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LOCAL DEVELOPMENT II URBAN PROJECT

Submitted to

USAID / CAIRO

Submitted by

WILBUR SMITH ASSOCIATES

in association with

PUBLIC ADMINISTRATION SERVICE
DEVELOPMENT CONSULTING OFFICE

DELOITTE HASKINS AND SELLS
ENGINEERING AND GEOLOGICAL
CONSULTING OFFICE

Proposal for
A Central Equipment Maintenance Workshop
Suez Governorate
October, 1988

LOCAL DEVELOPMENT II URBAN PROJECT

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O&M - Suez
LD-II/88/02
October 19, 1988

HE Gen. Tahseen Shanan
The Governor of Suez
Suez Governorate

Your Excellency,

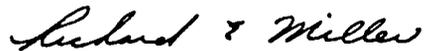
With the assistance and cooperation of your staff we have completed the preparation of the special project documentation for A Central Equipment Maintenance Workshop. Five Arabic and five English copies of the project documents are enclosed. Should you have any questions about the project data we will be most happy to meet with you and discuss or clarify any portions or items that may be in question.

Should you find the project scope and detail suitable for your needs, the next step in the procedure is to submit the project data, in Arabic and English, to Mr. M. El Kholy, Reporter for the ULDC for review and approval by that body. Upon their approval, the ULDC will forward the special project to the AMANA. Kindly note that a copy of this letter and project documentation is being sent directly to Mr. Gisiger of USAID.

I personally look forward to a visit with you in the near future. We appreciate your support and assistance in implementing the various components of the LD-II Program.

With deepest respect,

WILBUR SMITH ASSOCIATES



Richard E. Miller
Chief of Party

cc: Mr. Jack Gisiger
Chief, Urban Department
USAID, Cairo

Gen. Bassim Sabra
Cairo Coordinator

WILBUR SMITH ASSOCIATES

DELOITTE HASKINS AND SELLS
DEVELOPMENT CONSULTING GROUP

PUBLIC ADMINISTRATION SERVICE
ENGINEERING AND GEOLOGICAL
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Abstract

A Central Equipment Maintenance Workshop is proposed to handle complete overhaul and maintenance of all vehicles and heavy equipment serving the Suez Governorate. Services are to include road maintenance equipment, street cleaning equipment, waste-disposal vehicles, electrical department vehicles, housing department vehicles, as well as vehicles of sanitary & drainage departments, agricultural administration, civil defense, utility police, traffic, fire-fighting, social affairs, and education departments. In addition, after fulfillment of primary governmental functions, workshop would be available for repairs to private sector vehicles and equipment. For extremely difficult repair, which might be beyond capabilities of workshop, private sector specialized firms would provide the services.

Workshop is to be located at the site of a heavy truck garage located on the Suez-Ismailia Road (Km. 2). This parking area is presently not used. It consists of about 6,700 m² of concrete base parking area including an office space of about 87 m². Lighting surrounds the area, with full utilities connections provided.

The proposal is to enclose with metal sheds about 1200 m² to provide workshops and vehicles service stations and to construct stores and welfare buildings required for workshop operations. The remainder area will be used as a parking space for vehicles needing repair. Appropriate machines and tools are to be provided including diagnostic equipment, workshop machines, wheel balancer, lathes, shapers, alignment and tyre repair equipment, battery chargers, exhaust pipes repair equipment, sewing machine for repair of car's interior, as well as washing and lubricating equipment. The central workshops will be leased to the private sector.

Estimated Project Budget is LE 692,000.

Estimated implementation time after receipt of order to commence the project is 46 weeks.

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I. Project Definition

- A. Construction of and equipping a central maintenance workshop at the present site of a heavy truck parking garage is proposed.
- B. Workshop will be equipped with machines and tools required to carry out all types of maintenance and repairs, excepting very major repairs not suitable to the shop equipment as proposed.
- C. The purpose of the workshop will be to provide a repairs and maintenance facility for all departments of the Suez Governorate fleet of vehicles and heavy equipment.
- D. Present site consists of a walled enclosure with two entrance gates, office space, a parking area of concrete pavement, surrounding lighting systems, and connections to water, sewer, and electricity mains.
- E. The proposal is to convert the 6,700 m² of parking space into 1,200 m² of workshops, stores and welfare buildings with remainder to the use for parking of equipment awaiting repair or pick-up.
- F. Existing 87 m² offices and WC will be used for workshops administration.
- G. Appropriate machines, and tools are to be provided, including diagnostic equipment (i.e. engine analysers, etc) for engine repair and maintenance. Cost of vehicle equipment is detailed in section V of this report.
- H. The workshops will be leased to a private sector specialized firm by competitive bidding (see Suez Governorate letter appendix 1).

II. Project Justification

- A. Owing to present lack of adequate maintenance and repair facilities in Suez, many vehicles and much heavy equipment does not receive adequate maintenance leading to premature breakdown.
- B. Major repairs are accomplished in Cairo, owing to lack of adequate repair facilities in Suez.
- C. The proposed site is located in Suez, along the Ismailia Road (Km. 2), presently unused, with some amount of civil works, to be converted into a central vehicle and equipment workshop for the Governorate of Suez.
- D. Such a facility will provide many jobs for mechanics and laborers in the Suez Governorate, and can be also used as a training center.
- E. In addition, the workshop could provide an additional revenue source for the Suez Governorate by leasing it to the private sector and making it available for repair and maintenance of local private sector vehicles and equipment.

III. Facility Location and Layout

See Figure 1, 2, 3 and 4.

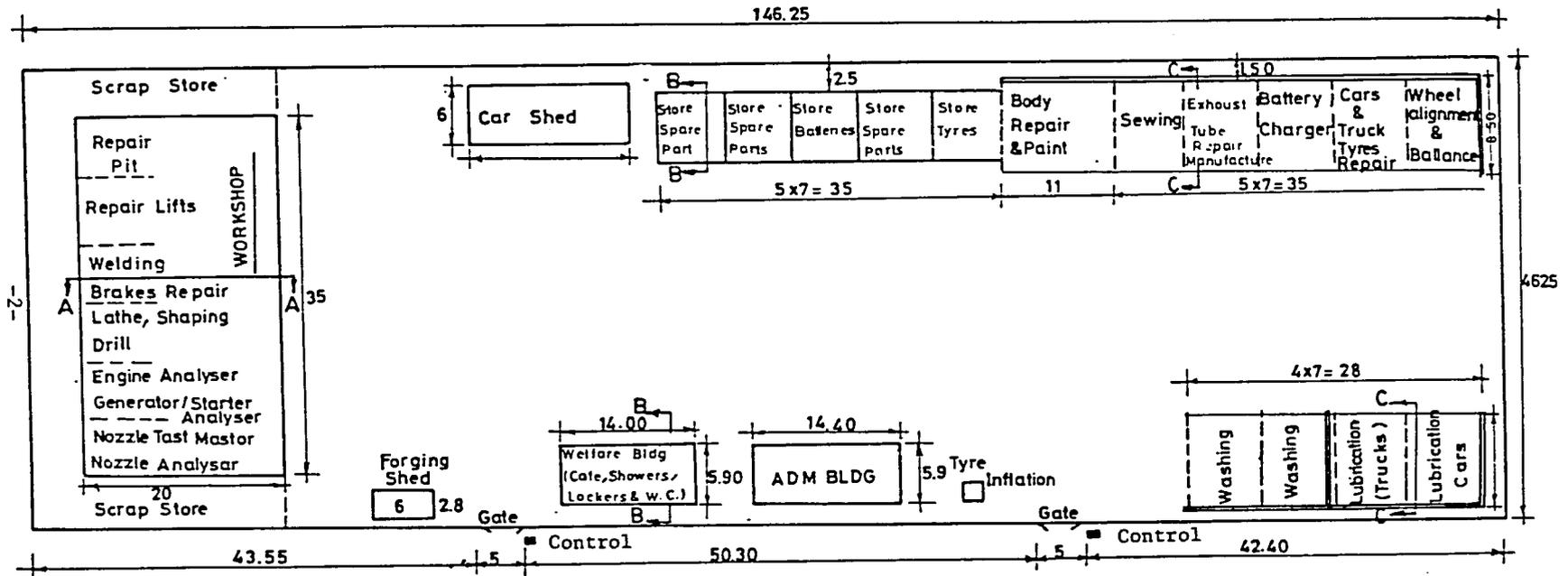
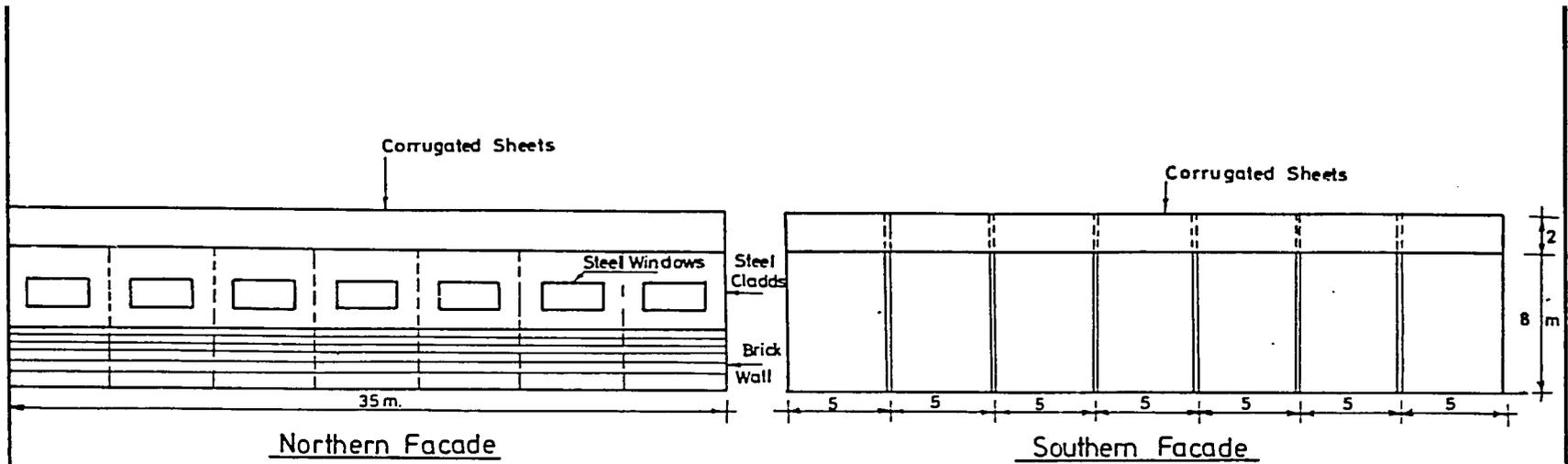
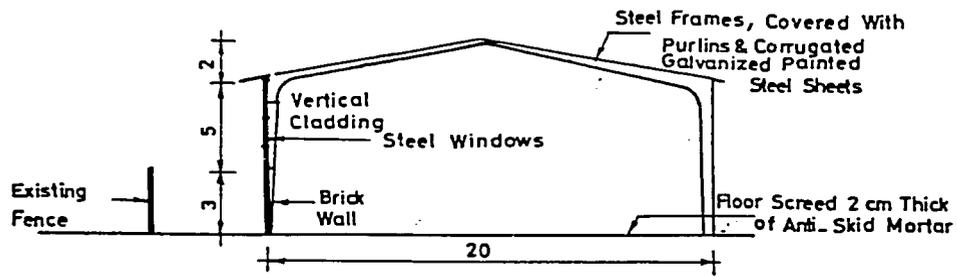


Fig (1) - Plan of Central Workshops
(At km..... Suez- Ismailia Road)

* Section A-A, B-B, C-C
are Shown in
Figs 2, 3 & 4
* Dimensions in ms.



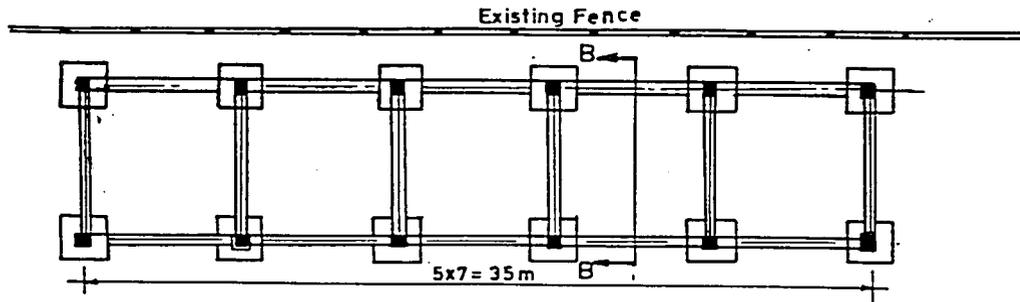
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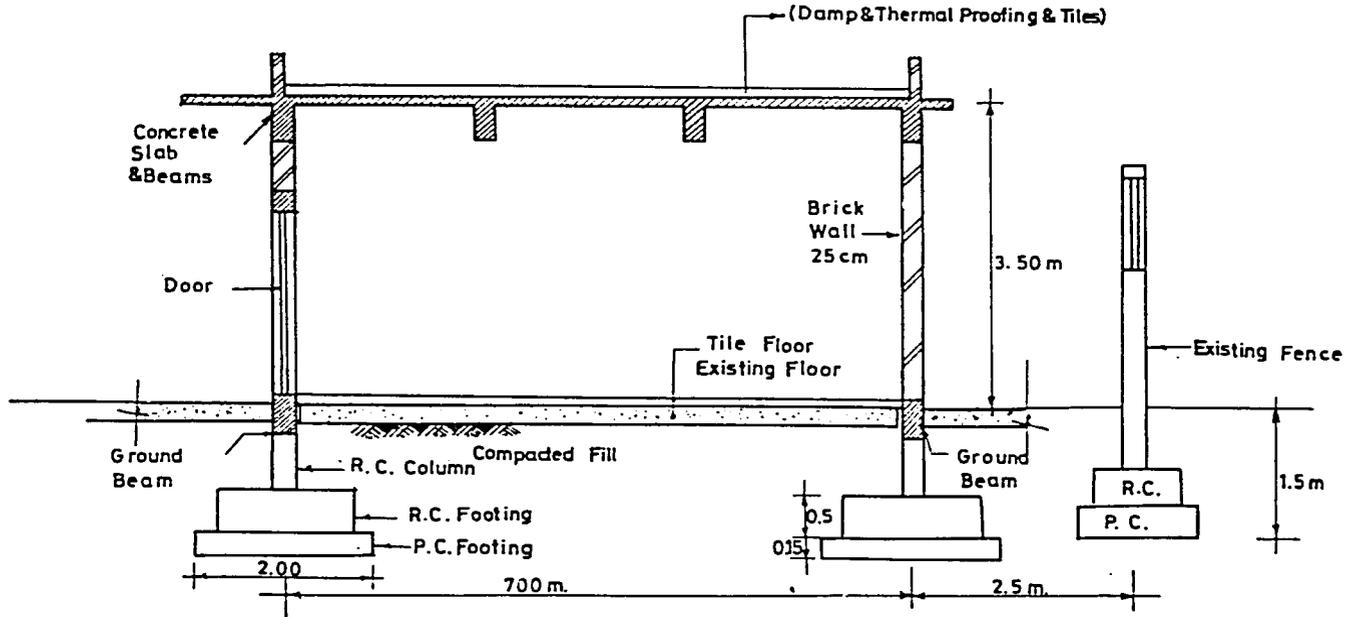
Sec. A -A (See Fig(1))

Fig (2) Workshop, Section & Elevations

Dimensions in ms

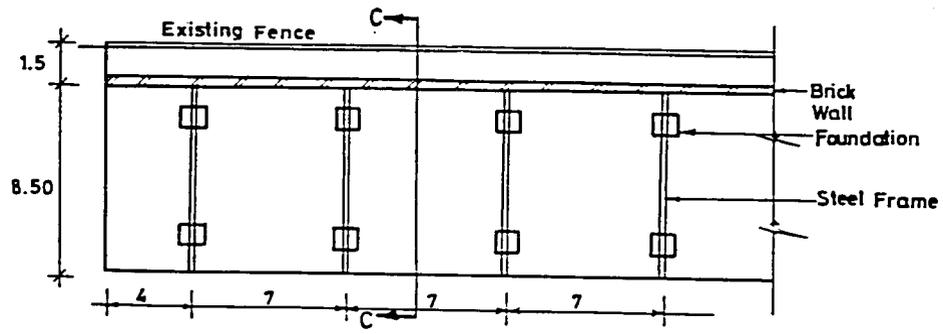


Plan of Foundations (Stores Area)

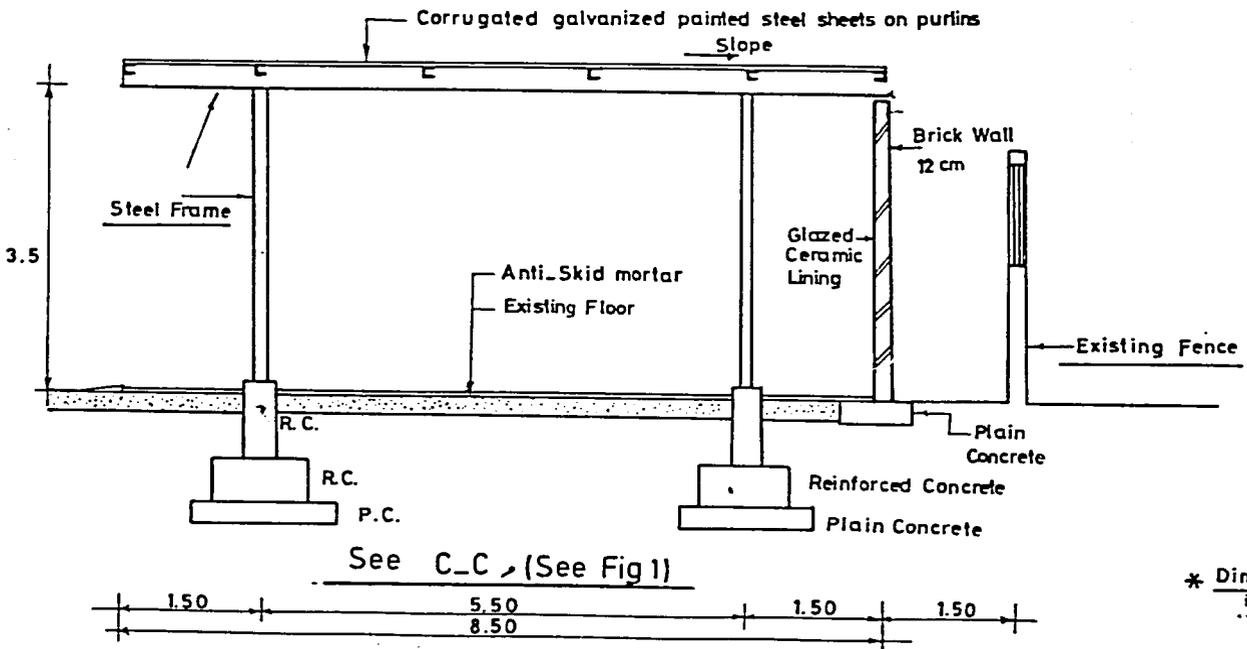


Fig(3) - Sec B-B, Stores & Welfare Buildings

* Dimensions are in ms



Part Plan



See C-C (See Fig 1)

* Dimensions are in ms.

Fig (4) Repair, Washing & Lubrication Areas Sheds

5-

IV. Project Staff Requirements

Two governorate engineers (one civil and one mechanical) will be assigned by the governorate to coordinate the activities needed for the proper implementation of the Project and supervision of Civil Construction and mechanical installations. The salaries of the two engineers will be borne by the governorate.

V. Project Budget

	<u>Unit</u>	<u>Qty</u>	<u>Unit Price</u>	<u>Total</u>
A. <u>Civil Works</u>			LE	LE
1) <u>Workshop</u>				
a) <u>Soil investigation</u>				
Boreholes for foundations 25m depth and submission of soil report	l.m	100	35	3500
b) <u>Earth Work</u>				
1. Demolition of existing floor at places of foundation ground beam & repair pit and transportation of residues to to disposal site	m3	30	50	1500
2. Excavation for foundations, & repair pit and transportation of excavated soil to disposal site	m3	300	5	1500
3. Filling using compacted sand	m3	190	5	950
c) <u>Concrete work</u>				
1. Plain concrete (180 kg/cm ²) for foundations using sulphate resistant cement	m3	25	70	1750
2. Reinforced concrete (250 kg/cm ²) for foundations, ground beams and repair pits using sulphate resistant cement (rate excludes reinfor- ment)	m3	85	120	10200
3. Concrete floors (250 kg/cm ²), 20 cm thick, including joints	m2	150	25	3750
4. Supply and installation of steel reinforcement	ton	15	950	14250

d) Damp Proofing

1. Damp proof course consisting of 3 layers of bituminous membranes on glass fiber base, 1.6 kg/m ² and four mopping coats of oxidized bitumin (1.5 kg/m ²) for pit base	m ²	20	12	240
2. Damp proof course of above formation for pit vertical wall, including external brick wall, 12 cm thick	m ²	50	22	1100
3. Painting of foundations surfaces with 3 coats of oxidized bitumin, 1.5 kg/m ² each coat	m ²	200	3	600

e) Structural Steel

1. Supply and installation of structural steel, including painting	ton	25	2200	55000
2. Supply and installation of steel anchor bolts	ton	0.5	1500	750
3. Grouting with rich cement, anti-shrink mortar	m ³	1	1200	1200
4. Supply and installation of galvanized painted corrugated steel sheets, 0.7 mm thick for vertical cladding	m ²	350	15	5250
5. Supply and installation of galvanized painted corrugated steel sheets, 0.7 mm thick for ceiling	m ²	700	15	10500

f) Finishings

1. Repair of joints between existing floor slabs including removal of top part of joints filler and replacement by approved filler	l.m	400	2	800
2. Floor screed, 2 cm thick, using anti-skid mortar	m ²	650	10	6500
3. Sand lime brick walls, 25 cm thick	m ³	55	110	6050
4. Steel windows, including hardware, painting and glass	m ²	35	110	3850
5. Lining of repair pit walls with glazed ceramic tiles, 0.6 cm thick	m ²	70	25	1750

g) Lighting & Electrical Connections

Supply and installation of lighting lamps, cable, electrical fixture, switch boards and connections to equipment	sum			15000
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h) Plumbing

Supply and installation of water piping and fire fighting stands	sum			5000
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Sub-total			LE	150990
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2) Spare Parts, tyres and batteries stores and welfare building

a) Earth Work

1. Demolition of existing floor at places of foundations & transportation of residues to disposal site	m3	50	50	2500
2. Excavation for foundations and transportation of excavated soil to disposal site	m3	300	5	1500
3. Filling using compacted sand	m3	200	5	1000

b) Concrete Work

1. Plain concrete (180 kg/cm ²) for foundations using sulphate resistant cement	m3	12	70	840
2. Concrete floors (250 kg/cm ²), 20 cm thick, including joints	m2	250	25	6250
3. Light weight concrete, 5 cm average thick, for top ceiling slopes	m2	350	4	1400
4. Reinforced concrete (250 kg/cm ²) for foundations using sulphate resistant cement (rate excludes reinforcement)	m3	20	100	2000
5. Reinforced concrete (250 kg/cm ²) for columns, ground beams and ceiling. (Rate excludes reinforcement)	m3	85	150	12750
6. Supply and installation of steel reinforcement	ton	10	950	9500

d) Damp Proofing

1.	Damp proofing course consisting of 3 layers of bituminous membrane on hessian base, 2 kg/m, and four mopping coats of oxidized bitumin (1.5 kg/m ²) for ceiling & toilet parts	m ²	400	10	4000
2.	Painting of foundation surfaces with three coats of oxidized bitumin	m ²	125	3	375

e) Finishings

1.	Concrete brick walls, 25 cm thick	m ³	100	75	7500
2.	Clay brick (Tafli) walls, 25 cm thick	m ³	10	70	700
3.	Concrete brick walls 12 cm	m ²	100	15	1500
4.	Clay brick (Tafli) walls, 12 cm thick	m ²	40	15	600
5.	Repair of joints between existing floor slabs including removal of top part of joints filler and replacement by approved fillers	l.m	150	2	300
6.	Ceramic floors 10x10x1.1 cm	m ²	350	20	7000
7.	Ceramic skirting, 10 cm height	l.m	200	2	400
8.	Cement tiles for top ceiling, 20x20x2	m ²	350	6	2100
9.	Cement tile skirting, 20 cm height	l.m	120	1.50	180
10.	Sand lime plaster for internal walls and ceilings	m ²	750	5	3750
11.	Cement plaster for internal walls and ceilings	m ²	100	6	600
12.	Plastic paint	m ²	850	5	4250
13.	External cement stucco	m ²	500	15	7500
14.	Glazed ceramic tiles 0.6 cm thick for lining of walls in showers & WC areas	m ²	250	25	6250
15.	Wooden doors	m ²	15	100	1500
16.	Wooden windows	m ²	30	100	3000

f. <u>Thermal Insulation</u>					
1.	Polystyrene boards, 3 cms thick	m2	350	10	3500
g. <u>Lighting</u>					
1.	Supply and installation of lamps, cables, fixtures	sum			5000
h. <u>Plumbing</u>					
1.	Supply and installation of showers water closets, water supply piping, drainage piping, fixtures	sum			5000
Sub-total					102745

3) Sheds for Cars & Trucks body repair, exhaust pipes repair, sewing, battery charger, tyres repair, washing & lubrication areas

a. <u>Earth Work</u>					
1.	Demolition of existing concrete floor at places of foundations and transportation of residues to disposal site	m3	40	50	2000
2.	Excavation for foundations and lubrication pit and transportation of excavated materials to disposal site	m3	250	5	1250
3.	Filling using compacted sand	m3	190	5	950
b. <u>Concrete Works</u>					
1.	Plain concrete (180 kg/cm ²) for foundations using sulphate resistant cement	m3	25	70	1750
2.	Concrete floors (250 kg/cm ²), 20 cm thick, including joints	m2	150	25	3750
3.	Reinforced concrete (250 kg/m ²) for foundations & lubrication pit base and walls using sulphate resistant cement	m3	20	120	2400
4.	Supply and installation of steel reinforcement	ton	2	950	1900

c. <u>Damp Proofing</u>					
1.	Damp proof course consisting of 3 layers of bituminous membranes on glass fibre base (1.6 kg/m ²) and four mopping coats of oxidized bitumin (1.5 kg/m ²) for pit base	m2	20	12	240
2.	Damp proof course of above formation for pit vertical wall including external brick wall, 12 cm thick	m2	50	22	1100
3.	Painting of foundation surfaces, with 3 coats of oxidized bitumin, 1.5 kg/m ² each coat	m2	100	3	300
d. <u>Structural Steel</u>					
1.	Supply and installation of structural steel, including painting	ton	6	2200	13200
2.	Supply and installation of corrugated galvanized painted steel sheets	m2	630	15	9450
e. <u>Finishings</u>					
1.	Sand lime brick wall 12 cm thick, external side pointed	m2	350	15	5250
2.	Glazed Ceramic tiles, 0.6 cm thick walls & pit lining	m2	400	25	10000
3.	Repair of joints between existing floor slab including removal of top part of filling material and replacement with approved filler	l.m	300	2	600
4.	Anti-skid cement mortar, 2 cm thick	m2	630	10	6300
f. <u>Plumbing</u>					
	Supply and installation of all water piping, draining channels, fire fighting stands	sum			5000
g. <u>Electrical</u>					
	Supply and installation of lamps, fixtures and cables.	sum			4000

					Sub-total
					LE 69440

3) **Yard**

a.	Repair of expansion joints including removal of top part of filling material and replacement with approved fillers	l.m	1000	2	2000
b.	Construction of light weight steel sheds for car park, forging and tyres inflation areas	sum			20000
c.	Electrical works for site (additional lighting poles, cables, connections to workshop and ancillary building)	sum			6000
d.	Water and drainage site networks	sum			6000

	Sub-total				34000

Total of Civil Works

1)	Workshop	LE	150990
2)	Stores & Welfare Buildings		102745
3)	Sheds for car and trucks repair, washing and lubrication		69440
4)	Yard		34000
	Total, Civil Works	LE	357175

B. Civil Design Fees (3% of Civil works cost including periodical supervision) 10715

C. **Mechanical Equipment**

1.	<u>Cars & Trucks Washing</u>	Price (LE)
a.	High pressure cleaner	6500
b.	Turbo laser cleaner	5500
2.	<u>Lubrication</u>	
a.	Four post lift for lubrication	13500
b.	Complete set for grease distribution including trolley (up to 200 kg), grease pumps, rubber hoses and grease guns 2 X 1850 =	3700

c.	Complete set for oil distribution including trolley (up to 200 kg), oil pumps and oil hoses with oil guns 2 X 1850 =	3700
3.	<u>Wheel Alignment, balance and tyre repair</u>	
a.	Electronic wheel alignment equipment	12000
b.	Wheel balancing machine with micro-compressor	9000
c.	Wheels tyres mounting and demounting (14" to 52") machine	20000
d.	Jacks (large size) 4 X 500	2000
e.	Rubber welder 2 X 250	500
4.	<u>Battery Charger</u>	
	Battery charger (fast & slow)	1000
5.	<u>Exhaust pipes repair, manufacture</u>	
a.	One four post lift	13500
b.	Manual sheet metal rolling machine (1.5 mm)	2600
c.	Manual table sheet metal sheer (1.5 mm), 1.00 m width	5500
6.	<u>Sewing</u>	
	Sewing machine	1200
7.	<u>Body repair & paint</u>	
a.	Pulling equipment, pull rods	600
b.	Basic hand tools	150
c.	Disk sander	350
d.	Compressor, 300 liter	3000
e.	Spray gun	250
f.	Oxyacetylene cylinder with accessories for welding	1600
g.	Welding transformer and arc welding torch	600

8. Workshop Equipment

a.	Diesel injection tester	8500
b.	Nozzles test master	7000
c.	Engine analyzer	22000
d.	Generator - alternator - starter components analyzer	3000
e.	Mechanical saw (5 hp)	4500
f.	Shaping machine (0.5 m stroke) locally made	12000
g.	Lathe, 1.5 m stroke, locally made	18000
h.	Universal lathe grinding machine for brakes drums & disks with accessories	29000
i.	Vertical drilling machine, 25 mm	1900
j.	Oxyacetyline torch with tubing	1600
k.	Welding transformer (400 amp) and arc welding torch	600
l.	Compressor (300 liter)	3000
m.	Blacksmith forge	1000
n.	Press (60 ton)	8000
o.	One four post lift	13500
p.	One two post lift	13000
q.	Crane 1 ton	4000

9. Tyre inflation

r.	Compressor, 300 LE, 5.5 hp with gauge	3200
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10. Tools, furniture

s.	Hand tools	3000
t.	Workshop tables, cupboards, store racks	8000
u.	Small mechanical equipment (grinding, drill, etc.)	4000

II. <u>Consumed articles and spare parts</u>			
v.	Consumed articles (welding, rods, paints, etc ...)		5000
w.	Spare parts as requested by SUEZ Mechanical Directorate		20000
12. <u>Erection of fixed equipment including electrical connections</u>			
			20000
Total of Mechanical Equipment			320550
D. Fee for Mechanical and Electrical Consultant (layout, connections, tenders)			
			3000
<u>Total of Project</u>			
-	Civil works	LE	357175
-	Civil work design fee		10715
-	Mechanical equipment		320550
-	Mechanical Consultant Fee		3000
	Grand Total	LE	691440
	Rounded to	LE	692000

V. Bidding & Contract Procedures

A. Civil Works

1. Only prequalified contractors, selected via a standard prequalifications procedure, will be invited to bid. Qualified contractors shall have a thorough experience in construction of steel structures.
2. Tender documents shall include general and special conditions, detailed drawing specifications and bills of quantities. All tender documents will be submitted to the technical assistance contractor of USAID for review prior to issuance of call for tenders.
3. Contract shall be limited to a maximum ceiling price based on drawings and specifications. Unit prices will be used in evaluating payment certificates and variation orders.
4. Foundation designs of workshop buildings shall be based on a minimum of 2 soil boreholes, 20 ms depth, performed by a specialist firm, directly hired by Suez Governorate prior to commencement of design work. Additional four boreholes will be performed by the civil work contractor (see bills of quantities of civil works, item V.1.1) to ascertain the results of the boreholes previously made.
5. Tenderers should be allowed to submit alternative designs to the workshop tender designs to allow for use of modern systems of prefabricated steel construction. The alternative tenders, including alternative designs, shall be attached to the original tenders (of the basic design) and shall include detailed drawings, basis of design and design calculations, architectural details as well as explanatory catalogues of the system and lists of projects executed before. The review of the alternate design, by USAID technical consultant or Suez Governorate consultant will not reduce the responsibility of the contractor for his alternative designs. Payment for the alternate shall also be based on a lumpsum ceiling price.
6. Existing floors, in the garage site, shall be preserved with minimum spoilage or demolition during construction. Accordingly, the borders of excavated parts shall be of minimum dimensions allowing for execution of foundation. Also, equipment with rubber wheels shall only be used for construction. Maximum limits of parts of floors which will be demolished and re-constructed shall be pre-determined in contract. Repair or reconstruction of spoiled floors, outside those limits shall be paid for by the contractor.
7. Civil and mechanical works (installation of equipment) shall be carefully coordinated to avoid problem of mismatching of machine supports and removal of new constructed parts.
8. Scope of work

Construction of workshops, welfare building store, sheds for repair and vehicle lubrication and washing, parking shed, (see figures 1, 2, 3 and 4) as well as the supply and installation of utilities in the yard and repair of joints in existing floor. Generally, construction will be comprised of the following procedures:

- a. Demolition of concrete floors in places of foundations and reconstruction of floors after completion of work.

- b. **Excavation and backfilling**
 - c. Construction of reinforced concrete foundations, machine foundations, pits, columns and ceiling.
 - d. Construction of steel frames and claddings for workshop and sheds.
 - e. Erection of brick walls and placement of finishings (plastering, painting, flooring, ceramic linings, windows, doors, store racks, workshop benches, etc...)
 - f. Installation of roof and pits water proofing layers, thermal proofing for top ceilings and painting of foundation surfaces with protective bituminous paints.
 - g. Installation of water and drainage piping and sanitary fixtures inside buildings.
 - h. Installation of electrical conduits, cables and lighting fixtures inside buildings.
 - i. Installation of utilities networks (electrical, water supply, fire fighting sewerage).
 - j. Repair of existing floor joints
9. Evaluation of tenders is to be made on the basis of lowest price bid in compliance with conditions of contract and specifications. Alternative tenders including alternative structural steel designs shall be technically evaluated considering factors of structural rigidity, architectural features, previous experience with the system and minimization of foundations area.
 10. Handing over the site to the selected contractor will take place at the time of contract award.
 11. After contractors' initial handing over of work, a completion certificate will be issued by the Governorate.
 12. Final completion certificate will be issued and performance bond returned to contractor after lapse of one year from time of issuance of initial completion certificate.

B. Mechanical Equipment

1. Documents pertaining to bids for procurement and installation of equipment listed in item V.2 (bills of quantities of mechanical equipment) shall include general conditions, special conditions, specifications, bills of quantities, maximum delivery periods, period of guarantee (one year) and spare parts requirements. Technical assistance contractor of USAID shall review tender documents prior to issuance of tender.
2. Equipment suppliers shall be limited to non-communist countries.
3. Tenders shall include complete detailed catalogues of equipment as well as the lists of spare parts recommended by the manufacturer.
4. It shall be clearly stated in the tender conditions that the employer (the Suez Governorate) shall have the full right to purchase any of items included in any of tenders, separately, without considering other items.

5. The following specifications cover the main equipment required to be supplied under contract. Wherever a certain trade mark is mentioned hereunder or in the attached catalogs, an approved similar will be acceptable.

a. High Pressure Cleaner (fig. 5) - for trucks washing

Working pressure	130 bar
Water capacity (max-min)	3-4/3 US gallons/min
Temperature	40-80 c
Heating capacity	63 kw
Motor capacity	4-4 hp

Can be used with or without high pressure detergent

b. Turbo laser cleaner (fig. 6) - for cars cleaning

Working pressure	60 bars
Water capacity (max-min)	2-4/2 US gallons/min
Temperature adjustable	40-80 c
Heating efficiency	38 kw
Motor capacity	1.3 kw

Can be used with or without high pressure detergent

c. Lifts

1) Four post lift (fig. 7)
(three lifts required)

Capacity	4000 kg
Lifting height	1800 mm
Motor	3 hp

2) Two post lift (fig. 8)
(one lift)

Capacity	2500 kg
Lifting height	1960 mm
Motor	3 hp

d. Lubrication equipment (fig. 9)

1) Grease lubrication equipment
(2 sets required)

Consisting of a trolley for drums up to 200 kg, grease pump with long stem, 4 ms, rubber hose with grease gun

2) Oil lubrication equipment
(2 sets required)

Consisting of a trolley for drums up to 200 kg, oil pump (with long stem, delivery 9 liter/min.), 4 ms rubber hose with oil gun.

e. Electronic wheel alignment equipment (fig. 10)

Shall allow the survey of all angles related to the vehicle alignment on road, separately on the two axles in connection with the thrust axle, using only two projectors, mounted alternately on the two axles.

Digital displays shall allow the direct reading of the collected data, alignment, total and partial toe-in, camber, caster & king-pin.

f. Wheel balancing machine with microprocessor (fig. 11)

A balancing machine with microprocessor including self-calibration, self diagnosis and digital data setting

- Max. wheel weight 65 kg
- Max. power absorption 500 w
- Balancing speed 200 rpm
- Balancing precision 1 gr
- Rim diameter 10 to 24"
- Rim width 40 to 510 mm
- Cycle time 8 sec.

g. Wheels tyres mounting and demounting

The machine shall be adequate for dismantling and erection of wheels tyres of diameters ranging from 14" to 52".

h. Battery charger (fig. 12)

- For both low and fast battery charge, 6/12/24 volts
- DC output rates 70 amp, 7.3 v/60 amp, 13 v/35 amp, 26.3 v
- Boost rate at 0 volt 375 amp
- Crank rate at 6.0 volts 200 amp

i. Diesel injection tester (fig. 13)

Test engine speed and injection timing on diesel powered trucks, passenger cars and off-road vehicles. Measures RPM, delivery start angle, checks automatic advance mechanism, checks arrival of the pressure wave at the injection nozzles and test engine RPM at idle and higher speed ranges to check the correct functioning of the governor.

j. Nozzle test master (fig. 14)

Hand operated nozzle testmaster for analysing injector nozzle performance before and after reconditioning.

k. Engine Analyzer (fig. 15)

A computerized analyzer measuring the following engine parameters

Parameter	range (s)
RPM f	100 to 6000
Dwell %	0 to 100%
Dwell deg	0 to 180 deg
Timing, strobe	0 to 60 deg
Timing, mag	0 to +/- 180 deg
Amps Lo	0 to +/- 180 deg
Amps Hi	100 to +/- 100 A

Battery V	0 to +/- 40 V
Coil (+) V	0 to +/- 40 v
Dist. volts	0 to +/- 14 V
Vacuum Hg	0 to 25 Hg
HC	0 to 2000 ppm
CO	0 to 10%
CO2	0 to 16%
O2	0 to 20.8%
DC volts Lo	0 to +/- 20 v
DC volts Hi	20 to +/- 100 v
Ohm	(0 to 200 k ohms)

l. Generator - alternator - starter components analyzer (fig. 16)

Test generators, alternators (up to 120 amp output), alternators with internal regulators, self - exciting regulators, alternators with diode trios, rotors, fields, stator, starters with or without solenoids, starters armature test, and starter winding core test and solenoid action tests.

m. Universal lathe grinding machine (fig 17) for brake drums & disc

Permits making simultaneous rough and finish cuts on a drum, with one carriage.

Min turning dia	150 mm
Max turning dia	1000 mm
Min grinding dia	180 mm
Max grinding dia	1000 mm
Turning and grinding depth	420 mm
Spindle speed steps	18 by 120 rpm
Max carriage longitudinal slide traverse	490 rpm
Max carriage cross-slide traverse	200 rpm
Feed speed	0/250 mm/m2
Main motor capacity	1.5 hp
Motors for grinding unit	1 hp
Carriage feed motors	0.2 hp

Gerni 2000 combines more than 20 years' experience with economy in design and operation



best in materials and techniques. Chassis, tanks and boiler are all made in stainless steel. Design of the high pressure pump provides for a common motor pump unit based on the axial piston principle.

Using the Gerni 2000 lance, you can always be sure of a quick and reliable response from pump and boiler. Gerni guarantees the boiler coil for 3 years. With the burner in operation, the pump produces constant hot water at up to 80°C so that tough substances such as oil, grease and tar are easily removed.

Instinctively you feel that cleaning efficiency and total operation are way above the average whether applying high or low pressure, hot or cold water, with or without high pressure detergent.



In fact, you not only feel it gets things cleaner - you can see they are cleaner after using the Gerni 2000.

special accessories

Gerni 2000 has a large range of optional accessories for tackling specialised cleaning tasks. Please ask for the separate brochure.



Gerni 2000 cleans quickly and thoroughly

Based on user requirements efficient high-pressure cleaning, the Gerni 2000 is technically advanced, practically designed and provides economy where it is most needed.

Gerni 2000 cleans light weight low consumption, minimum maintenance and big capacity

Gerni 2000 is the first light-weight hot water cleaner capable of tackling even the most difficult cleaning tasks. With a top weight of only 100 kg, small exterior dimensions and compact construction,

it is easy to move between working locations. Superior operating economy results in quick, efficient heating with high energy utilisation.

Gerni 2000 is a complete stranger to rust. The entire cleaner is built in corrosion-free materials within a strong glass-fibre body. With simple hose and cable connections, the cleaner is quickly ready for daily use in the automotive industry, building and construction, farming, the food industry, engineering and printing, local authorities and many other sectors.

Basic construction of the Gerni 2000 is thoroughly tested and incorporates the

Technical data/model	2000*	2300	2400	
Working pressure	bar	90	100	130
Working pressure	psi	1300	1450	1900
Water capacity	l/m	11.5/10.5	12.5/11	13/11.5
Water capacity	US gal/min.	3.0/2.8	3.3/2.9	3.4/3.0
Cleaning power ¹⁾	kW	1.4	1.7	2.3
Temperature, adjustable ²⁾	°C	40-80	40-80	40-80
Heating capacity	kW	5.6	6.1	6.3
Motor capacity	kW/Hp	2.2/3	2.6/3.5	3.2/4.4
Amp. consumption 1 = 220V		13		
Amp. consumption 3 = 220/380V		10/6	13/7	
High pressure detergent max.	%	8	8	10
Fuel consumption	l/h	5	5	6
Weight	kg	102	107	110
Fuel tank	l		15	
Electric cable	m		8	
High pressure hose	m		8	
l x w x h	mm		907 x 550 x 760	
Packed ³⁾ x w x h	mm		825 x 590 x 780	
Packed	kg/m ³	107/0.4	112/0.4	115/0.4

¹⁾ Cleaning power (kW) = nozzle pressure (bar) x water capacity (l/min.) : 600.

²⁾ Cleaning power (kW) = nozzle pressure (psi) x water capacity (l/min.) : 8700.

³⁾ With steam device 40-130°C.

* Is not available in Great Britain.



Gerni

Gerni Cleaning Equipment A/S, Myntevej 2, DK-9900 Randers, Denmark
Phone +45 6 42 84 33, Telex 65123 dk, Telefax +45 6 43 14 81

Fig. 5

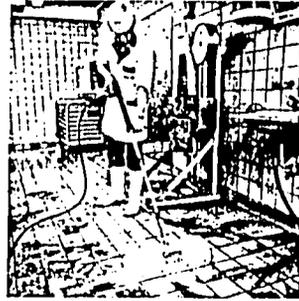
Complete Programme of Accessories

A complete range of accessories and equipment makes Gerni MiniHot with Turbo Laser unique for innumerable cleaning tasks. The equipment is automatic descaling equipment. And all accessories can be connected without tools. These are sandblaster, foam equipment, pipe cleaner, rotating brush, floor washer and much more. Therefore it is also ideal for a lot of trades such as the motor-car trade, the transport sector, car hire service, large-scale agriculture, the public sector, contractors, and small industries.

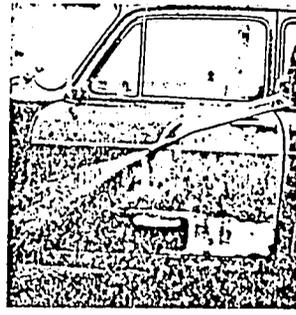
Rotating Brush
Suitable for
cleaning of large
surfaces.



Floor Washer
Ideal for cleaning
of floors - no
splash or drops.



Sandblaster
Suitable for rough
cleaning of house
fronts and removal
of rust, concrete
or paint.



Foam Equipment
For application of
detergents with
foam. Increases the
length of time for
which the detergent
is effective.



Complete Detergent Programme

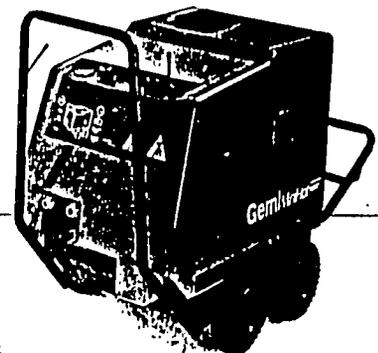
Working pressure	bar/psi	60/870
Equivalent turbo pressure	bar/psi	105/1520
Equivalent turbo cleaning power	kW	12
Water capacity max./min	l/min	7.8/8.8 ¹⁾
Water capacity max./min	US gal/min	2.4/2.0
Temperature adjustable	°C	40-80
Heating efficiency	kW	38
Motor capacity	kW	13 ²⁾
Amp. consumption 1 x 220/240 V	A	8.5/8.0
Amp. consumption 1 x 115 V ¹⁾	A	15
High-pressure detergent	%	10
Fuel consumption	l/h	5.0
Weight	kg	73
Fuel tank	l	15
Electric cable	m	8
High pressure hose	m	8
L x w x h	mm	920 x 580 x 840

¹⁾ 60 Hz ²⁾ 60 Hz - 7.8/8.0 l/min ³⁾ 60 Hz - 11 kW

Gerni Express are concentrated detergents in powder form. They have been specially developed for high-pressure cleaners and cover many types of cleaning tasks within every branch of trade. Detailed directions for use and application are stated on each box.

In addition to the complete range of high-pressure cleaners Gerni can offer you vacuum cleaners, extraction cleaners, and detergents for any application.

Please contact us for further information on Gerni MiniHot with Turbo Laser and its accessories.



Gerni

Gerni Cleaning Equipment A/S
Myntevej 2, 8900 Randers, Denmark
Phone: 06 42 84 33, Telex 65123 dk, Telefax: 06 43 14 81

Front wheel alignment is more accurate and safer on a STENHOJ DS 4 than on any other lift

STENHOJ DS 4 is the ideal lift for front wheel alignment work. Adjustable parking rails for the pneumatic ratchet system ensure that platforms and cross members are completely horizontal at all times.



The DS 4 line is the most advanced on the market. STENHOJ 4-post lifts in either 3 t (MINI) or 4 t (STANDARD) design not only comply with all safety regulations, but also satisfy the workshop demand for a versatile and economical lift.

The DS 4 is the ideal lift for car inspection and brake service, and it is most suitable for exhaust and muffler repairs as the undercarriage is 100% accessible.

DS stands for "double safety" for the mechanic and the car.

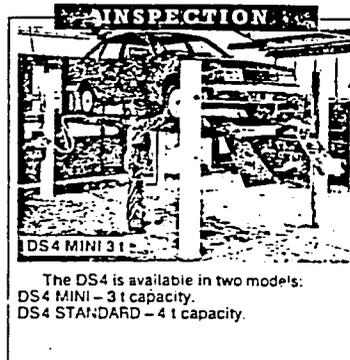
Ask for leaflet covering DS 4 MAXI 8 t 4-post lift for medium size trucks and vans.

DS 4 STANDARD 4 t capacity

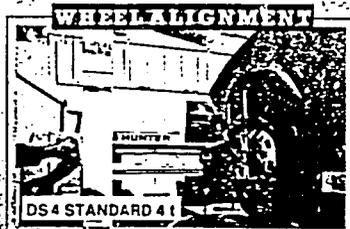
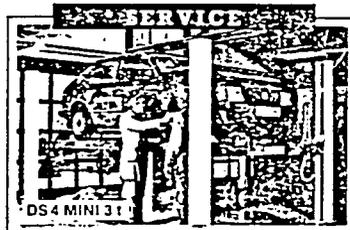
Friction brakes automatically stop the lift in case of cable breakage. Pneumatically operated safety ratchets provide a fixed horizontal parking position at the required working height and release the load from the cables and hydraulic system.

Optional Equipment

1. The auxiliary jack is an indispensable piece of equipment for wheel change and front wheel alignment work.
2. DS 4 can on request be delivered with 4 impact-proof, watertight neon lighting tubes.
3. Post cover caos as shown below are available if required.
4. Extra drive-off ramps can replace the fixed stops for drive-through applications.
5. Drive-over ramps available for recessed installation.



The DS 4 is available in two models:
DS 4 MINI - 3 t capacity.
DS 4 STANDARD - 4 t capacity.



STENHØJ DS 2 MASTER

Minimum maintenance - only one service every 6 months

The Ideal Repair Lift

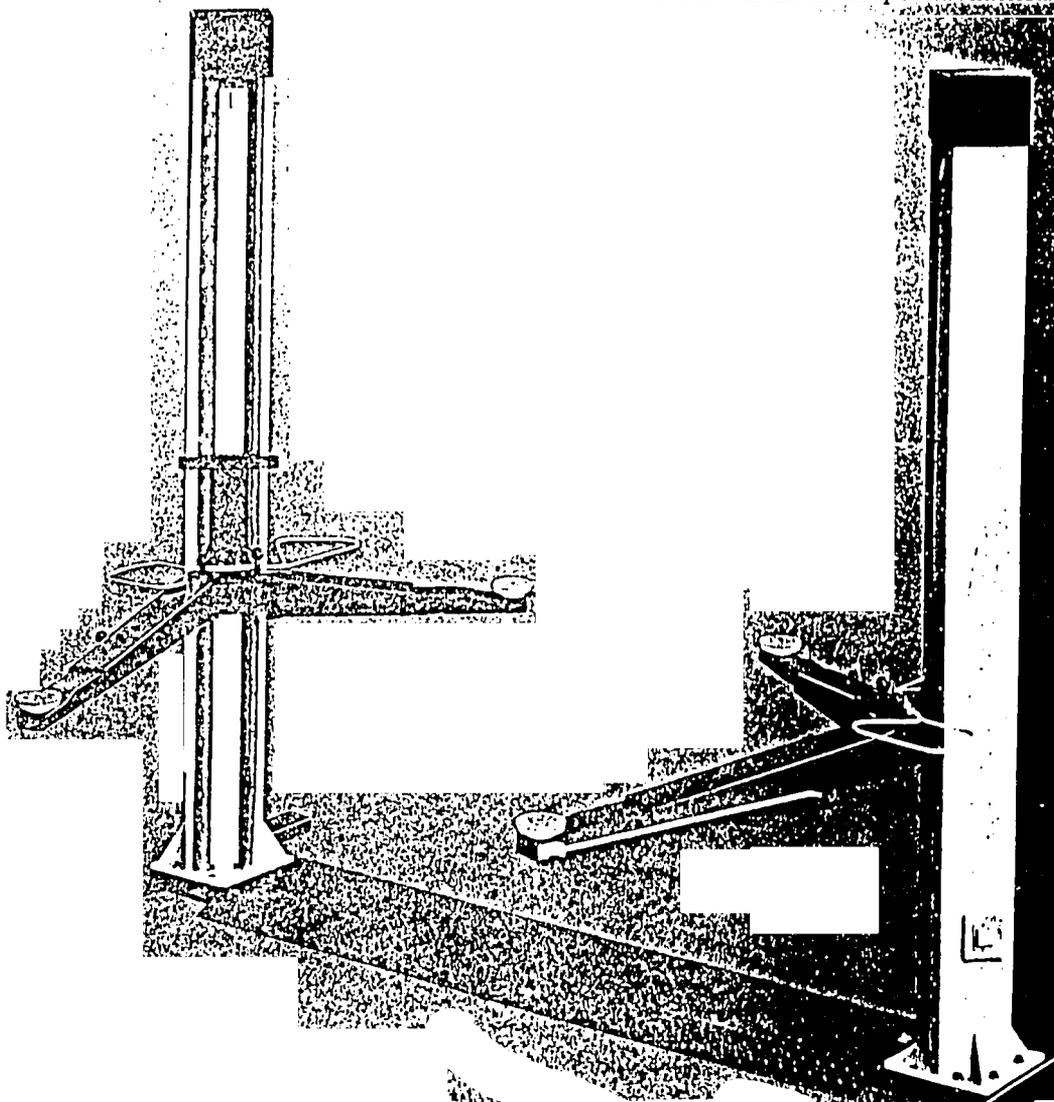
DS 2 MASTER gives you completely unobstructed working space under the car as wheels and undercarriage are 100% accessible.

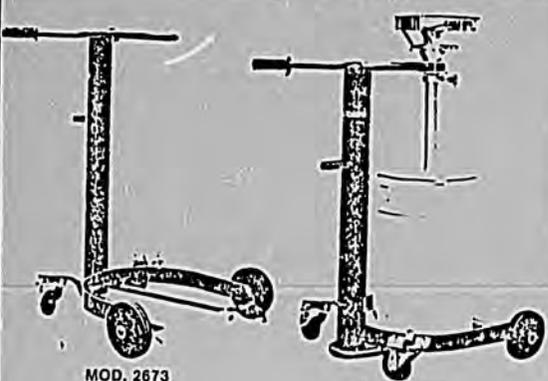
The special asymmetric design of the lift allows the doors to be opened freely.

Adjustment rods facilitate easy location of arms, which lock automatically during lifting to prevent the car from sliding off.

The lifting movement is synchronized, and the car rests on skid-proof polyurethane pads. The posts are fitted with plastic seals to protect the spindles.

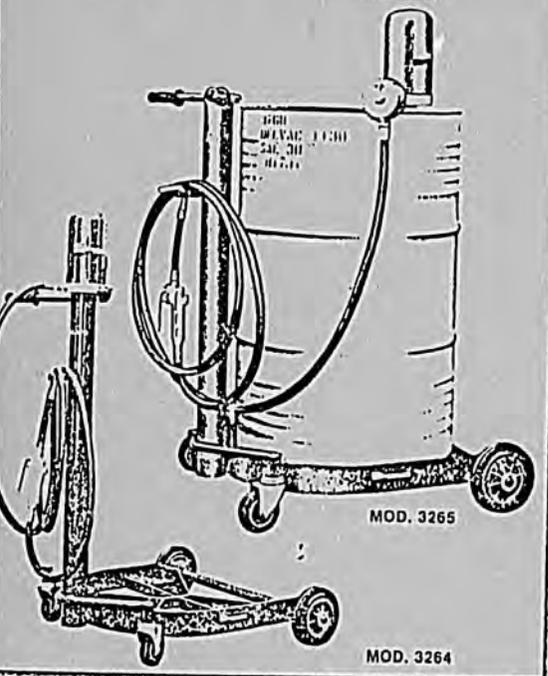
DS 2 MASTER complies with the latest regulations for lifts in Europe and America.





MOD. 2673

MOD. S.010



MOD. 3265

MOD. 3264



MOD. 3084

MOD. 3081

trolleys for drums up to 50 kg

MOD. 2673. Bare trolley, weight 11.5 kg.
Measurements 730 x 560 x 800 mm (height).
According to the service for which it is required, it is completed with the following equipment:

MOD. 3260 (S.007). For grease distribution:

- trolley mod. 2673;
- grease pump mod. 3216;
- 2 m rubber hose with grease gun.

MOD. 3261 (S.008). For oil distribution:

- trolley mod. 2673;
- oil pump mod. 3201;
- 2 m rubber hose with oil gun.

MOD. 3262 (S.009). For oil distribution:

- trolley mod. 2673;
- oil pump mod. 3201;
- oil meter mod. 2681;
- 2 m rubber hose with oil gun.

MOD. S.010. For recovery of waste oil:

- trolley mod. 2673;
- funnel mod. 2674, adjustable in height, Ø max. 265 mm. Weight of funnel: 2 kg.

trolleys for drums up to 200 kg

MOD. 2675. Bare trolley, weight 22.5 kg.
Measurement: 870 x 780 x 1020 mm (height).

MOD. 3263 (S.021). For grease distribution:

- trolley mod. 2675;
- grease pump mod. 3217 (with long stem);
- 4 m rubber hose with grease gun.

MOD. 3264 (S.022). For oil distribution:

- trolley mod. 2675;
- oil pump mod. 3202 (with long stem, delivery 9 l/min);
- 4 m rubber hose with oil gun.

MOD. 3265 (S.023). For oil distribution:

- trolley mod. 2675;
- oil pump mod. 3202 (with long stem, delivery 9 l/min);
- oil meter mod. 2681;
- 4 m rubber hose with oil gun.

Both trolleys can also be used for transporting drums in service stations, garages, industries, etc. During the change of drums or while they are transported, the pump can be rested in a hook on the central arm.

accessories

MOD. 3084. Hose support with swivel head, including counterweight, hooks for fixing to wall, etc. hose-holder.
Supplied without rubber hose or gun.
Height: 2700 mm.
External Ø steel post: 60 mm.
Weight: 13.7 kg.

MOD. 3081. Hose-support, for attaching to wall.

APPARECCHIATURA PER IL CONTROLLO TOTALE DELLA GEOMETRIA DELLE RUOTE

Fig. 10

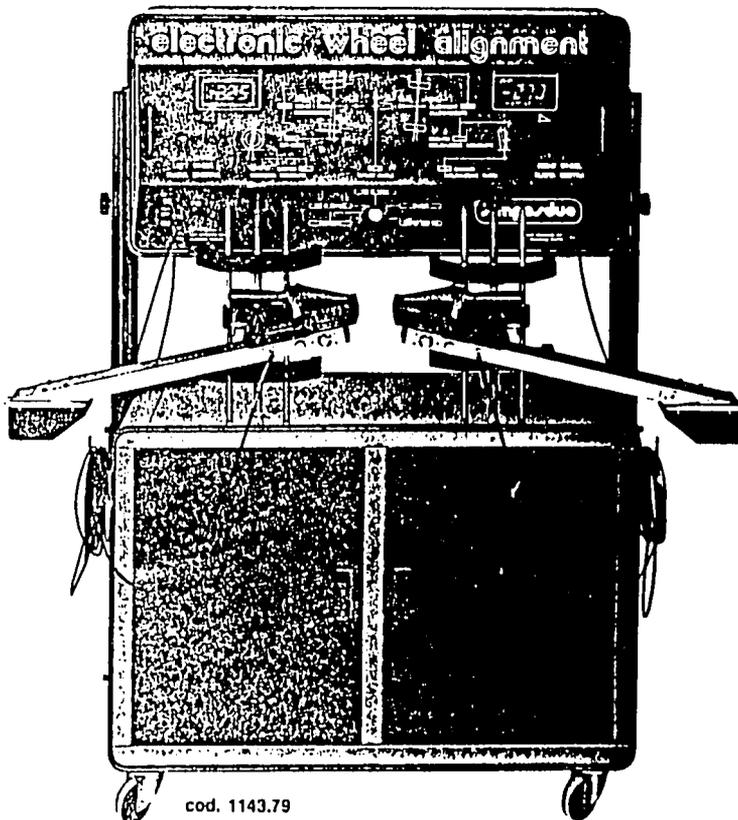
Le apparecchiature elettroniche della serie EURO consentono il rilevamento di tutti gli angoli interessati all'assetto del veicolo su strada, separatamente sui due assi o totale sulle quattro ruote, con registrazione dell'asse anteriore in funzione dell'asse di spinta utilizzando solo due rilevatori, montati alternativamente sui due assi.

- Ogni rilevatore è funzionalmente autonomo e sostituibile senza richiedere ulteriori tarature di abbinamento. Di costruzione particolarmente robusta, è dotato di un'unità di rilevamento, ad aggancio per filo elastico, di nuova concezione e di apposito dispositivo per la compensazione elettronica della scentratura dei cerchi ruota. Il collegamento al cabinato strumentazione è realizzato con cavi disinseribili a mezzo connettori.

- Il pannello frontale del cabinato strumentazione è protetto da una pellicola di policarbonato, serigrafata internamente, resistente all'abrasione ed inalterabile nel tempo.

- La strumentazione, con alimentazione elettrica monofase V 110 - 220 - 240, è completa di selettore funzioni con relativi indicatori luminosi e, sugli indicatori digitali ad alta efficienza, consente la lettura diretta dei dati rilevati:

- Allineamento
- Convergenza (TOE-IN) totale e parziale
- Inclinazione ruota (CAMBER)
- Inclinazione longitudinale montante (CASTER)
- Inclinazione trasversale montante (KING-PIN)
- Angolo di spinta (THRUST-ANGLE) - solo per cod. 1145.79



- Scostamento ruote (SET-BACK) - solo per cod. 1145.79
- Segnalatore automatico del senso di direzione per thrust-angle e set-back solo per cod. 1145.79
- Indicatori digitali per memorizzazione dati - solo per cod. 1145.79

- Le apparecchiature sono corredate di una serie di graffe autocentranti, per cerchi ruota da 10" a 16", con aggancio esterno e bloccaggio irreversibile a garanzia della massima stabilità del gruppo graffa-rilevatore.

- Un'unica e semplice operazione di taratura, tramite l'apposito attrezzo in dotazione, consente all'operatore di controllare direttamente l'unità di rilevamento e di ripristinare le condizioni base per la misurazione.

cod. 1143.79/1145.79

dimensioni: 1450x1550x500 mm

peso: 95 Kg

cod. 1143.79/1145.79+cod. 1243.09

dimensioni: 2150x1800x500 mm

peso: 150 Kg

La Ditta si riserva di apportare, in qualsiasi momento e senza preavviso, le modifiche che ritenesse utili

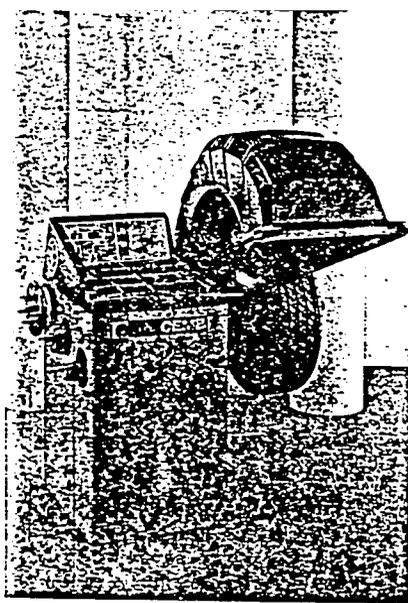
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ENGINEERING & DEVELOPMENT

Strada Antica di None 23
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10092 BEINASCO (Torino) Italia
Telex 215055 SIMPES I

Fig. 11



The C 31 is:

a balancing machine with microprocessor, including self-calibration, self-diagnosis, ALU functions and digital data settings. This machine possesses all the features which are only normally found on machines in a much higher price range.

Microprocessor electronics. By using modern and sophisticated electronics this machine offers a greater accuracy and higher reliability.

Self-diagnosis. This takes place automatically, and identifies any operating errors or technical problems.

Self-calibration. Even though CEMB balancing machines are manufactured in such a way as not to require calibration adjustments even over time, it is possible to calibrate the machine in only two spins. To calibrate use a normal wheel, even not balanced.

Personalization. Using the command push buttons some of the machine functions may be "personalized": i.e. read-out in grammes or ounces, starting the cycle by closing the wheel guard or by using the start button.

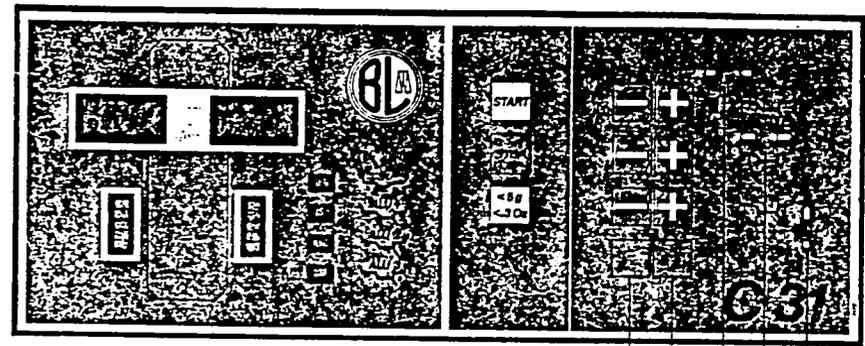
Digital data setting. Data is set using a fast, modern and fool-proof system. This is two to three times faster than the numerical button method and is more precise than the traditional potentiometer system. Width measurements may be set in inches or millimetres.

Programmes for light alloy wheels. These programmes are especially for particular shaped rims or static only balancing. It is possible to select this programme even after the measuring spin. Lighted leds demonstrate which programme has been chosen.

Digital display. This brightly lit display indicates both the unbalance values and the machine's functions.

Machine drive. The machine is driven by a single phase motor with reduced absorption. Power consumption is minimal; up to four times less than similar wheel balancers with the same features.

Cycle time. The cycle time is very brief: 8 seconds for an average wheel from standstill to



- Push button F
- Push button R
- Distance setting
- Width setting
- Diameter setting

Push button F - This is used to select ALU and static functions. The selection will be shown on the panel's led display. To return to the initial setting press the STOP button.

Push button R - If button 'R' is pushed after having re-called the wheel's measurements, the unbalance will be displayed re-calculating any new dimensions set.

If button 'R' is pushed while the unbalance is being displayed, the wheel's dimensions will be given out in sequence. In this way it is possible to quickly check the set values.

If button 'R' is pressed contemporarily with the start button, the self-calibration operations will begin.

Distance 'd' setting - Pressing '+' or '-' the measurement on the display will increase or decrease. Possible measurement is from 0.0 to 17 cm. Release the button when the desired measurement is obtained.

Width 'b' setting - Set the rim's dimensions from 40 to 510 mm or 1.5 to 20 ins. Using the appropriate commands it is possible to select a measurement in millimeters or inches.

Diameter 'd' setting - between 10 and 24

TECHNICAL DATA

Max. wheel weight	Kg	65
Max. power absorption	W	500
Standard power supply	220/240 V single phase	
Balancing speed	rpm	200
Balancing precision	gr	1
Rim diameter	from 10 to 24 inches	
Rim width	1.5" - 20" or 40 - 510 mm	
Cycle time	sec	8
Net weight with guard (exc. adaptor)	Kg	113




ASSOCIATED
**Associated
Equipment
Corporation**

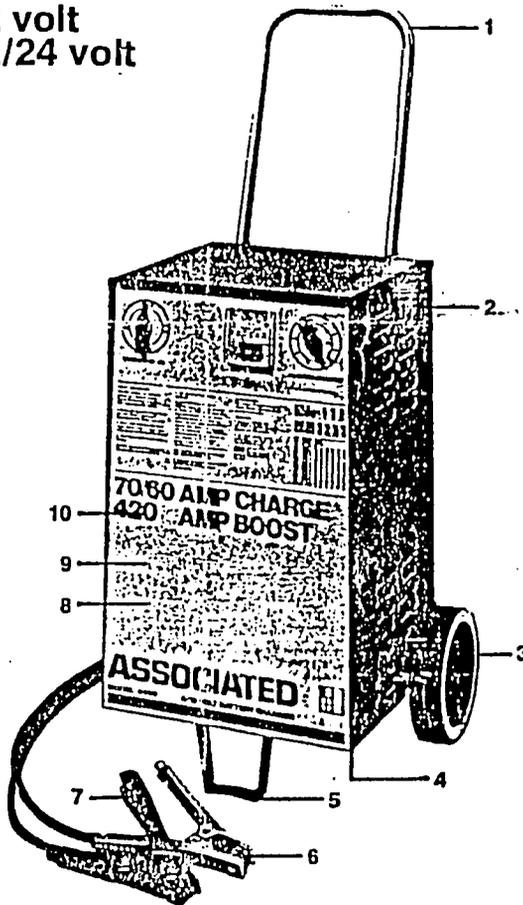
Fig. 12

(12)

BATTERY FAST CHARGERS 220 VOLT

Model 6025 — 6/12 volt
Model 6026 — 6/12/24 volt

1. Tubular chrome handle
2. Down-draft ventilation
3. Larger wheels
4. 16 gauge steel base
5. Heavy-duty zinc chromate foot
6. Insulated safety clamps
7. Stop/go light polarity protection
8. Vacuum sealed transformer
9. Multi-diode rectifier
10. 420 amp boost rate



Ratings:

Continuous duty charge rates:

AC input:

DC output rates:

Boost rate at 0 volts:

Crank rate at 6.0 volts:

Model 6025

70/60 amps

220-240 vac, 50/60 Hz, 7.3 amps

70 amps, 7.2v/60 amps, 13.8v

420 amps

230 amps

Model 6026

70/60/35 amps

220-240 vac, 50/60 Hz, 6.9 amps

70 amps, 7.3v/60 amps, 13v

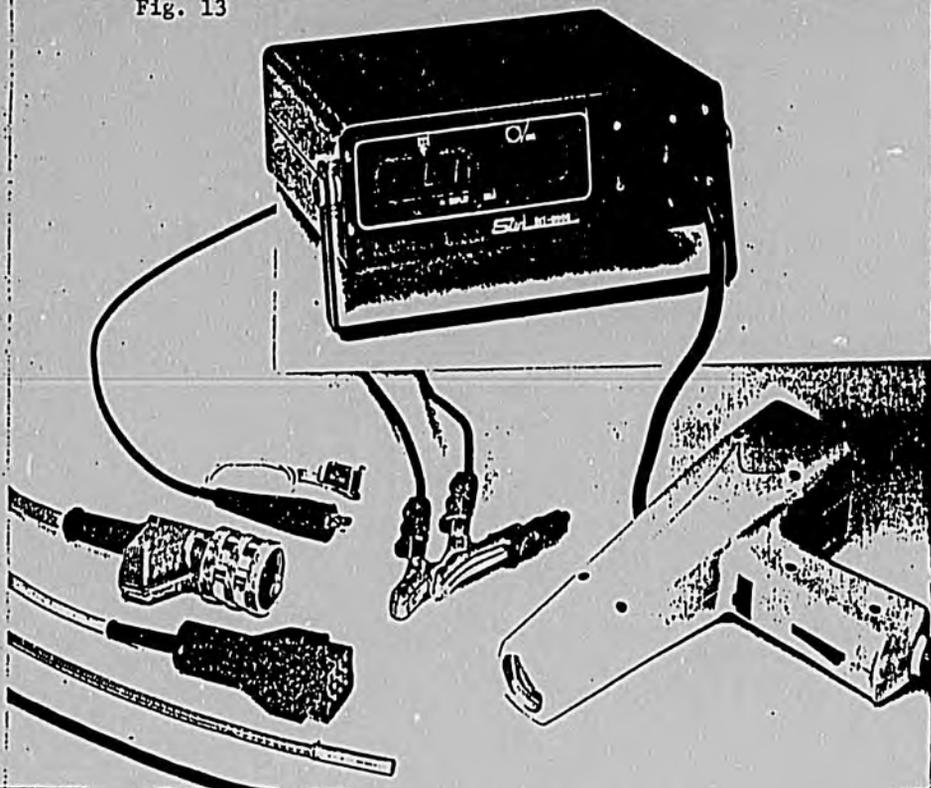
35 amps, 26.3v.

375 amps

200 amps

(see reverse side)

Fig. 13



SUN DIESEL INJECTION TESTER DIT-9000

THE SUN DIESEL INJECTION TESTER, MODEL 9000, enables the operator to quickly and accurately test engine speed and injection timing on diesel powered trucks, passenger cars and off-road vehicles. The unique CLAMP-ON transducer eliminates the necessity to open the injection tubes thus avoiding any possibilities of dirt entering, and damage to the injection system.

Additionally, the DIT-9000 is suitable for a new test system comprising a magnetic position sensor screwed into the injection pump, defining the position of the pump camshaft and relating this to the crankshaft position, defined by the usual TDC sensor.

The tester is fully portable and powered by the vehicle's battery, which makes it possible to use it at any place in the workshop or in the field. The large and bright digital displays and the use of microprocessor technology ensure good readability and a high degree of accuracy.

SPECIAL FEATURES

- Fast response on two easy-to-read, four place digital displays.
- Easy to use CLAMP-ON transducer.
- Measured RPM (± 5 RPM) and delivery start angle ($\pm 0.5^\circ$ crankangle).
- Stores delivery start angle and engine speed with displays hold feature.
- Checks automatic advance mechanisms.
- Checks arrival of the pressure wave at the injection nozzles.
- Tests engine RPM at idle and higher speed ranges to check the correct functioning of the governor.
- Allows measurement of delivery start with timing light or monolythic TDC pickup.

SPECIFICATIONS

Supply voltage	: 0.5 ... 35 volts DC, positive and negative ground
Current drain	: max. 2 amps (3.15 amps fuse)
RPM display	: 118 ... 6000 RPM
- Accuracy	: ± 1 RPM
- Resolution	: ± 10 RPM
- Resolution of display hold	: ± 1 RPM
Beginning of delivery display in 110°C mode	: -9.99° ... 180° c.a.
in stroboscopic mode	: 0° ... 60° c.a.
- Accuracy - total system	: $\pm 0.5^\circ$ c.a.
- Resolution	: $\pm 0.1^\circ$ c.a.
Dimensions	: W 248 mm, H 90 mm, D 225 mm.
Weight	: 2,5 kg, Stroboscope 0,9 kg.
Shipping dimensions	: 385 mm, 150 mm, 350 mm, stroboscope: 305 mm, 100 mm, 265 mm.
Weight	: 2,8 kg, stroboscope 1,2 kg.

STANDARD ACCESSORIES

- 2 x 6 mm clamp-on-transducers
- Transducer cable
- Timing light (stroboscope)

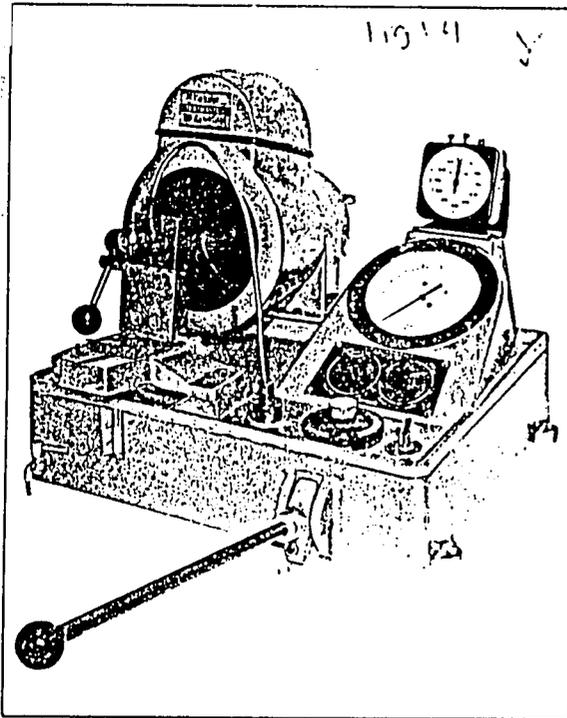
OPTIONAL ACCESSORIES

- Clamp on transducers for injection lines with the following outer diameters: 5 mm, 5.6 mm, 6 mm, 1/4", 7 mm, 8 mm, 9.5 mm, 10 mm, 1/2", 6 mm S for DB.
- Adapter for 15% or 2 slots
- Diagnostic Cable Daimler Benz
- Diagnostic Cable Citroën, Peugeot, Talbot
- Diagnostic Cable VW, Audi
- Diagnostic Cable Monolithic US/GM
- TDC Sensor VW, Audi
- Remote control with cable

One year factory warranty against defective materials and workmanship. Specifications subject to change without notice.

HH 601 Nozzle Testmaster

Fig. 14



The Hartridge HH 601 hand operated Testmaster has for many years satisfied the demand for a low cost but sophisticated test unit, for analysing injector nozzle performance before and after reconditioning.

An air operated fume extractor is fitted to the illuminated spray chamber and a flow control valve enables injectors to be critically tested under minimum flow conditions. An optional quick action clamp is available for the rapid testing of nozzle assemblies, without the need to fully assemble the injector.

All recognised nozzle test procedures can, with the aid of special clamps and adaptors, be carried out quickly and easily on the Testmaster. The availability of a comprehensive range of accessories ensures that the Testmaster will handle most types of injectors, including large industrial and marine types.

BRIEF SPECIFICATION

Fully Controllable Oil Flow

Fingertip control valve allows the rate of oil flow to be adjusted from full flow to a minimum for critical testing.

Illuminated Spray Chamber

With air operated centrifuge and fume extractor.

Pressure Gauge

6 inch diameter; 0-400 bar and 0-6000lb/² or 400 at an 0-410kg/cm², with isolating valve and external zero setting device.

Volume Adjuster

Allows trapped volume to be regulated to ensure uniformity of back leakage figures.

Fuel Tank

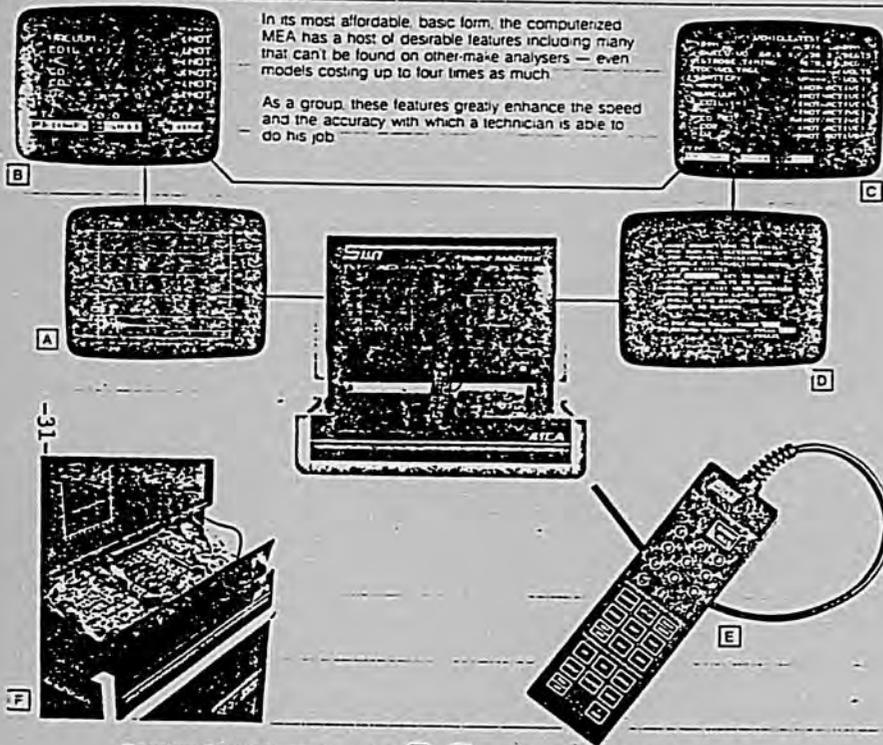
A 1½ gal (7 litres) fuel tank, fitted with a 2 micron filter, is incorporated into the base of the machine.

For full information see leaflet Ref No. P.601.

BASICALLY, IT'S A WINNER

In its most affordable, basic form, the computerized MEA has a host of desirable features including many that can't be found on other-make analysers — even models costing up to four times as much.

As a group, these features greatly enhance the speed and the accuracy with which a technician is able to do his job.



A The real time 12-inch SUN scope is computer-controlled. You can actually switch patterns, modes and scales right from the remote control. The MEA scope displays primary, secondary, alternator and M/C solenoid patterns.

B Scope patterns, modes and scales in view can be easily identified via word labels that appear at the bottom of the MEA's companion monitor screen whenever the technician wishes to call them up. There's never need for doubt or confusion over what information the scope is delivering.

C The MEA's bright 12-inch monitor displays test data digitally and permits valuable comparison of scope and digital information simultaneously. MEA program data is also carried on the monitor which can be "frozen" at any time.

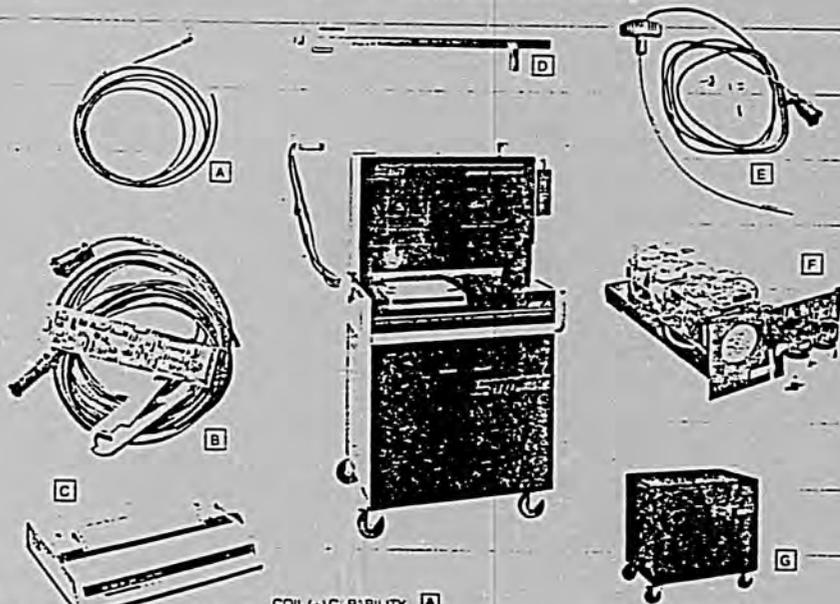
D Throughout the sequence of vehicle setup and testing procedures, "help" screens that provide supplementary operator prompts and instructions are available. It's yet another way the MEA eliminates mistakes and saves time.

E The remote control is full-function, giving the operator total ability to handle the MEA away from the unit. Ruggedly built, the remote clings magnetically to metal surfaces and its keypad is a sealed membrane that resists dirt, grease and moisture.

F An electronics "drawer" that slides out below the analyser's front face makes the unit's inner workings highly accessible for ease of servicing. That too is a potential time and money saver. And those are just some of the design highlights and power advantages of the MEA.

LOADED, IT'S EVEN BETTER

Among the MEA options available are the following:



A **COIL (+) CAPABILITY**
Do primary ignition problem diagnosis/examination of engines with ease and speed when you employ this MEA option.

B **AMPS AND VACUUM KIT**
Pinpoint starting and charging system shortcomings and a variety of mechanical failures with the addition of this extremely handy kit.

C **HIGH-SPEED PRINTER**
Give your shop's work extra credibility and create permanent records of work performed with this full 80-column model. The printer is sprocket-fed and uses economical fan-folded paper and it's able to print any and all monitor screen data in the wink of an eye.

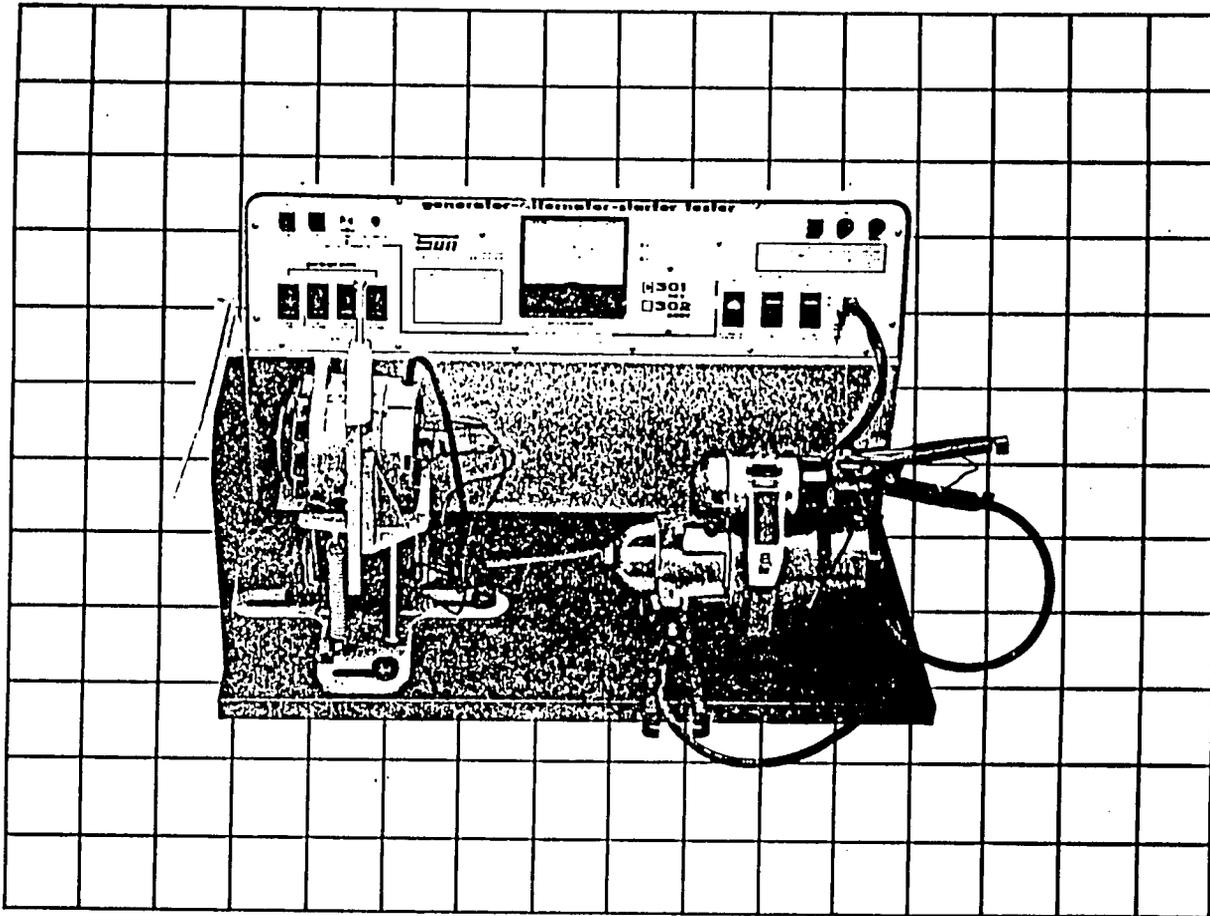
D **SWIVELING BOOM**
Protect MEA leads by keeping them off the floor and out of the way using this stamped metal assembly. Unless your technicians are ultra careful, the boom could pay for itself almost overnight.

E **MAG TIMING KIT**
Thanks to this kit, beat the clutter of hoses and controls that most timing light use.

F **FOUR-GAS AND TWO-GAS EMISSION MODULES**
Verify emission levels and track down carburetor and fuel injection problems rapidly with one of these. The four-gas module checks HC, CO, CO₂, and O₂; the two-gas does HC and CO. The four-gas module also permits examination of HC and O₂ on a per cylinder basis, helping to precisely isolate fuel delivery abnormalities.

G **CABINET BASE**
Add mobility to the MEA with this sturdy, custom SUN cabinet base. The wheels can be locked in position and the double doors on the front open to expose a large storage compartment with shelf.

MORE OPTIONS TO COME
As additional testing capabilities are developed by Sun to meet on-going operational changes in the very latest car engines, additional equipment options will be added to the MEA analyser's offerings. The MEA was designed with expansion and upgrading in mind and, thanks to its modularity, will be an exceptionally easy analyser to augment. Even now, every MEA can be linked to other computers.



SUN 301/302

Generator-Alternator-Starter Components Analyzer

Fig. 16

SUN
SUN ELECTRIC
CORPORATION

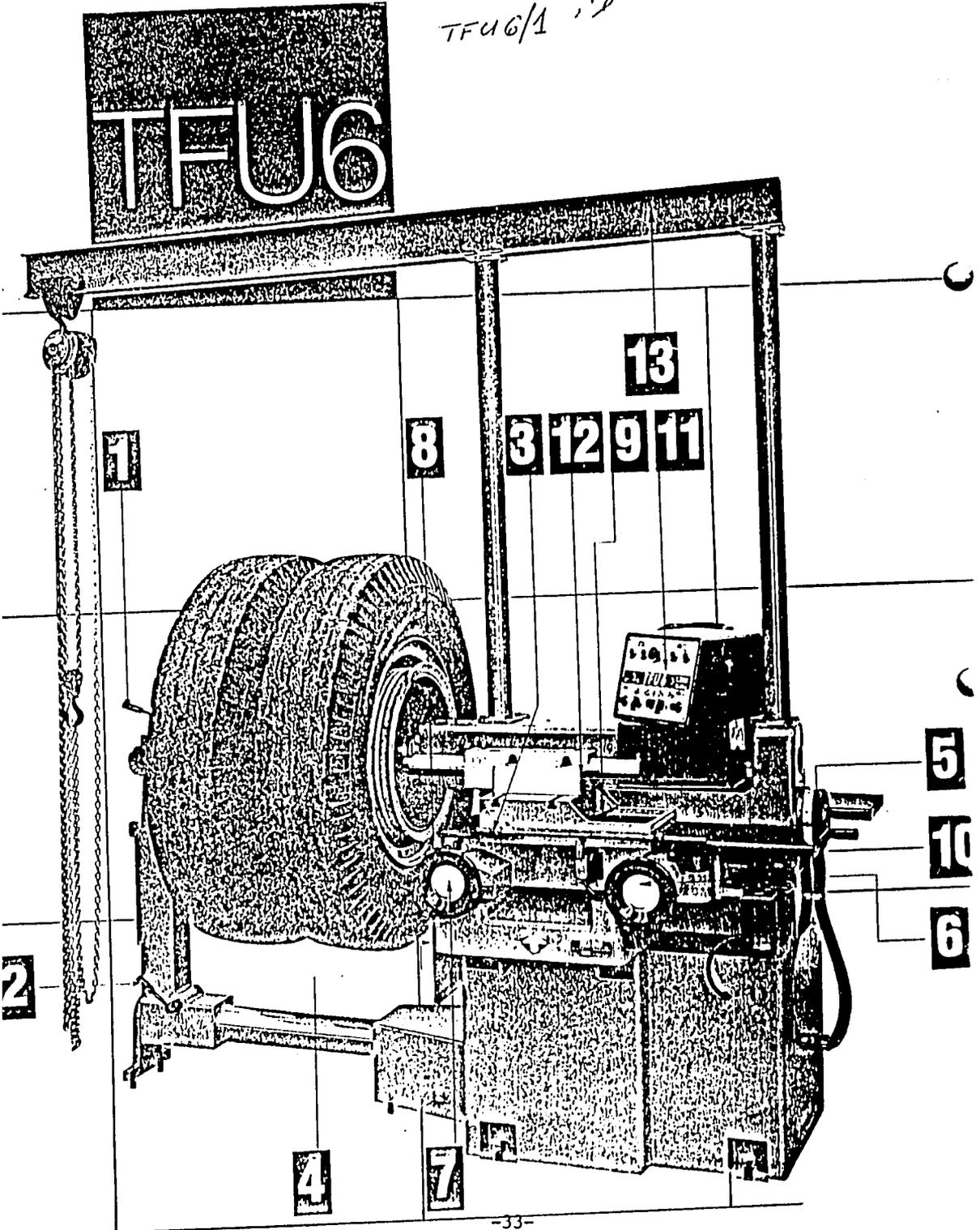
TORNIO RETTIFICA PER TAMBURI
E DISCHI FRENO

UNIVERSAL LATHE GRINDING MACHINE
FOR BRAKE DRUMS AND DISCS

Fig. 17

TFUG/1

TFUG6



VII. Project Implementation

- a. A schedule for project implementation is included in this proposal in Figure (18) and table (I). Critical path method was used to estimate a complete time of forty four weeks after receipt of order to commence.
- b. As shown on diagram, the installation of equipment follows the completion of construction (except for machine foundations) and the supply of equipment. This sequence of activities would guarantee the proper installation of equipment without being spoiled by construction works.
- c. Bid period for leasing the facility (activity g) commences after completion of construction (activity i) and the supply of equipment to the site (activity n) so that tenderers should familiarize themselves with the workshop construction and equipment prior to submission of their price.
- d. Lease contract shall contain strict legal conditions and technical warranties to assure that all equipment will be maintained in well operable condition during lease period. An adequate guarantee bond should be withheld by the governorate till lapse of lease period. Reports on workshop equipment conditions shall be submitted periodically by governorate engineers. (see contract's proposed outlines - Appendix B).
- e. Lease contract shall allow for training of a finite number of governorate mechanics annually. The contract rates for repair of governorate vehicles and equipment shall cover all possible repair operations to avoid future disputes.

Table (I)

Implementation Schedule

	<u>Duration</u> <u>(week)</u>	<u>Preceding</u> <u>Activities</u>
a. Order to commence	0	-
b. Preliminary borcholes	2	a
c. Civil work design & specifications	7	b
d. Review of (c) by TA contractor for USAID	2	c
e. Civil contractors prequalifications	3	a
f. Call for bid for civil works	2	d&e
g. Bid period for civil works	3	f
h. Evaluation of civil works tenders and review of evaluation by TA contractor	3	g
i. Construction of civil work (foundations - buildings - floor not related to machines foundations)	18	h

j.	Preparation of tender for supply and installation of mechanical equipment	8	a
k.	Review of (j) by TA contractor for USAID	2	j
l.	Bid period for mechanical equipment	3	k
m.	Evaluation of bids for mechanical equipment and review by TA contractor	3	l
n.	Supply of equipment	10	m
o.	Installation of equipment and construction of machine foundations	6	n&i
p.	Preparation of bid documents for leasing the facility by governorate legal department	5	a
q.	Bid period for leasing the facility	4	p, n, i
r.	Selection of leaser and contracting	4	q
s.	Handing over of project to lesser	1	o&r

VIII. General Remarks

1. It is highly recommended to landscape the area between the workshop and the main road. This should include the plantation of some parts, construction of side walks and provision of adequate lighting and traffic signals. Cost of these works is not included in this project budget, and should be paid by Suez Governorate.
2. The supply and installation of external power supply transformer will be the responsibility of Suez Governorate.
3. Coordination between civil work designer and mechanical consultant of the project is essential, mainly for the determination of sizes of spaces and bays needed for different mechanical and repair operations and for the design of machine foundations and site utilities as well.
4. Special precautions shall be taken to protect the external existing fence from failure during construction of the adjacent buildings foundations. This implies provision of an adequate clearance between the fence and the building to allow for safe excavation for foundation construction.

Appendix A

Translation

**Suez Governorate
Governor's Office**

**Mr. Richard Miller
LD-II Project Manager**

Dear Sir,

The Suez Governorate has many constraints to effective maintenance, medium and major repairs, which affect the performance of the different Governorate Agencies.

As there is no central maintenance center in Suez that can do major repairs and overhauls; and referring to our discussions with your staff; we hope that you take necessary measures to help constructing and equipping a maintenance center in the Suez Governorate. We are ready to run this proposed facility by the private sector by competitive bidding.

Sincerely Yours



بسم الله الرحمن الرحيم

جمهورية مصر العربية
محافظة السويس
مكتب المحافظ
التخطيط والمتابعة

السيد / ريتشارد ميلر - مدير مشروع اتفاقية التنمية المحلية (٢)
المكتب الاستشارى (ويلبرسميث)

القاهرة .

تحية طيبة وبعد .

لما كانت المحافظة تواجه صعوبات كبيرة فى سبيل اجراء
الصيانة الضرورية والاصلاحات المتوسطة والثقيلة للسهارات والمعدات
الامر الذى يعوق القيام بالاعمال الضرورية المنوطة باجهزة المحافظة .

ولعدم وجود مراكز صيانة قادرة على عمل العمرات والاصلاحات
الثقيلة للعربات والمعدات والمركبات .

وبالاشارة الى اتصالاتنا المتكررة بمكتبكم بخصوص انشاء مركز
صيانة تخصصى لاجراء الاصلاحات المتوسطة والثقيلة .

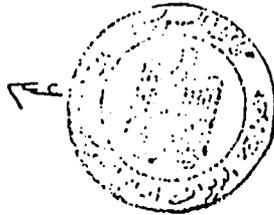
فاننا نأمل اتخاذ الاجراءات اللازمة نحو تنفيذ مشروع انشاء
مركز صيانة للمعدات والمركبات فى محافظة السويس ، علما بان المحافظة
مستعدة لتشغيل هذا المركز باسلوب التأجير الى القطاع الخاص
من طريق المزايدة .

وتفضلوا بقبول فائق الاحترام ،،،

محافظ السويس

زين

احمد تحسين شنن -



١٩٨٨/٤/٤

Appendix B

CONTRACT OUTLINE
AGREEMENT FOR
FLEET MAINTENANCE AND MANAGEMENT SERVICE

Article I Definitions

1. Routine Maintenance Work
2. Non-Routine Maintenance Work
3. Optimum Economic Life
4. Rehabilitation
5. Operator Abuse/Misuse
6. Vehicles
7. Fleet
8. Fleet Coordinator
9. Target Price
10. Target Range

Article II The Scope and Services

1. Implementation
2. Operations

Article III Agreement Time

Article IV General Conditions

Article V Responsibilities

1. The Company responsibilities
2. Governorate responsibilities

Article VI Costs and Payments

1. Basis of Payment - Routine Work
2. Authorized Adjustments to the Target Price and the Management Fee
3. Basis of Payment - Non-Routine Work

Article VII Notices

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