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LOCAL DEVELOPMENT II URBAN PROJECT

Submitted to

USAID / CAIRO

Submitted by

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in association with

PUBLIC ADMINISTRATION SERVICE
DEVELOPMENT CONSULTING OFFICE

DELOITTE AND TOUCHE
ENGINEERING AND GEOLOGICAL
CONSULTING OFFICE

LD II PROGRAM

**ROAD MAINTENANCE MANAGEMENT SYSTEM
OPERATIONS MANUAL**

ROAD
MAINTENANCE MANAGEMENT SYSTEM

OPERATIONS MANUAL

INTRODUCTION

This Operations Manual is designed to assist and guide engineers of the Roads Directorates in organizing, planning, scheduling, and carrying out street and road maintenance operations. The key tasks of a Street and Road Maintenance Management System are:

1. Development of an Annual Work Program (AWP) with priorities.
2. Adjustment of the AWP within budget allocations.
3. Detailing Weekly Work Schedules (WWS) one month in advance, rescheduling where necessary.
4. Completing Daily Work Orders (DWO) two days in advance and preferably one week in advance.
5. Recording the work performed on the DWO and the Work Accomplished Summary (WAS) sheet.

As can be seen by the above five key elements, planning and scheduling are paramount in the Maintenance Management System. By implementing this Maintenance Management System and following the guidelines set out in this Operations Manual, a significant improvement in the quality work will be seen and increased production of street and road maintenance operations will result. The words street and road are interchangeable terms throughout this Operations Manual. For clarification, basic definitions of pavement maintenance are listed below. These definitions are applicable for asphalt pavements, dirt streets, curbstone repairs, sidewalk repairs, etc.

- A. **ROUTINE MAINTENANCE** - For streets in good condition, routine maintenance is generally the most cost effective use of funds i.e.
 - (1) Pothole patching
 - (2) Skin patching
 - (3) Crack repairs
 - (5) Utility cut repairs

- B. **PREVENTIVE MAINTENANCE** - For streets in fair condition. This type of maintenance is necessary to prevent deterioration of the street before the street turns into one that is classified as poor condition i.e.

- (1) Pothole patching
- (2) Short asphalt overlays

C. **REHABILITATION** - For streets that are between fair and poor condition but are still structurally strong. These streets can be rehabilitated to begin a new surface life i.e.

- (1) Pothole patching
- (2) Leveling with asphalt
- (3) Complete overlay with asphalt

D. **RECONSTRUCTION** - For streets in very poor condition and at the end of their life cycle. This involves the replacement of the entire pavement structure i.e.

- (1) Excavate existing street structure
- (2) Place new base course
- (3) New asphaltic concrete pavement

The objective of a good street maintenance program is to provide smooth, safe, and durable streets for the riding public. In order to accomplish this, it is necessary to plan and schedule all work activities. This Maintenance Management System Operations Manual should greatly assist in accomplishing this task.

In order to be able to implement a Maintenance Management System it may be necessary to reorganize staff. This of course depends on present organization and personnel capabilities. For information and assistance, there is a sample Organization Chart on page 5 that includes a section for road & street maintenance.

The following notes now detail the five key elements that are necessary to implement and execute a street and road Maintenance Management System. At the back of this manual are blank forms for use in organizing and executing the System.

1. ANNUAL WORK PROGRAM (AWP)

An Annual Work Program is essential to facilitate the planning of present and future maintenance work needs. A large map should be put on the Roads Directorate field office wall and streets color coded as to their priority for maintenance work. These priorities should be evaluated taking into consideration the extent of repairs needed, the amount of traffic and other considerations applicable to the Governorate. A listing of priorities is essential and should be posted on the office bulletin board for reference. These must be updated and kept current at all times. A sample of an Annual Work Program (AWP1) is shown on page 6. All sections included on this form should be completed. If the

form is not completed in full, there will be a lack information for scheduling work and adjusting the schedule when necessary. This Annual Work Plan must be done yearly so that all maintenance work can be coordinated with in budget allocations. In order to be able to calculate budget is it is necessary to compile personnel costs, equipment maintenance and operating costs and materials costs. This Operations Manual does not cover costs or budgeting.

2. WEEKLY WORK SCHEDULES (WWS)

Weekly Work Schedules are an essential part of the Maintenance Management System. Each form has room on it for three days of work activities at four activities per day. Therefore it is necessary to complete at least eight sheets for a months work schedule. It is essential that these Weekly Work Schedule's be completed in advance. In this way planning the work to be undertaken, scheduling personnel assignments, equipment and materials needs may be done. If equipment is in need of repair, there will be time to repair it; if personnel are on vacation, there is time to find replacements. By scheduling work in advance, there will be time to order the materials that are necessary to do the work. A sample of part of a Weekly Schedule (WWS1) is shown on page 7.

3. DAILY WORK ORDER (DWO)

Daily Work Order forms should to be filled in for each activity that is to be undertaken each day. This form is the backbone of the Street and Road Maintenance Management System in that it details all information necessary to carry out the activity planned. The Daily Work Order directly references the "Performance Standard" that is relative to the work planned. Performance Standards are discussed below. The first section of the Daily Work Order lists the date the work is to be done, the work activity, the activity code and the exact location of the work. The main part of this form is divided into two sections - the first one lists the crew, equipment, materials, production, and hours planned and the second section is used to record what actually took place. The 'Planned' section of the Daily Work Order is to be filled in at least one day before the maintenance work is undertaken. By doing this it will oe know what personnel, equipment and materials are needed the next day to undertake this activity. A separate Daily Work Order must be used for each activity each day. Samples of three completed Daily Work Orders are shown on pages 8 to 10 inclusive.

4. PERFORMANCE STANDARDS (PS)

Performance Standard's give, in detail, all the information necessary to carry out a work activity. A Performance Standard is written for each type of work that is to be undertaken. Each Performance Standard names the work activity, gives it a code number, states the description and purpose of the work,

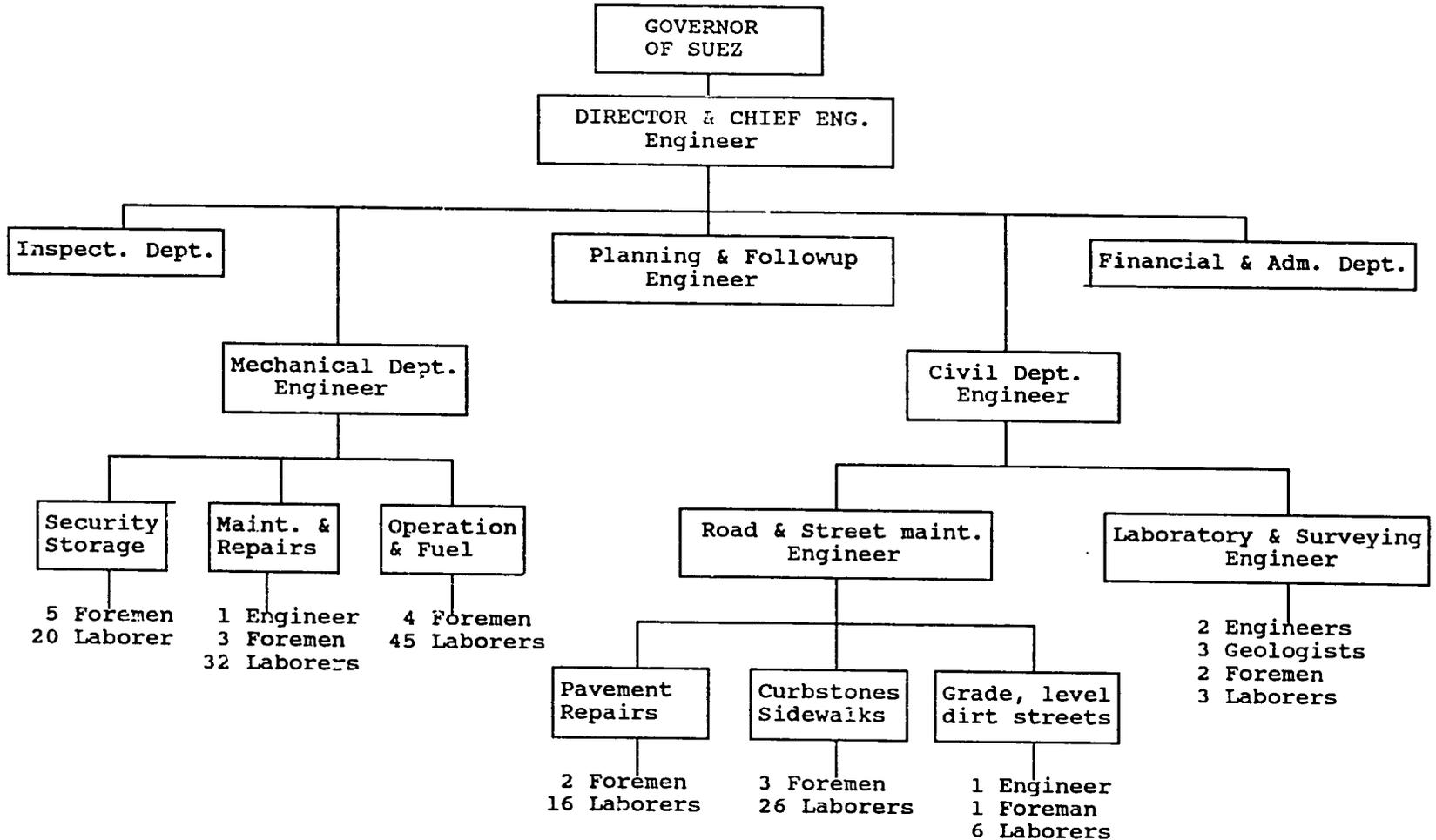
details the performance guidelines, details the methods of doing the work in sequence, recommends a typical crew size, lists the probable equipment needed, and the materials needed to accomplish the estimated daily production. Seven Performance Standard's are given on pages 11 to 17 inclusive. These Performance Standards were compiled using actual results from work undertaken in Egypt. Performance Standards are to be used when planning work and filling out the Daily Work Orders. When work is planned that is not on a Performance Standard, use should be made of the blank form included with this manual. The engineer scheduling maintenance work, as well as the engineer supervising the work in the field, should always have copies of the Performance Standards. It is important that the Work Methods detailed on the Performance Standards be followed to insure that good street maintenance is accomplished. All Performance Standard's should be reviewed yearly and updated as to current resources and production capabilities.

5. WORK ACCOMPLISHED SUMMARY (WAS)

The information that is recorded on the right side of the Daily Work Order, after the work is completed, is transferred to the Work Accomplished Summary, and plotted on the large scale street plans that should be up on the wall of the field office. This is a necessary part of the Street and Road Maintenance Management System since it enables engineers and all others concerned to visually see what maintenance work has been accomplished. Keeping these records is essential for the following reasons - (a) they assist in updating personnel, equipment, materials and production capabilities on the Performance Standards, (b) they provide accurate reference when calculating budget requirements for the coming year, (c) a record of the maintenance work accomplished is readily available. A sample of a completed WAS is shown on page 18.

Blank copies of the typical forms necessary to set up and carry out Street and Road Maintenance Systems are included in this Operations Manual.

SUEZ ROADS DIRECTORATE
 ORGANIZATION CHART
 (JUNE 1990)



SUEZ ROADS DIRECTORATE
ANNUAL WORK PROGRAM

Date Revised: 2 May 1990
Anticipated Work Time - 8 months

Priority Sequence	District	Street	Total Length in mtrs.	Average Width in mtrs.	Area in sq. mtrs.	Estimated Area for Repairs	Estimated Crew Days for Repairs	Notes
1	Arbeen	Ahmed Orabi	750	14	10,500	500	19	
2	Arbeen	Sedkey	700	10	7,000	500	19	
3	Suez	Baladiea	500	20	1,000	300	11	
4	Suez	Port Sayed	2,500	12	30,000	300	11	
5	Arbeen	Army	2,000	16	32,000	200	7	
6	Arbeen	Maher	700	10	7,000	250	9	
7	Arbeen	Tal el Kalzem	650	10	6,500	300	11	
8	Suez	El Galoa	400	15	6,000	125	5	
9	Suez	Amrc Benel Asa	300	16	4,800	80	3	
10	Suez	Abdel Khalek Sarwat	250	10	2,500	250	9	
11	Suez	El Shohada	700	12	8,400	120	4	
12	Arbeen	Abdel ei Hady	250	10	2,500	125	5	
13	Arbeen	Ataka	160	12	1,920	100	4	
14	Suez	Khaled ben el Walied	200	8	1,600	60	2	
15	Arbeen	El Menieo	120	12	1,440	100	4	
16	Arbeen	Howdel Road	300	8	2,400	50	2	
17	Suez	Bank Misr.	500	6	3,000	250	9	
18	Suez	Saad Zaglool	250	10	2,500	75	3	
19	Ataka	Fiasal el Sabah	4,000	10	40,000	1,000	37	

Starting date 1/1/90

Ending date 1/2/90

Date compiled 1/12/90

Sheet 1 of 1

Work Day	Work Date	Districts	Streets	Detailed Locations	Activity Codes	Work Activities
Wed.	4-18-90	ARBHIM	Ahmed Orabe	Beside El date st.	03	Pothole, utility cut repairs
-	-	Arbhim	- Osama -	After 407 from the start	04	Curbsstone resetting or replacement
-	-	Suez	Saad Zaglol	Beside the old Gov. Buil.	08	Footpathe Repair (tile surface)
-	-	Suez	Saad Zaglol	" " " "	07	Cleaning
Thur.	4-19-90	Arbhim	Ahmed Orabe	Between Cross of Wadec & el Gendia st.	03	Pothole utility cut repairs
-	-	"	- Osama -	After 70 m from the start	04	Curbsstone resetting or replacement
-	-	Suez	El Galaa	Beside the new Gov. Buil.	07	Cleaning
-	-	"	Saad Zaglol	Beside the old Gov. Buil.	08	Footpathe repair (tile surface)
Sat.	4-21-90	Arbhim	Ahmed Orabe	Beside el Nagdi st.	03	Pothole utility cut repairs
-	-	"	- Osama -	at the middle of st.	04	Curbsstone resetting or replacement
-	-	Suez	El Galaa	Beside the old Gov. Buil.	07	Cleaning
-	-	"	Salah Salem	" " " "	08	Footpathe repair (tile surface)

NOTES: Work under each Activity Code is to be listed separately.
 The "WEEKLY WORK SCHEDULES" are to be updated whenever any changes occur.
 At least one month of "WEEKLY WORK SCHEDULES" are to be posted on the
 Roads Directorate bulletin board.

ROAD & STREET MAINTENANCE
** DAILY WORK ORDER **DATE 22/5/90Sheet 1 of 3

Refer to PERFORMANCE STANDARDS - Activity Codes - for Crew sizes, Equipment needs, materials needs and Work Methods. Use a separate sheet for each "Work Activity". List the crew, equipment, materials, and production you have planned to use on the left side of this form. Upon completion of the work day, you complete the right side of this form and show the actual crew, equipment, materials, and production that was accomplished for this "Work Activity".

WORK ACTIVITY Pothole & Utility Cut Repair ACTIVITY CODE 03District SUEZ Street ELBALADYA
Location on street in medium street

Crew Planned	
Foremen <u>1</u>	Skilled Laborer <u>3</u>
Laborer <u>9</u>	Equipment Oper. <u>4</u>

Crew Used	
Foremen <u>1</u>	Skilled Laborer <u>3</u>
Laborer <u>9</u>	Equipment Oper. <u>4</u>

Equipment Planned	
Dump truck <u>1</u>	<u>shovels</u> <u>4</u>
Tractor w/d <u>1</u>	<u>Rakes</u> <u>3</u>
Compressor <u>1</u>	<u>Hand Tamper</u> <u>2</u>
Roller <u>1</u>	<u>paint brushes</u> <u>3</u>
Barrel w/wa <u>1</u>	<u>straight edge</u> <u>1</u>
<u>Buckets</u> <u>4</u>	<u>cones</u> <u>5</u>
<u>Brooms</u> <u>4</u>	
<u>picks</u> <u>3</u>	

Equipment Used	
Dump truck <u>1</u>	<u>shovels</u> <u>4</u>
Tractor w/d <u>1</u>	<u>Rakes</u> <u>3</u>
Compressor <u>1</u>	<u>Hand Tamper</u> <u>2</u>
Roller <u>1</u>	<u>paint brushes</u> <u>2</u>
Barrel w/wa <u>1</u>	<u>straight edge</u> <u>1</u>
<u>Buckets</u> <u>3</u>	<u>cones</u> <u>5</u>
<u>brooms</u> <u>3</u>	
<u>picks</u> <u>3</u>	

Materials Planned	
Bitum. Tack	<u>30</u> ltr.
Diesel	<u>20</u> ltr.
Asphalt Mix	<u>4</u> m ³
Tiles	___ ea.
Curbstones	___ ea.
Bedding sand	___ m ³
Mortar sand	___ m ³
Cement	___ bags
Mortar	___ m ³
___	___
___	___
___	___

materials Used	
Bitum. Tack	<u>20</u> ltr.
Diesel	<u>10</u> ltr.
Asphalt Mix	<u>4</u> m ³
Tiles	___ ea.
Curbstones	___ ea.
Bedding sand	___ m ³
Mortar sand	___ m ³
Cement	___ bags
Mortar	___ m ³
___	___
___	___
___	___

Production Planned	
Asphalt mix	<u>4</u> m ³
Potholes	<u>51</u> m ²
Surface Repair	___ m ²
Curbstones	___ ea.
Curbstone placing	___ lin. m.
Sidewalk tiles	___ ea.
Sidewalk placing	___ m ²
Street cleaning	___
Street grading	___
___	___
___	___

Production Actual	
Asphalt mix	<u>4</u> m ³
Potholes	<u>24</u> m ²
Surface Repair	___ m ²
Curbstones	___ ea.
Curbstone placing	___ lin. m.
Sidewalk tiles	___ ea.
Sidewalk placing	___ m ²
Street cleaning	___
Street grading	___
___	___
___	___

Work Hours Planned 4 hrs.Work Hours Actual 3.5 hrs.

ROAD & STREET MAINTENANCE
 ** DAILY WORK ORDER **

DATE 24 5/ 90

Sheet 2 of 3

Refer to PERFORMANCE STANDARDS - Activity Codes - for Crew sizes, Equipment needs, materials needs and Work Methods. Use a separate sheet for each "Work Activity". List the crew, equipment, materials, and production you have planned to use on the left side of this form. Upon completion of the work day, you complete the right side of this form and show the actual crew, equipment, materials, and production that was accomplished for this "Work Activity".

WORK ACTIVITY Curbstone Re-setting or Replacement ACTIVITY CODE 04

District SUEZ Street ELBALADYA
 Location on street beside -SUEZ Central station

Crew Planned			Crew Used		
Foremen	<u>1</u>	Skilled Laborer	Foremen	<u>1</u>	Skilled Laborer
Laborer	<u>4</u>	Equipment Oper.	Laborer	<u>2</u>	Equipment Oper.
<u>masons</u>	<u>2</u>		<u>masons</u>	<u>2</u>	

Equipment Planned			Equipment Used		
Dump truck	<u>1</u>	<u>shovel</u>	Dump truck	<u>1</u>	<u>shovel</u>
Tractor w/d		<u>buckets</u>	Tractor w/d		<u>buckets</u>
Compressor			Compressor		
Roller			Roller		
Barrel w/wa			Barrel w/wa		
<u>picks</u>	<u>2</u>		<u>picks</u>	<u>2</u>	
<u>straightedge</u>	<u>1</u>		<u>straightedge</u>	<u>1</u>	
<u>stringline</u>	<u>1</u>		<u>stringline</u>	<u>1</u>	

Materials Planned

Bitum. Tack	---	ltr.
Diesel	---	ltr.
Asphalt Mix	---	m3
Tiles	---	ea.
Curbstones	<u>60</u>	ea.
Bedding sand	---	m3
Mortar sand	<u>0.2</u>	m3
Cement	<u>0.5</u>	bags
Mortar	---	m3
---	---	---
---	---	---

Materials Used

Bitum. Tack	---	ltr.
Diesel	---	ltr.
Asphalt Mix	---	m3
Tiles	---	ea.
Curbstones	<u>60</u>	ea.
Bedding sand	---	m3
Mortar sand	<u>0.1</u>	m3
Cement	<u>0.5</u>	bags
Mortar	---	m3
---	---	---
---	---	---

Production Planned

Asphalt mix	---	m3
Potholes	---	m2
Surface Repair	---	m2
Curbstones	<u>60</u>	ea.
Curbstone placing	<u>30</u>	lin. m.
Sidewalk tiles	---	ea.
Sidewalk placing	---	m2
Street cleaning	---	---
Street grading	---	---
---	---	---
---	---	---

Production Actual

Asphalt mix	---	m3
Potholes	---	m2
Surface Repair	---	m2
Curbstones	<u>60</u>	ea.
Curbstone placing	<u>30</u>	lin. m.
Sidewalk tiles	---	ea.
Sidewalk placing	---	m2
Street cleaning	---	---
Street grading	---	---
---	---	---
---	---	---

Work Hours Planned 3.5 hrs.

Work Hours Actual 3 hrs.

ROAD & STREET MAINTENANCE
 ** DAILY WORK ORDER **

DATE 22/ 5/ 90

Sheet 3 of 3

Refer to PERFORMANCE STANDARDS - Activity Codes - for Crew sizes, Equipment needs, materials needs and Work Methods. Use a separate sheet for each "Work Activity". List the crew, equipment, materials, and production you have planned to use on the left side of this form. Upon completion of the work day, you complete the right side of this form and show the actual crew, equipment, materials, and production that was accomplished for this "Work Activity".

WORK ACTIVITY Foot paths Repair (Tiles surface) ACTIVITY CODE 08

District SUEZ Street So Rd. Zaglal
 Location on street 120 limit Governorate of SUEZ - Building old

Crew Planned
 Foremen 1 Skilled Laborer
 Laborer 4 Equipment Oper. 1
masons 2

Crew Used
 Foremen 1 Skilled Laborer
 Laborer 4 Equipment Oper. 1
masons 2

Equipment Planned
 Dump truck 1
 Tractor w/d
 Compressor
 Roller
 Barrel w/wa
picks 2
shovels 2
straightedge 1

Equipment Used
 Dump truck 1
 Tractor w/d
 Compressor
 Roller
 Barrel w/wa
picks 2
shovels 2
straightedge 1

Materials Planned
 Bitum. Tack ltr.
 Diesel ltr.
 Asphalt Mix m3
 Tiles 250 ea.
 Curbstones ea.
 Bedding sand 0.1 m3
 Mortar sand 0.2 m3
 Cement 0.5 bags
 Mortar m3

Materials Used
 Bitum. Tack ltr.
 Diesel ltr.
 Asphalt Mix m3
 Tiles 250 ea.
 Curbstones ea.
 Bedding sand 0.1 m3
 Mortar sand 0.2 m3
 Cement 0.5 bags
 Mortar m3

Production Planned
 Asphalt mix m3
 Potholes m2
 Surface Repair m2
 Curbstones ea.
 Curbstone placing lin. m.
 Sidewalk tiles 250 ea.
 Sidewalk placing 10 m2
 Street cleaning
 Street grading

Production Actual
 Asphalt mix m3
 Potholes m2
 Surface Repair m2
 Curbstones ea.
 Curbstone placing lin. m.
 Sidewalk tiles 250 ea.
 Sidewalk placing 10 m2
 Street cleaning
 Street grading

Work Hours Planned 4 hrs.

Work Hours Actual 3 hrs.

WORK ACTIVITY: Short Asphalt Overlays

ACTIVITY CODE: 02

DESCRIPTION & PURPOSE: Placing a layer of hot-mix asphaltic concrete over an existing asphalt roadway to correct settlements, restore smoothness, and in turn prolong the useful life of the roadway.

PERFORMANCE GUIDELINES: Before doing an asphalt overlay, the roadway must be repaired as per Performance Standards (Activity Codes 03 & 03A). This work is to be undertaken when the base course is structually sound and the asphalt pavement has deteriorated and become excessively rough.

TYPICAL CREW		WORK METHOD
Foreman	1	<ol style="list-style-type: none"> 1. Make sure all necessary repairs have been completed using Activity Codes 03 & 03A. 2. Place cones, barrels and/or other safety devices to protect personnel and area. 3. Clean thoroughly removing all dirt by using shovels, picks, brooms and compressed air. 4. Spray a bitumen tack coat evenly over the existing pavement. Application rate will vary between 0.23 liters and 0.45 liters per sq. meter depending on the condition of the existing road surface. Use as little as possible to "tack" the new asphalt mix to the old pavement. 5. Lay the new asphalt mix with the asphalt finisher at a depth so that you get a 6 cm. depth after rolling is completed. 6. Roll the mix as soon as it is laid by the finisher in order to obtain maximum compaction. The drive wheel of the roller is to be next to the finisher. Roll from outside edges towards the center of the roadway. Overlay each pass of the roller by one-half of the cylinder width. 7. Check the surface before the final rolling with a long straightedge for depressions or high spots and correct while the mix is very hot. 8. Do the final rolling after the mix has cooled some, but you can still roll out the roller marks left by the initial rolling.
Equipment Operators	8	
Skilled laborers	4	
Laborers	12	
EQUIPMENT		
Dump trucks	3	
Asphalt finisher	1	
Air Compressor	1	
Tractor w/bed	1	
Rollers	1	
Asphalt distributor with sprayer	1	
MATERIALS		
Asphalt mix	75 m ³	
Bitumen tack coat	190 to 374 ltr	
Diesel for cleaning tools	30 ltr	
ESTIMATED DAILY PRODUCTION		
830 m ² at a compacted depth of 6 cm.		

NOTES:

**** PERFORMANCE STANDARD ****

WORK ACTIVITY: Pothole & Utility Cut Repairs

ACTIVITY CODE: 03

DESCRIPTION & PURPOSE: Damaged areas can be any of the following: Potholes, utility cuts, raveling, depressions, edge breaks, etc. Restoration of the roadway to a smooth and uniform surface reduces vehicle maintenance costs and reduces future road maintenance costs.

PERFORMANCE GUIDELINES: It is necessary to repair all damaged areas as soon as possible. If damaged areas are not repaired in their early stages, they increase in size and soon the pavement requires complete rebuilding.

TYPICAL CREW	WORK METHOD
Foreman 1	<ol style="list-style-type: none"> 1. Place cones, barrels and/or other safety devices to protect personnel and area. 2. Mark area to be repaired at least 10 cm. outside area to be repaired. 3. Excavate area to be repaired. Use Compressor with cutter to form verticle edges. Excavate to a depth where the underlying asphalt layer is undisturbed or the base course is solid. 4. Thoroughly clean the bottom of the hole so there is no loose material. 5. If bottom of hole is asphalt concrete, put a light tack coat on and let it dry. 6. If bottom of hole is base course material, dampen with water and compact using hand tampers & vibrating compactor. Apply a light prime coat to the bottom of the hole. 7. Paint the sides of the hole with tack coat material using paint brushes. 8. Lay asphalt mix in hole not more than 7.5 cm. thick per layer. Compact each lift thoroughly using the vibratory compactor. Use hand tampers only where necessary. 9. The last layer of asphalt mix (top) must be very level and be slightly higher than the existing road. Use the 'Wooden Straightedge to check the level and height. Asphalt concrete must not extend past the edges of the hole. 10. Compact the top layer with roller using a small amount of water on the rollers.
Equipment Operators 5	
Skill laborers 4	
Laborers 6	
EQUIPMENT	
Dump Truck 1	
Tractor w/bed 1	
Air Compressor 1	
Roller 1	
Vib. Compactor 1	
SMALL TOOLS	
(a) Buckets 4	
(b) Buckets w/holes 2	
(c) Brooms 4	
(d) Picks 2	
(e) Shovels 4	
(f) Rakes 3	
(g) Hand Tampers 4	
(h) Paint Brushes 4	
(i) Straight Edge 1	
(j) Cones or barrels	
MATERIALS	
Asphalt Mix 3 to 5 m ³	
Bitumen Tack & Prime 10 to 20 ltr.	
Diesel (cleaning) 5 ltr.	
ESTIMATED DAILY PRODUCTION	
4 m ³ = 34 m ² (approx.) @ 8 cm. compacted depth	
4 m ³ = 27 m ² (approx.) @ 10 cm. compacted depth	
4 m ³ = 23 m ² (approx.) @ 12 cm. compacted depth	

NOTES:

ROAD & STREET MAINTENANCE

** PERFORMANCE STANDARD **

WORK ACTIVITY: Pavement Repairs - Alligator cracks, depressions, raveling, small potholes ACTIVITY CODE: 03A

DESCRIPTION & PURPOSE: This type of repair is to be done on areas that that do not need to be cut or excavated. Engineering judgement is to be used to determine if the distressed area should be repaired using Performance Standard with Activity Code 03 or this one.

PERFORMANCE GUIDLINES: Repairs are to be done as soon as Alligator cracks, depressions, raveling, or small damaged areas are observed.

TYPICAL CREW		WORK METHOD	
Foreman	1	1. Place cones, barrels or other safety devices to protect personnel and area.	
Equipment Operators	5	2. Mark area to be repaired at least 10 cm. outside of damaged area.	
Skill laborers	4	3. Clean thoroughly with picks, shovels, brooms and air so that all of damaged area is showing and very clean.	
Laborers	6	4. Use picks or air compressor cutter to cut a notch 2 cm. deep and 8 cm. wide around the outside edge of the area to be patched. This ensures that the edge of the patch is well bonded to the existing pavement.	
EQUIPMENT		5. Use pick to make many small chips on the complete area that is to be repaired.	
Dump truck	1	6. Thoroughly clean again as in number three above.	
Tractor w/bed	1	7. Apply a tack coat to the area that is being repaired.	
Air Compressor	1	8. Wait until the tack coat has 'cured' before filling with asphalt concrete.	
Roller	1	9. While waiting for the tack coat to 'cure' got to the next spot to be repaired. Start the procedure over by starting with Item No. 1 above.	
Vib. Compactor	1	10. Use "straightedge" to make sure that the asphalt mix is level and slightly higher than the existing pavement.	
SMALL TOOLS		11. Use roller (preferred) or vibrating compactor to thoroughly compact the asphalt mix. Start from the outside edges and work towards the center.	
(a) Hand tampers	4		
(b) Shovels	4		
(c) Rakes	3		
(d) Brooms	4		
(e) Picks	4		
(f) Bucket w/holes	2		
(g) Buckets	4		
(h) Paint brushes	4		
(i) Straight edge	1		
(j) Cones or Barrels			
MATERIALS		ESTIMATED DAILY PRODUCTION	
Asphalt mix	6 to 12 m3	6 m3 =	81 m2 (approx.) @ 5 cm. compacted depth
Bitumen		9 m3 =	121 m2 (approx.) @ 5 cm. compacted depth
Tack coat	30 to 60 ltr	12 m3 =	162 m2 (approx.) @ 5 cm. compacted depth
Diesel for cleaning tools	5 ltr		

NOTES:

/PD03AE

**** PERFORMANCE STANDARD ****

WORK ACTIVITY: Curbstone Re-setting or Replacement **ACTIVITY CODE:** 04

DESCRIPTION & PURPOSE: Re-set or replace curbstones that are loose, tilted, broken or missing.

PERFORMANCE GUIDELINES: A survey of the necessary curbstone repairs is to be undertaken along with the survey for street and footpath repairs. Curbstone repairs are to be done using the same type of curbstone and lined up with the existing curbstone alignment using a stringline.

TYPICAL CREW		WORK METHOD		
Foreman	1	<ol style="list-style-type: none"> 1. Place cones, barrels and/or other safety devices to protect personnel and area. 2. Remove and dispose of broken and damaged curbstone sections and other unusable materials. 3. Compact underlying surface & new bedding sand, adding water for maximum compaction. 4. Make sure area is level using wooden straightedge. 5. Place mortar material on base and check level with straightedge. 6. Set curbstone and line up using stringline. 7. Fill all joints with mortar. 8. Smooth all joints flush with the curbstones. 9. Clean up area. 		
Masons	2			
Equip. Operator	1			
Laborers	4			
EQUIPMENT				
Dump truck (or tractor w/trailer)	1			
Small Tools				
(a) Picks	2			
(b) Straightedge	1			
(c) Stringline	1			
(d) Shovels	2			
(e) Ruckets	2			
(f) Trowels	2			
MATERIALS				
Curbstones	100 ea.			
Sand	0.20 m3			
Cement	0.75 bag			
(mortar=0.15 m3)				
		ESTIMATED DAILY PRODUCTION		
		50 meters		

NOTES:

WORK ACTIVITY: Grading & Shaping Unpaved Streets ACTIVITY CODE: 05 & 06

DESCRIPTION & PURPOSE: Grade, shape and smooth earth street surfaces with motorgrader and roller to restore proper crown and smooth riding surface.
 ACTIVITY CODE: 05 To be used when material is needed for leveling.
 ACTIVITY CODE: 06 To be used when no material is needed.

PERFORMANCE GUIDELINES: This work is to be performed when the street has developed corrugations, traffic ruts, holes, uneven settlements, or accumulation of debris that obstructs vehicular use.

TYPICAL CREW		WORK METHOD		
Equipment operators	3	<ol style="list-style-type: none"> 1. Place cones, barrels and/or other safety devices to protect personnel and area. 2. Use laborers to remove large stones and other materials that should not be graded into street. 3. Use motorgrader to cut high areas and fill low areas, starting at the outside edges of street and working towards the center of the street. 4. Shape the street with a slight crown in center making sure the complete street is smooth. 5. Add water as necessary for proper compaction. 6. Roll street to a smooth surface and to a compacted state. 		
Laborers	3			
EQUIPMENT				
Motorgrader	1			
Roller	1			
Water tanker	1			
Picks	2			
Shovels	2			
Rakes	2			
MATERIALS		ESTIMATED DAILY PRODUCTION		
Activity Code: 05 Gravel and/or earth fill material when necessary.		2000 to 5000 m2		
Activity Code: 06 - None				

NOTES:

ROAD & STREET MAINTENANCE

** PERFORMANCE STANDARD **

WORK ACTIVITY: Street Cleaning before pavt. repairs ACTIVITY CODE: 07

DESCRIPTION & PURPOSE: Thorough cleaning of street area is necessary so that a detailed inspection can be undertaken before starting pothole, alligator crack, etc. repairs. All dirt, trash and other debris is to be removed so that the existing asphalt pavement is fully exposed and cleaned.

PERFORMANCE GUIDELINES: The method and equipment used for cleaning is to be determined by the Engineer. The crew, equipment and work methods listed below are guides to assist the Engineer in his decisions.
A "Daily Work Order" form is to be completed before work begins and upon completion of the work the right side of the form is to be filled in.

TYPICAL CREW

Foreman	1
Equipment Operators	?
Laborers	?

EQUIPMENT

Grader	1
Loader	1
Tractor w/bed	1
Dumpster	1
Air Compressor	1
Small tools (as necessary)	

MATERIALS

None

WORK METHOD

1. Place cones, barrels and/or other safety devices to protect personnel and area.
2. Clean the existing asphalt pavement using personnel and equipment necessary so that the pavement is very clean.
3. Load the dirt, trash and other debris into the vehicle that is to transport it for disposal.
4. Inspect the cleaned pavement thoroughly and record locations that need repaired.
5. Fill out "Daily Work Order" forms using "Activity Codes" for the work to be undertaken.
6. Complete the "Weekly Work Schedule" using the information from the "Daily Work Orders". The "Weekly Work Schedules" must be coordinated with other work that is planned. In this way you are scheduling all maintenance work that is to be accomplished within the next month.

ESTIMATED DAILY PRODUCTION

m2 Cleaned to be recorded after completion.

NOTES:

** PERFORMANCE STANDARD **

WORK ACTIVITY: Footpaths Repair (Tile Surface)

ACTIVITY CODE: 08

DESCRIPTION & PURPOSE: Repair of footpaths (sidewalks) using the same design of tiles as were originally used. Restore footpath to its original smooth condition.

PERFORMANCE GUIDELINES: Survey of necessary footpath repairs are to be done along with the survey for necessary street repairs. Repair work on the footpaths is to be scheduled so that all repairs are completed as soon as possible after completion of street repairs.

TYPICAL CREW

Foreman	1
Masons	2
Equip. Operators	1
Laborers	4

EQUIPMENT

Truck	1
(or tractor w/trailer)	
Small Tools	
(a) Picks	2
(b) Shovels	2
(c) Straightedge	1
(d) Bucket	1
(e) Trowels	2

MATERIALS

Tiles	300 ea.
Sand	0.30 m3
Cement	0.70 bag

(mortar = 0.14 m3)

WORK METHOD

1. Remove damaged tiles and loose material.
2. Compact underlying surface & new bedding sand adding water for maximum compaction.
3. Level area using wooden straightedge.
4. Place mortar and and make sure it is level.
5. Place tiles using straightedge to make sure they are level.
6. Broom area to make sure that the mortar fully fills all spaces between tiles.
7. Block off area for a period of at least 24 hours to make sure that tiles are not disturbed during curing period.
8. Return after 24 hours, remove barricades and clean up area.

ESTIMATED DAILY PRODUCTION

12 m2

NOTES:

SUEZ ROADS DIRECTORATE
WORK ACCOMPLISHED SUMMARY

DATE	HRS. * WORK	ENG.	FOR MAN	SKILL LABOR	LAB ORER	EQUIP OPER	EQUIPMENT USED	MATERIAL USED TYPE & AMOUNT	WORK ACCOMP m2-m3-lin.m	ACT. CODE	ACTIVITY DETAILS	LOCAT. WORK ACCOMP.
5/10	4.0	1	1	2	2	1	Truck	Curbstones 60 ea Sand 0.2 m3 Cement .5 bag	30 lin m.	04	Place curbston	Etaka dist Elewah City
	4.0	1	1	1	3	1	Truck	Tiles 125 ea Sand 0.2 m3 Cement .5 bag	5 m2	08	Footpath repair	Suez dist behind Govt. bldg
	5.0	1	1	2	6	3	Truck Grader Dumpster	None	500 m2	07	Street cleanin	Suez dist Elbaladeya st.
5/12	5.0	1	1	2	4	1	Truck	Curbstones 120 ea Sand 0.2 m3 Cement .75 bag	60 lin m.	04	Place curbston	Etaka dist Elewah City
	5.0	1	1	2	4	1	Truck	Tiles 250 ea Sand 0.3 m3 Cement .75 bag	10 m2	08	Footpath repair	Suez dist behind Gov. bldg.
	7.5 (mix arrived late-pd.overtime?)	1	1	3	7	4	Truck Roller Tractor w/bed Air Comp	Asph. mix 2 m3 Tack coat 20 ltr Diesel 10 ltr	17 m2	03	Potholes	Suez dist Amro Ben Elahas st
5/13	5.0	1	1	2	4	1	Truck	Curbstones 100 ea Sand .2 m3 Cement .75 bag	50 lin. m	04	Placing curbston	Etaka dist Elewah City
	4.0	1	1	1	2	1	Truck	Tiles 125 ea Sand 0.2 m3 Cement .3 bag	5 m2	08	Replacin Tiles	Suez dist Behind Gov. bldg
	5.0	1	1	2	3	1	Grader	None	3000 m2	07	Street cleaning	Arbeen dis El Rowad st

ROADS DIRECTORATE
WORK ACCOMPLISHED SUMMARY

DATE	HRS. * WORK	ENG.	FOR MAN	SKILL LABOR	LAB ORER	EQU OPER	EQUIPMENT USED	MATERIAL USED TYPE & AMOUNT	WORK ACCOMP m2-m3-in.m	ACT. CODE	ACTIVITY DETAILS	LOCAT. WORK ACCOMP.
<p>* Includes 1 hr. total travel to & from site.</p>												

GOVERNORATE OF _____ ROAD & STREET MAINTENANCE

ROADS DIRECTORATE

**** PERFORMANCE STANDARD ****

WORK ACTIVITY:

ACTIVITY CODE:

DESCRIPTION & PURPOSE:

PERFORMANCE GUIDLINES:

TYPICAL CREW

WORK METHOD

EQUIPMENT

MATERIALS

ESTIMATED DAILY PRODUCTION

NOTES:

/PSE

GOVERNORATE OF _____

ROAD & STREET MAINTENANCE
 ** WEEKLY WORK SCHEDULE **

ROADS DIRECTORATE

Starting date / / Ending date / / Date compiled / / Sheet of

Work Day	Work Date	Districts	Streets	Detailed Locations	Activity Codes	Work Activities
- - -	- - -	- - -	- - -	- - -	- - -	- - -
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NOTES: Work under each Activity Code is to be listed seperately.
 The "WEEKLY WORK SCHEDULES" are to be updated whenever any changes occur.
 At least one months of "WEEKLY WORK SCHEDULES" are to be posted on the
 Roads Directorate bulletin board at all times. Therefore at least eight
 of these completed forms will be posted on the bulletin board.

GOVERNORATE OF _____

ROADS DIRECTORATE

ROAD & STREET MAINTENANCE

** DAILY WORK ORDER **

DATE ___/___/___

Sheet ___ of ___

Refer to PERFORMANCE STANDARDS - Activity Codes - for Crew sizes, Equipment needs, materials needs and Work Methods. Use a separate sheet for each "Work Activity". List the crew, equipment, materials, and production you have planned to use on the left side of this form. Upon completion of the work day, you complete the right side of this form and show the actual crew, equipment, materials, and production that was accomplished for this "Work Activity".

WORK ACTIVITY _____

ACTIVITY CODE _____

District _____

Street _____

Location on street _____

Crew Planned

 Foremen _____ Skilled Laborer _____
 Laborer _____ Equipment Oper. _____

Crew Used

 Foremen _____ Skilled Laborer _____
 Laborer _____ Equipment Oper. _____

Equipment Planned

 Truck _____
 Tractor w/b _____
 Compressor _____
 Roller _____
 Vib. Compact _____
 Dumpster _____

Equipment Used

 Truck _____
 Tractor w/b _____
 Compressor _____
 Roller _____
 Vib. Compact _____
 Dumpster _____

Materials Planned

 Asphalt Mix _____ m3
 Bitum. Tack _____ ltr.
 Diesel _____ ltr.
 Tiles _____ ea.
 Curbstones _____ ea.
 Bedding sand _____ m3
 Mortar sand _____ m3
 Cement _____ bags
 Mortar _____ m3

Materials Used

 Asphalt Mix _____ m3
 Bitum. Tack _____ ltr.
 Diesel _____ ltr.
 Tiles _____ ea.
 Curbstones _____ ea.
 Bedding sand _____ m3
 Mortar sand _____ m3
 Cement _____ bags
 Mortar _____ m3

Production Planned

 Asphalt mix request _____ m3
 Potholes - Area _____ m2
 - Depth _____ cm.
 Surface Repair _____ m2
 - Depth _____ cm.
 Curbstones _____ ea.
 Curbstone placing _____ lin.m.
 Sidewalk tile _____ ea.
 Sidewalk tile area _____ m2
 Street cleaning _____ m2
 Street grading _____ m2

Production Actual

 Asphalt mix receive _____ m3
 Potholes - Area _____ m2
 - Depth _____ cm.
 Surface Repair _____ m2
 - Depth _____ cm.
 Curbstones _____ ea.
 Curbstone placing _____ lin.m.
 Sidewalk tiles _____ ea.
 Sidewalk tile area _____ m2
 Street cleaning _____ m2
 Street grading _____ m2

Work Hours Planned _____ hrs.

Work Hours Actual _____ hrs.

ROADS DIRECTORATE
ANNUAL WORK PROGRAM

Date Compiled: _____
Anticipated Work Time: _____

Priority Sequence	District	Street	Total Length in mtrs.	Average Width in mtrs.	Area in sq. mtrs.	Estimated Area for Repairs	Estimated Crew Days for Repairs	Notes