and utilities. For example, it should determine the relative value of the city's fuel, foods, materials of building construction, rubber for fire hose and firemen's boots, etc.

Until the laboratory can be organized and equipped as a "Standard Laboratory" to handle the testing that is warranted by the entire field of municipal activities, the scope of the work will be mostly engineering testing. The question naturally aroused is how will the men be usefully employed during the winter months. If the letting of contracts is planned in advance, then many samples of materials will be received with bids for work during the early spring of the year. Investigations of materials and specication remodelling would fill in the partly vacant time freed by the curtailment of work in the late fall. In the beginning, the mid-winter testing may be confined to sewer work, for example, and the remaining time could not be more profitably applied than if used for research work. An example of this possibility is the determination of the applicability of magnetic testing of iron and steel. Determining the practicability of ideas received from the field and arising in the laboratory during the busiest times of the construction season, is another item of work properly belonging to the winter season.

As the volume of testing increases and the scope of the laboratory expands, occasional special studies will warrant even more highly specialized apparatus than is needed for routine testing. In order that such special work may receive accurate analysis, and, at the same time, that the investment in special equipment be made economical, it is recommended that the laboratory do some local commercial testing.*

The laboratory then not only would serve all of the city departments but aid local industry. This would materially facilitate civic business, procure better materials for citizens, and would bring revenue to the city. The more frequent use of special apparatus would make its purchase economical. Experiments then could be performed that ordinarily would not be made because of the lack of facilities. The extra money and work to be done would be provided, thereby enabling the employment of highly specialized scientists in many branches of the work. In performing this function it is essential to keep all interests secondary to the official city requests, giving each class of work the relative attention that it deserves.

Development of Personnel

The successful operation of any enterprise depends upon the personnel responsible for it. This is especially true of a testing laboratory. No matter what plans are adopted, they will be fruitless unless energetically carried into effect. Moreover, efficient growth depends upon the initiative and earnest effort of the laboratory personnel to cover its useful field.

Naturally a capable and experienced director is very important. He should be given money and authority to gradually build up a modern testing laboratory that will properly safeguard the city's interest. If he is qualified to determine the relative value of expenditures and purchases for the city, he is fit to be trusted with an expense account ample enough to enable him adequately to cope with the ever-changing conditions in his work. The director should not be restricted by any influences except limitations similar to those placed upon a thoroughly business-like, energetic manager of an industrial enterprise. This is no more than fair to the taxpayers whose public purchases he would endeavor to safeguard, improve and cheapen. The testing laboratory, rightfully considered, is a municipal business enterprise in which the taxpayers are the stockholders. The laboratory director is the manager of the enterprise by right of his special knowledge and experience. Not only money, but authority to spend it must be allowed him. Dividends in the form of decisions as to the best materials are the economic products.

(Concluded in next week's issue)

*In some cities a charter change or some form of state legislation is necessary to give the authority to do this.

HOT MIX ASPHALT PAVEMENTS

(Continued from page 474)

is followed the pavement will carry a heavier traffic than if a coarse stone surface, liable to fracture, is left exposed. Pavements of this type will not carry as heavy an iron tired traffic as sheet asphalt or Topeka. The method of laying them is substantially the same as in the case of Topeka.

Pulverized Earth Pavements (National Pavements) are usually laid without any binder course and from 1½ to 2½ inches in thickness. They are very rich in bitumen (15 to 20%) but are extremely stable and so malleable that at a temperature of 60 to 75°F., a piece may be cut out of them and hammered back with a hammer and a perfect cold weld obtained. Their stability is due to the extreme fineness and absorbent properties of the mineral aggregate, and for the same reason it is impossible to wear away the surface by any fracturing or grinding of the individual particles, as they have been reduced to practically their ultimate state of fineness before incorporating them into the pavement. In many respects they resemble the old French Rock Pavements, which had an unequalled record for long life. As compared with the French Rock Pavements, they do not become polished under traffic but maintain throughout a very wide range of temperature, a consistency very closely approaching that of sheet lead, and as they contain from one and one-half times to twice as much bitumen, they are more waterproof and wear resisting. The clayey material of which they are composed has a much greater affinity for bitumen than any other known paving material, which still further adds to their permanence. With the exceptions noted under the discussion of plants, their manufacture and laying are very similar to sheet asphalt. A National Pavement weights about 170 pounds per square yard 2 inches thick as compared to 200 pounds per square yard for sheet asphalt of the same thickness. Their cost is somewhat higher than sheet asphalt owing to the large amount of water frequently contained in the mineral aggregate and the high percentage of bitumen used in them. They are capable of carrying the heaviest kind of traffic, and when properly constructed mark less in summer than do sheet asphalt pavements and are much less susceptible to shoving and displacement. They are equally suitable for very light traffic. The bituminous cement used in them is about 90 penetration at 77°F. which is much softer than is used in other types of mixed pavements. For this reason they do not become hard and crack, even if not subjected to traffic for a considerable length of time.

The choice of routes on the provincial highway between London and Windsor, Ont., has not yet been definitely decided upon. Extensive surveys have been taken along both routes. The tenders will soon be awarded and construction work on the chosen route will commence immediately thereafter.

Along the National Transcontinental Railway, extending over that area north and west of Cochrane, a large amount of road building is to be done this summer. Graded roads already extend west beyond the Driftwood River. Seventy miles west from Cochrane a good road has been started from Kapuskasing toward the east, and has already been graded for a considerable distance. Only a few miles remain to be built in order to complete the road from Cochrane to Kapuskasing. South from Cochrane, along the T. & N. O. Railway, a good deal of road building is being done, in some instances gravel for grading having been hauled during the winter months. Ultimately, it is hoped, these roads will connect up with the Cobalt-Haileybury-New Liskeard-Englehart road, and thus constitute a highway, direct from Cobalt to Kapuskasing, a distance of about 225 miles. This would leave that section from Cobalt to North Bay as the only link lacking in the chain of roads that would make travel possible between old Ontario and the great silver and gold camps of the north as well as the agricultural districts along the Cochrane clay belt.