors for seeding. In such cases the seed of the several species is usually bought separately and mixed as required under the supervision of individuals who are familiar with seed mixing.

The following discussion is concerned primarily with specifications for seed to be furnished by a contractor as part of his seeding contract. Much of it applies equally well, however, to the direct purchase of seed by public agencies through specifications.

Quality of Seed vs. Quantity - It is recognized that a given quantity of high quality seed will, under comparable conditions, give better results than will the same quantity of low quality seed. Seed, however, is unlike most items such as the machine-made materials which are usually described in specifications. There are few cases where specifications define materials that are alive as in the case of seed. Where the finished product involves life and growth, the materials used and methods of using them will not necessarily determine entirely the success or failure of the end product. A weak seedling which comes from a poor seed may, under favorable conditions, develop into a robust plant. On the other hand, a strong seedling which is produced from an exceptionally good seed may, under adverse conditions, develop into nothing but a dwarfed and unsatisfactory plant. As a result, it is a common experience to find individuals attributing the failure in obtaining a good cover of turf to poor seed, when in reality the seed was of high quality. Conversely, a low quality seed, sown under favorable conditions, may be credited with satisfactory results.

Because of the influence of growth conditions on final results, it is important that specifications for seed provide for evaluation of the seed on the basis of its known quality rather than on the subsequent growth of grass that is produced from the seed. The quality of any lot of seed may be established by laboratory tests which determine the percentages of purity, germination and weed seed content. The percentage of germination, however, may drop rapidly under unfavorable conditions of handling or storage, after the germination tests have been made so the seed tests results must not necessarily be considered final.

Seed Laws and Need for Definitive Clauses in Specifications - Specifications frequently contain clauses that are supposed to define minimum seed requirements but

which in reality are practically meaningless. A commonly used statement is that "seed must meet the minimum requirements of the State seed laws," or the Federal seed laws. Seed laws, in general, require that all seed be labelled according to prescribed methods to show their quality. The laws do not set up minimum requirements for various types of seed. Therefore, a stock of seed of extremely low quality which is correctly labelled may meet all the requirements of Federal and State seed laws.

Seed Requirements and Laboratory Tests of Seed Samples - Another common clause in specifications that appears to protect the buyer is "the seed shall be mixed under the supervision of the Engineer." Most seedsmen, if so inclined, could readily prepare false mixtures under the type of "supervision" that is usually provided in such cases. Laboratory tests of properly drawn samples of the seed mixtures will give more dependable information as to the species content of the mixture than is obtainable from inexperienced "supervision" of mixing operations.

Often those who write specifications are not acquainted with seed supplies that are most readily available and there is a tendency to simply copy requirements from other specifications. Therefore, in many instances, the requirements as stated in specifications tend to limit the bidding unnecessarily. As an example, a specification for seed may fix a minimum purity of 90 percent and a minimum germination of 80 percent. A large local stock of this particular kind of seed analyzing 85 percent purity and 85 percent germination would not meet these requirements due to the lower purity than stated. For roadside and most other turfing work there seems to be no justification for this type of discrimination. Theoretically, equal unit weights of a 90-80 seed and an 80-90 seed will each contain the same number of seeds which will germinate and produce the seedlings desired.

Percentage of Pure Live Seed and Required Quantity of Seed - The percentage of seed that will germinate, obtained by multiplying the percentage of purity by the percentage of germination, is referred to as the percentage of pure live seed (PLS). Since the purpose of seeding is to produce on any given area not less than a certain desired minimum population of seedlings, the quantity of seed required will depend on its percentage of pure live seed. Therefore, it seems logical to express minimum seed requirements in specifications in terms of pure live seed. If the minimum requirement of the above example of seed is expressed as 72 percent pure live seed, the specification will make it permissible for one seedsman to bid on his stock of 90-80 seed, another seedsman can bid on 80-90 seed, and a third can bid on his stock of 85-85 seed. This greater flexibility is an advantage to the seedsmen and, indirectly, to the agency paying for the seed.

The maximum limit of weed seed content should be stated with any method of stating minimum seed qualities. Throughout the following discussion it will be assumed that a maximum weed seed tolerance is stated in the specification.

Methods of Stating Minimum Seed Requirements Compared - In reviewing seeding specifications one finds minimum seed requirements stated in several ways. The following example of a simple mixture is given to illustrate a few commonly used methods of stating minimum seed requirements.

Method A: Kind of seed.

60% Red fescue
40% Kentucky bluegrass

Method B:

	<u>Purity %</u>	<u>Germination %</u>
60% Red fescue	90	90
40% Kentucky bluegrass	80	80

Method C:

	<u>Pure Seed %</u>	<u>Germination %</u>
Red fescue	54	90
Kentucky bluegrass	32	80

Method D:

	<u>Pure Live Seed (PLS) %</u>
Red fescue	48.6
Kentucky bluegrass	25.6

It is surprising how many seeding specifications have been written using method A, even though there is obviously no limitation on the quality of the seed to be furnished. In method B, the seed requirements are clearly stated. However, unless the actual mixing is observed, there is no way of telling from reports of seed analysis whether the mixture was prepared exactly as stated. The report of the seed tests will show the percentages in the mixture of pure seed of the two species and the percentage germination of each. If a seedsman has on hand stocks of seed of higher purity of one species and lower purity of the other species than is stated in method B, he may change the 60-40 proportion to balance them in such a way that the mixture will test the same as if he had used the 60-40 mixture as stated. Actually, from a practical standpoint, it makes no difference if he does change them. If the mixture cannot be definitely checked for analysis and possible changes are of no importance, there seems no point to stating the requirements in the manner shown in method B. In method C the minimum requirements are shown in terms that are more definite than in A and can be checked directly against seed laboratory reports. In method D, the minimum requirements are stated in the simplest manner that definitely sets a limit on seed quality and proportion of each seed in the mixture. It will be noted that the minimum number of seedlings that may be expected from a given weight of seed will be the same whether the specifications are written with methods B, C or D.

Flexibility in Utilizing Stocks of Seed to Best Advantage - In stating seed requirements for mixtures in terms of pure live seed (Method D), the seedsman is able to adjust the proportion of the different lots to enable him to utilize the stocks of seed he has on hand to best advantage and yet make up a mixture that will be of equal value to those that are made up precisely according to either B or C requirements. If the requirements are set high enough for the

mixture, it should not be possible to use stocks of seed of the several species in the mixture that are of questionable value, except in cases where the mixture contains small proportions of seed of one or more species. In the above simple example of a seed mixture, for instance, the qualities indicated are by no means excessive. In actual practice, the above mixture expressed in terms of method D would probably be changed to:

	<u>Pure Live Seed (PLS) %</u>
Red fescue	50
Kentucky bluegrass	25
Other materials*	25

*(Other material is composed of chaff, dead seed, other inert material and seed of other species.)

To illustrate how a seedsman would be limited against furnishing worthless seed in such a mixture, let us make the extreme assumption that he could use seed of both species that test 100 percent purity and that the germination of the fescue seed is 100 percent. In this theoretical mixture the seedsman would put in 50 pounds of fescue seed for each 100 pounds of a mixture. For the other 50 pounds of the mixture he could use his 100 percent pure bluegrass seed, provided its germination did not fall below 50 percent. Since the above assumed extremes of 100 percent purity and germination are impractical, it follows that any mixture, to comply with the above requirements, could not contain seed with percentages of purity or germination as low as 50.

It has been contended that the requirement in terms of pure live seed permits the use of chaff or filler. To illustrate this possibility, the above theoretical example will be continued. Let us assume that the bluegrass seed used is also a 100-100 lot. The seedsman could put in 25 pounds of this seed with 50 pounds of his 100-100 fescue and add 25 pounds of chaff or other filler. By using these 2 lots of perfect seed he would supply the potential plants contemplated by the specifications writer. In other words, if a seedsman adds any appreciable chaff or filler, he must put in the mixture seed well above the minimum quality anticipated by the specification writer. Simple principles of economics will discourage a seedsman from using seed from which he has cleaned chaff and inert matter at considerable expense and then mixing back inert matter into it.

If the mixture contains small proportions of one or more species, however, it may be advantageous and practical for a seedsman to use seed of very low germination. This is particularly so in the case where the low percentage seed is much more expensive than the other seeds of the mixture. One example of this is a seed mixture including only 2 percent pure live seed of one of the species. In this case if a seedsman used higher quality seed of the other species than was anticipated by the specifications writer, he could fill in this 2 percent item by using for each 100 pounds of the mixture 12 pounds, for example, of a 90-20 seed. This low germination percentage is entirely too low even though best quality seed is used for the other items. For most specifications it obviously would not be to the advantage of a seedsman to carry this possibility out to extremes in order to unload small quantities of low grade seed. In cases where the specifications include such small proportions of a seed that a low germination is likely to be encouraged it may be prevented by including a requirement that in no case will the

germination of seed of any species in the mixture be less than a stated minimum. Such a minimum requirement for any species should be low enough to permit the seedman the desired flexibility in adjusting his lots of seed of all the species in the mixture.

Provisions in Specifications for Higher Quality Seed Available - In establishing minimum specification requirements for seed, it is desirable to have standards high enough to be able to use seed that will give satisfactory results and yet low enough to take advantage of readily available stocks. When the specifications have minimum pure live seed requirements sufficiently low to encourage competitive bidding from ample supplies it often is found that some seedsmen who wish to bid have on hand stocks of much higher quality than the minimum stated. In such cases it is advisable to enable them to bid directly on the basis of higher quality seed, rather than to encourage dilution with lower quality seed or inert matter. Such a provision does not generally occur in specifications. In our new C.A.A. specification we have included a provision for accepting seed of higher quality than the minimum specified and making allowance for this better quality seed. In this case the seedmen must claim such higher quality at the time of delivery and show it on the labels. There is a requirement that the proportion of seed stated for a mixture must be maintained when there is an increase in the total percentage of pure live seed in the delivered mixture. Since the contractor is required to sow seed on the basis of pure live seed, he is permitted to sow at a proportionately lower rate than is required with seed that just meets the minimum requirements of the specification when he purchases seed of higher quality than the minimum stated. Therefore, he is enabled to pay the seedsmen proportionately for the higher PLS content than the minimum stated in the specification.

Adjustments for Costs of Seed Based on Seed Tests - Specifications should contain provisions for testing seed when it is deemed advisable. Such testing should be done before the seed is sown. However, in much contract work it may become impractical to obtain results of seed tests before sowing seed. Thus seeding specifications should permit the use of such seed, but should include provisions for adjustments for costs of seed and resowing if the seed tests later indicate that inferior seed was used.

Where seed is purchased by the contractor for use under a seeding contract, there are often cases where a seedsmen is asked to deliver seed without being given an opportunity to examine the seed requirements as stated in the specifications. The following example is given as an illustration.

Poor seed was reported to have been delivered on a large government job. The specification had stated the requirement in terms of percentage of pure live seed of four species, together with the maximum percentage of "other material." Upon investigation it was revealed that a representative of the contractor had telephoned a local seedsmen and asked for immediate delivery of the prescribed mixture. Instead of giving the seedsmen the percentages of each in terms of pure live seed, as stated, the contractor's agent had simply read off the names of the grass seeds and the percentages of each. When the seedsmen looked over his order as it had been written from the telephone conversation, he read "Kentucky bluegrass 40 percent," etc. There had been no mention of pure live seed or any other designation of quality. He, therefore, included in the mixture 40 percent of the Kentucky bluegrass seed he had in stock. He admitted he was

puzzled with the requirement for the "other material" consisting of chaff, etc. However, seedsmen have plenty of occasions to be puzzled about items in seed specifications so he naturally raised no further question.

Seed tests later showed that the seedsman had not delivered the seed mixture as required in the specification. The responsibility in this case was of course the contractor's but the government had also lost a growing season in obtaining the desired cover as a result of this simple misinterpretation of seed specifications by an individual who was probably handling his first specification for seed.

Required Statement from Seedsmen Based on Specifications - Many misunderstandings similar to the above may occur where the purchase of seed is through a second party, especially if he is not familiar with seed or seedsman's terminology. Such trouble can be avoided if the seedsman is furnished a copy of the specification requirements when the order is placed. In our new CAA specification it is required that when the seed is delivered a statement be obtained from the seedsman that in his opinion the seed meets the requirements as stated in the specification. A seedsman is not expected to make such a statement unless the contractor has provided him with a copy or full information as to the specification requirements. Experienced seedsmen are usually better able to interpret the terms of the specification relating to seed than are the engineers or inspectors in charge of the project so this clause is inserted to give the contracting agency the benefit of the opinion of the seedsman.

When seed of legumes that require inoculation is required for a seeding, it is usually preferable to purchase it separately. It can be inoculated and then mixed on the job with another seed or a seed mixture, or sown by a separate operation.

Summary - Seed is one of the most important items in roadside improvement work but the specifications for seed are often indefinite or too restrictive. Federal and State seed laws and regulations place certain restrictions of labeling and handling of seed but they do not set up minimum requirements of quality, so it is essential that these needed restrictions be stated in specifications. Quality of seed can be expressed in a most practical way in specifications by stating requirements in terms of the minimum percentages of pure live seed and maximum weed seed tolerances.