DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

CAPITAL ASSISTANCE PAPER

Proposal and Recommendations
For the Review of the
Development Loan Committee

A.I.D. HISTORICAL AND
TECHNICAL REFERENCE
ROOM 1656 NS

BRAZIL - D.E.R.-Sao Paulo (Sao Paulo Highway Maintenance)

BRAZIL - D.N.E.R. (Technical Assistance - Highways)

512-L-059

512-L-060

512-22-310-240 folder

512-21-310-229 ? Dick

AID-DLC/P-431

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DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

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AID-DLC/P-431
June 16, 1966

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Brazil - D.E.R. - Sao Paulo (Sao Paulo Highway Maintenance)
Brazil - D.N.E.R. (Technical Assistance - Highways)

Attached are revised pages to be inserted in the subject Capital Assistance Paper.

The recommendations for authorization of loans (1) in an amount not to exceed $20,000,000 to the Highway Department of the State of Sao Paulo to assist in financing the United States dollar costs of highway maintenance equipment and technical assistance and training required to adequately maintain the road network in the State of Sao Paulo and to accomplish an effective reorganization of the Borrower and (2) in an amount not to exceed $400,000 to the Government of Brazil ("Borrower"), acting through the National Highway Department ("D.N.E.R.") to assist in financing United States dollar costs of technical assistance to the D.N.E.R., including related commodity requirements, were discussed by the Development Loan Staff Committee at its meeting on Wednesday, June 15, 1966.

Rachel C. Rogers
Assistant Secretary
Development Loan Committee

Attachments: (Revised June 16, 1966)
Summary and Recommendations, p. i.
Project Analysis, pp. 14, 31b, 31c, and 46
New Annex V

Previously Distributed: June 3, 1966
Summary and Recommendations
Project Analysis
Annexes I-IV

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BRAZIL - FIRST PHASE - COMBINED HIGHWAY MAINTENANCE EQUIPMENT/TECHNICAL ASSISTANCE PROGRAM

SUMMARY AND RECOMMENDATIONS

1. BORROWER: The Borrowers are (1) The State Highway Department of Sao Paulo (DER/SP) and (2) the National Highway Department (DNER). The DER/SP Loan will be guaranteed by the GOB.

2. AMOUNT OF THE LOANS:

	($Million)
Sao Paulo	20
DNER	.4
Total	$ 20.4

3. TOTAL COST OF PROJECT:* The total cost of the two projects is as follows:

	AID Loan ($ Million)	GOB Participation (Cr$ expressed in US$million) x/
Sao Paulo		
Equipment	$ 19.0	$ 20.0
T/A	1.0	-
DNER		
T/A xx/	.4	.320
	$ 20.4	$ 20.320

x/ US$ 20.0 million represent Cr$ 44.0 billion at Cr$ 2,200/US$

xx/ DNER will provide cruzeiros to meet local costs (See Exhibit 7, Annex III)

* For details see Financial Analysis, page 31.

4. PURPOSE AND PROJECT DESCRIPTION

a) The DNER Project

The DNER loan is to provide the dollar cost for the services of United States technicians, engineers and administrators to assist the DNER in reorganization.

b) The São Paulo Project

The project is designed to accomplish the following objectives: provide the DER (1) with the necessary equipment to adequately maintain the road network in the State 1/; (2) with the necessary technical assistance to accomplish a reorganization within the Department and to establish standards and systems which will lead to a greater management capability on the part of the Department. The establishment of such standards and systems will be coordinated with the Federal Program being undertaken by the BPR with the DNER.

5. BACKGROUND: In recent years there has been increasing concern among Brazilian officials concerned with transport and more particularly with the highway network regarding the premature deterioration of the road network in Brazil. This deterioration was primarily a consequence of inadequate maintenance. In January 1965, USAID initiated discussions with DNER designed to result in a program which would lead to an improvement in the maintenance capability of the State Highway Departments and DNER. The program as it evolved contemplated the following elements.

1/ The Municipal Roads are not included in this project. The maintenance of these roads is an important problem, particularly in connection with agricultural production. Nevertheless, because of the administrative and organizational problems they constitute a separate effort.

a) A redefinition by the DNER of its role in maintenance and construction. Specifically, the DNER is to divest itself of its operating responsibility for maintenance (and construction). The States would be delegated over a period of time the operating responsibilities for maintenance and construction. DNER would then assume a more normative role along the lines of the United States Bureau of Public Roads, planning road construction, establishing standards and arranging financing.

b) A build-up of the operational and managerial capability of the individual State Highway Departments by providing necessary equipment and technical assistance.

These two projects are the first phase of this program. The individual projects are separable and justified in their own right.

The further stages of the maintenance program are described in detail in Section I of this paper. Briefly summarized they involve the following:

(1) Possible financing of equipment and technical assistance in the Southern States, Paraná, Rio Grande do Sul, and Santa Catarina in early 1967. This financing would be based upon a World Bank master plan for the Southern States which is expected to be completed and released in August of 1966. The financing of the program in the Southern States would be linked to the program being undertaken by the BPR with the DNER.

(2) Two further maintenance studies have been initiated in the Littoral-Western States and in the Northeast. The Northeast study covers the federal road requirements, while the studies in the Littoral-Western States include the combined Federal-State road network. The NE State Highway Departments are being assisted under an existing AID Loan to SUDENE. With the exception of Pernambuco, the other Northeast States will not be able to assume overall maintenance responsibility for some time to come. Both of the above studies will be completed in 1967. The studies may also be enlarged to include a master highway plan for the Western States and the Northeast.

By 1970 it is thus expected that the following will have been accomplished:

(1) A redefinition of the DNER role in Highway Maintenance and construction;

(2) A reorganization plan for DNER with a phased implementation initiated divesting DNER of operating responsibility for construction and maintenance;

(3) A build-up in the managerial and operating capability of the individual state highway departments;

(4) Effective delegation of operating responsibility to a limited number of state Highway Departments, most probably São Paulo, Paraná, Rio Grande do Sul and Pernambuco;

(5) Establishment of minimum standards for delegation and a phased timetable for other states.

6. OTHER FREE WORLD FINANCING: Export-Import Bank indicated no interest in these projects. Formal clearances with the World Bank is being actively solicited.

7. PLACE OF THE LOAN IN THE PROGRAM: The projects involve prospects of substantial improvements in efficiency and cost savings in a significant public sector activity. As such the projects merit support.

8. STATUTORY CRITERIA: All statutory criteria of the United States Foreign Assistance Act of 1961 as amended have been satisfactorily met (see Exhibit 1, Annex 1 for details).

9. ISSUES: None

10. COUNTRY CLEARANCE: COCAP approved this project for AID financing on May 19, 1966.

11. RECOMMENDATIONS: It is recommended that two loans be authorized as follows:

a) A loan to the State Highway Department of São Paulo not to exceed $ 20.0 million to finance the cost of (i) highway maintenance equipment imported from the United States and (ii) U.S. Consulting Engineering Services under the following terms and conditions:

(1) Repayment to be within 18 years from the date of the first disbursement, including a three-year grace period;

(2) Interest at 3-1/2% will be charged on disbursed loan funds including during the grace period.

(3) Interest and principal to be repaid in United States dollars; in semi-annual installments;

(4) Supervisory, engineering services are to be contracted with a firm satisfactory to AID and under approved AID conditions;

(5) All equipment, material, and services financed under this loan are to have their sources and origin in the United States of America;

(6) The two step option will be offered to the GOB with repayment scheduled at forty (40) years including a ten (10) year grace period, with interest at one (1) percent during the grace period and two and one-half (2 1/2) percent thereafter;

(7) And such other conditions as AID may deem necessary.

b) A loan to the National Highway Department not to exceed four hundred thousand dollars ($ 400,000) to finance

the cost of technical assistance under the following terms and conditions:

(1) Repayment to be within 40 years from the date of the first disbursement, including a ten-year grace period;

(2) Interest to be charged on the disbursed amount at 1% per annum during the grace period and 2 1/2 % thereafter;

(3) Interest and principal to be repaid in United States dollars in semi-annual installments;

(4) All services financed under this loan are to have their sources and origin in the United States;

(5) And such other conditions as AID may deem necessary.

12. PROJECT COMMITTEE

Loan Officer/Chairman	- Lawrence J. Brailsford, USAID/B - ADCD
Engineers	- J.L. Campbell, USAID/B - ENRO C. Fisher, USAID/B - ENRO
Equipment Specialist	- P. Tysinger, USAID/B - ENRO
Economists	- J.F. Carruthers, USAID/B - DPEC Lawrence J. Brailsford, USAID/B - ADCD
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Drafting Officer:
Lawrence J. Brailsford:ADCD
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Approved by:
Jerome I. Levinson:ADCD
William A. Ellis:DDOM
Stuart H. Van Dyke:DOM

SECTION I - DETAILED DESCRIPTION OF THE PROJECT

HISTORY AND BACKGROUND

The National Program

1.01 - The projects described herein constitute the first phase of a "National Highway Maintenance Technical Assistance Program". The program basically arose as a consequence of discussions between the DNER and the Mission in which the then Director of the DNER requested AID assistance in accomplishing the reorganization and redefinition of purpose of the National Highway Department, with the view of training personnel and developing the DNER into an institution comparable in function to the BPR.

1.02 - During the early discussions with the DNER the concept of the DNER's delegating the maintenance function to the various states was first officially advanced by the Director of the DNER. The IBRD and the USAID had separately concluded that the DNER should divest itself of operating functions (construction and maintenance) and concentrate on planning construction programs, establishing standards, supervising and financing. Therefore, the DNER Director's request for assistance to begin reorganization was favorably received by the Mission.

1.03 - The rapid growth of the Brazilian road network and its surprising early deterioration caused highway officials to focus on maintenance as well as construction.

1.04 - In the decade 1955-65 Brazil almost doubled its road network. During this period the network increased from 387 to over 690 thousand Km. Also during this period only an average 18% /2 of highway budgets was allocated to maintenance, as compared to 30 to 50% suggested by the US/BPR for developing countries during this period.

/2 (DNER and DER/SP Data)

1.05 - Another factor that led to the development of this National Program was AID's participation in two highway maintenance projects, both of considerable size.

1.06 - AID authorized the NE/SUDENE equipment loan (512-L-019) on 11-18-64 for $ 20.0 million, and the Minas Gerais equipment loan (512-L-047) on 5-28-65 for $ 15.0 million. With the knowledge that international financing could be obtained for highway maintenance, both the National Highway Department and many of the state highway departments approached the Mission for loan assistance to improve their maintenance capability.

1.07 - On March 22, 1965, the National Highway Department requested AID Loan assistance to purchase maintenance equipment. The Mission also received similar requests from the State of Espírito Santo, São Paulo, Rio Grande do Sul, Santa Catarina, Paraná, Acre, Rio de Janeiro, Goiás, and Mato Grosso, among others, during the time that preliminary discussions were beginning with the DNER.

Combined A.I.D./DNER Work Group

1.08 - The Mission and the DNER by an exchange of letters /3 agreed that a special DNER/USAID/Brazil combined work group should be organized to develop the proposed program. The combined Work Group consisted of two DNER high level engineers, two USAID engineers and a USAID loan officer. Following several months of intensive work, the Group successfully developed the program described herein, which includes these projects as the first phase.

1.09 - The DNER and the Mission decided that a national program would be a more logical approach /4. Thus, on September 23, 1965, the DNER informed each of the States involved that the GOB and AID were considering a National Highway Maintenance Equipment/Technical Assistance Program under which the individual state requests would be included/5.

/3 See Exhibits 1 and 2 of Annex III
/4 See Exhibits 4 of Annex III
/5 See Exhibit 3 of Annex III

1.10 - This National Program is to be further refined by feasibility studies conducted by U.S. firms in the States outside of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo and Minas Gerais. A phased operation was agreed upon.

World Bank Transport Study

1.11 - Following the conclusion of a World Bank Economic Mission to Brazil, the GOB and the Bank entered into an agreement, the terms of which requires the Bank to select "experts" to conduct studies in the transportation field in Brazil. The Bank's team concluded, "that the country's"... (Brazil's)..." transportation system faces serious problems and that important improvements in planning administration and operations of various transport facilities are urgently needed". /6

The transport study being financed by the World Bank is being conducted by four consultant firms as follows:

a) A French consulting firm is drawing up a Master Transport Plan for Minas Gerais;

b) A Danish consulting firm is doing a similar plan for the Southern States;

c) A Dutch consulting firm is studying three major ports: Rio de Janeiro, Santos and Recife;

d) A U.S. Consulting firm (Coverdale and Colpitts) is studying the railroads and is acting as overall coordinator for the Transport Study. The U.S. firm is being assisted in the economic aspect of this work by Stanford Research Associates.

/6 From the Memorandum of Understanding - Annex I between the GOB and the Bank.

1.12 - In the Memorandum of Understanding between the Bank and the GOB, the following objective relative to the National Highway Department is set forth: "The National Highway Department will be reorganized with a view to concentrating its activities on its major function of planning and control. The construction and maintenance of national highways will, as soon as practicable, be delegated to the individual State Highway Departments".

1.13 - The DNER, acting for the GOB, has requested AID to assist in the accomplishment of this objective. The technical assistance proposed for the DNER is specifically designed to assist in achieving this objective.

USAID/World Bank Coordination

1.14 - Highway maintenance was not originally included in the Bank's terms of reference. However, as the DNER/AID maintenance program was developed to begin in the three Southern states, AID, the GOB, and the Bank agreed to the Bank's modifying its terms of reference to include maintenance rather than having separate studies conducted in the same area at the same time. The Bank thus agreed to provide, through its consultants, a report in two steps for the GOB which AID agreed to consider for financing. The first report was to be an equipment replacement program for Rio Grande do Sul, Santa Catarina, and Paraná. This report was to be submitted by March 31, 1966. The second report to be an optimum program as part of the State Master Plans; this report is due August, 1966.

1.15 - The attempt to identify a minimum replacement program was based on the fact that an optimum program could only be developed following the completion of the master highway plans for these states which was anticipated to require the remaining months of 1966. This schedule, in the absence of the minimum program, would have involved no transport financing for approximately one year. This was thought to be undesirable by both the GOB and AID.

1.16 - Additionally, because the state highway departments do not possess adequate technical skills to reach an optimum level of operational capacity, it was felt that the states should begin with a minimum equipment and a

maximum technical assistance program to ensure the proper utilization of the major portion of equipment needed to fully meet the demand for maintenance. It was also concluded by the DNER and the Mission that the reorganization studies should precede a major equipment program.

1.17 - However, in late March it became clear that the optimum program would be available in August instead of November/December, 1966, and the decision was made to postpone the interim (minimum) investment in Rio Grande do Sul, Santa Catarina, and Paraná for which states the Bank's consultant will complete the final state road master plan report in August 1966. It is clear that the objectives set forth for the interim program contemplated earlier can be incorporated in the implementation of the optimum program. Additionally, with a final report in hand, the danger of error based on incomplete data is eliminated.

Feasibility Studies - FINEP

1.18 - While the World Bank's consultants were given the task of studying maintenance needs as well as specific road studies and state master road plans for the states in which the Bank is involved, the DNER/USAID/Brazil Combined Work Group prepared "scopes of work" for two other studies /7 . One is being conducted for the combined State/Federal road system of Pará, Mato Grosso, Goiás, Espírito Santo, Guanabara, Rio de Janeiro, Amazonas and Acre, and the other for the federal road network in the states of Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, and the Federal Territories. It is expected that these studies will be completed in 1967.

1.19 - Equipment and technical assistance financing in these states is planned to be the third and fourth phases of the National Program. The Northeast states and Minas Gerais have not been included in these phases for delegation of maintenance responsibility of Federal roads, nor are these states included for additional equipment. The combined DNER/USAID/Brazil Work Group decided that these states should be encouraged to fully execute the maintenance improvement program already underway.

/7 See Exhibit 4, Annex III

1.20 - In summary, then, this program is likely to develop along the following lines:

Phases	DNER & States	Feasibility Studies Completed	Financing Authorized
I	São Paulo, DNER(TA)	April 66	May 66
II	Paraná	August 66	Feb 67
	Rio G. do Sul	August 66	Feb 67
	Santa Catarina	August 66	Feb 67
III	Littoral-Western States	July 67	Dec 67
	Espírito Santo, Guanabara, Rio	May 67	Sep 67
IV	DNER, NE States	Sep 67	Jan 68

SECTION II - THE DNER PROJECT

2.01 - As indicated above, this project is in response to the DNER request to aid it in transforming itself from a federal highway operating agency into a highway planning, control and standard-setting organization.

2.02 - The technical assistance to be provided to the DNER is proposed to be made available from the United States Bureau of Public Roads. Private consulting firms were considered, but based on the unique experience in the BPR and the nature of the proposed TA program it was decided by the Mission (and requested by the DNER) that BPR personnel be used rather than private consultants. The BPR has agreed to assist the DNER in the reorganization, training, and providing the day-to-day technical assistance for at least two years, working with the responsible DNER personnel in developing the institution to meet the objectives of the transformed organization. Specifically the loan will pay for the services of five appropriate technicians (1) in working out a feasible plan for delegation of its operating responsibilities to the state highway departments; (2) in reorganizing itself; (3) in developing its proficiency in planning the highway program which would maximize use of highway funds for development objectives; and (4) in establishing more adequate norms in such specific areas as contracting and cost accounting. This effort is consistent with the recommendations of the World Bank as stated in their memorandum of understanding with the Government of Brazil and is in direct response to the request from the DNER for assistance in achieving this objective.

2.03 - A description of the duties of the U.S. team of technicians and the implementation plan for technical assistance to the DNER is as follows:

Duties of Chief Party

2.04 - The Chief of Party will be responsible for providing overall leadership to the U.S. group of technicians, engineers and administrators in addition to approximately twelve temporary duty specialists in various fields. He

will assist the DNER in identifying the most practical method of implementing changes in the present DNER organization and will further assist in the analysis of problems and participate in the development of corrective measures. It is anticipated that the Chief of Party will arrive in Brazil in advance of the other team members for the purpose of on-the-ground familiarization based upon which he will select the other team members. Further, the Chief of Party will assist the DNER in re-analysing the DNER-State relationship with a view to developing modifications consistent with the eventual reorganization of the DNER. Included in his responsibilities will be assisting the DNER in analysing bidding procedures and developing an effective system for controlling truck axle weights and the necessary follow-up to execute all DNER approved recommendations.

2.05 - Along with one other team member, the Chief of Party will remain on the project approximately one year after the other team members have completed their assignment to assist DNER in implementing adopted changes and making adjustments as necessary.

Duties of Programming and Planning Advisor

2.06 - The Programming and Planning Advisor will be principally involved in assisting the DNER in establishing and training DNER staff responsible for highway planning including the development of methods of analysis and determination of priorities for maximizing highway expenditures for development needs and objectives; this may include the development of a highway master plan. This task will include an analysis, with the appropriate DNER division of economic planning, traffic and available data relative to economic planning and traffic forecasts. He will assist DNER in organizing for and in compiling road inventories including road condition; economic and financial data and other information needed to develop master plans. He will also assist DNER in establishing truck weighing procedures.

Duties of Cost Accountant

2.07 - The Cost Accountant team member will be primarily responsible for assisting the DNER in establishing and training staff within the DNER to develop realistic and reliable cost data, will further assist the DNER in analysis of its present organization as it is related to cost accounting. Together with the appropriate DNER division or divisions, he will participate in the preparation of an implementation plan to include cost accounting procedures for procurement, repair, operation and overhaul, depreciation schedules, equipment rentals and the development of effective and accurate cost for force accountant construction. The proposed cost accounting system should further include adequate data to identify the cost of maintenance and construction by type of road surfaces. As a part of these procedures, this team member will also assist the DNER in preparing adequate internal audit procedures to ensure the effectiveness of the system once implemented.

Duties of Materials and Design Engineer

2.08 - The Materials and Design Engineer will be responsible to assist the DNER in establishing and training within the staff of the DNER responsible for standards, materials and specifications. In carrying out his duties, he will further assist the DNER in the conduct of the study of local materials, mapping the sources of such materials, their proper use, and based upon these findings, shall further assist the DNER in the development of construction specifications and improved engineering plans.

Duties of Construction Engineer

2.09 - The Construction Engineer team member shall assist the DNER and the Chief of Party in the analysis of the DNER-State relationship. His duties to the DNER outside his deputy function will be to assist the DNER in analysing its present overall organization, its construction contracting policies and based upon the results of such studies, will assist the DNER in developing an effective implementation plan. To help the DNER in ensuring higher uniform construction standards, prior to his departure this

team member will assist the DNER in preparing a construction manual for national distribution.]

2.10 - The major areas these US/BPR technicians will concentrate on are basically the same as described in earlier sections of this paper. These areas of emphasis were selected based on present knowledge of the apparent ills of the National Highway Department, the DNER's request for the assistance proposed, and investigation conducted during the project development (IR).

The Present DNER Organization

2.11 - The DNER was organized in 1945 under Law no. 8,463. It was placed under the Ministry of Transportation and Public Works where it still remains, but it is a self-governed institution under the law and is administered by the National Highway Council. The Director-General of the DNER is the operating head; he is appointed by the Minister of Transportation and Public Works.

2.12 - The National Highway Council consists of (1) a President who must be a graduate engineer, appointed by the President of the Republic; (2) the Director-General of the Department; (3) one representative from each of the Ministries of War, Labor and Finance; (4) one representative from the National Engineering Society; and (5) one representative from the College of Engineering of the University of Brazil.

2.13 - The National Highway Department's organization as well as its method of operating will be studied by the U.S. technicians the $ 400 thousand proposed loan is scheduled to pay for. Its present organization is divided into eleven divisions: Planning, Design, Construction, Maintenance, Administration, Traffic Control, Technical Studies, Purchasing and Supplies, Equipment and State Liaison. It has eighteen offices through which most of its functions are carried out.

SECTION III - THE SÃO PAULO PROJECT

A. The Borrower

3.01 - The São Paulo State Highway Department will borrow for the equipment and technical assistance to be procured from United States sources at an estimated total cost of $20 million.

3.02 - The State Highway Department of São Paulo was organized on December 26, 1946, by Law no. 16546, which was amended on April 13, 1951.

3.03 - The DER/SP is subordinated to the State Secretary of Transportation; but is responsible for its own administrative and financial operations.

3.04 - The DER/SP is charged with the following functions: (1) perform all technical services required to convert programs into completed highways, (2) permanently maintain the State road network, (3) police the use of the highways including the right of way, (4) regulate passenger transport by highway between "municipalities" (counties), (5) provide ferry service at river and sea crossings, (6) perform the necessary studies and revise the State Highway Plan at least once every five years, (7) collect and disseminate technical studies relating to highways, (8) participate as the State's representative in highway congresses, (9) exercise over the federal highways in the State all functions of the National Highway Department when such functions are delegated to the State by the DNER, and (10) all and any other activities compatible with the law which tend to promote the development of highway travel.

3.05 - The State Highway Council makes policy, approves programs, budgets and technical standards, financial plans and accounts, general rules for contracts, and accepts the State quota of the National Highway Fund on behalf of the DER/SP. The Council also must pass on all personnel matters, and assures compliance with State highway laws.

3.06 - The State Highway Council is made up of a civil engineer as President, one representative for the "counties", the Institute of Engineering, Agriculture, Industry and Commerce, and the Director-General of the DER/SP; a total of seven members.

3.07 - The Governor is required to pass on certain actions taken by the Council while others become binding when approved by the Council if not vetoed or amended by the Secretary of Transportation within thirty (30) days.

3.08 - Within the DER/SP, the Executive Council acts as the Board of Directors. It consists of the Director-General, as permanent President, the Division Directors, Engineer-Chiefs of Sub-Divisions, and the Chief Legal Counsel. This group judges the results of bidding and awards contracts, acts as an advisory body to the State Highway Council, reviews departmental operation manuals, and maintains a general surveillance on the works of the DER/SP. A detailed organization chart of the DER/SP is included as Exhibit 1 in Annex II.

B. Engineering Analysis

3.09 - The project consists of a highway maintenance equipment and technical assistance project in the State of São Paulo.

3.10 - The level of maintenance to be provided will equal the needs for maintaining the existing road network plus the roads to be added to the system over the next three years. The project includes in the implementation phase a systemized delegation of authority by the DNER to the State to maintain the federal roads. The time to completely effect the transfer of responsibilities for maintenance of federal roads will be based on results of studies to be conducted by the DNER and consultants at the National Highway Department (DNER) and the State Highway Department (DER/SP) during implementation of this project.

3.11 - A feasibility study was conducted to determine the equipment and technical assistance needs of the DER/SP.

Maintenance Organization (DER/SP)

3.12 - The Maintenance Division of the DER/SP embraces the Office of Director, the Office of Maintenance, State Force Work, Landscaping, Property Inventories, the Office of Highway Aid for Municipalities, the Office of Mechanics and Equipment, the Office of Traffic and Signs, the Highway Police, and the administrative force. The obligations of the Maintenance Division are administered in the field by regional subdivisions, of which there are five, and regional districts, of which there are two. These seven geographic subdivisions are further divided into 48 maintenance residencies, each containing twelve "counties" and 300-400 kilometers of roads; paved and unpaved. Each maintenance residency is headed by an engineer and is organized into office, materials storage, garage and shop, and pipe factory. (See Annex II, Exhibit 1 - DER/SP Organization Chart).

3.13 - Nearly 90% of the State's highways are less than ten years old, and half are less than five years old. The deterioration of the State's maintenance equipment has coincided with the progressive road construction program of the last ten years. Therefore, the State's maintenance capacity has been deteriorating concurrently with the rapid conversion to newly paved construction which demands the least immediate attention. With advancing age, these pavements are now in critical need of maintenance.

3.14 - The delegation of maintenance responsibilities to the DER/SP for federal roads within the State will be based on a determination of administrative and management capabilities. Such determination will be made in cooperation with the National Highway Department. Financial compensation to the State for maintaining federal roads will be based on cost of maintenance per kilometer which will be a part of the delegation of maintenance responsibility by the DNER to qualified states.

Engineering Plan for Execution of the Project

3.15 - Consulting engineers will be employed to advise and assist the State in planning and implementing maintenance programs including the implementation of reorganization recommendations. The consultant will be responsible for assisting the DER in developing and approving a training program for the adequate training of engineers, technicians, and equipment operators in maintenance procedures and use of maintenance equipment. For implementation of this phase of the state program the consultant will, with cooperation of the DER/SP, submit complete plans for organization of the program, integration of the existing DER personnel and facilities with the recommended state-wide plan, and additional facilities needed. The consultant, in carrying out this assistance will staff its own forces with engineers, technician-specialist and other key personnel as required to fully implement and carry to fruition the intent of this project. The DER/SP will cooperate with the consultant in all phases of the program, and the consultant will be given sufficient latitude and authority by the DER/SP in implementing the project. The proper organization of maintenance yards, shops, warehouses, and training of personnel shall be considered essential to an organized plan for procuring equipment. Equipment purchases will be made first for the existing network maintenance requirement and as new road construction warrants the purchase of additional equipment this will be ordered. The detailed purchase chronogram will reflect this order of purchasing.

Procurement

3.16 - The road equipment, spare parts, shop tools and supplies to be procured from the proceeds of this loan represent equipment and supporting spare parts that are not presently manufactured in Brazil. The equipment list (shown in Annex II) has been approved by the Ministry of Industry and Commerce. Procurement in the United States will be limited to those companies which have established parts and services facilities in Brazil and therefore will be able to supply parts and technical assistance for the equipment procured. The acquisition of equipment and supplies in Brazil will be carried out in accordance with local highway department regulations under the supervision of the consulting engineers.

Excess Property

3.17 - The Borrower shall utilize, with respect to imported goods financed under the Loan to which the Borrower takes title at the time of procurement, such reconditioned United States Government-Owned Excess Property as may be consistent with the requirements of the Project and as may be available with a reasonable period of time. The Borrower shall seek assistance from A.I.D. and A.I.D. will assist the Borrower in ascertaining the availability of and in obtaining such Excess Property. A.I.D. will make arrangements for any necessary inspection of such property by the Borrower or its representative. The costs of inspection and of acquisition, and all charges incident to the transfer to the Borrower of such excess Property, may be financed under the Loan. Prior to the procurement of any goods, other than Excess Property, financed under the Loan and after having sought such A.I.D. assistance, the Borrower shall indicate to A.I.D. in writing, on the basis of information then available to it, either that such goods cannot be made available from reconditioned United States Government-Owned Excess Property on a timely basis or that the goods that can be made available are not technically suitable for use in the Project.

Technical Feasibility

3.18 - The level of the proposed program is based on the nature and condition of the existing State road network, kilometrage to be added in the foreseeable future in the State of Sao Paulo, the present and anticipated traffic flow and the relative importance of the road network to the State's economy in terms of overall transport facilities. The equipment requirements in support of this determination are itemized and attached in Annex II. The total needs were established by actual reconnaissance of the roads to be maintained and repair shops to be equipped. The equipment on hand was then inventoried and that portion found to be less than five years old plus the units from five to ten years old that are estimated to still possess an average of two years remaining service life after repairs at reasonable cost were retained as part of the usable inventory, while the remaining obsolete and worn out machines and their spare parts were subtracted from the DER/SP's inventory. The equipment found to be from five to ten years old will be examined unit by unit during the implementation of the project, and only those specific units which can be repaired at reasonable cost and after repairs will produce more than two years of work will be retained.

3.19 - In the past, spare parts requirements were estimated to equal 10% of total equipment purchases by value. This rule of thumb clearly does not apply to São Paulo in face of the fact that 97% of domestic equipment manufacturers are located in São Paulo; therefore, spare parts are readily available from the manufacturers. Thus, in the project spare parts are being held to a minimum, and the requisitioning system is to be revised to fit the lower level of supplies to be maintained on the shelf. The spare parts to be purchased will then be selected after the basic equipment has been purchased in consultation with the manufacturer's local representative, with consultation of the technical consultant and approval by USAID.

3.20 - Prices of equipment and parts were obtained partly from prior contract experience and partly from catalog listings. This method is the one widely used and is generally considered as the most rational manner of determining the cost of maintenance equipment. A reasonably firm estimate of cost to the U.S. Government of providing this assistance is included in this report based on the above procedures.

Proposed Technical Assistance for Execution of the Project

Summary and Recommendations

3.21 - The technical assistance phase of the project will provide for training of the DER personnel during the project implementation period. It is anticipated that approximately the first half of the project implementation period will be required to study the DER organisational and operational structure by the consultant. This study would have as objectives the determination of requirements for improving the organizational framework of the State Highway Department. The second half of the technical assistance phase concerns the execution of organizational requirements as determined by the study, and the training of DER personnel concurrent with the procurement of maintenance equipment. The timing relation between the study and execution phases of the training program are not intended to be rigidly fixed to exclude the desirability of some aspects of these two phases to be conducted concurrently.

3.22 - Although the project consists of procurement of basic maintenance equipment and training in the proper use of this equipment, the technical assistance in the training of engineers and engineering technicians has as its principal objectives to train personnel in all functions of highway engineering. Among the major functions of a state highway department are highway planning engineering designs, development of adequate specifications, and the engineering supervision of construction projects. These latter functions will be considered to occupy a major position in training programs for this project, since the cost and degree of difficulties in maintaining constructed highways are directly related to how well highways are designed and constructed. (See Exhibit 8, Annex III)

3.23 - Although the training ground is to be Brazil, through "on-the-job" procedures, it is proposed that this program be supplemented by selected training programs conducted in the United States for the benefit of key positioned personnel. The United States organizations to provide training, type and duration of programs, and number of participants to be selected will be determined from the consultants' study of conditions and needs.

3.24 - The USAID Engineering Division representatives believe that the general objectives of the technical assistance program as outlined in this paper are sound and essential to the success of the project.

C. Economic Analysis

3.25 - The State of São Paulo is located in the South of Brazil, mostly within the Paraná-Uruguay watershed. Occupying an area of 247,564 square kilometers, it borders on the State of Minas Gerais in the north and northeast, the State of Rio de Janeiro in the east, the Atlantic Ocean in the southeast, the State of Paraná in the south and southwest, and the State of Mato Grosso in the northwest.

3.26 - The major part of the State consists of highlands between 300 and 900 m elevation. These physiographic regions are designated as the Atlantic Plateau, Paleozoic Depression and Western or Central Plateau. The mountain peaks, some as high as 2,422 m, occur in the parallel Serra do Mar and Mantiqueira mountain ranges which form a part of the eastern Atlantic Plateau. The coastal plain known as Littoral forms a separate physiographic region having a tropical climate characterized by intense rainfall and a lack of a pronounced dry season. Annual rainfall in this State ranges from 1,100 to 1,900 cm per year. Maximum precipitation occurs normally during the months of January and February. Average mean temperatures generally decrease from north to south, and these vary from 21 to 25 degrees Centigrade in January and February and from 13 to 20 degrees Centigrade during the relatively dry months of June, July and August.

Population

3.27 - The present population of São Paulo is estimated at 16,000,000. The State grew at an annual rate of 3.57% during the decade 1950-60. It is estimated that in 1970, the capital city São Paulo will contain 6,659,000 persons, more than 1/3 the population of the State. Urban centers will contain approximately 71% of the population. The urbanized southeast of the State is the most densely populated, and the rural southwest is the most sparsely settled area. Nearly fifty percent of the population is under twenty years of age, and it is estimated that in 1970 the birth rate will be 34 per thousand inhabitants and mortality rate will be about eight per thousand.

Agriculture

3.28 - In 1955, the agricultural production of São Paulo, represented 33.2% of the total national output. By 1960, this figure had dropped to 18.1% and in 1962 it was 22.0%. Much of the fluctuation in these figures is attributed to wide variations in coffee production.

The number of tons of coffee produced in the State was reduced by one half from 1959 to 1962. Nearly 10% of the areas previously devoted to coffee has been diverted to such crops as corn, rice, and cotton. The State of São Paulo contributes the following percentages of the total production of these crops: cotton 40%, corn 40%, peanuts 96%, bananas 17%, beans 95%, potatoes 42%, rice 16%, sugar cane 35%, and tomatoes 48%.

3.29 - Much of the agricultural land in São Paulo belongs to small farmers; nearly 98% of farms in São Paulo have 100 hectares or less (the average size is 62 hectares). Only 0.8% of the owners control areas larger than 1,000 hectares. There are approximately 20,000,000 hectares of arable land with about sixty percent of this being classed as coffee property. Much of this so-called coffee area, however, has been diverted to other uses including pasture lands.

3.30 - The livestock herds in São Paulo, among the largest in Brazil, are principally composed of cattle and pigs. Cattle herds in this State are increasing more rapidly than in other parts of the country, but pork production has not kept pace with the rate of increase in other areas of Brazil. São Paulo produces twenty-five percent of the nation's milk, and only the State of Minas Gerais exceeds this share of dairy production. Because facilities are available, São Paulo fattens and slaughters much of the cattle raised in Goiás, Minas Gerais, and Mato Grosso as well as its own internal production. Pigs, too, from Minas Gerais, Paraná, and Santa Catarina are trucked into the State for fattening and slaughter.

3.31 - There is, along the coastline of the State, a virtually untapped source of food supplies, fishing. These fishing grounds have not been developed, and with improved technology, particularly refrigeration facilities, it is anticipated that a substantial fishmeal industry can be developed.

Industry

3.32 - São Paulo has the most advanced industrial complex in Latin America. More than 11,000 different products are produced by industrial firms located in the State. Most of this industrial concentration lies in the City of São Paulo, but other centers close by and in order of their importance are: Cubatão, Sorocaba, Campinas, Jundiaí, Mauá, Santos, and Guarulhos. The industrial census of 1960 listed 36,129 establishments with 828,182 employees. Eighty-three percent of all industrial establishments employ less than twenty workers each, but the remaining 17% of the firms employ 85% of the total industrial work force. Less than two percent of the firms employ almost one half of all industrial workers in São Paulo. The value of total industrial output in the city of São Paulo has been estimated in 1965 to be more than one trillion cruzeiros.

3.33 - For many years people from Europe have migrated to Brazil in large numbers and particularly to the State of São Paulo. Many of these migrants possessed skills that have contributed greatly to the industrial development of this State. In 1962, skilled workers including engineers and technicians comprised 19% of the total work force; semi-skilled amounted to 54% and 27% were classed as unskilled.

3.34 - During the past decade, the fastest growing industrial sectors have been in transport equipment including automobiles, electrical and communication materials, plastics, and chemicals. Output by value is still greater for textile and food processing industries, but the share of these two is declining in relation to total value of production. São Paulo ranks first in the production of iron, steel, tubes, aluminum, and automobiles. Most of the tractors, motorcycles, turbines and meters are also produced in São Paulo. Other "paulista" contributions to the national economy are tires, radios, television, synthetic fabrics, shoes, paper, and celulose.

3.35 - Electric energy consumption of the State of São Paulo in 1965 was 14,833,489,953 kilowatt-hours, or a per capita consumption of 947 kilowatts. Planning agencies estimated that consumption will more than double by 1972. The second largest power project in the world, the Urubupungá, is now under construction on the upper Paraná River about 700 kilometers northwest of the city of São Paulo. The first unit, Jupiá, will be on the line in 1968; it will have a capacity of 1,400,000 kilowatts. The second unit, Ilha Solteira, with 3,200,000 kilowatts will come on the line in 1973. With the completion of this second unit, it is believed that São Paulo will have ample power available for a considerable number of years.

Benefit Cost Analysis

3.36 - This benefit cost analysis of the proposed highway maintenance equipment loan for São Paulo includes quantifiable benefits accruing to the producer, DER/SP, and to the consumer or highway user. No attempt, however, is made to estimate important indirect benefits from improved highways such as extending industrial or agricultural markets, reducing transport rates, or providing greater accessibility to schools, hospitals, etc. It is recognized that these benefits are significant, but often they are extremely difficult to calculate, let alone quantify. These benefits can become highly subjective, depending, in part, upon subsequent unknown public policy measures; further, important as they may be, indirect benefits can cause double counting.

3.37 - An optimum highway maintenance program has a practical limit. The newly-constructed road, when it is first completed, is at its maximum level of efficiency. No maintenance program can improve or better this new highway. Optimal maintenance may be defined as that which assures to producers and users alike the benefits which were anticipated and used to justify the original construction of the highway. It is thus clear that maximum benefits will accrue to both producers and consumers when the highway network is subjected to a program of optimal maintenance.

3.38 - Highway equipment machinery has a useful economic life based on the unit's ability to perform efficiently. But at some point in the life of the machine, costs of repair and down time become such that it is no longer economically justified to continue operating this equipment. The physical life may be more than the economic life of the machine. Technological advance is another factor affecting the economic life of maintenance equipment.

3.39 - One of the problems facing the DER/SP is the aged and deteriorated condition of much, if not most, of the present inventory of highway equipment. With this equipment it was not possible to adequately maintain the highways. The proposed loan will provide urgently needed new equipment for replacing a substantial portion of the present inventory. With this replacement, benefits will accrue to producers and consumers.

3.40 - The economic life of maintenance equipment can be measured by criteria of productive efficiency, repair costs, and value on the used equipment market. An analysis of these factors compared with the cost of acquisition and operating new machinery will determine whether a given unit of equipment should be repaired or replaced. A unit of equipment has reached the end of its economic life when a new unit of equal productivity may be used by the owner at equal or less annual cost. The type of records, observation, and analysis needed for such a determination were lacking in the DER/SP in the present instance. Therefore, the Consultant based upon his experience in Brazil and other countries has drawn upon his body of knowledge to develop factors and criteria which formed the basis for determining which equipment should be retained and which had exceeded its economic life.

3.41 - Engineering practice indicates that highway maintenance equipment has a useful life of 10,000 hours, assuming a normal mix of equipment. The Consultants found that in Sao Paulo due to the lack of reliable statistical data (cost records) it is impossible to verify the applicability of this engineering experience.

3.42 - The decision to replace equipment in São Paulo was based on inspection of the existing machines. As is stated in paragraph 3.18, the Consultants recommend that equipment less than five years old plus the units from five to ten years old estimated to still possess an average of two years remaining serviceable life after repairs at reasonable cost be retained as part of the usable DER inventory. The remaining obsolete and worn out machines and their spare parts should be subtracted from the total inventory. Equipment between five and ten years old will be examined unit by unit during implementation and only those that after repair at reasonable cost will produce a reasonable useful life will be retained as part of the DER's inventory.

Benefits to Producer

3.43 - The justification for the expenditure of public funds in the construction of new highways has a corollary requirement, namely that those highways once constructed must remain in service virtually in perpetuity. Universal experience suggests that a commitment to invest in highways must be protected and preserved by an optimum program of highway maintenance.

3.44 - Maintenace of roads is a major item of cost to the Highway Department (DER) in the State of São Paulo. Visual observations by an independent consulting firm concluded that the current level of surface maintenance of the State highways is not over three fourths that which is commonly considered desirable.

This condition of less than optimal maintenance could within a period of years, lead to a program of relatively expensive reconstruction of the existing road network.

3.45 - São Paulo, as the most highly developed state in Brazil, has some 135,000 kilometers of highways and roads of all types. The State network comprises 13,711 kilometers, of which 7,741 are paved and the balance of 5,970 being of dirt or gravel construction. The remaining kilometers of roads are in cities, villages

or counties. The consultant estimates that by the end of 1968, at which time the maintenance equipment will have been delivered, there will be a paved network of 9,870 kilometers and 5,150 kilometers of dirt roads.

3.46 - 1965 data furnished the consultant by the DER show the cost of reconstructing (herein defined as rebuilding the roadbed itself as well as paving or asphalting the surfaces) an average kilometer of paved road was $ 25,000 (Cr$ 55,000,000). The cost per kilometer of repaving a road surface in São Paulo is estimated by the consultant to be $ 8,200 (Cr$ 18,000,000).

Condition I

3.47 - Full maintenance expenditures are assumed, but equipment obsolence and inefficiency provide only limited or partial maintenance service. Under this condition, repaving is required at 13-year intervals. This represents the approximate present level of highway maintenance programs in the State of São Paulo. Total cost will be as follows:

9,870 kms x $ 8,200 = $ 80,934,000

3.48 - Assuming annual repaving of one-thirteenth of the highways the annual cost to the State under this condition is:

$ 80,934,000 ÷ 13 = $ 6,225,690

Condition II

3.49 - Assume optimum maintenance with full maintenance expenditures and modern, efficient equipment. Under these conditions, the useful life of the roads will be extended to an eighteen-year period, the original planned life of the road; thus, repaving of these highways will become necessary only at the end of the life of the original pavement and reconstruction will be avoided. This represents the anticipated future level of highway maintenance in the State of São Paulo after the implementation of the proposed

project. The total cost will be:

Paved 9,870 km x $8,200 = $ 80,934,000

Assuming the adequate level of maintenance proposed in this project: annually, one-eighteenth of the highways would require repaving; the annual cost under condition II will thus be:

$80,934,000 ÷ 18 = $ 4,496,330

3.50 - For all categories of highways in the State of Sao Paulo, the Consultant has calculated from DER/SP records that, over a ten-year period expenditures for highway maintenance have averaged $ 800 per kilometer. This estimate does not include any provisions for the betterment or the upgrading of existing road surfaces. Thus, the annual maintenance cost to the DER for the existing State highway network under both conditions I and II is:

(9,870 + 5,150) x $ 800 = $ 12,016,000

Since the 1968 system has been considered as the appropriate base for computing benefits, applying the USAID analysis to the paved system, (9,870) x ($8,200) equals $ 80,934,000 per replacement cycle.

Under Condition I, annual cost is	$ 6,225,690
Under Condition II, annual cost is	$ 4,496,330
Annual saving to owner under USAID formula	$ 1,729,360

3.51 - The average cost per kilometer of maintenance of $ 800 was used for both conditions because of the lack of sufficient cost data to determine what the average cost per kilometer will be with the new equipment and an optimum maintenance program. It is felt, however, that this comparison, while not completely accurate on this basis, gives a fair accounting of the benefits to accrue to the DER. Further, it is recognized that the increased total cost of operations at the anticipated higher level of maintenance would not necessarily be balanced by the savings in lower per unit costs. In the absence of reliable data the assumption employed here i.e, that the additional higher costs would be balanced by the saving of per unit operating costs, does not materially affect the benefit cost ratio demonstrated herein.

Benefits to Consumers

3.52 - For the Consumer or highway user, well maintained road surfaces provide a relatively uniform level of transportation services. But when levels of maintenance service are less than adequate, surface damage to paved highways accrue rather rapidly. Unless an improvement in the standards of road maintenance occurs, highway surfaces deteriorate at an accelerating rate. Ultimately, surface conditions will reach a point at which the pavement structure begins to disintegrate. Complete destruction of the highway will then take place.

3.53 - During the period of neglect, vehicle operating costs increase. At first highway surfaces roughen, and the user is obliged to reduce vehicle speed in order to avoid potholes. This raises operating costs, and damage accelerates to a rate involving ten percent or more of the paved surface each year; at that stage the pavement begins to disintegrate. Thus, the consumer or user of a neglected highway must pay the penalty of increased operating costs, greater vehicle repairs, more time required to travel a given distance and other possible losses resulting from accidents.

3.54 - Research previously conducted by the consultant in Minas Gerais would indicate that on highways of comparable geometric characteristics, there is a difference in operating costs between highway surfaces in good condition and those in bad condition. The range of savings appears to be at least 8% on paved surfaces and up to 22% on unpaved.

3.55 - Although maintenance in São Paulo has not been adequate, nevertheless, the São Paulo road network has not as yet deteriorated to the level of the Minas Gerais system. Hence, the consultant has concluded that the savings in vehicle operating costs to the road users resulting from an optimal maintenance program, will not be as great as in Minas Gerais. Specifically, the consultant estimates that the savings to road users in São Paulo of an optimal maintenance program compared to the present level of maintenance, are likely to be of an order of magnitude of 2% on paved roads and 4% on unpaved roads. These savings have been

calculated for commercial vehicles; for passenger vehicles, it is estimated that, with a light truck used as comparison, only half as great a saving will accrue. The Mission considers this conclusion to be a reasonable one.

3.56 - The following table shows the 1966 vehicle operating cost in São Paulo:

1966 Vehicle Operating Cost in São Paulo

	Paved		Unpaved	
	Ave. Speed	Oper.Cost US$ per km	Ave. Speed	Oper.Cost US$ per km
Passenger Car	70	.04	50	.07
Light Truck	56	.06	40	.10
Medium Truck (Gas)	45	.11	30	.19
Heavy Truck (Diesel)	36	.10	26	.22

3.57 - Applying 2% and 4% saving factors noted above to the operating cost shown in the above table, annual road user savings are computed as shown below:

PROJECT ROAD USER SAVINGS

Paved Roads

	Operating Cost cents/Km Present (U_1)	Future(U_2)	Savings %	ADT x	365 days x	9870 Km	x(U_1-U_2)	=	$ per year
Passenger Cars	4,318	4,273	1.0	1114	406,610	4,013,240,700	(.045)		1,806,000
Light Trucks	6,136	6,022	1.9	133	48,545	479,139,150	(.114)		546,200
Medium Trucks	11,127	11,000	2.0	486	177,390	1,750,839,300	(.227)		3,974,400
Heavy Trucks	10,409	10,204	2.0	75	27,375	270,191,250	(.205)		553,900
Buses	11,227	11,000	2.0	79	28,835	284,601,450	(.227)		646,000
Subtotal - Road User Savings on Paved Highways									$ 7,526,500

Unpaved Roads

	Operating Cost cents/Km Present (U_1)	Future(U_2)	Savings %	ADT x	365 days x	5150 Km	x(U_1-U_2)	=	$ per year
Passenger Cars	7,454	7,295	2.1	212	77,380	398,507,000	(.159)		633,600
Light Trucks	10,454	10,045	3.9	73	26,645	137,221,750	(.409)		561,200
Medium Trucks	19,364	18,591	4.0	148	54,020	278,203,000	(.773)		2,150,500
Heavy Trucks	21,818	20,954	4.0	9	3,285	16,917,750	(.864)		146,200
Buses	15,909	15,273	4.0	18	6,570	33,835,500	(.636)		215,200
Subtotal - Road User Savings on Unsurfaced Roads									$ 3,706,700
Total Annual Road User Saving After Full Project Implementation 2/									$11,233,200

1/ Cruzeiros conv rted to dollars at Cr$ 2,200 = US$ 1.00.
2/ Assuming 1968 to be first year of complete implementation
3/ Any differences are the result of rounding.

Sao Paulo Average Daily Traffic

3.58 - During the period 1960 through 1964, traffic counts were taken in Sao Paulo by both the DER/SP and the DNER. Additional unpublished traffic counts, ADT, were analyzed to see if recent traffic growth patterns continue to follow those of the early sixties. The consultant concluded that the present level of traffic growth as established by the 1960-1964 data is likely to be maintained. Further, projections of the ADT have been made for the year 1968 based on the estimated 12% historical rate of growth in the number of vehicles using the Sao Paulo highway system. The preceding Table reflects these figures; it is presented in the benefit cost section of this application.

3.59 - The Mission, after careful examination, believes that this is a conservative estimate. Since the historical rate of 12% occurred during a period, 1960-64, during which the economic activity in the Sao Paulo region was, particularly in the years 1962-64, at a low level, it is anticipated that the industrial and agricultural activity during the years through 1968 will be at an appreciably higher level.

3.60 - This projection is further supported by the vehicle registration in Sao Paulo. In 1961, there were 451,010 vehicles of all types registered in the State of Sao Paulo. A total of 733,946 vehicles were registered in 1965. The rate of increase in the vehicle registration in Sao Paulo has, during this period, averaged about 13% per annum.

3.61 - It must be recognized that highway traffic in the State of Sao Paulo reflects not only local activity but producers and trade in the surrounding states as noted by GEIPOT 1/ in a recent report: "Like a suction pump, the State of Sao Paulo, having the best highway system in Brazil, draws all goods produced in Northern Parana, part of Minas Gerais, and Mato Grosso, and after processing these goods redistributes them to the rest of the Country..."

1/ Executive Group for Transport Operation Planning

3.62 - In addition, with the improved highways in the State of São Paulo increased traffic can be anticipated from neighbouring states. GEIPOT has also noted that; "Countless highways in São Paulo are congested. Seventeen toll-stations registered an extraordinary traffic increase over the key highways, which already require the construction of second lanes. Other highways, having reached their traffic limits are now in a condition of permanent congestion..."

3.63 - Benefits have been quantified under most conservative assumptions, and every effort has been expended to avoid any double counting of benefits; thus indirect or other benefits are not included in the benefit/cost ratio. There will be two quantifiable annual benefits; one for the producer (DER) and the second for the consumer or highway user.

3.64 - The length of time, or what might be more accurately termed the amortization period, is limited to the useful life of the highway maintenance equipment. It is realized that much of the equipment will be useful to the DER after the amortization period. Nonetheless, it is proposed that most of the equipment for this calculation be amortized within an eight-year period. A small portion, principally boats and shop equipment, will be amortized over a twenty-year period. The eight and twenty-year amortization periods represent the estimated economic life of the different types of equipment.

Amortization Periods & Int.	Fund Source	Amount	Annual Factor/1	Annual Costs/2
20 yr life 7%	US Import	850,000 x		
	DER/SP	2,560,000 x		
		3,410,000xx	.09439	321,870
8 yr life 7%	US Import	43,150,000 x		
	DER/SP	41,780,000 x		
		84,930,000 x	.16747	14,223,227
	Total Annual Cost in CR $			14,545,097
	Total Annual Cost in US $			6,611,400

Benefits are:

Total Benefits to highway users	$ 11,233,200
Total Benefits to producer DER	1,729,360
Total Annual Benefits	$ 12,962,560

Ratio of Benefits to costs:

Annual benefits $\frac{\$\ 12,962,560}{6,611,400} = 1.96$

/1 This factor is the necessary uniform annual payment to be made each year for eight and twenty years respectively at the applicable interest rates which will retire the debt with interest.

/2 Cruzeiros in millions.

The benefit cost ratio shown above has been calculated using two direct benefits; the lower cost to the DER and the saving in operating costs to the road users. In spite of this restriction the project still shows a favorable benefit cost ratio. Moreover, those benefits which, due to inadequate data, are not included really make up the objectives for doing the project. The indirect benefits and the institutional change this project will generate, formed the basis for the Mission's initial willingness to consider financing this project, and are the major reasons for the Mission's recommending approval of the proposed loan.

3.64a - The Mission benefit-cost analysis could have been presented under another approach, as is illustrated below.

3.64b - The benefit to be achieved by the project, in the opinion of the State's Consultant, may be realized by State Highway Department and road users at no increase in annual maintenance cost. The present annual costs are considered sufficient to accomplish an optimum state of maintenance as well as

to provide perpetual renovation of the maintenance equipment fleet through equipment rentals charged to the maintenance activity. These benefits will be realized by the use of modern, efficient equipment in a revitalized and reoriented maintenance program.

3.64c - The analysis which follows measures the total cumulative benefit accruing to the owner and public during the mimimum estimated eight-year life of the equipment to be purchased, and measures it against the total cost of the investment which is required to accomplish the anticipated result.

I - BENEFITS

3.64d - The saving which will accrue to the owner of the paved highway system is computed for each of the eight years by multiplying the anticipated length of system by the estimated $175.21 1/ per km of saving which will accrue to the owner through improved maintenance and consequent extension of pavement life. Each annual saving is then reduced to present value through the application of discount factors reflecting the estimated 9% opportunity cost of capital. That computation produces an anticipated saving to the owner for the eight-year period which has a present value of $11,985,940.

3.64e - Vehicle-km of travel for each traffic category (passenger, light truck, medium truck, etc.) will be computed for each of the eight years, utilizing the 12% annual growth factor which is projected, based on past growth rates. Each year's level of traffic in each category is multiplied by the unit user savings attributed to that category; the sum represents a total user saving for the year. Finally, each total annual saving is discounted to a present value, using the factors for the 9% opportunity cost of capital. These present values are then totalled.

3.64f - The present worth of the user benefit, under this procedure, for the entire eight-year period is thus found to be $83,395,280.

In summary:	benefit to owner is	$11,985,940
	benefit to user is	83,395,280
Present value, total benefit		$95,381,220

1/ $\frac{\text{Savings to owner} - \$1,729,360}{\text{1968 paved network} - 9,870} = \$175.21$

II - COSTS

3.64g - The cost of achieving the benefit is measured by the present worth of the initial capital expenditure (loan amount plus the state contribution - $40,896,000) discounted to present value at the 9% rate. These funds will be disbursed in approximately equal sums over each of the benefit analysis period. The resultant cost figure is (0.956 x 22,632,000) + (0.874 x 18,264,000) = $37,598,930.

3.64h - It is believed that perpetual renovation of the equipment fleet will be realized within the present expenditure of $800 per km for maintenance. Since the asset will not be depleted in the 8-year analysis period, that portion of the maintenance expenditure which is expected to provide renewal should be considered an offset against a portion of the initial investment cost. It is believed that about $130 per km maintained should be considered equipment renewal cost. Reducing these annual expenditures to a present value produces a total of $8,893,170 (the total present value of that portion of maintenance expenditure which is expected to provide equipment renewal.

3.64i - Net present worth of costs = $37,598,930 - $8,893,170 = $28,705,760.

III - BENEFIT-COST RATIO

3.64j - Dividing benefits by costs produces a ratio of

$$\frac{\text{Total present value of benefits} - 95,381,220}{\text{Net present value of costs} - 28,705,760} = 3.32$$

D. Financial Analysis

3.65 - The Financial plan for the project established that $19 million of imported equipment and $1 million of technical assistance will be financed by A.I.D. and $20 million (cruzeiro equipment) of locally manufactured equipment will be financed by the Borrower in accordance with the following schedule:

(Thousands of U.S. Dollars)

	1966	1967	1968	1969	Total
A.I.D. Dollar financing	180	11,075	8,565	180	20,000
DER cruzeiro financing		11,046	9,318		20,364

The total cost of the proposed project is shown in the table below:

(In thousands)

	AID	DER/SP
Equipment	19,000 1/	20,364
TA	1,000	290
Improvement of physical plant	0	5,040
	20,000	25,694

1/ $19,000 for U.S. purchases represents:

List price plus freight	=	$16,400
Contingencies	=	2,600
		$19,000

2/ DER contribution shown in US dollars at Cr./200 = US$1.00

Source and Application of Funds

3.66 - As can be seen from Table I, on page 36, the State of Sao Paulo derives a portion of its resources from the National Highway Fund (NHF). The NHF is based on a federal tax on motor fuels and lubricants. It originated with Federal Decree-Law 26/5 of September 1940. The law has been modified several times over the years. In 1964, the NHF was changed through the adoption of the Sole Tax on Lubricants and Fuels which ties the tax resources of the National Highway Fund to the price of imported crude oil and thus the exchange rate. This new law adopted a fuel and lubricant pricing formula which eliminated a subsidized exchange rate for the internal pricing of petroleum and increased the tax rate; together these resulted in an 80% real increase in revenues to the NHF. The Fund is administered by the National Highway Department (DNER), and is distributed, by law, as follows:

40% to the DNER
48% to the States
12% to municipalities

3.67 - The State quotas are established according to area, population, and consumption of petroleum products. Under this formula São Paulo has, over the past five years, received 24% of the total amount set aside for the states. As can be seen from Table I, the State received a fairly constant Cr$ 35 to Cr$ 38 billion from this source, thereby maintaining its revenue in real terms, until 1965 when as a result of the new law, revenues from this source increased by 80%.

3.68 - The major portion of the DER's revenues as can be seen from Table I, comes from the State, in the form of the matching fund earmarked tax receipts, the capital expenditure account of the State agency for planning and investment (PLADI), and special budget appropriations. While the special state matching fund has not achieved parity with the NHF revenues, the State has through these other sources provided more than an amount equivalent to the NHF revenues. In 1964, for example, out of total receipts of Cr$ 218 billion, slightly more than one-half was provided

out of extraordinary resources, and in 1965, the Capital Expenditure Fund supplied Cr$ 143 billion out of total Cruzeiro resources of Cr$ 257 billion. Indeed, over the 1961 to 1965 period, the State provided 75% of the DER's funds. This reflects the high priority accorded highways by the State. The amount of State funds applied to highways have claimed a mounting share (6.2%, 6.1%, 4.8%, 10.4% and 15.8%) of the State's budgeted revenues over the past five years. With respect to State resources, no attempt has been made to analyse whether or not the State is spending too much or too little on highways in relation to other sectors of the State economy. The Mission is of the opinion that the leverage provided by this loan is not sufficient to influence inter-sectoral allocations of the State budgets which is the result of a complex of political and economic pressures.

3.69 - On the expenditures side, Table I shows a dramatic increase in expenditures for construction in 1964 and 1965, a slightly increasing level of maintenance (in the face of a growing road network), and a better than 40% increase in paving and improvements in 1964 and 1965. It is apparent from this Table that maintenance has been the expendable item. The request for this loan and the increased expenditures projected for maintenance in future years is a reflection of this past neglect.

3.70 - However, the problem is larger than this. It is apparent from the previous analysis that the expenditures of State funds in the highway sector is subject to sudden sharp increases and declines. It is probably a reflection of inadequate planning. The consequence of course is the necessity to recur to programs like the one proposed herein to be financed as a corrective measure. A major purpose of this loan is to improve the management and planning of the highway network in São Paulo in order to achieve a balanced maintenance and construction program.

3.71 - Table II projects the proposed DER program budget for the period 1966 through 1967 (as a result of a misunderstanding with the consultants, projection figures were prepared using 1966 cruzeiros while the historical data was prepared using average 1965 cruzeiros, this

resulted in an increase of approximately 18% the difference between the average 1965 and January 1, 1966 index). This program budget projects a twofold increase in expenditures commencing in 1968. On the expenditure side, this increase reflects the DER's commitment to an increased level of maintenance and betterment and to the proposed five-year highway construction program.

3.72 - Insofar as maintenance and betterment are concerned, a complete reclassification of accounts by the DER as well as the lack of a clear distinction between these two activities makes a meaningful comparison of projected and historical maintenance costs impossible. The DER however proposes financing for these combined activities at 25% of total resources in 1967, and approximately 18% thereafter. This is a substantial increase from previous levels both as a percentage and as an absolute amount. A major task of the consultants in providing technical assistance to the DER will be to develop an adequate cost accounting system which will enable better measurement of maintenance cost and consequently allow better maintenance programming. Loan agreement covenants and implementation agreements will provide for joint USAID-DER review of maintenance and training budgets during project implementation.

3.73 - The investment program as projected includes the construction of 2,679 km of new paved roads, including a $ 150 million dollar circumferential highway around São Paulo, and the completion of the east-west highway, connecting Santos with Mato Grosso and Paraguay. The circumferential beltway is a part of the larger problem of urban transport in the São Paulo metropolitan area for which the Mayor of São Paulo also seeks financing for a proposed subway system.

3.74 - Execution of the DER program will require more than a twofold increase in income, and will require a substantially greater state contribution to the DER plus external financing. The DER has stated its intent to obtain IDB financing for the circumferential beltway, and is presently attempting to marshall support for such a loan by obtaining GEIPOT approval of its program. GEIPOT, an executive group established by the Government to work with the World Bank on the transport study now in progress is

rapidly becoming a major factor in influencing Brazilian transport planning; therefore, GEIPOT approval of the DER plan will assist the DER in obtaining IDB financing.

3.75 - While the level of revenues projected for 1966 is realistic, the twofold increase in revenues and expenditures from 1966 to 1967 and thereafter are dependent on the support of a new state administration to be elected this year and receipt of external financial assistance. In view of this, it is obvious that the program will be subject to continuous review. In view of the urgency, however, of new highway investment, the State of São Paulo is certain to provide an even higher level of assistance than in previous years.

3.76 - The procurement of maintenance equipment under this project as shown on the disbursement side of the projections is Cr$ 47,919 million for 1967, and Cr$ 38,133 million for 1968 with purchases of a decreasing order of magnitude after the project is completed. The 1967 and 1968 expenditures represent approximately 15% to 18% of the greatly increased 1965 and 1966 expenditure levels, and between 25% and 35% of total DER annual expenditures from 1961 to 1963. In view of the operational needs of the system, it is obvious that the State, if forced to finance this capital investment from revenues rather than borrowing could not carry out such a program without cutting deeply into operations or other investment.

TABLE I

SÃO PAULO

(Cruzeiros in Millions)

Constant Cruzeiros 1/

RECEIPTS

	1961	1962	1963	1964	1965
National Highway Fund	35,784.09	35,426.12	36,198.09	38,635.57	64,077.18
State: a) Matching	11,100.91	7,815.93	6,151.24	38,635.57	46,294.97
b) Tax Receipts	8,276.86	11,707.56	8,357.51	5,260.93	3,790.33
c) Capital Receipts	51,174.42	50.756.83	24,589.43	15,656.35	143,000.00
d) Misc. Revenue	5,574.91	3,226.43	1,907.79	802.20	388.24
Extra budgetary state	34,110.91	23,783.88	32,606.34	119,169.01	311.53
Total	147,022.10	132.716.75	109,810.40	218,159.63	257,862.25

EXPENSES

New Construction	17,236.89	14,887.61	8,768.80	69,271.41	83,668.02
Maintenance	8,842.25	8,139.57	8,360.70	7,137.31	10,315.14
Paving and Improvements	62,314.77	51,915.31	38.398.36	81,303.46	86,546.84
Administration	51,530.80	51,197.82	53,188.77	50,226.09	68,257.04
Miscellaneous	683.11	577.41	485.67	306.24	3,205.16
Total	140,607.82	126,717.65	109,202.24	208,244.52	251,992.25

1/ Cruzeiros expressed based on Getulio Vargas Foundation 1965 General Wholesale Price Index.

TABLE II

DER/SP PROJECTED RECEIPTS
(MILLIONS OF JANUARY 1, 1966 CRUZEIROS)

	1966	1967	1968	1969	1970
National Highway Fund	91,171	101,789	108,760	116,311	124,488
State a) Matching	91,171	101,789	108,760	116,311	124,488
b) Tax Receipts	3,732	6,134	6,747	7,422	8,164
c) Capital Receipts	55,560	358,520	394,673	513,822	444,501
d) Miscellaneous Revenue	1,450	1,517	1,641	1,778	1,928
e) Matching Funds Owed	46,790	-	-	-	-
f) USAID Loan	-	24,760	19,240	-	-
g) Contribution to Equipment Purchase	-	25,031	20,940	15,799	9,120
	289,874	619,540	660,761	771,443	712,689

EXPENDITURES
(MILLIONS OF CRUZEIROS)

Current Disbursements	73,580	107,562	122,034	138,181	158,320
Capital Disbursements					
a) Equipment 1/	2,700	47,919	38,133	14,536	5,752
b) New Construction	196,418	433,700	470,360	587,960	518,930
c) Other	1,966	8,351	6,292	5,241	5,435
Debt Service	805	987	1,195	2,805	4,303
Miscellaneous	14,407	20,702	22,137	23,695	20,400
	289,876	619,221	660,151	772,418	713,140

1/ Includes disbursements for both U.S. and nationally procured equipment.

RELATIONSHIP OF PROPOSED SAO PAULO HIGHWAY EQUIPMENT LOAN

TO BUDGET EXPENDITURES FOR STATE OF SAO PAULO

1. On the basis of a three year plan for the State of Sao Paulo prepared by the Sao Paulo Planning Agency, 1/ State investment is being allocated over the period 1964-1966 in the following proportions:

	Percent
Education, health, housing, other social investment	25
Agriculture	10
Transport: Highways	26
Railways, other	5
Electric energy	26
Public safety, administration, other	8
Total	100

The source of these funds is as follows:

	Percent
State revenues	80
Share of federal taxes (e.g. gasoline and electric energy)	7
Borrowings - internal	8
Borrowings - external	4
Other funds	1
Total	100

1/ "Plano de Desenvolvimento Integrado - PLADI" - 1964-1966 Sao Paulo, Brazil (1964)

2. The growth rate of the State of Sao Paulo in real terms, averaged 8.5% in the period 1955-1960, as compared to a national growth rate of 5.8%. Growth in Sao Paulo is expected to continue at the level of 7% per annum over the next decade.

3. Investment as a percentage of gross product in Sao Paulo amounted to about 25% in the period 1959-1962, and is projected to amount to about 19% in the period 1964-1966. This compares favorably with the projected Federal Government rate in 1966, amounting to about 13%.

4. The above distribution of investment and resources indicates that the State is making a reasonable effort in financing its development expenditures. As will be noted, external loans represent only 4% of these expenditures. The Mission did not attempt to judge the proper balance of investment as between sectors, but the heavy emphasis on infrastructure in the State plan appears to be generally in line with the national priorities for investment.

5. The State budget expressed in U.S.$, for 1965 is approximately $545 million; the deficit amounts to less that 5% of total expenditures. The State Highway Program for 1965, amounting to the dollar equivalent of about $114 million, represents about 21% of total budget expenditures! Highway maintenance expenditure for 1965 (based on a maintenance cost of $800 per Km over the existing networ of 14,000 Kms.) is estimated at about $12 million or roughly 10% of total highway investment. The proposed A.I.D. loan of $20 million to be disbursed in tranches of approximately $6 to $7 million per year over a three-year period represents, on an annual basis, about 6% of total highway investment and about 1% of total budgeted expenditures by the State.

6. Given the diminimus relationship of the proposed A.I.D. loan to both the total State budget, and to highway investment, it does not appear feasible to attempt to use the proposed loan to bring about any possible reallocation of State investment, should this be necessary. However, within the highway sector it is anticipated that this loan will bring about significant institutional improvement, as set forth in Section IV.

Repayment Capacity

3.77 - Between 1956 and 1962, a series of five ten-year loans were negotiated by the DER/SP with the Caixa Econômica do Estado de São Paulo. This principal sum of these loans totaled Cr$ 4,795,000,000 (approximately equivalent to $ 30,400,000 exchange value at the time the loans were executed). The status of each of these loans at the end of 1966 is set forth below. The listed amount of the outstanding debt includes both principal and interest according to the agreed plan of amortization:

Loan Number	Year of Final Payment	Total Outstanding Amount	Annual Payment
I	1967	$ 52,593.55	$ 52,593.55
II	1968	105,187.09	52,593.55
III	1970	187,842.27	56,352.68
IV	1971	692,612.30	140,870.29
V	1972	248,172.05	50,475.67
		$1,286,407.26	$352,885.74

3.78 - The maximum payment of the outstanding indebtedness will be due in 1967, a sum of $ 352,885.74. Payments thereafter will diminish until the final payment in 1972. Service of the existing debt in 1967 will constitute about 8.1% of the minimum anticipated revenues of the DER/SP.

3.79 - These figures suggest that the State of São Paulo has been able to install its large system of highways without incurring long-term indebtedness of significant proportions. There are no outstanding liens against the State's share of the National Highway Fund.

3.80 - Payment of interest and repayment of principal on the loan will equal $ 1,654,000 on the total disbursed balance of the AID loan in 1969; this represents only 5.1% of the projected 1969 revenue; total debt service is less than 6.1% of 1969 income. This sum represents an extremely low level of debt service and leaves the DER with the flexibility of obtaining a considerable amount of external financing for its construction program. The prospects for repayment of this loan are good.

Loan Terms

3.81 - The Brazil Mission has recommended that the loan be made on the following terms:

> 18-year amortization including the 3-year grace period, interest at 3-1/2% per annum. It is expected that the Federal Government will adopt a two-step payment option; thus the terms to the Government of Brazil will be 40 years repayment, including the 10-year grace; 1-1/2% interest during the grace period and 2-1/2% thereafter.

Interest Rate

3.82 - The project here proposed to be financed is a highway equipment project -- a non-revenue producing project. Hence, a departure from the 5-1/2% interest rate appropriate for revenue-producing projects appears appropriate in this case. The 3-1/2% rate has been recommended on the grounds that in Brazil a previous project of a similar nature, namely, the Minas Gerais Highway Equipment Loan, was made by the Agency at a 3-1/2% interest rate. We feel that there is no reason to depart from this precedent and that the 3-1/2% rate is a reasonable one under the circimstances. A concessionary rate to the operating entity, the Sao Paulo Highway Department, is in order in this case as an inducement to adopt the institutional changes which are quite fundamental and which are contemplated in this project. Moreover, as the two-step option is certain to be adopted by the Federal Government, there is no question of the U.S. receiving a lower interest rate. Rather, the question is as to the "spread" on the Brazilian side between the interest payable by the Brazilian Government under the payment agreement and the interest payable by the Highway Department. We think that there are no compelling reasons why the spread should be enlarged in favor of the Federal Government.

Sao Paulo

3.83 - At the same time, however, the Mission is of the opinion that a distinction should be made between Sao Paulo and the other States in Brazil. Sao Paulo has the highest per capital income and has a greater degree of financial capacity. Hence, the terms to Sao Paulo are substantially harder than they were in the Minas case, in the following respects:

1. The amortization period is 18 years instead of 20, as in the case of Minas;

2. Sao Paulo is financing over 50% of the cost of the project; and

3. The Sao Paulo Loan is exclusively for foreign exchange costs of imported equipment, whereas in Minas 50% of the loan funds were available for local costs.

Term of Loan

3.84 - The suggested term of 18 years exceeds the generally accepted U.S. useful life (about 8 years) of the equipment; however, in Brazil, the useful life of equipment is considerably longer (estimated between 10 and 13 years) which reflects the lower costs of repair and maintenance of equipment locally. Further, the somewhat longer term, i.e., 18 years versus 10-13 years, is recommended as an inducement to the State Highway Department to bring about the proposed institutional objectives. (See page 42, Section IV, subject loan paper)

E. Implementation Plan

3.85 - The plan for the implementation of the Sao Paulo project is based on the three identifiable phases of the project:

1) Negotiation, signing and the registration of the loan agreement, hiring a consulting firm satisfactory to A.I.D., (including the DER/SP meeting all initial conditions precedent);

2) The development of detailed chronograms for purchases in Brazil (the Borrower's contribution) and purchases in the United States. This phase includes the start of the reorganization studies;

3) The third phase is the actual purchasing and implementation of the recommended changes in the DER/SP's organizational structure and any modifications in operations necessary to give the revised organization effective meaning.

3.86 - The time required to fully implement the Sao Paulo project is estimated at 24 months. The consultants will be required to remain on the job for 30 months to further observe the Department's first six months of operations under the new organization.

3.87 - The reorganization study will take one year. The execution of modifications will require eighteen months which is equal to one full operational cycle plus six months for corrections. Based on experience gained in the Minas Gerais project, this implementation plan appears to be the most realistic approach to ensuring the effective execution of the program.

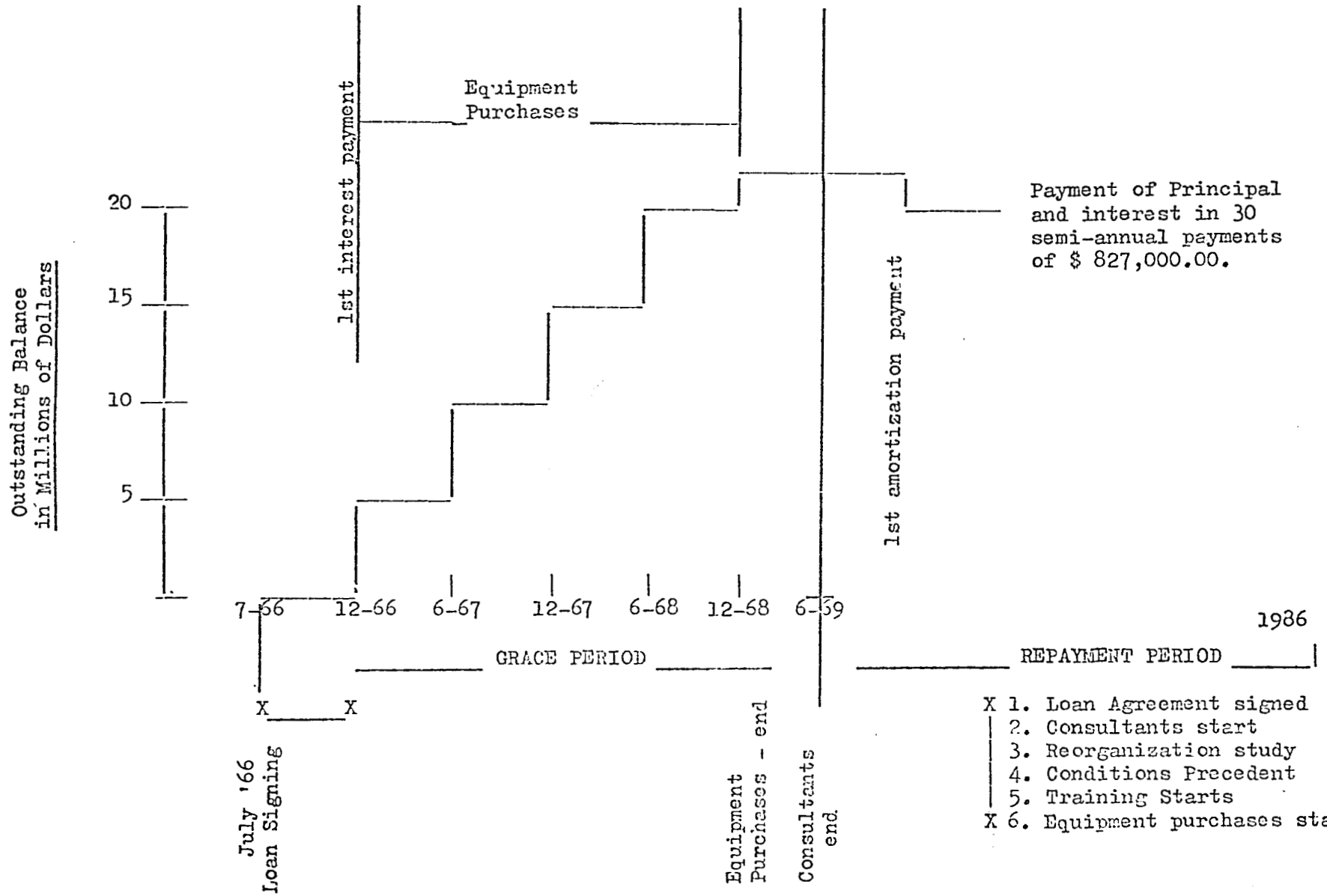
3.88 - The consultant will be required to assist the DER/SP in preparing detailed chronograms for the USAID's approval as one of his first tasks. All procurement will be time phased with other aspects, i.e., training to ensure the proper utilization of

the equipment to be purchased under this project. Additionally, no deliveries will be scheduled prior to installation of a shop capacity for repair and maintenance of the new equipment.

3.89 - The USAID engineering staff will monitor the execution of this project. Adequate skills in this area are presently available in the Mission, and plans are being formulated increase the Mission's capability as the needs become greater with A.I.D.'s anticipated further involvement in future phases of the National program.

[illegible]mentation Plan Chart below includes [illegible] of interest during the grace period (three years) and amortization and interest payments thereafter.

IMPLEMENTATION - PLAN



SECTION IV - INSTITUTIONAL DEVELOPMENT

4.01 - The major portion of the dollar investment proposed in this project is for equipment — $19 million — while only $1.4 million is indicated for technical assistance. However, the emphasis of this National Highway Equipment Program is the institutional change — improvement — that will result.

4.02 - The DNER participation represents a departure from existing practices which, when fully implemented, will result in more rational planning for roads, a higher level of maintenance, a nationally uniform more modern and useful accounting procedure, a better allocation of and better trained personnel, lower cost of maintenance per kilometer, revised construction standards, national standards of construction and maintenance based on more realistic data, and additional improvements in administration and operations that will naturally flow from the institution of the recommendations the studies to be conducted will include.

4.03 - The investigations conducted during IR by the USAID/Brazil staff, DNER personnel and the consultants engaged by the DER/SP clearly point out the need for up-grading the level of administration and operations. In its twenty-one year history, the DNER has never undergone the kind of analysis proposed in this first phase of the National Highway Equipment Program. The organization that was created in 1945 certainly is not equal to the task placed on it today.

4.04 - Exploring the reasons for the poor conditions of most of the existing road network in Brazil, both the consultant and the Mission staff have repeatedly found that the lack of supervision during construction is one of the major causes for early deterioration of Brazilian roads, and equally important the reason for the extensive betterment work that is carried out by highway forces. In the case of São Paulo almost as much was spent for betterment over the period 1961-1965, as was spent for maintenance, i.e., 9.4% for

betterment as compared to 12.7% for maintenance.

4.05 - This is a clear indication that the highway forces of the State carry out work that should not be left to it. The construction industry has continued to leave drainage, shoulders and general finishing work to state highway forces mainly because the State highway engineers have failed to properly supervise construction, or draw up adequate specifications. This practice has resulted in much of the funds allocated for maintenance ending up being applied to "road completion" work. Subsequently, the maintenance activity is curtailed. In new road construction in which the Mission is participating, this condition has been overcome. It is based on the Rio Grande do Sul North Production Road (since re-named "President Kennedy Road") experience that the DER/SP and the Mission are convinced that the industry is willing to accept such changes. The higher cost of construction, it is believed, will be more than offset by the savings gained in the reduction, if not complete elimination (over time) of the "road completion expense" currently being borne by the state highway departments. Clearly, São Paulo is the logical beginning point with the Rio Grande do Sul experience as a guide.

4.06 - An effective cost accounting system will make it possible for the National and the State Highway Departments to develop rental schedules that are realistic, on which to base replacement schedules and annual operating cost, to be better able to decide how large a supply of spare parts they should keep on hand, and to better allocate personnel. The economies these modifications will bring about will be substantial. No effort has been made to calculate them because the required data is not available in any form, which is another reason why reorganization of these agencies is so critical to their becoming efficient operating entities.

SECTION V - REPAYMENT CAPACITY

See Financial Analysis, Section III, D.

SECTION VI - CONDITIONS AND COVENANTS

6.01 - The recommended terms for the São Paulo loan are as follows:

a) A loan to the State Highway Department of São Paulo not to exceed $20.0 million to finance the cost of (i) highway maintenance equipment imported from the United States and (ii) U.S. consulting engineering services under the following terms and conditions:

1) Repayment to be within 18 years from the date of the first disbursement, including a three-year grace period;

2) Interest at 3-1/2% will be charged on disbursed loan funds including during the grace period.

3) Interest and principal to be repaid in United States dollars, in semi-annual installments;

4) all equipment, material and services financed under this loan are to have their source in the United States of America.

b) The DER/SP loan shall be subject to the following conditions before disbursement for other than engineering services:

1) Engage, immediately, qualified professional services satisfactory to A.I.D. to supervise the implementation of this highway maintenance equipment project, and for the conduct of a study of DER organization, operations, and management; and to undertake, in good faith the implementation of such recommendations as are demonstrably sound, reasonable, legal and economically feasible;

2) Meet the legal requirements of the GOB and AID, including approval of the Brazilian Congress.

3) Open a Special Separate Account in a bank of its choice for its contribution to the project and submit a schedule of deposits approved by the appropriate State Authorities which should total the amount to be contributed by the State, and further the deposits should be scheduled to be made available as the project will require the DER's funds.

4) Develop a Project Chronogram to include training schedules, equipment purchases both in Brazil and the United States, financing, physical improvements of existing facilities or construction of additionally needed facilities. This chronogram must be approved by the AID cleared consulting firm.

c) The DER/SP loan shall be subject to the following conditions before any AID loan funds may be disbursed for other than engineering services:

1) Submit an equipment replacement schedule approved by the consultant. This schedule will be supported by an equipment replacement fund, approved by the appropriate State officials.

2) Submit to AID a final equipment list approved by the consultants based upon which AID will advise the DER/SP of available AID Excess Property. Before proceeding with purchases from the U.S. the DER/SP shall examine the lists of equipment and inform AID in writing under the instructions to be included in Implementation Letter No. 1.

d) The DER/SP shall further covenant to:

1) Take all measures possible to secure enforcement of the State and Federal load limitation laws, including establishment of fines and penalties which will discourage violations;

2) Thoroughly review, as part of the management study, the procedures of the department in design and plan preparation, specifications and contract documents, penality provisions, cost estimates, construction inspection and supervision, to make those changes which are necessary to secure a better quality constructed road, and to extend consultant assistance and advice to key personnel in positions of responsibility for construction;

3) Provide training courses of sufficient depth and duration to install acceptable skills in the personnel assigned to operation, maintenance, and repair of equipment; further, to provide sufficient orientation to all administrative and supervisory personnel connected with highway maintenance to ensure a reasonable similarity of philosophy, methods, and objectives throughout the state-wide program;

4) Submit evidence to AID that the appropriate State authorities will take whatever legal and administrative measures necessary to insure that in future years the DER/SP budgets will include specific allocations to maintenance, sufficient to execute adequate maintenance over the State (and if appropriate, the Federal) network. Further, the DER/SP will covenant to AID that all subsequent budgetary requests include maintenance as a priority expenditure.

5) Agree with AID in writing to the conduct of a study for a Statewide Master Road Plan to be undertaken by the AID approved consultants as soon as practicable.

6) The loan shall be subject to such other terms and conditions as AID may deem advisable.

SECTION VII - IMPACT ON US ECONOMY

7.01 - These projects will not result in any adverse effects on the U.S. economy. Total loan funds to be made available under these projects will be expended in the United States for highway maintenance equipment purchases from private manufacturers, the cost of the services of a private U.S. consulting firm and the cost of the services of technicians from the United States Bureau of Public Roads.

SECTION VIII - ISSUES

None

June 3, 1966

STATUTORY CHECK LIST

1. FAA §.102. Every effort is being taken to assure the loan proceeds are not diverted to short-term emergency purposes (such as budget, balance of payments or military purposes) or any other purpose not essential to the long-range economic development of Brazil.

2. FAA §.102. The Borrower shall be required to examine the A.I.D. list of excess property prior to purchasing any new equipment from the United States will inform A.I.D. in writing which equipment or spare parts it desires to purchase from A.I.D. excess property stocks or explain why it does not desire to use A.I.D. excess property in this project. (See paragraph 3.17 - Excess Property).

3. FAA §.102. Brazil has adequately taken measures to protect United States property in Brazil.

4. FAA §.210(d). The proposed loan is consistent with the laws of Brazil and the United States and the terms are considered reasonable by both the Borrower and A.I.D.

5. FAA §.251(a). The loan will promote economic development in Brazil and will contribute to the welfare of its people. (See Section III C - Economic Analysis and Section III E - Institutional Development).

6. FAA §.251(b)(1). Account has been taken of the extent to which Brazil is adhering to the principles of the Act of Bogotá and the Charter of Punta del Este and is showing a responsiveness to the vital economic, political and social concerns of its people, and of the extent to which Brazil has demonstrated a

clear determination to take effective self-help measures. A full report of Brazil's efforts to comply with both the Act of Bogotá and the Charter of Punta del Este is set forth in the 1966 Country Program Submission.

7. FAA §. 251(b)(2). The activity to be financed is economically and technically sound. (See Section III C and Section III D of the loan paper).

8. FAA §. 251(b)(3). The activity is consistent with and is related to the other development activities being undertaken or planned and will contribute to realizable long-range objectives. (See Country Program Submission for 1966).

9. FAA §. 251(b)(4). The loan will have no foreseeable adverse effects on the United States economy. (See Section VII Impact on U.S. Economy).

10. FAA §. 251(b). The World Bank, the IBRD and the Exim Bank rejected in writing financing this project on the following dates:

World Bank
IBRD
Exim Bank

Financing from other free-world sources was not available on reasonable terms.

11. FAA §. 251(b). The terms of the loan (interest, year amortization) are reasonable under the circumstances affecting the loan and the capacity of the Borrower to repay. (See Section III D - Repayment Capacity).

12. FAA §. 251(b). Account has been taken of the extent to which Brazil is making reasonable efforts to encourage repatriation of capital invested in other countries by its own citizens.

13. FAA §. 251(b). There are reasonable prospects that the loan will be repaid. (See Section III D - Repayment Capacity).

14. FAA §. 251(c). An application was submitted on March 31 in support of this project and was prepared by the U.S. consulting firm Brown & Root Overseas, Inc., which gives sufficient information and assurances to indicate reasonably that the funds will be used in an economically and technically sound manner.

15. FAA §. 251(g). In view of the nature of the project, it is not appropriate to utilize the loan to assist in promoting the cooperative movement in Latin America.

16. FAA §. 252(a). N.A. All loan funds are being made available to public sector except consulting engineering fees. All loan funds, other than those for consulting engineering services, are for the financing of imports from the United States private sector.

17. FAA §. 601(a). The loan will encourage efforts of the country to increase the flow in international trade through improved highways, thus permitting produce to reach major ports for sale in international markets; and will foster private initiative and competition by opening domestic markets to a greater number of producers and manufacturers, and will also encourage the use of cooperatives. However, credit unions and savings and loan associations are not expected to be affected.

18. FAA §. 601(a). Procurement will be exclusively for U.S. manufactured goods and equipment. This arrangement will not cause any undue interference with domestic programs

or compete with private enterprise. (See §252(a) above).

19. FAA §.601(d). United States engineering services will be utilized in the São Paulo project. However, the DNER project, due to its peculiar requirements, will receive technical assistance from the United States Bureau of Public Roads where the unique experience called for in the DNER project is most logically found. This project attempts to bring about the reorganization of the DNER to more properly execute its function of planning and supervising the development of highways in Brazil, which very closely resembles the function of the United States Bureau of Public Roads.

20. FAA §.602. Procurement in the United States is to be limited to U.S. companies with sales and service facilities available in Brazil. This technical requirement will undoubtedly eliminate some small business. However, the additional cost to the Borrower in services and parts, when not available in Brazil, will be considered to off-set modifications of the procurement procedures for this project. Small business modification will be required.

21. FAA §.604(a); App. §.106. Equipment, material, and services financed for the project under the loan shall be procured from the United States.

22. FAA §.604(b). N.A. Any commodities financed by the loan and purchased in bulk will be purchased at prices no higher than prevailing U.S. market prices.

23. FAA §.604(d). Loan funds shall be available for Marine Insurance on commodities shipped when such insurance is placed on a competitive basis, as specified in this section of the Act. In the event that Brazil discriminates against any U.S. amrine insurance company, commodities

purchased with loan funds shall be insured against marine risk with a U.S. company, as required by this section.

24. FAA §.611(a)(1). Necessary substantive technical and financial planning for the project has been completed, and a reasonably firm estimate of cost of the project to the United States has been obtained. (See Section III B).

25. FAA §.611(a)(2). No further legislative action in Brazil is required for implementation of the project.

26. FAA §.611(b); App. §.101. The project does not involve water or related land resource construction.

27. FAA §.611(c). No construction contracts will result from the loan.

28. FAA §.612(b) and 636(h). The loan is for U.S. dollar costs only. All local currency costs are being borne by the Borrower with his own resources.

29. FAA §.619. N.A. Brazil is not a newly independent country.

30. FAA §.620(a); App. §.107(a). No assistance will be furnished under this loan to the present Government of Cuba, nor does Brazil furnish assistance to the present Government of Cuba. Brazil has taken appropriate steps to prevent ships or aircraft under its registry from engaging in any Cuba trade.

31. FAA §.620(b). The Secretary of State has determined that Brazil is not controlled by the International

Communist Movement.

32. FAA §.620(c). Brazil is not indebted to any U.S. citizen for goods or services furnished or ordered, where such a citizen has exhausted available remedies or where the debt is not denied or contested by or the indebtedness arises under an unconditional guaranty of payment given by Brazil.

33. FAA §.620(d). Loan funds will not finance construction or operation of any productive enterprise which will compete with United States enterprise.

34. FAA §.620(e)(1). Neither the Government of Brazil nor any governmental agency or subdivision thereof has, on or after January 1, 1962, nationalized, expropriated, or seized ownership or control of property of any U.S. citizen or firm, taken steps to repudiate or nullify contracts with such citizens or firms, or imposed or enforced discriminatory taxation or other exactions or restrictive conditions, or taken other actions having the effect of nationalizing, expropriating or otherwise seizing ownership or control of property owned by U.S. citizens or firms, as specified in this section of the Act, without taking appropriate steps to discharge its obligations, as specified in this section of the Act.

35. FAA §.620(f); App. §.109. Assistance provided by this loan will not be furnished to any Communist country.

36. FAA §.620(g). Assistance provided by this loan will not be used to compensate for expropriated or nationalized property.

37. FAA §.620(h). Assistance provided by this loan will not be used in a manner which promotes or assists foreign aid projects or activities of the Communist bloc countries.

38. FAA §.620(i). The President has not determined that Brazil is engaging in or preparing for aggre[illegible] efforts directed against the United States, or any country to which sales are made under PL 480, nor is any basis for such determination known to A.I.D.

39. FAA §.620(k). N.A. The project does not include the construction of productive enterprise where aggregate value of assistance to be furnished by the United States will exceed $100 million.

40. FAA §.620(l). Brazil has instituted an investment guaranty program.

41. FAA §.620(n); App. 107(b). No assistance will be furnished under this loan to the present Government of North Vietnam, nor does Brazil furnish assistance to the present Government of North Vietnam. Brazil has taken appropriate steps to prevent ships or aircraft under its registry from engaging in any North Vietnam trade.

42. FAA §.620(o). Brazil has not seized or imposed any penalty or sanction against any U.S. fishing vessel in international waters.

43. FAA §.621. The United States Bureau of Public Roads has been requested under the DNER project to provide technical assistance to assist the DNER in reorganizing itsself from an operational agency into a planning institution. The

DNER possesses experience which is particularly suitable in meeting the needs of the DNER project and will not be competitive with private enterprise and it is not anticipated that the BPR's providing this technical assistance will cause any undue interference with domestic programs. In the São Paulo project, a private consulting firm will provide the technical assistance called for in accordance with this section of the FAA.

44. App. §. (unnumbered). Funds will not be so used.

45. App. §. 102. Obligations of funds in excess of $25,000 for engineering fees to any firms or group of firms financed under the loan will be reported to the committees on appropriations of the Senate and House.

46. App. §. 104. Funds obligated by the loan, will not be used to pay pensions, annuities, etc., as prohibited in this section.

47. App. §. 106. Brazil does not create discrimination because of their race or religion among Americans in granting personal or commercial access or other rights otherwise available to U.S. citizens generally.

48. App. §. 111. U.S. personnel to serve under contracts for services financed by the loan shall have security clearance, to the extent required by A.I.D. regulations under this section.

49. App. §. 112. Firms which provide engineering and procurement services financed by the loan for the project, and the terms of their contracts, shall be approved by A.I.D.

50. App. §. 114. Loan funds will not be used to make any payment to the United Nations.

51. App. §. 115. N.A. Not a construction loan.

52. App. §. 401. Loan funds will not be used for publicity or propaganda purposes within the United States.

UNCLASSIFIED
AID-DLC/P-431
ANNEX II
June 3, 1966

Exhibit 1 - Organization Chart of the Highway Department of Sao Paulo

Exhibit 2 - D.E.R./S.P. Highway Equipment

Exhibit 3 - Shop Equipment Inventories

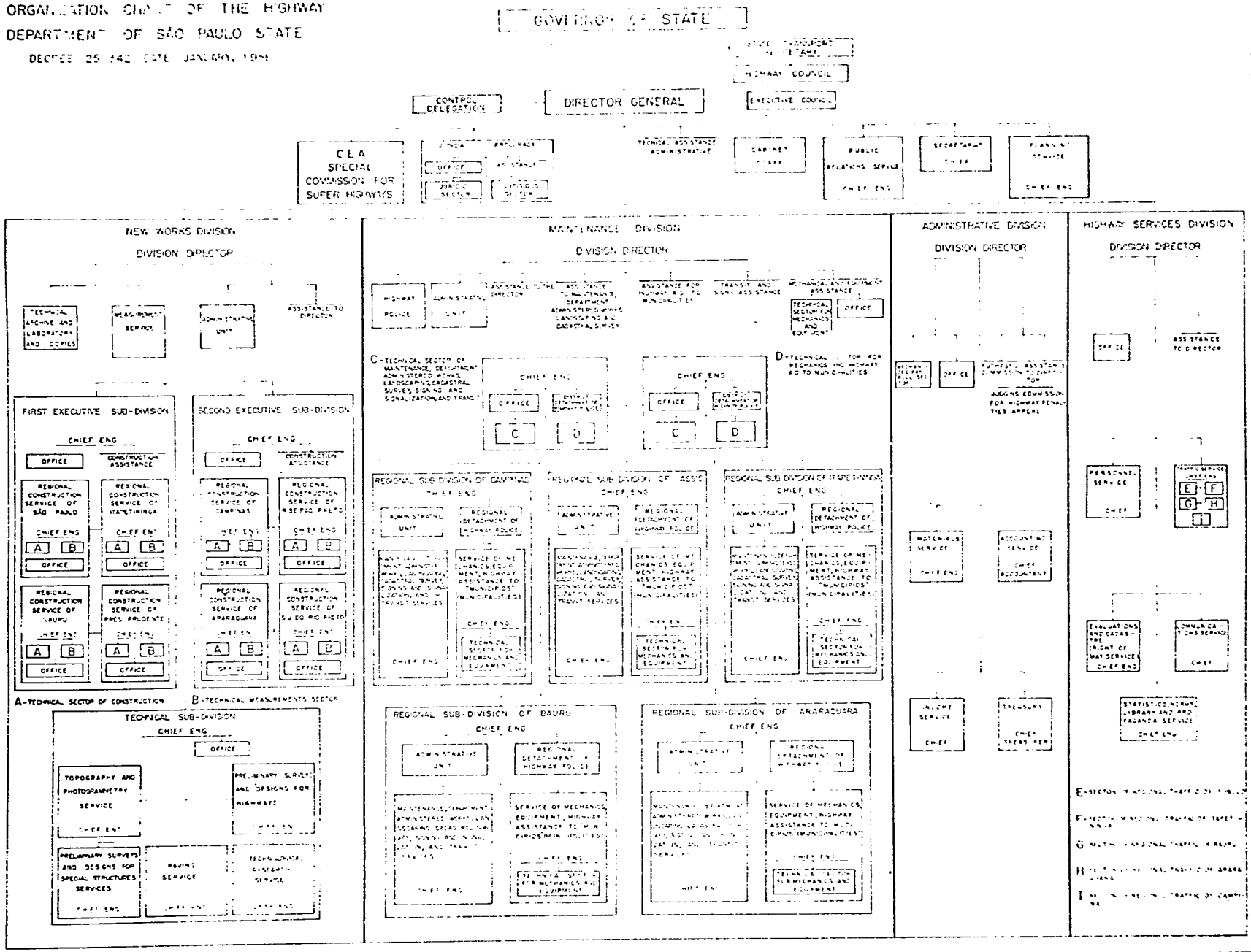
Exhibit 4 - Rationale for Equipment Needs

Exhibit 5 - D.E.R./S.P. Repair Shop Equipment

Exhibit 6 - Equipment and Vehicle Requirements

ORGANIZATION CHART OF THE HIGHWAY DEPARTMENT OF SÃO PAULO STATE

DECREE 25 242 DATE JANUARY 1984



"DEMP" HIGHWAY EQUIPMENT

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	MODEL, CAPACITY, OTHER DATA
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
VIBRATOR, CONCRETE		-	-	9	9	Tedlor
WAGON, BOTTOM DUMP		-	-	2	2	11-13.4 m^3
WINCH, FOR DROP PILE DRIVING HAMMER		-	-	1	1	500 kgs.
WINCH, FOR TRACTOR		-	-	10	10	
WINCH, MARINE		2	-	1	3	

"DER" HIGHWAY EQUIPMENT

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	MODEL, CAPACITY, OTHER REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
SCRAPER		8	-	63	71	3-24 c.y.
SCRAPER, MOTOR WITH TRACTOR	13.0	8	-	27	35	Cat D-10, LeTourneau Woolridge TC-514, Heiliner 20500, 11-20 c.y.
SCREENS, VIBRATORY		-	20	-	20	Dragon
SPREADER, AGGREGATE	7.0	-	5	-	5	1.5 c.y. Highway
SPREADER, ASPHALT		-	-	4	4	2 Ton Burch
SPREADER, STONE		1	-	14	15	Burch
TANK, (FOR TRANSPORT OF ASPHALT)	7.0	-	4	-	4	18,000 L
TANKS, STORAGE, FOR ASPHALT	6.8	6	45	-	51	4200 Gallon
TRACTOR, CRAWLER		6	12	101	119	6500 kg - 20500 kg
TRACTOR, WHEELED, PNEUMATIC		10	-	49	59	1120 kg - 3994 kg
TRAILER, PLATFORM FOR TRANSPORTING EQUIPMENT	11.9	7	2	17	26	25 Ton Capacity
TRAILER, PLATFORM FOR TRANSPORTING MATERIALS	10.8	21	5	16	42	2-4 Tons Capacity

"DER" HIGHWAY EQUIPMENT

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	MODEL, CAPACITY, OTHER REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
MOTOR, OUTBOARD		-	11	-	11	10-12 hp
MOTOR, STATIONARY		398	224	186	808	From 1.5 to 180 hp
MUDJACK, SELF PROPELLED		-	-	2	2	
PAVER, ASPHALT	15.0	-	-	2	2	P & HLA-88, Wood 36
PAVER, ASPHALT LAYDOWN MACHINE		6	5	4	15	Barber Green
PAVER, CONCRETE LAYDOWN MACHINE		-	-	5	5	Triller
PAVING PLANT, ASPHALT, FIXED	8.5	3	7	7	17	B-G 15-45 T/hr.
RIPPER		-	-	3	3	3-4 Teeth
ROLLER, PNEUMATIC WHEELED	15.3	8	-	-	8	2-12 T
ROLLER, PNEUMATIC WHEELED, MOTOR		7	-	-	7	8-13 T
ROLLER, SHEEPSFOOT	21.1	-	-	36	36	2700-6500 kgs.
ROLLER, TANDEM	11.3	7	10	15	32	Galion, Huber 5-8 Tons
ROLLER, THREE WHEELED		-	5	55	60	Various 8-10-12 Tons
ROLLER, VIBRATING, SMOOTH WHEELED	5.0	7	7	-	14	Terrapactor TPVL 3500 kgs.

"DER" HIGHWAY EQUIPMENT

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	MODEL, CAPACITY, OTHER REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
GRADER, FULL TYPE	24.8	-	-	2	2	
HOIST, SELF PROPELLED		6	3	1	10	4540 kgs. (Hyster)
KETTLE, ASPHALT	11.2	15	24	29	68	500-2268 lts.
LOADER, BELT CONVEYOR		-	2	-	2	
LOADER, BUCKET (LINK-BELT)	16.4	-	-	7	7	B-G & Nelson 1.2-3 m^3 /min
LOADER, FRONT END (TRACK MOUNTED)	6.5	15	15	-	30	Traxcavator Cat 955, Case 800-C 1 1/2 c.y.
LOADER, FRONT END (RUBBER TIRE MOUNTED)	10.8	10	15	7	32	Various, 5/8, 3/4 and 2 c.y.
MARKER, MACHINE FOR HIGHWAY STRIPING PAINTS	14.8	-	-	6	6	
MIXER, ASPHALT, TOWED	15.0	-	-	20	20	85 lts.
MIXER, ASPHALT, PORTABLE		5	25	-	30	5 to 10 tons
MIXER, CONCRETE	15.1	22	12	114	148	0.1-1cy. ave. about 1/4 c. y.
MIXER, PULVI-MIXER (PULL TYPE)		-	-	15	15	6'
MOTOR, MARINE		24	35	4	63	Principally 165 hp

"DER" HIGHWAY EQUIPMENT

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	MODEL, CAPACITY, OTHER REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
DRILL, CORE		-	-	4	4	Sullivan Model 7
DRILL, PERCUSSION		-	-	1	1	
DRILL, ROTARY		1	-	6	7	
DRIVER, PILE, DROP HAMMER	17.8	4	-	22	26	Principally 500 kgs. Capacity w/Tripod and Engine.
EMULSIFIER, ASPHALT		-	-	4	4	
EXCAVATOR, SHOVEL (CRAWLER)	14.4	-	-	15	15	Bucyrus-Erie, Misc. 3/4 c.y.
EXCAVATOR, SHOVEL (RUBBER TIRE MOUNTED)	9.6	3	-	2	5	Unit Crane 3/4 c.y.
FEEDER, APRON TYPE, FOR PRIMARY CRUSHER	9.0	-	7	-	7	Bergeaud
GENERATOR, ELECTRIC	14.3	-	2	10	12	37.5-100 KVA
GRADER, MOTOR	10.7	100	83	101	284	Caterpillar 12, Galion 118, Pettibone Mulliken 402, Warco 40-115

"DER" HIGHWAY EQUIPMENT

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	MODEL, CAPACITY, OTHER REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
BED, DUMP, STEEL	6.0	-	8	-	8	2.5 m^3
BLADE, DOZER	21.0	-	-	4	4	Attachment for Cat D-7
BOAT, FERRY		9	6	2	17	Various
BOAT, TUG		1	1	-	2	
BUCKET, GRAB		-	2	-	2	
CARS, CRS (RAILROAD)		-	-	29	29	3/4 cubic yards
COMPACTOR, HAND OPERATED	15.5	-	15	48	63	100 kg
COMPRESSOR, AIR	14.8	-	7	34	41	105-315 CFM
COMPRESSOR, AIR (SELF PROPELLED)		-	-	3	3	105 CFM
CRUSHER, ROCK (STATIONARY)	12.3	-	-	4	4	Cedar Rapids 42-85 m^3/hr. 30" x 30"
CRUSHER, JAW	19.0	-	7	62	69	"Borgeaud, 50 m^3/hr.
CRUSHER, JAW, SECONDARY	8.7	14	4	-	18	Various
DISTRIBUTOR, ASPHALT	9.5	8	9	9	26	1250-1700 Gal.
DITCHER		-	1	-	1	Buckeye Gartwood Model 306

VEHICLES - "DNER" (FEDERAL HIGHWAY DEPARTMENT)

TYPE OF VEHICLE	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
AUTOMOBILE		2	-	5	7	
JEEP		2	23	-	25	
MOTORCYCLE		1	-	7	8	
PICK-UP		42	8	7	57	
STATION WAGON		17	15	4	36	
TRACTOR		1	-	-	1	
TRUCK		16	11	10	37	FROM 5 TO 8 TON
TRUCK, DUMP		45	17	24	86	
TRUCK, INTERCHANGEABLE BED		-	-	6	6	
TRUCK, PANNEL DELIVERY		-	1	-	1	
WRECKER		1	-	-	1	
TOTAL		127	75	63	265	

VEHICLES "D.E.R."

TYPE OF VEHICLE	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
AMBULANCE	7.3	3	7	2	12	
AUTOMOBILE	2.4	171	2	10	183	71 in use by Hwy Pol.
BUS	19.5	--	--	2	2	
JEEP	7.7	--	47	2	49	32 in use by Hwy Pol.
PICK-UP	7.2	81	100	98	279	50 in use by Hwy Pol.
STATION WAGON	9.1	47	41	22	110	40 in use by Hwy Pol.
TRACTOR	8.7	7	4	15	26	
TRUCK	10.1	85	15	149	249	FROM 5 TO 8 TON
TRUCK, DUMP	--	50	125	91	266	
TRUCK, INTERCHANGEABLE BED	4.9	20	10	--	30	
TRUCK, TANK	8.3	7	2	6	15	
TRUCK, WATER	6.9	--	50	12	62	
WRECKER	8.6	1	1	3	5	
TOTAL		472	404	412	1288	

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
TESTER, CYLINDER COMPRESSION		1	-	-	1	
TESTER, ENGINE		-	4	9	13	
TESTER, FUEL INJECTION PUMP NOZZLE		1	2	-	3	
TESTER, GENERATOR AND BATTERY		-	1	-	1	
TESTER, GENERATOR AND STARTER MOTOR		2	-	-	2	
TESTER, INDUCTION		1	-	-	1	
TESTER, SPARK PLUG		-	-	1	1	
TESTER, SPRING		-	1	-	1	
TESTER, VOLTMETER AND AMMETER		2	-	-	2	
TRANSFORMER		22	1	2	25	
TRANSFORMER, ELECTRIC CURRENT		-	-	3	3	
VISE, JAW		-	-	6	6	
VOLTMETER		-	-	2	2	
VOLTMETER, AMMETER		3	-	-	3	
WELD, POINT -PORTABLE		5	-	1	6	
WELDER, SAW BAND		1	-	7	8	
		1898	687	1386	3971	

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
PUMP, PRESSURE FOR WASHING VEHICLES		-	-	1	1	
SANDBLAST, SPARK PLUG		1	3	15	19	
SANDBLASTER FOR GLEANING MACHINERY		1	-	-	1	
SANDERS, DIX		8	2	10	20	
SANDER, WOOD		1	1	1	3	
SAW, BAND		7	13	27	47	
SAW, CIRCULAR		14	14	24	52	
SAW SET, BAND		-	-	1	1	
SHEAR, STEEL BAR		40	19	30	89	
SHEAR, STEEL PLATE -PORTABLE		5	1	13	19	
SPLICER, BELT		-	1	-	1	
STAND, MOVABLE FOR CHAIN HOIST		42	22	-	64	
TESTER, BATTERY		-	-	1	1	
TESTER, COMPRESSION		-	1	-	1	
TESTER, CONNECTING ROD		-	-	1	1	

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS				REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER TEN		
MACHINE, VALVE FACE GRINDING		1	1		16	
MACHINE, VALVE SEAT GRINDING		1	4		22	
MACHINE, VEHICLE WHEEL BALANCING		1	--		1	
MACHINE, VULCANIZING		29	11		56	FOR TIRE INNER TUBES
MACHINE, WELDING, ELECTRIC		22	13	47	82	
MACHINE, WELDING, TRACK PIN		1	--	-	1	
MACHINE, WIRE WINDING		-		1	1	
MOTORS, ELECTRIC		574		43	692	
PLANERS, PRECISION FOR STEEL		-		-	1	
PLANER, WOOD		1	2	9	12	
PLANER, WOOD		1	2	15	18	
PLANT, GENERATOR -ELECTRIC		-	-	1	1	
PRESS		43	3	17	63	
PULLERS, GEAR		-	-	1	1	
PULLER, TRACK PIN AND BUSHING		6	-	-	6	HYDRAULIC
PUMP, PRESSURE FOR CLEANING PARTS		-	--	1	1	
PUMP, PRESSURE FOR WASHING CARS		1	-	-	1	

UNCLASSIFIED
ANNEX II
Exhibit 3
Page 3 of 10

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
MACHINE, LATHE FOR WOOD		2	3	9	14	
MACHINE, POLISHING		-	1	4	5	
MACHINE, REAMING, BEARING		-	-	2	2	
MACHINE, RIVETING - BRAKE BAND		1	2	13	16	
MACHINE, SEWING - FOR UPHOLSTERY MATERIALS		2	3	2	7	
MACHINE, SHAPING		2	2	22	26	
MACHINE, SHEET METAL WORKING		-	2	3	5	
MACHINE, STATIONARY BEARING BORING		-	-	1	1	
MACHINE, STEEL PLATE BENDER		1	-	-	1	
MACHINE, STEEL PLATE BENDER		3	1	2	6	
MACHINE, STEEL PLATE ROLLING		1	-	2	3	
MACHINE, SURFACE DRESSING		-	-	1	1	
MACHINE, TRACK PIN AND BUSHING CHANGING		2	-	-	2	
MACHINE, UNIVERSAL BORING		-	-	4	4	

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
GRINDER, TOOL		--	--	1	1	
GRINDER, UNIVERSAL		1	--	--	1	
GRINDER FOR WOOD PLANE CUTTING BLADE		1	2	6	9	
GRINDSTONE WITH ELECTRIC MOTOR		--	--	1	1	
GUN, PNEUMATIC -RUST REMOVER		4	--	--	4	
GUN, RUST REMOVER		2	--	--	2	
HACKSAW, POWER DRIVEN		18	2	16	36	
HAMMER, PNEUMATIC		2	1	2	5	
HOIST, CHAIN -ELECTRIC		4	--	3	7	
HOIST, CHAIN -HAND OPERATED		145	85	120	350	
HOIST, VEHICLE		4	2	5	11	
HONES, CYLINDER		--	--	1	1	
INSTRUMENT, FUEL INJECTION PUMP CALIBRATION		--	1	--	1	
JACK (VARIOUS TYPES AND MODELS)		244	80	132	456	

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
LATHE		24	17	76	117	
LATHE, BRAKE DRUM		2	1	1	4	
LATHE WITH RECTIFIER		3	2	26	31	
LUBRICATOR, GREASE -MANUAL		121	127	78	326	
LUBRICATION EQUIPMENT SET		-	2	6	8	
MACHINE, BORING -CONNECTING ROD		-	-	1	1	
MACHINE, CONNECTING ROD BORING		-	-	1	1	
MACHINE, CONNECTING ROD FILLER		-	-	1	1	
MACHINE, CHUCKING -CONNECTING ROD		-	-	2	2	
MACHINE FOR CLEANING PARTS		-	-	3	3	
MACHINE, CRANKSHAFT REGRINING		-	-	3	3	
MACHINE, CYLINDER BURNISHING		-	-	1	1	
MACHINE, MILLING		7	2	-	9	
MACHINE, PISTON GRINDING		-	-	3	3	

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
CLEANER, DIESEL - CENTRIFUGAL		5	-	-	5	
CLEAVER, LEATHER		1	-	-	1	
CONTAINER, PRESSURE - FOR CHARGING GEAR BOX AND DIFFERENTIAL		48	-	-	48	
COMPRESSOR, AIR		56	13	58	127	
CRANE, AUTO - SHOP		1	-	-	1	
CRANE, MANUAL OPERATED		5	5	6	16	
CRANE, OVERHEAD		-	2	1	3	
CUTTER, HYDRAULIC - FOR ROUND STEEL AND IRON		1	-	-	1	
CUTTER, STEEL PLATE		1	-	-	1	
CUTTER, REINFORCEMENT - STEEL		-	-	1	1	
DENSIMETER		-	2	-	2	
DEVICE, ELECTRIC ENGRAVING		2	1	-	3	
DRILL, CORE		1	-	6	7	

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
DRILL, ELECTRIC		28	5	-	33	
DRILL, ELECTRIC -BENCH TYPE		30	10	65	105	
DRILL, ELECTRIC -PORTABLE		51	13	97	161	
DRILL, WOOD		-	1	1	2	
DYNAMOMETER, ENGINE		1	-	-	1	
EXHAUST, PAINTING ROOM		5	1	4	10	
FAN, EXHAUST -AIR		16	7	2	25	
FIXTURE, TESTING -FUEL INJECTION PUMP NOZZLE		-	1	-	1	
FORGE, ELECTRIC		10	1	1	12	
GAUGE, AIR -TIRE		29	-	7	36	
GENERATOR, ACETYLENE		21	17	12	50	
GENERATOR, ELECTRIC		24	21	66	111	
GRINDER, BENCH		16	21	19	56	
GRINDER, BUSHING -"SUNNER"		-	-	2	2	
GRINDER, PORTABLE		17	3	22	42	
GRINDER, SHAFT -FLEXIBLE		11	1	8	20	

"D.E.R."

SHOP EQUIPMENT INVENTORIES

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
ALIGNER, STEERING		5	2	-	7	
APPARATUS, METAL TREATMENT (METCO)		-	-	1	1	
APPARATUS FOR RUBBER COATING		-	1	1	2	
APPARATUS FOR TESTING ELECTRICAL RESISTANCE		-	-	1	1	
APPARATUS FOR TESTING VEHICLE ELECTRICAL CIRCUITS		7	-	-	7	
APPARATUS, TIRE CHANGING		-	-	4	4	
APPARATUS FOR WATER DISTILLATION		5	3	4	12	
APPARATUS FOR WIRE WINDING FOR TRANSFORMERS		-	2	1	3	
BAR, BORING - CYLINDER		-	-	6	6	
BLEEDER, BRAKE FLUID		1	-	-	1	
BUFFER AND GRINDER, FLOOR TYPE		43	6	52	101	
CHARGER, BATTERY		22	12	47	81	
CHARGER, BATTERY - GENERATOR TYPE		1	-	-	1	

HIGHWAY EQUIPMENT - "DNER" (FEDERAL HIGHWAY DEPARTMENT)

TYPE OF EQUIPMENT	AVERAGE AGE, YEARS	AGE GROUPS			TOTAL UNITS	REMARKS
		UNDER 5 YEARS	5 TO 10 YEARS	OVER 10 YEARS		
TRAILER, PLATFORM FOR TRANSPORTING EQUIPMENT		-	-	1	1	
TRAILER, PLATFORM FOR TRANSPORTING MATERIALS		1	3	1	5	
VIBRATOR, CONCRETE		1	1	-	2	
WINCH, FOR TRACTOR		-	-	1	1	
T O T A L		27	27	69	123	

RATIONALE FOR ESTABLISHING EQUIPMENT NEEDS GROUPS FOR EXECUTION OF THE FOLLOWING SERVICES:

A — MAINTENANCE

1. *Sections Not Paved*

(For each 150 km. one group as follows):

I	Motor Grader, 10 to 12 tons	3
II	Roller Three Wheel, Self Propelled, 10 to 12 ton	2
III	Truck, with Water mtd, 8000 liters capacity	2
IV	Pump, Water — Self Priming Type 30-M	2
V	Tractor, Front-End Loader and Excavator, Crawler, 1 3/4 c.y. Bucket (Minimum)	1
VI	Truck, Dump 3 to 4 cubic meters	2

NOTE: As they become necessary dump trucks will be rented, in accordance with the distances.

For 6,165 km. 41 groups of equipment are necessary.

2. *Sections — Asphalt Paved*

(For each 150 km. one group as follows)

(a) *Paving and Shoulders*

I	Motor Grader, 10 to 12 ton	2
II	Plant, Asphalt Towed, 5 to 10 ton	1
III	Roller Pneumatic Wobbly Wheel, Self Propelled	1
IV	Roller Vibrating, Self Propelled, 3/4 to 1.0 ton	1
V	Tractor, Front End Loader Excavator, Pneumatic Wheeled, Bucket 2 c.y. (Minimum)	1
VI	Truck, with Water Tank Mtd, 8000 liters capacity	1
VII	Pump, Water Self Priming, Type 30-M	1
VIII	Truck, Dump 3 to 4 cubic meters	2 *
IX	Tank, Storage, for Asphalt, capacity 16000 ltrs	1

* NOTE: As they become necessary, dump trucks will be rented, in accordance with the distances.

For 7,7[illegible] kms, 52 groups of equipment are necessary.

(b) *Base Repairs in Cement Soil, Hydraulic Macadam, and Stabilized Soil*

I	Motor Grader, 10 to 12 tons	3
II	Truck, with Water Tank Mtd, 8000 Ltrs capacity	2
III	Pump, Water Self Priming, Type 30-M	2
IV	Mixer, Pulvi-Towed Type 2.10 M, 7 FT. Width	2
V	Tractor, Front End Loader and Excavator, Pneumatic Wheeled, Bucket 2 c.y. (Minimum)	1
VI	Tractor, Crawler, with Dozer Blade and Ripper, Weight up to 12 tons	1
VII	Roller, Pneumatic, Wobbly Wheel, Self Propelled	1
VIII	Roller, Smooth Wheel, Vibrating, Towed	1
IX	Roller, Sheepsfoot, Towed	1
X	Roller, Three Wheel, Self Propelled, 10 to 12 ton	1
XI	Tractor, Wheeled, Pneumatic Tires, 80 h.p.	4
XII	Truck, Dump, 3 to 4 cubic meters	4 *
XIII	Lubricating Equipment, Truck Mounted	1
XIV	Washing Equipment, for Machines and Vehicles, Truck Mounted	1
XV	Truck, Tank for Transport of Combustibles, Cap. 8000 ltrs	1

* NOTE: As they become necessary, dump trucks will be rented, in accordance with the distances.

7 groups of equipment are necessary.

B — *BETTERMENTS*

(a) *Excavation and Transport of Small Quantities*

I	— Motor Grader, 10 to 12 tons	2
II	— Tractor, Crawler, w/Dozer Blade, Weight up to 15 tons	2
III	— Tractor, Front End Loader and Excavator, Pneumatic Wheeled, Bucket 2 c.y. (Minimum)	1
IV	— Tractor, Front End Loader and Excavator, Pneumatic Wheeled, Bucket 2 c.y. (Minimum)	1
V	— Truck, Dump _3 to 4 cubic meters	4 *
VI	— Roller, Sheepsfoot, Towed	1
VII	— Tractor, Crawler, with Dozer Blade, Weight up to 12 tons (Roller, Sheespsfoot, Towed)	1
VIII	— Roller, Pneumatic, Wobbly Wheel, Self Propelled	1
IX	— Truck, with Water Tank Mtd, 8000 ltrs capacity	2
X	— Pump, Water, Self Priming _Type 30-M	2

18 groups are necessary, distributed as follows:

B1C (Campinas)	4
B2C (Itapetininga)	3
B3C (Bauru)	2
B4C (Araraquara)	3
B7C (Assis)	2
FXC-1 (Cubatão)	2
FXC-2 (Taubaté)	2
	18

NOTE: As they become necessary, dump trucks will be rented, in accordance with the distances.

(b) *Highway Maintenance*

I	— Tractor, Front End Loader and Excavator, Pneumatic Wheeled, Bucket 2 c.y. (Minimum)	1
II	— Distributor, Asphalt _Truck Mounted, 8000 ltrs capacity	1
III	— Roller, Tandem, Self Propelled, 6 to 8 ton	1
IV	— Roller, Pneumatic, Wobbly Wheel, Self Propelled	1
V	— Compressor, Air Towed (Rubber Tires) 365 cu ft min.	1
VI	— Truck, Dump _3 to 4 cubic meters	4
VII	— Truck, Tank _for Transport of Combustibles, Cap 8000 ltrs	2
VIII	— Truck, with Water Tank Mtd., 8000 ltrs capacity	1
IX	— Pump, Water _Self Priming, Type 30-M	1
X	— Tank, Water, Storage capacity 15000 ltrs	1
XI	— Steam Cleaning Equipment, 180 G.P.H.	1
XII	— Lubricating Equipment, Truck Mounted	1
XIII	— Broom, Self Propelled	1

26 groups of equipment are necessary,distributed as follows:

B1C (Campinas)	6
B2C (Itapetininga)	3
B3C (Bauru)	4
B4C (Araraquara)	4
B7C (Assis)	2
FXC.1 (Cubatão)	4
FXC.2 (Taubate)	3
	26

* NOTE: As they become necessary, dump trucks will be rented, in accordance with the distances.

C — *STRUCTURES*

I — Mixer, Concrete _250 ltrs capacity 1
II — Vibrator, Concrete _Gasoline Motor 2
III — Pump, Water _Self Priming, Type 30-M 2
IV — Saw, Circular _with 40 cm Blade 1
V — Driver, Pile _with a 500 kgs weight 1

16 groups of equipment are necessary, distributed among the regional subdivisions and districts.

D — *IN THE REGIONAL SUBDIVISIONS AND DISTRICTS*

I — Shovel, Crawler, Equipped with 3/4 cy., Dipper Bucket, 3/4 c.y., Dragine Bucket and Pile Driver 1
II — Compressor, Air-Towed (Rubber Tires) 365 cu.ft./min. 1
III — Drill, Rock _with Gasoline Motor 3
IV — Painter, Stripe _Wheel Mounted 1

E — *IN THE MAINTENANCE RESIDENCIES*

I — Plant, Pipe-Concrete, Complete, for all Sizes 1
II — Table, Vibrating _for Concrete Posts 1
III — Mixer, Concrete _250 ltrs capacity 1
IV — Truck, Transport, Flat-Bed (Wood) 5.5 ton 2
V — Truck, Dump _3 to 4 cubic meters 2
VI — Truck, Pick-Up, 700 kgs capacity 5
VII — Painter, Stripe _Self Propelled 1
VIII — Centrifuge, Diesel 1

F — *NECESSARY EQUIPMENT FOR EACH GARAGE AND REGIONAL SUBDIVISION AND DISTRICT*

I — Automobile, for 6 passengers 2
II — Automobile, for 4 passengers 5
III — Truck, Transport, Flat-Bed (Wood), Diesel, 9 ton capacity 2
IV — Truck, Transport, Flat-Bed (Wood), 5.5 ton 2
V — Truck, Pick-Up, 700 kgs capacity 10
VI — Truck, Tank _for Transport of Combustibles, cap. 8000 ltrs 1
VII — Winch, Chassis Mtd., capacity 6 ton 1
VIII — Truck, Tractor, w/5th Wheel, Diesel Engine, w/Deck Trailer, 35 ton capacity 3
IX — Pump, Air 2
X — Elevator, Hydraulic, for Washing and Greasing 2
XI — Pump, Water (Complete-Hoses, Manometers, Etc.) 2

G — *CENTRAL GARAGE*

I — Automobile, for 6 passengers 5
II — Automobile, for 4 passengers 10
III — Truck, Pick-Up 700 kg capacity 10
IV — Truck, Transport, Flat-Bed (Wood), Diesel, 9 ton capacity 3
V — Truck, Transport, Flat-Bed (Wood), 5.5 ton 4
VI — Truck, Tractor, w/5th Wheel, Diesel Engine, w/Deck Trailer, 35 ton capacity 1
VII — Winch, Chassis Mtd., capacity 6 ton 1
VIII — Centrifuge, Diesel 1

H — *MUNICIPAL ASSISTANCE*

I — Motor Grader _10 to 12 tons 1
II — Tractor, Crawler, with Dozer Blade, Weight up to 12 ton 1
III — Tractor, Front End Loader and Excavator, Pneumatic Wheeled, Bucket 2 c.y. (Minimum) 1
IV — Truck, Dump _3 to 4 cubic meters 4

48 groups of equipment are necessy.

* NOTE: As they become necessary, dump trucks will be rented, in accordance with the distances.

D.E.R. REPAIR SHOP EQUIPMENT

TYPE AND DESCRIPTION	QUANTITY TO HOX	UNIT COST CR$ 1,000	UNIT COST US$	TOTAL COST CR$ 1,000	TOTAL COST US$
VULCANIZING MACHINE FOR TIRE INNER TUBES	11	145	---	1,595	—
VOLTMETER-AMMETER, 45A, 6 TO 8 VOLTS, 12 TO 24 VOLTS, 24 TO 30 VOLTS	8	300	---	2,400	—
WHEEL BALANCING MACHINE	9	---	1,383.63	---	10,909.04
WOOD PLANER, 410 MM CUTTING BLADE	1	1,200	---	1,200	—
WOOD SANDER	2	500	---	1,000	—
WELDING MACHINE SPOT WELDING, ELECTRICAL	12	5,000	---	60,000	—
WOOD PLANER, (COMBINED	1	1,000	---	1,000	—
WHEEL DOLLY, 3000 KG CAPACITY	7	900	---	6,300	—
T O T A L S				1,481,323	309,738.32

UNCLASSIFIED
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D.E.R. REPAIR SHOP EQUIPMENT

TYPE AND DESCRIPTION	QUANTITY TO BE	UNIT COST		TOTAL COST	
		GE$ 1,000	US$	GE$ 1,000	US$
PRESSURE REGULATING EQUIPMENT FOR AIR TIRES	5	650	—	3,250	—
PNEUMATIC GREASE LUBRICATOR	10	180	—	1,800	—
PORTABLE ELECTRIC DRILL, 220V, VARIOUS DRILL SIZES	11	200	—	2,200	—
PORTABLE CRANE FOR SHOPS, CAPACITY 4.5 TON	7	18,000	—	126,000	—
PLANING MACHINE WITH 0,60 M STROKES	4	3,000	—	12,000	—
POWER DRIVEN HACKSAW, 14" BLADE	13	804	—	10,452	—
POWER DRIVEN HACKSAW, 21" BLADE	2	1,600	—	3,200	—
PLANER MACHINE FOR WOOD, COMBINED WITH CIRCULAR SAW AND DRILL	2	2,000	—	4,000	—
ROLLING MACHINE FOR METAL PLATES, WITH 4 CYLINDERS, DIAMETER 0.5 TO 2.0 M	7	25,000	—	175,000	—
SEMI-AUTOMATIC EQUIPMENT FOR WELDING	7	5,000	—	35,000	—
SET BODY WORKING TOOL	5	100	—	500	—
SPARK PLUG CLEANER	9	650	—	5,850	—
"SUN" ENGINE TESTER	4	6,000	—	24,000	—
STEEL PLATE SHEAR, MANUAL FOR PLATES UP TO Nº 16	13	—	454.55	—	5,909.15
SHEARING MACHINE, MOTORIZED FOR STEEL PLATES UP TO 3/8"	7	4,500	—	31,500	—
TORQ METER	5	320	—	1,600	—
VALVE SEAT GRINDING MACHINE	4	—	909.09	—	3,636.36
VALVE FACE GRINDING MACHINE	3	—	1,363.63	—	4,090.89

D.E.R. REPAIR SHOP EQUIPMENT

TYPE AND DESCRIPTION	QUANTITY TO BUY	UNIT COST CB$ 1,000	UNIT COST US$	TOTAL COST CB$ 1,000	TOTAL COST US$
LATHE, FLOOR TYPE, WITH 2,50 TO 3,00M CENTER TO CENTER	6	10,000	—	60,000	—
LATHE, WOOD	1	300	—	300	—
MULTIPLE PURPOSE DRILL PRESS ATTACHMENT FOR LATHE, W/ SAE US"3/8"TO 1"	7	—	136.36	—	954.52
MILLING MACHINE Nº 2	1	20,000	—	20,000	—
MILLING MACHINE Nº 3	7	30,000	—	210,000	—
MACHINE FOR APPLICATION OF SCOTCH LIGHT FILM	14	3,000	—	42,000	—
MICROMETER OUTSIDE, 0" TO 4"	6	—	131.82	—	790.92
MICROMETER OUTSIDE, 0 TO 100 MM	6	—	131.82	—	790.92
MICROMETER INSIDE, 1" TO 3"	4	—	172.72	—	690.88
MICROMETER INSIDE, 2" TO 6"	6	—	172.72	—	1,036.32
MICROMETER INSIDE, 25 TO 75 MM	2	—	172.72	—	345.44
MICROMETER INSIDE, 50 TO 150 MM	2	—	172.72	—	345.44
MACHINE FOR SEWING UPHOLSTERY MATERIALS	1	1,756	—	1,756	—
MAGNETIC PLATE FOR LATHE, DIAMETER 10"	1	300	—	300	—
OXYGEN BOTTLE	43	300	—	12,900	—
PRESSURE CONTAINER FOR LUBRICATING GEAR BOX AND DIFFERENTIAL	20	73	—	1,470	—
PRESSURE PUMP FOR WASHING MOTORIZED EQUIPMENT	5	200	—	1,000	—
PRECISION BALANCE, CAPACITY 1 KG, ACCURACY, 0.1 GRAM	3	1,000	—	3,000	—

D.E.R. REPAIR SHOP EQUIPMENT

TYPE AND DESCRIPTION	QUANTITY	UNIT COST		TOTAL COST	
		CR$ 1,000	US$	CR$ 1,000	US$
FLOOR-TYPE ELECTRIC DRILL, 2"	1	1,500	—	1,500	—
FORGE HAMMER, TEN TON CAPACITY	1	5,000	—	5,000	—
FUEL INJECTION TESTER	7	510	—	3,570	—
GRINDER, SURFACE, UNIVERSAL	2	5,000	—	10,000	—
GRINDER DOUBLE PURPOSE, FOR MAINTENANCE OF CUTTING AND DRILLING CARPENTER TOOLS	7	300	—	2,100	—
HYDRAULIC JACK, WHEEL MTD.(ALLIGATOR TYPE) CAPACITY 5 TON	9	180	—	1,620	—
HYDRAULIC JACK, WHEEL MTD.(ALLIGATOR TYPE) CAPACITY 10 TON	10	220	—	2,200	—
HYDRAULIC PRESS, MANUAL, CAPACITY 60 TON	22	5,000	—	110,000	—
HYDRAULIC PRESS, ELECTRIC, CAPACITY 200 (OR 150) TON	7	—	2,272.73	—	15,909.11
HYDRAULIC PRESS, COMPLETE, ELECTRIC, FOR TRACTOR TRACK	7	—	6,818.18	—	47,727.26
HYDRAULIC TRACK PIN PRESS	23	800	—	18,400	—
INDUCTION TESTER, COMPLETE	8	88	—	704	—
LUBRICATING PUMP, MANUAL OPERATED	2	25	—	50	—
LATHE WITH RECTIFIER, MILLING TO 2"	13	1,500	—	19,500	—
LATHE WITH RECTIFIER, MILLING TO 6"	2	2,000	—	4,000	—
LATHE, TURNING	2	10,000	—	20,000	—
LATHE, BENCH TYPE, WITH 0,60 TO 1,0M CENTER TO CENTER	3	1,450	—	4,350	—
LATHE, FLOOR TYPE, WITH 1.50 TO 2.0M CENTER TO CENTER	24	6,000	—	144,000	—

D.E.R. REPAIR SHOP EQUIPMENT

TYPE AND DESCRIPTION	QUANTITY TO BUY	UNIT COST		TOTAL COST	
		CR$ 1,000	US$	CR$ 1,000	US$
CRANKSHAFT REGRINDING MACHINE, 2,50 M	1	—	22,727.25	—	22,727.25
CIRCULAR SAW COMBINED WITH DRILL	11	1,500	—	16,500	—
CHAIN HOIST, CAPACITY 500 KG	22	70	—	1,540	—
CHAIN HOIST, CAPACITY 1,000 KG	20	120	—	2,400	—
CHAIN HOIST, CAPACITY 2,000 KG	2	250	—	500	—
CHAIN HOIST, CAPACITY 3,000 KG	11	260	—	2,860	—
CHAIN HOIST, CAPACITY 5,000 KG	2	750	—	1,500	—
CHAIN HOIST, CAPACITY 10,000 KG	1	1,310	—	1,310	—
DIESEL INJECTION PUMP CALIBRATING STAND WITH (8) TEST NOZZLES	8	—	8,636.35	—	69,090.80
ELECTRICAL ENGINE DYNAMOMETER, 50 HP	1	—	1,363.63	—	1,363.63
ELECTRICAL ENGINE DYNAMOMETER, 100 HP	1	—	1,818.18	—	1,818.18
ELECTRIC STORAGE CABINET, ELECTRICALLY HEATED, 1 CI MET.CAP.	8	500	—	4,000	—
ELECTRIC FORGE, COMPLETE	18	176	—	3,168	—
ELECTRIC WELDING MACHINE, 300 A, WITH ELECTRIC MOTOR	12	1,500	—	18,000	—
ELECTRIC WELDING MACHINE, 400 A, WITH ELECTRIC MOTOR	1	2,400	—	2,400	—
ELECTRIC WELDING MACHINE, 300 A, WITH DIESEL OR GAS ENGINE	22	5,100	—	112,200	—
FLOOR-TYPE BUFFER AND GRINDER 4" TO 14"	18	500	—	9,000	—
FLEXIBLE SHAFT GRINDER, ELECTRIC	12	150	—	1,800	—
FLOOR-TYPE ELECTRIC DRILL 1 1/4"	5	1,000	—	5,000	—

D.E.R. REPAIR SHOP EQUIPMENT

TYPE AND DESCRIPTION	QUANTITY TO BUY	UNIT COST		TOTAL COST	
		CR$ 1,000.	US$	CR$ 1,000	US$
ACETYLENE GENERATOR WELDING SET -- 5 KG CHARGE	13	600	—	7,800	—
ACETYLENE GENERATOR WELDING SET -- 7 KG CHARGE	1	800		800	—
AIR COMPRESSOR W/5 HP. MOTOR ELECTRIC MOTOR	15	1,730	—	25,950	—
AIR COMPRESSED PORTABLE GRINDER	15	150	—	2,250	—
APPARATUS FOR RUBBER COATING	2	1,000	—	2,000	—
ACETYLENE BOTTLE	17	210	—	3,570	—
AUTOMATIC ELECTRIC WELDING MACHINE, CONTINUOUS FLOW	7	—	11,363.63	—	79,545.41
"BRINELL AND ROCKWELL" HARDNESS TESTER	7	—	1,818.18	—	12,727.26
BATTERY CHARGER FOR 12 UNITS	11	290	—	3,190	—
BENCH TYPE ELECTRIC DRILL, 1/2"	6	500	—	3,000	—
BEARING BORING MACHINE	2	—	11,363.63	—	22,727.26
BRAKE BAND LINING MACHINE	2	800	—	1,600	—
BRAKE DRUM LATHE	1	1,000	—	1,000	—
BAND SAW FOR STEEL	7	1,750	—	12,250	—
BAND SAW FOR WOOD, FLY WHEEL OF 0,80 M	16	1,548	—	24,768	—
BATTERY TESTER	28	50	—	1,400	—
CYLINDER HONES, (2" TO 4") ELECTRIC DRILL DRIVEN	3	—	79,55	—	238,65
CYLINDER GRINDING AND POLISHING MACHINE	1	—	6,363.63		6,363.63

EQUIPMENT AND VEHICLE REQUIREMENTS - MAINTENANCE AND BETTERMENT

TYPE AND DESCRIPTION	QUANTITIES			UNIT COST		TOTAL COST	
	ENDED	ON HAND	TO BUY	CR$ 1000.	US$ 1.	CR$ MILLION	US$ 1000.
AUTOMOBILE, FOR 4 PASSENGERS	45	43	2	5,500	—	11	—
AUTOMOBILE, FOR 6 PASSENGERS	19	33	-	—	—	—	—
BROOM, SELF-PROPELLED	37	—	37	10,000	—	370	—
CENTRIFUGE, DIESEL	49	2	47	4,000	—	188	—
COMPRESSOR, AIR-TOWED (RUBBER TIRES) 365 CU.FT./MIN.	45	7	38	45,000	—	1,710	—
DISTRIBUTOR, ASPHALT-TRUCK MOUNTED 8000 LTRS CAPACITY	47	17	30	35,000	—	1,050	—
DRILL, ROCK -WITH GASOLINE MOTOR	21	—	21	600	—	13	—
DRIVER, PILE -WITH A 500 KGS. WEIGHT	16	—	16	2,000	—	32	—
ELEVATOR, HYDRAULIC, FOR WASHING AND GREASING	14	6	8	3,000	—	24	—
HOIST, PORTABLE, MOTOR POWERED, LIFTING CAPACITY 4.5 TON	7	7	-	—	—	—	—
LUBRICATING EQUIPMENT, TRUCK MOUNTED	44	4	40	7,750	—	310	—
MACHINE, LAYDOWN (PAVER) ASPHALT, VIBRATING, SPREADING WIDTH OF 10 TO 14 FEET, WITH EXTENSIONS *	40	11	29	65,000	—	1,885	—
MIXER, CONCRETE -250 LTRS. CAPACITY	64	34	30	5,000	—	150	—
MIXER, PULVI-TOWED TYPE 2.10 M, 7 FT. WIDTH	14	—	14	10,000	—	140	—
MOTOR GRADER -10 TO 12 TONS	461	183	278	70,000	—	19,460	—

* = Excluded

EQUIPMENT AND VEHICLE REQUIREMENTS - MAINTENANCE AND BETTERMENT

TYPE AND DESCRIPTION	QUANTITIES			UNIT COST		TOTAL COST	
	NEEDED	ON HAND	TO BUY	CR$ 1000.	US$ 1.	CR$ MILLION	US$ 1000.
PAINTER, STRIPE -SELF PROPELLED	21	—	21	—	4,550	—	95.5
PAINTER, STRIPE -WHEEL MOUNTED	7	—	7	—	6,820	—	47.7
PLANT, ASPHALT, SEMI-PORTABLE, 65 TON/HR *	42	10	32	120,000	—	3,840	—
PLANT, ASPHALT, TOWED, 5 TO 10 TON/HR	92	30	62	5,000	—	310	—
PLANT, PIPE-CONCRETE, COMPLETE, FOR ALL SIZES	48	—	48	10,000	—	480	
PUMP, AIR	14	36	—	—	—	—	—
PUMP, WATER (COMPLETE-HOSES, MANOMETERS, ETC.)	14	55	—	—	—	—	—
PUMP, WATER -SELF PRIMING, TYPE 30-M	266	100	166	3,000	—	498	—
ROLLER, PNEUMATIC, WOBBLY WHEEL, SELF-PROPELLED	145	7	138	18,000	—	2,484	—
ROLLER, SHEEPSFOOT, TOWED	25	36	—	—	—	—	—
ROLLER, SMOOTH WHEEL, VIBRATING, TOWED	7	14	—	—	—	—	—
ROLLER, TANDEM, SELF-PROPELLED, 6 TO 8 TON	38	17	21	18,000	—	378	—
ROLLER, THREE WHEEL, SELF-PROPELLED, 10 TO 12 TON	71	5	66	20,000	—	1,320	—
ROLLER, VIBRATING, SELF-PROPELLED, 3/4 TO 1.0 TON	82	-	82	—	6,820	—	559.1
SAW, CIRCULAR -WITH 40 CM. BLADE	16	-	16	2,000	—	32	—

* = Excluded

EQUIPMENT AND VEHICLE REQUIREMENTS - MAINTENANCE AND BETTERMENT

TYPE AND DESCRIPTION	QUANTITIES			UNIT COST		TOTAL COST	
	NEEDED	ON HAND	TO BUY	CR$ 1000.	US$ 1.	CR$ MILLION	US$ 1000.
SHOVEL, CRAWLER, EQUIPPED WITH 3/4 C.Y., DIPPER BUCKET, 3/4 C.Y., DRAGLINE BUCKET AND PILE DRIVER	7	3	4	120,000	—	480	—
STEAM CLEANING EQUIPMENT, 180 GAL/HR	37	—	37	—	4,550	—	168.2
TABLE, VIBRATING -FOR CONCRETE POSTS	48	—	48	3,000	—	144	—
TANK, STORAGE, FOR ASPHALT, CAPACITY 16000 LTRS.	130	57	73	7,000	—	511	—
TANK, WATER, STORAGE CAPACITY 15000 LTRS.	37	—	37	4,000	—	148	
TELECOMMUNICATIONS SYSTEM -COMPLETE (100) BETWEEN THE MAINTENANCE RESIDENCIES, - WORKS RESIDENCIES, SUB-DIVISIONS, - REGIONAL DISTRICTS AND THE GENERAL HEADQUARTERS IN SÃO PAULO .-	100	—	100	—	1,910	—	191.0
TRACTOR, CRAWLER -WITH DOZER BLADE, WEIGHT UP TO 12 TONS	73	—	73	—	50,000	—	3,650.0
TRACTOR, CRAWLER -WITH DOZER BLADE, WEIGHT UP TO 15 TONS	48	12	36	—	61,360	—	2,209.1
TRACTOR, FRONT END LOADER AND EXCAVATOR, CRAWLER, 1 3/4 C.Y.BUCKET (MINIMUM)	74	30	44	—	38,180	—	1,680.0
TRACTOR, FRONT END LOADER AND EXCAVATOR, PNEUMATIC WHEELED, BUCKET 2 C.Y.(MINIMUM)	213	25	188	—	38,180	—	7,178.2
TRACTOR, WHEELED, PNEUMATIC TIRES, 80 H.P.	28	10	18	15,000	—	270	—
TRUCK, DUMP -3 TO 4 CUBIC METERS	891	175	716	15,000	—	10,740	—

EQUIPMENT AND VEHICLE [illegible] - MAINTENANCE AND REPAIRING

TYPE AND DESCRIPTION	QUANTITY			UNIT COST		TOTAL COST	
	NEEDED	ON HAND	TO BUY	CR$ 1000.	US$ 1.	CR$ MILLION	US$ 1000.
TRUCK, PICK-UP, 700 LB. CAPACITY	440	131	309	10,000	—	3,090	—
TRUCK, TANK -FOR TRANSPORT OF COMBUSTIBLES CAPACITY 8000 LBS.	84	9	75	32,000	—	2,400	—
TRUCK, TRACTOR, W/5TH WHEEL, DIESEL ENGINE, W/DECK TRAILER, 35 TON CAPACITY	26	12	14	41,000	—	574	—
TRUCK, TRANSPORT, FLAT-BED (WOOD) 5.5 TON	154	72	82	14,000	—	1,148	—
TRUCK, TRANSPORT, FLAT-BED (WOOD), DIESEL 9 TON CAPACITY	21	28	—	—	—	—	—
TRUCK, WITH WATER TANK MTD., 8000 LBS. CAPACITY	234	50	184	32,000	—	5,888	—
VIBRATOR, CONCRETE -GASOLINE MOTOR	32	-	32	2,000	—	64	—
WASHING EQUIPMENT FOR MACHINES AND VEHICLES TRUCK MOUNTED	7	-	7	5,000	—	35	—
WINCH, CHASSIS MTD., CAPACITY 6 TON	8	-	8	20,000	—	160	
TOTALS						CR$ 61,065	US$ 15,778.8

UNCLASSIFIED
AID-DLC/P-431
ANNEX III
June 3, 1966

MISCELLANEOUS EXHIBITS

Exhibit 1 - Letter of 8-10-65 from DNER to USAID

Exhibit 2 - Letter of 7-27-65 from USAID to DNER

Exhibit 3 - Sample letter of 9-28-65 from DNER to State Governments

Exhibit 4 - Scope of Work for an Economic and Engineering Study of Maintenance Requirements

Exhibit 5 - Memo of Conversation dated 7-22-65 in DNER's Office

Exhibit 6 - Letter of 9-4-65 from IBRD to DNER

Exhibit 7 - Estimated Dollar Cost - Technical Assistance to DNER

Exhibit 8 - Technical Assistance S.P. Project

Exhibit 9 - Benefit Cost Analysis -- 8 year Benefits

MINISTERIO DA VIAÇAO E OBRAS PÚBLICAS
DEPARTAMENTO NACIONAL DE ESTRADAS DE RODAGEM

Rio de Janeiro, August 10, 1965

Mr. Merten M. Vogel
Chief, Engineering and Natural Resources Office
U.S. Agency for International Development
American Embassy, Rio de Janeiro, Brazil

Dear Sir:

In reference to your letter of July 27, 1965 concerning the study of USAID loans to assist in financing the purchase of highway maintenance equipment for DNER and State Highway Departments, I wish to inform you that I have appointed engineers Thomas J. L. Landau, José Francisco Azevedo and Ivo de Almeida Bicudo as members of the working group which will meet with the USAID group to lay out the work plan for the project.

Sincerely yours,

(signed)
José Lafayette Silviano do Prado
Director General

Rio de Janeiro,
July 27, 1965

Dr. José Lafayette S. do Prado
Director General
Departamento Nacional de Estradas de Rodagem
Av. Presidente Vargas, 522

Dear Dr. Lafayette:

In discussions at your office on 22 July we agreed to pursue the concept of a large USAID loan or a group of related loans to assist in financing the purchase of highway maintenance equipment for the DNER and the many States which have requested such assistance from us. The concept includes a systemized delegation of authority to several of the more prominent States for maintenance of federal highways within their boundaries as an opening step in a long range institutional change in the highway maintenance responsibilities of the DNER.

The prosecution of such a plan will obviously require an immense amount of groundwork and coordination between your staff, the highway staffs of the various States involved and the USAID staff. In anticipation of this effort we also agreed to appoint a planning group to meet for the purpose of laying out a work plan for this project. USAID has appointed Messrs. C. L. Bower, L. J. Brailsford, and M. M. Vogel as our members of the planning group. We await the appointment of your members, and are ready to commence work immediately.

The proposed project, as we envision it, will be a keystone in our development loan program for the next few years, and we believe will be of tremendous assistance in the systematic and economical maintenance of Brazil's far-flung highway system. We look forward with enthusiasm to working with you in this important endeavor.

Sincerely,
(signed)
Merten M. Vogel
Chief, Engineering and
Natural Resources Office

MVOP - DEPARTAMENTO NACIONAL DE ESTRADAS DE RODAGEM

Rio de Janeiro, September 28, 1965

Representative of the State Government

In attention to loan requests for acquisition of equipment for highway maintenance, received from DNER and from various states, AID suggested the elaboration of an ample and integrated plan for highway maintenance. The effectiveness of this plan would constitute in a significative contribution to the improvement of the state highways and the federal system.

A mixed commission AID-DNER studied this plan, and is now submitting a general description to you for your appreciation.

AID and this Department are at your disposal for any additional information you may require.

We hereby request that the State expresses in writing its interest in participating in the mentioned plan, accepting the responsibility assigned to it of the proportional part of the execution cost of the feasibility study.

Due to the urgency in proceeding with the work, we request that the answer be delivered to us as of October 8 of this year.

Sincerely,
(signed)
Eng. José Lafayette S. do Prado
Director General - DNER

SCOPE OF WORK FOR AN ECONOMIC AND ENGINEERING STUDY OF MAINTENANCE REQUIREMENTS OF FEDERAL HIGHWAYS IN THE STATES OF MARANHÃO, PIAUI, CEARÁ, RIO GRANDE DO NORTE, PARAÍBA, PERNAMBUCO, ALAGOAS, SERGIPE, BAHIA AND THE FEDERAL TERRITORIES.

I. ENGINEERING

1. Existing Highways

Inventory and description of Federal highways in each state or territory, giving general data on the topography, geology, climate, vegetation, and land use in the areas served highway length, major right of way structures, type of surface and shoulders, and length condition of maintenance.

2. Current Construction

List all Federal highway sections under construction which are scheduled for completion within the next three years so that they may be included in the general maintenance plan, and include them in the inventory and description outlined above.

3. Maintenance Organization

Prepare a description and an analysis of the existing organization and maintenance operations of the DNER in each of the States and Territories, including an inventory of maintenance buildings, shops, yards, and equipment; and information as to number, level of skills, classification, and age of personnel. Prepare recommendations for changes in the organization and maintenance operations of the DNER, and for changes in the relationship between each DNER's district and the headquarters of the DNER.

4. Current Highway Use

Compile and analyse existing data (average daily traffic, by vehicle type and other) on highway traffic on all Federal highways for each State and Territory. Any additional traffic counts and origin-destination studies required shall be undertaken by the DNER, or by other organizations, but all such studies shall be made under the general supervision of the consultants.

5. Future Traffic

Estimate 1970 and 1980 traffic (ADT by vehicle type) on Federal highways in each of the subject States and the Territories.

6. Organization, Specific Equipment and Personnel Needs

Develop and organization and maintenance plan for the Federal highways for each Federal District setting forth the needs for maintenance equipment, shop equipment, sturctures, personnel, and training of personnel. Needs as expressed shall be consistent with criteria as to capacity of each unit of equipment, or of each facility.

II. ECONOMICS

Total Transportation and its Highway Share

1. prepare an analysis of the relative importance of highway transportation as compared to other transport modes in Brazil.

2. undertake analysis of the rebuilding costs, by type and condition of roads, at specified intervals, to meet minimum standards for the traffic postulated, if improved maintenance is not provided.

3. prepare a comparison of transport cost over good versus poor roads. Use material and cost data available from the U.S. Bureau of Public Roads, the Highway Research Board, the United Nations, the O.A.S., industrial and commercial firms in Brazil and other sources. This data should be related to estimated traffic to yield order of magnitude of cost savings that can be secured by good maintenance. Prepare an analysis of the impact on the economy of the availability of good versus poor roads.

4. a clear explanation of the premises, data, and method of computing the estimated benefits, should be given. Finally, the analysis should include a comparison of the present value of benefits (benefit cost ratio) as calculated above. As part of the benefit cost ratio analysis, the consultant should present the present value of the net savings and transport cost with the present value of the cost of maintaining the roads. These data should be translated into annual rates of return. The benefits and cost as well as rates of return should be provided by major areas, and types of roads.

5. indicate all sources for data and formulas used in preparing the report. The methodology employed in computing the benefit cost ratio should be fully set forth specifically where indirect cost and benefits are derived.

III. FINANCIAL

Estimate future level of highway revenues by source, segregating funds available for maintenance operations, and probable cost of such operations on an annual basis (in constant currency). Based upon the last five-year

record of receipts and expenditures of funds, a projected account shall be constructed for each State, to show the availability funds over the next 10 years to maintain the existing Federal and State Highway network.

Sources of funds should be indicated by major categories, and expenditures by principal functions, i.e., [illegible]ction, maintenance and administration.

The report should include a "Source and Use of Funds" Financial Statement for a ten year period (five years of actual experience and a five year projection).

SCOPE OF WORK FOR CONSULTANT OF AN ECONOMIC AND ENGINEERING HIGHWAY STUDY IN STATES OF PARÁ, MATO GROSSO, GOIÁS, ESPIRITO SANTO, GUANABARA, RIO DE JANEIRO, AMAZONAS, AND ACRE

I. ENGINEERING

1. Existing Highways

Prepare an inventory and description of existing Federal and State highways in each State, giving general data on the topography, geology, climate, vegetation, and land use in the areas served, highway length, major right-of-way structures, type of surface and shoulders, and maintenance condition.

2. Current Construction

List all Federal and State highway sections under construction which are scheduled for completion within the next three years so that may be included in the general maintenance plan. Include inventory and description outlined in (1) above as it applies to the completed construction.

3. Maintenance Organization

Prepare a description and an analysis of the existing organization and maintenance operation of each of the eight State Highway Departments and of the DNER in each of the eight states, including an inventory of maintenance buildings, shops, yards, and equipment; and information on number, level of skills, classification, and age of personnel. Include equipment both on order

and for which funds have been obligated. Prepare recommendation for changes in the organization and the maintenance operations of each of the State Departments, and for changes in the relationships between these Departments and the DNER which will enable the Department to best handle maintenance.

4. Current Highways Use

Compile and analyze existing data on highway traffic [illegible] State Highways within th[illegible] [illegible]ny additional traffic counts and origin-destination studies required shall be undertaken by the State Highway Departments and DNER or by mutual agreement, by other organizations. All such studies shall be made under the supervision of the Consultants.

5. Future Traffic

Estimate 1970 and 1980 traffic (ADT by vehicle type) on the indicated highways.

6. Developing a Maintenance Plan

a) Develop a maintenance plan for the Federal Highway network in each of the states, as it now exists, and as it is recommended that it be changed.

b) Develop a similar plan for the State highway network in each of the states.

c) Develop a similar integrated plan for the Federal and State networks in each State.

d) Determine whether separate State and Federal system maintenance programs or an integrated program, would be preferable for one or more, or for all states.

e) Each of the above maintenance plans should set forth the needs for maintenance equipment, shop equipment, structures, personnel, and training of personnel. Needs as expressed shall be consistent with criteria as to capacity of each unit of equipment, or of each facilty.

II. FINANCIAL

Estimate future level of highway revenues by source, segregating funds available for maintenance operations, and probable cost of such operations on an annual basis for each of the above alternative (in constant currency). Based upon the last five-year record of receipts and expenditures of funds, a projected account shall be constructed for each State, to show the available funds over the next 10 years to maintain the existing Federal and State highway network.

Source of funds will be indicated by major category, and expenditures by principal functions, i.e., construction, maintenance, and administration.

The report should include a "Source and Use of Funds" Financial Statement for a ten year period (five years of actual experience and a five year projection).

III. ECONOMICS

Total Transportation and its Highway Share

1. Prepare an analysis of the relative importance of highway transportation as compared to other transport modes in Brazil.

2. Undertake analysis of the rebuilding costs, by type and condition of roads, at specified intervals, to meet minimum standards for the traffic postulated, if improved maintenance is not provided.

3. Prepare a comparison of transport cost over good vs poor roads. Use material and cost data available from the U.S. Bureau of Public Roads, the Highway Research Board, the United Nations, the O.A.S., industrial and commercial firms in Brazil and other sources. This data should be related to estimated traffic to yield order of magnitude of cost savings that can be secured by good maintenance. Prepare an analysis of the impact on the economy of the availability of good vs poor roads.

4. A clear explanation of the promises, data, and method of computing the estimated benefits, should be given. Finally, the analysis should include a comparison of the present value of benefits (benefit cost ratio) as calculated above. As part of benefit cost ratio analysis, the consultant should present the present value of the net savings and transport cost with the present value of the cost of maintaining the roads. Those data should be translated into annual rates of return. The benefits and cost as well as rates of return should be provided by major areas, and types of roads.

5. Indicate all sources for data and formulas used in preparing the report. The methodology employed in computing the benefit cost ratio should be fully set forth, specifically where indirect cost and benefits are derived.

Drafting Officer: LJBrailsford:ero
May 18, 1966

MEMORANDUM OF CONVERSATION

PLACE: Dr. Lafayette's Office, DNER

DATE: July 22, 1965

SUBJECT: Combined Highway Maintenance Equipment

PARTICIPANTS: Dr. Lafayette, Director of DNER
Messrs. Landau and Schmidt of DNER
Messrs. Vogel, Levinson, and Vieira of USAID

Summary of the main points discussed:

1. The purpose of the meeting, as stated by Messrs. Vogel and Levinson, was to discuss the overall needs of highway maintenance equipment in Brazil, in view of the fact that the USAID has received requests for financing the purchase of equipment both from the DNER itself and from some 10 individual states.

2. Mr. Levinson noted that, considering the concurrent needs of state and federal road maintenance, a national approach to the problem seems clearly desirable.

3. Dr. Lafayette agreed and suggests that the states can be divided into two categories: (a) those which are capable, in material and human terms, to take care of road maintenance in their area (e.g., São Paulo, Minas Gerais, Paraná) and (b) those which do not have these capabilities and therefore need greater and closer assistance from the DNER (e.g., Rio Grande do Sul, Santa Catarina, certain states in the Northeast).

4. To those in the first category the DNER would delegate authority and provide the equipment for maintenance of both state and federal roads in the area; to those in the second category the DNER would provide a more direct help by supervising the work, training engineers

and equipment operators and generally trying to improve their level of performance, so that they too could eventually be delegated authority.

5. Dr. Lafayette described the difficulties which the DNER and the state highway departments have in obtaining engineers and skilled equipment operators, so that it is imperative to develop a system which would enable both the DNER and the states to make the best possible use of their scarce human and material resources.

6. Dr. Lafayette suggests and Messrs. Vogel and Levinson concur that a joint DNER-USAID working group be formed to study overall country needs for road maintenance equipment and make recommendations as to the types and numbers to serve both the DNER and the states, so as to achieve an optimum allocation of the equipment.

7. Dr. Lafayette immediately appointed Messrs. Landau and Schmidt to be the DNER members of the working group. Messrs. Vogel and Levinson will name the USAID members.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

Rio de Janeiro,
September 4, 1965

José Lafayette do Prado
Depto. Nacional de Estradas de Rodagem
Rio de Janeiro

Dear Sir:

Following discussions with Brazilian officials and Mr. Kaufmann and other AID officials, we have amended the Terms of Reference for highway consultants to include the following:

1) The language has been clarified so that investment requirements for maintenance equipment will be specifically included in the highway master plans.

2) In addition, consultants for highway studies in the three southern States will submit a preliminary report within the first five months, identifying and justifying the minimum requirements for investments in maintenance equipment during the first three years of the master plan. This report will include preliminary comments and recommendations on organization and management of maintenance in these States.

The inclusion of the above is based on the assumption that no other consultants will be engaged on studies covering these subjects.

I shall be grateful if this understanding is confirmed by your signature below as representative of DNER and the States of Paraná, Santa Catarina and Rio Grande do Sul.

Yours Sincerely,

(signed)
S. Aldewereld
Vice President

TECHNICAL ASSISTANCE TO DNER

ESTIMATED DOLLAR COST

FY 67								
1	at	$ 21,500	x	1	=	=	$	21,500
1	at	21,500	x	6/12	=			10,750
3	at	19,000	x	6/12	=			28,500
TDY		19,000	x	6/12	=			9,500
							$	70,250
FY 68								
2	at	$ 21,500	x	1	=		$	43,000
3	at	19,000	x	1	=			57,000
TDY		19,000	x	6/12	=			9,500
							$	109,500
FY 69								
2	at	$ 21,500	x	1	=		$	43,000
3	at	19,000	x	6/12	=			28,500
TDY		19,000	x	6/12	=			9,500
							$	81,000
FY 70								
2	at	21,500	x	6/12	=		$	21,500
		Sub-Total - Salaries					$	282,250

Personnel Benefits		
$ 282,250 x 8 1/2%	=	$ 23,991
Transportation of Household Effects and Automobile		
5 x $ 4,000	=	$ 20,000
BPR Backstopping		
Estimated	=	$ 10,000
Contingency		
		$ 35,000
	Sub-Total	$ 88,991
	Total	$ 371,241
	Use	$ 375,000

TECHNICAL ASSISTANCE TO DNER

ESTIMATED CRUZEIRO COST

Cash		
5 Automobiles or Station Wagons	=	45,000,000
Housing		
150 man months at 1,000,000	=	150,000,000
International Travel		
5 x 7,000,000	=	35,000,000
TDY 12 x 2,200,000	=	26,400,000
Sub Total		61,400,000
Local Air Travel		
Estimated	=	88,000,000
Operation & Maintenance of Vehicles		
130,000 kms. at 200	=	50,000,000
Per Diem		
540 days TDY at 40,000	=	21,600,000
1000 days Regular Team at 33,000	=	33,000,000
Sub Total		54,600,000
Brazilian Personnel		
2 Interpreters at 300,000 x 39 mos	=	23,400,000
3 Interpreters at 300,000 x 24 mos	=	14,400,000
2 Drivers at 150,000 x 39 mos	=	11,700,000
3 Drivers at 150,000 x 24 mos	=	7,200,000
2 Engineers at 700,000 x 39 mos	=	54,600,000

Brazilian Personnel (Cont.)

3 engineers	at 700,000 x 12 mos	=	25,200,000
1 economist	at 700,000 x 12 mos	=	8,400,000
1 Secretary	at 300,000 x 42 mos	=	12,600,000
1 Clerk-typist	at 200,000 x 36 mos	=	7,200,000
	Sub-Total Personnel	=	164,700,000

Supplies & Miscellaneous

50,000,000

Contingency

60,000,000

Total Cash	=	723,700,000
Use	=	725,000,000

In Kind

Office Space, furniture, equipment, utilities, 2,000,000 per mo. x 36 mos	=	72,000,000

TECHNICAL ASSISTANCE - SAO PAULO STATE HIGHWAY DEPARTMENT

The technical assistance to be provided to the State (DER/SP) will be provided by a private consulting firm selected by the State and acceptable to A.I.D. Specifically, the consultant is to provide services of qualified professional engineers and technicians over a period of 30 months in the following fields:

1) highway construction and maintenance;

2) construction materials and design;

3) cost accounting;

4) maintenance equipment operation and upkeep; and

5) shop facilities and warehouseing.

The general objectives of this program will be to assist the State Highway Department in improving its capabilities in the areas of engineering planning, design, specifications, administration of construction contracts, and maintenance of highways. The State will provide logistical support, such as office space and furnishings, office equipment as required, and field transportation. Additionally, the State will complement consultant personnel through the use of its key employees as counterpart engineers and technicians on a fully cooperative and integrated basis.

A description of the duties of the U.S. team of engineers and technicians and the implementation plan for accomplishing the program, as well as the bio-data for each member of the team, must be approved by A.I.D. In addition, a description of the duties and responsibilities of the State's counterpart personnel to be assigned to the program will be a condition precedent to A.I.D. approval of the plan for implementation.

It is estimated that the total program of 30 months will be phased in (1) 12 months of organizational study, (2) 12 months for implementation of the study recommendations, and (3) 6 months devoted to observation and correction of deficiencies as may be required.

In as much as the 12% rate of growth applies to traffic generally as does the 9% discount to present value factor, one calculation was made instead of the five calculations for each type of vehicle. The conversion factor (F.4240) thus determined was applied to the 1968 savings shown in the foregoing benefit cost analysis (page 28) to expand the savings of that single year to the value of the eight period of the minimum equipment life.

On the paved system the saving is $0.00045 per veh/km and on the unpaved, $0.00159 per veh-km.

12% Annual Growth Year	Paved Veh-Km	(.00045 x 9% factor) Unit saving x Discount Factor	Total saving
1967	3,583,250,600	0.000430	$ 1,541,510
1968	4,013,240,700	.000393	1,577,200
1969	4,494,829,600	.000360	1,618,140
1970	5,034,209,100	.000329	1,656,250
1971	5,638,314.200	.000300	1,691,490
1972	6,314,912,000	.000275	1,736,600
1973	7,072,701,400	.000251	1,775,250
1974	7,921,425,600	.000229	1,814,010

8 yr saving:--$13,410,450 = 7.4255 factor

1 yr saving used in report 1,806,000

12% Annual Growth	UNPAVED		
1967	355,809,800	.001520	$ 540,830
1968	398,507,000	.001390	553,920
1969	446,327,800	.001270	566,840
1970	499,887,100	.001160	580,370
1971	559,873,600	.001060	594,020
1972	627,058,400	.000970	608,250
1973	702,305,400	.000890	622,240
1974	786,582,000	.000810	636,340

8 yr saving:--$ 4,702,810 =7.4224 factor

1 yr saving used in report 633,600

Average Factor 7.4240

Thus total user saving for 8 years = 7.4240 x $11,233,200= $83,395,280

The saving to owner, per km of highway = $\frac{\$1,729,360}{9,870}$ = $175.21.

Over the 8 yr period, discounted to present

	Paved KM	Disc Factor	
1967	9,100	0.956	8700
1968	9,870	.874	8626
1969	10,810	.799	8636
1970	11,720	.730	8556
1971	12,780	.667	8524
1972	13,930	.610	8497
1973	15,180	.557	8455
1974	16,530	.509	8414
			68,409

68,409 x 175.21 = $11,985,940

Equipt replacement fund = 68,409 x $130 = $8,893,170

LOAN AUTHORIZATION

Provided from: Alliance for Progress Funds
BRAZIL - D.E.R.-Sao Paulo (Sao Paulo Highway Maintenance)

Pursuant to the authority vested in the Administrator of the Agency for International Development ("A.I.D.") by the Foreign Assistance Act of 1961, as amended, and the delegations of authority issued thereunder, I hereby authorize the establishment of a loan pursuant to Part I, Chapter 2, Title VI, Alliance for Progress, of said Act to the Highway Department of the State of Sao Paulo ("Borrower") of not to exceed twenty million United States dollars ($20,000,000) to assist in financing the United States dollar costs of highway maintenance equipment and technical assistance and training required to adequately maintain the road network in the State of Sao Paulo and to accomplish an effective reorganization of the Borrower. This loan shall be subject to the following terms and conditions:

1. Interest and Terms of Repayment:

(a) Borrower shall repay the loan to A.I.D. in United States dollars within eighteen (18) years from the first disbursement under the loan, including a grace period of not to exceed three (3) years. Borrower shall pay to A.I.D. in United States dollars on the disbursed balance of the loan interest of three and one-half percent (3-1/2%) per annum.

(b) If prior to the end of the grace period the Government of Brazil ("Government") so elects, the Borrower shall fulfill its dollar obligation under the loan by paying the Government in the currency of Brazil the equivalent, determined as of the time and in a manner satisfactory to A.I.D., of the United States dollar amounts payable to A.I.D. under (a) above and in such event the Government shall pay to A.I.D.:

(i) the equivalent in United States dollars, determined as of the time and in a manner calculated to obtain repayment of all dollars disbursed plus interest, of all amounts paid to Government as follows:

(a) all interest immediately upon receipt subject to Government's right to retain all payments in excess of one percent (1%) per annum during a grace period of not to exceed ten (10) years from the first disbursement under the loan ("Government grace period") and all payments in excess of two and one-half percent (2-1/2%) per annum thereafter.

(b) principal within forty (40) years, including the Government grace period.

(ii) interest in United States dollars of one percent (1%) per annum during the Government grace period, and two and one-half percent (2-1/2%) per annum thereafter on all amounts of outstanding principal paid by Borrower to Government from the respective dates of such payments of principal.

2. Other Terms and Conditions:

(a) Equipment, materials and services financed under the loan shall be procured from the United States of America.

(b) The loan shall be guaranteed by Government.

(c) Borrower shall employ qualified technical consultants, satisfactory to A.I.D., to advise and assist in carrying out the project.

(d) The loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

_____
Administrator

_____
Date

LOAN AUTHORIZATION

Provided from: Alliance for Progress Funds
BRAZIL - D.N.E.R. (Technical Assistance - Highways)

Pursuant to the authority vested in the Deputy U.S. Coordinator, Alliance for Progress, by the Foreign Assistance Act of 1961, as amended, and the delegations of authority issued thereunder, I hereby authorize the establishment of a loan pursuant to Part I, Chapter 2, Title VII, Alliance for Progress, of said Act to the Government of Brazil ("Borrower"), acting through the National Highway Department ("D.N.E.R.") of not to exceed four hundred thousand United States dollars ($400,000) to assist in financing United States dollar costs of technical assistance to the D.N.E.R., including related commodity requirements. This loan shall be subject to the following terms and conditions:

1. Interest and Terms of Repayment:

   (a) Borrower shall repay the loan to the Agency for International Development ("A.I.D.") in United States dollars within forty (40) years from the first disbursement under the loan, including a grace period of not to exceed ten (10) years. Borrower shall pay to A.I.D. in United States dollars on the disbursed balance of the loan interest of one percent (1%) per annum during the grace period and two and one-half (2-1/2%) per annum thereafter.

2. Other Terms and Conditions:

   (a) Equipment, materials and services financed under the loan shall be procured from the United States of America.

   (b) The loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

_____
Deputy U.S. Coordinator
Alliance for Progress

_____
Date

UNCLASSIFIED
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June 16, 1966

ANNEX V

MEMORANDUM TO DEVELOPMENT LOAN COMMITTEE

THRU : Messrs. Levinson and Glaessner, LA/CD

FROM : Lawrence J. Brailsford
USAID/Brazil/ADCD

SUBJECT: Sao Paulo Maintenance and Technical Assistance Proposed $20 million Loan -- Outstanding Issues

The issues listed below constitute the remaining questions raised by Donald Green of the Bureau of the Budget. Mr. Wright of Brown and Root and myself have attempted to set out these questions as we understand them and provide suggested responses. The issues are:

1. Explain the manner in which the maintenance cost per kilometer of $802 was derived.

2. Average daily traffic should be shown for each year from 1960 to 1964 classified by type of vehicle and class of road.

3. Similar data should be provided for the years 1965 and 1966.

4. The 12% projected rate of traffic increase should be substantiated.

5. Calculations should be shown for the savings factors of 1, 2, and 4%.

6. The savings to be generated by this project should be ranked in a distribution table showing the range of savings by type of road over the life of the project.

7. The tables on pages 36 and 37 should be analyzed to show what the increasesin capital expenditures represent, from what sources the increased funds will come, and the cost of the proposed plan of construction over the next five years.

8. It has been proposed that equipment purchases by the State initially should be restricted to that equipment required to properly maintain the existing highway network and that

equipment for additional mileage to be added to the network over the next three year period should be ordered following the acquisition of the necessary equipment to maintain the existing network. This requirement has been included in the loan paper in paragraph 3.15.

Our suggested responses to the questions set forth above in the order which they are presented are:

Answer #1: The average cost per kilometer of maintenance estimated at $800 was derived based on the following considerations:

(a) The inadequate cost data available in the State Highway Department of Sao Paulo, dictated that the Consultant draw on other experience in Brazil, in the United States and other areas in the world to arrive at a cost of maintenance per km that could be reasonably used in the benefit cost calculations. The National Highway Department, for planning purposes, estimates that the cost of maintenance per kilometer over the Federal network is 1,300,000 cruzeiros per kilometer, which at present exchange rates equals about $800 per kilometer.

Maintenance costs in the United States range between $720 to $960 per kilometer ($1,200 to $1,600 per mile) which supports the consensus that the DER/SP has been allocating adequate funds to maintenance but receiving unsatisfactory results.

(b) The Consultant attempted to verify this experience and the National Highway Department's estimates of per kilometer maintenance cost from the historical records available in the State Highway Department of Sao Paulo. The result of those efforts are set forth in Technical Appendix II-D, which represents the attribution of costs to specific operations based entirely on the Consultant's judgment. The resultant average maintenance cost per kilometer set forth in Section II-D(3) of the Consultant's Report as $802 per kilometer, appears to contain a high degree of accuracy in that it is the result of the application of adjusted historical data. However, it is the result of the Consultant's judgment, the National Highway Department's figures, and the Consultant's actual inspection of both the network and the DER's present equipment inventories and an evaluation of the DER's present operating procedures.

(c) The Consultant's experience and a general study of maintenance cost reported to the U.S. Highway Research Board both indicate that $800 per kilometer is a level of expenditure adequate to provide optimum maintenance, including renewal of the equipment through application of rental schedules. Thus, the Consultant determined that the State Highway Department has been allocating, through its normal budgetary procedures, sufficient funds to adequately maintain the State highway network. The present unacceptable level of maintenance is a result of inefficiency of both equipment and operating procedures. Therefore, the estimated $800 cost of maintenance per kilometer has been projected into the future as an adequate expenditure assuming that the introduction of modern methods and efficient equipment will permit the Department to execute the proposed program with about the same level of funds per kilometer for maintenance. Additionally, the Consultant and the Mission concur that "maintenance" as used in Brazil includes as a major cost item the cost of completing newly constructed roads. It is anticipated that following the successful adoption of better specifications and contract controls, these expenditures will no longer be attributed to maintenance. This approach, i.e. the application of the $800 cost of maintenance per kilometer in both conditions one and two is considered to be the most conservative estimate available, and totally consistent with the philosophy employed throughout the study of applying the most conservative assumptions available to ensure that in no case will benefits be overstated.

Answer #2: The chart set out below is a break-out of average daily traffic by year for the years 1960 through 1965. The data is presented by vehicle type and class of road, i.e. paved and unpaved.

ADT BY YEAR (1960 - 1965)

	1960		1961		1962		1963		1964		1965	
1/	P	UP	P	UP	P	UP	P	UP	P	UP	P	UP
PC2/	338	43	442	57	537	69	581	76	689	89	826	106
LT	102	38	108	40	116	43	122	45	132	49	140	52
MT	374	77	396	81	423	87	445	91	482	99	513	105
HT	58	4	62	5	66	5	69	5	75	6	80	6
Bus	58	9	63	9	67	10	71	11	77	12	81	12
TOTALS												

Answer #3: Average daily traffic figures for 1965 are included in the above chart, similar data for 1966 are not available.

Answer # 4: The 12% projected growth rate for all categories of traffic set forth in the Consultant's Report represents a weighted average. Computations were performed which produced total vehicle/kms of travel on both paved and unpaved systems for 1960 - 64. The over-all growth rate was developed from these computations. Growth by vehicle type was also computed from these same basic data for use in a corollary study relative to the destructive effect of over loanding.

The table set forth in Section III-C(2) of the Consultant's Report shows the annual growth rate of total traffic by highway section for each of the principal radial and transverse highways of the State of Sao Paulo. These annual growth rates are the exponential rates derived mathematically from the past ADT on each highway section.

Answer #5: The 8% savings factor for the paved network represents the maximum range of savings that maintenance could possibly bring about over a paved road network in excellent condition and a road network in poor condition. Correspondingly, the 22% represents the range of savings that maintenance could create over the unpaved network. These savings factors (ranges of maximum and minimum savings) are the result of actual measurements of operating costs over

1/ P= Paved
UP= Unpaved
2/ PC=Passenger Car LT=Light Truck MT=Medium Truck HT=Heavy Truck

Brazilian roads conducted by the Consultants. On the low side, these ranges thus reflect the absolute minimum cost of operation (realistically a condition which maintenance is not designed to achieve) and, on the high side, the practical maximum cost of operating over the traveled way, a point at which responsible public agencies would take the step of surface restoration. The Consultant computed for the Sao Paulo network, both paved and unpaved, that the average possible savings would fall in a range as is determined in the attached chart, i.e. 2% for the paved network and 4% for the unpaved network. These factors are based upon a physical inspection by the Consultant of the Sao Paulo network and the application of the Consultant's judgment as to the obtainable benefits the proposed investment will realize.

The maintenance of unpaved surfaces does not require the same sophistication and technique as that of paved surfaces. The deficiencies of the current maintenance are not as apparent on the unpaved system as on the paved, and the Consultant estimates that the possible savings, through up-grading will only be about 75% as great as that to be realized on the paved system. Hence, the estimate that a total 4% of operating cost might be saved on the unpaved system. (75% x $\frac{1}{2}$ x 11%)

The research which established the ranges to which the Consultant refers was performed with a medium truck fleet. Time was a vital factor in the costs thus determined. The value of time to the operator of a passenger vehicle is controversial. To be on the conservative side in the benefit estimation, the Consultant chose to consider that passenger vehicles, because of the questionable value of time and because of the greater maneuverability, lesser weight and impact value, less costly repairs, etc., would enjoy a savings only one-half as great as the commercial vehicle over both the paved and the unpaved roads.

Answer #6: We have attempted to calculate the distribution of savings to be generated by the proposed investment over the Sao Paulo network along the lines suggested by Mr. Green of the Bureau of the Budget. We have found, that given the data available to us that meaningful results are not possible. We have, however, been able to establish rough estimates as to how the savings will be distributed over the paved and unpaved State network. For the paved network indications are that the range of savings will probably be between 40 and 15% with approximately 20% of the paved network enjoying savings in the lower range, i.e. 15%. This estimate is based on the fact that the average age of the paved network is five years; moreover, evidence of the type of maintenance that has been applied to these roads shows that no more than 20% of the road network falls in this category. An estimated 20 to 30% of the network would fall along the distribution of savings in the range of 20 to 25%. The remaining 55% appears to be spread over the range of 30 to 40% savings. The unpaved network in Sao Paulo does not consist of clearly defined sections of dirt or gravel roads, rather these two types of unpaved surfaces are inter-mixed. Thus, the savings are distributed as follows: approximately 40% of the unpaved network will earn savings in the range of 15 to 20% while the remaining 60% will probably earn savings in the range of 30 to 40%.

Answer #7: The capital expenditures as shown in the cash flow statements on pages 36 and 37 of the Capital Assistance Paper consist principally of expenditures for construction over a five year period - 1966 to 1970. It is estimated that

Cr $502.6 billion will be expended for betterments, Cr $9 billion for highway construction, Cr $769.1 billion for freeway construction and Cr $920.6 billion for paving and betterments. Treating each item separately, some commentary follows:

Betterments consists generally of recap paving designed to preserve the life of deteriorating pavements. The roads to which the recapping will be applied meet appropriate geometric design standards.

Highway construction consists of new, non-freeway construction.

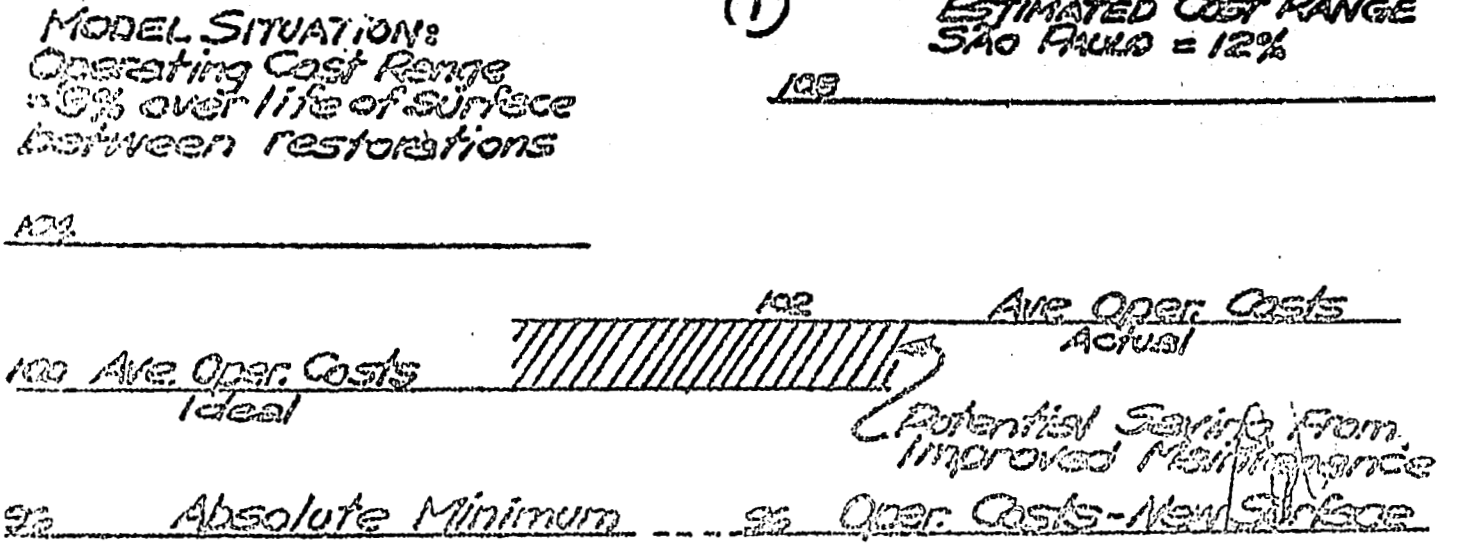
Freeway construction consists of the extension of the four lane divided West Freeway which has currently reached approximately one-half its projected length. The balance of the funds designated for freeway construction will be expended on construction of the inner beltway, a circumferential route designed to by-pass and distribute traffic around the capital city of Sao Paulo. This construction will be four to six traffic lanes with local service roads adjacent. Proposed freeway construction will total 411 kilometers and constitute an equivalent of 1,008 kilometers of two-lane highways.

Paving and betterments will consist of the up-grading of existing roads through grading construction designed to improve geometric standards, and the paving or recapping of the up-graded roads. Section II-B(2) of the Consultant's Feasibility Study illustrates graphically the pattern of evolution and up-grading of the highway system of Sao Paulo. Map #12 to be found in Technical Appendix II of the Report also illustrates the changing character of the road network.

(1)

MODEL SITUATION:
Operating Cost Range
= 6% over life of surface
between restorations

ESTIMATED COST RANGE
SÃO PAULO = 12%

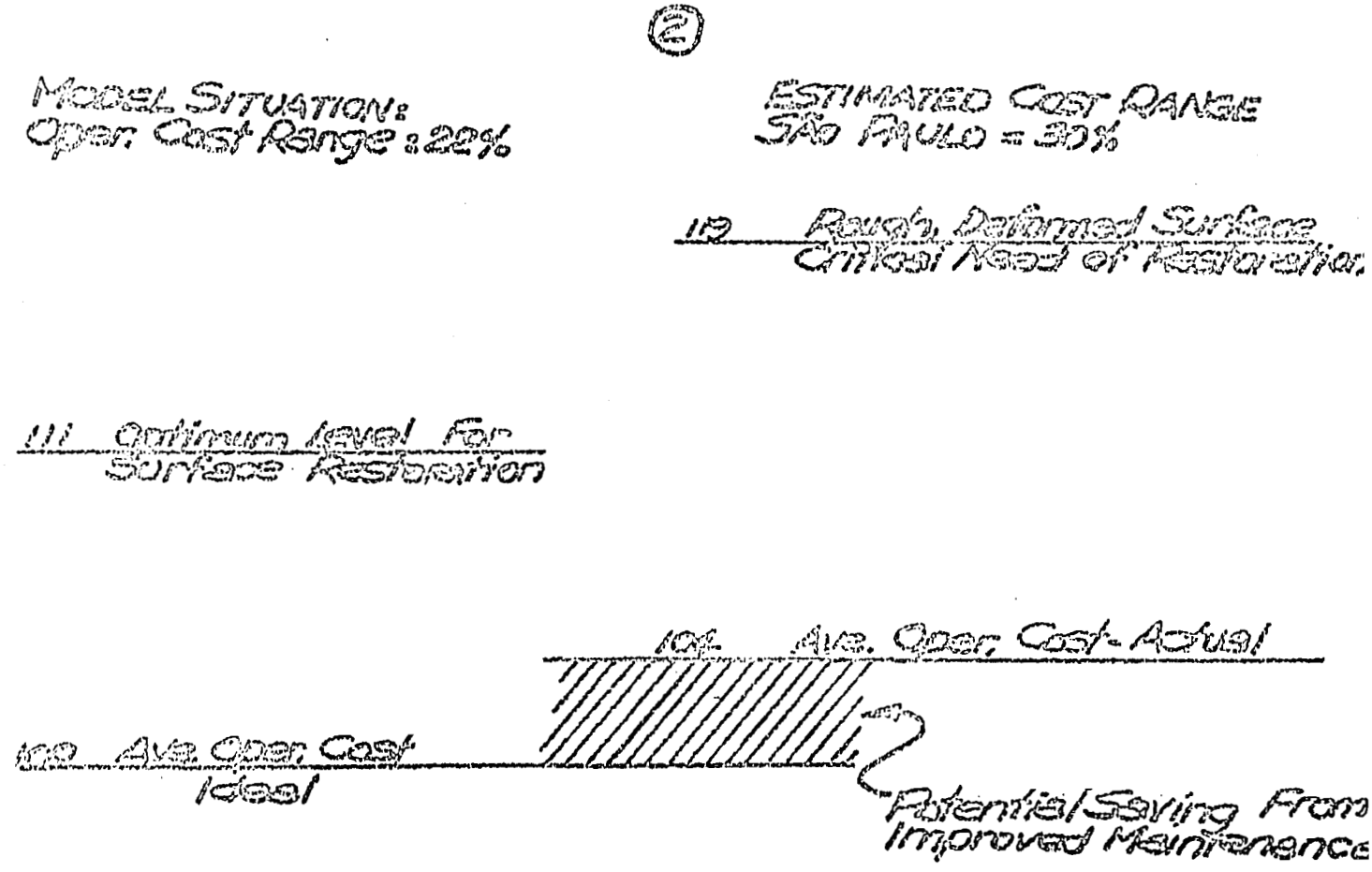


PAVED HIGHWAYS

(2)

MODEL SITUATION:
Oper. Cost Range : 22%

ESTIMATED COST RANGE
SÃO PAULO = 30%



UNPAVED HIGHWAYS