

PD-ABK-806  
93983

BITUMINOUS PAVING MAINTENANCE  
PLANNING FOR THE 1992-1993  
WORK PROGRAM

MARCH 23, 1992

USAID PROJECT 677 - 0050

N'DJAMENA, TCHAD.

LOUIS BERGER INTERNATIONAL, INC.

P.O. BOX 413 - N'DJAMENA, CHAD



**BITUMINOUS PAVING MAINTENANCE PLANNING  
FOR THE 1992-1993 WORK PROGRAM  
MARCH 23, 1992**

1.0. Although the bituminous paved road inventory in the N'Djamena Agency is all relatively new and dates from 1990-1991, the Agency and OFNAR must assume that some routine paving maintenance will be required and that some periodic or extraordinary maintenance may become necessary during the 1992-1993 work program. A provisional sum should be provided in the 1993 budget for this purpose.

1.1. Equipment and Materials. The Agency presently has most, but not all, of the basic equipment necessary for minor bituminous pavement maintenance but has none of the special materials and hand tools which will be required. The single item of necessary basic paving maintenance equipment the Agency does not have is an asphalt heating kettle of which three should ultimately be <sup>provided</sup> several in various capacities from 700 to 2,000 liters. Bulk materials such as asphalt cement, cutback asphalt emulsified asphalt and crack sealing compounds are not ~~or~~ available except as long lead time items, unless available from Nigeria.

1.2. N'Djamena Agency Paved Road Inventory

The Agency has an inventory of (244) kilometers bituminous surfaced roads. There are 167 kilometers of primary road having a high-type surfacing known as asphalt concrete and 66 kilometers of a less sophisticated type of surfacing which can be termed bituminous surface treatment (Djermaya-Dandi). In all there are over 1 million square meters of asphaltic concrete travelway plus 330 thousand square meters of similarly paved shoulders and 528,000 square meters of bituminous surface treated road.

1.3. Necessity for Paving Maintenance 1992-1993

The necessity for a crack sealing operation during the 1992-1993 work program is already obvious and it can be anticipated that some minor spot patching may be required. The requirement for spot patching, or localized repair, can result from latent construction defects, vehicular accident including fires, military activity, or damage resulting from drainage failure. Recent inspection of the Djermaya-Dandi road, which has a thin bituminous surface treatment as a surfacing, indicates that spot repairs will be necessary in 1992-1993 owing to damage from the heavy truck traffic on that route.

## 2.0. Institutional Capability in OFNAR/ARN for Paving Maintenance

OFNAR does not have an institutional history of paved road maintenance. The requisite skills are lacking, although there is general theoretical knowledge of pavement maintenance practices. This would be equally true if paved surface maintenance were to be carried out by private Chadian entrepreneurs. Skill requirements vary with the operation to be performed, and the amount and complexity of equipment coordination required.

2.1. Crack Sealing. This operation does not require prior skill. Provided the requisite materials and hand tools are available, trial and error under normal supervision would be sufficient to accomplish this task in an acceptable manner. This operation could be performed equally well by ARN or private enterprise.

2.2. Pavement Patching. A variety of skills and judgements are required depending on the extent of work to be performed and the coordination of several units of equipment may be required. For small patches a certain amount of trial and error when supervised by one reasonably knowledgeable person, would be tolerable. Large patches, or future periodic maintenance of paved surfaces, will require in-depth experience and skills that cannot be acquired by trial and error. Requirements large patches for these operations are not foreseen for the 1992-1993 work program. It is unlikely that private enterprise could undertake this work without competent technical supervision.

2.2. In terms/<sup>of</sup> relative experience and skill requirements, pavement maintenance and repair operations can be ranked in the following order of sophistication.

Crack sealing. Unskilled. Trial and error training sufficient.

Patches 1-2 m<sup>2</sup>. Moderately skilled. This is an operation which would require the use of a small bituminous mixer such as Item 3.2 described in the Inventory of Existing Equipment. The operation requires a supervisor with some prior experience. A certain amount of trial and error is tolerable. Necessary manual skills are relatively easily acquired.

Larger Patches. Skills required. For satisfactory results these repairs require a higher level of skill and experience. These would be patches of a size that would require prior knowledge of pavement construction and would be difficult or inappropriate for a casually mobilized team, even with some prior experience. Trial and error is not likely to restore a pavement to its original condition, although results might be sufficient to permit vehicles to pass over a previously damaged area. The necessary skills, utilizing the small mixer (3.2) or the Camion Point A Temp (3.1) cannot be retained without frequent repetition. A solution to this problem would be to make temporary patches until sufficient work accumulates to justify the mobilization of an experienced supervisor.

Sherry

2.4. Periodic Maintenance. These operations are performed at long intervals (5-10 years) and would involve resurfacing or seal coats and would require experience, skills and equipment that would be inappropriate for OFNAR to attempt to acquire. Such work should be performed under expatriate supervision or expatriate contract.

### 3.0. Existing Equipment Inventory for Paving Maintenance

The Agency presently has in inventory the following new and as-yet unused paving maintenance equipment, all funded from non-AID sources.

3.1. Distributor. A 2,000 liter asphalt distributor (spray truck) with two small aggregate storage compartments. This units is specifically designed for minor pavement repairs (spot patching) and is therefor identified as a Camion Point A temp. The unit, OFNAR CEP 002 with a 1991 acquisition value of 27 million CFA, is complete in itself but is presently unusable without an accessory asphalt heating kettle to preheat and sufficiently liquify bituminous materials to transfer by pump to the storage tank on the distributor. Skilled operation is required.

3.2. Mixer. A small, trailer mounted unit for producing bituminous patching mixtures. The unit, OFNAR No MBT 001, with a 1991 cost of 13 million CFA, is apparently lacking an accessory device for weighing or proportioning bitumen. It is otherwise complete and self contained and ideal for producing small quantities of patching material. Skill requirements are minimal under experienced supervision.

3.3. Aggregate Spreader. This equipment mounts on the tailgate of a dump truck for purposes of evenly spreading crushed aggregate in controlled quantities over a previously placed layer of hot liquid asphalt. This unit, OFNAR No. GRA 001, is operated in conjunction with an asphalt distributor and is intended for relatively large scale paving maintenance rather than for minor spot patching. The unit is new and unused but would require minor alteration to adapt it to fit a specific model dump truck. Skilled operation is required, but easily acquired under experienced supervision.

3.4. Pavement Broom. The OFNAR inventory presently contains a towed, traction type, rotary pavement broom (MBT 001) The unit, when towed by an agricultural type tractor, is used for preparing road surfaces for maintenance and for final clean up. The unit is complete but requires replacement brooms before it can be operated. Skill requirements are minimal. *wire brooms recommended*

3.5. Compaction Rollers. The OFNAR inventory contains several rollers appropriate for paving maintenance. A self propelled rubber tire roller, OFNAR CPA 006, is specifically intended for minor paving maintenance. It is presently inoperative and awaiting repair parts. In addition there are two small vibratory compactors, CVB 007 and 008, intended for spot repairs. The ARN has requisite skills to operate this equipment.

4.0. Equipment Inventory Deficiencies. There is no asphalt heating kettle in the ARN inventory. This is an essential item for the maintenance of bituminous pavements and without which the Camion Point A Temp (distributor truck), (3.1) in the existing equipment inventory, is unusable.

4.1. The small mixer, (3.2.) in the existing inventory, is the only item of equipment that can function without the assistance of a heating kettle.

4.2. Hand Tools. A variety of hand tools must be acquired for pavement repairs and maintenance. Many of these, but perhaps not all, can be acquired in Chad. These include pouring pots, wire bristle brooms, rakes, hand tampers, mattocks, picks, shovels, wheel barrows, etc. The paving maintenance equipment inventory is incomplete without these essential items.

4.3. Recommended Initial Equipment Procurement.

1. Asphalt Heating Kettle. 1,800<sup>local</sup> liter minimum capacity trailer mounted unit complete with pump for circulating heated bitumen and for pressurizing hand spray attachment. Estimated cost 8-10 million CFA.

2. Replacement Brooms for OFNAR MBT 001 rotary broom. Three brooms would be a reasonable stock for a period of a year. Estimated cost 200,000 CFA. <sup>steel wire</sup>

3. Assorted Hand Tools. Estimated cost 250,000 CFA.

5.0. Maintenance Materials.

OFNAR/ARN has no existing stock<sup>of</sup> paving maintenance materials. This same is true for the local importer/distributor TOTAL who presently supply SATOM, but only on specific order.

5.1. Quantities that will be required during the 1992-1993 work program are conjectural in that the paved roads are relatively new. Presently it is apparent that minor maintenance of pavement cracks is required. This form of maintenance does not require equipment other than hand tools but does require special materials in the form of sealing compounds.

5.2. In view of the very high capital investment in the paved road inventory, it would be prudent for OFNAR to acquire a stock of bituminous materials for pavement patching purposes, in addition to crack sealing compounds. The thin surfacing (surface treatment) on the Djermya-Dandi road will definitely require minor spot patching during the 1992-1993 maintenance program, although it may be that SATOM, the principal road user, will still be responsible for maintenance on this route.

5.3. Recommended Materials Procurement. A reasonable anticipatory stock materials for pavement maintenance during 1992-1993 would be as follows :

<u>Type</u>	<u>Quantity</u>
Crack Sealing Compound, Cold pour type	500 liters
Asphalt Emulsion, Cationic type	25 drums
Cut-Back Asphalt, Medium cure	25 drums
Asphalt Cement, 80/100 grade	10 drums

Except for the crack sealing compound, it may be that minor quantities of bituminous materials could be acquired by arrangement through SATOM, rather than by direct import. Costs for acquisition of a minor initial stock of materials cannot be presently estimated but are thought to be on the order of 3-4 millions CFA.

5.4. Aggregates. Crushed stone, sieved into various size ranges, is essential for satisfactory pavement patching mixtures. The costs for these materials cannot presently be estimated. OFNAR/ARN should identify sources and costs and include a provisional sum in the 1991-1993 work program budget.

*Dandi Quarry via  
SATOM.*