

## PANEL DISCUSSION ON MAINTENANCE

Moderator — M. F. JOHNSON, Director of Maintenance  
Department of Highways

Panel —

W. F. KNARR — Asst. Dist. Engineer of Maintenance  
C. O. YOCHUM — Asst. Dist. Engineer of Maintenance  
J. E. ADAMS — Asst. Dist. Engineer of Maintenance  
DEWEY SPARKS — Asst. Director, Division of Maintenance  
F. H. HILLYARD — Asst. Director, Division of Materials  
W. R. WRAY — Asst. Dist. Engineer of Traffic

### RIGID PAVEMENTS

1. Q. *The best method of patching on badly broken concrete surface.*

A. ADAMS — We have achieved good results by removing the broken concrete and excavating sufficiently to secure a solid foundation. After the area is excavated we use No. 2 stone or field stone and tamp this material with a mechanical tamper, choking the larger material with No. 610 stone or smaller aggregates. It is then primed and cold patch placed and rolled.

2. Q. *What is the best method and material to use to patch concrete pavement that is scaled?*

A. KNARR — Of course the degree of scaling has a very definite bearing on the type and amount of material to use. If the scale is extensive, and the pavement pitted to a marked degree, then Rock Asphalt tacked with RS-2, a quick setting emulsion, has been used successfully. From our experience the degree of success of this type material depends chiefly on the roughness of the scaled areas and the thickness of the Rock Asphalt which can be applied.

For ordinary scaling, or sealing, in its early stages, we suggest the use of sand, a Class A Concrete Sand gradation, as coarse sand prevents skidding. However, the tack coat for sand should be the same as for Rock Asphalt, merely a paint coat of RS-2 emulsion, applied and broomed just prior to the application of the sand. We have used both of these methods, depending on the existing condition, and have had fairly good results.

3. Q. *Are we using the most suitable material for concrete crack and joint filling? If not, what material would be best suited for this purpose, especially small cracks?*

A. HILLYARD — Our experience with concrete crack and joint filling has not been very satisfactory. We are not alone in that experience. At a recent meeting of the Materials Section of the Mississippi Valley Conference, this question was discussed. Some of the States used partially blown asphalt with penetration of 85 to 100, and others used RC-3, RC-2 and emulsified asphalt. The discussion was summarized with this statement, "None of these is satisfactory". In recent years we have had very satisfactory results with hot poured rubber and cold mastic type filler for joints and large cracks. PAC-3 with a penetration range of 50 to 60 and softening point of around 140° is recommended for small cracks.

Comments — YOCHUM — I can comment only as far as my experience has been with material used for this purpose. I have used Asphalt Cement, usually penetration 40 to 50. This material definitely is not what I want. It does not do the job as a joint filler. I have used Hot-poured Rubber-type Compound and Cold-applied Mastic-type Compound. Both of these materials give the required results expected of a good filler, that is, long life and weather proof joints.

## BITUMINOUS PAVEMENTS

4. Q. *What method would you use to repair holes in Rock Asphalt Surface? To repair areas that are badly cracked but not broken out?*

A. KNARR — By "holes" I presume you mean a hole that extends into the base. The method we use for repairing this type of break is to first square up the break, then patch it to within  $\frac{1}{2}$ " to  $\frac{3}{4}$ " with cold patch, preferably No. 8 Stone mixed lean. This is in turn topped with Rock Asphalt and rolled, if the patch is large enough to permit rolling, otherwise hand tamped until the patch is tight and slightly higher than the adjoining surface.

In repairing areas that are badly cracked but not broken out, the Foreman has to rely on his judgement of the reasons why this condition has occurred. A Rock Asphalt surface will not crack wide open of its own accord. The cracks were caused by the base failing to begin with. The area in question therefore should be examined closely to determine the cause and then corrections made to prevent a recurrence, otherwise ninety-nine times out of a hundred the cracks will reappear after the area has been patched. Sometime, but not often, it is possible to seal these areas with emulsion and Rock Asphalt, but as stated before if the cause is not corrected the same condition will occur again.

5. Q. *What is the best method to use in placing Rock Asphalt for deslicking purposes?*

A. ADAMS — In my opinion, the best method for deslicking purposes is to use a spinner. Of course the first operation is to apply the tack coat, which consists only of a very fine mist on the pavement. The rock asphalt is then applied and a wire mesh drag is used. This drag smoothes out the rock asphalt and it is then rolled with a light roller.

6. Q. *What are best methods for having available dry aggregates for winter patching? Is it economical to pre-mix and stockpile coated aggregates for this work?*

A. ADAMS — This is quite a problem with us in the Ninth District due to the lack of storage space. However, we do stockpile inside our maintenance garages a small quantity of aggregates for winter patching.

I believe it is economical to pre-mix and stockpile coated aggregates for winter patching.

7. Q. *What is a good mix for winter cold patch material made in the fall and stock-piled for winter use?*

A. ADAMS — A good cold patch material which is to be stockpiled for winter use consists of liquid asphalt MC-3 and No. 9 aggregates, using approximately fourteen to fifteen gallons of liquid asphalt per ton of stone.

8. Q. *On plant mix surfacing don't you believe the prime material should be a PAC material or if a cut-back is used time should elapse between the application of cut-back and the placing of the surface to allow the distillate to escape?*

A. KNARR — There have been many thoughts expressed from time to time in regard to this subject, but it has been my experience that a PAC material cut back with about ten (10%) per cent kerosene and applied at a rate of about .05 gallon per square yard is all right. This material should be applied just far enough ahead of the paver to be in "sticky" condition when the plant mix material is applied. About five years ago we constructed 20 miles of Class I Binder @ 150 pounds and Rock Asphalt Surface @ 100 pounds per square yard. The tack coat material was PAC-5 Cut-back with 10% kerosene. When the project was completed, the amount of prime used on the road surface was .03 of a gallon per

square yard. The amount used as a tack coat for the Rock Asphalt surface was .05 of a gallon. Ordinarily, the Rock Asphalt Prime would not have exceeded the binder prime, but the binder had gone through the winter and needed this amount. As stated before that was five years ago, recent examinations of this road did not reveal any bleeding spots or any slippage due to insufficient tack coat or bond to the base or binder. Therefore, it appears that only enough time should elapse between the application of the prime and the placing of the binder to allow the prime material to become "sticky" or "tacky."

Comments — HILLYARD — Prime material should be a PAC except on surfaces where there is a tendency for the material to pick up. When a cutback is used, time should elapse between the application of cutback and the placing of surface to allow the distillate to escape. This is especially true when kerosene is the distillate used.

9. Q. *Can you cold patch when road is wet; can you cold patch in rain?*

A. ADAMS — We have placed cold patch material in holes when the road was wet. Results were satisfactory in most cases. I am opposed to attempting to cold patch when it is raining; however, it can be done.

10. Q. *The best method of patching rock asphalt surface during winter months.*

A. KNARR — This is the \$64.00 question. A great deal depends on the nature and extent of the cracks or breaks. Base failures of an advanced stage should, of course, be corrected as soon as the weather permits. Cracked areas which need sealing to prevent the further admittance of water should be done with RS-2 emulsion and sand. This can be later covered with a rock asphalt seal in order to keep the surface the same type throughout. As explained before, eventually these cracked areas will have to be replaced with a patch from the base up.

11. Q. *How soon should cold patch be skin patched?*

A. YOCHUM — Cold patches should be skin patched as soon as the distillate has left the mixture and the patch is thoroughly set. The period of time depends upon the type of material and the temperature.

12. Q. *How important is it to add filler to cold patch material?*

A. YOCHUM — I think it is very important to add filler to cold patch material particularly if the patching is to be done on Concrete Surface or any Bituminous Surface where a thin patch is necessary, such as usually required on city streets. Cold patch of this type, when properly applied, gives a smooth, dense, compacted and weather proof patch that seldom requires skin patching.

13. Q. *When should base failure sections of the surface be dug out and the base replaced?*

A. KNARR — A lot depends on the condition existing at the location, the traffic involved and the weather itself. Under normal conditions where only a few breaks are to be repaired, we try to repair them as rapidly as possible, taking into account the causes and trying to correct them at the same time. Usually, the trouble maker is water. It may be necessary to lay farm tile, or construct French drains in order to relieve the affected area, but they should be repaired as rapidly as possible. However, during a winter such as the present one, we have had to use gravel and stone in these areas to keep them as smooth as possible as other areas were breaking up.



14. Q. What bituminous materials should be used for what purposes?

A. HILLYARD — Briefly, bituminous materials and purposes for which used are: (Bulletin No. 2100 is available)

*Asphalt Cements*

PAC-1, 2, & 3 .....Crack and Joint Filler  
PAC-4 .....Used in plant mix for city streets and heavy traffic  
PAC-5 ..... Used in Class I Mixes  
PAC-6, 7 & 8 .....Used in Plant Mix (Class F)  
PAC-9 ..... Used in Seal Coats

*Cutback Asphalts*

RC & MC 1 & 2 .....Prime Coats  
RC & MC 3, 4, & 5 .....Mixed in place, Plant Mix and Seal Coats

*Slow-Curing Asphalt*

SC 1 & 2 .....Dust Palliative  
SE 3 & 4 .....Surface treatment and mixed in place  
SC-5 .....Mixed in Place

*Bituminous Emulsion*

Emulsions are used for prime coats, surface treatment, seal coats and mixed in place.

*Refined Tars*

RT-1 to 4 ..... (Light Grades) Used for prime coats and base stabilization  
RT 5 to 7 .....Used for road mixes and surface treatments  
RT 8 to 10 ..... Used for surface treatment and seal coats  
RT 11 to 12 .....Used for seal coats and plant mixes  
RTCB 5 and 6 .....Used in cold patch material and skin patching

15. Q. What are the best methods and materials to use to seal hair and check cracks on rock asphalt surfaces?

A. ADAMS — We have used RC-3 for tack coat and rock asphalt. The tack coat is applied with a hand spray which is held high forming a fine mist and the asphalt is applied with a mechanical spinner. In severe cases, I think a chip seal should be applied and covered with a light treatment of rock asphalt.

16. Q. What is the best method to use to repair low type bituminous surfaces, such as preservative treatments, to utilize the existing loose material on the roadway?

A. YOCHUM — To repair a low type Bituminous surface utilizing the existing material the first operation would be to send a grader over the road and cut off all high places, then drag the surface with a wire drag. This would distribute the existing material. Next add No. 6 stone to the weak places, roll with a 10 ton roller and follow with a good penetration material such as tar. After the penetration material has set, give the surface a good heavy seal. This would be a fairly cheap repair job, however, a more expensive repair job an overall heavy treatment, such as road mix.

17. Q. What is your opinion of No-Strip or other additives?

A. HILLYARD — No-Strip or other additives are of value when, because of weather conditions, it is not practical to dry the aggregates, or when aggregates with unusual affinity for water are being used.

Comments — ADAMS — No-Strip is an excellent material which we have used in the winter months when the pavement was damp. We have received good results by adding No-Strip to liquid asphalt. There may be other additives as good but we have used mostly No-Strip.

T.B.M.,ETC.

18. Q. *Traffic bound limestone No. 610 used as replacement materials has a tendency to form a wash board effect surface. Why?*

A. KNARR — In my opinion the corrugated effect of traffic-bound limestone roads is not altogether due to using No. 610 stone. Several things contribute to this condition. Too many fines in the stone itself, the method of grading the road, the type and character of the sub-base soil, the amount and kind of traffic, but not least among these is the method of grading. We have long advocated the cutting of the surface to the sub-grade, wind-rowing this to the center of road then shaping the surface back to a good section. Of course this method has to be done at such time as the surface can be readily cut and reshaped. Many grader operators are reluctant to do this but by following this method in sections of a mile and not more than two miles in length, the results will be such that he will no longer doubt its advantages. However, any road if not properly graded will corrugate. Rains have a very decided effect. Also, fines are washed from one section and lodged in another which accounts for some of the corrugations. How many times have you walked along a traffic-bound limestone or gravel road after a rain and noticed the displacement of the fines. However, I believe that with proper grading the corrugated effect can be largely overcome.

19. Q. *On bank gravel, don't you believe the amount passing a No. 4 screen should be lessened?*

A. HILLYARD — For bank gravel used as a floater course, it would be better to have a lesser amount passing the No. 4 screen than is called for in our specifications, but for replacement and patching the finer material is needed.

Comment — KNARR — No, I don't think the amount of material passing a No. 4 screen of bank gravel aggregate should be lessened. I am afraid that should this be done a great percentage of the clay binder would be lost resulting in having a surface that would be hard to consolidate or "set."

20. Q. *Should there be a provision whereby in certain cases traffic bound replacement stone could be bought exempt of Special Provision No. 2-R?*

A. YOCHUM — I definitely think there should be a provision whereby in certain cases traffic bound replacement stone could be bought exempt of the special provision No. 2-R. The District Engineer knows his district, its requirements and he knows the producers. Let him decide if this provision should apply.

21. Q. *What type and size of aggregate should be used to repair weak sections on traffic bound roads?*

A. ADAMS — I prefer to use No. 6 stone to repair weak sections on traffic bound roads. Of course, in severe cases it is sometimes necessary to use large aggregates.

#### SHOULDERS & ROADSIDES

22. Q. *What is the cheapest and best method of preventing erosion of ditches?*

A. KNARR — This is a hard one to answer. In the counties where we have limestone available small masonry dams are effective and economical. However, in our counties west of the rivers where we have no limestone available we have found that Bermuda grass is our best answer. We have bought thousands of old sacks with holes in them because they are so cheap. Into these sacks we place chopped-up Bermuda sod, throw in a truck and thoroughly soak them with water. These are hauled to the ditches and placed at intervals. Altho the top half of the sack dries out in dry weather the bottom half will remain moist, giving the grass a chance to establish its roots along the ditch. We have not had many complaints against using Bermuda grass as we find that due to the steepness of the cut slopes the grass does not spread as wildly as you would think.

23. Q. *When is the best time of the year to clean ditches and shape shoulders?*

A. YOCHUM — The best time to clean ditches and shape shoulders is from mid-summer to early fall.

24. Q. *What is the best method of maintaining earth shoulder on steep grades?*

A. ADAMS — We endeavor to maintain shoulders on steep grades by sloping the shoulder sufficiently for the water to run off, seeding, and in some instances, we cut little valleys along in the shoulder where the water may run off.

#### SIGNS, MARKERS, GUARD RAIL AND TRAFFIC CONTROL

25. Q. *On four lane highways, do you believe it is better to use men working signs mounted on tripod and placed on the surface rather than use flagmen?*

A. WRAY — Yes, unless the flagman is a police officer. I know of one case where one lane of a multiple lane road was blocked and a flagman was waving traffic into an adjacent lane and it so happened that one motorist had to wait because traffic was moving in the adjacent lane. The flagman had set out flags which were to be used in place of barricades preparatory to starting the Maintenance Operation. The motorist could see that the Maintenance Operation had not started and since there was nothing to prevent him from using the lane, except the flags, he said "I am going through" and ran his car toward the flagman, who would have been hit had he not been agile enough to jump out of the way. It is realized that some drivers will ignore all warnings but I believe that a flagman is constantly in danger of being run down by careless drivers.

Comments — YOCHUM — I believe it is better to use signs placed in the lane where work is being done not more than 500' away. This would release the two flagmen for other essential duties. This method has been used for the past years by the utilities and I know of no accident they have had.

26. Q. *As traffic is becoming so congested in smaller towns and is as much a problem to confront as in larger cities, do you believe the traffic could be controlled and enforced more successfully if a traffic and safety council composed of representatives of all civic organizations; namely, P.T.A., Rotary, Lions, Women's Clubs, etc., were organized to consider traffic problems and their solutions with traffic authorities and also create public opinion for enforcement of regulations recommended by the traffic authorities, and support local enforcement officers in enforcing traffic laws.*

A. WRAY — I believe that is the only way any traffic control program can be effective. Most citizens consider themselves traffic engineers and as such believe that they can give you the answer to any traffic problem and I have found that most civic groups decide in their meetings that "something must be done" about a traffic condition at a certain location and they solve the problem in the meeting and set it up as a project demanding that their wishes be carried out. As an example, a group of cub Girl Scouts set up as one of their civic projects, a traffic control signal at a certain location. I knew that a signal was not justified at that location, but I do not know yet if I have convinced the Girl Scouts of this.

It is necessary and important to listen to the public views concerning problems. Continual complaints from the public is evidence that some remedial measures are needed. In most cases, the traffic engineer can offer a solution after making the necessary studies. Factual information needed for these studies can be furnished



in a lot of cases, by the civic groups mentioned. Traffic Engineers should seek confidence and encourage the support of civic groups for their programs. The public must be sold on any program and the best way to do any selling job is through civic organizations and local newspapers. It is the responsibility of the traffic engineer to offer a practical and workable solution and if he can convince the civic organizations that his program is a good one, these organizations will "put it over" for him.

It is my opinion that no regulations can be effectively enforced unless the public thinks they are needed and believe them to be reasonable (witness the Prohibition Act), so it follows that your solution must be a good one and the general public must be so convinced.

27. Q. *As freight and delivery trucks cause about 90% or more of congestion on city streets and seem to believe that it is their right to do so, do you believe it possible to enact legislation requiring freight lines to establish depots for central unloading, the same as railroads?*

A. WRAY—As there are so many factors to be considered, I frankly do not know the answer to this question. There is a difference of opinion as to where the responsibility lies for establishment of such facilities. Trucking interests contend they have as much right to park and unload on the streets as they do to drive over them. Wholesale and retail business houses contend that loading space should be provided by the Government from taxes just as streets are provided. Most Cities and State Highway Department take the stand that streets are built primarily for the movement of traffic.

In most cases, congestion caused by truck loading and unloading can be minimized by the establishment of unloading zones, requiring unloading to be done in alleys; prohibiting of trucks parking at 90° to the curb and requiring loading and unloading to be done during the hours of the day when flow of traffic is light. Narrow streets, lack of alley space and other physical conditions may prevent any of these measures being put into effect. If traffic flow becomes stagnant due to these conditions, the public will demand the establishment of depots for central loading and unloading. The question then arises as to who should construct such facilities. It is my opinion that it is a joint responsibility of business houses, local government and trucking interests, and the best solution would be the establishment of an authority or commission to carry out the necessary measures. There are numerous ways in which these depots can be financed; either with private capital or public funds.

28. Q. *As accident frequency is increasing, although traffic control has been improved, it indicates that the driving public either ignores or is not familiar with information warning signs and pavement markers. Do you think the results obtained would justify requiring drivers applying for drivers' licenses to submit to a test from prepared questionnaires as to the meaning of warning signs, pavement markers, such as yellow stripes, stop bars, etc., before licenses are issued?*

A. WRAY—Such a law already exists in most States including Kentucky. I personally believe the reason that such warning signs and markers are ignored, is that there are too many of these placed where there is no need for them. By this, I mean that yellow "NO PASSING" should not be placed on a pavement except where the sight distance is limited and I believe that the sight distance should be measured at each location. Small communities have requested that "NO PASSING" lines be painted through the town just to prevent speeding and this has been done in some cases by paint crew foremen. Motorists will not follow a heavy truck or any slow moving vehicle if they can see far enough ahead to pass.

Another case of motorists ignoring signs is the "CATTLE CROSSING" signs and consequently the Highway Department has removed all "CATTLE CROSSING" signs which were permanently mounted for the reason that any motorists will ignore such signs when they pass them day after day and fail to see any cattle. For the same reason, it is my opinion that school warning signs would be more effective, and the public would observe them, if they could be removed from sight except such times that children are crossing the Highways going to and from school; (but try and sell this idea to the P.T. Associations). My answer as to the best way to get the public to observe signs and markers, is to install them only where they are needed and not put up signs such as "CONGESTED AREA" - "CAUTION - CHILDREN" "SPEED LIMIT - 15 MILES PER HOUR" etc. at the request of some uninformed citizen or public officials.

#### SNOW AND ICE CONTROL

29. Q. *Do you think it is advisable to continue the use of rock salt as a winter abrasive considering the damage it does to the road surface?*

A. WRAY - Yes, especially in districts where the traffic flow is heavy and it is necessary that something be done immediately so as to keep traffic moving and prevent accidents which will cause personal injuries and property damage. The George Rogers Clark Memorial Bridge in Louisville is a location where I believe that salt is the only thing that can be used to keep traffic moving. If the bridge becomes blocked, traffic is tied up all over the down town section of Louisville. I believe the prevention of personal injuries and property damage over balances the damage to the roadway surface.

#### BRIDGES

30. Q. *Should drainage structure inspection be made in conjunction with other work?*

A. SPARKS - Yes, in order to detect any needed repairs before serious damage is done. As we all know, the first fundamental of maintenance is keeping all drainage structures functioning properly.

Pipe culverts are the most numerous drainage structures on any road, and each pipe, if functioning properly, is an integral part of the entire drainage system. It is important that they be kept in good working condition. A clogged pipe may not cause immediate damage but eventually, if not opened up, it will cause serious damage to both road-bed and surface.

Pipe culverts should also be inspected for evidence of failure or the pulling apart of joints. The headwalls should be observed for evidence of underscour or overturning. Weeds, grass and brush should not be permitted to clog inlets or outlets and inlet and outlet ditches should be kept clean of debris and sediment.

Box culverts are less numerous than pipe culverts, but being larger, there is more likelihood of immediate and greater damage to the road if they do not function properly. They should be inspected frequently to insure that they are structurally sound and functioning properly.

1. The barrels, headwalls and wings should be examined for cracks and evidence of unusual pressure or settlement.
2. Inlet and outlet ditches to insure that weeds, grass and bushes are not permitted to interfere with the flow of the water.
3. The stream above the culvert should be kept clear of logs, tree slashing or other debris that may in time of high water float down and obstruct the opening.

Bridges are the largest of the three types of drainage structures. They should be inspected frequently and floors, bridge shoes and other members should be kept clean. Weep holes in concrete decks should be kept open and not allowed to clog up.



## POLICIES

31. Q. *Considering the heavier traffic we now have, both as to volume and individual weights and speed, and the extreme damage caused by the recent bad weather, should we not design our roads in the future with a heavier base, even though it does mean less mileage?*

A. YOCHUM — We should design our roads with a heavier base. Our method of constructing 3' traffic bound roads is old and antique. It answered the needs 15 to 20 years ago. Now with the enormous increase in cars and freight truck hauling, which no doubt will continue to increase, it becomes necessary that we build better roads, even if it does mean less mileage. It takes an increase in the maintenance budget every year to maintain the states roads. Even with this increase the maintenance is falling behind. Weak base roads require lots of material each year in order to increase the base thickness. However, our budget will not permit this and as it is we are losing base thickness each year. If we continue to construct roads in the years to come as we have in the past, I believe we will approach the time when approximately  $\frac{2}{3}$  of each dollar of road fund will go to maintenance. Let's construct better roads with the thought of future maintenance in mind and keep this cost at a minimum.

Comments — KNARR — Of course it is highly desirable to construct all roads with a base fully adequate to stand up under traffic of a column and weight even beyond that for which it was originally designed. However, many of us who live in the country would still be using dirt roads. So, it seems to me that the policy which has been pursued by the Department of Highways in the past is one, on the whole, which has served the people of Kentucky remarkably well. It is true that this severe winter has damaged ours to a very great extent, but our neighbors, whose roads had the reputation of exceeding ours, have been damaged to a greater extent despite the spending of millions of dollars in bond issues which fortunately we do not have.

The road system has consistently expanded and improved over the years and I firmly believe that had we spent enough money to build sufficient bases as we went along our highway system, while tho ample in its limited extent, would be of very little service to the people of the rural areas of Kentucky. I believe the policy has been fully justified in that it made markets available to farmers and small business, brought untold numbers of visitors to Kentucky and most of all it brought the town and country together in a manner which could not have other wise been accomplished. There are no ends to the benefits the people have derived from the Department's policy and I for one hope it continues.

32. Q. *Should the Department of Highways make charges for handling encroachment permits, particularly for encroachments within the limits of the pavement?*

A. SPARKS — Applications for encroachment permits have increased in volume to the extent that it requires almost the full time of one person in the district to handle them. He is, most of the time, required to make a field inspection of the proposed work, prepare sketch showing type of work to be done and then make second visit to the site after completion of the work to determine if it has been done in accordance with the terms of the permit. For this reason and that we have always made a charge for the issuance of overweight truck permits, I believe that it would be perfectly right and proper for the Department to make a reasonable charge for the issuance of all encroachment permits. The amount of this charge could be determined after giving the matter closer study.

33. Q. *In view of the fact that so many samples of material sent to the laboratory have failed when there is reason to believe the material used meets the requirements, don't you believe the Engineer in charge of construction projects should appoint a responsible man on his party to sample all materials and make the required test?*

A. HILLYARD — Since all material is accepted or rejected on the basis of results obtained from tests of samples submitted to the Laboratory and tested in the field, it is essential that these samples be representative of the material on the job. It is, therefore, of the utmost importance that a responsible man of good judgment and some experience be designated to do the sampling and make the required tests.

34. Q. *What is the best method of controlling highway right of way encroachments?*

A. SPARKS — The encroaching party should be notified, in writing, to remove such encroachment in a reasonable length of time, from ten to thirty days, depending upon the amount of work that will be involved in its removal. If he has failed to respond to the notice at the expiration date, then the Legal Section at Frankfort should be notified and supplied with all the details involved, so that proper legal steps can be taken to have the encroachment removed.

35. Q. *Below what temperature should maintenance work of a non-emergency nature be discontinued?*

A. SPARKS — Patching of bituminous surfaces should not be undertaken when the air temperature is below 35 degrees, unless an emergency exists. This is in accordance with our specifications. Other types of maintenance work such as roadside cleaning, cleaning of drainage structures and shoulder patching can be carried on almost without regard to air temperature.