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**PROCUREMENT DOCUMENT DEVELOPMENT
AND ANALYSIS FOR ACQUISITION OF
DIESEL ELECTRIC LOCOMOTIVES, SPARES, AND SERVICES
FOR
IMPROVEMENT TO TAZARA LOCOMOTIVE FLEET**

Dar es Salaam Corridor Project No. 690-0240
IQC No. OTR-0000-I-00-6071-00
Delivery Order No. 10

submitted to:
**U.S. Agency for International Development
Washington, DC**

prepared by:
**Parsons Brinckerhoff International, Inc.
New York, New York**

EXECUTIVE SUMMARY

The Grant Agreement between the Tanzania-Zambia Railway Authority and the United States of America, acting through the Agency for International Development (USAID), provides the financial assistance to meet the costs of implementing the means of improving, strengthening, and expanding the railway's motive power. The purpose of the efforts resulting in this report was to define the locomotives, spare parts, tools, shop equipment, and training to increase the number of diesel electric (DE) locomotives in TAZARA's fleet in accordance with the agreement; to compile lists of spare parts, tools, and define technical assistance required for existing DE locomotive overhaul and repair; and, finally, to develop cost-effectiveness information concerning the type or model of locomotive to be acquired.

The efforts necessary to complete the tasks included in the statement of work required intensive gathering of information from TAZARA's two main workshop complexes located in Mpika, Zambia, and Dar es Salaam, Tanzania; and also from its Mbeya depot and repair shop. The communication of information took place in numerous meetings with the TAZARA general manager and key members of his staff. More detailed data resulted from workshop tours and interviews with mechanical engineering department management, supervisors, and engineers.

A team of three professional consultant engineers conducted the efforts and received responsive, cooperative assistance from TAZARA.

Assistance was provided to TAZARA for their development of the technical specification defining the DE locomotive required for the railway. The technical and administration bid procurement documents for TAZARA's use have been finalized and are included in

Part 1 of this report.

Analysis of the complexity of the product to be purchased, the source and limited number of manufacturers, the details of technical specification definitions, and the criteria for evaluation of RFQ responses resulted in recommending the procurement be made in accordance with the Informal Competitive Procedure as defined in USAID Handbook 11, Chapter 3.

The lists of spare parts, tools, and equipment for the existing fleet have been compiled. The definition of technical assistance required for the completion of rebuild work on two collision-damaged General Electric/Krupp U30C locomotives and for the overhaul of the fleet of 13 DE locomotives has been completed. The technical and administrative procurement documents for use by TAZARA in the purchase of the items and services have been finalized and are included together with the lists and support information in Part 2 of this report.

Since the purchase of parts and services for the overhaul, maintenance, and rebuild of TAZARA's existing fleet of DE locomotives will be made on a sole-source basis with the General Electric Company, a major-part price-level verification effort was performed. This effort included a comparison of prices paid by the Zambia Railway for a \$7.0 million US order of locomotive spares. The parts were supplied by General Electric, Kessler, WABCO, MYRON SNYDER, ARBACO, and American Equipment Company. General Electric was awarded 60 percent of the total order with the other five suppliers sharing the balance of \$2.8 million US for parts. Contacts also were made with U.S. railroads such as Burlington Northern, Southern Pacific, and Union Pacific, with total U30C ownership of over 400 locomotives, to determine recent parts pricing levels. Price verification results from this study indicate that General Electric's current prices are in line with prices charged for similar parts supplied to other customers. Additional monitoring of this price information will be performed. Any evidence of prices for TAZARA U30C parts not in line with current market-pricing levels for similar or same parts will be

documented and included in the negotiations with the supplier.

Studies by various donor groups since 1984 have reported numerous problems concerning effectiveness of workshops and depot operations in the TAZARA system. The problems as defined relate directly to low productivity which, in turn, relates to low wage levels, inadequate supervision, ineffective training (classroom and on-the-job), and insufficient controls of material, production, quality, and work performance. The level of competence achieved in maintaining the original Chinese fleet for 11 years, the MTU diesel-powered Chinese fleet for a weighted average of 4 years, and the GE/Krupp diesel electrics for over 4 years is not more than 50 percent of the level attained in a railroad shop staffed with fully trained, competent mechanics.

In the work environment of TAZARA--with the slow learning capability of workshop personnel and the maintenance complexity of a 3,200-horsepower DE locomotive--the introduction of changes in equipment, procedures, or maintenance practices compounds the low productivity problem. A high percentage of locomotive mechanics, classified as Artisans I, II, and III, cannot read or write (CPCS Report Sept. 1984). An analysis of the maintenance operation factors affected by the introduction of DE locomotives of a model/type/manufacture different from those in TAZARA's existing fleet shows that a considerable cost disadvantage would develop. Since one manufacturer's design and construction differs appreciably from another, the effects in TAZARA of these differences are multiples of the effects experienced by railroads in more advanced countries. The added costs to introduce a second type/manufacture DE locomotive, and maintain the same availability of DE locomotives that is possible with only one type/manufacture of equipment, exceed \$8 million US. These added costs result from the following requirements: need for tooling and shop equipment to service two types of locomotives; additional workshop floor and storage space for equipment and spare parts; more workshop personnel; and different maintenance practices and training programs.

PROJECT SUMMARY REPORT

**PROCUREMENT DOCUMENT DEVELOPMENT AND ANALYSIS
FOR ACQUISITION OF
DIESEL ELECTRIC LOCOMOTIVES, SPARES, AND SERVICES**

FOR

**IMPROVEMENT TO TAZARA LOCOMOTIVE FLEET
DAR ES SALAAM CORRIDOR PROJECT NO. 690-0240**

**IQC NO. OTR-0000-I-00-6071-00
DELIVERY ORDER NO. 10**

**SUBMITTED TO: U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, DC**

**PREPARED BY: PARSONS BRINCKERHOFF INTERNATIONAL, INC.
NEW YORK, NEW YORK**

**SUBMITTED BY: J. F. Forman
DATE: December 1987**

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SECTION I. INTRODUCTION

1.1 BACKGROUND

The United States Agency for International Development (USAID) contracted for the services of Parsons Brinckerhoff International, Inc. in March 1987 to perform a two-week study. The efforts were directed toward a technical evaluation of the motive power needs of the TAZARA railway with specific emphasis toward determination of:

- o Technical cost feasibility of re-engining an additional quantity of Chinese-manufactured locomotives;
- o Effectiveness of the alternative action of acquiring new replacement mainline locomotives.

After one week of study, it was recognized that additional study efforts should be expended to investigate the underlying causes of unacceptable levels of locomotive availability.

The study duration totalling three weeks was completed with the final report issued in May 1987. The findings reported included specifics concerning a most serious weakness in TAZARA's depots and workshops of a total lack of control of materials, spare parts, production, quality, work planning, and work measurement. The motive power evaluation findings reported included a definite need for additional new locomotives and the continuing of a re-engining program. However, as emphasized in the report, the addition of new U30C locomotives and the additional repowering of existing locomotives would be only as effective as the improvements in TAZARA's performance in workshops and depots. Without major changes in TAZARA's management controls, the rate of converting new motive power equipment to scrap will continue to rise.

On the last day of September 1987, USAID again contracted for Parsons Brinckerhoff services to:

- o Develop procurement documents pertaining to TAZARA's purchase of new diesel electric (DE) locomotives, spare parts, maintenance tools and equipment, testing tools and equipment, technical assistance, and a training program. This task includes identification of procurement procedures, as well as development of work scope definition for locomotive technical assistance and training to be provided by the manufacturer. The procurement documents also include definition of evaluation criteria to be applied to locomotive manufacturers' responses to requests for proposals/quotations.

- o Compile a list of DE locomotive spare parts, repair parts, and tooling required for the 4-year overhaul of the General Electric/Krupp locomotives and for completing the remaining rebuild work of the two collision-damaged locomotives. This task includes definition of type and duration of technical assistance required for rebuild work and for the 4-year inspection and maintenance schedule; development of the necessary procurement documents and price verification for sole-source procurement.

- o Perform a study of differential levels of effort and magnitude of costs that would result from the acquisition of DE locomotives other than those in TAZARA's existing fleet. Costs include additional workshop area, shop equipment, tools, test equipment, spare parts, parts storage area, employee training, and organization staffing.

These services were performed in Tanzania (and Zambia) during October and November 1987. The results are summarized in the sections that follow.

1.2 APPROACH

The volume of data needed to complete the three major tasks required a three-pronged approach. The sources of data required travel to three different TAZARA workshop/depot locations spread over a total distance of 1860 kilometers. The TAZARA headquarters in Dar es Salaam housed the main office of the mechanical engineering department and provided the initial input to the consultant engineers' professional team. After receiving this input, the three-man team rapidly dispersed to the locations of the damaged U30C locomotives and the location of the U30C locomotive repair shop.

1.2.1 Task A

The procurement documents to be used by TAZARA for the procurement of new locomotives, spares, training, tools, equipment, and technical assistance consist of the technical specifications and the administrative instructions to tenderers. The approach to develop the technical specifications, as directed by USAID in Washington, DC, was to update the locomotive specifications used by TAZARA in 1981 for purchase of the GE/Krupp units.

The 1981 specifications were reviewed, updated, and discussed with the TAZARA general manager and his staff. Inputs from TAZARA's mechanical engineering department (chief mechanical engineer, assistant chief mechanical engineer, and principal mechanical engineer) were used in modifying the specifications. Information provided by locomotive manufacturers was also included in the modified specifications. Reviews of drafts, conducted with TAZARA

general manager and staff, led to the issuance of the specifications included in Part 1 of this report.

The grant agreement specifically directs that the implementation method for procurement of locomotives, spare parts, tools, equipment, training, and technical assistance must be in accordance with USAID, Handbook 11, Chapter 3. The agreement also stipulates that the procurement must be conducted by competitive negotiation in accordance with the same handbook and chapter.

Review of Handbook 11, Chapter 3 explanations and definitions of alternative procurement procedures indicated that the Informal Competitive Procedure is the most applicable. (See Type of Procurement, Section 2.1.)

Observations of the workshop operations at Mbeya, where the existing fleet of U30C locomotives is maintained, indicated that the performance capability of technicians and artisans does not always result in application of appropriate troubleshooting techniques and corrective actions to a locomotive malfunction. The need for technical assistance still exists even after 4-1/2 years of assistance from a very capable Krupp service engineer. The inefficient performance of the technicians and artisans is not a reflection on the service engineer's technical assistance efforts or his capabilities. The TAZARA personnel do not appear to have either the incentive or the initiative to learn. The work scope of the required technical assistance for the period immediately following the receipt of the new DE locomotives is based on observed capabilities of workshop personnel and the amount of detailed direction needed to accomplish and complete maintenance and malfunction correction tasks. (See Section 2.3.) This scope definition also includes specific requirements for the training program to be provided by the locomotive manufacturer.

The development of technical and financial criteria for evaluation of tenderers offering submittals was accomplished through

application of standard evaluation techniques coupled with the element of cost of introducing a new locomotive in the TAZARA fleet. Consideration must be given to the total costs anticipated by TAZARA in introducing a locomotive different from the locomotives in their existing diesel electric fleet. (See Section IV.) It should be noted here that members of TAZARA's technical staff have expressed their preferences for U30C locomotives. See letter signed by the chief mechanical engineer in the appendix of this summary.

1.2.2 Task B

Compilation of information on requirements for spare parts necessary to perform the 4-year inspection and maintenance schedule (4-year overhaul) was accomplished through on-site audit of spare parts inventory at Mbeya along with a detailed analysis of spare parts normally required for this level of maintenance. The resulting list of required parts was carefully scrutinized by the Krupp service engineer, the General Electric service engineer, the TAZARA principal mechanical engineer, and the consultant's mechanical engineer.

The parts, components, and material required for rebuild of the two damaged locomotives (1006, 1008) was developed through direct inspection of each locomotive by a team that included the Krupp service engineer, the TAZARA principal mechanical engineer, and the consultant's mechanical engineer. Reviews of drawings, parts lists, and maintenance manuals provided the supporting information for determining correct part nomenclature and quantities. The resulting list of required parts was carefully scrutinized by the team for completeness and deletion of unnecessary items.

The maintenance tools and equipment and the testing tools and equipment required for the Mbeya workshop to perform all the required tasks included in the 4-year inspection and maintenance

schedule were provided through reviews of lists developed by TAZARA.

These lists were carefully analyzed for completeness and elimination of unnecessary items.

The technical assistance requirements for a period of 18 months are based on the schedule established by the Krupp service engineer with a contingency of 30 percent added to allow for anticipated delays. The Krupp service engineer is funded until January 1989, therefore an extension of only one (1) year is required to cover the period of overhaul for 13 U30C locomotives.

The engineer's cost estimate is based on information secured from locomotive and tool/equipment manufacturers, and includes prices for spare parts, equipment, and tools. The technical assistance costs are based on current actual prices adjusted for inflationary increases.

Comparison of prices charged by General Electric (sole-source supplier for the spare parts) for similar or same items has been made using information provided by the Zambia Railway for items purchased in a \$7.0 million US order delivered in 1986/87. No significant price discrepancies have been noted. Additional price comparisons were made with information from three major U.S. railroads that have a combined total of over 400 U30C locomotives. Price discrepancies were not significant in these comparisons.

The technical and administrative specifications for TAZARA's procurement of the parts, tools, equipment, and services are patterned after the locomotive tender documents.

1.2.3 Task C

The development of differential factors was accomplished through

analysis of Mbeya workshop maintenance operations as performed for the existing fleet of DE locomotives. The locomotive that could be selected by TAZARA that is different from that in the existing fleet is General Motors Model GT 26 CU-2, modified with higher horsepower-rated traction motors, controls, bogies, as well as dimensional changes for clearance to meet the procurement technical specifications. The differences in design, manufacture, and assembly between the General Motors model and the General Electric model are many. Only an estimated 4 percent of the parts and special tools are common to both models. These differences were analyzed with consideration to the following workshop requirements:

- o Special tools and equipment for maintenance.
- o Special equipment for component testing.
- o Space for equipment.
- o Personnel to perform maintenance tasks.
- o Training of personnel.
- o Storage for spare parts inventory.
- o Additional locomotives to maintain equivalent level of availability.
- o Additional equipment for different fuel and engine oils.

The quantification of the above requirements resulted in a difference in excess of \$8.0 million US for introducing a locomotive model of a type other than the DE locomotive in TAZARA's existing fleet.

SECTION II. LOCOMOTIVE PROCUREMENT

2.1 TYPE OF PROCUREMENT

This section sets forth procedures for TAZARA's procurement of diesel electric (DE) locomotives under USAID Grant Agreement Project Number 690-0240. A review of the procurement procedures identified in USAID Handbook 11, Chapter 3 resulted in recommending the use of the Informal Competitive Procedure described in Section 2.2.3 of HB11, Chapter 3 in the form of an RFQ followed by response evaluation and negotiation.

The 17 DE locomotives are to be procured in two purchases. The first quantity of eight is scheduled for ordering in April 1988 with delivery expected July 1989. The balance of nine locomotives is scheduled for ordering in December 1989 with delivery expected in May 1991. The consummation of the second order is contingent on TAZARA's realization of forecasted annual freight increases, proof of compliance to certain performance improvements, and an accumulated reserve of \$1.125 million US in their DE locomotive maintenance and repair fund.

The schedule is shown graphically as follows:

<u>First</u> <u>Order</u>	<u>Delivery</u> <u>of Eight</u>	<u>Second</u> <u>Order</u>	<u>Delivery</u> <u>of Nine</u>
APR 1988	JULY 1989	DEC 1989 - 1990 -	MAY 1991

The obvious question is, if the placement of the second order is based on realization by TAZARA of attaining certain improvements of performance, when will milestone measurements be made? New locomotives will not be commissioned until August 1989, allowing only three to four months as an evaluation period. Measurements must start earlier than August of 1989. Also, according to the special covenant defined in Section 5.2 of the Agreement, TAZARA agreed to have not less than US \$1,125,000 (at rate of US \$500,000 per year) in reserve by end of 1989 for purchase of locomotive spare parts. Evidence of attaining this amount in the repair and maintenance fund must be shown by TAZARA as a condition for the disbursement of funds for the second order.

The locomotive is a complex, massive machine that can be described by a specification. Some procurements are made by issuing a basic description in the form of a "performance" specification, which includes a definition of track configuration, loads to be hauled, speeds required, and other parameters such as track gauge, limits of axle loads, environmental conditions, and clearance envelope. The performance specification communicates sufficient information to interested manufacturers to enable them to respond with a technical proposal. After reviews and clarification of the proposed locomotive, a cost proposal is submitted. This procedure is very time-consuming and usually delays delivery. Such delays would not be acceptable in this procurement.

The informal competitive procurement is recommended for the following reasons.

1. A reasonably detailed specification is available.
This document was developed through updating of the specification used by TAZARA in the purchase of the DE locomotives delivered in 1983/84.
2. Locomotives are complex machines which can be defined in a specification.

3. The criteria for evaluating offers will include:
 - Price -- locomotives
 - Delivery -- locomotives and spares
 - Technical assistance level
 - Training program plan
 - Spare parts price
 - Compatibility with existing DE fleet
 - Compliance to specifications
 - Service capability
 - Costs of introducing new locomotives in TAZARA system

4. The qualified offerers are limited. The source of locomotives and spares is designated as AID Geographic Code 000. The USA has only two major manufacturers with capability of supplying these locomotives.

5. Some negotiation with each of the two suppliers will be required.

2.2 TECHNICAL AND ADMINISTRATIVE SPECIFICATION

The technical and administrative specifications used by TAZARA in the procurement of new DE locomotives, spare parts, maintenance tools and equipment, testing tools and equipment, technical assistance, and workshop maintenance training is a self-contained document identified as Part 1 of this report.

Part 1 includes:

<u>SECTION</u>	<u>SUBJECT</u>	<u>SOURCE</u>
I	Invitation for Tenders	Consultant
II	Instructions to Bidders	AID HB 11, CH.3
III	General Conditions of Contract	AID HB 11, CH.3
IV	Special Conditions of Contract	Consultant -- TZR
V	Schedule of Requirements	Grant Agreement TZR/USAID/Consultant
VI	Technical Specification	Consultant -- TZR
VII	Tender Form and Price Schedule	AID HB 11, CH.3
VIII	Bid Bond	AID HB 11, CH.3
IX	Contract Form	Consultant -- TZR
X	Performance Bond	AID HB 11, CH.3
XI	Payment Bond	AID HB 11, CH.3

It is intended that the entire contents of Part 1 be finalized and bound as a tender document for issuance by TAZARA to interested manufacturers of locomotives.

The responses received will be evaluated by TAZARA and award of contract made accordingly.

2.3 TECHNICAL ASSISTANCE AND TRAINING

TAZARA must be provided with a competent level of technical assistance and a program of training for all levels of workshop personnel. The type and amount of each will depend on the DE locomotive selected at the completion of the procurement procedure. Selection of an offer to provide model U30C locomotives, the same diesel electric unit in TAZARA's existing fleet, would permit the continuation of the ongoing technical

assistance and an extension of workshop personnel training that would be based on various elements of training given since the U30C introduction. Selection of an alternate locomotive would require a totally new technical assistance program coupled with a totally new training program.

The manufacturer of the selected locomotive must include, as part of his offer, technical assistance for a period of up to 5 years to include the 4-year inspection and maintenance (overhaul) work on the eight locomotives. He is also required to plan, develop, and conduct an on-site training program for all levels of workshop personnel.

2.3.1 Technical Assistance

The start of technical assistance in Tanzania is at the point of delivery and unloading of locomotives from the ship to the TAZARA track. Each locomotive should undergo appropriate mutual inspection by the manufacturer's service engineer and TAZARA technical representatives. The locomotive shipping blocking should be removed by TAZARA receiving personnel.

The initial checkout of the locomotive in accordance with manufacturer's instructions should be made by TAZARA. The commissioning of each new locomotive shall be undertaken per Article 50 of the technical specification.

The manufacturer's locomotive service engineer(s) scope of work is defined as follows:

- o Provide complete technical assistance to TAZARA in the form of service engineering which includes review of manufacturer's locomotive servicing instructions with workshop and depot personnel assigned to perform the tasks.

- o Observe adherence to instructions by technicians and artisans (workshop/depot mechanics and inspectors) in performing daily inspection and maintenance tasks.
- o Monitor performance of assigned artisans and technicians, and provide direction for correction of nonadherence to instructions on all levels of inspection and maintenance.
- o Enlist supervisory/management involvement where understanding is not achieved.
- o Provide technical direction to all levels of workshop and depot personnel on operation and maintenance of locomotives.
- o Review maintenance manuals, operation manuals, and troubleshooting guides with all levels of workshop and depot personnel.
- o Provide technical assistance/direction to workshop personnel in determining cause of any locomotive malfunction. Relate this action to troubleshooting instructions.
- o Provide all levels of on-the-job (hands-on) training at every opportunity and as time permits.
- o Conduct classroom training where group presentations and demonstrations can be more effective than on a one-on-one basis.
- o Provide technical assistance to TAZARA personnel in their performance of each level of inspection and maintenance on each locomotive including:

Daily	One Year
Monthly	Two Year
Three Month	Three Year
Six Month	Four Year

- o Provide technical direction to supplies and storeroom personnel for analysis of spare parts replenishment requirements including parts identification and quantities.
- o Assist manufacturer's training program personnel (instructors/teachers) in conducting classroom sessions.
- o Provide hands-on training to all classifications of artisans, technicians, and others responsible for performing the 4-year (overhaul) inspection and maintenance schedule and train as many workers as available during the period covering this work on the first eight locomotives.

The qualifications of locomotive service engineers required to provide the above defined technical assistance work scope are as follows:

- Education - Graduate mechanical engineer or equivalent.
- Experience - Minimum of 8 years as locomotive service engineer (diesel electric).
- Interests - Getting a first-hand education in problem solving in third-world developing countries.
- Living in a remote area/seeing the wilds.

- Traveling/learning new languages.
- Self-learning of locomotive maintenance practices and achieving self-accomplishment.
- Self-confidence.
- Patience -- if the work force doesn't learn the first time try, try again.
- Instructor/teacher.
- Stamina.

Other - Fluent in English (read and write).

Period of technical assistance would total 5 years, starting at time of locomotive delivery up to and including completion of the 4-year overhaul on the last of eight new locomotives.

2.3.2 Training

The selected locomotive manufacturer must plan, develop, and conduct a full training program for all levels of TAZARA workshop and depot personnel. The training must be performed on-site in Mbeya, Tanzania and must be scheduled to start when locomotives are delivered and continue until the defined acceptable level of competence is achieved.

The TAZARA personnel who will receive training have a broad range of educational and experience backgrounds. The entry level person for Artisan III classification level may not be able to read English or even Kiswahili. Kiswahili is spoken fluently and

spoken English is usually understood. The other end of the range could consist of college graduates (usually technical) with some years of railway locomotive maintenance and operational experience.

The results of the training program are expected to be:

<u>CLASSIFICATION</u>	<u>LEVEL OF COMPETENCE/CAPABILITY</u>
Artisan III	- A trained mechanic's assistant
Artisan II	- A fully trained locomotive mechanic
Artisan I	- A fully trained mechanic (electrical or mechanical) with broad technical knowledge to lead and direct
Technician IV	- Trained equivalent to a 2-year technical/vocational school level with 2 years of hands-on locomotive experience

The individuals who achieve the above levels of capability/competence will do so based on their learning ability, their interest in accomplishment, and the incentives offered to them by TAZARA.

The training program should be designed to allow the participants the opportunity to raise their level of ability to perform the tasks required in the locomotive inspection and maintenance schedules. They should be able, after completing the training program, to perform the tasks without additional technical assistance from the manufacturer's service engineers.

The training program must be of a duration to achieve these results. The program will be conducted simultaneously with the hands-on (on-the-job) training given by the manufacturer's technical assistance service engineers.

TAZARA advises that the training program should be conducted 5 days per week with no more than 2 to 3 hours of classroom work per day. The remainder of their 8-hour day should be spent on performing maintenance work in workshop at a level that matches their achieved level of competence.

A demonstration room at the Mbeya workshop will be available (approximately 600 square meters) for classroom use.

2.4 TECHNICAL AND FINANCIAL EVALUATION

Responses submitted by tenderers must be received at TAZARA's headquarters on or before the date requested. Submittals not received by close of business on that date will be rejected.

2.4.1 Technical Evaluation

Compliance to Technical Specification No. TZR/MED/LI-87 dated December 1987 as amended by TAZARA during the procurement procedure must be indicated in the offering. Each article of the specification must be addressed; if the offering is noncompliant, documented evidence of TAZARA acceptable substitutions for each noncompliant item must be obtained during negotiations and submitted as part of the final negotiated offering. Evidence of proven performance of the locomotive offered must be acceptable by TAZARA. The technical specification was developed by TAZARA based on more than 11 years of operations and maintenance experience of diesel hydraulic locomotives and over 4 years of experience with DE locomotives in the TAZARA railway system. TAZARA believes strongly that the specification describes the locomotive needed for acceptable performance in their freight- and passenger-hauling service. Therefore, compliance to each specification item or a TAZARA-acceptable substitute is mandatory.

Each technical offering will be reviewed by an evaluation team comprised of TAZARA and USAID representatives. Each negotiated substitution for deviations from specification items must be acceptable by TAZARA's chief mechanical engineer, assistant chief mechanical engineer, and traffic department manager. Unacceptable deviations or substitutions will be cause for rejection of the offering.

2.4.2 Technical Assistance and Training Evaluation

Compliance to technical assistance requirements and a guarantee that personnel qualifications and time duration will be met must be included in the agreement. Performance bond for future action will be executed if adherence to the agreement is not made. The manufacturer's plan for compliance to training requirements will be reviewed in total, including:

- o Time duration of training
- o Planned curriculum
- o Classwork schedule
- o Instructor/teacher qualifications
- o Training aids included in plan
- o Utilization of demonstration room
- o Demonstration models included in plan
- o Use of actual components in training

2.4.3 Financial Evaluation

Each major item included in the bid/quotation package will be evaluated on individual merits; that is, the content of offered item and the price of that item. The total bid/quotation offering will also be evaluated. Unacceptable or apparent out-of-line prices must be explained by the tenderer. Unacceptable prices for an offered item will be cause for rejection. The prices for the

following will be given individual as well as combined consideration in evaluation:

- o Locomotives
- o Spare parts
- o Maintenance tools and equipment
- o Testing tools and equipment
- o Technical assistance
- o Training program

**SECTION III. SPARE PARTS, TOOLS, EQUIPMENT, AND
TECHNICAL ASSISTANCE FOR MAINTENANCE OF EXISTING
GE/KRUPP DIESEL ELECTRIC LOCOMOTIVES**

The work of developing lists of material, parts, tools, and equipment required to perform the 4-year inspection and maintenance schedule (4-year overhaul) and to complete the rebuild of two collision-damaged U30C locomotives necessitated visits to the three major workshops of TAZARA. The material and parts requirements for the overhauls were systematically identified and tabulated. Operational, functional, and structural requirements for electrical and mechanical repairs of the damaged locomotives were detailed. The manufacturer's drawings of the locomotives were used to determine exact dimensions, quantities, and arrangements of parts. Determinations of tools and equipment (not available in TAZARA's workshops) required in performing the inspections, maintenance, and rebuilds were made through analysis of manufacturer's instructions and inspections of existing shop tools and equipment.

Personal inspections of workshops and locomotives were conducted to verify tool and equipment availability and needs, parts availability and needs, and actual conditions of collision-damaged units. These inspections provided the details not included on previously prepared listings of requirements as well as information not available on drawings or in maintenance instructions. The knowledge and experience of the manufacturer's service engineers and TAZARA's principal mechanical engineers aided in determination of final listing of parts, tools, and equipment required. Final listings are included in procurement documents included in Part 2 of this project report.

3.1 PARTS FOR OVERHAUL AND MAINTENANCE

Delivery of the GE/Krupp locomotives, parts, and equipment in 1983/84 included designated maintenance spares and tools. During the 4 years of revenue service, a considerable portion of the spares were used in the daily, monthly, 3-month, 6-month, and yearly scheduled maintenance work. In addition, parts from the original quantities of spares were used in damage correction and rebuild of locomotives (example--the collision-damaged 1008). An inventory of remaining spares was made and the information was utilized in determining additional spares needed to complete the 4-year inspection and maintenance schedule on 13 U30C locomotives.

3.2 PARTS FOR REBUILD OF TWO COLLISION-DAMAGED LOCOMOTIVES

Analyses of the condition of each of the two collision-damaged locomotives were made by the team of representatives of Krupp, TAZARA, and the engineering consultant. The parts required to complete the rebuild of 1008 and to perform the total rebuild of 1006 are included in Part 2, procurement documents for spare parts.

3.3 SPECIAL TOOLS, SHOP EQUIPMENT, AND TESTING EQUIPMENT

TAZARA's reviews of tools and equipment requirements for the Mbeya shops were performed by a committee including the assistant chief mechanical engineer, principal mechanical engineer, district mechanical engineer, and works manager. The results of these reviews were documented in a report dated August 1987. This report (see Part 2, Exhibit 6) includes equipment requirements far in excess of the equipment needed in Mbeya for the 4-year overhaul work on the existing fleet of 13 diesel electrics.

The Exhibit 6 report lists equipment for an expanded Mbeya workshop with capacity to perform both heavy and light maintenance

on 67 DE locomotives. Analyses of these lists along with first-hand observations of Mbeya existing equipment (Exhibit 2 - Part 2) resulted in the actual needs list for the 4-year overhaul work included in procurement documents in Part 2 for tools and equipment.

The procurement documents list identifies the equipment (tools and shop equipment) for maintenance and testing of the existing DE fleet including the 4-year overhaul.

3.4 TECHNICAL AND ADMINISTRATIVE SPECIFICATION

Direction from USAID as defined in the project work scope is to sole-source the order for spare parts required for the 4-year overhaul of 13 U30C locomotives. Even with a sole-source order, the procurement needs to be supported by technical and administrative documents.

The procurement documents for spare parts must include the significant terms and conditions which will govern the procurement. It must also contain the definition of the products to be provided: that is, the parts for overhauling 13 U30Cs, the parts to complete the rebuild of two damaged locomotives, the maintenance tools and equipment, the testing equipment, and the technical assistance required during the overhaul period.

The above documents have been developed and consolidated in two procurement packages for use by TAZARA in securing the required parts and services (see Part 2).

3.5 TECHNICAL ASSISTANCE FOR MAINTENANCE

Upon receipt of the first DE locomotive from GE/Krupp, the services of a qualified service engineer were provided to TAZARA.

This technical assistance has continued for a period of 4 years and 8 months as of the end of 1987.

The engineer fulfilling the requirements of technical assistance is a Krupp employee who lives in Mbeya, Tanzania, the location of TAZARA's DE workshops. The daily on-the-job instruction that has been provided for the artisans and technicians resulted in developing a trained, knowledgeable work force. Their level of competence, however, is not as high as expected after the long period of technical assistance. This achievement level is most likely the effect of low job incentives and inadequate direction from supervisors and managers and not from the effectiveness of technical assistance.

Since the date of introduction of the U30C DE locomotives in the TAZARA system, all tasks of scheduled maintenance recommended by the manufacturer have been performed in the Mbeya workshops. This includes daily, monthly, 3-month, 6-month, 1-year, 2-year, and 3-year maintenance levels. The 4-year (overhaul) level includes work tasks over and above those included in the 3-year and shorter period levels. Since the work force has no experience on the advanced (4-year overhaul) maintenance tasks, technical assistance will be required to assure that the work performed complies with the manufacturer's recommendations. The definition of the technical assistance work scope is included in Part 2, Segment A, Section IV.

The duration of technical assistance for the overhaul of 13 U30Cs is estimated to be 18 months. This allows two months each for the first three units and one month each for remaining units, with contingency and with all spare parts available as required. The Krupp service engineer is currently funded to January 1989, as confirmed by Krupp and GE. The overhaul program is scheduled to start January 1988. However, the unavailability of required spare parts (procurement will result from this study) will control the schedule. If reasonable progress is made in coordinating parts,

labor, and locomotive accessibility, the overhaul program could be completed in 2 years. This schedule would require an extension of the GE/Krupp service engineer's time for only 1 year, to January 1990.

3.6 MAJOR PARTS PRICE VERIFICATION

The spare parts for U30C overhaul work are not totally available on the open market. The locomotives built by Krupp to a GE design have parts requirements that can be totally complied with and warranted only through the original equipment manufacturer. Substitute parts could be procured from suppliers other than GE; however, quality and warranty would be questionable.

The direction from USAID is to sole-source the spare parts order with GE. Along with sole-sourcing, a price level verification was requested to assure that GE's prices for these parts are favorably comparable to prices charged other railroads for same or similar parts.

Analyses of price information from such sources as Zambia Railway, Burlington Northern, Southern Pacific, and Union Pacific Railroads have not shown evidence of pricing infractions.

General Electric's policy for selling spare parts is defined in a letter dated November 3, 1987, and included in the Appendix to this summary report.

3.7 ENGINEER'S COST ESTIMATE FOR SPARE PARTS, TOOLS, AND SERVICES

Material and spare parts price information was obtained from suppliers wherever possible, including catalog prices where

available. When time or other circumstances precluded obtaining prices from suppliers, the necessary costs were derived from prices or costs of similar items available from other sources. These included users' information and actual invoiced prices for items recently purchased. Adjustments of derived costs were made to compensate for origin and age of information.

The prices for maintenance tools and testing equipment were obtained from tooling manufacturers and distributors. Prices for such items from locomotive manufacturers appear to be about 50 percent higher than those quoted directly by the tooling company. This suggests that the orders for tools and equipment be placed directly with the tool manufacturer or distributor, resulting in a savings (cost avoidance) of \$150,000 to \$200,000 US.

The technical assistance services should be obtained from the sole-source supplier of the spare parts. General Electric has advised that they can arrange with Krupp to extend the services of the present service engineer to January 1990. The estimated cost for this service-extended period is based on current costs adjusted for increases due to merit increases and escalation.

The summary of the engineer's cost estimate is:

ITEM	ESTIMATED USD
o Spare Parts for Overhaul	\$1,100,000
o Parts for 1006 Rebuild	500,000
o Parts for 1008 Rebuild	150,000
o Tools & Equipment	425,000
o Technical Assistance (1 Year Extension)	<u>275,000</u>
	\$2,450,000
 Contingency 15%	 <u>368,000</u>
	\$2,818,000

Details of parts, tools, equipment, and services required are contained in Part 2.

SECTION IV. COST DIFFERENTIALS OF ALTERNATE PROCUREMENT

4.1 LOCOMOTIVE DESIGN AND CONSTRUCTION DIFFERENCES

Considerable differences in design and construction exist between the locomotive in TAZARA's fleet and the probable alternative locomotive that could be proposed for TAZARA's application. These differences are in the basic design of the diesel engine, the related fuel and cooling systems, the control devices, the control panels and components, the wheel slip/slide control system, and general arrangement of equipment.

These differences are so great that less than 4 percent of the parts and special tooling are interchangeable, i.e., from a U30C locomotive to a non-U30C type.

4.2 EFFECTS ON MAINTENANCE SHOP BUILDINGS

Each manufacturer's unique design requires that the workshops, in effect, will need essentially duplicate areas for locating the different shop equipment required for each locomotive. These duplicate areas apply to both the light repair shop section and the heavy repair shop section. Also, since many of the diesel engine components as well as subassemblies and parts from traction motors, gears, and controls are different for non-U30C types, the component areas of the workshop will require two sets of tools and equipment. The additional areas required to accommodate the non-U30C type result in facility cost increases amounting to \$107,000 US. (See Part 3 for details.)

4.3 EFFECTS ON TOOLS, EQUIPMENT, AND STORAGE AREA FOR SPARE PARTS REQUIREMENTS

Since major differences exist between the U30C diesel engine and the engine of the probable alternate locomotive, 4 cycles versus 2 cycles, compatible special tooling is virtually nonexistent. Some electrical testing equipment and most miscellaneous tools are applicable to either locomotive. General workshop equipment such as welders, burners, ovens, material moving, machine tools, presses, and cleaning machines can be cross utilized.

Separate sets of tooling and equipment for maintaining and overhauling the locomotive and the major components including the engine, turbocharger, traction motors, generators/alternators, and electrical control devices will be required if an alternate locomotive is procured. Based on tool and equipment catalogs and additional information from suppliers, the estimated cost of the additional items is \$350,000 US for special tooling. The additional shop equipment required will result in an added expenditure of \$330,000 US.

The design of a U30C locomotive when compared to that of the probable alternate indicated very little if any interchangeability of spare parts. Even such items as gaskets, wear plates, contact tips, brushes, cable, and wire are different. With the design differences, the spare parts for the alternate locomotive will require segregated storage space. The non-U30C locomotive procurement would require an estimated 300 square meters for storage of materials and spare parts at a cost of \$113,000 US.

The details of the above costs are included in Part 3 of this project report.

4.4 EFFECTS ON WORKSHOP STAFFING AND TRAINING REQUIREMENTS

The experience to date with the developed capabilities and competence of the locomotive maintenance personnel in TAZARA workshops indicates that versatility is not a major strength. Even after 4-1/2 years of technical assistance in the form of one-on-one instruction, on-the-job training, and some classroom-type training, the cadre of technicians and artisans at the DE workshop still require technical direction from the locomotive manufacturer's representative. Under these circumstances, the introduction of an alternate locomotive into the TAZARA system would necessitate development of a separate group of technicians and artisans for maintaining and overhauling the non-U30Cs. Training and retraining the non-U30C maintenance crews would be required for at least 5 years and possibly up to 8 years to cover the duration period of the maintenance schedule.

The additional personnel to staff the separate maintenance crews is estimated to cost \$353,000 US.

The training program required for development of locomotive maintenance capability and competence in the separate maintenance crews (including driver training) is estimated at \$2,465,000 US.

The details used in the derivation of these cost estimates are included in Part 3 of this project report.

4.5 EFFECTS ON LOCOMOTIVE PURCHASE QUANTITY TO MAINTAIN EQUIVALENT AVAILABILITY

Locomotive availability for hauling freight and passenger trains is the critical measure of a railway's maintenance effectiveness. The capability, competence, and production efficiency of

maintenance crews performing work in maintaining a fleet of a single-type locomotive as compared to workshop crews handling a mixed locomotive fleet is much more effective. While the capability to maintain a mixed fleet or, in effect, two separate fleets will improve over time, it may require a period of 8 years before attaining maintenance service comparable to that of a single-type locomotive fleet.

During the 8-year period of developing trained maintenance crews separate from the U30C crews, maintaining the level of locomotive availability equivalent to that of a single-type fleet would be extremely difficult, if not impossible. To compensate for a mixed fleet of lower availability, additional locomotives would be required. It is estimated that a quantity of at least three additional non-U30C locomotives would be needed.

The estimated costs for the added quantity of locomotives including spare parts is \$4,320,000 US.

The rationale and detailed calculations used in supporting this additional cost of introducing non-U30C locomotives into the TAZARA system are included in Part 3 of this project report.

SECTION V. SUMMARY

5.1 MULTIPLE-TYPE MAINTENANCE COMPLEXITIES

Analyses of TAZARA's performance in operating and maintaining locomotives for hauling freight and passengers resulted in confirmation that purchase of non-U30C locomotives at this point in the railway development will result in additional costs. These additional costs can be categorized into the following:

- o Workshop facilities including design engineering
- o Maintenance and test tooling
- o Maintenance and test equipment
- o Spare parts storeroom space including design
- o Maintenance crew training programs
- o Staffing of non-U30C maintenance crews
- o Increases of non-U30C quantity to maintain equivalent availability

The rationale and calculation details may be disputed, and some might conclude that utilizing TAZARA's current performance results in exaggerated costs for introducing non-U30Cs. However, observation of TAZARA's current operations and maintenance effectiveness, reviews of the numerous studies conducted by CPCS, KfW, Parsons Brinckerhoff International, Inc., and other consultant groups, and TAZARA's self-analysis support the results of this project study.

The summary of quantified costs for the effects on the above categorized items of introducing non-U30C locomotives into TAZARA's system is:

		<u>US Dollars</u>
Workshop facility	-	107,000
Maintenance and test tooling	-	350,000
Maintenance and test equipment	-	330,000
Spare parts storage	-	113,000
Training program	-	2,465,000
Staffing	-	353,000
Reserve locomotives	-	<u>4,320,000</u>
		<hr/> \$8,038,000 US

5.2 CONCLUSIONS AND RECOMMENDATIONS

The study provided convincing data that resulted in the following conclusions and recommendations:

- o The locomotive acquisition should proceed utilizing the procurement documents included in Part 1 of this project report.
- o The procurement procedure should be an Informal Competitive Negotiation as defined in AID Handbook 11, Chapter 3.
- o Evaluation of offerings in response to RFQ and as negotiated must include consideration of total costs to TAZARA of introducing a non-U30C locomotive in their railway system.
- o Procurement from the selected manufacturer should be in two batches, of eight and nine respectively, with the option of nine exercised only if TAZARA meets forecasted increases in freight haulage requirements, improvements in performance, and the accumulation of required reserve in the maintenance and repair fund.
- o Sole-source procurement of required spare parts for the

existing locomotive fleet should proceed as soon as practical.

- o Procurement of maintenance tools and equipment, and testing tools and equipment should proceed in line with locomotive overhaul and new locomotive acquisition schedules.
- o Technical assistance and training programs should be provided as defined and scheduled.
- o Monitoring of action items included in the locomotive acquisition project should be made at frequent (monthly) intervals to assure reasonable adherence to plan.
- o Continued monitoring of TAZARA's overall performance is required to provide direction and corrective action to develop improved performance.

GENERAL ELECTRIC

TRANSPORTATION
SYSTEMS
BUSINESS
OPERATIONS

GENERAL ELECTRIC COMPANY, 2901 EAST LAKE ROAD, ERIE, PENNSYLVANIA 16531

November 3, 1987

Mr. J. Forman
Assistant Vice President
Parsons, Brinckerhoff, Quade & Douglas, Inc.
c/o U.S. AID Mission
Dar es Salaam, Tanzania

RE: TAZARA RENEWAL PARTS FOR KRUPP - GE LOCOMOTIVES

Dear Mr. Forman:

In response to your request, we wish to state the following with regard to General Electric's Policy to only sell renewal parts to end-user customers:

- Transportation Systems Business Operation of the General Electric Company, as a matter of policy, will only sell spare parts to end-user customers directly, or through a limited number of distributors appointed by TSBO. This policy is intended to support the reputation and integrity of GE's products by ensuring that the quality, performance and reliability of our products are maintained and strong levels of pre- and post-sale support services to our customers are afforded.
- Krupp, as a part of our licensing agreement, is the only other authorized source, besides direct from TSBO, of genuine GE parts to TAZARA. No other distributor has been appointed with responsibility to sell TSBO parts to Tanzania.
- Anyone else claiming access to a TSBO-GE parts supply either is misrepresenting non-genuine or imitation parts as GE parts, or is obtaining them from a source not authorized to make such distribution. In any case, as discussed below, we do not feel that parts offered by parties other than GE or its authorized distributors offer the same value to the end-user.
- The only parts guaranteed to be authentic, and therefore warranted by GE, are those supplied by us directly or through Krupp. Any parts obtained through unauthorized channels will not be warranted. Warranty is only passed to the end-user on parts procured from GE and, in the case of TAZARA, Krupp.

4/1x

With respect to our pricing policy we issue a published price list of stock authorized materials. Although it has been implied that our prices are high compared to competition, we believe our pricing to be reasonable, since our prices reflect many services we provide that the competition normally is not prepared to perform and, in many instances, is not capable of performing. For example, we maintain a staff of product assurance and engineering personnel who strive to improve our product, to offer extended life and/or improved performance of our parts by design or material changes.

Often, we elect to use more expensive materials in our parts, but in our evaluation the additional expense is more than offset by improved performance, reliability and longer life. In many instances we impose on our vendors quality assurance checks that they would not normally perform for other customers. Also, we have our own quality control audit procedures that we follow for items we produce as well as those we purchase from our vendors. Finally, we offer technical assistance to our customers as well as routine call back visits by our Area Service Managers who discuss maintenance practices, and any problems customers might be having whether they be technical or commercial.

Given the foregoing, you can imagine our frustration when someone claims that our prices are too high, particularly when the basis of that claim is a comparison with only the prices of parts offered by a party other than ourselves or one of our authorized distributors. We feel that such a claim ignores the adage that "you get what you pay for." It is relatively simple to make an offering that looks attractive on the basis of price alone, particularly if one has elected not to have the same readiness-to-serve capability, not to have the quality assurance programs, not to offer the same technical support, and/or not to offer parts with the same level of performance, reliability and life that we offer. Moreover, evaluations on price alone do not take into account the reputation, background and reliability of the offeror, particularly when it comes to delivery and after-sale support. In short, price alone does not equal value, and we are willing to have the value of our total offering, that is the products, services support, reliability and reputation thoroughly compared to that offered by any other party. We challenge anyone claiming that their parts offer the same value as the parts we offer to substantiate that claim. It has been our experience that when such an examination is made, the results are favorable to us.

I know you will appreciate why we feel so strongly about these issues. After all, if a part fails and a locomotive is put out of service, the end-user never seems to say "XYZ company's part failed;" they always seem to say "GE's locomotive is out of service." We value our reputation and will stand behind our product, as long as it is our product.

We have agreed to provide TAZARA with preferential pricing for any renewal parts purchased on a proprietary basis and funded by U.S. AID. That is to say, we will offer a discount from our published price in effect at the time the order is placed. The rate of discount will be dependent upon the terms

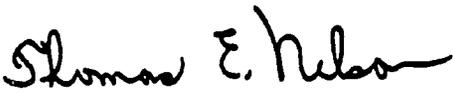
GENERAL  ELECTRIC

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and conditions of purchase applicable to the particular transaction. As an example, if the terms of delivery are F.O.B. factory with freight prepaid to East Coast Port of Export, and the goods packed in containers for shipment, we would offer a discount of 10 to 15% below our published prices. Actual rate of discount will be negotiated after we have had an opportunity to review the list of material and the terms and conditions requested.

Should you require any additional information after your review of the above, please do not hesitate to contact the undersigned.

Very truly yours,



Thomas E. Nelson

TEN:1151F



Tanzania-Zambia Railway Authority

Telephone: TZR/G/84/3/VIII/37

Telegrams: TAZARA

Our Ref: 19th October, 1987

Your Ref:

US-AID

USAID,
c/o Embassy of the United States of America,
P.O. Box 9123,
DAR ES SALAAM.

Dear Sir,

RE: U30C GE/KRUPP LOCOMOTIVE - PROJECT ME: 1

In view of the fact that the U30C DE locomotive has performed satisfactory from 1982 to 1987, and that the performance indices have been more than satisfactory, it is considered of prime importance to maintain the same locomotive for the future.

The maintenance and repair facilities have been developed to cater for DE locomotives including the trained staff and hence investment costs shall be minimal as compared to introduction of a completely new locomotive for which we do not have experience on technologically and in terms of repair plans.

Yours faithfully,
TANZANIA ZAMBIA RAILWAY AUTHORITY

M.J. Kachumi
for GENERAL MANAGER

PART 1

U.S.A.I.D.

**United States Agency for
International Development**

Project ME-1

**Supply of New Diesel
Electric Locomotives to
Tanzania-Zambia Railway**

**Tender Documents For
Diesel Electric Locomotives
December 1987**

SPECIFICATION NO. TZR/MED/LI-87 - LOCOMOTIVES

**Tanzania/Zambia Railway Authority/TAZARA Railway
Headquarters Office
P.O. Box 2834
Dar es Salaam, Tanzania**

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SECTION I. INVITATION FOR TENDERS

Date of Issuance

U.S.A.I.D. Reference

TAZARA Reference

1. The Tanzania Zambia Railway Authority has entered into an agreement with the United States of America, acting through THE AGENCY FOR INTERNATIONAL DEVELOPMENT (U.S.A.I.D.), with respect to financing by the parties of the procurement of diesel electric locomotives and associated spare parts and services.

2. The Tanzania Zambia Railway Authority (TAZARA) invites sealed tenders from eligible tenderers for the supply, delivery, and commissioning of diesel electric locomotives and associated spare parts, tools and equipment for maintenance and testing, technical assistance, and a maintenance training program for workshop personnel.

3. The supply of locomotives, associated spare parts, and services will be required in two phases:

(a) PHASE I tenders are required for the following:

- Quantity of eight (8) locomotives in accordance with technical specifications herein.
- Recommendations for spare parts (identification and

quantity) for eight (8) locomotives for optimum level maintenance during first five (5) years of revenue service.

- Recommendations for maintenance tools and equipment (identification and quantity).
- Technical assistance (service engineering) for period of sixty (60) months.
- Recommendations for maintenance training program for TAZARA for on-site application complete with training materials, demonstration equipment, and instructors, including full definition of curriculum, agenda, visual aids, text books, instructors' teaching credentials and classroom/on-the-job training plan.

(b) PHASE II tenders are requested for the following which will be exercised as an option:

- Quantity of nine (9) locomotives in accordance with technical specifications herein.
- Recommendation of spare parts (identification and quantity) for nine (9) locomotives for optimum level maintenance during the first five (5) years of revenue service.
- Technical assistance (service engineering) for period of twelve (12) months.

4. The contracting agency reserves the right to accept one tender or no tenders at his discretion.

5. Tenderers may obtain further information from the office of:

THE SUPPLIES MANAGER,
TANZANIA ZAMBIA RAILWAY AUTHORITY,
TAZARA HEADQUARTERS,
P.O. BOX 2834,
DAR ES SALAAM, TANZANIA

All telex communications should be made to telex 41059 TAZARA TZ.

6. All tenders must be accompanied by a fully executed bid bond in the amount five (5) percent of the offered price and must be delivered to:

GENERAL MANAGER,
TANZANIA ZAMBIA RAILWAY AUTHORITY,
P.O. BOX 2834,
DAR ES SALAAM,
TANZANIA

on or before _____ on _____

SECTION II. INSTRUCTIONS TO BIDDERS

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INSTRUCTIONS TO BIDDERS

1. Introduction

The Tanzania-Zambia Railway Authority (TAZARA) invites firms to submit bids for the supply of equipment, materials, and related services as part of the Dar es Salaam Corridor Project. The contract will be financed by USAID under Project Number 690-0240 Grant Agreement.

Firms invited by TAZARA to submit bids are under no obligation to do so. At the same time, bidders will not be reimbursed for any costs incurred in connection with the preparation and submission of their bids.

These instructions to bidders shall not form part of the bid or of the contract. They are intended to aid bidders in the preparation of their bids.

For the purposes of interpretation of these instructions to bidders, the periods named herein shall be consecutive calendar days.

This Invitation for Bids consists of (1) these Instructions to Bidders, (2) the attached "Bid/Award/Contract Form," (3) the attached "Bid Schedule," (4) the attached "Forms of Bid and Performance Bonds," (5) the attached "Conditions of Contract," and (6) the Technical Specifications attached hereto.

Bidders should note that the "Supplier's Certificate and Agreement with AID for Project Commodities/Invoice and Contract Abstract" (Form AID 1450-4) is required to be submitted by the payment

clause in the "Conditions of Contract." This form must be completed in order for the supplier to receive payment.

2. Bid Opening

The original and four completed copies of the bid must be delivered in person or sent by registered mail or other means to the following address:

General Manager
Tanzania Zambia Railway Authority
P.O. Box 2834
Dar es Salaam,
Tanzania, Africa

All documents must be enclosed in sealed packages marked on the outside with the words "RFQ No. _____, BID DOCUMENTS: Do not open before _____ and must be delivered not later than 12 noon on _____, 19____. The bids will be opened at that time in the Headquarters Office of the Tanzania Zambia Railway Authority in the presence of the public. The bidder's names, the bid prices, and whether a bid bond is included will be announced.

3. Preparation of Bids

(a) Bidders are expected to examine the specifications and all instructions contained in this Invitation for Bids. Failing to do so will be at the bidder's risk.

(b) Bids shall be on a unit price, firm price basis.

(c) TAZARA reserves the right to increase or decrease the quantity of an item duly awarded in accordance with this RFQ.

This option shall be exercised, if at all, at time award is made.

(d) All correspondence in connection with the bid and the contract is to be in English.

4. Content of Bids

Bidders are required to complete the following in an original and four copies:

(a) Bid/Award/Contract Form.

(b) The Bid Schedule.

Bidders shall fill in the unit price for each item in the bid schedule. For each item, the quantity given in the "Quantity" column shall be multiplied by the unit price, and the result entered in the "Amount" column. In case of any discrepancy between a unit price and an amount, the unit price will be taken as correct and the amount adjusted accordingly. It will be assumed that the bidder is not bidding on any item for which a unit price or amount is not shown.

The bidder shall complete the form in type or in indelible ink making no alterations to the form provided. The completed form shall have no interlineations or erasures except those necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

One original copy of the completed bid is to be clearly marked "ORIGINAL BID" and the other completed copies are to be marked "COPY OF BID." In case of any discrepancy, the copy marked "ORIGINAL BID" shall govern.

(c) Bid Bond.

Bids must be accompanied by a bid bond in the amount of five (5) percent of the bid price. No bid will be considered unless it is so secured.

The bond provided by unsuccessful bidders will not be repaid or discharged until the expiration of 150 days from the day of bid opening or until such earlier time as a bid shall have been accepted by TAZARA and a performance bond shall have been duly provided by the bidder whose bid is accepted.

The bond provided by the bidder whose bid is accepted shall be discharged when the performance bond has been duly entered into and executed.

(d) Manufacturer's Standard Warranty.

(e) Descriptive Literature.

Descriptive literature for the items, including full technical specifications, must be submitted with each copy of the bid. This literature will be used to demonstrate compliance with the specifications of the bid and will not be considered to amend the bid in any way. Deviations from RFQ requirements included in descriptive literature furnished must be fully explained. In case of any conflict between the specifications in the descriptive literature and specifications in the bid, the latter will control.

5. Bid Acceptance Period

Bids offering less than 150 days for acceptance by TAZARA from the date set for opening will be considered nonresponsive and will be rejected.

6. Signature of Bid

The bid must be signed by a person duly authorized to do so. A bid submitted by a corporation must bear the seal of the corporation.

Associated companies or joint ventures shall jointly designate in one power-of-attorney persons authorized to obligate all the companies of the association or joint venture. A bid submitted by a joint venture must be accompanied by the document of formation of the joint venture, duly registered or authenticated, in which is defined precisely the conditions under which it will function, its period or duration, the persons authorized to represent and obligate it, the participation of the several firms forming the joint venture, the principal member of the joint venture, and address for correspondence for the joint venture. Bidders are advised that the joint venture agreement must include a clause stating that the members of the joint venture are severally and jointly bound.

7. Late Bids

Bidders will be held responsible for ensuring that their bids are received in accordance with the instructions stated herein and a late bid will not be considered even though it became late as a result of circumstances beyond the bidder's control. A late bid will be considered only if the sole cause of its becoming a late bid was attributable to TAZARA, its employees, or agents.

8. Modification of Bids

Any bidder has the right to withdraw, modify, or correct its bid after it has been delivered to TAZARA provided the request for

such a withdrawal, modification, or correction together with full details of such modification or correction is received by TAZARA at the address given above by letter, telegram, or telex before the time set for opening bids. The original bid, as amended by such communication, will be considered as the bidder's offer. TAZARA may ask any bidder for a clarification of its bid; nevertheless, no bidder will be permitted to alter its bid price or make any other material modification after bids have been opened. However, clarifications which do not change the bid price may be accepted. No bidder may withdraw its bid after the time set for opening bids until and unless a period of 150 days has elapsed after the time set for opening bids, except with the written permission of TAZARA.

9. Prebid Conference

A prebid conference will be held on _____, 19____, at _____ in the following location:

Bidders are not required to attend but are encouraged to do so. Modifications to the Invitation for Bids resulting from the conference will be provided to all bidders by means of an addendum to the Invitation for Bids.

10. Addenda to the Invitation for Bids

If for any reason prior to bid opening it becomes necessary to modify the bid documents, an addendum will be issued to and be binding on all bidders. Receipt of all addenda shall be acknowledge by bidders.

Addenda will be numbered consecutively commencing with No. 1 and bidders are required to insert the numbers of addenda received in paragraph 3 of the bid.

11. Bid Document Questions

Should any bidder have questions to ask or should it have any doubt about the meaning of the bid documents, it should refer them in writing to TAZARA not later than fifteen (15) days before the date set for opening of bids.

12. Bid Evaluation and Contract Award

(a) Award will be made to the responsible and responsive bidder whose bid has been determined to be the lowest evaluated bid in accordance with the following:

- o Compliance to technical specifications
- o Compliance to delivery requirements
- o Compliance to technical assistance and training requirements
- o Cost of introducing locomotives to TAZARA including costs of:
 - Locomotives
 - Tools
 - Equipment
 - Workshop modifications
 - Spares
 - Spares storage
 - Training
 - Technical assistance
 - Staffing

(b) A responsive bid is one which complies with all of the terms and conditions of the RFQ without material modification. A material modification is one which affects the price, quantity, quality, delivery date of equipment or materials, or which limits

in any way any responsibilities, duties, or liabilities of the bidder or any rights of TAZARA or USAID as any of the foregoing have been specified or defined in the RFQ. TAZARA may waive any minor informality in a bid which does not constitute a material modification.

(c) TAZARA will reject any bid that is nonresponsive. TAZARA reserves the right to waive any minor informalities in the bids received if it appears in TAZARA's best interests to do so; to reject the bid of any firm if, in TAZARA's judgment, the firm is not fully qualified to provide the goods and services as specified in the contract, or to reject all bids.

(d) TAZARA reserves the right to delete any item or group of items.

(e) Failure on the part of the successful bidder to provide a performance bond in accordance with the conditions of contract shall be sufficient grounds for the annulment of the award and forfeiture of the bid bond. The award may then be made to another bidder or TAZARA may call for new bids.

(f) The bid of any bidder which does not conform to the foregoing instructions may be rejected.

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GENERAL CONDITIONS OF CONTRACT

1. Definitions

Set forth below are terms used in the contract and reference to them shall be interpreted as follows:

- a. "AID" means the Agency for International Development.
- b. "Authorized Geographic Code" is AID Geographic Code 000.
- c. "Contract" means the "Bid/Award/Contract Form" signed by both bidder and Contracting Agency including all attachments and appendices thereto and all documents incorporated by reference therein.
- d. "Contracting Agency" is Tanzania Zambia Railway Authority (TAZARA).
- e. "Supplier" is the person or firm supplying the equipment and materials called for under this contract.

2. Governing Law and Language

- a. This contract shall be interpreted in accordance with the laws of the United States of America.
- b. The English language version of this contract shall govern. All notices pursuant to the provisions of this contract shall be in English.
- c. Shipping terms will be defined in accordance with the general and special conditions of contract (herein).

3. Delivery

Delivery of all equipment and materials to be supplied under this contract to the port of loading in the source country shall be made as follows:

Phase I - Within three hundred sixty-five (365) days from receipt of order.

Phase II - Within three hundred sixty-five (365) days from order if option is exercised.

4. Responsibilities of Other Contractors

_____ is employed by TAZARA to supervise this contract and is responsible for:

a. Witnessing tests of equipment prior to shipment to the cooperating country;

b. Inspecting and accepting or rejecting the commodities at point of delivery;

c. Requiring replacement of defective equipment or materials;

d. Issuing change orders. Concurrence of TAZARA is necessary if the value exceeds \$10,000 U.S.

5. Legal Effect of AID Approvals and Decisions

The parties hereto understand that the contract has reserved to AID certain rights such as, but not limited to, the right to

approve the terms of this contract, the supplier, and any or all plans, reports, specifications, subcontracts, bid documents, drawings, or other documents related to this contract and the project of which it is part. The parties hereto further understand and agree that AID, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure the proper use of United States Government funds, and that any decision by AID to exercise or refrain from exercising these approval rights shall be made as a financier in the course of financing this project and shall not be construed as making AID a party to the contract. The parties hereto understand and agree that AID may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the project with the parties jointly or separately, without thereby incurring any responsibility or liability to the parties jointly or to any of them. Any approval (or failure to disapprove) by AID shall not bar TAZARA or AID from asserting any right, or relieve the supplier from any liability which the supplier might otherwise have to TAZARA or AID.

6. Payment

a. Requests for Payment

Payment due the supplier under this contract shall be made based upon the supplier's written request accompanied by the following documentation:

(1) The Supplier's Invoice;

(2) "Supplier's Certificate and Agreement with AID for Project Commodities/Invoice and Contract Abstract" (Form AID 1450-4); and

(3) For each shipment of equipment or materials for which payment is requested:

(a) A copy or photostat of the dated bill of lading (ocean, airway, charter party, railway, barge or truck) or parcel post receipt evidencing shipment from the source country or a free port or bonded warehouse to the host country is to be submitted. The bill of lading shall indicate the carrier's complete statement of charges including all relevant weights, cubic measurements, rates, and additional charges whether or not freight is financed by AID.

b. Partial Payments

The supplier may request partial payment upon delivery and acceptance of each twenty-five (25) percent of the total items required by this contract. The supplier shall submit the documentation required by paragraph a. above with the request.

c. Local Currency

Unless directed otherwise by the Contracting Agency, all local currency costs paid or incurred by the supplier under the contract including, without limitation, all local taxes, duties, and imports, when not exempted, shall be reimbursed to the supplier in local currency and not by payment of United States dollars.

Except as otherwise approved in writing by TAZARA, when it is necessary for purposes of this contract for the supplier to convert United States dollars to local currency, such conversion shall be made through arrangements with the U.S. Disbursing Office.

7. Audit and Records

a. The supplier shall maintain books, records, documents, and other evidence and shall apply consistent accounting procedures and practices sufficient to reflect properly all transactions under or in connection with the contract. The foregoing constitute "records" for the purpose of this article.

b. The supplier shall maintain such records during the contract term and for a period of 3 years after final payment. However, records which relate to appeals under the "Disputes and Appeals" article or litigation or the settlement of claims arising out of the performance of this contract shall be retained until such appeals, litigation, or claims have been finally settled.

c. All records shall be subject to inspection and audit by the Contracting Agency (or its authorized agents) at all reasonable times. The supplier shall afford TAZARA proper facilities for such inspection and audit. This is a fixed price contract and is not subject to audit of costs (except for any cost-reimbursable items), but is subject to audit for compliance with other provisions of this contract.

d. The supplier further agrees to include in all its subcontracts hereunder a provision that the subcontractor agrees that TAZARA or any of its authorized agents shall, until the expiration of 3 years after final payment under the subcontract, have access to and the right to examine any records of such subcontractor involving transactions related to the subcontract.

8. Assignment

The supplier may not assign its obligation to perform under the contract except with the prior written consent of both TAZARA and AID. The supplier may not assign its rights to receive

payment under the contract except with the prior written consent of both TAZARA and AID.

9. Host Country Taxes

a. Pursuant to bilateral agreement between the United States Government and the host country government, the supplier and those of its employees who are not citizens or permanent residents of the host country shall be free of all taxes, fees, levies, customs, or impositions imposed under laws in effect in the host country with respect to all equipment and materials supplied and services performed under this contract. This exemption includes all customs, duties, and registration fees.

b. The Government will allow the supplier to import free of customs and duties such materials and equipment as may be required under this contract.

c. Any taxes, fees, levies, customs, or impositions within the scope of paragraphs a. and b. above paid by the supplier shall be reimbursed by TAZARA.

10. Nationality and Source

a. Eligibility of Suppliers

(1) No equipment, materials, or services shall be eligible for AID financing if offered by a supplier or subcontractor included on any list of suspended, debarred, or ineligible bidders used by AID.

(2) The supplier and any subcontractor(s) must be:

(a) An individual who is a citizen or legal

resident of a country or area included in the authorized geographic code;

(b) A corporation or partnership organized under the laws of a country or area included in the authorized geographic code;

(c) A controlled foreign corporation, i.e., any foreign corporation of which more than 50 percent of the total voting power of all classes of stock is owned by United States shareholders within the meaning of the Section 957 et seq. of the Internal Revenue Code (26 U.S.C. 957); or

(d) A joint venture or unincorporated association consisting entirely of individuals, corporations, or partnerships which fit any of the foregoing categories.

(3) Citizens or firms of any country not included in AID Geographic Code 935 are ineligible as suppliers, contractors, subcontractors, or agents in connection with AID-financed contracts for goods or services. However, non-U.S. citizens legally admitted for permanent residence in the United States are eligible.

b. Eligibility of Commodities

(1) Definitions

(a) Source

"Source" means the country from which a commodity is shipped to the cooperating country or the cooperating country itself if the commodity is located therein at the time of purchase. However, where a commodity is shipped from a free port or bonded warehouse in the form in which received therein, "source" means the country from which the commodity was shipped to

the free port or bonded warehouse.

(b) Origin

The "origin" of a commodity is the country or area in which a commodity is mined, grown, or produced. A commodity is produced when through manufacturing, processing, or substantial and major assembling of components a commercially recognized new commodity results that is substantially different in basic characteristics or in purpose or utility from its components.

(c) Componentry

"Components" are the goods that go directly into the production of a produced commodity.

(2) Rule

All equipment and materials shall have their "source" and "origin" in an authorized country and meet the following componentry rules:

(i) If the commodity contains no imported component, it meets AID's componentry requirements.

(ii) If the commodity contains components imported from countries included in Geographic Code 935 which are not included in the authorized geographic code for the procurement, the components are limited according to the following rules:

I. They are limited only if they are acquired by the producer in the form in which they were imported.

II. The total cost of such components to the producer of the commodity (delivered at the point of production of

the commodity) may not exceed 50 percent of the lowest price (excluding the cost of ocean transportation and marine insurance) at which the supplier makes the commodity available for export sale (whether or not financed by AID).

III. AID may prescribe percentages other than 50 percent for specific commodities.

IV. Components from the cooperating country may be used in unlimited amounts whenever any geographic code other than Code 000 is authorized.

(iv) Any component from a non-free world country makes the commodity ineligible for AID financing. (NOTE: This numbering is same as Handbook 11, Chapter 3 which does not contain an item Numbered (iii).)

c. Motor Vehicles (not applicable)

d. Delivery Services

(1) With respect to ocean or air freight, "source" means the flag of the vessel or aircraft.

(2) Ocean Freight

(a) All goods covered by this contract which are transported on ocean vessels shall be transported on privately owned U.S. flag commercial vessels to the extent they are available at fair and reasonable rates for U.S. flag commercial vessels. If such flag vessels are not available, the supplier may request a waiver from the Office of Commodity Management, AID, Washington, D.C. 20523.

(b) When shipment is made under a through bill of lading issued by an eligible flag carrier, AID will finance costs

incurred on vessels under flag registry of any free world country if the costs are part of the total cost paid to the eligible flag carrier.

(3) Air Freight

The supplier will use U.S.-flag air carriers to the extent they are available as set forth in the clause of this contract entitled "Air Travel and Transportation." When U.S.-flag air carriers are not available, preference should be given to the use of host country or Code 941 flag air carriers before using Code 899 flag air carriers.

(4) Charters

All air or ocean charters, covering full or part cargo, for the transport of equipment, materials, or other goods procured for the performance of this contract must be approved by AID in writing prior to shipment.

(5) General Transportation

Unless otherwise authorized, AID will not finance any transportation costs:

(a) For shipment beyond the point of entry in the host country except when intermodal transportation service covering the carriage of cargo from point of origin to destination is used and the point of destination is established in the carrier's tariff and stated in the "through bill of lading";

(b) On a transportation medium owned, operated, or under the control of any country not included within Code 935;

(c) On any vessel designated by AID as ineligible to carry AID-financed cargo; or

(d) Under any ocean or air carrier covering full or part cargo which has not received prior approval by the Office of Commodity Management, AID, Washington, DC 20523.

e. Source of Marine Insurance

(1) The eligibility of marine insurance is determined by the country in which it is "placed." Insurance is placed in a country if payment of the insurance premium is made to, and the insurance policy is issued by, an office located in the country. Insurance must be placed in a country included in the authorized geographic code, or when the authorized geographic code is other than 000, it may be placed in the cooperating country.

(2) If at any time AID determines that the government of the host country by statute, decree, rule, or regulation discriminates, with respect to AID-financed procurement, against any marine insurance company authorized to do business in any state of the United States, then AID shall require that any AID-financed goods thereafter shipped to the host country shall be insured against marine risks, and that such insurance shall be placed in the United States with a company or companies authorized to do insurance business in any state of the United States.

11. Air Travel and Transportation

a. The supplier shall utilize U.S.-flag carriers for international air transportation of personnel (and their personal effects) or property to the extent service by such carrier is available, in accordance with the following criteria:

(1) If a U.S.-flag air carrier cannot provide the international air transportation needed, or if the use of a non-U.S.-flag carrier is approved by AID in order to accomplish the agency's mission, foreign-flag air carrier service may be

deemed necessary.

(2) Passenger or freight service by a U.S.-flag air carrier is considered available even though:

(a) Comparable or a different kind of service can be provided at less cost by a foreign-flag air carrier;

(b) Foreign-flag air carrier service is preferred by, or is more convenient for, the contractor or traveler; or

(c) Service by a foreign-flag air carrier can be paid for in excess foreign currency (unless U.S.-flag air carriers decline to accept excess or near excess foreign currencies for transportation payable only out of such monies).

(3) Except as provided in paragraph (1) above, U.S.-flag air carrier service shall be used for commercial foreign air travel under this contract if service provided by U.S.-flag air carriers is available. In determining availability of a U.S.-flag air carrier, the following scheduling principles shall be followed unless their application would result in the last or first leg of travel to or from the United States being performed by a foreign-flag air carrier.

(a) U.S.-flag air carrier service available at point of origin shall be used to destination, or in the absence of direct or through service, to the farthest interchange point on a usually traveled route.

(b) When an origin or interchange point is not served by a U.S.-flag air carrier, foreign-flag air carrier service shall be used only to nearest interchange point on a usually traveled route to connect with U.S.-flag air carrier service.

(c) When a U.S.-flag air carrier involuntarily reroutes the traveler via a foreign-flag air carrier, the foreign-flag air carrier may be used notwithstanding the availability of alternative U.S.-flag air carrier services.

(4) For travel between a gateway airport in the United States and a gateway airport abroad, passenger service by a U.S.-flag air carrier shall not be considered available if:

(a) The gateway airport abroad is the traveler's origin or destination airport and the use of U.S.-flag air carrier service would extend the time in travel status, including delay at origin and accelerated arrival at destination, by at the least 24 hours more than travel by a foreign-flag air carrier; or

(b) The gateway airport abroad is an interchange point and the use of U.S.-flag air carrier service would require the traveler to wait 6 hours or more to make connections at that point, or if delayed departure from, or accelerated arrival at, the gateway airport in the United States would extend time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier.

(5) For travel between two points outside the United States, the rules in paragraphs (1), (2), and (3) shall be applicable, but passenger services by a U.S.-flag air carrier shall not be considered to be available if:

(a) Travel by a foreign-flag air carrier would eliminate two or more aircraft changes en route;

(b) One of the two points abroad is the gateway airport en route to or from the United States and the use of a U.S.-flag air carrier would extend the time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier,

including accelerated arrival at the overseas destination or delayed departure from the overseas origin, as well as delay at the gateway airport or other interchange point abroad; or

(c) The travel is not part of the trip to or from the United States and the use of a U.S.-flag air carrier would extend the time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier including delay at origin, delay en route, and accelerated arrival at destination.

(6) For all short-distance travel under either paragraph (4) or paragraph (5) above, U.S.-air carrier service shall not be considered available when the elapsed travel time on a scheduled flight from origin to destination airport by foreign-flag air carrier is 3 hours or less and service by a U.S.-flag air carrier would involve twice such travel time.

b. Freight service by a U.S.-flag air carrier will be considered to be unavailable:

(1) When no U.S.-flag air carrier provides scheduled air freight service from the airport serving the shipment's point of origin and a non-U.S.-flag air carrier does;

(2) When the U.S.-flag air carrier(s) serving the shipment's point of origin decline to issue a through airway bill for transportation to the shipment's final destination airport;

(3) When use of a U.S.-flag air carrier would result in delivery to final destination at least seven (7) days later than delivery by means of a non-U.S.-flag air carrier;

(4) When the total weight of the consignment exceeds the maximum weight per shipment which the U.S.-flag air carrier will accept and transport as a single shipment and a non-U.S.-flag air carrier will accept and transport the entire consignment as a

single shipment.

(5) When the dimensions (length, width, or height) of one or more of the items of a consignment exceed the limitations of the U.S.-flag aircraft's cargo door opening, but do not exceed the acceptable dimensions for shipment on an available non-U.S.-flag scheduled air carrier.

c. In the event that the supplier selects a carrier other than a U.S.-flag air carrier for international air transportation, it will include a certification on vouchers involving such transportation which is essentially as follows:

CERTIFICATION OF UNAVAILABILITY OF U.S.-FLAG CARRIER

I hereby certify that transportation service for personnel (and their personal effects) or property by U.S.-flag air carriers was unavailable for the following reasons:

d. If travel is by indirect route or the traveler otherwise fails to use available U.S.-flag air carrier service, and the certification required by paragraph c. above is not attached to the applicable voucher, AID will not finance the amount determined under the following formula:

Sum of U.S.-flag carrier segment <u>mileage authorized</u>	X	Fare payable by
Sum of all segment mileage authorized		AID

MINUS

Sum of U.S.-flag carrier segment <u>mileage traveled</u>	X	Through fare
Sum of all segment mileage traveled		paid

e. The terms used in this clause have the following meanings:

(1) "Gateway airport abroad" means the airport from which the traveler last embarks en route to the United States or at which the traveler first debarks incident to travel from the United States.

(2) "Gateway airport in the United States" means the last U.S. airport from which the traveler's flight departs or the first U.S. airport at which the traveler's flight arrives.

(3) "International air transportation" means transportation of persons (and their personal effects) or property by air between a place in the United States and a place outside the United States.

(4) "U.S.-flag air carrier" means an air carrier holding a certificate under Section 401 of the U.S. Federal Aviation Act of 1958 (49 U.S.C. 1371).

f. The supplier shall include the substance of this clause, including this paragraph f., in each subcontract or purchase order hereunder, which may involve international air transportation.

12. Subcontracts

a. Subcontracts must comply with the nationality, source, origin, and componentry requirements of this contract. The supplier agrees to include the following provisions of this contract in all subcontracts hereunder:

"Host Country Taxes"

"Air Travel and Transportation"

"Nationality and Source"

"Worker's Compensation Insurance" if incidental services are to be performed under the subcontract, and

b. All subcontracts and purchase orders in excess of \$100,000 shall only be awarded with the prior written consent of TAZARA and AID and such consent, if given, shall not relieve the supplier from any liability or obligation under this contract.

13. Change Orders

TAZARA may at any time, by a written order, and without notice to the sureties, make changes within the general scope of this contract, in any one or more of the following:

(a) Drawings, design, or specifications, where supplies to be furnished under this contract are to be specially manufactured for TAZARA;

(b) Method of shipment or packing; or

(c) Place of delivery.

If any such change causes an increase or decrease in the cost of, or the time required for, the performance of any part of the work under this contract, whether changed or not changed by any such order, an equitable adjustment shall be made in the contract price or delivery schedule, or both, and the contract shall be modified in writing accordingly. Any claim by the supplier for adjustment under this clause must be asserted within 30 days from the date of receipt by the supplier of the modification or change. Change orders which exceed \$1,000 U.S. must be approved by AID.

14. Amendments

Modification of the terms of this contract shall be made by amendment signed by the parties. Any amendments, including letter amendments, which increase the contract amount or extend the completion date of the contract must be approved by AID.

15. Disputes and Appeals

a. In the event of a disagreement under this contract, the supplier shall submit a written statement to TAZARA briefly describing the nature of the problem, the position of the supplier regarding the issue, and a narrative of facts in support of the supplier's position.

b. Within 10 days after receipt of the supplier's statement, TAZARA shall decide the issue and deliver a written statement of the decision to the supplier, including the reasons supporting the decision, if adverse to the supplier.

c. Within 30 days after receipt of TAZARA's decision or the date such decision was due, the supplier may submit to TAZARA a written notice of appeal including a detailed description of the facts of the dispute with the dates of events, names of persons involved, references to documentation bearing on the matter (with copies attached), the relevant contract provision(s), the supplier's contentions and conclusions, and a statement of why TAZARA's decision is being questioned.

d. If within 30 days after delivery of a notice of appeal, the parties cannot mutually agree to a satisfactory settlement, the matter shall be presented for arbitration following the rules of the International Chamber of Commerce.

16. MARKING

a. The supplier shall be responsible for assuring that all commodities to be furnished under this contract and their shipping containers carry the official AID emblem and for correctly marking goods and shipping containers. Emblems shall be affixed by metal plates, decal, stencil, label, tag, or other means depending upon the type of commodity or shipping container and the nature of the surface to be marked.

b. The emblem placed on the commodities shall be as durable as the trademark, company, or brand name affixed by the manufacturer, and the emblem on each shipping container must be affixed in a manner which assures that it will remain legible until the container reaches its destination. Such containers shall display the last set of digits of the identification number of the pertinent implementing document in characters equal in height to the shipper's marks.

17. Inspection

a. All supplies (including raw material, components, intermediate assemblies, and end products) shall be subject to inspection and test by or on behalf of TAZARA at the expense of TAZARA prior to shipment. TAZARA will notify the supplier in writing of the names of any inspectors or inspection firms. It is understood that inspection and testing shall not in any way release the supplier from any warranty or other obligations under this contract.

b. If any inspection or test is made by or on behalf of TAZARA on the premises of the supplier, the supplier shall provide all reasonable facilities and assistance for the safety and convenience of TAZARA or its inspectors in the performance of their duties without additional charge.

18. Force Majeure

a. Except with respect to default of subcontractors, the supplier shall not be liable for any excess costs if the failure to perform the contract arises out of causes beyond the control and without the fault or negligence of the supplier (force majeure) and if the supplier, within 20 days from the beginning of any such force majeure, notifies the contracting agency of such prevention of performance and the cause thereof. Such causes may include, but are not restricted to, acts of the borrower/grantee in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather, but in every case the failure to perform must be beyond the control and without the fault or negligence of the supplier. If the failure to perform is caused by the fault of a subcontractor and if such default arises out of causes beyond the control of both the supplier and the subcontractor and without the fault or negligence of either of them (force majeure) and the supplier, within 20 days from the beginning of any such force majeure, notifies TAZARA of such prevention of performance and the cause thereof, the supplier shall not be liable for any excess costs due to the failure to perform, unless the supplies or services to be furnished by the subcontractor were obtained from other sources in sufficient time to permit the supplier to meet the required delivery schedule.

b. In the event of a force majeure, the supplier, unless otherwise directed by TAZARA in writing, shall continue to undertake and perform the duties set forth in this contract as far as is reasonably practical.

c. In the event of a force majeure resulting in a suspension of work, this contract shall be extended by a period equal to that for which the supplier was prevented from performing.

d. The supplier shall be entitled to reasonable costs incurred as a consequence for a force majeure.

e. If the supplier's inability to perform by reason of the force majeure lasts for more than 45 days after notice has been given to TAZARA, either party may terminate this contract and the supplier shall be entitled to any sums which would be payable in case of termination of this contract by TAZARA for convenience.

19. Termination by TAZARA for Default

a. TAZARA may, by written notice of default sent to the supplier by registered mail, terminate in whole or part this contract:

(1) If the supplier fails to make delivery of the equipment within the time specified herein or any extension thereof, or

(2) If the supplier fails to perform any of the other provisions of this contract, or so fails to make progress as to endanger performance of this contract in accordance with its terms, and, in either of these two circumstances, does not cure such failure within a period of ten (10) days (or such longer period as TAZARA may authorize in writing) after receipt of notice from TAZARA specifying such failure.

b. In the event TAZARA terminates this contract in whole or in part as provided in paragraph a. of this article, TAZARA may procure, upon such terms and in such manner as TAZARA may deem appropriate, supplies similar to those so terminated, and the supplier shall be liable to TAZARA for any excess costs for such similar supplies. However, the supplier shall continue performance of this contract to the extent not terminated under the provisions of this article.

20. Liquidated Damages

If the supplier fails to deliver and install the commodities as scheduled in this contract, TAZARA will assess the supplier liquidated damages of \$ _____ per day, not to exceed a total of \$ _____.

21. Termination by TAZARA for Convenience

a. This contract may be terminated by TAZARA in whole, or from time to time in part, in accordance with this article, whenever TAZARA shall determine that such termination is in the best interest of TAZARA.

b. Termination shall be effected by a notice of termination to the supplier, specifying that termination is for the convenience of TAZARA, the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.

c. After receipt of a notice of termination and except as otherwise directed by TAZARA, the supplier shall:

(1) Stop work under the contract on the date and to the extent specified in the notice of termination, and place no further orders or subcontracts except as may be necessary for completion of the portion of the work under the contract which is not terminated;

(2) Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination;

(3) Assign to TAZARA as it may direct, all of the right,

title, and interest of the supplier under the orders and subcontracts so terminated, in which case TAZARA shall have the right to settle or pay any claims arising out of the termination of such orders and subcontracts;

(4) With the approval or ratification of TAZARA, to the extent TAZARA may require, which approval or ratification shall be final and conclusive for all purposes of this clause, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts;

(5) Transfer title to TAZARA and deliver, as directed by TAZARA, the completed or partially completed equipment, material, and parts which would be required to be furnished to TAZARA under this contract;

(6) Complete performance of the part of the work which has not been terminated by the notice of termination; and

(7) Take such action as may be necessary for the protection of the property related to this contract which is in the possession of the supplier and to which TAZARA has title.

d. The supplier shall submit to TAZARA its written claim promptly but not later than three months from the effective date of termination, except as TAZARA may agree in writing.

e. The supplier and TAZARA shall consult within 30 days of the submission of the claim concerning the whole or any part of the amount to be paid to the supplier by reason of the termination of work. The contract shall be amended accordingly, and the supplier shall be paid the agreed amount.

f. In deciding the amount due the supplier, all settled claims which TAZARA may have against the supplier in connection

with this contract, and the agreed price for, or the proceeds of, sale of property acquired by the supplier or sold and not otherwise recovered by or credited to TAZARA, shall be deducted.

g. Any disagreement regarding termination amounts or procedures shall be settled under the clause of this contract entitled "Disputes and Appeals."

22. Worker's Compensation Insurance

a. The supplier, before commencing performance under this contract, shall maintain coverage through worker's compensation insurance or security covering each employee to the extent required by the Defense Base Act of the United States, but in any event equivalent to coverage required by law or custom in the location where the supplier's employee is performing services. The supplier shall obtain all Defense Base Act insurance required by this clause from the Insurance Company of North America through Wright & Company, 1400 I Street, NW, Suite 1100, Washington, D.C. 20005, U.S.A.

b. The supplier agrees to insert this clause in all subcontracts hereunder except those exclusively for furnishing materials or supplies.

23. Performance Bond or Guaranty

a. The supplier shall furnish to TAZARA within 15 days after award, a performance and payment bond or performance guaranty fully protecting TAZARA against any excess costs incurred by it as a result of any failure to the supplier to perform any of its obligations under this contract.

b. Such bonds or guaranty shall be satisfactory to TAZARA

and, at the option of the supplier, shall be in the form of a surety bond, certified check, cashier's check, bank guaranty, or irrevocable letter of credit. If a performance guaranty in the form of a certified check, cashier's check, bank guaranty, or irrevocable letter of credit is used, it shall be in an amount evaluated to ten (10) percent of the contract value. If a performance bond is used, the bond shall be in an amount equivalent to ten (10) percent of the total amount of the contract value. The performance guaranty shall be drawn in favor of TAZARA and shall be collectible upon receipt of TAZARA's written certification and verification of supplier's default hereunder.

c. The bonds or guaranty shall be released not later than 30 days following the date of completion of the contract performance.

24. Warranty

The supplier shall provide a warranty under which it will replace or repair the equipment to be supplied under this contract, or repair or replace any parts of such equipment, found to be defective due to faulty workmanship or materials. Replacements and repairs shall be made without cost to TAZARA other than the cost of transportation from the port of entry to the project site. Such warranty shall be effective for twenty-four (24) months after commissioning of the equipment is completed. TAZARA shall give the supplier prompt notice of any claims under such warranty and, if the supplier fails to remedy defects within a reasonable time, shall have the right to take such remedial action as may be necessary and to claim the reasonable cost thereof from the supplier.

25. Packing

All materials and equipment must be properly prepared for export to withstand exposure to the elements and rough handling during ocean or air shipment. Such packing must be sufficient to insure safe arrival at destination and fully cover such hazards as extreme temperature and/or possible corrosion due to salt air or open storage.

26. Incidental Services

Upon delivery of equipment to the site, the supplier agrees to furnish the services of a fully qualified mechanic or serviceman to supervise the assembly and perform the initial start-up and to ensure that the equipment will be completely adjusted, lubricated with the type and grade of lubricant recommended by the manufacturer, battery fully charged, and made ready for continuous operation. All materials required for the foregoing operations shall be furnished by the supplier.

27. Spare Parts

The supplier shall furnish to TAZARA a representative list of all spare parts and components necessary for proper and continuing functioning of each unit for a period of five years. The list will be prepared in such form so that each line item can be readily identified by the manufacturer's part number, nomenclature, and unit.

28. Suspension of Work

a. TAZARA may, at any time, by written order to the supplier (suspension of work order), require the supplier to stop all, or any part, of the work required by the contract for a period of up to 90 days from the specified effective date.

b. Upon receipt of such an order, the supplier shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs related to the work covered by the order.

c. Within the period of the suspension of work order, TAZARA shall either:

(1) Cancel the suspension of work order; or

(2) Terminate the work covered by such order as provided in the "Termination by TAZARA for Convenience" clause of the contract.

d. If the suspension of work order is cancelled or the order expires, the supplier shall resume work. An equitable adjustment shall be made as necessary in the time schedule, the price, or a combination thereof, of any other provisions of the contract that may be affected and the contract shall be amended accordingly, if the supplier asserts a claim for such adjustment within 30 days after the end of the period of work suspension. Failure to agree to any adjustment shall be a dispute under the "Disputes and Appeals" clause of the contract.

29. Equal Employment Opportunity

The supplier will not discriminate in recruitment or employment conditions of personnel hired in the United States because of race, religion, color, sex, or national origin and is in compliance with its equal employment opportunity obligations under Executive Order 11246 dated September 24, 1965.

30. Vesting of Title and Diversion Rights

AID reserves the right to vest in itself title to the goods financed under this contract, provided that such goods are in a deliverable state and have not yet been offloaded in ports of entry in the cooperating country. AID may direct the carriers to divert these goods to alternative destinations.

31. Escalation

Freight costs will be paid in accordance with those submitted in the bid if there is no change in bunker or congestion surcharges between bid opening date and shipping date. The bidder will furnish with its bid, a copy of the page(s) of the prevailing tariff in effect on the bid opening date showing the bunker and/or congestion surcharges applicable to the shipping period(s) of the intended shipments which are on file with the U.S. Federal Maritime Commission and have been published in the applicable shipping conference tariff. If bunker or congestion surcharges are increased or decreased subsequent to bid opening date, calculation of the increase or decrease will be the difference between the tariff rates submitted with the supplier's bid and the applicable effective tariff rate at the time of shipment. TAZARA agrees to make payment on the basis of the cost of goods delivered at destination adjusted in accordance with the above procedure. In order that TAZARA may make necessary amendments to the financing documents prior to shipment, the supplier will provide information to TAZARA concerning any increases in bunker or congestion surcharges that the carrier has filed with the Federal Maritime Commission subsequent to the bid opening date.

32. Marine Insurance

The supplier shall provide all risk marine insurance on a

warehouse-to-warehouse basis at 110 percent of the c.i.f. value of each shipment. The premiums shall not exceed the prevailing rate for similar coverage, and all loss payment proceeds shall be payable in any freely convertible currency. The source of any goods financed by loss payments which are used to repair or replace goods procured under this contract shall be AID Geographic Code 935.

33. Notices

Any notice given by either party will be in writing or by telegram or cable and will be deemed duly given or sent when delivered to the following addresses:

To Supplier: (to be decided after tender evaluation)

To TAZARA: General Manager,
Tanzania Zambia Railway Authority
P.O. Box 2834
Dar es Salaam,
Tanzania (Telex 41059 TAZARA, TZ)

Notices shall be effective when delivered or on the effective date of the notice, whichever is later.

SECTION IV. SPECIAL CONDITIONS OF CONTRACT

NOTE: The article number refers to the articles in the General Conditions of Contract.

ARTICLE NUMBER		PAGE
1.	DEFINITIONS	1-IV-1
3.	DELIVERY AND DOCUMENTS	1-IV-1
6.	PAYMENT	1-IV-3
17.	INSPECTION APPROVALS AND TESTS	1-IV-4
24.	WARRANTY	1-IV-6
26.	INCIDENTAL SERVICES	1-IV-6
27.	SPARE PARTS	1-IV-7.
32.	MARINE INSURANCE	1-IV-7
ADDITIONAL ITEMS		
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B.	TECHNICAL ASSISTANCE	1-IV-8
C.	TRAINING PROGRAM	1-IV-11
D.	MAINTENANCE TOOLS AND EQUIPMENT	1-IV-13
E.	TESTING TOOLS AND EQUIPMENT	1-IV-13

SECTION IV. SPECIAL CONDITIONS OF CONTRACT

The special conditions of contract contained herein shall supplement and shall be read with the general conditions of contract. Whenever there is a conflict, the special conditions shall prevail over those in the general conditions of contract. The article numbers given below refer to the articles in the general conditions of contract.

1. DEFINITIONS

In this contract the following terms shall be as defined below.

- f. The buyer is the Tanzania Zambia Railway Authority (TAZARA).
- g. The supplier is (name of supplier).
- h. The United States Agency for International Development is providing funds for the contract and is responsible for making payments on behalf of the buyer.

3. DELIVERY AND DOCUMENTS

3.1 Goods Transport by Sea

Upon shipment, the supplier shall notify the buyer and the insurance company by cable or telex the full details of the shipment including contract number, description of goods, quantity, the vessel, the bill of lading number and date, port of loading, date of shipment, port of discharge. The supplier shall send by air mail the following documents to the buyer, with a copy to the insurance company:

- (i) Copies of the supplier's invoice showing goods description, quantity, unit price, total amount;
- (ii) Original and three copies of the negotiable, clean, on-board bill of lading marked freight prepaid and three copies of non-negotiable bill of lading;
- (iii) Copies of packing list identifying contents of each package;
- (iv) Insurance certificate;
- (v) Manufacturer's/supplier's warranty certificate;
- (vi) Inspection certificate, issued by the buyer or his duly authorized inspection report; and
- (vii) Certificate of origin.

The above documents shall be received by the buyer at least one week before arrival of goods at the port and, if not received, the supplier will be responsible for any consequent expenses, including costs, delays, and claims for demurrage and liquidated damages.

3.2 Delivery Schedule

A detailed delivery schedule shall be agreed between the buyer and the supplier before the date of contract and that schedule shall form part of the contract. The schedule shall define the size of each delivery batch and the date of each delivery. It shall closely follow the schedule given in the supplier's tender and it shall form the basis of any calculation of

liquidated damages pursuant of article 24 of the general conditions of contract.

The buyer shall not accept the first or any subsequent delivery batch before the design, calculations, and drawings, pursuant to articles 43, 45, and 50 of the technical specifications have been fully approved by the buyer.

3.3 Point of Delivery

The locomotives shall be shipped to Dar es Salaam and landed/unloaded on TAZARA track.

3.4 Delivery Certificates

The goods will be offered to the buyer for acceptance at the selected point of delivery pursuant of article 41.9 of specification. The buyer shall arrange for each delivery batch of goods to be inspected and he shall issue a delivery certificate in respect of that part of each batch which is found to comply with the technical specification in all respects.

6. PAYMENT

- d. All payments will be made by USAID/buyer to the supplier in the currency or currencies declared in Section VII of the tender.
- e. All payments shall be made pursuant of article 6 of the general conditions of contract.
- f. No payment shall be made before signature of the contract pursuant of article 6 of the instruction to bidders and the furnishing of performance security pursuant of

article 23 of the general conditions of contract.

- g. Advance payments shall be made on behalf of the buyer within 30 days of receipt by the buyer of the relevant invoice and payment security from the supplier. All other payments shall be made on behalf of the buyer within 60 days of receipt by the buyer of the appropriate invoice and/or certificate from the supplier.
- h. If as a result of any change order pursuant to article 13 of the general conditions of contract or for any other reason the total amount payable to the supplier is changed during the course of the contract, appropriate adjustments will be made to the delivery payments.
- i. Performance Retention

An amount equal to 5 percent of the total value of the contract price or any revision of the contract price shall be paid after full delivery and acceptance of the last delivery as follows. The balance of the total value of the contract price, or revision of the contract price, will be paid after all claims under the conditions of warranty and other conditions of the contract have been satisfactorily met or on the expiry of the warranty period, whichever is later.

17. INSPECTION APPROVALS AND TESTS

- c. The buyer shall notify the supplier of the names of all employees authorised to approve procedures, inspect and attend tests on his behalf, together with any restrictions placed on the powers and authority of such employees.
- d. The buyer shall similarly advise the supplier of all agents not being employees who are appointed to carry out approvals and inspections and witness tests on his behalf.
- e. The buyer shall meet all costs of travel, accommodation,

and subsistence incurred by his duly authorised employees and agents in carrying out such inspections and attending inspections and tests.

- f. The buyer shall pay all fees payable to duly appointed agents.
- g. The supplier shall pay the costs of all tests specified in the contract.
- h. Approval of Design, Calculations, and Drawings

At the signature of contract, the supplier shall notify the buyer of the date when the detail design, calculations, and drawings, as defined in article 43 of the technical specification, will be available for checking and approval.

The buyer shall send to the supplier's factory a team fully authorised and qualified to examine and approve on behalf of the buyer all the documents so defined in the technical specification. The buyer's team shall approve or otherwise make final comment on these documents within 10 working days of the date all documents were presented for approval.

The supplier shall undertake to revise and resubmit his documents at a time mutually agreed with the buyer's team. No such resubmission of the documents shall be taken as a reason for extending the agreed dates for delivery of the goods.

Any materials or components ordered or work commenced before the designs, calculations, and drawings are fully approved by the buyer shall be undertaken at the supplier's risk.

The buyer's team shall approve, or otherwise refer back to the supplier, these documents as described in the technical specification, within 10 working days of the date documents are presented for approval.

- i. Inspections and Tests

Notwithstanding the buyer's right to inspect the goods at any time, the following principal inspections and tests

shall be made by the supplier. The buyer shall be given the opportunity to carry out his own inspections at these times and to witness all the tests specified. The supplier shall give due notice of his intention to carry out such tests.

All tests shall be carried out in accordance with the provisions of the technical specification.

List of principal tests.

- Testing and inspection of components before assembly.
- Tests on subassemblies.
- Tests on the first batch of locomotives.
- Acceptance and inspection of all locomotives, spare parts, and maintenance equipment before dispatch from the factory.
- Delivery tests and inspection at the point of delivery.

j. Acceptance Certificate

The supplier shall not dispatch any goods from his factory without an acceptance certificate from the buyer's representative.

24. WARRANTY

The warranty period for all locomotives shall be 24 months from the in-service date as defined in article 24 of the general conditions of contract.

The guaranty provisions detailed in article 4 of the technical specification shall also apply.

26. INCIDENTAL SERVICES

The following services covered under article 26 of the

general conditions of contract shall be furnished. The cost shall be included in the contract price.

- (i) Design of locomotives, including spares, tools and equipment.
- (ii) Performance of assembly at the port of delivery if appropriate.
- (iii) Recommendations of tools and equipment required for maintenance of locomotives and furnishing of such tools and equipment if so ordered by the buyer.
- (iv) Furnishing of detailed operations and maintenance manuals, troubleshooting guides, and training models/aides to assure understanding of maintenance procedures by workshop personnel.
- (v) Conducting training of buyer's personnel in locomotive operation, maintenance, and/or repair at the buyer's location.

27. SPARE PARTS

The spare parts to be supplied and paid for under this contract shall be defined by the buyer and listed in the contract.

Spare parts shall be delivered in the quantities defined by the buyer at award of contract and at the unit prices offered by the supplier in his accepted tender. These spare parts shall all be delivered with the first order of locomotives.

32. MARINE INSURANCE

The insurance shall be in an amount equal to 110 percent of the c.i.f. value of the goods from "warehouse and warehouse"

on "all risks" basis including war risks and strike clauses.

ADDITIONAL ITEMS

A. PRICES

The prices payable to the supplier shall be strictly in accordance with the price schedule. No adjustments to allow changes in costs of labor, material, or other elements of cost will be made with the exception of approved, written contract change orders.

B. TECHNICAL ASSISTANCE

The manufacturer's locomotive technical assistance (service engineer) scope of work is defined as follows:

- o Provide complete technical assistance to TAZARA in the form of service engineering which includes review of manufacturer's locomotive servicing instructions with workshop and depot personnel assigned to perform the tasks.
- o Observe adherence to instructions by artisans (workshop/depot mechanics and inspectors) in performing daily inspection and maintenance tasks.
- o Monitor performance of assigned artisans and technicians, and provide direction for correction of nonadherence to instructions on all levels of inspection and maintenance.

- o Enlist supervisory/management involvement where understanding is not achieved.
- o Provide technical direction to all levels of workshop and depot personnel on operation and maintenance of locomotives.
- o Review maintenance manuals, operation manuals, and troubleshooting guides with all levels of workshop and depot personnel.
- o Provide technical assistance/direction to workshop personnel in determining cause of any locomotive malfunction. Relate this action to troubleshooting instructions.
- o Provide all levels of on-the-job (hands-on) training at every opportunity and as time permits.
- o Conduct classroom training where group presentations and demonstrations can be more effective than on a one-on-one basis.
- o Provide technical assistance to TAZARA personnel in their performance of each level of inspection and maintenance on each locomotive including:

Daily	One Year
Monthly	Two Year
Three Month	Three Year
Six Month	Four Year

- o Provide technical direction to supplies and storeroom personnel for analysis of spare parts replenishment requirements including parts identification and

quantities.

- o Assist manufacturer's training program personnel (instructors/teachers) in conducting classroom sessions.
- o Provide hands-on training to classifications of artisans, technicians, and others responsible for performing the 4-year (overhaul) inspection and maintenance schedule and train as many workers as available during the period covering this work on the first eight locomotives.

The qualifications of locomotive service engineers required to provide the above defined technical assistance work scope are as follows:

- Education - Graduate mechanical engineer or equivalent.
- Experience - Minimum of 8 years as locomotive service engineer (diesel electric).
- Interests - Getting a first-hand education in problem solving in third-world developing countries.
 - Living in a remote area/seeing the wilds.
 - Traveling/learning new languages.
 - Self-learning of locomotive maintenance practices and achieving self-accomplishment.
 - Self-confidence.
 - Patience -- if the work force doesn't learn the first time try, try again.

- Instructor/teacher.

- Stamina.

Other - Fluent in English (read and write).

Period of technical assistance would total 5 years, starting at time of locomotive delivery up to and including completion of the 4-year overhaul on the last of eight new locomotives.

C. TRAINING PROGRAM

The selected locomotive manufacturer must plan, develop, and conduct a full training program for all levels of TAZARA workshop and depot personnel. The training must be performed on-site in Mbeya, Tanzania and must be scheduled to start when locomotives are delivered and continue until the defined acceptable level of competence is achieved.

The TAZARA personnel who will receive training have a broad range of educational and experience backgrounds. The entry level person for Artisan III classification level may not be able to read English or even Kiswahili. Kiswahili is spoken fluently and spoken English is usually understood. The other end of the range could consist of college graduates (usually technical) with some years of railway locomotive maintenance and operational experience.

The results of the training program are expected to be:

<u>CLASSIFICATION</u>	<u>LEVEL OF COMPETENCE/CAPABILITY</u>
Artisan III	- A trained mechanic's assistant
Artisan II	- A fully trained locomotive mechanic

1-IV-11

101 x

- Artisan I - A fully trained mechanic (electrical or mechanical) with broad technical knowledge to lead and direct
- Technician IV - Trained equivalent to a 2-year technical/vocational school level with 2 years of hands-on locomotive experience

The individuals who achieve the above levels of capability/competence will do so based on their learning ability, their interest in accomplishment, and the incentives offered to them by TAZARA.

The training program should be designed to allow the participants the opportunity to raise their level of ability to perform the tasks required in the locomotive inspection and maintenance schedules. They should be able, after completing the training program, to perform the tasks without additional technical assistance from the manufacturer's service engineers.

The training program must be of a duration to achieve these results. The program will be conducted simultaneously with the hands-on (on-the-job) training given by the manufacturer's technical assistance service engineers.

TAZARA advises that the training program should be conducted 5 days per week with no more than 2 to 3 hours of classroom work per day. The remainder of their 8-hour day should be spent on performing maintenance work in the workshop at a level that matches their achieved level of competence.

A demonstration room at the Mbeya workshop will be available (approximately 600 square meters) for classroom use.

D. MAINTENANCE TOOLS AND EQUIPMENT

The tenderer must include a list of all maintenance tools and equipment which would be required in performing all levels of maintenance recommended by the manufacturer. The list must include complete definition of tools or equipment, description of purpose and use, price, source, and delivery availability.

The buyer will review and evaluate workshop requirements and, with consideration to cost of tools and equipment, decisions will be made and orders placed for necessary items.

E. TESTING TOOLS AND EQUIPMENT

The tenderer must include a list of all testing tools and equipment which would be required to test and verify correct operation of locomotives and all locomotive components normally tested after maintenance or repair work. The list must include complete definition of testing tools and equipment, description of purpose and use, price, source, and delivery availability.

The buyer will review and evaluate workshop requirements and, with consideration to costs of testing tools and equipment, decisions will be made and orders placed for necessary items.

SECTION V. SCHEDULE OF REQUIREMENTS

The submittal and delivery requirements for the diesel electric locomotives and associated spare parts, tools, and equipment for maintenance and testing, technical assistance, and maintenance training program for working personnel is as follows:

PHASE I ORDER

- o Tender submittal per invitation for tenders
- o Quantity of eight (8) locomotives -- 12 months from receipt of order
- o Recommendations for spare parts -- included in tender submittal
- o Recommendations for maintenance tools and equipment -- included in tender submittal
- o Recommendations for testing tools and equipment -- included in tender submittal
- o Technical assistance -- to start on locomotive delivery date in Dar es Salaam
- o Recommendations for maintenance training program -- included in tender submittal
- o Training program -- to start on locomotive delivery date at Mbeya
- o Maintenance manuals -- with locomotive delivery
- o Troubleshooting guides -- with locomotive delivery
- o Training program materials and demonstration equipment -- with locomotive delivery
- o Spare parts, maintenance and testing tools/equipment -- with locomotive delivery

PHASE II ORDER

- o Quantity of nine (9) locomotives -- 12 months from receipt of order
- o .Recommendations for spare parts -- included in option part of tender submittal
- o Spare parts -- with locomotive delivery
- o Technical assistance -- to start on locomotive delivery date in Dar es Salaam

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DIESEL ELECTRIC MAINLINE LOCOMOTIVES

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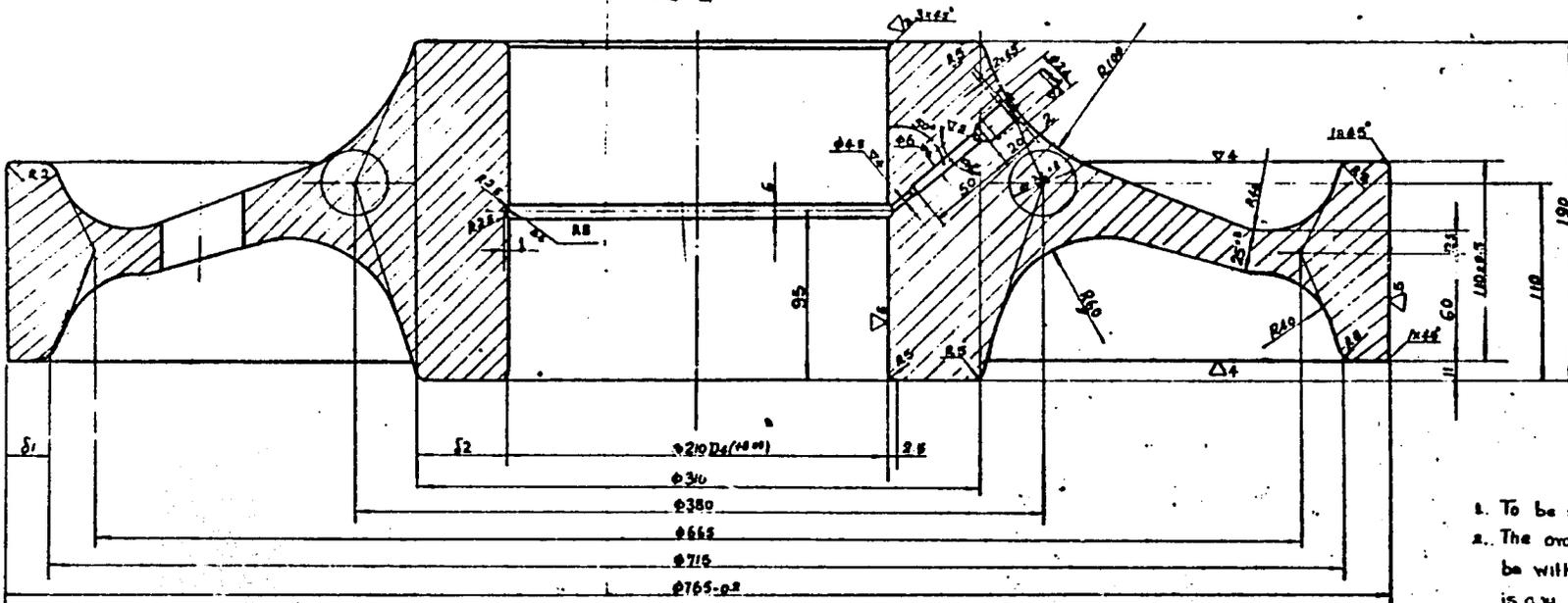
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LIST OF ATTACHED DRAWINGS

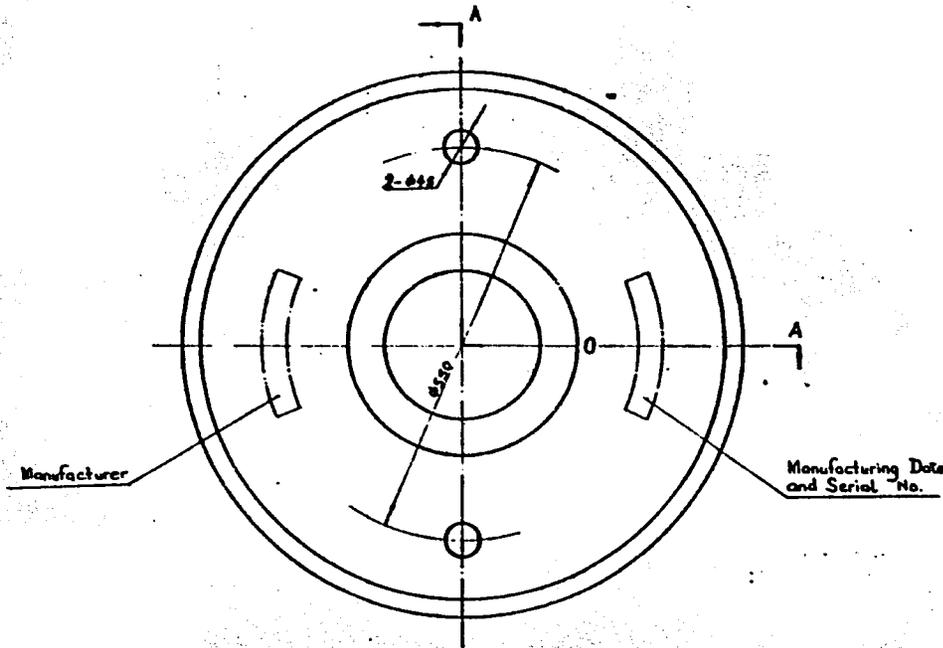
Title	Drwg. No.
1. Structural Gauge on TAZARA	MED-LS 002A
2. Locomotive Wheel Tyre	MED-LS 003
3. Locomotive Wheel Centre (Rim)	MED-LS 004
4. Locomotive Brake Block	MED-LS 005
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7. Air Brake Hose and Coupling	MED-LS 007
8. Vacuum and Air Brake End Pipe Arrangement	L40-06-000 Issue A
9. Cow-Catcher	L40-04-0010 Issue A
10. Cow-Catcher Arrangement	L40-04-000 Issue A
11. Tunnel Gauge	MED-LS 009

M1.2

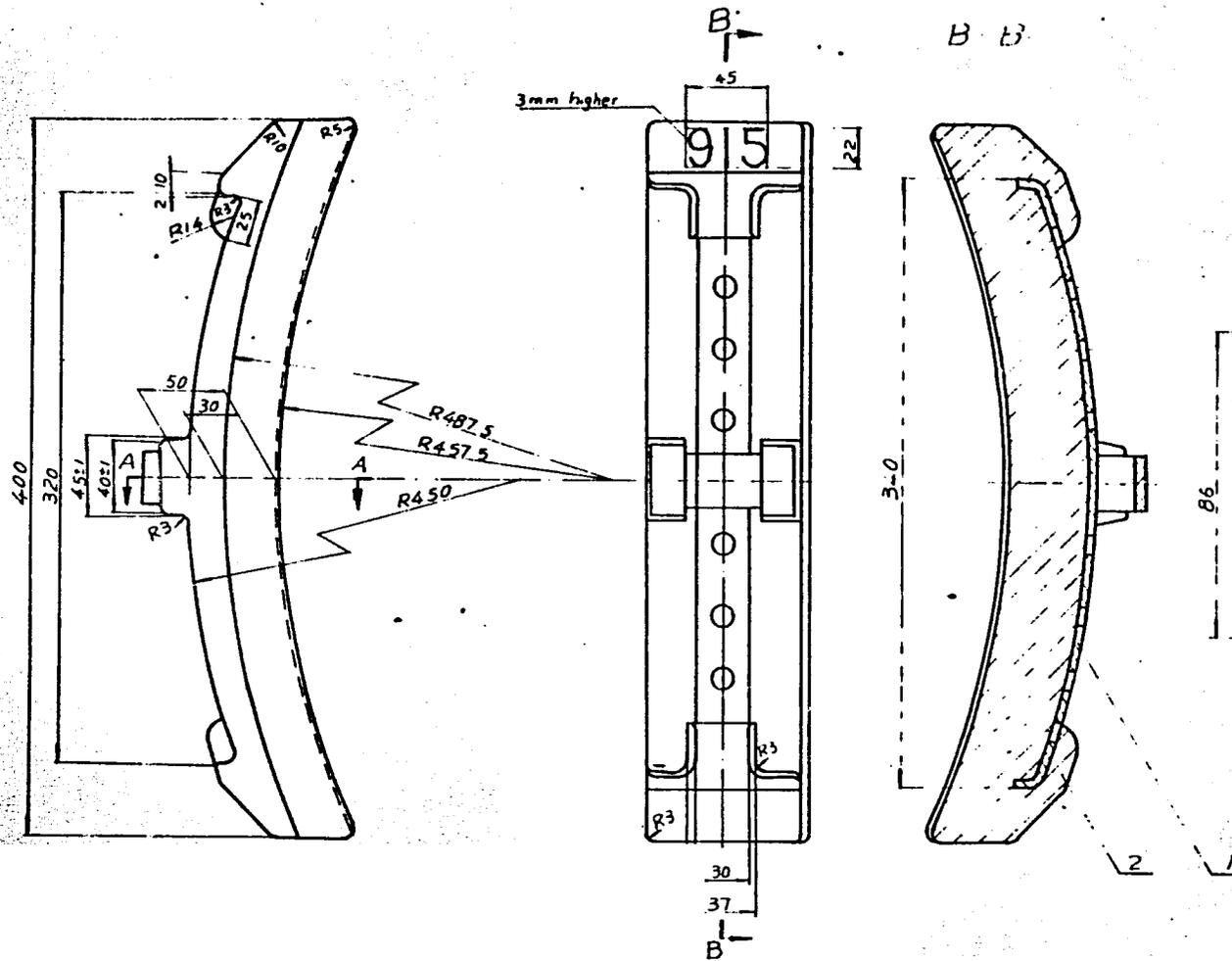


Technical Requirement.

1. To be shot peened.
2. The ovality and conic of hub hole $\phi 210$ should be within 0.05 and 0.1 mm respectively. (If there is any conic, the big end must be the top end as shown in the drawing)
3. The run-out of the rim $\phi 765$ with respect to the hub hole $\phi 210$ should be within 0.5 mm.
4. The ovality and conic of $\phi 765$ should be within 0.2 and 0.1 mm respectively.
5. The difference in thickness ($\delta 1$) of any two sections at the rim should be within 3 mm, and the difference in thickness ($\delta 2$) of any two sections of the hub should be within 4 mm.
6. The outer diameter of the rim $\phi 765$ should be 0.8-1.1 mm greater than the inner diameter of the tire.
7. Hole $\phi 210 \pm 0.04$ may be machined with a tolerance of 0.1 mm and then the mated axle should be machined to provide a specified interference.



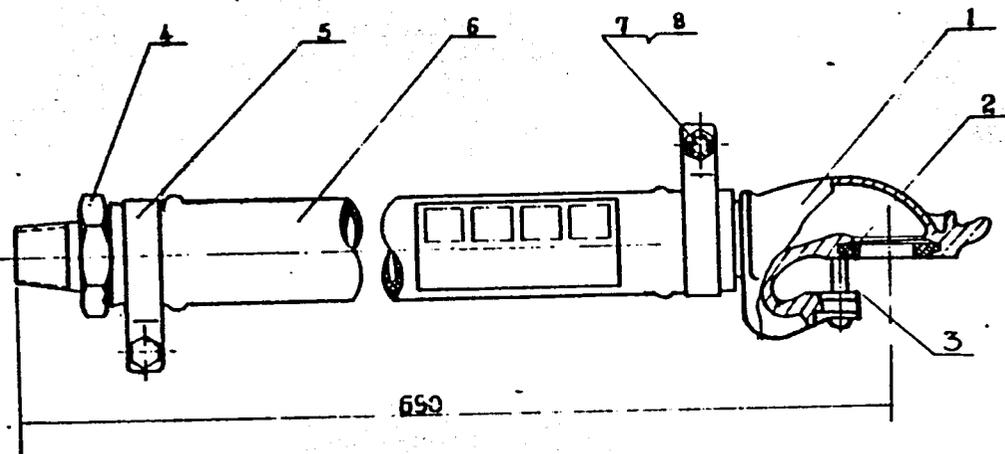
LIST NO.	CHANGE NO.	DESCRIPTION	DATE	APPROVED	DESIGNED BY	DATE	MANUFACTURED BY	TANZANIA ZAMBIA RAILWAY
								DIM LOGS & ROLLING STOCK ENGINEERING
								MW1-52-01-005
								DRG 100
								WHEEL
								CENTRE
								SCALE 1:5
								ZG 25 II
								WEIGHT 273



2		Brake Shoe	1	HT20-40	14.1
1	DEHI-5505 401	Brake Shoe Back	1	Steel Plate	8.66
Item No	Drawing No	Name	Quan	Material	Wt Total
TANZANIA ZAMBIA RAILWAY					
DESIGN, ENGINEERING & ROLLING STOCK REPAIR WORKS					
LETTER	CHANGE NO	DESCRIPTION	DATE	APPROVED BY	DATE
				DESIGNED BY: S. ZEMBO	
				CHECKED BY: H. M. M. M.	
				APPROVED BY: H. M. M. M.	
					SCALE: 1:2
					WORKING: 1:10

7/11

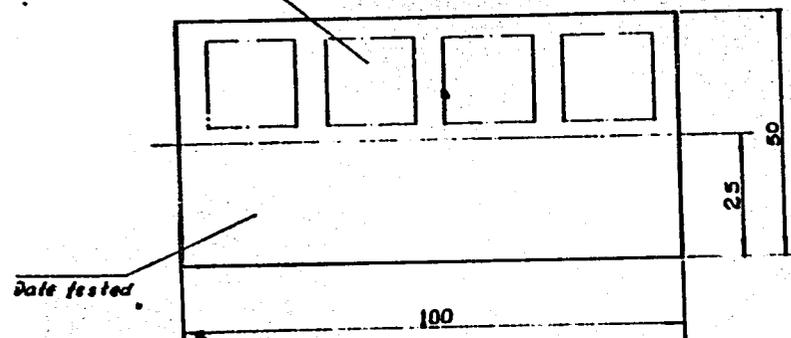
AIR BRAKE HOSE & COUPLING



Example of designation
Air BK. Hose & Coupling

Pc No	Standard	Name of part	Qty	Material	(Kg) Unit wt	(Kg) Total wt	Remarks
1	TB 60-001	Coupling	1	KT30-6		1.2	
2	TB 60-002	Gasket	1	Rubber		0.008	
3	TB 60-003	Guard Arm Pin	1	Al		0.008	
4	TB 60-004	Hose Nipple	1	KT30-6		0.6	
5	TB 60-005	Hose Clamp	2	Al	0.18	0.36	
6	TB 60-006	Hose	1	Duck Reinf Rub Tubg			
7	GB 18-66	Hex Hd Bolt M8 x 40	2	ML2	0.006	0.012	
8	GB 45-66	Hex. Nut AMB	2	ML2	0.02	0.04	

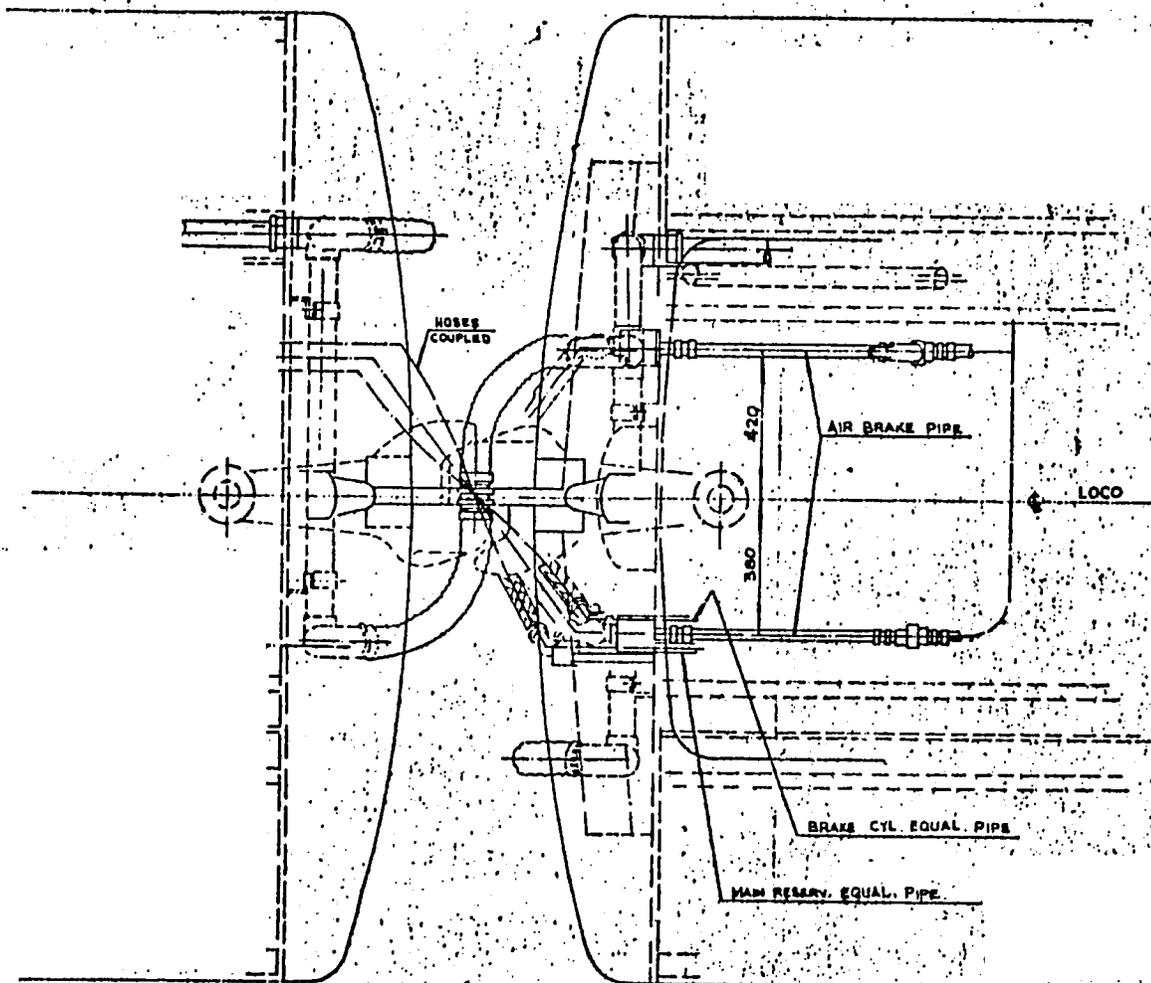
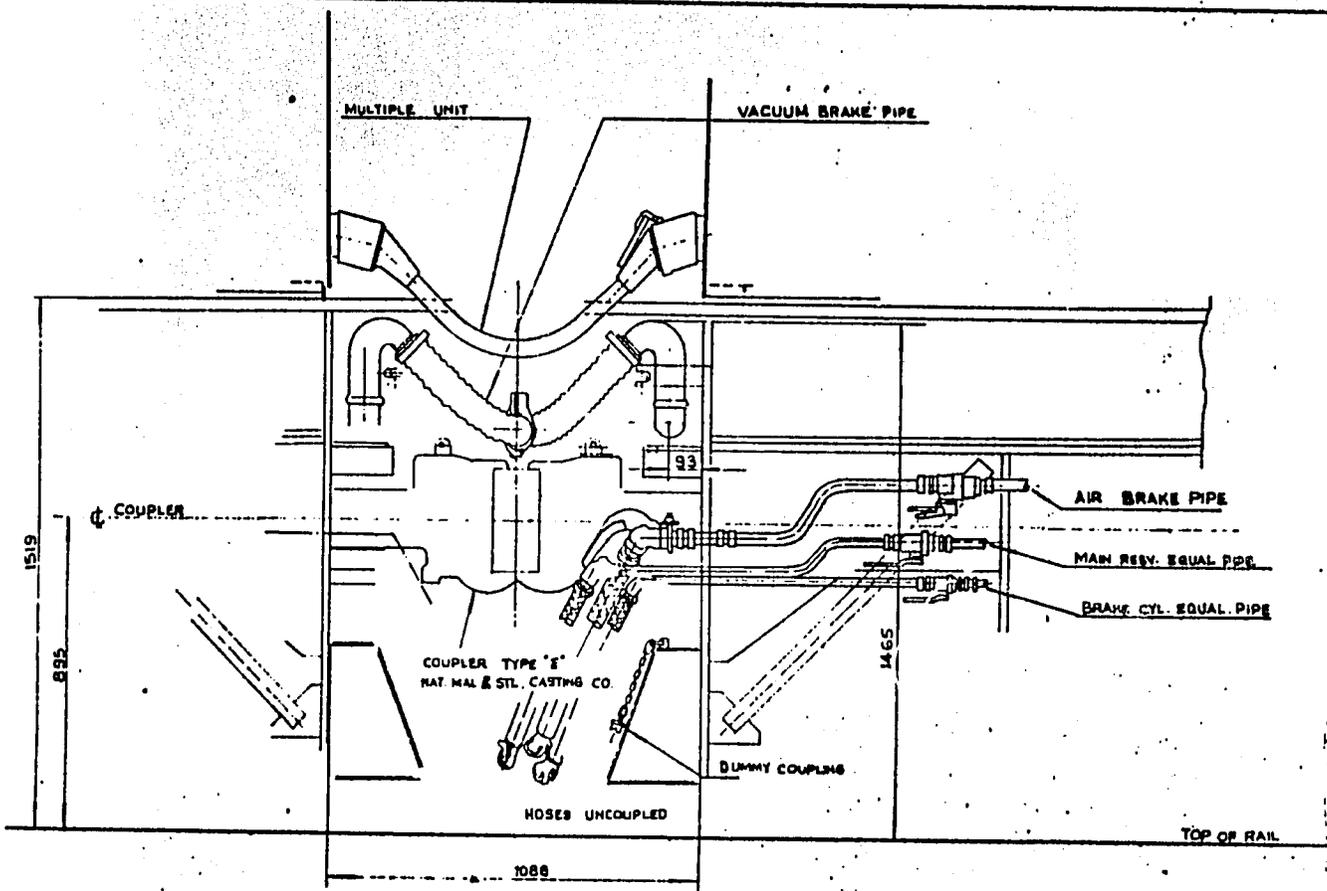
Name of works
Name of works or depots

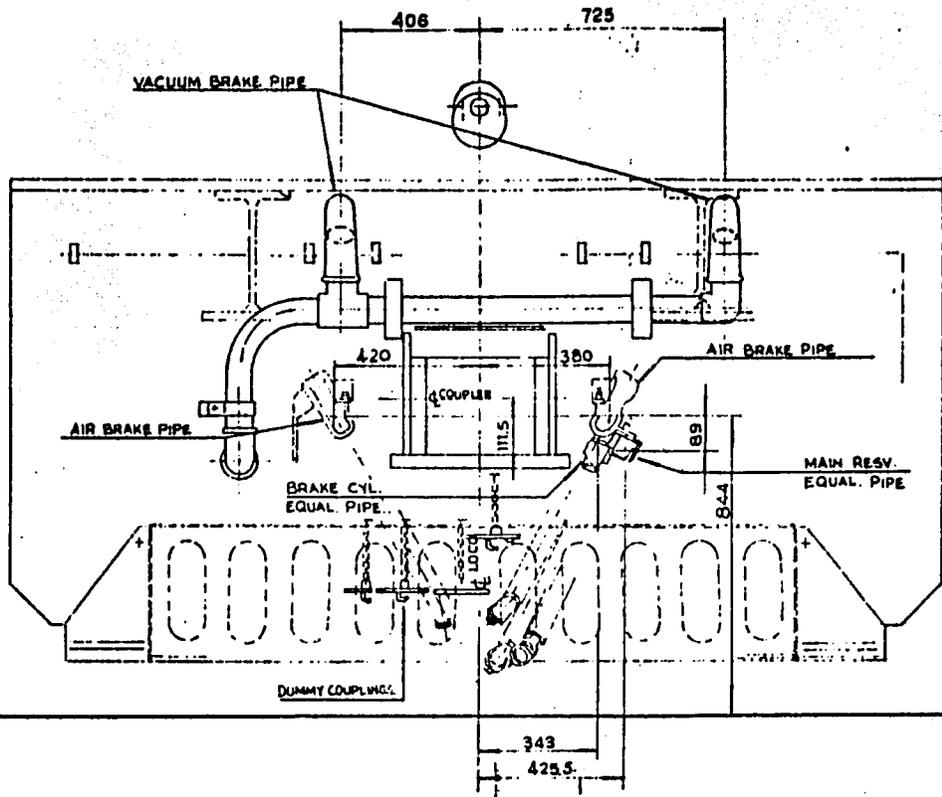


Marks to be stencilled white enamel

LETTER	CHANGE NO	DESCRIPTION	DATE	ORIGINATOR	DRAWN BY	H. S. MUKUMU	TANZANIA ZAMBIA RAILWAY
							DSM LOCU & ROLLING STOCK REPAIRWORKS
					CHECKED BY	H.S. Mukumu	TB 60-59
					APPROVED BY	H.S. Mukumu	DWG NO
							SCALE
							WEIGHT 3.3 Kg

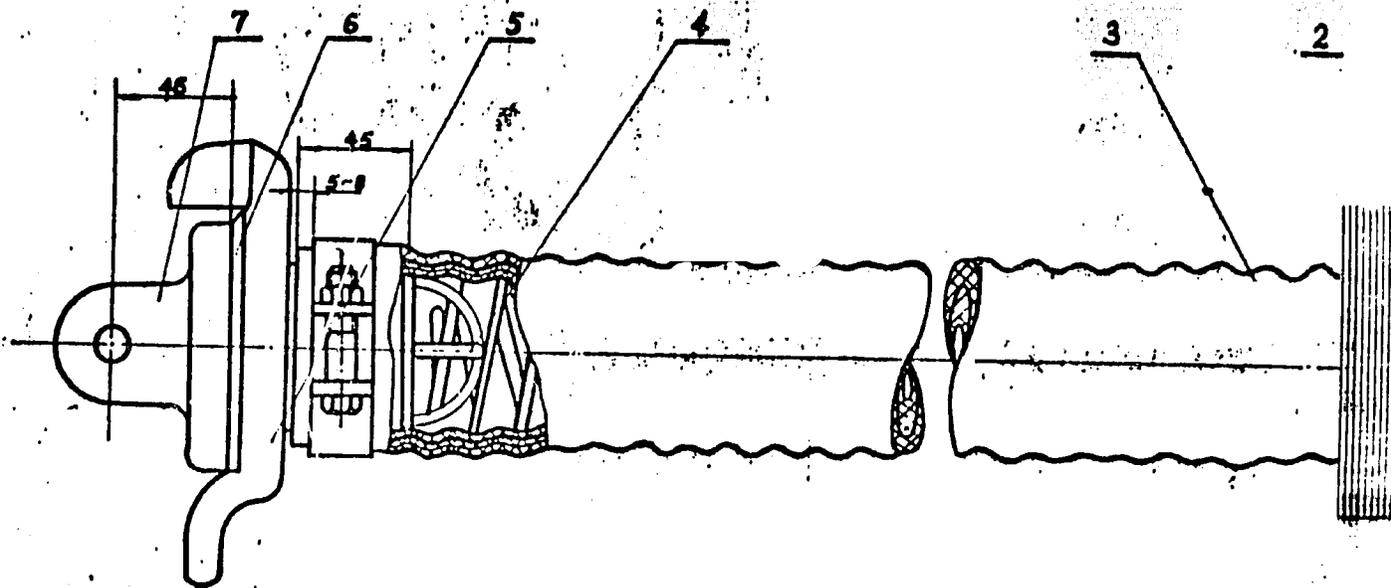
116





118

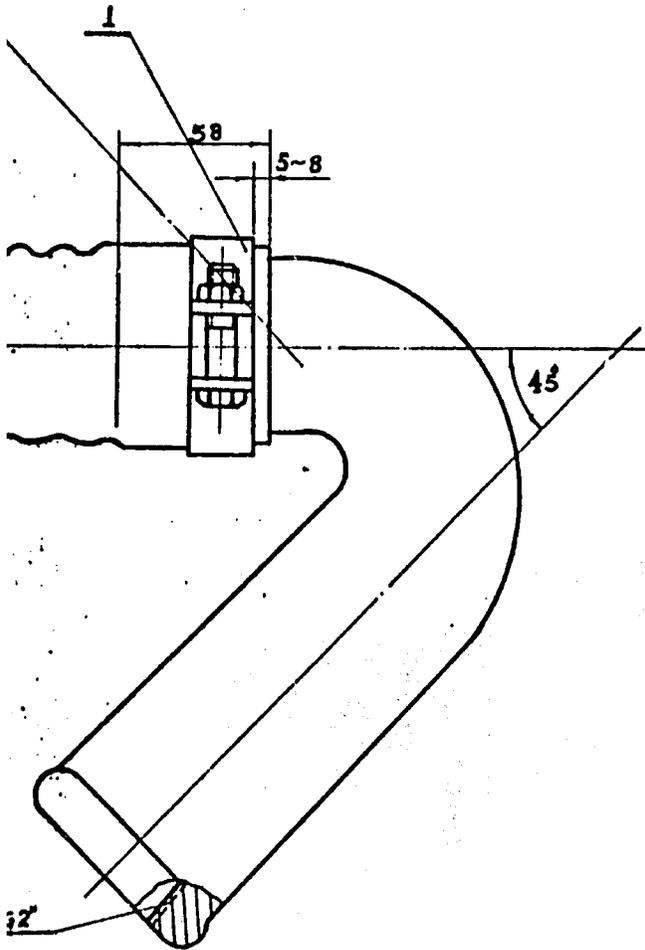
DESIGNED	TANZANIA ZAMBIA RAILWAY AUTHORITY		
DRAWN	MECHANICAL ENGINEERING DEPT. DAR-ES-SALAAM.		
TRACED	VACUUM & AIR BRAKE END PIPE ARRANGEMENT		
CHECKED			
PASSED			
APPROVED	DIMENSIONS	MM	DRG NO: L40-06-000
SCALE 1:10	MANUF. DRG. NO. Ld. 40637		ISSUE A



Technical Requirements

1. Clamps must have an uniform tightness on hose when securing hose to coupling and swan neck. Distance between the two bolting lugs on hose clamp should be 15-25mm.
2. In assembly the locating lugs of the coupling should be placed 180° to the swan neck.
3. With the dummy coupling being tightly clamped with the coupling, the hose and coupling assembly should be subjected to an air pressure of 1kg/sqcm. When it submerged in water, holding for 1 minute any bulbs occurring at any part of the coupling are not permitted.
4. After passing the test, all parts should be cleaned. The dummy coupling should be tied to the coupling with wire or cord, and the pipe connection of swan neck be plugged by a spigot.

MED LS 006



7	2" Dummy Coupling	QZ45-5	1.75		
6	Gasket	Rubber	0.001		
5	2" Hose Coupling	QZ45-5	0.9		
4	Wire Guard	Q 5H. Wire 1-2.5YB544-65	0.014		
3	2" 610 Hose Pipe	Duck Reinforced Rubber Tube	1.55		
2	Swan Neck	QZ45-5	0.9		
1	Clamp Complete		0.54		
Item No.	Name	Material	Wt.	Total Wt.	Remark.

28.000000

H/S clamp 2" HOSE & COUPLING ASSY
H/S clamp (SWAN NECK)

QCP418-00-01

1:2

5-6

TENDER

This tender specification is for the supply of seventeen (17) diesel electric high-output mainline locomotives to be used for the haulage of heavy goods traffic as well as medium-weight passenger trains. The seventeen (17) locomotives will be purchased in two batches. The first batch of eight (8) locomotives will include spare parts sufficient to maintain the locomotives at their optimum level during the first five (5) years. Also included will be equipment, tools, technical assistance, and a program of training, including all necessary maintenance manuals, detailed troubleshooting guides, training aids, and instructors. The purchase of a second batch of nine (9) locomotives will be contingent on the realization of TAZARA's forecasted increases in annual freight haulage and compliance to certain performance improvements. This batch will be priced as an option, and will include spare parts sufficient to maintain the nine (9) locomotives at their optimum level during the first five (5) years of operation. The prices for the option must hold to January 1990. Extension of technical assistance and training will also be included.

TECHNICAL SPECIFICATION FOR DIESEL ELECTRIC MAINLINE LOCOMOTIVES

This specification shall apply to all mainline locomotives on order. The specification and its attachments shall be read together.

1. Definitions

1.1 In this specification the following definitions shall apply:

1.1.1 "Authority" means the Tanzania Zambia Railway Authority (TAZARA).

1.1.2 "Agent" means a person(s) appointed from time to time by the Authority and notified in writing to the contractor to act as an agent for the purpose of the contract on behalf of the Authority.

1.1.3 "Inspector" means the official designated by the Authority or a representative or agent appointed by the Authority to carry out inspection work.

1.1.4 The "contractor" means the firm or company with whom contract for the supply of complete locomotives is placed.

1.1.5 "Subcontractor" means any person, firm, or company from whom the contractor may obtain materials or components to be used in the manufacture of the locomotives or parts thereof.

- 1.1.6 "Contract drawings" means the drawings which are exhibited or provided for the guidance of the contractor.
 - 1.1.7 "General conditions of contract" means the Authority's conditions of contract.
 - 1.1.8 Abbreviations "B.S.S." means British Standards or British Standard Specifications.
 - 1.1.9 Abbreviations "I.S.O." means International Standards Organisation.
 - 1.1.10 "U.I.C." means International Union of Railways.
 - 1.1.11 "AAR" means Association of American Railroads.
 - 1.1.12 Major components shall mean the diesel engine, alternator, traction motors, bogies, and compressor/exhauster.
- 1.2 Headings to paragraphs of this specification shall not affect the interpretation thereof.

2. Tender Requirements (General)

- 2.1 Tenderers must be diesel electric locomotive manufacturers located in the USA. They must have extensive experience over a long period of time in the design and manufacture of locomotives. Tenderers must have significant experience in the design and

manufacture of locomotives essentially similar to those referred to in this specification. Tenderers must submit adequate and detailed data and information to show to the satisfaction of the Authority that they comply with this requirement.

2.2 Tenderers must SPECIFICALLY AND SEPARATELY note, acknowledge, indicate compliance or otherwise with, reply to, comment on, or furnish the information and/or data called for against, as the case may be, EACH and EVERY individual article and sub-article of this specification. This shall be in the form of an article-by-article commentary, separate from any specification or technical data which the tenderer may submit.

2.3 Tenderers must furnish at the time of offer submission, complete and detailed information, comments, data, drawings, and illustrations as called for in this specification such that the technical details of their offers are complete and clear thus allowing evaluation, comparison, and adjudication of their offers to be carried out.

2.4 Tenderers will not assume that any information or data supplied to the Authority at an earlier date for whatever purpose is still available. They shall therefore not make any reference to such information in their response to this specification. Tenderers must not assume that the Authority is familiar with any products offered by them.

2.5 Should tenderers, in submitting information, data, etc. called for in the specification, enclose existing or available literature, pamphlets, drawings, illustrations, etc. which refer to their locomotives or

components, and should such enclosures illustrate or describe more than one type, model, or design of equipment concerned, such enclosures shall be specifically marked up in a clearly distinguished manner to indicate or draw attention to the relevant mode, section, illustration, etc. which is directly applicable to the locomotive or component being offered.

- 2.6 The offers shall be for locomotives complying fully with all the requirements of this specification. If there are any minor details in the main offer which do not fully comply to this specification, tenderers must draw specific attention to each and every instance or detail in which the locomotive differs from the specified requirements. Tenderers must in all such instances furnish detailed reasons and comments as to why they are unable or unwilling to meet the specification. In addition, they must furnish complete and detailed information, comments or data in respect of the items or details which differ from the specified requirements.
- 2.7 Should the Authority decide during adjudication of tenders that a proposed minor departure from specified requirements of the kind outlined in article 2.6 above cannot be accepted, this may result in the offer in question being rejected entirely.
- 2.8 In addition to offers which comply fully with the requirements of this specification, tenderers may also offer as alternatives, variation of details which they consider may be acceptable by the Authority and are of positive advantage to the performance of the locomotives on offer. However, upward variations of axle-load, maximum bending stresses in rail maximum

stress range, or variation in essential draw gear dimensions or loading gauge restrictions will not be permitted under any circumstances. Any offers which depart from this requirement will not be considered.

2.9 The following information must be furnished to the Authority for all cases where alternatives are offered for consideration:

2.9.1 The amount and extent of information, comment, and data applicable to the alternative as is applicable to the main offer.

2.9.2 Detailed reasons for offering the alternative.

2.9.3 Detailed implications of the alternative in respect of locomotive performance, maintenance considerations, weight, price, and delivery.

2.9.4 Any additional information, comment, or data not specifically called for in this specification but considered by the tenderer to be of possible importance in assessing the locomotive or components offered.

2.10 It is the desired wish of the Authority that tenderers should draw attention to, and furnish their detailed comments and views on, any clauses of this specification which, in their considered opinion, and based on their experience, are unrealistic, unwise, or not in the best interest of the Authority.

2.11 To facilitate evaluation, comparison, and adjudication

of offers, tenderers are requested to suitably bind, mark, index, and cross-reference the technical enclosures referred to in, and forming part of, their offers.

2.12 The locomotives as eventually supplied must be in strict accordance with the requirements of the specification and/or the details of the successful tenderers' accepted offer. Deviations from the specification or alternations to the accepted tender offer may not be made without prior approval by the Authority or its duly authorised agent in writing. For any proposed variations in the design of material of any part of the locomotive, full particulars of the proposed variations shall be submitted for consideration before work on the part begins.

2.13 The Authority reserves the right to put forward MINOR modifications and alterations to be effected before or during construction, and the contract will be placed on this understanding

3. Responsibility of the Contractor

3.1 The contractor will be held solely and entirely responsible for meeting and fulfilling all the terms and conditions of the contract, including subcontractors.

3.2 The work shall be of the highest quality in accordance with modern practice for diesel electric locomotives. The contractor will be held responsible for ensuring that the locomotive or parts thereof are satisfactory in all respects and he shall not be relieved of such

responsibility notwithstanding any approval which the Authority or its agent may have given.

3.3 The locomotive shall be supplied complete in all respects ready for service. The contract price shall include all the necessary parts and fittings -- whether or not mentioned in the contract -- to make the work complete, including an initial supply of any special lubricants, etc. which may not be readily available at the site. This provision shall also cover the provision of bolts, nuts, washers, split pins, screws, etc. required for assembling any parts which have been removed for shipment, plus an allowance of 10 percent extra on the net number for all such loose materials.

4. Guaranty

4.1 The contractor shall guaranty the proper working of each locomotive supplied under the contract for a period extending to a minimum of two years from the date of entry into service.

4.2 If major components incorporate features which have not been fully proven in traction service, notwithstanding that the basic design has been so proven, the contractor shall guaranty (at no additional cost) the proper working of each major component for a period extending to at least four years from the date of entry into service. Contractor must identify such components.

4.3 If during the period outlined in articles 4.1 and 4.2, any defects in design material or workmanship shall appear, or if the proper working of the locomotive

shall in any way deteriorate under proper use, the contractor will make the following arrangements:

- 4.3.1 Supply and deliver to the Authority promptly and at his own cost such replacement for additional materials or parts as are necessary to restore the locomotive to satisfactory working condition.
- 4.3.2 Install promptly and at his own cost such materials or parts or alternatively by arrangement, to pay the Authority the cost of undertaking the work, and
- 4.3.3 If sufficient experienced personnel are not available locally, to supply in addition, at the appropriate time and at his own cost, suitable staff for the proper supervision of the work of replacement.
- 4.3.4 In the event of the contractor failing to make good such defect or deterioration referred to herein, the Authority may make good the same and the contractor shall be liable for the cost thereof unless it can be shown and proved that these were due to causes for which the contractor is not responsible under the terms of this contract.
- 4.4 Any replacement parts or additional materials which may be supplied under sub-article 4.3.1 above shall be guaranteed for a period of two years from the date of installation of the replacement part or additional material.
- 4.5 The period of guaranty stipulated under articles 4.1

and 4.2 above shall be extended by a period equal to the time which a locomotive is out of service as a result of a defect for which the contractor is liable under the terms of guaranty.

- 4.6 If the tenderer wishes to propose any variation in the above guaranty terms, full details for such variations should be given in the tender. Except for major components as stipulated in article 4.2, separate guaranty terms for individual items of equipment are not acceptable and the guaranty terms offered shall apply to the locomotive as a whole.

5. Materials and Workmanship

- 5.1 All materials and workmanship used in the manufacture of the locomotives/or their equipment shall be in accordance with the provisions of the AAR and of their equivalent in U.I.C. code of practice, or in the B.S.S. code. They must be of the best quality and of the class most suitable for the purpose for which they are required.
- 5.2 The work shall be subject to the inspection by the Authority's inspector. Testing shall be to his requirements as approved by the Authority or its agent.
- 5.3 The locomotives and their components shall be made from materials complying with, and shall conform in all respects to, the AAR and US accepted standards. Particulars of the standard specifications compliance shall be given when tendering.

6. Interchangeability

6.1 Assemblies, whether major or minor in nature, subassemblies, components, and individual parts of the locomotives must be interchangeable in all respects. Dismantling of adjacent parts and special fitting work for this purpose shall be avoided. The arrangement of all equipment shall permit ready accessibility for maintenance.

6.2 As many components as possible shall be interchangeable with those presently in use. These include, but are not limited to, electrical equipments, bogies, control equipment, couplers and brake blocks, keys and pins, tyres, spring gear, draft gear, compressor exhausters, and brake systems. The contractor shall call for details on these parts from the Authority.

7. Units of Measurement and Screw Threads

Locomotives shall be designed and constructed to AAR accepted system of dimensions. All screw threads shall be AAR standard threads. In the case of items of equipment of standardised or proprietary nature, consideration will be given to the acceptance of U.I.C. and other units of measurement and thread forms. A complete list of such items which would be fitted to the locomotive together with details of the thread forms employed shall be submitted with the tender.

8. Service Conditions

The locomotive as offered shall be suitable to operate under the following conditions:

- 8.1 Track gauge: 1067mm
- 8.2 Minimum curvature on the mainline: 200m
- 8.3 Curvature for turnouts: 107m
- 8.4 Locomotive maximum designed speed: 100 km/hr
- 8.5 Track nominal speed: 90 km/hr
- 8.6 Type of rail: 45 kg/m section
- 8.7 Maximum altitude approximately 2,000m above sea level, and the minimum 0m.
- 8.8 The line is located between the equator and the tropic of Capricorn. The maximum ambient temperature (open air) being 40 degrees Celsius and the minimum 0 degrees Celsius.
- 8.9 On the average, rain falls over a period of 120 days per year.
- 8.10 Maximum gradient is 2 percent and the maximum continuous distance with this grade is 15 kilometers. Further information on the rail profile is obtainable from the Authority.
- 8.11 Allowable axle load is 20 tons + or - 3 percent.

- 8.12 The locomotive gauge shall be to the existing locomotive structural gauge as per drawing No. MED-LS 002A, included herein.
- 8.13 Gross hauling tonnage (minimum) 1,000 metric tons under the conditions specified under articles 8.6 and 8.9.
- 8.14 Relative humidity varies from 45 percent to 100 percent. At sea level, highly corrosive humid atmosphere is prevalent. In the uplands, the low humidity is coupled with windy and dust, atmosphere for the greater part of the year.
- 8.15 The longest tunnel on the line is approximately 900 meters long; curves in tunnels are 300m radius and the maximum gradient is 18 per thousand. The tunnel gauge is as shown on drawing No. MED-LS 009, included herein.

9. Locomotive Performance

- 9.1 The locomotives are required primarily for heavy freight service working singly or in multiple units in gradient as detailed in article 8. In single-unit operation, the locomotive shall have capacity to haul a trailing load of 1,000 metric tons at minimum speed of 25 km per hour on 2 percent gradient. The train rolling resistance shall be calculated in accordance with the formula in article 9.6. On easy gradients, or when running on light load, e.g., passenger trains, maximum speeds of up to 80 km/hr shall be required subject to sectional speed restrictions that may be in force for particular locations at that particular time. It shall be possible to tow the locomotive at the maximum speed with the driver's controls set in the

normal close-down position without the necessity of making any special preparations.

9.2 Locomotives shall be suitable for operation at altitudes varying from sea level to 2,000 meters without any manual adjustment of the engine rating at intermediate stages, and shall be capable of the performance specified in article 9.1 at all altitudes.

9.3 The diesel engine shall be of adequate horsepower to provide the maximum performance as called for in article 9.1, but shall in any case not be less than 3,000 horsepower.

9.4 The following curves shall be submitted with the tender.

9.4.1 The horsepower developed by the engine at the continuous traction rating.

9.4.2 The horsepower available for traction, which shall be in accordance with the U.I.C. definition, shall be plotted against altitude from sea level to 2,000 meters assuming a constant ambient temperature of 30 degrees Celsius and 75 percent humidity. The continuous traction rating and the horsepower available for traction at the continuous rating at 2,000 meters and 30 degrees Celsius shall be stated.

9.5 The following curves will also be submitted with the tender.

9.5.1 Tractive effort in kilogramme-force (kgf) plotted against speed in kilometers per hour.

9.5.2 Tractive effort in kilogramme-force plotted against main generator current for all traction motor field strengths.

9.5.3 Trailing load in metric tons against balancing speed in kilometers per hour for the following gradients: 0, 5, 10, 15, 20 per thousand.

9.6 Rolling resistance shall be taken as

$$2 + \frac{0.057 (V-2)}{(10)} \text{ kgf per metric ton}$$

where V is the speed in kilometers per hour.

9.7 The maximum continuous tractive effort which can be maintained without exceeding the temperature rise as shown in the AAR standard for electric transmission under the operating ambient conditions mentioned in this specification shall be stated together with the speed at which this tractive effort is maintained. The maximum starting tractive effort shall be stated. The adhesive factor, or percentage adhesion at starting with fuel tanks half full, shall also be stated including allowance for weight transfer. Calculations for weight transfer shall be submitted with the tender.

9.8 The specified performance shall be maintained throughout the repair cycle of the locomotive under conditions of normal maintenance as recommended by the manufacturer. This should particularly be noted in relation to the claimed horsepower rating of the diesel engine in that

it shall not be set at a level which can only be achieved by recourse to excessive and uneconomical maintenance and servicing of the engine or its ancillaries.

10. The Locomotive -- General

- 10.1 The locomotive shall be installed with a single diesel engine. It shall have two bogies with three axles on each bogie. Bogies shall be of high adhesion type.
- 10.2 Tenders shall give offers for locomotives with single driving cabin, but with two driving positions per cabin (one forward, one reverse).
- 10.3 Locomotives shall be provided with electrodynamic braking with a minimum brake effort of 14 tons in the speed range between 20 and 50 km/hr. The dynamic brake shall only be interlocked with the throttle handle. Dynamic braking shall be fully operative even with low control pressure, emergency train brake application, or in case of overspeed.
- 10.4 The locomotive shall develop its fully rated horsepower and tractive effort at the same speeds regardless of whether the locomotive is operating in forward or reverse movement.
- 10.5 Multiple unit control is required for up to three locomotives.
- 10.6 No provision is required for train heating.
- 10.7 Each locomotive shall have a fuel tank capacity

sufficient for at least 2,000-kilometer operation on load without need for refueling.

- 10.8 The locomotive must be able to operate up to 18,000 kilometers or one month, whichever is earlier, without requiring any maintenance in the form of lubrication of, or adjustment to, any locomotive components. Exceptions are possibilities of topping up of the diesel engine crankcase, the compressor and exhauster crankcase, and the turbocharger sump. Air filters must operate for this period under dusty conditions without attention.
- 10.9 The complete locomotive offered must be, or be based on, a fully developed and service-proven model or type which has previously been built in significant quantity. Complete and detailed information and data must be furnished to show to the satisfaction of the Authority that the locomotive offered fully meets this requirement.
- 10.10 All components of the locomotive offered must be extensively in use in diesel electric locomotives, thoroughly service-proven, reliable, and as maintenance-free as practicable under diesel traction conditions. Tenderers must furnish complete and detailed information to show to the satisfaction of the Authority that the locomotive offered complies with this requirement. This must include performance data together with details of the railways on which the components in question are in use and for how long.
- 10.11 Tenderers must draw specific attention to each and every component and/or design feature included in their offer which has not previously been incorporated

in locomotives built by them.

- 10.12 The arrangement and layout of all components and equipment of the locomotive offered must provide for the maximum and best accessibility and convenience for maintenance requirements: i.e., inspection, examination, cleaning, lubrication, testing, adjustment, unit replacement, overhaul repair, etc.

11. The Diesel Engine

- 11.1 The diesel engine offered must comply with the requirements of AAR standards of practice, and must be of a type which has been extensively developed over a significant period specifically for diesel locomotive traction applications. Tenderers must furnish adequate data and information to show to the satisfaction of the Authority that this requirement is complied with.
- 11.2 In the event of a tenderer submitting an alternative offer in accordance with article 2.8 incorporating an engine the basic design of which has been proved in service but which has subsequently been subjected to further recent developments, the tenderer shall clearly define all the recent developments, and where engines with the said developments are in use.
- 11.3 The engine with its associated auxiliary equipment shall be suitable for running for long periods at idling speed or at any speed within the working range and shall be able to withstand sharp and wide fluctuations in operating conditions without suffering undue thermal or mechanical stress or undue wear.

- 11.4 Where the maker's derating of engines for site conditions does not comply with the provisions of the AAR or U.I.C. code of practice or tables 1 and 2 of Appendix B of BS 2953, the precise value of the derating shall be stated in the tender and shall be agreed upon between the contractor and the Authority, and this shall be done immediately when the contract is signed.
- 11.5 The turbocharger shall be of a reliable and efficient type capable of service over long periods with the minimum of maintenance. The type of turbocharger proposed, the degree of turbocharging, its technical characteristics, and name of the maker shall be stated when tendering.
- 11.6 The turbocharger must be correctly matched to the engine to give satisfactory engine performance and running condition throughout the range of operating conditions as specified by the manufacturer.
- 11.7 The engine shall be protected by safety devices specified in article 18 in addition to any others which the manufacturer considers necessary.
- 11.8 All moving parts shall be so balanced that the power unit will run steadily and evenly without undue vibration. Critical engine speeds shall be stated and these shall be outside normal operating speeds.
- 11.9 The diesel engine shall be directly coupled to the main generator so that the complete power unit can be installed in or removed from the locomotive without difficulty as a single unit.

- 11.10 Engines shall be started electrically. The starting equipment shall be capable of rotating the engine at firing speed for at least five consecutive cycles. Starting equipment shall be rated accordingly. Provision shall be made for emergency starting by connecting to the battery bank of another locomotive by means of an external electric cable. Suitable provision shall be made on the locomotive for the storage of the emergency electric cable.
- 11.11 Under the conditions specified in article 8.8, the engine shall be able to start without the necessity of preheating.
- 11.12 Engine starting, including the operation of any manually operated device(s) for providing sufficient fuel for starting, shall be carried out from either the engine compartment or the driving cabin, only one mode being proposed. These devices shall be arranged so that the engine cannot be overloaded due to improper use.
- 11.13 The engine stopping mechanisms, including those operated by safety devices, shall be arranged so that failure of any medium required to operate the stopping mechanism such as compressed air, electricity, lubricating oil pressure, etc. will result in the engine being shut down.
- 11.14 A secondary method of stopping the engine shall not be rendered inoperative by a jammed fuel rack, governor failure, or other defects. This method should preferably be manual and shall not depend upon availability of adequate air pressure or electricity. Full particulars of the mechanism shall be given in the tender.

- 11.15 The engine and associated equipment shall be so arranged as to give maximum accessibility to all parts requiring inspection in service. Cylinder heads and other components which may require removal, with the engine in position, shall be easily removable with a minimum of lifting equipment.
- 11.16 The type and method of engine speed governing, together with the associated equipment for engine load regulation, shall be fully described.
- 11.17 All intake air to the engine shall be efficiently filtered to exclude dust. Filter panels will be provided on body sides and they shall be of steel construction. The panels shall be designed so that they can be dismantled completely and the elements removed for thorough cleaning after prolonged service.
- 11.18 To prevent ingress of heavy rain into the diesel engine, the exhaust trunking shall be provided with an exhaust stack with drain holes of adequate diameter to prevent water collecting while the engine is standing idle. This shall be the same in construction as the one currently in use on diesel electric locomotives. Details of the same are available with the Authority on request.
- 11.19 It is desirable that the sound of the engine exhaust and turbocharger away from the immediate vicinity of the engine does not exceed a reasonable level. Provision shall be made for adequate silencing when running under all conditions of speed and load. Admissible noise rating number in the driver's cabin will be according to recommendation 150-TC-43.

- 11.20 The engine sump shall be such that surging of oil will not interrupt the supply to the lubricating oil system. The sump shall be completely self-draining.
- 11.21 Fuel spillage from the fuel injection system shall be kept to a minimum. The system shall be such that any failure of a pipe or joint shall not allow escaping fuel oil to enter the engine lubrication system.
- 11.22 Information on the measures employed to eliminate crankcase explosions must be provided in detail.
- 11.23 Provision shall be made at the end of the crankshaft for a hand-held tachometer.
- 11.24 No rubber shall be used for the mounting of any major components.
- 11.25 The consumption rate for fuel and lubricating oil shall be specified and guaranteed by the tenderer.
- 11.26 All technical data for the diesel engine shall be provided with the tender.
- 11.27 The diesel engine and its auxiliary equipment shall be designed to use fuel and lubricating oils available from local oil supply companies in Zambia and Tanzania from whom technical specifications for the fuel and lubricants can be obtained.

12. Gears

All gears shall be designed to handle arduous traction duties at all speeds. They shall be in accordance with

specified standard code(s) of practice.

13. Rotating Electrical Machinery

13.1 The main alternator and traction motors shall be capable of transmitting all the engine horsepower which is available for traction at any line speed above the balancing speed for full site engine horsepower without exceeding the maximum temperatures allowable for the machinery. Only class H or better insulation shall be used for traction motors and power circuits of the main alternator. Insulation specifications for the main alternator and traction motors shall be submitted with the tender. The Authority reserves the right to call for test samples of insulation material intended for use in these machines.

13.2 Characteristics of the main alternator and traction motors shall be provided with the tender.

13.3 A brushless-type main alternator shall be provided. For traction motors, special attention shall be paid to the brush gear to eliminate the occurrence of flashovers. Brushholder components shall be guaranteed against breakage. Adequate clearance shall be provided between all bare conductors, and these shall be insulated by taping wherever possible.

All traction motors shall be permanently connected in parallel. Series-parallel transition arrangement for traction motors will NOT be acceptable.

13.5 Traction motors shall be nose suspended, supported on

the axle by plain bearings.

- 13.6 Traction motors and other relevant machinery shall be vacuum impregnated. Parts and areas which are not vacuum impregnated shall be treated with a rust inhibitor before assembly.
- 13.7 The design of the reaction motor suspension shall be such that, in the event of failure, the traction motor cannot damage the locomotive or the track.
- 13.8 The traction motor armature shall run on roller bearings, and its axial location shall be provided by the commutator and bearing. An earthing connection shall be provided between the traction motor frame and the main frame of the locomotive.
- 13.9 Adequate access to the traction motor gear case and brushes shall be provided such that examination and attention to these components can be accomplished without the need to lift the locomotive.
- 13.10 Cooling air for the traction motors, the main alternator, and the auxiliary generator shall be efficiently filtered. Filter panels used for this purpose shall comply with the requirements of article 10.8.
- 13.11 The possibility of traction motors being contaminated by oil must be eliminated. Traction motor blowers shall be housed in a distant separate housing from that of the compressor exhauster.
- 13.12 Traction motor openings shall be fitted with suitable grids for protection against stones.

13.13 Flexible traction motor leads shall be resistant to oils and mechanical damage, and must be designed for easy connection and disconnection. Connection boxes shall be easily accessible to facilitate easy removal of bogies in the event of an accident.

13.14 An auxiliary generator and rectifier unit shall be provided with ample capacity at continuous rating to provide power simultaneously for compressors, exhausters, fans, control circuits, lights, battery charging, and any other auxiliary electrical appliances requiring either AC or DC power. Details of the method of mounting and driving this generator shall be supplied. The nominal voltage of this generator shall be 75 volts.

13.15 Power-driven machines shall be mounted so that their pulleys are always maintained in accurate alignment with the driving pulleys.

14. Electrical Control Equipment

14.1 All electrical control equipment shall, as far as possible, be mounted on a common framework which can be easily removed from the locomotive for unit replacement.

14.2 Electropneumatic and electromagnetic control units shall be of proven design and where necessary shall be provided with efficient arc-quenching devices. Electrical contacts which make or break current shall be of pure silver to avoid any tendency to pit or weld together.

14.3 Any electronic control units installed on the locomotive shall be in module form, easily replaceable. The basic design and characteristics of such modules shall be provided. The components making the module shall be replaceable.

15. General Electrical Equipment

15.1 The electrical system of the locomotive shall be 75 volts.

15.2 All locomotives shall be provided with nickel-cadmium storage batteries each with a minimum discharge capacity of 180 ampere-hours. Within the electrical system, provision shall also be made for charging the batteries from an external source of power. The battery-charging circuit shall incorporate a bank of rectifiers for blocking any reverse current flow through the windings of the charging generator. An additional 'trickle charging' external supply provision operative at 240V AC, single phase, 50 Hz may be included in the proposal.

15.3 The storage batteries shall be housed in containers of one or more compartments isolated from the rest of the equipment. The design and location of the containers shall permit easy access to each cell for servicing. They shall have an independent system for ventilation and drainage so that corrosive fumes and liquids do not collect or drain to other equipment. Heat insulation shall be applied to any surface exposed to the sun or heat source. The containers shall be protected against deterioration caused by action of the electrolyte or any other conditions arising from

usage. The cells shall be removable, but firmly fixed in position when in service.

- 15.4 The voltage regulator shall be capable of maintaining the voltage of the generator for use by the control equipment and other auxiliary systems to within 3 percent of the battery charging voltage throughout the full range of generator voltage and speed. It shall be of a type known to operate successfully under tropical conditions and when subjected to continuous vibrations.
- 15.5 All lighting equipment shall be of a type thoroughly proven in use on railway locomotives. Headlamps shall be mounted in an elevated position at each end of the locomotive, and two 200-watt standard sealed-beam headlamps on each side shall be provided.
- 15.6 Two twin marker lights, each having one red and one white glass in a vertical arrangement (the former being on top), shall be provided at each end of the locomotive, controlled from the reverser switch. In order to minimize damage caused to these lights by collision with wild animals, they shall be recessed into the buffer beam.
- 15.7 Each headlight and the marker lights shall have an independent switch located in the driver's cabin. Suitable lighting shall be provided in the cabin, engine, and equipment compartments and for illuminating the cab instruments. Basic lighting will also be provided for underframe lighting. The switches for headlights, marker lights, and cab lights shall be grouped in a convenient position for operation by the driver whilst seated.

- 15.8 A hand lamp, complete with a flexible lead and plug, shall be provided. This shall be accommodated in a readily accessible place on the locomotive when not in use. Sufficient plug sockets shall be provided, including at least one in the cab, to permit this hand lamp to reach any part of the locomotive without difficulty.
- 15.9 All electrical circuits shall be protected by circuit breakers of proven and approved types.
- 15.10 Electrical components shall, as far as possible, be mounted in suitable housings arranged so that, after disconnecting the cables, the housings can be removed from the locomotive as complete units.
- 15.11 Electrical equipment not subject to heating shall be enclosed in ducts and moisture-proof housing. Equipment subject to heating shall be enclosed in a housing provided with ventilation by filtered air.
- 15.12 Inspection doors or covers, which can be readily removed, shall be provided to permit access to all equipment within the housing. These doors/covers shall be dust- and moisture-proof where appropriate. Facilities for lead-sealing should also be provided.

16. Cables and Conduits

- 16.1 The contractor shall submit to the Authority for approval a schedule showing the sizes, insulation, and sheathing of the cables proposed, and indicating the circuits in which they will be used.

- 16.2 Impregnated asbestos, fabric, or woven-braid insulation will not be accepted. The cable sheathing shall be resistant to lubricating and fuel oils. Cables will also be flame- and vibration-resistant. They will have a smooth exterior surface.
- 16.3 Cables shall be drawn into heavy gauge-sheathed screwed-steel conduits of a high class as provided in the appropriate AAR standard. The conduits shall be grouped together in easily accessible positions and well clear of water and oil pipelines.
- 16.4 In multiple cable run locations, cable ducting with detachable oil and watertight covers may be used instead of conduits. Where such ducting is used, cables shall be positively clamped to prevent strain or chafing and they shall be accessible throughout.
- 16.5 Separate conduits or cable ducts shall be provided for power and control wiring.
- 16.6 As far as practicable, cables and conduits shall not be attached to portions of the locomotive which have to be removed for maintenance purposes. Where this is not practicable, provision shall be made for suitable connectors to facilitate disconnection and reconnection.
- 16.7 All cable ends shall be clearly and indelibly marked with the cable reference numbers of the AAR standard. A sample of the type of marking shall be submitted to the Authority or its authorized agent for approval at an early stage of the contract. Terminals shall be grouped on terminal blocks in such a manner that the testing of electrical circuits is facilitated. Terminal blocks shall be numbered to correspond to

that of the cable connected to each terminal.

- 16.8 Cable terminations shall be of crimped type with insulation covering. The crimping shall be for both the conductor and the cable sheath.

17. Driving Controls

17.1 The driving control equipment shall be suitably positioned in the driving cabin in relation to the driver's seat so that the locomotive may be driven with equal facility in either direction from either driving position. The controls shall be so arranged that they may be easily manipulated from the driving position whilst providing the driver ample room, comfort, and unrestricted view in either direction. It shall be possible for the driver to operate the controls whilst leaning out of the adjacent side window.

17.2 Duplicated controls shall be interconnected.

17.3 Detailed drawings of the control layout shall be forwarded to the Authority for approval at an early stage in the design.

17.4 All control handles shall be of a uniform, hard-wearing finish.

17.5 The reverser control handle shall be arranged so that it points generally in the direction of travel for which it is set.

18. Safety Devices

18.1 The locomotive shall as far as possible be self-protecting. The following safety devices shall be provided in addition to any devices which are incorporated by the manufacturer:

18.1.1 A removable key in the cab to prevent unauthorised starting of the engine or operation of the locomotive.

18.1.2 Interlocking between the master switch, control handle, and the reverse lever to prevent incorrect operation of the controls.

18.1.3 A vigilance control system and a deadman's device will be installed at every driving position. The deadman's device shall be conveniently placed so that it can be operated with ease when the driver is seated or when he is leaning out of the window. The system must be robust and able to withstand rough treatment. It must be guaranteed against incorrect operation in all circumstances. It will incorporate a time lag that will allow the driver to move from one side of the driving cabin to the other without the device coming into operation. The vigilance control shall be arranged to first give a sonical warning and subsequently to stop the train automatically should the driver fail to take some positive action either consciously or unconsciously within predetermined time intervals. The make of

the deadman's device and vigilance control system shall be approved by the Authority.

- 18.1.4 A device to ensure that the engine does not run on load when the cooling water temperature is too high, but permits the engine to run idle to prevent heat blocking.
- 18.1.5 A device to prevent the engine running if the cooling water level is too low and a low-water engine shutdown device if the level goes below a certain level.
- 18.1.6 A low-oil-pressure shutdown device.
- 18.1.7 A device to prevent the locomotive from moving under its own power if there is insufficient air pressure to operate either the pneumatic control system or the brakes efficiently, and to return the engine to idling speed if the air pressure in either the control system or brake system falls below a predetermined level.
- 18.1.8 A locomotive overspeed shutdown device. Also see article 11.13.
- 18.1.9 A sentry adhesion control system or equivalent system should be provided and should be described at the time of tendering.
- 18.1.10 Provision shall be made for the isolation of any traction motor in the event of failure in operation, whilst the locomotive is able to continue to operate with the remaining traction motors. Upon isolation of any

motor, dynamic braking will be inoperative.

18.2 It is essential for a locomotive to be able to proceed on service without permanent reduction in power even though an earth fault may occur in the main traction motor circuit. One of the following arrangements shall be provided.

18.2.1 A standard ground-relay-protection circuit shall be provided. The same shall be described at the time of tendering.

18.2.2 An earthed electrical system in which the earth connection is automatically removed in the event of a fault to earth, the nature of the fault being indicated by a flag relay.

18.3 The tenderers may suggest variations of the above devices if considered desirable, or submit alternative proposals but the functions above must be fully achieved unless written agreement to the contrary is given.

19. Multiple Unit Operation

19.1 Multiple unit control equipment to enable the operation of at least three (3) locomotives together from any driving position and in any direction shall be provided. The system shall allow for the isolation of any defective locomotive while continuing to operate with the other locomotives without causing additional damage to the defective unit. It shall also be possible to stop the diesel engines of all the multi-locomotives from the driving cabin of any

locomotive. This feature shall be operative with mixed consist of new and existing diesel electric locomotives.

19.2 The following warning devices shall give an indication in the attended driving cabin of faults occurring in unattended locomotives operating in multiple.

19.2.1 General warning indicators.

19.2.2 Fire sonical warning.

19.2.3 Wheelslip audible warning.

19.3 Provision shall be made for compressors and exhausters in locomotives operating in multiple to be run simultaneously.

19.4 The connecting boxes for the circuit jumper cables at the ends of locomotives shall be easily accessible for testing and other purposes; and shall be positioned in a manner that ensures that they are not damaged as a result of collision with game or minor collision with other locomotives or vehicles.

19.5 Compressed air pipelines used between locomotives solely for multiple-unit operation shall be colour coded and designed to prevent incorrect coupling. Isolating cocks shall be provided for these air pipes positioned inside the superstructure so that they can be used in the event of damage to the end cocks. Flexible hose pipe connections shall be provided with each locomotive, and shall be stored in a suitable container within the locomotive.

19.6 Couplers, connectors, train lines, and electric lines

will be compatible with the existing fleet of diesel electric locomotives. Details of the same are available with the Authority on request.

20. Gauges and Indicators

The following shall be provided, in addition to any others that the manufacturer considers necessary.

20.1 At each driving position, the following provision shall be made.

20.1.1 A Hasler recorder RT 19-type speed recorder shall be installed in one driving position and a Hasler slave unit A 16 shall be installed in the second driving position.

20.1.2 A duplex air pressure gauge calibrated in kilogrammes per square centimeter to indicate the main reservoir air pressure and the train pipe vacuum. The scale will read in millimeters of mercury. The two dials in each gauge shall be one red and the other black.

20.1.3 Locomotive brake cylinder air pressure gauge calibrated in kilogrammes per square centimeter.

20.1.4 A general warning indicator coupled to which is a flag relay arrangement which would give warning of a noticeable defect. The nature of the defect may by arrangement be shown by a separate indicator.

20.1.5 A driving ammeter to indicate the current passing in one traction motor. Copper straps shall be provided in each meter circuit for replacement by shunts for the connection of test ammeters when required.

20.2 Other instruments and indicators to be provided in each driving cabin are as follows:

20.2.1 Control reservoir air pressure gauge

20.2.2 Ammeter for battery charging

20.2.3 Fire warning

20.2.4 Wheel slip warning

20.2.5 Deadman's and vigilance control

20.2.6 Hot water indicator

20.2.7 Traction motor failure flag relay

20.2.8 Ground fault indicator

20.2.9 Engine running time recorder

20.2.10 Low lube oil indicator

20.2.11 Turbocharger gauge

20.2.12 Any other gauges, instruments, and indicators deemed necessary by the contractor.

20.3 Provision shall also be made for attachment of

portable instruments for the following.

20.3.1 Alternator voltage and current

20.3.2 Auxiliary generator voltage and current

20.3.3 Exhaust gas temperature at each cylinder and turbocharger inlet

20.3.4 Engine air inlet temperature

20.3.5 Inlet and outlet temperature of lubricating oil and cooling water temperature

20.3.6 Engine cylinder pressure indicator.

21. Locomotive Frame

21.1 The locomotive frame including any members forming an integral part of the body construction shall be designed to meet all applicable AAR standards. The construction shall be designed to accommodate the diesel engine, the alternator, auxiliary drives, and equipment both above and below floor level. The frame shall have to withstand without failure all static and dynamic stresses in accordance with the relevant stipulations in the AAR standards of practice. Lift stresses induced during maintenance should also be accommodated.

21.2 Provision shall be made for lifting the locomotive using fixed or portable electrically operated jacks, screw jacks, and hydraulic jacks as well as by crane. The lifting points shall be readily accessible and

arranged so that the lifting gear can be positioned easily and portable jacks traversed without dismantling any part of the locomotive.

- 21.3 Where necessary, trap doors shall be provided on the floor plate where the same would facilitate easy access to any equipment for maintenance. Such trap doors shall be dust- and water-sealed.
- 21.4 The main frame shall be designed to allow either end of the complete locomotive to be lifted from the coupler body by means of wire ropes. Provision shall also be made at either end of the locomotive for lifting the locomotive using brackets or shackles. Under normal circumstances, the lifting of such a locomotive would be done on one end at a time. The locomotive platform shall consist of steel plate of 35mm thickness.
- 21.5 At least eight jacking points shall be provided, two on each side at or near each end of the locomotive. This will facilitate recovering of locomotives in the event of accidents such that when it is being re-railed using lifting and traversing jacks, and the traverse jacks have reached their traverse limit, the weight of the locomotive can be taken by jacks placed on the other jacking points, whilst the traversing jacks are being repositioned. Jacking pads shall be at a reasonable height from the rail surface to allow easy positioning of jacks for purposes of re-railing a derailed locomotive.
- 21.6 The locomotive main frame shall be manufactured to AAR standard practice of tolerance limits.
- 21.7 The locomotive construction shall accommodate the

possibility of lifting the locomotive with its bogie in position.

22. Locomotive Superstructure

- 22.1 The locomotive superstructure shall be of the bonnet type. Provision shall be made for access to the engine and other compartments by means of removable doors from platforms along each side of the locomotive. It shall be wholly built as a unit separate from the underframe.
- 22.2 The locomotive superstructure shall be wholly of copper steel.
- 22.3 The body shall have a smooth external surface to facilitate cleaning. Where side and end panels are secured by rivets, the rivets shall have flush countersunk heads on the outside which shall completely fill the countersink. Any excess metal at welded joints shall be finished off flush neatly.
- 22.4 Hinged doors or hatches shall be provided in the roof for the inspection of cylinder heads and other parts as well as for the removal of details for periodic attention. These doors or hatches shall also allow for easy removal of turbochargers, cylinder heads, and other relevant components. The doors will be installed on removable roof sections which, when removed, will permit the removal of the complete power unit and other auxiliary machinery and components which cannot be removed through the side doors or the roof doors. Such removal would be by an overhead crane.

- 22.5 Doors, hatches, and removable sections shall be watertight and rainproof and shall also be dustproof where appropriate. Gutters of a reasonable size with drain pipes shall be provided on the locomotive to carry off rainwater along the entire locomotive. Gutters shall also be provided over the front and side windows, and entrance doors of the driving cabin.
- 22.6 The ends of the locomotive superstructure will be adequately reinforced and protected to minimize damage to panels, headlights, marker light, jumper cables, connecting boxes, etc. in the event of collision with large animals such as elephants, buffaloes, giraffes, etc. Installation of equipment likely to be easily damaged during such collisions in areas most vulnerable to damage should be avoided. A cow-catcher of wade-type similar to the one currently in use is preferred. The use of any other type cow-catcher must be sanctioned by the Authority.
- 22.7 Superstructure doors shall be appropriately sealed ensuring that they are water- and dust-sealed when closed. The door locks shall be operated by a standard 10mm square key. Hinges shall be of a type which will permit the doors to be easily lifted off when open. Door hinges and steps must be robust.
- 22.8 Adequate ventilation shall be provided for the locomotive interior. Radiator cooling air shall not be taken from or discharged into the engine compartment. The construction shall ensure that hot air or exhaust gases discharged from the locomotive is NOT recirculated into the ventilation or combustion air systems.

22.9 Where deemed necessary, moisture-separating louvers shall be provided at all air intakes.

22.10 For all rotating machinery in the superstructure such as shafts, belts, etc., into which clothing and other objects could be caught, protective guards shall be provided. However such provision shall not impair the accessibility of such equipment.

22.11 Access to roof hatches, through steps provided with adequate hand holds and protective guards where necessary, shall be provided.

22.12 The floor of the engine and the radiator compartments shall be so arranged that oil or water leaking from the engine or other equipment, or entering via other ducts and openings, is collected and discharged through drain pipes located well clear of frame members or any equipment below the floor. The floor shall extend under the whole of the power unit and shall be of good fit around any projecting equipment to minimize ingress of dust or other dirt.

22.13 The platforms and all floors in the superstructure where operating and maintenance personnel walk or stand shall be covered with a nonslip self-draining surface which can be cleaned easily. Any opening cut in the platforms or floors for access purpose shall be covered by a flush-fitting plate.

23. The Driving Cabin

23.1 As provided for under article 10.2, offers shall be for a single driving cabin. Similarly provisions

under article 17 shall apply. Driving positions shall give the driver an unrestricted view of the track ahead, and the train and surroundings as a whole.

23.2 The driving cabin shall be fully enclosed and positioned towards the end of the locomotive. It shall be as large as possible within the limits of the locomotive and rolling stock gauge.

23.3 Windows of the driving cabin shall be glazed with safety glass. Front and rear windscreens shall be of high-strength glass which has capacity to resist high-impact loads such as stones, bottles, birds, etc. The windscreen glass shall not shatter on impact when the locomotive is travelling at its maximum speed.

23.4 Side windows shall be large and openable. They will open through sliding mode.

23.5 The cab finish shall be such that no sharp corners or protrusions which may endanger the safety of the drivers shall be allowed.

23.6 Insulation shall be provided between the cab and the main frame, and between the cabin and the adjacent structure to reduce noise and vibration inside the cabin. The cabin shall also be suitably heat-insulated and the surface lining shall be fire- and wear-resistant.

23.7 The cab roof shall be of a double type and shall be adequately insulated against heat. The construction shall ensure that the spaces between the inner and outer roof sheathings are adequately drained and ventilated. Any insulating material used for the cab roof, walls, and bulkheads shall be of such a nature

that there is no danger of corrosion of the plates due to moisture being absorbed or collected.

- 23.8 The driving cabin shall be provided with two access doors, one on each side of the cabin. The doors shall be arranged to open inwards. The doors shall be provided with latchlocks of the same key for each locomotive in addition to any other door securing mechanisms which may be provided. Provision shall also be made for fastening the cab doors securely in the open position. This provision shall ensure that the driver's view during operation is not impaired.
- 23.9 All windscreens shall be provided with efficient and robust wipers which shall be electrically operated. They shall have two-stage speed variation. A separate water reservoir shall be provided to facilitate a pneumatically operated splash water mechanism for the windscreen wipers.
- 23.10 If the windows are to be of cast or drawn metal frame, they shall be made of aluminum.
- 23.11 Over the windscreen at each driving position, an adjustable sun visor will be provided. This may be made of hard-wearing plastic.
- 23.12 Over the front windows of every locomotive will also be provided sheet metal visors with gutter edges and drain pipes to reduce glare and shed rain clear of the windscreen. .
- 23.13 Foot steps and hand rails shall be provided for easy access from track/platform level to the cab, as well as the plant and equipment compartments. The steps shall have treads of large area with open work

surfaces of approved type. Small footsteps and hand-grips shall be provided for access to cab front and rear windows, headlamps, and any other parts requiring frequent attention and cleaning.

23.14 Roof ventilation extractors/openings shall be provided to enhance ventilation of the driving cabin even when the doors and windows are closed. The fans shall be of oscillating type.

23.15 Comfortable seats with back rests shall be provided for each driving position. Unless other more convenient arrangements are provided, the driver's seats shall be capable of swivelling through 180 degrees. The seats shall be adjustable longitudinally and vertically. A suitable footrest shall be provided to suit the seat when facing any direction. Adequate space shall be provided to enable a second person travelling in the cab to pass from one side of the cab to the other without disturbing the driver.

23.16 The floor of the driving cabin shall be covered by a nonmetallic nonslip material which can be cleaned easily. The floor shall be even.

23.17 A 1000-watt hot plate with a utensil holding/retaining ring should be provided in the cabin. The plate shall be robust in construction and securely mounted on the locomotive. All wiring for the hot plate shall be insulated by heat-resistant material such as ceramic beads.

23.18 Two standard 500-watt footwarmers shall be provided per driver's cabin. The same shall be powered by the auxiliary generator.

23.19 At least two coat hooks, two ashtrays, and one small table locker should be provided in each driving cabin.

23.20 A fixed slip-in pocket shall be provided for storing timetables, operation registers and journals, repair cards, etc. It will be so positioned as to avoid ingress of water or oil.

24. Bogies -- Also see article 10.1

24.1 The bogie frames shall be fabricated by welding. They shall be manufactured by an approved bogie manufacturer to a design which has been service proven to be entirely satisfactory and shall, as far as possible, be interchangeable with those currently in use. Axle box guides shall be an integral part of the bogie frame.

24.2 The design shall provide ease of inspection of the spring and brake gear, and other vital components with ready accessibility and low maintenance costs.

24.3 Bogies shall be designed so as to provide good riding qualities, and the minimum of both side thrust effects and of weight transfer at starting. The design should offer low proportions of unsprung weights and minimum rail, tyre-tread, and flange wear.

24.4 The front and rear bogies shall be identical and freely interchangeable.

24.5 If the bogie centres or underframe bearers carrying the superstructure weight and traction loads require lubrication, provision shall be made to exclude dust and dirt from sliding surfaces. Where oil lubrication

is employed, provision shall be made for draining surplus oil clear of all underfloor equipment and bogies. Oil baths, if fitted, shall be provided with effective seals to prevent loss of oil and a means of gauging and topping up the oil level. Oiling and greasing shall be done at a minimum frequency of once a month or 18,000 kilometers.

- 24.6 Bogies shall be securely attached to the underframe for lifting purposes as well as to prevent excessive movement in the event of derailment.
- 24.7 The manufacturer can recommend the use of inter-bogie control, steered bogies, or flange lubrication. This will be agreed between the contractor and the Authority.
- 24.8 Where inter-bogie control or the steered bogie is proposed, it shall be of a type requiring minimum of attention in all respects. In the event of its failure, it should be possible to remove it and the locomotive still be fully operational without any serious drawbacks.
- 24.9 For ease of maintenance, all heavy components of the bogie such as bogie frames, etc., with holes and wearing surfaces for various connections and attachments should be provided with bushing sleeves, wear plates, etc., as may be appropriate, which can be replaced by standard components to restore to the original standard without having to undertake excessive machining of such components.

25.

- 25.1 Bogies shall be provided with high-quality springs throughout ensuring that the specified axle loads are closely maintained in service. Unless otherwise agreed in consultations between the contractor and the Authority, all suspension springs shall be coil springs manufactured to AAR - M114 standards. Suitable shock absorbers shall be provided for each bogie. Resilient pads shall be provided on the top and bottom seats of the springs.
- 25.2 The spring gear shall operate entirely without lubrication.
- 25.3 The coil springs shall be made of the best material -- to be stated -- and shall be made to AAR standards for coil springs for locomotives.
- 25.4 All springs shall be given a coat of bituminous paint or an approved hard-drying composition to be approved by the Authority.
- 25.5 All springs shall be guaranteed from breakage in use for a minimum of six years under normal locomotive utility conditions.

26. Locomotive Wheelsets

- 26.1 The contractor shall propose the type of wheelsets for use in the locomotives. These shall be approved by the Authority.
- 26.2 If monoblock wheels are provided, there should be provision to machine the wheelset to a rim on which a

standard tyre can be fitted. See Drawing No. MED-LS 004, included herein.

- 26.3 As far as possible, the wheelsets proposed should be such that they can be fitted with a standard tyre currently used on the existing locomotives. A drawing showing all dimensions of the existing tyre is as contained in Drawing Nos. MED-LS 003 and MED-LS 004.
- 26.4 All wheelsets shall be standard and freely interchangeable with those currently in use. They shall be made in compliance to AAR standards.
- 26.5 Axles shall be machine forgings. Each axle shall be stamped at one end with the maker's initials, cast number, the year of manufacture and the initials TZR. No stamp marking or initials are permitted on the axle body.
- 26.6 Axles shall be to the dimensions shown on the contract drawings. Any variations must be clearly accounted for and agreed upon otherwise they shall be disqualified.
- 26.7 All axles shall be machined with strict abidance to the AAR -- M-101 (latest issue). The seating for wheels and gears shall be parallel. The lead for pressing on the wheels shall be provided by chamfering the outer end of the wheel seat extension for a distance of 5-6 mm, the chamfering being restricted to the amount required for entry to the bore of the wheel.
- 26.8 Seatings for roller bearings for traction motor suspension shall be machined to the limits and dimensions specified by the bearing manufacturer.

- 26.9 Permanent lathe centres shall be provided. These shall be of convenient dimension and shall have an included angle of 60 degrees.
- 26.10 The bosses of wheel centres shall be faced, the bore machined parallel and all sharp edges and burrs removed, but not so as to provide any lead for pressing on the axle. Wheel centre rims will be machined to a surface texture not lower than 250 C.L.A.
- 26.11 Rolled steel disc centres shall be marked with the maker's initials, cast number, year of manufacture and the initials TZR. The cast number shall be stamped on the web when hot; other markings shall be stamped on the boss when cold.
- 26.12 All tyres shall be made in compliance with relevant provisions in the AAR standards. Their dimensions shall be in accordance with article 26.3.
- 26.13 Each tyre shall be stamped on the outer surface with the maker's initials, cast number, year of manufacture, TZR, and the tyre wear limit line.
- 26.14 The lubricant used when pressing wheels on to the axle shall be agreed upon between the manufacturer and the Authority before the press work commences. During pressing, an automatic pressure recorder shall be attached to the press and a graphical record shall be taken for each wheel pressed on. The axle number shall be recorded on each graph. The maximum tonnage at which each wheel has been pressed on shall be clearly stamped on the applicable end of each axle.

26.15 The difference in finished diameter between two wheels mounted on the same axle shall not exceed 0.5 mm.

26.16 The tyre profile shall be the standard P 6 profile. Also see drawing No. MED-LS 003, included herein.

27. Axle Bearings and Bearing Boxes

All axle boxes shall be made of cast steel and shall be fitted with grease-lubricated tapered roller bearings. The type and make of the tapered roller bearings shall be approved by the Authority.

28. Axle Box Guides

28.1 Where the axle box so proposed also requires an axle box guide, the wearing faces of the axle box guides shall be fitted with liners made from manganese steel of approved compositions. The liners shall be welded to mild steel backing plates checked into the guide face, top and bottom, and secured by not less than two fitted bolts per backing plate.

28.2 The location of the axle boxes in the longitudinal direction shall be within +0.9 mm -0.9 mm.

28.3 The squareness of the axle box guide faces shall be such that diagonal measurements taken from corresponding points on the guide faces of adjacent axles shall not vary by more than 1.5 mm.

28.4 The alignment of corresponding axle box guide faces on

opposite sides of the frame shall be such that when a straightedge is laid across both faces, any gap between either face and the straightedge shall not exceed 0.05 mm.

28.5 The transverse distance across the frame between the inner faces of corresponding axle box guides shall be within a tolerance of +0.76 mm -0.76 mm. The transverse clearances shall be sufficient to permit the axle boxes to slide freely in the guides when the axle is inclined to the horizontal plane of the locomotive or bogie frame. The clearance from the frame above and below the axle box shall be ample for all service conditions.

28.6 Axle box guide clips shall be accurately fitted and registered, and shall be secured by bolts, nuts, and split pins.

29. Cooling Water System

29.1 Each locomotive will be provided with a complete cooling water system whose radiator capacity shall be adequate to permit the locomotive to develop its full rated power output under all operating conditions, particularly altitude, ambient temperature, and tunnels as specified under article 8. The capacity shall include an adequate margin to account for reduced heat transfer capacity due to scaling and dirt on the cooling elements. A light-pressure cooling system may be proposed to ensure adequate margin of temperature for the cooling water particularly under the maximum altitude conditions.

- 29.2 The radiator fan shall be thermostatically controlled and shall be driven directly by the engine. Tenderers may propose either an electric clutch drive or a hydraulic drive unit for the fan.
- 29.3 The radiators shall consist of individual units or elements which can be readily removed for maintenance or replacement. The elements shall be suitably protected against accidental damage and excess pressure. Double partitions shall be provided between sections of the radiator top and bottom tanks with a drain hole between the positions to indicate any leakage.
- 29.4 The cooling system shall be designed so as to ensure negligible spillage. Provision shall be made for the complete drainage of the radiator. The drainage cock shall be lead sealed.
- 29.5 The cooling system must not require topping up at more frequent intervals than the main fuel tank. Provision shall be made for low-pressure filling by means of a connection at each side of the locomotive at underframe level. The connection shall be of tapered type designed to receive a rubber hose of 25 mm bore. The outlets for the water system overflow shall be placed adjacent to the filler connection. An automatic engine shutoff at beyond low-water limit level will also be provided.
- 29.6 It is preferred that the cooling system be designed to use semi-treated water.

30. Fuel Supply

- 30.1 Notwithstanding the provisions of article 10.7, tenders shall state the capacity of the fuel tanks proposed for use in the locomotives on tender.
- 30.2 The main fuel tank shall be arranged for filling with filler connected on both sides of the locomotive at underframe level. The tank filling rate will stand at 500 litres per minute, and vent pipes and filters for filtration during filling should be provided to accommodate this rate of filling. Filler caps shall be permanently secured to the structure.
- 30.3 Provision for gravity filling shall also be made at both sides of the locomotive.
- 30.4 Appropriate fuel-level gauges shall be provided on each side of the fuel tank in positions where they are readily visible by the filler during filling operations.
- 30.5 Fuel tanks shall be of welded construction, adequately stayed and baffled and, where possible, provided with convenient access holes for inspection, cleaning, and repair. They will also be robust in construction and be able to withstand heavy impacts from objects, particularly stones, thrown up from the track. Straps of adequate strength will also be provided to enhance support of the tank. The tanks shall be calibrated in litres (in steps of 1000).
- 30.6 Adequate provision shall be made for filtering fuel and for the ready exchange of filter elements. Pumps shall be sited to be self-priming. Filters shall not require changing or cleaning more frequently than 18,000-km service or 1 month.

- 30.7 Provision shall be made for complete drainage of the fuel tanks. Drain pipes shall lead to suitable points below underframe level. Each drain pipe shall be fitted with a stopcock and a padlock.
- 30.8 Care shall be taken to ensure that adequate supply of fuel is always available at the fuel injection pumps and that air locks cannot occur.
- 30.9 Fuel spillage shall be returned to the fuel system only if it is collected without contamination. If this is not possible, the spillage shall be drained into an auxiliary tank provided for this purpose. See also article 11.21.

31. Lubricants and Lubricating Oil Systems

- 31.1 The specifications for lubricants for use in the diesel electric locomotives shall be submitted well in advance of completion of the first locomotive to be ordered. The number of different grades of lubricant shall be kept to a minimum, but must, as far as possible, be available from reputable oil suppliers in Tanzania and Zambia. Attention is drawn to the manufacturers that fuels with up to 1 percent sulphur content are generally in use.
- 31.2 As specified in article 10.8, the locomotives will not require replenishment of any lubricants within 18,000 km or 1 month of service, except for possible topping up of engine oil, which will only be done at locomotive refuelling intervals. As far as possible, every lubricating oil pool will be provided with a level inspection dipstick or sight glass.

- 31.3 All lubricating oil systems will be provided with adequate oil filter systems. All filters shall work efficiently and will not require attention in terms of filter cleaning or replacement at intervals less than 18,000 km or 1 month of service. Filter caps and oil filter caps will be secured to prevent incidental loss.
- 31.4 Provision shall be made for the complete drainage of lubricating oil from the engine and auxiliary units. The drain pipes shall be arranged so that blockage by sludge cannot occur. The pipes shall lead to suitable points below the underframe, and shall be accessible. Each drain pipe shall be fitted with a screw plug.
- 31.5 All lubrication points, whether for grease or oil, shall be readily accessible and, where practicable, grouped together conveniently to facilitate servicing of the locomotive.

32. Brakes

- 32.1 The locomotives on tender are intended for haulage of both air-braked as well as vacuum-braked trains, only one mode being used at a time. The locomotive shall always be braked by air brakes.
- 32.2 The locomotive cabin shall be fitted with a braking mode selector where necessary.
- 32.3 The offer for the brake system shall include provision of straight air brake for the locomotive and the automatic train air/vacuum brakes of the gradual

release inexhaustible type. The brake system to be adopted will be agreed upon between the contractor and the Authority.

- 32.4 Clasp brakes shall be applied on all wheels and the total braking power shall be greater than 60 percent of the locomotive adhesive weight.
- 32.5 The tenderer shall provide information on the applicable brake shoe forces and the brake gear leverages.
- 32.6 The brake gear shall be designed such that undue deflection, deformation, or damage is avoided. Provision shall be made for proper positioning of the brake shoe even when worn, as well as to avoid any lateral movement of the brake blocks during brake applications due to the taper of the wheel tread.
- 32.7 Provision shall be made for the easy adjustment of the brake gear from the position of brakes released with new brake blocks and new tyres, to the extreme position with worn-out blocks and worn-out tyres. At the two extreme positions and at all intermediate positions, sufficient working clearances shall exist in all parts to ensure there is no binding or fouling of levers or other members. The clearances shall also permit the brake cylinder position to travel the full length of its stroke without the gear fouling at any point.
- 32.8 The design of the brake rigging shall incorporate brake slack adjusters. The brake shoe and holder to be used will be the same as the current ones in use. The dimensions of the castiron brake shoe is as given in Drawing No. MED-LS 005 attached to this

specification. The slack adjusters shall be workable for the entire life-thickness of the brake block. Minimum brake block thickness is 20 mm.

- 32.9 Safety chains or slings shall be fitted where necessary to restrain brake beams and rods in the event of failure.
- 32.10 Roller clad supports shall be provided wherever brake rods pass through or rest on the underframe or bogie. The rods shall at all times be clear of all these members.
- 32.11 The brake rigging shall be fully compensated whilst the gearing will be as simple and maintenance free as possible. Hangers, links, and levers where applicable shall be arranged in a vertical plane and readily accessible for inspection and maintenance.
- 32.12 Slack adjusters will not require lubrication.
- 32.13 Brake cylinders shall be designed without cup leathers.
- 32.14 Air reservoirs shall be of welded construction made to the relevant AAR standards. They must be of ample capacity to perform the duty for which they are intended. The capacity of the reservoir tanks shall be stated in the tender.
- 32.15 The main reservoir pressure shall be 9 kg/cm and shall not drop below 7.5 kg/cm before the compressor cuts in again.
- 32.16 Automatic drain valves shall be fitted to the main reservoirs, compressor intercoolers and aftercoolers. The valves for the main reservoir shall be operated

positively by an external air control supply, whilst those for the intercoolers and aftercoolers shall be fitted with drain valves which are spring-loaded. These valves shall as far as practical be maintenance free.

32.17 Air compressors and exhausters shall be driven directly by the engine. The compressors and exhausters shall be of ample capacity for the duties they are required to perform. For the air compressor, the air intake shall be arranged to ensure the lowest inlet air temperature. Inlet air shall be adequately filtered.

32.18 Compressors and exhausters shall be air-cooled, and shall therefore be positioned conveniently to ensure adequate cooling air flow over them.

32.19 The tenderer shall propose the arrangement of brake hose connections, which will, as far as possible, be similar to the existing connections. Plug cocks will be provided adjacent to the buffer beam. Additional drain pipe cocks of the same type shall be fitted behind the buffer beam for operation in the event of damage to the outer cocks. The hose, pipes, and fittings shall be the same as those currently in use. See drawing Nos. MED-LS 006, MED-LS 006A, and MED-LS 007 included herein. Nipples, coupling heads, and dummy couplings shall be manufactured from malleable iron, spheroidal graphite iron, or steel only. Also see Drawing No. L40-06-000 Issue A, included herein.

32.20 The air and vacuum hoses shall be provided with 12-mm-wide stainless-steel clamping bands.

32.21 Centrifugal dirt collectors of other filter-type traps

and drains shall be provided to enhance cleanliness of the brake system.

32.22 All brake equipment, including cylinders, rigging, brake blocks, compressor exhausters, etc., shall be readily accessible for maintenance purposes particularly for such items as filters, drain cocks, and dirt collectors which demand frequent attention.

32.23 A hand brake, operated by a ratchet and handle mounted in the driving cabin, shall be provided for one bogie for parking purposes. The ratchet handle shall not have any protruding lever, and shall be placed so as to afford only the minimum obstruction in the cab.

33. Locomotive Piping

33.1 The pipe work for oil, water, and air system shall be as simple as practicable, and shall have maximum accessibility to pipe fittings, joints, etc., for inspection and maintenance. The arrangement of the pipe system shall be such that in the event of leakage, oil or water will not damage electrical or other equipment in the locomotive. For air-pipe systems, provision shall be made for the drainage of any water condensing in the system.

33.2 All pipe systems shall be effectively secured to prevent failures due to vibrations. The arrangement will also avoid pipes rubbing against each other or against other parts of the locomotive.

33.3 Flexible metallic or metal-bonded hose connections which are readily replaceable shall be provided

wherever it is likely that relative movement may occur between pipes and their fittings.

33.4 As far as possible, pipe work shall not be attached to parts which have to be removed for maintenance purposes. Where this cannot be avoided, special care shall be taken to ensure that such pipe work can be readily disconnected.

34. Coupler and Draft Gear

34.1 The coupler shall be the automatic middle-buffer coupling. It shall generally be the same as the one currently in use. Further information on the coupler is available from the Authority on request.

34.2 The coupler shall be AAR coupler Type E. The draft gear shall be National Casting Type MF 491K.

34.3 The height from the top of rail to the center line of the coupler shall be 895 mm.

35. Rail Guard and Cow-Catcher

35.1 A rail guard of adequate strength shall be provided on each bogie. This guard will protect, in the event of derailment, damage to traction motors. It will also assist in the removal from the running line, any hard materials, e.g., stones, pieces of metal, etc., thus protecting the locomotive from derailment. The rail-guard clearance to the rail surface shall be 110 mm +5mm -5mm.

35.2 A cow-catcher of a readily detachable type through removal of fitted bolts and nuts shall be fitted on each end of the locomotive. The cow-catcher arrangement will be such that when locomotives are operating in multiple, no fouling takes place. A drawing of the existing cow-catcher is included herein -- see L40-04-0010 Issue A. Also see drawing of cow-catcher arrangement L40-04-000, Issue A. It would be most desirable if the catcher attachments and general design would be the same as existing. The cow-catcher clearance to the rail surface shall be 150mm +5mm -5mm.

35.3 A shunter-step shall be incorporated on the cow-catcher.

36. Locomotive Sanding

36.1 Locomotive wheel-sanding gear shall be provided on each side at the end of each bogie. Apart from the provisions of article 18.1.9, a manual sanding control system will be incorporated for use in the event of failure of the automatic sanding device. The control switches for this device shall be located at the driving positions, one at each position.

36.2 The sand pipes shall have an adequate slope throughout their length, and the delivery ends of the pipes shall be as close as possible to the point of contact between rail and wheel, with due allowance being made for tyre wear and spring deflection. Flexible extension pipes shall be provided.

- 36.3 Sand boxes may be located either on the underframe or on the bogies. Sand boxes will not form part of the underframe or the bogie. The total sand storage capacity shall not be less than 800 kg.
- 36.4 The sand-box covers shall be positioned such that sand charging can be effected from a bucket with a minimum of spillage. If any spillage occurs, it should not fall on any parts of the running gear or other parts likely to be affected by the sand.
- 36.5 The sand boxes shall be effectively sealed to avoid any ingress of oil or water into the sand boxes while standing or during running. Sand-box covers (lids) will be secured by a galvanised chain attached inside the sandbox.
- 36.6 Sand boxes shall be of robust construction capable of withstanding abrasion and corrosion. The shape of the sand box shall permit complete filling and allow all sand to gravitate towards the outlet.
- 36.7 Provision for regulating sanding pressure by the driver shall be made.

37. Locomotive Horns and Warning Signals

- 37.1 Each locomotive shall be provided with dual-tone warning horns operated by a pull valve at each driving position arranged to give convenient operation.
- 37.2 A pneumatically operated bell will also be provided for use as a warning whilst the locomotive is moving either in the workshop sheds or depot sheds.

38 Locomotive Fire Extinguishers

- 38.1 Each locomotive shall have a built-in carbon dioxide fire extinguisher system in the engine compartment. This extinguisher shall be manually operated from the driving cab or from ground level, and the operating device shall be glass sealed. A warning device consisting of a bell -- see article 20.1.4 and article 20.2.3 -- shall be actuated by fire detectors located at strategic points in the locomotive. The extinguisher shall have a minimum capacity of 40 kg. The warning bell shall be soniferous enough to be heard by attendants standing outside the locomotive at some clear distance. Automatic operation of the fire extinguisher, though desirable, is not necessary.
- 38.2 Each locomotive will also be provided with at least two portable carbon dioxide fire extinguishers to be conveniently located in the driving cabin. The capacity of each fire extinguisher shall not be less than 10 kg.

39. Painting

- 39.1 The contractor shall undertake to carry out painting of the locomotives to finality ready for use, to colour schemes (paint specifications) to be provided by the Authority. Emblem colours are available from the Authority on request.
- 39.2 The painting of the locomotive body, as well as its

component parts and equipment, shall be in strict abidance to the AAR standards of practice.

39.3 To enable pipes to be easily distinguished, they shall be painted with distinguishing colours as follows:

39.3.1 Fuel Light brown

39.3.2 Engine oil Grass green

39.3.3 Cooling water French blue

39.3.4 Compressed air White

39.3.5 Vacuum pipes Yellow

39.3.6 Electrical conduit Light orange

39.3.7 Fire extinguishing Signal red

If deemed necessary, the contractor may propose alternative colour coding, but this must be approved by the Authority.

39.4 The pipes shall be painted in their ground colours throughout the entire length of the pipe. However, where this is not practicable, identification bands of ground colour shall be applied at frequent and suitable locations along the respective pipe.

40. Marking and Numbering

40.1 The marking letters T2R shall be stamped on all major

parts and assemblies, and on any other parts liable to pilferage.

- 40.2 All bogies shall bear a numbered plate to facilitate identification. These numbers shall be supplied by the Authority during the course of the contract.
- 40.3 All electrical equipment, controls, gauges, etc., shall be clearly marked for identification purposes using engraved labels wherever possible.
- 40.4 All names and instruction plates shall be in English. If subsidiary writings of names and instruction plates are provided in another language, these would be purely for the convenience of the contractor.
- 40.5 A chart giving particulars of the colour coding for pipe work shall be mounted in a prominent position in the engine compartment of the locomotive to assist maintenance and operation staff.
- 40.6 The Authority emblem and locomotive numbers shall be carried on each side of the locomotive on cast brass plates. At each end of the locomotive, the locomotive number will also be displayed. The details of the Authority emblem and locomotive numbers are available from the Authority. These can be obtained any time during the course of the contract.

41. Shipment

- 41.1 Locomotives shall not be prepared for shipment until they have been finally approved by the Authority.
- 41.2 Locomotives shall be shipped fully erected.

- 41.3 Each unit shall be effectively protected against mechanical damage and damage by exposure during transit. Special precautions shall be taken to prevent water or miscellaneous spray entering the interior of the superstructure or the pipe work, or causing damage to electrical equipment. Roof ventilators shall be sealed. Windows, louvers and other external openings shall be boarded up and sealed. Axle boxes shall be prepared in accordance with recommendations from the bearing manufacturer.
- 41.4 Where practicable, fragile parts on the exterior shall be removed and either stowed inside the locomotive, or packed in separate cases. Where such parts cannot be conveniently removed, they shall be protected adequately from mechanical damage.
- 41.5 Detailed proposals for protecting the locomotive, including inhibiting the engine, electrical and other auxiliary equipment shall be submitted to the Authority for approval. These will include particulars of components which will be drained of oil for shipment and which will remain filled.
- 41.6 When units are shipped during cold weather, care shall be taken that water installations are completely drained to avoid damage due to freezing. If necessary, piping shall be blown through by compressed air to remove any pockets of water.
- 41.7 Lamps, tools, and other parts liable to be lost shall be removed and packed in separate cases marked with the number of the locomotive to which the contents belong.

- 41.8 Wooden packing cases and crates shall be constructed from well-seasoned timber. The grade of timber, the thickness of the sheathing and battens shall be suitable for the dimensions of the case, and the weight and class of equipment for which the case is required. Generally, the sheathing thickness shall not be less than 25 mm nominal. When the centre of gravity of the case is not in the center of the case, the position for slings shall be determined and distinctly marked by a stenciled chain. The lifting position on heavy cases shall be reinforced by sheet steel pads to prevent crane slings cutting into the timber.
- 41.9 The locomotives shall be shipped in such a way that parts removed for shipment and required for assembly at the quay side, e.g., couplers (if removed), shall be stowed with the locomotive so that they are readily available. All parts removed for shipment shall be loaded in the same ship as the locomotive to which they belong. The locomotives shall be shipped to Dar es Salaam and landed/unloaded on TAZARA track.
- 41.10 The contractor's representative shall be present at the time of shipment, and shall satisfy himself that each unit has been properly stowed. Where special attachments are required for support, or to facilitate lifting, these shall be provided by the contractor.
- 41.11 In case the ship has no lifting tackle, the contractor shall lend, without extra charge, the necessary lifting tackle for unloading the locomotives at the port of Dar es Salaam.
- 41.12 One set of keys shall be shipped with each locomotive and handed over to the first officer of the ship

conveying the locomotives. The duplicate set of keys shall either be dispatched by separate air mail, or taken by the contractor's representative dispatched to assist in putting the locomotives into service in TAZARA.

42. Commissioning and After-Sales Service

42.1 The contractor shall provide, at his own cost, sufficient personnel to assist in the commissioning of the locomotives into service on the Tanzania Zambia Railway.

42.2 A service engineer(s) will be at the disposal of the Authority during the entire guarantee period while the locomotives are in service. Thereafter, any extension of the engineer's stay period shall be by agreement between the manufacturer and the Authority.

43. Approval of Locomotive Construction Drawings

43.1 Soon after the contract is placed, the contractor shall prepare working drawings showing full details of the locomotive construction. As these are completed, prints in quadruplicate shall be submitted to the Authority. Any special features shall be clearly explained. Drawings of highly stressed components such as axles will be accompanied by the contractor's detailed stress analysis, these being in the English language.

43.2 The following dimensioned drawings shall be submitted

in quadruplicate for approval by the Authority well in advance of construction (article 43.1 notwithstanding).

- 43.2.1 General locomotive arrangement or outline in end, side, and plan views showing the layout of equipment.
- 43.2.2 Driving cabin layout.
- 43.2.3 Bogie drawing showing its general arrangement, including method of construction, mounting of traction motors, brake gear, etc.
- 43.2.4 Sectional arrangement of the diesel engine.
- 43.2.5 Diesel engine installations outline showing auxiliary units mounted on the engine, and also giving information on the total weight of the engine, its centre of gravity, weight distribution at mounting, and the amount of clearance provided for maintenance.
- 43.2.6 The locomotive frame arrangement showing lifting points, main pilot housing, and engine mountings.
- 43.2.7 The locomotive frame bending moment and shear force diagrams.
- 43.2.8 Brake diagram showing the locomotive air brake system, train air brake and vacuum brake equipment, and control system.
- 43.2.9 The following schematic diagrams shall also be provided:

- (a) The power and control circuits
 - (b) Battery-charging circuit
 - (c) The electrodynamic brake circuit
 - (d) Warning and protection circuits
 - (e) Vigilance circuit
 - (f) Cooling water system
 - (g) Fuel oil system
 - (h) Lubricating oil system
- 43.2.10 Layout drawing of the control panel showing its method of mounting and accessibility for maintenance.
- 43.2.11 The radiators compartment arrangement showing the fan drive(s), radiators, etc., and their method of mounting.
- 43.2.12 Arrangement of electrodynamic brake equipment showing the resistors and their method of cooling.
- 43.2.13 Air filtration schemes for the engine, electrical machinery, compressors, control cabins, and so on.
- 43.2.14 General arrangement of the superstructure showing the method of construction,

positioning of doors, windows, roof hatches, removable sections, etc.

- 43.3 If the design is found satisfactory, one print will be returned to the contractor stamped "Approved by the Authority". Notwithstanding the approval, the contractor will bear liability for errors and negligence in the drawing. If found generally satisfactory, but still requiring some amendment, one print will be returned to the contractor stamped "Approved subject to modification". A covering letter will accompany the print with indications on the drawing showing what amendments are required. Triplicate copies of the modified drawing shall be resubmitted for approval unless permission is granted otherwise.
- 43.4 If deemed necessary, the contractor shall submit the respective contract drawings in batches according to construction priority. The contractor shall also give details of the method of operation where this is not clearly indicated by the drawings submitted, together with particulars of the performance characteristics of such components where applicable.
- 43.5 All drawings shall be made to AAR standard practices. All the wording shall be in the English language. Wording in a second language shall be entirely for the convenience of the contractor.
- 43.6 The Authority reserves the right to call for additional detail drawings and particulars for any equipment in addition to the above, if the information submitted is deemed to be insufficient.

44. As-Made Drawings

- 44.1 As made drawings shall be made in strict accordance with the AAR standards of drawing practice, exceptions as provided under article 7 still being valid.
- 44.2 The details of drawings to be produced and supplied to the Authority shall be made available to the contractor during the course of the contract, but will be generally the same as those of construction drawings.
- 44.3 The contractor shall also provide to the Authority detail drawings of parts and components, which are within the Authority's manufacturing capability and production capacity.

45. Design Completion and Production

45.1 Soon after the design of the locomotives has been finalised, duplicate copies of a diagram showing all major particulars including principal dimensions, wheel spacing, fuel capacity, calculated weight both when empty and fully loaded, height of the centre of gravity with the fuel tanks 2/3 full, and the characteristic curves shall be submitted to the Authority. Other details shall include the following:

- | | |
|----------------------------------|-------|
| (a) Locomotive adhesive weight | kg |
| (b) Maximum speed | km/hr |
| (c) Minimum radius of curvature | m |
| (d) Max starting tractive effort | kgf |

- (e) Speed at (d) above km/hr
- (f) Engine make
- (g) Cylinder arrangement and number
- (h) Bore size and stroke
- (i) Turbocharger type
- (j) Engine site rating HP at _____ RPM
- (k) Idling speed _____ RPM
- (l) Main alternator make and type
- (m) Maximum amperage (continuous rating)
- (n) Generated voltage (continuous rating)
- (o) Traction motor make and type
- (p) Continuous rating per motor _____ HP
- (q) One-hour motor rating _____ HP
- (r) Motor gear rating
- (s) Voltage of auxiliary system
- (t) Batteries type and capacity, etc.

45.2 Immediately on production of the first locomotive, the details as provided in article 45.1 will be revised to record the actual values. These shall be certified by

the manufacturer and approved by the Authority.

45.3 On accomplishment of article 45.2, production of the remaining locomotives shall continue without redress to this procedure.

46. Commissioning Drawings

Four complete sets of the appropriate edge-bound blue-prints of the general arrangement drawing and arrangement drawings of the principal components, together with the lubrication diagram and any other drawings which may be required for preparing the locomotives for service on delivery to TAZARA shall be provided before the first locomotive is shipped.

47. Manuals

47.1 Maintenance, operation, and spare parts manuals shall be provided by the contractor.

47.2 Detailed troubleshooting guides shall be provided by the contractor. Guides will include exploded views of components.

47.3 Details of content of the manuals and troubleshooting guides, and the numbers to be supplied shall be agreed upon between the contractor and the Authority soon after award of contract.

48. Testing and Acceptance Inspection

48.1 General procedures for inspection and testing shall be as follows:

48.1.1 Preliminary tests on components and the complete locomotive to check their proper operation shall be carried out by the contractor before they are offered to the Authority for acceptance test and inspection.

48.1.2 The entire work shall be to the satisfaction of the Authority. Any component, part, or system found defective or not complying with any provision of this specification shall be liable to rejection. The contractor shall submit, for approval, general particulars of the proposed inspection and testing procedures for locomotives and their main components soon after entering into contract.

48.1.3 On approval of procedure as provided under article 48.1.2, the contractor shall submit to the Authority a detailed testing schedule including the test rating for approval. This shall include testing of components, wiring, etc., on the locomotive during erection, and all proving tests on the completed locomotive. The approved schedule shall be subject to any reasonable additions or alterations found necessary by the Authority during testing.

48.1.4 All tests shall be carried out in the presence of an inspector representing the Authority.

- 48.2 Tanks, reservoirs, valves, and similar equipment shall be tested in accordance with the relevant stipulations of the AAR standards.
- 48.3 The locomotive main frame shall be checked for accuracy of assembly and camber after the members have been welded or riveted together.
- 48.4 All main components shall be offered for inspection and/or testing at such stages of manufacture as the Authority's representative may demand.
- 48.5 In the testing and inspection of diesel engines, apart from other provisions proposed by the contractor, the following shall also be undertaken:
- 48.5.1 During construction of the diesel engine, hydraulic tests shall be carried out on cylinder blocks and cylinder heads and cylinder liners. These tests shall be at the contractor's approved standard pressures.
 - 48.5.2 Overall engine testing shall be in accordance with the AAR standards, as well as pursuant with the additional requirements stated in article 48. The fuel used shall be the same as that used for the acceptance tests.
 - 48.5.3 When the declared intermittent traction rating is less than 110 percent of the declared continuous rating, the tests which are stipulated to be carried out at the intermittent traction rating shall be conducted at 110 percent of the continuous traction rating. The engine manufacturer

shall declare whether the overload is obtained by speed and/or torque increase.

48.5.4 When an alternator is used as the load during tests, it shall be the main alternator to which the engine will be coupled.

48.5.5 The manufacturer shall furnish the Authority with copies of the type test results of the engine.

48.5.6 The operation of the governor shall be checked, and the speed variation determined. Deflection of the crankshaft shall be measured in the presence of the Authority's representative, and the correct setting of clearances and timings for site conditions demonstrated as the Authority's representative may require. A sample open up after test may be undertaken.

48.6 Electrical machinery shall be tested in accordance with the stipulations in the AAR standards, as well as provisions herein. These are as follows:

48.6.1 For the main alternator, where the alternator is cooled by air which has previously passed through the auxiliary generator and/or exciter, all main alternator rating tests and routine tests shall be conducted with the auxiliary generator/exciter in position and carrying its continuously rated load appropriate to the engine speed concerned.

48.6.2 Where the auxiliary generator and/or exciter has two different rates corresponding to the

full load speed and the idling speed of the engine, the first machine shall be given rating tests to establish its continuously rated and short-time rated outputs at both these speeds. The remaining machines shall be given short-time soundness tests at both these speeds.

48.6.3 Each traction motor shall withstand an over-speed test in compliance with the AAR standards. The maximum service speed shall be calculated on the basis of wheels worn to the condemning limit. After testing, the correct fitting of the pinion, gear case, axle bearings, and nose suspension shall be demonstrated to the Authority's representative.

48.6.4 Motors for auxiliary equipment: After each motor has been individually tested, it shall be coupled to the machine that it has to drive in service, and then run at 10 percent overspeed, after which a check on lineup and balance of the combined set will be undertaken.

48.7 All control gear shall be tested in accordance with the relevant stipulations of the AAR standards. The satisfactory operation of the control gear, including the correct interlocking of the various controls, shall be proved where possible before installation in the locomotive.

48.8 Auxiliary equipment: One traction-motor cooling blower, radiator fan, and dynamic brake fan shall be tested. All traction motor blowers shall be

overspeeded to 110 percent of rated speed to prove dynamic balance.

48.9 Air compressors, exhausters, and other auxiliary components shall have a test certificate from their manufacturers stating capacity, performance, and power consumption.

48.10 Couplers shall be proof-tested in pairs with the specified load.

49. Acceptance Tests for Completed Locomotives

49.1 Prior to delivery, each locomotive will undergo strict tests of performance and abidance to these specifications. The AAR code on predelivery testing will be strictly adhered to. In addition, the following tests shall be carried out on each locomotive before running on its own power:

49.1.1 Traction motors shall be disconnected and a resistor load substituted. After the necessary adjustments to the control equipment, the ability of the power unit to develop full output shall be demonstrated. Characteristic test results should confirm that the performance complies with the declared curves submitted.

49.1.2 On the first locomotive, a test run shall be made at the site full-load of the engine. The test shall continue until all temperatures become steady over a 4-hour minimum

period. The test shall demonstrate the following:

- (a) That the results obtained during corresponding tests on individual components are reproduced closely.
- (b) That the air- and water-cooling systems are working properly and that the operating temperatures are within the specified limits.
- (c) That the maximum temperatures within the superstructure compartment do not exceed those recommended by the makers of the equipment contained therein.

In considering (b) and (c) above, allowance shall be made for the difference between the ambient temperature during test and the specified site temperatures.

After reconnection of the traction motors, the electrical equipment shall be high-voltage tested to AAR requirements. The traction motor, generators, and other rotating machinery shall not be disconnected during this test. This test shall be carried out after completion of all other mechanical and electrical tests and the internal painting of the locomotive.

49.2 The completed locomotives shall be finally tested as hereunder:

49.2.1 Each locomotive shall be run on its own power on a test track of a length to be agreed upon

by the manufacturer and the Authority. This test shall give a satisfactory demonstration of the working of the power plant, generators, drive gear, controls, safety devices, braking, and other equipment/systems.

- 49.2.2 All air, water, oil, and vacuum systems and piping shall be checked for leakages.
- 49.2.3 The operation of all safety devices shall be checked by actual operating tests.
- 49.2.4 The correct operation of the sanding gear, horn, and other auxiliary gear shall be demonstrated.
- 49.2.5 Illumination of all meters and gauges and the operation of all lamps and hand lamp sockets shall be checked.
- 49.2.6 Each locomotive shall be rainproof tested by spraying high-velocity jets to simulate heavy rains. The direction of the spray shall be varied. The operation of windscreen wipers shall be verified under water spray.
- 49.2.7 On completion of the running tests of each locomotive, the diesel engine shall be set to develop the site output, and the corresponding fuel pump setting shall be recorded.
- 49.2.8 The first locomotive shall be tried on both right- and left-hand curves of the operating minimum radius of curvature to check clearance.

49.2.9 Each locomotive shall pass through the equipment gauge profile applicable to the Tanzania Zambia Railway. Clearance shall be recorded, the minimum height and width, buffer height, overall length, minimum clearances, and the camber in the frame shall all be checked.

49.2.10 The locomotive shall also undergo the following tests to determine the workability of the multi-unit operation systems:

(a) The satisfactory functioning of all the equipment used for this method of operation shall be demonstrated.

(b) The clearance of the cow-catcher, length and clearance of jumper cables, and brake connections and other hose connections shall be checked both on straight track and on the minimum curve.

50. Commissioning Into Service

50.1 Commissioning of the locomotives shall be undertaken on the Tanzania Zambia Railway at a point to be designated by the manufacturer's representative and the Authority as each locomotive is commissioned.

50.2 As each locomotive is commissioned, it shall be put into service, and the service guaranty clause -- article 4 -- shall come into operation.

SECTION VII. BID/AWARD/CONTRACT FORM AND PRICE SCHEDULE

BID/AWARD/CONTRACT

1. RFP No. _____
2. Supplier's Name and Address:
3. In response to Invitation for Bids No. _____,
as modified by Addenda 1 through _____,
the supplier agrees to furnish the items listed in the
attached price schedule at the prices quoted therein in
accordance with the conditions of contract and technical
specifications. This bid is valid for a period of _____
calendar days after the bid opening date established in
the RFQ.
4. An executed bond or guaranty is also attached to this
submittal.
5. Signature of person authorized to sign bid:

Date: _____

TAZARA has accepted the quotation of _____ (hereinafter
called the "supplier") for the supply of equipment, materials,
and related services as set forth in this contract.

This contract consists of the following documents:

- 1) This Bid/Award/Contract Form;
- 2) The Price Schedule;
- 3) The General Conditions of Contract;
- 4) The Special Conditions of Contract;
- 5) The Technical Specifications; and
- 6) Manufacturer's Standard Warranty

By: _____

(TAZARA)

PRICE SCHEDULE

No. _____ RFP No. _____
_____ of _____
Name of Supplier _____

Item No.	Description	Quantity	Unit Price	Total Price
			f.o.b.	c.i.f. (U.S.-flag)

VIII. BOND

BID BOND

(See instructions on reverse)

DATE BOND EXECUTED (Must not be later than bid opening date)

PRINCIPAL (Legal name and business address)

TYPE OF ORGANIZATION ()

- INDIVIDUAL PARTNERSHIP
 JOINT VENTURE CORPORATION

STATE OF INCORPORATION

SURETY(IES) (Name and business address)

PERCENT OF BID PRICE	PENAL SUM OF BOND				BID IDENTIFICATION	
	AMOUNT NOT TO EXCEED				BID DATE	INVITATION NO.
	MILLIONS	THOUSAND(S)	HUNDRED(S)	CENTS		

FOR (Construction, Supplies or Services)

OBLIGATION

We, the Principal and Surety(ies) are firmly bound to ******* (hereinafter called *******) in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS

The Principal has submitted the bid identified above.

THEREFORE,

The above obligation is void if the Principal - (a) upon acceptance by ******* of the bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), executes the further contractual documents and gives the bond(s) required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by the principal; or (b) in the event of failure so to execute such further contractual documents and give such bonds, pays ******* for any cost of procuring the work which exceeds the amount of the bid.

Each Surety executing this instrument agrees that its obligation is not impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to *******. Notice to the surety(ies) of extension(s) are waived. However, waiver of the notice applies only to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

WITNESS

The Principal and Surety(ies) executed this bid bond and affixed their seals on the above date.

PRINCIPAL				
Signature(s)	1.	2.	Corporate Seal	
Name(s) & Title(s) (Typed)	1.	2.		
INDIVIDUAL SURETIES				
Signature(s)	1.	2.		
Name(s) (Typed)	1.	2.		
CORPORATE SURETY(IES)				
SURETY A	Name & Address	STATE OF INC.	LIABILITY LIMIT \$	
	Signature(s)	1.	2.	Corporate Seal
	Name(s) & Title(s) (Typed)	1.	2.	

CORPORATE SURETY(IES) (Continued)

SURETY B	Name & Address		STATE OF INC.	LIABILITY LIMIT \$	Corporate Seal
	Signature(s)	1.	2.		
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY C	Name & Address		STATE OF INC.	LIABILITY LIMIT \$	Corporate Seal
	Signature(s)	1.	2.		
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY D	Name & Address		STATE OF INC.	LIABILITY LIMIT \$	Corporate Seal
	Signature(s)	1.	2.		
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY E	Name & Address		STATE OF INC.	LIABILITY LIMIT \$	Corporate Seal
	Signature(s)	1.	2.		
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY F	Name & Address		STATE OF INC.	LIABILITY LIMIT \$	Corporate Seal
	Signature(s)	1.	2.		
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY G	Name & Address		STATE OF INC.	LIABILITY LIMIT \$	Corporate Seal
	Signature(s)	1.	2.		
	Name(s) & Title(s) (Typed)	1.	2.		

INSTRUCTIONS

1. This form is authorized for use when a bid guaranty is required.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. The bond may express penal sum as a percentage of the bid price. In these cases, the bond may state a maximum dollar limitation (e.g., 20% of the bid price but the amount not to exceed _____ dollars).

4 (a):

Where more than one corporate surety is involved, their names and addresses shall appear

in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)". In the space designated "SURETY(IES)" on the face of the form, insert only the letter identification of the sureties.

(b) Where individual sureties are involved, two or more responsible persons shall execute the bond.

may require these sureties to furnish additional substantiating information concerning their financial capability.

5. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal".

6. Type the name and title of each person signing this bond in the space provided.

7. In its application to negotiated contracts, the terms "bid" and "bidder" shall include "proposal" and "offeror".

*** Insert name of Contracting Agency.

IX. CONTRACT FORM

CONTRACT FORM

THIS AGREEMENT made the ____ day of _____, 19__, between The Tanzania Zambia Railway Authority of Tanzania and Zambia (hereinafter "the Buyer") of the one part and (Name of Supplier) of (City and Country of Supplier) (hereinafter "the Supplier") of the other part.

WHEREAS the Buyer is desirous that certain goods and ancillary services should be provided by the Supplier, viz., 8 No. diesel electric locomotives, spares, and services, and has accepted a tender by the Supplier for the provision of those goods and services in the sum of (Contract Price in Words and Figures) (hereinafter "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

- (a) the Bid/Award/Contract Form and the Price Schedule;
- (b) the Schedule of Requirements;
- (c) the Technical Specifications;
- (d) the General Conditions of Contract;
- (e) the Special Conditions of Contract; and
- (f) the Manufacturer's Warranty.

3. In consideration of the payments to be made on behalf of the Buyer to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Buyer to provide the goods and services and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Buyer hereby covenants to arrange for the Supplier to be paid in consideration of the provision of the goods and services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

5. This Contract shall be governed by United States of America laws.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with their respective laws the day and year first above written.

Signed, Sealed, and Delivered by the

said _____ (For the Buyer).

in the presence of: _____

Signed, Sealed, and Delivered by the

said _____ (For the Supplier).

in the presence of: _____

X. PERFORMANCE BOND

PERFORMANCE BOND
(See instructions on reverse)

DATE BOND EXECUTED (Must be same or later than date of contract)

PRINCIPAL (Legal name and business address)

TYPE OF ORGANIZATION ("X" one)

- INDIVIDUAL PARTNERSHIP
 JOINT VENTURE CORPORATION

STATE OF INCORPORATION

SURETY(IES) (Name(s) and business address(es))

PENAL SUM OF BOND

MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENTS

CONTRACT DATE CONTRACT NO.

OBLIGATION:

We, the Principal and Surety(ies), are firmly bound to ******* in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS:

The Principal has entered into the contract identified above

THEREFORE

The above obligation is void if the Principal -

(1) Performs and fulfills all the undertakings, covenants, terms, conditions, and agreements of the contract during the original term of the contract and any extensions thereof that are granted by ******* with or without notice to the Surety(ies); and during the life of any guaranty required under the contract, and (2) perform and fulfills all the undertakings, covenants, terms conditions, and agreements of any and all duly authorized modifications of the contract that hereafter are made. Notice of those modifications to the Surety(ies) are waived.

WITNESS

The Principal and Surety(ies) executed this performance bond and affixed their seals on the above date

PRINCIPAL

Signature(s)	1.	2.	Corporate Seal
	(Seal)		
Name(s) & Title(s) (Typed)	1.	2.	Corporate Seal
	(Seal)		

INDIVIDUAL SURETY(IES)

Signature(s)	1.	2.
	(Seal)	
Name(s) (Typed)	1.	2.
	(Seal)	

CORPORATE SURETY(IES)

SURETY A	Name & Address	STATE OF INC.	LIABILITY LIMIT	Corporate Seal	
	Signature(s)	1.	2.		\$
	Name(s) & Title(s) (Typed)	1.	2.		

*** Insert name of Contracting Agency.

CORPORATE SURETY(IES) (Continued)

	Name & Address	STATE OF INC.	LIABILITY LIMIT	
SURETY B	1.	2.	\$	Corporate Seal
	Signature(s)			
	Name(s) & Title(s) (Typed)			
SURETY C	1.	2.	\$	Corporate Seal
	Signature(s)			
	Name(s) & Title(s) (Typed)			
SURETY D	1.	2.	\$	Corporate Seal
	Signature(s)			
	Name(s) & Title(s) (Typed)			
SURETY E	1.	2.	\$	Corporate Seal
	Signature(s)			
	Name(s) & Title(s) (Typed)			
SURETY F	1.	2.	\$	Corporate Seal
	Signature(s)			
	Name(s) & Title(s) (Typed)			
SURETY G	1.	2.	\$	Corporate Seal
	Signature(s)			
	Name(s) & Title(s) (Typed)			

BOND PREMIUM ▶	RATE PER THOUSAND	TOTAL
	\$	\$

INSTRUCTIONS

1. This form is authorized for use in connection with ******* SURETY(IES)" in the space designated "SURETY(IES)" on the face of the form insert only the letter identification of the sureties contracts.
2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorization person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

(b) Where individual sureties are involved, two or more responsible persons shall execute the bond.

*** may require these sureties to furnish additional substantiating information concerning their financial capability.
3. (a)

Where more than one corporate surety is involved, their names and addresses shall appear in the spaces (Surety A, Surety B, etc.) headed "CORPORATE
4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal".
5. Type the name and title of each person signing this bond in the space provided.

*** Insert name of Contracting Agency.

XI. PAYMENT BOND

PAYMENT BOND
(See instructions on reverse)

DATE BOND EXECUTED (Must be same or later than date of contract)

PRINCIPAL (Legal name and business address)

TYPE OF ORGANIZATION ("X" one)

- INDIVIDUAL PARTNERSHIP
 JOINT VENTURE CORPORATION

STATE OF INCORPORATION

SURETY(IES) (Name(s) and business address(es))

PENAL SUM OF BOND

MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENTS
------------	-------------	------------	-------

CONTRACT DATE CONTRACT NO.

OBLIGATION

We, the Principal and Surety(ies), are firmly bound to *** in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS

The above obligation is void if the Principal promptly makes payment to all persons having a direct relationship with the Principal or a sub-contractor of the Principal for furnishing labor, material or both in the prosecution of the work provided for in the contract identified above, and any authorized modifications of the contract that subsequently are made. Notice of those modifications to the Surety(ies) are waived.

WITNESS

The Principal and Surety(ies) executed this payment bond and affixed their seals on the above date

PRINCIPAL				
Signature(s)	1.	2.	Corporate Seal	
	(Seal)			
Name(s) & Title(s) (Typed)	1.	2.	Corporate Seal	
	(Seal)			
INDIVIDUAL SURETY(IES)				
Signature(s)	1.	2.	(Seal)	
	(Seal)			
Name(s) (Typed)	1.	2.	(Seal)	
	(Seal)			
CORPORATE SURETY(IES)				
SURETY A	Name & Address	STATE OF INC.	LIABILITY LIMIT \$	
	Signature(s)	1.	2.	Corporate Seal
		(Seal)		
Name(s) & Title(s) (Typed)	1.	2.	(Seal)	
	(Seal)			

*** Insert name of Contracting Agency.

CORPORATE SURETY(IES) (Continued)

		STATE OF INC.	LIABILITY LIMIT	
SURETY B	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY C	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY D	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY E	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY F	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY G	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	

INSTRUCTIONS

1. This form, for the protection of persons supplying labor and material, is used when a payment bond is required.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. (a) Where more than one corporate surety is involved, their names and addresses shall appear in the spaces (Surety A, Surety B,

etc.) headed "CORPORATE SURETY(IES)". In the space designated "SURETY(IES)" on the face of the form, insert only the letter identification of the sureties.

(b) Where individual sureties are involved, two or more responsible persons shall execute the bond. (Insert the name of Contracting Agency) may require these sureties to furnish additional substantiating information concerning their financial capability.

4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal".

5. Type the name and title of each person signing this bond in the space provided.

**PART 2 - PROCUREMENT OF SPARES, TOOLS, AND SERVICES
FOR EXISTING DIESEL ELECTRIC LOCOMOTIVES**

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**SPARES, TOOLS, AND SERVICES
FOR EXISTING DIESEL ELECTRIC LOCOMOTIVES**

PREFACE

The work effort for Part 2 required compilation of information to define the spare parts, tools, equipment, and technical assistance necessary to maintain TAZARA's existing fleet of Krupp-built U30C diesel electric locomotives. The fleet has been in revenue service since commissioning in 1983/84 and is scheduled for the manufacturer's recommended 4-year inspection and maintenance overhaul early in 1988.

The parts, tools, equipment, and technical assistance required for the 4-year overhaul, including parts for rebuild of two damaged locomotives, are identified and defined by information included herein.

In conformance with AID direction for sole-sourcing the purchase of the items and services needed for the overhaul and rebuild, the procurement documents for parts and technical assistance were developed and are included herein.

Tool and equipment pricing data compiled from various sources indicates a cost avoidance ranging from \$150,000 to \$200,000 US could result by purchase of these items direct from a locomotive tool-equipment supplier. To permit TAZARA to realize this savings, separate procurement documents were developed and are included herein.

Since the locomotive spare parts procurement is to be sole-sourced from the General Electric Company, verifications of price levels were made to provide assurance that GE's prices

to TAZARA are commensurate with the GE invoiced prices for similar parts supplied to other railroads. No significant price differences were identified during comparison of prices charged the Zambia Railway for a \$4.2 million US order of locomotive spare parts delivered in 1986/87, to prices quoted in 1987 to TAZARA for similar items. Inquiries to USA railroads concerning spare parts pricing showed no evidence of overpricing by GE for like or similar parts to TAZARA.

The engineer's cost estimate for spare parts, tools, equipment, and services identified for the overhaul of 13 locomotives and including the remaining rebuild of two damaged locomotives is:

Parts for 4-year overhaul	\$1,100,000	
Parts for locomotive 1006 rebuild	500,000	
Parts for locomotive 1008 rebuild	150,000	
Tools and equipment	425,000	
Technical assistance-12 months	275,000	
	<u>\$2,450,000</u>	
	Contingency 15%	368,000
	Total	<u>\$2,818,000</u> US

The actions recommended are that TAZARA take immediate steps to release the procurement documents contained herein to the General Electric Company and to TESCO/Transportation Equipment Supply Company or equivalent to obtain quoted pricing of spare parts, tools, equipment, and services. After verification of pricing, TAZARA should expeditiously issue purchase orders for all necessary spare parts, tools, equipment, and technical assistance to permit timely performance of 4-year overhaul and damage repair work.

PART 2 -- SEGMENT A

**PROCUREMENT DOCUMENTS FOR SPARE PARTS AND SERVICES
FOR OVERHAUL AND REBUILD**

PART 2
SEGMENT A

U.S.A.I.D.

United States Agency for
International Development

Project ME-1

Supply of spare parts and
services for Tanzania
Zambia Railway for
overhaul of existing U30C
locomotive fleet

Administrative
Technical
Specifications

Tender documents for
sole-source procurement
of overhaul/rebuild parts
and technical assistance
December 1987

Specification No. TZR/MED/LI-87 spares

Tanzania Zambia Railway Authority/TAZARA
Headquarters Office
P.O. Box 2834
Dar Es Salaam, Tanzania

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**SECTION I. REQUEST FOR PRICES
SPARE PARTS AND SERVICES**

Date of Issuance _____
U.S.A.I.D. Reference _____
TAZARA Reference _____

1. The Tanzania Zambia Railway Authority has entered into an agreement with the United States of America, acting through The Agency For International Development (U.S.A.I.D.), with respect to financing by the parties of the procurement of diesel electric locomotive spare parts and services.

2. The Tanzania Zambia Railway Authority (TAZARA) requests prices from the General Electric Company for the supply and delivery of spare parts for the existing Krupp-built General Electric U30C locomotives, and technical assistance for the 12-month period required for the 4-year overhaul program.

3. TAZARA reserves the right to accept one offer or no offer at its discretion.

4. The supplier may obtain further information from the office of:

THE SUPPLIES MANAGER,
TANZANIA ZAMBIA RAILWAY AUTHORITY,
TAZARA HEADQUARTERS,
P.O. BOX 2834,
DAR ES SALAAM, TANZANIA

All telex communications should be made to telex 41059 TAZARA TZ.

5. Responses must be accompanied by a fully executed bond in the amount five (5) percent of the offered price and must be delivered to:

GENERAL MANAGER,
TANZANIA ZAMBIA RAILWAY AUTHORITY,
P.O. BOX 2834,
DAR ES SALAAM,
TANZANIA

on of before _____ on _____,

SECTION II. INSTRUCTIONS TO SOLE-SOURCE SUPPLIER

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INSTRUCTIONS TO SOLE-SOURCE SUPPLIER

1. Introduction

The Tanzania Zambia Railway Authority requests prices for the supply of spare parts and related services as part of the Dar es Salaam Corridor Project. The contract will be financed by AID under Project Number 690-0240 Grant Agreement.

The firm invited by TAZARA to submit prices is under no obligation to do so. At the same time, the supplier will not be reimbursed for any costs incurred in connection with the preparation and submission of its response.

These instructions shall not form part of the contract. They are intended to aid the supplier in the preparation of its response.

For the purposes of interpretation of these instructions, the periods named herein shall be consecutive calendar days.

This price request consists of (1) these instructions, (2) the attached "Price Request/Award/Contract Form," (3) the attached "Price Schedule," (4) the attached "Forms of Response and Performance Bonds," (5) the attached "Conditions of Contract," and (6) the technical specifications attached hereto.

The supplier should note that the "Supplier's Certificate and Agreement with AID for Project Commodities/Invoice and Contract Abstract" (Form AID 1450-4) is required to be submitted by the payment clause in the "Conditions of Contract." This form must be completed in order for the supplier to receive payment.

2. Price Request

The original and four completed copies of the response must be delivered in person or sent by registered mail or other means to the following address:

GENERAL MANAGER
TANZANIA ZAMBIA RAILWAY AUTHORITY
P.O. BOX 2834
DAR ES SALAAM
TANZANIA, AFRICA

3. Preparation of Response

(a) The supplier is expected to examine the specifications and all instructions contained in this request for price. Failure to do so will be at the supplier's risk.

(b) Prices shall be on a unit price, firm price basis.

(c) TAZARA reserves the right to increase or decrease the quantity of an item duly awarded in accordance with this RFP. This option shall be exercised, if at all, at time award is made.

(d) All correspondence in connection with the response and the contract is to be in English.

4. Content of Offering

The supplier is required to complete the following in an original and four copies:

(a) Price/Award/Contract Form.

(b) The Price Schedule.

The supplier shall fill in the unit price for each item in the price schedule. For each item the quantity given in the "Quantity" column shall be multiplied by the unit price, and the result entered in the "Amount" column. In case of any discrepancy between a unit price and an amount, the unit price will be taken as correct and the amount adjusted accordingly. It will be assumed that the supplier is not responding on any item for which a unit price or amount is not shown.

The supplier shall complete the form in type or in indelible ink making no alterations to the form provided. The completed form shall have no interlineations or erasures except those necessary to correct errors made by the supplier, in which case such corrections shall be initialed by the person or persons signing the bid.

One original copy of the completed response is to be clearly marked "ORIGINAL QUOTATION" and the other completed copies are to be marked "COPY OF QUOTATION." In case of any discrepancy, the copy marked "ORIGINAL QUOTATION" shall govern.

(c) Bond.

Price quotations must be accompanied by a bond in the amount of 5 percent of the price. No quotation will be considered unless it is so secured.

The bond provided by the supplier will not be discharged until the expiration of 150 days from the day of response opening or until such earlier time as the response shall have been accepted by TAZARA and a performance bond shall have been duly provided by the supplier.

(d) Manufacturer's Standard Warranty.

(e) Descriptive Literature.

Descriptive literature for the items, including full technical specifications, must be submitted with each copy of the price request response. This literature will be used to demonstrate compliance with the specifications and will not be considered to amend the quotation in any way. Deviations from RFP requirements included in descriptive literature furnished must be fully explained. In case of any conflict between the specifications in the descriptive literature and specifications in the price request, the latter will control.

5. Price Acceptance Period

Price offering less than 150 days for acceptance by TAZARA from the date the price response is received will not be acceptable.

6. Signature of Response

The quotation must be signed by a person duly authorized to do so. Price quotations submitted by a corporation must bear the seal of the corporation.

7. Late Response

The supplier will be held responsible for ensuring that the price quotations are received in accordance with the instructions stated herein and a late response will not be honored even though it became late as a result of circumstances beyond the supplier's control. A late quotation will be considered only if the sole cause of its becoming a late response was attributable to TAZARA, its employees, or agents.

8. Modification of Prices

The supplier has the right to withdraw, modify, or correct its price quotation after it has been delivered to TAZARA, provided the request for such a withdrawal, modification, or correction together with full details of such modification or correction is received by TAZARA at the address given above by letter, telegram, or telex before the time set for receiving the response. The original quotation, as amended by such communication, will be considered as the supplier's offer. TAZARA may ask the supplier for a clarification of this quotation. Clarifications which do not change the offered price may be accepted.

9. Price Request Conference

A price request conference will be held on _____, 19__, at _____ in the following location:

The supplier is not required to attend but is encouraged to do so. Modifications to the price request resulting from the conference will be provided to the supplier by means of an addendum to the price request.

10. Addenda to the Price Request

If for any reason prior to response it becomes necessary to modify the price request, an addendum will be issued to and be binding on the supplier. Receipt of all addenda shall be acknowledged by the supplier.

Addenda will be numbered consecutively commencing with No. 1 and the supplier is required to insert the numbers of addenda received in paragraph 3 of the price/award/contract form.

11. Price Request Questions

Should the supplier have questions to ask or should it have any doubt about the meaning of the price request, it should refer them in writing to TAZARA not later than 15 days before the date set for receipt of response.

12. Price Evaluation and Contract Award

(a) Award will be made to the supplier when prices have been determined to be comparable to market prices for same or similar parts supplied to other railways.

(b) A responsive quotation is one which complies with all of the terms and conditions of the RFP without material modification. A material modification is one which affects the price, quantity, quality, delivery or installation date of equipment or materials, or which limits in any way any responsibilities, duties, or liabilities of the supplier or any rights of TAZARA or USAID as any of the foregoing have been specified or defined in the RFP. TAZARA may waive any minor informality in the response which does not constitute a material modification.

(c) TAZARA reserves the right to delete any item or group of items.

(d) Failure on the part of the supplier to provide a performance bond in accordance with the conditions of contract shall be sufficient grounds for the annulment of the award and forfeiture of the price response bond.

(e) The quotation of the supplier which does not conform to the foregoing instructions may be unacceptable.

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GENERAL CONDITIONS OF CONTRACT

1. Definitions

Set forth below are terms used in the contract and reference to them shall be interpreted as follows:

- a. "AID" means the Agency for International Development.
- b. "Authorized Geographic Code" is AID Geographic Code 000.
- c. "Contract" means the "Bid/Award/Contract Form" signed by both bidder and Contracting Agency including all attachments and appendices thereto and all documents incorporated by reference therein.
- d. "Contracting Agency" is Tanzania Zambia Railway Authority (TAZARA).
- e. "Supplier" is the person or firm supplying the equipment and materials called for under this contract.

2. Governing Law and Language

- a. This contract shall be interpreted in accordance with the laws of the United States of America.
- b. The English language version of this contract shall govern. All notices pursuant to the provisions of this contract shall be in English.
- c. Shipping terms will be defined in accordance with the general and special conditions of contract (herein).

3. Delivery

Delivery of all equipment and materials to be supplied under this contract to the port of loading in the source country shall be made within 120 days from receipt of order.

4. Responsibilities of Other Contractors

_____ is employed by TAZARA to supervise this contract and is responsible for:

- a. Witnessing tests of equipment prior to shipment to the cooperating country;
- b. Inspecting and accepting or rejecting the commodities at point of delivery;
- c. Requiring replacement of defective equipment or materials;
- d. Issuing change orders. Concurrence of TAZARA is necessary if the value exceeds \$1,000 U.S.

5. Legal Effect of AID Approvals and Decisions

The parties hereto understand that the contract has reserved to AID certain rights such as, but not limited to, the right to approve the terms of this contract, the supplier, and any or all plans, reports, specifications, subcontracts, pricing documents, drawings, or other documents related to this contract and the project of which it is part. The parties hereto further understand and agree that AID, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity

to assure the proper use of United States Government funds, and that any decision by AID to exercise or refrain from exercising these approval rights shall be made as a financier in the course of financing this project and shall not be construed as making AID a party to the contract. The parties hereto understand and agree that AID may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the project with the parties jointly or separately, without thereby incurring any responsibility or liability to the parties jointly or to any of them. Any approval (or failure to disapprove) by AID shall not bar TAZARA or AID from asserting any right, or relieve the supplier from any liability which the supplier might otherwise have to TAZARA or AID.

6. Payment

a. Requests for Payment

Payment due the supplier under this contract shall be made based upon the supplier's written request accompanied by the following documentation:

- (1) The Supplier's Invoice;
- (2) "Supplier's Certificate and Agreement with AID for Project Commodities/Invoice and Contract Abstract" (Form AID 1450-4); and

(3) For each shipment of equipment or materials for which payment is requested:

(a) A copy or photostat of the dated bill of lading (ocean, airway, charter party, railway, barge or truck) or parcel post receipt evidencing shipment from the source country or a free port or bonded warehouse to the host country is to be submitted. The bill of lading shall indicate the carrier's complete statement of charges including all relevant weights, cubic measurements, rates, and additional charges whether or not freight is financed by AID.

b. Partial Payments

The supplier may request partial payment upon delivery and acceptance of each twenty-five (25) percent of the total items required by this contract. The supplier shall submit the documentation required by paragraph a. above with the request.

c. Local Currency

Unless directed otherwise by the Contracting Agency, all local currency costs paid or incurred by the supplier under the contract including, without limitation, all local taxes, duties, and imports, when not exempted, shall be reimbursed to the supplier in local currency and not by payment of United States dollars.

Except as otherwise approved in writing by TAZARA, when it is necessary for purposes of this contract for the supplier to convert United States dollars to local currency, such conversion shall be made through arrangements with the U.S. Disbursing Office.

7. Audit and Records

a. The supplier shall maintain books, records, documents, and other evidence and shall apply consistent accounting procedures and practices sufficient to reflect properly all transactions under or in connection with the contract. The foregoing constitute "records" for the purpose of this article.

b. The supplier shall maintain such records during the contract term and for a period of 3 years after final payment. However, records which relate to appeals under the "Disputes and Appeals" article or litigation or the settlement of claims arising out of the performance of this contract shall be retained until such appeals, litigation, or claims have been finally settled.

c. All records shall be subject to inspection and audit by the Contracting Agency (or its authorized agents) at all reasonable times. The supplier shall afford TAZARA proper facilities for such inspection and audit. This is a fixed price contract and is not subject to audit of costs (except for any cost-reimbursable items), but is subject to audit for compliance with other provisions of this contract.

d. The supplier further agrees to include in all its subcontracts hereunder a provision that the subcontractor agrees that TAZARA or any of its authorized agents shall, until the expiration of 3 years after final payment under the subcontract, have access to and the right to examine any records of such subcontractor involving transactions related to the subcontract.

8. Assignment

The supplier may not assign its obligation to perform under the contract except with the prior written consent of both TAZARA and AID. The supplier may not assign its rights to receive

payment under the contract except with the prior written consent of both TAZARA and AID.

9. Host Country Taxes

a. Pursuant to bilateral agreement between the United States Government and the host country government, the supplier and those of its employees who are not citizens or permanent residents of the host country shall be free of all taxes, fees, levies, customs, or impositions imposed under laws in effect in the host country with respect to all equipment and materials supplied and services performed under this contract. This exemption includes all customs, duties, and registration fees.

b. The Government will allow the supplier to import free of customs and duties such materials and equipment as may be required under this contract.

c. Any taxes, fees, levies, customs, or impositions within the scope of paragraphs a. and b. above paid by the supplier shall be reimbursed by TAZARA.

10. Nationality and Source

a. Eligibility of Suppliers

(1) No equipment, materials, or services shall be eligible for AID financing if offered by a supplier or subcontractor included on any list of suspended, debarred, or ineligible bidders used by AID.

(2) The supplier and any subcontractor(s) must be:

(a) An individual who is a citizen or legal

resident of a country or area included in the authorized geographic code;

(b) A corporation or partnership organized under the laws of a country or area included in the authorized geographic code;

(c) A controlled foreign corporation, i.e., any foreign corporation of which more than 50 percent of the total voting power of all classes of stock is owned by United States shareholders within the meaning of the Section 957 et seq. of the Internal Revenue Code (26 U.S.C. 957); or

(d) A joint venture or unincorporated association consisting entirely of individuals, corporations, or partnerships which fit any of the foregoing categories.

(3) Citizens or firms of any country not included in AID Geographic Code 935 are ineligible as suppliers, contractors, subcontractors, or agents in connection with AID-financed contracts for goods or services. However, non-U.S. citizens legally admitted for permanent residence in the United States are eligible.

b. Eligibility of Commodities

(1) Definitions

(a) Source

"Source" means the country from which a commodity is shipped to the cooperating country or the cooperating country itself if the commodity is located therein at the time of purchase. However, where a commodity is shipped from a free port or bonded warehouse in the form in which received therein, "source" means the country from which the commodity was shipped to

the free port or bonded warehouse.

(b) Origin

The "origin" of a commodity is the country or area in which a commodity is mined, grown, or produced. A commodity is produced when through manufacturing, processing, or substantial and major assembling of components a commercially recognized new commodity results that is substantially different in basic characteristics or in purpose or utility from its components.

(c) Componentry

"Components" are the goods that go directly into the production of a produced commodity.

(2) Rule

All equipment and materials shall have their "source" and "origin" in an authorized country and meet the following componentry rules:

(i) If the commodity contains no imported component, it meets AID's componentry requirements.

(ii) If the commodity contains components imported from countries included in Geographic Code 935 which are not included in the authorized geographic code for the procurement, the components are limited according to the following rules:

I. They are limited only if they are acquired by the producer in the form in which they were imported.

II. The total cost of such components to the producer of the commodity (delivered at the point of production of

the commodity) may not exceed 50 percent of the lowest price (excluding the cost of ocean transportation and marine insurance) at which the supplier makes the commodity available for export sale (whether or not financed by AID).

III. AID may prescribe percentages other than 50 percent for specific commodities.

IV. Components from the cooperating country may be used in unlimited amounts whenever any geographic code other than Code 000 is authorized.

(iv) Any component from a non-free world country makes the commodity ineligible for AID financing. (NOTE: This numbering is same as Handbook 11, Chapter 3 which does not contain an item Numbered (iii).)

c. Motor Vehicles (not applicable)

d. Delivery Services

(1) With respect to ocean or air freight, "source" means the flag of the vessel or aircraft.

(2) Ocean Freight

(a) All goods covered by this contract which are transported on ocean vessels shall be transported on privately owned U.S. flag commercial vessels to the extent they are available at fair and reasonable rates for U.S. flag commercial vessels. If such flag vessels are not available, the supplier may request a waiver from the Office of Commodity Management, AID, Washington, D.C. 20523.

(b) When shipment is made under a through bill of lading issued by an eligible flag carrier, AID will finance costs

incurred on vessels under flag registry of any free world country if the costs are part of the total cost paid to the eligible flag carrier.

(3) Air Freight

The supplier will use U.S.-flag air carriers to the extent they are available as set forth in the clause of this contract entitled "Air Travel and Transportation." When U.S.-flag air carriers are not available, preference should be given to the use of host country or Code 941 flag air carriers before using Code 899 flag air carriers.

(4) Charters

All air or ocean charters, covering full or part cargo, for the transport of equipment, materials, or other goods procured for the performance of this contract must be approved by AID in writing prior to shipment.

(5) General Transportation

Unless otherwise authorized, AID will not finance any transportation costs:

(a) For shipment beyond the point of entry in the host country except when intermodal transportation service covering the carriage of cargo from point of origin to destination is used and the point of destination is established in the carrier's tariff and stated in the "through bill of lading";

(b) On a transportation medium owned, operated, or under the control of any country not included within Code 935;

(c) On any vessel designated by AID as ineligible to carry AID-financed cargo; or

(d) Under any ocean or air carrier covering full or part cargo which has not received prior approval by the Office of Commodity Management, AID, Washington, DC 20523.

e. Source of Marine Insurance

(1) The eligibility of marine insurance is determined by the country in which it is "placed." Insurance is placed in a country if payment of the insurance premium is made to, and the insurance policy is issued by, an office located in the country. Insurance must be placed in a country included in the authorized geographic code, or when the authorized geographic code is other than 000, it may be placed in the cooperating country.

(2) If at any time AID determines that the government of the host country by statute, decree, rule, or regulation discriminates, with respect to AID-financed procurement, against any marine insurance company authorized to do business in any state of the United States, then AID shall require that any AID-financed goods thereafter shipped to the host country shall be insured against marine risks, and that such insurance shall be placed in the United States with a company or companies authorized to do insurance business in any state of the United States.

11. Air Travel and Transportation

a. The supplier shall utilize U.S.-flag carriers for international air transportation of personnel (and their personal effects) or property to the extent service by such carrier is available, in accordance with the following criteria:

(1) If a U.S.-flag air carrier cannot provide the international air transportation needed, or if the use of a non-U.S.-flag carrier is approved by AID in order to accomplish the agency's mission, foreign-flag air carrier service may be

deemed necessary.

(2) Passenger or freight service by a U.S.-flag air carrier is considered available even though:

(a) Comparable or a different kind of service can be provided at less cost by a foreign-flag air carrier;

(b) Foreign-flag air carrier service is preferred by, or is more convenient for, the contractor or traveler; or

(c) Service by a foreign-flag air carrier can be paid for in excess foreign currency (unless U.S.-flag air carriers decline to accept excess or near excess foreign currencies for transportation payable only out of such monies).

(3) Except as provided in paragraph (1) above, U.S.-flag air carrier service shall be used for commercial foreign air travel under this contract if service provided by U.S.-flag air carriers is available. In determining availability of a U.S.-flag air carrier, the following scheduling principles shall be followed unless their application would result in the last or first leg of travel to or from the United States being performed by a foreign-flag air carrier.

(a) U.S.-flag air carrier service available at point of origin shall be used to destination, or in the absence of direct or through service, to the farthest interchange point on a usually traveled route.

(b) When an origin or interchange point is not served by a U.S.-flag air carrier, foreign-flag air carrier service shall be used only to nearest interchange point on a usually traveled route to connect with U.S.-flag air carrier service.

(c) When a U.S.-flag air carrier involuntarily reroutes the traveler via a foreign-flag air carrier, the foreign-flag air carrier may be used notwithstanding the availability of alternative U.S.-flag air carrier services.

(4) For travel between a gateway airport in the United States and a gateway airport abroad, passenger service by a U.S.-flag air carrier shall not be considered available if:

(a) The gateway airport abroad is the traveler's origin or destination airport and the use of U.S.-flag air carrier service would extend the time in travel status, including delay at origin and accelerated arrival at destination, by at the least 24 hours more than travel by a foreign-flag air carrier; or

(b) The gateway airport abroad is an interchange point and the use of U.S.-flag air carrier service would require the traveler to wait 6 hours or more to make connections at that point, or if delayed departure from, or accelerated arrival at, the gateway airport in the United States would extend time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier.

(5) For travel between two points outside the United States, the rules in paragraphs (1), (2), and (3) shall be applicable, but passenger services by a U.S.-flag air carrier shall not be considered to be available if:

(a) Travel by a foreign-flag air carrier would eliminate two or more aircraft changes en route;

(b) One of the two points abroad is the gateway airport en route to or from the United States and the use of a U.S.-flag air carrier would extend the time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier,

including accelerated arrival at the overseas destination or delayed departure from the overseas origin, as well as delay at the gateway airport or other interchange point abroad; or

(c) The travel is not part of the trip to or from the United States and the use of a U.S.-flag air carrier would extend the time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier including delay at origin, delay en route, and accelerated arrival at destination.

(6) For all short-distance travel under either paragraph (4) or paragraph (5) above, U.S.-air carrier service shall not be considered available when the elapsed travel time on a scheduled flight from origin to destination airport by foreign-flag air carrier is 3 hours or less and service by a U.S.-flag air carrier would involve twice such travel time.

b. Freight service by a U.S.-flag air carrier will be considered to be unavailable:

(1) When no U.S.-flag air carrier provides scheduled air freight service from the airport serving the shipment's point of origin and a non-U.S.-flag air carrier does;

(2) When the U.S.-flag air carrier(s) serving the shipment's point of origin decline to issue a through airway bill for transportation to the shipment's final destination airport;

(3) When use of a U.S.-flag air carrier would result in delivery to final destination at least seven (7) days later than delivery by means of a non-U.S.-flag air carrier;

(4) When the total weight of the consignment exceeds the maximum weight per shipment which the U.S.-flag air carrier will accept and transport as a single shipment and a non-U.S.-flag air carrier will accept and transport the entire consignment as a

single shipment.

(5) When the dimensions (length, width, or height) of one or more of the items of a consignment exceed the limitations of the U.S.-flag aircraft's cargo door opening, but do not exceed the acceptable dimensions for shipment on an available non-U.S.-flag scheduled air carrier.

c. In the event that the supplier selects a carrier other than a U.S.-flag air carrier for international air transportation, it will include a certification on vouchers involving such transportation which is essentially as follows:

CERTIFICATION OF UNAVAILABILITY OF U.S.-FLAG CARRIER

I hereby certify that transportation service for personnel (and their personal effects) or property by U.S.-flag air carriers was unavailable for the following reasons:

d. If travel is by indirect route or the traveler otherwise fails to use available U.S.-flag air carrier service, and the certification required by paragraph c. above is not attached to the applicable voucher, AID will not finance the amount determined under the following formula:

Sum of U.S.-flag carrier segment <u>mileage authorized</u>	X	Fare payable by AID
Sum of all segment mileage authorized		

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Sum of U.S.-flag carrier segment <u>mileage traveled</u>	X	Through fare paid
Sum of all segment mileage traveled		

e. The terms used in this clause have the following meanings:

(1) "Gateway airport abroad" means the airport from which the traveler last embarks en route to the United States or at which the traveler first disembarks incident to travel from the United States.

(2) "Gateway airport in the United States" means the last U.S. airport from which the traveler's flight departs or the first U.S. airport at which the traveler's flight arrives.

(3) "International air transportation" means transportation of persons (and their personal effects) or property by air between a place in the United States and a place outside the United States.

(4) "U.S.-flag air carrier" means an air carrier holding a certificate under Section 401 of the U.S. Federal Aviation Act of 1958 (49 U.S.C. 1371).

f. The supplier shall include the substance of this clause, including this paragraph f., in each subcontract or purchase order hereunder, which may involve international air transportation.

12. Subcontracts

a. Subcontracts must comply with the nationality, source, origin, and componentry requirements of this contract. The supplier agrees to include the following provisions of this contract in all subcontracts hereunder:

"Host Country Taxes"

"Air Travel and Transportation"

"Nationality and Source"

"Worker's Compensation Insurance" if incidental services are to be performed under the subcontract, and

b. All subcontracts and purchase orders in excess of \$100,000 shall only be awarded with the prior written consent of TAZARA and AID and such consent, if given, shall not relieve the supplier from any liability or obligation under this contract.

13. Change Orders

TAZARA may at any time, by a written order, and without notice to the sureties, make changes within the general scope of this contract, in any one or more of the following:

(a) Drawings, design, or specifications, where supplies to be furnished under this contract are to be specially manufactured for TAZARA;

(b) Method of shipment or packing; or

(c) Place of delivery.

If any such change causes an increase or decrease in the cost of, or the time required for, the performance of any part of the work under this contract, whether changed or not changed by any such order, an equitable adjustment shall be made in the contract price or delivery schedule, or both, and the contract shall be modified in writing accordingly. Any claim by the supplier for adjustment under this clause must be asserted within 30 days from the date of receipt by the supplier of the modification or change. Change orders which exceed \$1,000 U.S. must be approved by AID.

14. Amendments

Modification of the terms of this contract shall be made by amendment signed by the parties. Any amendments, including letter amendments, which increase the contract amount or extend the completion date of the contract must be approved by AID.

15. Disputes and Appeals

a. In the event of a disagreement under this contract, the supplier shall submit a written statement to TAZARA briefly describing the nature of the problem, the position of the supplier regarding the issue, and a narrative of facts in support of the supplier's position.

b. Within 10 days after receipt of the supplier's statement, TAZARA shall decide the issue and deliver a written statement of the decision to the supplier, including the reasons supporting the decision, if adverse to the supplier.

c. Within 30 days after receipt of TAZARA's decision or the date such decision was due, the supplier may submit to TAZARA a written notice of appeal including a detailed description of the facts of the dispute with the dates of events, names of persons involved, references to documentation bearing on the matter (with copies attached), the relevant contract provision(s), the supplier's contentions and conclusions, and a statement of why TAZARA's decision is being questioned.

d. If within 30 days after delivery of a notice of appeal, the parties cannot mutually agree to a satisfactory settlement, the matter shall be presented for arbitration following the rules of the International Chamber of Commerce.

16. MARKING

a. The supplier shall be responsible for assuring that all commodities to be furnished under this contract and their shipping containers carry the official AID emblem and for correctly marking goods and shipping containers. Emblems shall be affixed by metal plates, decal, stencil, label, tag, or other means depending upon the type of commodity or shipping container and the nature of the surface to be marked.

b. The emblem placed on the commodities shall be as durable as the trademark, company, or brand name affixed by the manufacturer, and the emblem on each shipping container must be affixed in a manner which assures that it will remain legible until the container reaches its destination. Such containers shall display the last set of digits of the identification number of the pertinent implementing document in characters equal in height to the shipper's marks.

17. Inspection

a. All supplies (including raw material, components, intermediate assemblies, and end products) shall be subject to inspection and test by or on behalf of TAZARA at the expense of TAZARA prior to shipment. TAZARA will notify the supplier in writing of the names of any inspectors or inspection firms. It is understood that inspection and testing shall not in any way release the supplier from any warranty or other obligations under this contract.

b. If any inspection or test is made by or on behalf of TAZARA on the premises of the supplier, the supplier shall provide all reasonable facilities and assistance for the safety and convenience of TAZARA or its inspectors in the performance of

their duties without additional charge.

18. Force Majeure

a. Except with respect to default of subcontractors, the supplier shall not be liable for any excess costs if the failure to perform the contract arises out of causes beyond the control and without the fault or negligence of the supplier (force majeure) and if the supplier, within 20 days from the beginning of any such force majeure, notifies the contracting agency of such prevention of performance and the cause thereof. Such causes may include, but are not restricted to, acts of the borrower/grantee in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather, but in every case the failure to perform must be beyond the control and without the fault or negligence of the supplier. If the failure to perform is caused by the fault of a subcontractor and if such default arises out of causes beyond the control of both the supplier and the subcontractor and without the fault or negligence of either of them (force majeure) and the supplier, within 20 days from the beginning of any such force majeure, notifies TAZARA of such prevention of performance and the cause thereof, the supplier shall not be liable for any excess costs due to the failure to perform, unless the supplies or services to be furnished by the subcontractor were obtained from other sources in sufficient time to permit the supplier to meet the required delivery schedule.

b. In the event of a force majeure, the supplier, unless otherwise directed by TAZARA in writing, shall continue to undertake and perform the duties set forth in this contract as far as is reasonably practical.

c. In the event of a force majeure resulting in a suspension of work, this contract shall be extended by a period equal to that

for which the supplier was prevented from performing.

d. The supplier shall be entitled to reasonable costs incurred as a consequence for a force majeure.

e. If the supplier's inability to perform by reason of the force majeure lasts for more than 45 days after notice has been given to TAZARA, either party may terminate this contract and the supplier shall be entitled to any sums which would be payable in case of termination of this contract by TAZARA for convenience.

19. Termination by TAZARA for Default

a. TAZARA may, by written notice of default sent to the supplier by registered mail, terminate in whole or part this contract:

(1) If the supplier fails to make delivery of the equipment within the time specified herein or any extension thereof, or

(2) If the supplier fails to perform any of the other provisions of this contract, or so fails to make progress as to endanger performance of this contract in accordance with its terms, and, in either of these two circumstances, does not cure such failure within a period of ten (10) days (or such longer period as TAZARA may authorize in writing) after receipt of notice from TAZARA specifying such failure.

b. In the event TAZARA terminates this contract in whole or in part as provided in paragraph a. of this article, TAZARA may procure, upon such terms and in such manner as TAZARA may deem appropriate, supplies similar to those so terminated, and the supplier shall be liable to TAZARA for any excess costs for such similar supplies. However, the supplier shall continue performance of this contract to the extent not terminated under

the provisions of this article.

20. Liquidated Damages

If the supplier fails to deliver and install the commodities as scheduled in this contract, TAZARA will assess the supplier liquidated damages of \$ _____ per day, not to exceed a total of \$ _____.

21. Termination by TAZARA for Convenience

a. This contract may be terminated by TAZARA in whole, or from time to time in part, in accordance with this article, whenever TAZARA shall determine that such termination is in the best interest of TAZARA.

b. Termination shall be effected by a notice of termination to the supplier, specifying that termination is for the convenience of TAZARA, the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.

c. After receipt of a notice of termination and except as otherwise directed by TAZARA, the supplier shall:

(1) Stop work under the contract on the date and to the extent specified in the notice of termination, and place no further orders or subcontracts except as may be necessary for completion of the portion of the work under the contract which is not terminated;

(2) Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination;

(3) Assign to TAZARA as it may direct, all of the right, title, and interest of the supplier under the orders and subcontracts so terminated, in which case TAZARA shall have the right to settle or pay any claims arising out of the termination of such orders and subcontracts;

(4) With the approval or ratification of TAZARA, to the extent TAZARA may require, which approval or ratification shall be final and conclusive for all purposes of this clause, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts;

(5) Transfer title to TAZARA and deliver, as directed by TAZARA, the completed or partially completed equipment, material, and parts which would be required to be furnished to TAZARA under this contract;

(6) Complete performance of the part of the work which has not been terminated by the notice of termination; and

(7) Take such action as may be necessary for the protection of the property related to this contract which is in the possession of the supplier and to which TAZARA has title.

d. The supplier shall submit to TAZARA its written claim promptly but not later than three months from the effective date of termination, except as TAZARA may agree in writing.

e. The supplier and TAZARA shall consult within 30 days of the submission of the claim concerning the whole or any part of the amount to be paid to the supplier by reason of the termination of work. The contract shall be amended accordingly, and the supplier shall be paid the agreed amount.

f. In deciding the amount due the supplier, all settled claims which TAZARA may have against the supplier in connection with this contract, and the agreed price for, or the proceeds of, sale of property acquired by the supplier or sold and not otherwise recovered by or credited to TAZARA, shall be deducted.

g. Any disagreement regarding termination amounts or procedures shall be settled under the clause of this contract entitled "Disputes and Appeals."

22. Worker's Compensation Insurance

a. The supplier, before commencing performance under this contract, shall maintain coverage through worker's compensation insurance or security covering each employee to the extent required by the Defense Base Act of the United States, but in any event equivalent to coverage required by law or custom in the location where the supplier's employee is performing services. The supplier shall obtain all Defense Base Act insurance required by this clause from the Insurance Company of North America through Wright & Company, 1400 I Street, NW, Suite 1100, Washington, D.C. 20005, U.S.A.

b. The supplier agrees to insert this clause in all subcontracts hereunder except those exclusively for furnishing materials or supplies.

23. Performance Bond or Guaranty

a. The supplier shall furnish to TAZARA within 15 days after award, a performance and payment bond or performance guaranty fully protecting TAZARA against any excess costs incurred by it as a result of any failure to the supplier to perform any of its obligations under this contract.

b. Such bonds or guaranty shall be satisfactory to TAZARA and, at the option of the supplier, shall be in the form of a surety bond, certified check, cashier's check, bank guaranty, or irrevocable letter of credit. If a performance guaranty in the form of a certified check, cashier's check, bank guaranty, or irrevocable letter of credit is used, it shall be in an amount evaluated to ten (10) percent of the contract value. If a performance bond is used, the bond shall be in an amount equivalent to ten (10) percent of the total amount of the contract value. The performance guaranty shall be drawn in favor of TAZARA and shall be collectible upon receipt of TAZARA's written certification and verification of supplier's default hereunder.

c. The bonds or guaranty shall be released not later than 30 days following the date of completion of the contract performance.

24. Warranty

The supplier shall provide a warranty under which it will replace or repair the equipment to be supplied under this contract, or repair or replace any parts of such equipment, found to be defective due to faulty workmanship or materials. Replacements and repairs shall be made without cost to TAZARA other than the cost of transportation from the port of entry to the project site. Such warranty shall be effective for twenty-four (24) months after commissioning of the equipment is completed. TAZARA shall give the supplier prompt notice of any claims under such warranty and, if the supplier fails to remedy defects within a reasonable time, shall have the right to take such remedial action as may be necessary and to claim the reasonable cost thereof from the supplier.

25. Packing

All materials and equipment must be properly prepared for export to withstand exposure to the elements and rough handling during ocean or air shipment. Such packing must be sufficient to insure safe arrival at destination and fully cover such hazards as extreme temperature and/or possible corrosion due to salt air or open storage.

26. Incidental Services

Upon delivery of equipment to the site, the supplier agrees to furnish the services of a fully qualified mechanic or serviceman to supervise the assembly and perform the initial start-up and to ensure that the equipment will be completely adjusted, lubricated with the type and grade of lubricant recommended by the manufacturer, battery fully charged, and made ready for continuous operation. All materials required for the foregoing operations shall be furnished by the supplier.

27. Spare Parts

The supplier shall furnish to TAZARA a representative list of all spare parts and components necessary for proper and continuing functioning of each unit for a period of five years. The list will be prepared in such form so that each line item can be readily identified by the manufacturer's part number, nomenclature, and unit.

28. Suspension of Work

a. TAZARA may, at any time, by written order to the supplier

(suspension of work order), require the supplier to stop all, or any part, of the work required by the contract for a period of up to 90 days from the specified effective date.

b. Upon receipt of such an order, the supplier shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs related to the work covered by the order.

c. Within the period of the suspension of work order, TAZARA shall either:

(1) Cancel the suspension of work order; or

(2) Terminate the work covered by such order as provided in the "Termination by TAZARA for Convenience" clause of the contract.

d. If the suspension of work order is cancelled or the order expires, the supplier shall resume work. An equitable adjustment shall be made as necessary in the time schedule, the price, or a combination thereof, of any other provisions of the contract that may be affected and the contract shall be amended accordingly, if the supplier asserts a claim for such adjustment within 30 days after the end of the period of work suspension. Failure to agree to any adjustment shall be a dispute under the "Disputes and Appeals" clause of the contract.

29. Equal Employment Opportunity

The supplier will not discriminate in recruitment or employment conditions of personnel hired in the United States because of race, religion, color, sex, or national origin and is in compliance with its equal employment opportunity obligations under Executive Order 11246 dated September 24, 1965.

30. Vesting of Title and Diversion Rights

AID reserves the right to vest in itself title to the goods financed under this contract, provided that such goods are in a deliverable state and have not yet been offloaded in ports of entry in the cooperating country. AID may direct the carriers to divert these goods to alternative destinations.

31. Escalation

Freight costs will be paid in accordance with those submitted in the bid if there is no change in bunker or congestion surcharges between bid opening date and shipping date. The bidder will furnish with its bid, a copy of the page(s) of the prevailing tariff in effect on the bid opening date showing the bunker and/or congestion surcharges applicable to the shipping period(s) of the intended shipments which are on file with the U.S. Federal Maritime Commission and have been published in the applicable shipping conference tariff. If bunker or congestion surcharges are increased or decreased subsequent to bid opening date, calculation of the increase or decrease will be the difference between the tariff rates submitted with the supplier's bid and the applicable effective tariff rate at the time of shipment. TAZARA agrees to make payment on the basis of the cost of goods delivered at destination adjusted in accordance with the above procedure. In order that TAZARA may make necessary amendments to the financing documents prior to shipment, the supplier will provide information to TAZARA concerning any increases in bunker or congestion surcharges that the carrier has filed with the Federal Maritime Commission subsequent to the bid opening date.

32. Marine Insurance

The supplier shall provide all risk marine insurance on a warehouse-to-warehouse basis at 110 percent of the c.i.f. value of each shipment. The premiums shall not exceed the prevailing rate for similar coverage, and all loss payment proceeds shall be payable in any freely convertible currency. The source of any goods financed by loss payments which are used to repair or replace goods procured under this contract shall be AID Geographic Code 935.

33. Notices

Any notice given by either party will be in writing or by telegram or cable and will be deemed duly given or sent when delivered to the following addresses:

To Supplier: (to be decided after price evaluation)

To TAZARA: General Manager,
Tanzania Zambia Railway Authority
P.O. Box 2834
Dar es Salaam,
Tanzania (Telex 41059 TAZARA, TZ)

Notices shall be effective when delivered or on the effective date of the notice, whichever is later.

SECTION IV. SPECIAL CONDITIONS OF CONTRACT

NOTE: The article number refers to the articles in the General Conditions of Contract.

ARTICLE NUMBER		PAGE
1.	DEFINITIONS	2A-IV-1
3.	DELIVERY AND DOCUMENTS	2A-IV-1
6.	PAYMENT	2A-IV-3
17.	INSPECTION APPROVALS AND TESTS	2A-IV-4
24.	WARRANTY	2A-IV-5
32.	MARINE INSURANCE	2A-IV-6

ADDITIONAL ITEMS

A.	PRICES	2A-IV-6
B.	TECHNICAL ASSISTANCE	2A-IV-6

SECTION IV. SPECIAL CONDITIONS OF CONTRACT

The special conditions of contract contained herein shall supplement and shall be read with the general conditions of contract. Whenever there is a conflict, the special conditions shall prevail over those in the general conditions of contract. The article numbers given below refer to the articles in the general conditions of contract.

1. DEFINITIONS

In this contract the following terms shall be as defined below.

- f. The buyer is the Tanzania Zambia Railway Authority (TAZARA).
- g. The supplier is (name of supplier).
- h. The United States Agency for International Development is providing funds for the contract and is responsible for making payments on behalf of the buyer.

3. DELIVERY AND DOCUMENTS

3.1 Goods Transport by Sea

Upon shipment, the supplier shall notify the buyer and the insurance company by cable or telex the full details of the shipment including contract number, description of goods, quantity, the vessel, the bill of lading number and date, port of loading, date of shipment, port of discharge. The supplier shall send by air mail the following documents to the buyer, with a copy to the insurance company:

- (i) Copies of the supplier's invoice showing goods description, quantity, unit price, total amount;
- (ii) Original and three copies of the negotiable, clean, on-board bill of lading marked freight prepaid and three copies of non-negotiable bill of lading;
- (iii) Copies of packing list identifying contents of each package;
- (iv) Insurance certificate;
- (v) Manufacturer's/supplier's warranty certificate;
- (vi) Inspection certificate, issued by the buyer or his duly authorized inspection report; and
- (vii) Certificate of origin.

The above documents shall be received by the buyer at least one week before arrival of goods at the port and, if not received, the supplier will be responsible for any consequent expenses, including costs, delays, and claims for demurrage and liquidated damages.

3.2 Delivery Schedule

A detailed delivery schedule shall be agreed between the buyer and the supplier before the date of contract and that schedule shall form part of the contract. The schedule shall define the size of each delivery batch and the date of each delivery. It shall closely follow the schedule given in the supplier's tender and it shall form the basis of any calculation of

liquidated damages pursuant of article 24 of the general conditions of contract.

3.3 Point of Delivery

The locomotives shall be shipped to Dar es Salaam and landed/unloaded on TAZARA track.

3.4 Delivery Certificates

The goods will be offered to the buyer for acceptance at the selected point of delivery. The buyer shall arrange for each delivery batch of goods to be inspected and he shall issue a delivery certificate in respect of that part of each batch which is found to comply with the technical specification in all respects.

6. PAYMENT

- d. All payments will be made by USAID/buyer to the supplier in the currency or currencies declared in Section VII of the tender.
- e. All payments shall be made pursuant of article 6 of the general conditions of contract.
- f. No payment shall be made before signature of the contract pursuant of article 6 of the instruction to bidders and the furnishing of performance security pursuant of article 23 of the general conditions of contract.
- g. Advance payments shall be made on behalf of the buyer within 30 days of receipt by the buyer of the relevant invoice and payment security from the supplier. All other payments shall be made on behalf of the buyer within 60 days of receipt by the buyer of the appropriate

invoice and/or certificate from the supplier.

h. If as a result of any change order pursuant to article 13 of the general conditions of contract or for any other reason the total amount payable to the supplier is changed during the course of the contract, appropriate adjustments will be made to the delivery payments.

i. Performance Retention

An amount equal to 5 percent of the total value of the contract price or any revision of the contract price shall be paid after full delivery and acceptance of the last delivery as follows. The balance of the total value of the contract price, or revision of the contract price, will be paid after all claims under the conditions of warranty and other conditions of the contract have been satisfactorily met or on the expiry of the warranty period, whichever is later.

17. INSPECTION APPROVALS AND TESTS

c. The buyer shall notify the supplier of the names of all employees authorised to approve procedures, inspect and attend tests on his behalf, together with any restrictions placed on the powers and authority of such employees.

d. The buyer shall similarly advise the supplier of all agents not being employees who are appointed to carry out approvals and inspections and witness tests on his behalf.

e. The buyer shall meet all costs of travel, accommodation, and subsistence incurred by his duly authorised employees and agents in carrying out such inspections and attending inspections and tests.

f. The buyer shall pay all fees payable to duly appointed agents.

g. The supplier shall pay the costs of all tests specified in the contract.

i. Inspections and Tests

Notwithstanding the buyer's right to inspect the goods at any time, the following principal inspections and tests shall be made by the supplier. The buyer shall be given the opportunity to carry out his own inspections at these times and to witness all the tests specified. The supplier shall give due notice of his intention to carry out such tests.

All tests shall be carried out in accordance with the provisions of the technical specification.

List of principal tests.

- Testing and inspection of components before assembly.
- Tests on subassemblies.
- Acceptance and inspection of all locomotives, spare parts, and maintenance equipment before dispatch from the factory.
- Delivery tests and inspection at the point of delivery.

j. Acceptance Certificate

The supplier shall not dispatch any goods from his factory without an acceptance certificate from the buyer's representative.

24. WARRANTY

The warranty period for all locomotives shall be 24 months from the in-service date as defined in article 24 of the general conditions of contract.

The guaranty provisions detailed in article 4 of the technical specification shall also apply.

32. MARINE INSURANCE

The insurance shall be in an amount equal to 110 percent of the c.i.f. value of the goods from "warehouse and warehouse" on "all risks" basis including war risks and strike clauses.

ADDITIONAL ITEMS

A. PRICES

The prices payable to the supplier shall be strictly in accordance with the price schedule. No adjustments to allow changes in costs of labor, material, or other elements of cost will be made with the exception of approved, written contract change orders.

B. TECHNICAL ASSISTANCE

The manufacturer's locomotive technical assistance (service engineer) scope of work is defined as follows:

- o Provide complete technical assistance to TAZARA in the form of service engineering which includes review of manufacturer's locomotive servicing instructions with workshop and depot personnel assigned to perform the tasks.
- o Observe adherence to instructions by artisans (workshop/ depot mechanics and inspectors) in performing daily inspection and maintenance tasks.

- o Monitor performance of assigned artisans and technicians, and provide direction for correction of nonadherence to instructions on all levels of inspection and maintenance.
- o Enlist supervisory/management involvement where understanding is not achieved.
- o Provide technical direction to all levels of workshop and depot personnel on operation and maintenance of locomotives.
- o Review maintenance manuals, operation manuals, and troubleshooting guides with all levels of workshop and depot personnel.
- o Provide technical assistance/direction to workshop personnel in determining cause of any locomotive malfunction. Relate this action to troubleshooting instructions.
- o Provide all levels of on-the-job (hands-on) training at every opportunity and as time permits.
- o Conduct classroom training where group presentations and demonstrations can be more effective than on a one-on-one basis.
- o Provide technical assistance to TAZARA personnel in their performance of each level of inspection and maintenance on each locomotive including:

Daily	One Year
Monthly	Two Year
Three Month	Three Year
Six Month	Four Year

- o Provide technical direction to supplies and storeroom personnel for analysis of spare parts replenishment requirements including parts identification and quantities.
- o Assist manufacturer's training program personnel (instructors/teachers) in conducting classroom sessions.
- o Provide hands-on training to classifications of artisans, technicians, and others responsible for performing the 4-year (overhaul) inspection and maintenance schedule and train as many workers as available during the period covering this work.

The qualifications of locomotive service engineers required to provide the above defined technical assistance work scope are as follows:

- Education - Graduate mechanical engineer or equivalent.
- Experience - Minimum of 8 years as locomotive service engineer (diesel electric).
- Interests - Getting a first-hand education in problem solving in third-world developing countries.
- Living in a remote area/seeing the wilds.
- Traveling/learning new languages.
- Self-learning of locomotive maintenance practices and achieving self-accomplishment.
- Self-confidence.

- Patience -- if the work force doesn't learn the first time try, try again.
 - Instructor/teacher.
 - Stamina.
- Other
- Fluent in English (read and write).

Period of technical assistance will extend to the completion of the 4-year overhaul of the 13 U30C locomotives.

V. SCHEDULE OF REQUIREMENTS

Submittal of price request response (quotation) is required by _____.

The purchase order will be issued within two weeks of price verification and acceptance of quotation.

Delivery of all purchase order items required within 120 days of purchase order date.

**SECTION VI. TECHNICAL SPECIFICATION FOR SPARE PARTS
FOR U30C ELECTRIC DIESEL LOCOMOTIVES**

<u>ARTICLE</u>	<u>PAGE</u>
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2. Tender Requirements (General)	2A-VI-2
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8. Parts and Materials Needed for 4-Year Inspection and Maintenance of 13 GE/Krupp U30C Diesel Electric Locomotives	2A-VI-6
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**SECTION VI. TECHNICAL SPECIFICATION FOR SPARE PARTS
FOR U30C DIESEL ELECTRIC LOCOMOTIVES**

This specification shall apply to all spare parts for diesel electric locomotives currently in service in TAZARA's system.

The specification and its attachments shall be read together.

1. DEFINITIONS

1.1 In this specification the following definitions shall apply:

1.1.1 "Authority" means the Tanzania Zambia Railway Authority.

1.1.2 "Agent" means a person(s) appointed from time to time by the Authority and notified in writing to the contractor to act as an agent for the purpose of the contract on behalf of the Authority.

1.1.3 "Inspector" means the official designated by the Authority of a representative or agent appointed by the Authority to carry out inspection work.

1.1.4 The "Contractor" means the firm or company with whom contracted.

1.1.5 "Subcontractor" means any person, firm or company from whom the contractor may obtain materials or components to be used in the manufacture of the locomotives or parts thereof.

- 1.1.6 "Contract Drawings" means the drawings which are exhibited or provided for the guidance of the contractor.
- 1.1.7 "General Conditions of Contract" means the Authority's conditions of contract.
- 1.1.8 AAR means Association of American Railroads.
- 1.1.9 Major components shall mean the diesel engine, alternator traction motor, and bogies.
- 1.2 Headings to paragraphs of this specification shall not affect the interpretation thereof.

2. TENDER REQUIREMENTS (GENERAL)

The offers shall be for spare parts complying fully with all the requirements of this specification. If there are any minor details in the offer which do not fully comply to this specification, the supplier must draw specific attention to each and every instance of detail in which the part differs from the specified requirements. The supplier must in all instances furnish complete and detailed information, comments, or data in respect of the items or details which differ from the specified requirements.

3. RESPONSIBILITY OF THE CONTRACTOR

- 3.1 The contractor will be held solely and entirely responsible for meeting and fulfilling all the terms and conditions of the contract, including work performed or parts provided by subcontractors.

3.2 The work shall be of the highest quality in accordance with modern practice for manufacture of spare parts for diesel electric locomotives. The contractor will be held responsible for ensuring that the parts thereof are satisfactory in all respects and he shall not be relieved of such responsibility notwithstanding any approval which the Authority or its agent may have given.

3.3 The parts shall be supplied complete in all respects ready for service. The contract price shall include all the necessary parts and fittings--whether or not mentioned in the contract--to make the work complete, including an initial supply of any special lubricants, etc., which may not be readily available at site.

4. **GUARANTY**

4.1 The contractor shall guaranty the proper working of each part supplied under the contract for a period extending to a minimum of two years from the date of entry into service.

4.2 If during the period outlined in article 4.1, any defects in design, material, or workmanship shall appear, the contractor will make the following arrangements:

4.2.1 Supply and deliver to the Authority promptly and at his own cost such replacement for additional materials or parts as are necessary.

4.2.2 Install promptly and at his own cost such materials or parts, or alternatively by arrangement to pay the Authority the cost of undertaking the work; and

4.2.3 If sufficient experienced personnel are not available locally, to supply in addition, at the appropriate time and at his own cost, suitable staff for the proper supervision of the work of replacement.

4.2.4 In the event of the contractor failing to make good such defects or deterioration referred to herein, the Authority may make good the same and the contractor shall be liable for the cost thereof unless it can be shown and proved that these were due to causes for which the contractor is not responsible under the terms of this contract.

4.3 Any replacement parts or additional materials which may be supplied under sub-article 4.3.1 above shall be guaranteed for a period of two years from the date of installation of the replacement part or additional material.

4.4 The period of guaranty stipulated under articles 4.1 and 4.2 above shall be extended by a period equal to the time which a locomotive is out of service as a result of a defect for which the contractor is liable under the terms or guaranty.

5. MATERIALS AND WORKMANSHIP

5.1 All materials and workmanship used in the manufacture of the parts shall be in accordance with the provisions of the AAR standards of practice, or their equivalent U.S. codes. They must be of the best quality and of class most suitable for the purpose for which they are required. No defects shall be repaired without the written approval of the Authority or its agent.

5.2 The work shall be subject to the inspection by the Authority's inspector. Testing shall be to his requirements as approved by the Authority or its agent.

5.3 The components shall be made from materials complying with and shall conform in all respects to the AAR and U.S. standards. Particulars of the standard specifications complied shall be given when tendering.

6. INTERCHANGEABILITY

6.1 Assemblies, whether major or minor in nature, subassemblies, components, and individual parts must be interchangeable in all respects with the parts of existing fleet of U30C locomotives. Dismantling of adjacent parts and special fitting work for this purpose shall be avoided.

7. UNITS OF MEASUREMENT AND SCREW THREADS

7.1 Spare parts shall be designed and manufactured to AAR imperial system of dimensions. All screw threads shall be AAR imperial threads. In the case of items of equipment of standardized or proprietary nature, consideration will be given to the acceptance of UIC and other units of measurement and thread forms.

8. PARTS AND MATERIALS NEEDED FOR 4-YEAR INSPECTION AND MAINTENANCE OF 13 GE/KRUPP U30C DIESEL ELECTRIC LOCOMOTIVES

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
<u>WATER PUMP</u>			
1.	Kit, water pump overhaul	150 x 1069	13
2.	Kit, water pump installation gasket	150 x 1070	13
<u>LUBE OIL PUMP</u>			
1.	Kit, lube oil pump overhaul	150 x 1145	13
2.	Kit, lube oil installation gasket	150 x 1139	13
<u>BONDED RUBBER PUMP DRIVE</u>			
1.	Dowels	115 x 2175 115 x 2176 115 x 2177	6 6 6
2.	O ring	41A219499P138	13
3.	O ring camshaft access cover	115 x 2246-1	13
4.	Gasket, blanking cover lube oil fill opening	115 x 2075	13
5.	Gasket, cover to frame	115 x 1925-1	13
6.	Coupling, driver	114 x 1105-4	4
7.	O ring, retainer to cover	115 x 1929	13
8.	Seal, oil	115 x 1930-3	13
9.	Gasket, water pump	115 x 1209	13
10.	Gasket, connection to water pump	115 x 1208	13
11.	Gasket connection to cover	115 x 1857	13

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
<u>TRUCKS & CENTRE PLATE</u>			
1.	Driver gear housing	K41C620970	33
2.	Bearing plate	K41A244359	33
3.	Washer	K41D726101P23	8
4.	Gasket, 20mm x 50mm X 355mm long	K41D7225162PB	10
5.	Wear plate 5/16 in. x 5½ in. X 10 in.	339B789P11	10
6.	Wearing ring	339B785P2	6
7.	Wear plate	339B785P3	3
8.	Wear plate	41A244372ABP1	5
9.	Bearing pad	41A244372ADP1	5
10.	Shim, ¼ in. x 2 in. x 3½ in.	495A857P5	21
<u>JOURNAL BOXES</u>			
1.	Seal	984 x 39	156
<u>BRAKE RIGGING</u>			
1.	Key, brake cylinder	K3A88568	10
<u>ELECTRICAL TRACTION MOTORS</u>			
1.	Spring seat	41A233868P1	312
2.	Spring	41A237901P1	312
3.	Pin	41A233880P3	156
4.	Kit, gasket	1 x 9888	40
5.	Gasket, ¼ in. thick 1-5/8 in. wide, 7 1/4 in. long	9961549P2	80
6.	Gasket, ¼ in. thick, 1-5/8 in. wide, 4 in. long	9961549P3	80

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
<u>FUEL BOOSTER PUMP</u>			
1.	O ring, housing plug	132 x 1408	13
2.	Seal assembly	132 x 1407	13
3.	Gasket, cover	132 x 1412	13
<u>FUEL BOOSTER PUMP</u>			
1.	Bearing	149 x 1029	26
2.	Seal, shaft	149 x 1043	13
<u>COMPRESSOR/EXHAUSTER</u>			
		6 CD x 44C	
		41A203648P5	
1.	Safety Valve	10526-0060	13
2.	Gasket	514650	39
3.	Gasket	516274	13
4.	Gasket	514644	13
5.	Gasket	514627	13
6.	Gasket	553399	13
7.	Gasket	514644	26
8.	Gasket	514638	26
9.	Gasket	514637	26
10.	Gasket	514644	26
11.	Gasket	514651	13
12.	Gasket	514627	13
13.	Gasket	514626	13
14.	Gasket	514644	52
15.	Gasket	514651	52
16.	Gasket	514027	52
17.	Gasket	514626	52

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
18.	Chain	584006	13
19.	Mechanical seal	505165	13
20.	O ring	585166	13
21.	Bearings	585168	13
22.	Gasket	552658	26
23.	Gasket	573554	13
24.	Gasket	584525	13
25.	Gasket	572403	13
26.	Gasket	563411	13
27.	Ring	514624	26
28.	Ring	520128	26
29.	Ring	523429	26
30.	Ring	523430	26
31.	Ring	520130	26
32.	Ring	523432	26
33.	Ring	523427	26
34.	Bearings	540589	78
35.	Bearings	541078	78
36.	Bearings	540590	78
37.	Ring	520123	130
38.	Ring	523401	130
39.	Ring	523402	130
40.	Ring	520133	130
41.	Ring	523404	130
42.	Ring	523405	130
43.	Ring	566271	26

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
44.	O ring	575929	26
45.	Gasket	552660	13
46.	Bearing	549826	26
47.	Spring	567379	13
48.	Shims	567809	65
49.	Shims	567810	26
50.	Shims	567811	26
51.	Gasket	522758	13

SKF/FAG BEARING

1.	Bearings	6- $\frac{1}{2}$ in. x 12 in.	6
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TURBOCHARGER

Type 7S1612C1

1.	Turbo gasket kit	150 x 1083-1	13
2.	Bearings (blower end)	126 x 1223-1	13
3.	Bearing (turbine end)	126 x 1222-1	13
4.	Magnetic pick up	126 x 1389-1	6
5.	Sealant RTV 106	41B562849P156	20
6.	Turbo end seal	126 x 1562-1	13
7.	Blower end seal	126 x 1563	13
8.	Seal	126 x 1461	52
9.	Seal	115 x 2245	13
10.	Turbine casings	126 x 1633	4

ENGINE CONTROL SPEED
GOVERNOR TYPE

1.	Repair kit	150 x 1112-2	13
2.	Modulator kit	150 x 1079	13
3.	Governor converter kit	150 x 1123	13

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
<u>DIESEL ENGINE</u>			
1.	Cylinder head assembly to main frame gasket kit	150 x 1024-1	156
2.	Cylinder head and liner installation gasket kit	150 x 1023-6	156
3.	Water seal	125 x 1015-3	13
4.	OS link ring seal	132 x 1491	13
5.	OS link ring seal	132 x 1492	13
6.	Mechanical seal	125 x 1015-8	13
7.	Umbrella	123 x 1001	312
8.	Nozzle kit	150 x 1095	152
9.	Pump and nozzle kit	150 x 1087	152
10.	Bearing	132 x 1093-1	26
11.	Ring kit	150 x 1044	156
12.	Fuel hose	140 x 2283	168
13.	Conrod bearings	117 x 1042-2	20
14.	Conrod bearing	117 x 1050	20
15.	Plates	123 x 1058	100
		123 x 1044	100
		123 x 1059	100
		123 x 1086	100
		123 x 1060	100
		123 x 1061	100
		123 x 1062	100
		123 x 1063	100

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
16.	Shims	123 x 1046	100
		123 x 1047	100
		123 x 1048	100
		123 x 1049	100
		123 x 1050	100
17.	Loctite	147 x 1898-1	10
18.	Shims	132 x 1022	100
		132 x 1023	100
		132 x 1024	100
		132 x 1025	100
19.	Cam bearings	116 x 1070-1	160
20.	Crankshaft deflection gauge	147 x 1227	1
21.	Bearings	125 x 1075	13
	Bearings	125 x 1026	13
22.	Water pump overhaul kit	150 x 1069	13
23.	Water pump installation kit	150 x 1070	13
24.	Lube oil pump overhaul kit	150 x 1145	13
25.	Lube oil pump installation kit	150 x 1139	13
26.	Water inlet header kit	150 x 1116	156
27.	O ring	115 x 1268	234
		115 x 1902-1	78
		115 x 1865	26
28.	Ring	128 x 1447	26
29.	Gasket	128 x 1413	13

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
30.	Gasket	128 x 1357	78
31.	Seal	128 x 1358	156
32.	Gasket	128 x 1006	156
33.	Compound	147 x 1640	13
34.	Bushing	115 x 1876-1	26
35.	Spring	146 x 1059-1	26
36.	Seal	132 x 1491	13
36A.	Ring	132 x 1492	13
37.	Seal	132 x 1491	13
37A.	Top Cover Retaining Ring	N901 P412	13
38.	O ring	115 x 1902-1	156
39.	Lube oil filters	2 x 4223	104
40.	Fuel filters	132 x 1250	13
41.	Air filters	41A216508P4	286
42.	Sealant	RTV/10.3 497A806P60	44
43.	Sealant	41A212051P5	44
44.	CHEC III Panel	17FL237L1	4 panels
45.	Motor speed panel	17FL281F2	4 panels
46.	Valve inlet	123 x 1090	314
47.	Valve exhaust	123 x 1037-4	314
48.	Bolt Steel crown	142 x 1034-1	72
	<u>EXCITER/AUX. GENERATOR</u>	GY27M1	
1.	Carbon brushes	8828400PA	260
2.	Bearings (roller)	8864951P29	26
	(ball)	8864950P81	26

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
	<u>FUEL BOOSTER PUMP MOTOR</u>	41C610401G2	
1.	Carbon brushes	2 x 4072	52
2.	Bearings	626A259ABP1	26
	<u>DYNAMIC BRAKING BLOWER MOTOR</u>	GA57	
1.	Bearings	8864950P81	2
2.	Carbon brushes	6727520P1	52
	<u>HEAD LIGHTS</u>		
1.	Lamp 200 PAR 30V	41A2104466P1	52
	<u>GENERATORS</u>	GTA11C1	
1.	Carbon brushes	41A235676P4	78
2.	Brush holder with pressure arm	41B531649G2	78
	<u>TRACTION MOTORS</u>	GE 761	
1.	Carbon brushes	41A235897P4	624
	Bearings (roller) (ball)	8864951P1148 8864950P169	78 78
2.	Connecting sleeves	41A232340P3	624
3.	Speed sensor	41B537105G1	78
4.	Brush holder	41C633996G2	78
5.	Dust guard	994918294	78
	<u>VALVE BRAKE APPLICATION</u>		
		PB 252408	
1.	Kit, overhaul maintenance, rubber parts	562533	13
2.	Kit maintenance, rubber parts for moving parts	562534	13

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
	<u>BELL OPERATING VALVE</u>		
		PB 25290A	
3.	Seal	1 x 4553	40
4.	Seal	1 x 2702	26
	<u>HORN OPERATING VALVE</u>		
		PB 25300B	
5.	O ring	1 x 3549	13
	O ring	1 x 5164	13
	O ring	1 x 3662	13
	<u>VALVE SAFETY</u>		
6.	Strainer	542291	13
	<u>VALVE</u>		
7.	Trail or dead	MU-2B	
8.	Kit maintenance (all rubber parts)	574673	13
	<u>CHECK VALVE</u>		
9.	Seal	1 x 4553	26
	Seal	1 x 4554	26
	O ring	1 x 5777	26
10.	<u>DOUBLE CHECK VALVE</u>	41A300573ABP1	
	Seal	1 x 4550	26
11.	<u>CONTROL VALVE/ RELEASE VALVE</u>	PB 25404 PB 25408A	
	Kit, all rubber items	562541	40

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
13.	<u>PILOT AIR VALVE</u>	PB 25409	
	Ring packing 3 per locomotive	P5014	40
	Ring packing	536579	40
14.	<u>PILOT VALVE</u>	PB25409-001	
	O ring 15/16 in. O.D.	524614	26
	O ring 7/16 in. O.D.	532268	26
	O ring 7/8 in. O.D.	523734	26
	Filter	569557	26
15.	<u>PILOT AIR VALVE</u>	PB25411	
	Gasket, ring 1/4 in.	99458	26
	Filter	564391	26
	Diaphragm (1)	526346	13
	O ring 13/16 in. O.D.	524935	26
16.	<u>MAGNET VALVE</u>	PB 25460 (41A212869P4)	
	O ring	1 x 2705	13
	Plunger assembly	1 x 5779	13
	O ring	41A288377P17	13
	Gasket, cover	2 x 4378	13
	Grommet	1 x 5795	13
	Gasket	1 x 6423	13

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
17.	<u>REDUCING VALVE TYPE N-1</u>	PB 25481 (41B590469P1)	
	Gasket filter	558515	30
	Filter	564391	30
	O ring 3/4 in. O.D.	531868	26
	O ring 3/4 in. O.D.	564056	26
	Diaphragm	526346	13
18.	<u>RELAY VALVE TYPE J-1</u>	PB 25506 (499A924BEP1)	
	Kit rubber parts maintenance	560728	20
19.	<u>VALVE, AUTO DRAIN SHUT-OFF</u>	4LA211183P2	
	Seal, cap	1 x 3139	13
	Seal	1 x 3143	13
	Seal, top	1 x 3143	13
	Seal, bottom	1 x 2733	13
	Seal, plug	1 x 2705	13
	Gasket, bracket buse	1 x 3153	13
20.	<u>PUSH - PULL VALVE</u>	PB 25290-1 (41A211352P1)	
	Seal	1 x 3449	40

9. PARTS/COMPONENTS REQUIRED FOR REBUILD OF LOCOMOTIVE 1006

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
1.	Lower air cylinder assembly	41A203981ABP	1
2.	Radiator unit	41D704572P1	1
3.	Radiator fan impeller	41C63048663	1
4.	Shutter, magnetic valve (pilot air valve)	41A304753P1	1
5.	Compressor, magnetic valve	17ME1A20	1
6.	Dirt exhauster assembly	41B519090P2	1
7.	Flexible hose	41A241157P5	1
8.	V-belt pulley	41A244997P1	2
9.	Key	N3402P8096	2
10.	Hub, coupling	41C619141P1	1
11.	Equipment blower plastic filter	41E901373G2	20
12.	Coupler supporting plate	K41B542750P2	1
13.	Ajax coupling cover bulkhead	K41C622110G1	1
14.	Inertia filter paper	41A204671G2	22
15.	Hose	497A803P1	2
16.	Hand rail, 2018mm long	K431C418P10	2
17.	Hand rail, 112mm long	K41A205760P1	2
18.	Pulley	413531394G1	1
19.	Bolt, hex head 3/8 in.-16, 2½ in. long	N22P25040	3
20.	Bolt, hex head ½ in.-13, 2¼ in. long	N22P29016B	16

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
21.	Bolt, hex head ½ in.-13, 1 3/8 in. long.	N22P29022B	6
22.	Lock washer ½ in.	N405P45	6
23.	Coupling	41A243112P1	1
24.	Hub	41B517255P1	1
25.	Flange	41C17235P1	1
26.	Guard with screen left side overhead	41D722567G2	1
27.	Guard with screen left side overhead	41D722567G4	1
28.	Guard with screen, right side overhead	41D722567G1	1
29.	Guard with screen, right side overhead	41D722567G3	1
30.	Pipe support	155B9006AFP214	2
31.	Foot pipe support mounting	41A242713P1	2
32.	Foot pipe support mounting	419A908AAP1	2
33.	Fitting choke 3/64 in.	41A210033P	3
34.	Cut out cock 3/8 in. vental with plain handle	41A216250P1	5
35.	Hatch with screen and grab handle	41D704673G1	1
36.	Nut, self locking 3/4 in.-10	499A906AAP7	6
37.	Washer, grab handle	41A203813P2	6
38.	Bolt, hatch mounting 5/8 inch-11, 4½ in. hex head	N14P33072	8
39.	Washer, lock 5/8 in.	N405P47B	8

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>	
40.	Washer, plain 5/8 in.	N402P77B	8	
41.	Water level glass	499A452P2	1	
42.	Lock washer 3/8 in.	N405P43B	3	
43.	Bolt, hex head 3/8 in.-16, 4 in. long	N22P25064	12	
44.	Nut, self locking 3/8 in.-16	41A260076P3	12	
45.	Bolt, hex head 5/8 in.-11, 1-3/4 in. long.	N22P33028	8	
46.	Lock washer 5/8 in.	N405P47B	8	
47.	Screen 0.5-13, 1 1/2 long	K41D726147P35	10	
48.	Lock washer 1/2 in.	K41D726147P36	4	
49.	Resistor panel	41B561936G1	1	
50.	Rectifier panel	PB15501	1	
51.	Power cables (from traction alternator).		12	
52.	Power cable (from high- voltage compartment)	K41B542791P2	6	Size 180x40 460 long
53.	Alternator current control reactor (ACCR)	17ET13F	1	
54.	Braking current control reactor (BCCR)	17ET34A1	1	
55.	Control console arrangement (complete CS1)	PB12416-001	1	With all connections and mechanical interlocking
56.	Rheostat for dynamic braking (CS 2)		1	
57.	Braking resistor	17EM92D5	1	Includes 17EA5A19

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>	
58.	Radiator fan assembly (Eddy current, clutch Type 5GDY5341)	41C630922G6	1	Includes clutch resister
59.	Temperature switch, WTS1	339B949P22-1	1	
60.	Temperature switch, WTS2	339B949P23-1	1	
61.	Temperature switch, HITS	3393949P216-1	1	
62.	Temperature switch, HWTS	339B949P221-1	1	
63.	Safety control pressure switch	41B510557P14	1	
64.	Emergency pressure switch	413510557P14	1	
65.	Braking control pressure switch	41B510557P4	1	
66.	Crankcase overpressure switch	41D713511P1	1	
67.	Locomotive overspeed valve LOSV pressure switch	41A210583P2	1	
68.	Control magnetic valve pressure switch	41A210583P2	1	
69.	Shutter magnetic valve pressure switch	41A304735P1	1	
70.	MU-jumper wire	332B255G1	1	Rear 27 pins
71.	MU-jumper wire	332B255G2	1	Front 27 pins
72.	Fuel cut out	41A302391P1	2	
73.	Overload relay	17LV59	1	GE1-85743
74.	Relay (LV-compartment)	17LV66	43	GE1-85743
75.	Time-delay relay	41A264347P13	1	Long cycle
76.	Reverser contractor	DP22B1	1	GE1-85127D
77.	Braking switch	GP26B1	1	GE1-910
78.	Time-delay relay	41A264547P10	1	Short cycle
79.	Voltage regulator	17FH23D5	1	

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>	
80.	Governor plug (receptacle)	41B561446G1	1	Engine regulating
81.	Governor plug	41B536025G7	1	With BOS
82.	Terminal board (LV)	17BC17C1	23	
83.	Sentry panel	17FL218A1	1	
84.	CHEC II	17FL237A1	1	Excitation panel
85.	Reverser, current	FM 203	1	
86.	Speed sensor	41B537105G1	6	
87.	Speed-sensing alternator	MM24	1	GEX-73051F
88.	Air duct, end motor	41D716865G1	4	
89.	Air duct, above bolster	41D704604G1	2	
90.	Air duct, centre motor	343B109G3	2	
91.	Sensor cables	41B53105G1	6	
92.	Car body to traction motor cable connection boot and sleeve	41B536062G7 1600/24	24	Copper
93.	Cable clamps (steel)	41A216236P1 Two 1925/24 or 2300/24	24	
94.	Terminal board (TB-3)	17BC26B1	5	
95.	Contactor	17CM55Y3	9	
96.	Alternator overload relay	17AF41	1	
97.	Control transfer switch (SBM)	41A245406P1	1	GEH.2038B
98.	Vigilance control	41D704859G1	1	
99.	Speed record (assembly)	K41B54411P1	2	
100.	Foot switch	499A936AAP1	2	

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>	
101.	Switch panel (complete)	PB12404-006	1	Includes all circuit breakers
102.	Injector pump	132 x 1535	6	
103.	Injector nozzles	123 x 1041-2	6	
104.	High pressure pipes	140 x 1826	12	
105.	Relief valve	140 x 2386	2	
106.	Fuel transfer pump	132 x 1420	1	
107.	Overspeed link	132 x 1605	1	
108.	Overspeed governor	136 x 2250	1	
109.	Both pipes leading to the relief valve		2	
110.	All fuel supply headers and all drain headers of both sides of the engine and their fittings including Tee connections:			
	Hose with fitting fuel supply	140 x 2289	14	
110A	Header, head drain (left)	140 x 1967	1	
110B	Header, head drain (right)	140 x 1967	1	
111.	The whole fuel linkage mechanism (complete)	PB961002	1	
112.	Turbocharger BP94311-1A	126 x 1630-1	1	
113.	Intercooler (left) PB94501B	128 x 1361-4	1	
114.	Intercooler (right)			
115.	Free end cover PB92100E	114 x 1147-1	1	
116.	Camshaft section (right hand)	116 x 1122-1	1	

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
117.	Injection pump cross heads	124 x 1058	4
118.	Valve cross heads	124 x 1068	4
119.	Exhaust manifold (single pipe)	128 x 1585	1
120.	Kit, water pump installation gasket	150 x 1070	1
121.	Connection, water pump	140 x 1488-3	1
122.	Shaft, fuel control (left hand)	132 x 1238	1
123.	Shaft, fuel control (right hand)	132 x 1239	1
124.	Low-voltage compartment (complete)		1
125.	Hand brake	41A240674P3	1
126.	Marker lights (red)	41A205337P1	2
127.	Operator's cab (complete) (for DE 1006 Krupp No. 5537)	DE 1006/Krupp No. 5537	1
128.	Marker lights (white)	41B205337P1	2
129.	Operator's seat	K41D726145P1	2
130.	Operator's cab and accessories	PB 1136	1
131.	Dome light (complete)	PB 11400-1A	1
132.	Headlight arrangement	PB 11405	4
133.	Hot plate	41B540253P1	1
134.	Ventilator (complete)	41A215982P1	2
135.	Automatic fire extinguisher arrangement	PB1146-001	1
136.	Sliding windows (sets)	PB11622	2

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
137.	Safety glass 11.97 in. by 23.97 in. by 0.56 in. 3.67 in. radius	41A244111AAP2	3
138.	Window sliding chrome plate		2
139.	Window wiper arrange- ment (complete, Col A)	PB11641-2A	1
140.	Switch panel (complete)	PB12404-006	1
141.	Turbo gauge (complete)	PB12417	1
142.	Auxiliary cab (complete)	PB14003	1
143.	Engine cab (complete)	PB15008	1
144.	Washer $\frac{1}{2}$ in.	189V173P1	32
145.	Nuts $\frac{1}{2}$ in.	41A245425P9	16
146.	Compressor drive shaft arrangement (without shaft and pulley)	PB 15254	1
147.	Alternator discharge air duct (complete)	PB15382	1
148.	Radiator cab (complete) (for DE 1006 or Krupp No. 5537)	PB16003A	1
149.	Exhauster	41B519090P2	1
150.	Radiator fan guard arrangement (complete)	PB16751A	1
151.	Bolt, hex 0.5 - 13, $1\frac{1}{2}$ in. long	K41D726147P35	10
152.	Lock washer $\frac{1}{2}$ in.	K41D726147P36	14
153.	Screw, hex 0.5-13 $1-1/8$ in. long	K41D726147P37	4
154.	Wire 1.6	K41D726147P38	1
155.	Cable kit connection cover	41D536062G7	18

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QTY</u>
156.	Water sealant	41A216775P1	9
157.	Hose clamp	499A910AAP3	36
158.	Cut out cock 1 in. non-vented with plain handle	41A215509P13	2
159.	Air pipe (copper)	12 x 1.5 @ 6m.	5
160.	Wear plate	41A244371ABP1	4
161.	Snubber, vertical	41A244100AAP4	8
162.	Air pipe (copper)	6 x 1 @ 6m.	5
163.	Air pipe (steel)	12 x 1.5 @ 6m.	5
164.	Air pipe (steel)	10 x 1.5 @ 6m.	5
165.	Air pipe (steel)	6 x 1.5 @ 6m.	5
166.	Air pipe (copper)	10 x 1.5 @ 6m.	5

10. PARTS REQUIRED FOR REBUILD OF LOCOMOTIVE 1008

1.	NIFE batteries	41A24555P3	8
2.	Cooling fan impeller	41C630922G11	1
3.	Radiator	41D704572P1	1
4.	Handrails	K41B544108P1	Set
5.	Handrails	K41B544108P2	Set
6.	Rubber seal	41A200021	1
7.	Air cleaner, plastic	41A901373G2	1
8.	Circuit breakers:		
	(i) dynamic breaking.		2
	(ii) other breakers.		2

SECTION VII. PRICE/AWARD/CONTRACT FORM AND PRICE SCHEDULE

PRICE/AWARD/CONTRACT

1. RFP No. _____
2. Supplier's Name and Address:
3. In response to Request for Prices _____, as modified by Addenda 1 through _____, the supplier agrees to furnish the items listed in the attached price schedule at the prices quoted therein in accordance with the conditions of contract and technical specifications. This quotation is valid for a period of _____ calendar days after the request date established in the RFP.
4. An executed bond or guaranty, is also attached to this submittal.
5. Signature of person authorized to sign quotation:

Date: _____

TAZARA has accepted the quotation of _____
(hereinafter called the "supplier") for the supply of spare parts and related services as set forth in this contract.

This contract consists of the following documents:

- 1) This Price/Award/Contract Form;
- 2) The Price Schedule;
- 3) The Conditions of Contract;
- 4) The Technical Specifications; and
- 5) Manufacturer's Standard Warranty

By: _____

(TAZARA)

PRICE SCHEDULE

No. _____ RFP No. _____
Page _____ of _____
Name of Supplier _____

Item No.	Description	Quantity	Unit Price	Total Price
			f.o.b.	c.i.f. (U.S.-flag)

VIII. BOND

BID BOND

(See instructions on reverse)

DATE BOND EXECUTED (Must not be later than bid opening date)

PRINCIPAL (Legal name and business address)

TYPE OF ORGANIZATION (Select one)

- INDIVIDUAL PARTNERSHIP
 JOINT VENTURE CORPORATION

STATE OF INCORPORATION

SURETY(IES) (Name and business address)

PENAL SUM OF BOND					BID IDENTIFICATION	
PERCENT OF BID PRICE	AMOUNT NOT TO EXCEED				BID DATE	INVITATION NO.
	MILLIONS	THOUSANDS	HUNDREDS	CENTS		
					FOR (Construction, Supplies or Services)	

OBLIGATION

We, the Principal and Surety(ies) are firmly bound to ******* (hereinafter called *******) in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS

The Principal has submitted the bid identified above.

THEREFORE,

The above obligation is void if the Principal - (a) upon acceptance by ******* of the bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), executes the further contractual documents and gives the bond(s) required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by the principal; or (b) in the event of failure so to execute such further contractual documents and give such bonds, pays ******* for any cost of procuring the work which exceeds the amount of the bid.

Each Surety executing this instrument agrees that its obligation is not impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to *******. Notice to the surety(ies) of extension(s) are waived. However, waiver of the notice applies only to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

WITNESS

The Principal and Surety(ies) executed this bid bond and affixed their seals on the above date.

PRINCIPAL

Signature(s)	1.	2.	Corporate Seal
	<i>(Seal)</i>		
Name(s) & Title(s) (Typed)	1.	2.	

INDIVIDUAL SURETIES

Signature(s)	1.	2.
	<i>(Seal)</i>	
Name(s) (Typed)	1.	2.

CORPORATE SURETY(IES)

SURETY A	Name & Address	STATE OF INC.	LIABILITY LIMIT \$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	

CORPORATE SURETY(IES) (Continued)

		STATE OF INC.	LIABILITY LIMIT	
SURETY B	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY C	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY D	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY E	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY F	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	
SURETY G	Name & Address		\$	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	

INSTRUCTIONS

1. This form is authorized for use when a bid guaranty is required.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. The bond may express penal sum as a percentage of the bid price. In these cases, the bond may state a maximum dollar limitation (e.g., 20% of the bid price but the amount not to exceed _____ dollars).

4. (a)

Where more than one corporate surety is involved, their names and addresses shall appear

in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)". In the space designated "SURETY(IES)" on the face of the form, insert only the letter identification of the sureties

(b) Where individual sureties are involved, two or more responsible persons shall execute the bond.

may require these sureties to furnish additional substantiating information concerning their financial capability.

5. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal".

6. Type the name and title of each person signing this bond in the space provided.

7. In its application to negotiated contracts, the terms "bid" and "bidder" shall include "proposal" and "offeror".

*** Insert name of Contracting Agency.

IX. CONTRACT FORM

CONTRACT FORM

THIS AGREEMENT made the ____ day of _____, 19__, between The Tanzania Zambia Railway Authority of Tanzania and Zambia (hereinafter "the Buyer") of the one part and (Name of Supplier) of (City and Country of Supplier) (hereinafter "the Supplier") of the other part.

WHEREAS the Buyer is desirous that certain goods and ancillary services should be provided by the Supplier, viz., spare parts and services, and has accepted a tender by the Supplier for the provision of those goods and services in the sum of (Contract Price in Words and Figures) (hereinafter "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

- (a) the Price/Award/Contract Form and the Price Schedule;
- (b) the Schedule of Requirements;
- (c) the Technical Specifications;
- (d) the General Conditions of Contract;
- (e) the Special Conditions of Contract; and
- (f) the Manufacturer's Warranty.

3. In consideration of the payments to be made on behalf of the Buyer to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Buyer to provide the goods and services and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Buyer hereby covenants to arrange for the Supplier to be paid in consideration of the provision of the goods and services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

5. This Contract shall be governed by United States of America laws.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with their respective laws the day and year first above written.

Signed, Sealed, and Delivered by the

said _____ (For the Buyer).

in the presence of: _____

Signed, Sealed, and Delivered by the

said _____ (For the Supplier).

in the presence of: _____

X. PERFORMANCE BOND

PERFORMANCE BOND
(See instructions on reverse)

DATE BOND EXECUTED (Must be same or later than date of contract)

PRINCIPAL (Legal name and business address)

TYPE OF ORGANIZATION ("X" one)

- INDIVIDUAL PARTNERSHIP
 JOINT VENTURE CORPORATION

STATE OF INCORPORATION

SURETY(IES) (Name(s) and business address(es))

PENAL SUM OF BOND

MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENTS

CONTRACT DATE CONTRACT NO.

OBLIGATION:

We, the Principal and Surety(ies), are firmly bound to ******* in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS:

The Principal has entered into the contract identified above

THEREFORE

The above obligation is void if the Principal -

(1) Performs and fulfills all the undertakings, covenants, terms, conditions, and agreements of the contract during the original term of the contract and any extensions thereof that are granted by ******* with or without notice to the Surety(ies), and during the life of any guaranty required under the contract, and (2) perform and fulfills all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of the contract that hereafter are made. Notice of those modifications to the Surety(ies) are waived.

WITNESS

The Principal and Surety(ies) executed this performance bond and affixed their seals on the above date

PRINCIPAL

Signature(s)	1.	2.	Corporate Seal
	(Seal)	(Seal)	
Name(s) & Title(s) (Typed)	1.	2.	

INDIVIDUAL SURETY(IES)

Signature(s)	1.	2.
	(Seal)	(Seal)
Name(s) (Typed)	1.	2.

CORPORATE SURETY(IES)

SURETY A	Name & Address	STATE OF INC.	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1.	2.	
	Name(s) & Title(s) (Typed)	1.	2.	

*** Insert name of Contracting Agency.

CORPORATE SURETY(IES) (Continued)

SURETY B	Name & Address			STATE OF INC.	LIABILITY LIMIT	<i>Corporate Seal</i>
	Signature(s)	1.	2.		\$	
	Name(s) & Title(s) (Typed)	1.	2.			
SURETY C	Name & Address			STATE OF INC.	LIABILITY LIMIT	<i>Corporate Seal</i>
	Signature(s)	1.	2.		\$	
	Name(s) & Title(s) (Typed)	1.	2.			
SURETY D	Name & Address			STATE OF INC.	LIABILITY LIMIT	<i>Corporate Seal</i>
	Signature(s)	1.	2.		\$	
	Name(s) & Title(s) (Typed)	1.	2.			
SURETY E	Name & Address			STATE OF INC.	LIABILITY LIMIT	<i>Corporate Seal</i>
	Signature(s)	1.	2.		\$	
	Name(s) & Title(s) (Typed)	1.	2.			
SURETY F	Name & Address			STATE OF INC.	LIABILITY LIMIT	<i>Corporate Seal</i>
	Signature(s)	1.	2.		\$	
	Name(s) & Title(s) (Typed)	1.	2.			
SURETY G	Name & Address			STATE OF INC.	LIABILITY LIMIT	<i>Corporate Seal</i>
	Signature(s)	1.	2.		\$	
	Name(s) & Title(s) (Typed)	1.	2.			

BOND PREMIUM ▶	RATE PER THOUSAND	TOTAL
	\$	\$

INSTRUCTIONS

1 This form is authorized for use in connection with ******* contracts.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorization person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. (a)

Where more than one corporate surety is involved, their names and addresses shall appear in the spaces (Surety A, Surety B, etc.) headed "CORPORATE

SURETY(IES)" In the space designated "SURETY(IES)" on the face of the form insert only the letter identification of the sureties

(b) Where individual sureties are involved, two or more responsible persons shall execute the bond

******* may require these sureties to furnish additional substantiating information concerning their financial capability

4 Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal"

5 Type the name and title of each person signing this bond in the space provided

******* Insert name of Contracting Agency.

XI. PAYMENT BOND

PAYMENT BOND
(See instructions on reverse)

DATE BOND EXECUTED (Must be same or later than date of contract)

PRINCIPAL (Legal name and business address)

TYPE OF ORGANIZATION (Check one)

- INDIVIDUAL PARTNERSHIP
 JOINT VENTURE CORPORATION

STATE OF INCORPORATION

SURETY(IES) (Name(s) and business address(es))

PENAL SUM OF BOND

MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENTS

CONTRACT DATE CONTRACT NO.

OBLIGATION

We, the Principal and Surety(ies), are firmly bound to *** in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS

The above obligation is void if the Principal promptly makes payment to all persons having a direct relationship with the Principal or a sub-contractor of the Principal for furnishing labor, material or both in the prosecution of the work provided for in the contract identified above, and any authorized modifications of the contract that subsequently are made. Notice of those modifications to the Surety(ies) are waived.

WITNESS

The Principal and Surety(ies) executed this payment bond and affixed their seals on the above date.

PRINCIPAL

Signature(s)	1. _____	2. _____	Corporate Seal
	(Seal)		
Name(s) & Title(s) (Typed)	1. _____	2. _____	

INDIVIDUAL SURETY(IES)

Signature(s)	1. _____	2. _____
	(Seal)	
Name(s) (Typed)	1. _____	2. _____

CORPORATE SURETY(IES)

SURETY A	Name & Address	STATE OF INC.	LIABILITY LIMIT \$	Corporate Seal
	Signature(s)	1. _____	2. _____	
	Name(s) & Title(s) (Typed)	1. _____	2. _____	

*** Insert name of Contracting Agency.

CORPORATE SURETY(IES) (Continued)					
SURETY B	Name & Address		STATE OF INC.	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1.		\$ /	
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY C	Name & Address		STATE OF INC.	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1.		\$	
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY D	Name & Address		STATE OF INC.	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1.		\$	
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY E	Name & Address		STATE OF INC.	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1.		\$	
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY F	Name & Address		STATE OF INC.	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1.		\$	
	Name(s) & Title(s) (Typed)	1.	2.		
SURETY G	Name & Address		STATE OF INC.	LIABILITY LIMIT	Corporate Seal
	Signature(s)	1.		\$	
	Name(s) & Title(s) (Typed)	1.	2.		

INSTRUCTIONS

1. This form, for the protection of persons supplying labor and material, is used when a payment bond is required.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. (a) Where more than one corporate surety is involved, their names and addresses shall appear in the spaces (Surety A, Surety B,

etc.) headed "CORPORATE SURETY(IES)". In the space designated "SURETY(IES)" on the face of the form, insert only the letter identification of the sureties.

(b) Where individual sureties are involved, two or more responsible persons shall execute the bond. (Insert the name of Contracting Agency) may require these sureties to furnish additional substantiating information concerning their financial capability.

4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal".

5. Type the name and title of each person signing this bond in the space provided.

PART 2 -- SEGMENT B

**PROCUREMENT DOCUMENTS FOR TOOLS AND EQUIPMENT
FOR OVERHAUL OF U30C LOCOMOTIVE FLEET**

PART 2
SEGMENT B

U.S.A.I.D.

**United States Agency for
International Development**

Project ME-1

**Supply of tools and
equipment for Tanzania
Zambia Railway for overhaul
of existing U30C locomotive
fleet**

**Administrative
Technical
Specifications**

**Tender documents for
procurement of identified/
required tools and equip-
ment for U30C overhaul
December 1987**

Specification No. TZR/MED/LI-87 tools - equipment

**Tanzania Zambia Railway Authority/TAZARA
Headquarters Office
P.O. Box 2834
Dar Es Salaam, Tanzania**

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**SECTION I. REQUEST FOR PRICES
MAINTENANCE TOOLS AND TEST EQUIPMENT**

Date of Issuance _____
U.S.A.I.D. Reference _____
TAZARA Reference _____

1. The Tanzania Zambia Railway Authority has entered into an agreement with the United States of America, acting through The Agency For International Development (U.S.A.I.D.), with respect to financing by the parties of the procurement of diesel electric locomotive maintenance tools and test equipment.

2. The Tanzania Zambia Railway Authority (TAZARA) requests prices from the Transportation Equipment Supply Company (TESCO) for the supply and delivery of maintenance tools and test equipment for the existing Krupp-built General Electric U30C locomotives required for the 4-year overhaul program.

3. TAZARA reserves the right to accept one offer or no offer at its discretion.

4. The supplier may obtain further information from the office of:

THE SUPPLIES MANAGER,
TANZANIA ZAMBIA RAILWAY AUTHORITY,
TAZARA HEADQUARTERS,
P.O. BOX 2834,
DAR ES SALAAM, TANZANIA

All telex communications should be made to telex 41059 TAZARA TZ.

5. Responses must be accompanied by a fully executed bond in the amount five (5) percent of the offered price and must be delivered to:

GENERAL MANAGER,
TANZANIA ZAMBIA RAILWAY AUTHORITY,
P.O. BOX 2834,
DAR ES SALAAM,
TANZANIA.

on of before _____ on _____,

SECTION II. INSTRUCTIONS TO SUPPLIER

<u>ARTICLE</u>		<u>PAGE</u>
1.	Introduction	2B-II-1
2.	Price Request	2B-II-2
3.	Preparation of Response	2B-II-2
4.	Content of Offering	2B-II-2
5.	Price Acceptance Period	2B-II-4
6.	Signature of Response	2B-II-4
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8.	Modification of Prices	2B-II-5
9.	Price Request Conference	2B-II-5
10.	Addenda to the Price Request	2B-II-5
11.	Price Request Questions	2B-II-5
12.	Price Evaluation and Contract Award	2B-II-6

INSTRUCTIONS TO SUPPLIER

1. Introduction

The Tanzania Zambia Railway Authority requests prices for the supply of maintenance tools and equipment as part of the Dar es Salaam Corridor Project. The contract will be financed by AID under Project Number 690-0240 Grant Agreement.

The firm invited by TAZARA to submit prices is under no obligation to do so. At the same time, the supplier will not be reimbursed for any costs incurred in connection with the preparation and submission of its response.

These instructions shall not form part of the contract. They are intended to aid the suppliers in the preparation of their response.

For the purposes of interpretation of these instructions, the periods named herein shall be consecutive calendar days.

This price request consists of (1) these instructions, (2) the attached "Price Request/Award/Contract Form," (3) the attached "Price Schedule," (4) the attached "Forms of Response and Performance Bonds," (5) the attached "Conditions of Contract," and (6) the technical specifications attached hereto.

The supplier should note that the "Supplier's Certificate and Agreement with AID for Project Commodities/Invoice and Contract Abstract" (Form AID 1450-4) is required to be submitted by the payment clause in the "Conditions of Contract." This form must be completed in order for the supplier to receive payment.

2. Price Request

The original and four completed copies of the response must be delivered in person or sent by registered mail or other means to the following address:

GENERAL MANAGER
TANZANIA ZAMBIA RAILWAY AUTHORITY
P.O. BOX 2834
DAR ES SALAAM
TANZANIA, AFRICA

3. Preparation of Response

(a) The supplier is expected to examine the specifications and all instructions contained in this request for price. Failure to do so will be at the supplier's risk.

(b) Prices shall be on a unit price, firm price basis.

(c) TAZARA reserves the right to increase or decrease the quantity of an item duly awarded in accordance with this RFP. This option shall be exercised, if at all, at time award is made.

(d) All correspondence in connection with the response and the contract is to be in English.

4. Content of Offering

The supplier is required to complete the following in an original and four copies:

(a) Price/Award/Contract Form.

(b) The Price Schedule.

The supplier shall fill in the unit price for each item in the price schedule. For each item the quantity given in the "Quantity" column shall be multiplied by the unit price, and the result entered in the "Amount" column. In case of any discrepancy between a unit price and an amount, the unit price will be taken as correct and the amount adjusted accordingly. It will be assumed that the supplier is not responding on any item for which a unit price or amount is not shown.

The supplier shall complete the form in type or in indelible ink making no alterations to the form provided. The completed form shall have no interlineations or erasures except those necessary to correct errors made by the supplier, in which case such corrections shall be initialed by the person or persons signing the bid.

One original copy of the completed response is to be clearly marked "ORIGINAL QUOTATION" and the other completed copies are to be marked "COPY OF QUOTATION." In case of any discrepancy, the copy marked "ORIGINAL QUOTATION" shall govern.

(c) Bond.

Price quotations must be accompanied by a bond in the amount of 5 percent of the price. No quotation will be considered unless it is so secured.

The bond provided by the supplier will not be discharged until the expiration of 150 days from the day of response opening or until such earlier time as the response shall have been accepted by TAZARA and a performance bond shall have been duly provided by the supplier.

(d) Manufacturer's Standard Warranty.

(e) Descriptive Literature.

Descriptive literature for the items, including full technical specifications, must be submitted with each copy of the price request response. This literature will be used to demonstrate compliance with the specifications and will not be considered to amend the quotation in any way. Deviations from RFP requirements included in descriptive literature furnished must be fully explained. In case of any conflict between the specifications in the descriptive literature and specifications in the price request, the latter will control.

5. Price Acceptance Period

Price offering less than 150 days for acceptance by TAZARA from the date the price response is received will not be acceptable.

6. Signature of Response

The quotation must be signed by a person duly authorized to do so. Price quotations submitted by a corporation must bear the seal of the corporation.

7. Late Response

The supplier will be held responsible for ensuring that the price quotations are received in accordance with the instructions stated herein and a late response will not be honored even though it became late as a result of circumstances beyond the supplier's control. A late quotation will be considered only if the sole cause of its becoming a late response was attributable to TAZARA, its employees, or agents.

8. Modification of Prices

The supplier has the right to withdraw, modify, or correct its price quotation after it has been delivered to TAZARA, provided the request for such a withdrawal, modification, or correction together with full details of such modification or correction is received by TAZARA at the address given above by letter, telegram, or telex before the time set for receiving the response. The original quotation, as amended by such communication, will be considered as the supplier's offer. TAZARA may ask the supplier for a clarification of this quotation. Clarifications which do not change the offered price may be accepted.

9. Price Request Conference

A price request conference will be held on _____, 19__, at _____ in the following location:

The supplier is not required to attend but is encouraged to do so. Modifications to the price request resulting from the conference will be provided to the supplier by means of an addendum to the price request.

10. Addenda to the Price Request

If for any reason prior to response it becomes necessary to modify the price request, an addendum will be issued to and be binding on the supplier. Receipt of all addenda shall be acknowledged by the supplier.

Addenda will be numbered consecutively commencing with No. 1 and the supplier is required to insert the numbers of addenda received in paragraph 3 of the price/award/contract form.

11. Price Request Questions

Should the supplier have questions to ask or should it have any doubt about the meaning of the price request, it should refer them in writing to TAZARA not later than 15 days before the date set for receipt of response.

12. Price Evaluation and Contract Award

(a) Award will be made to the supplier when prices have been determined to be comparable to market prices for same or similar parts supplied to other railways.

(b) A responsive quotation is one which complies with all of the terms and conditions of the RFP without material modification. A material modification is one which affects the price, quantity, quality, delivery or installation date of equipment or materials, or which limits in any way any responsibilities, duties, or liabilities of the supplier or any rights of TAZARA or USAID as any of the foregoing have been specified or defined in the RFP. TAZARA may waive any minor informality in the response which does not constitute a material modification.

(c) TAZARA reserves the right to delete any item or group of items.

(d) Failure on the part of the supplier to provide a performance bond in accordance with the conditions of contract shall be sufficient grounds for the annulment of the award and forfeiture of the price response bond.

(e) The quotation of the supplier which does not conform to the foregoing instructions may be unacceptable.

SECTION III. GENERAL CONDITIONS OF CONTRACT

ARTICLE NUMBER		PAGE
1.	DEFINITIONS	2B-III-1
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GENERAL CONDITIONS OF CONTRACT

1. Definitions

Set forth below are terms used in the contract and reference to them shall be interpreted as follows:

- a. "AID" means the Agency for International Development.
- b. "Authorized Geographic Code" is AID Geographic Code 000.
- c. "Contract" means the "Bid/Award/Contract Form" signed by both bidder and Contracting Agency including all attachments and appendices thereto and all documents incorporated by reference therein.
- d. "Contracting Agency" is Tanzania Zambia Railway Authority (TAZARA).
- e. "Supplier" is the person or firm supplying the equipment and materials called for under this contract.

2. Governing Law and Language

- a. This contract shall be interpreted in accordance with the laws of the United States of America.
- b. The English language version of this contract shall govern. All notices pursuant to the provisions of this contract shall be in English.
- c. Shipping terms will be defined in accordance with the general and special conditions of contract (herein).

3. Delivery

Delivery of all equipment and materials to be supplied under this contract to the port of loading in the source country shall be made within 150 days from receipt of order.

4. Responsibilities of Other Contractors

_____ is employed by TAZARA to supervise this contract and is responsible for:

- a. Witnessing tests of equipment prior to shipment to the cooperating country;
- b. Inspecting and accepting or rejecting the commodities at point of delivery;
- c. Requiring replacement of defective equipment or materials;
- d. Issuing change orders. Concurrence of TAZARA is necessary if the value exceeds \$1,000 U.S.

5. Legal Effect of AID Approvals and Decisions

The parties hereto understand that the contract has reserved to AID certain rights such as, but not limited to, the right to approve the terms of this contract, the supplier, and any or all plans, reports, specifications, subcontracts, pricing documents, drawings, or other documents related to this contract and the project of which it is part. The parties hereto further understand and agree that AID, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity

to assure the proper use of United States Government funds, and that any decision by AID to exercise or refrain from exercising these approval rights shall be made as a financier in the course of financing this project and shall not be construed as making AID a party to the contract. The parties hereto understand and agree that AID may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the project with the parties jointly or separately, without thereby incurring any responsibility or liability to the parties jointly or to any of them. Any approval (or failure to disapprove) by AID shall not bar TAZARA or AID from asserting any right, or relieve the supplier from any liability which the supplier might otherwise have to TAZARA or AID.

6. Payment

a. Requests for Payment

Payment due the supplier under this contract shall be made based upon the supplier's written request accompanied by the following documentation:

(1) The Supplier's Invoice;

(2) "Supplier's Certificate and Agreement with AID for Project Commodities/Invoice and Contract Abstract" (Form AID 1450-4); and

(3) For each shipment of equipment or materials for which payment is requested:

(a) A copy or photostat of the dated bill of lading (ocean, airway, charter party, railway, barge or truck) or parcel post receipt evidencing shipment from the source country or a free port or bonded warehouse to the host country is to be submitted. The bill of lading shall indicate the carrier's complete statement of charges including all relevant weights, cubic measurements, rates, and additional charges whether or not freight is financed by AID.

b. Partial Payments

The supplier may request partial payment upon delivery and acceptance of each twenty-five (25) percent of the total items required by this contract. The supplier shall submit the documentation required by paragraph a. above with the request.

c. Local Currency

Unless directed otherwise by the Contracting Agency, all local currency costs paid or incurred by the supplier under the contract including, without limitation, all local taxes, duties, and imports, when not exempted, shall be reimbursed to the supplier in local currency and not by payment of United States dollars.

Except as otherwise approved in writing by TAZARA, when it is necessary for purposes of this contract for the supplier to convert United States dollars to local currency, such conversion shall be made through arrangements with the U.S. Disbursing Office.

7. Audit and Records

a. The supplier shall maintain books, records, documents, and other evidence and shall apply consistent accounting procedures and practices sufficient to reflect properly all transactions under or in connection with the contract. The foregoing constitute "records" for the purpose of this article.

b. The supplier shall maintain such records during the contract term and for a period of 3 years after final payment. However, records which relate to appeals under the "Disputes and Appeals" article or litigation or the settlement of claims arising out of the performance of this contract shall be retained until such appeals, litigation, or claims have been finally settled.

c. All records shall be subject to inspection and audit by the Contracting Agency (or its authorized agents) at all reasonable times. The supplier shall afford TAZARA proper facilities for such inspection and audit. This is a fixed price contract and is not subject to audit of costs (except for any cost-reimbursable items), but is subject to audit for compliance with other provisions of this contract.

d. The supplier further agrees to include in all its subcontracts hereunder a provision that the subcontractor agrees that TAZARA or any of its authorized agents shall, until the expiration of 3 years after final payment under the subcontract, have access to and the right to examine any records of such subcontractor involving transactions related to the subcontract.

8. Assignment

The supplier may not assign its obligation to perform under the contract except with the prior written consent of both TAZARA and AID. The supplier may not assign its rights to receive

payment under the contract except with the prior written consent of both TAZARA and AID.

9. Host Country Taxes

a. Pursuant to bilateral agreement between the United States Government and the host country government, the supplier and those of its employees who are not citizens or permanent residents of the host country shall be free of all taxes, fees, levies, customs, or impositions imposed under laws in effect in the host country with respect to all equipment and materials supplied and services performed under this contract. This exemption includes all customs, duties, and registration fees.

b. The Government will allow the supplier to import free of customs and duties such materials and equipment as may be required under this contract.

c. Any taxes, fees, levies, customs, or impositions within the scope of paragraphs a. and b. above paid by the supplier shall be reimbursed by TAZARA.

10. Nationality and Source

a. Eligibility of Suppliers

(1) No equipment, materials, or services shall be eligible for AID financing if offered by a supplier or subcontractor included on any list of suspended, debarred, or ineligible bidders used by AID.

(2) The supplier and any subcontractor(s) must be:

(a) An individual who is a citizen or legal

resident of a country or area included in the authorized geographic code;

(b) A corporation or partnership organized under the laws of a country or area included in the authorized geographic code;

(c) A controlled foreign corporation, i.e., any foreign corporation of which more than 50 percent of the total voting power of all classes of stock is owned by United States shareholders within the meaning of the Section 957 et seq. of the Internal Revenue Code (26 U.S.C. 957); or

(d) A joint venture or unincorporated association consisting entirely of individuals, corporations, or partnerships which fit any of the foregoing categories.

(3) Citizens or firms of any country not included in AID Geographic Code 935 are ineligible as suppliers, contractors, subcontractors, or agents in connection with AID-financed contracts for goods or services. However, non-U.S. citizens legally admitted for permanent residence in the United States are eligible.

b. Eligibility of Commodities

(1) Definitions

(a) Source

"Source" means the country from which a commodity is shipped to the cooperating country or the cooperating country itself if the commodity is located therein at the time of purchase. However, where a commodity is shipped from a free port or bonded warehouse in the form in which received therein, "source" means the country from which the commodity was shipped to

the free port or bonded warehouse.

(b) Origin

The "origin" of a commodity is the country or area in which a commodity is mined, grown, or produced. A commodity is produced when through manufacturing, processing, or substantial and major assembling of components a commercially recognized new commodity results that is substantially different in basic characteristics or in purpose or utility from its components.

(c) Componentry

"Components" are the goods that go directly into the production of a produced commodity.

(2) Rule

All equipment and materials shall have their "source" and "origin" in an authorized country and meet the following componentry rules:

(i) If the commodity contains no imported component, it meets AID's componentry requirements.

(ii) If the commodity contains components imported from countries included in Geographic Code 935 which are not included in the authorized geographic code for the procurement, the components are limited according to the following rules:

I. They are limited only if they are acquired by the producer in the form in which they were imported.

II. The total cost of such components to the producer of the commodity (delivered at the point of production of

the commodity) may not exceed 50 percent of the lowest price (excluding the cost of ocean transportation and marine insurance) at which the supplier makes the commodity available for export sale (whether or not financed by AID).

III. AID may prescribe percentages other than 50 percent for specific commodities.

IV. Components from the cooperating country may be used in unlimited amounts whenever any geographic code other than Code 000 is authorized.

(iv) Any component from a non-free world country makes the commodity ineligible for AID financing. (NOTE: This numbering is same as Handbook 11, Chapter 3 which does not contain an item Numbered (iii).)

c. Motor Vehicles (not applicable)

d. Delivery Services

(1) With respect to ocean or air freight, "source" means the flag of the vessel or aircraft.

(2) Ocean Freight

(a) All goods covered by this contract which are transported on ocean vessels shall be transported on privately owned U.S. flag commercial vessels to the extent they are available at fair and reasonable rates for U.S. flag commercial vessels. If such flag vessels are not available, the supplier may request a waiver from the Office of Commodity Management, AID, Washington, D.C. 20523.

(b) When shipment is made under a through bill of lading issued by an eligible flag carrier, AID will finance costs

incurred on vessels under flag registry of any free world country if the costs are part of the total cost paid to the eligible flag carrier.

(3) Air Freight

The supplier will use U.S.-flag air carriers to the extent they are available as set forth in the clause of this contract entitled "Air Travel and Transportation." When U.S.-flag air carriers are not available, preference should be given to the use of host country or Code 941 flag air carriers before using Code 899 flag air carriers.

(4) Charters

All air or ocean charters, covering full or part cargo, for the transport of equipment, materials, or other goods procured for the performance of this contract must be approved by AID in writing prior to shipment.

(5) General Transportation

Unless otherwise authorized, AID will not finance any transportation costs:

(a) For shipment beyond the point of entry in the host country except when intermodal transportation service covering the carriage of cargo from point of origin to destination is used and the point of destination is established in the carrier's tariff and stated in the "through bill of lading";

(b) On a transportation medium owned, operated, or under the control of any country not included within Code 935;

(c) On any vessel designated by AID as ineligible to carry AID-financed cargo; or

(d) Under any ocean or air carrier covering full or part cargo which has not received prior approval by the Office of Commodity Management, AID, Washington, DC 20523.

e. Source of Marine Insurance

(1) The eligibility of marine insurance is determined by the country in which it is "placed." Insurance is placed in a country if payment of the insurance premium is made to, and the insurance policy is issued by, an office located in the country. Insurance must be placed in a country included in the authorized geographic code, or when the authorized geographic code is other than 000, it may be placed in the cooperating country.

(2) If at any time AID determines that the government of the host country by statute, decree, rule, or regulation discriminates, with respect to AID-financed procurement, against any marine insurance company authorized to do business in any state of the United States, then AID shall require that any AID-financed goods thereafter shipped to the host country shall be insured against marine risks, and that such insurance shall be placed in the United States with a company or companies authorized to do insurance business in any state of the United States.

11. Air Travel and Transportation

a. The supplier shall utilize U.S.-flag carriers for international air transportation of personnel (and their personal effects) or property to the extent service by such carrier is available, in accordance with the following criteria:

(1) If a U.S.-flag air carrier cannot provide the international air transportation needed, or if the use of a non-U.S.-flag carrier is approved by AID in order to accomplish the agency's mission, foreign-flag air carrier service may be

deemed necessary.

(2) Passenger or freight service by a U.S.-flag air carrier is considered available even though:

(a) Comparable or a different kind of service can be provided at less cost by a foreign-flag air carrier;

(b) Foreign-flag air carrier service is preferred by, or is more convenient for, the contractor or traveler; or

(c) Service by a foreign-flag air carrier can be paid for in excess foreign currency (unless U.S.-flag air carriers decline to accept excess or near excess foreign currencies for transportation payable only out of such monies).

(3) Except as provided in paragraph (1) above, U.S.-flag air carrier service shall be used for commercial foreign air travel under this contract if service provided by U.S.-flag air carriers is available. In determining availability of a U.S.-flag air carrier, the following scheduling principles shall be followed unless their application would result in the last or first leg of travel to or from the United States being performed by a foreign-flag air carrier.

(a) U.S.-flag air carrier service available at point of origin shall be used to destination, or in the absence of direct or through service, to the farthest interchange point on a usually traveled route.

(b) When an origin or interchange point is not served by a U.S.-flag air carrier, foreign-flag air carrier service shall be used only to nearest interchange point on a usually traveled route to connect with U.S.-flag air carrier service.

(c) When a U.S.-flag air carrier involuntarily reroutes the traveler via a foreign-flag air carrier, the foreign-flag air carrier may be used notwithstanding the availability of alternative U.S.-flag air carrier services.

(4) For travel between a gateway airport in the United States and a gateway airport abroad, passenger service by a U.S.-flag air carrier shall not be considered available if:

(a) The gateway airport abroad is the traveler's origin or destination airport and the use of U.S.-flag air carrier service would extend the time in travel status, including delay at origin and accelerated arrival at destination, by at the least 24 hours more than travel by a foreign-flag air carrier; or

(b) The gateway airport abroad is an interchange point and the use of U.S.-flag air carrier service would require the traveler to wait 6 hours or more to make connections at that point, or if delayed departure from, or accelerated arrival at, the gateway airport in the United States would extend time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier.

(5) For travel between two points outside the United States, the rules in paragraphs (1), (2), and (3) shall be applicable, but passenger services by a U.S.-flag air carrier shall not be considered to be available if:

(a) Travel by a foreign-flag air carrier would eliminate two or more aircraft changes en route;

(b) One of the two points abroad is the gateway airport en route to or from the United States and the use of a U.S.-flag air carrier would extend the time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier,

including accelerated arrival at the overseas destination or delayed departure from the overseas origin, as well as delay at the gateway airport or other interchange point abroad; or

(c) The travel is not part of the trip to or from the United States and the use of a U.S.-flag air carrier would extend the time in a travel status by at least 6 hours more than travel by a foreign-flag air carrier including delay at origin, delay en route, and accelerated arrival at destination.

(6) For all short-distance travel under either paragraph (4) or paragraph (5) above, U.S.-air carrier service shall not be considered available when the elapsed travel time on a scheduled flight from origin to destination airport by foreign-flag air carrier is 3 hours or less and service by a U.S.-flag air carrier would involve twice such travel time.

b. Freight service by a U.S.-flag air carrier will be considered to be unavailable:

(1) When no U.S.-flag air carrier provides scheduled air freight service from the airport serving the shipment's point of origin and a non-U.S.-flag air carrier does;

(2) When the U.S.-flag air carrier(s) serving the shipment's point of origin decline to issue a through airway bill for transportation to the shipment's final destination airport;

(3) When use of a U.S.-flag air carrier would result in delivery to final destination at least seven (7) days later than delivery by means of a non-U.S.-flag air carrier;

(4) When the total weight of the consignment exceeds the maximum weight per shipment which the U.S.-flag air carrier will accept and transport as a single shipment and a non-U.S.-flag air carrier will accept and transport the entire consignment as a

single shipment.

(5) When the dimensions (length, width, or height) of one or more of the items of a consignment exceed the limitations of the U.S.-flag aircraft's cargo door opening, but do not exceed the acceptable dimensions for shipment on an available non-U.S.-flag scheduled air carrier.

c. In the event that the supplier selects a carrier other than a U.S.-flag air carrier for international air transportation, it will include a certification on vouchers involving such transportation which is essentially as follows:

CERTIFICATION OF UNAVAILABILITY OF U.S.-FLAG CARRIER

I hereby certify that transportation service for personnel (and their personal effects) or property by U.S.-flag air carriers was unavailable for the following reasons:

d. If travel is by indirect route or the traveler otherwise fails to use available U.S.-flag air carrier service, and the certification required by paragraph c. above is not attached to the applicable voucher, AID will not finance the amount determined under the following formula:

Sum of U.S.-flag carrier segment <u>mileage authorized</u>	X	Fare payable by AID
Sum of all segment mileage authorized		

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Sum of U.S.-flag carrier segment <u>mileage traveled</u>	X	Through fare paid
Sum of all segment mileage traveled		

e. The terms used in this clause have the following meanings:

(1) "Gateway airport abroad" means the airport from which the traveler last embarks en route to the United States or at which the traveler first debarks incident to travel from the United States.

(2) "Gateway airport in the United States" means the last U.S. airport from which the traveler's flight departs or the first U.S. airport at which the traveler's flight arrives.

(3) "International air transportation" means transportation of persons (and their personal effects) or property by air between a place in the United States and a place outside the United States.

(4) "U.S.-flag air carrier" means an air carrier holding a certificate under Section 401 of the U.S. Federal Aviation Act of 1958 (49 U.S.C. 1371).

f. The supplier shall include the substance of this clause, including this paragraph f., in each subcontract or purchase order hereunder, which may involve international air transportation.

12. Subcontracts

a. Subcontracts must comply with the nationality, source, origin, and componentry requirements of this contract. The supplier agrees to include the following provisions of this contract in all subcontracts hereunder:

"Host Country Taxes"

"Air Travel and Transportation"

"Nationality and Source"

"Worker's Compensation Insurance" if incidental services are to be performed under the subcontract, and

b. All subcontracts and purchase orders in excess of \$100,000 shall only be awarded with the prior written consent of TAZARA and AID and such consent, if given, shall not relieve the supplier from any liability or obligation under this contract.

13. Change Orders

TAZARA may at any time, by a written order, and without notice to the sureties, make changes within the general scope of this contract, in any one or more of the following:

(a) Drawings, design, or specifications, where supplies to be furnished under this contract are to be specially manufactured for TAZARA;

(b) Method of shipment or packing; or

(c) Place of delivery.

If any such change causes an increase or decrease in the cost of, or the time required for, the performance of any part of the work under this contract, whether changed or not changed by any such order, an equitable adjustment shall be made in the contract price or delivery schedule, or both, and the contract shall be modified in writing accordingly. Any claim by the supplier for adjustment under this clause must be asserted within 30 days from the date of receipt by the supplier of the modification or change. Change orders which exceed \$1,000 U.S. must be approved by AID.

14. Amendments

Modification of the terms of this contract shall be made by amendment signed by the parties. Any amendments, including letter amendments, which increase the contract amount or extend the completion date of the contract must be approved by AID.

15. Disputes and Appeals

a. In the event of a disagreement under this contract, the supplier shall submit a written statement to TAZARA briefly describing the nature of the problem, the position of the supplier regarding the issue, and a narrative of facts in support of the supplier's position.

b. Within 10 days after receipt of the supplier's statement, TAZARA shall decide the issue and deliver a written statement of the decision to the supplier, including the reasons supporting the decision, if adverse to the supplier.

c. Within 30 days after receipt of TAZARA's decision or the date such decision was due, the supplier may submit to TAZARA a written notice of appeal including a detailed description of the facts of the dispute with the dates of events, names of persons involved, references to documentation bearing on the matter (with copies attached), the relevant contract provision(s), the supplier's contentions and conclusions, and a statement of why TAZARA's decision is being questioned.

d. If within 30 days after delivery of a notice of appeal, the parties cannot mutually agree to a satisfactory settlement, the matter shall be presented for arbitration following the rules of the International Chamber of Commerce.

16. MARKING

a. The supplier shall be responsible for assuring that all commodities to be furnished under this contract and their shipping containers carry the official AID emblem and for correctly marking goods and shipping containers. Emblems shall be affixed by metal plates, decal, stencil, label, tag, or other means depending upon the type of commodity or shipping container and the nature of the surface to be marked.

b. The emblem placed on the commodities shall be as durable as the trademark, company, or brand name affixed by the manufacturer, and the emblem on each shipping container must be affixed in a manner which assures that it will remain legible until the container reaches its destination. Such containers shall display the last set of digits of the identification number of the pertinent implementing document in characters equal in height to the shipper's marks.

17. Inspection

a. All supplies (including raw material, components, intermediate assemblies, and end products) shall be subject to inspection and test by or on behalf of TAZARA at the expense of TAZARA prior to shipment. TAZARA will notify the supplier in writing of the names of any inspectors or inspection firms. It is understood that inspection and testing shall not in any way release the supplier from any warranty or other obligations under this contract.

b. If any inspection or test is made by or on behalf of TAZARA on the premises of the supplier, the supplier shall provide all reasonable facilities and assistance for the safety and convenience of TAZARA or its inspectors in the performance of

their duties without additional charge.

18. Force Majeure

a. Except with respect to default of subcontractors, the supplier shall not be liable for any excess costs if the failure to perform the contract arises out of causes beyond the control and without the fault or negligence of the supplier (force majeure) and if the supplier, within 20 days from the beginning of any such force majeure, notifies the contracting agency of such prevention of performance and the cause thereof. Such causes may include, but are not restricted to, acts of the borrower/grantee in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather, but in every case the failure to perform must be beyond the control and without the fault or negligence of the supplier. If the failure to perform is caused by the fault of a subcontractor and if such default arises out of causes beyond the control of both the supplier and the subcontractor and without the fault or negligence of either of them (force majeure) and the supplier, within 20 days from the beginning of any such force majeure, notifies TAZARA of such prevention of performance and the cause thereof, the supplier shall not be liable for any excess costs due to the failure to perform, unless the supplies or services to be furnished by the subcontractor were obtained from other sources in sufficient time to permit the supplier to meet the required delivery schedule.

b. In the event of a force majeure, the supplier, unless otherwise directed by TAZARA in writing, shall continue to undertake and perform the duties set forth in this contract as far as is reasonably practical.

c. In the event of a force majeure resulting in a suspension of work, this contract shall be extended by a period equal to that

for which the supplier was prevented from performing.

d. The supplier shall be entitled to reasonable costs incurred as a consequence for a force majeure.

e. If the supplier's inability to perform by reason of the force majeure lasts for more than 45 days after notice has been given to TAZARA, either party may terminate this contract and the supplier shall be entitled to any sums which would be payable in case of termination of this contract by TAZARA for convenience.

19. Termination by TAZARA for Default

a. TAZARA may, by written notice of default sent to the supplier by registered mail, terminate in whole or part this contract:

(1) If the supplier fails to make delivery of the equipment within the time specified herein or any extension thereof, or

(2) If the supplier fails to perform any of the other provisions of this contract, or so fails to make progress as to endanger performance of this contract in accordance with its terms, and, in either of these two circumstances, does not cure such failure within a period of ten (10) days (or such longer period as TAZARA may authorize in writing) after receipt of notice from TAZARA specifying such failure.

b. In the event TAZARA terminates this contract in whole or in part as provided in paragraph a. of this article, TAZARA may procure, upon such terms and in such manner as TAZARA may deem appropriate, supplies similar to those so terminated, and the supplier shall be liable to TAZARA for any excess costs for such similar supplies. However, the supplier shall continue performance of this contract to the extent not terminated under

the provisions of this article.

20. Liquidated Damages

If the supplier fails to deliver and install the commodities as scheduled in this contract, TAZARA will assess the supplier liquidated damages of \$_____ per day, not to exceed a total of \$_____.

21. Termination by TAZARA for Convenience

a. This contract may be terminated by TAZARA in whole, or from time to time in part, in accordance with this article, whenever TAZARA shall determine that such termination is in the best interest of TAZARA.

b. Termination shall be effected by a notice of termination to the supplier, specifying that termination is for the convenience of TAZARA, the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.

c. After receipt of a notice of termination and except as otherwise directed by TAZARA, the supplier shall:

(1) Stop work under the contract on the date and to the extent specified in the notice of termination, and place no further orders or subcontracts except as may be necessary for completion of the portion of the work under the contract which is not terminated;

(2) Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination;

(3) Assign to TAZARA as it may direct, all of the right, title, and interest of the supplier under the orders and subcontracts so terminated, in which case TAZARA shall have the right to settle or pay any claims arising out of the termination of such orders and subcontracts;

(4) With the approval or ratification of TAZARA, to the extent TAZARA may require, which approval or ratification shall be final and conclusive for all purposes of this clause, settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts;

(5) Transfer title to TAZARA and deliver, as directed by TAZARA, the completed or partially completed equipment, material, and parts which would be required to be furnished to TAZARA under this contract;

(6) Complete performance of the part of the work which has not been terminated by the notice of termination; and

(7) Take such action as may be necessary for the protection of the property related to this contract which is in the possession of the supplier and to which TAZARA has title.

d. The supplier shall submit to TAZARA its written claim promptly but not later than three months from the effective date of termination, except as TAZARA may agree in writing.

e. The supplier and TAZARA shall consult within 30 days of the submission of the claim concerning the whole or any part of the amount to be paid to the supplier by reason of the termination of work. The contract shall be amended accordingly, and the supplier shall be paid the agreed amount.

f. In deciding the amount due the supplier, all settled claims which TAZARA may have against the supplier in connection with this contract, and the agreed price for, or the proceeds of, sale of property acquired by the supplier or sold and not otherwise recovered by or credited to TAZARA, shall be deducted.

g. Any disagreement regarding termination amounts or procedures shall be settled under the clause of this contract entitled "Disputes and Appeals."

22. Worker's Compensation Insurance

a. The supplier, before commencing performance under this contract, shall maintain coverage through worker's compensation insurance or security covering each employee to the extent required by the Defense Base Act of the United States, but in any event equivalent to coverage required by law or custom in the location where the supplier's employee is performing services. The supplier shall obtain all Defense Base Act insurance required by this clause from the Insurance Company of North America through Wright & Company, 1400 I Street, NW, Suite 1100, Washington, D.C. 20005, U.S.A.

b. The supplier agrees to insert this clause in all subcontracts hereunder except those exclusively for furnishing materials or supplies.

23. Performance Bond or Guaranty

a. The supplier shall furnish to TAZARA within 15 days after award, a performance and payment bond or performance guaranty fully protecting TAZARA against any excess costs incurred by it as a result of any failure to the supplier to perform any of its obligations under this contract.

b. Such bonds or guaranty shall be satisfactory to TAZARA and, at the option of the supplier, shall be in the form of a surety bond, certified check, cashier's check, bank guaranty, or irrevocable letter of credit. If a performance guaranty in the form of a certified check, cashier's check, bank guaranty, or irrevocable letter of credit is used, it shall be in an amount evaluated to ten (10) percent of the contract value. If a performance bond is used, the bond shall be in an amount equivalent to ten (10) percent of the total amount of the contract value. The performance guaranty shall be drawn in favor of TAZARA and shall be collectible upon receipt of TAZARA's written certification and verification of supplier's default hereunder.

c. The bonds or guaranty shall be released not later than 30 days following the date of completion of the contract performance.

24. Warranty

The supplier shall provide a warranty under which it will replace or repair the equipment to be supplied under this contract, or repair or replace any parts of such equipment, found to be defective due to faulty workmanship or materials. Replacements and repairs shall be made without cost to TAZARA other than the cost of transportation from the port of entry to the project site. Such warranty shall be effective for twelve (12) months after commissioning of the equipment is completed. TAZARA shall give the supplier prompt notice of any claims under such warranty and, if the supplier fails to remedy defects within a reasonable time, shall have the right to take such remedial action as may be necessary and to claim the reasonable cost thereof from the supplier.

25. Packing

All materials and equipment must be properly prepared for export to withstand exposure to the elements and rough handling during ocean or air shipment. Such packing must be sufficient to insure safe arrival at destination and fully cover such hazards as extreme temperature and/or possible corrosion due to salt air or open storage.

26. Incidental Services

Upon delivery of equipment to the site, the supplier agrees to furnish the services of a fully qualified mechanic or serviceman to supervise the assembly and perform the initial start-up and to ensure that the equipment will be completely adjusted, lubricated with the type and grade of lubricant recommended by the manufacturer, battery fully charged, and made ready for continuous operation. All materials required for the foregoing operations shall be furnished by the supplier.

27. Spare Parts

The supplier shall furnish to TAZARA a representative list of all spare parts and components necessary for proper and continuing functioning of each unit for a period of five years. The list will be prepared in such form so that each line item can be readily identified by the manufacturer's part number, nomenclature, and unit.

28. Suspension of Work

- a. TAZARA may, at any time, by written order to the supplier

(suspension of work order), require the supplier to stop all, or any part, of the work required by the contract for a period of up to 90 days from the specified effective date.

b. Upon receipt of such an order, the supplier shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs related to the work covered by the order.

c. Within the period of the suspension of work order, TAZARA shall either:

(1) Cancel the suspension of work order; or

(2) Terminate the work covered by such order as provided in the "Termination by TAZARA for Convenience" clause of the contract.

d. If the suspension of work order is cancelled or the order expires, the supplier shall resume work. An equitable adjustment shall be made as necessary in the time schedule, the price, or a combination thereof, of any other provisions of the contract that may be affected and the contract shall be amended accordingly, if the supplier asserts a claim for such adjustment within 30 days after the end of the period of work suspension. Failure to agree to any adjustment shall be a dispute under the "Disputes and Appeals" clause of the contract.

29. Equal Employment Opportunity

The supplier will not discriminate in recruitment or employment conditions of personnel hired in the United States because of race, religion, color, sex, or national origin and is in compliance with its equal employment opportunity obligations under Executive Order 11246 dated September 24, 1965.

30. Vesting of Title and Diversion Rights

AID reserves the right to vest in itself title to the goods financed under this contract, provided that such goods are in a deliverable state and have not yet been offloaded in ports of entry in the cooperating country. AID may direct the carriers to divert these goods to alternative destinations.

31. Escalation

Freight costs will be paid in accordance with those submitted in the bid if there is no change in bunker or congestion surcharges between bid opening date and shipping date. The bidder will furnish with its bid, a copy of the page(s) of the prevailing tariff in effect on the bid opening date showing the bunker and/or congestion surcharges applicable to the shipping period(s) of the intended shipments which are on file with the U.S. Federal Maritime Commission and have been published in the applicable shipping conference tariff. If bunker or congestion surcharges are increased or decreased subsequent to bid opening date, calculation of the increase or decrease will be the difference between the tariff rates submitted with the supplier's bid and the applicable effective tariff rate at the time of shipment. TAZARA agrees to make payment on the basis of the cost of goods delivered at destination adjusted in accordance with the above procedure. In order that TAZARA may make necessary amendments to the financing documents prior to shipment, the supplier will provide information to TAZARA concerning any increases in bunker or congestion surcharges that the carrier has filed with the Federal Maritime Commission subsequent to the bid opening date.

32. Marine Insurance

The supplier shall provide all risk marine insurance on a warehouse-to-warehouse basis at 110 percent of the c.i.f. value of each shipment. The premiums shall not exceed the prevailing rate for similar coverage, and all loss payment proceeds shall be payable in any freely convertible currency. The source of any goods financed by loss payments which are used to repair or replace goods procured under this contract shall be AID Geographic Code 935.

33. Notices

Any notice given by either party will be in writing or by telegram or cable and will be deemed duly given or sent when delivered to the following addresses:

To Supplier: (to be decided after price evaluation)

To TAZARA: General Manager,
Tanzania Zambia Railway Authority
P.O. Box 2834
Dar es Salaam,
Tanzania (Telex 41059 TAZARA, TZ)

Notices shall be effective when delivered or on the effective date of the notice, whichever is later.

SECTION IV. SPECIAL CONDITIONS OF CONTRACT

NOTE: The article number refers to the articles in the General Conditions of Contract.

ARTICLE NUMBER		PAGE
1.	DEFINITIONS	2B-IV-1
3.	DELIVERY AND DOCUMENTS	2B-IV-1
6.	PAYMENT	2B-IV-3
17.	INSPECTION APPROVALS AND TESTS	2B-IV-4
24.	WARRANTY	2B-IV-5
32.	MARINE INSURANCE	2B-IV-5
ADDITIONAL ITEMS		
A.	PRICES	2B-IV-5

SECTION IV. SPECIAL CONDITIONS OF CONTRACT

The special conditions of contract contained herein shall supplement and shall be read with the general conditions of contract. Whenever there is a conflict, the special conditions shall prevail over those in the general conditions of contract. The article numbers given below refer to the articles in the general conditions of contract.

1. DEFINITIONS

In this contract the following terms shall be as defined below.

- f. The buyer is the Tanzania Zambia Railway Authority (TAZARA).
- g. The supplier is (name of supplier).
- h. The United States Agency for International Development is providing funds for the contract and is responsible for making payments on behalf of the buyer.

3. DELIVERY AND DOCUMENTS

3.1 Goods Transport by Sea

Upon shipment, the supplier shall notify the buyer and the insurance company by cable or telex the full details of the shipment including contract number, description of goods, quantity, the vessel, the bill of lading number and date, port of loading, date of shipment, port of discharge. The supplier shall send by air mail the following documents to the buyer, with a copy to the insurance company:

- (i) Copies of the supplier's invoice showing goods description, quantity, unit price, total amount;
- (ii) Original and three copies of the negotiable, clean, on-board bill of lading marked freight prepaid and three copies of non-negotiable bill of lading;
- (iii) Copies of packing list identifying contents of each package;
- (iv) Insurance certificate;
- (v) Manufacturer's/supplier's warranty certificate;
- (vi) Inspection certificate, issued by the buyer or his duly authorized inspection report; and
- (vii) Certificate of origin.

The above documents shall be received by the buyer at least one week before arrival of goods at the port and, if not received, the supplier will be responsible for any consequent expenses, including costs, delays, and claims for demurrage and liquidated damages.

3.2 Delivery Schedule

A detailed delivery schedule shall be agreed between the buyer and the supplier before the date of contract and that schedule shall form part of the contract. The schedule shall define the size of each delivery batch and the date of each delivery. It shall closely follow the schedule given in the supplier's tender and it shall form the basis of any calculation of

liquidated damages pursuant of article 24 of the general conditions of contract.

3.3 Point of Delivery

The locomotives shall be shipped to Dar es Salaam and landed/unloaded on TAZARA track.

3.4 Delivery Certificates

The goods will be offered to the buyer for acceptance at the selected point of delivery. The buyer shall arrange for each delivery batch of goods to be inspected and he shall issue a delivery certificate in respect of that part of each batch which is found to comply with the technical specification in all respects.

6. PAYMENT

- d. All payments will be made by USAID/buyer to the supplier in the currency or currencies declared in Section VII of the tender.
- e. All payments shall be made pursuant of article 6 of the general conditions of contract.
- f. No payment shall be made before signature of the contract pursuant of article 6 of the instruction to bidders and the furnishing of performance security pursuant of article 23 of the general conditions of contract.
- g. Advance payments shall be made on behalf of the buyer within 30 days of receipt by the buyer of the relevant invoice and payment security from the supplier. All other payments shall be made on behalf of the buyer

within 60 days of receipt by the buyer of the appropriate invoice and/or certificate from the supplier.

h. If as a result of any change order pursuant to article 13 of the general conditions of contract or for any other reason the total amount payable to the supplier is changed during the course of the contract, appropriate adjustments will be made to the delivery payments.

i. Performance Retention

An amount equal to 5 percent of the total value of the contract price or any revision of the contract price shall be paid after full delivery and acceptance of the last delivery as follows. The balance of the total value of the contract price, or revision of the contract price, will be paid after all claims under the conditions of warranty and other conditions of the contract have been satisfactorily met or on the expiry of the warranty period, whichever is later.

17. INSPECTION APPROVALS AND TESTS

- c. The buyer shall notify the supplier of the names of all employees authorised to approve procedures, inspect and attend tests on his behalf, together with any restrictions placed on the powers and authority of such employees.
- d. The buyer shall similarly advise the supplier of all agents not being employees who are appointed to carry out approvals and inspections and witness tests on his behalf.
- e. The buyer shall meet all costs of travel, accommodation, and subsistence incurred by his duly authorised employees and agents in carrying out such inspections and attending inspections and tests.
- f. The buyer shall pay all fees payable to duly appointed agents.

g. The supplier shall pay the costs of all tests specified in the contract.

i. Inspections and Tests

Notwithstanding the buyer's right to inspect the goods at any time, the principal inspections and tests shall be made by the supplier. The supplier shall give due notice of his intention to carry out such inspections. The buyer shall be given the opportunity to carry out his own inspections at these times.

j. Acceptance Certificate

The supplier shall not dispatch any goods from his factory without an acceptance certificate from the buyer's representative.

24. WARRANTY

The warranty period for all tools and equipment shall be 12 months from the in-service date as defined in article 24 of the general conditions of contract.

The guaranty provisions detailed in article 4 of the technical specification shall also apply.

32. MARINE INSURANCE

The insurance shall be in an amount equal to 110 percent of the c.i.f. value of the goods from "warehouse and warehouse" on "all risks" basis including war risks and strike clauses.

ADDITIONAL ITEMS

A. PRICES

The prices payable to the supplier shall be strictly in accordance with the price schedule. No adjustments to allow changes in costs of labor, material, or other elements of cost will be made with the exception of approved, written contract change orders.

V. SCHEDULE OF REQUIREMENTS

Submittal of price request response (quotation) is required by _____.

The purchase order will be issued within two weeks of price verification and acceptance of quotation.

Delivery of all purchase order items required within 120 days of purchase order date.

**SECTION VI. TECHNICAL SPECIFICATION FOR MAINTENANCE TOOLS
AND EQUIPMENT FOR U30C DIESEL ELECTRIC LOCOMOTIVES**

<u>ARTICLE</u>	<u>PAGE</u>
1. Definitions	2B-VI-1
2. Tender Requirements (General)	2B-VI-2
3. Responsibility of the Contractor	2B-VI-2
4. Guaranty	2B-VI-3
5. Materials and Workmanship	2B-VI-4
6. Interchangeability	2B-VI-5
7. Units of Measurement and Screw Threads	2B-VI-5
8. Special Tools and Testing Equipment Required for 4-Year Overhaul of 13 GE/KRUPP U30C Diesel Electric Locomotives	2B-VI-6

SECTION VI. TECHNICAL SPECIFICATION FOR MAINTENANCE TOOLS AND EQUIPMENT FOR U30C DIESEL ELECTRIC LOCOMOTIVES

This specification shall apply to all maintenance tools and equipment for diesel electric locomotives currently in service in TAZARA's system.

The specification and its attachments shall be read together.

1. DEFINITIONS

1.1 In this specification the following definitions shall apply:

1.1.1 "Authority" means the Tanzania Zambia Railway Authority.

1.1.2 "Agent" means a person(s) appointed from time to time by the Authority and notified in writing to the contractor to act as an agent for the purpose of the contract on behalf of the Authority.

1.1.3 "Inspector" means the official designated by the Authority of a representative or agent appointed by the Authority to carry out inspection work.

1.1.4 The "Contractor" means the firm or company with whom contracted.

1.1.5 "Subcontractor" means any person, firm or company from whom the contractor may obtain materials or components to be used in the manufacture of the locomotives or parts thereof.

1.1.6 "Contract Drawings" means the drawings which are exhibited or provided for the guidance of the contractor.

1.1.7 "General Conditions of Contract" means the Authority's conditions of contract.

1.1.8 AAR means Association of American Railroads.

1.1.9 Major components shall mean the diesel engine, alternator, traction motor, and bogies.

1.2 Headings to paragraphs of this specification shall not affect the interpretation thereof.

2. TENDER REQUIREMENTS (GENERAL)

The offers shall be for maintenance tools and equipment complying fully with all the requirements of this specification. If there are any minor details in the offer which do not fully comply to this specification, the supplier must draw specific attention to each and every instance of detail in which the item differs from the specified requirements. The supplier must in all instances furnish complete and detailed information, comments, or data in respect of the items or details which differ from the specified requirements.

3. RESPONSIBILITY OF THE CONTRACTOR

3.1 The contractor will be held solely and entirely responsible for meeting and fulfilling all the terms and conditions of the contract, including work performed or parts provided by subcontractors.

3.2 The work shall be of the highest quality in accordance with modern practice for manufacture of maintenance tools and equipment for diesel electric locomotives. The contractor will be held responsible for ensuring that the tools and equipment thereof are satisfactory in all respects and he shall not be relieved of such responsibility notwithstanding any approval which the Authority or its agent may have given.

3.3 The tools and equipment shall be supplied complete in all respects ready for service. The contract price shall include all the necessary parts and fittings--whether or not mentioned in the contract--to make the work complete, including an initial supply of any special lubricants, etc., which may not be readily available at site.

4. **GUARANTY**

4.1 The contractor shall guaranty the proper working of each tool/equipment supplied under the contract for a period extending to a minimum of one year from the date of entry into service.

4.2 If during the period outlined in article 4.1, any defects in design, material, or workmanship shall appear, the contractor will make the following arrangements:

4.2.1 Supply and deliver to the Authority promptly and at his own cost such replacement for additional materials or parts as are necessary.

4.2.2 Install promptly and at his own cost such materials or parts, or alternatively by arrangement to pay the Authority the cost of undertaking the work; and

4.2.3 If sufficient experienced personnel are not available locally, to supply in addition, at the appropriate time and at his own cost, suitable staff for the proper supervision of the work of replacement.

4.2.4 In the event of the contractor failing to make good such defects or deterioration referred to herein, the Authority may make good the same and the contractor shall be liable for the cost thereof unless it can be shown and proved that these were due to causes for which the contractor is not responsible under the terms of this contract.

4.3 Any replacement parts or additional materials which may be supplied under sub-article 4.3.1 above shall be guaranteed for a period of one year from the date of installation of the replacement part or additional material.

4.4 The period of guaranty stipulated under articles 4.1 and 4.2 above shall be extended by a period equal to the time which the tool or equipment is out of service as a result of a defect for which the contractor is liable under the terms or guaranty.

5. MATERIALS AND WORKMANSHIP

5.1 All materials and workmanship used in the manufacture of the tools and equipment shall be in accordance with the provisions of the AAR standards of practice, or their equivalent U.S. codes. They must be of the best quality and of class most suitable for the purpose for which they are required. No defects shall be repaired without the written approval of the Authority or its agent.

5.2 The work shall be subject to the inspection by the Authority's inspector. Testing shall be to his requirements as approved by the Authority or its agent.

5.3 The components shall be made from materials complying with and shall conform in all respects to the AAR and U.S. standards. Particulars of the standard specifications complied shall be given when tendering.

6. INTERCHANGEABILITY

6.1 Assemblies, whether major or minor in nature, subassemblies, components, and individual parts must be interchangeable in all respects with the parts of existing identical tools or equipment. Dismantling of adjacent parts and special fitting work for this purpose shall be avoided.

7. UNITS OF MEASUREMENT AND SCREW THREADS

7.1 Tools and equipment shall be designed and manufactured to AAR imperial system of dimensions. All screw threads shall be AAR imperial threads. In the case of items of equipment of standardized or proprietary nature, consideration will be given to the acceptance of UIC and other units of measurement and thread forms.

8. SPECIAL TOOLS AND TESTING EQUIPMENT REQUIRED FOR 4-YEAR
OVERHAUL OF 13 U30C DIESEL ELECTRIC LOCOMOTIVES

ITEMS TO TO OBTAINED FROM TRANSPORTATION EQUIPMENT SUPPLY
COMPANY OR EQUIVALENT

QTY ITEM

- 1 T50301 Tool Cart
With the provision to house the following tools:
- 1 T15681 pneumatic torque wrench for installing or removing
cylinder hold-down bolts - complete with 5:1 verifier.
- 1 T22040 engine barring-over tool complete with remote
control - (air operated)
- 1 T1780 box wrench torque kit - 1/2 inch through 1 inch in
1/16 inch increments - 30-150 lb/ft torque wrench
- 6 T12962 Governor Gap Gauges
- 1 T11220 Art Rod Guide Pin
- 1 T18591 Piston & Rod Lifter
- 1 T19161 Turbocharger Lifter
- 1 T16060 Cylinder Lifter
- 1 T18250 0-1000 lb/ft Torque Wrench
- 1 T18230 0-600 lb/ft Torque Wrench Ratcheting

QTY	ITEM
1	T-18560 Fuel Nozzle Remover
1	T10900 Piston Support Bar
1	T14581 Art Rod Pin Bolt Wrench
1	T15171 Adapter
1	T16550 Master Rod Lifter
1	T18410 Piston Pin Bolt Wrench
1	T15100 Socket
1	T15100 Socket
2	T13670 Cylinder Guide Pins
2	T14921 Conn Rod Bearing Retainers
1	T13220 Cylinder Insert Wrench
1	T12300 Timing Tram Bar
1	T10402 Rocker Arm Depressor
1	T10890 Piston Ring Compressor
1	T14062 Piston Retainer
1	T14740 Art Rod Pin Retainer
1	T15923 Fuel System Torque Kit

QTY	ITEM
1	T50001 Fuel Line Removing/Torquing Tool
1	T15804 Governor Tail Rod Jack
1	T23520 Turbocharger Mounting Bolt Torque Kit
1	T52050 Cam Roller Lifter
1	T10992 Piston Ring Expander

ADDITIONAL ITEMS TO BE OBTAINED FROM TRANSPORTATION EQUIPMENT
SUPPLY COMPANY OR EQUIVALENT

QTY	ITEM
1	T51750 Cooling System Test Kit
1	T54111 Main Bearing Cap Lifter
1	T17420 Hydraulic Frame Spreader
1	T23221 Piston Retainer
1	T20702 Universal Fuel Rack Setting Gauge
3	T195510 Piston Protectors
1	T11322 Cam Bearing Spanner Wrench
1	T10980 Piston Ring Groove Scraper
6	T52060 Valve Setting Gauges

QTY	ITEM
1	T23330 High-Pressure Hot Water Cleaner 230V 50 Hz 3 Phase
1	T18890 Crankcase Cleaner 230/460V 50 Hz 3 phase
1	T12270 Crankcase Deflection Gauge
6	T14930 Fuel Pump Mounting Wrench
2	T2X2437 Blower Coupling Wrench
3	T50370 Turbocharger Transition Section to Exhaust Inlet Casing Wrench
1	T54210 Test Gauge Set
1	T22061 Preturbine Temperature Measuring Kit
1	T16510 Connecting Rod Service Fixture
1	T18960 0-1000 lb/ft Torque Wrench Tester
1	T19271 Machinists Hand Tool Set
6	T54470 Inspection Lights
12	T54470B Pack of Four Batteries
1	T54330 Master Rod Cap Lifter
1	T18400 Magnetic Base Drill Kit 230V 50 Hz
1	T12940 General Purpose Puller Set
1	T21060 Main Bearing Wrench-Hydraulic 230V 50 Hz

QTY	ITEM
1	T16730 Cylinder Head Aligner
1	T13640 Alternator Coupling Wrench
1	T14140 Conn Rod Bearing Cap Remover
1	T70051 Radiator Fan Remover
6	T18260 Crankshaft Main Journal Protective Pad
6	T18270 Crankshaft Rod Journal Protective Pad
6	T18280 Connecting Rod Shank Protective Pad
1	T19530 Valve Holder
1	T19450 Valve Spring Compression (4 valves)
1	T16460 Liner Lifter
1	T19280 Cylinder Service Fixture
1	T10310 Piston Ring Liner Bore Master Gauge
1	T16712 Hydraulic Cylinder Liner Remover 230V 50 Hz
1	T19141 Crankshaft Front Drive Puller Set
1	T16791 Valve Checking Fixture
1	T14460 Valve Grinder 220V 50 Hz
6	T14100 Grinding Wheel - Valve Face

QTY	ITEM
6	T14101 Grinding Wheel - Valve Stem
1	T10480 Valve Seat Grinding Set
12	T18810 Grinding Wheel - Rough
12	T18820 Grinding Wheel - Finish
2	T10610 Grinding Wheel - 30 in.
1	T14420 Valve Guide Driver
1	T14430 Fuel Pump Tappet Guide Driver
1	T20240 Cylinder Head Lifter
1	T18701 Cylinder Jacket Lifter
1	T20240 Cylinder Head Groove Gauge Set
1	T22181 Cylinder Liner Tang Gauge Set
1	T18500 Blast Cleaning Machine 230V 3 Phase 50 Hz
6	T18550 50-lb Bag Glass Beads
1	T22550 Turbocharger Service Fixture
1	T17320 Fuel Pump Service Fixture
1	T19170 Overspeed Link Assy. Fixture
1	T11970 Bearing Installing Tool - Turbo

QTY	ITEM
1	T20750 Compressor Wheel Puller - Turbo
1	T20720 Bearing Puller - Turbo
1	T20770 Rotor Stud Cap - Turbo
2	T21980 Guide Pin - Turbo
1	T20740 Stud Driven - Turbo
1	T20790 Guide Sleeve - Turbo
1	T21210 Stud Protector - Turbo
1	T19800 Impact Drives
1	T19790 Screw Driver Tip
1	T20810 Wire Twister
1	T20800 Feeler Gauges
1	T60220 Induction Heater for Pinion Removal GE761 Motors
1	T50850 Hydraulic Pinion Removal Kit
1	T70101 Digital Multimeter
1	T70200 Engine Speed Reading Kit
1	T2X1957 Megger Tester 230V 50 Hz
1	P 8843613 G1 Commutator Grinding Kit

QTY ITEM

1 41 B 532339G1 Puller Set (under Traction Motor Section)

SKF/FAG BEARING (VIA TESCO)

1 FAG 157317 Mobile Unit for Mounting and Dismounting Bearings

1 FAG 157317/1-F Mounting and Dismounting of Seals

1 FAG 157317/2-F RAM

1 FAG 157317/3-F Seal Case Jaws

1 FAG 157317/4-F Counter Rent

1 FAG 157317/5-F Support Ring

1 FAG 157317/6-F Adaptor Ring Bearing

1 T16180 Lapmaster Machine 230V 50 Hz

1 T17320 Fuel Pump Holding Fixture

1 T14511 Injector Nozzle Viewer

1 T16712 Cylinder Head/Line Assy. Press 230V 50 Hz

1 T24220 Governor Test Stand

1 41 A31302261 Pressure Tester (20 psi)

1 41 D753624G1 Card Extender (44 pin long)

QTY	ITEM
1	T12270 Crankshaft Deflection Gauge
1	T54400 Temp Switch Checking Fixture
1	T20130 Governor Tool Kit
1	Drying Oven 6 ft x 10 ft x 6 ft Max Temp 700 Degrees Centigrade
1	Megger Tester 1,000V 500 Megohms
1	8843578G1 Set of puller tools for GE 761 traction motor
1	9949075G1 Commutator grinder for GE 761 traction motor
1	994918294 Pinion puller kit for GE 761 traction motor
1	H2B/5 Balancing machine for turbocharger rotor
1	Press for mounting and dismounting of seals Height 328mm Stroke 150mm Order No. 50209 OTC Owaton Tool Company, Minnesota

SECTION VII. PRICE/AWARD/CONTRACT FORM AND PRICE SCHEDULE

PRICE/AWARD/CONTRACT

1. RFP No. _____
2. Supplier's Name and Address:

3. In response to Request for Prices _____, as modified by Addenda 1 through _____, the supplier agrees to furnish the items listed in the attached price schedule at the prices quoted therein in accordance with the conditions of contract and technical specifications. This quotation is valid for a period of _____ calendar days after the request date established in the RFP.
4. An executed bond or guaranty, is also attached to this submittal.
5. Signature of person authorized to sign quotation:

Date: _____

_____ The _____
(hereinafter called the "Contracting Agency") has accepted the quotation of _____ (hereinafter called the "supplier") for the supply of maintenance tools and equipment and test tools and equipment as set forth in this contract.

This contract consists of the following documents:

- 1) This Price/Award/Contract Form;
- 2) The Price Schedule;
- 3) The General Conditions of Contract;
- 4) The Special Conditions of Contract;
- 5) The Technical Specifications; and
- 6) Manufacturer's Standard Warranty

By: _____

(Contracting Agency)

PRICE SCHEDULE

No. _____ RFP No. _____

Page _____ of _____

Name of Supplier _____

Item No.	Description	Quantity	Unit Price	Total Price
			f.o.b.	c.i.f. (U.S.-flag)

VIII. BOND

BID BOND <i>(See instructions on reverse)</i>	DATE BOND EXECUTED (Must not be later than bid opening date)
PRINCIPAL (Legal name and business address)	TYPE OF ORGANIZATION ("and") <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> PARTNERSHIP <input type="checkbox"/> JOINT VENTURE <input type="checkbox"/> CORPORATION STATE OF INCORPORATION
SURETY(IES) (Name and business address)	

PERCENT OF BID PRICE	PENAL SUM OF BOND				BID DATE	INVITATION NO.
	AMOUNT NOT TO EXCEED					
	MILLIONS	THOUSAND(S)	HUNDRED(S)	CENTS		
					FOR (Construction, Supply or Service)	

OBLIGATION

We, the Principal and Surety(ies) are firmly bound to ******* (hereinafter called *******) in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS

The Principal has submitted the bid identified above.

THEREFORE,

The above obligation is void if the Principal - (a) upon acceptance by ******* of the bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), executes the further contractual documents and gives the bond(s) required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by the principal; or (b) in the event of failure so to execute such further contractual documents and give such bonds, pays ******* for any cost of procuring the work which exceeds the amount of the bid.

Each Surety executing this instrument agrees that its obligation is not impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to *******. Notice to the surety(ies) of extension(s) are waived. However, waiver of the notice applies only to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

WITNESS

The Principal and Surety(ies) executed this bid bond and affixed their seals on the above date.

PRINCIPAL					
	Signature(s)	1.	2.		Corporate Seal
			<i>(Seal)</i>	<i>(Seal)</i>	
	Name(s) & Title(s) (Typed)	1.	2.		
INDIVIDUAL SURETIES					
	Signature(s)	1.	2.		
			<i>(Seal)</i>	<i>(Seal)</i>	
	Name(s) (Typed)	1.	2.		
CORPORATE SURETY(IES)					
SURETY A	Name & Address			STATE OF INC.	LIABILITY LIMIT
	Signature(s)	1.	2.		Corporate Seal
	Name(s) & Title(s) (Typed)	1.	2.		

CORPORATE SURETY(IES) (Continued)

		STATE OF INC.	LIABILITY LIMIT	
SURETY B	Name & Address		\$	Corporate Seal
	Signature(s)	1. _____	2. _____	
	Name(s) & Title(s) (Typed)	1. _____	2. _____	
SURETY C	Name & Address		\$	Corporate Seal
	Signature(s)	1. _____	2. _____	
	Name(s) & Title(s) (Typed)	1. _____	2. _____	
SURETY D	Name & Address		\$	Corporate Seal
	Signature(s)	1. _____	2. _____	
	Name(s) & Title(s) (Typed)	1. _____	2. _____	
SURETY E	Name & Address		\$	Corporate Seal
	Signature(s)	1. _____	2. _____	
	Name(s) & Title(s) (Typed)	1. _____	2. _____	
SURETY F	Name & Address		\$	Corporate Seal
	Signature(s)	1. _____	2. _____	
	Name(s) & Title(s) (Typed)	1. _____	2. _____	
SURETY G	Name & Address		\$	Corporate Seal
	Signature(s)	1. _____	2. _____	
	Name(s) & Title(s) (Typed)	1. _____	2. _____	

INSTRUCTIONS

1 This form is authorized for use when a bid guaranty is required.

2 Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g. an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership or joint venture, or an officer of the corporation involved.

3 The bond may express penal sum as a percentage of the bid price. In these cases, the bond may state a maximum dollar limitation (e.g. 20% of the bid price but the amount not to exceed _____ dollars).

4 (a)

Where more than one corporate surety is involved, their names and addresses shall appear

in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)". In the space designated "SURETY(IES)" on the face of the form, insert only the letter identification of the sureties.

(b) Where individual sureties are involved, two or more responsible persons shall execute the bond.

may require these sureties to furnish additional substantiating information concerning their financial capability.

5 Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal".

6 Type the name and title of each person signing this bond in the space provided.

7 In its application to negotiated contracts, the terms "bid" and "bidder" shall include "proposal" and "offeror".

*** Insert name of Contracting Agency.

IX. CONTRACT FORM

CONTRACT FORM

THIS AGREEMENT made the ____ day of _____, 19__, between The Tanzania Zambia Railway Authority of Tanzania and Zambia (hereinafter "the Buyer") of the one part and (Name of Supplier) of (City and Country of Supplier) (hereinafter "the Supplier") of the other part.

WHEREAS the Buyer is desirous that certain goods and ancillary services should be provided by the Supplier, viz., maintenance tools and equipment and test tools and equipment, and has accepted a tender by the Supplier for the provision of those goods and services in the sum of (Contract Price in Words and Figures) (hereinafter "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

- (a) the Price/Award/Contract Form and the Price Schedule;
- (b) the Schedule of Requirements;
- (c) the Technical Specifications;
- (d) the General Conditions of Contract;
- (e) the Special Conditions of Contract; and
- (f) the Manufacturer's Warranty.

3. In consideration of the payments to be made on behalf of the Buyer to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Buyer to provide the goods and services and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Buyer hereby covenants to arrange for the Supplier to be paid in consideration of the provision of the goods and services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

5. This Contract shall be governed by United States of America laws.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with their respective laws the day and year first above written.

Signed, Sealed, and Delivered by the

said _____ (For the Buyer).

in the presence of: _____

Signed, Sealed, and Delivered by the

said _____ (For the Supplier).

in the presence of: _____

X. PERFORMANCE BOND

XI. PAYMENT BOND

PART 2 -- SEGMENT C
EXHIBITS AND APPENDICES

LIST OF EXHIBITS AND APPENDICES

1. Inventory of U30C parts as of 30th September 1987.
2. Equipment available at Mbeya light repair shop.
3. Inspection trip reports of workshop tours: Dar es Salaam, Tanzania, October 14 and 15, 1987; Mpika, Zambia, October 18 and 19, 1987; Mbeya, Tanzania, October 23 and 24, 1987.
4. Diesel electric locomotive 1006 showing extent of damage-- photographs taken at Mbeya, Tanzania; diesel electric locomotive 1008 showing progress in rebuilding-- photographs taken at Mpika, Zambia.
5. Four-year inspection and maintenance schedule (export DE locomotives with GE engines; pages referring to 4-year overhaul).
6. Tanzania Zambia Railway Authority, head office, mechanical engineering department; upgrading of Mbeya locomotive repair facilities.

*Appendix 1--TAZARA's preliminary drawing of depot layout showing proposed extension and support units.

*Appendix 2--TAZARA's preliminary drawing of workshop layout details.

Appendix 3--Legend for the proposed workshop layout.

Appendix 4--Major equipment and testing services to be installed in the new workshop.

Appendix 5--Power requirements, annual maintenance schedules, and service positions.

Appendix 6--Main facilities to be installed in Mbeya.

7. Reference documents used in preparation of this report; assistance of TAZARA personnel.

*Note: Appendices 1 and 2 of the August 1987 Report on Upgrade of Mbeya Locomotive Repair Facility included the two drawings cited. Prints of these drawings are omitted in this report.

EXHIBIT 1

MECHANICAL ENGINEERING DEPARTMENT, MBEYA, TANZANIAINVENTORY OF U30C PARTS AS OF 30TH SEPTEMBER 1987

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
1.	Interlock	17AF20B25	1
2.	Interlock	17AF41A2	1
3.	Interlock	17AF41C1	1
4.	Contactor	17CM55Y3	3
5.	Contactor	17CM55N3	1
6.	Contactor	17CM57B9	1
7.	Contactor	M53E10A	1
8.	Reactor	17ET13F1	1
9.	Reactor	17ET34A1	1
10.	Card	17FD1229A1	5
11.	Card	17FD732A2	2
12.	Card	17FD739C1	1
13.	Card	17FD733B3	4
14.	Card	17FD1320A2	5
15.	Card	17FD1411B1	3
16.	Card	17FD1197B1	3
17.	Card	17FD1197D1	2
18.	Card	17FD1197A	2
19.	Card	17FD1198C1	2
20.	Card	17FD1284A1	2
21.	Card	17FD1285A1	2
22.	Card	17FD1286A1	2
23.	Card	17FD1287C1	2
24.	Card	17FD1290A1	2
25.	Card	17FD1291A1	2
26.	Card	17FD1295A1	2
27.	Card	17FD1297A1	2
28.	Card	17FD1310A1	2
29.	Card	17FD1316A1	2
30.	Card	17FD1317B1	2

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
31.	Card	17FD1318A2	2
32.	Card	17FD1320A1, 2	3
33.	Card	17FD1321A1	2
34.	Card	17FD1322A1	2
35.	Card	17FD13222B1	2
36.	Card	17FD1331A1	3
37.	Card	17FD1347A1	2
38.	Card	17FD1348A1, 2	5
39.	Card	17FD1375A1	4
40.	Voltage regulator	17FH23D5DNO	0
41.	Rectifier	17FM203D1	2
42.	Rectifier	17FM307A5	2
43.	Relay	17LV66BD52	3
44.	Relay	17LV66J10	3
45.	Relay	17LV59N38	4
46.	Relay	17LV66S40	5
47.	Relay	17LV67D3	4
48.	Valve	17MV38A6	4
49.	Hydraulic hose	1 x 5309	1
50.	Filter (air brake)	1 x 6383	30
51.	Diaphragm assembly	1 x 6849	24
52.	Brush	1 x 6860	192
53.	Spring	1 x 6862	12
54.	Gear, pinion (clutch gear unit)	1 x 7281	2
55.	Kit	1 x 8670	5
56.	Gasket (part 1 x 7281)	41B532088P5	2
57.	Gasket	41B532088P6	4
58.	Gasket	41B532088P7	12
59.	Kit	1 x 9888	20
60.	Gasket	9949049P2	NIL
61.	Kit, engine measuring	2 x 2795	NIL
62.	Gasket	9949049P3	NIL
63.	Diode	2 x 2823	2

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
64.	Hose connector	2 x 4135	2
65.	Hose connector	2 x 4136	2
66.	Hexagonal die	2 x 4946	2
67.	Die	2 x 4947	2
68.	Kit (auto brake valve)	2 x 4975	36
69.	Gasket kit (auto brake valve)	2 x 4976	36
70.	Crimper die	2 x 5079	4
71.	Adapter	2 x 5084	5
72.	Main bearing	114 x 1103-1	12
73.	Front end coupling	114 x 1105-4	7
74.	Holder, bearing	114 x 1106-2	4
75.	Thrust bearing	114 x 1127-1	2
76.	Gear, pinion	114 x 1127-1	4
77.	Shaft	114 x 1132-1	5
78.	Main bearing, lower	114 x 1150	16
79.	Adhesive	115 x 1030-1	6
80.	Dowel	115 x 1046	60
81.	O ring	115 x 1045-3	3
82.	Seal, door	115 x 1133	128
83.	Washer, seal	115 x 1140	30
84.	Gasket, plug	115 x 1154	20
85.	Gasket	115 x 1208	18
86.	Gasket	115 x 1232	60
87.	Gasket	115 x 1245	32
88.	O ring	115 x 1268	233
89.	Packing	115 x 1342-4	28
90.	Stud	115 x 1412	10
91.	Gasket	115 x 1413	60
92.	Gasket	15 x 1419	60
93.	Gasket	115 x 1427	44
94.	Oil seal	115 x 1444	25
95.	Bolt	115 x 2444-1	6
96.	O ring	115 x 1840	290

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
97.	Gasket	115 x 1843	4
98.	Gasket	115 x 1844	4
99.	O ring	115 x 1865	22
100.	Gasket, housing	115 x 1871	40
101.	Gasket, filter	115 x 1872-1	25
102.	Seal, shaft	115 x 1877	24
103.	Gasket	115 x 1896-2	22
104.	O ring	115 x 1905	150
105.	Gasket	115 x 1925-1	6
106.	O ring	115 x 1929	18
107.	Oil seal	115 x 1930-3	6
108.	Gasket, bearing	115 x 1931-1	8
109.	Gasket, idler	115 x 1936	18
110.	Bolt, nylok	115 x 2025-1	50
111.	O ring	115 x 2050	20
112.	Gasket	115 x 2075	20
113.	Gasket	115 x 2155	10
114.	Bolt clamp	115 x 2164	40
115.	Bolt, clamp	115 x 2165-1	50
116.	Nut, manifold	115 x 2166	50
117.	Nut, manifold	115 x 2167	50
118.	Stud	115 x 2170	10
119.	Fuel	115 x 2173	20
120.	Gasket	115 x 2187	25
121.	Seal	115 x 2239	36
122.	Seal	115 x 2244	55
123.	O ring	115 x 2246-1	10
124.	O ring	115 x 2322-1, 2	40
125.	Gasket	115 x 2327	27
126.	Washer	115 x 2337	24
127.	O ring	115 x 2363-1	60
128.	Gasket	115 x 2376	60
129.	Gasket	115 x 2378	22

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
130.	Gasket	115 x 2381	28
131.	Nut	115 2393	344
132.	Ring, clamp	115 x 2395	30
133.	Boot, seal	115 x 2399-1	30
134.	O ring	115 x 2401	25
135.	O ring	115 x 2420	50
136.	Bolt, manifold	115 x 2450	45
137.	O ring	115 x 2445	36
138.	O ring kit	115 x 2472	60
139.	Seal	115 x 2612	20
140.	Thrust bearing	115 x 1047	10
141.	Cam, bearing	116 x 1070-1	2
142.	Cam, right - 12 cyl.	116 x 1122-1	20
143.	Shaft, stub	116 x 1085-2	10
144.	Ring	116 x 1086	2
145.	Cam, left - 12 cyl.	116 x 1123-1	12
146.	Cam, stud	116 x 1141	96
147.	Art rod	117 x 1012-4	6
148.	Dowel	117 x 1013-1	12
149.	Bushing	117 x 1028-1	2
150.	Art rod pin	117 x 1029-4	4
151.	Rod, cap bolt	117 x 1038	20
152.	Bolt-A pin	117 x 1039	10
153.	Bolt-P pin	117 x 1040	20
154.	Spacer, bolt	117 x 1041-1	10
155.	Washer	117 x 1042	20
156.	Bearing	117 x 1045-2	10
157.	Key, gear	119 x 1058	20
158.	Clamp ring	119 x 1062-1	10
159.	Clamp	121 x 1037-4	20
160.	Handle	121 x 1036	10
161.	Bolt kit	121 x 1045-2	20
162.	Nozzle stud	121 x 1109	10
163.	Bushing	121 x 1120-1	4

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
164.	Valve guide	121 x 1126-3	60
165.	Clamp	121 x 1127-1	10
166.	Seal	121 x 142	10
167.	Gear	121 x 1156-2	5
168.	Gasket	121 x 1157	20
169.	Adapter	121 x 1163	4
170.	Seal 0.200	121 x 1164-1	26
171.	Seal 0.150	121 x 1165-1	50
172.	Seal 0.100	121 x 1166-1	50
173.	Retainer	121 x 1167-1	100
174.	Plug/handle	121 x 1169	6
175.	O ring	121 x 1174	30
176.	O ring	121 x 1048	30
177.	Seal	121 x 1178	20
178.	Seal	121 x 1179	38
179.	Umbrella	123 x 1001	20
180.	Exhaust valve	123 x 1037-4	38
181.	Keeper	123 x 1039	98
182.	Nozzle	123 x 1041-2,3	162
183.	Shim	123 x 1046	186
184.	Shim	123 x 1047	136
185.	Shim	123 x 1047	114
186.	Shim	123 x 1049	100
187.	Shim	123 x 1050	200
188.	Rod	123 x 1051	23
189.	Valve assembly	123 x 1052	150
190.	Spring	123 x 1053	220
191.	Nut	123 x 1055	14
192.	Plate 0.052	123 x 1058	170
193.	Plate 0.058	123 x 1059	270
194.	Plate 0.070	123 x 1060	265
195.	Plate 0.076	123 x 1061	218
196.	Plate 0.082	123 x 1062	260

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
197.	Plate 0.088	123 x 1063	270
198.	Spring seal	123 x 1079-1	24
199.	Rotator	123 x 1085	48
200.	Plate 0.67	123 x 1086	340
201.	Inlet valve 15°	123 x 1090	100
202.	Keeper	123 x 1039	250
203.	Shim	123 x 1046	150
204.	Spacer	124 x 1006	6
205.	Spacer	124 x 1007	6
206.	Push rod	124 x 1013	24
207.	Umbrella	124 x 1015-3	6
208.	Rod	124 x 1014	7
209.	Push rod	124 x 1030-7	12
210.	Push rod	124 x 1031-7	6
211.	Guide	124 x 1036-2	10
212.	Cross head	124 x 1058	12
213.	Guide	124 x 1059-1	6
214.	Spring retainer	124 x 1061	12
215.	Cross head	124 x 1068	10
216.	Rocker, exhaust	124 x 1070-1	12
217.	Rocker, inlet	124 x 1075-2	12
218.	Rocker	124 x 1080-1	12
219.	Magnetic pick-up	126 x 1389-1	4
220.	Mechanical seal	125 x 1015-8	3
221.	Turbo inlet	126 x 1619-1	5
222.	GE turbocharger	126 x 1630-1	1
223.	TE bearing	126 x 1222-1	12
224.	BE bearing	126 x 1223-1	12
225.	Seal TE	126 x 1562	24
226.	Seal BE	126 x 1563	24
227.	Right elbow	128 x 1354-1	6
228.	Elbow	128 x 1355-1	12
229.	Gasket - main	128 x 1357	10
230.	Elbow seal	128 x 1358	10

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
231.	Intercooler - SR	128 x 1360-3	12
232.	Gasket	128 x 1400	10
233.	Gasket	128 x 1401	8
234.	Door	131 x 1005-3	4
235.	Shim	132 x 1022	60
236.	Shim 0.016	132 x 1023	60
237.	Shim	132 x 1024	30
238.	Shim	132 x 1025	30
239.	Bearing	132 x 1093-1,2	30
240.	Fuel filter	132 x 1250-2	152
241.	Rod, end	132 x 1261	30
242.	Pellet	132 x 1274-1	10
243.	Holder	132 x 1279	6
244.	Valve	132 x 1283	10
245.	Sleeve	132 x 1284	40
246.	Rack assembly	132 x 1286	3
247.	Screw control rack	132 x 1290	160
248.	Sleeve	132 x 1294	10
249.	Follower	132 x 1295	20
250.	Pilot	132 x 1297	10
251.	Spring plate	132 x 1298	10
252.	Seal assembly	132 x 1407	10
253.	Bushing	132 x 1323	20
254.	O ring housing	132 x 1408	20
255.	Fuel pump	132 x 1410-1	2
256.	Quad ring	132 x 1491	39
257.	Quad ring	132 x 1492	35
258.	Spring plate, lower	132 x 1498	36
259.	OS link	132 x 1500	2
260.	Injection pump	132 x 1535	20
261.	Packing	132 x 1538	176
262.	Packing	132 x 1539	176
263.	Barrel and plunger	132 x 1541	30

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
264.	Gear, idler	135 x 1014	10
265.	Gear	135 x 1039	2
266.	Gear	135 x 1044-3	4
267.	Gear, crank	135 x 1045-3	3
268.	Oil pump gear	135 x 1046-1	3
269.	Idler gear	135 x 1048-1	3
270.	Gear	135 x 1059-2	3
271.	Gear, OS DR	135 x 1061-1	3
272.	Cam gear	135 x 1067	3
273.	Ball bearing	136 x 1044	3
274.	Bearing	136 x 1096-1	3
275.	Gasket	136 x 1338	20
276.	Gasket	136 x 2067	56
277.	Bracket/SW	136 x 2137	8
278.	Gear, drive	136 x 2223	6
279.	Overspeed governor	136 x 2250	1
280.	Nut - LO pump	139 x 1107-4	1
281.	Fuel drain	140 x 1041-2	20
282.	Fuel line	140 x 1826	10
283.	Hose, oil	140 x 1850	5
284.	Hose	140 x 1850	5
285.	Hose, LG	140 x 2289	40
286.	Tee, fitting	140 x 2292	6
287.	Core plug	140 x 2385	5
288.	Piston pin	142 x 1000-4	10
289.	Bolt, steel crown	142 x 1034-1	30
290.	Spring	146 x 1082-1	40
291.	Spring & head	146 x 1083	10
292.	Spring	146 x 1084	4
293.	Spring	146 x 1085	130
294.	Spring	146 x 1086	60
295.	Pump spring	146 x 1087-2	10
296.	Spring	146 x 1101	10

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
297.	Spring	146 x 1102	20
298.	K-intercooler	150 x 1049-2	20
299.	Pump kit	150 x 1069-1	10
300.	Pump installation kit	150 x 1070	10
301.	Governor - mod. kit	150 x 1079	10
302.	Cyl. top deck kit	150 x 1087	100
303.	Nozzle kit	150 x 1095	350
304.	Injection pump kit	150 x 1096-1	75
305.	Governor con.	150 x 1095	2
306.	Piston ring kit	150 x 1044	57
307.	Cyl. dresser	150 x 1116-1	48
308.	Lamp	GE 30511/DC 75V	180
309.	Governor gasket	150 x 1136-1	10
310.	Lube pump kit	150 x 1139-1	10
311.	Cyl. liner kit	150 x 1169	10
312.	OS splin	150 x 1194-1	24
313.	Kit consist	150 x 1145	10
314.	Gasket	139 x 1097	NIL
315.	Gasket	139 x 1102	NIL
316.	Gasket 0.010	139 x 1238	NIL
317.	Gasket 0.015	139 x 1239	NIL
318.	Gasket 0.021	139 x 1240	NIL
319.	Bushing	139 x 1242	NIL
320.	Bushing	139 x 1243	NIL
321.	Bushing	139 x 1244	NIL
322.	Kit	150 x 1171	10
323.	K-OS link	150 x 1202	2
324.	Brush	8828400P1	500
325.	Hasler paper	5-0260-12-13	700
326.	Steel crown, piston	142 x 1040-2	10
327.	Gasket	139 x 1102	NIL
328.	K-mod. governor	150 x 1112-2	5
329.	Resistor	17EA5A131	6
330.	Resistor	17EA5A19	10

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
331.	Bolt	149733P1	10
332.	Crankshaft	119 x 1096	1
333.	Damper	119 x 1006-3	1
334.	Bearing, grooveless	117 x 1060-1	6
335.	Master rod	-	NIL
336.	Water pump	125 x 1072-2	3
337.	Cylinder head	121 x 1190-1	10
338.	Trans. sect.	128 x 1444-1	3
339.	Intercooler - SL	128 x 1361-3	2
340.	Turbo rotor	126 x 1636	2
341.	Main sect	128 x 1363-3	2
342.	Governor	136 x 2196	1
343.	Lube oil pump	139 x 1146-3	1
344.	Auxiliary generator	5 GY7L1	NIL
345.	Traction motor	5GY761A18	NIL
346.	Auxiliary generator	5GY27M1	NIL
347.	Blower motor	5GY19A5	NIL
348.	Alternator	5GTA11C1	NIL
349.	Screw	N170P15008B	200
350.	Screw	N170P2301B13	3
351.	Screw	N170P2302013	5
352.	Gasket	514655	40
363.	Ring	518472	5
354.	Gasket	516296	40
355.	Bolt	N170P29030	40
356.	Lock washer	N405P113	200
357.	Lock washer	N405P45	100
358.	Cap screw	N22P25012	100
359.	Cap bolt 3/8 - 16 1 in.	N22P2516	100
360.	Screw cap	N22P25016	100
361.	Cap bolt	N22P29020	100
362.	Cap bolt 1/2 in. - 13, 1 in.	N22P29024	100

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
363.	Cap bolt	N22P33084	20
364.	Cap bolt	N22P33024B	40
365.	Washer seal	115 x 1021-1	100
366.	Nut	N258P29B	40
367.	Key	N3400P204	20
368.	Key	N3400P406	20
369.	Lock washer	N405P17	100
370.	Lock washer	N405P40	100
371.	Washer	N402AP39B	300
372.	Lock washer	N405P75	200
373.	Ring	N901P412	28
374.	Oil filter	2 x 4223-E	176
375.	Valve	PD4-20-1198	1
376.	Nut	N210P16B	350
377.	Hex bolt	N22P23024B	6
378.	Lock washer	N405P40B	250
379.	Ext. pump	489A413ABG10	1
380.	Lamp	50A19/RS-75V	170
381.	Lamp	25A17/RS-75V	150
382.	Bulb	656-DC-75V	24
383.	Brush	27888G	24
384.	Ring	514624	5
385.	Valve	518326	2
386.	Gasket	514627	45
387.	Gasket	514645	2
388.	Gasket	51465	40
389.	Ring	520123	10
390.	Ring	520128	5
391.	Ring	520130	5
392.	O ring	522758	40
393.	Wrist pin	523714	2
394.	Gear	552674	3
395.	Gear	552675	1

EXHIBIT 1

<u>S/NO.</u>	<u>DESCRIPTION</u>	<u>GE PART NO.</u>	<u>QUANTITY</u>
396.	Motor	41A203148P2	1
397.	RTV 10.3 black	41A212051P5	100
398.	G-gun	41A212051P6	4
399.	Breaker	41A218841P5	12
400.	Traction motor brush	41A235897P4	2500
401.	Head light (30-200W)	41A210446P1	100
402.	Spring seat	41A233867G2	20
403.	Spring seat	41A233868P1	20
404.	Cylinder installation kit	150 x 1024-2	200
405.	Turbo gasket	150 x 1083-1	200
406.	Filter element (air)	41A216504P4	50
407.	Switch	41B510557P15	4
408.	Digital kit	41A288473G1	5
409.	Kit	41A323702G1	20
410.	Speed sensor	41B537105G1	12
411.	Sealant	41B562849P156	10
412.	Rheostant	41AB557209P1	10
413.	Blower	41C618369P2	4
414.	RB DR Hub	41C619140P1	4
415.	Core 16 in.	41D71179G2	10
416.	Cage	41D703980P14	10
417.	Oil-30 gal	147 x 1152-1	20
418.	Seal	121 x 1081	NIL
419.	Gasket	121 x 1080	NIL
420.	Seal	121 x 1078	NIL
421.	Gasket	121 x 1144-2	NIL
422.	Seal	121 x 1142	NIL
423.	O ring	121 x 1143-2	NIL
424.	O ring	115 x 2147-1	NIL
425.	O ring	121 x 1174	NIL

Source of this document:

Mr. A. O. Mkamba, Principal Mechanical Engineer-System
Headquarters, TAZARA

Data confirmed by inspection & audit
October 23-24, 1987 by D. Eisele

EQUIPMENT AVAILABLE AT MBEYA LIGHT REPAIR SHOP

S/ No.	Name	QTY	Specification	Manufac- ture Ordered from:	REMARKS
1.	Universal milling machine model: X62W	1	Table working width: 320mm Table working length: 1250mm	CHINA	Machine Shop
2.	Engine lathe model C616		Swing overbed: 320mm Max length of workpiece 750mm	CHINA	Machine Shop
3.	Geared head lathe model	1	Swing overbed 400mm Distance between centre 1400mm	CHINA	Machine Shop
4.	Vertical drilling machine model Z535	1	Max drilling diameter 35mm	CHINA	Machine Shop
5.	Crank shaping machine model B665	1	Max cutting length 650mm	CHINA	Machine Shop
6.	Horizontal surface grinding M7130	1	Table width 300mm Table length 1000mm	CHINA	Machine Shop
7.	Hydraulic single column forging and straightening press model Y41-25A	1	Nominal pressure 25 tons	CHINA	Turbocharger converter servicing and repair room
8.	300mm double end pedestrial grinder	1	Speed 1420 rpm 220 volts	CHINA	Turbocharger converter servicing and repair room

EQUIPMENT AVAILABLE AT MBEYA LIGHT REPAIR SHOP

S/ No.	Name	QTY	Specification	Manufac- ture Ordered from:	REMARKS
9.	Overhead crane	1	1 ton	CHINA	Power assembly converter servicing and repair room
10.	Overhead crane	1	5 tons	CHINA	Light Repair Shop
11.	Rectifier equipment type GA30/160		Current 30 A voltage 0-160V	CHINA	Light Repair Shop
12.	JZ6 type air brake testing equipment	1		CHINA	Air/Vacuum Brake Room
13.	JZ6 type vacuum brake testing equipment	1		CHINA	Air/Vacuum Brake Room
14.	Lifting jacks	4	25 tons capacity	CHINA	Light Repair Shop. Situated on one track. Can handle one locomotive at a time.
15.	Drop table	1		CHINA	Light Repair Shop. Used in the dropping down of one wheelset with its TM.
16.	Compressor type 3/8-L	2	Delivery 3m ³ /min Rated pressure 8kg/lm ² 19 KW 980 rpm	CHINA	Compressor Room

EXHIBIT 2

EQUIPMENT AVAILABLE AT MBEYA LIGHT REPAIR SHOP

S/ No.	Name	QTY	Specification	Manufac- ture Ordered from:	REMARKS
17.	Pneumatic hammer type c41-150	1	150 kg	CHINA	Blacksmith Room
18.	Furnace	1	812 x 368x340	CHINA	Blacksmith Room
19.	Crane	1	1/2 ton	CHINA	Battery Charge Room
20.	Battery Charging Machine	1	GCA 30/180 30A, 0-180V	CHINA	Battery Charge Room
21.	Steam Boiler	1	10 kg/cm ²	CHINA	Boiler Room

EQUIPMENT AVAILABLE AT MBEYA LIGHT REPAIR SHOP ORDERED FROM GE

1.	Fuel pump calibrating model 46000	2	Part No. 147 x 2124 220V 3P 50 5HP	GE	One machine temperature motor overheats during working.
2.	Nozzle Test	2	147 x 1149-2	GE	
3.	Nozzle Tip Cleaner	2	147 x 1985	GE	
4.	Nozzle Tip Tester	2	147 x 1884-1	GE	
5.	Nozzle valve grinding and lapping machine	2	147 x 1447-1	GE	
6.	Digital Pyrometer	1		GE	

EQUIPMENT AVAILABLE AT MBEYA LIGHT REPAIR SHOP

S/ No.	Name	QTY	Specification	Manufac- ture Ordered from:	REMARKS
7.	Pinion advance gauge	1		GE	
8.	Compression kit	1	147 x 2230	GE	
9.	Nozzle	2	147 x 1871	GE	
10.	Hydraulic leak test fixture	2	147 x 1748		
11.	Bore Scope	2	147 x 1987	GE	
12.	Cylinder liner bore gauge	2	147 x 1030	GE	

INSPECTION TRIP REPORT
WORKSHOP TOURS - DAR ES SALAAM, TANZANIA
OCTOBER 14 and 15, 1987
D.O. Eisele

Toured the complete locomotive and rolling stock repair workshops at Dar es Salaam.

In the larger buildings, overhead cranes were observed to be operational. A very long transfer table is located across the center of the complex permitting movement from one building to another without the need to move all the way to the front of the shops.

Also toured the chemical analysis and supporting test laboratories. These were in an excellent condition. Several laboratories were locked. Most of the equipment in the laboratories toured was of Chinese manufacture.

There were locomotives, goods wagons, components, cars waiting for repairs to be made, cars waiting for parts, and cars designated for scrap. Nearly every building contained rows of parts, locomotive components, or goods wagons components that were waiting to be repaired. There was a great deal of work waiting to be done.

On the other hand, it is estimated that only 10 percent of the observed work force was occupied. This may have been due to the fact that a very "obvious outsider" was inspecting them and their work. However, even as we left a particular building, in most cases there did not seem to be any attempt for employees to return to work.

EXHIBIT 3-1

There were some visible signs of production--the casting of brake shoes being an example. This particular function has reporting hours earlier than the rest of the shops, and the workers were gone when I arrived. However, the still warm brake shoes indicated their output that day.

The lack of cleanliness left a great deal to be desired. Oil and grease appeared everywhere leading to the possibility of fire. Conditions like this hinder production and provide a very dangerous situation for workers.

INSPECTION TRIP REPORT
WORKSHOP TOURS - MPIKA, ZAMBIA
OCTOBER 18 and 19, 1987
D.O. Eisele

Toured the TAZARA workshops at Mpika, Zambia. The general layout of the shops is the same as that at Dar es Salaam, except that there are several additional functions handled at Mpika.

The difference between the two shops--the one at Dar es Salaam in Tanzania, and the one at Mpika, Zambia--are noted below:

At the narrow end of the yard and wisely located at considerable distance from the other buildings, there is an oxygen-producing plant. It produces oxygen for all points on the railroad and has a great deal of excess capacity. This capacity could be used to supply other industry if desired. It was reported that the plant produces its quota in one-half month and then shuts down. The workers are therefore necessarily idle for the other half of the month. I observed these workers at their station during the late phase.

The plant also has the capacity of producing nitrogen if a use for this material could be found.

On the opposite side of the yard, near the narrow end, is an acetylene production plant which appears to have sufficient capacity to serve other parts of the community. It was not operating at the time chosen to inspect it.

EXHIBIT 3-2

There appeared to be far more goods wagons awaiting repair at Mpika than at Dar es Salaam. Well over 100 wagons were in sight. Due to the lack of track space, some of these were placed off the track on the ground. In fact, in many cases, the wagons were piled on top of other wagons. Most of these were awaiting repair and are separated from those destined to be scrapped.

There was a long line of diesel hydraulic locomotives (many fire damaged) awaiting repair. There were many spare parts in sight. There were over 100 engine blocks stacked at the end of the yard, all of which had reportedly failed in service.

The condition of the Mpika facility was generally less clean than that of the Dar es Salaam facility. The floors of many parts of the facility were covered with oil and grease. Much shop equipment and most tools were covered with grease or dust.

The laboratories were extremely clean and are maintained so well as to suggest that they are hardly ever used. I visited one facility so fastidiously maintained that one was required to take off one's shoes before entering.

It is estimated that the productivity level is about 10 percent. It was also learned that there are serious staff shortages in the Mpika area, which partially explains the low number of employees observed in the workshops.

INSPECTION TRIP REPORT
WORKSHOP TOURS - MBEYA, TANZANIA
OCTOBER 23 and 24, 1987
D.O. Eisele

Toured the facilities of TAZARA at the light repair depot at Mbeya. This facility consists of ten buildings and one oil tank located south of the main track. There were seven tracks running through the yard and a "wye" track facility at the east end of the yard to allow turning of locomotives.

The major building is a light repair shop which has three run-through tracks and a storeroom. Most of the parts for the TAZARA fleet of GE U30C locomotives are located in a separate structure on the opposite side of the service roadway.

The workshop is equipped with a gantry crane which was observed being used to move shipping crates of parts that had just arrived. Each track is equipped with a pit and is long enough to handle two locomotives at the same time.

TAZARA has proposed to increase the capacity and range of this facility by the addition of eight buildings, one of which is a building the same size as the existing shop which will be located between the existing shop and the mainline track. A boiler house, "paint bay" building, and a "testing station" building are to be located directly east of this shop. A large building for a storeroom is located east of these buildings.

The proposed storeroom is to be reached by a rail siding accessible only from the east side of the yard. The plans do not show any roadway access to the storehouse.

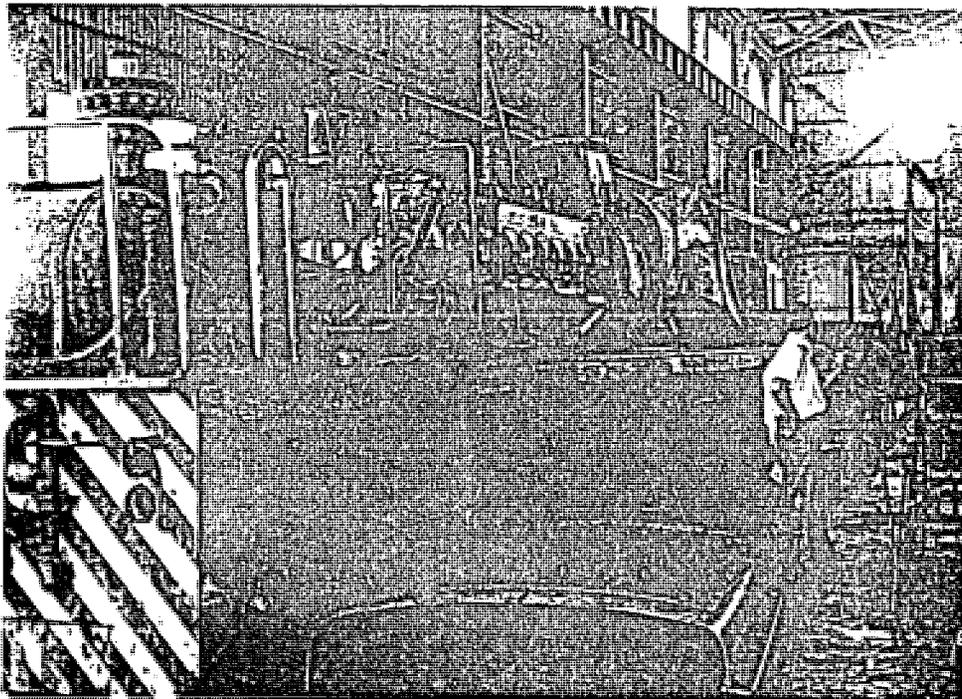
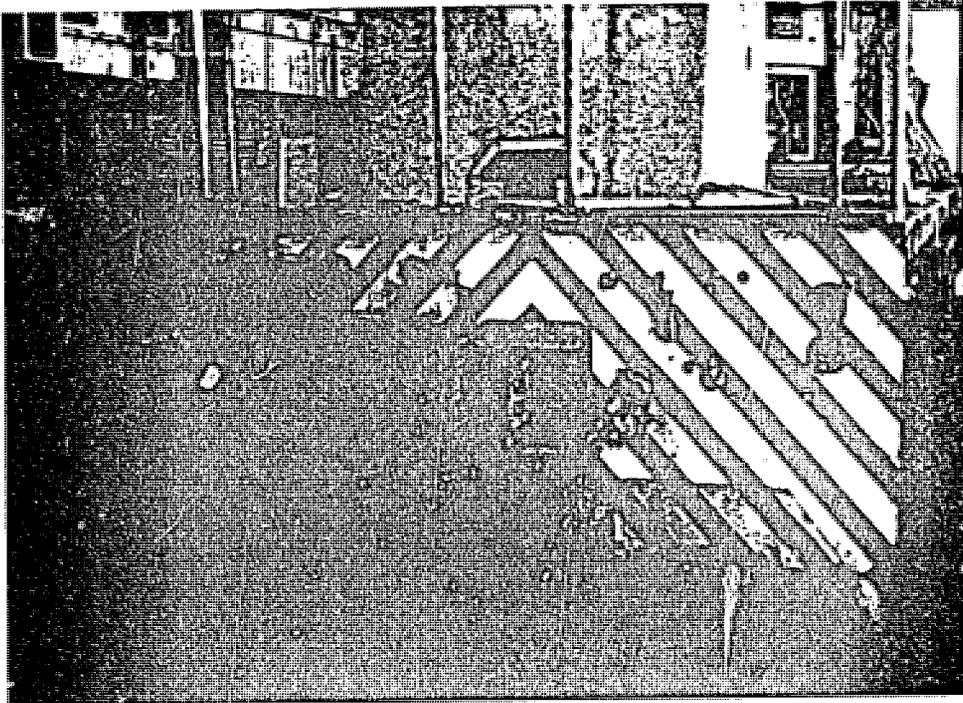
EXHIBIT 3-3

The nature of the repair work requires mechanics, electricians, and other workers to make many trips between the locomotive being repaired and the storehouse. It is recommended that the storehouse be located as close as possible to the location of the work being done--ideally directly adjacent. It is preferable that a supply of small, frequently used items be maintained in the workshop building itself, if at all possible.

The planned location of the storehouse requires that a locomotive and wagon containing supplies move through the entire length of the locomotive depot, then on to one of the legs of the "wye," and then a reverse move into the storeroom. This is a complex and undesirable arrangement. It is recommended that the approach into the storehouse be directly from the west on a track built for the purpose north of the existing buildings and parallel to the mainline.

It is also recommended that the storehouse be connected to the other buildings of the complex by the internal roadway network. This will permit the use of movement of heavy items by forklift truck or motorized vehicle.

DIESEL ELECTRIC LOCOMOTIVE 1006 SHOWING EXTENT OF DAMAGE
PHOTOGRAPHS TAKEN AT MBEYA, TANZANIA



Front of locomotive (top)
Right side of locomotive showing diesel
engine and traction alternator (bottom)

DIESEL ELECTRIC LOCOMOTIVE 1006 SHOWING EXTENT OF DAMAGE
PHOTOGRAPHS TAKEN AT MBEYA, TANZANIA

EXHIBIT 4

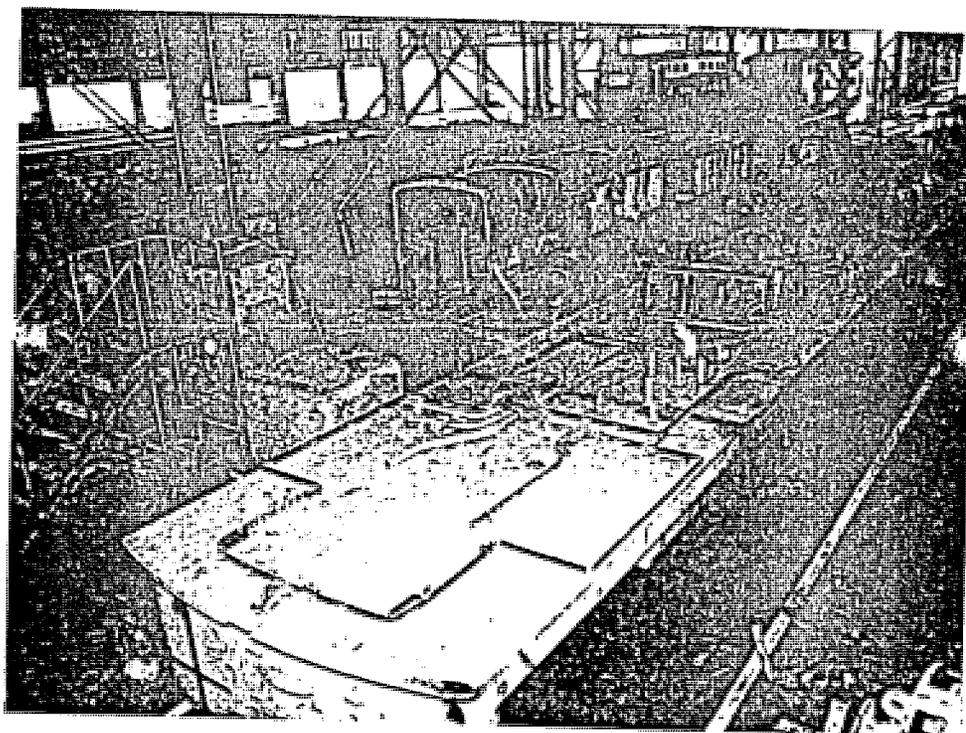
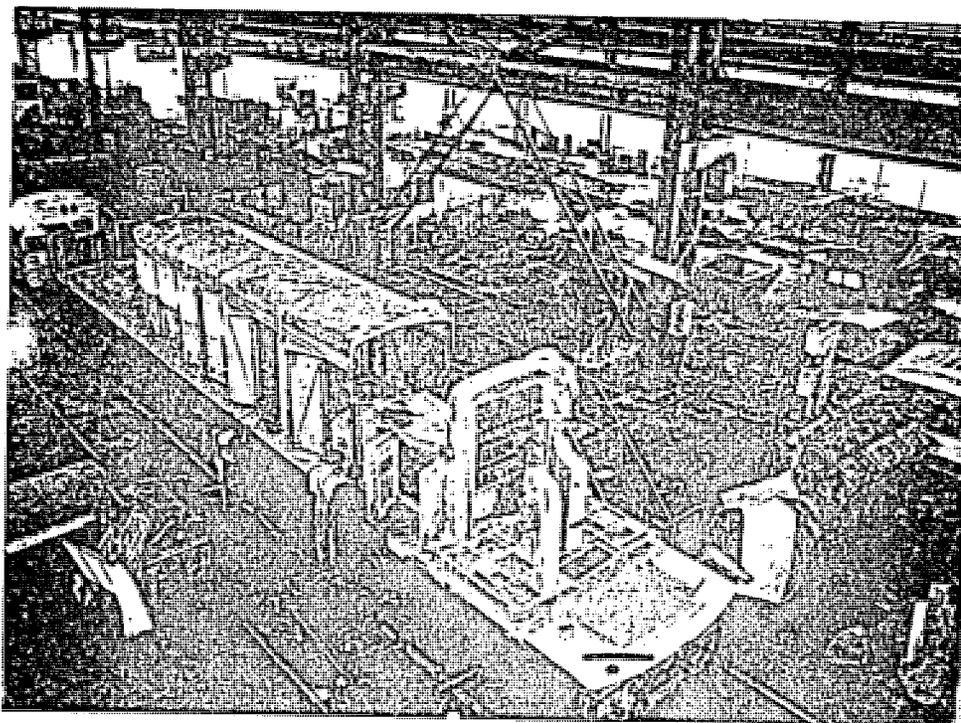


Right of locomotive
from front showing
equipment blower



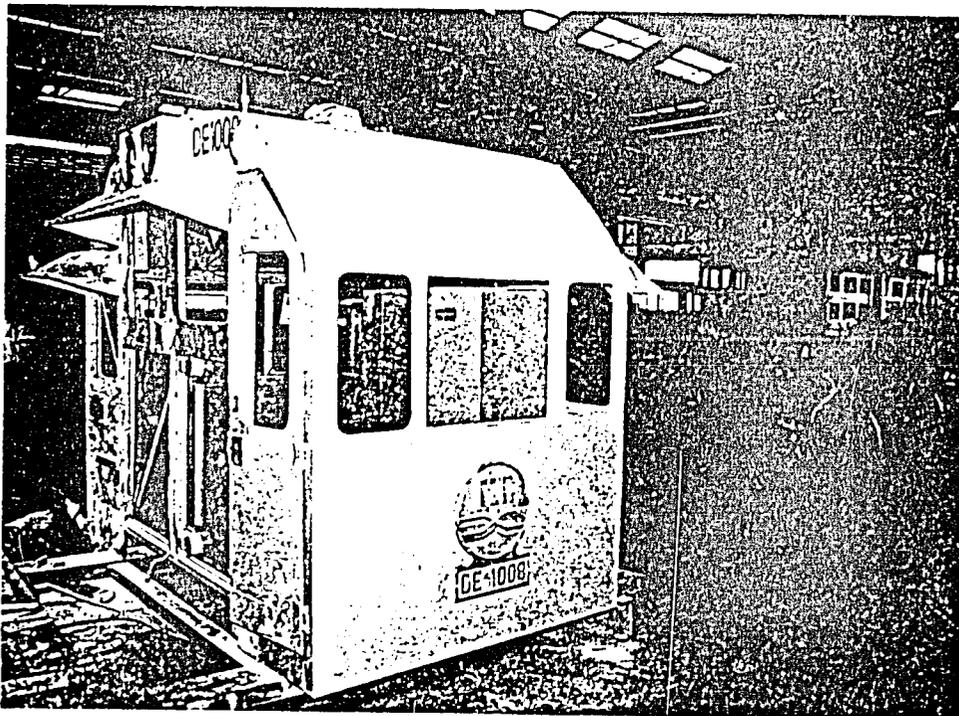
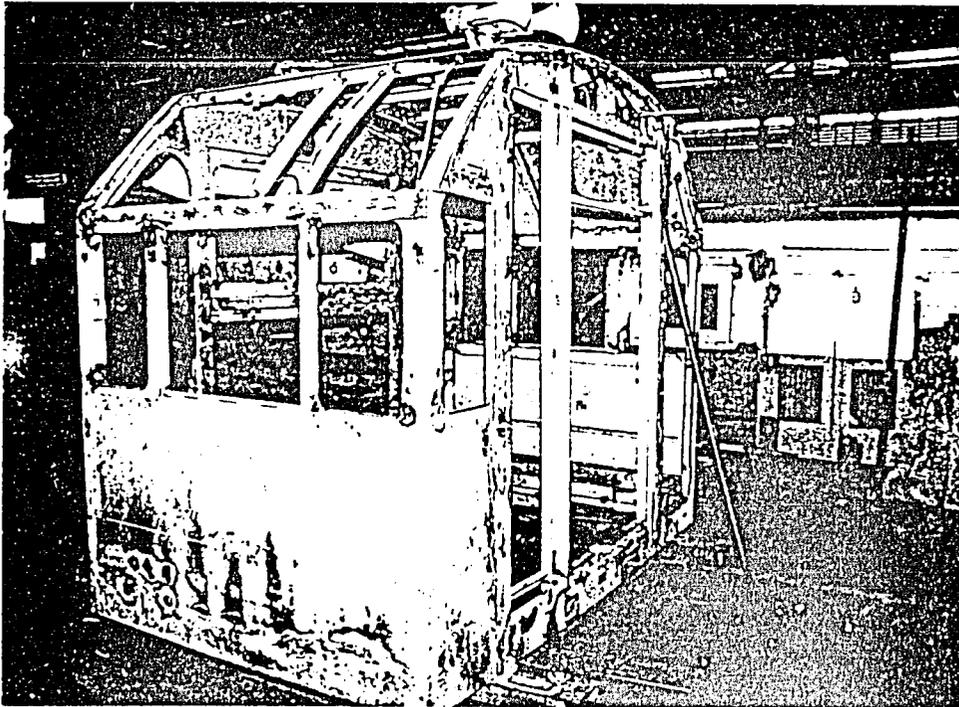
Remaining portion of
operator's cab showing
control stand

DIESEL ELECTRIC LOCOMOTIVE 1008 SHOWING PROGRESS IN REBUILDING
PHOTOGRAPHS TAKEN AT MPIKA, ZAMBIA



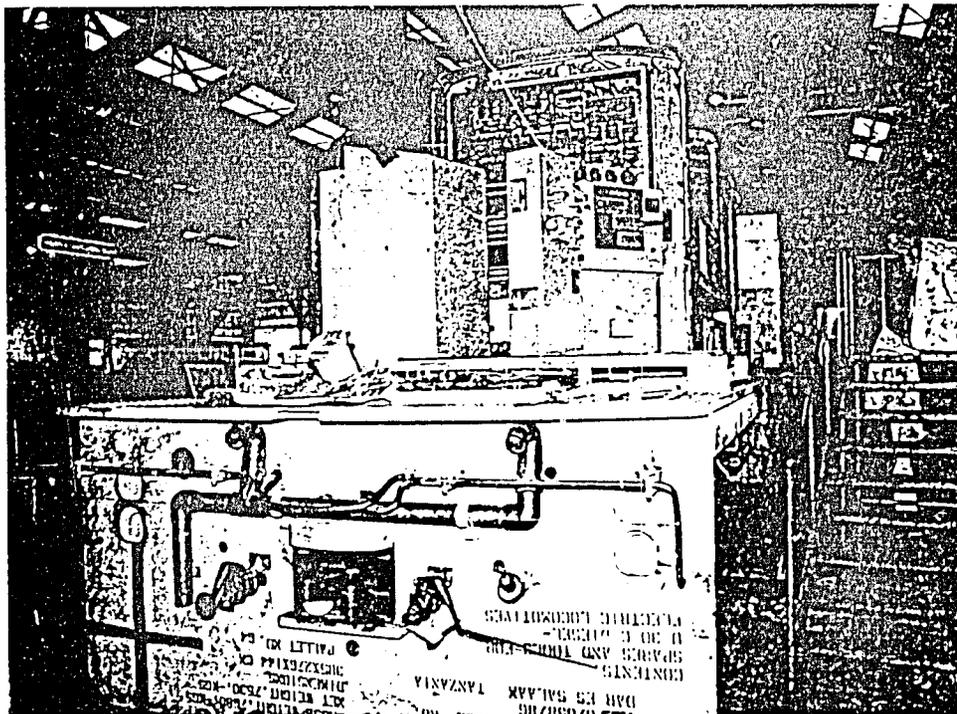
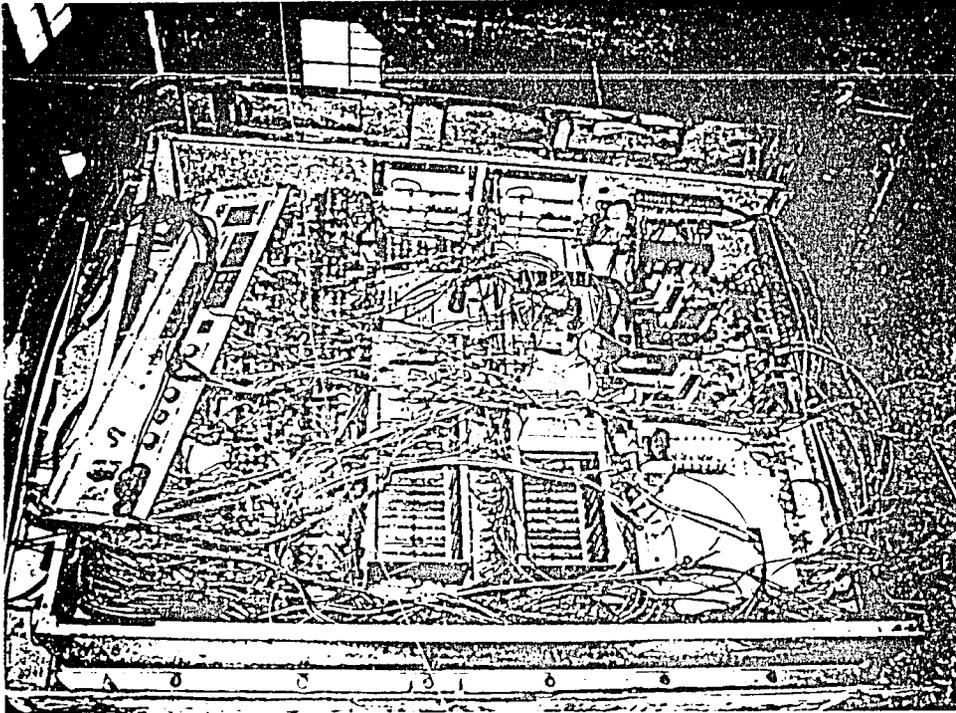
Platform of locomotive showing new section attached (top)
and with major components in place (bottom), Oct. 1987

DIESEL ELECTRIC LOCOMOTIVE 1008 SHOWING PROGRESS IN REBUILDING
PHOTOGRAPHS TAKEN AT MPIKA, ZAMBIA



Driver's cab as recovered from accident (top)
and after rebuilding (bottom)

DIESEL ELECTRIC LOCOMOTIVE 1008 SHOWING PROGRESS IN REBUILDING
PHOTOGRAPHS TAKEN AT MPIKA, ZAMBIA



Newly rewired electrical cabinet (top)
and in place on platform (bottom)

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FOUR-YEAR INSPECTION AND MAINTENANCE SCHEDULE

Note that the 4-year inspection and maintenance schedule includes all of the items requiring inspection and maintenance. The schedule preceding the 4-year schedule is as follows:

One Month

Three Months

Six Months

One Year

Two Years

Three Years

Four Years

Source: Inspection and Lubrication Schedule
(Export Diesel Electric Locomotive
Powered with GE Engines)
General Electric

ONE MONTH
(These Items In Addition to Preceding Schedule)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
ENGINE Lube-Oil Filters	DE-13	Remove old elements. Clean housing. Install new elements.	Change elements, maximum filter element life is two months.	
Engine Crankcase	DE-2, RM-3	Bar engine over. Visually inspect condition of cylinder walls, piston skirts, cams, areas around piston pins, articulated rod pins and bushings. Also check inside of crankcase doors and door pockets for signs of loose metal or sludge.	Make complete laboratory analysis of lube-oil sample, to determine if oil is suitable for continued use. If acceptable, fill to FULL mark, with engine idling. If not acceptable, drain, remove, clean, and replace lube-oil suction strainer. Refill with approved oil. See Note 1, Page 2.	See GEK-61435 and GEK-61436, TAB RM-3, for approved lubricants.
Cylinder Valve Mechanism	DE-2	Visually inspect rocker boxes for signs of overheating, lack of lubrication, loose or broken parts.		
Exhaust Manifold	DE-11	Check tightness of connections at cylinders and at turbocharger, and check for leakage.		
MECHANICAL Panelbath Air Filter	ME-6		After engine has been shut down five minutes or more, check level and add oil, if needed, through the grill on the front of the filter cover, maintaining level between FULL and ADD marks in sight glass.	Mineral oil or engine crankcase oil.
Air Compressor or Compressor/Exhauster	AE-2		Check and maintain oil level to FULL mark.	GE Spec. D6B11D3
Engine Cab Door Filters (if used)	ME-6	Inspect and clean.	Charge with oil. See instructions.	Panel filter oil
Carbody Filters (if used)	ME-6	Inspect, clean or change as required.		
Platform Drains	ME-6	Check and clean.		

ONE MONTH (Cont'd.)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
Radiator Fan and Shutter Control (if used)	ME-6	See Radiator Shutter Louver Control instructions.		
Louver Control Air Filter	ME-6		Add one oz. to fluid chamber.	Kysor Cat. B7758-4, GE Part 2.2790
Shutter Pins and Linkage (if used)	ME-6		Place a few drops at bearings.	SAE-30 Oil
Fan Eddy Current Clutch (if used)	RE-5		Remove fan cover; blow out with clean, dry air. Check slip rings, leads and brushes worn near the minimum length of 7/16 in. (11 mm).	
Traction Generator Gearcase	RE-1	Check oil level on dipstick.	If below ADD mark, add oil to proper level.	Engine lube oil
Center Plates	T-6		Fill oil cups to maintain level.	AAR Spec. M-963 (latest revision)
Traction Motor Axle Suspension Bearings	T-4		Fill to filler cap opening.	AAR Spec. M-963 (latest revision)
Traction Motor Gearcase	T-4	Check for heavy film of lubricant on gear teeth.	Check lubricant while it is fluid, to be level with hole or not more than 1 in. below. DO NOT add lubricant until it is at minimum level. DO NOT OVERFILL.	GE Spec. D50E8C Lubricant
Slack Adjusters	T-2		Clean grease fittings (if used), and add a small amount of grease with pressure gun.	GE Spec. D6A2C5
Flexible Traction Motor Air Duct	ME-6	Check for tightness and alignment, and rubber bellows.		
Trucks	T-1	Inspect for any loose or dragging equipment. Repair as needed. Make sure sand pipes are aligned properly and sanders operate.		
Brake Shoes and Rigging	T-2	Inspect for excessive wear. Replace as needed. Make sure slack adjusters are working properly and are not damaged.		

ONE MONTH (Cont'd.)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
Wheels and Tyres	T-5	Make visual inspection for cracks, shelled treads, flat spots or loose tyres. Make corrections as necessary.		
Motor Nose Suspension	T-3	Check for damaged or deteriorated rubber pads, separation of rubber pads from steel separators and for cracks in parts or welds.	Renew wear plates when excessively worn.	
Bolster Wear Plates	T-6	Check for proper clearance and excessive wear.		
Coupler	ME-2	Check operation.		
Flexible Couplings	ME-1	Inspect.		
Belts (if used)	ME-1	Inspect and check tension.		
Barco Speed Recorder	ME-3		Check oil level of wheel diameter compensator gear box and of axle drive, and maintain at half-full.	Texaco Thuban SAE-90, or equivalent
C-P Speed Recorder - Models C and D - Grease Lubricated	ME-3		Supply additional grease to drive through the button head fitting until grease escapes through pressure relief fitting at recorder end of flexible shaft. Apply with hand gun only.	Amoco Lithium Multi-Purpose grease (soft), or equivalent
Hasler Speed Recorder	ME-3		Put some drops of oil in the paper feed gear lubricator.	Olyt 554, or equivalent
Bell Ringer			Apply two shots for a squirt can.	SAE-30 oil
Fuel-Tank Sump			Drain sediment from bottom of tank.	

ONE MONTH (Cont'd.)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
ELECTRICAL Traction Motor, Traction Generator, Alternator Auxiliary Generator, Exciter, Braking Resistor Blower Motor (if used), Eddy Current Clutch	RE-1, RE-3, RE-4, RE-5	Vacuum or blow out, and inspect commutator, alternator slip rings, brush rigging and leads. Clean and repair or repaint, as necessary, all creepage bands, coils, accessible parts. Renew any brushes too short to last until next inspection. Experience will indicate frequency of inspection and renewal of brushes.		
Control Equipment	CE	Inspect for burned contact tips, burned wiring, loose or overheated electrical connections.		
Control Sequence		Check after cleaning control equipment.		
Battery	CE-8	Check voltage regulation.		
Rectifier Panels		Inspect panels for defective or failed diodes. See Control Tab for maintenance procedure.		
Axle Alternator (if used)		Check wiring for damage.		
Battery a. Electrolyte Level Nickel-Cadmium Lead-Acid		Check in fully charged condition See Battery Nameplate and Battery Maintenance Manual. See Battery Nameplate and Battery Maintenance Manual.		
b. Electrolyte Gravity		Check. Refer to Battery Maintenance Manual.		
c. Battery Trays		Wash down or flush; grease terminals; inspect blocking and connections. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">CAUTION: Use care that flushing solution does not enter traction motor ventilation duct.</div>		

THREE MONTHS
 (These Items In Addition to Preceding Schedules)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
ENGINE Engine Control Governor	DE-8	Check operation of low lube oil and low water pressure shutdown device. Check engine speeds at idle and 8th notch no load.		
Engine Overspeed Trip	DE-9	Check operation.		
Fuel Strainer and Filter	DE-14	Clean strainer and renew filter elements (see Note 2)		
Fuel Rack Linkage	DE-14	Check parts from power piston to fuel racks, for free operation.	Add a few drops of oil to each oiler button, or grease to each grease fitting, with engine idling.	Engine lube oil or GE Spec. D6A2C9 grease
MECHANICAL Radiator Fan Gear Box	RE-5		Check oil level (with engine stopped). Fill to top of level plug.	Engine crankcase oil or SAE-40
Radiators	DE-12	Inspect for cleanliness.		
Mounting Bolts Engine, Compressor/ Exhauster, Radiator Fan Gear Unit, Flexible Couplings	DE-15, ME-1	Check for proper torque.		
Control Air		Check leak-off. Leakage should not exceed 3 psi in three minute test.		
Exhaust/Comp. or Compressor a. Air intake filter sump strainer type)	AE-2	Drain sump.		WABCO - GE Spec. D50E13B below 10 F (-12 C)
b. Crankcase			Drain oil. Remove, clean and replace this strainer on the oil suction pump. Refill.	GE Spec. D50E13C above 10 F (-12 C) G-D - GE Spec. D6B11D3

THREE MONTHS (Cont'd.)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
c. Intake filters (compressor only)			Clean element, immerse in oil, drain.	Capacity: 3 cylinder - 13 qt. (12,3 liters) 4 cylinder - 23 qt. (21,7 liters) 6 cylinder - 21 qt. (19.8 liters) SAE-20 motor oil
Panelbath Air Filter	ME-6		Change oil. Clean out sump. Clean filter media.	Mineral oil or engine crankcase oil. Capacity - each filter: 8 cylinder engine - 7.6 qt. (7,2 liters) 12 cylinder engine - 6.3 qt. (5,9 liters)
Vacuum Brake System Filters (if used)	AE-5		Remove oil bowl, clean, add oil to level of oil bead on bowl.	Engine crankcase oil
Equipment Blower Coupling (Spicer)	ME-1	Check operation (see maintenance information, Tab ME-1)	Add grease at the fittings.	GE Spec. D50E21
Speed Recorder (if used)	ME-3	Dismantle and inspect axle drive.	Lubricate flexible shaft.	GE Spec. D6A2C5
Window Wiper Motor			Add oil through pipe plug opening in sufficient amount to moisten packing.	GE Spec. D50E5B oil
ELECTRICAL High and Low Voltage Circuits	ET-1	Check for grounds.		
Commutators or Slip Rings and Brushes on: Fuel Booster-Pump Motor, Traction Alternator Exciter and Auxiliary Generator, Eddy Current Clutch if so equipped	RE-	Inspect. See Rotating Equipment Tab.		

SIX MONTHS
(These Items In Addition to Preceding Schedules)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
ENGINE Lube-Oil Suction Strainer	DE-14	Remove basket and clean.		
Fuel System	DE-14	Re-torque fuel injection pump mounting bolts. Inspect hoses for wear and fraying. Tighten all low pressure fuel fittings.		
Intake Port Carbon	DE-10	Check several cylinders. If carbon approaches 1/4 in., clean all ports per GEK-5807.		
Lube-Oil Filters	DE-13		Replace gaskets on the two dummy cover pipes (those without filter elements) at the lower end.	
Fuel Control Linkage	DE-14		Inspect, clean and lubricate spherical linkage bearings and shaft bearings.	High-temperature grease, GE Spec. D6A2C9
MECHANICAL Flexible Couplings	ME-1		Remove two plugs from coupling. Insert a grease fitting and add grease. Replace plugs. See Instruction Manual.	GE Spec. D50E21 bearing grease
Traction Generator Gearcase	RE-1		Check oil level and maintain to FULL mark. Do not overfill.	Engine crankcase oil
Truck Pedestal-Guide and Journal Box Wear Plates	T-8	Inspect. Replace if necessary.		
Emergency Fuel Trip (if used)	RE-1	Check operation.		
Crankcase Over-Pressure Switch	DE-9	Check operation.		
Barco Speed Recorder	ME-3		Lubricate flexible driveshaft.	Texaco 979RB, or equivalent
C-P Recorder (Models C and D)	ME-3		Remove recorders above Serial No. 5434 and grease intermediate shaft and needle bearings with an Alemite hand gun equipped with standard flush-type nozzle.	Amoco Lithium Multi-Purpose grease (soft), or equivalent.

ONE YEAR
(These Items In Addition to Preceding Schedules)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
ENGINE				
a. Injection Nozzles	DE-14	Remove and recondition.		
b. Fuel Pumps	DE-14	Check timing; readjust if found off.		
c. Fuel Pump Rack and Governor Power Piston	DE-9	Check for proper rack setting at specified full load power piston gap.		
d. Low Pressure Fuel Hose	DE-14	Inspect and replace if necessary.		
e. Crankcase Over-Pressure Switch	DE-9	Recondition or replace.		
f. Overspeed Link and Governor	DE-9	Recondition.		
g. Engine Governor (Woodward if used)	DE-8	Drain.	Refill with clean oil. Operate engine for five minutes. Then add to proper level.	SAE 10W-30 Grade MS or better. Capacity: 2 qt. (1,9 liters)
h. Crankshaft	DE-4	Ascertain thrust clearance is within limits.		
i. Cylinder-Valve Mechanism	DE-14	Inspect for proper tappet clearance. Adjust if necessary.		
j. Turbocharger	DE-10	Inspect "in place" for foreign material damage to compressor, free movement of rotor and condition of turbine buckets.		
Lube-Oil Cooler	DE-13	Inspect and clean as required.		
MECHANICAL Air Brake System	AE-1, AE-2, AE-3, AE-4, AE-5, AE-6	Clean all filtering devices and dirt collectors in the system. Clean, repair, and test all relay valve portions, main reservoir safety valves, brake pipe vent valves portions, feed and reducing valve portions.		No. 2 silicone grease per Spec. MIL-L-4343
Air Brake Gages and Pressure Switches	AE-1	Test and Calibrate.		
Loadmeter	AE-1	Check calibration. Adjust as needed.		
Inertial Filters	ME-6	Clean if necessary.		
Secondary (paper) Air Filter	ME-6	Change filters.		
Radiator Shutter Air Cylinder	ME-6	Disassemble, clean and relubricate.		

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ONE YEAR (Cont'd.)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
Radiator Shutter Louver Control	ME-6	Disassemble filter and renew felts, or thoroughly wash in suitable solvent and dry. Reassemble.		
Flexible Couplings	ME-1	Clean and inspect. Check backlash.		
Radiator-Fan Gear Box	RE-5	Clean backlash of gears.	Drain and refill with new oil.	Engine crankcase oil or SAE-40 Capacity - see instructions
Radiator-Fan Gear Box Vertical Shaft Bearing	RE-5		Remove pipe plug, insert a grease fitting and add grease. Replace plug. See Instruction Manual.	GE Spec. D6A2C10 - 3 oz.
Radiator-Fan Eddy Current Clutch Bearings	RE-5	Remove the clutch cover by removing three, 3/8-in. bolts and add grease at fitting. Replace cover.		GE Spec. D6A2C10 - 1.5 oz.
Traction Generator Gearcase	RE-1		Change oil.	Engine crankcase oil - Capacity 5 pt. (2,4 liters)
Dirt Exhauster (if used)	ME-1		Add lubricant.	Alvania EP No. 3, Regal Starfax Premium No. 3, or equivalent
Equipment - Blower, Bearings	ME-1		Change grease by pumping grease into the fitting on the pillow blocks.	Grease, GE Spec. D6A2C5
Air Reservoirs		Test per railway rules.		
Bolster Side Bearings, Dust Guard and Lateral Stops	T-6	Inspect.		
Window Wipers		Disassemble and clean.		
Gages, Pressure and Temperature		Calibrate.		
Barco Speed Recorder	ME-3	See corresponding publication in Instruction Book.		
C-P Speed Recorder (Models C and D)	ME-3	See corresponding publication in Instruction Book.		
Hasler Speed Recorder	ME-3	See corresponding publication in Instruction Book.		
C-P "Bantam" Speed Recorder Right Angle Drive	ME-3		Lubricate.	GE Spec. D6A2C5 Ball Bearing Grease

ONE YEAR (Cont'd.)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
Exhauster/ Compressor Valves	AE-2	Clean.		
Traction Motor	RE-4		Drain, inspect and clean axle caps. Inspect and clean wicks in hot oil. Refill.	AAR Spec. M-963 (latest revision) Capacity per cap: GE-763 - 3 pt. (1,4 liters); GE-761 - 4 pt. (1,9 liters)
Journal Bearings (Tirnken AP)	T-9		Refer to journal bearing instructions for lubrication based on average monthly mileage.	AAR M-942-75 grease
Controller	CE-1		Put a few drops of oil on pins, and rollers and bushings.	GE Spec D50E5B oil
Controller, Reverser and Braking Switch (if used)	CE-4		Apply a thin film of grease to starwheel.	GE Spec. D50E6B grease
Dynamic Braking Grids and Insulators (if used)		Inspect and clean if necessary.		
Electrical Instruments		Calibrate.		
Fuel Booster Pump Motor and Cab Heater Fan Motor (if used)	RE-5	Inspect and clean.		
Alarms, Protective Switches and Relays		Check calibration.		
Load Test Locomotive	ET-2	See Load Testing instructions.		

TWO YEARS
 (These Items In Addition to Preceding Schedules)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
MECHANICAL Air Brake System	AE-3, AE-4, AE-5, AE-6	Clean, repair and test all other brake valves and valve portions that were not done at the one year interval.		
Engine Inspection a. Turbocharger	DE-10	Remove, disassemble, inspect and clean. Replace parts as needed.		
b. Exhaust Manifold		Inspect internally for loose pieces which could cause turbo damage and eventual failure.		
c. Power Assembly	DE-7	Remove representative percentage of complete power assemblies, including pistons, rods and cylinder. Determine wear and deposit conditions of pistons, rings, valves, etc. Results of this inspection should be used in scheduling more extensive work. When cylinders have been removed for changing out piston rings at the regular change period, recondition all cylinders (renew all gaskets and O-rings).		
d. Timing and Auxiliary Drive Gears, Engine Gearing, Including Overspeed Governor and Camshaft Gears	DE-5	Visually inspect for tooth wear or abnormal conditions.		
e. Fuel Injection Pumps	DE-14	Recalibrate at time of piston ring change.		
f. Crossheads	DE-7	Inspect in place.		
Crankshaft to Main Generator	DE-15	Check alignment.		
Intercoolers	DE-	Inspect and clean.		

AT TYRE REPLACEMENT NEAREST TWO YEAR INTERVAL

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
ELECTRICAL Traction Motors and Gears	T-4	Inspect. a. Measure and record insulation resistance. Run motor to check armature bearings by use of a listening rod. Check vibration. Check commutator smoothness with fiber rod; stone smooth and air cure if necessary. Inspect armature field coils, brush rigging and leads. Blow out thoroughly. Clean creepage bands. b. Check lateral and radial clearance of axle suspension bearings. Inspect surface of bearings and axle. Inspect felt-wick lubricators for wear and glaze. c. Clean and inspect pinion and axle gears for wear and damage. Clean and inspect gearcase. Renew seals if necessary.		
Traction Motor Axle Suspension	T-4		Drain, inspect and clean axle caps. Inspect and clean wicks. Refill.	AAR Spec. M-963 (latest revision) Capacity - per cap: 764 Motor - 3 pt. (1,4 liters) 761 Motor - 4 pt. (1,9 liters)
Traction Motor Gearcase	T-4		After draining, cleaning, and inspection, refill with new lubricant.	GE Spec. D50E8C gear lubricant. Capacity: 761 Motor - 7 lb. (3,2 kg) 764 Motor - 5 lb. (2,3 kg)

AT TYRE REPLACEMENT NEAREST TWO YEAR INTERVAL (Cont'd.)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
MECHANICAL Trucks: Brake Rigging	T-2	Replace excessively worn pins and bushings. Replace or rebuild worn brake shoe heads. Clean, lubricate, repair slack adjusters. Rebuild brake cylinders.		
Wear Plates	T-6, T-8	Replace any that are excessively worn. Inspect all welds for cracks. Reweld as needed.		
Bolster Mounts	T-1	Visually inspect for separation of steel and rubber. Check free height and height under specified load.		
Center Plate	T-6	Inspect and replace wear plates as required.	Before lowering locomotive platform into position, add oil.	AAR Spec. M-963 (latest revision) Capacity - 1-1/2 qt. (2,8 liters)
Journal Bearings (Timken AP)	T-9	Rotate bearing assembly by hand to check for any abnormal condition. Disassemble, clean. inspect bearing in accordance with instructions.	See corresponding publication in Instruction Book.	AAR M-942-75 grease
Brake Rigging Axle Alternator Drives (if used)	T-2	Inspect and renew as required. Inspect.		

FOUR YEARS
 (These Items In Addition to Preceding Schedules)

Item	Tab Ref.	Inspection & Maintenance	Lubrication & Servicing	Lubricant
Fuel Booster Pump and Water Pump	DE-12, DE-14	Recondition.		
Lube-Oil Pump	DE-13	Recondition.		
Bonded Rubber Pump Drive	DE-3	Inspect gears for possible damage. Renew as required.		
Low Pressure Fuel Hose	DE-14	Replace.		
Trucks	T-6, T-8	Inspect and replace any wear plates as required.		
Center Plate	T-6	Inspect and replace wear plates as required.		
Journal Boxes	T-9	Rotate bearing assembly by hand to check for any abnormal condition. Disassemble, clean, inspect and relubricate bearing in accordance with instructions.		
Brake Rigging	T-2	Inspect and renew as required.		
ELECTRICAL Traction Motors	RE-4	Recondition.	Clean and repack - motor armature bearing. See Motor instruction.	GE Spec. D6A2C10 bearing grease
Fuel Booster Pump Motor	RE-5	Renew bearings.		
Cab Heater Motor and Cab Fans (if used)	ME-6	Recondition.		
Pressurizing Blower, MG Set (if used)	RE-5	Recondition.	Disassemble, clean and lubricate.	GE Spec. D6A2C10 bearing grease
Dynamic Braking Blower Motor (if used)	RE-5	Recondition.		
Battery		Remove, clean and paint boxes.		
Compressor/Exhauster or Compressor	AE-2	Overhaul. See Compressor/Exhauster or Compressor instructions.		

TANZANIA ZAMBIA RAILWAY AUTHORITY
HEAD OFFICE
MECHANICAL ENGINEERING DEPARTMENT
UPGRADING OF MBEYA LOCOMOTIVE REPAIR FACILITIES

1.0 INTRODUCTION

As a result of impending higher classes of maintenance to be undertaken on U30C locomotives (i.e., 4-year and 8-year); and the anticipated increase of the U30C fleet which will consequently require a bigger repair capacity, a committee was formed to work out proposals on the upgrading of the Mbeya locomotive repair facilities so as to enable the workshop to undertake all classes of maintenance and repairs on U30C locomotives. The committee consisted of:

1. Mr. L.B.J. Chogo - ACME - Chairman.
2. Mr. A.O. Mkamba - Principal Mech. Eng.
3. Mr. N.S. Magoti - Works Manager - DSM.
4. Mr. R. Sinyinza - Principal Mech. Eng. (Z).
5. Mr. A.A.U. Kyejo - District Mech. Eng. -Mbeya.
6. Mr. Chui Ga Zheng - CRET CME.
7. Mr. Wang Shan Tai - CRET Engineer.
8. Mr. Fu Gen Sheng - CRET Engineer.

The proposed expansion is based on maintenance requirements of the locomotive fleet that will be required to haul 2.5 million tons a year in the Mlimba-Chozi section. Provision has, however, been made to cater for an annual haulage of 5.0 million tons; this is in terms of floor space in the workshop for

additional equipment installation and other ancillary facilities to be erected in the depot as the fleet grows. It is envisaged that from 1991, only diesel electric locomotives will be operating in the Mlimba - Chozi section, apart from elsewhere.

2.0 MBEYA LOCOMOTIVE DEPOT REPAIR CAPABILITY AND CAPACITY

2.1.0 Present Capability and Capacity

2.1.1 The present physical facilities at the light repair shop were installed to cater for all classes of inspections and light repairs not higher than repair C and minor casual repairs on diesel hydraulic locomotives. The shop has six repair positions.

2.1.2 With the introduction of U30C locomotives, the equipments installed could not meet maintenance requirements of the U30Cs which were higher than 2-year inspections.

2.1.3 To date the following classes of maintenance have been undertaken on the U30Cs viz:

- (i) G2 - Monthly inspection.
- (ii) G3 - 3-month inspection.
- (iii) G4 - 6-month inspection.
- (iv) G5 - 1-year inspection.
- (v) G6 - 2-year inspection.
- (vi) G7 - 3-year inspection.

2.1.4 Although some 3-year inspections have been undertaken with the existing facilities, the inspections were far

from being completed due to lack of essential maintenance tools and facilities for this class of maintenance.

2.1.5 Since the introduction of the diesel electric locomotives, only fuel injection pump test stand and nozzle test stand have been installed. It will also be noted that due to inadequate maintenance facilities, some repairs were either referred to the main workshops (Dar es Salaam or Mpika) and sometimes to the workshops of Tanzania Railways Corporation. Such repairs included:

- (i) Repair and testing of the modulating governor.
- (ii) Truing of wheelsets.
- (iii) Overhaul of power assemblies.
- (iv) Drying of traction motor armatures and car cases.
- (v) Retyring of wheelsets.
- (vi) Machining of commutators.

Obviously these repairs heavily contributed to long locomotive downtime and low motive power availability as the Authority does not have an adequate pool of interchangeable components for this type of locomotive.

2.2 Additional Capacity and Facility Requirements

2.2.1 Appendix 5 part A shows diesel electric locomotive fleet requirements for various annual haulage tonnages. Part B of the appendix shows projected annual maintenance schedules for locomotives operating in the Mlimba-Chozi section when the haulage tonnage rises to

5.0 million tons, while in part C these maintenance schedules are translated into daily service positions.

5.0 million tons has been considered in order to determine overall service positions required when that tonnage is reached.

2.2.2 During 4-year maintenance and 8-year overhauls, components will be stripped. Servicing and overhauls of these components will require workrooms which are presently lacking in the present light repair shop. In addition, service and test benches, machine tools, and other logistic support units will be required.

2.2.3 From Appendix 5 part C, the minimum number of daily service positions is determined to be 6.90. In addition, two service positions for casual repairs and one service position for accident repairs are required. This brings the total number of service positions to 9.90 (say: 10).

2.2.4 Appendix 2 shows the layout of the proposed workshop extension. Workrooms and other necessary facilities and machinery are clearly indicated. Refer to Appendix 3 for legend.

2.2.5 Appendix 1 shows depot layout complete with the proposed extension and other support units.

2.2.6 From the foregoing, it will be noted that with the anticipated increase in the locomotive fleet, the present light repair shop will not be able in terms of repair space and repair capability to cope with the

increased workload and repair scope. For this reason, an additional workshop which is fully equipped with the necessary machinery to enable it to undertake all locomotive repairs up to major overhauls is necessary. In addition, there will be need to add logistic support units or increase the capacity of the existing ones viz:

- (i) Air compressor station.
- (ii) Steam boiler house.
- (iii) Materials stores.
- (iv) Paint shop.
- (v) Underfloor wheel lathe.
- (vi) Locomotive body cleaning bays.
- (vii) Water storage tank.
- (viii) More tracks.
- (ix) Demonstration classroom.

For more details, see Appendix 1.

These additional support units will guarantee continuity in the repair activities without referring repairs to other workshops. The list of equipments and facilities to be added appears as Appendix 4. Construction of these facilities will be done in phases as the fleet grows. Construction priority is as indicated in section 3 of this report.

- 2.2.7 Upon completion of the workshop extension, logistic support units, and installation of equipments, the Mbeya locomotive depot shall then be capable of undertaking all classes of maintenance up to major overhauls for all diesel electric locomotives foreseen

to be allocated to the Mbeya home depot. The proposals aim at making Mbeya self-reliant for all repairs. However, retyring of wheelsets and heavy accident repairs shall continue to be undertaken in the major workshops. Also some of the existing facilities in the present light repair shop shall continue to render service to the new workshop. These include:

- (i) Brake room (air and vacuum).
- (ii) Injector pump room - for repair and calibration of injector nozzles and injection pumps.

In case motor rewinding and testing facilities are installed in Mpika instead of Mbeya, then major repairs including overhaul of traction motors shall be done in Mpika.

3.0 WHAT SHOULD BE DONE

3.1. Tasks to be undertaken are as detailed in 2.2.6 above. Their order of priority shall be as follows.

3.1.1 Priority Number 1

1. Workshop extension - complete with machinery and equipment.
2. Materials store.
3. Locomotive body cleaning bays.
4. Demonstration classroom.
5. Paint shop.
6. More tracks.
7. Steam boiler.

3.1.2 Priority Number 2

1. Compressor station.
2. Underfloor wheel lathe.
3. Extension of the present light repair shop to provide for 3 level pits.
4. Standby power house.

4.0 CIVIL ENGINEERING WORKS TO BE UNDERTAKEN

In order to upgrade the repair capability of the Mbeya locomotive depot as mentioned in 2.2.6 above, the following civil engineering work will have to be undertaken.

1. Building of a new workshop as indicated in the layout (Appendix 1) and whose details appear in Appendix 2.
2. Constructing a new materials depot for storage of all spare parts for diesel electric locomotives.
3. Installing an underfloor wheel lathe (Phase II).
4. Constructing a water storage tank (Phase II).
5. Constructing two new toilets (as the present one will be demolished to give way to the proposed extensions).
6. Building a demonstration classroom.
7. Constructing a boiler house.

8. Constructing a painting shop.
9. Constructing a power house for a stand-by generator (Phase II).

5.0 GENERAL OBSERVATION

The committee observes that the floor area of the proposed new workshop is inadequate and this will probably lead to crowding of activities and equipments when haulage reaches 5.0 million tons a year. Since the layout is based on a floor area that was already decided upon, the layout in Appendix 2 is the best the committee could come up with.

Source: Mr. A.O. Mkamba Principal Mechanical Engineer-System,
Head Office, TAZARA, Dar es Salaam.

TAZARA
HEAD OFFICE
DAR ES SALAAM
AUGUST 1987

APPENDIX 1

APPENDIX 2

Appendices 1 and 2 of the August 1987 Report on Upgrade of Mbeya Locomotive Repair Facility included two drawings.

APPENDIX 1 TAZARA's Preliminary Drawing of Depot Layout Showing Proposed Extension and Support Units.

APPENDIX 2 TAZARA's Preliminary Drawing of Workshop Layout Details.

NOTE: Prints of the above drawings are omitted in this report.

LEGEND FOR THE PROPOSED WORKSHOP LAYOUT

<u>S/NO.</u>	<u>LOCATION</u>	<u>TYPE OF ACTIVITY OR MACHINERY</u>	<u>AREA (M²)</u>	<u>REMARKS</u>
1.	A	Tools and auxiliary store.	35	
2.	B	Instruments and gauges. Repair and test room.	27.5	
3.	C	Electronic room.	27.5	
4.	D)	22.5	
5.	E)Office for	22.5	As Above
6.	F)works manager,	22.5	A, B, C.
7.	G)senior foremen.	22.5	
8.	1	Oven.		
9.	2	Hydraulic press.		
10.	3	Deep freezer.		
11.	4	Tallysurp test machine.		
12.	5	Bearing fitting machine. Flaw detector.		
13.	6	Shock absorber test stand.		
14.	7	Bogie repair section (surface table).		
15.	8	Bogie repair section.		
16.	9	4 x 35-ton jacks.		
17.	10	30-ton bridge crane.		
18.	11	Working bench.		
19.	12	Universal test stand for traction motors.		
20.	13	Traction alternator assembly stand.		
21.	14	Auxiliary motors test stand.		
22	15	Universal rewinding, Tig welding, commutator machining, and undercutting.		

LEGEND FOR THE PROPOSED WORKSHOP LAYOUT

<u>S/NO.</u>	<u>LOCATION</u>	<u>TYPE OF ACTIVITY OR MACHINERY</u>	<u>AREA (M²)</u>	<u>REMARKS</u>
23.	16	Traction alternator cores and field winding bench.		
24.	17	Auxiliary motor windings preparation.		
25.	18	Traction motor preparation.		
26.	19	Traction alternator preparation.		
27.	20	Working bench.		
28.	21	Blower motor repair stand.		
29.	22	Compressor/exhauster repair section.		
30.	23	Turbocharger repair section.		
31.	24	Power assemblies repair section.		
32.	25	Working bench.		
33.	26	Compressor/exhauster pistons and con-rods repair bench.		
34.	27	Turbocharger repair.		
35.	28	Power assemblies repair.		
36.	29	Drying oven.		
37.	30	Diesel engine stand (assembly).		
38.	31	Diesel engine and traction alternator alignment stand.		
39.	32	Traction alternator assembly stand.		
40.	33	Hydraulic press.		
41.	34	Working bench.		

LEGEND FOR THE PROPOSED WORKSHOP LAYOUT

<u>S/NO.</u>	<u>LOCATION</u>	<u>TYPE OF ACTIVITY OR MACHINERY</u>	<u>AREA (M²)</u>	<u>REMARKS</u>
42.	35	Diesel engine disassembly/ assembly stand.		
43.	36	Cleaning bays.		
44.	37	Descaling tank for radiators.		
45.	38	Rinsing tank for radiators.		
46.	39	Pressure test tank for radiators.		
47.	40	Radiator/intercooler repair and welding point.		
48.	41	Gantry crane.		

MAJOR EQUIPMENT AND TESTING SERVICES TO BE INSTALLED
IN THE NEW WORKSHOP

A. MACHINE SHOP

- 1.
2. Flaw Detector - Camshaft, Crankshaft.
3. Universal Lathe Machine.
4. 2-Ton Gantry Crane.
5. Hydraulic Press.
6. Deepfreezer - for storage of raw rubber.
7. Small Oven - for making of rubber seals.
8. Pipe Bending Machine.
9. Shock Absorber Test Bench.
10. Valve Grinding Machine.

B. WHEEL AND BEARING SHOP

1. Bearing Cleaning Machine.
 2. Bearing Fitting Machine.
 3. Small Oven.
 4. Tallysurp Test Machine - for determination of surface roughness on journal and wheel axles and for polishing the same.
- OR 5. Axle and Journal Turning and Grinding Machine.

C. BOGIE FRAME SECTION

1. Bogie frame repair stand (surface table) for alignment.
2. Arc welding machine - A.C./D.C.
3. Grinding machine radius 12.70mm
4. Carbody burring tool No. H - 141.

D. TURBOCHARGER REPAIR AND TESTING

1. Turbocharger rotor assembly balancing machine.
2. Jib crane.
3. Turbocharger service fixture.

E. COMPRESSOR/EXHAUSTER REPAIR AND TESTING

1. Compressor/Exhauster Test Stand.
2. Alignment jib for alignment of compressor shafts.

F. PISTONS, CON-ROD REPAIR SECTION

1. Con-rod checking fixture.

G. POWER ASSEMBLY/DISASSEMBLY, INSPECTION AND REPAIR

1. Cylinder Head Inlet Port Cleaner.
2. Power Assembly Hydraulic Leak Test Fixture.
3. Cylinder Liner Remover.
4. Inlet Port Cleaner.

H. DIESEL ENGINE DISASSEMBLY/ASSEMBLY

1. Diesel Engine Rotation Table (Rotation 360°) - 2 no.
2. Diesel Engine Stand - 1 no.
3. Diesel Engine/Traction Alternator Alignment Stand.
4. Crankcase Flushing Machine.

I. INJECTOR AND INJECTOR PUMP REPAIR AND TESTING

(TO BE INSTALLED IN THE EXISTING LIGHT REPAIR SHOP)

1. Fuel Pump Calibrating Stand.
2. Nozzle Test Stand.
3. Lapmaster Machine (for high-volume lapping of nozzle valves and seats).

APPENDIX 4

4. Fuel Pump Holding Fixture.
5. Nozzle Tip Cleaner.
6. Injector Nozzle Viewer.
7. Injector Nozzle Tip Tester.

J. TRACTION MOTOR TESTING

1. Traction Motor Test Stand.

K. ARMATURE REWINDING SECTION

1. Field Coil Brazing Machine.
2. Armature Removal Fixture.
3. Jib Crane.
4. Universal Tig Welding, Dynamic Balancing, Cutting, Mica Undercutting Machines.
5. Bending Machine.
6. Universal Armature Machine.
7. Armature Upender.
8. Taping Machine.
9. Coil Forming Machine.
10. Armature Winding Stand.

L. DRYING AND HEATING SECTION

1. Drying and Heating Ovens 2M x 2.5M x 2M
Range up to 250°C.
2. Cylinder Head/Liner Assembly Press.
3. Jib Crane.

M. TRACTION ALTERNATOR SECTION

1. Traction Alternator Stands.

N. GOVERNOR SERVICE AND TEST SECTION

1. Governor Test Stands and Accessories.
2. Overspeed Link Assembly Fixtures.

O. AUXILIARY MOTORS AND POWER CONTACTORS TESTING AND REPAIR

1. Armature Rewinding Stand.
2. Hipot Test Stand (Portable).
3. Test Rack for Power Contactors.

P. COILS AND WINDINGS PREPARATION SECTION

1. Working Benches.
2. Oven 1m x 1m x 1.5m.
3. Pressing Machine.

Q. TOOL-ROOM AND AUXILIARY STORES

1. Racks.
2. Cupboards.

R. RADIATOR AND INTERCOOLER REPAIR SECTION

1. Pressure Tester Equipment (20 psi).
2. 2 tanks - large enough to hold the submerged radiators/radiator cores.
3. Bench.

S. INSTRUMENTS ROOM

1. Card Extenders - for current check (44-pin-long card extender)
2. Megger Tester 115 VAC.
3. Digital Multimeter (bench type).
4. TM-14 Test Kit Stand (for testing and calibrating wheel slip/slide detector, speedometer, transition and speed-sensing systems.)

5. Thermostat Checking Fixture.
6. Pinion Advance Gauge.

T. ELECTRONICS ROOM

1. CHECKIT.
2. Oscilloscope.
3. Ultrasonic Test Equipment.

NB: - In case motor rewinding will be done in the Mpika workshop, then equipments and testing devices under J, K, and P will be installed in Mpika instead of Mbeya.

XX XX XX XX

APPENDIX 5

A. SCHEDULE OF MAINLINE MOTIVE POWER REQUIREMENTS
(DIESEL ELECTRIC LOCOMOTIVES ONLY)

<u>PERIOD</u>	<u>SECTION</u>		
	<u>YOMBO-MLIMBA</u>	<u>MLIMBA-CHOZI</u>	<u>CHOZI-N/K/MPOSHI</u>
1987 (1.25 MIL-TONS)	NIL	18	NIL
1992 (2.5 MIL-TONS)	6	36	10
1996 (3.75 MIL-TONS)	17	51	29
2002 (5.0 MIL-TONS)	22	67	38

B. PROJECTED ANNUAL MAINTENANCE SCHEDULES:

<u>ANNUAL TRAFFIC CAPACITY (MILLION TONS)</u>	<u>RUNNING SECTION</u>	<u>NO. OF LOCO- MOTIVES REQ'D</u>	<u>NUMBER OF REPAIRS</u>							
			<u>G2</u>	<u>G3</u>	<u>G4</u>	<u>G5</u>	<u>G6</u>	<u>G7</u>	<u>G8</u>	<u>G9</u>
5.0	MLIMBA TO CHOZI	67	560	140	72	36	12	6	9	9

C. DAILY SERVICE POSITION

<u>CLASS OF MAINTENANCE</u>	<u>TOTAL PER ANNUM</u>	<u>NUMBER OF REPAIRS PER DAY</u>	<u>DETENTION TIME (DAYS)</u>	<u>SERVICE POSITIONS PER DAY</u>
G2	560	2.3	1.0	2.30
G3	140	0.6	1.5	0.90
G4	72	0.3	3.0	0.90
G5	36	0.15	5.0	0.75
G6	12	0.05	6.0	0.30
G7	6	0.025	10.0	0.25
G8	9	0.0375	16.0	0.60
G9	9	0.0375	24.0	0.90
Allow 2 positions for Casual Repairs				2.00
Allow 1 position for Accident Repairs				<u>1.00</u>
Total Service Positions				9.90

Say: 10 positions.

NB: = Maintenance schedules and service positions based on annual haulage capacity of 5.0 million tons and will cater for locomotives running in Mlimba - Chozi only.

APPENDIX 6

MAIN FACILITIES TO BE INSTALLED IN MBEYA

<u>S/No.</u>	<u>FACILITY</u>	<u>REMARKS</u>
1.	Load Box	Supplied
2.	Traction Motor Test Stand	
3.	Governor Test Stand	
4.	Fuel Pump Calibration Stand	Supplied
5.	Nozzle Test Stand	Supplied
6.	Power Assembly Leakage Test Tank	
7.	Compressor/Exhauster Test Stand	
8.	Underfloor Wheel Lathe	
9.	Voltage Regulator Test Equipment	
10.	Relay and Contactor Test Benches	
11.	Test Bench for Meters	
12.	Diesel Engine Test Stand	
13.	Turbocharger Rotor Balancing Machine	
14.	Crankshaft Balancing Machine	
15.	Main Bearing Bores Measuring Device	
16.	Lathe Machine	
17.	Con-rod Checking Fixture	
18.	Axle Bearing Mounting/Dismounting Tool	
19.	Magnetic Particle Flaw Detector	
20.	30-Ton Bridge Crane	
21.	Radiator Cleaning and Testing Facilities	
22.	Drying Ovens	
23.	Varnish Impregnation Tanks	
24.	Axle Electroplating Facilities	
25.	Spray Painting Facilities	
27.	Turret Lathe	
28.	Wheel (Tyre) Heater	
29.	Steam Boiler	2 No. @ 0.5-ton/hr

APPENDIX 6

<u>S/No.</u>	<u>FACILITY</u>	<u>REMARKS</u>
30.	Air Compressor Station	
31.	Gantry Crane	4 No. Varying capacities
32.	Lathe Machine	For cutting imperial threads
33.	35-Ton Lifting Jacks	4 No.
34.	Deepfreezer	
35.	Forklift - 10-Ton	
36.	Electric Trolley	
37.	Shunting Tractor	
38.	Trailer Tractor	
39.	Fire Extinguisher Generator	
40.	Slotting Machine	
41.	Radial Grinding Machine	
42.	Power Hacksaw	
43.	Valve Grinding Machine	
44.	Spectrophotometer	
45.	Brake Testing Rig	

Source: Mr. A.O Mkamba, Principal Mechanical Engineer-System, Head Office, TAZARA, Dar es Salaam.

X X X X X X X X X

EXHIBIT 7

REFERENCE DOCUMENTS USED IN PREPARATION OF THIS REPORT

Ten years of TAZARA Operations, Review and Perspective. July 30, 1987.

Inspection and Lubrication Schedule, Diesel Electric Locomotives Powered by General Electric Locomotives.

Tools for Locomotive Maintenance, Locomotive Renewal Parts, General Electric Locomotive Operations.

TESCO Catalog, Running Maintenance Backshop Tools, Electrical Tools, Alternate Tools.

TESCO Price List, General Electric Tools and Equipment.

Identified Improvements to Equipment Fleet for the TAZARA Railway, U.S. Agency for International Development by J.F. Forman, Parsons Brinckerhoff International, Inc.

General Electric U30C Diesel Electric Locomotive 3000 Horsepower/2238 Kilowatts Specification 4530A.

Zambia Railways Purchase Order - Spare Parts Requirements from General Electric and Other Suppliers.

India C36-7 Price List GP-129 C 17 November 1986 for Backshop Tools for \$610,917.18 - Source General Electric.

India C36-7 Price List GP-129 C 17 November 1986 for Running Maintenance Tools for \$113,245.25 - Source General Electric.

ASSISTANCE OF TAZARA PERSONNEL

Tanzania Zambia Railway Authority

M.J. Kachumi	Chief Mechanical Engineer
A.O. Mkamba	Principal Mechanical Engineer - System
Edwin Sinyinza	Supplies Manager
John M. Mwambenja	Principal Mechanical Engineer - Tanzania
Capt. Robin Sinyinza	Principal Mechanical Engineer - Zambia
Allen A.U. Kyejo	District Mechanical Engineer - Mbeya
John Manumbu	Mechanical Engineer I
Willy Kwidika	Senior Mechanical Technician
Angelo Kilufi	Senior Electrical Technician
Willy Mhanjilwa	Mechanical Technician - Mbeya
Timled Hazole	Electrical Technician - Mbeya
Stephen Mahenge	Diesel Fitter
Horst Anton	Service Engineer, Krupp
Zachary Hahn	Project Development Officer, USAID
Norman Hollma	Manager - Locomotive Service & Parts Central Africa, General Electric
Rauno Rinamo	Project Coordination Unit, Swecko
Siegfried Schluszas	Service Representative M.T.U.

U.S.A.I.D.

UNITED STATES AGENCY FOR
INTERNATIONAL DEVELOPMENT

PROJECT ME-1

SUPPLY OF NEW DIESEL
ELECTRIC LOCOMOTIVES TO
TANZANIA ZAMBIA RAILWAY

ANALYSIS OF COSTS
TO INTRODUCE NEW
LOCOMOTIVES IN TAZARA

STUDY AND QUANTIFICATION
OF COSTS RESULTING FROM
EFFECTS OF NON-U30C
LOCOMOTIVE PROCUREMENT

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EXECUTIVE SUMMARY

This study quantifies the effects on TAZARA's workshop, equipment, tools, staffing, parts storage, training, and technical assistance for differences between two diesel electric locomotives, one being the existing diesel electric fleet provided by GE/Krupp (U30C) and the other being an alternate locomotive.

To obtain data for this study, field observations and interviews were conducted at the Dar es Salaam and Mbeya workshops. Information provided by TAZARA and reports prepared in various donor studies by consultants from Europe and the United States of America were reviewed and analyzed.

The most significant factors resulting from the study are as follows:

- o The estimated incremental difference in acquisition costs of an alternate type of locomotive instead of a copy of the existing GE/Krupp units is \$8 million US. The cost differentials result from the requirements of additional different tooling, shop equipment, facilities, personnel, and training.
- o TAZARA has significant institutional issues that affect its operating and locomotive availability performance. These issues include:
 - (1) The low general skill level of new hires.
 - (2) The insufficient formal training level of its work force.
 - (3) The learning abilities of the work force during both formal and on-the-job-training.
 - (4) The work force's ability (or lack thereof) to read maintenance manuals and to follow written instructions in English.

These issues affect the costs for alternate locomotive training and the availability of mixed-fleet locomotives for revenue service.

- o The deficiencies reported in this and other studies, concerning the lack of maintenance management control and the logistics and time involved in providing locomotive parts at the point of use, result in low availability of locomotives.

- o TAZARA's mechanical department will be challenged in 1988/89 by the anticipated project workload and DE maintenance activities at Mbeya. These activities will include training programs, 4-year overhaul and heavy maintenance on DE locomotives, rebuilding locomotive 1006, facility expansion, and normal running maintenance on 13 DEs while accepting new locomotives with planned delivery for mid to late 1989. The priorities of these activities will also have an impact on the availability of DEs.

Considering the above factors, it is concluded that the acquisition of additional U30C-type locomotives is more cost effective than introducing alternative locomotives. This conclusion is based on:

- o Incremental monies to be expended over the initial 8 years, expressed in current US dollars, are estimated to be as high as \$8 million more for the alternate units.

- o U30Cs can be quickly assimilated into TAZARA's revenue operation since drivers, technicians, and artisans are experienced and can act as a cadre to train new hires for 17 additional U30C locomotives.

- o A U30C-type locomotive procurement would take advantage of 6 years of DE shop and operational experience on those already in the fleet.

**SUMMARY OF INCREMENTAL ADDITIONAL CURRENT DOLLAR COSTS
OF ALTERNATE VESUS U30C-TYPE GE LOCOMOTIVE UNITS**

<u>Study</u>		US Dollars
<u>Item</u>	<u>Difference Element</u>	<u>(Estimated)</u>
		<u>(Rounded)</u>
Subtask 1	Facility Enlargement	112,000
Subtask 2	Equipment	330,000
	Tools	350,000
	Storage	113,000
Subtask 3	Training	2,465,000
	Staffing	353,000
Subtask 4	Added Locomotives to Maintain Availability	<u>4,320,000</u>
		8,043,000
		or 8,000,000

SECTION I. LOCOMOTIVE DESIGN AND CONSTRUCTION DIFFERENCES

TAZARA ACQUISITION OF NEW LOCOMOTIVES

The Dar es Salaam corridor project includes the acquisition of 17 new locomotives to augment the existing 13-unit TAZARA diesel electric (DE) locomotive fleet. A 3,200-horsepower DE locomotive has greater equivalent power than two Chinese locomotives and can be used as a single unit in the 2 percent grade territory between Mlimba, Tanzania and Chosi, Zambia. TAZARA's 13 locomotives of GE U30C design were acquired from Krupp who built the units as a licensee of General Electric.

The May 1987 report, prepared by Parsons Brinckerhoff International, Inc., recommended that TAZARA acquire additional U30C locomotives to minimize the costs associated with fleet expansion and capitalize on work force skills.

Since the locomotive procurement is funded by USAID, competitive bidding will be required. Consequently, additional information was needed to determine how to evaluate the differences between the two possible locomotive candidates with respect to TAZARA's operations, and to estimate the costs of the effects of these differences.

STUDY TASK OBJECTIVES

The overall task objective was to:

- o Develop a list of differences between the two possible locomotive types to determine the effect on the heavy and light maintenance performed at TAZARA's Mbeya shop.
- o Identify any additional effects resulting from differences between these locomotive candidates.

- o Develop estimates of costs resulting from the effects of these differences.

SCOPE OF PART 3 STUDY

The study examined the effect of introducing locomotives different from those in the existing fleet on:

- o Requirements for workshop areas at Mbeya for both heavy and light locomotive maintenance repair.
- o Requirements for shop equipment, tooling, test equipment, and storage area for spare parts and components.
- o Requirements for training and staffing for the maintenance and repair of a mixed locomotive fleet at Mbeya.

This report contains a description and quantification of facts derived from a study of different manufacturers' locomotives that could be proposed for the TAZARA fleet.

SECTION II. EFFECTS ON MAINTENANCE SHOP BUILDINGS

LOCOMOTIVE WORKSHOPS, GENERAL DEFINITION

The work performed in a diesel locomotive shop is generally classified as heavy repair, medium and light running repair, and servicing. A diesel shop complex usually includes a backshop for the overhauling, rebuilding, and modification of locomotives, components, and assemblies.

The different types of locomotives which can be supported by a single diesel shop are limited to those locomotives that dimensionally fit within the facility, and the locomotive's dynamic and static loading on facility structures and plant equipment. Hence, a single shop may support several makes of locomotives, provided it contains specific equipment and work areas required for each type/make of locomotive.

DIESEL LOCOMOTIVE WORKSHOP SIZING

The real differences between single-type locomotive shops and mixed-fleet shops are in the tools and specific shop equipment required for each type and design of the locomotive. The shop design and space allocations for shop functions are developed from component and reliability data indicating the mean time between failure (MTBF) or component removal rates to quantify the number of units to be processed over a year--the throughput of the respective shop and the mean time to repair (MTTR) a locomotive or component. These data then provide the basis for the number of work stations in the functional area, aisles, and work-in-process storage areas resulting in the overall space needs in the component shop area.

The Mbeya heavy and light maintenance shop, described in Exhibits 2, 3, and 4, illustrates the commonality of buildings, plant and equipment, and component shop areas of a diesel locomotive shop. For the Mbeya facility, the differences in

facility requirements are minimal considering that expansion for the enlarged fleet is planned. The differences are primarily those required for duplicating needs based on the locomotive manufacturer's design.

The facility additions for the non-U30C-type locomotive are shown below. Aside from these additions, Mbeya's existing light repair shop will require a comprehensive facility upgrading and additional shop equipment to accommodate the enlarged DE locomotive fleet, costs for these are not included below.

**ADDITIONAL MBEYA WORKSHOP/DEPOT AREAS
REQUIRED FOR NON-U30C LOCOMOTIVES**

		<u>Total Area</u>
Tools/Equipment		
Light repair	20 sq.m.	
Heavy repair	<u>30 sq.m.</u>	
Subtotal		50 sq.m.
 Turbocharger repair/overhaul		 16 sq.m.
 Servicing shed:		
Locomotive oil dispensing		16 sq.m.
 Injector/fuel pump testing, repair, storage (clean room)		 46 sq.m.
 Offices		
Non-U30C personnel	46 sq.m.	
Maintenance	<u>22 sq.m.</u>	
Subtotal		68 sq.m.
 Oil and grease storage		 <u>62 sq.m.</u>
 TOTAL		 258 sq.m.
Contingency/growth 15%		<u>39 sq.m.</u>
 Total additional facility area required		 297 sq.m.

Estimated construction cost for additional area.

Each sq.m. = 24,000 Tanzania Shillings

297 sq.m. = 7,128,000 Tanzania Shillings

Using conversion rate: 70 Tanzania Shillings = 1 USD

Facility cost for additional area of 297 sq. m.

Construction \$ 101,800 US

Design engineering (10%) \$ 10,180 US

Cost of difference \$ 111,980 US

or \$ 112,000 US

**SECTION III. EFFECTS ON TOOLS, EQUIPMENT,
AND ON SPARE PARTS STORAGE AREA**

LOCOMOTIVE TOOLING

The diesel engines of the alternate and GE-powered locomotives are different. GE and GE/Krupp have the same 4-cycle engine; the alternate is a 2-cycle design. Consequently, the compatibility of tools for maintaining and overhauling engine and engine component parts is virtually nonexistent. Some electrical test equipment and miscellaneous tools can be used for both locomotives.

A separate group of engine tooling, measuring devices, and gauges is required for each locomotive type. The additional tool inventory to support an alternative locomotive model is estimated to cost \$350,000 US.

The costs were developed from tool catalogs, maintenance manuals, and contacts with suppliers.

SHOP EQUIPMENT

Maintenance manuals, illustrated equipment catalogs, and recommended equipment lists were reviewed and compared for differences in the locomotives.

In the shop equipment category, equipment for a specific locomotive is based on the manufacturer's design. Two major differences between the GE and alternate locomotives aside from the engine are the fuel injector/pump assembly and the wheel slip/slide control system. These differences will require two sets of test equipment.

Another significant difference is the turbocharger for the engine. Two complete work stations and test stands would be required with two sets of shop equipment.

Miscellaneous workshop equipment such as welders, lifting systems, cranes, jib cranes, hydraulic mobile/lift tables, cleaning machines, steam, glass, shot blast, and cleaning tanks are the same for either locomotive. Testing equipment such as magnaflux, bore scope, penetrant dye checking, meggers, and hipot test units are applicable to each type of locomotive.

Vendor contacts verified the differences and cost estimates of additional equipment. Table 3.1 lists the equipment differences and estimated costs.

SPARE PARTS AND COMPONENTS STORAGE DIFFERENCES

Storage space requirements for spare components and consumable parts are different for each of the two locomotive types.

Less than 4 percent of the parts and tooling are interchangeable. The two locomotives are different in theory of operation, design, component nomenclature, and component usage. The parts storage area requires a duplicate space allocation for each locomotive type except for the capital components. For the capital components, the same amount of space would be required for an additional 17 locomotives regardless of the type. If the GE U30C locomotive is chosen, the consumable parts, protection parts, materials, and supplies could occupy the same floor/shelving space that now exists, with more efficient use of the stock room and shelf bin space.

The estimated additional space allocations for non-U30C items were developed from an inspection of existing facilities, measuring current allocations for the DE and diesel hydraulic locomotives, a review of drawings of the facility, and interviews with the staff. This provided a means for interpolating the space differences for a new type of locomotive.

TABLE 3.1
 COSTS OF EQUIPMENT DIFFERENCES--NON-U30C VERSUS U30C

	DOLLAR COST DIFFERENCES		
	<u>For</u> <u>Alternate</u>	<u>For</u> <u>GE</u>	<u>Difference</u>
INJECTOR CALIBRATION			
Test stand (9547232 or 9547515)	\$40,000	---	\$ 40,000
LOAD BOX - Estimate	\$81,000	---	\$ 81,000
TESTER, MODULE & SUBASSEMBLY (9087560 Export)	\$ 6,010	---	\$ 6,010
EXTENSION BOARD FOR SLIP-SLIDE (8482259) (8415827 Fuse)	\$ 750	---	\$ 750
MODULE (AUTOMATIC TEST EQUIPMENT)	\$12,000	---	\$ 12,000
ENGINE BLOWER/REPAIR/OVERHAUL	\$20,000	---	\$ 20,000
GOVERNOR TEST STAND	\$60,000	---	\$ 60,000
LINE BORE APPARATUS	\$100,000	---	\$100,000
ELECTRICAL SYSTEMS DIAGNOSTIC	<u>\$ 11,000</u>	---	<u>\$ 11,000</u>
ESTIMATED EQUIPMENT DIFFERENCE COST			US \$330,760

General observations of existing conditions are as follows:

- o Parts storage area is congested. Aisles are partially blocked and shelf space is crowded. Note: The storage space can be expanded at relatively minor cost by installing a mezzanine level. A fold-up stair could be installed instead of a permanent located stairway to save floor space. Low-usage parts and materials could be stored on the mezzanine level (filters and items held in inventory for 1 or 2 years). Small quantities can be binned on the floor level. The stocking of items on the mezzanine and binning of parts used every one to three months in the floor shelf bins will free space for items now on the floor. This arrangement would place under lock and key most, if not all, items observed in non-secured areas.

- o The storeroom building is a combination parts-issue and warehouse operation.

- o Stock locator system and inventory stock cards were used to check and verify quantities and locations. Note: Quality assurance checks should be periodically performed to assure the locator card and the material in the bin have the same part number. In a spot check of 30 bins, there were 5 or 6 misbinned parts. All misbinned parts were in the adjacent space and the proper alignment of locator card/number and parts was quickly corrected. Accuracy of information checked indicated acceptable level of control.

A non-U30C locomotive procurement would require an additional 300 square meters for materials and parts at a cost of \$102,857 US plus \$10,285 design fee.

A new stores facility is planned by TAZARA for construction during the Mbeya facility expansion. A sketch (refer to BL310-03-000B(B), Layout Plan for Mbeya) was developed by TAZARA and includes the warehouse layout. The sketch is intended as a nominal space allocation and arrangement for a partial stock issue and full warehouse operation. The sketch shows that at a preconceptual planning level, all the space is allocated to existing operations and a U30C procurement. A non-U30C locomotive procurement will require a larger warehouse.

The space allocation considerations were based on the following drawings:

- o TAZARA BL310-00-000 Issue A
Mbeya Locomotive Depot Layout Plan
- o TAZARA BL310-02-000 Issue A
Layout Plan of Servicing Shed and Auxiliary Room
- o TAZARA BL310-01-000 Issue A
Mbeya Locomotive Depot Repair Shop and
Auxiliary Room Plan
- o TAZARA BL310-03-000B Issue B
Layout Plan Mbeya Locomotive Depot

These drawings are not included in this report.

SECTION IV. TRAINING AND STAFFING

TRAINING

An important objective in locomotive workshop operations is to improve the quality of maintenance which would result in increased locomotive availability for current and anticipated increases in freight and passenger business.

This improvement can be accomplished by standardizing to one locomotive type. Standardization increases on-the-job training proficiency of the maintenance personnel which improves through the repetition of servicing, inspection, repairs, and troubleshooting jobs.

Especially important and critical to returning locomotives to service is the time spent in troubleshooting, quickly performing confirmation tests, and correcting the defect properly the first time. Key factors in troubleshooting are training and experience. Through repetitive experience and successful repairs, the skill and confidence of the worker will increase. Adding 17 units to the U30C-type fleet will double the potential troubleshooting tasks, reinforcing techniques and thereby accelerating the learning curve, and will result in lower unit operating costs and improved productivity.

With an illiteracy rate of approximately 15 percent for the artisan maintenance force, and with 60 percent having no more than a 7th grade education, both formal and on-the-job training are critical elements in the implementation of any new equipment. (See Appendix C, Reference 5, pages 25 and 26.)

An important consideration in introducing new processes and procedures is the ability of the work force to adapt to new conditions. Human resource training concerns itself with the ability of the work force to assimilate new information and

rapidly gain technical experience through formal training, hands-on experience, and the ability to absorb the instructions in the manufacturer's literature and manuals.

The new Kreditanstalt für Wiederaufbau (KfW) training program planned to start in 1988 for the upgrading of the DE maintenance work force over the next few years is a vital and an integral part in developing the self-sufficiency and productivity of the work force. The KfW program is designed for a 4-year period. However, the KfW program startup has been delayed. This schedule adjustment will have a greater impact on the human resources readiness to accept an alternate type locomotive than on acceptance of additional U30Cs.

As the locomotive fleet ages, component reliability will deteriorate and troubleshooting procedures must be modified to reflect the changing failure modes of the locomotives' systems. Manufacturer's training must emphasize troubleshooting techniques and ensure that the artisans have the skills to adapt to technological changes in the repair and overhaul procedures of the failed component.

Skills required for servicing the locomotive include preventive maintenance, test operation, calibration, troubleshooting, disassembly, repair, assembly, use of tools and test equipment, and unit/component overhaul repair and servicing.

Based on interviews with the workshop staff and a review of the training records for the DE locomotives, the training to date consisted primarily of a general two-week crash course for key people and on-the-job training for others by the quickly trained staff. Testing, troubleshooting, and repair were not emphasized. Training in these skills was left to the manufacturer's field representative. The crash courses appear to have developed a dependency on the manufacturer's local field service organization for technical guidance and leadership including on-the-job training and supervisory technical assistance. Appendix B provides an insight on maintenance issues during 1986. The casual repair durations should be analyzed to determine specific training needs. Also, Reference 4, Appendix C, includes performance reports which provide additional insight to maintenance and repair issues.

The manufacturer providing the next DE locomotives must be cognizant of the educational levels of the work force. The training/technical support requirements must include formal, on-the-job, and feedback sessions to assure that training efforts meet the performance objectives of TAZARA.

The workplace must have maintenance manuals, troubleshooting handbooks, and maintenance specifications and instructions that are readily understood by the work force. Maintenance manual English word phrasing and usage must be structured so that vocabulary idioms, nomenclature definition, and procedural directions are simple and understandable by the work force. Technical manuals should be written to be a primary teaching aid. Repeated use of the manual enforces standard maintenance procedures and acquaints the worker with the information needed to perform preventive maintenance, troubleshooting, and repair. If the manuals do not communicate to more than one or two individuals, there will be problems understanding what to do when the manufacturer's technical assistance (service engineer) or key technical people are not available.

On a troubleshooting chart, for example, pictures should illustrate the sequence of events. Effective maintenance instructional manuals use pictures and graphics for easier maintenance training, and mechanical information to provide the reader with easily understood explanations of detail work required for maintenance tasks.

If the majority of workers have difficulty in understanding the manuals, then this technical responsibility goes by default to the person who best understands what is required. At Mbeya, the manufacturer's technical assistance representative (service engineer) is that person.

If a new type of locomotive fleet is acquired, the manufacturer's technical field support personnel will have a similar role and a new training program will be required. Hence the additional field service representatives will create a difference in training costs.

The training requirements for a new type of locomotive will be extensive and must cover:

- o Familiarization
- o Preventive maintenance
- o Servicing
- o Repairs
- o Troubleshooting
- o Test operation
- o Disassembly/assembly
- o Use of tools and test equipment
- o Component renewal/overhaul

Training Manuals

The locomotive training manuals should be divided into sections that provide overview, theory of operation, inspection, servicing, repair, overhaul, and troubleshooting. The troubleshooting section for each system and component must be presented in illustrations showing troubleshooting fault tree chart relationships. The troubleshooting fault chart must be presented to the technician, artisans, and engineers in simple language terms and graphics so they can easily relate it to the job at hand. Servicing and repair descriptions require translation to Kiswahili translatable English words. Only 60 percent of the work force has up to 7 years of education.

The classroom training sessions must be followed by considerable on-the-job training to reinforce the class sessions and provide feedback to the instructor for additional training needs.

A special artisan's requirement of the on-the-job training phase is obtaining troubleshooting experience and confidence. Presently, the artisans depend on the troubleshooting skills of the manufacturer's field representative. Artisan troubleshooting self-sufficiency is a critical prerequisite before a manufacturer's field representative leaves TAZARA. Troubleshooting experience is a vital requirement in shop component repair and

overhaul, as well as in operating test equipment and tooling. The troubleshooting skills need cannot be overstated or simplified.

The maintenance training program for a new type of locomotive should not presume to be combined with available resources by simply integrating the new locomotive work into the Mbeya shop. The elements of differences between a 2-cycle and a 4-cycle engine, the components, theory of operation, and the entire set of parts, tools, test equipment, and testing procedures will have negative consequences on the maintenance levels of the existing locomotive fleet as well as the new locomotive fleet.

It is reasonable to assume that the human resources for a new type of DE locomotive will be acquired from Chinese-trained diesel/hydraulic locomotive artisans. The retraining of these artisans may be especially difficult particularly due to verbal communication difficulties. Dependence on written instructions will not be adequate for startup of a new fleet. Hence, considerable instructional effort will be expended on retraining the most experienced artisans for a new type of DE locomotive. The nominal class time that an artisan can be expected to be attentive in a classroom session is 2 to 3 hours. Hence, the training duration can be expected to be prolonged compared to Western standards.

Experienced DE locomotive artisans (mechanics) are not available from the local area manpower pool. Workers hired for a new type of locomotive will require basic mechanical training and will have to progress through an apprentice-type program in the main workshops to acquire basic mechanical experience. Electricians will require 2 to 4, probably 4 or more years, to acquire the skills required for electrical/electronic troubleshooting. TAZARA does not have an electrical/electronic training program as such. However, as TAZARA acquires an enlarged fleet, the timeliness for an electrical/electronics apprenticeship program should be considered. The future startup of such a program could provide a core of artisans trained in basic electrical/ electronic theory in time to meet the expanded work force requirements for the additional 17 locomotives.

The training burden imposed by the addition of an alternate type of locomotive procurement requires careful consideration by TAZARA and USAID.

Different Type of Locomotive Training Support Needed

Based on interviews and perceptions from onsite observations and the duration of technical support provided by Krupp on the 13 DE locomotive fleet, the following is an estimate of the human resource requirements to assure that TAZARA's performance objectives of the fleet expansion are met even if alternate locomotives are procured:

- o Service engineer/maintenance/component repair specialist - 5 years through the first complete locomotive/component overhaul cycle and thereafter periodically. Consideration should be given towards field service support through a complete locomotive component replacement type overhaul which would total 8 years.
- o Maintenance methods/procedures and practices specialists - 2 to 4 years specializing in troubleshooting training, both formal and on-the-job. Prepares locomotive availability, reliability, and parts consumption rates for corrective engineering and parts procurement for component repairs/overhauls.
- o Driver training specialist - 6 months to 1 year.
- o Training specialist to prepare training curriculum for TAZARA's use, and test training performance effectiveness for 1 to 2 years.

The technical assistance to date and the current funding plans indicate that GE/Krupp will have had a field service representative on site to assist TAZARA for a total of 7 years by

the end of 1989. The representative's primary responsibility is technical--providing in-shop instruction on repair of locomotives for maximum availability. A comprehensive training program must be developed as part of the procurement of alternative locomotives for TAZARA's use in the training of new artisans, fitters, drivers, and technicians.

The estimated cost for technical assistance to support an alternate type locomotive fleet is (see Exhibit No. 5):

	<u>US</u>
Service engineer - 8 years	\$2,120,000
Maintenance specialist/on-the- job training - 3 years	720,000
Driver training/operations specialist - 1/2 year	115,000
Training specialist - 1 year	<u>230,000</u>
	\$3,185,000 Total

The cost estimate for technical assistance to support an addition to the U30C locomotive fleet is (see Exhibit No. 5):

	<u>US</u>
Service engineer - 3 years	\$ 720,000 Total

The difference for alternate locomotive procurement is:

Alternate	\$3,185,000 US
Less GE	<u>- 720,000</u>
	\$2,465,000 US Total

(Current dollars; not adjusted for cost-of-living or merit increases.)

MBEYA SHOPS ORGANIZATION AND STAFFING

With the diesel electric maintenance responsibility assigned to Mbeya, the organizational structure will change to reflect expansion at the workshop. However, additional staffing will be required to support an alternate locomotive procurement. Considering the type of locomotive specialization that is required at the artisan level for training and general skills availability, duplicate staffs will be needed in the heavy repair area and in troubleshooting to cover both locomotive types.

The existing organization is relatively simple as shown in Exhibit 6A. How this organization changes will depend upon whether the additional units are GE or an alternate.

If the additional units are GE, then an organization similar to that shown in Exhibit 6B is proposed. The additional workload will increase the size of the work force to 92 positions (excluding locomotive driver positions) as shown in Table 4.1.

If the additional units are non-U30C, then the proposed organization will be that shown in Exhibit 6C. This organization must effectively add two functions for the alternate heavy and light repairs. The total number of positions required to staff this organization is estimated to be 141 as shown in Table 4.1.

The incremental difference in the number of positions is estimated to be +49 if a mixed GE/alternate fleet is to be maintained as opposed to a GE-only fleet. The additional cost of this added number of positions is \$44,100 US per year, as shown in Table 4.2.

The projected needs for additional staff are based on the immediate needs that will arise as the new units arrive and require maintenance and repair work. If the U30C locomotive is acquired, it is reasonable to assume that the existing staff will provide the expertise until training and experience improve the capabilities of new employees.

When competent field representatives are made available from the locomotive manufacturers, proper facilities and equipment

provided, and adequate training programs implemented, the need for 141 positions should be steadily reduced. It is further assumed that a long-range program goal of 90 to 100 positions by 1997 should be attainable through the planned training program as outlined in the KfW report.

In the Work Study and Job Evaluation Exercise (see Appendix C, Reference 12), studies accomplished by Rail India Technical and Economic Services Limited (RITES) and Canadian Pacific Consulting Services (CPCS) indicated problems of attracting and retaining personnel. These problems are real and in all probability will be an issue in locomotive fleet expansion. The staffing situation will be acute with two different types of locomotives, U30C and an alternate. A non-U30C locomotive procurement has a significant element of risk.

TABLE 4.1
WORKSHOP STAFFING FOR DIFFERENT LOCOMOTIVE ACQUISITIONS

Position Title	Positions				
	<u>Current</u>	Add if 17 GE <u>Acquired</u>	Sub- <u>total</u>	Incremental if 17 Are <u>Alternates</u>	<u>Total</u>
Works					
Manager	0	1	1	0	1
Maintenance					
Engineer	1	-	1	1	2
Senior					
Technician	2	1	3	1	4
Technician IV	6	3	9	4	13
Artisan I	1	1	2	1	3
Artisan II	7	2	9	6	15
Artisan III	<u>60</u>	<u>7</u>	<u>67</u>	<u>36</u>	<u>103</u>
Total	77	15	92	49	141

3-IV-10

TABLE 4.2

INCREMENTAL COST OF GE/ALTERNATE FLEET MAINTENANCE

<u>Shop</u>	<u>Force Required</u>		
	<u>GE Only</u>	<u>GE/ Alternate</u>	<u>Increment</u>
General	9	13	+ 4
Heavy Repair	61	100	+39
Light Repair	<u>22</u>	<u>28</u>	<u>+ 6</u>
Total	92	141	+49

Additional Cost

Average annual salary \$900 US* x 49 = \$ 44,100
 Eight-year cost = \$352,800 US
 or \$353,000 US

*Based on 5,250 Tanzania shillings per man-year and exchange rate of 70:1 per USD.

**SECTION V. EFFECTS ON LOCOMOTIVE PURCHASE QUANTITY
TO MAINTAIN EQUIVALENT AVAILABILITY**

The actual number of locomotives required to support the TAZARA service will depend upon the ratio of serviceable locomotives to the total locomotives in the fleet. This fleet availability ratio for the existing DE locomotive units is projected to be 60 percent and for new locomotives is projected to be 75 percent (see Appendix C, Reference 5, CPCS Report, page 52).

These ratios are obtainable given the assumption that the diesel electric fleet will be GE-only. If the fleet is composed of both GE and alternate units, it is reasonable to assume that the problems previously discussed and identified in this and other reports will result in a lower ratio. The ability to maintain a fleet composed of both existing GE and new alternate units at the rate projected for a GE-only fleet cannot be compensated for by simply adding to the work force. While the capability to maintain two separate diesel electric fleets will improve over time, it may be as long as 8 years, or the equivalent of one complete 8-year overhaul cycle, before service standards comparable to that of a GE-only fleet are attained.

If the fleet requirement is based on an expected actual availability ratio considered to be more realistic than that projected, then additional locomotives will be required. The number of serviceable locomotives available in a fleet of 30 units based on the higher planned availability is 20 units:

13 existing units at 60 percent =	7.8 units
17 new units at 75 percent =	<u>12.8</u> units
Total available units	20.6 units

If the availability of the existing fleet is only 55 percent as a result of introducing alternates to the fleet, the 13 existing units will provide only 7.2 serviceable units, and the new units must provide the balance, or 13 serviceable units. If

the availability of the new alternates is only 65 percent instead of 75 percent, 20 units will be needed (13 divided by 65 percent availability).

This lower availability would result in a need for 3 additional locomotive units (20 versus 17) to meet the service requirements. At an average cost of approximately \$1,440,000 US (\$1,350,000 US per locomotive and \$90,000 US for spare parts per locomotive), the additional cost of 3 locomotives is estimated at \$4,320,000 US (see Appendix C, Reference 4, Item 1 Quotation).

As TAZARA builds its resources to meet the projected traffic requirements and operational efficiencies for the 1990s while centralizing its DE operations at Mbeya, the activities of training, shop modernization and expansion, and the increase in DE locomotive fleet and component overhaul workload may affect the overall performance of DE operations. The activities occurring simultaneously would challenge any organization, and the likely impact of these activities on performance should not be underestimated. The combined impact of all these activities may have a negative effect on fleet availability.

The major activity profiles, for example on the GE and alternate locomotive acquisitions, are shown on Exhibits 7A and 7B and portray the location's nominal programs over the next 3 years. It should be recognized that the startup effort required by introducing a different type of locomotive will create additional planning, scheduling, and training demands. The lead times to provide the maintenance support requirements will be of a longer duration and have a larger resource commitment for an alternate fleet than for a GE-only fleet. The crucial period as shown on the exhibits will occur when new locomotive planning and training are required at the same time as other vital responsibilities of the Mbeya shop are being introduced. The potential interaction of all the activities at Mbeya may affect the facilities' performance. Introducing additional U30C-type locomotives may have an effect on operations for just a short duration, but

integrating an alternate locomotive will be more significant and require a considerably longer period. The locomotive overhaul planning, for example, now underway for the U30Cs will require another planning effort in 5 years for the alternate type locomotive. The second fleet overhaul planning process will not be able to capitalize fully on the work experience gained on the present locomotive overhauling process and program.

It is reasonable to assume, for planning purposes, that alternate provisions for providing backup mainline power will be needed during a new type of locomotive implementation. This alternate backup power may be translated into new locomotives or equivalent power from units ready for retirement being held in service for a longer period than originally planned. It should be noted that one DE locomotive is equivalent to two diesel hydraulic units. The efficiencies expected from the new fleet acquisitions must then be postponed until the locomotive availability is adequate to maintain the desired level of operations. The retention of equivalent power for an indefinite duration will have a detrimental result on planned revenue operations. The alternate locomotive procurement has a risk factor that must be carefully reviewed by TAZARA and USAID.

SECTION VI. INCREMENTAL COST SUMMARY

The locomotive differential cost comparison summary is presented in Table 6.1. The estimates are in current US dollars and represent additional expenditures that are projected to be required during the first 8 years if a decision is made to acquire alternate locomotives as opposed to U30C units to augment the TAZARA fleet.

A decision to acquire alternate units and the expenditure of these additional monies should result in similar locomotive availability as that available with a decision to acquire GE units. At the end of the first 8 years after receipt of the new alternate units, the trained staff with the additional facilities, equipment, and tools should be capable of servicing locomotives at a rate such that the three locomotive units would then be reserve units, or available to handle increased traffic volume.

The incremental costs developed in this study should be considered along with other evaluation factors in reaching a decision on the type of locomotive unit to be acquired to augment the TAZARA fleet.

TABLE 6.1

LOCOMOTIVE DIFFERENTIAL COST COMPARISON SUMMARY (USD)

	<u>ALTERNATE</u>	<u>U30C</u>	<u>DIFFERENCE (NET)</u>
Workshop Requirements			
Facility Requirements	\$ 101,829		
Design Engineering	<u>10,183</u>		
		--	\$ 112,012
 Tools, Test Equipment, Storage Area for Spare Parts			
1. Tooling	\$ 350,000		
2. Equipment	330,760		
3. Storage Space			
Construction	102,857		
Design	<u>10,286</u>		
		--	\$ 793,903
 Training and Staffing			
1. Training	\$3,185,000	\$720,000	\$ 2,465,000
2. Staffing (1st 8 years)	352,800		352,800
 Other			
Reserve Locomotives	\$4,050,000	--	
Additional Spare Parts	<u>269,200</u>	--	<u>4,319,200</u>
			<u>\$8,042,915 US</u>
		Rounded	\$8,000,000 US

APPENDIX A

TAZARA KEY PERSONNEL INTERVIEWED FOR
BACKGROUND INFORMATION

M. J. Kachumi	Chief Mechanical Engineer
A. O. Mkamba	Principal Mechanical Engineer
J. Mumba	Traffic Manager
E. E. Sinyinza	Supplies Manager (Acting)
R. Rinamo	Mechanical Engineer PCU
J. Kyejo	District Mechanical Engineer (Mbeya)
J. Nunumbo	Mechanical Engineer

NOTE TO TAZARA'S STAFF:

I appreciated this opportunity to serve TAZARA in its preparedness for self-sufficiency and productivity improvement to meet its growth and operating objectives, and, secondly, to help USAID in defining how best to dispense financial assistance to the Dar es Salaam Corridor Improvement Project.

Thanks are extended to the TAZARA staff for their assistance and cooperation in touring the facility and also for providing an insight to the operational issues and needs for TAZARA's fleet expansion program.

J. R. Nielsen

TANZANIA ZAMBIA RAILWAY AUTHORITY

REPORT ON THE PERFORMANCE OF U30C LOCOMOTIVES:REF: PERIOD - JANUARY - DECEMBER 19861.0 INTRODUCTION:

1.1 During the period under review there were 11 locomotives in service. Accident locomotives nos DE 1004 and DE 1008 continued to be grounded. Locomotive no. DE 1006 was involved in a serious accident on 8 January 1986 was not available for the remaining part of the in calculating percentage availability of the locomotives.

1.2 As part of this report are tables as follows:

Table 1 - Locomotive availability indices.

Table 2 - Locomotive repair fulfilment.

Table 3 - Locomotive operation indices

Table 4 - Accidents and locomotive failure summary.

1.3 Explanatory notes on performance of the locomotives is summarised as follows:-

2.0 LOCOMOTIVE AVAILABILITY AND UTILITY

2.1 During the period accident locomotive nos DE 1004 and DE 1008 Continued to be out of service. Another locomotive no DE 1006 was involved in a capsizement accident on 8th January 1986 and was not available for operation for the rest of the year. This further affected motive power availability. During the year accident locomotives accounted for 21% of the total fleet of U30C locomotives.

2.2 Overall motive power availability for the year was 59.5%. This is lower than availability for the preceding year. Main reasons for the low availability are:-

- 2.2.1 Locomotive no. 1006 further affected availability. If the accident locomotives are excluded, average availability based on the 11 serviceable locomotives is 75.2%.
- 2.2.2 Long detention time for locomotives whose wheels needed reprofiling. On average 1.5 locomotives need tyre reprofiling every month. Since there are only two spare bogies, one locomotive has always got to wait for its own bogies. Also as there is no underfloor wheel lathe in Mbeya the wheelsets have to be sent to the main workshops. Average turnround time for the wheelsets when they are sent to the workshops for reprofiling has always been over 3 weeks. During this period most of the wheels needed to be fitted with new tyres and this made the turnround time even longer.
- 2.3 Percentage utility, though rated good, was lower than the average utility for the preceding year by 3.6%. The main contributing factors for the low average utility were:
- 2.3.1 Line closure due to formation failures at kilometer 6: Due to heavy rains in the months of April and May, a section of the railway line leading to Dar es Salaam port was twice washed away. Consequently, the section was closed for a total of 4 weeks. The closure heavily affected imports and exports through the line.
- 2.3.2 The line closure also affected traffic plan in the month of June as some of the exports and imports used other alternative routes.
- 2.3.3 With DE locomotives, less was transported in the first half of 1986 compared to the corresponding period in 1985. In the months of January - June 1986 the Authority moved a total of 25504.0 ton-km whereas the corresponding figure for the same period in 1985 was 34,247.2 ton-km.

3.0 MAINTENANCE AND REPAIR

3.1 Table 2 outlines a summary of maintenance and repairs undertaken on U30C locomotives.

A total of 128 locomotive sets were planned to undergo various classes of maintenance and 102 maintenance schedules were executed, representing 79.7% of the plan.

3.2 Although the plan was not fulfilled, no locomotive was overdue for any class of maintenance at the end of 1986. Underfulfilment of the repair plan was due to following reasons:

3.2.1 Locomotive no. DE 1006 was to have undergone 5 maintenance schedules in the months of January - June. Since the locomotive was involved in an accident in early January these schedules were not carried out. The locomotive was not planned for any class of maintenance in the second half of 1986.

3.2.2 Long detention times of locomotives awaiting for wheelsets led to some of the locomotives staying for a month or so in the repair shop. Consequently some of the repair schedules overlapped.

3.2.3 The 3-month oil filters which were fitted in the months of August and September were due for replacement in the months of October and November but because we had no oil filters in stock, maintenance services for the locomotives were postponed by an average of two weeks.

3.2.4 As in 3.2.2, casual repairs with long downtime also affected maintenance schedules.

3.3 During the year 120 cases of casual repairs were undertaken compared to 65 cases in the preceding year. The number of locomotive days under causal repairs were, however, lower than in 1985.

Main problems attended to include:-

- (i) Leaking of power assemblies. This phenomenon is mainly found on locomotives that were delivered in 1983. The main cause is worn out sealing rings.
- (ii) Locomotives due for wheel reprofiling or retyring but not due for any scheduled maintenance: The locomotives delivered in 1983 were due for re-tyring during this period.
- (iii) Tripping of crankcase overpressure switches mainly due to clogged crankcase breather pipes or heavy carbonization of the inlet ports. This phenomenon is also common in the locomotives delivered in 1983.
- (iv) Replacement of burnt cards.
- (v) Defective sensor cables.

During the period there was one case of turbocharger casing cracking.

4.0 LOCOMOTIVE OPERATION INDICES

- 4.1 Table 3 is a schedule of locomotive operation indices.
- 4.2 Total running kilometrage was 829,750 km which was lower by 120,714 kilometers compared to the preceeding year. Main contributing factors were:-
 - 4.2.1 Low availability of locomotives due to DE 1006 being out of service.
 - 4.2.2 As mentioned in 2.3.3, less was transported in the first half of 1986.
 - 4.2.3 Line closure, vide 2.3.1, affected train movement and hence running kilometrage.

4.2.4 Less cargo was transported during the first half of 1986.

4.3 Before 1986 maximum nominal hauling tonnage was deliberately set at 900 tons so as to enable locomotive drivers gather enough operating experience before the locomotives started hauling the design tonnage. From the end of 1985 the nominal hauling tonnage was increased to 1000 tons, the design tonnage. This has resulted into a modest increase of average hauling tonnage by 4% compared to 1985. Pick-up trains, which are seldom full load; and other negative factors sighted above, affected average hauling tonnage.

4.4 Average daily locomotive running kilometers for goods trains was 341, while overall average (goods trains, passenger trains and others) was 404 kilometers. These are lower than corresponding figures in 1985. This is due to negative factors sighted in 2.3.1, 2.3.2 and 2.3.3.

4.5 Light running decreased by 9.5% i.e. decreased from 45308 km in 1985 to 40996 km in 1986.

5.0 ACCIDENTS AND LOCOMOTIVE FAILURES

5.1 Table 4 gives a summary of accidents and locomotive failures.

5.2 During the year, there was one serious accident involving locomotive no. DE 1006 and to derailments involving locomotive nos DE 1003 and DE 1009.

5.2.1 On 8.1.86 locomotive no. DE 1006 capsized in Uyole-Inyala section due to stock brake failure. The superstructure was badly damaged and it is now grounded awaiting rehabilitation.

5.2.2 Locomotive no. DE 1003 derailed at Mbeya Depot during shunting. After rerailing, the locomotive was inspected and released for operation as there were no defects found.

5.2.3 On 27.5.86 locomotive no. DE 1039 derailed in Kangaga-Wanging'ombe section as the stock started moving backwards after engine shutdown. No. 2 cowcatcher sustained minor damages and after repairs. the locomotive was put into operation.

5.3 Altogether a total of 158 locomotive failures were recorded on U30C locomotives during the year. The majority of them were due to minor operational problems such as wheelslipping, lack of sand, lack of fuel etc. In table 4 only failures due to component failure/mal-functioning have been reported.

TAZARA HEAD OFFICE
DAR ES SALAAM

TABLE I
LOCOMOTIVE AVAILABILITY INDICES FOR USOC LOCOMOTIVES:
(JANUARY — DECEMBER 1986)

INDEX MONTH	TOTAL NUMBER OF LOCODAYS	NUMBER OF LOCODAYS AVAILABLE	NUMBER OF LOCODAYS UNDER REPAIR				PERCENTAGE AVAILABILITY	PERCENTAGE LOCOMOTIVE UTILITY.
			PLANNED	CASUAL	ACCIDENT	TOTAL		
January	434	226.3	24.3	121.3	62.1	207.7	52.1	59.2
February	392	238.6	18.4	51.1	83.9	153.4	60.9	69.0
March	434	278.0	8.2	54.9	92.9	156.0	64.1	63.2
Quarterly	1260	742.9	50.9	550.2	238.9	517.1	59.0	63.8
April	420	289.8	17.6	22.7	89.9	130.2	69.7	62.5
May	434	284.4	19.7	37.3	92.9	149.9	65.5	69.0
June	420	240.0	45.6	44.5	89.9	180.0	68.1	68.4
Quarterly	1274	814.1	82.9	104.5	272.7	460.1	63.9	66.5
Half-Yearly	2534	1557.0	133.8	654.7	511.6	977.2	61.4	65.2
July	434	238.4	36.0	66.7	92.9	195.6	54.9	74.9
August	434	264.3	48.2	28.6	92.9	169.7	60.9	63.7
September	420	217.8	25.6	86.7	89.9	202.2	51.9	72.3
Quarterly	1288	720.5	109.8	182.0	275.7	567.5	56.0	68.6
October	434	251.1	27.3	62.7	92.9	182.9	57.9	74.2
November	420	246.3	35.5	48.3	89.9	173.7	58.7	74.9
December	434	266.6	16.5	58.0	92.9	167.4	61.4	65.5
Quarterly	1288	764.0	79.3	169.0	275.7	524.0	59.3	71.3
Half-Yearly	2576	1484.5	189.1	351.0	551.4	1091.5	57.6	70.0
Yearly	5110	3041.5	322.9	1005.7	1063.0	2068.7	59.5	67.6

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APPENDIX B

LOCOMOTIVE REPAIR FULFILMENT
~~MAINTENANCE~~ SUMMARY FOR USOC LOCOMOTIVES
 (JANUARY - DECEMBER 1986)

TABLE 2.

CLASS OF REPAIR MONTH	1 - MONTH		3 - MONTH		6 - MONTH		1 - YEAR		2 - YEAR		3 - YEAR		CASUAL REPAIRS
	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL	PLAN	ACTUAL	
January	9	6	1	1	0	0	0	0	0	0	0	0	4
February	7	6	3	3	0	0	0	0	0	0	0	0	8
March	7	7	1	1	2	2	0	0	0	0	0	0	8
Quarterly Totals	23	19	5	5	2	2	0	0	0	0	0	0	20
April	6	6	0	0	4	4	0	0	1	1	0	0	7
May	7	6	0	0	4	4	0	0	1	1	0	0	9
June	8	7	0	0	2	2	0	0	1	0	0	0	16
Quarterly Totals	21	19	0	0	10	10	0	0	3	3	0	0	32
Half-year Totals	44	38	5	5	12	12	0	0	3	3	0	0	56
July	7	3	3	2	0	0	0	0	1	1	0	0	13
August	7	5	1	1	0	0	0	0	2	2	0	0	9
September	8	2	3	2	0	0	0	0	0	0	0	0	14
Quarterly Totals	22	10	7	5	0	0	0	0	3	3	0	0	36
October	5	5	4	3	0	0	0	0	0	0	1	1	9
November	9	4	1	1	0	0	0	0	2	2	1	1	11
December	9	9	0	0	0	0	0	0	0	0	0	0	12
Quarterly Totals	23	18	5	4	0	0	0	0	2	2	2	2	32
Half-year Totals	45	28	12	9	0	0	0	0	5	5	2	2	68
Annual Totals	89	66	17	14	12	12	0	0	8	8	2	2	120

TABLE 3:
LOCOMOTIVE OPERATION INDICES FOR CLASS U30C LOCOMOTIVES
(JANUARY — DECEMBER 1986)

INDEX MONTH	Total Running Kilometrage	GOODS LOCO KILOMETERS			Passenger Loco Kilometers	Railway Works and others Kilometers	GOODS LOG INDICES			Total Turnround Time (hrs)	Locomotive Availability	Actual Running time (hrs)	Number of Turnrounds	Average Turnround Time	
		Total	Main Loco Km.	Light Loco Km.			Total TON KM. x 10 ⁴	Average Daily Loco Km.	Technical Speed						Average Haulage per loco
January	57148	46933	44452	2481	9485	730	4544.2	350	31.7	1022	3211.7	133.8	1402.7	77.0	41.7
February	65015	55377	51825	3551	9592	46	4216.9	336	35.4	813	3950.4	164.6	1455.3	100.0	39.5
March	70546	59227	55472	3755	11319	—	4457.5	337	33.0	804	4215.7	175.7	1681.5	105.5	40.0
Quarterly	192709	161537	151749	9788	30396	776	13218.6	340	33.4	871	11377.8	474.1	4549.5	282.5	40.3
April	70487	58182	50014	8168	12305	—	4045.8	321	33.3	809	4344.7	181.0	1501.2	99.5	43.7
May	78329	66094	61176	4918	12080	155	4388.1	337	34.2	717	4706.6	196.1	1789.5	115.0	40.9
June	67273	57983	51382	3601	11596	694	3851.5	335	33.6	750	3939.4	164.1	1531.5	104.5	37.7
Quarterly	216089	179259	162572	16687	35981	849	12285.4	331	33.7	756	12990.7	541.2	4822.2	319.0	40.7
Half-yearly	408798	340796	314321	26475	66377	1625	25504.0	336	33.5	811	24368.5	1015.3	4571.7	609.5	40.5
July	77738	65276	63222	2054	12462	—	5426.5	370	33.7	858	4234.5	176.4	1857.0	120.0	35.3
August	64684	54500	51510	2990	9806	378	4766.3	340	32.8	925	3853.0	167.5	1585.0	101.0	38.1
September	64475	54622	52612	2010	9853	—	4690.3	347	32.6	891	3777.0	157.4	1615.0	103.0	36.7
Quarterly	206897	174398	167344	7054	32121	378	14883.1	353	33.0	889	11865.4	494.3	5065.0	324.0	36.6
October	72204	62892	60774	2118	9312	—	5701.0	338	33.7	938	4471.9	186.3	1800.9	114.0	39.2
November	73032	63595	62230	1365	9437	—	5873.0	345	32.0	944	4427.3	184.5	1943.5	112.0	39.5
December	68819	58425	54441	3984	10394	—	4950.2	335	30.3	909	4189.3	174.6	1799.0	108.0	38.8
Quarterly	214055	184912	177445	7467	29143	378	16524.2	339	32.0	931	13088.5	545.4	5543.4	334.0	39.2
Half-yearly	420952	359310	344789	14521	61264	378	31407.3	346	32.5	911	24953.9	1039.7	10608.4	658.0	37.9
Yearly	829750	700106	659110	40996	127641	2003	57911.3	341	33.0	863	49322.4	2055.0	19480.1	1267.5	38.9

9 OF 14

July

511 x

~~ACCIDENTS~~ ^{BEFO} LOCOMOTIVE FAILURES FOR UBOC LOCOMOTIVES.
(From JANUARY - DECEMBER 1986).

TABLE 4.

S/No.	DATE	Loco No.	PLACE OF FAILURE	DESCRIPTION OF FAILURE AND ACTION TAKEN.
1.	13-1-86	1005.	Kimbwe	Turbocharger pressure dropping to zero. Wire no. 88 was loose. Tightened in the workshop.
2.	17-1-86	1007.	Chikola - Idiga	Power reduction. Traction motor No. 2 was found to have a loose pinion. Replaced.
3.	8-1-86	1006	Uyole - Inyala	Locomotive and whole stock capsized due to stock brake failure. Superstructure of the locomotive seriously damaged, now awaiting rehabilitation.
4.	20-1-86	1013	Kapriola	No dynamic braking. This was due to delay in changing from motoring to braking. Cleaned and greased movable contacts on BKT.
5.	23-1-86	1001	Kangaga	#5 Automatic brake valve leaking air. Tightened connections.
6.	25-1-86	1001	Uyole.	Automatic brake valve leaking air. Tightened connections.
7.	28-1-86	1003.	Mbeya Depot.	Derailed during shunting. Rerailed, inspected and released for operation as there were no defects.
8.	13-2-86	1005	Makambako	Fuel filter pipe cracked. Pipe replaced.
9.	3-3-86	1007	Nakonde	Wheel slip relay defective. Relay replaced.
10	5-3-86	1005	Wanging'ombe - Makambako	Crankcase overpressure switch tripped. Cleaned breather pipe.
11	1-4-86	1009	Wanging'ombe - Makambako	Crankcase overpressure switch tripped. Cleaned crankcase breather pipe.
12	14-4-86	1014	Uyole Mbeya Station.	No excitation. Changed ^{Carbon} brushes. Brushes too short.

13.	20-4-86	1002	Kangaya - Kangaya	Hot diode. cleaned low voltage compartment and replaced compartment filters.
14	14-5-86	1011	Mpanga	Reduced excitation. Wheelship buzzer defective. Changed.
15	27-5-86	1009	Kangaya - Wang'ing'ombe	Low water pressure leading to engine shutdown. The train stopped on a gradient. Due to the leakage in the stock brake system the train started rolling backwards. The whole stock capsized and the locomotive derailed. Only the Cowcatcher and brake riggings of the locomotive were damaged. They were reconditioned and locomotive put into service.
16	31-5-86	1003	Kapirila	Low tube oil pressure. Low oil pressure relay tripped. Relay was calibrated and water temperature switch (WTS) replaced.
17	2-6-86	1010	Mbalizi	Brake warning and serious wheelslipping followed by power removal the removal. Pinion on traction motor no. 1 (TM-1) loose. Replaced.
18	7-6-86	1005	Kimbwe - Mpanga	Crankcase overpressure switch tripped. COPS reset and the locomotive continued in operation. Breather pipe cleaned on 10/6/86.
19.	18-6-86	1014	Inyala	No motoring. Motoring to braking configuration failing to pick-up. Cleaned and greased all movable contacts.
20	24-6-86	1009	Kangaya	Low water pressure relay tripped. Expansion tank cap not sealing properly. Reconditioned cap.

21	28-6-86	1002	Msesule	Power reduction. MD Card on the CTEC system defective. Replaced.
22	29-6-86	1009	Chimata	No propulsion. CMV valve piston stuck. Cleaned and greased the piston.
23	7-7-86	1002	Wanging'ombe-Makambalo	Crankcase overpressure switch tripped. Cleaned breather. Cleaned crankcase breather pipe.
24	9-7-86	1009	Mhimba - Lumumbwe	Crankcase overpressure switch tripped. Cleaned breather pipe and changed air filters.
25	12-7-86	1002	Inyala - Uyoale	Low water pressure switch tripped. Power assemblies B3 and B4 leaking. Replaced with reconditioned power assemblies.
26	14-7-86	1011	Kiyowela	Blower motor ceased. Brushholders stuck on commutator due to flushovers. The motor ^{commutator} was reconditioned.
27	27-7-86	1013	Nakonde	No dynamic braking. Cleaned and greased movable contacts on BKT.
28	23-8-86	1009	Mbeya Station	Low water pressure switch tripped due to loose expansion tank cap. Cap replaced.
29	28-8-86	1005	Igurusi	Independent brake brake Valve leaking air. Repaired tightened connections.
30	16-9-86	1005	Kiyowela - Kitandali	Crankcase overpressure switch tripped. Cleaned breather pipe, oil strainer, did compression tests and cleaned air inlet manifolds ports.
31	24-9-86	1010	Mbalizi	No dynamic braking and ground fault. Burnt insulation on high voltage compartment cables connecting to rectifier panel. Reconditioned using rubber insulation instead of the mica insulation.

32	4-10-86	1001	Makongola	High pressure pipe for cylinder no. B2 cracked. Replaced.
33	10-10-86	1011	Makamba	Low pressure fuel pipe cracked. Replaced.
34	11-10-86	1005	Kangaga - Wanginjomba	Crankcase overpressure switch tripped. Checked oil and check COPS.
35	13-10-86	1013	Mbalizi	Turbocharger pressure dropping to zero. On inspection it was found that the casing was found cracked. Turbocharger replaced.
36	2-11-86	1005	Lumbi - Inyala	Crankcase overpressure switch tripped. Changed lube oil.
37	4-11-86	1005	Kangaga	Crankcase overpressure switch tripped. Thorough inspection was conducted and it was found that the prob problem was due to heavy carbon deposits in the inlet ports. Since there is no inlet port cleaner, the power assemblies were replaced with reconditioned ones. Fuel pumps also calibrated.
38	12-11-86	1014	Olyole	No excitation. Burnt low terminals on traction motor No. 6 (TM-6). Machined other terminals and replaced.
39	5-12-86	1012	VIRANA	No dynamic braking. Pigtailes ceased on commutator due to flashovers. Reconditioned commutator and replaced brushes of the two affected traction motor.
40	10-12-86	1014	Mpanga - Kitete	Ground relay tripped. Brushholder spring broken causing short-circuit. Replaced the spring.
41	12-12-86	1012	Nakonde	Crankcase overpressure switch tripped. COPS was reset.

42	13-12-86	1005	Lumba	Ground relay tripped. This was due to flashovers on traction motor no 2 (TM-2). Reconditioned commutator and replaced brushes.
43	15-12-86	1009	Uchindile - Kiyowela	Crankcase overpressure switch tripped. COPS reset.
44	18-12-86	1005	Lumba	Ground relay tripped. This was due to flashovers on traction motor no. 2. Reconditioned commutator and replaced brushes.
45	19-12-86	1005	Uyole	No dynamic braking Flash-Fn due to flashovers on power. Contactors for traction motor no. 2. Cleaned the contactors.
46	25-12-86	1009	Inyala	No dynamic braking. Brushholder for traction motor no. 2 burnt. Cleaned the commutator and replaced brushholder and brushes.

APPENDIX C

REFERENCES/SOURCE DOCUMENTS

1. Mechanical Engineering Department
1986/87 Revised Personnel Establishment.
2. Principal Mechanical Engineering Office.
3. Project Grant Agreement between Tanzania Zambia
Railway Authority and the United States of
America for Regional Transport Development-Dar es
Salaam Corridor Project.
4. Cost and Technical Feasibility Study identified
improvements to the equipment fleet of the TAZARA
railways Dar es Salaam Corridor Project (630-2040)
IQC No. OTR-0000-1-6071-00 Work Order No. 5 and
appendices, May 1987, Parsons Brinckerhoff
International, Inc.
5. Consultancy to prepare a programme of training and
related measures to strengthen the mechanical
engineering department at the Tanzania Zambia
Railway Authority (TAZARA); final report - November,
1986.
6. Tools for Locomotive Maintenance - General
Electric.
7. Service Tools Catalog - non-U30C.
8. Instructions, General Electric (various).

APPENDIX C

9. Overhaul Guide for General Electric Diesel-Electric Road Locomotives.
10. Tool Equipment catalog for running basic shop; TESCO Transportation Equipment Supply Co. 6850 Peach Street, Erie, PA 16509-Chris F. Felte Contact.
11. Report on the performance of U30C locomotives; Ref: Period January-December 1986, issued by TAZARA.
12. Work Study and Job Evaluation Exercise for Commonwealth Secretariat. Commonwealth Fund for Technical Co-operation, September 15, 1987.

EXHIBIT 1A

USAID PROJECT - DAR ES SALAAM CORRIDOR PROJECT
TRIP REPORT DAR ES SALAAM LOCOMOTIVE AND ROLLING STOCK REPAIR
WORKS - OCTOBER 19, 1987 BY J. R. NIELSEN

The shop tour was intended as an initial familiarization of TAZARA's workshops and facilities. The following are nominal observations within the various shops within the short tour-time allowance. Follow-up visits are intended to comprehensively quantify and qualify the observations.

1. The general work pace in the diesel shop was minimal. In the machine/diesel engine and transmission shop's engine teardown and buildup area, I could not positively identify engine(s) in a high state of buildup or readiness for shipment to the engine testing shop.
2. The locomotive shop had significant repair work, i.e., repairing and restoration of the fire-damaged locomotive; however, the work pace and activities were again noted as minimal. It was not apparent that there was an urgency to complete the locomotive repairs as quickly as possible.
3. The wheel and axle shop should be analyzed for layout efficiency and throughput. Nearly all the floor space was occupied with wheelsets. There was no evidence of loading/unloading flatcars or loaded cars awaiting marshalling for movement to Mbeya. I was advised, however, that the wheel truing lathe has been unserviceable, awaiting repairs for an extended period, and had just become operational. Several DE wheelsets were noted awaiting reprofiling.

EXHIBIT 1A

4. There was a noticeable absence of forklift material movement activity within or between the respective shops. In a rail complex the size of Dar es Salaam's, one becomes aware of forklift movements dispatching parts, components, and materials between central stores and the shops. More site observation time is required to confirm the schedule and volumes of material/component moves.
5. During the tour, the overcast sky and rain made the shop interiors relatively dark, especially for precision-type assembly work. In this case, the absence of shop lighting in key assembly/work areas was noted. Footcandle measurements should be taken at various workstations to determine if the lighting levels are within the original design criteria of the buildings or sufficient for complex component assembly operations.
6. The parts/component cleaning areas were checked for work in process. It is suggested that each cleaning station should have its output checked for cleaning effectiveness by a quality control and physical testing laboratory to assure that the cleaning process, chemicals, and cleaned surfaces do not have contaminants being carried into the component rebuilding process.
7. Although the facility tour was a brief walk through, additional observation is warranted to resolve the following impressions and questions.
 - o The work pace seemed extremely slow. There was no perception of urgency in progressing the work. Hence, one gets the impression of production quotas or the shops were awaiting new production schedules.

EXHIBIT 1A

- o Consequently, the impression is the shop is over-staffed, underutilized, or the shop personnel are not being directed to improve their productivity.

Hence the following shop work elements become questions due to lack of time for confirmation.

1. What are the respective shops' workload planning and scheduling tools? Do all artisans, supervisors, and support people know their responsibilities in achieving the required component and locomotive output needs to meet revenue operational requirements?
2. What shop control documents or systems are used to route the components from the point of entry into the workshops to installation on a locomotive?
3. What production manhour reports are used for each shop?
4. What productivity trend indicators are used for each shop?
5. What quality control and production/engineering problem resolution procedures are used to support shop output and standards?
6. What job-expediting controls are used? What procedures are used to schedule people to accommodate production needs? Is there cross utilization of artisans?

EXHIBIT 1A

7. What type of work order, production control system is used to repair shop equipment?
8. What is the utilization of the light repair locomotive shop?
9. What are standard operating procedures for protecting components and assemblies from dust contamination? Are diagnostic lubricant analyses performed on oil samples to determine types and sources of contaminant materials and fluids?
10. Considering the reduction in the number of diesel hydraulic locomotives in the system, are shop or space consolidations practical to centralize the repair operations to minimize the material-handling movement between buildings?

As previously mentioned, an observer tends to raise more questions than can be answered in the tour time allotted. Perhaps the impressions and questions can be quickly resolved by programs that are in place or being implemented by the workshop manager and TAZARA.

In general, the facility appears to have the potential for improved productivity and increased utilization of available space. Furthermore, the locomotive repair operations appear to offer facility consolidation of functions to improve production and productivity while reducing material-handling costs. Space made available from consolidation may be reallocated to other functions.

The chief mechanical engineer's office should, if not already underway, study Dar es Salaam's facility utilization over the next 5- to 10-year planning cycles for potential operational efficiencies through consolidation of shop operations.

USAID PROJECT - DAR ES SALAAM CORRIDOR PROJECT
TRIP REPORT MBEYA WORKSHOPS
OCTOBER 22-23, 1987, BY J. R. NIELSEN

The following notes and comments have been made regarding the Mbeya workshop repair and servicing capabilities for diesel locomotives.

LOCOMOTIVE CLEANING

- (a) A specific area should be designated to wash, rinse, and drip dry a locomotive. The location should be equipped with drip slabs for water and cleaning agent(s) runoff from the locomotives. The location should be used for locomotive exterior, cab, and engine compartment cleaning.
- (b) The cleaning location should be equipped with hot and cold water and steam. Water lines may be suspended hanging or reeled hoses.
- (c) The area should be lighted for night cleaning operations.

WHEELSETS

The single wheelset drop table should be upgraded to change DE wheelsets; minimum drop table capacity 60 tons.

ELECTRIC/ELECTRONICS ROOM

A separate electric/electronics shop area should be provided. This area should ultimately be constructed as a clean room. Serviceable parts should be stored in plastic bags,

especially printed circuit boards. Unservicable cards should similarly be protected to preclude dust or moisture contamination of circuits, chips, or integrated circuit units. Cards should be sent to manufacturer's designated repair shop for testing, repair, and calibration.

PARTS/FILTER CLEANING ROOM

The cleaning room requires upgrading and new cleaning equipment. Hot-water, high-pressure, low-volume equipment should be supplied for nondetergent cleaning of components.

USED OIL DISPOSAL

Used oil should be analyzed for dilution requirements for burning in boiler plant/or retention for conservation purposes for reprocessing into similar or a lower grade lubricant.

SMALL PARTS/COMPONENT CLEANING

Small self-contained agitating fluid tanks are required. The typical cleaning agent is an oil distillate-like mineral spirits.

STORAGE SPACE

Secured storage space is crowded. The wall height appears adequate for a mezzanine-type storage area. A fold-up stairway may be used to gain access to the mezzanine level. The mezzanine level may be at approximately 2.5 meters above the existing floor level. The mezzanine area would provide storage for filters and low-usage protective parts and materials.

CRANE LIGHT REPAIR SHOP

The crane capacity is insufficient (5 tons) for DE locomotives. For complete wheel assembly handling, a 10-ton crane capacity is needed.

SHOP LIGHTING - LIGHT REPAIR TRACK AREA

The footcandle intensities should be reviewed to flood locomotive sides and trucks. Fixtures or receptacles for drop lights should be provided in the pits for under-locomotive inspection.

CRANE CAPACITY - HEAVY REPAIR AREA

Provide the 30-ton overhead crane with a 10-ton auxiliary crane. The two-crane arrangement on the single-bridge system is more efficient for loads in the 10-ton or less range, i.e., traction motors, wheelsets, etc. The 10-ton is faster lifting than the 30-ton and will require less maintenance than on the 30-ton portion of the crane.

PITS

Inspection pits should have a minimum depth of 4 feet below the top of the rail. Pit drains should be provided for cleaning the pits and fluid leaks from locomotives. Compressed air should be provided for cleaning (blowing out dust and grime from traction motors, electrical cabinets) and provide a capability of air source for the vacuuming of residual fluids and dust from the interior spaces of the locomotives.

ENGINE OIL FILTER HANDLING

Containers are required for temporary storage of oil filters to drain before filter disposal. The drained engine oil can be recycled or disposed of. The oil should not drain off onto the ground.

POWER UNIT HANDLING/STORAGE

Dollies should be provided for moving, storing, and repairing power units. Pallets may be used for storage so the power units rest on their mounting flange.

ELECTRONIC/ELECTRICAL COMPONENT TESTING

The electronic/electrical repair area should be isolated from other types of fluid/mechanical testing.

LOCOMOTIVE SAND FILLING

A gravity sand servicing station should be provided for the servicing tracks and should be no closer than 50 feet to the fueling and oiling spot. This sand servicing station could be either a platform parallel to the track and at a suitable height so the locomotive tenders can reach the sand boxes on both ends of the DE locomotive, or a single platform where the driver spots the locomotive for the filling of each sand box.

VENDOR SUPPLIES - MANUALS/INSTRUCTIONS

The vendor's area representative, Krupp and/or GE, should make periodic quality assurance checks to assure all instructions are current in specifications and procedures, illustrated parts catalog, locomotive tooling, and shop equipment catalogs.

ELECTRIC WELDING EQUIPMENT

An electric welding rig such as a 3- to 5-KW 100-volt set should be provided to use as a power supply for rotating traction motor commutator grinding purposes. Vacuum equipment should also be provided for the removal of grinding dust and chips from the traction motor housing.

LOCOMOTIVE BATTERY CHARGING

A nicad-type battery charger is warranted for trickle charge maintenance of a serviceable locomotive battery set.

LOCOMOTIVE WATER TREATMENT ROOM

The recharging rate of the engine-treated water supply requires a capacity check to assure the unit can meet the increased water demand caused by the nearly 150 percent increase in the DE fleet.

SERVICE SHED/STEAM CLEANING

Provisions should be made for providing steam/hot water and air for miscellaneous cleaning of locomotives being serviced for a rapid turnaround for line service, or for augmenting the new locomotive cleaning facility.

The following shop equipment was not observed but may be on the property. The equipment is necessary for either DE fleet:

- o DC welder
- o Oven for large engine assemblies, pinions, and bearings
- o Shot blast-cleaning unit for large units
- o Glass-bead cleaning unit for small and light parts
- o Magnaflux booth

WHEELSET LOGISTICS

The turnaround time for wheel truing must be factored into the spare parts requirements. The wheel truing cycle time of over 3 weeks is unacceptable for the fleet to sustain maximum locomotive availability. The TAZARA mechanical department requires 18 spare wheelsets.

o Need per month	9 to 12	say	12
o Mbeya wheelset assembled	3		3
o Dar es Salaam ready for shipping	3		<u>3</u>
Total Wheelsets			18

With the fleet expansion, this quantity would double for the 17 new locomotives about 2 years after the new locomotives are placed into revenue service.

WHEELSET MAINTENANCE - MBEYA, DAR ES SALAAM

Dar es Salaam equipment engineering should inspect the hydraulic bearing puller-installer equipment used to remove and apply the axle journal bearings, to verify that it has the proper adapter for the type of bearing on the wheelset.

WHEEL LATHE/INFLOOR OR OVERFLOOR - MBEYA

A study should be undertaken to determine procedures to reduce the logistics of wheelset availability for DEs. The 3 or more weeks the locomotive is awaiting wheelsets is an extreme negative on locomotive availability. If the logistics combination of spare wheelsets at Mbeya and quicker turnaround of units at Dar es Salaam do not reduce the 3-week time to one or two days at the most, a wheel lathe at Mbeya is warranted. Assuming one locomotive out of service per month per year, the lost engine revenue hours should more than offset the cost of the wheel lathe.

Prepared by John R. Nielsen, October 26, 1987, Dar es Salaam, Tanzania.

FACILITY REQUIREMENTS PARAMETERS - MBEYA LOCOMOTIVE SHOP

Facility requirements parameters are assumed to be as follows:

Facilities are sized to:

- o Support fleet requirements through 1995
- o Maintain running repairs and inspections on DH2s and DH1s
- o Perform all heavy and light repairs on DEs with forecast assignment of 30 locomotives either same type of locomotives or mixed fleet available from the USA
- o Wheel truing, wheel/axle assembly and disassembly, wheel boring, and axle grinding will be done in Dar es Salaam.

Determination of sizing factors includes:

- o Tours of Dar es Salaam and Mbeya
- o Other consultancy studies.

Facility throughput sizing parameters as follows:

- o Operate one shift per day 5 days a week
- o Casual repairs as required on Saturday and Sunday or as required
- o Storage department to operate one shift per day. Technicians have keys for access to secured areas on an as-needed basis.

Fleet Sizing

The projected fleet size in 1991 is 30 DE locomotives that will be supported by the workshop. The locomotives will be based at Mbeya for assignment to the 2 percent grade portion of the TAZARA route.

Staffing

Staffing for 1991 will be based on a one-shift operation with locomotive servicing and fueling conducted by personnel drawn from the light repair shop.

The total maintenance shop staff is projected to increase by 60 percent if a similar GE/Krupp locomotive is acquired, or 130 percent if a new type of locomotive is acquired.

Locomotive Light Maintenance Conceptual Design Considerations

The locomotive light repair shop will perform two work functions: scheduled and unscheduled engine maintenance and repair. This will include running repairs, inspections up to and including 12- and 24-month inspections, wheel/axle set assemblies, and related support shop activity. There will be no wreck repair, truck replacement, truck rebuilding, or component overhaul since these will be done in the heavy repair shop.

The facility will be the approximately 1,458-meter existing light repair shop with dimensions of 54 meters long and 27 meters wide. There is a two-way flow of locomotives through the repair shop. Temporary storage is provided on the west shop tracks for light repairs and adjustments to operating units.

The light repair area has three tracks with space for three locomotives on each track. Elevated platforms should be provided on each track. The single axle drop table should be upgraded to 125-ton capacity and equipped with body supports. The drop table pit elevating cover should be made operable. Track S7 should remain as a release track. Depressed floor along the inspection pits should be provided. However, the cost of construction and interference to the light repair work needs probably preclude the

EXHIBIT 2

depressed pit for inspecting and making repairs to trucks, braking systems, and other underbody equipment. The inspection pits should be at a depth of 4 feet below the top of rail. The locomotive jackup floor locations should be checked to assure the floor can take the increased floor loading of the 105-ton DE locomotive. The overhead crane should be upgraded to 10 tons to handle wheel/axle assemblies for material-handling purposes. It is estimated that the shop will handle 75 percent of the DE locomotives for inspection and light repairs. The unserviceable rate may vary from 25 percent to 40 percent depending on operating conditions, accidents, parts, and components. With a 30-unit DE fleet, this will range from 7 to 8 units undergoing overhauls and heavy repairs, components and engine changeouts, and truck changeouts. Hence the shop will handle from 5 to 9 locomotives on 4 to 6 spots per day including scheduled maintenance.

<u>Average Time</u>	<u>Average Units/Day</u>
30-day inspection	1
90-day inspection	0.25
180-day inspection	0.13
360-day inspection	0.13
720-day inspection	0.13

This rate will prevail until the shop is defined. Perhaps 20 to 30 additional pages would be required for full definition. The end result is a planning document for the building design engineers and architect.

GENERAL WORKSHOP FACILITIES REQUIREMENTS - MBEYA LOCOMOTIVE SHOP

HEAVY REPAIR AREA

- Equipped with four 30-ton portable jack-screw-type jacks
- Bridge crane to lift diesel engine/main alternator
 - Crane equipped with 30-ton and 5-ton hooks
 - 400-ampere DC welder
 - Holding area located adjacent to heavy maintenance area to store components removed
 - Hydraulic press
 - Drill press
 - Compressed air supply
 - Oven
 - Locomotive load box
 - Overhead and pit lighting

DIESEL ENGINE FACILITIES

- Disassembly area
- Component cleaning
- Component rebuild area
- Assembly area
- Equipment
- Crane to lift diesel engine/alternator assembly
- Shot blast cleaning unit (self-contained)
- Steam cleaning
- Ultrasonic/caustic solution cleaning equipment
- Magnaflux area
- Water tank and air supply to test cylinder assembly
- Deep freezer
- 350-degree oven
- Polishing unit

Turbocharger Repair

- Balancing machine
- Zyglo process equipment

Miscellaneous

- Line bore scope
- Water tank

Others

- Jib cranes
- Work benches
- Cabinets
- Dollies

Electrical Equipment Facilities

Work station space
Two-ton jib crane
Steam cleaner
Component cleaner (grit blaster)
General-purpose industrial lathe
Commutator undercutting attachment
Micrometers
Impedance bridge
Bar-to-bar resistance bridge
Oxygen acetylene torch
Varnish dip tank
Oven to bake varnish on motor and alternator assemblies
Work benches
Torque wrenches
One-contact pyrometer
Bearing and pinion oven

ELECTRONIC FACILITIES

Clean room
Electronic card test kit

MECHANICAL EQUIPMENT FACILITIES

BOGIE

Area to accommodate 4 bogies
Bridge crane 30 tons (lift complete bogie assembly)
Wheelset removal station
Wheelset work area
Truck component cleaning area/steam
Probable welding rig(s)

WHEEL/AXLE AREA

Work area
Storage area
Bearing puller
Bearing overhaul tools including
Jib crane
Wheel truing lathe (Dar es Salaam)
Wheel lifting (1 ton)
Wheelpress (Dar es Salaam)

AIR COMPRESSOR

Work station area
Cylinder boring machine
Hand tools, piston ring compressor, and expander
Work bench for rebuilding of valves and tube pump

RADIATOR AREA

Water tank for leak test
Jib crane 1/2 ton

AIR BRAKE AREA

Work station area
Storage racks
Work bench
Air brake test stand

GENERAL WORKSHOP

100-ton press
Drill press
Buffer/grinder
Hand tools
Storage racks/shelving
Cantilever storage racks.

MACHINE SHOP

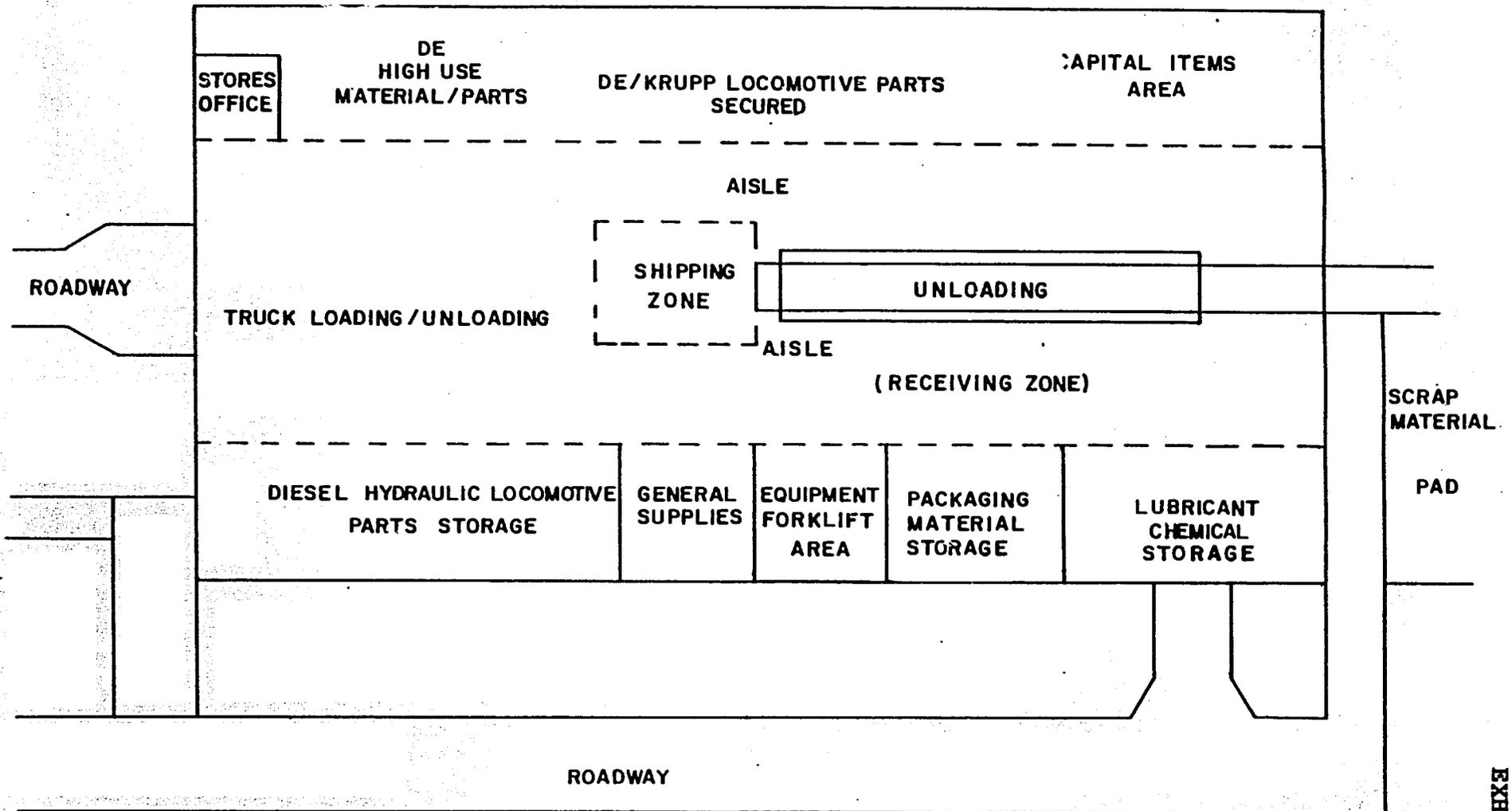
Honing machine
Drill press (heavy duty)
Drill, radial arm
Horizontal band saw
Centering lathe
Milling machine
Boring machine
Disk sander
Heavy duty shaper
Arbor press
Tool grinder
Hydraulic press - 25 tons
Crane/jib crane
Lathe
Blast cleaning machine (grit)
Measuring tools
Vacuum cleaner/wet-dry industrial
Layout table

SHEET METAL AREA

Pipe cutter(s)
Pipe threading dies/cutter
Roller (manual)
Brace (manual)
Storage racks

The design of an expanded heavy/light repair workshop requires additional data such as space allocations, work stations, equipment "footprints," and work in process need to be quantified to determine functional area needs, and utility requirements. Again, the document would be a planning instrument for the preliminary design. Again, note the general type of conceptual design parameters. Specifics are the tools and some shop equipment, primarily fixtures. The number of workstations and work in process needs would be developed for mean time between failure (MTBF) and mean time to repair (MTTR) locomotives and components.

STORAGE AREA ALLOCATION--EXPANDED MBEYA LOCOMOTIVE DEPOT



CRANE COVERAGE SUGGESTED ENTIRE LENGTH OF BUILDING
 CRANE TOP OF RAIL APPROXIMATELY 20'-0 TO ALLOW FUTURE
 MEZZANINE LEVEL IN WEST PORTION OF WAREHOUSE.
 BUILDING 54x27 METERS

EXHIBIT 4

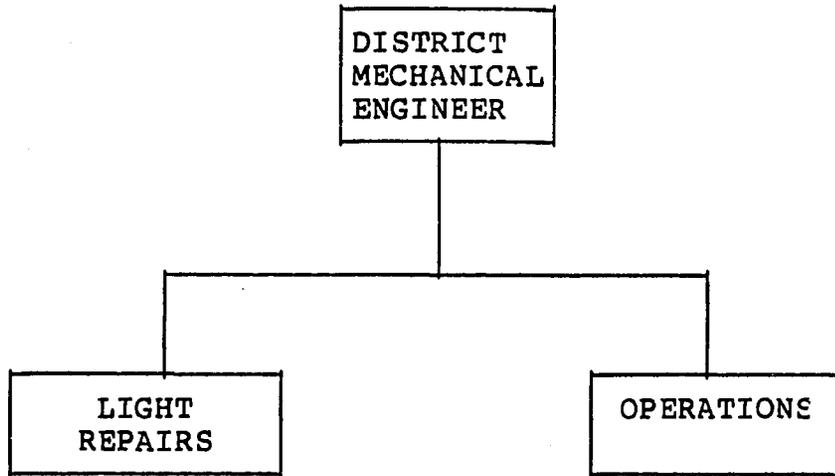
536

EXHIBIT 5**LOCOMOTIVE DIFFERENCE
TECHNICAL TRAINING/SUPPORT COST ESTIMATE SCHEDULE**

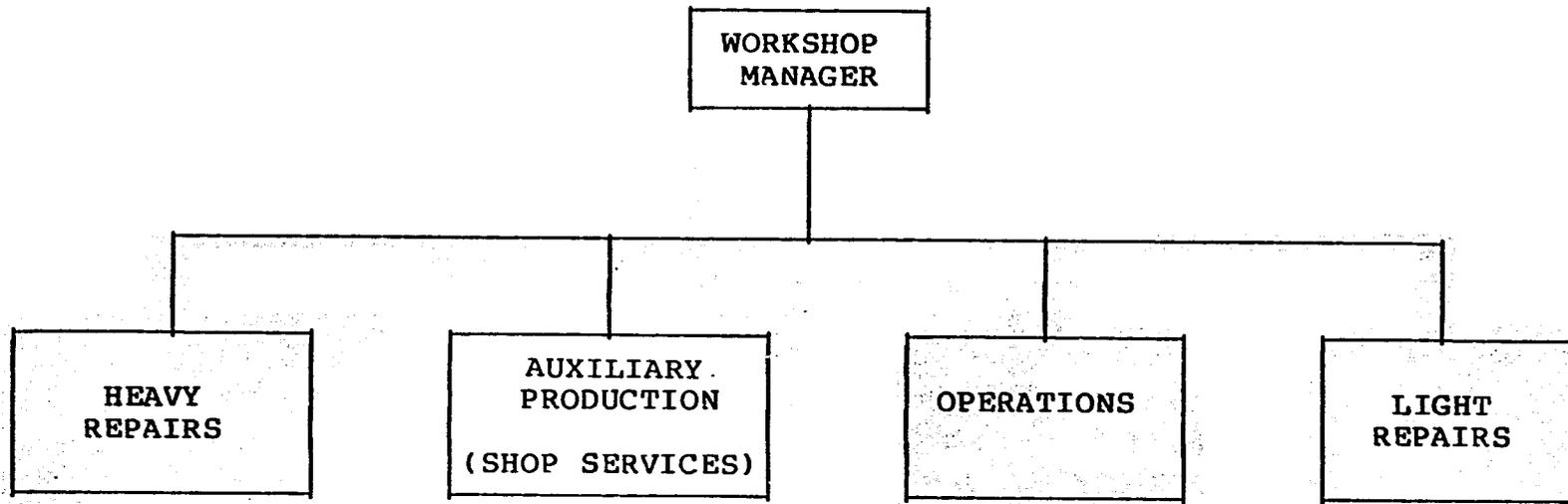
<u>Year</u>	<u>Service Engineering Costs/Engineer/Support Person</u>	<u>Cumulative Total (USD)</u>
1	230,000	230,000
2	240,000	470,000
3	250,000	720,000
4	260,000	980,000
5	270,000	1,250,000
6	280,000	1,530,000
7	290,000	1,820,000
8	300,000	2,120,000
9	310,000	2,430,000
10	320,000	2,750,000

Source: Quotation from General Electric included in
Reference 4 of Appendix C.

EXISTING FUNCTIONAL ORGANIZATION CHART



PROPOSED FUNCTIONAL ORGANIZATION CHART
30-LOCOMOTIVE FLEET (SAME TYPE)



Equipment Repairs
Auxiliary Production
Blacksmith & Welders
Stores/Warehousing

539

PROPOSED FUNCTIONAL ORGANIZATION CHART
TWO DIFFERENT LOCOMOTIVE TYPES
2 CYCLE/4 CYCLE--30 UNITS

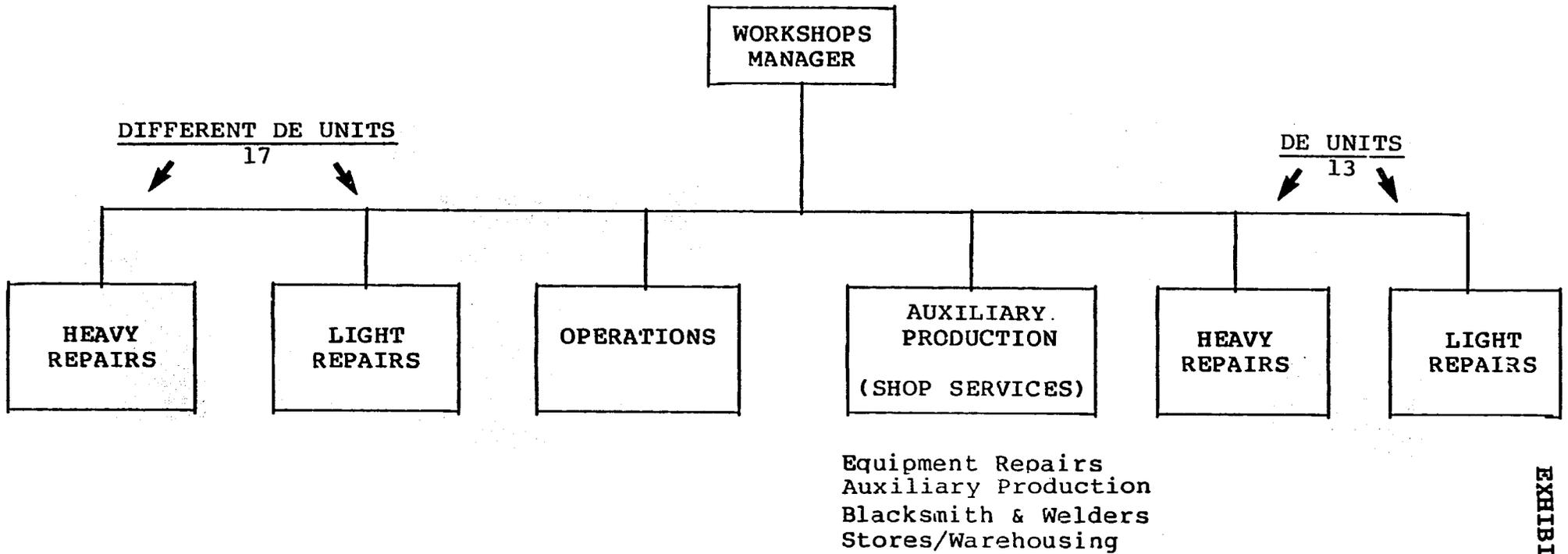
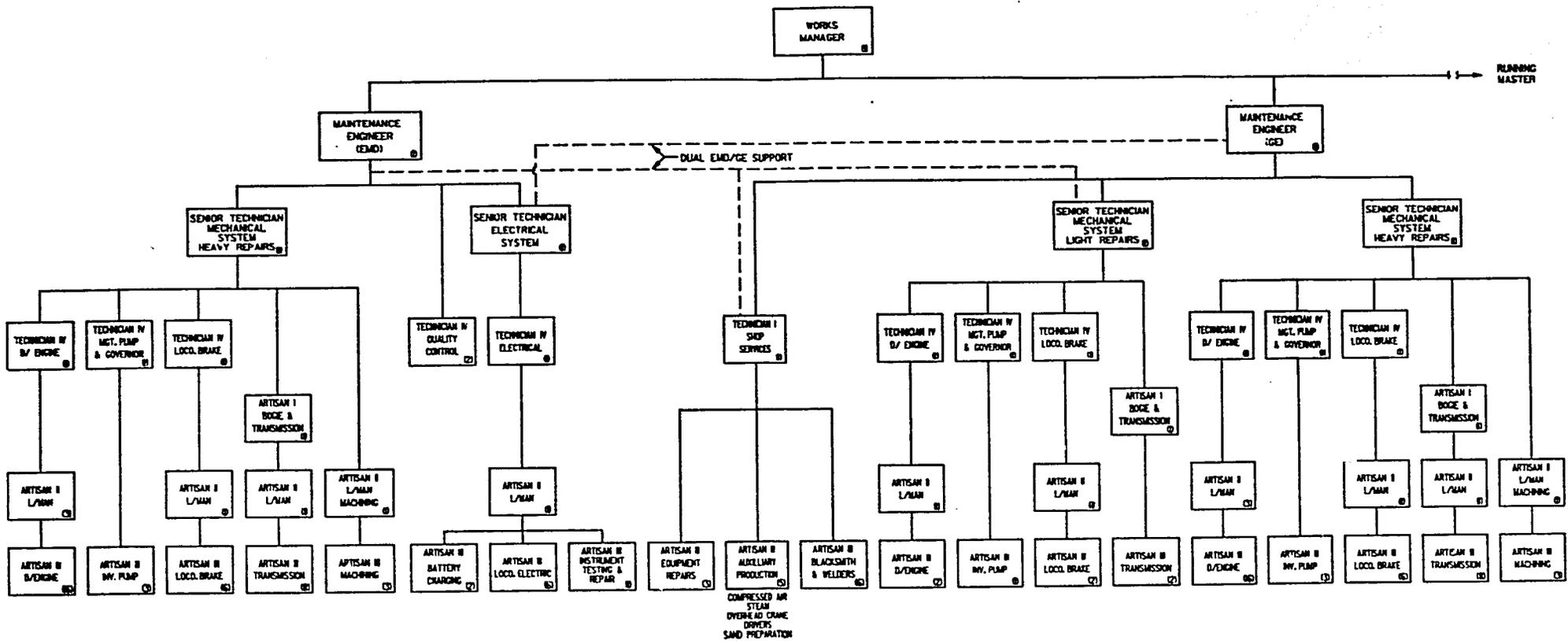


EXHIBIT 6C

045

CONCEPTUAL ORGANIZATIONAL STRUCTURE FOR EMD/GE MBEYA LOCOMOTIVE DEPOT EXCEPT DRIVERS

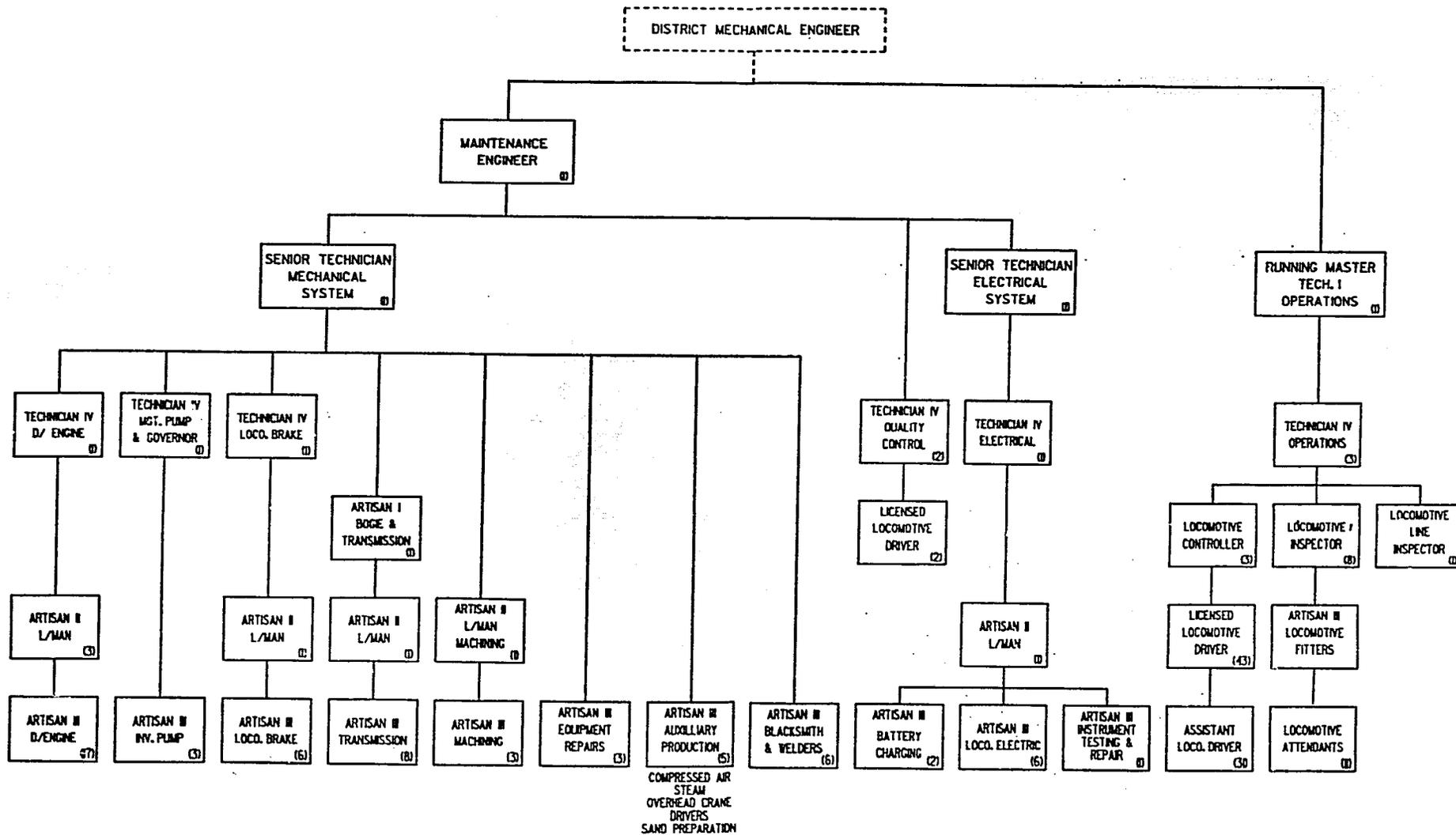
EXHIBIT 6D



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ORGANIZATIONAL STRUCTURE OF MBEYA LOCOMOTIVE DEPOT

OCTOBER, 1987



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