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ROAD INFRASTRUCTURE AND MUNICIPAL SERVICES

A Project Design
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I

INTRODUCTION AND BACKGROUND

This presentation, while it deals with trucks and loaders, and management systems, is designed to help enhance daily life in Egypt's cities and villages . Life will be better, safer, healthier and more prosperous for the residents of Egypt if city streets and rural roads are better maintained, if trash is collected regularly, and septic tanks are pumped out more promptly. These conditions are more likely to occur if the mechanical equipment which performs these tasks is in good working order and if the staff that plans and implements these programs has access to the latest, pertinent development in public works management.

For these reasons this presentation is about the purchase, importation, operations, maintenance and management of the rolling stock which performs road maintenance and municipal services in Egypt's rural and urban governorates.

This document is the final component of work on this subject performed by TransCentury in Egypt during April, May and

June, 1985, and in consultations with manufacturers in the U.S. during July, 1985.

The presentation describes a seven-year project as follow-on to the Decentralization Support Fund (DSF) project launched in September, 1980, amended in June, 1983, which was one of six components of USAID/Egypt's Decentralization Support Sector Program. We have designed this activity, entitled The Operations and Maintenance Project, for consideration as one component of USAID/Egypt's new funding and support of the decentralization sector, Local Development (LD) II and III.

During April, May and June, 1985, TransCentury performed field visits and consultations in Egypt in partnership with the Technical Liaison Group (TLG) of USAID, suppliers, and Government officials. (See TransCentury's Interim Report, Revised 13 June 1985.) During late June and early July, TransCentury arranged consultations in the U.S. with manufacturers of DSF equipment for His Excellency Hamdy El-Hakim, His Excellency Adel Bassouni, Sami Yacoub, and Ernest Kuhn, who will be among those planning and implementing LD II and III.

Therefore, as a result of consultations in Egypt and the U.S., this report presents the seven-year Operations and Maintenance Project. Because of its importance to the design of

this project, and to avoid repetition, Section II: Analysis of Present Situation, of TransCentury's Interim Report, is included as Annex A to this report.

Because we are unfamiliar with the latest planning by USAID/Egypt and the Government of Egypt for LD II and III, we cannot presume that details of our presentation mesh with funding levels, timing or designs for LD II and III. However, on the basis of our analyses, consultations and research, we submit our seven-year project with confidence that it will be as a feasible and valuable component to the decentralization process. Alterations and modifications in the design are probable and expected. Some segments will require further refinement. No project design is faultless. However, to avoid endless entrapment in design debate, and to permit implementation to become part of an on-going design process, we submit this project for consideration, critique and implementation.

There is one deliberate omission from the presentation: operations and maintenance of potable water systems. From our consultations in the field, with suppliers, and in meetings with USAID specialists, and with manufacturers in the U.S., we must conclude that operations and maintenance of potable water systems should be separated from roads, municipal services, and equipment operations and maintenance.

River water purification and demineralization units have been installed as part of DSF I and will continue to be imported during LD II and III. TransCentury and others have suggested that maintenance and repair of these units could be handled by the governorate's maintenance center, as part of an operations and maintenance project. Whereas there are components of repair that could be carried out at the maintenance facility, such as basic engine and some pump repair, we now believe it important to separate such activity, as a matter of policy, from the maintenance and repair of rolling stock. Water systems operation and maintenance should be organized under some form of water authority, which would also have responsibility for assessing, collecting, and accounting for user-fee payments. The governorate's maintenance center could be utilized for some types of repair on engines, for instance, but, generally, water-related staff expertise and operations and maintenance systems will be entirely different from that established at the centers. Specific logs need to be maintained on each water unit - whether water is from rivers or wells - and these logs will become the basic data for planning maintenance and repair schedules. Good operational systems under direction of a water authority, and repair support from suppliers, is the proper strategy for water units operations and maintenance requirements. Further, potable water supply at village and municipal levels is too important and

too large in magnitude to be combined with the relatively modest components of this Operations and Maintenance Project design.

With regard to potable water, but not as a component of this project, we suggest consideration be given to designing a well-maintenance inventory, to be carried out by manufacturers of water supply units or their suppliers in Egypt. Such an inventory would establish base-line data on which maintenance and repair could be scheduled by the governorate's water authority. Records on pump and well activities would facilitate enhanced user services and limit escalating costs due to major rehabilitations. Not only will pumping and station equipment be better maintained, but so will wells through the use of state-of-the-art television well-hole assessments and cleaning through ultrasonic sound.

Finally, TransCentury gives special thanks to the numerous people and organizations participating in our work; they made this presentation possible. In addition to members of the TransCentury Team, we thank Engineers Saad Abdalla, Adel Halim, Adel Khairy, and Sami Yacoub of the TLG; USAID officials Ernest Kuhn and Douglas Tinsler; the representatives from Ionics, ICON, El Ektessadeya, Carlin Middle East, ADATCO, and ORASCOM from the Suppliers Group; the U.S. manufacturers (see Annex G) who gave freely of their time and counsel; Dr. John Thomas, of the John F.

Kennedy School of Government, Harvard University, who ranks among the world's foremost authorities on rural development; and George Lee Scott, presently on assignment with TransCentury in Yemen, who has devoted his professional career to rolling stock maintenance and repair.

II

PROJECT DESCRIPTION

A. Summary and Conceptual Framework

The Operations and Maintenance Project will have four components: importation of rolling stock for road maintenance and municipal services at governorate levels, maintenance of road infrastructure, municipal services, and operations and maintenance of governorate-owned rolling stock which performs road maintenance and municipal services.

The Project will span a period of seven years, in two phases of two and five years respectively. The goals, purposes, outputs and inputs are described below. See Annex F for a complete logical framework.

1. Goal

The goal of this activity is the acceleration of decentralized decision and implementation processes which, in turn, will help improve the quality of life and economic conditions, primarily of rural people.

Measures of goal achievement include:

- improved inter- and intra-governorate transportation systems;
- expanded governorate road networks linking production and market centers;
- increased commerce in products which are indigenous to the governorates;
- increased governorates' BAB II and III budgets annually;
- locally-generated revenues retained, aggregated, and expended by governorates for development purposes.

2. Purposes

The purposes of the project are to expand the number of kilometers of roads maintained; to improve road maintenance systems; and to expand and improve municipal services.

Achievements at the end of the project will include:

- kilometers of roads maintained in the governorates will be increased by an average of 2,140 kilometers annually during the seven-year project term; by 1992, 15,000 kilometers will be maintained annually;
- kilometers of roads maintained, as a percent of total road maintenance requirements, will increase from 6% in 1986 to 68% in 1992;
- personnel and systems will be improved in 23 governorates for planning and executing road maintenance;
- municipal services will be expanded by importation of additional rolling stock;
- municipal services will be improved through proper maintenance and repair of old and new rolling stock.

3. Outputs

Quality maintenance and repair services will be performed on municipal services and road maintenance rolling stock. Governorates' offices of planning, budgeting, contracting, and implementation for road maintenance and municipal services will be upgraded in terms of their personnel and systems.

Magnitudes of outputs include:

- privately-managed profitable maintenance centers will operate in 13 rural and two urban governorates;
- publicly-managed profitable maintenance centers will operate in eight rural governorates;
- Egyptian training institutions will certify 40 apprentices and 24 journeypersons annually as equipment maintenance personnel;
- U.S. manufacturers will certify 46 technicians annually as qualified for maintenance and repair of their equipment;
- 69 governorate and marakaz staff will be trained annually in American road maintenance and municipal services systems; they will be expected to modify these learning experiences for application in Egypt.

4. Inputs

The following inputs will be required to achieve the project's purposes: national policies are required to expedite private-sector wage levels for employees of governorate-managed

maintenance centers; rolling stock equipment for road maintenance and municipal services will be purchased and delievered to governorates; governorate-owned buildings will be constructed or renovated as new maintenance center facilities; and tools and apparatus to equip the maintenance facilities will be purchased and delivered to the governorates.

Financial inputs include: LE grants for training and spare parts; US $ grants for training in the U.S. and technical assistance; and CIP foreign exchange credits for spare parts.

More precisely, types and quantities of inputs include:

- changing established policies for non-civil service wage levels in 23 governorates (GOE);
- $80 million for rolling stock (USAID);
- $5 million for tools and apparatus (USAID);
- $3 million for governorate staff training in the U.S. (USAID);
- $3 million for technical assistance (USAID);
- $16 million CIP foreign exchange credits (USAID);
- LE 5 million for facility construction/renovation (GOE);
- LE 1 million for technician training in Egypt and the U.S. (GOE).
- $1.4 million for specialized training in the U.S. (GOE and USAID).

5. The Conceptual Framework

The conceptual framework for the Operations and Maintenance Project is grounded upon five criteria: expatriate technical assistance should be minimized; rolling stock purchasing, shipment and delivery to governorates should be managed by a USAID-registered procurement agent; management systems for the governorates' maintenance centers must be flexible to accommodate different governance options; major tools and equipment supplied to the maintenance centers must be standardized; and the project should be implemented in two phases.

The time has come in Egypt to maximize qualified indigenous institutions and personnel and to minimize the expatriate role. For instance, some might propose that expatriate training institutions design and implement training programs for the staff of the maintenance centers. We disagree with that approach. Others may conclude that numerous expatriate specialists are required to improve infrastructure and rolling stock maintenance. We disagree. There are significant institutional and skilled personnel resources on which the project can and should build to maximize long-term achievements. Therefore, a significant portion of the scope of work for technical assistance is applied to identification and mobilization of such indigenous resources.

We know that our suggestion for commodity imports to be managed by an independent procurement agent has not achieved support within USAID/Egypt. However, we urge renewed consideration. The Operations and Maintenance Project will be a complex one. It will be testing new methods for rolling stock maintenance in the private and public sectors. It will be introducing new systems for road maintenance planning and execution. It will be soliciting ever greater participation by suppliers and manufacturers, especially in training and spare parts supply. Expatriate technical assistance will be at minimal levels. Equipment purchasing, shipment and delivery are mechanical functions for which there are numerous qualified agents. Therefore, we suggest it is a waste of limited skilled resources, with aptitudes far exceeding those required for procurement, for the TLG and other USAID officers to be responsible for the management of purchasing, shipment and delivery of rolling stock. Qualified agents can assist with specifications, draft tenders, analyze bids, recommend awards, ship and insure, arrange for delivery to the governorate, and process all claims for damage. Agents would be cost-effective, and they would free the TLG for more substantive roles as described in sections that follow. We suggest no changes in USAID's approval of equipment and specifications recommended by the governorates. We suggest no changes in the system of awards being made by the governorate with USAID's assistance. We

request consideration only for the management of purchasing, through delivery, by a qualified agent.

Whereas this report suggests private and public approaches to the operation of the governorates' maintenance centers, within those approaches there potentially are several different management styles. Whether a center is privately or publicly run, specific components of the management must remain open so that creative local initiatives can be applied. The primary focus must be upon the center's profitability - not on imposed management structures. Local initiatives to realize profits must be encouraged.

At the same time that we argue for flexibility in management systems, we urge standardization of the major hardware in the centers. The extent to which the hardware can be standardized is the extent to which apparatus' repair and replacement can be facilitated. Standardization criteria will be difficult to establish. Whether a center's management is in the private or public sector, leadership will perceive different requirements for tools and equipment. However, within those different perceptions, standards can be set for types and brands of equipment. Specifications can vary. The purpose will be to avoid outfitting the centers with various brands of hoists,

mobile shops, office air conditioners, diagnostic gear, and other equipment.

The Operations and Maintenance Project should be implemented in two phases. In close collaboration with government officials, suppliers and USAID, Phase One will define parameters of the project's implementation. It will develop, test and refine policy and operational instruments for privately and publicly-managed centers. It will develop final procedures for spare parts supply. It will identify and mobilize indigenous resources for the project. It will identify and mobilize U.S. training resources. Phase One assistance will apply the demonstrated advantages of the concept of "rolling project design". By using the concept of rolling design we mean to avoid pitfalls inherent in those projects which establish predetermined fixed outputs and time schedules. By rolling design we reinforce the premise that DSF I, LD II and III are intended to achieve long-term institutional goals of decentralization of decision processes to governorate levels.

To achieve long-term institutional goals, project design must not exceed reasonable projections. The further one goes into the future in designing projects, the more the exercise is like catching a handful of smoke. Therefore, we suggest the two-phased approach. Phase

One will concentrate upon details of project design, including standard evaluation methodology which allows for adjusting targets or repositioning project components, if circumstances warrant during the course of Phase One or Two. (See Section II.F., Evaluation Plan.) Phase One will also develop and test assumptions and components of design prior to launching the full project, when major expenditures are anticipated. A two-phased approach is cost effective. It makes sense. By the same token, the final Phase Two design will be phased for adjustments, remedies and adaptations.

B. Maintenance Centers

1. A Review of the Problem and Solutions

1.1 The Problem

As reported in TransCentury's DSF I Analysis (Annex A), there are four groups of obstacles to performing adequate maintenance and repair functions at governorate levels: physical facilities; tools and repair equipment; spare parts invertory and control systems; and availability of trained technical personnel.

From TransCentury's observation and information supplied by the TLG and other knowledgeable sources, buildings for rolling

stock maintenance are generally available in governorates. However, as efficient maintenance facilities, these buildings are inadequate in either size or layout or both.

Tools and equipment for maintenance and repair are inadequate or non-existent. Further, governorate planners and technicians do not have access to information which would help them plan adequately tooled and equipped facilities for particular rolling stock inventories.

Spare parts are generally available at governorates. (DSF-I did finance adequate spare parts to service the equipment purchased.) However, because of inadequate facilities for storage and security, and the absence of trained personnel in cataloging and inventory systems, available spare parts are inefficiently accessed, or remain crated and unused.

Throughout Egypt and West Asia, there are large numbers of trained Egyptian mechanics and technicians. Further, within every governorate there are personnel with skills and backgrounds that could be dramatically upgraded by well-designed and incentive-oriented training programs. The key to unlocking this human resource for the governorates' rolling stock maintenance is incentive: higher pay. Trained and skilled technicians abound in Egypt's private sector and abroad; but public sector salary

levels discourage the recruitment and retention of qualified persons. Where skilled public-sector technicians are available, they are forced to accept secondary employment opportunities outside their civil service functions.

Finally, the majority of rolling stock equipment is assigned to marakaz or particular departments of the governorates. Assignments are logically based upon local infrastructure maintenance requirements and governorate functions (fire trucks to fire departments; sewage and street cleaning trucks to housing departments). Therefore, responsibility for maintenance and repair of rolling stock is decentralized, and constraints on governorate capabilities are further compounded.

1.2 The Solutions

Solutions to constraints to adequate rolling stock maintenance can be achieved through establishment of governorate-owned, privately or publicly-managed maintenance centers, mobile workshop capability, and satellite service facilities at those marakaz with high rolling stock inventories. The establishment of such centers and mobile capabilities would be phased, first on a pilot basis in a selected number of rural and urban governorates, and eventually to all governorates.

The success of privately or publicly-managed centers will be dependent wholely upon their profitability. Some persons suggest that publicly-managed centers could be effective with lower profits than those privately managed; perhaps even at break-even levels. However, the premise for establishment of maintenance centers as described below is that they will be profitable. Sustained subsidies for losses will eventually undermine the utility of the maintenance centers.

It appears from TransCentury's field visits, meetings with suppliers in Cairo, and consultations with manufacturers in the U.S., that such centers could be profitable. Profitability, however, presupposes particular criteria: high volume of equipment to be maintained and repaired; control of spare parts inventory; control of pricing of services and spare parts based upon market values; administrative and management authority over the labor pool; and appropriate capitalization of centers, primarily in foreign exchange. Application of these criteria will overcome an implicit concern regarding profitability: distributorships in the U.S. and other industrialized countries which specialize in service to limited brands of heavy equipment do not realize profit from service, rather from the sale of new equipment. For instance, a local distributor in the U.S. for specific types and brands of equipment performs maintenance and repair service for the products he sells, and sometimes for

products he does not sell, but such service to the customer is designed to maintain and enhance his position in the new sales market and help cover the overhead costs of his business. Consultations with manufacturers in the U.S. repeatedly confirmed that their dealerships realized profit only from the sales of new equipment, not equipment servicing of any type.

However, maintenance and repair centers (as distinct from distributorships) in the U.S. and other industrialized countries do make handsome profits if their service extends to diverse brands of vehicles and equipment, spare parts have significant mark up, and volume is sufficient to bill approximately 80 percent of their labor time. (Hourly billings for labor everywhere include a component for down time, in addition to standard overhead costs.) Therefore, to ensure profitability for governorate maintenance centers, high volume, diversity of customers, and appropriately priced parts and labor rates will be required.

There is one final note regarding profitability of the maintenance centers: market forces will tend to support higher than average labor rates and mark-ups on parts. Put another way, assuming the maintenance centers deliver quality performance, private and public customers will pay premium fees. In Egypt, as

elsewhere, customers will accept premium prices for good work performed promptly.

Whether the maintenance center is privately or publicly-managed, initial governorate and USAID subsidies will be required. We propose that the physical facility be provided by the governorate - either newly constructed or through renovation of an existing facility; and that USAID provide all foreign exchange funding for equipping the facility. Annex B is a drawing of a typical maintenance facility which could be adjusted to local requirements. Annex C details specifications, quantities, and ex-factory costs of equipment and tools for a maintenance center as envisioned, with mobile capability and satellite locations, which also could be adapted for local requirements.

1.3 The Facilities and Apparatus

The equipment for which these repair facilities are designed, should provide sustained, long-term services. Sustained, long-term service can best be accomplished by standardization of shop tools and equipment, and of certain operating procedures (pricing, labor rates, quality standards) at each of the locations. The advantages of standardization will be important because of the potential magnitude of the operation.

With regard to the facility, the ideal situation would be to build the same facility in each location, varying only the size according to the work load. This will not be possible, because in many locations there are existing usable buildings. Therefore, Annex B presents a concept of component units.

In locations where a completely new facility is needed, each of the components would be constructed. In other locations, existing facilities would be evaluated and only needed additional components would be constructed. These components would be arranged in different configurations to suit diverse building conditions and equipment maintenance needs.

The following components will be needed in most locations:

- Office
- Parts department/tool room
- Truck and equipment maintenance shop
- Small vehicle maintenance shop
- Machine shop and component repair room
- Clean and wash department
- Tire repair department

Arrangement of these components would be developed considering varying needs for supervision, security, and proximity. This plan would be followed as closely as possible as each of the facilities is designed.

The components should be designed so as to be easily built in different sizes. For example, to a standard width and height, with the length varied in accordance with the expected work load. A description of each component of the facility follows.

Office

- Centrally located
- Easy access to all other components
- Adequate in size
- Adequate security

Parts Department - Tool Room

- Centrally located
- Frontal area for inventory control
- Tool room accessible only to authorized personnel
- Adequate area for parts storage
- All areas designed to keep out dust
- In storage areas, use of half doors and counters to limit access to authorized personnel
- Large door at rear for receiving shipments
- Layout designed to promote flow of parts in rear door, through storage area and out over front counter

Truck and Large Equipment Repair Shop

- Security doors or grille work to close and lock all areas
- Work benches for minor component repair
- Minimum of one pit
- One overhead crane (this can be attached to the building or movable on the floor)
- Level, durable concrete floor
- Adequate light and ventilation
- Area for jack, engine hoist, and other equipment storage
- All areas designed to keep out dust
- Adequate air and electricity available at numerous locations
- High enough ceiling for repair of large trucks and heavy equipment
- The general design should provide ease of entrance for disabled vehicles, such as doors on each side so vehicles can be towed through.

Vehicle Maintenance Shop

- This shop should have the same set of features described above for the truck and equipment repair shop modified for the size of the vehicles to be repaired there.

Machine Shop and Component Repair Room

- Centrally heated
- Adequate space
- Adequate air and electricity available at numerous locations
- Work benches for component repair

Vehicle Clean and Wash Area

- An outside area for high pressure washing
- Located away from office area because of noise and dirt
- Should have a pit for cleaning under vehicles
- Facility to dispose of accumulated residue

Tire Repair Shop and Air Compressor

- Should be away from office because of noise and dirt

A major effort should be made to standardize all major apparatus and tools purchased. Because these facilities will be used on a long-term basis, most of the equipment will eventually break down. Because of the number of facilities potentially involved, it probably will be reasonable to stock spare parts for the tools and to train people to repair the shop equipment and tools. A good example of this would be the air compressors. If only one brand and size is used, each governorate would have the same type. It would make sense to stock components and parts and to train staff for repair and maintenance of these units. This would limit down-time and greatly help in the long-term operation of the centers. If several different brands are purchased it would become uneconomical and much more difficult to stock repair parts and to train repair personnel.

Also in the future, consideration might be given to a central procurement facility to purchase all out-of-country repair parts and to assist with in-country purchases for the centers. Small orders could be pooled and systems could be developed for emergency orders. It will be difficult for each of the governorates' maintenance centers to maintain trained personnel for this job, and there would be numerous different systems as a result.

Another consideration for the future would be a central parts rebuilding facility. In many countries there is extensive use of rebuilt or remanufactured repair parts. These parts can be as good as new ones and would be much less expensive. It would not, however, be economical for each maintenance center to have the equipment and specialists to do this work.

A good example would be a starter for a GM 6.2 liter diesel engine truck that would have failed on a truck with 50,000 km. A new starter would cost $650.00 and could be expected to last about the same 50,000 km. If the mechanic repaired the old starter, he would have replaced the brushes and bushings and maybe the solonoid. This repair would cost about $35.00 and could be expected to last 5,000 to 20,000 km. However, a remanufactured starter would have had all castings checked

against specifications. It would have new brushes bushings, and the solonoid. The armature and fields would have been tested electrically; then they would have been recoated with insulating varnish and baked in an oven. This remanufactured unit would cost approximately $125.00 and could be expected to last about 50,000 km.

Therefore, in the future, a rebuilding facility for starters, generators, alternators, carburetors, waterpumps, fuelpumps, etc. should be considered. The more that vehicles and equipment are standardized, the more practical and economical a facility of this type would become.

Returning to the individual maintenance centers, an annual budget for miscellaneous shop equipment and supplies will be necessary; e.g., glues, nuts and bolts, and gasket paper, and an annual budget for repair and replacement of shop equipment will be necessary.

Security of tools is always a problem. The best solution is to sell the tools to the individual mechanics. A program can be developed to do this, probably involving time payments, and with periodic inspections to ensure that the tools were maintained in good condition.

Survey work needs to be done in each location to ascertain the availability and adequacy of support services such as body shops, radiator shops, and tire repair shops. In many locations such services already function efficiently and should not be duplicated by the maintenance centers.

All maintenance centers should be equipped with mobile workshops as described in Annex C. In some centers, consideration should be given also to more sophisticated equipment such as a tractor/trailer for hauling equipment (see Annex C), a lubrication truck, heavy wrecker, yard cranes and fork lifts. And in some maintenance centers consideration should be given to installing an oil analysis laboratory which is an indispensable tool for preventative maintenance. It is an excellent money maker for any service center. This sophisticated laboratory analyzes various fluids in vehicle compartments and calculates wear patterns or foreign bodies that show up in the oils. A sampling can be done in the field with a simple siphon gun and plastic can for holding the sample fluid. The fluids are then returned to the maintenance center where they undergo diagnostic analysis using an atomic absorption spectrophotometer. This laboratory is not cheap. The atomic absorption spectrophotometer could run up to $25,000. However, in some governorates with a high inventories of rolling stock, it may preclude substantial repair and overhaul costs.

Finally, if warranted by volume, some centers could provide additional shifts to fully utilize the center's capacities. A second shift could be used to provide clients with the opportunity to have equipment serviced after hours. The staffing of the center can be on a rotational basis, with technicians changing hours on a weekly basis; or, fixed day and night shifts can be established. Such premium service would demand higher labor rates, but equipment would be on line more quickly, and overall costs reduced for the client. Equipment downtime is expensive: it has a negative rippling affect on all related activities. Double or additional shift time would generate higher revenue for the center and should increase profits proportionally.

1.4 Spare Parts

The acquisition of spare parts and their supply to maintenance centers is an important issue. We present here an approach on which further deliberation and collaboration with suppliers and manufacturers is required.

Under DSF, a liberal stock of spare parts was purchased as part of equipment purchases, through USAID funding, and delivered

to governorates. The DSF system was conceptually sound, but, in practice, there were snags.

First, sometimes governorates had to pay substantial sums to clear customs and expedite delivery. Second, facilities and systems for parts storage and access were faulty. Third, because parts were purchased directly by USAID funds, supplier's responsibility was minimal, and no incentive was included in the system for suppliers' participation.

Therefore, the Operations and Maintenance Project must design different methodologies. New procedures are required which structure supplier's and manufacturer's involvement more vigorously. To perform timely quality maintenance and repair services, the centers will need appropriate inventories of fast-moving spare parts, and have immediate access to slower-moving stock. Large inventories will be difficult to maintain. They tie up capital, usurp space, and assume management time. Some parts may be part of an inventory for extended periods, even years. In the U.S. and elsewhere, manufacturers have systems through which a percentage of spare parts can be returned and for which 100% credit is applied for the distributor/supplier. Such a system would be appropriate for Egypt, but logistical constraints preclude returns (distance, shipping costs, customs regulations...).

However, in terms of potential volume of DSF, LD II and III rolling stock, we believe adequate market incentives for manufacturers and suppliers will evolve to facilitate timely spare parts acquisition and delivery. As basis for negotiation, we suggest the following model.

Spare parts will not be purchased in tandem with equipment. Manufacturer's recommendations for initial spare parts inventory will be provided to maintenance centers and suppliers, with FOB prices, as part of the equipment tender bid. Further, the bid will include commitments on pricing and timely delivery of spare parts when ordered. USAID will provide Egyptian pound credits to maintenance centers, consistent with FOB quotations, plus shipping costs, duties, and up to a 15% mark-up. Egyptian suppliers, in turn, will be given CIP foreign exchange credits by USAID to order parts, CIF/Cairo. Maintenance centers will use the LE credits to purchase parts directly from suppliers, and sell them, with additional mark-ups, as rolling stock is maintained and repaired. The system would be designed only to acquire initial inventories; market demand would guide on-going systems.

The intent of the initial-inventory system is to:

- stimulate parts shipments to Egypt;

- provide a profit incentive for suppliers;
- preclude maintenance centers and suppliers having to freeze capital; and
- to create competitive forces among manufacturers and suppliers to generate increasingly innovative spare parts delivery systems as part of their tender bids on original equipment, and as part of their long-term competitive service reputation in Egypt.

2. Privately-Managed Centers

Privately-managed centers will be established through:

- competitive tenders
- governorate and USAID subsidies
- management contracts
- leasing arrangements

Bid tenders will be issued by the governorate. Annex D provides an example of such a tender. It is envisioned that bids will be solicited from a wide spectrum of entrepreneurs, especially Egyptian suppliers and manufacturers' representatives, but also from smaller businesses already functioning in the governorate issuing the tender. Because of the potential pitfalls inherent in planned subsidies, and to ensure credible bidders, prequalification criteria need to be formulated by the governorate which is consistent with the known resources and potential within the particular governorate. For instance, governors, their staff, and local councils know better than

outsiders the business reputations and capacities of entrepreneurs in their jurisdictions. They will know whom to exclude and whom to encourage in prequalification.

Governorate and USAID subsidies will include the following: provision of physical facilities which meet the requirements of the bidder winning the award; foreign exchange grants to tool and equip the maintenance center per specifications designed by the bidder winning the award, but not to exceed a predetermined (Government/USAID-approved) amount which would vary among governorates. The contract will include provisions for:

- performance standards;
- prices for services;
- guarantees by the contractor of certain standards of equipment maintenance and repair; and
- training for locally-recruited personnel

Annex E is a model which could be adapted as part of a management contract to standardize pricing of parts and labor for particular services. Annex E also includes time-frames for maintenance and repair functions which could be adapted to schedule services within standard time periods. Guarantees of volume would include all governorate-owned vehicles and

equipment, and permit the contractor to solicit and perform services throughout the private sector.

The fully-equipped maintenance facility would be leased to the winning contractor for the period of the contract. Lease payment amounts would be negotiated by the governorate with the contractor. Rates should be determined on the basis of commercial leases in the area for roughly comparable property and would relate to an amortization of capital investment in the fully-equipped facility over a given number of years. It is possible that in some cases lease rates could be determined on the basis of gross revenue, but administration of such a system would probably be unwieldy in most cases. Gross revenue calculations are subject to various distortions, and accrual or cash accounting systems will present undesirable administrative complexities.

The lease payment would need to be fair and equitable for the full range of facilities leased to the contractor. Through the use of these facilities the contractor must expect a reasonable profit after all costs are considered. Further, the contract will need to carefully specify the responsibility for major capital maintenance and replacement needs. Both the governorate and contractor have a vested interest in the continued functioning of the physical plant, and the scheduled

preventative maintenance of the building and equipment are crucial to both interests. Use of lease payments will be the responsibility of the governorate. Conceptually, they should be part of those capital reserve funds allocated for maintenance and repair apparatus within the maintenance center.

The following table illustrates gross revenue potential at a typical rural maintenance center. The table revises the original projection presented in the Interim Report, based upon further information of magnitudes of non-DSF equipment owned by governorates, manufacturers' estimates of composite O&M costs and of probable net profits.

REVENUE/PROFIT PROJECTION
Typical Maintenance Center
Starting Operation in 1986

(U.S. $000,000)

Source	Capital Value of Rolling Stock Per Governorate						
	1986	1987	1988	1989	1990	1991	1992
DSF I 1/	3.8	3.8	3.8	3.8	3.0	1.9	1.9
LD II 1/	0.3	0.7	0.7	0.7	0.7	0.5	0.4
LD III 1/			0.7	1.3	2.0	2.7	3.3
Other Gov. Equipment 2/	2.9	3.0	3.2	3.4	3.5	3.7	3.9
Private Equipment	0	0.2	0.4	0.6	0.8	1.0	1.2
Totals	7.0	7.7	8.8	9.8	10.0	9.8	10.7
Gross Revenue @ 6.5% 3/	0.46	0.50	0.57	0.64	0.65	0.64	0.70
Profit @ 15%	0.07	0.08	0.09	0.10	0.10	0.10	0.10

Notes

1/ Estimate of Capital Values:

	DSF I	LD II	LD III
Total Equipment Value x $1.0 M	98.0	20.0	100.0
Water & Other	17.5 (18%)	4.0 (20%)	20.0 (20%)
Maintenance Facilities	--	2.0 (10%)	10.0 (10%)
Rolling Stock	80.5 (82%)	14.0 (70%)	70.0 (70%)
Rolling Stock per Governorate (21)	3.83	0.67	3.33
Delivery Period		2 years	5 years
Value of Yearly Deliveries		0.33	0.67

2/ Initially 0.75 x DSF values, with 5 percent annual growth.

3/ Factored from O&M costs composite for all types of vehicles and equipment; does not include costs of major overhaul which would be additional source of revenue.

3. Publicly-Managed Centers

Publicly-managed maintenance centers would be organized and managed by the governorate. Terms of reference would be the same as for centers under private management. Building facilities would be designed and newly constructed or existing buildings renovated as described above. USAID funding would equip the centers according to specifications illustrated in Annex C. By policy, as with privately-managed centers, vehicles and equipment from the public and private sectors would be repaired and maintained. Pricing of parts and labor for servicing would be at market rates. Similar profit targets would be established as at privately-managed centers. (The profits from the publicly-managed centers would be used by the governorates as capital reserve for new equipment.) Management and technical personnel would be paid at rates competitive with the private sector. Similar publicly-managed institutions exist within Egypt's governorates, and policy formulations should not be difficult.

There would be one major difference between the publicly and privately-managed centers: responsibility for a sustained skilled labor pool would be vested in the governorate. Assuming profitability of the center, there would be strong incentive to sustain a quality work force. However, to establish a technical

person-power foundation, we suggest a sharply-focused recruitment and training program designed with the following components.

- basic technicians recruitment
- basic training in mechanical and electric systems
- apprenticeship
- specialized and advanced training

3.1 Technician Recruitment

At local levels in virtually all governorates there are varying numbers of persons with requisite skills who could be recruited as staff in the maintenance centers. In some cases skilled persons would be available for immediate assignment in technical and management positions. However, in most cases training in technical and management skills will be required.

Therefore, based upon local systems of recruitment, solicitations for maintenance center staff would be made. Candidates would be screened by a governorate-appointed committee comprised of knowledgeable persons in the maintenance field. Egyptian suppliers of DSF and LD II and III equipment would serve as advisors to the committee in reviewing the candidates' credentials. Members of USAID's TLG would also advise the committee in the screening process. A group of applicants would

be chosen (approximately two-thirds more than the available positions), and the selected candidates would be placed in a twelve-week program in basic mechanical training.

3.2 Basic Mechanical Training

There are a number of alternatives for the location, staffing, funding and curriculum of the basic training program. However, the best would be the use of an already existing mechanical vocational training institute with tested curriculum, with governorate funds subsidizing student fees and expenses in a predetermined amount. The student would pay the difference. In the absence of a training institution within the governorate, the nearest appropriate one would be selected.

The 60% of students having the highest rating after the twelve-week course would be assigned as apprentices in the governorate's maintenance center.

3.3 Specialized and Advanced Training

In addition to basic training there is a need for specialized and advanced training programs. Specialized training refers to that focused upon generic types of vehicles and equipment, and those brands of specific manufacturers. For

instance, specialized training needs to be provided for maintenance and repair of construction equipment used for road rehabilitation and maintenance (loaders, scrapers, dump trucks...); and the governorate's staff needs to know the particularities of Caterpillar, International Hough, GMC, and John Deere. We suggest that generic equipment training can be accomplished in Egypt, but that a minority of the technical staff need to attend special courses in the U.S. regarding particular equipment used in the governorate. All manufacturers have this training capability, in courses already designed for distributors, which could be modified accordingly for governorate technical staff. (The classes, for example, would be taught in Arabic.)

The key to effecting such training in the U.S., of course, is funding. We suggest that in all future tenders, manufacturers be requested to quote, as a separate line item, costs of specialized training on their equipment. Quotations would be on the basis of specific training goals established in the tender, and specific time frames for such training, in terms of duration and alternative dates. It will be important that special attention be afforded the drafting of the tender, so that manufacturers' training quotes are comparable. However, tender awards will not be determined on selection criteria related to training quotations. Contract negotiations, however, will

ensure that specific training programs will be implemented as quoted and finally negotiated, and will be financed through cost-reimbursement contracts financed by USAID. International travel and per diem would be financed by the governorate (or Central Government).

Advanced training would be handled in a similar way as specialized. All manufacturers have the ability to mount advanced training for highly skilled technicians - in complex hydraulics, electrical systems, and the like. However, such advanced training normally would be available for suppliers in Egypt and only on rare occasions. far in the future, do we envisage the need at governorate staff levels. Advanced training would not be quoted as part of an equipment tender.

The imperative for establishing governorate-managed maintenance centers is that a sustained number of trained technicians be available for staffing and managing the centers. This will be accomplished only through careful use of on-going training programs in Egypt and the U.S.

C. Road Maintenance and Municipal Services

Road maintenance has four primary components: planning, budgeting, contracting and execution. TransCentury's fieldwork

as well as TLG experience over many years suggest that each governorate carries out these functions with an effectiveness directly proportional to available resources. Road maintenance is an enormous burden on governorates, if only because of low BAB II funding levels. Demands far exceed local capacities in terms of manpower and equipment available. However, each governorate has planning, budgeting, contracting and engineering execution capabilities. Further, each governorate exercises effective use of these capabilities within their particular levels of expertise. Planning offices design plans and schedules for road infrastructure maintenance. Budget offices prepare BAB II budgets and supervise expenditures. Contract offices design and execute contracts with local contractors and often monitor the contractor's performance. Engineering offices perform technical appraisal of paved and unpaved road requirements and set standards and specifications for work to be performed.

Therefore, we do not presume to be able to design road maintenance systems for any or all governorates in Egypt. However, as described in Section II D, below, we suggest highly focused technical assistance to expand the capabilities of the existing offices. Further, technical assistance would be applied selectively to the marakaz, especially to planning and technical monitoring functions. Improved planning systems at marakaz levels will facilitate decision processes at the

governorate level, in terms of describing magnitudes and specifications of work to be performed. Improved technical monitoring capabilities will relieve the burden of this task on governorate-level personnel. Finally, it is likely that technical assistance will introduce road maintenance planning and implementation models used at state and county levels in the U.S.

The primary obstacle to improved road maintenance, however, is the scarcity of BAB II funds allocated to the governorates. This constraint must be overcome by central government reassessment and realignment of priorities, and probably should be done as a precondition to accelerated USAID participation. Section II.B and the Financial Plan in Section III.D of TransCentury's Interim Report illustrate the magnitudes of BAB II increases required. At the same time, there are other funding sources which could be more aggressively used by governorates. These include: petrol taxes and license fees. Both are already collected by the governorates, but it is unclear whether or not these funds are retained by the governorates. All such revenue should be regarded as a function of road use in the governorates. It should be aggregated, retained and allocated for road maintenance by the governorates.

Based upon the referenced texts in the Interim Report, which describe increased magnitudes of BAB II funding and other revenue

sources, we project funding levels consistent with road maintenance requirements. However, it is unclear whether or not governorate planning and implementation systems and personnel can handle such large increases in road maintenance. Further, it is unclear whether or not present or anticipated inventories of road maintenance equipment will satisfy such increases in demand. In sum, vast increases in available funds for road maintenance will not ensure corresponding increases in kilometers of roads maintained.

Conceptually, there is a clear interrelationship between BAB II funding, other revenues, effective governorate planning and implementation systems, and adequate numbers and types of well-maintained, on-line, equipment. All components support each other in a symbiotic relationship. Together, they are the foundation of successful institutionalization of governorates' road maintenance requirements.

Therefore, the following table illustrates realistic annual projections of kilometers of roads to be maintained in the 23 governorates. The projections must be viewed as targets for planning the Operations and Maintenance Project. They will be refined during Phase One, and up-graded annually during Phase Two, on the basis of governorates' resources, establishment of

efficient maintenance centers, potential imports of new rolling stock during LD II and III, and actual maintenance achievements.

Illustrative Table for Road Maintenance

	1986	1987	1988	1989	1990	1991	1992
No. maint ctrs. in operation	-	6	12	23	23	23	23
No. Govnts. with improved maint. systems	-	3	23	23	23	23	23
No. kms. (000) of roads requiring maintenance 1/2/	16	17	18	19	20	21	22
No. kms. (000) of roads maintained	1	3	6	9	11	13	15
Kms. of roads maintained as % of requirements 2/	6	17	33	47	55	62	68
BAB II funds for road maintenance (LE million)3/	1.1	1.3	5.0	9.0	12.0	14.0	17.0
Other road maint. revenues (LE million)3/	.1	2.6	2.8	3.6	4.5	5.5	7.0

1/ Calculated on basis of Interim Report projections for 21 rural governorates; interpolated here for 21 rural and 2 urban.

2/ Calculation does not include possibility that governorates may expand their road networks by more than the 5% assumed here.

3/ Calculated on basis of Interim Report estimates of per km composite costs for paved and unpaved maintenance (LE 1200, 1986; increasing annually @ 5%).

D. Procurement of Rolling Stock and Centers' Apparatus

Procurement of rolling stock and centers' tools and apparatus will be contracted to a USAID-registered purchasing agent. The agent will be responsible for assigning a full-time representative in Egypt during Phase One to work with the 23 governorates, the TLG and technical assistance team in determining types and specifications of equipment required. The agent will perform the following tasks:

- preparation and refinement of specifications;
- preparation of IFBs;
- placing bid advertisements with the Small Business Opportunities Office and Commerce Business Daily;
- acting as liaison between manufacturers and governorates in handling inquiries;
- analyzing bids and making recommendations to governorates for awards;
- providing cost summaries and time schedules;
- purchasing approved commodities;
- advertising notices of awards through the AID Office of Business Relations;
- issuing letters of credit, if required;
- following-up on U.S. freight delivery to port warehouses;
- arranging warehousing, freight forwarding, and negotiating freight rates with steamship lines;
- third-party inspections, if required;

- providing monthly status reports, and warehouse computer printouts;
- arranging Egyptian customs clearances;
- shipping, clearing customs, and delivery to appropriate governorates.

E. Technical Assistance

1. General Approach

Components of technical assistance will be a five-person team and training. The team will be comprised of three Egyptians and two expatriates and will be contracted for five of the seven-year project period. Training will be in Egyptian institutions; and under the auspices of U.S. manufacturers and selected state and county authorities in the U.S.

The seven-year project will be implemented in two phases of two and five years. The final design will be developed and approved during the first two years, but will be conceptually consistent with the of goals projected herein. In collaboration with central government authorities, governorate officials, suppliers, U.S. manufacturers, Egyptian training institutions, and USAID, the technical assistance team will share responsibility for achieving all outputs and purposes of the final design by year five of project implementation.

2. The Technical Assistance Team

The team will be comprised of the following persons.

- a team leader (expatriate) who will be a civil engineer with special expertise in road infrastructure maintenance, a thorough knowledge of rolling stock used in road maintenance, and at least ten years experience as a senior manager and advisor to governments in non-industrialized countries;
- an operations and maintenance specialist (expatriate) who would have at least 10 years experience in spare parts, warehousing and inventory control, and who has experience in designing and managing maintenance and repair shops, either in the U.S. or in non-industrialized countries;
- a budgeting specialist (CPA or equivalent; Egyptian) with at least 10 years experience in Egyptian Government budgeting systems.
- an economist (Egyptian) with at least 10 years experience in Egyptian Government service;
- a vocational training specialist (Egyptian) with at least 10 years experience in Egyptian educational institutions, preferably in mechanical engineering training.

Section III, Scope of Work and Implementation Schedule, describes scopes of work for each team member.

We suggest that the team have a formalized institutional relationship with USAID's Technical Liaison Group (TLG) and the Suppliers' Committee. By formalized, we mean that the TLG and Suppliers' Committee would act as decision-making participants

during the period, as distinct from performing in an advisory role, under the leadership of the team leader.

We recognize the uniqueness of a partnership approach, and its potential disadvantages. Persons cannot serve two masters. The TLG works under the authority of USAID. Suppliers have vested interest in the products they sell and owe allegiance solely to their company. The team leader is responsible to his company. Clearly, diverse loyalties and lines of authority can be disadvantageous. In fact, a case can be made for conflicts of interest emerging within certain activities outlined for the team.

However, the advantages of a partnership approach are just as clear; and we believe, outweigh the handicaps.

First, commodity expenditures in the project are immense and mandate intense collaboration. About $80 million worth of rolling stock must be effectively apportioned to 23 governorates to achieve developmental, as distinct from political, purposes. Suppliers know their equipment. The TLG knows the equipment and the governorates. The team needs the knowledge of both groups as participants.

Second, the proposed maintenance center system is unique in structure, scope and subsidies, and it must be profitable to succeed. The business of suppliers is profit. The business of the TLG is making structures and subsidies effective in Egypt. The Team needs the input of these participants.

Third, a cornerstone of the project is technical training. Choosing curricula, trainees and trainers are critical tasks. Suppliers have access to U.S. manufacturers' training programs. We suspect the TLG is thoroughly familiar with technical training institutions in Egypt which can be mobilized for the benefit of the project. And both suppliers and the TLG are equipped to assist with criteria for selecting trainees and for monitoring their progress. The team needs both groups as participants.

Fourth, the project is designed for seven years, but its goal is to ensure sustained achievements for decades. Technical assistance contract teams come and go, almost as visitors. No matter what their nationality, prowess and expertise, contract teams are temporary. They are never woven into the fabric of long-term development. By definition, suppliers are and the TLG is. Suppliers and members of the TLG, whatever their future employer allegiance, will be part of Egypt's growth for the decades to follow this project. The Team needs their perspectives now and for the time to come.

Fifth, and finally, U.S.-funded projects are implemented too often in an insular fashion. Usually, private enterprise, the instrument for economic growth, is excluded. Normally, there is collaboration with the host government, and monitoring and evaluation functions are performed by USAID, but seldom does an opportunity arise where the private sector and U.S. Government can cooperate for sustained developmental change. This project offers such an opportunity. The team can be the catalyst for the joint activity. The question is not what suppliers can give to the project; the question is how to optimize their entrepreneurial skills within the project.

Of course, the success of the partnership approach depends upon the management and technical skills of the Team Leader; skills which encompass more than engineering and management aptitudes. The Team Leader must understand and be comfortable with the interests and loyalties of his partners. He must be a person with demonstrated abilities in leadership of diverse people and collaboration with diverse perspectives.

The team and its partners (hereinafter collectively referred to as the cadre), would accomplish the following objectives during Phase One.

3. Objectives of Phase One

There are six objectives of Phase one:

- establish road maintenance and municipal services requirements in 23 governorates;
- identify rolling stock types and specifications to contribute to or achieve required road maintenance and municipal services in 23 governorates;
- create operational centers in seven governorates for maintenance and repair of DSF and other rolling stock; three rural and one urban under private management, and three rural under public management;
- establish effective road maintenance and municipal services planning and execution systems in the seven governorates with newly operational maintenance centers;
- run training programs for operators, technicians and governorate staff in the seven governorates;
- devise the final Operations and Maintenance Project design for 23 governorates.

4. Tasks

The following tasks will be performed by the cadre. The tasks are grouped sequentially, but many would be performed concurrently.

4.1 Governorate Surveys

4.1.1 determination of requirements for road maintenance and municipal services in 23 governorates.

4.1.2 inventory of existing rolling stock and operational status in 23 governorates.

4.1.3 identification of types and specifications of rolling stock needed for road maintenance and municipal services planned for 23 governorates.

4.1.4 selection of a procurement agent to work with governorates and the cadre to finalize specifications and draft IFBs and other documents.

4.1.5 issuance of rolling stock tenders.

4.1.6 assessment of the status of facilities available for utilization as maintenance centers and estimations of new construction or renovation costs in 23 governorates.

4.1.7 inventory of existing maintenance and repair apparatus and operational status in 23 governorates.

4.1.8 determination of plans for rolling stock operations and maintenance, and decisions on whether a privately or publicly-managed center is appropriate, in 23 governorates.

4.1.9 assessment of existing lease agreements on property comparable to the potential maintenance centers.

4.1.10 determination of appropriate models already operational in the governorates for private-sector salary levels.

4.2 Establish Maintenance Centers

4.2.1 design criteria and instruments for implementation of privately and publicly-managed centers, and estimate average gross magnitudes of costs anticipated for 23 governorates.

Criteria will include levels of governorate-owned rolling stock (on hand and anticipated) which would be maintained and repaired at the centers; anticipated volume of other rolling stock, including vehicles, in the private sector, which would utilize the centers; repair facilities in the Governorates which would be competitive, or which could supplement the services to be offered by the Governorate's centers; potential businesses in the Governorates which may bid on the tender for privately-managed facilities; and the probability of suppliers as potential bidders.

Instruments will include tender and contract documents for privately-managed centers; governorate agreements to construct or renovate facilities; and USAID grant agreements for funding tools and apparatus to equip the facilities.

4.2.2 recommend three rural and one urban governorate to establish privately-managed centers; three rural governorates for public management.

4.2.3 assist the four governorates with privately-managed centers in issuing tenders and selecting bidders for awards, and negotiating contracts.

4.2.4 assign the procurement agent to contractor-award winners and governorates to design specifications and tenders for apparatus to equip the centers.

4.2.5 issue tenders.

4.2.6 assist governorates with construction/renovation plans for the maintenance facilities, and initiate construction.

4.3 Training

4.3.1 design and implement operator training programs with suppliers for operators of DSF and other rolling stock in the seven governorates.

4.3.2 identify training institutions for training for technicians to be assigned to the three publicly-managed centers.

4.3.3 assist the governorates in negotiating contracts with the training institution for training, including any specialized curricula for specific types of rolling stock.

4.3.4 assist the governorates in recruiting trainees after determining availability of appropriately skilled persons in governorates.

4.3.5 design training plans for governorate staff in planning and executing road maintenance and municipal service

programs in six rural and one urban governorate; training plans are expected to include on-site training in the U.S. with road maintenance and municipal services authorities at state or county levels.

4.3.6 design training plans for specialized equipment training by U.S. manufacturers.

4.3.7 implement all training plans.

4.4 Final Project Design

4.4.1 prepare a final project design and phased implementation schedule for 23 governorates through 1992.

The final project design will modify the purposes, outputs and inputs described herein and will include detailed evaluation plans and appropriate project analyses based upon the Phase One experience. However, gross funding levels would remain constant, in terms of GOE and USAID contributions.

F. Evaluation Plan

The Evaluation Plan is designed to permit adjusting targets and repositioning project components during Phases One and Two. Therefore, the Plan calls for four regular evaluations at intervals of approximately 18 months during the seven-year

project period. For instance, assuming a start date of January, 1986, for Phase One, evaluations would be performed in June, 1987; January, 1989; June, 1990; and January, 1992.

We suggest that each of the evaluations be performed by an evaluation team composed as follows:

- team leader; senior official of the Ministry of Local Government;
- members: Governors (2)

  USAID/Egypt (1)

  AID/W (2); equipment specialist
  roads engineer

  Supplier's representative (1)

  Rapporteur (1); personal services contractor

The scope of work for each evaluation would be designed by the Ministry of Local Government, with participation by USAID and the cadre.

The Evaluation Plan is more than scheduling and mobilizing an evaluation team. Effective evaluation requires three tools for systematic monitoring: impact indicators, tracking indicators, and periodic reports that interpret the indicators. These tools need to be integrated in the project design.

Impact indicators. The key to successfully measuring impact is choosing an appropriate analytical model that extracts the maximum useful information from locally-available data. Rigorous analysis is crucial to the proper choice of indicators. The choice of an inappropriate indicator can have negative consequences for evaluation and management decisions. Impact indicators for the Operations and Maintenance Project should include increases in the number of kilometers of roads maintained in the governorate; expanded road maintenance and municipal services planning and implementation staff at governorate and marakaz levels; improved systems of planning and implementation; proficable maintenance centers; and down-time of rolling stock.

Tracking Indicators. In addition to impact indicators, there is a need for indicators that track project implementation. A set of tracking indicators provides a common language for managers, focuses attention on the key factors for success of the project, takes the pulse of each component, helps to control quality and signals early warning of trouble.

In the Operations and Maintenance Project, the raw data for needed indicators will be found in governorate offices and would include: funding and expenditure levels - BAB II and other revenue sources; numbers and quality of planning and

implementation staff; rolling stock logs; fiscal data from maintenance centers; training schedules completed and planned; and municipal services reports and logs.

Periodic reports. Periodic reports, say quarterly, can serve as road maps for interpreting and monitoring project data. Reports should be designed to interpret indicators and otherwise document the relationships of evidence of specific achievements to progress toward objectives. A side-benefit to reports is to highlight the most useful indicators and identify data gaps.

The learning process, often a major output of development projects is commonly ignored in monitoring and evaluating for lack of documentation. Periodic reports will document where and how learning occurs, and will help managers focus on improving the learning process. In such a fashion, periodic reports are the key to success of the "rolling design" process advocated for this project. At each step, information is acquired and interpreted to reduce uncertainties, identify promising lines of activities, and refocus strategy.

Therefore, impact and tracking indicators and periodic reports will be developed as part of the final project design and become the foundation of the evaluation plan.

III

SCOPE OF WORK AND IMPLEMENTATION SCHEDULE

Phase One

A. Scope of Work

The tasks will be carried out by the cadre as indicated in the implementation schedule below, with specific scopes of work as follows.

1. Technical Assistance Team

1.1 Team Leader. The team leader will report directly to the official of the Egyptian counterpart agency as specified by the GOE and USAID, and be the primary liaison officer with both the GOE and USAID. He will be responsible for coordinating and directing the work of the team, and its cadre partners, to ensure that all tasks are accomplished and the objectives of Phases One and Two are achieved. With the team and the cadre partner's participation, he will be primarily responsible for designing survey and assessment instruments for tasks 4.1.1, 4.1.2, and 4.2.1. He will have particular responsibility for

final decisions related to tasks 4.1.8, 4.1.9, 4.1.10, 4.2.2, 4.2.3, 4.3.5, 4.3.6, and 4.4.1.

1.2 Operations and Maintenance Specialist. The operations and maintenance specialist will report directly to the Team Leader. He will be primarily responsible for implementing tasks 4.1.2, 4.1.6, 4.1.7, 4.1.8, 4.2.4, 4.2.6, and 4.3.6.

1.3 Budgeting Specialist. The budgeting specialist will report directly to the team leader. He will be primarily responsible for advising the team leader on all matters related to government budgeting, especially to BAB II and III sources. He will participate in implementing tasks 4.1.1, 4.1.6, 4.1.8, 4.1.9, 4.1.10, 4.2.3, and 4.3.3. As requested, he will assist governorates in budget submissions to the Central Government regarding road maintenance and municipal services allocations; advise governorates on questions of local revenue generation, aggregation, retention and use; and advise governorates on innovative applications of national policies regarding budgeting and accounting systems.

1.4 Economist. The economist will report directly to the team leader. He will be primarily responsible for advising the team leader on economic issues related to returns on investment for road maintenance and municipal services; and

returns on investment in the maintenance centers. He will be particularly responsible for participating in tasks 4.1.1, 4.1.6, 4.1.8, 4.1.9, 4.2.1, 4.2.2, and 4.4.1.

1.5 Vocational Training Specialist. The training specialist will report directly to the team leader. He will be primarily responsible for implementing tasks 4.1.8, 4.1.10, 4.2.2, 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.3.6, and 4.3.7. He will assemble and assess data on technically trained Egyptians serving abroad and develop possible incentive models to encourage their return to manage or serve as technical staff in the maintenance centers. Further, he will develop systems, as relevant, to improve Egyptian training institutions, especially in rural areas, and assess suppliers' and manufacturers' training capacities and programs and recommend improvements.

2. The TLG

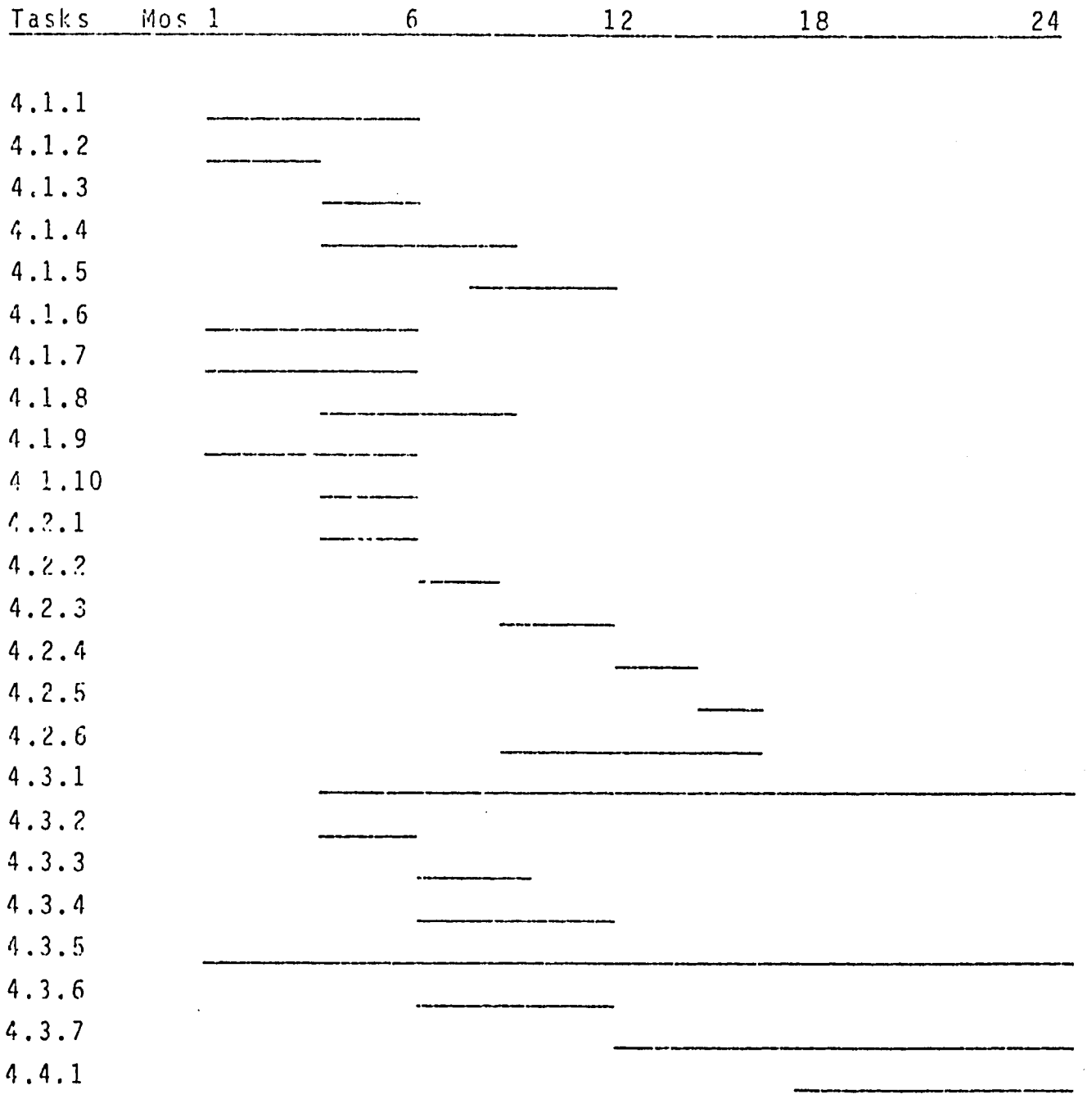
The four members of the Technical Liaison Group will remain operationally responsible to their USAID supervisors. However, for the purposes of this project, they will apply time (the amount to be negotiated) as participants with the technical assistance team coordinated by the team leader. The TLG will participate in all tasks undertaken by the team, with particular priority placed upon tasks 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5,

4.1.7, 4.2.2, 4.2.4, 4.2.5, and 4.3.2. In the initial weeks of project mobilization, the TLG will assist the team leader in orienting other members of the team on the history of the program, resources the TLG can optimize for the success of the project, and suggest priorities in planning details of Phase One.

3. Suppliers

Suppliers of rolling stock during DSF will remain operationally responsible to their firms' leadership. However, for purposes of this project, they will apply time (the persons and amounts of time to be negotiated) as participants with the team, coordinated by the team leader. Their participation will place particular priority on tasks 4.1.2, 4.1.3, 4.1.6, 4.1.7, 4.1.8, 4.2.1, 4.3.1, 4.3.4, and 4.3.7. Suppliers will assist the team leader in understanding their short and long-term interests in the project, and will be encouraged to recommend desireable incentives for their increased participation in the achievements of the project.

B. Implementation Schedule



IV

PROJECT COSTS

The project costs are itemized on the following tables: Summary, Technical Assistance, and Training. Costs presented illustrate gross magnitudes and have been rounded where applicable.

SUMMARY

PROJECTED PROJECT COSTS
1986-1992

	(LE Million)			
	BAB II	GOE OTHER	GOVERNORATES	USAID ($ Million)
Road Maintenance[1/]	98	39	-	80
Municipal Service[1/]	148	59	-	
Maintenance Facilities[2/]	-	-	5	
Maintenance Ctrs. Apparatus[3/]	-	-	-	5
Training	-	-	1	4
Technical Assistance	-	-	-	3
Spare Parts (CIP credits)	-	-	-	16[4/]
Rolling Stock, Purchasing, Shipping, Inland Transport, Insurance	-	-	-	20[5/]
Totals	246	98	6	128

[1/] Based upon TransCentury's Interim Report

[2/] Calculated at an estimated average of LE 250,000/center and rounded.

[3/] Calculated at an estimated average of $200,000 (see Annex C) and rounded.

[4/] Calculated at 20% of rolling stock capital cost.

[5/] Calculated at 25% of rolling stock capital cost.

TECHNICAL ASSISTANCE COSTS

		1986 - 1990 ($ million)
I.	Salaries[1/]	
	Expatriates (2) @ $150,000/yr x 5 years	$1.50
	Egyptian (3) @ $50,000/yr x 5 years	.75
II.	Travel and Per Diem	
	@ 5 RTs/yr x 3 yrs @ $4,000/trip	.06
III.	Other Direct Costs	.50
	Communication Reproduction Local Transport	
IV.	Miscellaneous	.19
	Totals	3.00 [2/]

[1/] Expatriate salaries include allowances (fringes, housing, education, differential) and corporate indirect costs and fee; Egyptian salaries include fringes, administration and fee only.

[2/] Whereas costs are calcualted in $US, an estimated 35% would be in local currency.

TRAINING COSTS
(LE000 and $000)

	Yr.	2	3	4	5	6	7	Total
I. Egyptian Institutions LE		32	64	125	160	160	190	733
Yr. 2: 16 persons @ 2000								
3: 32 " @ 2000								
4: 50 " @ 2500								
5: 64 " @ 2500								
6: 64 " @ 2500								
7: 64 persons @ 3000								
II. U.S. Manufacturers $		120	150	195	299	322	322	1,408[1/]
Yr. 2: 20 persons @ $6000								
3: 25 " @ $6000								
4: 30 " @ $6500								
5: 46 " @ $6500								
6: 46 " @ $7000								
7: 46 " @ $7000								
III. Governorate Staff $		240	360	536	587	621	621	2,965[2/]
Yr. 2: 30 persons @ $8,000								
3: 45 " @ $8,000								
4: 63 " @ $8,500								
5: 69 " @ $8,500								
6: 69 " @ $9,000								
7: 69 " @ $9,000								

[1/] One-third to be paid by GOE for international transport and two-thirds by USAID under cost-reimbursable contracts with USAID

[2/] All travel, tuition and other training costs by USAID.

ANNEX A

ANALYSIS OF PRESENT SITUATION

ANNEX A: ANALYSIS OF PRESENT SITUATION

In the following pages we will describe the process for planning infrastructure projects that we found in our visits to the six governorates, their budgeting methods, their management of DSF equipment and observations on the DSF equipment maintenance capability. What we present represents a concensus model of how things are generally done in the governorates. There are, of course, some differences between the governorates which are either not material or will be commented upon in the text. We will also attempt to describe the financial magnitude of the cost of operating and maintaining infrastructure (particularly roads and water systems) and DSF equipment.

In considering the overall cost of operating and maintaining infrastructure and equipment, the costs of operating and maintaining equipment are not necessarily to be added to the costs of maintaining infrastructure. This is because that, to the extent that equipment is used for infrastructure maintenance, which is particularly true of heavy equipment, it is already counted in the cost of infrastructure maintenance.

A. Planning and Budgeting. Planning, in the governorates, for infrastructure investment is a more orderly process than planning and budgeting for operations and maintenance costs. In most cases, the governorates' accounting system does not lend itself to aggregating cost data sufficient to support O&M budget requests.

1. Investment. Each governorate has a five year plan of investment infrastructure. This plan -- at least initially -- represents all of the projects (except ones of national scope) that are both wanted in the governorate and agreed to by the Central Government. In fact, these plans have the characteristics of law because they are ultimately ratified by the National Assembly.

The plans are arrived at with significant grass roots input. Villages present their wanted projects to the Marakez who, in turn, negotiate with each village to arrive at what will be requested from the governorate. Once completed, the plan is sent to the governorate which reviews it, balances it against the needs of other Marakez, sometimes holds public hearings and finally arrives at a plan request from the Central Government. The governorate negotiates the plan with the Ministry of Planning and once it is agreed to, the plan is submitted to the National Assembly for ratification.

We believe this system is as responsive as it could be to the concerns of the people living in the governorates. We were advised by the officials in the governorates that it was their experience that once the plan was approved, BAB\III (investment) funds were allocated to finance the projects. In effect, the five year plan becomes an out-year budget.

2. Maintenance. We did not find that the budgeting process for maintenance (BAB\II) funds was as orderly as for infrastructure investment. In one governorate, accurate costs for new paved roads were available (L.E.24,000, 1983; L.E.110,000, 1985), and maintenance was anticipated in year three. However, according to governorate officials, the BAB\II budget process is little more than the governorates asking for a lot more money than they got last year and being allocated a little more than the previous year. It seems to be more an allocation to the governorates of revenue left over after financing other costs, such as BAB\I (salaries) and BAB\III (investment). The budget requests are not based upon the costs experienced for the various maintenance functions that must be performed. For example, the governorate knows how many kilometers of roads exist, for which they are responsible, but they do not aggregate historical maintenance costs with which to calculate average maintenance cost per kilometer of the various types of roads they have to maintain. The same is true for water systems and equipment maintenance. The governorates need to improve the methods used to calculate budget requests. To do this, they would first have to accumulate costs in a way that would permit them to fully justify their requests.

As things now stand, there is not a great deal of budget discipline. We found that most governorates used BAB\II (maintenance) until it was gone, then looked to other sources of financing such as BAB\III to finance maintenance. After

visiting six governorates we concluded that the BAB\II budget is regarded as such a minor item as compared to actual maintenance needs, that the justification process for it was not taken as seriously as it might have been.

B. Financing of O&M Costs. The financing of O&M costs for roads, water systems and DSF equipment presents serious problems. Not only is there insufficient funds, but in most cases cost data is not accumulated in a way that permits an accurate picture of the needs. These factors are discussed in the following sections of this report.

1. Road Maintenance. In most cases, it is not possible, in the governorates, to determine the exact amounts allocated and spent for road maintenance from the BAB\II budget, and other financial sources, because the financial data is not aggregated in such a way as to permit this sort of analysis. There is, however, another method available from which one can extrapolate data which we believe will illustrate the order of magnitude of the gap between the funds allocated and spent from the BAB\II budget, and other sources, and the funds required to adequately maintain the road system.

We know that of the entire BAB\II national budget of LE\281,680,000, .56% or LE\1,588,565 was allocated to support recurrent costs in the transport sector. The amount of funds allocated specifically to roads, from this amount, cannot be identified, but our projection will assume that it was all spent on road maintenance.

Assuming our six test * governorates are representative of the numbers and types of roads that exist throughout Egypt, and we believe they are, then useful extrapolations can be made that indicate the magnitude of the financial gap between the funds allocated from the BAB\II budget, and other sources, for road maintenance, and that needed to adequately maintain them.

For the purpose of our calculations we have excluded five city governorates because we know that they generally do not contain significant amounts of high cost maintenance unpaved roads. The elimination of these governorates will understate, to some extent, the magnitude of the problem.

However, the gap is of such proportions that even assuming the entire BAB\II national budget for the transport sector was used for road maintenance in only 21 governorates, a serious shortfall is demonstrated.

The average governorate in our sample contained a total of 257 kilometers ** of paved and 438 kilometers ** of unpaved road. Using this average we calculated that nationally

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* Our test governorates included those from the Delta, Upper Egypt and the desert

** These represent only the roads for which the governorates are responsible. It does not include national roads for which a national roads authority is responsible for maintenance.

there would be 5,397 kilometers of paved and 9,198 kilometers of unpaved roads that should be maintained in the 21 rural governorates.

	Total Kms. to maintain nationally	Cost per km. to maintain	Total Funds Need for Road Maintenance
paved	5397	LE 1345	LE 7,258,965
unpaved	9198	LE 1051	LE 9,667,098
	TOTAL		LE 16,926,063
	Total BAB\II budget allocation for transport sector		LE 1,588,565
	Gap between BAB\II funds allocated and that needed for adequate road maintenance		LE 15,337,498

This table indicates that there is a financing shortfall of about 90%. In other words, BAB\II is only financing about 10% of the costs required for adequate road maintenance.

The indication that the BAB\II budget is financing only about 10% of the amount necessary for adequate road maintenance corresponds closely to what we found in individual governorates (where their accounting data permitted such a

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* This average cost for adequate road maintenance is taken from the study made by the Chemonics, dated February 1985, "A Village Infrastructure Maintenance Program." The figure we use for the average cost per km of road maintenance eliminates labor costs upon the assumption that this would be financed by the BAB\I budget.

comparison). For example, in one governorate we found that the BAB\II allocation of LE\45,000 was entirely used up in no more than one month.

The road maintenance picture, however, is not quite as bleak as the numbers indicate. We found that in some governorates, officials were using their ingenuity to cope with the problem.

(i) In most governorates, they had used substantial portions of BAB\III funds for road maintenance even though this is the investment budget.

(ii) In another governorate, they had borrowed a large amount of maintenance materials from a national road authority to maintain roads, but presumably this will have to be paid back at some point in the future.

(iii) At still another governorate, DSF equipment was being leased to contractors to generate revenues that could be used, in part, for road maintenance.

The road maintenance problem is further ameliorated by funds obtained in the governorate from other sources. Governorates are allocated a portion of the funds from the fuel tax with which they can construct new roads or maintain roads. We found that in two of the six governorates visited, funds had been allocated by the governorates for road maintenance. The other four governorates used the funds for new construction. The national allocation of gasoline tax to the governorates amounted to a total of LE\13,435,000. If our finding that one-third (2 of 6) of the governorates use a portion of these funds holds, and further, that of those who used some of the funds for road maintenance, they had allocated about one-half of that received to road maintenance, an

additional LE\2,240,000 would have been spent on road maintenance on a national basis. This would reduce the national financial shortfall in road maintenance funds from 90% to about 77%.

Another potential source of funding for road maintenance is found in the Local Service and Development Fund (LSDF) account. This money is allocated to governorates to be used for local development activities as determined by the local authorities. The total of this fund nationally, amounts to LE\16,390,867, but we found only one governorate that reported any use of these funds for roads and in that case, the figures did not distinguish between new construction and maintenance. We do not believe that this fund is currently a significant source of road maintenance funding. It probably amounts to about 2 or 3% of the total amount required.

The obvious source of financing that is universally used, is the depreciation of capital assets -- e.g., heavy equipment and trucks -- without any reserve to replace them. These costs are included in our calculations of road maintenance financing requirements, but are unfunded. In other words, it is a cost, but there is no immediate cash outlay required.

There is, without a doubt, a serious shortage in the allocation of funds for road maintenance. BAB\II funds represent no more than about 10% of the total needed. Other

funds allocated to the governorate that can be used for road maintenance, at the discretion of local authorities, represent another 15% of that required. Therefore, in total, perhaps no more than 25% of the road maintenance funds needed are actually provided through regularized formal procedures. The governorates cope with the problems presented by using a variety of unofficial and innovative financing sources. The amounts derived from these informal sources are not determinable. But, in any event, there is a large amount of unfunded deferred road maintenance in the governorates.

In addition to existing roads, our survey of the governorates disclosed that they had plans to construct additional roads within the next two years. On an average the governorates planned to add an additional 25% to the total kilometers of existing roads. This indicates that in addition to financing the maintenance shortfall, they must plan to increase the maintenance budget to cover the additional roads constructed.

2. Water Systems. As difficult as it was to calculate the maintenance costs of roads, the problem is compounded for water systems. The problems are (i) the great variety of types of water systems and (ii) the variety of ways in which financing is obtained.

Water systems vary in types from artesian wells, with pumps, to filtration and purification systems, to desalination units. They also vary in capacity from a small

well serving a village at a central location to large-scale city systems complete with purification and extensive distribution capability.

We found that different governorates used different systems to finance the operations and maintenance of water systems. There are locations that bill for water and include a surcharge that is retained in the local council to offset costs (with the amount of the basic bill being sent to the Central Government) and there are others that had established a local (City or Markez) water authority that was essentially self-sustaining through the sale of water.

Still further aggravating our difficulty is that as far as we can find out, no office within the GOE, either at the Central Government level or locally, has developed average costs of maintaining a distribution system. In some cases, particularly with DSF equipment use, we could determine the cost of producing potable water, but did not have a factor to include for the maintenance of the distribution system. As far as we could determine, a break in the distribution system was repaired on an ad hoc basis with the cost being buried in costs of other types to the point they were unidentifiable.

Given the constraints to quantifying the amount of funds necessary to operate and maintain water systems let us examine what we do know about water systems in Egypt.

(i) 1984/85 Article 1 and 2 of BAB II contained LE\6,630,500 to finance the maintenance in the housing sector (which includes water systems among other things).

(ii) Average household use of water in Egypt is one cubic meter per day.*

(iii) There are 10 million households in Egypt (population 48 million).

(iv) A portion of the Local Service and Development Fund allocated to governorates could be used for O&M of water systems. Nationally, this Fund amounts to LE\16,390,867.

(v) From the governorates we visited, we concluded that it is common practice to charge the consumer for water used. In most places water was metered and the consumer was billed at a rate between 2 and 5 piasters per cubic meter. These funds were generally remitted to the Central Government, but in one governorate, we were told that the local councils retained the funds and used them to help offset the cost of water production. In some cases where the water fee was remitted to the Central Government, the local council added a surcharge to the water bill and retained the resulting proceeds to help offset the cost of production.

(vi) The cost per cubic meter of potable water, excluding labor, produced by the systems financed under the DSF program range from a low, for river water purification plants, of about 5.04 piasters per cubic meter,** to a high, for demineralization and desalination plants, of 16 or 17 piasters per cubic meter. These production costs do not include the cost of maintaining a distribution system. And they assume that the equipment will be operated sufficiently close to design capability to be relatively efficient.

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* This is a commonly used figure for planning purposes in Egypt.

** This does not include a depreciation amount for the capital cost of the unit because the cost of water production includes a factor for spare parts which, we were advised, if regularly used, would extend the life of the unit for an indefinite period of time.

(vii) By GOE calculations, an additional 600 units (particularly the river water purification units and the demineralization units) are needed in Egypt.

Using these facts, we can make some estimates of the order of magnitude of the O&M costs of water systems that are either currently in place or may be on line in the foreseeable future. For example, the 10 million households of Egypt need approximately 3.65 billion cubic meters of potable water per year. If we assume that the cost of producing this is 5.04 piasters per cubic meter (that of the river water purification units), the cost to maintain the nationwide potable water production facilities would be LE\183,960,000 per year, excluding labor and the cost of maintaining the distribution system.

Another method of examining the magnitude of the water system maintenance financing problem would be to calculate just the cost of operating and maintaining the additional units -- of the type supplied under DSF -- that the GOE says is needed in Egypt. The GOE says that an additional 600 units are needed and we know that the weighted average cost, excluding labor, of operating and maintaining units of the type supplied under DSF is LE\39,424 per year; therefore, the added cost that would have to be funded amounts to LE\23,654,400, excluding any maintenance of a distribution system.

The cost of maintaining potable water systems in Egypt, of LE\183.96 million, and even the LE\23.65 million cost of maintaining the additional potable water production capacity

that the GOE says it needs, completely dwarf the BAB\II allocation to the entire housing sector of LE\6,630,500.

We know, of course, that there are other sources of financing of O&M for water systems in addition to BAB\II. Most governorates charge, through a metering system, for water. The fees range from 2 to 5 piasters per cubic meter. Some governorates retain all or a part of these funds to help offset the cost of water production. Also, we found examples in which local councils had set up water authorities that sold potable water for prices almost sufficient to recover costs (as high as LE\2.8 per cubic meter). We further found that governorates routinely spent from the BAB\III (investment) budget to cover maintenance costs. Also, BAB\I covers the salary cost of water production in most cases. Governorates also can, and sometimes do, use LSDF funds for water costs. (We found one out of six governorates that did so.) But considering all financing sources, we believe that there remains a serious shortfall in O&M funding. This manifests itself in the form of reduced water production capacity. While water systems may still be operating, they may, as we found, be doing so at far less than the design capability for want of replacement parts. Eventually this deferred maintenance cost must be paid.

The concept and indeed the system of charging the consumer for water seems well established in Egypt. The only location that we visited where water was generally free, was a new governorate that had not yet been able to obtain the meters

to install. While the water fees do not recover the cost of production and distribution, they are a base upon which to build. The ultimate goal, within a foreseeable number of years should be to recover the cost of water production and distribution through user fees.

The first step that the GOE (or the governorates) must take is to determine the cost of production and distribution. They should then design a plan to reach the goal of user fees recovering the total cost. Such a plan must provide for a system of financing the gap until that goal is reached.

As a second step, the GOE should consider revising the method by which water fee revenues are currently handled. At present most governorates send water fees collected to the Central Government which, in turn, uses it as a revenue source to allocate to public sector (including governorates) activities. This seems cumbersome. We believe that the local authorities should retain all water fee revenues to offset the cost of production. They would then have to finance only the deficit (between the cost of production and distribution and fees) through budget requests to the Central Government or otherwise, until the operation became self-sustaining.

The system of water fees also lends itself to the eventual financing of the O&M of sewer systems. At present, sewerage service is free to the user once they pay the cost of

hooking into the system. It seems logical that the O&M of sewer systems should be financed by including a charge for the service in proportion to the amount of water used. While no sewage treatment systems were financed with DSF, there is significant interest in them at some governorates, and waste water is becoming a major problem in some locations. Sewage treatment facilities are not yet very widespread. They are generally limited to cities and larger towns -- such as the governorate capital. The cost of maintaining them is supposed to come from the housing sector allocation of BAB\II (LE\6,630,500) which, as we have already found, is not adequate to finance the maintenance of the water systems.

3. <u>DSF Equipment (Rolling Stock)</u>. The financing of DSF maintenance is not yet a problem because (i) the governorates were each allocated LE\575,000, for O&M of equipment by the GOE and (ii) USAID financed a large quantity of spare parts at the time the equipment was purchased. All governorates * still had on hand, at the time of our visit substantial spare parts and funds remaining from the original allocation. Once the spare parts and the funds are exhausted, O&M costs could become a problem if mechanisms are not found to provide for it.

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* One governorate had failed to transfer the funds allocated to a special account and, as a result, lost them at the end of the Fiscal Year. All other governorates transferred the remaining funds and were able to retain them.

Under the current system, the GOE would allocate funds for the O&M of DSF equipment through the EAB\II budget. These funds would be allotted to the departments or Marakez that are responsible for the O&M of the equipment, generally as follows:

Sewage pumping trucks	Housing Department of appropriate level of governorate
Heavy Equipment, Refuse Trucks, Water Spray Trucks	Road Department of appropriate level of governorate
Fire Trucks	Fire Departments of appropriate level of governorate

This mechanism finances all O&M costs out of general revenues. For most equipment, the general revenue method of financing is the best available at the present time. However, we believe that a viable alternative exists for the sewage pumping trucks.

In all governorates that we visited, the users were charged fees to have trenches and septic tanks pumped out. The fees ranged from LE\1 to LE\7 per truckload. We did not analyze the entire sewage pumping operation to determine what it cost per truck load to pump sewage (the governorates didn't know), but the concept and system to charge for the service seems well established. We believe that the O&M of these trucks could be financed through user fees.

Some governorates retained the revenues generated from sewage pumping trucks while others remitted it to the Central Government. Of those retaining the revenue, it was not clear for what the revenue was used.

We believe that the cost of providing the sewage pumping service should be determined and a plan devised to eventually finance this service from user fees.

The balance of the DSF rolling stock will have to be financed with Government general revenues. While this is not yet a problem, plans should now be formulated to provide for O&M costs in future years.

Using the manufacturer's equipment specifications we have calculated some average O&M costs for DSF equipment, including depreciation costs but excluding operator salary costs upon the theory that those would be financed by BAB\I.

Potable water units and sewage pumping equipment are excluded from this section upon the theory that they will be financed by user fees.

Most of the balance of the equipment can be categorized into either heavy equipment, such as dozers and graders, or truck-type equipment. Our analysis of DSF equipment so far delivered indicates that it included about the equivalent of LE\22.8 million of heavy equipment. It will cost an average of about 13% per year of acquisition cost to operate, maintain and recover capital (excluding operators salary). This amounts to about LE\3 million per year. Our study of the truck-type equipment indicated that about LE\39 million had so far been delivered. Manufacturers averages indicate that to operate,

maintain, and recover depreciation (excluding operators salary) amounts to 21% of the acquisition cost per year or 21% of LE\39 million or about LE\8.2 million.

In addition to the DSF financed heavy equipment and trucks, the governorates have substantial quantities that were obtained from other sources. On average, we found that the governorate had as many trucks on hand financed from other sources, as there were DSF financed trucks. Therefore, the cost of maintaining and operating truck-type vehicles could be doubled. In addition, heavy equipment financed from sources other than DSF amounted to 175% of that financed by DSF. Therefore, the O&M cost of DSF heavy equipment could be increased by a factor of 1.75 times the cost of heavy equipment O&M costs.

Thus, in the longer term (once the original allocation of O&M funds and spare parts is depleted) provisions will have to be made to finance over LE\11 million in costs of DSF equipment use that will not be user fee financed. In addition, provision should be made to finance the O&M of the non-DSF equipment that is located in the governorates.

C. Management and Maintenace of DSF Rolling Stock. The management of DSF equipment is, for the most part, highly decentralized. Depending on the type of equipment, this may be a good management system or an inefficient one.

When DSF equipment became available, it was assigned to a particular department of the governorate or a markez based upon the needs perceived by the governorate. Generally, fire trucks went to fire departments at town councils or marakez, sewage trucks went to the housing departments of the appropriate jurisdiction as did street cleaning trucks and other equipment used to satisfy the day-to-day needs of the population. We believe that this is a good system when the utilization of the equipment is relatively good. (There are instances in which utilization of equipment of this type is less than desired.) We question the efficiency of such a decentralized system, however, for heavy equipment. We found in most cases (not all), that motor graders, dump trucks, loaders, etc. had been assigned to marakez along with complete responsibility for the utilization and maintenance of the equipment. In five of the six governorates visited, no one at the governorate level monitored the utilization or maintenance of the equipment. The five governorates did not routinely get and use reports on equipment utilization and maintenance. This could (and did) lead to imbalances in the utilization of equipment and some inconsistancy in how the equipment was used. For example, most marakez used equipment for their own public sector activities, however, in some marakez, the equipment was being heavily (more than 50%) leased to private contractors. This may be desirable, but no one was monitoring the use of the generated revenues.

We believe that the management of some of the heavy equipment may have been decentralized to the point that it is inefficiently utilized.

1. Maintenance Capability. Maintenance capabilities in the governorates we visited ranged from deficient to almost non-existent. On each of our visits we were accompanied by a senior engineer from the private sector who assessed the maintena nce capability of the places visited. Their assessments were, on balance, as follows:

a. Facilities. In governorates there were generally buildings available but they needed improvement. In many marakez, there were no buildings.

The facilities at most governorates were inadequate in size, poorly layed out and did not provide sufficient security for the equipment, spare parts and such tools and equipment as were available.

b. Training. Training was needed in most locations we visited. Existing skills were not adequate to do the job. In one governorate the engineer found general skill levels very high (this was a unique governorate), but because Government salaries were so low the technicians all had additional jobs to increase their income. Adequate salaries would have greatly increased productivity.

The DSF program included a training component as part of the equipment purchase. But a universal complaint that we heard was that the training was not in enough depth to permit those attending the class to do very much maintenance on equipment. On the other hand, not all governorates sent people to the training classes offered. In one governorate no one had been sent to the training classes in Cairo because they had no money to pay lodging and food allowances to the participants. One supplier's training class was designed to train trainers. But they found in the field that rather than training others, the information was being jealously guarded and not imparted to others. Knowledge is power. Another comment by suppliers was that often the personnel sent to training classes were too high up in the administration structure and far removed from the actual equipment maintenance. We were told of one case -- that did <u>not</u> involve DSF equipment -- in which the training program was supposed to be an intensive two-week class in the U.S. for two people. According to the supplier the class was changed to a one-week class in the U.S. for four people so that local officials could attend. Indeed, the local Chief of the Town Council went.

c. <u>Tools and Equipment</u>. Universally, it was found that the existing tools and equipment were extremely deficient. This was true even in the location where we found high technician skill levels. This factor particularly hampered maintenance in this governorate.

Not only were tools and equipment a problem, but there is also a serious need for technical manuals appropriate to the DSF equipment. Most governorates needed additional manuals and in one governorate they had no manuals at all.

d. Spare Parts. The DSF program financed a great deal of spare parts for the equipment. However, in most cases (not all) the parts were inadequately catalogued and stored. In at least two cases we found spare parts stored outside in their packing crates. In all locations we visited spare parts management could be improved. For example, at two governorates spare parts were still in the packing crates in outside storage. They had not been unpacked, cataloged and stored so that they could be located when needed. In fact, suppliers related instances of being called to replace a particular part that was defective, when the part was available in the governorate, but they were unable to find it.

In one governorate we found that the DSF equipment had been assigned to marakez, along with the responsibility for maintaining it, but the spare parts had been retained at the governorate.

In another case, one complete engine rebuild kit had been provided to a governorate as a reserve against four vehicles which had been assigned to marakez. The kit was complete with cylinder liners, undersize bearing, etc., necessary to rebuild an eight cylinder engine. Rather than

keeping the kit at the governorate for use on whatever vehicle needed it, they were in the process of sending one-fourth of the kit to each markez. Each markez was to get two cylinder liners, undersize bearing, etc., which would render the kit useless. We believe this plan was scrapped during our visit.

e. Adequacy of Maintenance. The adequacy of maintenance on DSF equipment varied a great deal between locations. Some places it was fairly good and in others there was clear evidence of improper use, resulting in equipment failure. While some equipment was inoperative for maintenance reasons it did not appear to be an inordinate amount. This is due in large part to the fact that the equipment is relatively new.

2. GOE Salaries. Current maintenance capability in the governorates is severely limited by the factors cited above. Another systemic major constraint, that is not topically highlighted, is the GOE salary structure. The technical skills necessary to operate and maintain equipment are also in high demand in the private sector in Egypt and elsewhere in the world. The private sector in Egypt pays much more than the public sector for the same skills as illustrated by the following table.

Equipment Skill	Average Public Sector Salary*	Average Private Sector Salary	Public Sector Salary as a Percentage of Private Sector
	LE/mo	LE/mo	
Operator	84	184	46%
Technician	109	312	35%
Engineer	273	606	45%

The salary structure in the public sector has resulted in severe skill shortages in the governorates. For example, in one governorate there were only 42 people available in skilled positions, such as engineers and technicians, to do the job that the governorate says takes 144 people. In another governorate, two pieces of equipment had not been used since they were received a year ago, because of inability to hire skilled people.

A system of adequate salaries is an essential component of any system devised to improve the operation and maintenance of DSF equipment.

D. Minor Problems. In addition to the systemic problems of financing the O&M costs of infrastructure and equipment, we noted a few areas that needed special or individual attention.

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* These are average salaries within the GOE salary range. In most cases, the governorates must recruit at entry levels which are far lower.

In these cases, correction of the problem does not require system changes but rather some specific action taken within an existing system.

(i) In one governorate several sewage pumping trucks had been provided. These trucks were not used much because there was not much demand from the citizens. This lack of demand was because local soil conditions readily accept sewage disposal. Care should be taken in the future in analyzing the need for some types of equipment. To solve the immediate underutilization problem, perhaps there could be a trade arranged between governorates. There are locations in dire need of sewage pumping trucks.

(ii) In one governorate we found 70 deep well pumps, supplied by the DSF program, that were uninstalled because the governorate either did not know the proper installment procedure or some additional supplies were needed (they did not know which). This governorate needed help from the supplier.

(iii) In one governorate, desalination water units are being supplied under the DSF program. They were not yet installed. This same governorate had earlier purchased identical desalination units using other revenue sources. These units had been operating for over two years but at only about 10% of capacity because of lack of demand for the product. There are plans to hook these units to another distribution system(s) which may increase the utilization. In any case, demand for units such as these should be carefully analyzed in the future. There may be sources of water that are cheaper than the relatively high cost desalination units.

A N N E X B

ILLUSTRATIVE MAINTENANCE FACILITY

A N N E X C

ILLUSTRATIVE SPECIFICATIONS AND COSTS

TOOLS AND APPARATUS: MAINTENANCE CENTERS

SUMMARY COSTS BY CATEGORY

	Ex Factory Cost
Machine Equipment	$ 20,102
Vehicle and Truck Equipment	19,475
Heavy Equipment	27,939
Electric and Battery Equipment	11,459
Welding Equipment	8,320
Injector Pump Equipment	1,500
Body Repair Equipment	1,600
Tire Repair Equipment	11,650
Carpentry Equipment	3,230
Lubrication Equipment	18,170
Tools	10,300
Miscellaneous Shop Equipment	32,145
Total	$165,890

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Machine Equipment	
1	1	Lathe, Gap, 14" swing over bedways, 23" swing with gap removed, 30" distance between centers, minimum 8 spindle speeds. Complete with 7" 3-jaw chuck, 10" 4-jaw chuck, center rest, follow rest and taper attachment. 220 VAC, 50HZ, 3 phase. Jet Lathe Model 1430 or equal	$ 6,445.30
2	1	Drill Press, Floor Mounted, 1" hole in steel capacity, 16" x 18" tilting table, 3-3/4" column diameter, roller bearing spindle nose. Complete with drill chuck and arbor, and vise. 220 VAC, 50HZ, Single Phase. Rockwell Model 2000 or equal	2,205.00
3	1 1 1 1 1 1 1	Drill and Countersink Set, consisting of: 3/64" drill, 1/8" body 5/64" drill, 3/16" body 7/64" drill, 1/4" body 1/8" drill, 5/16" body 3/16" drill, 7/16" body Plastic case McMaster Carr No. 2A17A1 or equal	16.00
4	1	Drill Bit Set, high speed, 29 drilled, 1/16" through 1/2". Snap On No. DB129B or equal	35.60
5	1	Pipe, Stud and Screw Extractor Set, heavy duty, consisting of ten stud and screw extractors ranging from 3/8" to 3-1/2", and all classes of pipe sized 1/8" to 2". McMaster Carr No. 2566A14 or equal	85.00
6	1	Power Hack Saw, heavy duty, 10" diameter straight cutting capacity, 5-1/2" angle cutting capacity at 45°. Blade length 18", 70-150 strokes per minute, 5-1/4" stroke. Complete with 20 extra hack saw blades, 220 VAC, 50 HZ, single phase. Keller No. 5HY-DUTY or equal	3,446.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
7	1	Hydraulic Shop Press, 100 ton capacity, double acting hdyraulic cylinder, hand operated. Minimum 60" from ram to bed, 48" between press uprights. Complete with hand pump, gauge, optional straightening fixture and 5 gallons of hydraulic oil. OTC No. Y1405-A or equal	3,314.40
8	1	Valve Refacing Machine, Bench Mounted. For refacing 15°, 30° and 45° valves with valve stem diameter ranging from 7/32" to 5/8". Lever operated chuck and grinding wheel, 220 VAC, 50HZ, single phase. Complete and heavy duty wheel dresser attachment and 5 gallons of oil. Kwik-Way Model VS or equal	2,286.88
9	1	Valve Seat Grinder, consisting of grinder motor with built-in brake, flex grinder unit with coupling and stabilizer, heavy duty wheel dresser attachment, one component set "I" 7/16 consisting of 20 wheels and 15 tapered arbors, necessary tools and wrenches, and steel carrying case. 220 VAC, 50HZ, single phase. Kwik-Way Model SGF or equal	820.36
10	1	Outside Micrometer Set, with friction stop and spindle locking lever, graduated in .001". Consisting of 0"-1", 1"-2", 2"-3", 3"-4", 4"-5" and 5"-6" range micrometers with 5 standard test gauges and case. Snap On No. CM60RL or equal	238.55
11	1	Inside Micrometer Set, .001" graduations, 2"-8" range, consisting of one inside micrometer, four measuring rods, spacing collars and extension handle. Snap On No. CM85 or equal	41.65
12	1	Vernier Calipers, calibrated in both English 0"-6" and Metric 0-150 mm, with thumb lock slide. Snap On No. CM206 or equal	34.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
13	1	Pocket Rule, 6", calibrated in 32nds and 64ths with decimal equivalents etched on back and pocket clip. Snap On No. CM3070 or equal	.49
14	1	Brake Deliner and Riverter. For delining and riveting brake shoes and clutches with 9/64" and 3/16" rivets. Adjustable anvil for various length rivets. Manual foot operated. McMaster Carr No. 6132A12 or equal	368.00
15	1	Mechanics Work Bench, 72" long, 29" deep. Brodhead Garrett No. 595080 or equal	117.98
16	1	Combination Pipe and Machinists Vise, 4-1/2" jaw width, 6-1/2" jaw opening, locking swivel base. McMaster Carr No. 5289A2 or equal	242.00
17	1	Air Hose 3/8" x 50' long, 1/4"-18 NPT threaded ends, 200 PSI pressure. Snap On No. 1M50B or equal	36.47
18	2	Quick Coupler, with male and female adapters, 1/4"-18 thread size. Snap On Nos. AHC23, AHC23M, and AHC23F or equal	5.36
19	1	Blow Gun, 100 PSIG. Brodhead Garrett No. 259292 or equal	6.23
19A	1	Bench Grinder, two 7 inch grinding wheels, 30 and 60 grit, 220V, 50HZ, 1725 RPM, with eye shields. Brodhead Garrett No. 593581 or equal	181.50
20	1	Face Shield 8" long x 13" wide clear molded visor, cushioned headband. Brodhead Garrett No. 261706 or equal	7.60
21	1	Cylinder Hone Set, 3" to 4-1/4" with case. Snap On No. CFL 10	26.50

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ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
22	1	Valve Spring Compressor 1" to 2-1/2" spring diameter, valve in head type. Brodhead Garrett No. 425752 or equal	34.09
23	1	Split Lock Replacer for replacing split type valve keys. Broadhead Garrett No. 431390 or equal	6.51
24	1	Cylinder Ridge Reamer, 3" to 5" with replacement cutter bits. Snap On No. WR-30 or equal	26.76
25	1	Piston Ring Expander, 2" to 4" capacity. Snap On No. PRS9 or equal	5.50
26	1	Piston Ring Groove Cleaner, 2-1/2" through 5". Snap On No. RC500 or equal	5.37
27	1	Piston Ring Compressor, 2-band, 2-1/8" to 5". Snap On No. RC40C or equal	5.93
28	1	Snap Ring Pliers Kit, consisting of internal pliers, external pliers, and 8 pairs of tips. Snap On No. PR50 or equal	15.00
29	1	Ignition Timing Light, 12V, induction type. Sears No. 28HT2134 or equal	41.97
		TOTAL EX FACTORY	$ 20,102.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Vehicle and Truck Equipment	
30	8	Mechanics Tool Set, inch and metric sizes. Sears No. 9HT46383N or equal	5,922.32
31	8	Mechanics Tool Chest, 3 drawers, with lock. Sears No. 9HT65253L or equal	523.20
32	8	Mechanics Tool Cabinet, 3 drawers with lock, roll-a-way type. Sears No. 9HT65063N or equal	721.60
33	4	Torque Wrench, 3/8" drive, inch and metric, click type, with case. Sears No. 9HT44467 or equal	214.52
34	4	Torque Wrench, 1/2" drive, inch and metric, click type, with case. Sears No. 9HT44478 or equal	237.32
35	2	Air Impact Wrench, 1/2" drive. 250 ft. lb. torque, with air hose and filters. Sears No. 9HT1889 or equal	205.60
36	2	Impact Socket Set, 1/2" drive, 13 piece set. Sears No. 9HT44012 or equal	48.80
37	1	Cylinder Compression Tester, cone type, 0 to 250 PSI. Snap On No. MT24J or equal	9.97
38	1	Cylinder Compression Tester, with 5 adapters, 0-1000 PSI. For diesel engines. Motorite No. 70-7003 or equal	330.00
39	1	Truck Wheel Dolly, dual wheels, 1200 lb. capacity. McMaster Carr No. 2899T11 or equal	273.90
40	5	Hydraulic Floor Jack, 4 ton capacity. McMaster Carr No. 8832T12 or equal	3,230.05
41	22	Jack Stand, adjustable, 5 ton capacity. McMaster Carr No. 8798T14 or equal	943.80

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
42	1	Transmission/Differential Floor Jack, 1000 lb. capacity. Brodhead Garrett No. 191422 or equal	306.90
43	1	Engine Stand, Universal Type, 360° rotation, 4-wheel. Brodhead Garrett No. 442176 or equal	223.21
44	1	Transmission Repair Stand, Universal type, 360° rotation, 4-wheel. Broadhead Garrett No. 187200 or equal	636.90
45	1	Electric Drill, Heavy Duty, 3/8 inch reversing, 220V, 50HZ, 0-1000 RPM. Milwaukee No. 0222-3 or equal	104.50
46	6	Electric Drill, Heavy Duty, 1/2 inch, reversing 220 V, 50HZ, 0-600 RPM. Milwaukee No. 1001-3REV or equal	926.64
47	7	Drill Bit Set, high speed, 21 drills, 1/16" through 3/8". Snap On No. DB121B or equal	101.01
48	1	Spark Plug Cleaner and Tester, 220 VAC, 50HZ. McMaster Carr No. 6750A21	177.16
49	5	Spark Plug Wire Gap Gauge, .022" through .040". Snap On No. FB301 or equal	13.40
50	8	Feeler Gauge, 25 blades, .002" through .023", general purpose. Snap On No. FB325A or equal	24.96
51	5	Spark Plug Socket, 3/8" drive, 5/8 inch, 6 point. Snap On No. 59706 or equal	13.45
52	5	Spark Plug Socket, 1/2" drive, I3/16 inch, 6 point. Snap On No. S9705A or equal	16.50
53	5	Spark Plug Socket, 1/2" drive, 7/8 inch, 6 points. Snap On No. 59712 or equal	23.20
54	1	Vacuum and Fuel Pump Gauge Set. Complete with 4' of hose, 13 adaptors in metal box. Snap On No. MT311EB or equal	98.32

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
55	1	Brake Bleeder Tank, 2-1/2 gallon capacity. Brodhead Garrett No. 192195 or equal	175.81
56	4	Brake Spring Pliers. Brodhead Garrett No. 401207 or equal	29.64
57	1	Truck Brake/Drum Gauge, 22" capacity. Brodhead Garrett No. 107527 or equal	72.60
58	8	Mechanics Work Bench, 72" long, 29" deep. Brodhead Garrett No. 595080 or equal	1,038.16
59	5	Bench Vise, 4" jaw width, 5" jaw openings, locking swivel base. Brodhead Garrett No. 224128 or equal	253.00
60	5	Air Hose, 3/8" x 50' long, 1/4"-18 NPT threaded ends, 200 PSI pressure. Snap On No. 1M50B or equal	154.80
61	10	Quick Coupler, with male and female adaptors, 1/4"-18 thread size. Snap On Nos. AHC23, AHC23M and AHC23F or equal	49.70
62	5	Blow Gun, 100 PSIG Brodhead Garrett No. 259292 or equal	23.80
63	8	Drop Cord, 16 gauge, metal guard and switch/tool outlet. Snap On No. EC691 or equal	105.28
64	2	Mechanics Work Stool, with 4 caster wheels. Snap On No. JCN19A or equal	40.14
65	7	Bench Grinder, two 7 inch grinding wheels, 36 and 60 grit, 220V, 50HZ, 1725 RPM, with eye shields. Brodhead Garrett No. 593581 or equal	1,455.86

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
66	1	Drill Bit Set, high speed, 15 drills, 1/16" through 1/2". Snap On No. DB115B or equal.	18.18
67	3	Drill Bit Set, 11 drills, 1mm through 6mm. Snap On No. DBM111A or equal	24.51
68	1	Brake Cylinder Hone, 3/4" to 2-1/2" dia. range, with four extra sets of stones. Snap On No. CF63 or equal	8.54
69	5	Feeler Gauge, 25 blade, .0015" through .025", for adjusting engine governor gaps. Snap On No. FB325A or equal	14.60
70	10	Adjustable Wrench, 6 inch, 3/4" jaw capacity, chrome plated. McMaster Carr No. 5385A12 or equal	44.80
71	10	Adjustable Wrench, 8 inch, 15/16" jaw capacity, chrome plated. McMaster Carr No. 5385A13 or equal	55.80
72	2	Flexible Wire Carbon Scraper, 10 blades, tempered spring steel. Snap On No. CS1 or equal	5.36
73	8	Wire Brush, 13-3/4" wood handle. Snap On No. AC58C or equal	7.92
74	6	Radiator Pressure Tester, with truck and diesel adaptors. Snap On Nos. SVT262, A450 and TA15 or equal	428.70
75	7	Face Shield, 8" long x 13" wide clear molded visor, cushioned headband. Brodhead Garrett No. 261706 or equal	53.62
76	8	Mechanics Creeper, smash proof, 4 caster wheels, head rest. Brodhead Garrett No. 192436 or equal	86.96
		TOTAL EX FACTORY	$ 19,475.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Heavy Equipment	
77	8	Heavy Duty Mechanics Tool Set, inch and metric sizes. Sears No. 9HT46384N or equal	6,640.00
78	8	Mechanics Tool Chest, 3 drawers with lock. Sears No. 9HT65253L or equal	403.68
79	6	Mechanics Tool Cabinet, 3 drawers with lock, roll-a-way type. Sears No. 9HT65063N or equal	484.14
80	4	Torque Wrench, 3/4" drive, 100-600 lb. ft. capacity, click type with case. Snap On No. QJ4600A or equal	724.80
81	1	Air Impact Wrench, 3/4 inch drive, 500-700 ft. lb. torque, reversible, with air hose and filter. Sears No. 79HT or equal	129.19
82	1	Impact Socket Set, 3/4 inch drive, 20 bolt clearance 6-point sockets, 3/4" and 2". Snap On No. 42051M or equal	342.34
83	1	Impact Extension Bar, 3/4 inch drive, 7" long. Snap On No. 1M62A or equal	14.00
84	6	Cylinder Compression Tester, with 5 adaptors, 0-1000 PSI, For diesel engines. Motorite No. 70-7003 or equal	470.16
85	1	Hydraulic Sleeve Puller Set, 30 ton capacity, with five sleeve puller plates. OTC No. 975HY or equal	780.01
86	1	Valve Spring Compressor, 1" to 2-1/2" spring diameter, valve in head type. Brodhead Garrett No. 425752 or equal	14.55
87	1	Split Lock Replacer, for replacing split type valve keys. Brodhead Garrett No. 431390 or equal	6.80

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
88	1	Piston Ring Expander, 2-3/4" to 4-1/4" capacity. Snap On No. PRS 10 or equal	4.21
89	1	Piston Ring Groove Cleaner, 2-1/2" through 5". Snap On No. RC500 or equal	11.62
90	1	Piston Ring Compressor, 4 brand, 3-1/2" to 7". Snap On No. RC150A or equal	9.49
91	1	Snap Ring Pliers Kit, consisting of internal pliers, external pliers, and 8 pairs of tips. Snap On No. PR50 or equal	15.00
92	1	Feeler Gauge, 19 blades, .0025" through .020" for adjusting diesel engine injector. Snap On No. FB319 or equal	16.00
93	3	Feeler Gauge, 25 blades, .0015" through .025", for adjusting engine governor gap. Snap On No. FB325A or equal	7.98
94	3	Injector Timing Pin Guage, for timing injectors on Detroit Diesel 53, 71 and 92 series engines. Snap On No. M3520 or equal	20.55
95	6	Hydraulic Jack, axle type, 12 ton capacity, with carrying handle. McMaster Carr No. 2913T10 or equal	468.24
96	1	Hydraulic Jack, axle type, 20 ton capacity, with carrying handle. McMaster Carr No. 2913T20 or equal	74.49
97	20	Jack Stand, adjustable, 10 ton capacity, McMaster Carr No. 8825T20 or equal	1,500.00
98	1	Electric Drill, Heavy Duty, 1/2 inch, reversing 220V, 50HZ, 0-600 RPM Milwaukee No. 1001-3REV or equal	145.00
99	1	Electric Drill, Heavy Duty, 3/4 inch, 220 V, 50HZ, 0-400 RPM, with key type chuck. Sioux No. 1575 or equal	294.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
100	4	Drill Bit Set, high speed, 29 drills, 1/16" through 1/2". Sears No. 9HT6817 or equal	142.40
101	3	Hydraulic Systems Tester, for testing systems up to 75 GPM at operating pressures to 500 PSI. Two flow scales: 3-15 GPM low flow, 15-75 GPM high flow. Complete with three 9 Volt batteries. OTC No. Y-94A or equal	2,142.00
102	3	Hydraulic Track Pin Remover/Installer, for removing and installing master track pins on Caterpillar bulldozers in the field OTC No. 1642 or equal with tooling for Cat D7G.	7,542.99
103	1	Universal Hose and press, for fabrication of 3/8" to 1-1/2" hydraulic hoses. Complete with assortment of hoses, male and female stems, ferrules. Gates No. 7480-0300 Press Gates No. 7481-0014 Power Unit Gates No. 4Z039 Saw or equal	4,062.50
104	1	Chain Wrench, heavy duty, 1/4" to 6.6" diameter capacity, dual reversible jaws, 24" long. McMaster Carr No. 537A16 or equal	52.00
105	6	Mechanics Work Bench, 72" long, 29" deep. Brodhead Garrett No. 595080 or equal	587.88
106	5	Mechanics Vise, 5" jaw width, 6" jaw opening, locking swivel base. Brodhead Garrett No. 224139 or equal	290.00
107	5	Air Hose, 3/8" x 50' long, 1/4"-18 NPT threaded ends, 200 PSI pressure. Snap On No. 1M508 or equal	140.75
108	10	Quick Coupler, with male and female adaptors, 1/4" - 18 thread size. Snap On Nos. AHC23, AHC23M, AHC23F or equal	20.90

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
109	5	Blow Gun, 100 PSI. Brodhead Garrett No. 259292 or equal	21.65
110	8	Drop Cord, 16 gauge, metal guard and switch/ tool outlet. Snap On No. EC691 or equal	95.76
111	1	Bench Grinder, two 7 inch grinding wheels, 36 and 60 grit, 220V, 50HZ, 1725 RPM with eye shields. Brodhead Garrett No. 593581 or equal	128.97
112	1	Face Shield, 8" long x 13" wide clear molded visor, cushioned headband. Brodhead Garrett No. 261706 or equal	8.00
113	6	Mechanics Creeper, smash proof, 4 caster wheels, head rest. Brodhead Garrett No. 192436 or equal	127.26
		TOTAL EX FACTORY	$ 27,939.31

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Electric[illegible]ery Equipment	
114	5	Electric[illegible]l Set, inch sizes, with meta[illegible] box and tote tray. McMaster [illegible]7211A13 or equal	2,952.70
115	1	Generato[illegible]ator, Regulator Test Bench, 2[illegible] 50HZ, single phase. Brodhead [illegible] No. 435938 or equal	4,455.35
116	5	Volt/Amp[illegible]rnator Tester, portable. Brodhead[illegible] No. 187667 or equal	633.75
117	1	Volt/Amp[illegible]meter, hand held, AC/DC Volts: 0[illegible]0, AC Amperes: [illegible], Watts: [illegible]0/1500/3000, with carrying [illegible] McMaster [illegible]o. 6976K61 or equal	177.10
118	3	Economy [illegible] Volt-Ohm-Milliameter, hand held, [illegible] 0-1000, DC Volts: 0-1000, DC Curr[illegible] 0-50uA thru 0-500mA, Resistan[illegible]0 ohms. McMaster [illegible]o. 7097K12 or equal	161.37
119	1	Armatur[illegible]er, with meter, for open circuit [illegible] ground test and short circuit [illegible] 220 Volts, 50HZ. McMaster [illegible]o. 7273K2 or equal	142.08
120	5	Solderi[illegible] 250 watts, heavy duty, with on[illegible]xtra soldering tip and one (1) ext[illegible]ch tip. 220 Volts, 50 HZ. McMaster [illegible]o. 7720A9 or equal	125.95
121	1	Multiple [illegible]ery Charger, 50 amps, parallel [illegible]ging of ten 12 volt batteri[illegible]wenty 6 volt batteries, complete[illegible] charging stand. McMaste[illegible] No.: Charger: 7047K5 Stand: 7239K1 or equal	488.95
122	3	Battery [illegible]er, 30 amps, with 200 ampere boost c[illegible] complete with charging leads wi[illegible]0 ampere clamps, 220 Volts, 50HZ. McMaste[illegible] No. 7319K41 or equal	354.48

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
123	1	Battery Charger, portable, 50 amps, 6 and 12 volt charger, with color coded 500 amps. battery clamps, handle and rubber tired wheels. McMaster Carr No. 7322K52 or equal	209.85
124	7	Spilnot Battery Filler, 2-1/4 quart capacity. McMaster Carr No. 4428T1 or equal	47.39
125	7	Battery Hydrometer with built-in thermometer. Complete with one (1) extra float and two (2) extra glass jars. McMaster Carr No., 4058K11 or equal	61.11
126	7	Battery Pliers Brodhead Garrett No. 306850 or equal	44.52
127	7	Battery Terminal Brush McMaster Carr No. 6708A12 or equal	20.51
128	6	Battery Carrier Brodhead Garrett No. 108088 or equal	80.34
129	1	Battery and Circuit Tester, 12 Volts batteries, temperature adjustable, 500 amperes. McMaster Carr No. 7451K11 or equal	49.60
130	6	Battery Jumper Cables, heavy duty, 16 feet 4-gauge copper stranded cables with 400 ampere clamps. McMaster Carr No. 7234K15 or equal	180.18
131	5	Acid Resistant SBR Rubber Coated Apron, with cotton web tapes, vulcanized seams. Size 33-3/4" x 45". McMaster Carr No. 5245T14 or equal	87.15
132	5	Hi-Flex PVC Coated Gloves, 10" gauntlet, medium size. McMaster Carr No. 5414T5 or equal	24.00
133	4	Hi-Flex PVC Coated Gloves, 10" gauntlet, large size. McMaster Carr No. 5414T6 or equal	19.20

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
134	6	Battery Filler Bulb, rubber bulb, 6 ounces, straight stem. Snap On No. BB6 or equal	18.48
135	4	Battery Terminal Puller. Snap On No. GA486 or equal	30.52
136	1	Headlight Aimers, consisting of two headlight aimers, adapters for 5-3/4" and 7" circular and 4 x 6-1/2" rectangular seal beams, floor compensation and calibration adapters, light meter, aiming screen and storage case. Brodhead Garrett No. 157763 or equal	268.38
137	8	Blow Torch, gasoline, one quart capacity, solid brass and bronze construction, cannon type bronze burner, Durex valve knob and pistol grip handle. Complete with wrench, spare orifice, orifice cleaner and spare leather washer. McMaster Carr No. 3377K14 or equal	427.12
138	7	Soldering Iron, torch heated, 2-pound forged copper head, pointed tip. McMaster Carr No. 7739A19 or equal	74.90
139	8	Soldering Iron, torch heated, 1-pound forged copper head, flat bottom tip. McMaster Carr No. 7739A22 or equal	51.44
140	10	Handle, for above soldering irons, self-threading type. McMaster Carr No. 7736A1 or equal	21.10
141	7	Soldering Iron Holder, bench type. McMaster Carr No. 7780A11 or equal	53.48
142	1	Chain Vise, bench mounted, 1/4" to 8" diameter capacity. For holding alternators and starter motors during repairs or rebuilding. McMaster Carr No. 5329A4 or equal	198.00
		TOTAL EX FACTORY	$ 11,459.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Welding Equipment	
143	1	Arc Welding Machine, portable, constant current, water cooled diesel engine driven, 350 amps, 40 volts, 100% duty cycle. Current range 40 to 500 amps, fully enclosed. Complete with: Control panel with all standard gauges and keylock starting switch. Optional welding meters and polarity switch. 3 KW, 220 VAC auxiliary power. Minimum 25 gallon fuel tank with locking cap. Tropical or fungus treatment. Two 50' Welding cables: one with lug and ground clamp, one with lug and heavy duty 400 amp insulated electrode holder. Off-highway, 4-wheel trailer with lunette hitch. Equal to: Hobart DR-353-F Welding Machine. Hobart Model 809 Off-Road Trailer. Perkins diesel engine preferred or equal.	7,128.91
144	4	Arc Welding Helmet, one-piece molded fiberglass helmet, with adjustable ratchet head band, with 2" x 4-1/4" shade No. 10 filter and clear glass plate. Complete with extra filters and plates listed below:	71.72
	1	Filter Shade No. 8	
	3	Filters Shade No. 10	
	2	Filters Shade No. 11	
	1	Filter Shade No. 12	
	2	Cover Plate, Clear Glass	
		McMaster Carr No. 5423T23 or equal	

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
145	3	Acetylene/Oxygen Welding and cutting outfit, heavy duty. Complete with: Welding torch w/mixer Cutting attachment 2-stage acetylene regulator 2-stage oxygen regulator 5 welding tips, No. 1 thru No. 9 No. 2 cutting tip Sparklighter Welding goggles 6-way wrench 20' of 3/16" twin neoprene hose with connections Brodhead Garrett No. 396053 or equal	631.47
146	4	Welders Apron with adjustable waist and neck straps. Size 24" x 36". Brodhead Garrett No. 493305 or equal	83.16
147	6	Welders Gloves, leather, gauntlet type. Brodhead Garrett No. 202744 or equal	38.46
148	4	Welders Chipping Hammer with brush and wire handle. Complete with 6 replacement brushes. McMaster Carr No.: Hammer: 7954A11 Brushes: 7954A14 or equal	23.68
149	6	Welders Shield, 6 x 6, single panel, free standing with platform legs, fire-retardant 12 oz. duck curtains. McMaster Carr No. 5475T15 or equal	343.20
		TOTAL EX FACTORY	$ 8,320.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Injector Pump Equipment	
150	1	Diesel Injector Nozzle Tester, universal type, bench mounted, 0-5000 PSI gauge. For checking opening pressure, making chatter and leakage tests. Complete with following accessories. Bacharach No.: Tester: 65-0030 or equal Connector Set: 65-0275 or equal Connector Set: 65-0645 or equal Connector Set: 65-1385 or equal Spray Cup Set: 65-0935 or equal	1,102.95
151	1	Lapping Blocks, set of 3 blocks in wooden case. Bacharach No. 66-0657 or equal	337.45
152	2	Lapping Compound, 600 grit, 1/2 lb. jar. Bacharach No. 66-0655 or equal	29.80
153	2	Lapping Compound, 1000 grit, 1/4 lb. jar. Bacharach No. 66-0661 or equal	29.80
		TOTAL EX FACTORY	$ 1,500.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Body Repair Equipment	
154	1	Tool Set, Body and Fender Repair, with metal tool box. Brodhead Garrett No. 114017 or equal	266.18
155	1	Set, Hydraulic Body Jack, 4 ton capacity, with metal tool box. Brodhead Garrett No. 59534 or equal	224.48
156	1	Disc Grinder/Sander, 7", 6000 RPM, heavy duty, 220 VAC, 50HZ., with side handle and guard. Milwaukee No. 6084-2. With following extra wheels and discs:	291.66
	2	Fine grinding wheels	
	2	Medium grinding wheels	
	1	Coarse ginding wheel	
	20	Fine 80 grit discs	
	40	Medium 50 grit discs	
	20	Coarse 36 grit discs	
		or equal	
157	1	Air Hammer, heavy duty, 0-2800 blows per minute, quick change spring retainer. Complete with:	266.29
	2	Flat chisel, 7"	
	2	Flat chisel, 4"	
	4	Body forming tool	
	2	Sheet metal cutter	
	2	Panel metal cutter	
	1	Panel crimper	
	2	Spotweld breaker	
	1	Air regulator	
		Brodhead Garrett No. 246751 or equal	

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Paint Shop (Body Repair Shop)	
158	1	Paint Spray Outfit, complete with 1 quart siphon cup, air transformer, 2 fluid nozzles, 2 air nozzles, 25' hose with connections, 2 respirators and 100 respirators filters. Binks Model 7 or equal	551.39
		TOTAL EX FACTORY	$ 1,600.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Tire Repair Equipment	
159	1	Truck Tire Demounter, heavy duty, air operated. Capable of handling truck wheels and rims from 17" to 24" rim size with 6" to 18" cross section, with revolving tire platform. Bishman Model 948 or equal	5,175.00
160	1	Truck Tire Balancer, air operated lift cylinder for lifting tire from ground, self-leveling and aligning cone with large center bubble. Bishman Model 580 or equal	969.07
161	6	Tool Set, truck tire service, 12 pieces consisting of 4-way wrench, 2 hammers, 1 truck wrench, 2 ring tools, 1 driving iron, 1 Budd wrench, 2 tire irons, 1 ring tool and 1 bead tool. Brodhead Garrett No. 507044 or equal	1,314.06
162	8	Tire Thread Depth Gauge, 1" depth capacity in 1/32" increments, with pocket clip. Snap On No. GA599 or equal	13.76
163	7	Tire Valve Remover and Repair Tool, combination type for cleaning valve threads and replacing valve cores. Brodhead Garrett No. 507099 or equal	6.51
164	6	Vulcanizer, electric 220 VAC 50HZ, complete with: Buffing cone and wheel 1 extra upper heat unit 1 extra lower heat unit 1 extra shoulder plate 240 small patches 240 medium patches 300 large patches 5 one pint cans of cement 12 rolls mutual rubber 100 #13-103 patches 4 extra wire buffing wheels 2 buffing cones Egan-Camel Model 18-279 or equal	3,471.60

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
165	4	Tire Inflator with gauge, 0-120 PSI, single head chuck, 12" whip hose. McMaster Carr No. 6113A11 or equal	57.00
166	4	Air Hose, 3/8" x 50' long, 1/4"-18 NPT threaded ends, 200 PSI pressure or equal	123.92
167	4	Mechanics Work Bench 72" long, 29" deep. Brodhead Garrett No. 595080 or equal	519.08
		TOTAL EX FACTORY	$ 11,650.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Carpentry Equipment	
168	1	Carpenters Tool Set, consisting of one (1) each: 16 oz. Nail hammer 16 oz. Ripping hammer 6" English/metric folding ruler 7 pc. Screwdriver set, standard 7 pc. Screwdriver set, Phillips 12" English/metric combo square 9" Smooth plane 24" Level, aluminum 26" 8-Point crosscut saw 26" 5-1/2 Point rip saw 6" Combination plier 10" Keyhole saw File, Surform type 13 pc. Auger drill bit set Line level 10' English/metric tape 10" Dovetail saw 18" Wrecking bar 10" Bit brace 10" Channelock plier Metal tool box Brodhead Garrett No. 406032 or equal	365.06
169		Combination Table Saw/Jointer, 10" blade, 20" x 27" table with two 10" x 27" side extensions. Capacity of saw blade 3-3/8" at 90^0, 2-1/4" at 45^0. With jointer/planer attachment. Jointer capacity up to 3/8". Planer capacity up to 4-1/8" wide. Separate drive motors for saw and jointer/planer attachment. Complete with 5 extra cutter blades for saw/jointer. Sears No. 9HT2982IN or equal	1,451.51
170	1	Vise, Woodworking, 4" x 10" jaw size, 12" jaw opening, with slotted mounting brackets, removeable wood faces, bronze thrust bearing; and mounting bolts, washers, and screws. Brodhead Garrett No. 223929 or equal	154.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Blacksmith Shop	
171	2	Cold Chisel, 1-1/4" x 6-1/4" head size, handled. McMaster Carr No. 2484A21 or equal	66.36
172	2	Cold Chisel, 1-1/2" x 7" head size, handled McMaster Carr No. 2484A22 or equal	79.42
173	1	Cold Chisel, 1-3/4" x 8-1/4" head size, handled. McMaster Carr No. 2484A23 or equal	58.47
174	2	Hot Chisel, 2" x 8-1/4" head size, handled. McMaster Carr No. 2484A12 or equal	91.00
175	2	Hot chisel, 2-1/4" x 9-3/4" head size, handled. McMaster Carr No. 2484A13 or equal	76.66
176	2	Square Flatter, 3", handled. McMaster Carr No. 2491A30 or equal	126.00
177	2	Grab Tongs, general purpose, 24" long. Brodhead Garrett No. 206980 or equal	46.78
178	1	Blacksmith Tong, curved lip to hold 1/2" rounds. Brodhead Garrett No. 206884 or equal	71.09
179	1	Blacksmith Tong, curved lip to hold 3/4" rounds. Brodhead Garrett No. 206895	25.57
180	4	Sledge Hammer, double face, 8 pounds, 6-1/2" head, 2-1/4" face, 32" handle. Brodhead Garrett No. 367046 or equal	98.00
181	2	Sledge Hammer, double face, 10 pounds, 7-1/8" head, 2-3/8" face, 34" handle. Brodhead Garrett No. 180515 or equal	63.00
182	2	Brass Spray Can, 1/2 pint capacity. Brodhead Garrett No. 423311 or equal	39.24

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
183	1	Anvil, 140 pounds. Once piece cast steel with hardened face and softer inner body, 14" x 4-3/8" work surface, 1-1/4" hardie square hole, 8-5/8" horn. McMaster Carr No. 2481A45 or equal	316.75
184	1	Blacksmith Forge, heavy duty coal fired with hand operated fan, positive valve control fire pot with up and down valve action to facilitate cleaning from the bottom. Complete with half hood and water tank. McMaster Carr No. 2465A2 or equal	36.47
185	2	Leather Apron, 24" x 36", with leather neck straps and waist tie strings. Brodhead Garrett No. 493305 or equal	64.64
		TOTAL EX FACTORY	$ 3,230.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Lubrication Equipment	
186	3	Bucket Grease Pump, portable, hand operated, 3,500 pound pressure, 28 oz. per stroke, 30 pound bucket capacity. Complete with 7' hose with hydraulic coupling. McMaster Carr No. 1001K2 or equal	468.60
187	3	Bucket Grease Pump, portable, hand operated, 7,000 pound pressure, 1/4 oz. per stroke, 30 pound bucket capacity. Complete with 7' hose with hydraulic coupling. McMaster Carr No. 1075K11 or equal	686.13
188	6	Gear Lubricant Dispenser, portable, hand operated, 1 pint per 7 strokes using SAE 90 gear oil, 30 pound bucket capacity. Complete with 5' hose or equal	497.16
189	6	Grease Gun, hand lever type, 10,000 pound pressure, 1 oz. per 25 strokes, 20 oz. capacity. Complete with filler nipple, 6" extension with hydraulic coupling. McMaster Carr No. 1048K1 or equal	52.56
190	5	Rotary Vane Hand Pump, for handling diesel fuel and lubricating oils, 12 times per gallon. Complete with suction pipe for 55 gallon drums, discharge spout, 8' hose with curved steel nozzle. McMaster Carr No. 4242K1 or equal	382.25
191	5	Oil Filler Measuring Can, 1 quart capacity, with thumb operated flow valve, flexible spout. McMaster Carr No. 4340T1 or equal	49.25
192	5	Oil Filler Measuring Can, 2 quart capacity, with thumb operated flow valve, flexible spout. McMaster Carr No 4340T2 or equal	71.20
193	4	Oil Filler Measuring Can, 4 quart capacity, with thumb operated flow valve, flexible spout. McMaster Carr No. 4340T3 or equal	63.56

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
194	5	Funnel, galvanized, 3/4" diameter spout, 1 quart capacity. McMaster Carr No. 4363T1 or equal	9.05
195	5	Funnel, galvanized, 3/4" diameter spout, 2 quart capacity. McMaster Carr No. 4363T2 or equal	11.85
196	6	Funnel, galvanized, 3/4" diameter spout, 4 quart capacity. McMaster Carr No. 4363T3 or equal	13.02
197	4	Bearing Packer, heavy duty, for lubricating bearings with a minimum I.D. of 1/2" and a maximum O.D. of 6-1/2". McMaster Carr No. 1074K2 or equal	92.64
198	12	Oil Filter Wrench, strap type, for oil filters up to 6 inch diameter. McMaster Carr No. 6860A14 or equal	27.60
199	14	Drain Pan/Can, 12 quart capacity, polyethylene. Complete with spout cap and drain. McMaster Carr No. 4539T12 or equal	123.34
200	7	Oil Drain Pump, suction type, for draining engine crankcase oil through dipstick, 1-1/4" diameter pump cylinder. Complete with:	143.99
	2	1/2" I.D. x 36" long hoses	
	2	Dipstick probes, 1/4" x 40" and 5/16" x 40"	
	1	Neoprene intake adapter	
	1	Tube Connector	
		McMaster Carr No. 9911K11 or equal	
201	1	Grease Fitting Assortment, consisting of 132 grease fittings in 7 different sizes, 12 replacement jaws for hydraulic couplings, two tools for extracting broken fittings and rethreading holes, steel divider box. McMaster Carr No. 1345K11 or equal	58.69

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
202	5	Hydraulic Grease Fitting Assortment consisting of:	55.00
	30	Straight fittings	
	10	45° angle fittings	
	10	90° angle fittings	
	1	Plastic divider box	
		McMaster Carr No. 1123K11 or equal	
203	1	Lubrication Unit, Stationary, Skid Mounted, consisting of:	15,364.11

Skid: 114" x 84", 3/16" steel diamond plate platform

Air Compressor: 5 HP 220 VAC, 50HZ, 3 phase motor, 24.7 CFM at 110 PSI, 60 gallon ASME receiver tank, constant speed unloader, belt guard, air regulator and gauge, automatic water separator and 40' heavy duty hose reel assembly.

Chassis Lube System: 50:1 ratio 400 pound pump with 4-1/4" air motor; 40' high pressure heavy duty hose real assembly.

Two (2) Gear Oil Systems: One for SAE 90 and one for SAE 140 gear oil 9.1 ration 400 pound pump with 4-1/4" air motor, 40' high pressure heavy duty hose reel assembly.

Two (2) Motor Oil Systems: For increased capacity of diesel engine oil, 9.1 ratio 400 pound pump with 4-1/4" air motor, 40' high pressure heavy duty hose reel assembly.

Hydraulic Oil System: 9.1 ration 400 pound pump with 4-1/4" air motor, 40' high pressure heavy duty hose reel assembly.

Three Drawer Tool Box: Mounted across width of platform.

Hose Reel Mounting: Seven (7) hose reels mounted on top of tool box with large metal tag identifying type of lubricant in each hose.

Note: All hose reals except air, shall

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
203		be equipped with high pressure heavy duty hoses "regardless of pump ratio." Plumbing: Under platform floor from pumps to reels, securely fastened. Air Manifold: Mounted in center of platform and connected to air compressor by 1/2" heavy duty hoses. Equipped with air pressure gauge and an air pressure regulator. Rassow Model R-976 or equal	
		TOTAL EX FACTORY	18,170.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Tools	
204	6	Copper Tube Flaring, Cutting and Bending Kit, 45 flare. For flaring 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", and 3/4" copper and aluminum tubing. Complete with 1/4, 3/8" and 1/2" tube bending springs, ratchet wrench with 3/16" and 1/4" square opening with 1/2" hex. in handle, metal tool box. McMaster Carr No. 2700A12 or equal	371.16
205	6	Mechanically Powered Puller Set, consisting of:	3,886.32
	1	-7 ton 2 jaw puller	
	1	-17-1/2 ton push-puller	
	1	-Bearing puller	
	1	-Internal puller	
	4	-Extra push puller legs (two 16-1/2" and two 22-1/2")	
	2	-Threaded adapters, 5/8" - 18 female x 3/4" - 16 female	
	2	-Box wrench, 1-1/4" and 1-1/2"	
	1	-Wrench handle	
		McMaster Carr No. 6348K5 or equal	
206	4	Pilot Bearing Puller, with two sets of jaws. Inside jaw Spread Range: 3/4" to 1-1/4" 3 ton capacity Snap On No. A78 or equal	179.40
207	6	Gasket Punch Set, one 5-3/8" long mandrel ten hole punches 1/4" thru 1" in plastic box Snap On No. PGH8A or equal	137.64
208	6	Bushing, Bearing and Oil Seal Driver Set. Complete with:	691.20
	2	-Interchangeable handles, 5" and 6" long	
	1	-Allen wrench	
	41	-Discs with diameter sizes 1/2" to 3" in 1/16" increments	
		McMaster Carr No. 6015A11 or equal	

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
209	6	C-Clamp, Deep Throat, 4" opening, 4-7/8" depth. Brodhead Garrett No. 185354 or equal	115.98
210	6	C-Clamp, Deep throat , 6" opening, 7-1/8" depth. Brodhead Garrett No. 185376 or equal	162.60
211	4	C-Clamp, Deep Throat, 6-1/2" opening, 4-1/2" depth. Brodhead Garrett No. 185405 or equal	80.72
212	1	Die Punch Letter Set, 1/8" size, 27 characters A to Z and period. McMaster Carr No. 1860T22 or equal	32.21
213	1	Die Punch Number Set, 1/8" size, 0-9 digits with 6 doubling as 9. McMaster Carr No. 1860T12 or equal	12.32
214	1	Etcher, Electric 1500 Watt, 220 VAC, 50HZ with 12 heat stages. For marking tools, jigs, and other metal surfaces. Complete with stage selector switch, pilot light, 3 foot pencil cord, ground cable, ground plate steel housing with handle, one regulator tungsten marking tip and the following extra replacement tips: McMaster Carr No. Etcher: 1605T7 or equal Three Heavy Duty Tungsten Replacement Tips: 1605T6 or equal	176.00
215	1	Jumbo Adjustable Wrench, heavy duty, 24" size, 2000 ft. lb. rated capacity. Adjustable from 1-3/8" to 2-7/8" McMaster Carr No. 5394A1 or equal	245.15
216	1	Jumbo Adjustable Wrench, heavy duty, 36" size, 5000 ft. lb. rated capacity. Adjustable from 2-15/16" to 4-3/4" McMaster Carr No. 5394A3 or equal	499.66

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
217	1	Shearing Kit, heavy duty, consisting of:	77.76
	1	-Ending cutting nippers, 8"	
	1	-Diagonal lap joint pliers, 8"	
	1	-Compound action straight snips, 10" with 1-1/2" cut serrated blade	
	1	-Duckbill circular pattern snips with 2-1/2" cut	
	1	-Folding roll-up kit bag	
	-	McMaster Carr No. 3580A11 or equal	
218	6	Pipe Wrench, 8 inch, forged still hardened hook jaw, 1" jaw capacity. McMaster Carr No. 7178A11 or equal	61.80
219	6	Pipe Wrench, 10 inch, forged steel hardened hook jaw, 1-1/2" jaw capacity. McMaster Carr No. 7178A13 or equal	104.04
220	1	Pipe Wrench, 14 inch, forged steel hardened hook jaw, 2" jaw capacity. McMaster Carr No. 7178A13 or equal	21.68
221	1	Pipe Wrench, 18 inch forged steel hardened hook jaw, 2-1/2" jaw capacity. McMaster Carr No. 7178A14 or equal	26.18
222	3	Bolt Cutter, 36 inch, heavy duty, center cut, Rockwell hardness C-42 cutting capacity. McMaster Carr No. 3757A13 or equal	316.80
223	4	Chain Hoist, 3000 pound capacity, 8 foot lift, hook suspended type, with load brake, hardened steel load chain, swivel hook with safety latch. McMaster Carr No. 3094W14 or equal	924.72
224	6	Wrecking Bar, truckman type slate bar with a chisel bit on one end and pointed tip at other end, 48 inches long. McMaster Carr No. 5995A43 or equal	86.40
225	7	Tape Measure, English and Metric Graduations, 10 ft. 3m, 1/2" blade in plastic case. McMaster Carr No. 8993A56 or equal	42.14

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
226	1	Steel Tape Measure, English and Metric Graduations, 100 ft./30m, 3/8" blade in steel case. McMaster Carr No. 6838A53 or equal	16.94
227	4	Steel Rule, English and Metric Graduation, 12"/300mm. Brodhead Garrett No. 585050 or equal	16.96
228	6	41-pc. Standard Tap and Die Set, consisting of:	220.80
	17	-Taps	
	17	-Hex dies	
	1	-Adjustable guide die stock	
	2	-"T" handle tap wrenches	
	1	-Tap and reamer wrench	
	1	-Screwdriver	
	1	-Thread gauge	
	1	-Case	
		Sears No. 9HT5201 or equal	
229	6	29-pc. Metric Tap and Die Set, consisting of:	249.60
	11	-Taps	
	11	-Hex dies	
	1	-Adjustable guide die stock	
	2	-"T" handle tap wrench	
	1	-Tap and reamer wrench	
	1	-Screwdriver	
	1	-Thread gauge	
	1	-Case	
		Sears No. 9HT5200 or equal	
230	1	7-pc. Expansion Reamer Set, angle blade type, consisting of following reamers in hardwood case:	201.60
	1	-7/16" to 1/2" Reamer	
	1	-1/2" to 9/16" Reamer	
	1	-9/16" to 5/8" Reamer	
	1	-5/8" to 11/16" Reamer	
	1	-11/16" to 3/4" Reamer	
	1	-3/4" to 13/16" Reamer	
	1	-13/16" to 7/8" Reamer	
		McMaster Carr No. 2999A11 or equal	

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
231	1	Tachometer, Single Range, 100-4000 RPM, hand held. For setting engine speed governors. Complete with following accessories: McMaster Carr Nos: Tachometer: 1416T1 or equal 12" Extension Shaft: 1416T3 or equal Two Extra Rubber Tips: 1416T3 or equal	129.25
232	6	Tire Pressure Gauge, 20-130 PSI, dual head, bar type, with hangup ring. McMaster Carr No. 5469K2 or equal	52.32
233	5	Gas Can, 3 gallon capacity, constructed of 20 gauge terne plate steel, built-in air vent, with cap securely chained to can. Complete with flexible pour spout with filter and dust cap. McMaster Carr Nos: Gas Can: 4303T2 or equal Flexible Spout: 4303T3 or equal	44.80
234	9	Gas Can, 5 gallon capacity, constructed of 20 gauge terne plate steel, built-in air vent, with cap securely chained to can. Complete with flexible pour spout with filter and dust cap. McMaster Carr Nos. Gas Can: 4303T5 or equal Flexible Spout: 4303T3 or equal	292.77
235	4	Flash Light, heavy duty, two cell size "D" batteries, ABS plastic body, 2" reflectors. Complete with six batteries with each flash light. McMaster Carr Nos: Flash Light: 1050T41 or equal Alkaline Batteries: 1026T27 or equal	46.72
236	6	First Aid Kit, consisting of a balanced assortment of first aid supplies adequate to administer first aid up to 25 people. Complete with metal box and an American Red Cross First Aid Manual. Brodhead Garrett No. 262011 or equal	177.60

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
237	1	Step Ladder, 6-foot, 250 pound capacity, constructed of sitka spruce or western hemlock with flat grooved steps and slip resistant shoes at base. McMaster Carr No. 8244T13 or equal	73.60
238	9	Refuse Can, 20 gallon capacity, galvanized corrugated steel side with two drop handles. Lid and bottom constructed of one-piece sheel steel. Smooth handle on lid. McMaster Carr No. 4062T2	308.16
239	1	Blind Rivet Kit, extra long handle with 3 nosepieces, one bag of 50 each 1/4" Klik-Split rivets, and following extra rivets: Snap On Nos: Rivet Kit: HP300 or equal Extra Rivets Packaged 50 Rivets per Bag: -3 Bags 3/16" Klik-Fast Rivets: HP371 or equal -2 Bags 1/4" Klik-Split Rivets: HP373 or equal -3 Bags 1/4" Klik-Fast Rivets: HP376 or equal	216.99
		TOTAL EX FACTORY	10,300.00

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
		Miscellaneous Shop Equipment	
240	1	Adjustable Gantry Crane, 6000 pound capacity, 10' span, adjustable height from 12'1" to 15'7". Complete with two hand winches for raising and lowering I-beam, spring loaded height positioning bolts automatically engaging when desired 6" spaced hole in reached, four 6" swivel lock casters with composition wheels, and a 6000 pound capacity geared trolley designed for use with a hook suspended hoist. McMaster Carr No. 8904T17 or equal	2,732.55
241	1	Chair Hoist, 6000 pound capacity, 12 ft. lift hook suspended type, with load brake, hardened steel load chain, swivel hook with safety latch. McMaster Carr No. 3094W26 or equal	380.83
242	1	Sling, Engine Lift, 4000 pound capacity, equalizing wore rope type, with adjustable legs and positive locking. McMaster Carr No. 8905T2 or equal	160.50
243	5	Air Compressor, 90 CFM, electric motor driven, consisting of a two stage, 4 cylinder air compressor with intercooler, automatic pressure control valve and totally enclosed belt drive. Compressor shall be mounted on a horizontal 200 gallon capacity tank equipped with a safety relief valve, air pressure gauge, drain valve and service valve. Electric motor shall be 220 VAC, 50HZ, three phase, equipped with a magnetic starter switch with overload protection. Saylor Beall No. 92024 or equal	24,775.00
244	1	High Pressure Steam Cleaner, oil-fired, electric motor driven, portable. Complete with 35' high pressure hose, discharge gun with heat insulated handle and grip and turret head nozzles. Electric motor shall be 220 VAC, 50 HZ. Steam cleaner shall be provided with two (2) 55 gallon drums of cleaning solution, shipped and received with the unit. Jenny No. PW1000-OEP or equal	2,857.60

ITEM	QUANTITY	DESCRIPTION	EX FACTORY COST
245	4	Pneumatic Parts Cleaner, 12 gallon capacity steel tank and cover. Designed and constructed to create turbulence in the solvent by means of air agitation. Complete with a control valve for regulating agitation, fusible link which melts at 160°F and automatically closes cover in case of fire and parts basket. Three (3) extra fuse links shall be shipped and received with the unit. McMaster Carr No. 3176K11 or equal	269.48
246	18	Twenty Pound Capacity Fire Extinguishers, multi-purpose dry chemical type. Capable of extinguishing Class A, B and C fires in accordance with Underwriters Standard 299. Brodhead Garrett No. 406551 or equal	968.94
		TOTAL EX FACTORY	$ 32,145.00

VEHICLE SPECIFICATIONS

1985 Truck Tractor with Fifth Wheel

Minimum 61,000 C.V.W. - L.H. Drive 6" x 4"
Diesel Engine Min. 300 SAE Horsepower, 4 Cycle Water Cooled Min. 6 Cylinder Turbocharged
15" H.D. Airclearner Dry Type w/Precleaner Preferred
H.D. High Capacity Cooling System. Min. 900 Sq. In.
Manufacturers H.D. Clutch not less that 14" in Diameter 2 Plate Ceramic Disc
H.D. Transmission Maximum 10 Speed. Manual Shift Constant Mesh (10 Speed Forward 2 Reverse) Transmission Suitable for On-Off Highway use, with easily removable Magnetic Plug
Front Axle with Rated Capacity of not less than 13,000 lbs.
Tandem Rear Dual Reduction Axle Min. 48,000 lbs.
Lowest Rear Axle Ratio as required to obtain a maximum speed of 55 M.P.H. in High Gear with Engine running at Full Throttle.
H.D. Front, Multi Leaf Spring. Min. 5 Leaf to meet the Axle Capacity
H.D. Rear Multi Leaf Spring, Min. 6 Leaf to meet the Axle Capacity
Air Brakes on all Wheels Min. 16.5 x 5" Front Min. 16.5 x 7" on Rear
Minimum 2 - Auxiliary Spring Brakes on Rear Bogie
Minimum 12 C.F.M. Air Compressor
Power Steering
Single Front, Dual Rear Tires with Tubes, On-Off Highway Design. Tires must meet Axle Capacity when loaded. Mounted on Min. 20" Rims. All tires to be the same size, if possible.
Spare Tire w/Tube Mounted
H.D. Front Bumper with Front Tow Connection
Rear Pintle Hook Min. 15 Ton Pulling Capacity
H.D. Electric System Min. 65 AMP. Alternator
Minimum 55 Gal. Capacity Fuel Tank

Cab Mfg. Conventional Cab or Cab over engine. Cab shall be complete with all safety glass standard instruments. In the event Cab over engine is offered the Cab shall be manually lifted and counterbalanced with a positive type locking device to prevent accidental lowering and locking device at rear of Cab to retain Cab in lowered position. Bench Seat and full insulation.
Front Seat Belts
Tinted Glass on Front Windshield
Windshield Wipers Dual Electric or Air operated with Washers
Dual Electric Horn
Metric Speedometer and Odometer and all Gauges
Mirrors - 2 Exterior Westcoast Type
20 Ton hydraulic Jack with Wheel Lug Wrench

Fixed Fifth Wheel - Dual Oscillating. Preferred to be Compatible with Trailer
Minimum 2" King Pin
Back of Cab Mounted. Winch Minimum 30 Ton w/100' of Wire Rope. Size Suitable for Winch Capacity
P.T.O. Driven
Lights and Reflectors
Export Model Less Emission Controls

Spare Parts Requirement to maintain each Unit for a Period of one (1) year.
Air Cleaner Elements
Oil Filter Elements
Fuel Filter Elements
Engine V-Belt Set for Pump, Alternator and Fan. Parts must be bid as a separate item, and must be shipped and received with equipment.
Satisfactory for Tropic Desert Zone Operation
Parts and Service Books with each Truck
Standard Tool Box and Tools with each Truck

Manufacturer to specify Frame RBM
Minimum Gradability of Chassis when loaded 15%
Color - Light Blue w/Top of Cab White

Optional Item
Caterpillar Diesel Engine Model 3406 installed in place of Manufacturer's Standard Engine - 300 H.P. Turbocharged

VEHICLE SPECIFICATIONS

1985 Semi-Trailer Tandem Axle - 40 U.S. Tons Capacity
Level Deck for On and Off Hauling
Useable Deck length minimum 18' Maximum 20' Long 9' Wide
Fixed Gooseneck
Sloping Beaver Tail and Rear Loading Ramps
Minimum 2" (50mm) Hardware Floor
4 Lashing Rings H.D. per side
Adjustable spring assisted read loading ramps
Cast spoke wheels
Minimum 20,000 lbs. per axle preferred
H.D. Suspension preferred
Wheels to be covered
Minimum 10.00 x 15 - 14 ply G rated w/tubes and one complete spare tire and tube mounted on gooseneck
Air brakes
High Tensil steel main frame
Pierced Cross Members preferred
Stenco oil seals
Kingpin SAE Hardened Interchangeable 2" and 3-1/2" pins
12 or 24 volt electric system
Capacity maximum 80,000 lbs. at 50 M.P.H.
Standard lighting and reflectors, sealed wiring harness
Standard lighting and reflectors, sealed wiring harness
Telescopic supports, Pull pin, Adjustable parking jacks

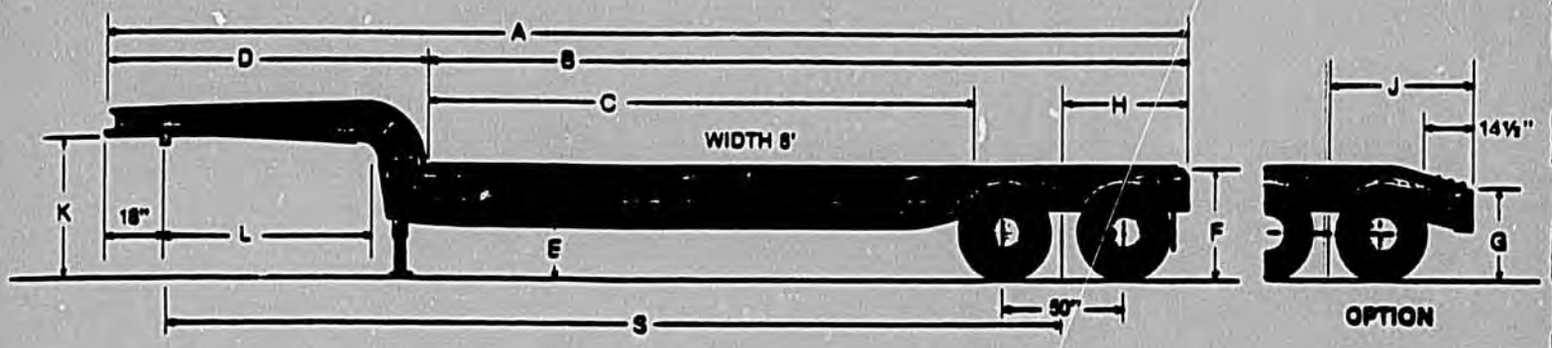
137
#2

TANDEM AXLE LOWBEDS
25-40 TON CAPACITY

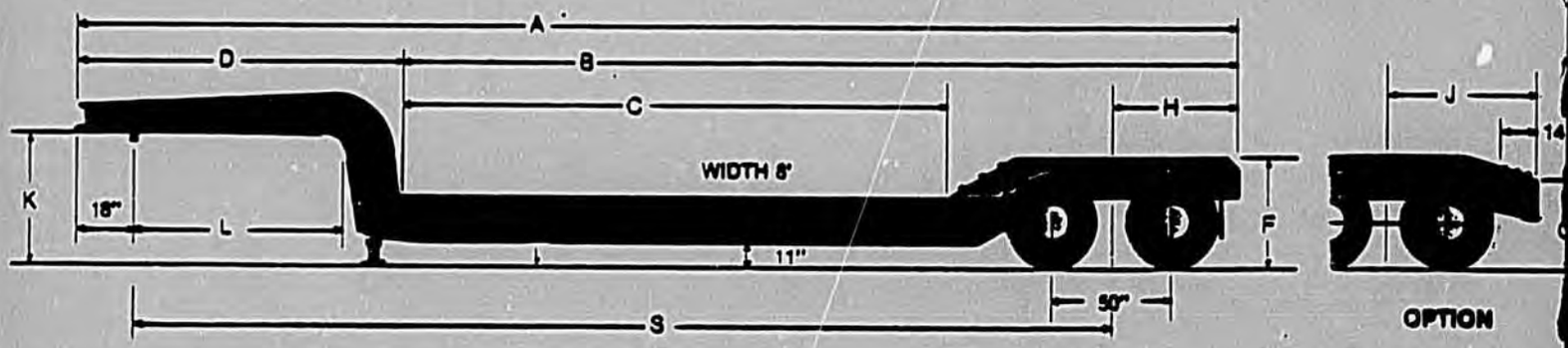
138

BIRMINGHAM
MANUFACTURING COMPANY, INC.

25-35-40 TON TANDEM AXLE LOWBEDS



MODEL	RATING TONS	APPROX. WT.	TIRES	AXLE CAPACITY	A	B	C	D	E	F	G	H	J	K	L	S
825-FLR	25	8,863#	8.25x15x12 PR	23,000#	33'-2"	23'-10"	16'-1"	9'-4"	36"	36"	26¼"	53½"	57½"	47½"	78"	27'-3"
835-FLR	35	9,728#	10.00x15x14 PR	23,000#	33'-6"	23'-10"	16'-1"	9'-7"	37"	37"	27¼"	53½"	57½"	48"	78"	27'-6"
840-FLR	40	10,446#	*10.00x15x14 PR	25,000#	34'-6"	23'-10"	16'-1"	10'-2"	37"	37"	27¼"	53½"	57½"	51"	84"	28'-1"



MODEL	RATING TONS	APPROX. WT.	TIRES	AXLE CAPACITY	A	B	C	D	E	F	G	H	J	K	L	S
825-DLR	25	10,316#	8.25x15x12 PR	23,000#	35'-3"	25'-9"	16'-1"	9'-6"	24¼"	36"	26¼"	53½"	57½"	47½"	78"	29'-4"
835-DLR	35	11,431#	10.00x15x14 PR	23,000#	35'-3½"	25'-7"	16'-1"	9'-8½"	27½"	37"	27¼"	53½"	57½"	48"	78"	29'-4"
840-DLR	40	12,394#	*10.00x15x14 PR	25,000#	35'-11"	25'-7"	16'-1"	10'-4"	27½"	37"	27¼"	53½"	57½"	51"	84"	29'-11"

All Dimensions Are Nominal And Refer To An Unloaded Trailer

GENERAL SPECIFICATIONS

Wheels 4 — Cast Steel Spoke
Axles 2 — 5" Diameter
Brakes 4 — 12¼" x 7½" Air
Suspension — Rockers with 4 — 4" Diameter x 6" Ryertex Bearings
Stemco Oil Seals
Telescopic Supports

Deck — 2" Net Oak
Lights — Comply with D.O.T. Requirements
Lashing Rings 8 — Heavy Duty
Kingpin — S.A.E. Hardened
Hi-Tensile Steel
Undercoated
Painted — Red or Yellow

*MICHELIN TIRES

139 44

PRINTED USA

BIRMINGHAM MANUFACTURING COMPANY

P. O. DRAWER 289 • SPRINGVILLE, ALABAMA 35146 PHONE 205 — 467-6171 • TELEX 5-9766 BIRMCO

VEHICLE SPECIFICATIONS

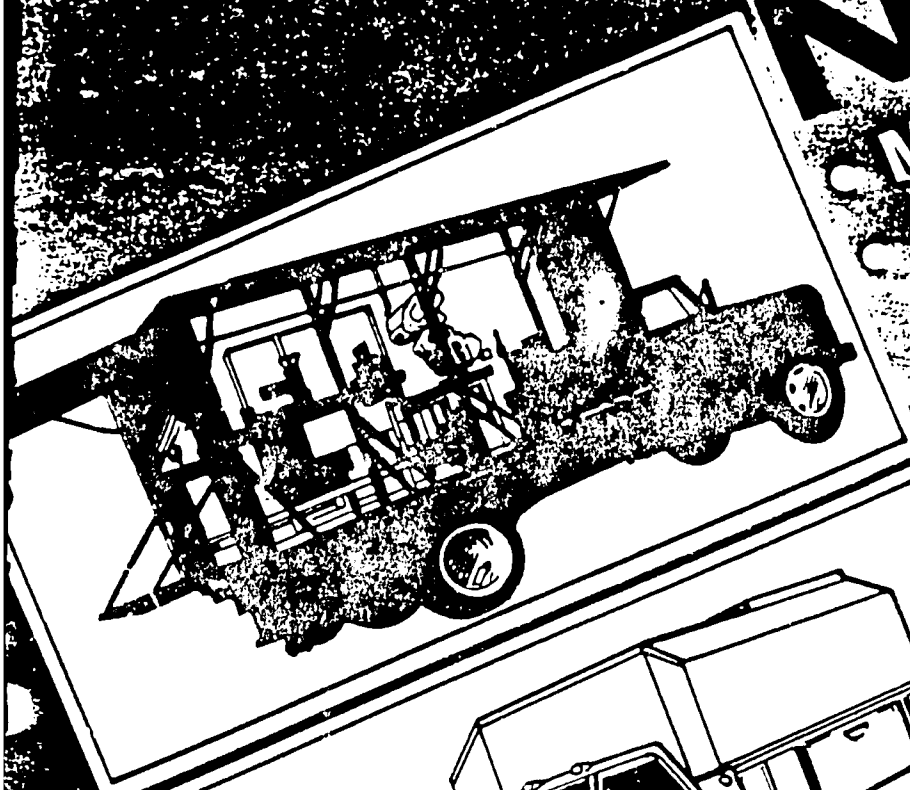
1985 Truck With Trailer Mobile Work Shop
Minimum 29,000 G.V.W. - L.H. Drive
Diesel Engine Min. 250 SAE Horsepower, 4 Cycle Water Cooled Min. 6 Cylinder Turbocharged
15" H.D. Aircleaner Dry Type 2/Precleaner Preferred
H.D. High Capacity Cooling System. Min. 90 Sq. In.
Manufacturers H.D. Clutch not less than 14" in Diameter 2 Plate Ceramic Disc
H.D. Transmission Maximum 10 Speed. Manual Shift Constant Mesh (10 speed Forward 2 Reverse) Transmission Suitable for On-Off Highway use, with easily removable Magnetic Plug
Front Axle with Rated Capacity of not less than 10,500 lbs.
Single Rear Axle Minimum 18,500 lbs.
Lowest Rear Axle Ratio as required to obtain a maximum speed of 55 M.P.H. in High Gear with Engine running at Full Throttle.
H.D. Front, Multi Leaf Spring. Min. 5 Leaf, to meet the Axle Capacity
H.D. Rear Multi Leaf Spring. Min. 6 Leaf to meet the Axle Capacity
Air Brakes on all Wheels Min. 15" x 5" Front Min. 16.5 x 7" on Rear
Minimum 2 - Auxiliary Spring Brakes on Rear Bogie
Minimum 12 C.F.M. Air Compressor
Power Steering
Single Front, Dual Rear Tires with Tubes, On-Off Highway Design. Tires must meet Axle Capacity when loaded. Mounted on Min. 20" Rims. All tires to be the same size, if possible.
Spare Tire w/Tube Mounted
H.D. Front Bumper with Front Tow Connection
Rear Pintle Hook Min. 15 Ton Pulling Capacity
H.D. Electric System Min. 65 AMP. Alternator
Minimum 55 Gal. Capacity Fuel Tank
Cab Mfg. Conventional Cab or Cab over engine. Cab shall be complete with all safety glass standard instruments. In the event Cab over engine is offered the Cab shall be manually lifted and counterbalanced with a positive type locking device to prevent accidental lowering and locking device at rear of Cab to retain Cab in lowered position. Bench Seat and full insulation.
Front Seat Belts
Tinted Glass on Front Windshield
Windshield Wipers Dual Electric or Air operated with Washer
Dual Electric Horn
Metric Speedometer and Odometer and all Gauges
Mirrors - 2 Exterior Westcoast type
12 Ton Hydraulic Jack with Wheel Lug Wrench
Machine Shop Trailer
Fully enclosed Shop Body with Hinged Side and Rear Panels
1/8" Steel Diamond Plate Floor, Welded to Longitudinal Members and Cross Members
Off-Highway 4 Wheel Trailer with Lunette Hitch Bolted to Platform on Shop Truck Equal to Hobart Model 809 Off-Road Trailer.
Brakes - Electric on Both Axles. Brake Control for Mounting to Prime Mover, Supplied with Couplings.

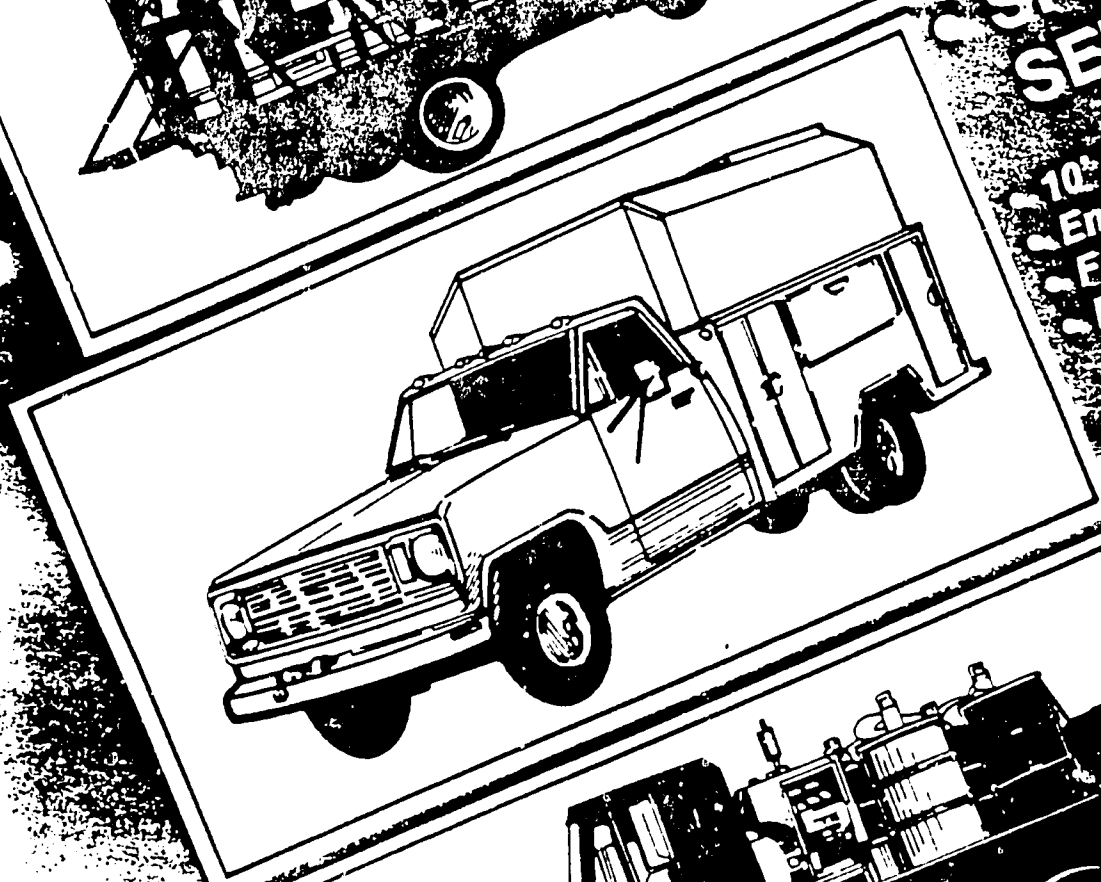
Tires - Manufacturers recommended with Tubes Plus 1 - Complete Spare Tire and Tube Mounted
Lighting - Four Sections of 4A Flourescent lighting 22 V - 50 HZ
Arc Welding Machine, Portable, Constant Current, Water Cooled Diesel Engine driven, 350 Amps, 40 Volts, 100% Duty Cycle. Current Range 40 to 500 Amps., Fully Enclosed.
Complete with: Control Panel with all Standard Gauges and Keylock Starting Switch.
Optional Welding Meters and Polarity Switch
3 KW, 220 VAC Auxiliary Power
Minimum 25 Gallon Fuel Tank with Locking Cap
Tropical or Fungus Treatment
Two 50' Welding Cables: One with Lug and Ground Clamp; One with Lug and Heavy Duty 400 Amp. Insulated Electrode Holder
Hobart DR-353-P Welding Machine or Equal
Perkins Diesel Engine Preferred or Equal
2 - Mechanics Work Benches with 6 Lockable Drawers in each Bench
5 - Swivel Bench Vises with Anvil
1 - Oxygen and 1 - Acetylene Cylinder with Valve and Cap Mounted at Rear
Detachable Rear Access Steps
Light and Reflectors
Export Model less Emission Controls
Spare Parts Requirement to Maintain each Unit for a Period of one (1) Year
Air Cleaner Elements
Oil Filter Elements
Fuel Filter Elements
Engine V-Belt set for Pump, Alternator, and Fan. Parts must be bid as a separate item, and must be shipped and received with equipment.
Satisfactory for Tropic Desert Zone Operation
Parts and Service Books, with each Truck
Standard Tool Box and Tools with each Truck
Manufacturer to Specify Frame RBM
Minimum Gradability of Chassie When Loaded 15%
Color - Light Blue w/Top of Cab White
Optional Item
Caterpiller Diesel Engine Model 3208 Installed in Place of Manufacturers Standard Engine 250 HP Turbocharged

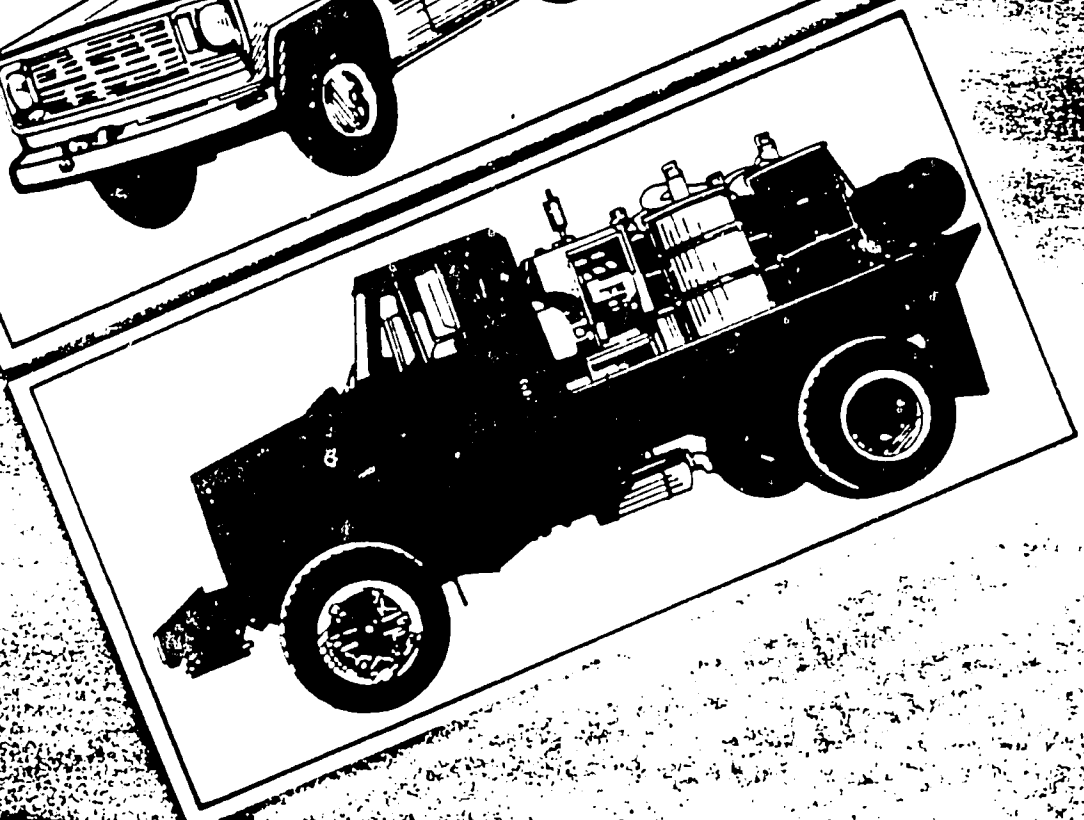
NUEX

- MOBILE WORKSHOPS
- FIELD SERVICE WORKSHOPS
- MOBILE LUBE UNIT
- SPECIALIZED FIEL SERVICE UNITS

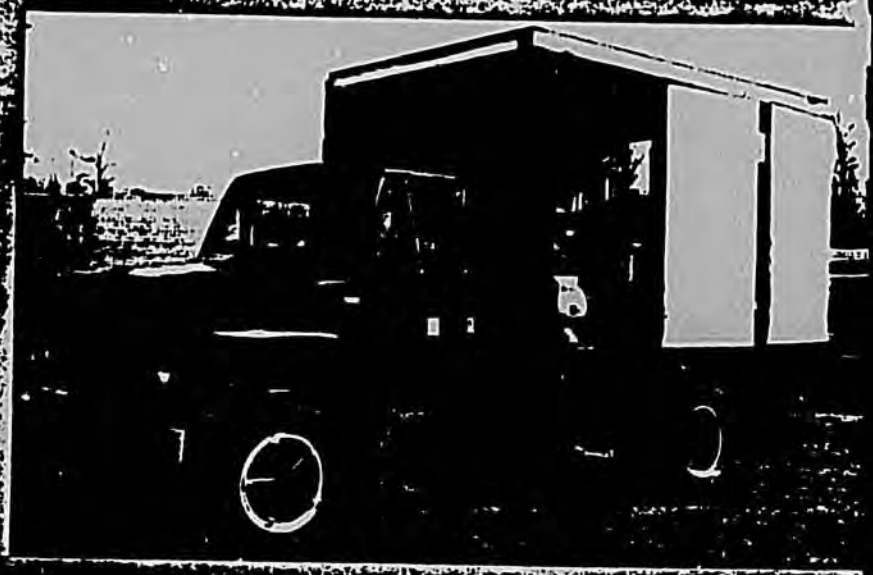
- 10' to 35'
- Enclosed Van Models
- Full Opening Side Models
- Platform Body Models



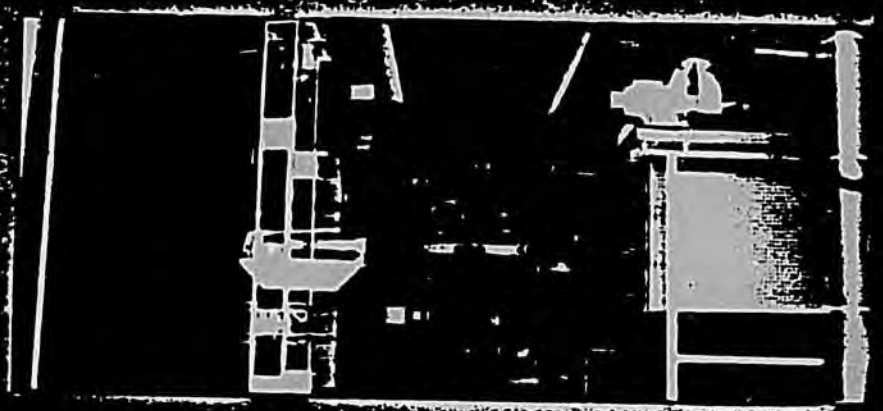




MOBILE WORKSHOPS Model MWS

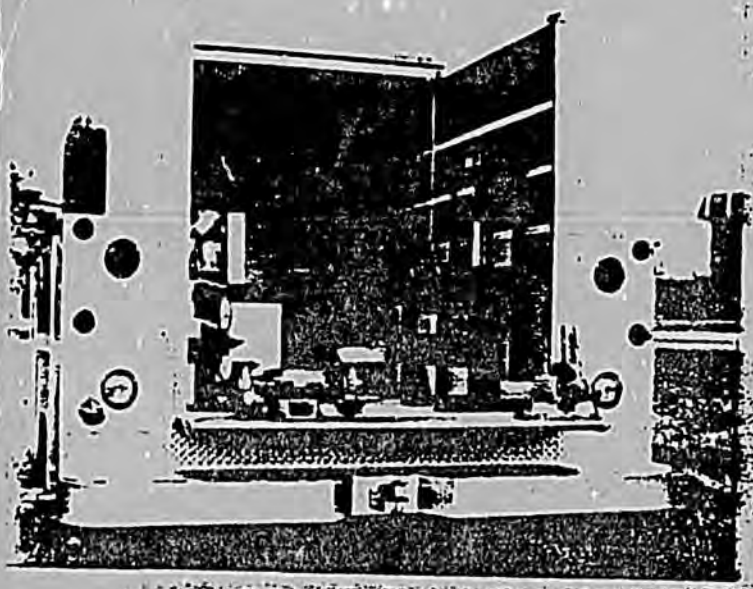


- Electric Generator (p.t.o., gasoline or diesel engine driven)
- Arc Welding Equipment and Accessories
- Oxy-Acetylene Welding and Accessories
- Air Compressor and Related Equipment
- Electric and/or Pneumatic Hand Tools
- Grinder, Bench or Pedestal Type
- Lathe and Accessories
- Precision Tools
- Mechanic Tools
- Blacksmith Tools
- Carpenter Tools
- Electrician Tools
- Hydraulic Press and Jacks
- Battery Charger
- Automotive Testing Equipment for Gasoline and/or Diesel Engines
- Cranes and Hoists
- Grease Pumps or Greasing Gun Air Operated
- Work Benches with Drawers Underneath

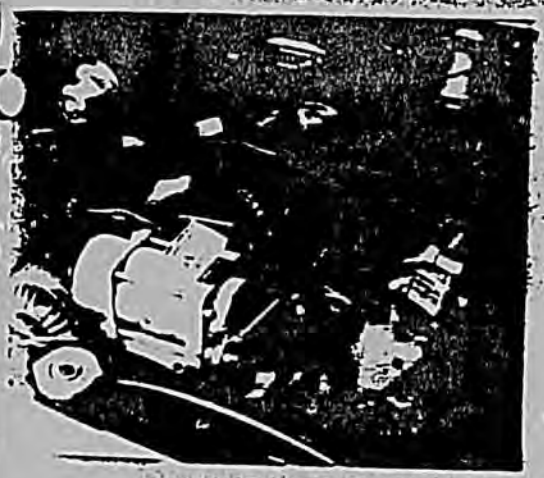


NUEX Mobile Workshops are built in accordance with the customer's requirements and designed for his particular application. Tools and equipment are selected on the basis of work to be performed in the field.

FIELD SERVICE WORKSHOPS Model FSW



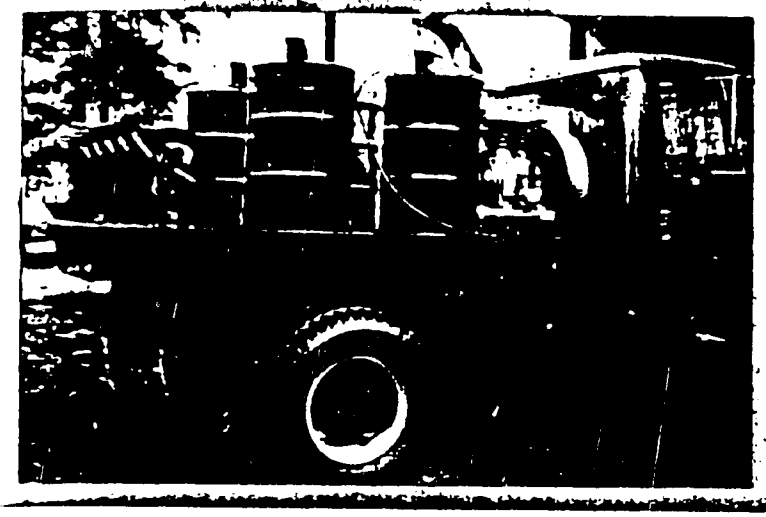
All-Wheel Drive Vehicle (4 X 4)
Storage Compartments with Locking Facilities on Both Sides
Sliding Roof (Stand-Up Room)
Pintle Hook — Electric Grinder
Vise — Anvil with Base
Hydraulic Press (10-ton) with Base
Air Compressor — Electric Generator
Jerry Cans and Arc Welder with Right Side Compartment Access



Electronic Actuator (Frequency Variation within ½ Cycle) or Mechanical Variable Speed Governor

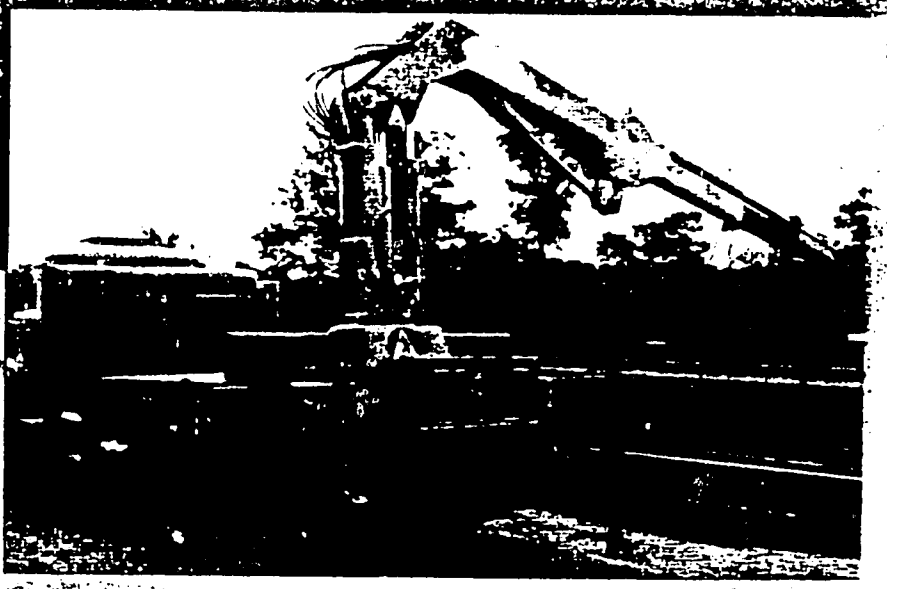
Side Compartment Contains — Air Reel with 25 ft. Air Hose, Oxygen/Acetylene Bottles, Welding Accessories, Portable Flood Light, Extension Cords, Vise Grips, Grease Gun, Grease [illegible]

MOBILE LUBE UNITS Model ML



Custom-built lubrication units for all heavy-duty construction equipment available with heavy-duty or extra heavy-duty pumps, standard or large capacity hose reels, P.T.O. driven air compressors or gasoline engine driven. Units can be installed on flat beds or van type bodies.

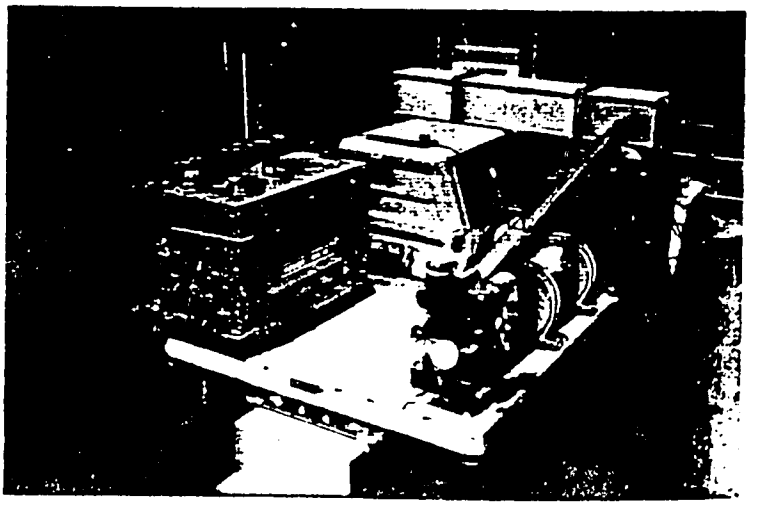
SPECIALIZED FIELD SERVICE UNITS



Contact us with your particular requirements for a Mobile Workshop, Lube Unit, or Field Service Unit and Workshop. We can design the unit to fit your specifications.

Our proposal will contain complete and detailed specifications, floor plans and all necessary information subject to your approval.

Our full-service line includes water tank trucks, fuel trucks, dump bodies, cranes, garbage trucks.



NUEX

NUEX, INC.
P.O. Box 661013
Miami, Florida 33166
(305) 871-5287

GAYNON IRON WORKS, INC.
1354 Wigmore Street
Jacksonville, Florida 32206
(904) 353-9603

COLLINS, INC.
3260 E. Kemper Road
Cincinnati, Ohio 45241
(513) 772-6800

145

VEHICLE SPECIFICATIONS

1985 Lubrication Truck 4 x 4
Minimum 29,000 GVW L.H. Drive
Diesel Engine Min. 250 SAE Horsepower, 4 Cycle Water Cooled Min. 6 Cylinder Turbocharged
15" H.D. Aircleaner Dry Type w/Precleaner Preferred
H.D. High Capacity Cooling System. Min. 900 Sq. In.
Manufacturers H.D. Clutch not less than 14" in Diameter
2 Plate Ceramic Disc
H.D. Transmission Maximum 10 speed. Manual Shift
Constant Mesh (10 speed Forward 2 Reverse)
Transmission Suitable for On-Off Highway use, with easily removable Magnetic Plug
Front Axle with Rated Capacity of not less than 10,500 lbs.
Single Rear Axle Min. 18,500 lbs.
Lowest Rear Axle Ratio as required to obtain a maximum speed of 55 MPH in High Gear with Engine running at Full Throttle.
H.D. Front, Multi Leaf Spring. Min. 5 Leaf, to meet the Axle Capacity
H.D. Rear Multi Leaf Spring, Min. 6 Leaf to meet the Axle Capacity
Air Brakes on all Wheels Min. 15 x 5 Front Min. 16.5 x 7 on Rear
Minimum 2 - Auxiliary Spring Brakes on Rear Bogie
Minimum 12 C.F.M. Air Compressor
Power Steering
Single Front, Dual Rear Tires with Tubes, On-Off Highway Design. Tires must meet Axle Capacity when loaded. Mounted on Min. 20" Rims. All tires to be the same size, if possible.
Spare Tire w/Tube Mounted
H.D. Front Bumper with Front Tow Connection
Rear Pintle Hook Min. 15 Ton Pulling Capacity
H.D. Electric System Min. 65 AMP. Alternator
Minimum 55 Cal. Capacity Fuel Tank

Cab Mfg. Conventional Cab or Cab over engine. Cab shall be complete with all safety glass standard instruments. In the event Cab over engine is offered the Cab shall be manually lifted and counterbalanced with a positive type locking device to prevent accidental lowering and locking device at rear of Cab to retain Cab in lowered position. Bench Seat and full insulation.
Front Seat Belts
Tinted Glass on Front Windshield
Windshield Wipers Dual Electric or Air operated with Washer
Dual Electric Horn
Metric Speedometer and Odometer and all Gauges
Mirrors - 2 Exterior Westcoast Type
12 Ton Hydraulic Jack with Wheel Lug Wrench

Fully enclosed Body with 2 Sliding Side Doors and Full Width Rear Opening Door.

Lubrication Unit, Stationary, Skid Mounted, consisting of:

Skid: 114" x 84" x 3/16" Steel Diamond Plate Platform.

Air Compressor: 5 HP 220 Volt 50 HZ/3 Phase Motor 24.7 CFM at 110 PSI 60 Gallon ASME Receiver Tank, Constant Speed Unloader, Belt Guard, Air Regulator and Gauge, Automatic Water Separator and 40' Heavy Duty Hose Reel Assembly.

Chassis Lub System: 50:1 Ratio 400 Pound Pump with 4 1/4" Air Motor 40' High Pressure Heavy Duty Hose Reel Assembly.

Two (2) Gear Oil System: One for SAE 90 and One for SAE 140 Gear Oil, 9.1 Ratio 400 Pound Pump with 4 1/4" Air Motor, 40' High Pressure Heavy Duty Hose Reel Assembly.

Two (2) Motor Oil Systems: For increased capacity of Diesel Engine Oil, 9.1 Ratio 400 Pound Pump with 4 1/4" Air Motor, 40' High Pressure Heavy Duty Hose Reel Assembly.

Hydraulic Oil System: 9.1 Ratio 400 Pound Pump with 4 1/4 " Air Motor, 40' High Pressure Heavy Duty Hose Reel Assembly.

Three Drawer Tool Box: Mounted across Width of Platform.

Hose Reel Mounting: Seven (7) Hose Reels Mounted on Top of Tool Box with Large Metal Tag Identifying Type of Lubricant in each Hose.

NOTE: All hose reels except air, shall be equipped with high pressure heavy duty hoses "regardless of pump ratio"

Plumbing: Under Platform Floor from Pumps to Reels, securely fastened.

Air Manifold: Mounted in Center of Platform and Connected to Air Compressor by 1/2" Heavy Duty Hoses. Equipped with Air Pressure Gauge and Air Pressure Regulator.

Rassow Model R-976 or Equal.

1/2 Ton Center Mounted Swinging Davit with Barrel Grip

Lights and Reflectors

Export Model Less Emission Controls

Spare Parts Required to Maintain Each Unit for a Period of One (1) Year.

Air Cleaner Elements

Oil Filter Elements

Fuel Filter Elements

Engine V-Belt Set for Pump, Alternator and Fan. Part must be bid as a separate item, and must be shipped and received with equipment.

Satisfactory for Tropic Desert Zone Operation

Parts and Service Books with each Truck

Standard Tool Box and Tools with each Truck

Manufacturer to specify Frame RBM

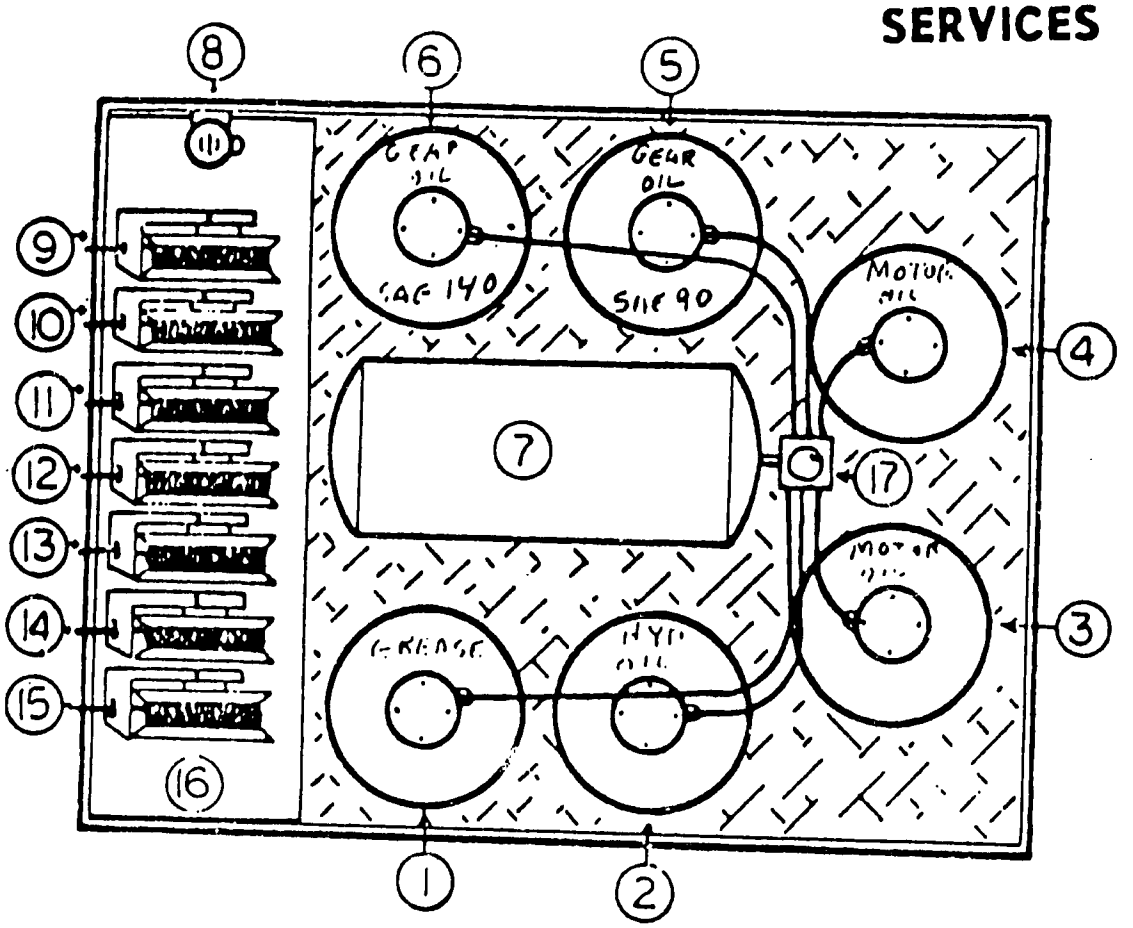
Minimum Gradability of Chassis when loaded 15%

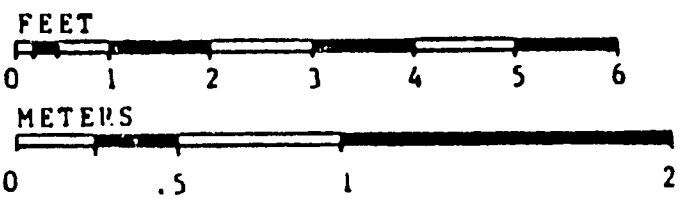
Color - Light Blue w/Top of Cab White

Optional Item

Caterpillar Diesel Engine Model 3208 installed in place of Manufacturer's Standard Engine 250 H.P. Turbocharged

EXTRA HEAVY-DUTY
4¼" 400-LB. PUMP SERVICES





1. CHASSIS GREASE 50 : 1 RATIO PUMP
2. HYDRAULIC OIL 9 : 1 RATIO PUMP
3. MOTOR OIL 9 : 1 RATIO PUMP
4. MOTOR OIL 9 : 1 RATIO PUMP
5. GEAR OIL 9 : 1 RATIO PUMP
6. GEAR OIL 9 : 1 RATIO PUMP
7. AIR COMPRESSOR 60 GAL. TANK
8. FIRE EXTINGUISHER 20 LB. CAP.
9. HOSE REEL, HYDRAULIC OIL 40 FT.
10. HOSE REEL, GEAR OIL 40 FT.
11. HOSE REEL, MOTOR OIL 40 FT.
12. HOSE REEL, AIR, 40 FT.
13. HOSE REEL, MOTOR OIL 40 FT.
14. HOSE REEL, HYDRAULIC OIL 40 FT.
15. HOSE REEL, GREASE 40 FT.
16. THREE-DRAWER TOOL BOX
17. AIR MANIFOLD

A N N E X D

ILLUSTRATIVE RFP

FOR

PRIVATELY MANAGED MAINTENANCE CENTERS

Issuance Date:

Subject: RFP No.

The Governorate of _____ is seeking proposals from Egyptian firms interested in providing management and technical services to operate the Governorates Maintenance Center as detailed in the attached Project Description (Section A).

To this end, we are issuing this Request for Proposal consisting of this cover letter and the following documents:

Section A: Project Description
Section B: Selection Criteria
Section C: Preparation and Submittal of Proposals
Section D: Solicitation Notices
Section E: General Provisions

If you decide to submit a proposal, it must be received no later than _____ on _____. Five (5) copies of the proposal and modifications thereof, submitted in sealed envelopes with the name and address of the offeror and Request for Proposal inscribed thereon, must be addressed to:

If handcarried:

Issuance of this solicitation does not constitute an award commitment on the part of the Governorate nor does it commit the Governorate to pay for costs incurred in the submission of a proposal. Further, the Governorate reserves the right to reject any or all proposals received and to negotiate separately with an offeror, if such action is considered to be in the best interest of the Governorate.

Telegraphic proposals or telegraphic notices of intent to propose are not authorized for this requirement and will not be accepted.

An explanation desired by an offeror regarding the meaning or interpretation of the solicitation must be requested in writing and with

sufficient time of their offers. Oral explanations or instructions given before the award of the contract will not be binding.

Any questions concerning this Request for Proposals should be addressed to _____ as indicated above.

Offerors should retain for their records copies of any and all enclosures which accompany their proposal.

Sincerely yours,

_____
Title
Governorate of_____

Attachments

ATTACHMENTS

		Page
Section A:	Project Description	
Section B:	Selection Criteria	
Section C:	Preparation of Submittal of Offers	
Section D:	Solicitation Notices	
Section E:	General Provisions	

5-7/58

SECTION A: PROJECT DESCRIPTION

I. BACKGROUND

II. PROJECT DESCRIPTION

- A. Goal
- B. Purpose
- C. Outputs
- D. Inputs

III. SCOPE OF WORK AND IMPLEMENTATION SCHEDULE

IV. CONTRACTOR QUALIFICATIONS AND PERSONNEL

V. CONTRACTOR INVESTMENT COMMITMENT

I. BACKGROUND

One of the major programs in Egypt which has been supported by the United States Agency for International Development (USAID) is the Decentralization Support Fund (DSF). The purpose of DSF has been to accelerate administrative decentralization to the governorates in Egypt by financing U.S. procurement of rolling stock and water supply equipment requested by the governorates for road maintenance, municipal services, and potable water supply. There have been two grant agreements between USAID and the Government of Egypt (1980 and 1983) under DSF,which have provided approximately U.S.$100 million for rolling stock and water systems equipment. The DSF Grant Agreement is scheduled to terminate in June, 1987.

It is anticipated that after the DSF Agreement terminates, there will be follow-on agreements which will continue the program, adding as much as an additional U.S.$100 million for further purchase of infrastructure maintenance equipment for the governorates.

Evaluations of the DSF program have indicated that additional technical resources are required by governorates to properly maintain and repair equipment supplied under the DSF Program. Specifically, maintenance centers are required, staffed by qualified technical and administrative personnel, and properly equipped with tools and apparatus for rolling stock maintenance and repair.

The Governorate of _____, with participation and funding by USAID,intends to provide the appropriate physical facility for the Center, and to fully equip it, for rolling stock maintenance and repair. Some centers will be managed by the governorate. However, the Governorate of _____intends for its Center to be managed by a private firm, under contract with the Governorate, for a period of ____ years.

Therefore, the Governorate of _____invites private Egyptian firms to submit a response to this request for proposal to manage the Governorate's Maintenance Center.

II. PROJECT DESCRIPTION

A. Program Goal

The overall goal of the program to which this project will contribute is to improve the quality and expand the magnitudes of maintenance of infrastructure in the Governorate of _____.

Specifically, during the two years of 1984 and 1985, the Governorate maintained _____kilometers of paved and _____ kilometers of unpaved roads. During the same period, municipal

services of sewage pumping, trash collection, street cleaning, and fire prevention reached _____ local people in _____ villages and _____ towns. During the period 1986-1992, the Governorate intends to maintain _____ kilometers of paved and _____ kilometers of unpaved roads, and expand municipal services by _____% annually, to benefit _____ persons in _____villages and _____municipalities.

B. Project Purpose

The purpose of the project is profit: that the Egyptian firm contracted to manage the Maintenance Center realize a profit of such magnitude as to be an appropriate incentive for sustained quality work performed in timely fashion.

C. Outputs

1. $_____ million worth of rolling stock equipment supplied the Governorate under DSF and successive grant agreements, including _____ graders, _____ trucks, ... (list of rolling stock in the Governorate supplied or to be supplied under funding by USAID), other governorate rolling stock, and vehicles and rolling stock owned by the private sector in the Governorate will be maintained and repaired according to manufacturer's specifications, in timely fashion, and at costs based upon market rates for parts and labor.

2. Technical and managerial personnel will be trained in vehicle and rolling stock maintenance and repair.

3. Employment opportunities for skilled technicians and managers will be expanded in the Governorate.

4. LE_____ will accrue to the Governorate annually from lease payments paid by the management contractor.

D. Inputs

1. An operational, functionally designed maintenance facility will be provided by the Governorate.

2. $_____ worth of tools and apparatus for equipping the maintenance facility will be provided by USAID, according to specifications of the Contractor approved by USAID and the Governorate.

3. A contract for a period of _____ years and annual lease agreement in the amount of LE_____ will be signed by the Contractor and the Governorate for maintenance and repair of Governorate and privately-owned vehicles and rolling stock and for utilization of the fully-equipped facility by the Contractor.

4. Policies establishing market pricing of parts and services and competitive labor rates for the Maintenance Center will be effected.

5. Qualified management and technical personnel will be provided the center by the Contractor, and all costs related thereto will be bourne by the Contractor.

6. .Maintenance and upkeep of the Center and its tools and apparatus will be the responsibility of the Contractor. Replacement or additional apparatus required will be provided by the Governorate, to the extent that such apparatus is not required because of improper maintenance or utilization by the Contractor.

III. SCOPE OF WORK AND IMPLEMENTATION SCHEDULE

A. Scope of Work

1. Governorate: the Governorate will provide the Contractor with a complete list, locations and specifications of all rolling stock and vehicles owned by the Governorate at contract signing and regularly thereafter. Logs of all previous maintenance and repairs,as available, will be provided the Contractor. The Governorate will provide the Contractor with all plans and schedules for road infrastructure maintenance in the Governorate, and operational plans and systems for municipal services so that the Contractor is fully appraised of rolling stock utilization requirements. Payment for services rendered will be due within 30 days of invoice submission.

For purposes of this tender, the Contractor s ould know that the Governorate of _____ presently has: (list of rolling stock on hand, condition and location); and, (description of infrastructure maintenance and municpal services to be performed 1986-1992).

2. Contractor: the Contractor will provide the Governorate with a maintenance schedule for each item of rolling stock owned by the Governorate. The maintenance schedule will include specific periods when maintenance should be performed, estimated costs, and whether such maintenance will be done at the Center or will be performed by a mobile workshop at location. The Contractor will schedule and perform periodic training for rolling stock operators in appropriate operational proceedures and regular maintenance which is the responsibility of the operator. The Contractor will keep records on all vehicles and rolling stock serviced or repaired, whether owned by the Governorate or private sector. The Contractor will keep records on all parts and labor charges by service performed.

B. Implementation Schedule (following contract signing)

Month	1	3	6	9	12
1. Facility const. or renovation					
2. Tools/apparatus tenders designed and issued					
3. Contract pers. assigned center					
4. Inventory of Gov. rolling stock by Gov. and Contr.					
5. Maintenance schedules					
6. Operator tng. schedules					
7. Tools/apparatus at center					
8. Maint. center operational					>

IV. CONTRACTOR QUALIFICATIONS AND PERSONNEL

The Contractor should provide a description of the firm's capacity and experience pertinent to the terms of reference of this Request for Proposal.

The Contractor is required to furnish the following personnel with minimum qualifications as specified for staffing the Maintenance Center. The Contractor may suggest alternative or additional personnel with equivalent qualifications,who could adequately maintain and repair the inventory of rolling stock on hand and anticipated,with appropriate justification. Contractor personnel, or equivalent replacements, will be expected to staff the center throughout the period of this contract.

(List of personnel requirements for management and technical positions with specific qualifications in terms of training and experience.)

V. CONTRACTOR INVESTMENT COMMITMENT

Planning and implementing a privately-managed maintenance center in the Governorate of _____ will require extensive personnel time at senior management levels, and technical personnel time, without compensation. Investments of such uncompensated time will be required after contract signing and in the early months of the Center's operation, before cash flows approach profit levels. Therefore, a clear commitment of time and related costs will be required of the contractor to whom an award is given.

Therefore, contractors submitting bids to this Request for Proposal are instructed to state their proposed levels of investment commitment by management and technical personnel and related costs, to ensure objectives of this project.

SECTION B: SELECTION CRITERIA

The contractor will be selected on the basis of the following criteria:

A. General Quality and Responsiveness of Proposal - _____ Points

1. Completeness and thoroughness
2. Responsiveness to all terms and conditions

B. Technical Approach - _____ Points

1. Innovativeness, appropriateness and flexibility of approach
2. Proposed work plan

C. Qualifications of Personnel - _____ Points

1. Technical expertise of proposed staff members (as evidenced by experience and training)
2. Extent to which staff can be in place by required dates

D. Qualifications of Organization - _____ Points

1. Experience managing and operating similar facilities
2. Institutional relationships with manufacturers in the U.S.;
3. Reliable access to spare parts for all rolling stock in the Governorate.

E. Extent of Investment Commitment - _____ Points Investment, calculated in time and costs to contractor, of personnel assigned to plan and implement an operational maintenance center.

SECTION C: PREPARATION AND SUBMITTAL OF OFFERS

A. General

1. Please follow the instructions contained herein and supply all information requested
2. Proposals must be received by _____ in _____
   If mailed, use the following address:

If not mailed, proposals should be delivered to:

3. Proposals should be submitted in five (5) copies.

4. Offerors must set forth full, accurate, and complete information as required by this Request for Proposal (including attachments).

5. Proposals offering less than ___ days for acceptance by the Governorate from the date set for opening will be considered nonresponsive and will be rejected.

6. You are requested to submit a proposal directly responsive to the terms, conditions, specifications and clauses of this Request for Proposal. Proposals not conforming to this Request for Proposal may be categorized as nonresponsive, thereby eliminating them for further consideration. Alternative terms, conditions, and specifications may be submitted as supplementary material to your proposal.

7. Late Proposals

   (a) Any proposal received at the office designated in the solicitation after the exact time specified for receipt will not be considered.

   (b) Any modification of a proposal, except a modification resulting from the Governorate's request for "best and final" offer is subject to the same conditions as in (a) of this provision.

   (c) A modification resulting from the Governorate's request for "best and final" offer received after the time and date specified in such request will not be considered.

   (d) Notwithstanding (a), (b), and (c) of this provision, a late modification of an otherwise successful proposal which makes its terms more favorable to the Governorate will be considered at any time it is received and may be accepted.

   (e) Proposals may be withdrawn by written notice received at any time prior to award. Proposals may be withdrawn in person by an offeror or his authorized representative, provided his identity is made known and he signs a receipt for the proposal prior to award.

8. A contract will be awarded to that responsible offeror whose offer, conforming to the solicitation, will provide the greatest value to the Governorate, investment and other factors

considered. The Governorate reserves the right to reject any or all offers and to waive informalities and minor irregularities in offers received. The right is reserved to accept a proposal other than a proposal containing the highest offered investment and to reject any and all offers.

9. Upon award of the contract resulting from this solicitation, the Governorate will disclose, use or duplicate any information submitted in response to the solicitation to the extent provided in the contract.

10. The term of the contract is estimated to be a period of _____ years.

11. The offeror's proposal is to identify the individual(s) having authority to contractually bind the offferor. It is also to name the person to be contacted both during the period of evaluation off proposals and for prompt contract administration upon award of contract. This information is to include: Name, Title, Address, and Telephone Number.

12. The Governor is the only individual who may legally commit the Governorate to the expenditure of funds. No cost chargeable to the proposed contract may be incurred before receipt of either a fully executed contract or a specific, written authorization from the Governor.

B. Proposal Contents

The following is intended as a listing of some of the salient items of information that should be furnished in addition to those issues explicit in Section A. The offeror may furnish any information he feels would be useful in the evaulation and selection process.

1. Offeror is invited to critique the project as designed. Comments on all aspects of the Project as described herein will be received and considered. An evaluation of the feasibility and limitations of the Project will be received with interest.

2. Describe privious work (by the firm) of a similar nature.

3. Provide biographic sketches and pertinent details on all known professional personnel that will be involved. This should include salary histories.

4. Provide a description of the firm's capacity and experience.

5. Provide the following information on all major projects during the last five years:

   (a) Brief description of project or services
   (b) Dates work commenced and completed
   (c) Name, title, address, and telephone number of person/agency for whom the work was performed.

6. The magnitude and nature of any planned subcontract should be fully explained.

7. The evaluation criteria set forth elsewhere in this Request for Proposal will indicate to you the basis upon which the Governorate will select offerors for consideration in the negotiation/award procedure. You should be familiar with these criteria.

8. The information submitted should substantiate that the offeror:

   (a) has adequate financial resources;
   (b) is able to comply with the proposed performance schedule, taking into consideration all existing business commitments;
   (c) has a satisfactory record of performance; and
   (d) has a satisfactory record of integrity and business ethics.

SECTION D: SOLICITATION NOTICES

Representations, Certifications, and Acknowledgements.

(Per Government of Egypt and USAID regulations)

SECTION E: GENERAL PROVISIONS

Contract Format

General Provisions

(Per Government of Egypt and USAID regulations)

ANNEX F

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

PROJECT DESIGN SUMMARY - LOGICAL FRAMEWORK

Project Title & Number

Life of Project
From FY ___ to FY ___
Total US Funding ___
Date Prepared ___

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader sector to which this project contributes Acceleration of decentralized decision and implementation processes to achieve local development goals, which improve the quality of life and economic conditions, primarily for rural people.	Measures of Goal Achievement: - Inter and intra-governorate transporation systems improved - governorate road networks expanding linking production and marketing centers - Increased commerce in products indigenous to governorate - Governorate's BAB II and III budgets increasing annually - Locally generated revenues retained and expended by governorate for developmental purposes	- ADT measurements - on-site evaluation - governorate records	Assumptions for achieving goal targets: Decentralization policy remains national priority
Project Purpose: - Expand annual road maintenance - Improve road maintenance systems - Expand and improve municipal services	Conditions that will indicate purpose has been achieved: End of project status - Kms of roads maintained increased by an average of 2,300 km/yr; 15,000 km/yr in 1992 - Kms of roads maintained as % of total requirements increased from 6% to 23% - personnel and systems improved in 23 governorates for planning and executing road maintenance. - Municipal services expanded by additional rolling stock; new and old rolling stock properly maintained and on-line per manufacturer's specifications.	- on-site evaluations - governorate records - markaz records - rolling stock maintenance records	Assumptions for achieving purpose: - Governorates do not expand their total road networks disproportionally to maintenance capabilities - Absence of internal or external conflicts which would divert local or national priorities
Outputs: - Quality maintenance and repair services performed on road maintenance and municipal services rolling stock. - Governorate offices of planning, budgeting, contracting and implementation for road maintenance and municipal services upgraded in terms of personnel and systems.	Magnitude of Outputs: - privately-managed profitable maintenance centers operating in 13 rural and 2 urban governorates. - publicly-managed profitable maintenance centers operating in 8 rural governorates - Egyptian institutions certifying 40 apprentices and 24 journeypersons annually as equipment maintenance personnel. - U.S. manufacturers certifying 46 technicians annually as qualified for maintenance and repair of this equipment - 69 governorate and markaz staff trained annually in U.S. state and county road maintenance and municipal services planning and implementation systems	- on-site evaluations - records of maintenance centers - length of maintenance center management contracts - renewal of maintenance center contracts - manufacturer's records on trainees - short-course training records	Assumptions for achieving outputs: - local and national taxation policies will remain constant and not inhibit free-market forces - Private-sector employment opportunities will not accelerate as competitive market forces to employment of skilled technicians in maintenance centers and in governorate's staff.
Inputs: - Rational policies to expedite private-sector wage levels for publicly managed maintenance centers - Purchase and delivery of rolling stock equipment for road maintenance and municipal services - Construction/renovation of governorate buildings for use as maintenance facilities - Purchase and delivery of tools and aparatus to equip maintenance centers. - LE grants for training - $ grants for training	Implementation Targets (Type & Quantity) - changing established policies for non-civil service wage levels in 23 governorates (GOE) - $80 million for rolling stock (USAID) - $5 million for tools and apparatus (USAID) - $3 million for governorate staff training in the US (USAID) - $3 million for technical assistance (USAID) - $16 million CIP foreign exchange credits (USAID) - LE 5 million for facility construction/renovation (GOE) - LE 1 million for technician training in Egypt and U.S. (GOE) - $1.4 million for specialized training in U.S. (GOE and USAID)	- Central government records - USAID records - Governorate's records	Assumptions for providing inputs: Egyptian - U.S. relations remain constant and positive.

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