Good Road Foundation Essential

AN important factor in the financing of good roads by county bonds is discussed by the authors of Bulletin No. 136, of the United States Department of Agriculture, entitled "Highway Bonds."

In this bulletin the authors point out that in expending money raised by the sale of highway bonds the highway commissioners should distinguish carefully between the permanent and the perishable features of the road. Foundations, drainage structures, alignment and grades, are permanent features which should be looked upon in the light of an investment. If these features do not comply with a certain standard, it will be poor economy to spend money on transitory improvements such as hard surfaces, which must be renewed at considerable expense from year to year.

Local conditions, of course, determine to a great extent the proper standards for the permanent features of any highway. Twenty years' experience in modern road building has shown, however, that there is a minimum which any road built on borrowed money should comply with. A close study of 244 different types of road shows that to meet this minimum standard, the following sums will probably have to be expended for three standard kinds of highways:

Standard Highways.

TYPE.	Drainage and grading	Surfacing	Total	Drainage and grading, per cent.	Surfacing per cent.
Gravel (20 feet wide)	$1,817	$2,599	$4,416	41.15	58.85
Ordinary or water-bound macadam (15 feet wide)	3,400	5,815	9,215	36.89	63.11
Bituminous macadam (15 feet wide)	2,765	7,533	10,298	26.85	73.15

A study of these figures will help counties to avoid the common error of first fixing the sum to be spent and then demanding an exorbitant mileage in return for it. So-called macadam roads have been built with bond money by simply spreading broken stone in the mud. The inevitable result of such shortsightedness is that long before the bonds have been paid off the improvements for which they were issued have ceased to exist and the county has nothing to show for its increased debt. In the same way, it is manifestly poor policy to build an expensive surface on defective grades with poor alignments and shortlived drainage features.

Even when much of the money expended upon a highway has gone into the permanent features, there is still danger that the cost of repairs and maintenance will be overlooked, or at least slighted, in the calculation of the road-builders. When roads are built with borrowed money it is, of course, especially important to avoid this error.

Not All Surfacing Temporary.

On the other hand, however, it is not necessary to regard the total cost of surfacing a road as a temporary improvement. Much of the surfacing may be classed as a permanent investment, for it is becoming more and more common to have surfaces built in two courses, the lower of which is as much a permanent feature of construction as the grading itself.

This is particularly true of those types of road that are built with concrete foundations for bituminous-macadam, brick, or asphalt surfaces. It is probably conservative, indeed, to regard 40 per cent of the surfacing cost of macadam or more enduring pavements as a permanent investment. It is seldom nowadays that hard roads are permitted to wear into the foundation course of the surfacing.

Probably it is safe to say that an average of about 62 per cent of the total cost of a well-built macadam road should be put into the permanent features, and with bituminous-macadam roads, about 56 per cent. This method of estimating cannot be applied to any gravel or natural soil road in which no part of the surfacing can advantageously be considered permanent, for under most systems of maintenance it steadily deteriorates.

Concrete Permanent.

Roads built with surfaces entirely of concrete, or with brick pavements resting on a concrete foundation, are generally regarded as permanent, but it is not yet definitely known how long the best concrete surface will last. The best vitrified brick surfaces may last a number of years, but even with them repairs will be required.

To sum up, the authors of this bulletin point out that the initial cost of a road is never the final one; that no surface is permanent, and that repairs and maintenance charges of a good road are to be regarded as permanent investments. When roads are built with borrowed money, the distinction between the permanent and the temporary improvement must be carefully observed, in order that the county may have something in exchange when the time comes to repay the loan.

Estimate Cost of Road in 20 Years

WHILE it is frequently easy for a county to issue bonds and borrow money for improving the local highways, the raising of the money to retire those bonds at maturity is often not so simple. Many counties, in borrowing money for bonds, figure that the amount of money raised represents the total cost of the road, forgetting that the road must be maintained and repaired if, at the end of the term of the bonds, the county is to have anything to show for its investment.

The question of financing country road building is discussed fully in a Department of Agriculture bulletin, written by the Office of Public Roads in collaboration with James W. Glover, professor of mathematics and insurance, University of Michigan. In this bulletin the authors discuss fully the various methods of financing road building and retiring debts for road construction, and also deal frankly with the actual total cost of a road during the life of the bonds. On the total cost of a road, the authors cite the following two examples as affording at least a basis for estimating the total minimum cost of a mile of road:

Cost of Mile of Road.

Bituminous macadam—	
Cost of construction ($10,500) under 5 per cent serial bond, with interest for 20 years	$16,012.50
Cost of annual repair and maintenance ($600) for 20 years	12,000.00
Total cost for 20 years	$28,012.50
Brick—	
Cost of construction ($18,500) under 5 per cent serial bond, with interest for 20 years	$26,426.73
Cost of annual repair and maintenance ($300) for 20 years	6,000.00
Total cost for 20 years	$32,426.73

The authors point out that the actual cost of building and maintaining a specific highway can be determined only after the character and volume of traffic and actual wear and tear have been studied for a series of years. The figures quoted above, of course, will not apply to ordinary macadam, gravel or clay roads, but in all these cases the interest on the bonds must be met, and there must be expenditures to maintain them in condition.

The poorer the drainage and the less permanent the character of the road foundation, the greater must be the percentage that repair costs will bear to the first cost.

Similarly, the question of whether the actual surfacing is designed to withstand the character of traffic and weather to which it is subjected also has an important bearing on what it will cost the county to keep the road in such shape that when the bonds are paid the locality still will have a valuable property to show as a result of its borrowing and repayment.

Millet.

Millet is a quick-growing crop. Common millet matures in the shortest time and therefore draws moisture from the soil for the least period of time. German millet yields the most and is preferred when there is an average supply of moisture. Common millet is one of the best drouth resisters. Northern seed produces much the hardiest plants. The foliage of plants from southern seed is heavier. Sow 15 to 20 pounds of seed to the acre.

Cut before the seeds get hard. It is a good plan to start cutting as soon as the heads become fully developed.

Continued feeding of millet to horses some times causes incurable lameness. It is fairly safe to use for horses when cut early and only one feed a day is given of the millet hay and some other forage at the other feedings. Millet is chiefly valuable as a cattle feed.

He who laughs his way through life is apt to have a good long laughing spell.