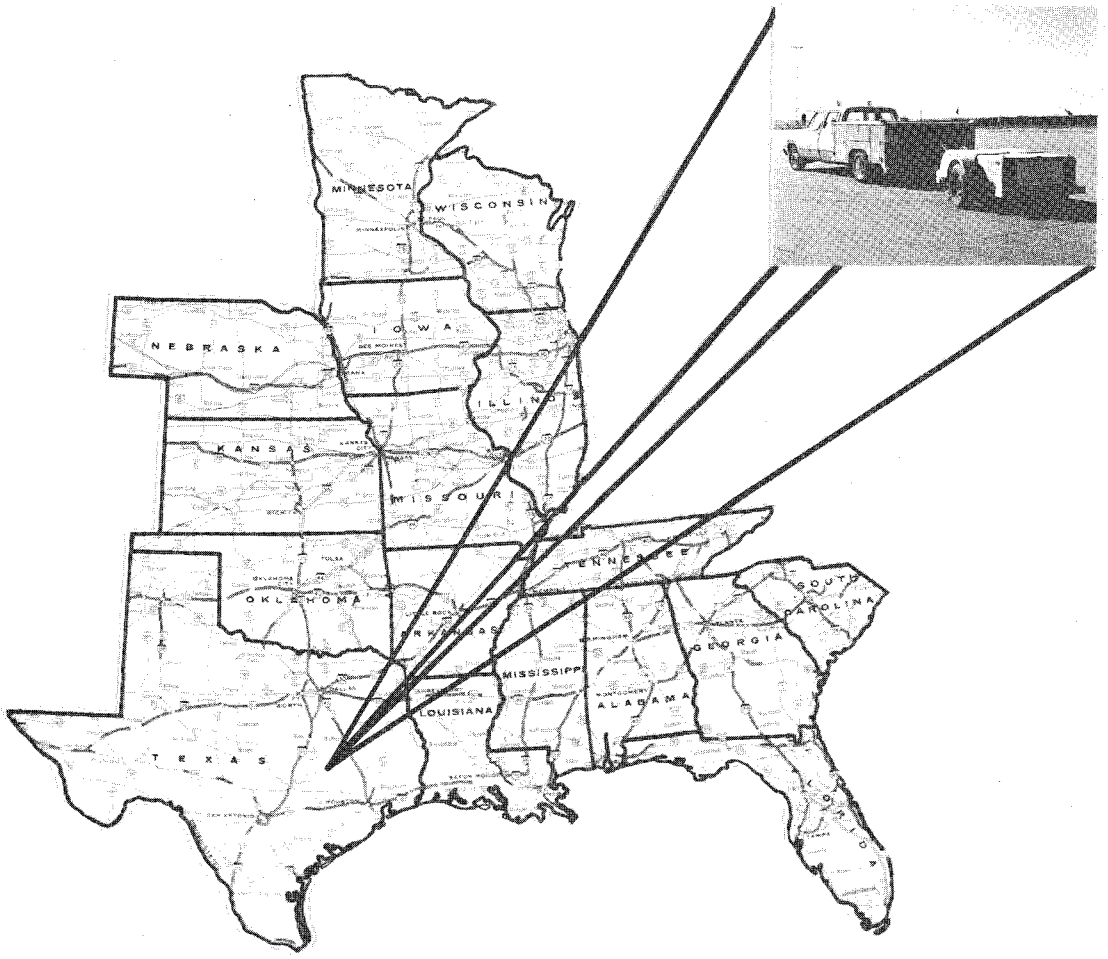
MATION FOR VISITING AGENCIES

FEDERAL HIGHWAY ADMINISTRATION
FIELD TEST AND EVALUATION CENTER



CENTRAL FIELD TEST AND EVALUATION CENTER
TEXAS TRANSPORTATION INSTITUTE
TEXAS A&M UNIVERSITY

INFORMATION FOR VISITING AGENCIES

to the

FEDERAL HIGHWAY ADMINISTRATION'S FIELD TEST AND EVALUATION CENTERS

A part of the National Program to Standardize
Skid Resistance Measurements

Federally Coordinated Program of Research and Development
in Highway Transportation

Prepared by the
Implementation Division
Office of Development
Federal Highway Administration
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I. INTRODUCTION

The purpose of this brochure is to provide to an agency desiring to make use of the services of the Federal Highway Administration's (FHWA) Field Test and Evaluation Centers (FTC), information concerning the preparations which they will be expected to make prior to visiting the site, activities in which they will engage while at the Center, what results they may expect and what will be asked of them after departure from the center. If questions remain after study of this brochure is completed, they should be addressed to Mr. Milton P. Criswell, Chief, Implementation Division (HDV-22), Federal Highway Administration, Washington, D. C. 20590, or to the Principal Investigator for the Field Test and Evaluation Center in the agency's service area who also participated in the preparation of this brochure.

A. Standardization as it Applies to Pavement Skid Testing

The establishment of three area centers designated as Field Test and Evaluation Centers (FTC) represents the latest and, to this point in time, most comprehensive effort to achieve standardization in the area of pavement skid testing. Previous efforts have included a number of fairly broad correlation studies (which have shown, generally, that different skid systems do not measure the same skid number on the same day under the same test conditions on the same pavement), adoption of standard skid test tires (ASTM Designation E249 and E501) and adoption of a standard test procedure for measuring pavement skid resistance using a towed trailer (ASTM Designation: E274). Although the latter document prescribes some details concerning the equipment to be used in

the test, it is widely understood that adherence to these details by many organizations has not resulted in a significant improvement in agreement between results obtained by more than one Skid Measurement System.

The equipment and procedures which constitute the SKID MEASUREMENT PROCESS, and require consideration if the process is to be standardized, include the following:

1. Skid measurement system*
2. Driver and operator
3. Equipment operating and maintenance procedures
4. Field testing procedures
5. Calibration equipment
6. Calibration procedures
7. Interpretation of test results
8. Reporting test results

If all of the above could be completely controlled and standardized, skid test measurements across the Nation would be expected to be compatible and comparable.

The SKID MEASUREMENT PROCESS is evaluated in terms of two basic performance criteria: accuracy and precision. Accuracy (reliability) concerns the deviation of measurements from an accepted reference level or value for the property of the reference material being measured. In this case, the reference materials are the primary reference surfaces at the field test centers and the property is their skid resistance. Precision (repeatability) concerns the spread between the individual measurements in the measurement process. It is the degree of agreement

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* As used in this brochure, the term "Skid Measurement System" applies to equipment for measuring pavement skid resistance in accordance with ASTM Designation: E-274.

among a series of measurements when expressed in terms of the standard deviation of a variable. These performance criteria can be used to describe a Skid Measurement System as a whole or any subsystem thereof.

The Federal Highway Administration has established a program to improve and standardize the measurement of pavement skid resistance. This program is specifically designed to aid State highway departments and other agencies in conducting the skid resistance inventories needed for their highway safety programs.

At the national level (see Figure 1), the FHWA program provides for a National Reference Skid Measurement System (NRS) which will be maintained and operated by the National Bureau of Standards (NBS). The NBS has also developed procedures for evaluating and calibrating the Area Reference Skid Measurement Systems (ARS) located at the three centers and furnish evaluation and calibration services for these systems. They will also provide technical assistance in operating the standardization program. The National Reference System will be the recognized skid measurement system used to establish the reference level to which Area Reference Systems and Inventory Systems shall be systematically related. Eventually, all measurement systems will be systematically related to the National Reference System.

B. Role of the Field Test and Evaluation Centers

At the area level, FHWA has established three Field Test and Evaluation Centers (FTC) at strategic locations across the Nation to provide standardization services to State Highway Departments and other agencies. These centers are being operated by the Ford Motor Company at its Arizona Proving Ground, Yucca, Arizona; the Texas Transportation Institute at its

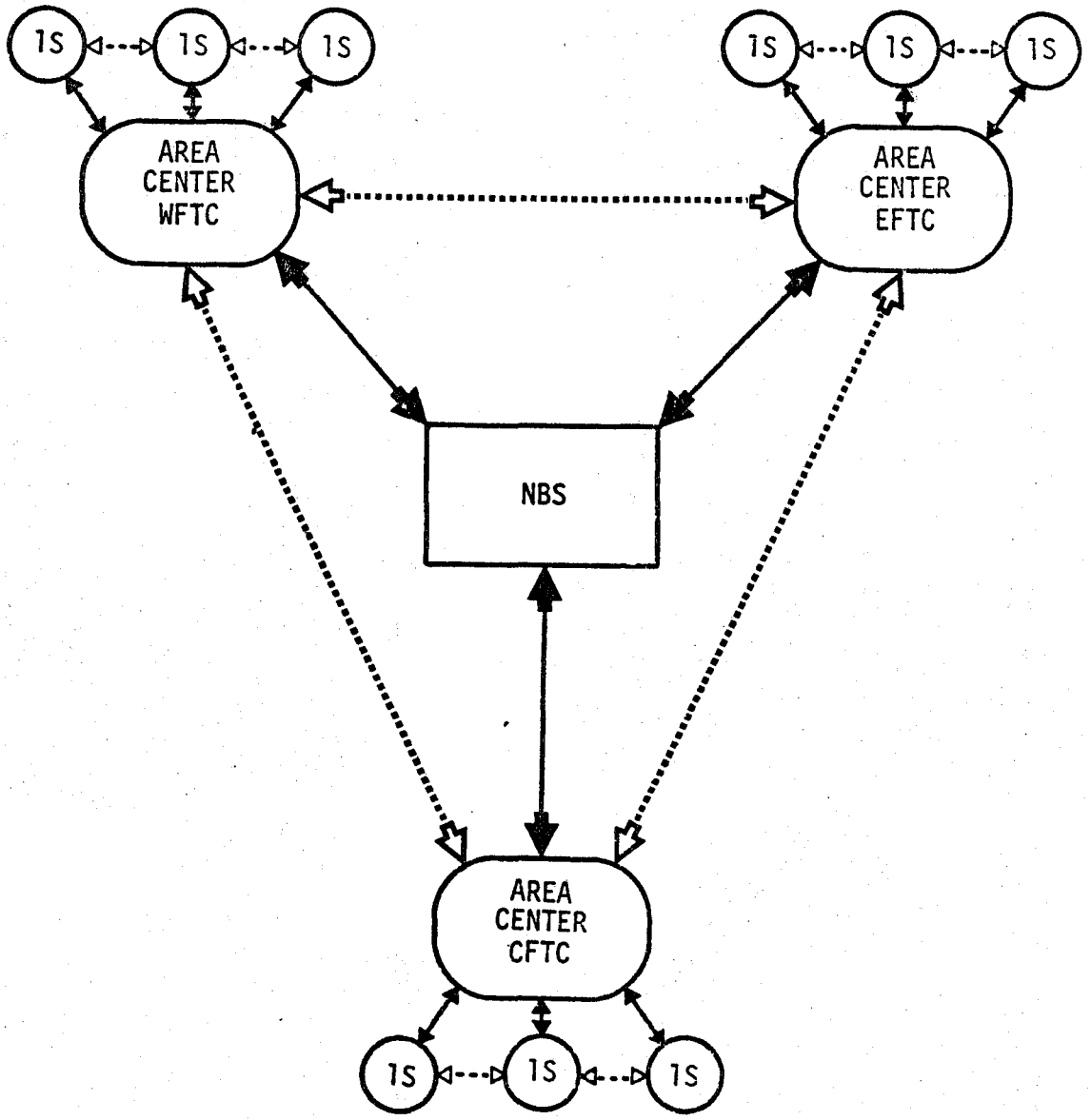


Figure 1 - Relationship among measurement systems.

IS represents inventory skid measurement systems for States and other agencies.

Research Annex near College Station, Texas; and the Ohio State University at the Transportation Research Center of Ohio near East Liberty, Ohio (see Section VII for addresses). Figure 2 shows the approximate location and service areas of these centers.

Each center has an Area Reference Skid Measurement System (ARS) which has been systematically evaluated and calibrated by NBS against the National Reference System. The Area Reference Systems will be used to establish a relationship between the National Reference System and visiting systems. At the present time, the evaluation and calibration services will be provided only with respect to Skid Measurement Systems which may be characterized as two-wheel, towed skid trailers operating in a locked wheel mode. Each center also has the necessary facilities and staff for static and dynamic calibration of skid measurement subsystems, evaluation of the SKID MEASUREMENT PROCESS, and providing technical advice and assistance on the measurement of skid resistance. To accomplish such evaluation, each center has constructed five primary reference surfaces which will serve as the reference material on which the skid measurement process will be evaluated.

Thus, the primary role of the Field Test and Evaluation Centers is to serve as the intermediary in systematically relating the performance of an individual inventory skid measurement system to that of the National Reference System.

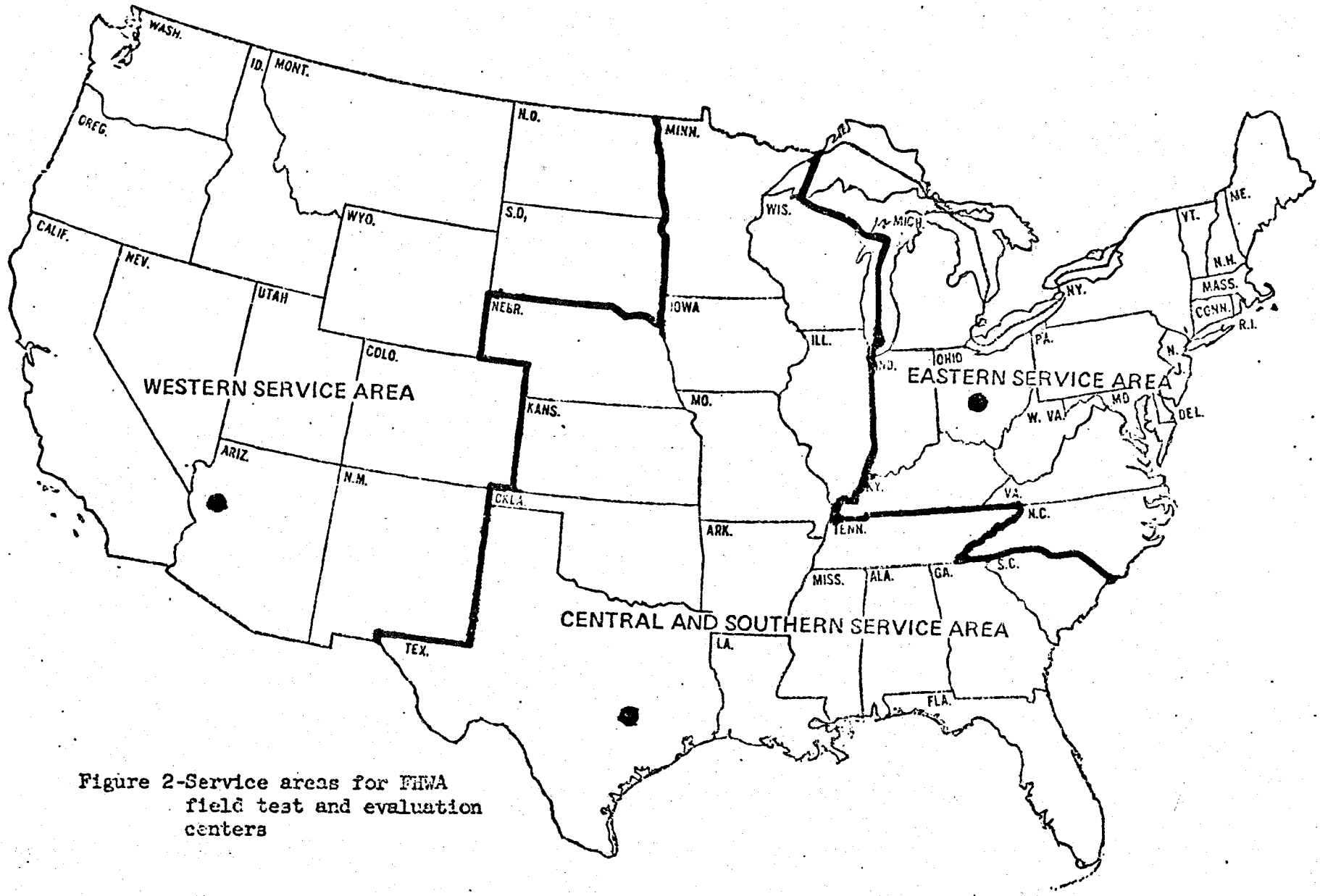


Figure 2-Service areas for FHWA field test and evaluation centers

II. HOW SERVICES ARE REQUESTED

A. Initial Requests

When a State or other agency within the area served by a center wishes to make use of a center's services, the appropriate office of that State or other agency should submit a written request to the Division Engineer of the Federal Highway Administration for that State. The request will be forwarded through the Regional Federal Highway Administration Office of Development, Implementation Division, and finally to the center. If possible, submit your request at least 3 months prior to the evaluation time period requested by the visiting agency. Upon receipt of the approved request, the center will contact the State or other agency directly to make the necessary arrangements to provide the services. Center personnel will then call the person actually in charge of the skid system for coordination and discussion of details. The center's electronics supervisor will also contact the electronics specialist responsible for the skid system's recording system and discuss possible interfacing problems.

B. Subsequent Requests

Subsequent to the first written request for each individual system, it will not be necessary for a State or other agency to request additional evaluations and services through the channels outlined above. All subsequent contact and written re-evaluation requests may be made directly between the State or other agency and the center with a copy of all re-evaluation request being sent to the appropriate FHWA Division Office.

C. Information to be Included in the Written Request

A request should at least include the following:

1. Request for the 2-week evaluation at the center in your service area.

2. Number of systems to be evaluated.

3. Manufacturer each system including model number and whether the system is used for inventory, research or both.

4. Date skid measurement system was received from manufacturer.

5. Indicate months during year in which skid system receives heaviest use.

6. Desired dates for evaluation - also give alternates or a 2 to 3 month block of time for scheduling.

7. Amount of lead time needed by requesting agency to prepare for trip.

8. Whether the transducers on the trailer left wheel, right wheel or both wheels are to be evaluated.

9. Name, title, address and telephone number of person within the requesting agency to be conducted directly by the center to make the necessary arrangements.

III. CRITERIA FOR SCHEDULING SERVICES

Weather records applicable to the area in which the centers are located indicate that calibration and evaluation procedures can be scheduled with reasonable confidence that they will not be unduly hampered by bad weather. During the bad weather period of November through March of each year (especially for the Eastern Field Test Center), inventory systems will be scheduled upon request, but a visit to a center during this time period should be made with the knowledge that adverse weather may prolong the time period required.

Aside from the above indicated weather limitations, every effort will be made to schedule the calibration and evaluation visits of each State's inventory system or systems in accordance with the desires of that State on a first-come, first-serve basis. In some cases, however, the magnitude of work load at a center will require that priorities be assigned in the scheduling of visiting systems. When such circumstances arise, the following criteria will be used in assigning dates to those wishing to make use of a center's facilities.

A. State's Testing Season

The geographic distribution of the States which will make use of a center is very broad. In some of these States, normal weather conditions are such that field testing can be accomplished for only a few months during the year; while in others, such testing can be undertaken almost throughout the year. When priorities are required, priority for the State having the short testing season will be assigned at a time outside its normal testing season.

B. Number of Skid Inventory Systems Available to State

At the present time, most States have one Inventory System and only a few have more than one. It is anticipated that, as time progresses, the number of Inventory Systems in use will increase. When it is necessary to assign priorities, particularly after the first round of calibration and evaluation of State systems, such priority will be assigned to the State having the least number of systems or to a State which has a new system that has not been calibrated and evaluated.

As a general rule, for States having more than one Inventory System, each system will be scheduled individually for a 2-week period. It will be possible, schedule permitting, to have more than one system from the same State scheduled back-to-back. In some cases, depending upon center work loads, two State systems may be scheduled to arrive on the same day to spend 4 weeks with the idea that both systems may be completed in 3 weeks.

C. Work Load at a Center

In assigning all priorities, consideration will be given to the work load at a center and priorities assigned to those times at which the workload is minimal in order that the service may be provided most efficiently and expeditiously.

D. Types of Systems

State inventory systems will be given preference over State research systems and systems from other agencies when priorities are required.

IV. TIME REQUIRED FOR SERVICES

A. Normal Time

It is estimated that if a visiting system is received on the site in satisfactory operating condition and immediately ready for calibration and evaluation, the foregoing steps could be accomplished in a period of 5 working days. This estimate assumes that there is no time lost due to malfunction of the equipment and/or inclement weather. Permitting some time for repairs and adjustments, which must be expected, and some for inclement weather, it is felt that the calibration and evaluation could almost always be concluded within 2 weeks.

The first time that a crew visits a center, its members will not be thoroughly familiar with what is to take place and some time must be taken in indoctrinating them. Additionally, on the first occasion on which a particular Skid Measurement System is brought to a center, more time will be required to develop an understanding of the system, locate and identify specific needed signal sources, and record all of its features than will be the case upon subsequent visits.

It is therefore recommended, that on the first occasion of any crew or any Skid Measurement System visiting the center, their travel orders provide for them to be at a center for a period of 10 working days. On any trip in which both crew and Skid Measurement System have previously visited that center, it is recommended that their travel orders provide for a stay of 2 weeks with the understanding that the evaluation may be completed in 1 week.

B. Overtime

It should be noted that there is a large probability of some overtime work during the time the visiting crew is at a center. Certain steps in the calibration and evaluation procedures, once started, should be completed without interruption. Although the normal working hours at a center are 8:00 a.m. through 5:00 p.m., Monday through Friday, arrangements have been made for each center crew to work when needed beyond the 5:00 p.m. closing hour and, if needed, on Saturdays. The agency submitting a Skid Measurement System for calibration and evaluation should complete the necessary arrangements to permit its crew to work overtime as needed during its visit to a center.

V. TRAVEL AND PER DIEM COSTS

Each State highway department should assume the responsibility for determining what funds they will use to get their personnel and skid inventory system to and from the Field Test and Evaluation Center and for their costs (travel and per diem) while at the Center. The State may use their own funds or Federal funds for these costs. Costs for the normal process of evaluation of the systems shall be borne by the Field Test and Evaluation Center during the evaluation period.

Federal funds may be programmed from the HP&R program or the Highway Safety Program. It may also be possible to use construction program funds if appropriate project programming procedures can be met. The State's decision for the type of funding should be coordinated with the FHWA Division and/or Regional Office.

Additional guidelines for the States to use in determining which funds are appropriate are as follows:

1. Funds used for obtaining the inventory skid system(s) and conducting the skid inventories would be the appropriate funds for charging travel and per diem to evaluate their skid inventory system (s).
2. If the State purchased the skid measurement system with research (HP&R Part II) funds and have transferred its use to conducting skid inventories, then the funds used to pay for the inventory could be used for the travel and per diem in receiving their evaluation.

3. If the State purchased the skid measurement system with research (HP&R Part II) or other research money besides HP&R and used the system for conducting both research and skid inventories, then a proportional split in funding may be used as another alternative.

All other government agencies and industry must assume the responsibility for travel and per diem costs to and from the center and during the two-week evaluation.

VI. HOW TO PREPARE FOR A VISIT TO A CENTER

Success in applying the evaluation process to a visiting system, and particularly the expediency with which the evaluation process is completed at a center, will be significantly influenced by preparations made in advance of the visit to the center.

> NOTE: Repair and/or modifications made to a visiting system after completion of the evaluation will negate the evaluation, the test results will no longer be valid and a return trip to the center will be paramount.

Therefore, the following recommendations are made in an effort to expediate the evaluation process after your arrival and to ensure the integreity of the skid measurement system after it returns home.

A. What to do at Home

It is of primary importance that your skid system arrive at the center in satisfactory mechanical and electrical operating condition. Past experience has indicated that such systems, particularly after having travelled several hundred miles, are often found to have mechanical and/or electrical defects which require considerable time for correction and should have been corrected prior to leaving home station.

Past experience has also shown that defects are likely to materialize in the towing vehicle as well as in the trailer itself. Your towing vehicle should be carefully tuned up before departure for a center. Your crew will be asked to conduct tests at a speed of 60 mph on the primary reference surfaces. The towing vehicle should be capable of

attaining this speed in a reasonable distance of travel and maintaining it during tests. The cooling system of the towing vehicle should be operating well, since it may be necessary to run the engine for extended periods of time with the vehicle not in motion.

The visiting system trailer and associated mechanical and electronic equipment should be inspected and any apparent defects corrected. One problem which frequently arises is difficulty in getting the test wheel to lock during dynamic test and/or while being calibrated on the force plate. The owner should insure that the trailer braking system can be locked continuously for 1 to 2 hours during static calibration. The braking system should be carefully inspected and fully operational before leaving home.

The system should be calibrated shortly before departure for a center and the results of that calibration brought to the center. As indicated in Section VIII, your crew will be requested to go through a calibration procedure using the techniques normally employed by your organization. If the personnel who normally conduct such calibrations are not a part of the operating crew, then they should accompany the crew to the center. If this is impossible, the crew bringing the system to a center should be adequately trained to perform all operations before departing for a center.

Evaluation of the watering subsystem is an important part of the service performed. All valves associated with this subsystem should be examined to assure that they are operating properly. Since much of the calibration process will be conducted inside a garage while there is

water in the tank of the towing vehicle, it is highly desirable that a valve or valves be provided which will completely cut off flow from the tank to avoid leakage through the nozzles while the calibration procedure is in progress. All leaks in the watering system should be fixed prior to departure for a center.

A part of the force plate calibration procedure, will require that your conditional signal (essentially the signal which drivers your recorder pen) be fed into an externally located X_Y plotter. It will be most helpful if your crew is sufficiently familiar with your apparatus to know at what point this signal may readily be tapped, and even more helpful if you can provide a connection to this point. The connection may be provided through a cable fitted with any type of plug convenient for your use if the mating half of the plug is brought to the center. If you are willing to undertake provision of such connection, it is recommended that you contact the center in advance to discuss an appropriate technique.

All Skid Measurement Systems used for research purposes must have each subsystem adjusted to within the ASTM specification E-274. As an example; a research system having a watering system which has the capability of adjusting or varying water film thickness over a wide range, should be set to meet the ASTM specification and should remain at that setting throughout the entire evaluation.

B. What to Bring With You

When your Skid Measurement System is submitted for evaluation and calibration, it should be accompanied by a crew fully capable of operating it. If, in your normal operation, you use a two-man crew, at least these

two men should be available during the evaluation process. If one or more additional men are used in calibrating the apparatus they will be welcome at the center and it is recommended that they accompany the equipment.

All calibration equipment used in connection with the skid system should be brought to the center. If, in your operation, you make use of more than one level of calibration, e.g., a force plate for periodic primary calibration and a torque-arm for more frequent secondary calibration, both systems should be brought to the center. Any associated equipment required to conduct your calibration procedure, such as strain boxes, load cells, etc., should be brought so that your crew will be able to conduct an on-site calibration essentially independent of the center.

Please have your crew bring at least four new skid test tires meeting the requirements of ASTM Designations: E501 (15" tire). These tires should have received the required 200-mile break-in run prior to arrival at the center, but should not have been used for locked wheel skid testing. The crew should also bring at least four wheels (rims) with the ASTM tires mounted. The tires brought with the visiting system will be used during the as-arrived correlation. Each center will furnish the tires used by the visiting system during the final correlation. Also bring the gage or gages which your crew normally uses to check inflation pressure in the trailer test tires and the towing vehicle tires.

In case of equipment malfunction, you should have with you all service and operation manuals for mechanical and electrical equipment mounted in your system, including instrumentation wiring diagrams. This is particularly true of amplifiers and oscillographs. Each center is building and will maintain a library of such service manuals. The wide array of apparatus available, however, is such that there is a distinct possibility that we may not have on-hand service manuals for your equipment. Also bring the maintanence logs for the towing vehicle, trailer and instrumentation.

Although each center will maintain a reasonable stock of spare parts, some visiting systems incorporate rather unusual components for which replacements are not readily obtainable. A recurring problem involves very low amperage fuses used in some recorders. If you are aware of such unusual components in your equipment, you should send replacements which you have on-hand with your system.

Bring all written procedures used by the visiting agency for system operation such as; equipment operating procedures, calibration procedures, field testing and/or inventory procedures and data reduction and analysis procedures. Also bring an adequate supply of chart paper, spare pens and/or styli, ink supplies, data sheets and forms, spare trailer brake parts, and special tools used with the skid system.

As indicated in Section VII, your crew should have a purchase order with them when they arrive at the Center to cover MAJOR repairs.

Finally, your crew should have the names and telephone numbers of responsible individuals in your organization who expect to be available at these telephone numbers during the period in which your system is undergoing evaluation. It is highly desirable that, should unforeseen circumstances arise, your crew be able to contact such persons by telephone on short notice at any hour of the day or night in order that they may obtain instructions on electrical, mechanical and administrative problems for which they do not feel prepared to make a decision.

VII. CENTER FACILITIES AND CAPABILITIES

The Field Test and Evaluation Centers are as follows:

Eastern Field Test Center (EFTC)
Transportation Research Center of Ohio
Post Office Box 249
East Liberty, Ohio 43319
Telephone: (513) 666-2061
Principal Investigator: Eldridge A. Whitehurst (Gus)
Director of Operations: Myron W. Gallogly

Central Field Test Center (CFTC)
Texas Transportation Institute
Texas A&M University
College Station, Texas 77843
Telephone: (713) 823-0054
Principal Investigator: Arthur J. Stocker (Jim)
Director of Operations: Joe Button

Western Field Test Center (WFTC)
Ford Motor Company
Arizona Proving Ground
Post Office Box 1031
Kingman, Arizona 86401
Telephone: (602) 753-5501 or 766-2511
Principal Investigator/Director of Operations: John L. King

Facilities available at each center include garages, shops, offices, static testing areas, dynamic testing areas and the primary reference surfaces. Upon arrival at a center, the visiting crew will be assigned office space suitable for the reduction of data and garage space for their skid measurement system.

A center's staff, available on the site, includes skilled electronic technicians and mechanics. Under the center's contract with FHWA, these personnel and facilities may be used to effect unexpected MINOR repairs and adjustments which may be required by the visiting system upon its arrival or during the course of the evaluation service.

Each center will also be prepared to provide or arrange for unexpected MAJOR electronic, mechanical or automotive repairs as may be required. Each center's contract with FHWA, however, precludes the furnishing of such services as part of its contract. Since past experience indicates that such repairs are often required when a visiting system is transported far from its home base, the crew should bring with it a purchase order for MAJOR repairs (suggested range of $500 to $1,000) made out to one of the following:

For EFTC: Ohio State University Engineering Experiment Station

For CFTC: Texas A&M Research Foundation

For WFTC: Ford Motor Company, Arizona Proving Ground

The visiting crew should have authority to authorize expenditures for required MAJOR repairs or should know how to reach the appropriate individual at home base who can authorize such expenditures immediately and at any hour of the day. The crew should have his office and home telephone numbers.

Determination of whether a repair and/or adjustment is MINOR or MAJOR will be the responsibility of the Field Test Center and will generally be based on costs of parts and labor, complexity of the problem, time needed to make the repair, and the affect that such repairs have on the evaluation. In general, cost including parts and labor of up to $500 per skid system will be considered MINOR.

VIII. GENERAL OUTLINE OF EVALUATION PROCESS

When a Skid Measurement System is brought to a center it will undergo a series of evaluations and calibrations. The evaluation procedures and the order in which this work takes place will be determined by the center staff. During evaluations, the visiting Skid Measurement System will, at all times, be under the direct control of the visiting crew and they will participate in all discussions and tests associated with their system.

In general this work includes, but is not limited to, the following:

1. An orientation meeting to discuss the FHWA Skid Accident Reduction Program, the field test center's role and to provide a summary of what visiting personnel may expect during their stay at the center.
2. A dynamic correlation between the visiting Skid Measurement System in "as arrived" condition and the center's Area Reference System.
3. A complete documentation of the system which includes photographing the truck and trailer, the nozzle, the water piping system, the brakes with the wheel off, the hitch, and closeups in the cab of the towing vehicle. It will involve determination and recording of information concerning the towing vehicle such as make, model and year, transmission, rear end, tire size, water capacity, water pump model, and pump drive type and ratio. The make and year of the trailer together with information concerning the type of wheel

transducer and the nozzle type and attitude will be recorded. All instrumentation will be examined and the make and model of the recorder, channel inputs, speed source, timing sequence, etc., will be noted. Various dimensions of the visiting system will be measured including hitch height with the towing vehicle water and gas tanks filled and empty, trailer axle to hitch distance, towing vehicle rear axle to hitch distance, towing vehicle wheel base, towing vehicle wheel track width (front and rear), trailer wheel track width, and trailer loaded wheel radius. This information will be kept on file at the center, and on subsequent visits by the same skid measurement system it will only be necessary that changes in the system made since the last visit be recorded.

4. The load on each wheel of both the towing vehicle and the trailer will be determined with the visiting crew in the towing vehicle and the vehicle water and gas tanks full.
5. The horizontal center of gravity of the trailer will be determined along with its roll, pitch and yaw characteristics.
6. The recording instrumentation and associated electronics will be checked to see if they are functioning properly.
7. The visiting system will be subjected to a wheel transducer calibration by the force plate method. As the first step the visiting crew will be requested to conduct a calibration of their equipment making use of whatever calibration equipment they normally use. Although assistance will be available to them in the event that extra hands are

needed, it will be expected that they will actually conduct the calibration, take the necessary readings and convert these readings to force to provide a calibration curve in the manner normally employed by the agency owning the vehicle. When this activity has been completed, center personnel will conduct a calibration of the visiting system using the center's air bearing force plate and associated equipment. The center calibration will also include determination of changes in hitch to axle dimensions during force plate loading, and unloading of the trailer wheel. The two calibrations will be compared and any differences noted.

8. A careful calibration will be made of the speed measuring and recording system of the visiting system. This will include determination of the accuracy of the system in measuring and indicating speed over a finite distance and the ability of the driver to maintain the indicated speed. Distance measuring systems will also be checked and calibrated.

9. The watering system will undergo evaluation and static calibration. Two techniques will be involved in this evaluation. In the first, the rear wheels of the towing vehicle will be jacked from the pavement and the driver instructed to run his engine at rates successively indicative of 20, 40 and 60 mph test speeds, while the total flow from the pumping system is collected and measured to determine flow rate in gallons per minute at the indicated speeds. In the second phase of this evaluation, he will be asked again to operate his engine in

such a manner as to achieve indicated test speeds of 20, 40 and 60 mph while the water is discharged from the nozzle into a static distribution gage (segmented receptacle) so that information can be obtained concerning the static distribution of the water across its trace width.

10. Following static water system calibration, a dynamic calibration of the watering system will be undertaken. In this operation, the driver of the visiting system will be requested to drive his vehicle and trailer over a prescribed course at successive test speeds of 20, 40 and 60 mph. The course will include a dynamic distribution gage (segmented receptacle) mounted within the pavement and with its surface level with the pavement. When the visiting system passes over this receptacle with its watering system in operation, information can be collected to define the dynamic distribution of water under circumstances approximating actual testing conditions.
11. The tire pressure gages used with the visiting system will be calibrated.
12. The inventory system will run the final skid test dynamic correlation. The driver and crew of the visiting system will be requested to conduct locked wheel skid tests at speeds of 20, 40 and 60 mph on the primary reference surfaces while similar tests are performed by the center crew using the Area Reference System. The results of the tests with the two systems will then be compared. The crew of the visiting system will be requested to reduce the data collected during

their tests of the primary reference surfaces to skid numbers. Center personnel will also examine and reduce the data collected by the visiting crew and a determination will be made of whether differences in technique of data reducing account for differences observed between results obtained with the two systems. A report giving the results of the calibration and evaluation procedures will be forwarded within 3 to 5 weeks.

13. An exit conference will be held to review the evaluation of the visiting system and to discuss a typical final report of data evaluation so that visiting personnel will know what to expect.

The foregoing is a list of the basic on-site calibration and evaluation services of the center. The State agency submitting its Skid Measurement System for calibration and evaluation will, however, be requested to establish, in the vicinity of its home base, a test loop involving several pavements having different levels of skid resistance and different speed gradients. It will be suggested that the State system be used at frequent intervals to test these surfaces and that the results of such tests be mailed to the center for concurrent evaluations. This technique will provide the State agency with some assurance that its crew and skid system continues to function as they were functioning at the time of the last calibration and evaluation at a center and may provide the State and the center an early indication that something is changing in the system and that recalibration and evaluation is desirable. The evaluation report will provide more detail on the recommended criteria for test-loop pavements and recommended procedures for testing the loop.

IX. FINAL EVALUATION REPORT

Within 3 to 5 weeks after the date of the departure of your crew from the center with the evaluation and calibration procedures completed, you will receive a final evaluation report. The purpose of the report will be two-fold.

The report will first speak to the general operational characteristics of your skid measurement system and crew. It will describe the performance of your watering subsystem as measured both statically and dynamically. It will provide a calibration of your force and/or torque measuring subsystem and vertical load subsystem as determined through use of the center's force plate which has been calibrated by the National Bureau of Standards and will provide a comparison of this calibration with that achieved by your crew using your calibration system. Where certain equipment requirements are specified in ASTM Designation: E274, it will point out any apparent deviations from these provisions. It may, as circumstances dictate, speak to the manner in which your crew, making use of your skid system, is able to comply with certain elements of that designation.

The report will document in detail the data processed by the center staff and will be presented in graphical, tabular, and/or written form. A summary of the activities performed during evaluation, the order in which performed, and the data reduction and analysis techniques will be presented. A section on definition of terms will also be included in the report.

All raw data obtained during the evaluation will be retained at the center, but will be available for review by the visiting agency after release of the final report.

The second purpose of the report will be to deal with the accuracy and the precision of your skid measurement system. If necessary, an appropriate correction procedure will be provided to permit your test data to be modified to produce the Skid Numbers which would be expected to have been measured under your circumstances of test, had the measurements been made with the National Reference Skid Measurement System. The level of complexity of such correction procedure is likely to be different for each skid system. In its simplest form, the correction might involve a flat percentage correction for all Skid Numbers measured. It is likely that in most cases, the correction will vary at least with the level of Skid Number measurement.

Information will be provided concerning the standard deviation of your test results at different levels of Skid Numbers. This will permit you to determine the number of tests required, under given circumstances, to assure that the average results of the tests represent the true value of the tested surface within selected limits of confidence.

As calibration, correlation and evaluation experience is developed, suggestions as to possible standardization of equipment, procedures and techniques may be introduced.

A final element of the report, which may or may not be included in any particular case, will consist of recommendations for improvement in the operation of your system. Whenever, in the course of the evaluation

and calibration procedure, the center becomes aware of apparent electrical or mechanical deficiencies in a skid system, or in the manner of operation of its crew, such deficiencies will be called to the attention of the owning agency, together with recommendations concerning their correction.

X. INTENT, USE AND DISTRIBUTION OF FINAL EVALUATION REPORT

From the point of view of the FHWA and the Field Test and Evaluation Centers, the report is primarily for the information of and aid to the owner of the skid measurement system. Consequently, only a limited distribution will be made. Two copies of the report will be forwarded to the State or agency submitting the skid measurement system for evaluation and calibration, one copy will be sent to each of the other two Field Test and Evaluation Centers, two will be sent to the Federal Highway Administration, one will be sent to the National Bureau of Standards, and one will be filed at the originating center. A prior agreement must be made with the owner before making any distribution of reports or papers containing information as a result of evaluation of the owner's system.

Neither the FHWA nor any of the centers have any concern over nor desire to limit the distribution of an approved final evaluation report by the State or agency submitting the skid system for evaluation. An approved evaluation report may be distributed by the visiting State or agency as it so desires. In the event that the FHWA, NBS, or the centers subsequently receives a request for information concerning an evaluation on a skid system either from some agency or person other than the State or agency submitting the system for evaluation, the inquiry will be forwarded to the State or agency owning the system in question. Also, the final evaluation report will not be released by the FHWA, the NBS or the Field Test Centers to any other State or agency unless approved in writing by the user State or agency and the FHWA.

Summary of evaluation report distribution is as follows:

Organization	Copies
Visiting Agency	2
Evaluating FTC	1
FHWA	2
Other FTC	2 (1 each)
NBS	1
Total	8

XI. RESTRICTION ON ACCEPTANCE TESTING AND CERTIFICATION

It has been decided as a matter of basic policy that the centers will not perform acceptance testing on any skid measurement system. Although the center's report may include reference to whether or not one of more subsystems of the skid measurement system are in compliance with the ASTM Designation: E274 or other pertinent specifications, the center will not certify that the system does or does not meet such specifications.

Further, the center will not knowingly receive, evaluate, and calibrate a new system for the purpose of certifying that it meets the owner's specifications, or any other specifications, as a step in the owner's acceptance of the system from the vendor thereof.

No actual certification or stamp of approval will be placed on the visiting skid measurement system. However, the final report will contain all necessary data and information required by the owner to support correlation to the National Reference System.

XII. SAFETY REQUIREMENTS ON SITE

Before the evaluation and calibration procedures are undertaken, the visiting crew will be conducted on a tour of the facilities available to the center to familiarize them with the layout and to call to their attention any particular problems which they may face. For most of the evaluation and calibration procedures, the crew of the visiting system and that of the center will be working in areas to which other parties do not have access, and conflicts will be largely non-existent. The facilities of the Field Test and Evaluation Centers, however, constitute only a small portion of the total facilities of the center's host organization, and during some procedures--particularly the dynamic tests over the primary reference surface areas--it may be necessary to coordinate traffic flow with that of other parties making use of other facilities. Possible conflicts and hazards which may be caused by this joint use of certain facilites will be carefully pointed out to the crew prior to testing.

To assure safest possible operation during the evaluation and calibration procedures, two basic safety rules have been established and will be firmly enforced:

1. No vehicle shall be operated within the garage or shop areas of the center for more than 5 minutes unless its exhaust system has been connected to the forced air exhaust system available in such areas.

2. Under no circumstances shall the crew of the visiting system operate that system over any facilities of the Field Test and Evaluation Center, other than its access roads, except when accompanied by a member of the staff of the Field Test and Evaluation Center.

XIII. PUBLIC FACILITIES AVAILABLE

Separate, individual appendices have been prepared by each Field Test Center on each of the following subsections. The attached appendices contain the necessary administrative details for the Field Test Center in your particular service area.

A. Directions to Each Center (Appendix A)

Directions for both ground and air transportation have been explained and maps are included where appropriate.

B. Local Transportation While at a Center (Appendix B)

Each center is located several miles from the nearest city or town where the crew will be housed. Since the towing vehicle of the visiting skid measurement system may be otherwise engaged, it will be necessary for the visiting crew to have local transportation available. Some visiting agencies have indicated they will want to send an automobile along with the skid measurement system for such purposes. If others desire not to do so, rental vehicles are available locally at the locations listed in the appendix. Center personnel will be happy to be of assistance to visiting crews in picking up and returning such rental vehicles.

Where needed, and to the extent possible, the center will assist visiting crews with their transportation problems.

C. Motel Accommodations (Appendix C)

The appendix contains the names, telephone numbers and current room rates (single and double) for the motels in the area of the center. Advance reservations are recommended and the center will be happy to assist in making such reservations upon your request.

D. Restaurants (Appendix D)

Adequate restaurant facilities are available at or in the area of each center. Many restaurants are listed in the appendix including old favorites, country-style restaurants and some that are uniqe to the area.

E. Driver Information (Appendix E)

This appendix includes maps indicating appropriate routes from your headquarters to the center and showing the general layout of the center. Included thereon are instructions for reaching the center office. Also included is the name and telephone numbers (office and home) of the person to contact upon your arrival in the vicinity of the center to receive instructions as to what to do next. These instructions will depend on the time of your call and where you are located. Special types or items of clothing will be suggested.

F. Other Information (Appendix F)

For additional information concerning the Field Test Center, or the brochure, or for assistance in making reservations contact the office of the center listed in the appendix. This appendix may also include any additional information the center feels is necessary at the time the brochure is distributed to the user agencies.

APPENDIX A

Directions to the Field Test and Evaluation Center for Central and Southern States.

LOCATIONS OF CENTER

The Center is located on Texas State Highway 21, approximately 12 miles from College Station and 5 miles west of Bryan, Texas, on 2,000 acres that was once a military air base. The location (noted as Texas A&M University Research Annex) is approximately 170 miles south of Dallas, 90 miles N.W. of Houston, and 100 miles N.E. of Austin. Maps of Texas, Bryan - College Station, and the Field Test and Evaluation Center, located at the Texas A&M University Research Annex are included in Appendix E.

AIR SERVICE

Bryan is connected by air to both Dallas and Houston by Davis Airlines (ZK) which makes six round trips a day to each city. Davis airlines flies twin engine Cessna 410's.

HOURS OF OPERATION

The entrance to the Center is open 24 hours a day, seven days a week; however, the normal scheduled work hours for the staff are from 8:15 a.m. to 4:45 p.m., Monday through Friday. Any unit arriving at other than these scheduled work hours can contact the Program Coordinator, A. J. Stocker, at his home telephone number 823-0610.

APPENDIX B

Local Transportation While at Center

Rental vehicles are available in the Bryan-College Station area and can be obtained at the following locations, or local delivery can be arranged. Prices as of March, 1975.

Avis Car Rental - located at Easterwood Airport - Phone 713/846-3245

Small cars - $18.00 a day and 18¢ per mile (20% discount-they furnish gas)

Large cars - $21.00 a day and 21¢ per mile (20% discount-they furnish gas)

Weekly charge - 7 days for the price of 5 (all cars).

All cars - $15.00 a day and 16¢ per mile (no discount-you furnish gas)

Hertz Car Rental - located at Easterwood Airport - Phone 713/846-2550

Small cars - $18.00 a day and 18¢ per mile (20% discount-they furnish gas)

Regular cars - $21.00 a day and 21¢ per mile (20% discount-they furnish gas)

Weekly charge - 7 days for the price of 5 (all cars).

National Car Rental - located on Texas Avenue and Easterwood Airport
Phone 713/846-4911

Small cars - $18.00 a day and 18¢ per mile (20% discount-they furnish gas)

Large cars - $21.00 a day and 21¢ per mile (20% discount-they furnish gas)

Weekly charge - 7 days for the price of 5 (all cars).

Thrifty Rent-A-Car - located at 519 Texas Avenue - Phone 713/846-0842

Pinto - $11.00 a day and 10¢ per mile (you furnish gas)

Maverick - $12.00 a day and 10¢ per mile (you furnish gas)

Torino - $13.00 a day and 10¢ per mile (you furnish gas)

LTD and Galaxy - $14.00 a day and 10¢ per mile (you furnish gas)

APPENDIX C

Motel Accomodations

The major motels are noted below and are also marked on the enclosed map. Mrs. Carey Graham, Mr. A. J. Stocker's secretary, at telephone number 713/823-0054, will make arrangements for visiting personnel as motel space must usually be reserved several weeks prior to your arrival. Price code: S - Single room; T - Two beds in room. Prices, including tax, as of March, 1975.

MOTEL	COST
Aggieland Inn 1502 Texas Ave., C.S. 713/846-5741	$16.15 - S $21.45 - T
Buona Sera Motel 1805 N. Texas Ave., Bryan 713/825-5414	$ 8.48 - S $12.72 - T
Casa Loma Motel 2000 Texas Ave., C. S. 713/822-3728	$ 8.48 - S $12.72 - T
Holiday Inn Motel 2300 Texas Ave., Bryan 713/823-8131	$14.84 - S $21.20 - T
Holiday Inn Motel 1503 Texas Ave., C. S. 713/846-1736	$15.90 - S $21.20 - T
Holiday Plaza 1720 Texas Ave., Bryan 713/822-3748	$11.66 - S $16.96 - T
Ponderosa Motor Inn 3702 Texas Ave., C. S. 713/846-5794	$11.66 - S $16.96 - T
Ramada Inn 410 Texas Ave., C. S. 713/846-8811	$17.21 - S $23-57 - T
Rodeway Inn 1601 Texas Ave., Bryan 713/823-5454	$11.66 - S $16.96 - T
Saber Inn 701 Texas Ave., C. S. 713/846-7755	$ 9.54 - S $16.96 - T
Sands Motel Hwy 6 South, C. S. 713/846-5791	$10.60 - S $15.90 - T

APPENDIX D

Restaurants

The Research Annex has a cafeteria that serves breakfast from 7:00 to 7:45 a.m. and lunch from 11:30 to 12:30 p.m. each work day. The entrance is on the west side of Building 4430. The staff regularly drive into Bryan-College Station for lunch at available restaurants. The location of several of these restaurants is given below and marked on the enclosed map of Bryan-College Station.

The Bryan-College Station area is well supplied with places to eat. Texas Avenue (Highway 6) is lined with a great variety of quick-order type establishments.

RESTAURANT	COST	RESTAURANT	COST
3C Bar-B-Que 810 South Main	Medium	Randy Sims Bar-B-Q 3824 Texas Avenue	Fairly Expensive
The Bayhouse 606 Tarrow	Fairly Expensive	Steak House 1803 Texas Avenue	Medium
Captain's Table 2900 Texas Avenue	Fairly Expensive	The Texan 3204 S. College Ave.	Expensive
The Country Kitchen FM Highway 60	Medium	Tokyo Steak House 2025 Texas Avenue	Fairly Expensive
Crown & Anchor Inn Highway 30 E.	Expensive	Wehrman's Cafe 1009 West 25th	Low
Fontana's 1037 S. Texas	Medium	Wyatt's Cafeteria 804 Texas Avenue	Medium
Monterey House 1816 Texas Avenue	Low	Youngblood's 3410 South College Ave.	Medium
Saber Inn 710 Texas Avenue	Medium		

APPENDIX E

Driver Information

Upon Arrival

Upon arrival at the Center or in the Bryan-College Station area, please contact the Program Coordinator, Mr. A. J. (Jim) Stocker, office telephone 713/823-0054, room 209, building 4431 or home telephone 713/823-0610. If you arrive at the Center during office hours (8:00 a.m.-4:30 p.m.) park at entrance to building 7092.

Overtime

Several of the skid trailer evaluation procedures should be continued once the equipment is warmed up and functioning properly, therefore, all personnel should be prepared for some overtime hours on one or two work days.

Services Available at Center

Operations	Mr. A. J. (Jim) Stocker, Program Coordinator, Office phone 713/823-0054, Office room 209, Building 4431, Home phone 713/823-0610. Mr. Joe Button, Director of Operations, Office phone 713/823-0054, Office room 220, Building 4431, Home phone 713/846-7035. (He will be with the visiting unit most of the time while on site.)
Electrical problems and repair	Mr. George Shute, Electronic Supervisor, Phone 713/823-8058, Building 7092. (He can provide experienced electronic technicians.)
Mechanical problems and repair	Mr. Lionel Milberger, Mechanical Supervisor, Phone 713/823-8056, Building 7090. (He can provide experienced auto mechanics and machinists.)
Electronic Service	Major or minor repair and/or adjustment (Contact George Shute).

Vehicle Service	Major repair, minor adjustments and tire repair. Fuel (both ethyl and regular gasoline) and lubricants are available . (Contact Lionel Milberger)
Machine Shop	Complete machine shop, with qualified machinist. Aluminum and steel welding available.
Cafeteria Hours	Breakfast 7:00 to 7:45 a.m. Lunch 11:30 a.m. to 12:30 p.m.

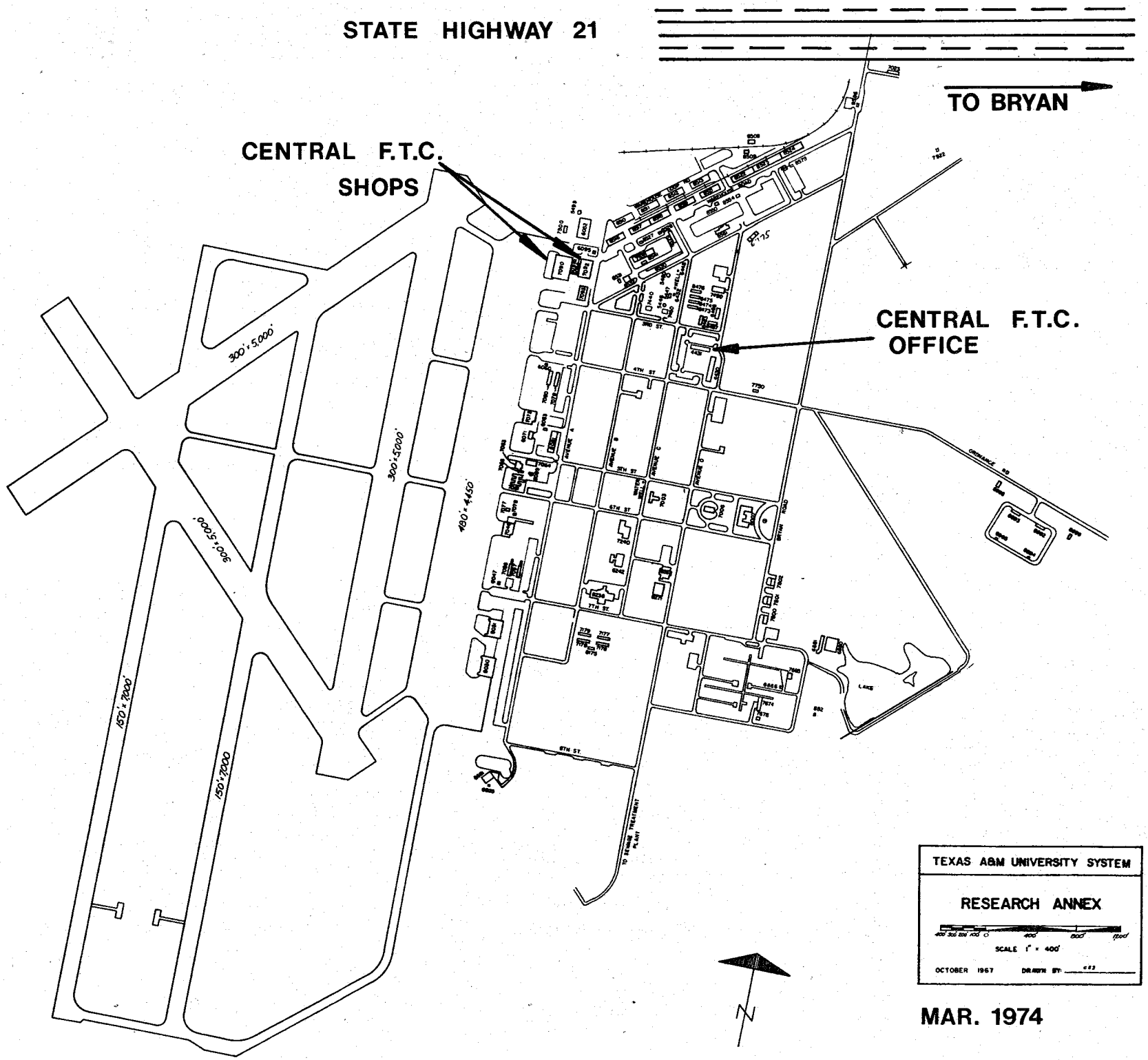
Temperature

The temperature in Central Texas is variable and should be considered when preparing for the trip to the Center. A jacket, rain gear, and sun hat might be needed depending on the time of the year. Temperature and rainfall is extremely variable, but the average is given below.

	Avg. Temp.	Rainfall		Avg. Temp.	Rainfall
January	52	2.34	July	84	2.02
February	55	3.21	August	85	2.53
March	61	2.16	September	79	5.73
April	68	4.24	October	72	3.11
May	75	4.22	November	60	3.30
June	82	3.32	December	54	3.45

Average temperature and rainfall for the geographical area of the Center (1971)

NOTE: STATE AND CITY MAPS ARE IN ENVELOPE ON INSIDE OF BACK COVER.


STATE HIGHWAY 21
TO BRYAN
CENTRAL F.T.C. SHOPS
CENTRAL F.T.C. OFFICE
300'x5,000'
300'x5000'
480'x4450'
900'x5000'
450'x7000'
150'x7000
8TH ST
7TH ST
6TH ST
4TH ST
AVENUE A
AVENUE B
AVENUE C
AVENUE D
BYRNE ROAD
ORDNANCE RD
LAKE
TO SEWAGE TREATMENT PLANT
TEXAS A&M UNIVERSITY SYSTEM
RESEARCH ANNEX
SCALE 1" = 400'
OCTOBER 1967
DRAWN BY:
N

MAR. 1974