LOCATION, DESIGN, PREPARATION AND PROCESSING OF PLANS

BOOK V

Prepared by the Land Service Roads
Division of the Texas Highway
Department for the Instructors
School

Austin, Texas December 1952

REPRODUCED BY
OPERATIONS DIVISION
TEXAS HIGHWAY DEPARTMENT
AUSTIN, TEXAS

FOREWORD

This book is dedicated to the promotion of closer relationship better understanding and improved teamwork among those of the Texas Highway Department responsible for design and planning of land service roads.

TABLE OF CONTENTS

LOCATION

INTRODUCTORY REMARKS

You are probably wondering why we are presuming to tell you something about location when each of you has probably had extensive field experience in the selection, running and staking of location. Actually, it is not our intention to instruct you in the mechanics of locating highway alignment. We recognize the fact that your presence here is indicative of your training and experience in such matters.

Therefore, the purpose of this discussion is to examine and explain various phases of highway location in order that you may have some idea as to what the Austin Office must consider in coordinating highway development over the State as a whole. Some of you have probably wondered just what function the Austin Office serves, when apparently all of the actual work is done by you in the field. However, if you will pause to consider the situation, an examination of the State highway map will graphically demonstrate the fact that we have 254 counties, divided into 25 highway Districts and that in each of these units, there are Engineers working on various and often seemingly unrelated projects. However, these individual projects are not unrelated, although they may be far removed from one another. In fact, each one constitutes another link in a vast network of which the Austin Office is the coordinating agency. Therefore, by virtue of this position in the Departmental organization, we of this office are in a better position to observe and study the overall aspects of the system than are you in the field who are primarily concerned with projects within a limited area or, at most, with the activities of those counties within your own District. It is logical to assume, therefore, that you are more concerned with the one or more projects for which you are personally responsible and, to a lesser extent, with other projects in your own District, than with the work and problems in an adjacent District, or over the State as a whole.

With this in mind, you will likely understand more clearly our approach to the discussion of "Location", which will involve the elements of policy and finance, terrain and topography, population and culture, industry and business, all of which are factors that determine the type of facility to be provided and, ultimately, the extent to which that facility can serve traffic requirements. From this examination of the various elements effecting highway construction, we will try to explain and demonstrate why, in one

instance, a certain type of facility is required while, in another, a different type should be considered.

This then brings us to a point which may have been a source of considerable confusion to the field forces in the past, namely, that of a seemingly variable policy regarding design features. In order to explain this in a logical manner, it will be necessary to digress a bit and go back a few years to the inception of the Postwar Secondary Highway Program. During the initial stages of the Farm Highway Program, there was a wide vergence of opinion, even among our older and more experienced Engineers, as to what should constitute a minimum design. Naturally, both location and right-of-way were important factors in the over-all design problem. Fortunately, our engineers were wise in their decision to begin at the bottom of the design scale, so to speak. This decision was based on sound economic reasoning as we can now more clearly see. As the program developed and Land Service projects were put into use, there was a gradual accumulation of evidence to show that certain minimum design features were not adequate. An illustration in point was the establishment of a minimum 18 feet surface width rather than the 16 feet width which was used at the inception of the program. As the program evolved further, there was increasing evidence that earlier thoughts, regarding location and right-of-way, were beginning to change. It was recognized that location would involve other considerations besides that of strictly land service, namely the importance of the particular project in an integrated system which, as it grew, would tend to generate ever increasing traffic volumes. With the resultant increase in traffic, it became apparent also that highway alignment, based primarily on land service principles, generally involved that of existing county roads which were of such irregular alignment for the most part that both the speed and volume of increasing rural traffic could not be adequately and safely served. In this connection, we hasten to add that it was not the intent of the Commission at that time, nor is it now, to provide high speed facilities on Farm Highways. However, it became apparent that Farm Highway traffic was developing speed characteristics not previously anticipated. This appeared due, in part, to other types of traffic, such as freight trucks, and other vehicles seeking cut-off routes over Farm Highways. It became evident, therefore, that it would frequently be advisable to relocate portions and, in some instances, all of a projected Farm Highway rather than build along the location of an existing county road. With the trend toward smoother alignment on Land Service projects, it was apparent also that some standard minimum right-of-way width should be adopted. Reasons for this were many but there were two which required a prompt solution. One involved the future cost of maintaining needless right-of-way; the other concerned the divergence of

opinion among the various counties regarding desirable widths. Some wanted and demanded widths of 100 feet to 150 feet for reasons peculiar to the locality. Others thought that widths approximating that normally provided for county roads would be adequate. We are all probably aware that our current design standards for both Federal and County-State Projects show minimums of 40 feet and 60 feet respectively; although, we have, for some time now, been attempting to secure a minimum of no less than 80 feet on rural sections and, where possible, an equivalent width on municipal sections. However, the problem of municipal right-of-way still constitutes one of our most controversial design features.

With this digression to cover certain features of the early stages of the Postwar Farm Highway Program, we can proceed now with consideration of our current attitude toward the problems of location.

CONTRASTS IN FARM HIGHWAY LOCATION: The development of Land Service or Farm Highway projects differs from that for Primary facilities in several respects, but there are two rather well defined variations. First, there is the difference in the amount of funds available and the resultant design cost per mile which these will permit. Secondly, there is the contrast in location and alignment which is governed by the volume of traffic as well as the type and speed of same. It is a more or less normal assumption that the Primary route should be the most direct, approximating as nearly as possible an air-line route, since it normally carries a much larger volume of traffic and is intended as a through-route between centers of population. Whereas, a Land Service Project must be considered on the basis of its potentiality. In other words, it must first be determined whether the project will ultimately become an important link on a possible through-route or whether it would likely remain a relatively low-traffic facility, functioning as a strictly land service project for local rural residents only. This in effect means that the relative importance of a project is determined on the basis of traffic to be served.

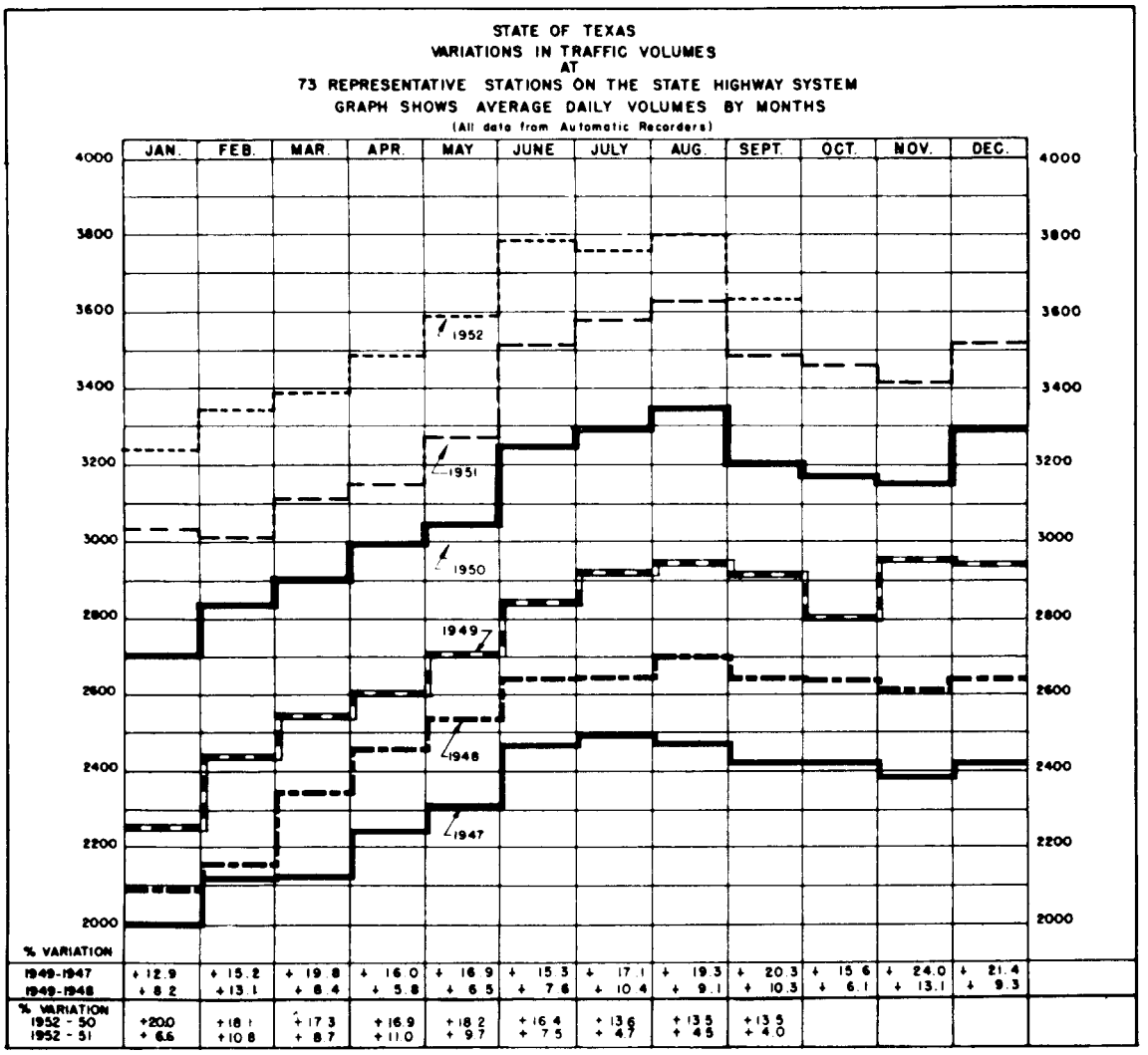


FIGURE 1

INCREASE IN TRAFFIC VOLUMES: Following World War II, the number of passenger cars and trucks in the State has steadily increased. The effect of this increase is reflected in Figure 1 which graphically shows the Variations In Traffic Volumes recorded at 73 permanent stations situated over the State. Although these stations are located on the Primary System, it is logical to assume that the effect of this increase would also be reflected to some extent on the Secondary System of Farm Highways. This assumption is substantiated by the registration of farm trucks and truck-tractors which increased from 122,662 in 1946 to 227,171 in 1951. The registration of such farm vehicles is estimated at 231,344 for 1952. The latter figure exceeds that for 1946 by 108,682 vehicles which is an increase of about 88.6% during the 6 year period.

VEHICLE REGISTRATION: A more complete and revealing perspective of traffic in Texas is shown in Figure 1-A, where total vehicle registration data for all types is provided for the period from 1917 through 1950.

MOTOR VEHICLE REGISTRATION COMPARISONS BY REGISTRATION YEAR

Registration Year	Vehicles Registered	Percentage of Increase or Decrease*
1917	194,720	- --%
1918	250,201	28.49
1919	331,721	32.58
1920	430,377	29.74
1921	470,575	9.34
1922	531,608	12.97
1923	695,822	30.89
1924	840,560	20.80
1925	983,420	17.00
1926	1,060,716	7.86
1927	1,126,982	6.25
1928	1,235,162	9.60
1929	1,376,427	11.44
1930	1,401,748	1.84
1931	1,345,436	4.02*
1932	1,237,850	7.99*
1933	1,241,848	.32
1934	1,358,882	9.42
1935	1,426,949	5.01
1936	1,537,947	7.78
1937	1,612,533	4.85
1938	1,630,040	1.09
1939	1,702,507	4.45
1940	1,802,063	5.85
1941	1,830,821	1.60
1942	1,704,295	6.91*
1943	1,624,593	4.68*
1944	1,625,428	.05
1945	1,713,944	5.45
1946	1,943,716	11.82
1947	2,192,654	12.81
1948	2,441,158	11.34
1949	2,784,480	14.06
1950 (Estimated)	3,183,500	14.33

Registration Year	Passenger Motor Vehicles	Commercial Motor Vehicles	Farm Trucks	Truck-Tractors	Farm Truck-Tractors	Trailers	House Trailers
1946	1,439,361	256,501	122,662	---	---	82,793	---
1947	1,605,081	278,435	138,479	20,148	---	97,568	---
1948	1,778,786	310,882	155,746	23,145	665	93,937	15,737
1949	2,045,768	337,990	186,838	23,978	802	102,751	19,066
* 1950	2,360,000	370,000	220,000	30,000	1,000	110,000	20,000

* Estimated

Registration Year	Motor Busses	City Busses	Motorcycles	Side Cars	Tractors	Exempt Vehicles	Total Vehicles
1946	2,017	---	17,327	75	318	22,662	1,943,716
1947	2,005	---	24,194	107	285	26,352	2,192,654
1948	2,078	3,440	28,903	70	276	27,493	2,441,158
1949	1,931	3,482	28,921	60	280	32,615	2,784,480
* 1950	2,500	4,500	30,000	100	400	35,000	3,183,500

* Estimated

FIGURE 1-A

More recent registration data for 1950, 1951 and 1952 is shown herewith in Figure 1-B to supplement the information in Figure 1-A. This then spans the total period from 1917 to date which also covers the existence of the State Highway Department from its inception. It could be said, too, that the increase in vehicle registrations, from year to year for this period is paralled by the progress and development of the Department as well as the highway system of the State.

Year	Passenger Cars	Commercial Vehicles	Farm Truck	Truck Tractor	Farm Truck Tractor	Trailer	House Trailer
1950	2,316,279	373,276	212,324	27,003	882	114,582	22,330
1951	2,412,022	393,834	226,219	30,563	952	127,419	24,615
1952*	2,486,334	404,200	230,369	32,200	975	136,977	25,500

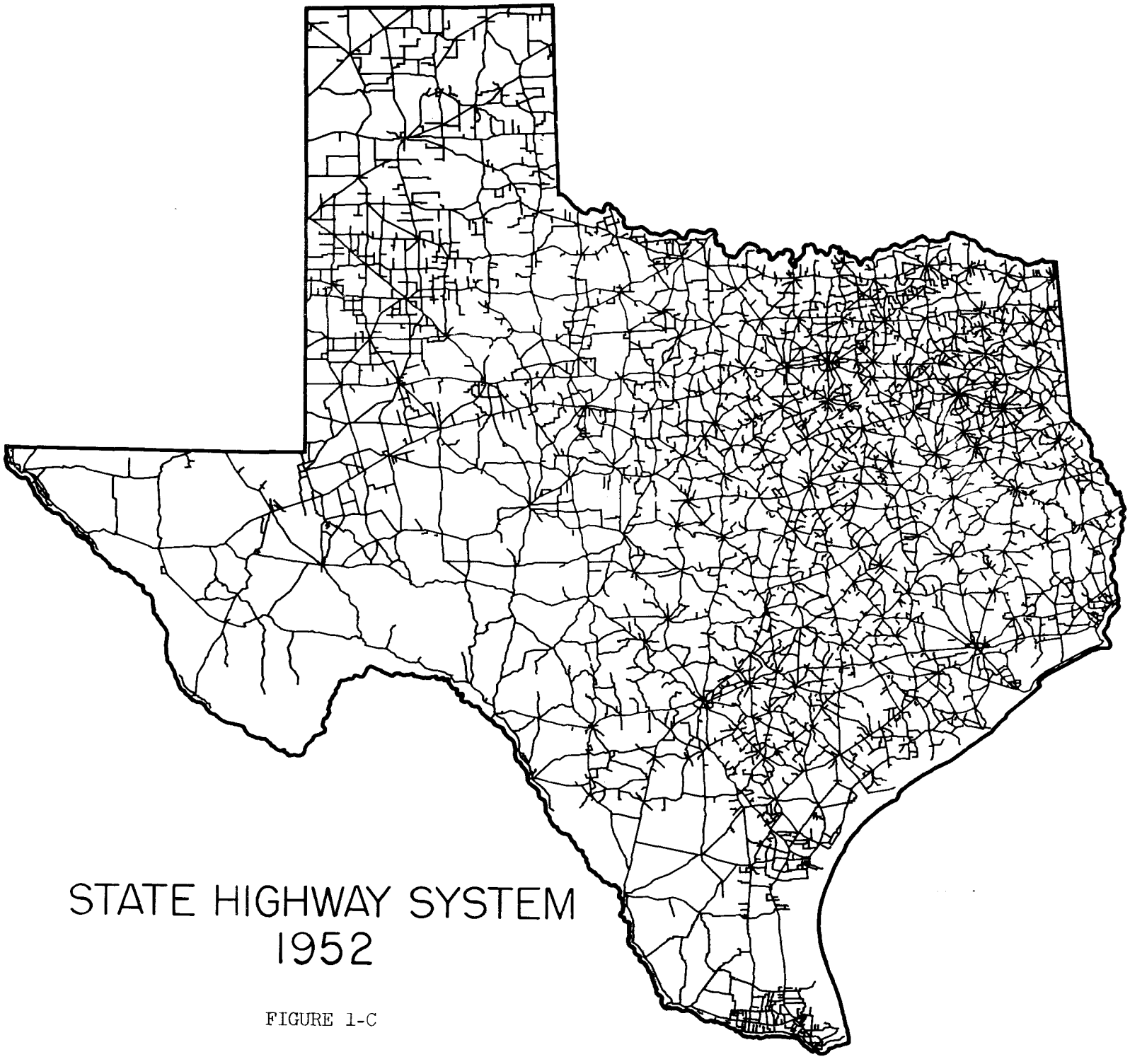
*Estimate for 1952.

Year	Motor Bus	City Bus	Motor-cycle	Exempt	Miscellaneous	Total Registration
1950	1,892	3,356	27,316	32,903	732	3,132,875
1951	1,896	3,335	27,336	36,014	378	3,284,583
1952*	1,900	3,325	27,870	39,736	350	3,389,736

*Estimate for 1952.

FIGURE 1-B

HIGHWAY NETWORK: The relative scope and importance of Land Service Roads in our State Highway System is strikingly illustrated in the comparison of Figures 1-C, 1-D, 1-E and 1-F which, in that order, show a composite network of all our highways, and the component systems comprised of the Federal Aid Primary System; State Highways not on the Primary System and the Farm Highways, or Secondary System.



STATE HIGHWAY SYSTEM
1952

FIGURE 1-C

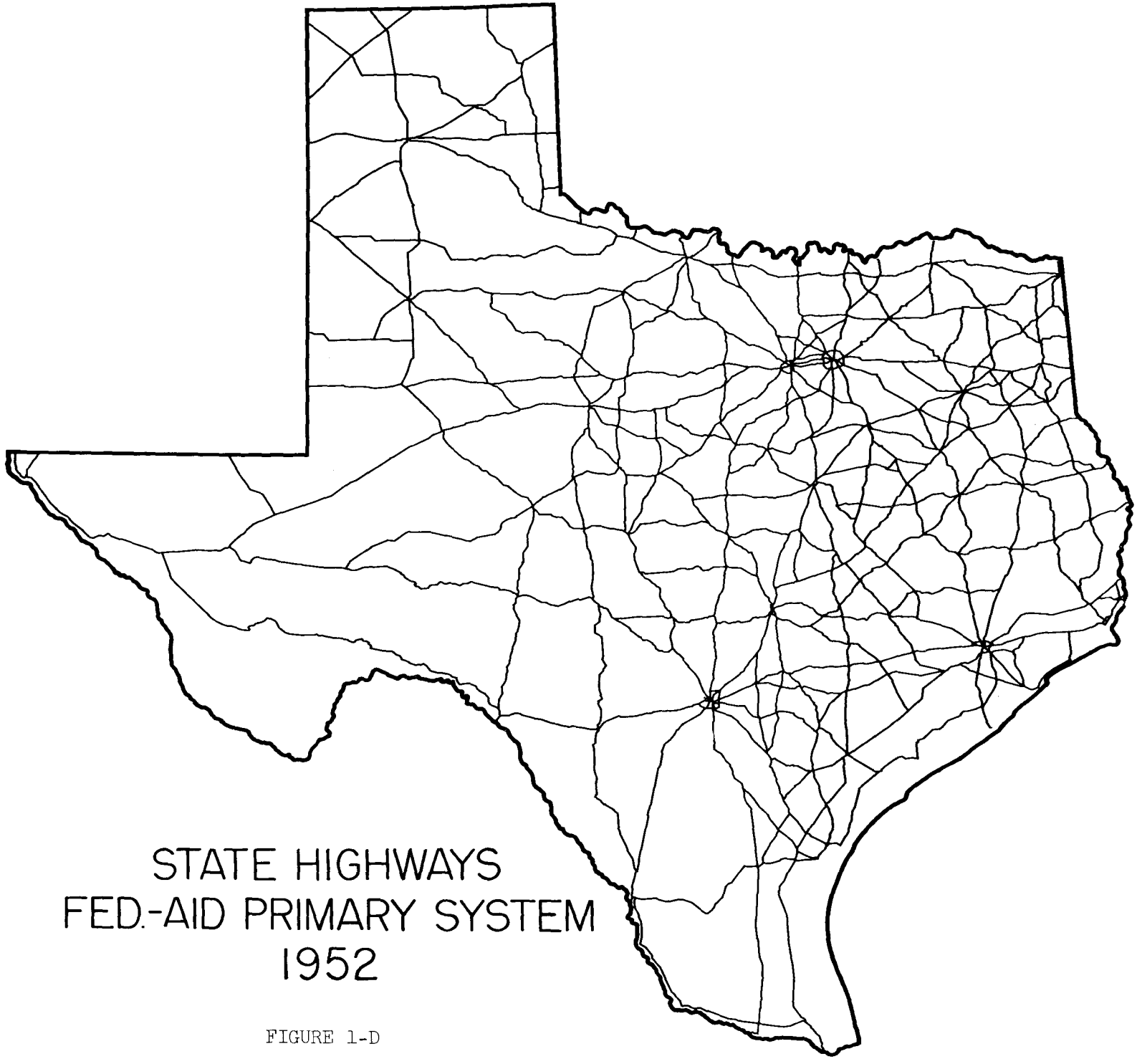


FIGURE 1-D

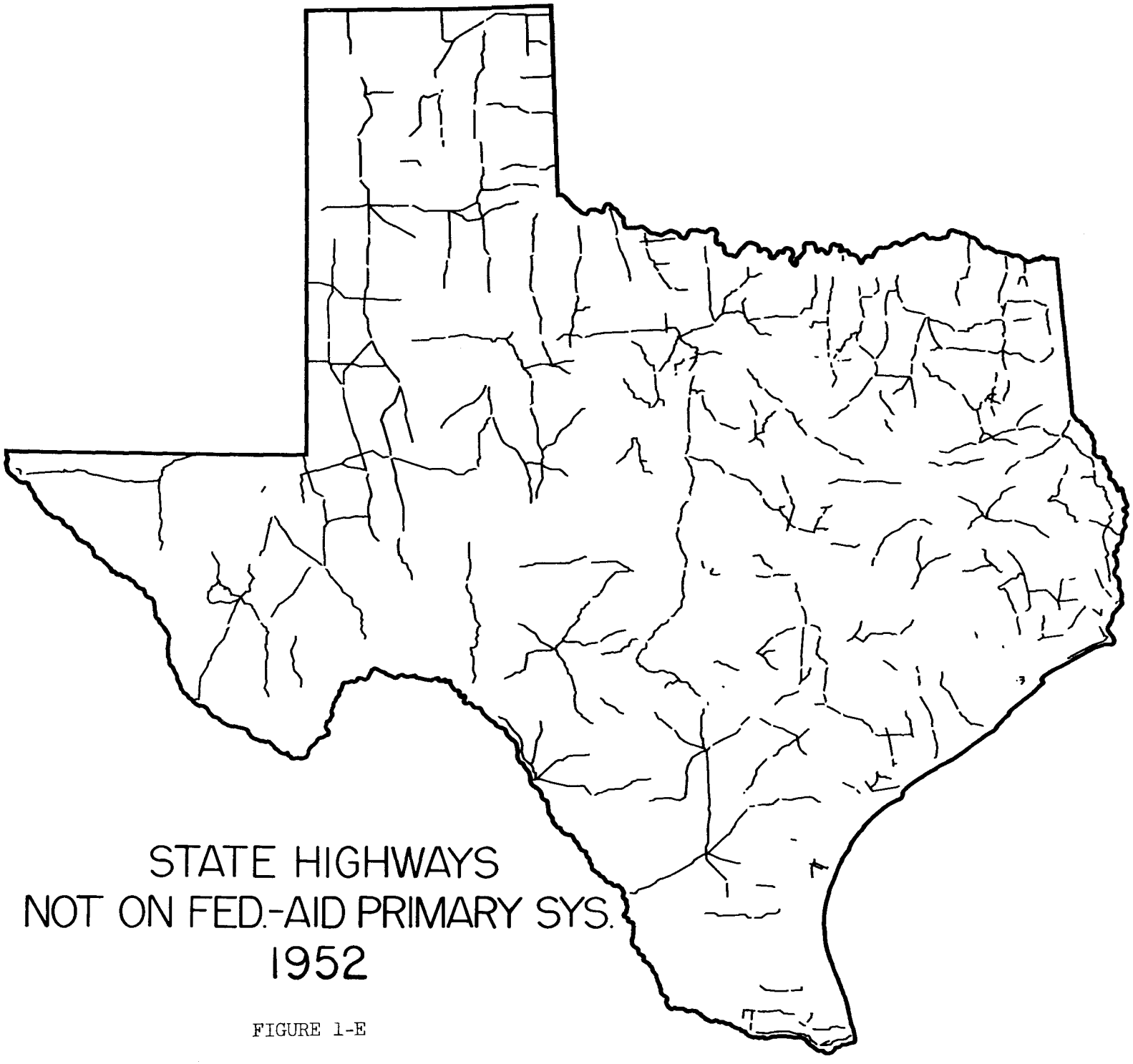
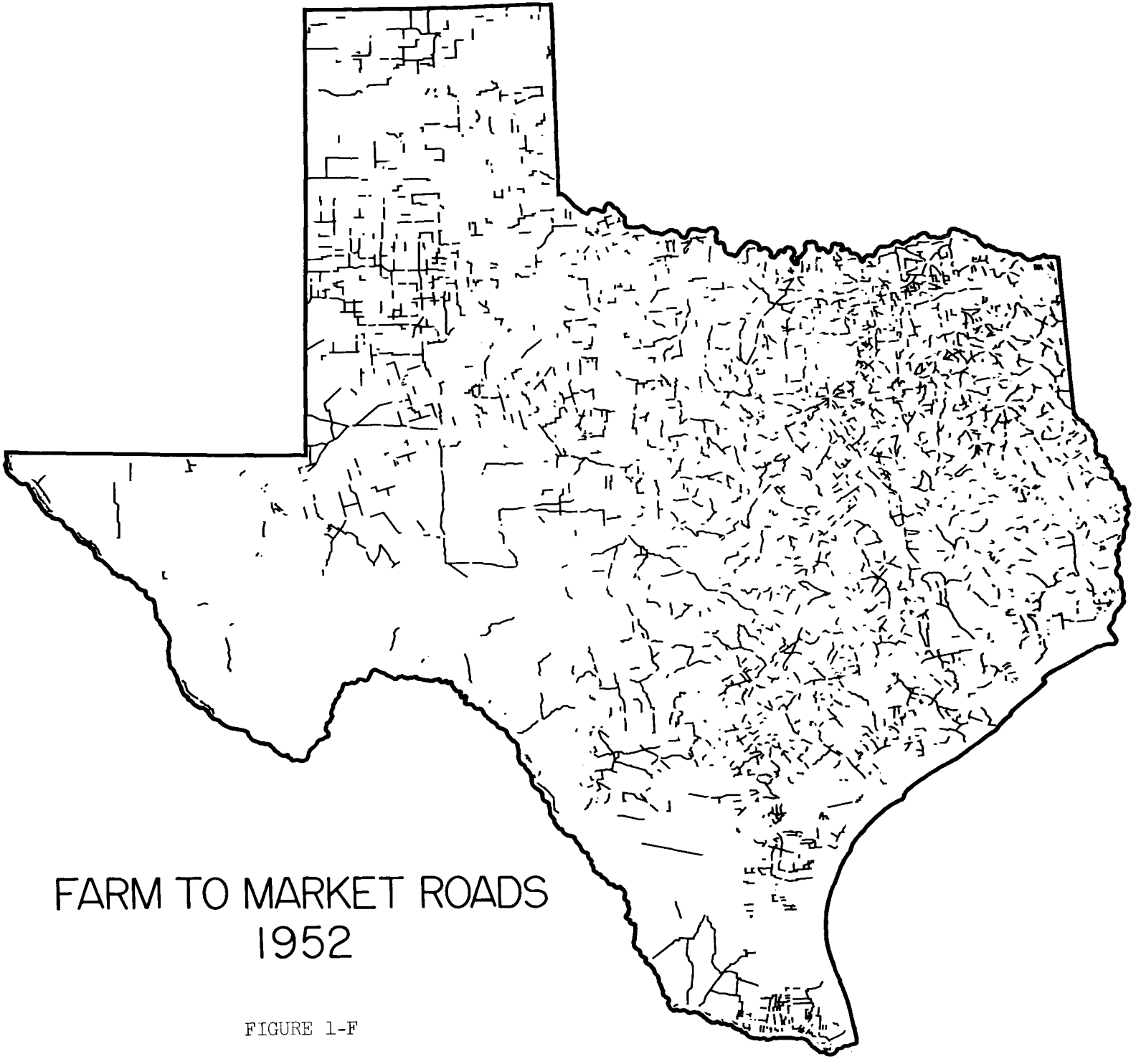


FIGURE 1-E



FARM TO MARKET ROADS
1952

FIGURE 1-F

TRAFFIC RANGE ON LAND SERVICE ROADS: It is estimated that the average Farm Highway, based on State-wide averages, will serve from approximately 100 to 200 v.p.d. However, there are Land Service Projects which have average annual daily traffic volumes ranging from 1000 to 2000 v.p.d. and, still others which are carrying in excess of 2000 v.p.d. This explains one of the important reasons why there is a need to consider the potentiality of a Land Service project before the matter of location and design is determined.

FACTORS IN THE DEVELOPMENT OF LAND SERVICE PROJECTS: There are numerous factors to be considered in the development of a farm highway. Such things as topography and drainage influence the cost of a project and therefore, will often determine whether a new location could be economically justified. Equally important is the effect of a location on the adjacent property owners. A farmer or rancher is reluctant to see his property divided by a highway, unless it can be proved that such an expedient is justified. There are other factors such as the natural formations of soil and rock prevailing in the locality which will often influence the cost of a location and possibly determine the ultimate selection.

Usually, these factors do not present a great problem on the average farm highway project, since the location generally follows that of an existing county road where relocations are required principally for the elimination of dangerous curves. It has been observed, however, that our major location problems generally result from the following:

1. More desirable stream crossings.
2. Extreme curvature of existing county road locations.
3. Entrance into population centers.
4. Traffic potential.

PROGRESS IN DESIGN: Since the inception of the Postwar Secondary Highway Program in 1945, more than 20,000 miles of improved farm highways have been built or placed under maintenance. From the more or less tentative design features employed during the earlier phases of the program, a more uniform approach has evolved from the experience gained during the past seven years. It is possible now to evaluate those earlier projects and to see where some might have been improved. From these observations, it is also possible to discern where still further improvements might be achieved in our current designs.

EXAMPLE OF EARLY FARM HIGHWAY LOCATION: Let us first consider one of the earlier projects, the location of which is indicated on the map in Figure 2 on which the 1951 traffic data is shown. This project was let to contract in August, 1947, and reflects the prevailing ideas in design at that time. It will be noted from the map location that the highway was built over the alignment of an existing county road and, hence, did not materially encroach upon the property of adjacent landowners. By virtue of this, the sharp curvature of the county road was incorporated into the highway as illustrated on the plan-profile sheets reproduced in Figure 3. This project is 6.9 miles in length and includes five 16 deg. curves and one of 26 deg. Were the plans being developed at this time, it would be suggested that this curvature be reduced appreciably to provide safer alignment and greater driving comfort.

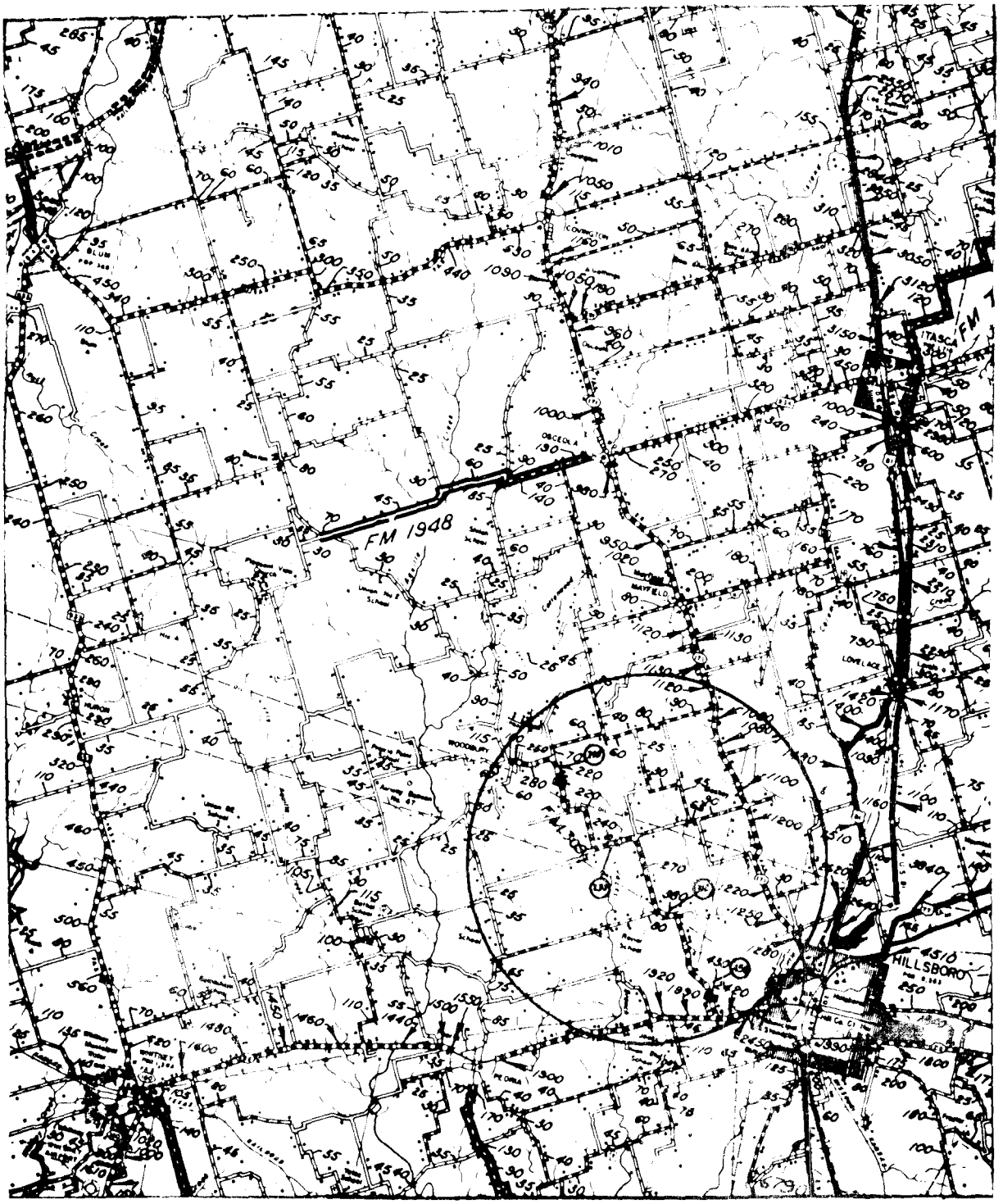
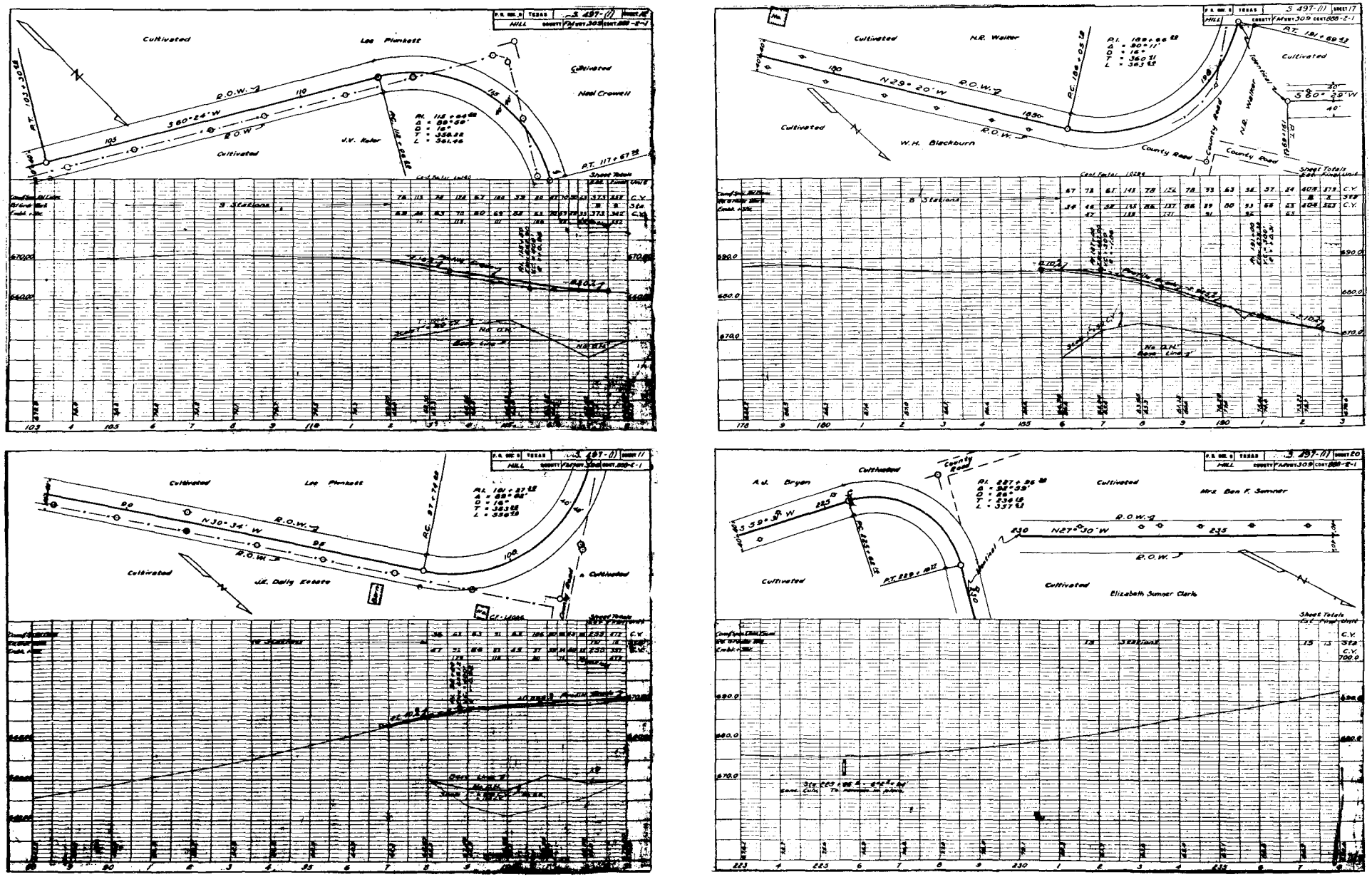


FIGURE 2


Cultivated
Lee Plunkett
Neal Crowell
J.V. Rofer
R.O.W.
S 60° 24' W
N 29° 20' W
W.H. Blackburn
N.R. Walter
County Road
A.J. Bryan
Mrs. Ben F. Sumner
N 27° 30' W
Elizabeth Sumner Clark
J.E. Daily Estate
N 30° 34' W
5 Stations
8 Stations

15

FIGURE 3

A relocation of two sharp curves is shown in Figure 4 and illustrates a desirable solution for such conditions.

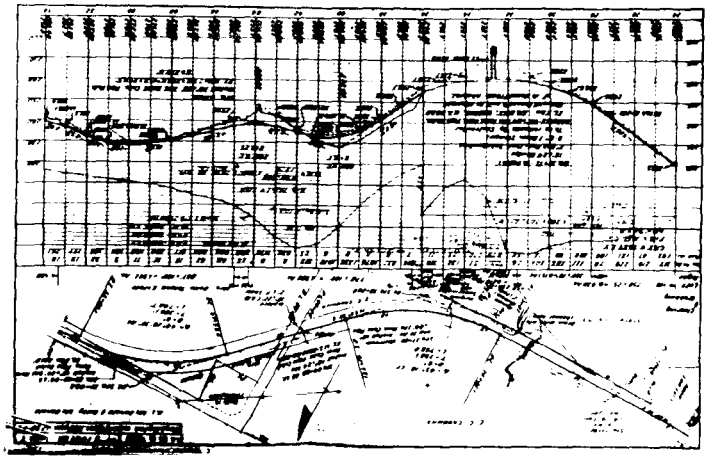


FIGURE 4

It is reasonable to assume that this route may be extended north, at some future time, to provide a connection with other existing highways. Therefore, it is likely that the extension will reflect those improvements in location and alignment which, from past experience, have been proved desirable and necessary for the safety and comfort of the driving public.

Our analysis of this project is not intended as a criticism, for it is clearly evident that the project reflects those design features which were characteristic of some of our earlier farm highway projects. As noted previously, the purpose of this analysis and those which are to follow is to examine what has been done in the past in order that we may explore the possibilities for improvement in our future work.

A CONTRAST IN LOCATION AND ALIGNMENT: A more recently completed farm highway is shown on the map in Figure 5. The contrast in alignment is very evident, since the lower portion is relatively straight while the upper, or easterly section involves more irregular alignment. The latter section was completed during 1952 and would therefore seem to be out of focus with our current attitude regarding location and alignment. However, this example is offered as an illustration of the manner in which our Land Service projects are influenced by existing alignment as well as culture and property lines.

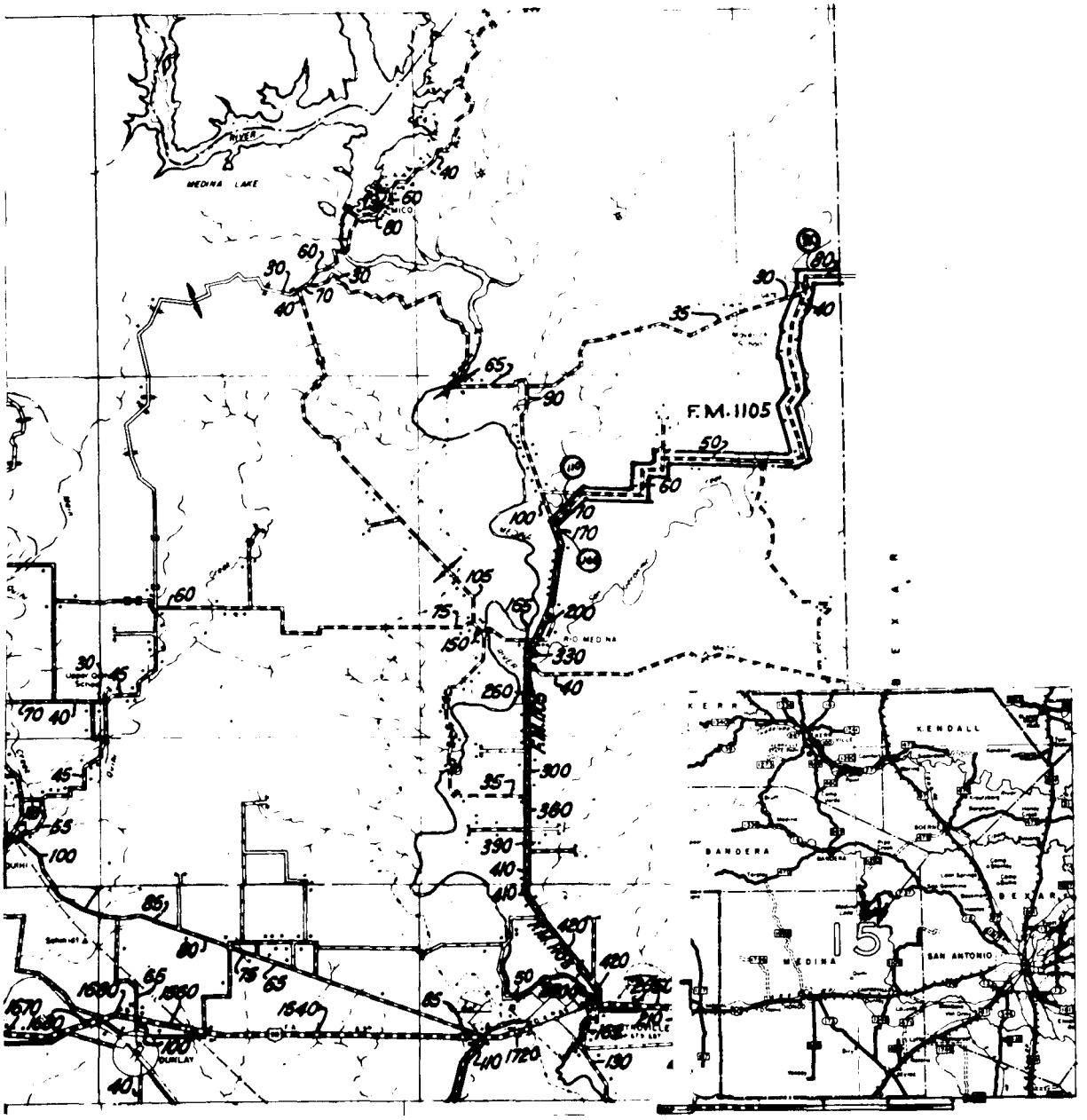


FIGURE 5

Based upon the 1951 traffic data as shown by open numbers, it is obvious that the lower section is serving from five to six times the amount of traffic carried over the more recently completed easterly portion. In this connection, it will be noted that the encircled traffic data on the latter section is the result of 1952 spot counts from which it is evident that no significant increase has as yet developed. It would appear, therefore that the relative alignment characteristics of the two sections conform in general with the existing traffic requirements. This, however, is not true, since the alignment of the upper, or easterly, section involves curvature ranging from 4^{o} to 30^{o}, with most of the curves varying from 18^{o} to 20^{o}.

In Figure 6, plan-profile sheet 18 for this project is reproduced in order that certain features may be emphasized. For example, it will be observed that house is situated on the inside of the 30° curve.

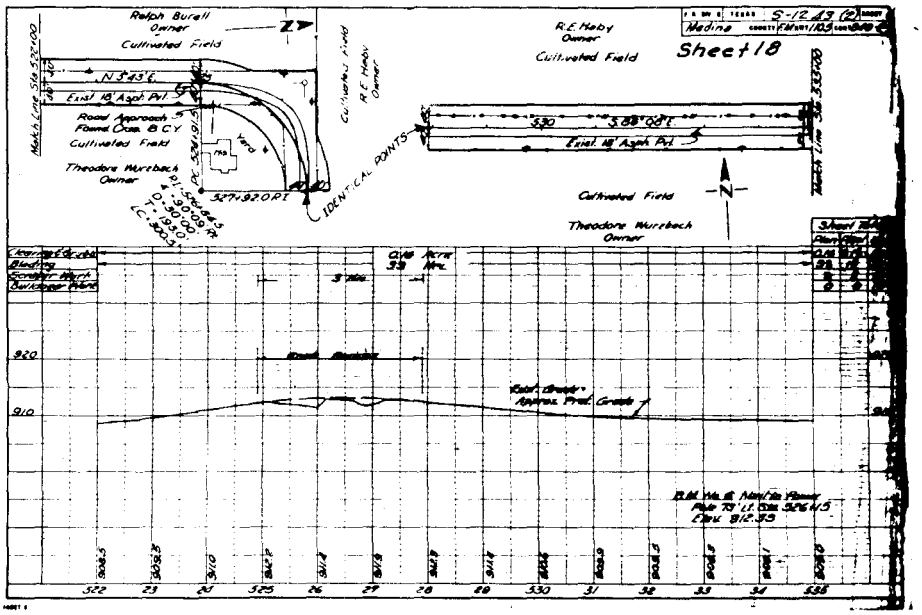


FIGURE 6

A picture of this home and its relation to the highway is shown in Figure 7, from which it is evident that the Engineer had no other reasonable alternative in the location of the curve. It is true that a relocation could have been made; however, it would have involved an undue hardship on adjacent property owners whose cultivated lands would have been encroached upon in the attempt to reduce the curvature at that point.

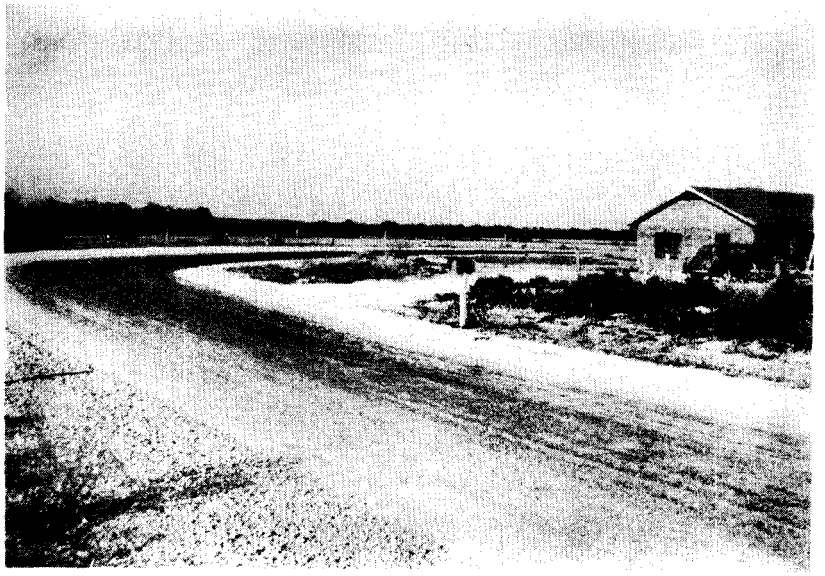


FIGURE 7

Since this project involved several other similarly undesirable curves, one can readily see the position in which the Engineer would have found himself had he insisted on the necessary right-of-way for improvements on the other curves while being forced by circumstances to employ the 30° curve as noted. The county would likely still be trying to secure the right-of-way and the property owners would surely not hold the Department in very high esteem.

This project has been used as an example for two specific reasons:

1. To show the contrast in alignment on the adjoining sections which reflects the influence that existing conditions in a well-developed farming area can have upon F.M. highway location.
2. By showing what had to be done in this instance, it is possible to illustrate very clearly what should not be done where conditions would permit a more desirable solution.

ROUTE AND LOCATION: Let us now consider a contrasting location problem in which both Land Service as well as through-highway characteristics are evident. A route location ABCD is shown on the map in Figure 8. Existing highways and population centers are shown at A, E, D and F. The section from A to B was recently placed under contract, while route approval has been secured for the section from C to D.

During the initial phase of the route study, there were certain problems on the section A-B which had to be worked out. These involved both location and design; but, before a satisfactory solution could be determined for the latter, the problem of location had to be settled. This involved the question of relocating to provide a more desirable location for a new bridge site. During the consideration of this problem, it was found that a route study was being made of the section C-D. From this it was readily apparent that, although the two sections have been assigned different highway numbers, both formed the nucleus of a through-route location. Additional investigation revealed that the existing county roads from A to D had, at one time in the past, formed the main route of travel between the towns at A and D, before the existing highways were built from A to E to D. Therefore, it was reasonable to assume that an improved facility from A to D, being the most direct route between the two towns, would develop a considerable volume of traffic. Inquiries with the Traffic Division of the Highway Planning Survey produced a conservative forecast of some 400 v.p.d. as the traffic volume which might be reasonably expected upon com-

pletion of improvements on the route. From this it was evident, therefore, that adequate provisions should be made accordingly in the location and design for the route.

This presents an ideal illustration of how the design of several different projects on the same route may be correlated if the eventual limits of the route are known in advance and proper consideration is given to the overall requirements of the route location. In contrast with this, we have found that some of our earlier projects developed traffic potentials far beyond original expectations; hence, subsequently improved sections on the same route demanded a higher design.

The proposed location for this route is shown by broken lines on the map in Figure 8, from which it will be noted that numerous relocations are contemplated. In this respect, the current attitude of the Land Service Roads Division, regarding Location and Traffic Potential, is more clearly illustrated than was possible in the two preceding project examples.

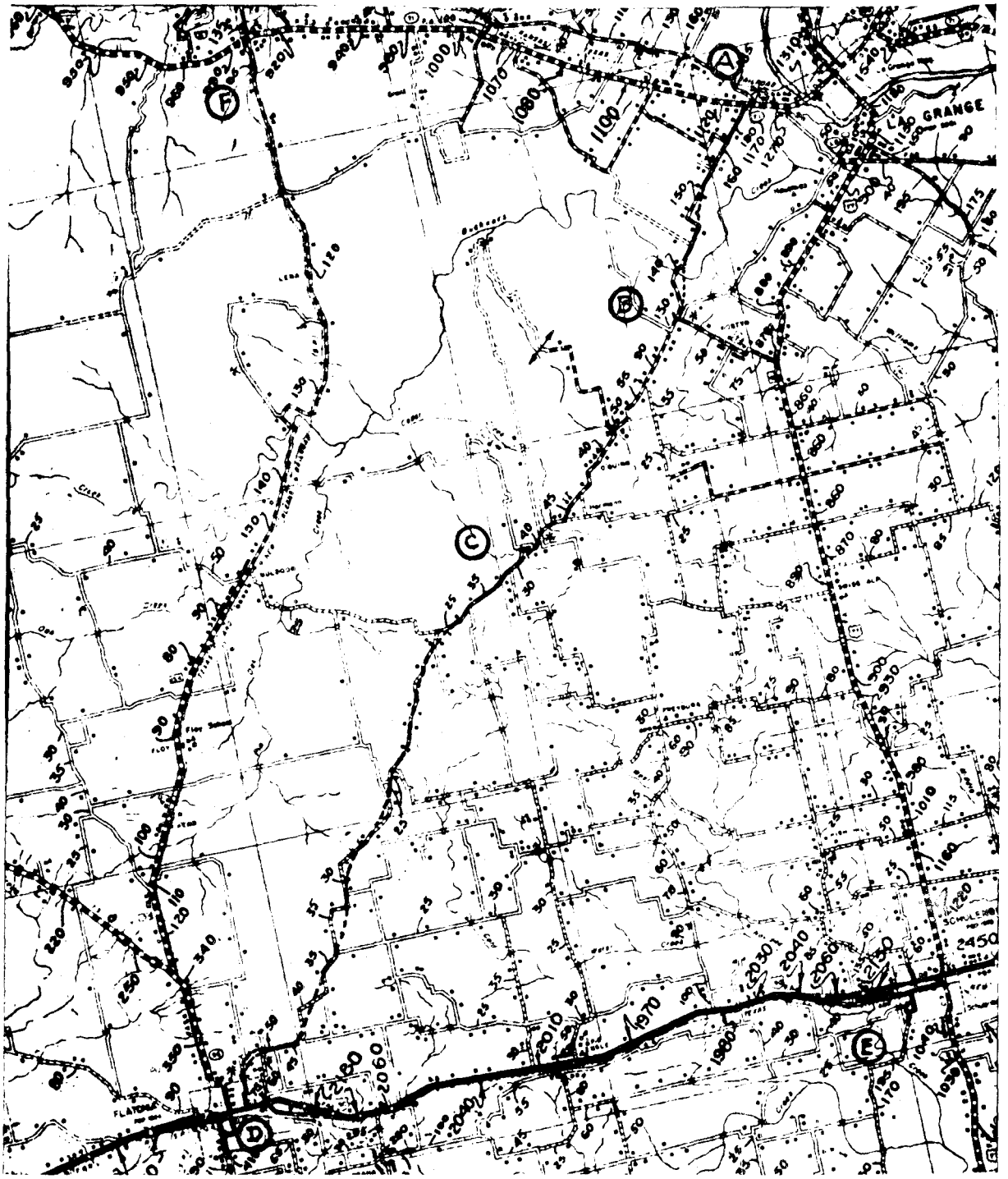


FIGURE 8

In connection with the location studies of this route, it was found that the use of aerial photographs was very helpful. Although much of the detail is lost in the reduction of the larger photographs to permit their use as illustrations, Figures 9 and 10 are included for the benefit of those who may not have had occasion to use such photographs in the study and development of highway locations. The larger illustration in Figure 10 is referred to as an "Index Sheet" or a Mosaic. The latter term is the more descriptive inasmuch as a Mosaic is a reduced composite photograph of numerous "contact prints" such as that shown in Figure 9 which, by virtue of a larger scale, provides greater detail within a limited area.

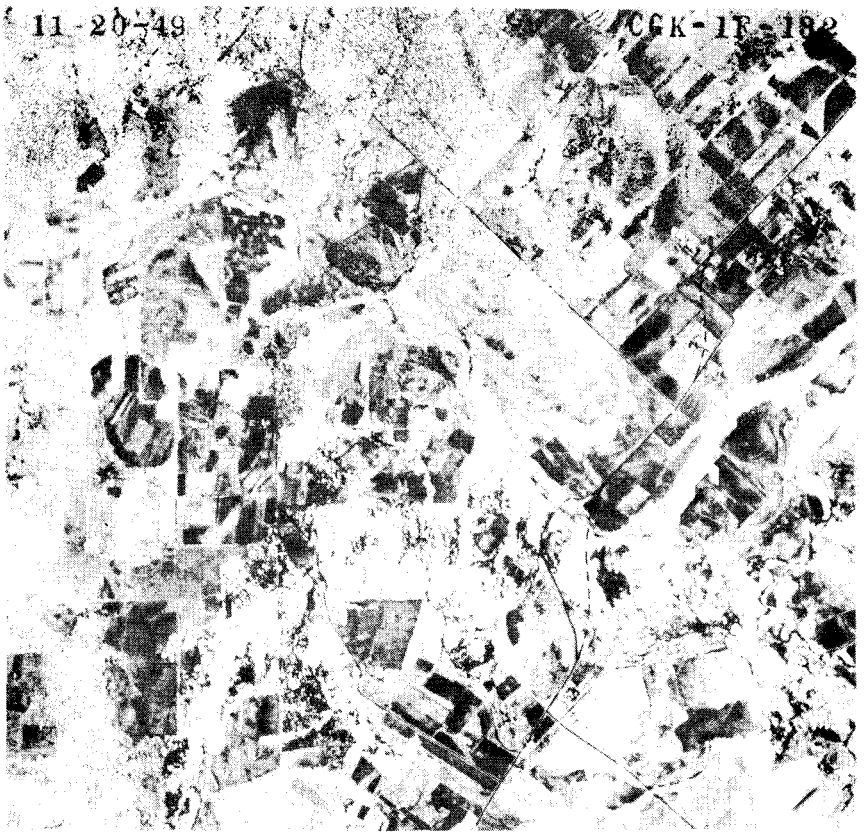


FIGURE 9

It will be noted from these illustrations that a dotted line, indicating the proposed location, is visible in Figures 9 and 10. The encircled area at point "B" in Figure 10 is depicted on a larger scale in Figure 9. In the latter, two relocations are shown; one is a relocation for the elimination of two sharp curves; the other provides a more desirable stream crossing for a new bridge and approaches. These, together with the numerous

FIGURE 10

others indicated over the remainder of the route, are considered essential to the development of a safe and adequate facility.

The importance of the route under discussion extends beyond the limits of the area AEDF. This becomes readily apparent upon examination of the arterial highway network in this area as shown in Figure 11. From this illustration, it will be observed that the proposed route will provide the last link necessary to secure a direct through-route extending through a large portion of this section of the State by connections with the present highway network.

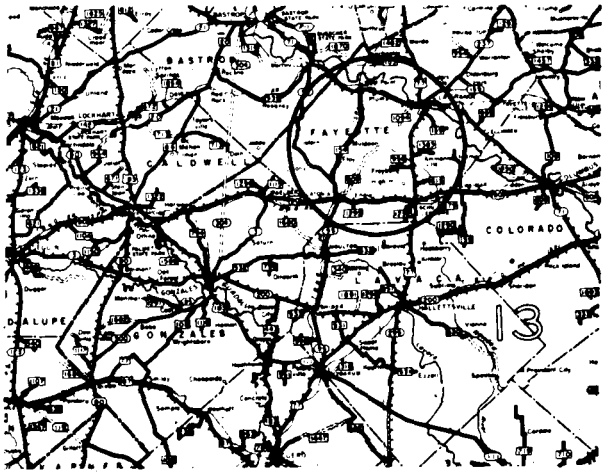


FIGURE 11

Thus far, the problem of location has been discussed primarily on the basis of land service, with emphasis on the effect of location and alignment for those projects in the lower and middle ranges of current farm highway traffic.

FUTURE ASPECTS OF CERTAIN LAND SERVICE PROJECTS: Let us now consider an example of one of the more unusual farm highway locations which, from all indications, has a high future traffic potential. This location, unlike those in the previous examples, involves a problem of design and section rather than alignment.

In Figure 12 a portion of the highway network in an area along the Gulf Coast is shown. It will be noted that an area has been blocked off around Jackson County in which Farm Highway 616 is shown from La Salle to La Ward. Attention is directed to this highway as a graphic example of the stage development of our expanding highway network. To emphasize the ultimate potential of F.M. 616, let us observe how U. S. 77 begins at Brownsville, on the southernmost tip of the State and extends north, paralleling the coast line and the St. L. B. & M Railroad via Raymondville, Kingsville, Robstown, Sinton and Refugio to a junction with S.H. 113, near McFaddin, at a point south of Victoria. From this point the St. L. B. & M. Railroad (M.P.) continues in a northeasterly direction to Bloomington on F.M. 404, and parallels F.M. 1302 from there to a crossing on U.S. 87 at Placedo Junction. At this point the St. L. B. & M. Railroad continues to La Salle at which point F.M. 616 begins a route paralleling the railroad location to La Ward on S.H. 172. From there, another gap exists in the highway network to the end of F.M. 1727 at the Matagorda County Line. At that point F.M. 1727 continues east to Blessing and a junction with the arterial highway system.

Retracing this route, it will be observed that highway gaps exist from McFaddin to Bloomington; Placedo Junction to La Salle; and from La Ward east to the end of F.M. 1727 at the Matagorda County Line. It is readily apparent therefore, that future programs will likely provide for the construction of these gaps and thereby complete this route from Brownsville to Bay City, West Columbia, Angleton and Alvin, from which point traffic could disperse north to Houston or east and southeast to either Beaumont and Orange or to Galveston.

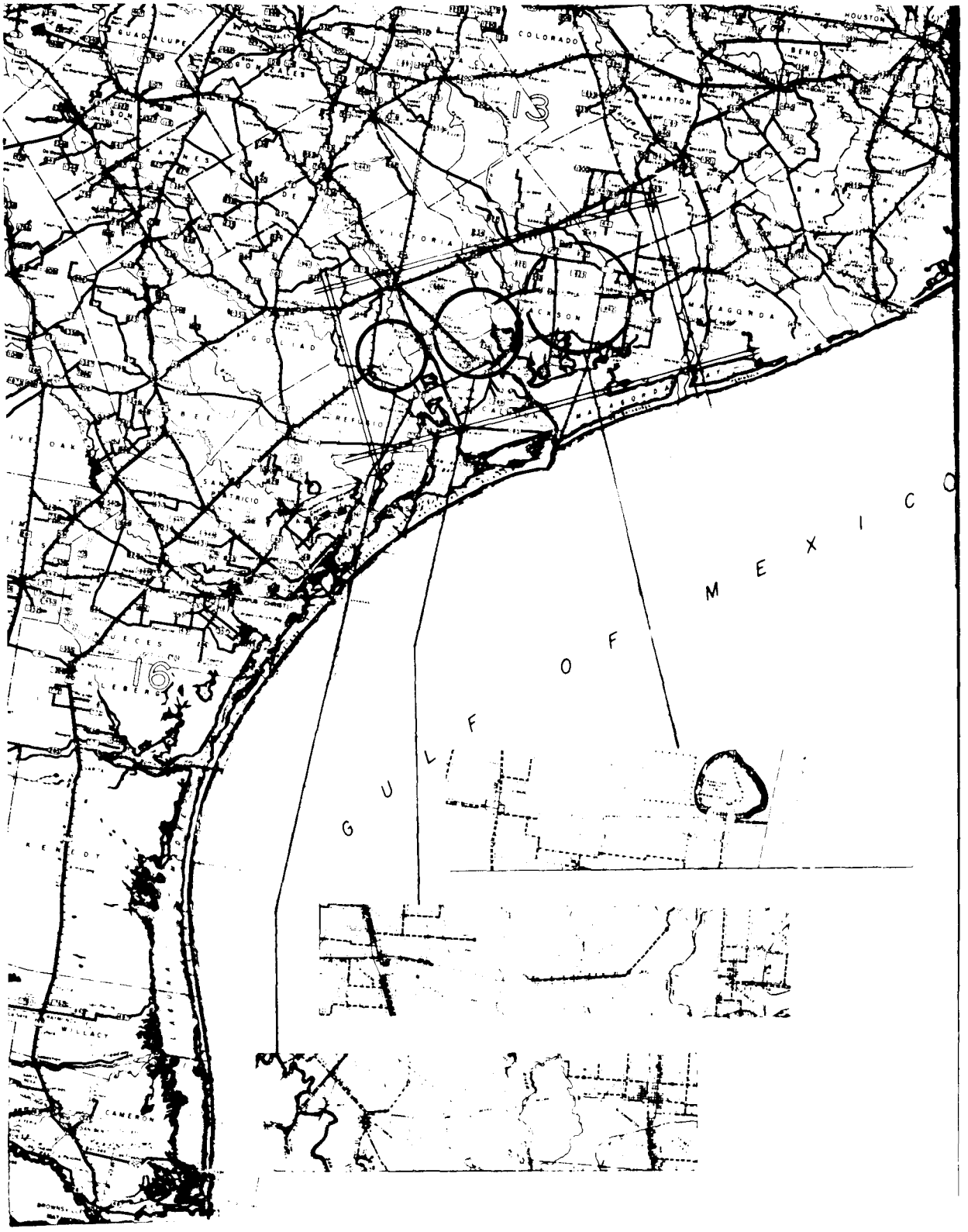

COLORADO
WHARTON
MATAGORDA
VICTORIA
CALHOUN
REFUGIO
SAN PATRICIO
NUECES
KLEBERG
KENEDY
WILLACY
CAMERON
13
16
GULF OF MEXICO

FIGURE 12

From our consideration of the potentialities revealed in Figure 12, we must conclude that F.M. 616, as well as the remaining three unimproved sections, have primary highway possibilities as well as secondary or land service characteristics. This example and discussion is presented in order that one important fact may be brought to your attention. Whenever a land service highway location is being considered, it would be well to first study the relative location of the proposed project with respect to the existing highway network. From this approach, it may be found that a seemingly unimportant stub highway, situated off in a remote rural section may eventually become an important link either in the county highway network or as a strategic section in an inter-county through-route. In such an event, the problem of location would then have a direct bearing on the design features used in order that adequate provisions could be made for future traffic requirements.

The problem presented in Figure 12 is a rare exception among Land Service Projects; however, we should not lose sight of the fact that similar situations are likely to become more prevalent in the future, as the network of Land Service Projects expands. For this reason, then, our Engineers should watch for and try to anticipate such developments in the program stage of future projects.

The four location examples considered thus far have involved the over-all aspect of the entire location. This permits only a discussion of generalities; whereas, the examination of numerous specific locations would likely prove more enlightening than a long analysis of a limited number of projects in general.

ILLUSTRATIONS OF VARIOUS LOCATION PROBLEMS AND SOLUTIONS: Therefore, from the plans and records of farm highway projects completed throughout the State since the War, pictures and plans of location problems have been selected for more detailed examples of how our Engineers have solved a variety of such problems. We believe that the pictures which follow will permit a more thorough perception than would an extended verbal description.

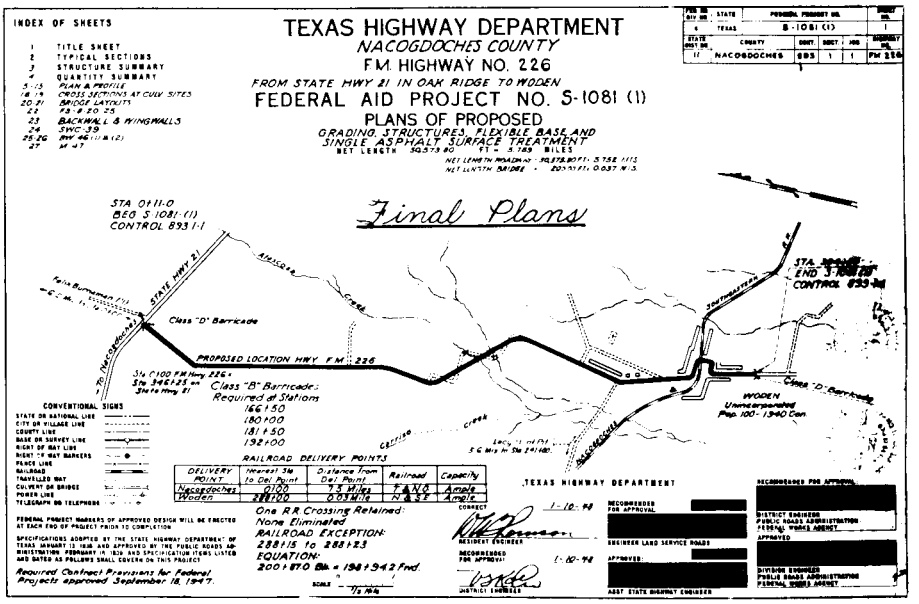
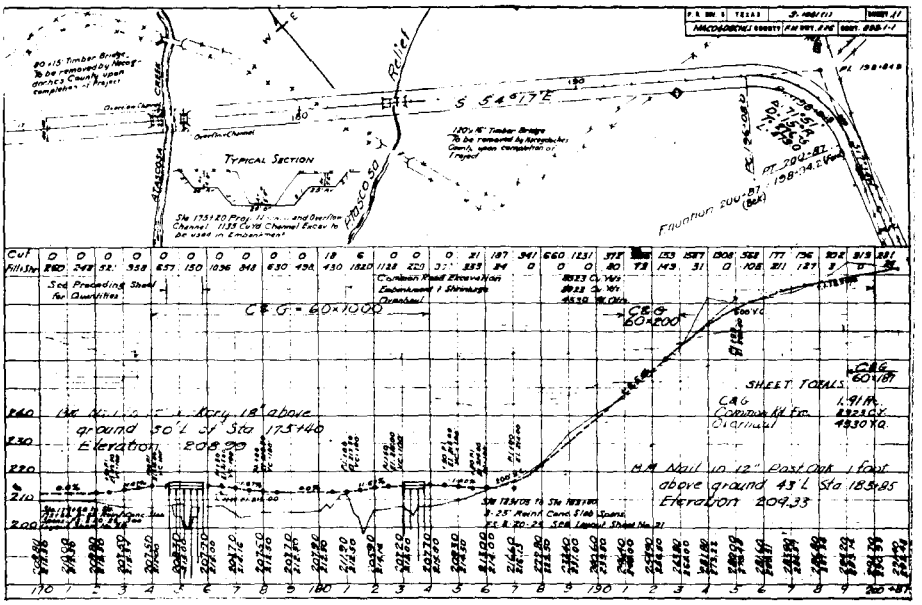
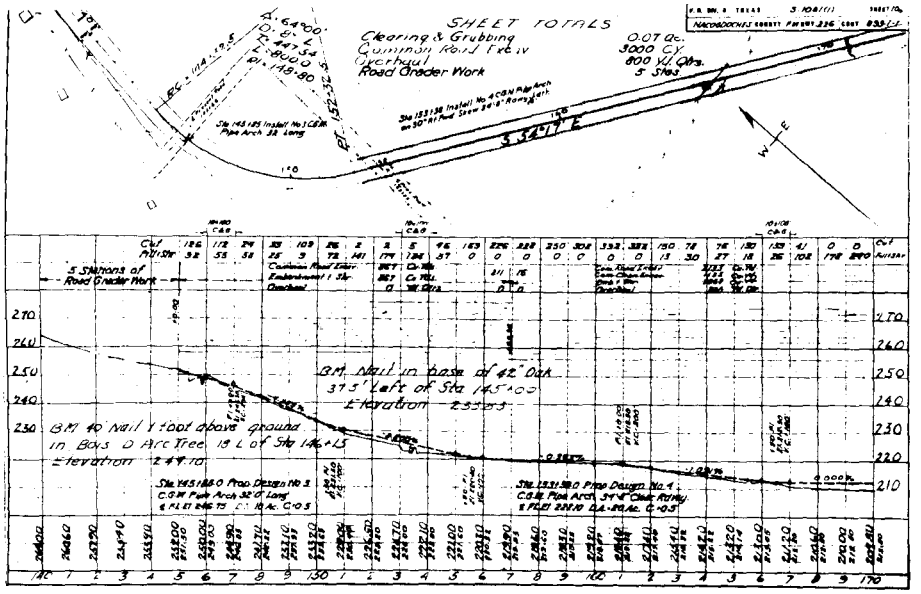


FIGURE 13

A TITLE SHEET SHOWING PROPOSED RELOCATIONS



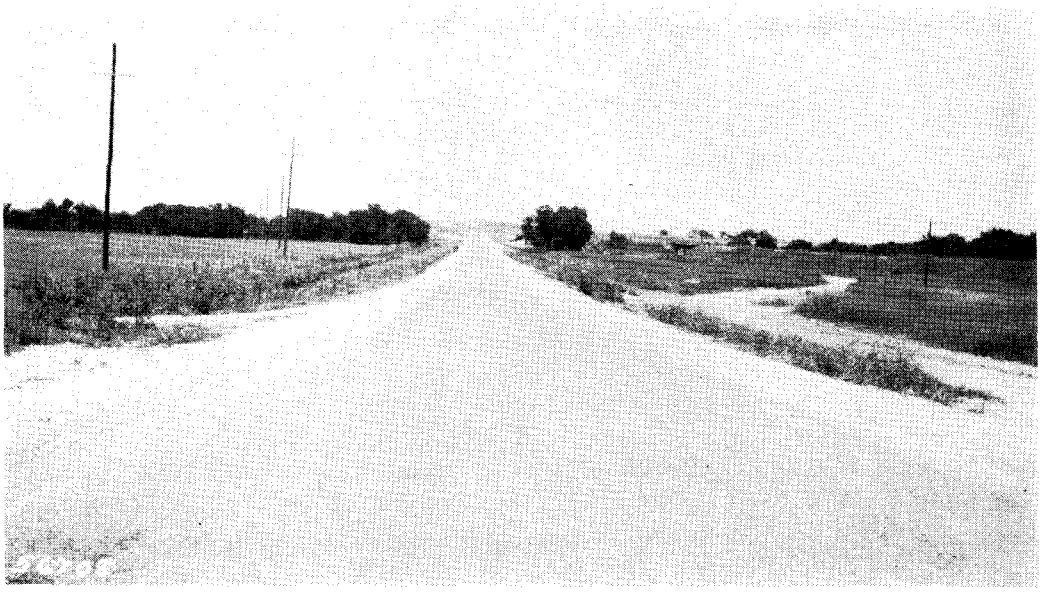
Plan-Profile Sheets showing in greater detail those relocations indicated in Figure 13.



Two scenes showing winding alignment on a Farm Highway. The improved facility follows, with minor exceptions, the existing location and alignment of WPA - improved County road.

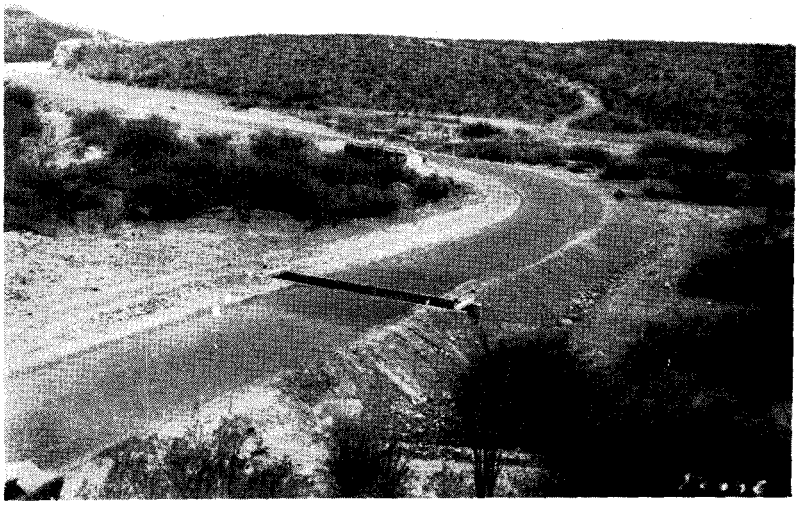
A contrasting scene showing the straight alignments and wide right-of-way on a Farm Highway.

A potential danger spot. Note the culvert headwall appearing on the inside of the curve. A minor relocation and culvert extension would have eliminated the hazard at this point. In this instance, limited funds influenced postponement of this and other desirable improvements. Note that sufficient R. O. W. was secured on the inside of the curve to permit elimination of this hazard when funds do become available.

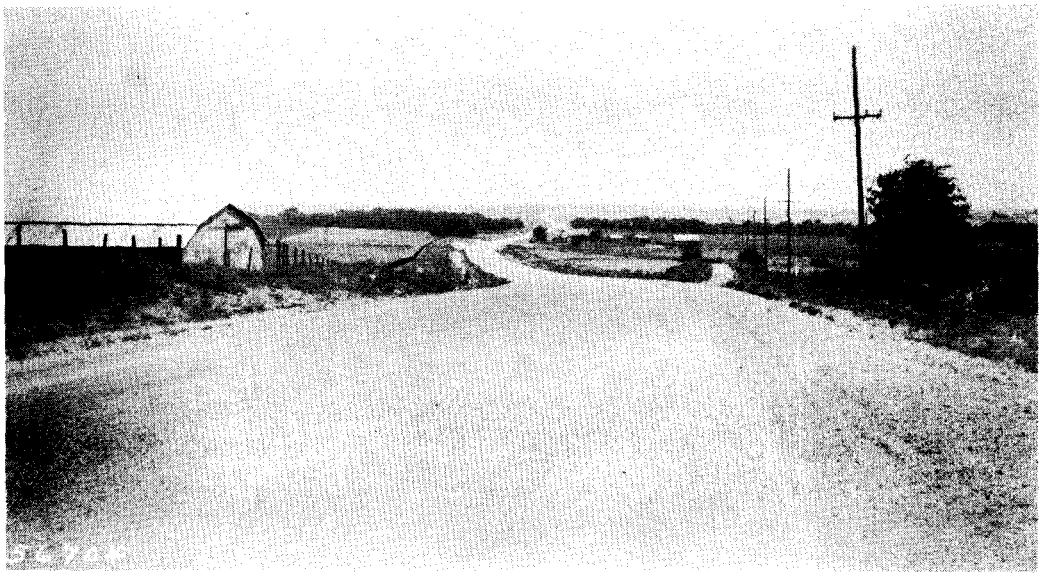


"Before" & "After"

A relocation to place highway centerline further from railroad for improved alignment and sufficient right-of-way for adequate roadway maintenance.

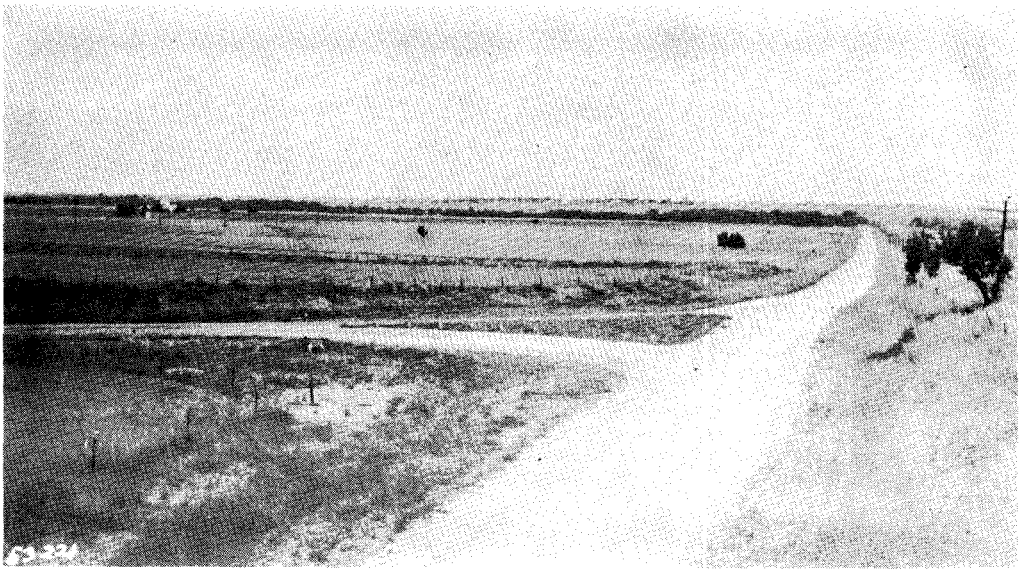


The economical repair and use of an existing bridge precluded the cost of a new structure on a more desirable location.



"Before" & "After"

Showing the improved alignment which eliminated two dangerous curves.



"Before"

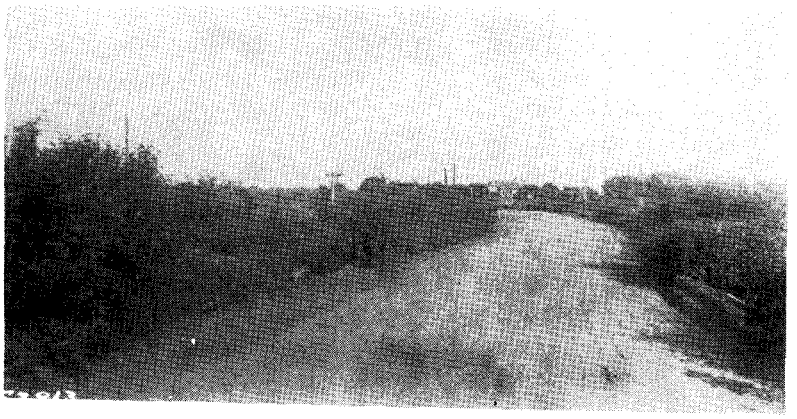
"After"

Note the "old" and "new" location in the background. The relocation permits a more desirable stream-crossing (Brush Line in background) as well as locating further from the Railroad.

"Before"

"After"

Note the comparative widths of right-of-way and new location straight ahead.

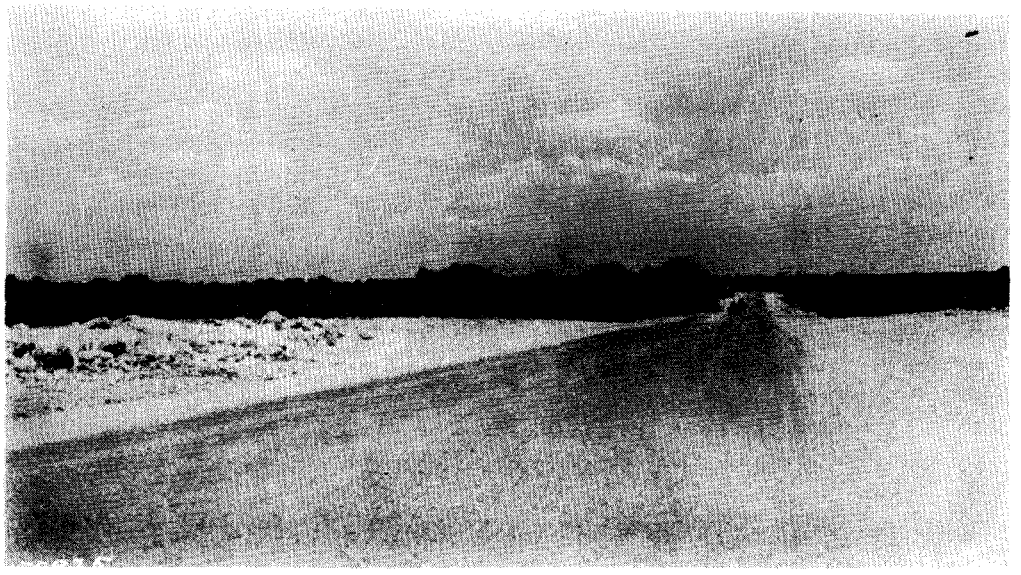


"Before"

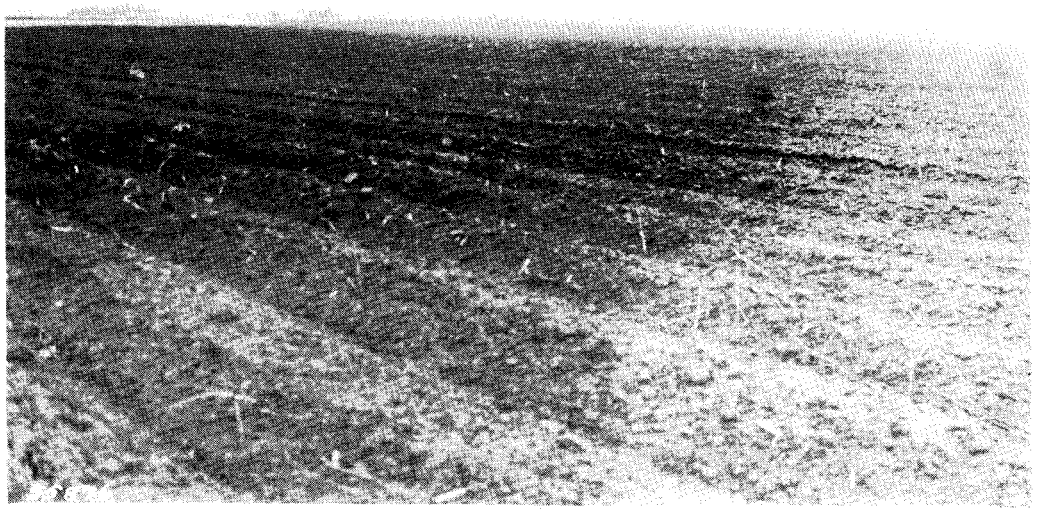
"After"

The "Old" and "New" location showing improved sight-distance and alignment. Center line now crosses existing culvert on a skew. Structure was extended on the right to provide a skew curb line.

"Before"

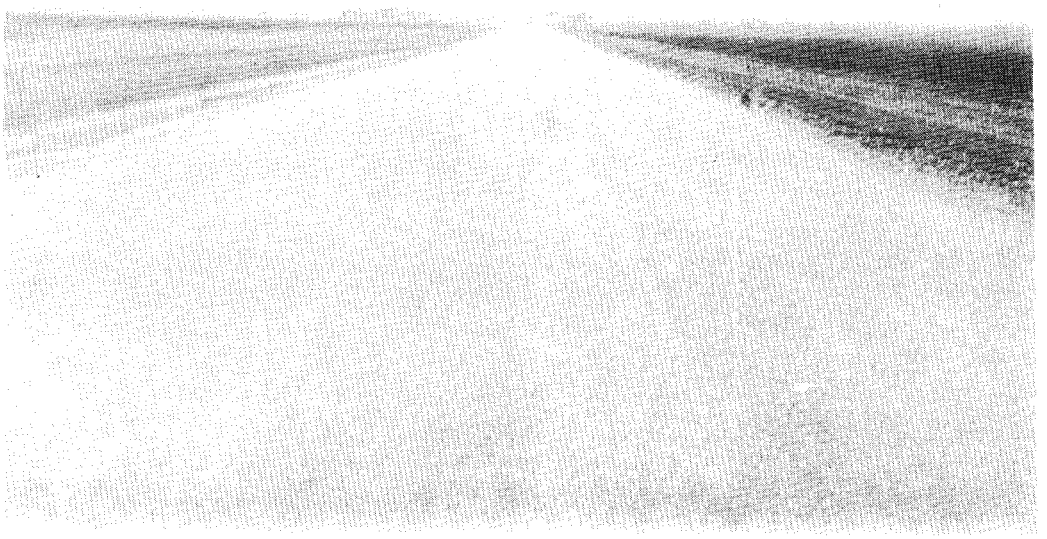


"After"



"Before"

Existing road location in upper left background.

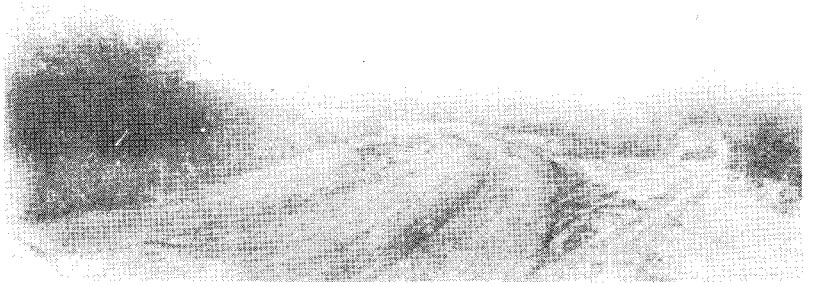


"After"

Relocation to meet old location on the curve in background.

"Before"

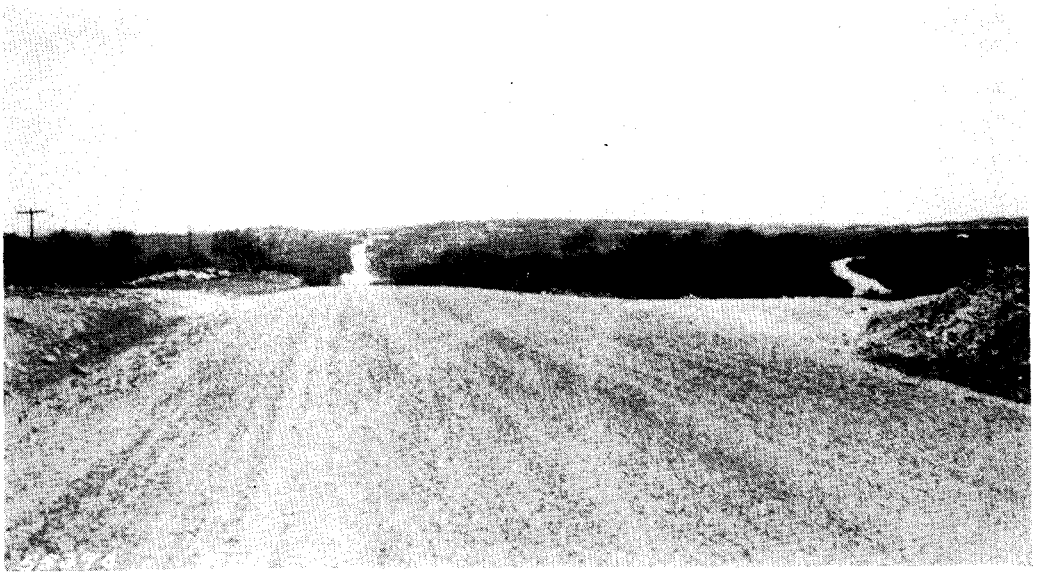
"After"



"Before"

"After"

The old and the new relocation in the background.



"Before" & "After"

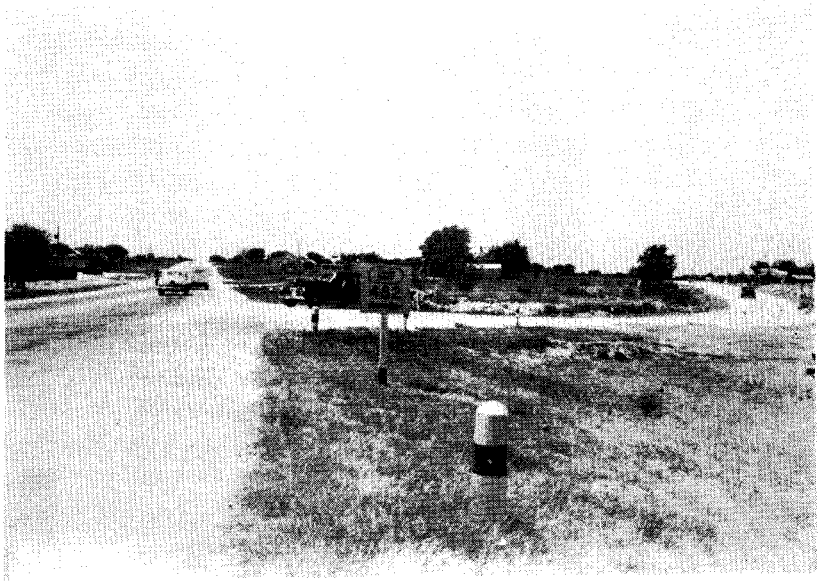
Note the contrast in alignment.

"Before" & "After"

A CONTRAST IN ROAD AND HIGHWAY JUNCTIONS

Illustrations are from different highways.

DANGEROUS



SAFER

FIELD INSPECTION

In this discussion, we have attempted to classify and analyze some of our location problems on Land Service Roads. We realize that, at best, this subject can only be covered in a general way by such a discussion. We know too that future problems may arise which will be radically different from any we have touched upon here. Therefore, unless we have presented sufficient information to you in this discussion to convey a better understanding of our policies and requirements to the end that such can be used as a guide in handling future problems of like nature, we have not done a complete job. Since it is our intention and desire to serve the Field to the limit of our capacities, we would like to leave this thought with you. The Land Service Roads Division functions as an intermediary between the Field and the Administration for those location and design problems effecting farm highways. If at any time there is a problem regarding location or, for that matter, any other phase of a Land Service Road Project about which there is some uncertainty, we would appreciate your advising us in order that the problem can be discussed on the ground, preferably during the IPE stage of the project.

The need for these conferences in the field has been evident on numerous occasions in the past. Even now we occasionally receive plans which reflect location, alignment and rights-of-way features which might have been improved upon had the Engineer known the extent to which he might have gone, or that which would be concurred in and recommended by the Austin Office. By the time we receive a completed set of plans a great amount of time and money has been invested in their preparation. From time to time we do return plans to the field for revisions; however, these for the most part do not often involve location or rights-of-way since we have found that agreements and right-of-way negotiations have gone too far and the Field Engineers are naturally reluctant to make changes. Reasons for this are easily understood. They would involve a request for additional rights-of-way which may adversely influence the relations between the Engineer and the County or with the local residents. The revision would also require further expense for the additional surveys and plan work which the limited allotment for Farm Highway projects may not permit. We, therefore, must weigh the advantages to be gained against the added cost and other intangibles which are likely to be involved. As a result, we are sometimes compelled to accept certain plan features which we would not care to recommend. We believe, however, that such instances can be minimized by

discussions with the Field Engineers during preliminary field inspections and reviews by representatives of the Austin Office.

In conclusion, we want to impress upon all concerned the fact that both the Field Forces and the Austin office are partners in a common undertaking, namely to give to the people of Texas the best highways their tax dollar will afford. To do this, we must make full use of the facilities at our disposal. Neither phase of the partnership can function effectively without the other. We must continue to recognize and understand the functions of the other, or this goal cannot be fully realized. If all of us, from the checker and rodman up to the District Engineers and Department Heads, will keep in mind his "position on the team" as well as of the responsibilities and services provided by the others - both individuals and divisions - it will then be possible for the Department - and the State - to realize maximum benefits from our facilities and personnel.

DESIGN OF LAND SERVICE ROADS

MINIMUM DESIGN STANDARDS: The "Design Standards For Construction and Reconstruction of Secondary and Feeder Roads" which govern for Federal Aid Secondary Projects were adopted by the American Association of State Highway Officials, August 1, 1945, and revised with respect to definition in January, 1949. The Special Committee on Planning and Design Policies recommended these Design Standards for A.A.S.H.O. approval June 18, 1945. The Special Committee arrived at the values for minimum and desirable standards by sending out questionnaire and obtaining opinions from all State Highway Departments. Design Standards for "State or State-County Land Service Roads" dated October 1, 1947, were arrived at by sending questionnaire to each District Engineer in the State and requesting their recommendations on the values to be used in the Design Standards. The District Engineer's recommendations were tabulated and those values which represented majority opinions were used.

You can readily see why these minimum and desirable design standards must have considerable flexibility in order to be applicable for nation-wide use in one case and for state-wide use on the other hand. It is reasonable to assume that these standards were adopted with the understanding that the Engineer would be free to give considerable thought and study to his design problems and would use good judgment in applying these standards to each individual project.

Please note that these standards are by no means solutions to your problems and should not be used to justify or as an excuse for poor design. These standards do form a somewhat uniform basis from which to start. It is not intended that the minimum design standards replace initiative and/or ingenuity. Therefore, considerable thought, study and usually hard work must be applied to the design of each project in order to obtain a balanced design, economical to build and maintain, all based on sound engineering principles.

DESIGN STANDARDS FOR FEDERAL AID PROJECTS:

DESIGN STANDARDS FOR CONSTRUCTION AND RECONSTRUCTION OF SECONDARY AND FEEDER ROADS

Recommended for A.A.S.H.O. Approval by the
Special Committee on Planning and Design Policies
June 18, 1945
Revised January 1949

Definition: Design standards for secondary and feeder roads are the set of values or controls to be used for minimum design under normal conditions, but not necessarily for exceptional cases for which lower values will provide a justifiable degree of improvement and for which the values will need to be determined separately.

Traffic Basis: These standards are shown for three ranges in volumes of annual average daily traffic. These volumes are assumed to be the present traffic or that estimated to occur when the improvement is completed. It is desirable that these standards be used for volumes which allow for future increases in traffic. The design peak hour traffic density is assumed to be approximately ten per cent of the annual average daily traffic.

These design standards are for roads with annual average daily traffic up to 1,000 vehicles. Roads with greater volumes should be designed in accordance with current practice applicable to roads with similar conditions on the Federal-aid highway system.

MINIMUM DESIGN STANDARDS

Design Control	Annual Average Daily Traffic Volume: Under 100 Min	Under 100 Desirable	100 to 400 Min.	100 to 400 Desirable	400 to 1000 Min	400 to 1000 Desirable
Design speed, miles per hour:						
Flat topography	40	--	45	55	50	60
Rolling topography	30	--	35	45	40	50
Mountainous topography	20	--	25	35	30	40
Sharpest curve, degrees:						
Flat topography	14	--	11	7	9	6
Rolling topography	25	--	18	11	14	9
Mountainous topography	15	--	36	18	25	14
Maximum gradient, per cent:						
Flat topography	8	5	8	5	7	5
Rolling topography	12	7	10	7	8	6
Mountainous topography	56	10	12	9	10	7
Non-passing sight distance, 1/ ft:						
Flat topography	--	--	315	415	350	475
Rolling topography	--	--	240	315	275	350
Mountainous topography	--	--	165	240	200	275
Width of surfacing or pavement, ft:	12, if any	--	16	20	18	20
Width of roadbed, feet:	20	--	24	28	26	30
New bridges:						
Clear width, feet:	14	20	22	24	24 2/	--
Design load, A. A. S. H. O.:	H10	H15	H15	--	H15	--
Bridges to remain:						
Clear width, feet:	--	--	15	--	18	--
Safe load, posting basis, tons:	--	--	6T	--	10T	--
Width of right-of-way, Feet:	40 3/	--	40 3/	80	50	80

Notes:

1/ As defined in "A Policy on Sight Distance for Highways."

2/ Minimum of 24 feet or 4 feet more than approach pavement width.

3/ Minimum of 40 feet or as required for construction

Desirable revisions to the "Design Standards For Construction and Reconstruction of Secondary and Feeder Roads" particularly with respect to structures became necessary, and accordingly the Bureau of Public Roads issued "General Administrative Memorandum No. 329". Adoption of these amended provisions of "G.A.M. No. 329" with recommended modifications is under consideration by the A.A.S.H.O. at the present time.

General Administrative Memorandum No. 329
(Supersedes General Administrative Memorandums Nos. 66 and 102)

Date: May 23, 1949

Subject: Design Standards for Bridges and Structures on Secondary and Feeder Roads

General Administrative Memorandum No. 286 issued September 18, 1945, transmitted a copy of the approved design standards for Construction and Reconstruction of Secondary and Feeder Roads adopted August 1, 1945, by the American Association of State Highway Officials. This memorandum supplements and amplifies the general policy concerning bridges and structures as set forth in those standards.

Since bridges and structures represent a significant portion of the cost of construction of secondary and feeder roads, the economic justification of expenditures will require careful coordination of bridge capacity and cost. Division Engineers and field representatives of the Public Roads Administration will give consideration to the volume, composition and speed of traffic to insure provisions of structural capacity and roadway width appropriate to probable use during the life of the structure and consistent with probable future secondary road improvement and traffic need. Judgment must be exercised to avoid the added expense of design standards higher than will be required. Care should be taken that limited funds do not unduly influence the acceptance of designs lower than will be necessary.

The determination of design standards and therefore of cost requirements should give general consideration to the character of local development, prospects for the incident of traffic growth, the possibility of a secondary road becoming a link in or an alternate to existing primary and other conditions which may account for the movement of unusual numbers of the heavier critical vehicles. Likewise, due consideration should be given to the use of low standards where conditions do not indicate an increase in the future.

Maximum desirable consistency in the standard and capacity of bridges and structures provided for secondary roads will be obtained by general adherence of the following guide. Except as special conditions may clearly indicate departure from these criteria, they shall be uniformly applied.

BRIDGE DESIGN CONTROL	Minimum Standard	CLASSIFICATION BASED ON AVERAGE DAILY TRAFFIC VOLUME Class I Over 1,000	Class II 400 to 1,000	Class III 200 - 400	Class IV Less than 200
New Bridges:					
	Design Loading	H-15	H-15	H-10 Timber Single H-15 for steel and concrete permanent construction	H-10
1/	Clear roadway width, feet	4-feet wider than approach pavement	22-24	20-22	2/ 14-20
Bridges to remain:					
	Safe load, inventory rating AASHO Specs. 1949	H-15	H-10	Single H-10	H-6
	Clear roadway width, feet	22	18	14	10

1/ In no case less than the traveled roadway width.

2/ On long bridges, turnouts may be considered.

Design standards for bridges Class I should conform with current practice applicable to roads with similar traffic conditions on the Federal-aid highway system.

Class II and III, excepted to carry heavy trucks on more than an intermittent basis, shall have bridges designed for a minimum capacity of H-15.

On Class III, it is generally intended that the H-10 minimum design loading shall apply only to treated timber trestle construction with main carrying members of timber. For steel or concrete stringer and concrete deck construction, H-15 single lane loading placed in any position on the roadway should be the minimum used for this class.

Single lane bridges and those of less than traveled roadway width, shall be considered for new construction only in exceptional cases. Their use shall be authorized only with the provision of advance warning signs and guard rail roadway transitions.

Culverts shall, in all cases, be of full shoulder to shoulder graded width, load carrying capacity to be as given for bridges.

Minimum overhead clearance for new through structures shall be 14 feet. Deficient clearance for spans to remain in place shall, if feasible, be increased to 14 feet and in all cases to at least 12 feet 6 inches. Clearances less than 14 feet should be indicated by high visibility overhead signs. All clearances shall preferably apply for full width between curbs.

The vertical clearances given in preceding paragraph and widths shown in the guide shall apply to underpasses, both new and those to remain in place.

Federal-aid funds may be used for reconstruction required to bring substandard bridges up to the minimum capacities and widths specified in the guide, under "bridges to remain." Such work shall be limited to bridges where the required expenditures can be economically justified as a temporary expedient. Approval will be conditioned on the understanding that the bridges will be put on the program for replacement in the future when conditions warrant.

Existing bridges, of width less than that specified for new bridges, having remaining useful life and adequate structural capacity or which may be strengthened to adequate capacity, may be retained in place contingent on:

1. Provision of good alignment and visibility in approach roads to insure safe passage at traffic speeds commensurate with the improved road.

2. Posting for load and speed limits.

3. Installation of advance reflectorized signs on approach roads and reflectorized buttons at bridge ends.

4. Provision of guard rail roadway transitions at bridge ends where traffic volumes are in excess of 100 vehicles per day.

DESIGN STANDARDS FOR STATE OR STATE-COUNTY PROJECTS:

DESIGN STANDARDS APPROVED FOR STATE OR STATE-COUNTY LAND SERVICE ROADS
October 1, 1947

"Design Standards for State or State-Aid Land Service Roads" refers to the minimum and usual design values to be used as a guide in the development of State or State-County financed farm-to-market roads, the Austin office responsibility for which, has been assigned to the Land Service Roads Division. Though exceptions will be considered on the basis of individual merit, predominant adherence to the limitations imposed by this set of values is essential for economical, efficient, and orderly progress administered on a fair, and impartial State-wide basis.

The traffic volumes shown refer to the latest available annual average daily traffic. The design values that follow allow for this traffic volume and the anticipated increase as indicated by Planning Survey studies. At points where significant changes in traffic volumes occur within the limits of a project, the governing traffic design bracket should also change.

Item No.	Item	Annual Average Daily Traffic Volume			
		0 to 300		300 to 700	700 to 1000
		Min.	Usual	Usual	Usual
1	Rights-of-way Width (Ft.)	60	80	80	100
2	Roadbed Width (Ft.)	20	24	26	28
3	Surface Width (Ft.)	16	18	18	20
4	Non-Passing Sight Distance (Ft.)	165	240	315	475
5	New Bridges:				
5a	Roadway Width (Ft.)	16	20	22	24
5b	Design Loading (AASHO)	H-10 (1 lane)	H-10 (1 lane)	H-10 (1 lane)	H-15
6	Old Bridges to Remain:				
6a	Roadway Width (Ft.)	12	16	18	18
6b	Safe Load Capacity (Tons)	6	6	10	10
7	Hydraulic Design Design Frequency (Yrs.)				
7a	Culverts	0	2	5	5
7b	Bridges over Minor Streams	0	5	10	10
7c	Bridges over Major Streams	5	10	20	20

NOTES:

Item 1. The width of rights-of-way required should be the value indicated or the roadway width plus 8 feet whichever is the greater.

Item 3. The Minimum width is established by Commission policy.

Item 4. As defined in "A Policy on Sight Distance for Highways" (A.A.S.H.O.)

Item 6. As a general rule, existing bridges which will not have a useful life of ten (10) years or more after reconditioning should not be retained in place. Also, when the cost of said reconditioning equals or exceeds twenty per cent (20%) of the cost of a new bridge, of comparable length and roadway width, the existing bridge should not be retained in place.

Item 6a. Exceptions to the widths shown will be considered in the case of truss spans which are otherwise in good condition.

Item 7a. & 7b. The minimum design frequency of 0 years anticipates that serious consideration will be given to the economical usage of low-water structures.

RIGHTS-OF-WAY: Although the minimum design standards permit right-of-way widths as low as 40 feet, or as required for construction, projects proposing right-of-way widths less than 80 feet on current programs are unusual. Through July, 1951, tabulations on total mileage of farm to market roads handled by D-14 indicated that 84.4% of the mileage was constructed on 80 feet or more right-of-way widths, 20.5% of which was on 100 feet. Of the 15.6% of mileage constructed on less than 80 feet of right-of-way, 1.6% was on less than 60 feet, 6.5% was on 60 feet, and 7.5% was constructed on 70 feet. Please keep in mind that it usually requires the same width of right-of-way to construct and maintain a rural section through or within a municipality as it does outside the municipality. A municipal type section with curbs and gutters can be constructed and maintained on somewhat less width than required for a rural type section. The cost of construction of curbs, gutters, extra width drainage facilities, pavement and base over that required for the normal rural width plus 6 feet must be paid for by the municipality. Furthermore, the allowable extra 6 feet width just referred to must be justified from the standpoint of design.

Stock passes are usually right-of-way considerations and as such should be paid for by either the county or the property owner. Where a combination stock pass and drainage structure is used the state may participate in the cost of that part of the structure required for drainage. Administrative approval should be secured for State participation in the cost of stock pass under other conditions.

The use of cattle guards have been handled heretofore on a project by project basis.

NEW BRIDGES: It will be noted that the minimum roadway width for new bridges is given as 22 to 24 feet for Federal projects where the average daily traffic is 400 to 1,000 v.p.d. and as 22 feet for State projects where the average daily traffic is 300 to 700 v.p.d. For average conditions the differences in cost of 22 and 24 feet width structures of otherwise equal design are usually insignificant. Accordingly, it becomes difficult to justify the intermediate 22 feet width. Reference is made to the requirement that culverts be of full shoulder to shoulder graded width. An exception to this would be a culvert of bridge classification. If the length between inside face of abutment walls, measured along the centerline of the roadway, is 20 feet or more the culvert is classified as a bridge, and if of direct traffic design, may be constructed to either 20 or 24 feet roadway widths provided railing or 18 inch height curbs are used.

OLD BRIDGES: Highway engineers are regularly confronted with decisions concerning retention and utilization of existing bridges and culverts on proposed Farm-to-Market roads. Due to wide differences in situations and many variable conditions encountered when considering the fate of old structures, each existing structure becomes a special case. For this reason, it is not feasible to set up iron-clad rules to follow in determining whether a structure should be retained and utilized or removed and a new one built instead; however, there are certain features which should be considered before arriving at either conclusion.

Before a decision can be reached, a survey of the old structure should be made to ascertain its condition and rating. Bridge Survey sheets are provided for the purpose of assimilating required information in proper form in order that calculations can be made and an inventory rating determined for the structure in question. The complete bridge survey form is made up in two sheets, Form No. 1 for general information and Form No. 2 for detail data. Both sheets should be filled out carefully. An error in size of one structure member may result in an erroneous rating.

The Bridge Division, upon request and furnished with the proper information, will calculate the inventory rating of an existing structure. Upon request the Bridge Division will advise what strengthening will be required in order to obtain a specified rating.

The inventory rating in H-loadings and safe load capacity in tons are sometimes confused. The inventory rating is determined from calculations wherein due consideration is given to deterioration of materials, type of material, physical condition thereof as shown by field examination, and safety factor; whereas safe posting load is the maximum load which may be permitted to pass over the structure. The safe posting load is arrived at from calculations using 1-1/2 times the design working stresses, and is therefore a rating based on a considerably reduced safety factor. All current structure ratings are furnished in terms of H-Loading and represent inventory rating unless otherwise stated.

With information available as to the rating and extent of repairs necessary to increase the strength of a structure to a required rating an estimate of cost of reconditioning the old bridge can be made. At this point the cost of a new bridge of design, loading, and roadway width consistent with the traffic involved should be calculated for comparison purposes. In general, when the cost of the repairs equals or exceeds 20% of the cost of a new bridge of comparable length and roadway width consideration should be given to replacement.

Another feature to consider which should influence a decision is the permanency of the old structure. If studies and investigations show that an existing bridge can be expected to have an estimated useful life of only ten years or less after reconditioning, in all probability the structure should not be retained.

The roadway width of the existing bridge should be in accord with minimum requirements or should be of such design that economical widening may be accomplished as part of the repairs to bring the structure up to the required roadway widths as set forth by G.A.M.329 for federal projects or the minimum design standards for state or county-state projects. Usually not much can be done in the way of widening a truss span; therefore, exceptions to the widths shown in the standards will be considered for good truss spans. In addition to roadway width consideration must also be given to overhead clearance. Minimum overhead clearance is 12 feet 6 inches and clearance less than 14 feet 0 inches should always be indicated by high visibility overhead signs.

Alignment adjacent to and across the existing structure should be given due consideration when deciding whether to retain or replace an old bridge. We certainly would not want to perpetuate a known hazard merely to retain an old bridge of substandard dimensions.

Needless to say the bridge in order to remain should be capable of handling the drainage as well as the prevailing vehicular traffic. The mere fact that an old bridge has withstood previous floods through the years with no visible damage to the super-structure, sub-structure, immediate stream banks, or existing roadway from high water should be proof of its adequacy from the hydraulic standpoint. This would be true, of course, providing any bridge repairs of new construction and improvements to the roadway would not alter drainage conditions or seriously change flow characteristics of the stream at the bridge site.

Do not overlook the possibility that the existing structure may be longer than necessary to take care of drainage. If conditions indicate such possibilities, it is suggested that a check of the drainage area and inquiries regarding high water be made. We certainly do not want to keep, repair and maintain a longer bridge than is necessary. Investigations of this nature on a previous project resulted in replacing a long steel truss with an economical multiple box culvert.

To determine if the structure will be adequate for vehicular traffic, a study of the area the proposed roadway will serve should be made such that the

type, speed, loading, size, and volume of the local prevailing traffic will be known. In farming, ranching, or oil field areas or where traffic is predominantly trucks hauling wide, heavy, and high loads, every precaution and care should be exercised in deciding whether or not the use of the existing bridge will be to the best interests of everyone concerned. Normally when a road is improved, the volume and speed of traffic increases considerably. Allowance should also be made for this change in traffic conditions in determining the adequacy of the bridge for traffic.

Old structure to be removed should be examined closely for salvagable materials. Uses can always be found for sound timber, I-beams and channels. Provision is made for salvaging materials in Item 500 "Removing Old Structures." However, the engineer advises the contractor regarding salvagable materials.

Substantial savings in replacement cost are conceivable when it is possible to utilize existing piers, bents, and/or abutments of an old bridge. Investigations will be necessary to insure adequacy of the existing substructure to support the loads imposed by the new structure.

It is a rare situation to find that the sub-structure to be utilized fits one of the new standard super-structure designs; however, with some ingenuity on the part of the engineer, simple revisions can sometimes be made to a standard to permit use of the existing substructure. It is suggested that any proposed change in a standard design be discussed with the D-14 and D-5 design sections in the Austin Office. A suitable revised design may already be on hand. Also personnel are usually available for consultation and in most instances available for field inspections.

The situation on a recently constructed farm-to-market road consisted of a bridge having very substantial abutments and wings. The super-structure was deficient in roadway width and load carrying capacity. Widening and strengthening to standards required for the traffic involved proved to be too costly to undertake. New construction appeared justified; however, it was considered costly and wasteful to remove and throw away the existing reinforced concrete abutments which were in excellent condition. Distance between outside faces of these abutments was 80 feet 0 inches which eliminated the possibility of using 3-FS-8-20-25 slab spans or 3-30 ft. CG-10 slab and girder spans. The problem was solved with a special design 30 ft. FS-8-20-30 slab span for the mid span and 2-FS-8-20-25 (Mod.) slab spans for the end spans to make up the required 80 ft. length. Two special design interior bents were also required to transition from the shallower depth 25 ft. span slab to the deeper 30 ft. span slab. The

standard 25 ft. spans had only to be modified by extending the curbs to rest on the angling abutment wings. This arrangement worked out very satisfactorily and resulted in a good looking serviceable structure.

Revisions on a larger scale were made for a farm-to-market road crossing one of the major rivers of this State. The existing bridge consisted of a 198 ft. truss span and approaches approximately 40 feet above streambed. Roadway width and inventory ratings of the existing bridge were deficient for the type and volume of traffic. The two piers supporting the truss were found to be sound enough to be used in the construction of a new bridge. A special design 198 ft. continuous concrete girder unit (59-80-59) was utilized here by constructing two intermediate piers and placing special caps on the two existing piers. Two standard 25 ft. slab spans were required for approach spans on each end to complete the structure resulting in a 24 ft. roadway H-15 design throughout. A critical shortage of structural steel at the time the design for this structure was prepared eliminated the possible use of an "I"-Beam design. Before removing the old structure the contractor used it as a platform for pouring concrete for the two intermediate piers. This is mentioned here merely as a matter of interest. It is possible that the same scheme may be used on a future project. On this particular project the original low water crossing was still available and was used as a detour during construction of the new bridge.

Regardless of what has been done in the past, ingenuity and initiative will be required on the part of the engineer in charge in order that all or parts of existing structures may be utilized economically and for the best interests of the state.

SIGHT DISTANCES: Non-Passing Sight Distance as defined in "A policy on Sight Distance for Highways" is based on a height of eye of 4-1/2 feet and height of object 4 inches. The formulas for calculating non-passing sight distances are as follows:

$$S = \frac{7.28}{A} + \frac{L}{2} \text{ when S is greater than L}$$

$$S = 3.82\sqrt{\frac{L}{A}} \text{ when S is smaller than L}$$

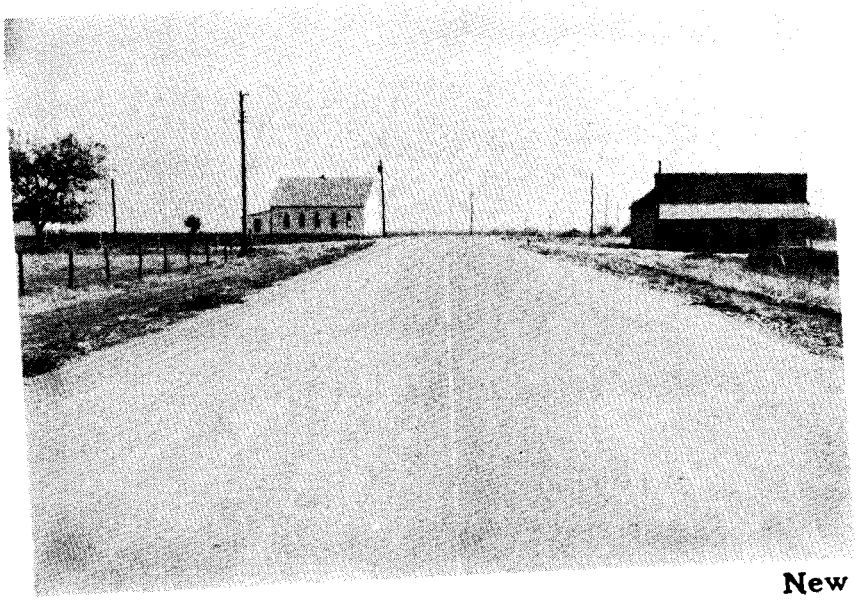
S = Sight distance in feet
L = Length of vertical curve in feet
A = Algebraic difference in grades in per cent divided by 100

Faced with the problem of proposed construction and later maintenance of an F. M. road on a narrow restricted right-of-way prompted the District personnel to investigate the possibilities of utilizing a minor relocation skirting the edge of the municipality shown in pictures on pages 60 and 61. The best that could be secured on the old alignment without moving part of a cotton gin and several houses was a non-symetrical width of right-of-way varying from 50 to 80 feet. On part of this section only 20 feet was available on one side of the proposed centerline. The existing road had deep ditches and a narrow roadbed. A generous right-of-way width would have been required merely to modernize the section. The District personnel worked with County Officials and being good salesmen as well as good Engineers came up with adequate right-of-way along the minor relocation. Traffic service to this little municipality was not impaired. The travel facility provided by this construction is something to be proud of and above all, it can be maintained.

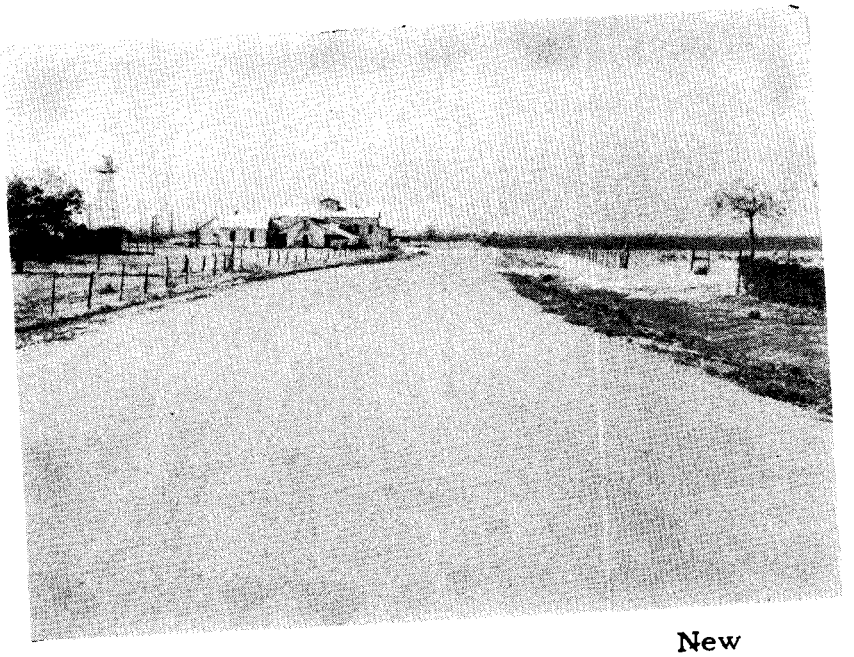
Old

Old

Old



New



New

Old to Right

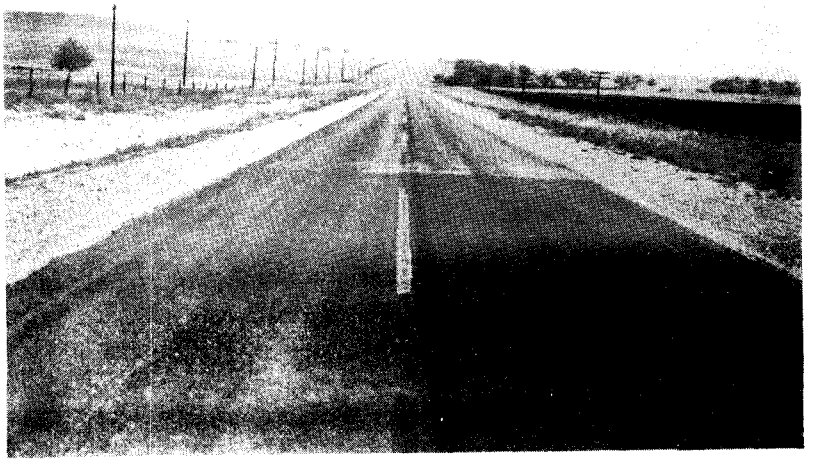
New to Left

18 ft. surface 20 ft. finished crown. 26 ft. subgrade crown on 60 ft. R/W through a small municipality. Note that surfacing, shoulders and side slopes use about all of the right-of-way.

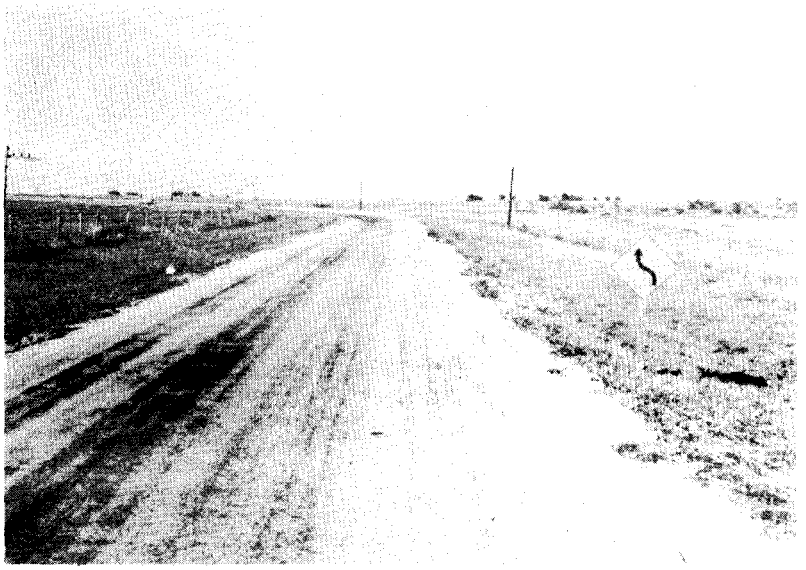
18 ft. surface local road on 33 ft. R.O.W. which leaves only 7.5 ft. on each side for shoulder, side slope, ditch and back slope. This one is not T.H.D. responsibility yet.

7 and 5 deg. curves well daylighted for sight distance. 100 ft. R.O.W., 18 ft. surface; 20 ft. finished crown, 26 ft. subgrade crown, usual 6:1 side slopes; "V" Type ditches - 24 ft. width structure in background used in place

100 ft. R.O.W., 18 ft. surface, 20 ft. finished crown, 26 ft. subgrade crown. Usual 6:1 side slopes "V" Type ditches



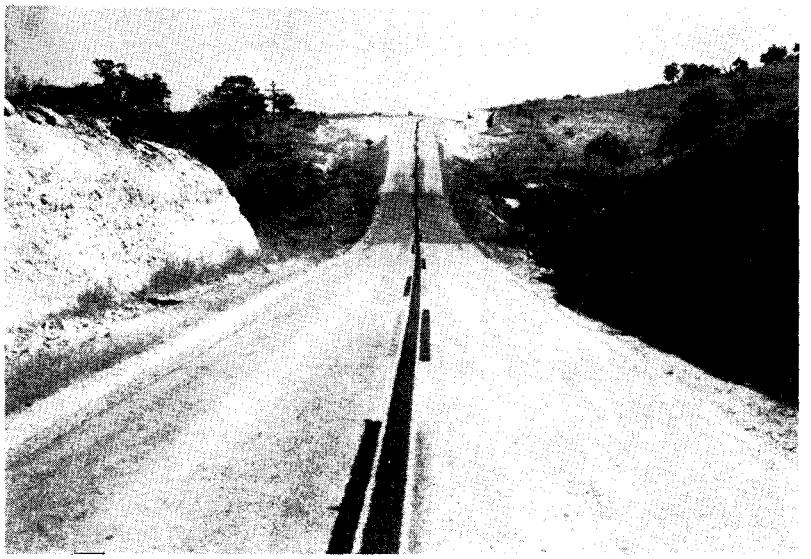
100 ft. R.O.W., 20 ft. surface 24 ft. crown - This F. M. road built before D-14.



10 deg. curve ahead.
20 ft. finished crown
26 ft. subgrade crown

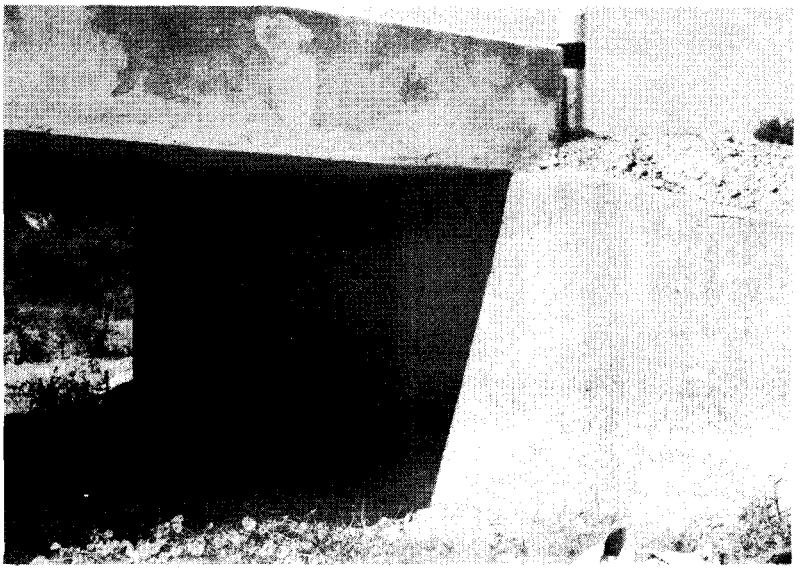
14 deg. curve ahead
20 ft. finished crown
26 ft. subgrade crown

12.3% grade ahead, 100 Ft. R.O.W.
16 ft. surface, 19 ft. finished crown,
24 ft. subgrade crown, 6:1 side slopes
(usual 2:1 on fills) "V" Type ditch
1/2 to 1 back slopes in rock
cuts - 1947 model

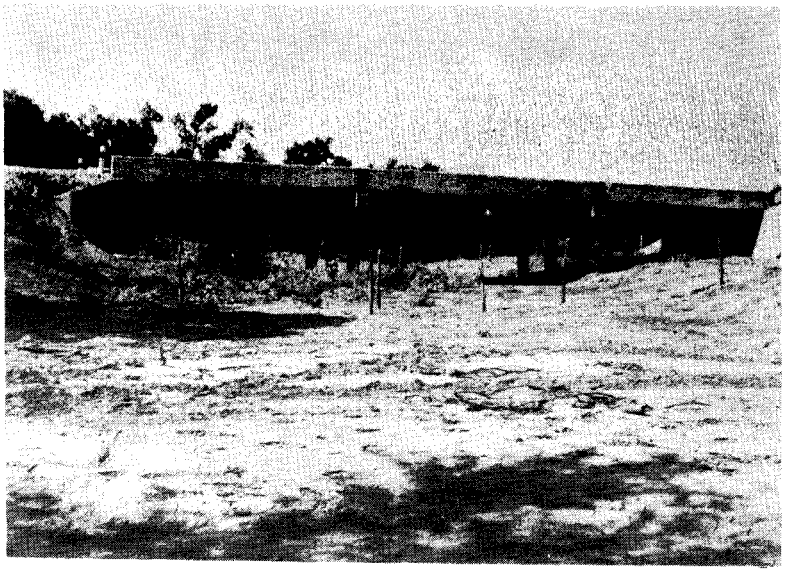


Low water crossing of major stream - 10-24 ft. x 38 ft. C.G.M. Pipes 26 ft. width Class "B" Concrete Riprap. Total length = 120 ft. Plans show H.W. Elev. to be 7.9 ft. above slab grade.

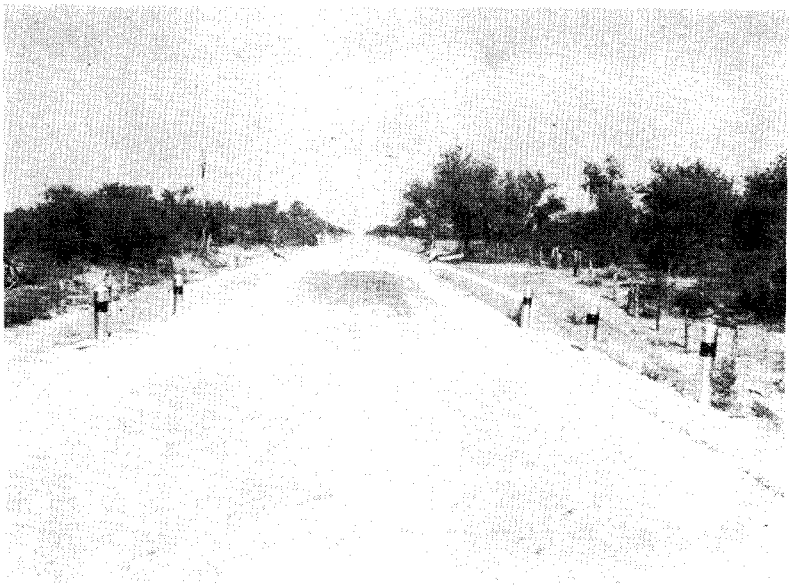
Overflow type structure. 3-5 ft. x 3 ft. x 26 ft. MBC-1 Mod. 45 deg. skew. 25 ft. Class "B" Concrete approach slabs. This structure is located in extremely sandy soil. This structure was recently subjected to overflow due to unusually heavy local rains.



Two existing abutments from obsolete bridge utilized to support new super structure. Abutments measured 80 ft. between outside faces requiring 2-25 ft. (FS-8-20-25) slab end spans and 1-30 ft. special design (FS-8-20-30) slab for middle span. Note two intermediate transition bents.



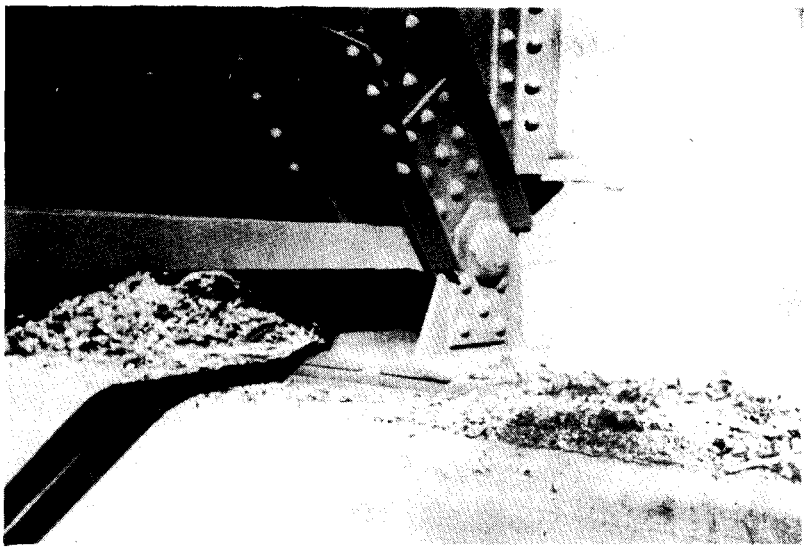
Standard 25 ft. (FS-8-20-25) end spans required modification in order for slab to bear on abutment wings. Note how curbs have been extended to rest on the angled section of the existing abutment wing.



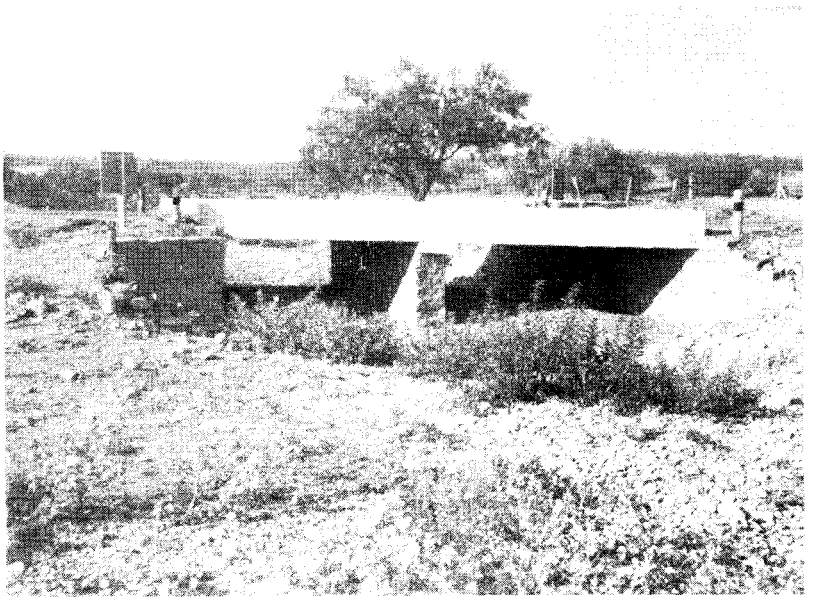
Roadway view shows completed 20 ft. width roadway structure with 18 in. high curbs.

This 150 ft. pin truss was dismantled, moved, erected and used on a Farm-to-Market road. Deck constructed of salvaged treated timber. The roadway width is 18 ft. Flex-Beam railing furnished by State and erected by Contractor.

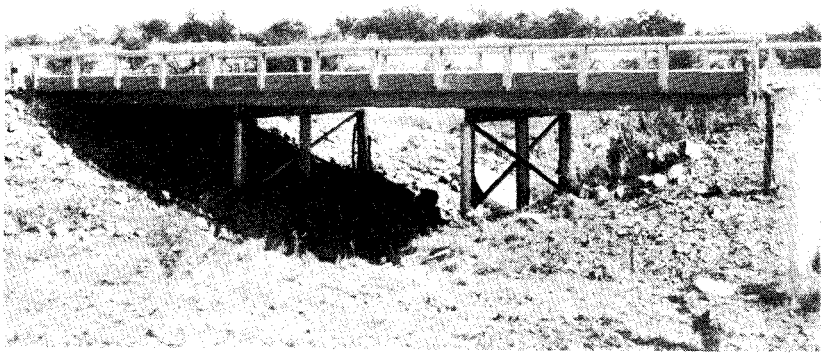
Construction of two special abutment bents was necessary. Bents consisted of a concrete cap and backwall on two 36 in. diameter drilled shafts. Set in hard shale without bell footings.

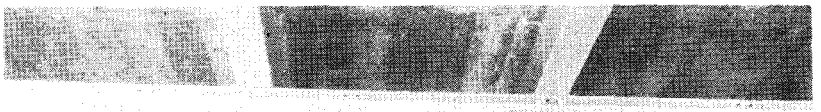


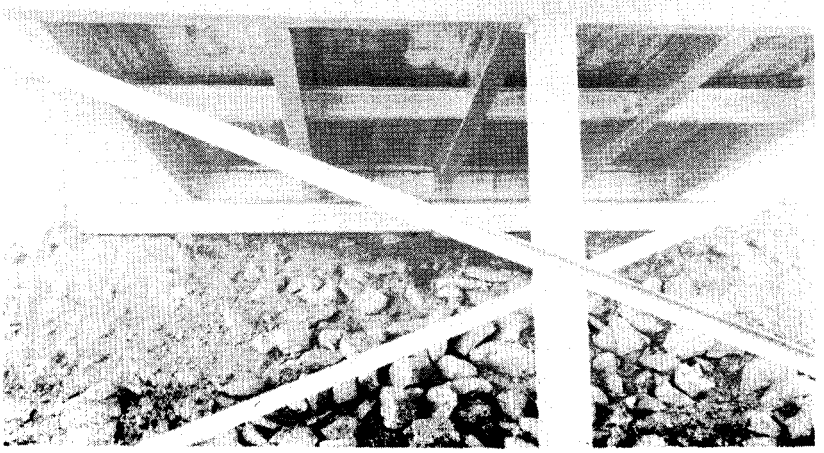
Close up of abutment showing bearing plates, bearing pin and shoe.

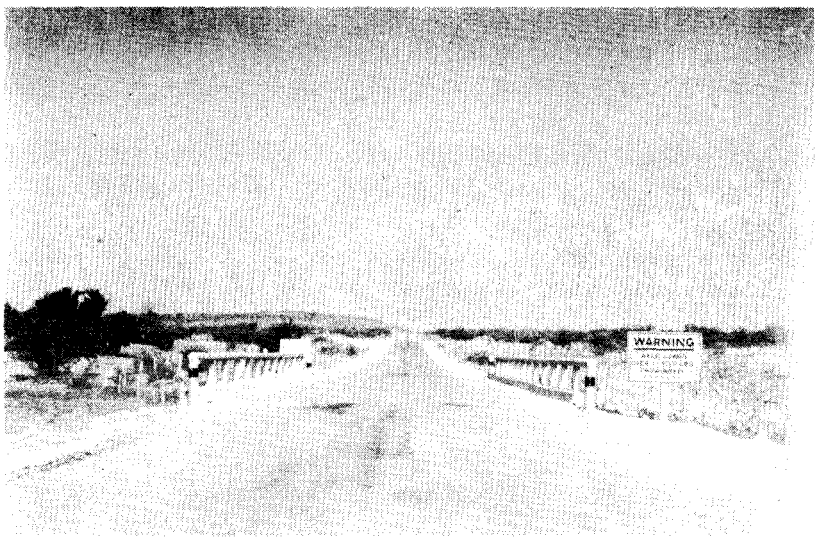


Two 16 ft. slab spans with 22 ft. roadway width designed for existing masonry abutments and bents on 31 deg. 45 min. right forward skew. Note concrete cap on center bent. 18 in. high curbs. Bridge designed for inventory rating of H-7. Posted for 10,000 pound axle load which is equivalent to about H-6.25.





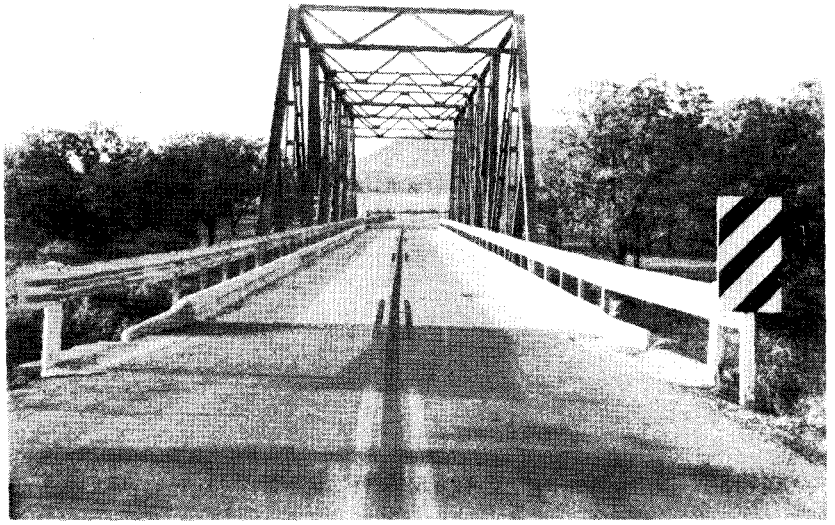




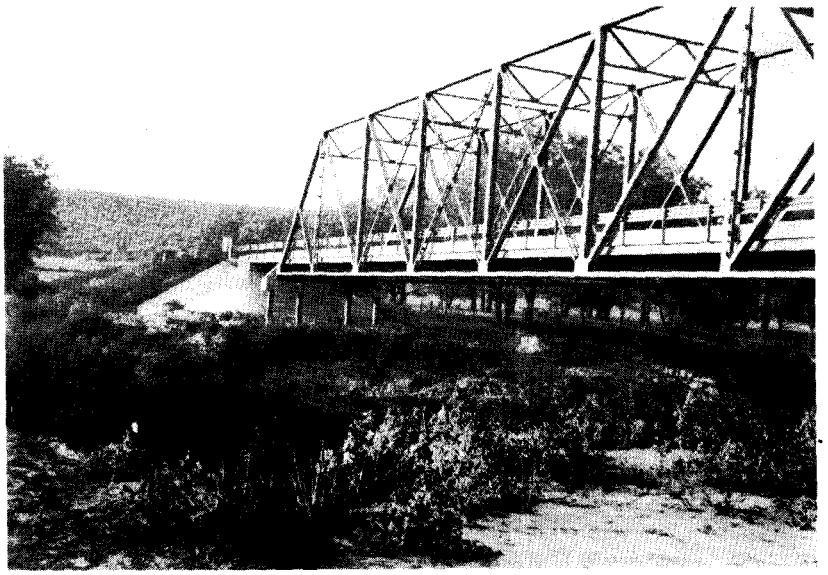
Original structure consisted of 3-20 ft. I-beam spans supporting 3 in. x 8 in. timber flooring.

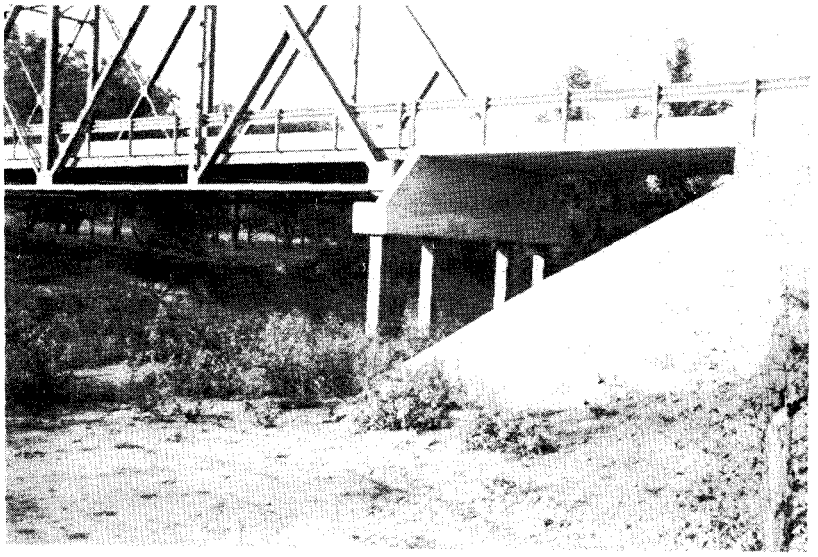
Each of the existing 4 bents 3-10 in. x 40# I-beam piling with 12 in. x 31.8# I-beam caps, were used "as is." The existing 8 in. x 18.4# I-beam stringers and timber floor were replaced by 15 in. x 42.9# I-beam stringers supporting a 6 in. concrete deck with 9 in. high curbs. Lateral bracing (diaframs) were 9 in. x 25# I-beams welded between stringers at center of each span. These braces were cut from the left railing of the old bridge. New railing consists of pipe on I-beam guard rail posts.

Roadway width of old bridge was 16 ft. New structure constructed with 22 ft. clear roadway. Design inventory rating of H-10. The bridge is posted for an axle load of 12,500# or a rating of about H-7.8.



150 ft. salvaged riveted truss span with 25 ft. concrete slab span approaches. 5 in. thick concrete deck, 12 in. high curbs. Flex-beam railing supported on angle iron guard rail posts.

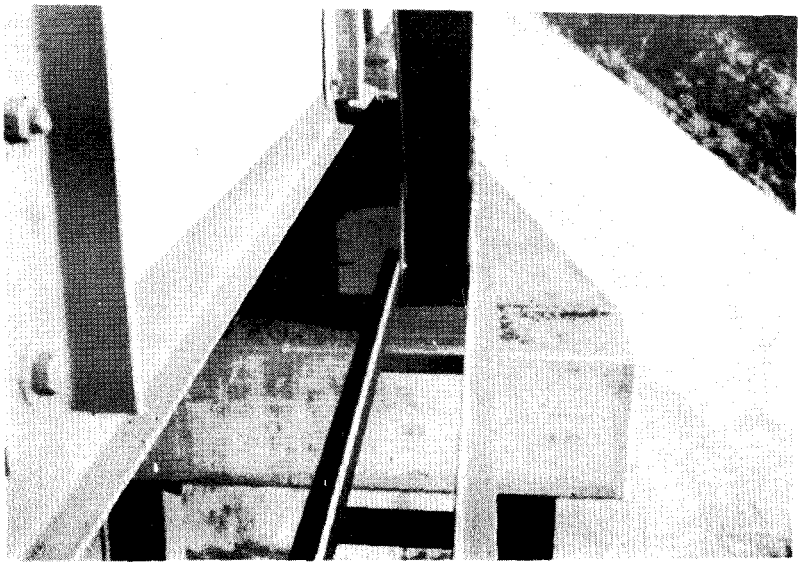




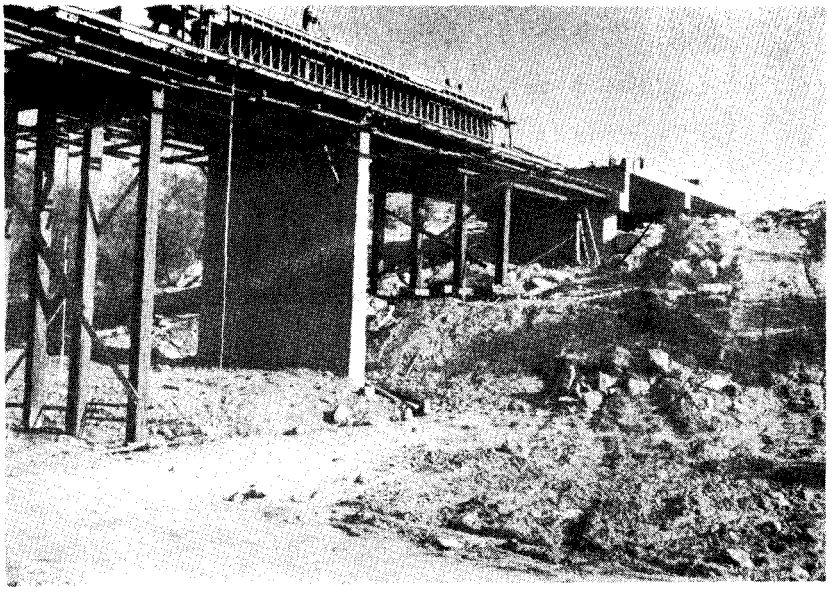
A standard 25 ft. slab span design with modifications was utilized for approach spans. Curb height was reduced to 12 in. and roadway width reduced to 17 ft. to align with concrete deck of truss.

Abutment bents for approach spans were standard FS-8 series design with wingwalls. Modification was made to handle the 17 ft. roadway design.

Transition bents between slab span and truss spans were special designs consisting of the concrete cap supported on 4-12 ft. x 53# steel piling as shown in the picture.

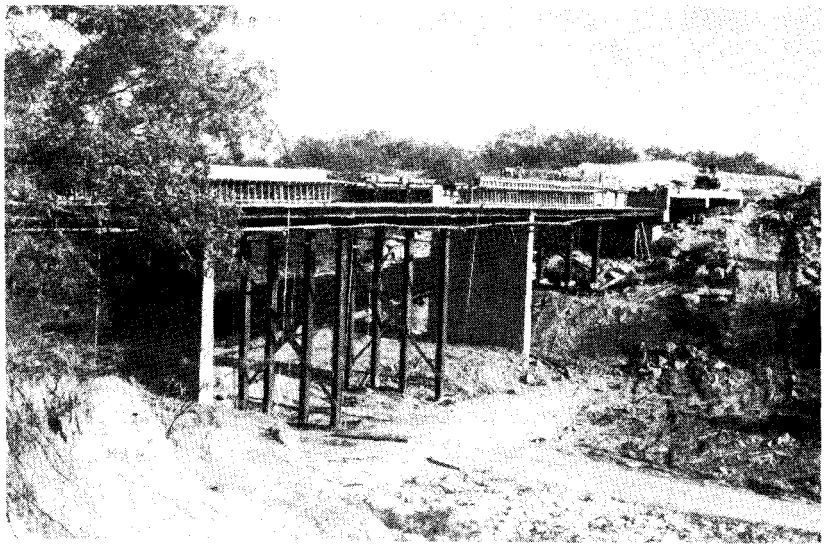


Close up shows the section of cap supporting the truss.

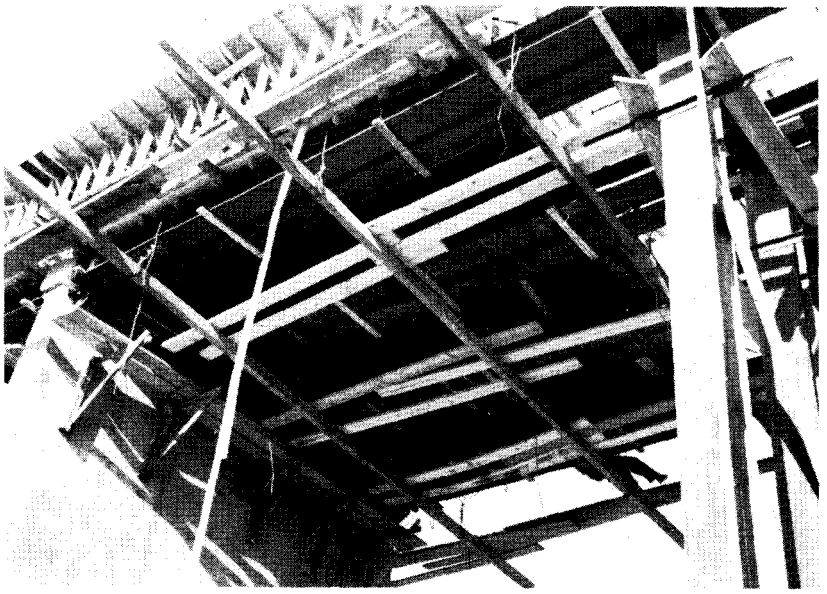


Construction underway on 300 ft. bridge where two piers of an old 200 ft. truss span were utilized. One of the existing piers can be seen (right background) with special cap to support the new super structure.

Existing piers are visible in picture at extreme right and extreme left (in trees.) The two intermediate piers are new construction required to complete the sub-structure to support the special design 198 ft. 4 in. concrete girder unit (59 ft. 2 in. -80 ft. -59 ft. 2 in.) Steel piling shown in picture are false work.



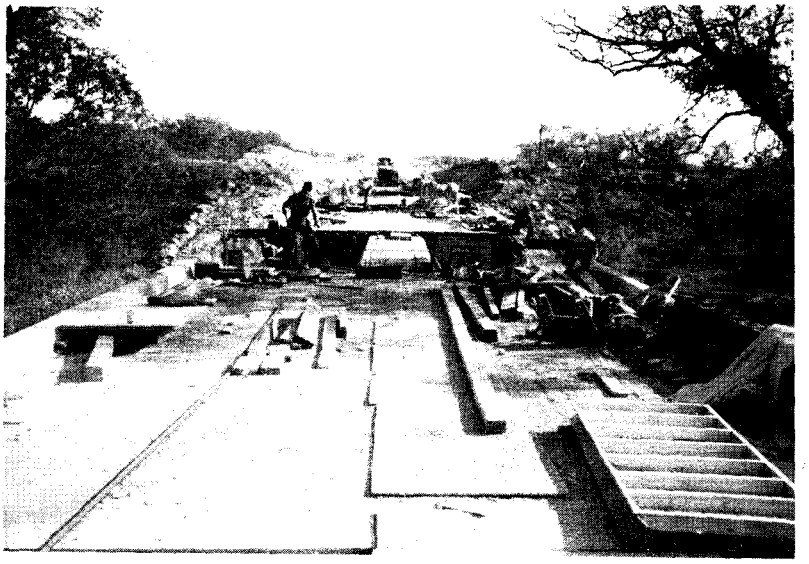
Forms have been removed from 2-25 ft. slab approach spans at far right.



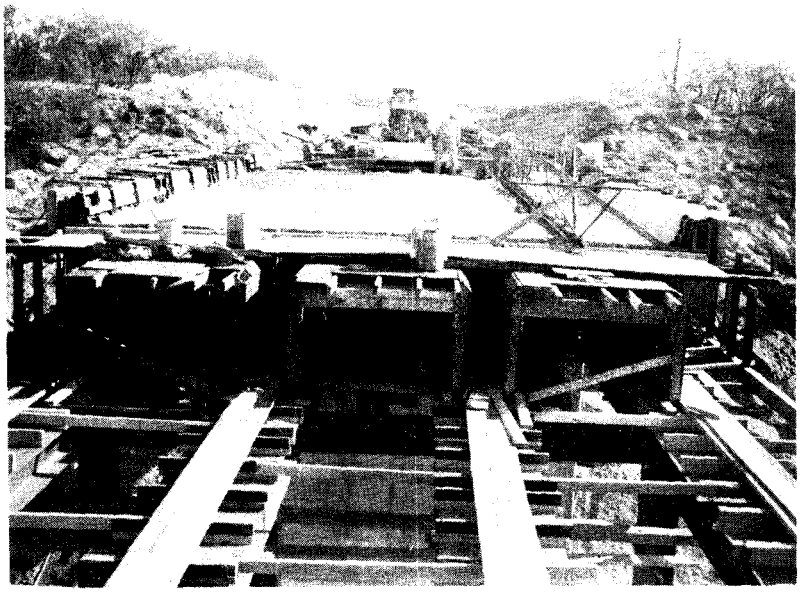
The two intermediate piers are 42 ft. high and were poured from the floor of the old bridge before it was removed. This was done by constructing the pier forms up to the old bridge floor, cutting an opening in the floor above the form, and utilizing the old bridge as a platform from which to pour the concrete thus eliminating the need for special equipment to accomplish these pours.

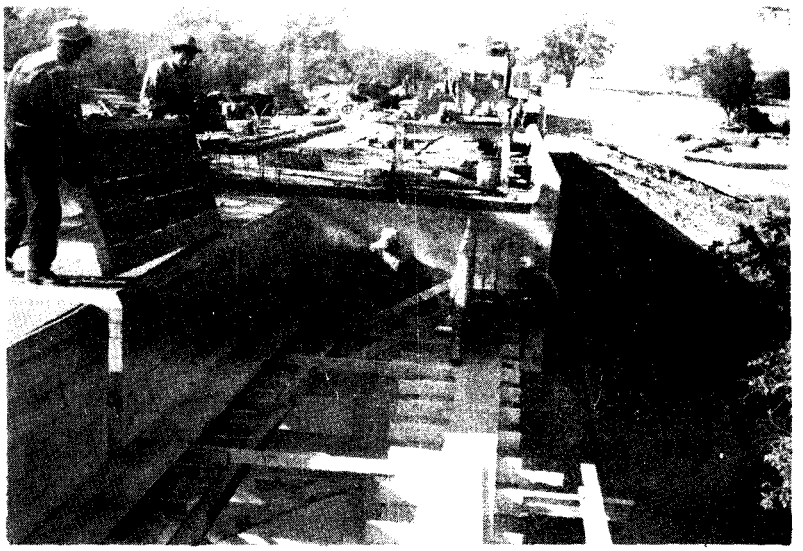
Salvaged I-beams from the old truss cut to lengths for guard rail posts to support proposed flex-beam railing.

Roadway will be 24 ft. in width. Loading is H-15. Curbs are 12 in. high. It is proposed to use flex-beam railing.



Form construction of the concrete girder section.





PREPARATION OF PLANS AND SPECIFICATIONS

GENERAL: The preparation of plans and specifications for any construction project, whether it be a primary highway or a land service road, is a problem to tax the ingenuity of any engineer charged with such responsibility. Simplification and standardization of plans and specifications in order to speed up the preparation of same has long been the desire of many engineers; however, the varying conditions and circumstances of each individual project limit the degree to which these two aims can be effected. Rather than try to conceive a scheme for effecting simplification and standardization on an individual project basis, it is thought that a review of the basic terms of plans and specifications for land service roads could be beneficial in both the formulation of new methods of simplification and standardization as well as the utilization of those presently employed. In this review it should be remembered that the methods of simplification suggested have the intention of making the plans and specifications easier to understand and that standardization is on an over-all basis rather than an individual project.

A set of plans from which a highway project is to be constructed can best be defined as an arrangement of parts in accordance to a fixed design. This can be further simplified to mean a definite method of procedure wherein it is stated or shown where the project is to be constructed and what is to be done. At this point it can be seen that simplification can be effected by including in the plans only that which has direct bearing on the construction of the project. Specifications in conjunction with plans particularize or name in detail how the proposed work is to be done. It can also be said that in some cases specifications outline when the desired construction may be performed. Certainly a properly correlated set of plans and specifications are conducive to the construction of a good project.

Under the Department's policy for the construction of proposed highway projects, there is open to the engineer two methods for obtaining the desired results. These methods are the enactment of a contract between the Highway Department and a responsible contractor on the basis of a low bid submitted and the performance of the desired construction by state maintenance forces on a day labor basis. Both methods of construction produce satisfactory results; however, there is a definite time and place where each should be used. As the type of plans and specifications to be prepared are dependent on the method of construction employed, it is nec-

essary that this be given first consideration. The prime factor for consideration in determining the method of construction to be employed is economy, with the factors of (1) location of project, (2) magnitude of work, and (3) type of work having a direct bearing thereon. It can be readily seen that for a project of any size the forementioned factors would definitely determine it as contract work. Smaller projects where it is impossible to affect a combination with other small projects are cases which would require careful consideration. Construction by contract methods require the preparation of a properly correlated set of plans and specifications in order to definitely outline what the contractor will be expected to do and also assure that the State will receive a properly constructed project. Where construction is to be performed by State Forces, it is only necessary in the initial stage to submit design data forms and project estimates as outlined by Administrative Order No. 34-52.

Every project presents various problems as to what should be shown on the plans as well as how it should be shown. To formulate a set of rules that would cover the various problems would be next to impossible, and if such a set of rules were devised certainly the individual engineer's ingenuity at solving these problems would be defeated. Rather than try to devise a detailed set of rules, it is believed that much can be accomplished by a review of the over-all requirements of each integral part of a set of plans with the view of affecting simplification and standardization.

TITLE SHEET: The purpose of the title sheet is primarily to locate and define the proposed construction as to project, control, highway number, county, type of work and length. Also shown on this sheet are detours, equations and exceptions, index of sheets and railroad delivery points. This information is for the most part uniform on all plans and further simplification or standardization does not appear necessary. The amount of detail required on the project location sketch probably varies more than any one thing on the title sheet. Only that detail required to locate the proposed project and establish a tie-in with the State or Federal system should be shown.

TYPICAL SECTION SHEET: This sheet is utilized to show sketches of various proposed sections with related dimensions and general notes. Dependent on the types of work proposed, typical sections may be shown for the existing road, road grader work, machine grading, cut, fill, side hill, municipal, overflow and completed roadway. On various projects it will be necessary for a number of these typical sections to be shown; however, every effort should be made to keep the number to a minimum either by superimposing or by the use of half sections.

SUMMARY SHEETS: These sheets summarize the proposed work in compact form for the purpose of easy reference and review. Summaries usually appearing on these sheets include the following: culverts, bridges, structures to be removed, and last but not least, the estimate summary. A grading summary is offtimes shown; however, as this summary is a more direct duplication of information shown on the plan-profile sheets, it appears that this summary could be omitted.

DESIGN DATA SHEET: This sheet is included in the plans for the purpose of showing such design information as is of interest to the contractor. Included on this sheet are the basis of estimate, gradation requirements for foundation course material, application rates for asphalt surfacing and such general notes as might be required.

PLAN PROFILE SHEET: Probably the most important sheets of a set of plans are the plan-profile sheets. While they alone are not sufficient for the construction of a project, the information shown thereon, such as alignment, grades and structure locations, is of prime importance. On these sheets, the plan of the proposed project should show existing improvements such as houses and county roads, proposed alignment, horizontal curve data and right-of-way lines, channel easements with typical sections of proposed channel excavation and existing structures, while the profile should show the existing ground line, proposed grade line and new structures. Various horizontal and vertical scales have been used in presenting the information shown on the plan-profile sheets; however, it is recommended that a scale of 1 in.=100 ft. horizontal and 1 in.=10 ft. vertical be used on small size farm to market plans. A scale of 1 in.=200 ft. horizontal and 1 in.=20 ft. vertical may be used if desired and where convenient to do so. On sections through small towns and cities where a great deal of detail is encountered, it is permissible to use a larger scale in order to clearly define the existing conditions.

BRIDGE LAYOUT SHEETS: Layout sheets should be prepared for all structures of bridge length which are to be constructed or repaired except multiple box culverts where there is no particular construction problem involved. Layout sheets of existing bridges on which no work is to be performed are not required provided bridge survey forms have been submitted and a load rating for the structure obtained. Other pertinent information which should be shown on the bridge layout sheet would include high water marks (observed or calculated), test boring data and penetrometer results.

Other sheets are often included in the plans which, although presenting valuable design information, are of no value or interest to the contractor. The information compiled on these sheets could very well be done in pencil on work sheets providing that the work sheets are submitted for review as supporting papers to the completed P. S. and E. Prominent among the design information sheets incorporated in plans are the following:

DRAINAGE AREA AND HYDRAULIC DATA SHEETS: These sheets are invaluable in designing the structures required for drainage. Once the desired structure has been determined this information usually has little or no bearing on how the structures are constructed and could be omitted from the plans.

CULVERT CROSS SECTION SHEETS: Except in special cases such as "broken back" culverts, drop inlet type culverts and special skew designs, these sheets are usually of little interest to the contractor. Work sheets prepared during preliminary plan work might be sufficient for the engineer's use during construction; however, U. S. and D. S. flow line elevations should be shown on the plan-profile sheets for the contractor's information. In those special cases where it is necessary to show a culvert cross section, it is suggested that they be shown by the use of a small scale sketch on the respective plan-profile sheets.

HAUL DIAGRAMS: Although haul diagrams might be required in the design of a project, the numerous calculations so laboriously inked on haul diagram sheets could easily be omitted. With the exception of those cases where a special condition exists, these diagrams could be replaced by a short tabular summary on one of the summary sheets showing pit designation and location, station limits of haul, quantity of base material, average haul and additional haul.

MASS CURVES: Mass curves for the determination of overhaul quantities are usually shown in pencil on the plan-profile sheets. As the drawing of these curves are necessary, it appears that this method is probably the best; however, these curves should not be inked. Separate sheets showing this information should not be included in the plans as the effective value of the mass diagram is lost when separated from the plan-profile sheet.

As previously stated the many varying circumstances of each individual project greatly curtails the degree to which simplification and standardization can be effected. The presentation of essential information in a clear and concise form is perhaps the best over-all method for accomplishing these two aims. In order for a set of plans to be clear and concise, only

that information having a direct bearing on the actual construction of the project should be shown. That is, a differentiation should be made between design information and construction information. Also where special conditions require, a note on the plans should be used to definitely outline what is to be done. Careful consideration should be given to the wording of such notes in order to eliminate excessive and ofttimes misleading information. There cannot be too much emphasis placed on the necessity for repeated analyzing of the plans for a proposed project, both prior to and during the actual preparation, in order to obtain the greatest degree of clearness and conciseness possible.

Contrary to the popular procedure, the standard specifications should be considered as one of the conditions of the project, and the plans drawn accordingly. Too many engineers overlook this important step and after completion of the plans find that numerous special provisions, special specifications and subsidiary items are necessary in order to make the specifications fit the plans. If a careful study was made of the specifications that might be used on a project prior to drawing of the plans, the problem of correlating the plans and specifications would be greatly reduced.

Since the advent of the "Green Book" specifications, the standardization and simplification of specifications used in conjunction with the plans has been a relatively simple problem. Prior to this time, our standard specifications were hopelessly outdated and numerous special provisions or special specifications were necessary to adequately cover even the simplest items of construction. Modernization in conjunction with flexibility, as exemplified in the new "Green Book" specifications, has greatly increased the desirability of using these standard specifications wherever possible. In addition it cannot be overlooked that a definite advantage is gained by the use of standard specifications in that the contractor is familiar with how the work is to be performed and as a result thereof, is able to present a more realistic price in bidding on the various items.

Regardless of how modern or flexible a set of standard specifications might be, there is always the special case where it is necessary to utilize a special provision to a standard specification or perhaps a complete special specification in order to cover the construction proposed. In these instances the possibility of using more than one standard specification should be investigated before resorting to the use of a special provision or special specification. Where possible rather than using a special provision or specification, it is considered acceptable practice to modify the basic spread of a standard specification by a note on the plans so long as

the "elastic limit" of the specification is not reached. This will allow the standard specification to maintain a reasonable facsimile of its original proportions for uniform bidding and interpretation. Certainly the fewer special provisions and specifications on a project, the fewer conditions the contractor will have to add into his bid.

Simplification and standardization of plans and specifications, as outlined in the foregoing discussion has many beneficial results. The elimination of excess information from the plans will have a direct result in the saving of man hours expended in the preparation of such information. With the shortage of engineering personnel that we now experience, these man hours could be put to good use. In addition, the elimination of this excess information from the plans will present a clear cut picture of what the contractor will be expected to do and thereby reduce the chances of disagreement between the contractor and the engineer. Proper use of standard specifications will eliminate the laborious task of the preparation of special provisions and specifications with the additional benefit that as the contractor is familiar with the standard specifications, he will be able to submit a better bid.

STANDARD SPECIFICATIONS: We want to include here just a few brief remarks about the use of some of the new green book standard specifications.

ITEM 108 - ROAD GRADER WORK: Attention is directed to the following wording under Paragraph 108.1 "Description". "This item shall consist of the construction of a roadway in conformity with the typical cross sections shown on the plans when the topography is such that it will not be necessary to control the finished grade line for purposes other than to obtain a uniform riding surface and to provide the desirable earth cover over culverts." "The work performed under this item shall not include work specified for payment under other specification items pertaining to the project."

For the engineer, Item 108 is of course a time and labor saving item. Care must be exercised however not to misuse this item. Misuse may result in uneconomical construction costs. Show only the existing ground line or profile on the plan-profile sheet for Road Grader Work. Do not show a proposed grade line except for short sections where it is proposed to supplement Road Grader Work with "Scraper Work" and/or "Bulldozer Work." These latter items may be used in conjunction with Road Grader Work where necessary to do work above that normally required for the Road Grader Work item.

ITEM 115 - MACHINE GRADING: "This item shall consist of the construction of a roadway in conformity with the line, continuous grade and typical cross-sections shown on the plans." "Machine grading shall include all necessary scarifying, plowing, moving and shaping of the earth to bring the roadbed, slopes and ditches to the grade line established on the plans and conforming to the typical cross-section shown on the plans."

For the engineer this is also a time and labor saving item. It is a complete grading item and includes all work necessary to construct the roadway to the grade elevation and typical section shown on plans. This item cannot be supplemented by Scraper Work and/or Bulldozer Work. A profile and proposed grade line must be shown on plan-profile sheet for this item. The use of this item should be limited to light and reasonably uniform grading work.

ITEM 218 - FOUNDATION COURSE: This item differs from Flexible Base specifications mainly with respect to material requirements. The flexibility permitted by this specification allows the engineer to use various types of material either processed or unprocessed. The control of material is indicated on plans, thus eliminating the need for a different specification or special provision for each project.

SURFACE TREATMENTS: Attention is directed to Items 304, 305, and 306. These specifications allow the engineer a wide selection of asphalts and aggregates without resorting to the use of special specifications or special provisions. Before these specifications were developed it was not unusual to find as many as three special provisions to the governing surfacing items for each project. We would like to point out here the time saved and confusion to contractor as well as to engineers that is avoided by using these new standard surface treatment specifications.

As there is no iron clad rule that can be used in the preparation of plans and specifications, it is urged that every engineer strive to obtain a clear and concise set of plans together with properly correlated standard specifications for every project.

The following pages exhibit plan sheets for two fictitious projects. These sheets have been compiled with the view of presenting a visual picture of some of the problems encountered in the preparation of plans. While by no means covering the many problems that arise, it is hoped that these sheets might be of value in standardizing and simplifying the information shown.

FED. RD. DIV. NO.	STATE	FEDERAL PROJECT NO.			SHEET NO.
6	TEXAS	S 3061(1) & R 1729-1-1			1
STATE DIST. NO.	COUNTY	CONT.	SECT.	JOB	HIGHWAY NO.
26	Esterbrook	1536	2	1	FM 4410
		1729	1	1	FM 4411

INDEX OF SHEETS

TEXAS HIGHWAY DEPARTMENT

ESTERBROOK COUNTY

F.M. HIGHWAY NO. 4410 & 4411

FM 4410 – FROM US 182, 4 MILES NORTH OF KEUFFEL TO END PRESENT FM 4410
FM 4411 – FROM US 92, 2.5 MILES EAST OF KEUFFEL TO FM 132

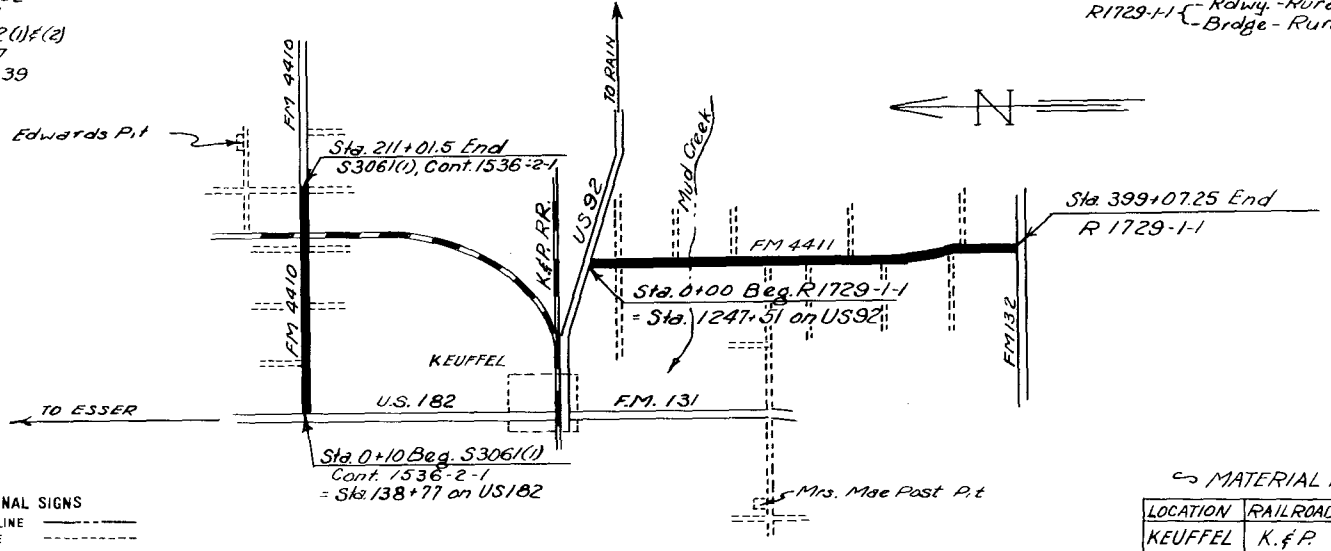
FEDERAL AID & STATE PROJECT NO. S 3061(1) & R 1729-1-1

PLANS OF PROPOSED

GRADING, STRUCTURES, BASE AND SURFACING

NET LENGTH 60,990.75 FT. = 11.550 MILES

S 3061(1) - Rdwy. - Rural = 21,083.5 Ft. = 3.993 Mi.
R 1729-1-1 - Rdwy. - Rural = 39,882.25 Ft. = 7.553 Mi.
R 1729-1-1 - Bridge - Rural = 25.0 Ft. = 0.004 Mi.



CONVENTIONAL SIGNS

STATE OR NATIONAL LINE
CITY OR VILLAGE LINE
COUNTY LINE
BASE OR SURVEY LINE
RIGHT OF WAY LINE
RIGHT OF WAY MARKERS
FENCE LINE
RAILROAD
TRAVELLED WAY
CULVERT OR BRIDGE
POWER LINE
TELEGRAPH OR TELEPHONE

FEDERAL PROJECT MARKERS OF APPROVED DESIGN WILL BE ERECTED AT EACH END OF PROJECT PRIOR TO COMPLETION

SPECIFICATIONS ADOPTED BY THE STATE HIGHWAY DEPARTMENT OF TEXAS JAN. 2, 1951 AND APPROVED BY THE BUREAU OF PUBLIC ROADS JULY 25, 1951 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT.
REQUIRED CONTRACT PROVISIONS FOR FEDERAL AID PROJECTS APPROVED AUGUST 5, 1948.

NO EQUATIONS
ONE EXCEPTION:
S 3061(1) – RR. X-ING:
Sta. 174+16 to Sta. 174+24 = -8.0 Ft.

SCALE: 0 1 Mi. 2 Mi.

MATERIAL DELIVERY POINTS

LOCATION	RAILROAD	DIST. TO PROJECT	CAPACITY
KEUFFEL	K. & P.	4.5 MI. TO 0+10 - FM 4410 2.5 MI. TO 0+00 - FM 4411	AMPLE

TEXAS HIGHWAY DEPARTMENT

CORRECT: _____

RESIDENT ENGINEER

RECOMMENDED FOR APPROVAL:

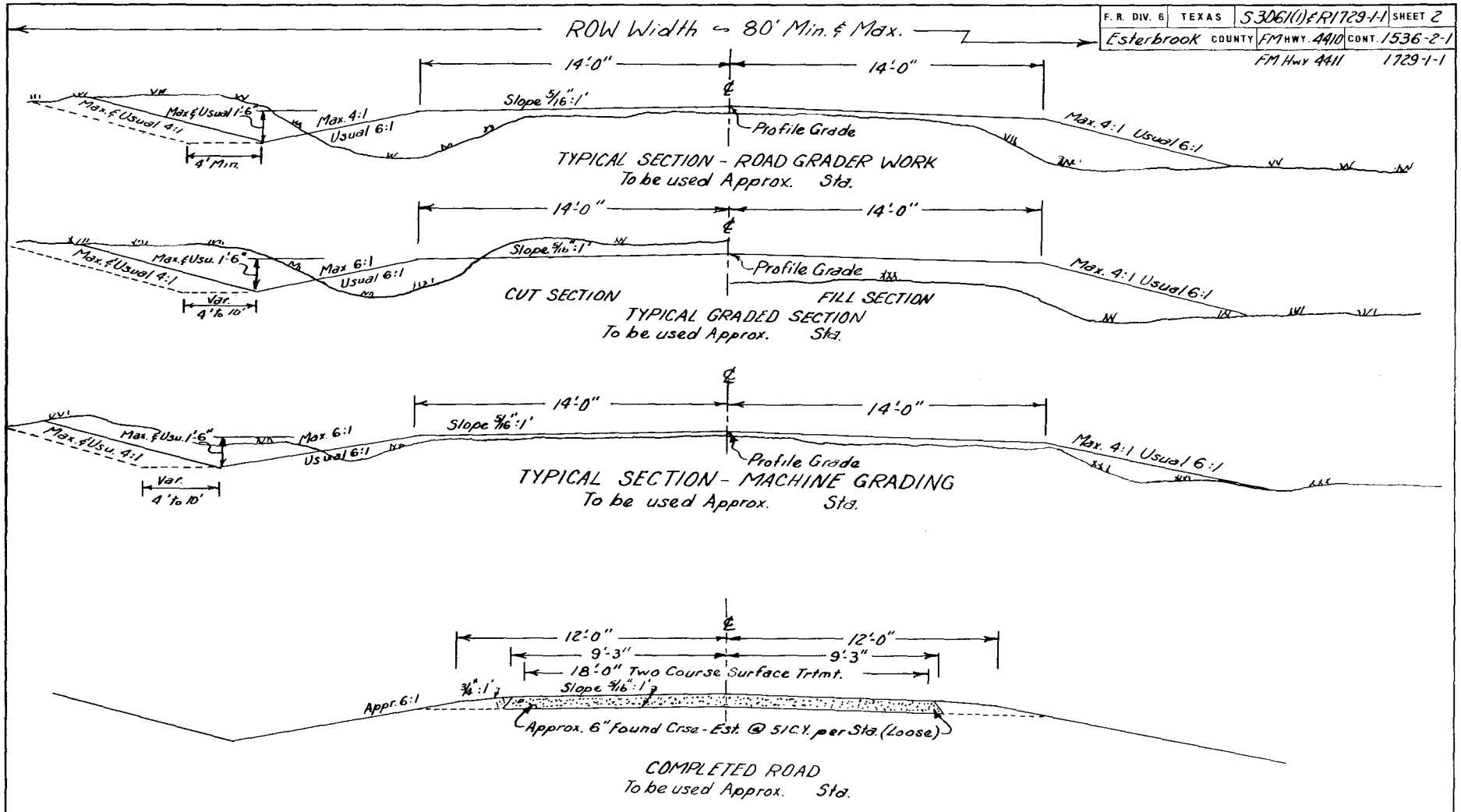
DISTRICT ENGINEER

RECOMMENDED FOR APPROVAL: [redacted]
ENGINEER LAND SERVICE ROADS

APPROVED: [redacted]
CHIEF ENGINEER OF PLANNING

RECOMMENDED FOR APPROVAL: [redacted]
DISTRICT ENGINEER
BUREAU OF PUBLIC ROADS
DEPARTMENT OF COMMERCE

APPROVED: [redacted]
DIVISION ENGINEER
BUREAU OF PUBLIC ROADS
DEPARTMENT OF COMMERCE



TYPICAL SECTIONS

SPECIFICATION DATA

Item 218 Foundation Course (Pit Run)*

Grading requirements:	
Retained on 4" screen	____ %
Retained on 3 1/2" screen	____ %
Retained on 3" screen	0 %
Retained on 2 1/2" screen	____ %
Retained on 2" screen	0 to 5 %
Retained on 1 1/2" screen	____ %
Retained on 1" screen	____ %
Retained on 3/4" screen	____ %
Retained on 1/2" screen	____ %
Retained on 1/4" screen	____ %
Retained on 40 mesh sieve	50-85 %

The material passing the 40 mesh sieve shall be known as "Soil Binder" and shall meet the following requirements:

The liquid limit shall not exceed 45
The plasticity index shall not exceed 15
The linear shrinkage shall not exceed 8.5
(Note: The linear shrinkage shall be calculated from the volumetric shrinkage at the liquid limit.)

* Oversize stone or gravel may be broken to proper size and uniformly mixed with the remaining material or may be wasted provided the wasted material is disposed of in a manner satisfactory to the Engineer.

SPECIFICATION DATA

TWO Course Surface Treatment

Item	Application		
	First	Second	Third
Asphalt, Type	OA-230	OA-230	
Asphalt, Rate (gal/sy)	0.30	0.30	
Aggregate, Type	A	A	
Aggregate, Grade	5	10	
Aggregate, Rate (cy/sy)	1:100	1:160	
Rolling 203 (Hrs/Mi)	3		
Rolling 203B (Hrs/Mi)		4	

Surface Treatment Area 124,571 Sq. Yds.
S 3061(1) 43,293 Sq. Yds.
R 1729-1-1 81,278 Sq. Yds.

SPECIFICATION DATA

Mineral Aggregate For Soil Asphalt or Soil Cement Base

The liquid limit shall not exceed ____
The plasticity index shall be:
Not less than ____ nor more than ____
The linear shrinkage shall not exceed ____
(Note: The linear shrinkage shall be calculated from the volumetric shrinkage at the liquid limit.)

All curves shall be superelevated and widened in accordance with SWC-39, Table 2.

All obstructions within limits of right of way to be removed by the County unless otherwise noted

In those instances where fixed features require the governing slopes indicated herein may be varied from between the limits and to the extent determined by the engineer

Concrete structures shall receive a Type 3 Finish.

BASIS OF ESTIMATE

ITEM	DESCRIPTION	RATE	ESTIMATED QUANTITIES	
			S 3061(1)	R1729-1-1
202	Sprink.-Rd. Gr. Wk & Mch. Grd.	1000 Gals/Sta.	211	269
202	Sprinkling - Emb.	20 Gals/C.Y.		269
202	Sprinkling - Base	100 Gals/C.Y.	1,187	2,225
203	Rolling - Base	1 Hr./150 C.Y.	79	148
203B	Rolling - Base	1 Hr./75 C.Y.	159	297
203B	Rolling-Rd.Gr. Wk & Mch. Gr.	0.25 Hr./Sta.	53	67
203B	Rolling - Emb.	1 Hr./150 C.Y.		90
203B	Rolling - Surf.	3 Hrs./Mi.	12	23
203	Rolling - Surf.	4 Hrs./Mi.	16	30

GENERAL NOTES
AND
SPECIFICATION DATA

F. R. DIV. 6	TEXAS	S3061(1) & R1729-1-1	SHEET 4
Esterbrook COUNTY	FM HWY. 4410	CONT. 1536-2-1	

FM Hwy 4411 1729-1-1

SUMMARY OF CULVERTS

SHEET NO.	STATION	DESIGN	DESCRIPTION	UNCL. STR. EXC.-CLV. C.Y.	CL. "A" CONC. C.Y.	REINF. STEEL LBS.	STD. REINF. CONC. PIPE 24"	30"	36"
		S 3061(1) ⤳ FM4410							
8	37+03	CH7-B	1-24"x36' S.R.C. Pipe	16	1.52	68	36'		
		TOTAL - S 3061(1)		16	1.52	68	36'		
		R 1729-1-1 ⤳ FM4411							
30	131+81	CH7-B	1-30"x 36' S.R.C. Pipe	12	2.10	86		36'	
33	185+00	CH7-B	1-36"x 36' S.R.C. Pipe	10	2.78	110			36'
38	256+00	MCS-1 & MCW-F1	2-5'x4'x28' M.B.C.	21	24.44	3,174			
		TOTAL - R 1729-1-1		43	29.32	3,370		36'	36'

SUMMARY OF BRIDGES ⤳ R1729-1-1 ⤳ FM4411

Sheet No. P.P	Sheet No. Layout	Perm. Str. No.	Stream Name	Limits Sta. to Sta.	Length	Description	Design	Uncl. Str. Exc. C.Y.	Class "A" Concrete Slabs Cu. Yd.	Class "A" Concrete Abts. & Bents Cu. Yd.	Reinf. Steel Lbs.	Precast Conc. Piling - 14" Sq. Lin. Ft.
28	48	2	Mud Creek	107+72.5 - 107+97.5	25.0'	1-25' Conc. Slab	FS-8-20-25	30	20.5	13.54	6,496	132
							& H=8' BW & W.W.					

HAUL DIAGRAM

Designation	Location	Sta. Limits of Haul	Quantity of Matl.	Avg. Haul	Add'l. Haul	Stripping
S 3061(1) ⤳ FM 4410						
C.O. Edwards P, t	7,920' D.H. to Sta. 211+01.5	Sta. 0+10 - Sta. 211+01.5	11,868 C.Y.	12.45 Qtrs.	147,757 C.Y.	0 C.Y.
R 1729-1-1 ⤳ FM 4411						
Mrs. Mae Post P, t	22,070' D.H. to Sta. 168+45	Sta. 0+00 - Sta. 168+45	9,373 C.Y.	22.62 Qtrs.	212,017 C.Y.	5000 C.Y.
		Sta. 168+45 - Sta. 399+07.25	12,877 C.Y.	24.93 Qtrs.	321,024 C.Y.	
TOTAL ⤳ R 1729-1-1			22,250 C.Y.		533,041 C.Y.	5,000 C.Y.

STRUCTURES TO BE REMOVED

Station	Description
	S 3061(1) ⤳ FM4410
37+03	1-24"x 24' C.G.M. Pipe
57+00 Rt.	1-18"x 16' C.G.M. Pipe
	R 1729-1-1 ⤳ FM4411
131+81	1-18"x 27' C.G.M. Pipe
171+19 Lt.	1-10'x 20' Wood Bridge
185+05	1-18"x 26' C.G.M. Pipe

HAUL DIAGRAM & STRUCTURE SUMMARY

F. R. DIV. 6	TEXAS	S3061(1) & R1729-1-1	SHEET 5
Esterbrook	COUNTY	FM HWY. 4410	CONT 1536-2-1

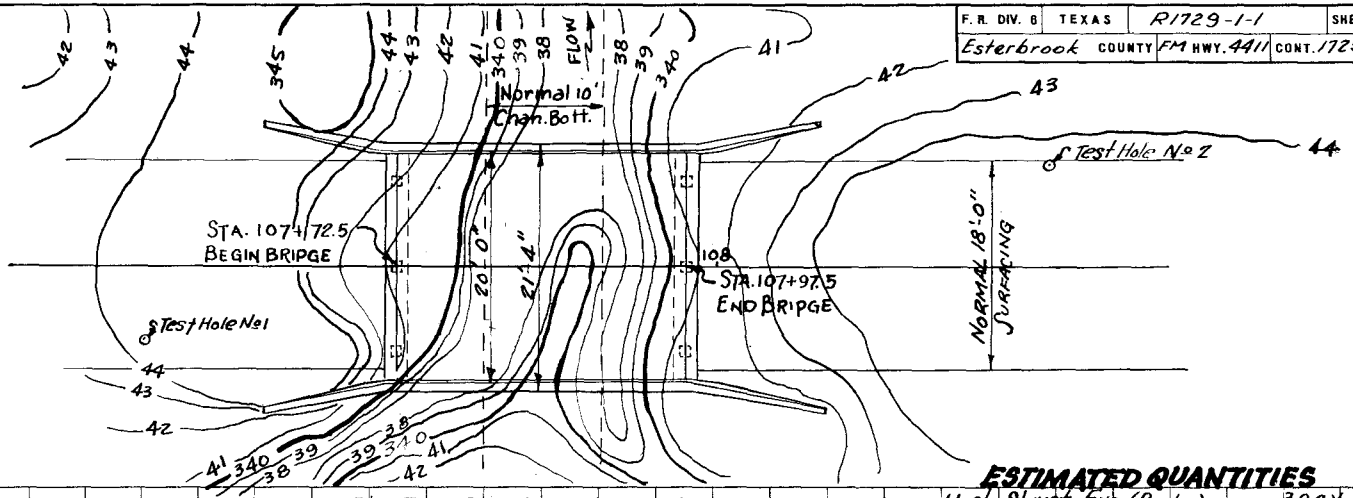
FM Hwy 4411 1729-1-1

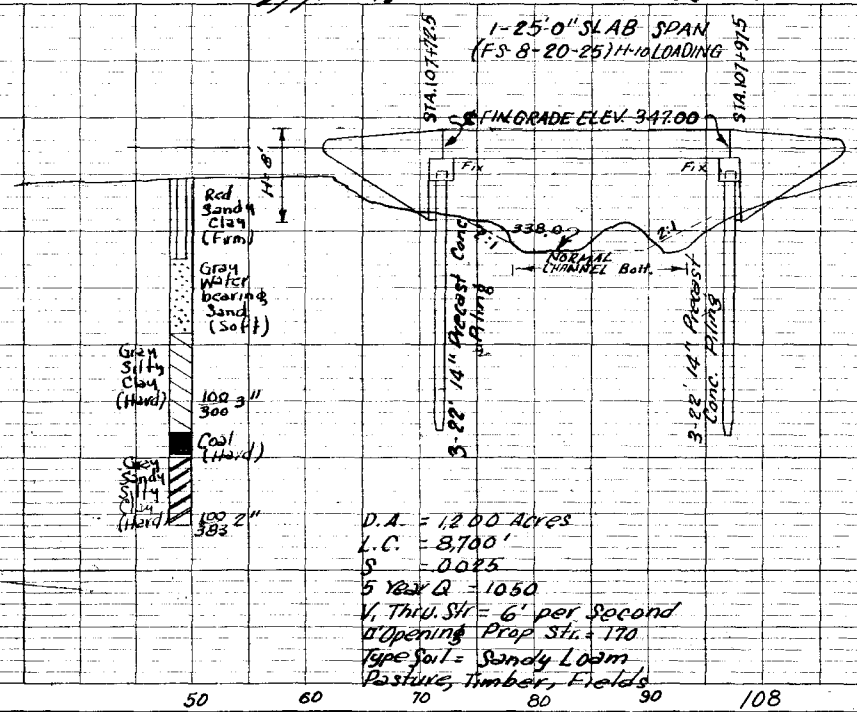
QUANTITY SUMMARY

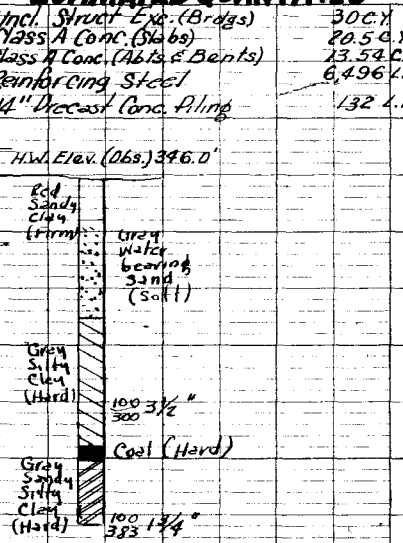
ITEM NO.	DESCRIPTION	QUANTITIES								Unit
		S3061(1) Roadway		R1729-1-1 Roadway		R1729-1-1 Bridges		TOTALS		
		Est.	Final	Est.	Final	Est.	Final	Est.	Final	
100	Clearing & Grubbing			0.25				0.25		Ac.
101	Common Road Excavation			11,948				11,948		C.Y.
103	Common Channel Excavation			1,513				1,513		C.Y.
104	Uncl. Struct. Excava. (Bridges)					30		30		C.Y.
104	Uncl. Struct. Excava. (Culverts)	16		43				59		C.Y.
108	Road Grader Work	96		63				159		Sta.
109	Stripping			5,000				5,000		C.Y.
110	Overhaul			3,268				3,268		Y.Q.
113	Scraper Work	25		19				44		Hr.
115	Machine Grading	115		206				321		Sta.
202	Sprinkling	1,398		2,763				4,161		M.G.
203	Rolling	95		178				273		Hr.
203-B	Rolling	224		477				701		Hr.
218	Foundation Course	11,868		22,250				34,118		C.Y.
218	Add'l. Qtr. Mile Haul	147,757		533,041				680,798		C.Y.
305	Asphalt (OA-230)	25,975		48,775				74,750		Gal.
305	Aggregate (Type A, Grades 5 & 10)	704		1,321				2,025		C.Y.
403	Class "A" Concrete (Culverts)	1.52		29.32				30.84		C.Y.
403	Class "A" Concrete (Slabs)					20.5		20.5		C.Y.
403	Class "A" Concrete (Abuts. & Bents)					13.54		13.54		C.Y.
405	Reinforcing Steel	68		3,370		6,496		9,934		Lbs.
412 & Sp.	24" Std. Reinf. Conc. Pipe	36						36		L.F.
412 & Sp.	30" Std. Reinf. Conc. Pipe			36				36		L.F.
412 & Sp.	36" Std. Reinf. Conc. Pipe			36				36		L.F.
418	Precast Concrete Piling - 14" Sq.					132		132		L.F.
500	Removing Old Structures (Small)	2		3				5		Ea.

QUANTITY SUMMARY

F. R. DIV. 6	TEXAS	R/729-1-1	SHEET 48
Esterbrook	COUNTY	FM HWY. 4411	CONT. 1729-1-1







ESTIMATED QUANTITIES

Unc. Struct Exc. (Brdgs)	30 C.Y.
Class A Conc. (Slabs)	20.5 C.Y.
Class A Conc. (Abts. & Bents)	13.54 C.Y.
Reinforcing Steel	6,496 Lb.
14" Precast Conc. Piling	132 L.F.

D.A. = 1.200 Acres
L.C. = 8,700'
S = .0025
5 Year Q = 1050
V, Thru. Str = 6' per Second
Opening Prop Str. = 170
Type Soil = Sandy Loam
Pasture, Timber, Fields

50 60 70 80 90 108 10

BRIDGE LAYOUT
MUD CREEK
FS-8-20-25
H-10 LOADING
BACKWALL & WINGWALLS (CES-SERIES)

AUSTIN OFFICE REVIEW AND PROCESSING OF LAND SERVICE ROADS PROJECTS

PREPARATION OF ESTIMATES: The preparation of a job estimate has long been standardized with regard to form. One only has to consult the files for a similar project for guidance in this respect. Since the estimate form is standard and the price extensions are purely mechanical, there remains but one variable to be satisfied. That variable is the all important unit price for each bid item.

Occasionally unit prices are "grabbed out of the air" and inserted in an otherwise perfectly prepared instrument with the end product resulting in a "guesstimate" instead of an engineering estimate.

On some occasions the funds available appear to influence the choice of unit prices. When the alloted funds are sufficient for the work proposed, unit prices are generous. When the allotment is meager the unit prices are pared to the bone to make the overrun of funds seem less conspicuous. Such practices are not only foolish but are glaringly exposed when the contractor's bids are in.

It behooves the engineer to study the conditions and problems imposed by his plans and specifications from the contractor's point of view when unit prices are being decided upon for his estimate.

Earth work composed of 50% rock and estimated at $0.35 per cubic yard as "Unclassified Road Excavation" might pass the Austin Office review without question simply because the person reviewing plans was unfamiliar with the type of soil encountered. It is neither necessary nor desirable to indicate on plans the probable percentage of rock in unclassified excavation items. To do so might be cause for serious disagreement with the contractor during construction. Unless the letter of P.S. and E. transmittal furnishes information in regard to items of this nature the field engineer's estimate must be accurate and realistic with respect to each individual bid item since it cannot be checked by anyone not entirely familiar with local project conditions.

The Land Service Roads Division, in reviewing the estimates submitted by the field, usually compares the estimate at hand with estimates for similar work and of comparable quantities on other projects recently let in the vicinity of the project. It is realized that the Austin Office may have

access to more records of recent bidding; however, the districts usually receive similar bidding information promptly and could therefore maintain adequate files on the subject.

The season of the year in which contract work is to be executed has a decided influence on the contractor's bid prices. Earth work to be done in some parts of the State during the rainy season can logically be expected to cost more than the same work at a more favorable season. This feature should be taken into consideration when preparing the estimate of cost.

The volume of work involved in a bid item influences the price bid to a material degree. If three types of rolling are proposed and only 30 hours of 203A rolling are required, it is certain that the unit cost of 203A rolling will be high. Of course it may be preferable to eliminate the small quantity of this rolling from the plans and make the other two types suffice. If it is not feasible to dispense with an insignificant item the unit price should allow for the higher percentage of overhead the contractor must charge out to each unit of work.

The unit prices of a few items of small quantity are not too significant unless the majority of the bid items of the proposed contract are relatively small. If small variation in the unit price of any bid item results in a large change in the cost of the item, it is clear that the item is critical. Under estimation of base haul for instance by one half cent and several other major items by a few cents can result in a substantial overrun on many projects. On such items every effort should be made to insure that the estimated unit prices are realistic and as accurate as possible.

DEADLINE FOR P. S. AND E. SUBMISSION: With the completion of a thoroughly comprehensive estimate the project's P. S. and E. are finished with the exception of actually submitting the work to the Austin Office.

The deadline for submission of P. S. and E. is set approximately 45 days ahead of the letting date. This appears to be considerable time on first thought. A little analysis will indicate the necessity for this minimum period. The Administration desires that plans for a project be available for prospective contractor's review 30 days in advance of letting. This means that only 15 days are available for review and processing of those P. S. and E. received on the deadline date.

If no projects were submitted late and only a few were submitted as late as the deadline, the Austin Office would have adequate time for thorough review of the P. S. and E. and processing of necessary supporting papers for a normal letting.

There are twenty-five District Offices, each endeavoring to get projects on each letting. As a result of this quite natural desire the Austin Office is flooded with P. S. and E. during the deadline week. These P. S. and E. should be reviewed by D-5 if structures are proposed. D-14 must make their review of P. S. and E. and prepare estimates, proposal forms, financial memorandums to the Administration and perform many other detailed operations. Then the master copies of contract data must be sent to the Reproduction Division for printing the necessary number of copies of each required. When copies are returned they must be distributed to the A. G. C., to several divisions in the Austin Office and to the field. The above is merely a brief explanation for the 45-day deadline date.

Due to the necessity for hurried review, the probability of error will be greater on those projects submitted at the last minute. The engineer should therefore submit P. S. and E. as far ahead of the deadline date as possible. Projects involving detail bridge studies or use of special designs or special specifications should be submitted early to insure their inclusion in the requested letting.

SUBMISSION OF P. S. AND E: The "Manual For P. S. and E. Submission" indicates what should compose the submission and how each supporting paper should be prepared. Inasmuch as the manual has been discussed elsewhere a detailed interpretation of its contents is not intended at this point. However, in view of persistent omissions and errors in some parts of the submissions a few points will be discussed for further emphasis and clarification.

Quite often P. S. and E. are submitted with a letter of transmittal that simply states "Submitted herewith are P. S. and E. for the above referenced project." This appears to be a rather anticlimaxal statement with which to complete the achievement of the P. S. and E. preparation.

The Resident Engineer preparing plans should write a letter of transmittal to the District Engineer explaining any job peculiarities or special construction procedures required. This letter should assume the nature of a report which is the usual climax of any engineering study or planning. Any justification of unusual design, discussion of specification changes, and explanation of unit prices used in the estimate that might be helpful to those

who review and process P. S. and E. should be commented on. The reason for the type of substructure chosen for bridges should be discussed. Any structures, particularly of bridge classification, which will remain in place should be discussed as to the economics of repair and maintenance of the old structure versus the cost of a replacement structure. The condition of structures to remain in place should be given. If base material with soil constants higher than standard specifications is proposed for use on a Federal Aid project the Bureau will request information as to where material from the proposed source or material of similar characteristics has been used and with what success it served the needs of traffic. The Resident Engineer should cover this condition in his report.

The District Engineer should approve or modify the Resident Engineer's report if necessary and submit it with the P. S. and E. Points not covered by the Resident Engineer may be included in the District Engineer's letter of transmittal of P. S. and E. The manual suggests explanation of appreciable differences between the project allotment and the plans estimate. Compliance with this request will aid in the financing of the project should approval of an anticipated overrun be required.

The "Project Data Sheet" should be carefully prepared in accordance with instructions in the manual. The status of right-of-way and agreements determines the priority of D-14 review of projects. Concise accurate statements concerning these features should be made. The subject of project priority will be dealt with more fully later.

Few option agreements are submitted correctly prepared as is evidenced by the number of agreements returned to the field bearing inked corrections or insertions. The manual is clear on the proper preparation of this form and should be consulted for guidance. In addition to instructions given in the manual the following might be found helpful. On the first sheet, the line headed "F. A. P. No." is an abbreviation of Federal Aid Project Number and should only be used for projects to be built with Federal Aid. The line headed "S. P. No." is an abbreviation for State Project Number and should be used to show the control, section and job numbers of Federal Aid Projects and to show the project number for state projects.

The second sheet of the option agreement form indicates a blank space for insertion of the county. This space should indicate the county in which the material source is situated. The date of the agreement should be that on which the property owner signs. The date should not be left blank when

the agreement is submitted to the Austin Office. Care should be exercised to see that each copy of the agreement is properly signed by the property owner, witnesses, the Resident Engineer and the District Engineer.

SCHEDULING OF PROJECTS FOR LETTING AND ADVERTISING: The tentative list showing projects to be contracted at a particular letting is prepared approximately seven weeks prior to the letting. This is about the time the Austin Office is receiving its heaviest submission of P.S. and E. for the letting and most projects are scheduled without previous review. This means that some projects will be scheduled that will develop trouble and miss the letting; however, no real harm is done since the contractors know the project will be coming up soon. Any project that misses a letting is automatically included on the tentative list for the next letting. Projects that are received after the tentative list is published are included in the subsequent Notice to Contractors with which the field is familiar. Notices to contractors are prepared by D-14 for Land Service Roads projects and forwarded to D-8. The notices are sent to contractors approximately thirty days ahead of the letting.

Data for advertisement for bids is assembled by D-14 for each of its projects and forwarded to D-8. D-8 routes the information through regular channels to the end that the project is duly advertised in at least one local and two state newspapers the required time before the letting as prescribed by law.

LAND SERVICE ROADS PROJECT PRIORITY: Land Service Roads projects with 100% right-of-way secured and obstructions removed are given top priority in review and processing for letting. This alone is not the only criterion determining priority however. The status of agreements with municipalities, railroads and with property owners for securing base materials also enter into the priority given a project. There have been instances when projects were processed and ready for letting and an option on one of the proposed base sources could not be secured. This resulted in withdrawal of the project from the letting and involved changing plans, estimates and proposals to indicate a different source. Changes of this nature utilize time that could be spent in processing P. S. and E. for other projects that are complete with respect to agreements. It should be obvious that completeness of the submission together with simple clear cut design and execution of plans together with use of standard specifications results in a top priority rating that will place a particular project in the group to receive first review and processing.

The Bureau of Public Roads requires that P. S. and E. be submitted for their review at least ten days prior to the final date Letters of Authorization can be issued for a particular letting. Because of this requirement Federal Aid Projects are usually reviewed and processed ahead of State projects, all other things being equal.

AUSTIN OFFICE REVIEW OF P. S. AND E: The actual review of P. S. and E. by D-14 involves checking of the title sheet rather closely for completeness and accuracy of mileages, equations and exceptions. It might be brought out here that most errors on this sheet involve mileage adjustments and correction of project numbers. The subject of mileage computation has been previously discussed and will not be enlarged upon. Errors in project numbers can be avoided. As plans are being completed and made ready for inking, the District Engineer should forward a request to the Austin Office for assignment of project numbers. This request should not be submitted until such time as the District Engineer is reasonably certain the project will be contracted within the near future since continuity of project numbers and logical sequence of their assignment will be disrupted if the project in question fails to be let according to schedule. The District Engineer's request for assignment of numbers should indicate the exact limits of the project, the plans length of the project, the type of work proposed and the proposed letting date. This procedure will save considerable time in processing of P. S. and E. and will eliminate the necessity of erasing erroneous numbers and correcting same in the Austin Office review stage.

The typical section sheet is examined closely for adherance to standarized design procedures. The design proposed is reviewed from the standpoint of current and anticipated traffic needs and is also compared with design used on previously constructed adjoining sections to insure uniformity of the road when a continuous facility is completed. Design that is considered either deficient or excessive for traffic needs will be brought to the attention of the District Engineer for further study and comment.

The structure summary, summary of structures to be removed and any other summaries included in plans are examined for accuracy and completeness. It is not unusual to find that a structure, noted for removal on one of the plan-profile sheets, has not been included in the summary of structures to be removed and consequently not included in the estimate summary. The various summaries should be checked preferably by more than one person to avoid as much as possible errors or omissions in P. S. and E.

Quantities indicated on the Quantity Summary are rough checked to see that no serious error of computation has been made. For instance, the project length in stations is multiplied by the rate of flexible base per station to determine the amount of material to be used. The actual quantity of base required will certainly equal or exceed this product. If a number of turnouts or curves requiring additional base are involved, a rough estimate of the additional quantity for these features is made and added to the quantity determined from multiplying the project length by the rate per station. It should be clearly stated that D-14 does not make minutely accurate computation of quantities unless rough checks indicate possible errors in computation. For this reason quantities should be carefully computed and checked prior to submitting P. S. and E. for Austin Office review.

The "General Notes and Specification Data" sheet of plans is examined to see that all essential information required to supplement the specifications is clearly stated. This sheet should be used to show general project notes as well as the specification data. If it is used as intended, the Austin Office as well as contractors bidding the work will be greatly aided in their review of plans.

A considerable portion of the Austin Office review is concerned with the examination of plan-profile sheets and the bridge layout sheets. The adequacy of the design proposed is of paramount interest in the review of these sheets; however, they are also examined for possible right-of-way encroachments, inclusion of channel sections, clarity of notes and many other features as well. Since a complete analysis of the contents of these sheets would require a separate volume, it must suffice to say that they should be prepared so well that a person unfamiliar with them would not have to ask additional questions for a complete understanding of the work proposed.

After a complete understanding of plans is obtained the proposed specifications and special provisions are examined for their adequacy in covering the work. If standard specifications are used both the Austin Office and the contractors will be familiar with their contents and no review will be required. If a special provision or specification must be used to cover a design peculiarity, simplicity and clarity are essential.

While on the subject of specifications, it would be well to emphasize that when two or more projects are combined for letting in one contract, the field needs to prepare only one "List of Governing Specifications and Special Provisions" to cover all the work contained in the several projects.

Due to the large number of projects handled for each letting, it might be well to emphasize here that the Austin Office can only spend a few hours in actual review of P. S. and E. for any one project. Likewise the contractor's time is limited for each project. P.S. and E. prepared according to a standard procedure, utilizing standard specifications, materials and construction procedures can naturally be reviewed, processed and finally figured by the contractor in less time.

Most D-14 plans on which structures are proposed are reviewed by D-5. Submissions of plans to D-5 for review are so scheduled as to allow for possible revisions or corrections to plans in ample time for the project to make the scheduled letting.

After P. S. and E. have been reviewed by D-5 and D-14 and the estimate has been prepared as previously explained, any indicated overrun of funds allotted for construction is directed to the attention of the Administration for approval. Statements made by the district in the letter of transmittal concerning the reasons for any overrun are obviously of material benefit to D-14 at this stage of handling the P. S. and E.

REPRODUCTION AND DISTRIBUTION OF COPIES OF P. S. AND E: When financial clearance of a project is obtained the master copies of the P.S. and E. are delivered to the Reproduction Division for reproduction of the number of copies of each required. The copies are distributed to the A. G. C., the Construction Division, and the Bureau for Federal Aid projects. The field's copies of P.S. and E. are forwarded before other distributions are made and are usually mailed the day after all copies necessary for the assembly are furnished by the Reproduction Division.

The District is requested to review the blueprint plans and mimeographed proposals and report any errors or corrections promptly. This is an essential step in the sequence leading to actual contracting of the project. The Administration has ruled that a project must be removed from the impending letting if corrections or changes must be made in P. S. and E. after a contractor has been issued a proposal by the Construction Division. For this reason the final field review should be done carefully and expeditiously.

RECEIPT OF BIDS AND BID TABULATION: When the field advises that P. S. and E. are satisfactory for release of proposals to contractors the Construction Division is notified. Contractors obtain proposals from the Construction Division and many obtain personal blueprint copies of

pertinent plan sheets from a local private blueprint company. With these papers in hand the contractor submits his bid by the date stipulated in the proposal.

Bids are opened at the specified time and read publicly. The unit prices submitted by each contractor are tabulated and extended to determine the total amount of each bid. The Districts are advised the three low bidders, their total cost bid and their unit prices bid for each major item by teletype. If the low bid is considerably in excess of the anticipated contract cost the District's recommendation concerning award is requested.

The Land Service Roads Division submits a recommendation concerning award of contract to the Construction Division for each project on which bids are taken. Except for concurrence in approval of field changes or subsequent changes in design the responsibility of D-14 for a project terminates with the award of the contract.

AGREEMENT

for purchase of

ROAD MATERIAL

by and between

the

STATE OF TEXAS

STATE HIGHWAY DEPARTMENT

and

John & Mary Doe
(Name)

Box 123, Elgin, Texas
(Mailing Address)

* * * * *

F.A.P. No. S231(2)

S. P. No. 1031-1-3 & R1031-2-1

Highway No. F.M. 128

Bastrop County

Type of Material:

Caliche

Type of Proposed Work:

Foundation Course

M-7-49-1785

STATE OF TEXAS
COUNTY OF Travis

This agreement is made this 23'rd day of October, 1952, by and between John Doe his/their executors, administrators, heirs, successors or assigns, hereinafter referred to as the Party of the First Part, and the State of Texas, State Highway Department, acting through its State Highway Engineer, hereinafter referred to as the Party of the Second Part.

Whereas, the Party of the Second Part contemplates the utilization of acceptable Caliche material for road building purposes on F.M. Highway No. 128, extending from Elgin to Butler in Bastrop County, and

Whereas, preliminary investigations have indicated that acceptable material of this nature is available from lands hereinafter described, owned/controlled by the Party of the First Part, and

Whereas, the Party of the First Part desires to sell any or all of this acceptable material:

Witnesseth: The Party of the First Part for, and in consideration of one dollar ($1.00) and other valuable considerations, receipt of which is hereby acknowledged, does hereby agree to hold for the exclusive use of the Party of the Second Part, its agent or Contractor, all Caliche material occurring on said lands, hereinafter described, and to sell any or all of this material that may prove acceptable to the Party of the Second Part at the unit royalty price of two cents per cubic yard. The Party of the First Part hereby further agrees to indemnify and save harmless the Party of the Second Part from any and all damage, or loss, that may develop from existing mortgages or liens on the lands hereinafter described.

The Party of the Second Part agrees to pay for all accepted material at the unit royalty rate designated above by the Party of the First Part. Only one royalty payment will be made for each project involved. This/these royalty payment (s) will be made at such time as the/each project is finaled. No royalty payment will be made for strippings of quarry or other unsuitable material, whether at quarry or delivered on the road.

It is mutually agreed that payment will be made only for acceptable material, measured loose measurement in vehicles as delivered at points on the road designated by the duly authorized representative of the Party of the Second Part. It is further mutually agreed and understood that the agents of Contractors for the Party of the Second Part are to have free ingress to and egress from said lands, hereinafter described, for the purpose of excavating and removing said material. All fences, gates and other existing improvements on the said lands, hereinafter described, after removal of all material desired by the Party of the Second Part, shall be placed in a condition comparable in repair to their former state by the Party of the Second Part, its agent or Contractor. All equipment placed on said lands by the Party of the Second Part, its agent or Contractor, to assist in the removal of said material, shall be removed by the Party of the Second Part, its agent or Contractor, upon the abandonment of the quarry.

It is further mutually agreed and understood that should the Party of the First Part at any time consider the maintenance of watchman or the erection of additional fences, cattle guards, etc., necessary to safeguard his/their land, improvements, livestock, etc., against possible damage or loss during quarry operations, all arrangements and costs incident thereto shall be the entire responsibility of the Party of the First Part. Any such safeguards considered necessary by the Party of the Second Part shall be the entire responsibility of the Party of the Second Part.

This agreement shall expire two year(s) from the date of execution unless the Party of the Second Part at that time has under contract or has issued work order for construction of the project or projects hereinbefore described, in which event this agreement shall remain in effect until all such material desired by the Party of the Second Part for construction of said project or projects has been removed and the conditions hereinbefore stated have been fulfilled.

Location and description of lands hereinbefore mentioned (Give such information as is necessary to establish the location and limits of the source of material in a manner satisfactory and understandable to both parties):

Northwest corner of Doe Farm in vicinity of existing pit located 4 miles west of Elgin on U.S.290

IN WITNESS WHEREOF, the Parties concerned hereto have set their hands the date herein named.

Party of the First Part

John Doe

Mary White Doe

(If married, both husband and wife should sign)

Witness:

Tom Walker

Jim Collins

STATE OF TEXAS
Party of the Second Part

Approved:

State Highway Engineer

Recommended for approval:

Harry Black
Resident Engineer

Robt. Mann
District Engineer

Engineer Road Design

Engineer Land Service Roads

M-7-49-1785

PROJECT DATA SHEET

(This form is to be completely filled out and submitted with supporting papers.)

Bastrop County: Control 1031-1-3: Project F S231(2) S

Highway F.M. 128 Limits Elgin to 3.5 Miles East.

(If one or more projects, for which separate plans are prepared, are to be combined with this project for contracting, list data for other projects below.)

PROJECT	CONTROL	HIGHWAY	COUNTY
R1031-2-1	1031-2-1	F.M. 128	Bastrop

The following supporting papers are attached for all work to be included in this Contract:

	DESCRIPTION	NO. COPIES	CHECK
(1)	Letter of Transmittal	3	X
(2)	Plans Estimate (use latest D-7 estimate form)	3	X
(3)	Governing Specifications and Special Provisions (use current blank form)	3	X
(4)	Special Provisions prepared by District, for special conditions	3	
(5)	Special Specifications prepared by District, for special conditions	3	
(6)	Material Test Data (use form 476A)	1	X
(7)	Options for purchase of material (each source) (use current blank form)	4	X
(8)	Municipal Construction Agreement and Municipal Ordinance (each incorporated city)(use current blank forms)	2	X
(9)	Wage Rate Statement and Recommendation (use current blank form)	2	X

Recommended Work Time for Total Contract: 90 Days. (If more than one contract is recommended, show working time for each contract in space below.)

Status of Right-of-Way: 35% secured. Remainder promised by Nov. 1, 1953.

Status of agreements with Railroads for Crossings and Encroachments: None involved.

Recommended Letting Date: December (Month Only)

Prospective Bidder may see plans at the office of Harry Black,

Engineer, at Elgin, Texas.
(Insert name and address of engineer who will be in charge of construction.)

DATE: Sept. 2, 1953

Robt. Mann
District Engineer
District No. 26

M-6-49-1400 R