

The opening of the two Road Corridors in Angola

**C H Eriksson
G Möller**

**Department for
Infrastructure and
Economic Cooperation**

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**Sida Evaluation 96/37
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Authors: C H Eriksson G Möller
STT & Transport Consultants AB

The views and interpretations expressed in this report are those of the authors and should not be attributed to the Swedish International Development Cooperation Agency, Sida

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SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
Address: S-105 25 Stockholm, Sweden. Office: Sveavägen 20, Stockholm
Telephone: +46 (0)8-698 50 00. Telefax: +46 (0)8-20 88 64
Telegram: sida stockholm. Telex: 11450 sida sthlm. Postgiro: 1 56 34-9
Homepage: <http://www.sida.se>

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PREFACE

The evaluation team comprised two Consultants to Sida, one Highway Engineer/Team Leader, Mr C-H Eriksson and one Bridge specialist, Mr. G. Möller. The team visited Angola during a three week fact finding mission, 14 April to 4 May 1996.

The views expressed in this evaluation report are the Consultants' and should not be attributed to official positions of the Angola Government or Sida.

The conclusions and recommendations of the evaluation are presented in Sections 4 and 5.

1. BACKGROUND

1.1 The Swedish support to the opening of road corridors in Angola

Requests and approvals

In 1994 the United Nations launched an inter-agency appeal for Angola. In the appeal, the World Food Programme (WFP) asked for support in order to ensure the demining and the rehabilitation of four major road corridors for the delivery of humanitarian assistance. The opening of the roads would enable WFP emergency convoys to reach targeted beneficiaries in remote areas, simultaneously reducing the dependency on costly air transport.

The Government of Sweden responded to the appeal and a joint Sida-SWEDRELIEF reconnaissance team was sent to Angola in May-June 1994.

In June 1994 the Swedish Government, as a first step, decided to engage SWEDRELIEF for a pre-appraisal mission for planning and liaison with UN representatives and NGO's, and as a result a Letter of Intent was signed between WFP-INEA-SWEDRELIEF in September 1994 to be followed by final agreements about responsibilities and cost sharing when the peace process had started and when detailed reconnaissance in what at that time were battle zones, had been carried out.

The signing of the Angolan peace agreement took place in November 1994. Subsequently, as a second step, the Swedish Government, in January 1995, decided to enter into a project aimed at opening the Luanda-Malange and the Benguela-Huambo-Kuito road corridors. An agreement was signed between Sida and SWEDRELIEF in February 1995. The Luanda-Malange road corridor was opened for traffic in September 1995.

Based on a request by WFP, supported by the Angolan Government, the Swedish Government in July 1995 decided to provide additional funds for a continuation of SWEDRELIEF's services related to the opening of the two road corridors. This would secure the opening of the corridor Benguela - Cubal - Huambo - Kuito. The previous agreement only included the preparation of a plan to open this road corridor. Consequently, Sida entered into a new agreement with SWEDRELIEF to participate in the implementation of the required works.

The corridor Benguela-Cubal-Huambo - Kuito was opened for traffic in February 1996.

According to the Lusaka-protocol, peace-keeping UN-troops should be stationed in various parts of Angola (UNAVEM III). The troops have played an important role in the process of road openings in Angola. UNAVEM III and SWEDRELIEF have been cooperating during the planning as well as during the implementation phases of the project.

SWEDRELIEF was placed under the umbrella of WFP. The projects have been executed in close cooperation with WFP and INEA.

1.2 Other funding agencies

In addition to funds from Sweden, the project has been funded by direct contributions by Japan and Norway. The project has received input from the Angolan Government through the organizations INEA and ENP. The inputs have mainly been by the provision of some bridge equipment, the erection of bridges and culverts, and participation in the road repair.

Norwegian People's Aid (NPA) and Halo Trust have been involved in demining activities. Norway has funded part of NPA demining activities.

WFP food donors have participated indirectly through the Food For Work (FFW) programme of the project. The project has relied on the WFP infrastructure and logistic support, also indirectly provided by the support of many different donors.

Various NGO's have supported with food distribution in the FFW programme.

1.3 SWEDRELIEF

SWEDRELIEF is a Government civilian organization under the Supreme Commander-in-Chief of the Swedish Army. The Swedish Parliament has decided that SWEDRELIEF's tasks were to "assist in relief work abroad at times of natural disasters or similar events". SWEDRELIEF's assistance is to be regarded as an extraordinary measure to be carried out over a limited period of time, six months at the most.

Normally a request to use the services of SWEDRELIEF originates from a UN agency with operative responsibility for development assistance. The request is directed to the Swedish Government via the Ministry of Foreign Affairs. SWEDRELIEF is normally financed wholly or partly by Swedish Government funds. For each mission the Swedish Government decides on a sum of money, which is placed at the disposal of SWEDRELIEF via the Swedish International Development Cooperation Agency (Sida).

SWEDRELIEF has access to professionals ready to serve abroad up to six months at short notice. The professionals include experienced administrators, logisticians, bridge and road engineers, i.e. staff qualified to serve in similar projects as discussed in this evaluation. The pool of candidates is updated every second year and seminars are held every year with specialists interested in providing services in projects carried out by SWEDRELIEF.

1.4 Description of the project

The project concerns the two road corridors Luanda-Malange and Benguela-Cubal-Huambo-Kuito. The total distance from Luanda to Malange is 435 km. The length of road sections which was in bad condition is about 310 km, and these sections of roads have to various extent been repaired within the project. The section includes eight bridges, four of them have been completely rebuilt with temporary bridges of Bailey type, two with permanent composite steel/concrete bridges, and two existing bridges have been repaired.

The total distance from Benguela to Kuito, via the southern route passing Cubal, is 510 km. The total road section has to a various extent been repaired or reinstated as part of the project. The section includes ten bridges, nine of them have been rebuilt with temporary bridges of Bailey type, and one existing bridge has been repaired. Some bridges have been replaced, or old culverts reconstructed with large steel pipe culverts (ARMCO type).

SWEDRELIEF played an active and an important role in the coordination and management of the joint WFP-INEA- SWEDRELIEF project. Specialists provided by the organization participated in reconnaissance studies, planning and design of the work, and in the actual implementation of the bridge and road repair works. Mine and ordnance clearing to render safe road -and bridge works, were additional tasks in which SWEDRELIEF staff was involved.

Details of the project, organization and implementation procedures are presented in Section 3.

2. THE EVALUATION

2.1 Introduction

Within Sida the project has been under the administration of the Department for Cooperation with Non-Governmental Organizations and Humanitarian Assistance. The project includes technical and organizational elements which are infrastructure related and normally handled or supervised by INEC, Transport Department of Sida. The purpose of the evaluation is to review the role and the achievements of SWEDRELIEF in this particular project as well as to substantiate whether SWEDRELIEF as an organization, and the methods used are suitable to similar projects or situations in the future. The aim of the SWEDRELIEF organization is to assist in relief work abroad in situations of disasters or similar events. The evaluation shall include comments on the appropriate stage when the respective local or external professional organizations shall take over and continue crash programme repairs or start rehabilitation of roads and bridges of a permanent character.

2.2 Objectives

The objectives of the evaluation is:

- to evaluate the achievements of SWEDRELIEF with the aim of establishing whether SWEDRELIEF and the methods used can be utilized in the future and in what situations
- to study the special role performed by SWEDRELIEF as "pusher" and negotiator when mobilizing Angola's own bridge and road authorities to cooperate with UN and carry out substantial field-works aiming at the opening of roads for relief transports; and
- to assess whether INEA gives priority to and has the capacity to maintain the roads.

The scope of the evaluation is detailed in the Terms of Reference for the evaluation presented in Appendix 2.

2.3 Methodology

Evaluation, approach and methods

The evaluation team comprised two Consultants to Sida, one Highway Engineer/Team Leader, Mr C-H Eriksson and one Bridge specialist, Mr. G. Möller. The team visited Angola during a three week fact finding mission, 14 April to 4 May 1996. The team conducted site visits, interviewed representatives of participating agencies and organizations, as well as other relevant organizations and individuals. The Final Report of the project, minutes of meeting from committees and work groups, planning documents, instructions, manuals and publications, etc., all of relevance to the project were reviewed. Before the departure to Angola a briefing of the project was given by SWEDRELIEF, which also after completion of the visit to Angola, provided additional information, not available in Angola.

A list of organizations and persons interviewed is presented in Appendix 3.

Limitations of the study

Site visits along the two road corridors were included in the planned programme of the evaluation team. Due to unforeseen circumstances, the programme could not be followed as intended. The period of the evaluation in Angola coincided with visits of many high ranked official delegations putting a strain on available air and road transport facilities. Furthermore, the security situation in the Cubal area on the Benguela-Cubal-Huambo road was not particularly good and somewhat unclear.

The road corridor Luanda-Malange was inspected as scheduled, although the trip had to start the first day leaving no time for initial contacts with local organizations in Luanda beforehand. The road from Luanda-Malange was driven in one day, the second day was used for visits and interviews of various organizations in Malange, the third day was used for the return trip to Luanda combined with meetings with organizations in N'Dalatando with the Governor of the province Kwanza Norte, and WFP.

The visit to the Benguela-Cubal-Huambo-Kuito road corridor, had to be restricted to the section Huambo-Kuito and a stretch of about 16 km on the Huambo-Cubal section. Instead of a 4-5 days visit in the area, the trip had to be cut short to a two day trip due to air and road transport problems. It was therefore only possible to conduct one of the planned meetings with relevant authorities in the area, a brief meeting with the Obras Publica's representative in Kuito. ENP's representative in Huambo was met briefly at the airport when departing to Luanda. A meeting with INEA's director for Huambo province was, however, arranged later in Luanda.

Local authorities in Benguela could not be visited due to transport and time limitations. Furthermore, it was not advisable to visit the road Benguela-Cubal because of security reasons. It is, however, considered that adequate information was collected during the road trips, meetings and interviews, and that the unforeseen limitations to the planned programme did not seriously hamper the data collection.

Details of the field visits of the roads and bridges are given in Section 3.

3. FINDINGS

3.1 Results achieved

The goal of opening the two road corridors for WFP transports has been achieved. The roads allow WFP transports to use the roads in accordance with set criteria. The criteria was that the condition of the roads and bridges should enable food relief of trucks up to a total weight of 50 tonnes to drive at an average speed of 30-40 km/h. For instance, truck convoys should be able to cover the section Luanda-Malange in two days, in daylight hours. To meet the set criteria, only repairs of emergency nature were required. The provision of temporary bridges was the most urgent task, followed by the road repair. The construction and repair of bridges as well as the emergency repair and reinstatement of the roads were completed in accordance with the intended schedule.

The road Luanda-N'Dalatando was officially opened for WFP traffic on 1 May 1995, N'Dalatando-Malange was opened in September, 1995.

The road corridor Benguela-Cubal-Humabo-Kuito was opened for WFP traffic in February 1996.

3.2 Project Organization

Management issues

During the execution of the project, three levels of management forums were available:

Technical Committee for road openings in Angola.

The committee, which is still active, includes high level representatives of UNAVEM, the Government of Angola and FAA, UNITA, EU, UCAH, WFP, the Swedish Embassy and SWEDRELIEF. The committee sets the priorities and assembles resources for implementation of actions based on a "Program of support of the Government for the deployment of the peace keeping forces and barracking UNITA military forces".

The committee met every second week. SWEDRELIEF received information and instructions related to the actual projects and provided information on the progress and specific problems encountered.

Management Group

The Management Group was established to deal with matters connected to the project, i.e. the openings of the two road corridors, Luanda-Malange and Benguela-Cubal-Huambo-Kuito.

The Management Group consisted of:

- Deputy Country Director WFP, Angola
- Director General, INEA
- The Director of SWEDRELIEF, Angola, (Chairman).
- Chief Engineer, UNAVEM III

The tasks of the Management Group:

- planning
- coordination of operations
- cooperation with UN agencies, NGO's and Angolan authorities and enterprises

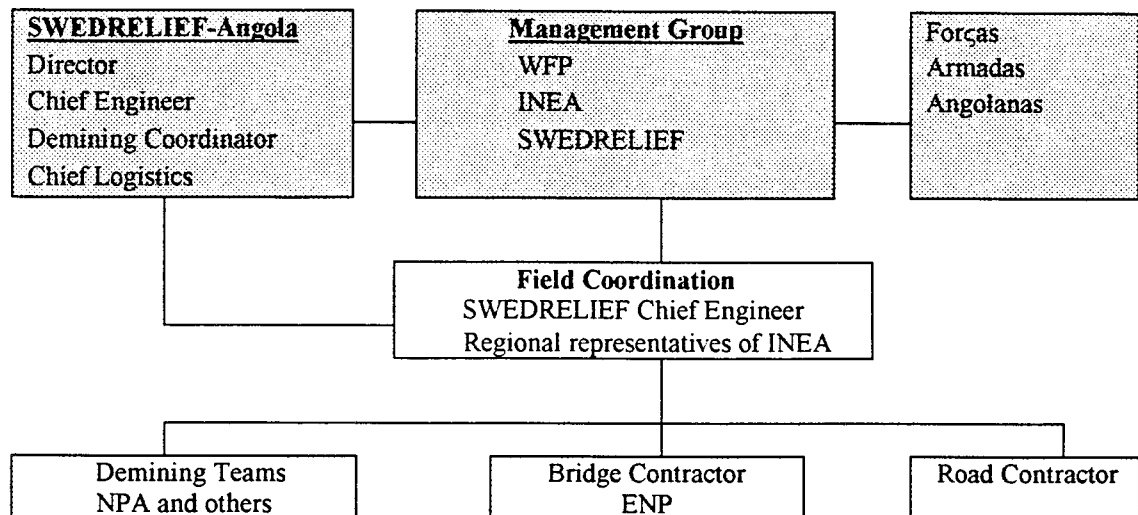
The group had meetings every second week.

Technical Group

The technical support group for the project consisted of:

- SWEDRELIEF, Chief Engineer
- INEA, Technical Director
- ENP, Technical Director
- Representatives of supporting demining organizations

Project Organization



WFP (World Food Programme) or PAM (Programa Alimentação Mundial).

On behalf of United Nation, WFP was the executing agency for the project, and SWEDRELIEF was placed under the umbrella of WFP. The two organizations together acted as the implementation agency. WFP provided efficient logistical services to the project. For instance, service provided by WFP included procurement of bridge materials, air transport of project staff and materials. WFP's representation in major towns in the actual provinces and its members logistic support was valuable during the implementation of the project.

INEA. (*Instituto Nacional de Estradas de Angola*)

INEA is placed under the "Ministério de Obras Publicas e Urbanismo" and is the state organization responsible for the management of state roads and bridges in Angola, except those in towns and municipalities. INEA is headed by a General Director and the organization has departments for studies and planning, construction, maintenance and administration. The construction and maintenance departments are each headed by a Technical Director. The departments include six graduate engineers, and one expatriate engineer.

INEA has local organizations in each province, each theoretically set up with equipment and staff for managing roads and bridges, particularly maintenance operations. At present, none or minimal maintenance activities are carried out due to lack of operational equipment or funds for procurement of fuel or materials for maintenance work. Normally, construction, rehabilitation and periodic maintenance are carried out on contracts by private contractors or the parastatal contractor ENP.

INEA is thus responsible for repair and maintenance of bridges, although these tasks normally are contracted to ENP.

In the project, INEA participated as partner in the WFP-INEA-SWEDRELIEF joint project and as such provided the local contribution to the project. The contribution consisted of the provision of own staff, materials and equipment, and bridge works through contracts with ENP.

INEA was responsible for the contractual arrangements with ENP, including financing. SWEDRELIEF sometimes financially assisted both INEA and ENP with certain facilities when work had come to a stop, due to lack of spareparts and fuel for equipment, or in facilitating transport of materials in order that work could proceed without serious delays.

ENP (Empresa Nacional de Pontes)

ENP is a state owned company which to a large extent is dependent on INEA, 90% of its contracts are made with INEA. ENP like INEA is under the direction of Obras Publicas. A partial privatization of ENP has been under consideration, but in January 1996 it was decided at ministerial level to continue without change, at least for the time being.

ENP is led by a General Director and is organized in three divisions, bridges, roads and administration. Under the General Director, an assistant Director is in charge of all technical matters in the company. The Production Department is headed by two graduate engineers, one for works and one for prefabrication. The Design Department is headed by one graduate engineer who has four other graduate engineers to his assistance as well as other technical staff. ENP has a local organization in most of the provinces in Angola, and the total number of staff is about 875.

In addition to the works for INEA, other works, about 10%, is carried out for other clients such as municipalities and private companies. The municipalities are responsible for bridges and roads within their boundaries. ENP has the capacity and knowledge to construct bridges, harbours and roads. In road construction they are mainly involved in earthworks. ENP does not have plant and equipment to construct bituminous pavements.

Since INEA is responsible for the construction, repair and maintenance of bridges within their jurisdiction, ENP carries out such work only when contracted to do so by INEA. For instance, the removal of old, destroyed bridge parts left in many river streams, will be removed by ENP only by order from INEA. However, ENP has the right to recover material from destroyed bridges which can be used elsewhere in repair or construction.

ENP was the only construction company utilized in the construction of bridges in the two road corridors.

UNAVEM III

UNAVEM III was represented in all committee meetings. Its input in the special management and technical groups established specifically for the project was of great value. Information was provided on the political situation as well as on the progress of demobilization and the establishment of quartering areas. UNAVEM III also carried out and assisted in negotiations to get access to areas controlled by UNITA. At a late stage of the project, UNAVEM established engineering squadrons which provided some assistance to the project.

SWEDRELIEF

SWEDRELIEF occupied a special role as coordinator", pusher", negotiator and manager in the project. It was endorsed by the other joint member organizations, WFP and INEA that the internal cooperation had been very good and successful during the implementation. Apparently, the members in the working groups established excellent and trustful relations and thus managed to employ flexible ways of solving work details and other problems. The organization managed to mobilize and involve INEA in the works without bypassing its normal responsibility and authority to manage road operations in the country. The organization, management and technical groups had to deal with and solve problems of political and technical nature as well as work in a tense and sensitive environment. Clashes between the different fractions could still happen, many areas included in the areas of work were not demined or cleaned of UXO, the Government had difficulties in providing enough operational funds to the local organizations, etc. It is widely accepted that SWEDRELIEF played an important role in the success of the project, particularly in their role as coordinator and "pusher"

3.3 General status of roads and bridges

The corridor Luanda - Malange

General status of the road

Section	Length km	Road width m	Description of road section and condition
Luanda (Viana)-Catete	48	7.0+2x3.0= 13.0m	Terrain: rolling Road surface: bituminous concrete Road condition: very good road Drainage: Erosion damage at culvert wingwalls Average travel speed: 80-100 km/h
Catete-Maria Teresa	65	6.0+2x1.0= 8.0m	Terrain: flat to gentle rolling Road surface: bituminous concrete Road condition: good road, some large potholes need to be repaired Average travel speed: 80 km/h
Maria Teresa-Zenza	13	6.0+2x1.0= 8.0m	Terrain: flat to gentle rolling Road surface: bituminous; surface dressing Road condition: very bad road, with some large potholes which need to be repaired Average travel speed: 33 km/h
Zenza-Dondo	56	6.0+2x1.0= 8.0m	Terrain: gentle rolling Road surface: bituminous; surface dressing Road condition: extremely bad road, with many shallow and large potholes, most of the larger potholes on the section 30 km before Dondo. Some short sections in between the bad ones are in fair to good conditions Average travel speed: 30 km/h
Dondo-Rio Lucala 2	50	6.0+2x1.0= 8.0m	Terrain: rolling Road surface: bituminous; surface dressing/penetration macadam Road Condition: from Dondo-about 20 km in fair condition, remaining part is bad with many shallow and large potholes, some short sections completely broken-up. Average travel speed: 32 km/h
Rio Lucala-2-N'Dalatando	30	6.0+2x1.0= 8.0m	Terrain: rolling, (one steep grade at mid section for about 2 km partly provided with climbing lane). Road surface: bituminous; surface dressing/penetration macadam Road Condition: section in fair to good condition, however interrupted with some large potholes Average travel speed: 46 km/h
N'Dalatando-Rio Lucala 1	37	6.0+2x1.0= 8.0m	Terrain: gentle rolling, Road surface: bituminous; surface dressing/penetration macadam Road Condition: section in fair condition, with many shallow potholes and some larger ones. Average travel speed: 39 km/h
Rio Lucala 1-Cacuso	63	6.0+2x1.0= 8.0m	Terrain: rolling, steep upgrade about 10 km before Cacuso. Road surface: bituminous; surface dressing/penetration macadam Road Condition: in general a bad road with many shallow potholes and some larger ones, particularly one large and risky (18 km before Cacuso), some 5-6 kilometres of sections in fair to good condition. Average travel speed: 56 km/h

Cacuso-Rio Lombe	50	6.0+2x1.0=8.0m	Terrain: gentle rolling Road surface: bituminous; surface dressing/penetration macadam Road Condition: road in fair to good condition interrupted with some bad sections with potholes some large. Some large potholes caused by military bombardment and mine explosions. The existence of these holes have been pointed out in previous reports, but still not repaired. Average travel speed: 61 km/h
Rio Lombe-Malange	23	6.0+2x1.0=8.0m	Terrain: flat to gentle rolling Road surface: bituminous; surface dressing/penetration macadam Road Condition: road in good condition interrupted with a few larger potholes Average travel speed: 63 km/h
Total distance	435		Average travel speed: Luanda-Malange: 43 km/h; average speed Maria-Teresa-Malange: 40 km/h (excl. the first good road section Viana-Maria Teresa)

Note: The division into sections and its distances follows the one used in the project's Final Report although the distances do not necessary correspond to those measured during the mission's site visit.

Comments on the general status of the road:

Existing road standard

The original road has been designed and built to an adequate and high standard. The geometric standard is good, the cross section is adequate, the road alignment is well designed and fits well into the terrain. At one location, a climbing lane is provided which is an indication of proper and careful design. The pavement structure has lasted surprisingly well despite many years of neglected maintenance. If the road had not been built to a high pavement standard, the damage would have been even worse and more frequent. The planned and necessary permanent rehabilitation needs only to concentrate on pavement rehabilitation by bituminous concrete overlays or single or double surface dressings, subsequent to a complete and careful repair of potholes and damaged parts of the road surface. At certain locations, there is a need of replacing the base layer or to provide additional pavement layers. It is also important that the cross section of the road, including shoulders and side drains, is brought back to its original shape and standard.

In general, all road sections are still in need of grass cutting, clearing of road edges and shoulders in order to improve the drainage from the road. It was observed at many places that water was standing on the road, since it could not drain into the side ditches or down the fill slopes. The gravel shoulders are generally in bad shape and condition. They are not in level with the pavement edge, the edges have been damaged, particularly where vehicles avoiding large potholes have gone over the paved edges and out on the shoulders causing damage to the edges and creating deep holes in the shoulders.

Roads suitable for other vehicles than 4WD vehicles

The present standard of the whole road section does not provide safe or comfortable travel with private cars unless they are four wheel driven and otherwise built for tough road conditions. It is possible at least during the dry season to drive on the road with a normal car, although some sections are difficult to pass. During the wet season, it is even more difficult, some sections with bad areas might not be passable with a small car with low ground clearance. It is therefore difficult to give general comments on the possibility to travel the road with other than four wheel driven vehicles. It is thus necessary to obtain actual information on the status of the specific road sections to be covered before starting a trip.

General status of the bridges:

Most of the temporary bridges are built with Compact 100 (C100), and 200 (C200) materials from Mabey and Johnson Ltd. The standard truss arrangements are shown in Appendix 5.

1) Rio Subo.

The bridge is under construction by ENP. It has two continuous spans of 19 metres and consists of a mixed steel-concrete bridge of composite type. The connecting studs have been welded to the steel beams. The precast concrete slabs for the deck had not yet arrived to the bridge site. The slab will rest on twelve steel beams, welded together two by two by short transoms without flanges. The lateral load distribution will thus be taken through the deck slab alone aided by steel bars connected near to the bottom flanges. The continuity over the beams is created by reinforcement and in situ concrete. The design has been done by ENP. The old abutments have been improved and are used in the new bridge. The bridge was planned for completion by the end of February 1996. ENP has problems with procurement of cement: price and the requirement of minimum quantity to be purchased.

The temporary bridge on the bypass presently being used needs to be adjusted in level, and the bridge should be provided with a curb. The bridge is a Russian war bridge type and is not well suited for civilian traffic.

2) Rio Mucoso

The bridge has two spans, 30.5 and 12.2 m and is of type SSR - C200. The bridge was completed in the end of July, 1995, and built by ENP with material from WFP. There are no problems related to the bridge structure itself. The large metal pipe culvert behind the Western abutment is nearly blocked by eroded soil. The culvert ought to be cleaned and at least the inlet should be protected from future erosion by retaining walls. The foundation slab of the abutment close to the culvert is presently being undercut by water flows and must be attended to, probably best by large stones to withstand additional damage.

3) Rio Lucala 2.

The bridge has three spans, each 37.0 metres and is a continuous bridge, type DSR2 - C200. The bridge was inaugurated 1 May 1995 when the road section Luanda-N'Dalatando was officially opened. The bridge was built by ENP with new material which had originally been ordered for another bridge not included in the two corridors studied in this evaluation. Some bridge material was provided by WFP.

The bridge has been opened for traffic although some very serious faults remain to be attended to. The faults are pointed out in a report dated 29 May 1995 by Mr. T.M. Murraay of Mabey & Johnson Ltd, the supplier of the bridge material. Some repair was done in the beginning of August 1995. A new report also by Mabey & Johnson Ltd, dated November 1995, was given to INEA and ENP on 12 December 1995. The bridge is continuous over the piers and the bottom chords have been damaged by deformation at the pier supports. There is a risk that the bridge can collapse without any noticeable forewarning if the fault is not repaired immediately. The two piers each consist of two columns each built with three steel pipes connected at the top by steel I-beams. A steel reinforcement cage has been placed at the top of the steel pipes to form a heavy beam at each pier, which would increase the resistance of the piers to transversal forces caused by the floods. The beams are probably also intended to support hydraulic jacks when lifting the bridge for the necessary correction. The beams should be poured well ahead in time to have the correct strength when the hydraulic jacks will be available, thus shortening the total time for repair.

4) Rio Lucala 1.

The bridge has one span of 57.8 metres and is of type DSR2 - C200. The bridge was opened for traffic 1 September 1995. The bridge is built by ENP with material provided by WFP.

There are no remarks to be made to the bridge structure. Initially the bridge was planned to be built at the site of the destroyed road bridge and as such requiring a much longer bridge. After negotiations with the railway authorities it was accepted to build the bridge at the location of the destroyed railway bridge not far from the road bridge. Thus, the bridge could be reduced in length to one span of 57.8 metres. A new permanent road bridge will be built at the site of the destroyed old road bridge before a new railway bridge may be required. The old bridge parts need to be removed since they are blocking the free water flow. Erosion on the upstream side of one of the embankments needs to be attended to.

5) Rio Lutete.

This is a composite steel-concrete bridge with a span of 11.0 metres. The bridge was completed in mid July, 1995. The bridge has a precast concrete deck and has railings of Bailey bridge material. It was constructed by ENP based on their own design. Old steel material was used in the superstructure. No further remarks on the construction or the status of the bridge.

6) Rio Lombe.

The bridge has two spans each of 30.5 metres and is of type SSRH - C200. The bridge was completed in mid July 1995 by ENP with material provided by WFP. The Eastern abutment is founded on a concrete slab that was poured on top of wet, not well drained soil and the abutment has settled 50 to 100 millimetres since the launching of the bridge. The foundation area has been drained and the soil has now dried out and there seems to be no risk for further settlements. However, there is no risk for damage to the superstructure which consists of two simply supported spans. To improve the situation, either the low end of the bridge should be lifted or the approach adjusted to level with the deck..

The corridor Benguela-Cubal-Huambo-Kuito

General status of the road:

Section	Length (km)	Road width (m)	Description of road section and condition
Benguela-Cubal 1)	160	6.0+2x1.0 = 8.0m	Road Condition: To Catengue bad to very bad road with potholes; from Catengue to Cubal good road with some potholes under rehabilitation by Technostrada. Road surface: Bituminous
Bypass at Cubal 1)	6.3	6.0m	Road condition: Rehabilitated by SWEDRELIEF, fully trafficable Road surface: Earth road
Cubal-Ganda 1)	49	6.0+2x1.0 = 8.0m	Road condition: Partly bad with big potholes, a few vehicle wrecks left; after Capco, a mixed asphalt-laterite road of acceptable character. Road surface: Bituminous
Ganda-Longonjo 1)	100	6-8m	Road condition: Rehabilitated by SWEDRELIEF at some key places, some soft areas outside Catumbela and in the surroundings of Tjindjenje. At dry weather acceptable, and bad to very bad in wet season. Road surface: Laterite road
Longonjo-Huambo 2)	51	6.0+2x1.0 = 8.0m	Road Condition: Acceptable rehabilitated road. Road surface: Bituminous; surface dressing
Huambo-Vila Nova	39	6.0+2x1.0 = 8.0m	Terrain: Gentle rolling Road surface: Bituminous; surface dressing Road Condition: exit from Huambo in very bad condition (6-7 km), some parts gravel, (average speed 30 km/h), the remaining part in fair condition with some sections in good condition, however with many shallow potholes, interrupted by some scattered, large potholes Average travel speed: (whole section), 41 km/h

Vila Nova-Cutato	55	6.0+2x1.0 = 8.0m	Terrain: gentle rolling to rolling, Road surface: bituminous; surface dressing Road Condition: section in fair condition interrupted by some bad sections with many shallow potholes and some scattered, larger ones. At many places the edges of the paved area are badly damaged (where there are large potholes in the centre of the road). Average travel speed: 38-50 km/h
Cutato-Cuchi	34	6.0+2x1.0 = 8.0m	Terrain: rolling Road surface: bituminous; surface dressing Road Condition: a bad road with many potholes and some larger ones. The section was repaired by UNAVEM, but is still in bad condition. Average travel speed: 33 km/h
Cuchi-Kuito	32	6.0+2x1.0 = 8.0m	Terrain: rolling Road surface: bituminous; surface dressing Road Condition: road in fair condition, but with many shallow potholes. Good standard of repair work. Average travel speed: 55 km/h
Total distance	510		Average travel speed: Huambo-Kuito: 43 km/h; (average speed return trip: 50 km/h)

Notes: 1) The road sections were not travelled by the evaluation team, information on the sections are taken from the project's Final Report.
2) Only the first 20 km from Huambo was inspected.

Comments on the general status of the road:

Existing road standard

In general, same comments as to the northern corridor apply. The original road has been designed and built to an adequate and high standard. The geometric standard is good, the cross section is adequate, the road alignment is well designed and fits well into the terrain. The pavement structure on this road has also lasted surprisingly well despite the many years of neglected maintenance. The planned and necessary permanent rehabilitation in this corridor also needs to concentrate on pavement rehabilitation by bituminous concrete overlays or single or double surface dressings, after a complete and careful repair of potholes and damaged parts of the road surface. Similarly, at certain locations, there is a need to replace the base layer or to provide additional pavement layers, and it is important that the cross section of the road, including shoulders and side drains, is brought back to its original shape and standard.

Roads suitable for other vehicles than 4WD vehicles

The present standard of some of the road sections do not provide safe or comfortable travel with private cars unless they are four wheel driven or otherwise built for tough road conditions. However, certain sections, for instance, the Huambo-Kuito and Huambo-Longonjo sections, are possible to drive with a normal car during the dry and wet seasons, although some sections are difficult to pass. The other sections might be difficult to drive with a normal car especially during the wet season. Some sections with bad areas might not be passable with a small car with low ground clearance. It is therefore difficult to give general comments on the possibility to travel the road with other than four wheel driven vehicles. It is thus necessary to obtain actual information on the status of the specific road sections to be covered before starting a trip.

General status of bridges

1) Rio Cunhangamau

The bridge has one span of 33.0 metres and is of type DSR2 - C100. It was built by ENP with old material provided by ENP. The bridge was completed mid June, 1995. Some adjustments should be made; bracings are missing between top chords of panels, and three deck plates are loose.

Parts of the old bridge remain under the new temporary bridge. These parts should be removed as soon as possible to clear the waterway and to avoid the risk of forming a dam at times of high floods.

2) Rio Cutato

The bridge has one span of 36.0 metres and is of type DSR1 - C200. The bridge was completed by end November 1995. Some adjustments should be made; end bracings are missing and should be placed without delay; only three bracing boxes between the top chords, additional should be placed; some bolts between top chord profiles are loose and should be tightened. The road approaches are in bad shape. In the design of the new permanent bridge, the required bridge opening shall be determined by hydraulic calculations. It was noticed that the latest destroyed permanent bridge at a new location had been constructed much longer than the original bridge.

3) Rio Cuchi

The bridge has one span of 21.0 metres and is of type DSR - C100. The bridge was completed in the beginning of December 1995. The bridge was built by ENP with old material provided by ENP:

One U-profile of the top chord is damaged at two locations, about 0.5 m apart, near the quarter span. The damage is not considered to be of a critical nature. Some adjustments should be made; bracings are missing at ends and tops of panels and should be placed without delay; three panels are heavily corroded and should be painted.

4) Rio Cuquema

The bridge has one span of 27.0 metres and is of type SSR - C200. The bridge was completed by mid June 1995. The bridge was constructed by ENP with old bridge material provided by ENP. One deck plate is loose and should be corrected.

5) Other bridges in the road corridor

The other bridges in the road corridor were not inspected due to various reasons; general air and road transport problems as well as security problems in the area between Benguela and Cubal. All the bridges have been constructed by ENP. For the status of these bridges reference is made to the inspection made by SWEDRELIEF in February 1996 and included in the project's Final Report.

3.4 Implementation and method of work

Planning of work

In the planning of the work, SWEDRELIEF played an important role. Reconnaissance of the corridors were made by helicopter at an early stage before the areas were accessible by road. Thus, preliminary plans for the repair and replacement of destroyed bridges could be prepared. Once the areas and bridge sites were accessible by road, and checked for mines and UXO, detailed designs of the bridges were prepared. For some bridge locations, the order of material had to be based on information from the helicopter reconnaissance. In cooperation with the relevant demining organization, plans for demining of the work areas were established.

Similarly, based on reconnaissance trips, plans for road repair were prepared. The evaluation team had access to road reconnaissance data for the road sections Zenza-Dondo-Lucala II. The results of the road reconnaissance inventory were summarized by definition of standard of road, repair requirements in terms of details of work and quantities for the various road sections. Detailed instructions of work priorities and how the works should be carried out were also established together with time plans. The above documentation was prepared in a professional manner and defined the work to be done as well as outlined the organization for carrying out the work.

It is anticipated that the road repair works for the other sections on the Luanda-Malange road, and those for the Benguela-Cutato-Huambo-Kuito were planned in the same professional manner.

Procurement of bridge material

Procurement of bridge material was carried out by WFP in Rome in accordance with its procurement regulations and based on specifications and quantity details provided in September 1994 by SWEDRELIEF. Bridge material of both Bailey and Compact type has since long been used in Angola and compatible material should be procured. The specifications did, however, not specify a particular type or make of bridge material. WFP advertised the requirement of bridge material and asked for tenders from suppliers. Eight companies acquired tender documents, three of them submitted tenders. In mid December 1994, the tenders were evaluated in Rome and Mabey & Johnson Ltd. in UK was selected for the delivery of the bridge material. SWEDRELIEF's Chief Engineer was present during tender opening and evaluation. The bridge material arrived to Luanda in the end of February 1995. One months consulting services was included in the supply contract with Mabey & Johnson Ltd. The value of the contract was about 1 million USD, including one small additional delivery.

Some old Swedish Bailey bridge material was given to Angola and used in the construction of the bridge at Rio Tchicanda in the Central corridor, and for the bridges at Rio Changondo and Rio Conga on the northern route between Benguela-Huambo, and Rio Cune east of Kuito. Some additional details were needed to make the Swedish material complete and was ordered and delivered also by Mabey & Johnson Ltd. The cost for this material, about SEK 50,000, was paid by SWEDRELIEF. However, in accordance with the agreement on cost sharing in the joint project, in which WFP should cover the cost of the bridge material, WFP paid about SEK 450,000 for the freight of the Swedish bailey material.

Through ENP, the Government provided bridge material for a number of temporary bridges in the Central corridor (Rio Catumbela, Cunhangama, Cuchi and Cuquema), and material for the large metal pipe culverts in the Central corridor. ENP also provided bridge material for the temporary bridge at Rio Lucala 2 and for the permanent bridges at Rio Subo and Rio Lutete.

Demining

Available documentation and interviews indicate that the cooperation with the demining organizations have been excellent. It appears that the works in mine and UXO suspected areas have been carried out in a disciplined and safe manner. Demining in the Luanda-Malange corridor has mainly been executed by the Norwegian People's Aid (NPA). They carried out the demining of most of the bridge sites and of certain stretches of roads suspected to contain mines and UXO. NPA also assisted in general in the demolition and handling of unexploded ammunition. FAA assisted with demining of the bridge site at Rio Muchau and at a few other single objects.

Demining of the Benguela-Cubal-Huambo-Kuito corridor has involved several demining organizations. Halo Trust executed the demining at bridge sites Rio Cuquema, Rio Cuchi and Rio Cutato and handled encountered UXO of various kinds. FAA did some demining at the bridge sites West of Huambo. The road from Benguela to Cubal was first demined by Cap Amur (beginning 1995) and then from Catengue to Ganda by Mechem. It is reported that Mechem will continue to verify the sections Ganda to Huambo and to Kuito.

The demining organizations have executed a highly professional and efficient work.

Road Works in the Northern Corridor, Luanda - Malange

Brief description of works carried out:

Section	Period of work	Resources	Work carried out	Remarks
Maria Teresa-Zenza			No work by SWEDRELIEF	
Zenza-Dondo	May-June -95	FFW	Limited grass-cutting, shoulder clearing work by SWEDRELIEF.	
Dondo-Lucala 2	June-Aug. -95	FFW	Grass-cutting, shoulder clearing, and some repair of potholes. 6 km section from Dondo	
Lucala 2-N'Dalatando	end March-mid August	FFW, 2 groups of 25 people, in total 50 people, each group with 2 foremen	Grass-cutting, shoulder clearing and repair of potholes. 11 km demining by NFA incl. grass-cutting and shoulder clearing	Potholes partly filled with material originating from old clay bricks.
N'Dalatando-Lucala 1	mid March-mid August	FFW, 2 groups of 25 people, in total 50 people, each group with 2 foremen	Grass-cutting, shoulder clearing and repair of potholes.	Potholes mainly repaired with emulsion and crushed stones on top of best available natural material (laterite). Emulsion transported by air to N'Dalatando.
Lucala 1-Rio Lutete	mid June-mid August -95	FFW, 1 group of 50 people with 2 foremen	Grass-cutting and shoulder clearing	
Rio Lutete-Malange	July-mid August-95	FFW, 1 group of 50 people with 2 foremen	Grass-cutting, shoulder clearing and repair of potholes	Potholes repaired with emulsion

Comments on road works:

Work carried out

In the beginning of the project, INEA already had advanced plans of full rehabilitation of the road from Maria-Teresa to Malange. Therefore, most of the works were concentrated to grass-cutting and shoulder clearing, and repair of the worst and largest potholes. However, as can be seen in the summary above, pothole repairs were carried out on certain sections.

Work procedure and methods

The outlined method of work for pothole repair included marking the area for repair; cleaning the hole; filling the hole layer by layer (100 mm) with best available material, and water and compact by hand-tamper to final level somewhat higher than existing surface level. When emulsion and crushed stones were used, the upper layer (100-200 mm) consisted of crushed stones and emulsion, and to finish off, the repaired area was covered with a thin layer of sand to absorb excess bitumen. When available, a manually operated vibrator plate was used to achieve better compaction, particularly when emulsion and crushed stones were used. Emulsion and stones were only used in the repair of sections N'Dalatando-Lucala 1 and Rio Lutete-Malange.

Results

During the site inspection of the roads, it was impossible to establish which potholes had developed since the repair and which had been repaired but subsequently not lasted due to the heavy rains and traffic by heavy vehicles. It was, however, observed that many sections were in poor condition and badly in need of repair. The road was said to be much worse now than it was when the emergency repairs were completed and the road opened to traffic. Since the repair, almost no further repair has been carried out, and Contractors engaged by INEA to repair and/or rehabilitate the road sections have not yet produced any noticeable results.

The methods applied are considered appropriate taken into consideration the purpose of the repair, i.e. to enable WFP transports of food relief on the road in accordance with set criteria. Furthermore, time and resource limitations made it impossible to search for better materials to fill the holes or to secure additional supplies of emulsion and crushed stones. It is obvious, that a proper and final repair of potholes on a paved road shall include the repair with bituminous material, thus providing a complete bituminous paved surface. The use of natural material such as laterite must be considered an emergency and temporary measure.

It was, however, observed that the repair of the potholes may not always have been repaired in accordance with given instructions or in accordance with normal practise. The final result of the pothole repair indicated that the holes may not have been cut straight or square in shape but circular. Furthermore, at many locations the surface of the repair was unnecessary high, much higher than existing road surface. The reasons may be related to lack of strict supervision or lack of knowledge and experience in pothole repair procedures. The lack of supervision may be explained by shortage of enough supervisory staff, and the incorrect or poor repair by inexperienced staff.

Road works in the Central Corridor, Benguela-Cubal Huambo-Kuito.*Brief description of works carried out:*

Section	Period of work	Resources	Work carried out	Remarks
Benguela-Catengue			No work by SWEDRELIEF	Rehabilitation by INEA
Catengue-Cubal			No work by SWEDRELIEF	Rehabilitation by Technostrada
The bypass at Cubal	Feb.-96	Work carried out by hired equipment	Rehabilitated by SWEDRELIEF	
Cubal-Ganda	Feb.-96	FFW, 1 group of 50 people working from Ganda towards Cubal about 10 km.	Grass-cutting, shoulder clearing; stopped due to mine problem. UNAVEM removal of wrecks on request by SWEDRELIEF.	
Ganda-Longonjo	Feb. -96	Hired equipment and operators from Lugomaco, 2 graders, front-end loaders, and roller plus FFW 1 team of 50 people	Rehabilitation by grader, and compaction equip. in 4 areas. Repair of potholes in certain areas and grass-cutting	
Longonjo-Huambo	Sept.-Dec. -95	FFW, 2 groups of 50 people, in total 100 people, each group with 2 foremen	Grass-cutting, shoulder clearing and repair of potholes with laterite, emulsion and crushed stones over sections totally of about 6 km	

Huambo- Vila Nova	mid Oct.-Dec.-95	FFW. 1 team of 50 people with 3 foremen working from Huambo in direction Vila Nova	Grass-cutting and shoulder clearing. repair of potholes with selected laterite material, with emulsion and crushed stones. only over the first 2 km	
Vila Nova Area-	Jan-Feb.-96	FFW. 1 group of 50 people with 2 foremen	Grass-cutting, shoulder clearing and repair of potholes with selected laterite material	The whole section was not completed due to problem in contracting people to work on normal pay conditions (about 20 km was completed)
Chinguar Area (to Cutato)	Oct.-Dec.-95	FFW, 1 team of 50 people (3 foremen), working in direction Kuito	Grass-cutting, shoulder clearing and repair of potholes with selected laterite material	
Kuito Area	Oct.-95-Feb.-96	FFW. 2 team of 50 people (3 foremen), working in direction Chinguar (to Cuchi) 1 team during 96	Grass-cutting, shoulder clearing and repair of potholes with selected laterite material	
Rio Cutato-Rio Cuchi	February -96	UNAVEM. Indian Engineering Squadron plus FFW 1 team of 50 people	Shoulder clearing, pothole repair, partly the road was graded, i.e. the badly damaged road bituminous surface was broken up and transformed into a gravel road.	

Comments on road works:

Work carried out

In general, the condition of the road sections travelled during the site visit is better than in the Northern corridor, Luanda-Malange. There are several reasons for that: the repairs in the Northern corridor were completed about half a year earlier and have been open for traffic longer than the Central corridor; better material might have been available and used in the repair work, and "lessons learned" from the repair in the Northern corridor have been applied. Trucks were rented to transport people and to carry materials from gravel pits. It is likely that more selected material was used in the repair work in the Central corridor, which was not always the case in the Northern corridor.

Work procedure and methods

In principle, the same procedures and work methods as for the Northern corridor were applied, except that better materials were available and used in the repair.

Results

At several locations it was observed that the use of laterite as filling in potholes without emulsion and crushed stones has been successful. The repair has stayed intact and become very hard. This is probably due to the better quality of laterite with correct grading, plasticity and strength. It was also noticed that the exposed base layer in the pothole was of good quality, which is an indication of availability of good material in the area. Since materials from old gravel pits were used in the repair it is likely that suitable materials were extracted.

Unfortunately, the pothole repair had to be carried out during wet weather conditions which was not the best solution. Furthermore, to obtain a good result it is important that the laterite repairs are left to dry for some time, about three days before traffic is allowed on the repair area. This was also difficult to arrange.

Bridge Works

Not all bridge sites were accessible by road at the planning stage, due to political reasons and uncertainties on the mine and UXO situation. By consultation of old documents and by helicopter reconnaissance preliminary designs were made in order that bridge material could be ordered without delay. Since the orders were based on preliminary designs, changes had to be expected during construction. Being bridges of Bailey type, smaller changes in span length could easily be made once detailed surveys had been carried out at the sites. Only at Rio Lucala 1, there was a major change to the preliminary design since the location was moved to a new site (the railway bridge site) which required a much shorter bridge, thus a simpler and cheaper solution. Excess bridge material from the original order could be used for other bridges.

All new bridge material delivered through WFP was Compact bridge material by Mabey & Johnson Ltd. This type of material has been delivered to Angola by Mabey & Johnson Ltd. since 1982-83 and due to compatibility with existing material it was advantageous to use same type of material.

The new bridges have been designed for the AASHTO H25 loading and the bridges in the two corridors have been approved for 50 tonnes vehicles. However, a reservation should be made concerning the acceptable loading on the bridge at Lucala 2 in its present condition. The free width of the bridges is 4.2 metres between curbs. The permanent bridges with concrete decks are about 8.0 metres wide.

The bridges have mainly been built using the old abutments and piers whenever possible and after necessary repair. The old, destroyed superstructures have at many places been left in the rivers, at some locations in the Central corridor whole superstructures have been left tilted and obstructing the water flow in the river under the new bridges. At these locations dams can easily be formed during heavy floods causing risks of damage to the superstructures, piers and abutments. These old structure parts should be removed as soon as possible before any damage is caused to the new bridges.

In many technical meetings it has been agreed to place "sleeping policemen" at each bridge site in order to reduce the speed of traffic passing over the bridge. ENP is prepared to install the devices if and when contracted to do so by INEA.

The construction of the new permanent bridges can in most cases be made next to the original bridge sites. The road alignments can easily be adjusted by small alterations to the new sites since there are no obstructions to such adjustments. The new permanent bridge at Rio Lucala 1 can be built at the original site of the road bridge after repair and reconstruction of the original substructure parts. The bridge at Cubal can be built at its original site. Not all bridges were visited, but it is anticipated that no specific problems exist with the future construction of permanent bridges which are caused or related to the selection of sites of the temporary bridges. Using the temporary bridges during the construction of the permanent ones, no special bypasses will be required. It is anticipated that in the design of the new bridges, proper hydraulic studies are made to check the opening areas required and decide on number and length on spans.

All bridges have been built by ENP which has formed special construction brigades, each brigade led by an experienced foreman. The construction site has been intermittently supervised by one of the ENP's bridge engineers. When contracted by INEA, normally one bridge engineer from INEA is appointed to supervise and approve the works by ENP on behalf of the client. This supervision is also carried out on an intermittent basis.

Some faults were observed in ENP's works at the inspected bridges. Some have been corrected, others can easily be corrected, and others cannot be corrected. The faults that should be corrected are pointed out under Section 3.3 under description of general status of the bridges.

The transition approaches to the bridge decks should generally be improved. Apparently, due to lack of time or other reasons, these details were not properly executed.

Taking into consideration the conditions under which the bridges were built, the bridges have in general been built to a good standard.

SWEDRELIEF staffing

The following Swedish staff was engaged in the project:

Name	Position/task	Phase 1 Planning	Phase 2 Luanda- Malange	Phase 3 Benguela- Kuito	Phase 3 Benguela- Kuito	Total Man- Months
		Period 1/1-31/12 1994	Period 1/1-31/12 1995	Period 1/9-31/12 1995	Period 1/1-1/3 1996	
L Windmar	Manager	3	8	4	2	17
P-A Carlsson	Administration	2				2
J Stening	Chief Engineer	2	5			7
T Andersen	Mine Expert	2	2			4
K Andersson.	Tech. Service	4	7	1		12
G Engström	Relief Service	1	3			4
T Andersson	Chief Engineer		6			6
T Göransson	Chief Logistics		7	4	2	13
L Persson	Mine Expert		5			5
A Ceder	Engineer		2			2
B Lindstöm	Engineer		1	3		4
H Bergman	Engineer		1	4	2	7
L Olsson	Chief Engineer			4		4
J-O Widar	Engineer			3		3
M Wänseth						2
Total		14	49	23	6	92

Note: Out of the total of 92 man months 4 months have actually been used in the MSL project, thus the actual man months spent on the project is 88.

It can be seen that SWEDRELIEF engaged many experts on short term assignments and a frequent shift of staff. This might have been unfortunate for the project and may be due to various reasons, such as uncertainty of extension of the contract to include phase 2, difficulties in recruiting suitable and qualified staff on short notice, a restricted resource base, etc. The possibility to extend the resource base should be considered.

3.5 Road and bridge maintenance

General

Proper road and bridge maintenance in Angola has not been carried out since many years due to the political unrest and war situation in the country. Despite the lack of maintenance, the project roads have lasted surprisingly well, with the exception of direct physical damage caused by mine and bomb explosions and burned vehicles. One reason is that the roads were once built to a high standard. Not only the pavement, but also the geometric and drainage standards are generally high.

Another reason might be that the roads when they were cut off had carried only a portion of the traffic they were designed for. After the problems started, almost no traffic has been carried on the road. The original cross section is adequate to carry medium to high traffic volumes. The road alignment is well designed and does not require any improvements in connection with a complete rehabilitation. Only the pavement structure needs a complete rehabilitation on most sections.

Despite the originally good pavement standard, the bituminous surface layers have suffered severe damage. A bituminous layer needs some traffic to stay elastic, otherwise it is likely to crack. Generally the potholes are shallow, the base layer has disappeared but not always the subbase layer. This is particularly the situation on road sections with base layers of macadam, while on sections with base layers of natural gravel material, the potholes are deeper. The natural gravel is generally of lateritic origin. Potholes have developed due to water penetrating into the pavement through cracks in the bituminous surface layers since water draining off the road into the side drains is hindered by vegetation and debris at the road edges. Furthermore, the side drains were covered by vegetation and bushes which have not regularly been cleared away.

When the project started, the project documentation describes some sections on the Luanda-Malange road to have been almost completely overgrown by vegetation only leaving the middle section open for traffic. Vegetation had penetrated through the paved layer at the road edges. Large holes were caused by bomb and mine explosions, and also by water erosions which had been unattended to and become larger and larger by the time.

The emergency maintenance carried out during the project was never meant to be a complete repair of all potholes but to repair the most urgent ones so that the roads were passable, although at a low service level. In the project's Final Report it is clearly stated that the emergency repair must be followed by a more systematic road repair, and thereafter annual routine maintenance operations must be organized. It is recognized that most of road sections require rehabilitation of a various degree. All sections need at least a new bituminous cover, for instance, a single surface dressing, other sections may need a double surface dressing or an overlay of bituminous concrete.

Present maintenance

INEA's possibility to carry out road and bridge maintenance on the project's roads at a proper level is at present almost non-existent. They will at best manage to keep the roads trafficable, not to a good standard but more in line with the standard set for the emergency repair. The reason for the poor maintenance prospects is said to be lack of funds.

An outlined organization for routine road maintenance which is set up on labour based methods is attached to the project's Final Report. The maintenance could be coordinated with WFP and organized as a "Food for Work" programme. The tools handed over to INEA by SWEDRELIEF would then be useful. It is, however, said that the problem is lack of funds to make INEA's own maintenance brigades operational. The teams cannot operate due to lack of money to buy materials, spareparts, vehicles and fuel. INEA's provincial organizations have programmes prepared and the necessary staff to carry out the required maintenance. For instance, the Director of INEA, Huambo province, has requested maintenance funds based on a programme of repair of the most urgent roads in the province. It is, however, not likely that money for the programme can be made available as requested.

INEA is responsible for the maintenance of all bridges in the country. At present, no bridge maintenance is carried out by its own organization. Necessary maintenance work is ordered from ENP. At present almost no general bridge maintenance is carried out.

The bridges at Rio Lucala 1 and Rio Lucala 2 are specifically checked every two weeks by two engineers, one from INEA and one from ENP. This is because of the particular problems at those bridges.

If anything will have to be attended to, INEA gives an order to ENP to carry out the work to be done. However, in emergency situations, for instance if a bridge has been hit and damaged by a vehicle, ENP will immediately repair the damage, even without an order by INEA.

UNAVEM III has now established own capacity to carry out bridge and road repairs. The organization has three engineering squadrons; a Brazilian in the Northern region; the Indian in the Central region, and the Bangladesh in the Southern region. In addition, there are two bridge units, one from South Korea in the Huambo area and one from Ukraine in the Malange area. The unit from Ukraine has floating bridge equipment and the one from South Korea has M2 Bailey bridge material. UNAVEM III has access to road maintenance equipment through their squadrons and can assist in keeping the two road corridors open.

Future maintenance

Immediate plans

Some of the short term needs of road and bridge maintenance are covered by the following projects:

Luanda-Malange Road

Plans for Road and Bridge Maintenance and Rehabilitation:

Road Section	Length	Contracted to:	Contract period	Type of Works	Contract value	Planned start **
Maria Teresa-Dondo	71 km	Paviterra	6 months	Emergency repair of potholes, grass- and drainage cleaning	MUSD 1.847	started
Maria Teresa-Dondo	71 km	Paviterra	18 months	Rehabilitation	N/A	June -96 ?
Dondo-N'Dalatando *	76 km	Somec and/or Tervia		Emergency Repair	N/A	May -96
N'Dalatando-Malange *	162 km	Tervia and/or Somec	22 months	Rehabilitation	MUSD 10.0	May -96 ?
Part of section Dondo-N'Dalatando	14 km	Somec		Emergency Repair	N/A	Started Feb.-96, stopped

* Negotiations are ongoing between the Contractors regarding a joint venture operation

** Starting date depends on when funds are made available

Benguela-Cubal Huambo Kuito Road

Plans for Road and Bridge Maintenance and Rehabilitation:

Road Section	Length	Contracted to:	Contract period	Type of Works	Contract value	Planned start
Benguela-Catenque-Cubal	160 km	Technostrada	6 months	Emergency repair of potholes, grass- and drainage cleaning	USD 800 000	Ongoing

Costs:

Some approximate cost figures for maintenance, rehabilitation and construction of roads provided by INEA:

- | | |
|---|------------------------|
| • Periodic Maintenance (every 5-10 years) | 10 000-20 000 USD/km |
| • Rehabilitation | 150 000-180 000 USD/km |
| • New construction | 300 000-800 000 USD/km |
| • Routine maintenance | not available |

The cost of the country's need to rehabilitate about 3 400 km of roads including bridges has been estimated to USD 240 million, of which USD 4 million have been received and used to date.

Maintenance Study

A Maintenance Study has been made by the consultants Provia, Consultores de Engenharia, Lda., and Colquhoun in association with DMJM International (Oct.-95-April -96). The study, which is financed by the World bank, comprises four main subjects:

- Education and training, all staff. (Training of high level management staff in Portugal or in Brazil).
- Economic analysis of selected roads (by the use of HDM) which will result in a rehabilitation programme. A total of 2 000 km is envisaged; at present, 190 km is being designed and a further 200-300 km will be selected for detailed design out of the 700 km identified to date of the 2 000 km.
- Maintenance policies and organization, activity, capacity and resource determinations of maintenance work.
- Establishment of a road data bank.

The study has recently been received by INEA but has yet not been approved for implementation. It is not known if the maintenance study also deals with bridge maintenance.

The Government has approved the establishment of a special road fund which will be used to cover maintenance and rehabilitation works. The use of the fund is not yet implemented, but planned to be so during 1996. The fund will be built up by the collection of different types of revenues, taxes, bridge tolls, etc. and charged to the road users. The majority of the funds will come from fuel taxes.

3.6 Socio-economic and humanitarian impacts

General

The program of support to the Government of Angola for the deployment of the peace keeping forces and barracking UNITA military forces, states under the objective of organization and maintenance of peace process and free circulation of persons and goods, that "the openings of roads, will assume a great deal of impact, because of the improvement of economic and social development of the country, and will answer one of the first priorities in the Lusaka protocol".

Positive effects by the opening of the road corridors.

- ***A better future***
The opening of the road corridors has showed that something positive happens and has led to changes in peoples' minds including hopes for a lasting peace and a better future. Politically the opening of the corridors has played an important role.
- ***Reduction in WFP transport costs when shifting from air to road transports.***
The WFP food relief transports in Angola started in mid 1993 and have been extensive and included the worlds largest air lift. At one time food relief quantities distributed by air reached a maximum of 12,000 tonnes/month.

Food transports to Malange only, exceeded 2,000 tonnes during some months. WFP successfully shifted its logistical support from 75% air transport and 25% road transport in early 1995 to 20% air and 80% road by beginning of 1996. The increased use of road transport over air transport has lowered the transport and handling costs considerably. Based on figures from WFP on food relief quantities transported on the actual roads since the roads were opened, the following estimates have been made:

Transport savings on the Luanda-Malange road (savings estimated at 95 USD/tonnes):

Year	Quantities (tonnes)	Total USD
1995	13,500	1,282,500
1996*	3,100	295,500
Total 1995-96	16,600	1,577,000

* up to mid 1996

Transport savings on the Benguela Cubal-Huambo-Kuito road (savings estimated at 80 USD tonnes):

Year	Quantities (tonnes)	Total USD
1995	16,250	1,300,000
1996*	5,750	460,000
Total 1995-96	22,000	1,760,000

* up to mid 1996

The total saving, both road corridors 1995 to April -96, is about USD 3,3 million.

- ***Phasing out of general distributions of WFP food supply.***

Due to increasing improvements in the food security and nutritional situations in many areas, it has been possible to eliminate general dry food distributions in several key areas. The opening of the roads has contributed by making it possible for displaced people to return home and start farming. The savings by the reduction in the cost of food itself is also considerable. For food operations in 1995, WFP, only, sourced and delivered 120,000 tonnes of food aid, for a monthly average of 10,000 tonnes, with a total annual value of about USD 28 million. In addition, other international organizations were also able to save considerable sums in costs of food supply.

- ***Emergency support can be given to new groups of people, previously beyond reach.***

The opening of the roads made it possible to reach areas which were not reached before. For instance, the opening of the road to N'Dalatando made it possible to reach areas North of N'Dalatando, towards Negage by road.

- ***The peace process is supported by enabling UNAVEM III to place troops and establish connections to quartering areas.***

The program of support of the Government of Angola for the deployment of the peace keeping forces and barracking UNITA military forces supports the importance of UNAVEM having access to road transports. The opening of the road corridors is of utmost importance to UNAVEM III peace keeping operations including the supervision of the access to roads for free transport of people and goods, which is one of the cornerstones of the Lusaka Agreement.

- ***Return by displaced persons to villages; start of food production and market activities.***

It was confirmed by many organizations that displaced populations are returning home at an increasing rate. Small rural markets are starting to operate along the roads where no activities were found only months ago. WFP and other international organizations, and international and national NGO's are supporting the return home of displaced persons. There are presently many resettlement and rehabilitation schemes in operation sponsored both by the Government and relief organizations.

For instance, when the team visited Malange, the provincial vice Governors had the same day inaugurated a resettlement of a community near Malange. The returnees were refugees from Luanda.

- ***Employment of many people by the "Food For Work" programme.***

The joint project WFP-INEA-SWEDRELIEF carried out most of the road repair as a FFW (Food for Work) activity. More than 45 000 working days were provided by about 650 workers from communities along the roads. The workers carried out basic pothole filling and clearing of vegetation. They were given food for 5 persons, thus more than 3 000 persons benefited from the works during several months. In addition to the food, a small daily bonus was paid which was used to buy small domestic essentials from which local shops or markets benefited.

- ***INEA, and ENP have been assisted in competence development.***

The close cooperation within the project by the participating organizations, and the utilization of the local organizations INEA and ENP, has had an impact on the development of their competence. Particularly in the management and organization aspects of the project, in which high level representatives of the organizations actively participated, and thus learned and benefited from the efficient way the project was executed. INEA has also been given tools suitable for labour based road maintenance as well as outline programmes on how to organize and carry out continued road maintenance utilizing labour based methods.

- ***Large interest and publicity.***

The opening of the road corridors has attracted large interest and publicity and has boosted the moral of the public. The official openings have attracted high level officials and large crowds of people. The importance of the food relief supplies, the road openings and the hope of a return to normal life is well expressed in a press release by WFP in connection with the opening of the first road, the Luanda-N'Dalatando road on 1 May 1995. Extracts from the press release:

"In the month of November 1994, there were up to 40 children dying every week in N'Dalatando. The main cause was lack of sufficient food for protein and energy requirements. NGO's (Concern, World Vision and AICF) started in December, 1994 the distribution of WFP food to all the population, some 60,000 people. Only 3 months later, in February 1995, the number of child deaths went down to 6 per month. This was mainly thanks to the humanitarian assistance program in the city. Now, another 3 months later, in the same centres where children were once dying, there are children singing".

- ***Opening of the road corridors has enabled demining to be spread out into rural areas.***

Access to rural settlements is now of highest priority, and WFP has initiated food-for work projects in several provinces. The roads are destroyed due to lack of maintenance and use. 1996 rural access roads will form a special sub-project for which WFP food-for-work is especially appropriate. For this project, WFP has made an appeal for technical assistance, tools and materials and for mine surveying and clearance.

A prerequisite for opening up the rural areas with reinstatement of roads and mine clearing is the opening of the main corridors providing access to feeder roads.

Negative effects

There are no negative effects on people, environment, employment situation, peace-creation process or humanitarian aspects, identified as a consequence of the road openings. Some remarks can, however, be made:

- The FFW forces engaged in the road repair did not include the women. The local village administrator or headman was responsible for providing resources to the FFW programme. Thus the evaluation of suitable and available people was done by the local headmen. It is said that women normally take care of the farming activities and cannot be taken away from these important activities. Also that they need to look after the children and that the road work is not well suited for women, etc. Still one can see women carrying large burdens along the roads, firewood, cassava, maize, etc. SWEDRELIEF's ongoing project, Malange-Saurimo-Luena, may employ women to cook food to the workers on the road.
- In the emergency repair, the potholes on many sections were filled with best available material from the road side. When the roads will be permanently repaired, the material placed in the hole is probably unsuitable and needs to be tested, and perhaps removed and replaced with material of better quality. This is unfortunate, and could perhaps to some extent have been avoided if the use of emulsion and crushed stones had been concentrated to sections where the pavement is constructed with penetration macadam or has a base layer of macadam.

3.7 Reporting

General

The documentation and information on the project were mainly found in the Minutes of Meetings from committees, work groups and weekly reports (in Swedish). There are no monthly or quarterly reports prepared or required in SWEDRELIEF's contract with Sida. This made it difficult to review the project, to establish what was done, where works were carried out and by whom during the various phases of the project. The planning of the works for the corridor Luanda-Malange, which was available, and previously commented upon as being well prepared, was apparently not followed up with comparisons between planned and actual progress. It is appreciated that large deviations may exist due to the nature of the work with many uncertainties and need of flexibility in carrying out the works. However, the actual works or progress should have been documented by graphs or bar charts providing information on what was done and achieved. The details reported in this evaluation report may therefore not always be complete.

Progress reports

It is proposed, in future projects of similar character, that Sida requires the preparation of monthly or quarterly progress reports to provide information on progress of works and specific problems. The progress report should include graphs and bar charts providing information on planned and actual progress, resources used during the period, planned and actual participation by expatriate staff, planned and used man months. In addition, a budget follow up of planned and actual expenditures should be included. The budget follow up is probably presented separately, since it may only concern the client, and not necessarily other participating agencies.

The progress report shall also include information on specific problems encountered and give comments on actions taken to overcome the problems.

3.8 Project budget and costs

Financing

External financing of the project has been provided by Japan, Sweden and Norway. The overall WFP budget appeals for the project include two sums; USD 2,435,000 (1994) and USD 2,405,000 (1995), a total of USD 4,850,000. The 1994 appeal included the Northern corridor, the Luanda-Malange road and planning for the Central corridor; the 1995 appeal included finalization of the Northern corridor and actual works on the Central corridor, the Benguela-Cubal-Huambo-Kuito road. The allocation from Sweden, to cover the amounts included in SWEDRELIEF's contract with Sida, and being part of WFP's appeals, were SEK 10,800,000 (1994), and an additional SEK 6,000,000 as part of the 1995 appeal, or a total of SEK 16,800,000.

WFP's appeal 1994-95:

Funds by:	USD	equivalent to SEK
Sweden/ SWEDRELIEF	2,230,000	10,800,000+6,000,000 = 16,800,000
Japan	2,435,000	
Norway	175,000	
Total	4,840,000	

In addition, Sweden in 1994 provided SEK 2,775,000 to cover costs for initial planning of the work, and SEK 200,000 for a special UCAH study.

The budget allocation by the Angola Government is not known.

Actual costs

SWEDRELIEF's budget and cost summary for the project, as included in the draft Final Report to Sida. Summary dated 12 March 1996.

Budget summary for SWEDRELIEF/Angola, period August 1994 to March 1996, (phases 1-3), (Figures in SEK):

	Budget	Expenditures	Balance	Notes
A. Phase 1 Planning 1994	2,775,000	2,724,400	-50,600	
B. Phase 2 -Luanda-Malange				
Overheads	4,650,000	4,434,600	-215,400	1)
Road repairs	3,750,000	636,400	-3,113,600	2)
Demining	<u>2,400,000</u>	<u>2,025,700</u>	<u>-374,300</u>	3)
Sub-total	10,800,000	7,096,700	-3,703,300	
C. Special study, UCAH	200,000	200,000	0	4)
D. Phase 3 -Benguela-Huambo-Kuito				
Overheads	3,000,000	2,596,700	-503,300	5) a+b
Road repairs	1,875,000	2,204,000	+329,000	6)
Demining	<u>1,125,000</u>	<u>39,600</u>	<u>-1,085,400</u>	7)
Sub-total	6,000,000	4,840,300	-1,259,700	
Total	19,775,000	14,861,300	-4,913,700	8)

Notes:

- 1) Approximately 150,000 have been used for planning the EU project in accordance with decision by the Swedish Embassy in Luanda.
- 2) Planned road repairs not carried out due to a decision by INEA to use contractors for complete rehabilitation of certain road sections.
- 3) Carried out by NFA in accordance with separate agreement
- 4) Special study regarding participation in demobilization project, etc.
- 5) a) The project was not fully staffed the whole period. b) final costs, salaries, etc. estimated to 100,000 are included.
- 6) Additional costs due to difficult laterite road.
- 7) Demining carried out by Halo Trust and Mechem at no cost to the project.
- 8) The amount ought to be reduced with a sum equivalent to USD 80,000 to 160,000 based on a request by WFP in July, 1995.

Comments:**SWEDRELIEF's budget and cost summary**

The breakdown is very brief and provides no details and is therefore impossible to evaluate. It is for instance, not possible to know the monthly cost of the expatriate staff, the costs of hired equipment and local contractors; the costs paid for materials, etc.

During the implementation period of the project, 92 man months were provided and the total overhead costs according to the budget summary were SEK 7,031,300, i.e. 76,427 per man month. The overhead costs include salary and salary related costs, daily allowances, accommodation, international travel, etc. WFP covered local costs such as provision of vehicles, fuel, air transport of personnel and materials, and various types of other services. SWEDRELIEF provided some second hand vehicles brought to Angola from a previous project in Mozambique. The above cost per man month can only be regarded as indicative figure since supporting details have not been reviewed.

The amount spent by SWEDRELIEF on road repairs was much less on the Luanda-Malange road than on the Benguela-Huambo-Kuito road. One reason for the difference is that INEA planned to carry out road rehabilitation by Contractors on the Luanda-Malange road and less work was therefore carried out within the project's budget. On the Benguela-Huambo-Kuito section more work was done. If the costs of road repairs are calculated as an average cost per km over the total length of roads, about USD 300 was used on the Luanda-Malange road, and about USD 830 on the Benguela-Huambo-Kuito road. These figures are average figures and only shows the difference of amounts spent on road repairs in the two road corridors. In reality, the cost per km varies considerably over each individual section. The average figures should be treated with considerable caution.

The contract agreement with Sida does not include a breakdown of planned expenditures. A budget amount is allocated to SWEDRELIEF who administer the expenditures and submits budget and cost summaries at the end of project together with an invoice over all expenditures to be covered by Sida as part of the contract.

Details of costs, bridge and road work

Details of bridge costs are not complete. WFP has procured bridge material for USD 1,027,294, excluding freight. INEA's costs for ENP's bridge works are not available neither other costs related to bridge works. SWEDRELIEF's Final Report to Sida includes some cost figures for the road rehabilitation works carried out in the project. It is estimated, that the simple road rehabilitation including clearing of road sides and repair of potholes with laterite, costs about USD 200/km. A team managed to repair around one kilometre per day. If the repair of potholes instead was done by using crushed stones and emulsion, then the cost increased to USD 500-700/km. Transport of the emulsion was costly, about 70% of the total cost. Other reported costs included USD 50,000 for hire of equipment for work planned to be carried out during four weeks, but in reality took 12 weeks due to frequent break downs and heavy rains. A normal daily rate for utilizing one grader, one front end loader and one truck was about USD 1,000. The difficulty in obtaining realistic offers from private contractors is demonstrated by an example where one company offered to construct the bypass at Cubal (6.3 km) for USD 180,000, while the project organization managed to construct the bypass in two days with hired equipment for about USD 3,000.

Local Contribution

The local contribution consists of costs incurred by INEA and ENP. INEA covers the costs of ENP's bridge construction contracts. It has not been possible to get cost figures from INEA for their own costs, or those for ENP's contracts. Apart from the ENP's costs, other costs covered by INEA are marginal and consist basically of salaries to own staff engaged in the project. Costs of materials, transport of materials and staff were covered by project funds from WFP or SWEDRELIEF. Some bridge material was provided by the Government and the costs for the material was covered by own funds or by other donors.

ENP's costs will not be known until INEA has paid ENP for its contracted works. To date INEA has not paid ENP for its work, i.e. invoices from May 1995 are not paid. When the time comes for payment, i.e. when INEA has the money, the amount to be paid will be negotiated. The amount which shall be paid includes compensation for interest and inflation.

With the extremely high inflation rate in the country, it is difficult for anyone to prepare budgets and make sure that the actual amounts are available at the date of payment. The contract amount may have multi-folded at the date of payment. This is maybe one reason for late payments, the amount budgeted for one project might have been used for paying older invoices which have also multi-folded. It is difficult to understand how any work by contract can be carried out under these circumstances, for instance how can ENP continue to work without being paid for invoices one year old ? ENP work is to 90% by contract with INEA.

4. CONCLUSIONS

This section contains the main conclusions of the evaluation team, and is based on the findings that have been presented in detail in previous sections. The conclusions deal specifically with the main objectives of the evaluation and are intended to provide answers to the issues raised in the terms of reference of the evaluation.

4.1 Appropriate organization and methods

Organization

The achievements of SWEDRELIEF and the appropriateness of engaging this organization and the applied procedures in similar, future situations should be commented upon. The conclusion of the evaluation team is that the engagement of SWEDRELIEF as an organization in this specific project was appropriate, based on the following reasons:

- The Swedish parliament has decided that SWEDRELIEF's tasks are to assist in relief work abroad at times of natural disasters or similar events. SWEDRELIEF's assistance should be regarded as an extraordinary measure to be carried out over a limited period of time, normally six months at the most. The nature of the actual project fits well within the roles and objectives of those of SWEDRELIEF.
- The project was based on the response by the Swedish Government to an appeal by the United Nations through its agency, the World Food Programme (WFP). The project was intended to be carried out in close cooperation with several UN-agencies and the Government of Angola. SWEDRELIEF as an organization and its staff have previous experience from work carried out under or in close cooperation with UN-and Government agencies.
- The objective of the project was to enable fast and efficient distribution of emergency food aid and other humanitarian assistance to a population in desperate need of such assistance. It was therefore an emergency action, which required a quick response and the measures were intended to be provided during a limited period of time. The specific role of SWEDRELIEF as a Government organization with pre-set procedures for engagement of its services with the appropriate channels in the Swedish Government facilitates quick contractual arrangements. The work can start without delay and time-consuming procurement procedures.
- When the project started the security situation was bad in the country. Many areas were still not in control by the Government, clashes between the different fractions could still occur and ambushes of vehicles by bandits happened from time to time. Roads and work sites were mined and UXO were frequently to be found. Thus, the working conditions required skills, experience and strict discipline by all participants in the project. It is believed that SWEDRELIEF and its staff are well suited to work and handle situations in environments as those described. Most of SWEDRELIEF's personnel have military background, many have previous experience from work in UN operations in other countries with similar insecure conditions. The engagement of any other organization, private or semi-Governmental, for the same type of services as those provided in this specific project, would include complicated contractual arrangements to cover risks and delays during the implementation which are bound to occur in projects carried out in similar insecure environments.
- The provision of temporary bridges of Bailey type was the most urgent task in the project. SWEDRELIEF possesses unique skills and experience in planning, design and construction of such types of bridges. Most of the staff are permanent staff drawn from the Corps of Engineers of the Swedish Army, or has previously been active therein. The Swedish army uses the same type of bridge material and selected staff is trained to become bridge specialists. Similar extensive skills and experience are normally not available in other Swedish Governmental or private organizations.

- When the emergency situation is over and conditions are normalized, respective local organization takes over and continue their normal responsibilities. For the road sector in Angola, this would certainly necessitate assistance to the organizations by donor agencies in the form of technical assistance by individuals or the engagement of specialized companies and contractors.

Procedures

The procedures applied in the management, coordination and implementation of the project have been appropriate and successfully accomplished. For instance:

- The different committees and work groups enabled close cooperation and weekly contacts between management staff of the joint partners during the implementation process. The special and successful role of SWEDRELIEF as coordinator, "pusher" and negotiator in the project was widely acknowledged.
- The project organization managed to mobilize and involve the local organizations in the works without taking away their normal responsibility and authority to manage road operations in the country. The engagement of the local organizations INEA and ENP with their close relations, was certainly the most cost-effective arrangement, but not necessarily the most efficient and fastest way to carry out the work. However, it would have been contractually and economically more complicated to use private contractors in the emergency works.
- The documentation of the project is well prepared when it concerns Minutes of Meetings from committees, work groups, etc., but could be improved in future projects when it concerns reports on progress of work and budget follow-up of expenditures.

Methods

The following conclusions are made to the methods of work:

Bridges:

- There are no better ways to provide emergency river crossings than using temporary bridges of Bailey type, other than for purely military purposes. They are simple and fast to install and can be built to carry heavy traffic.
- The temporary bridges were built by ENP, contracted by INEA. ENP's contract work is to 90% with the Government represented by INEA. These two organizations have therefore established close working relations including all contractual conditions which facilitated the use of ENP.
- The methods used in building the temporary bridges of Bailey type were familiar to ENP, they had built such bridges before. The quality of the work is of acceptable standard, although by stricter control, the faults observed could have been avoided. However, most of them are not of serious character and can easily be corrected. Some delays by ENP in the bridge construction work were caused by reason of administration or bureaucracy, sometimes between INEA and ENP.
- The selection of sites for the temporary bridges does not make it specifically difficult to construct the future permanent bridges. The temporary bridges can be used while the permanent bridges are constructed, thus making special by-passes unnecessary.
- Structural elements from destroyed bridges left in some river channels should be removed as soon as possible. INEA carries the responsibility for this removal.

Road Works:

- The emergency road repair included roadside clearing of grass and other vegetation, removal of wrecked cars, improvement of drainage from the road, repair of damage from bombs and mines as well as pothole repairs.

The side drains could not be always be cleaned since demining was normally carried out only to about 0.5-1.0 metres outside the road edge.

- The clearing of grass and vegetation was successfully carried out, having in mind the sometimes dangerous operations because of mines and UXOs which have not fully been cleared away on all sections. The vegetation was at places so dense and spread out over the road that traffic was hindered.
- The repair of potholes by using crushed stones and emulsion has lasted better than the repair by the use of natural gravel (laterite). Successful repair by the use of laterite requires good quality material, thus normally selected material. The laterite should be left to dry before traffic is allowed on the repaired area. Due to various reasons this conditions could not always be fulfilled. However, there are sections on which these conditions were fulfilled resulting in good quality pothole repair by using the method with laterite only.
- Although, conclusions were difficult to make during the inspection, since it was not possible to differentiate between newly developed holes and repaired holes which had not lasted, the quality control of the pothole repair seems not to have been strict enough. On certain sections, reported to have been repaired, there are indications of inferior quality repair. Little or no indications of the previous repair could be observed.
- However, the emergency repair was in general terms successfully completed according to set criteria and WFP transports could make use of the roads as intended.

SWEDRELIEF's resource base

- In order to train and develop new qualified SWEDRELIEF experts for similar future projects and situations, and to extend the resource base, it is proposed that the client accepts that one or two extra persons over and above the actual needed number are included in the staffing for future similar projects.
- While qualified Bailey bridge type experts are available within SWEDRELIEF's organization, the same qualifications may not exist when it concerns specialists in road rehabilitation and maintenance work of this nature. SWEDRELIEF should in future similar projects pay special attention to this situation and possibly engage more of such experts from other specialist organizations or firms.

4.2 Road and Bridge maintenance

The capacity of INEA to maintain the roads in the two corridors and whether priority is given to maintenance should be assessed. The following conclusions are made:

Short term perspective

- At present INEA does not have the capacity to maintain the roads to a proper standard. It lacks financial resources to make its own maintenance organization and brigades operational. These cannot operate due to lack of money to buy materials, spareparts, vehicles and fuel. INEA will at best manage to keep the roads trafficable not to a good standard, but more in line with the standard set for the emergency repair.
- INEA has engaged private contractors to carry out full rehabilitation of some sections in the two road corridors. The rehabilitation includes road repair as a first step before applying new bituminous layer(s). Some work on certain sections has started, the start of work on other sections is delayed due to financial difficulties. When the planned works are in full action, it is assumed that contractors take over the maintenance responsibility for their respective section, and that these sections then are well taken care of.

- UNAVEM III which now includes three engineering squadrons and two special bridge construction units can assist in keeping the roads open. This facility will only be available as long as the mandate of UNAVEM III is in force. Since the roads are of utmost importance for UNAVEM's operations, they will during their presence use their own squadrons to keep the roads open, should the need arise.

Long term perspective:

- The World Bank has financed a maintenance study as well as feasibility and design studies. The maintenance study covers the whole spectrum of road maintenance management and operations. It is likely that the World Bank will continue to promote maintenance management issues including institutional development and technical assistance either by their own capacity or by co-financing with other donor agencies.
- In the long term perspective, the prospect of proper road and bridge maintenance seems to be better than that in the short term perspective.

4.3 Costs

Conclusions can only be made based on summaries of the costs included in SWEDRELIEF's budget for the project. Further details were not available. The summary includes a positive balance between budget amount and expenditures of nearly SEK 5 million. The budget figure was SEK 19.775 million. Reasons for the balance are mainly related to less road repair than planned on the Luanda-Malange road and less demining costs on the Benguela-Huambo-Kuito road. The less road repair on the Luanda-Malange road was because INEA planned to undertake and finance rehabilitation by the use of contractors of certain road sections. On the Benguela-Huambo-Kuito road, work by the demining companies Halo trust and Mechem was done without costs to the project, i.e. covered by other sources.

There were no reports or follow ups available on WFP's budget for the project. It is assumed that WFP's expenditures are within the budget amounts. One large item in WFP's budget figure of USD 2.435 million was the cost of bridge material, about USD 1 million.

It was not possible to obtain figures of the local contribution channelled through INEA. The main part of the local contribution consists of ENP's contracts to construct the bridges.

5. RECOMMENDATIONS

The above conclusions result in the following main recommendations:

- SWEDRELIEF can be used in the future in similar projects. The conclusion of the evaluation team is that it was appropriate to engage SWEDRELIEF in this specific project. It is also considered appropriate to use SWEDRELIEF as an organization and the applied procedure and methods in future projects of similar character. However, some comments are made regarding the applied methods for road repair, progress reporting and staffing which should be considered in future projects.
- At present no further assistance to the road authority INEA in general road and bridge maintenance is considered appropriate unless such engagement includes institutional support and is of long term nature.

List of appendices:

- 1 List of abbreviations
- 2 Terms of Reference
- 3 Organizations and persons contacted by the evaluation team in Angola and Sweden
- 4 Programme for the evaluation team in Angola, period 14 April - 3 May 1996
- 5 Standard truss configurations
- 6 Map over road corridors

Photos

Appendix 1

List of abbreviation

ENP	Empresa Nacional de Pontes
FAA	Forças Armadas de Angola,
FFW	Food For Work
ICRC	International Committee of the Red Cross
INEA	Instituto Nacional de Estradas de Angola
INEC	Department of Infrastructure and Economic Cooperation, (Sida)
IOM	International Organization of Migration
MOPU	Ministerio de Obras Publicas e Urbanizacao
NPA	Norwegian People's Aid
PAM	Programa Alimentar Mundial
Sida	Swedish International Development Cooperation Agency
SWEDINT	Swedish International Armed Forces (Försvarsmakten, Försvarets Internationella Centrum)
UNAVEM	United Nations Angola Verification Mission
UNITA	Uniao Nacional para a Independencia Total de Angola
UXO	Unexploded ordnance
WFP	World Food Programme

**EVALUATION
OF
THE OPENING OF THE ROAD CORRIDORS FROM LUANDA TO MALANJE
AND FROM BENGUELA TO KUITO
ANGOLA**

TERMS OF REFERENCE

1. BACKGROUND

1.1 In 1994 the United Nations launched an inter-agency appeal for Angola. In the appeal the World Food Programme (WFP) asked for support in order to ensure the de-mining and the rehabilitation of four major road corridors for delivery of humanitarian assistance. The opening of the roads would enable WFP emergency convoys to reach targeted beneficiaries in remote areas, simultaneously while reducing dependency on costly air transport.

1.2 The Government of Sweden responded to the appeal and a joint SIDA - Swedrelief reconnaissance team was sent to Angola in May-June 1994

1.3 In June 1994 the Swedish Government, as step 1, decided to engage Swederelief for a pre-appraisal mission for planning and liaison with UN representatives, NGOs and government offices in Angola. The team visited Angola in August-September 1994 and as a result a Letter of Intent was signed between WFP-INEA-Swederelief in September 1994 to be followed by final agreements about responsibilities and cost sharing when the peace process had started and when detailed reconnaissance in what at that time were battle zones had been executed.

1.4 The signing of the Angolan peace agreement took place in November 1994. Subsequently, as step 2, the Swedish Government, in January 1995, decided to enter into a project aimed at opening the Luanda-Malanje and the Benguela -Huambo-Kuito road-corridors. An agreement was signed between SIDA and Swederelief in February 1995. The Luanda-Malanje road corridor was opened to traffic in September 1995 and a Final Report about the implementation of the Project was issued in October 1995. The corridor Benguela -Huambo-Kuito has recently been opened.

1.5 According to the Lusaka-protocol, peace-keeping UN-troops should be stationed in various parts of Angola (UNAVEM III). The troops have played an important role in the process of road opening in Angola. UNAVEM III and Swederelief have been cooperating during the planning as well as during the implementation phases of the project.

* Instituto Nacional de Estradas de Angola

2. OBJECTIVES OF THE EVALUATION

- 2.1 To evaluate the achievements of Swedrelief with the aim of establishing whether Swedrelief and the methods used can be utilized in the future and in what situations;
- 2.2 To study the special role performed by Swedrelief as "pusher" and negotiator when mobilizing Angola's own road and bridge authorities to cooperate with UN and carry out substantial field-works aiming at opening up roads for relief transports; and
- 2.3. To assess whether INEA gives priority to and has got the capacity to maintain the road.

3. SCOPE OF THE EVALUATION

- 3.1 The Evaluation Team shall on the basis of the Project documents and discussions with the concerned Angolan Authorities, the Swedish Embassy in Luanda, UNAVEM III, the WFP and Swedrelief:
- (a) summarize the present general status of the following two road-corridors: Luanda - Malanje and Benguela-Cubal-Huambo-Kuito, with regard to formation, geometry, pavements, culverts, retaining walls and drainage ;
 - (b) give a short account of bridge repair works and judge to what extent the repairs may have rendered a permanent rehabilitation of the bridges more complicated;
 - (c) look into the bridge procurement procedure and decide on the appropriateness of equipment procured;
 - (d) review the appropriateness of engaging Swedrelief and the applied procedure;
 - (e) review the implementation of the Project including the mine-clearance activities and the organization of the work;
 - (f) study positive and negative effects on people and environment in the vicinity of the road such as the employment situation, whether the expected reduction in the WFP transport costs has taken place and the significance of the project for the peace-creation process and from important humanitarian aspects
 - (g) compare the estimated and actual total costs and review the financing of the project (including the Angolan contribution);
 - (h) identify advantages and disadvantages of the chosen methods and determine whether the methods used for the opening of the road have been the most cost-effective, considering national and local plans, in the medium and long term perspectives;

- (i) assess the prospects for INEA's future maintaining of the road;
- (j) assess whether the road presently is suitable for other than 4WD vehicles;

4. EVALUATION TEAM AND TIMING

4.1 The Evaluation Team will comprise a Highway Engineer and a Bridge Specialist with the Highway Engineer acting as Team Leader. At least one of the Team Members shall be able to speak and read Portuguese.

4.2 It is estimated that the Team Leader will be engaged for five (5) weeks and the Bridge Specialist for four (4) weeks including time for preparations and report writing. The Team is scheduled to visit Angola during three (3) weeks in April 1996. The Team shall cooperate with the concerned staff at the Swedish Embassy in Luanda during its stay in Angola.

5. REPORTS

5.1 Before leaving Angola, the Team shall report briefly to INEA, WFP, Swedrelief and the Swedish Embassy, highlighting its findings and recommendations.

The Team shall prepare a report in English. A draft of the report shall be submitted within two (2) weeks after the return to Sweden. The report shall be finalized within three (3) weeks of the receipt of comments from Sida.

5.2 Sida shall be provided with three (3) copies of the Draft Report and with five (5) copies of the Final Report.

Organizations and persons contacted by the evaluation team in Angola and Sweden

Swedish Embassy, Luanda

Lena Sund	Ambassador
Rolf Folkesson	Counsellor
Alf Eliasson	First Secretary
Marie Andersson	First Secretary

Government Representatives

Manuel Pedro Pacavira	Governor of the Province of Kwanza Norte, N'Dalatando
Joaquim Marta	Vice Governor, Malange
Vieira Miguel	Vice Governor, Malange

Ministerio de Obras Publicas e Urbanizacao,

Sebastiao	Engineer, Malange
Marques Banfo	Chief Representative, Kuito

INEA (Instituto Nacional de Estradas de Angola)

Atanásio Rodrigues	General Director, Luanda
Gama Lopes	Technical Director, Luanda
Carlos Baptista Ambrósio	Provincial Director, Malange
Inácio Satambue,	Provincial Director, Huambo

ENP (Empresa Nacional de Pontes)

Julio Alberto Saturnino	Technical Director, Luanda
Campus	Chief Logistics, Luanda

WFP/PAM

Felix Bamezon	Deputy Country Director, Luanda
Amir M. Abdulla	Chief of Logistics, Luanda
David Schaad	Head of Planning Air and Land Transports, Luanda
Janse Sorman	Head of Air Operations, Luanda
Jan Charles Dei	Representative, Malange
Igidio Afonso,	Representative, N'Dalatando

NPA (Norwegian People's Aid)

Börje Höknes	Chief Operations, Malange
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UNAVEM III

Romero	Lt. Colonel, Luanda
Rakesh Katyal	Major, Luanda

IOM

Bengt Ljunggren,	Chief of Mission, Luanda
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SWEDRELIEF, Luanda

Jarl Lundgren	Director of SWEDRELIEF, Luanda
Leif Lewin	Chief Logistics, Luanda
Peter Lennerby	Bridge Engineer, Saurimo
Lars Pihl	Road Engineer, Saurimo
Kenneth Andersson	Logistics, Luanda
Bodil Dreifalt	Administration
Nelson Sousa	Technician, Saurimo

SWEDRELIEF/UCAH

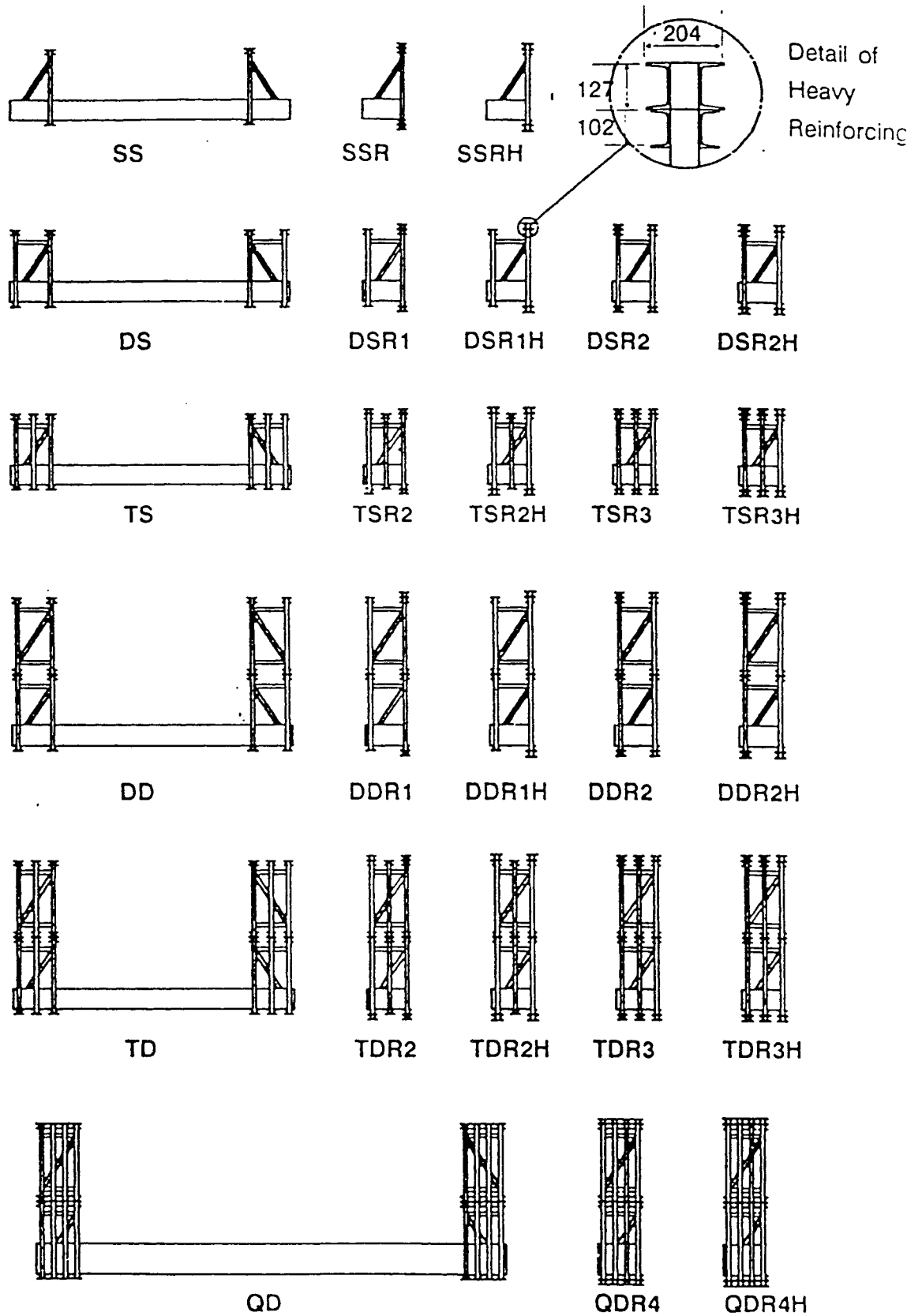
Håkan Olsson	Luanda
Kurt Pettersson	Huambo

SWEDRELIEF, Sweden

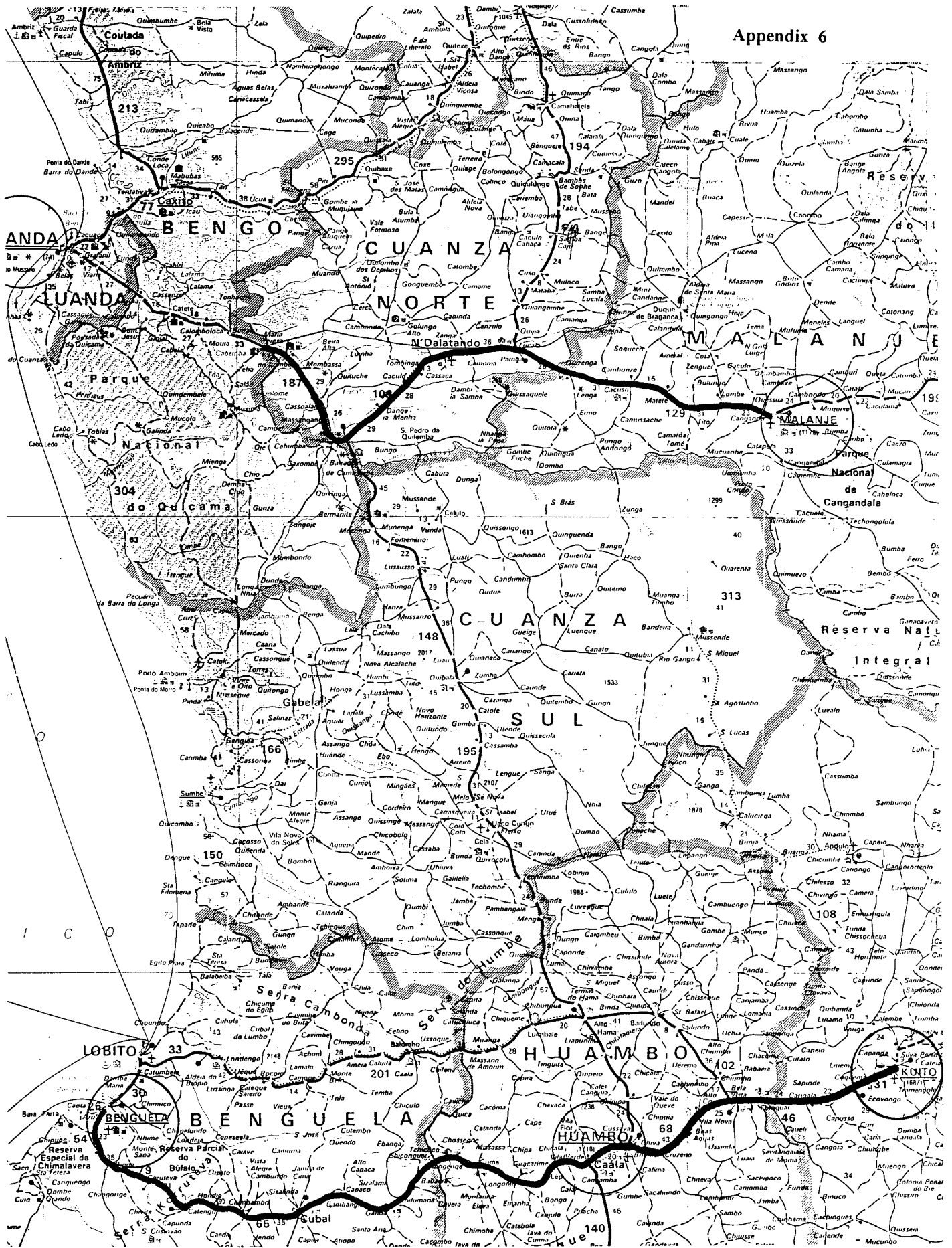
Leif Windmar	former Director of SWEDRELIEF, Luanda
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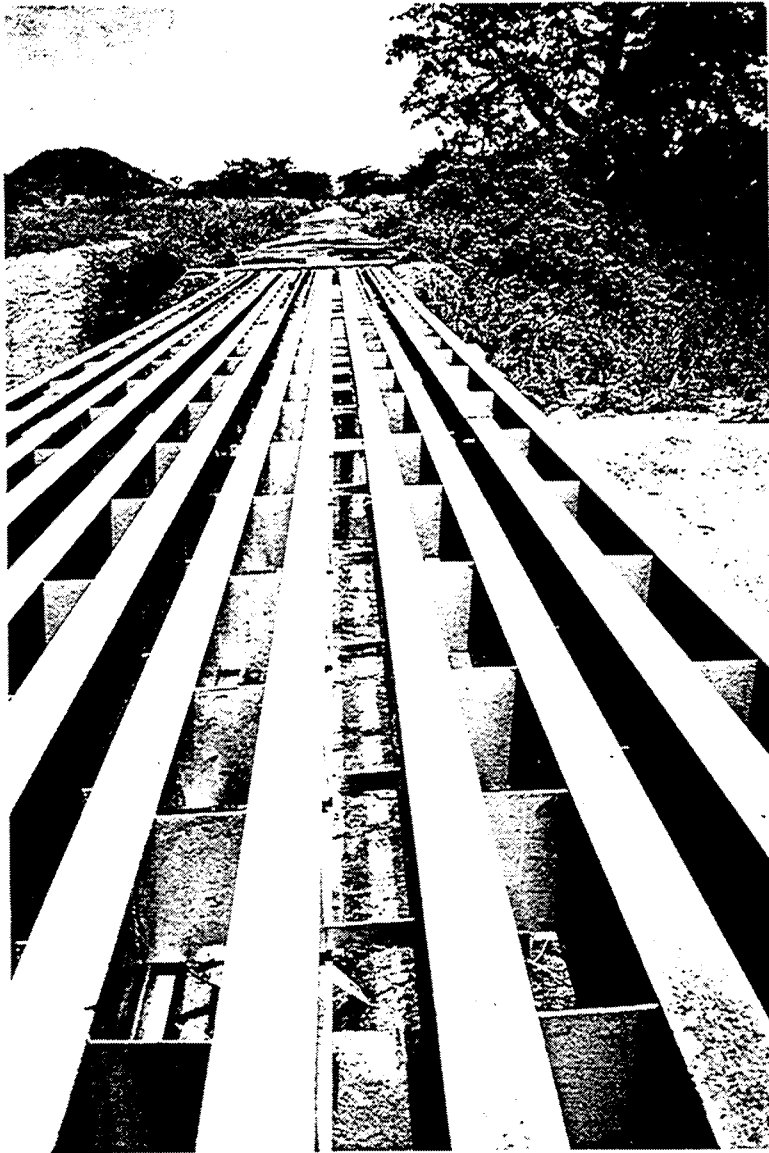
Programme for the evaluation team in Angola, period 14 April - 3 May 1996

Date		Programme
Sunday	14 April	0630 hours, arrival in Luanda afternoon, briefing by SWEDRELIEF, and planning for trip to Malange.
Monday	15 April	Road and bridge inspection, Luanda-N'Dalatando-Malange. Guided by SWEDRELIEF, Kenneth Andersson. Accommodation at NFA, Malange
Tuesday	April 16	Meetings in Malange, WFP, NFA, INEA, Vice Governors, Obras Publicas.
Wednesday	April 17	Return trip to Luanda. Meetings in N'Dalatando with Governor and WFP(PAM)
Thursday	April 18	Luanda, meetings with Swedish Embassy, SWEDRELIEF and WFP
Friday	April 19	Luanda, meetings with UNAVEM III and INEA
Saturday	April 20	Luanda, meetings with SWEDRELIEF and WFP
Sunday	April 21	Luanda. Review of data, summary of meetings
Monday	April 22	Meeting with SWEDRELIEF. Flight to Huambo. Accommodation at Ekumbi Pension. Field inspection of road section to bridge Rio Cunhangamau on Huambo-Longonjo road
Tuesday	April 23	Inspection of road and bridges section Huambo-Kuito. Meeting with representative of Obras Publicas in Kuito
Wednesday	April 24	Return flight to Luanda (morning). Meeting with SWEDRELIEF.
Thursday	April 25	Meetings in Luanda with INEA and Swedish Embassy, SWEDRELIEF, WFP
Friday	April 26	Participated in Technical Group Meeting in Luanda. Meeting with WFP. Review of data, summary of meetings
Saturday	April 27	Luanda. Review of data, summary of meetings
Sunday	April 28	Luanda. Review of data, summary of meetings
Monday	April 29	Luanda. Meetings with Swedish Embassy and WFP
Tuesday	April 30	Luanda. Meeting with INEA. Review of data, summary of meetings
Wednesday	May 1	Holiday. Compilation of data. Preparation for briefing
Thursday	May 2	Luanda. Briefing at Swedish Embassy, participation by Sida, WFP, UNAVEM, and SWEDRELIEF (INEA could not participate).
Meeting		with ENP, afternoon. Special briefing with Sida and SWEDRELIEF, late afternoon
Friday	May 3	Meeting SWEDRELIEF and the Swedish Ambassador. 2205 hours, leaving Luanda

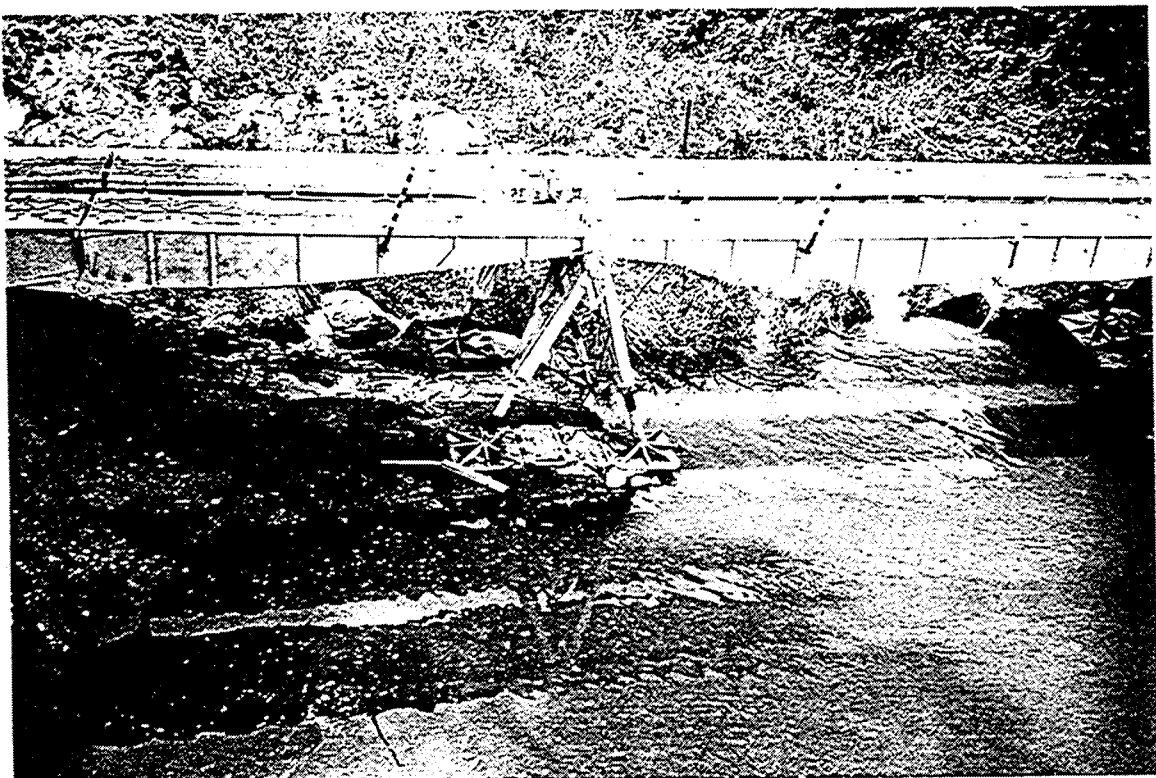


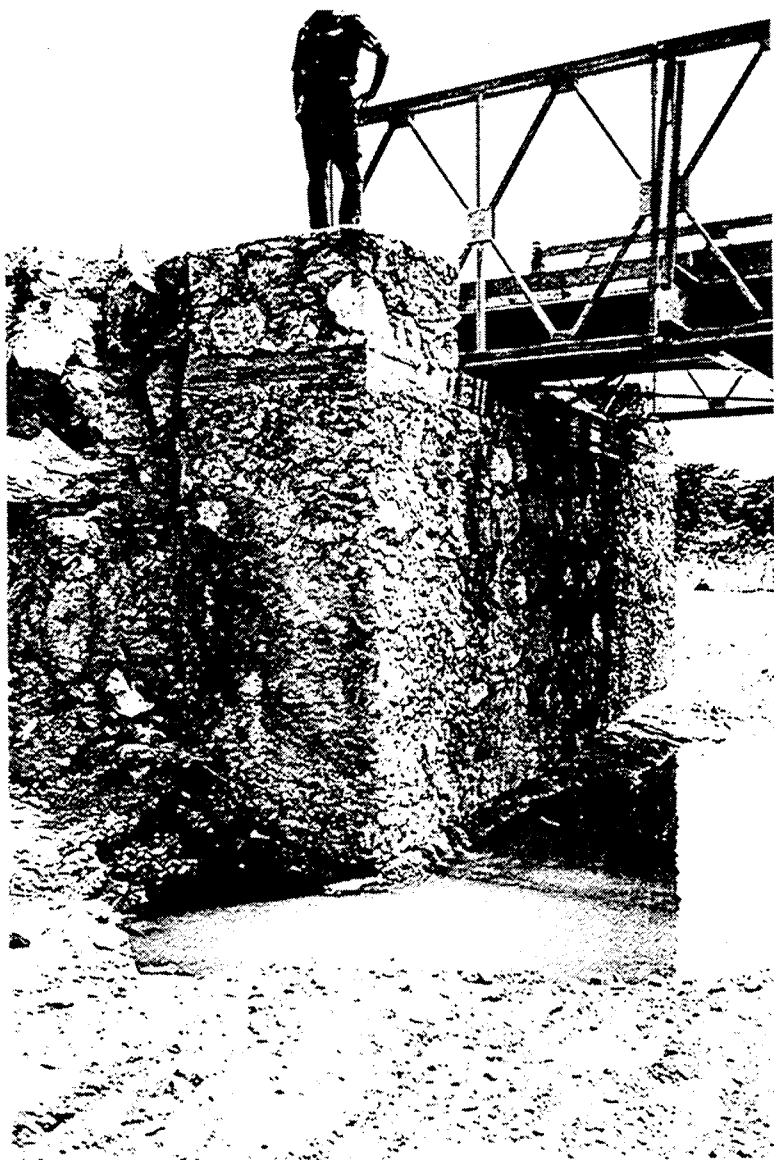
STANDARD TRUSS CONFIGURATIONS



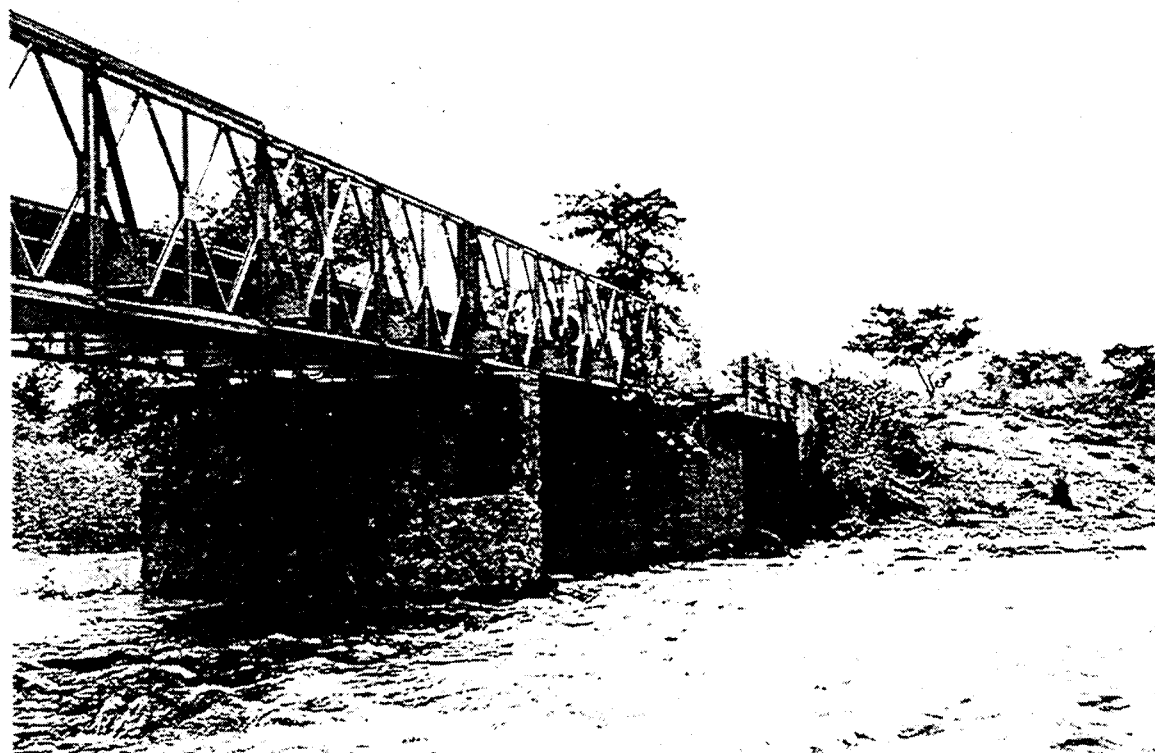


Luanda-Malange
Rio Subo
Permanent composite
steel-concrete bridge,
and temporary bridge
Russian type





Luanda-Malange
Rio Mucoso
Erosion damage at
one abutment



Luanda-Malange
Rio Lucala 1
Destroyed railway bridge



Malange
Selection of mines

Luanda-Malange

Zenza-Dondo section
Road in bad condition



Luanda-Malange

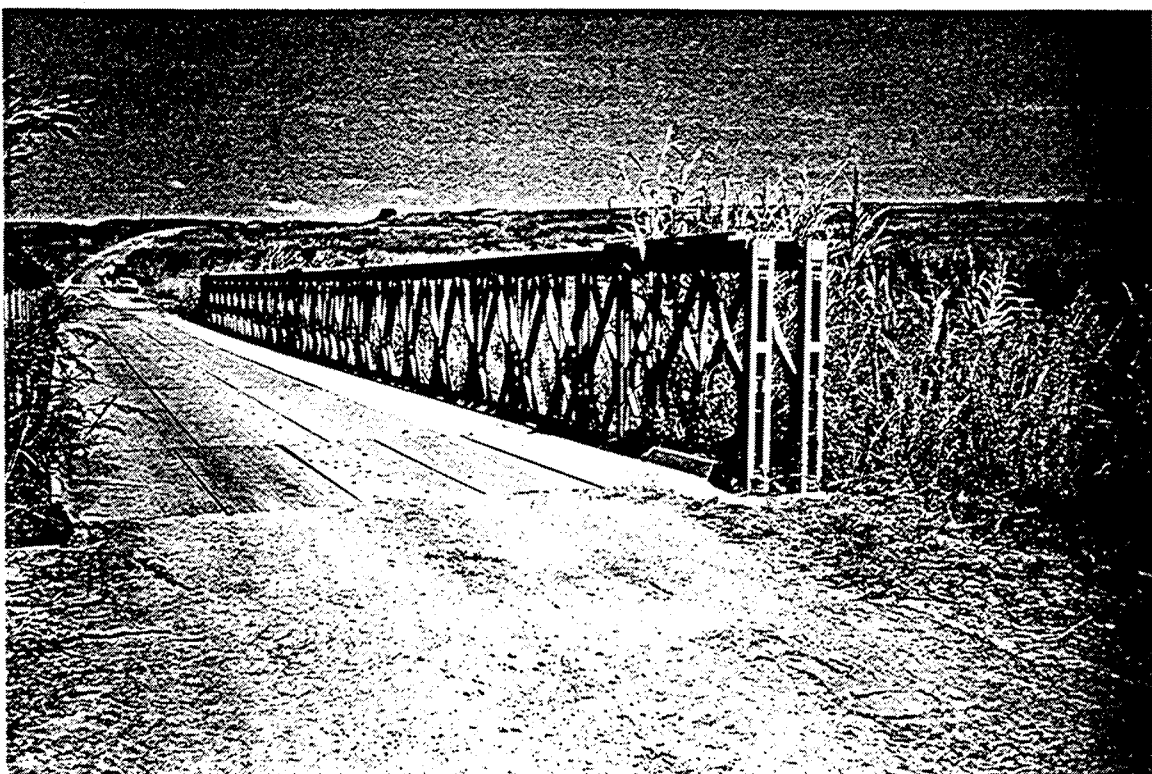
Lucala 2-N'Dalatando section

Road surface by penetration macadam

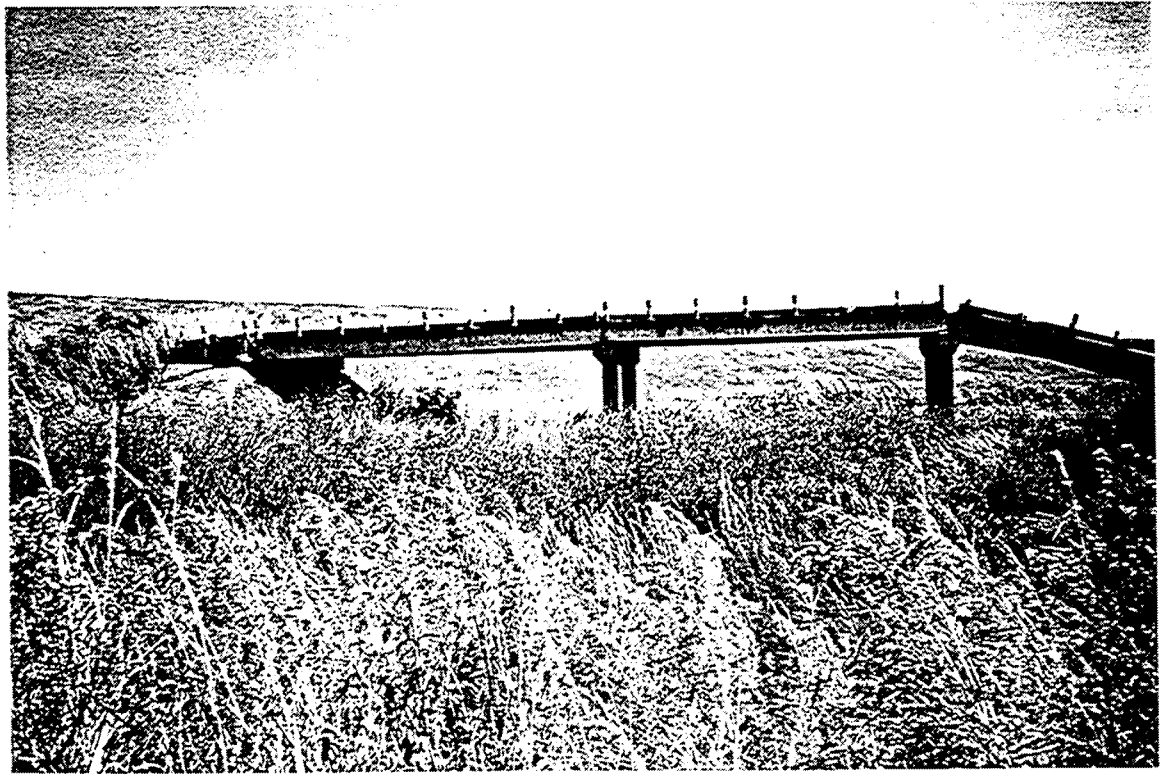


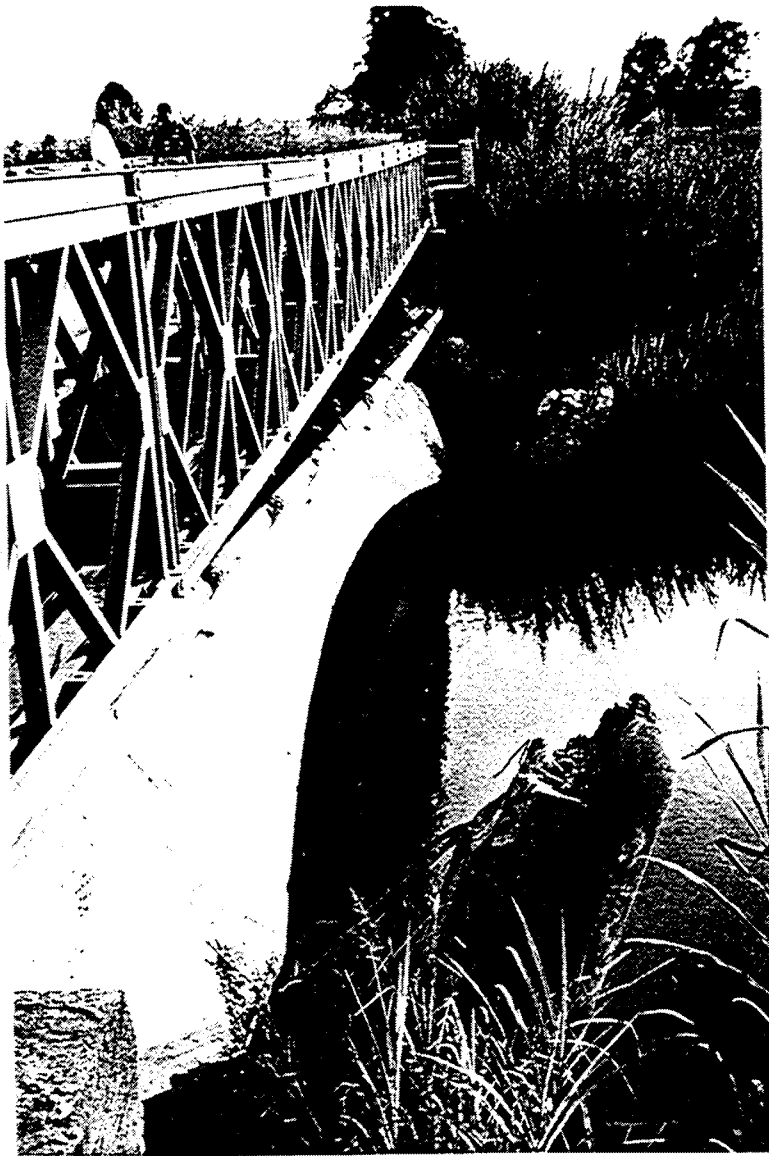


Huambo-Kuito
Rio Cuchi
Missing end and top
bracings



Huambo-Kuito
Destroyed permanent bridge at Rio Cutato





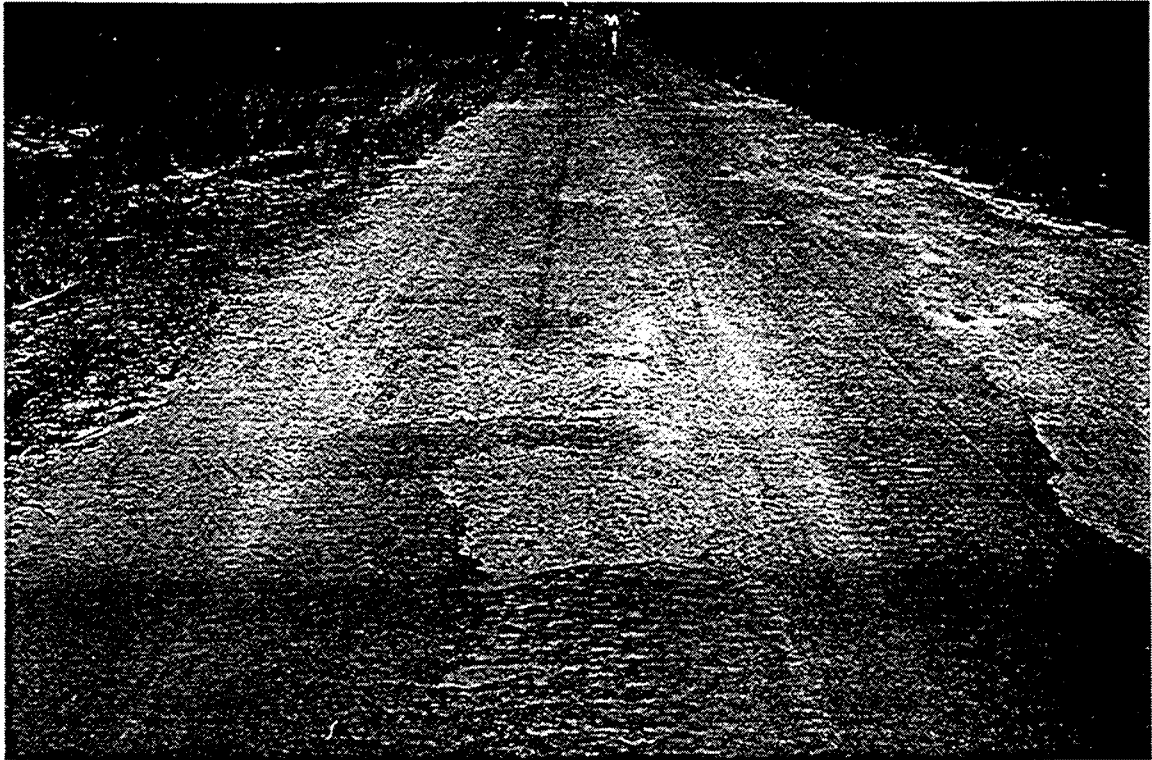
Huambo-Kuito
Rio Cunhangamua
Destroyed bridge left
in the river under the
temporary bridge

Huambo-Kuito
Pothole repair carried out by locals.
Commendable initiative, questionable standard of repair.



Huambo-Kuito

Successful pothole
repair with laterite



Sida Evaluations - 1995/96

- 95/1 Educação Ambiental em Moçambique. Kajsa Pehrsson
Department for Democracy and Social Development
- 95/2 Agitators, Incubators, Advisers - What Roles for the EPU's? Joel Samoff
Department for Research Cooperation
- 95/3 Swedish African Museum Programme (SAMP). Leo Kenny, Beata Kasale
Department for Democracy and Social Development
- 95/4 Evaluation of the Establishing of the Bank of Namibia 1990-1995. Jon A. Solheim, Peter Winai
Department for Democracy and Social Development
- 96/1 The Beira-Gothenburg Twinning Programme. Arne Heileman, Lennart Peck
The report is also available in Portuguese
Department for Democracy and Social Development
- 96/2 Debt Management. (Kenya) Kari Nars
Department for Democracy and Social Development
- 96/3 Telecommunications - A Swedish Contribution to Development. Lars Rylander, Ulf Rundin et al
Department for Infrastructure and Economic Cooperation
- 96/4 Biotechnology Project: Applied Biocatalysis. Karl Schügerl
Department for Research Cooperation
- 96/5 Democratic Development and Human Rights in Ethiopia. Christian Åhlund
Department for East and West Africa
- 96/6 Estruturação do Sistema Nacional de Gestão de Recursos Humanos. Júlio Nabais, Eva-Marie Skogsberg, Louise Helling
Department for Democracy and Social Development
- 96/7 Avaliação do Apoio Sueco ao Sector da Educação na Guiné Bissau 1992-1996. Marcella Ballara, Sinesio Bacchetto, Ahmed Dawelbeit, Julieta M Barbosa, Börje Wallberg
Department for Democracy and Social Development
- 96/8 Konvertering av rysk militärindustri. Maria Lindqvist, Göran Reitberger, Börje Svensson
Department for Central and Eastern Europe
- 96/9 Building Research Capacity in Ethiopia. E W Thulstrup, M Fekadu, A Negewo
Department for Research Cooperation
- 96/10 Rural village water supply programme - Botswana. Jan Valdelin, David Browne, Elsie Alexander, Kristina Boman, Marie Grönvall, Imelda Molokomme, Gunnar Settergren
Department for Natural Resources and the Environment
- 96/11 UNICEF's programme for water and sanitation in central America - Facing new challenges and opportunities. Jan Valdelin, Charlotta Adelstål, Ron Sawyer, Rosa Nunes, Xiomara del Torres, Daniel Gubler
Department for Natural Resources and the Environment
- 96/12 Cooperative Environment Programme - Asian Institute of Technology/Sida, 1993-1996. Thomas Malmqvist, Börje Wallberg
Department for Democracy and Social Development
- 96/13 Forest Sector Development Programme - Lithuania-Sweden. Mårten Bendz
Department for Central and Eastern Europe
- 96/14 Twinning Programmes With Local Authorities in Poland, Estonia, Latvia and Lithuania. Håkan Falk, Börje Wallberg
Department for Central and Eastern Europe
- 96/15 Swedish Support to the Forestry Sector in Latvia. Kurt Boström
Department for Central and Eastern Europe

- 96/16 Swedish Support to Botswana Railways. Brian Green, Peter Law
Department for Infrastructure and Economic Cooperation
- 96/17 Cooperation between the Swedish County Administration Boards and the Baltic Countries.
Lennart C G Almqvist
Department for Central and Eastern Europe
- 96/18 Swedish - Malaysian Research Cooperation on Tropical Rain Forest Management. T C Whitmore
Department for Research Cooperation, SAREC
- 96/19 Sida/SAREC Supported Collaborative Programme for Biomedical Research Training in Central America. Alberto Nieto
Department for Research Cooperation, SAREC
- 96/20 The Swedish Fisheries Programme in Guinea Bissau, 1977-1995. Tom Alberts, Christer Alexanderson
Department for Natural Resources and the Environment
- 96/21 The Electricity Sector in Mozambique, Support to the Sector By Norway and Sweden. Bo Andreasson, Steinar Grongstad, Vidkunn Hveding, Ralph Kårhammar
Department for Infrastructure and Economic Cooperation
- 96/22 Svenskt stöd till Vänortssamarbete med Polen, Estland, Lettland och Litauen. Håkan Falk, Börje Wallberg
Department for Central and Eastern Europe
- 96/23 Water Supply System in Dodota - Ethiopia. Bror Olsson, Judith Narrowe, Negatu Asfaw, Eneye Tefera, Amsalu Negussie
Department for Natural Resources and the Environment
- 96/24 Cadastral and Mapping Support to the Land Reform Programme in Estonia. Ian Brook
Department for Central and Eastern Europe
- 96/25 National Soil and Water Conservation Programme - Kenya. Mary Tiffen, Raymond Purcell, Francis Gichuki, Charles Gachene, John Gatheru
Department for Natural Resources and the Environment
- 96/26 Soil and Water Conservation Research Project at Kari, Muguga - Kenya. Kamugisha, JR, Semu, E
Department for Natural Resources and the Environment
- 96/27 Sida Support to the Education Sector in Ethiopia 1992-1995. Jan Valdelin, Michael Wort, Ingrid Christensson, Gudrun Cederblad
Department for Democracy and Social Development
- 96/28 Strategic Business Alliances in Costa Rica. Mats Helander
Department for Infrastructure and Economic Cooperation
- 96/29 Support to the Land Reform in Lithuania. Ian Brook, Christer Ragnar
Department for Central and Eastern Europe
- 96/30 Support to the Land Reform in Latvia. Ian Brook, Christer Ragnar
Department for Central and Eastern Europe
- 96/31 Support to the Road Sector in Estonia. Anders Markstedt
Department for Central and Eastern Europe
- 96/32 Support to the Road Sector in Latvia. Anders Markstedt
Department for Central and Eastern Europe
- 96/33 Support to the Road Sector in Lithuania. Anders Markstedt
Department for Central and Eastern Europe
- 96/34 Support to the Maritime Sector in Latvia. Nils Bruzelius
Department for Central and Eastern Europe
- 96/35 Sida/SAREC's Marine Science Programs. Jan Rudengren, Per Brinck, Brian Davy
Department for Research Cooperation, SAREC



SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

S-105 25 Stockholm, Sweden

Tel: +46 (0)8-698 50 00. Fax: +46 (0)8-20 88 64

Telegram: sida stockholm. Postgiro: 1 56 34-9

E-mail: info@sida.se. Homepage: <http://www.sida.se>