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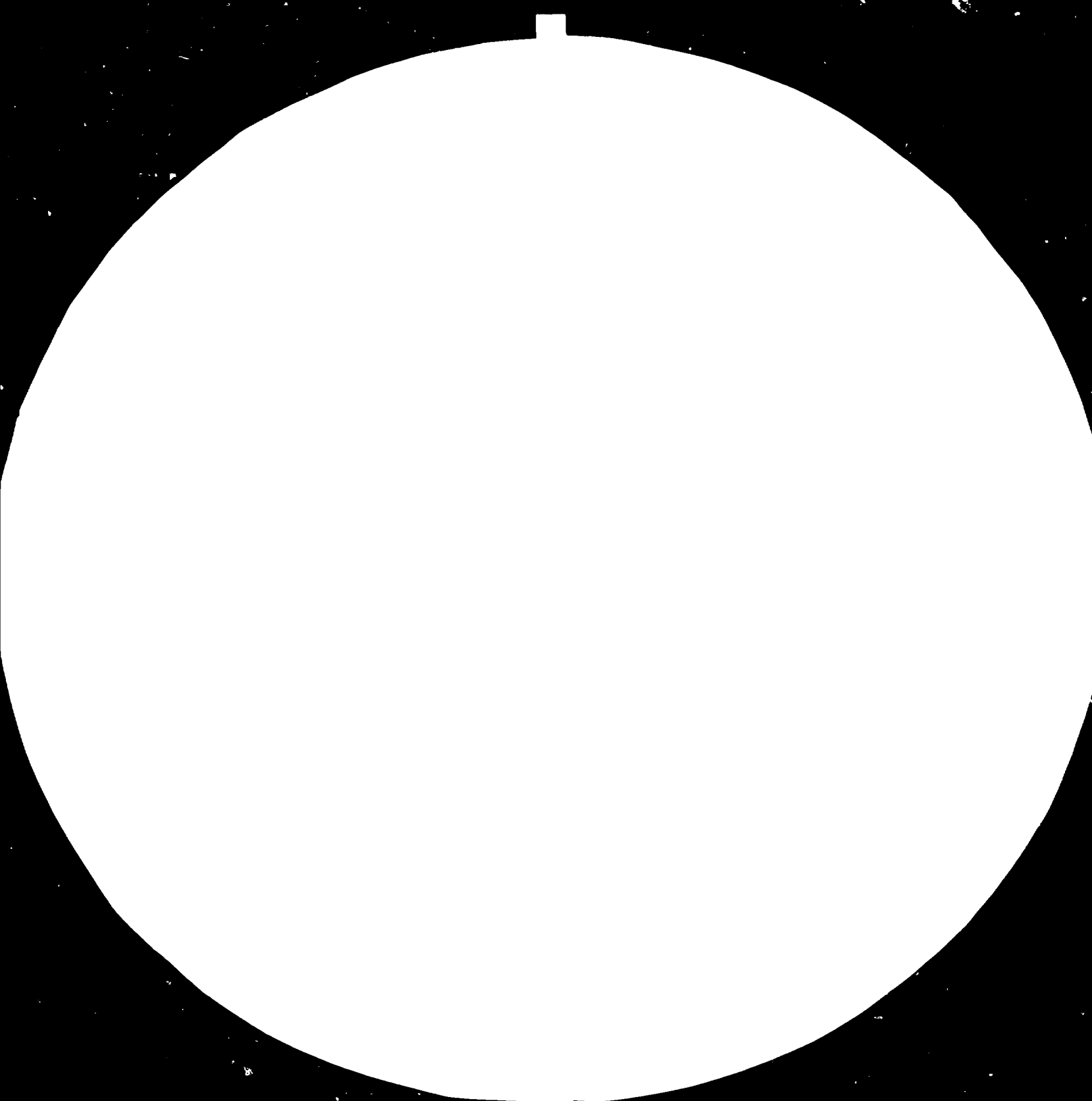
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MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

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ANALYTICAL CHEMISTRY, VOL. 35, NO. 2, P. 101-102 (1963)

13724

EXTENSION SERVICES FOR SMALL SCALE INDUSTRY
DP/TUR/80/010

Technical Report

Turkey.

Equipment specification for foundry laboratories
at Ankara Foundry Development Centre

and

determination of assistance to be provided through the centre

Prepared for the Government of Turkey
by the United Nations Industrial Development Organization
acting as executing agency for the United Nations Development Program

Based on the work of Manfred J. Schulze
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United Nations Industrial Development Organization
Vienna

This report has not been cleared with the United Nations Industrial Development Organization which does not, therefore, necessarily share the views presented.

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A B S T R A C T

The objective of the "Extension Service for Small Scale Industry" project (DP/TUR/80/C10) is to assist small scale industries on a countrywide basis through the National "Small Industry Development Organization" an organization within the Ministry of Industry and Trade responsible for monitoring and co-ordinating all activities relating to small-scale industries.

The purpose of the mission (9 January - 1 February) was to survey the existing small-scale foundries in the Ankara region in order to determine the need of assistance required and utilities for an envisaged "Regional Foundry Development Centre" in Ankara.

Through the interviews carried out during the foundry survey the need for technical improvements was identified as all foundries, although relatively skillful, operate at a very rudimentary level in terms of equipment, workshop buildings and technological inputs. The establishment of a foundry laboratory will indirectly help to improve the existing technical standards of the foundries and upgrade the present quality levels. In order to transfer the capabilities of a laboratory directly to the foundries, who are educationally and technically not in a position to consume results and analysis of a laboratory, a strong extension service should be built up using the envisaged lab. equipment and instruments only as a tool to provide the necessary help and to introduce adequate technology.

1. INTRODUCTION

Following the 1980 census of manufacturing industry the total number of industrial establishments in Turkey was 186 043 out of which 177 034 enterprises had less than 10 persons employed. This portion of the small-scale sector is presently contributing about 20% of the value added by the manufacturing industry and provides employment to about 36% of the total labour in the manufacturing labour force.

Presently the definition of a small-scale industry reads: up to 25 workers and manufacturing and equipment investment around 20,000,000 T.L. (1 US \$ = 309 T.L. - January 1984).

The development of small-scale industry has been given high priority in Turkey, following the Government's intention to support private as well as public industry in the country.

In 1970 a "Small Industry Development Centre (KÜSGEM)" was established as a "pilot centre" at Gaziantep. Based on the experience gained at this pilot centre the "Small Scale Industry Development Organization (SİDO)" was set up in 1974 in order to co-ordinate all activities related to small-scale industries.

One of the immediate objectives of the "Extension Services for Small Scale Industry" project is the establishment of the "Ankara Regional Development Centre" through SİDO with special consideration to assist the foundry industry in the Ankara region.

Presently 112 small-scale foundries operate in Ankara. All these units are concentrated in one industrial area close to Ankara (virtually one next door to each other). All of the foundries will be covered and serviced by the envisaged Regi-

onal Foundry Development Centre at their present location and once they are relocated to a new industrial estate outside Ankara (28 km) which is planned to take place around the second half of 1985.

2. FINDINGS

2.1 General

All 112 small-scale foundries in the Ankara region are members of a "Foundry Co-operative" which is responsible for the purchase of all foundry raw and operational materials (e.g. pig irons, bentonites, resins etc.) and the distribution to the individual co-operative members. This function allows the co-operative to purchase in bulk at competitive prices which a single foundry would not be in a position to. At the small-scale level no foundry could be identified not being member of the co-operative thus the figure of 112 establishments seems to constitute 100% of the small-scale foundries in the Ankara region.

Based on figures of a Producer Survey in the "Medium Scale Foundry Industry Sector" by "BC BERLIN CONSULT GmbH, GERMANY" (October 1982, financed by World Bank) it was calculated that about one third of the total casting production in Turkey is generated through small-scale foundries. In 1981 this one third contribution was about 100,000 tons and about 115,000 tons in 1982 respectively.

Following the production information given by the foundries visited and incorporating other production data made available by SICO the foundries located in the Ankara area produced in 1983 about 24,000 tons i.e. about 20% of the contribution of all small-scale foundries in Turkey and about 6.5% of the total casting production in Turkey (incl. large and medium scale foundries).

Out of the 112 foundries, 34 i.e. 30% were visited. These enterprises share about 40% of the annual production of this group which gives a reasonable and representative survey of the foundries in question.

In addition 2 large scale foundries and 2 medium scale foundries were visited to give a comprehensive picture of the overall foundry industry in the Ankara region. Some casting consumers (machine shops and machine manufacturers) were interviewed as well to gain some knowledge of problems that casting consumers have with products coming from small-scale industries.

2.2 Detail

2.2.1 Foundry personnel

The total number of employees per single foundry, ranges from 2 to 30 with an average of about 6. Approximately 90% of all workers have only basic education. The rest-mainly foundry owners- received further education at vocational training schools.

As most of the workers have worked in their respective fields already over long periods quite a substantial skill has been developed. The monthly salaries of this skilled group ranges from 25,000 to 35,000 T.L., whereas the group of helpers draw between 20,000 and 25,000 per month. The present monthly minimum salary fixed by the Turkish Government is 16,000 T.L.

2.2.2 Capacities

With the exception of 3 foundries, the rest is operating at about 40% capacity only. As stated by the foundries the reasons are as following :

- lack of orders
- non-availability of skilled manpower
- difficult working conditions
- lack of adequate production equipment

The main and key-problem however, seems to be the lack of orders and the incapability of the foundries to increase quality standards in order to penetrate more sophisticated consumer markets. One other problem should be seen in the total overcapacity of small-scale foundries in the Ankara region. Without an increasing demand in casting products in the near future, capacities will only increase through a decreasing total number of foundries. This process will most probably take place when foundries move to the new industrial estate as many of them will not be in a position to cope with additional financial burdens resulting from investments in new work-shops.

The monthly production ranges from 3 to 63 tons with an average of about 18 tons. Workshop (total) areas cover between 40 and 220 m² (average 85 m²).

Under the present conditions -manpower, equipment, location etc.- and with a favourable market situation the maximum capacity utilization rates could be increased to about 70%.

2.2.3 Products

About 50% of the foundries have specialized on a certain product, whereas the rest depends entirely on jobbing. Although the pieces produced are made with great skills and accurately, the quality demands are relatively low.

The main product groups are :

- domestic pipes and fittings
- stoves and stove parts for domestic use
- manhole covers
- wheels
- simple agricultural tools and machine parts
- machine frames and stands for wood working machines and mining equipments
- various general machine parts
- axle weights for tractors

The maximum net casting weight is around 400 kg.

2.2.4 Moulding and core-making equipment

About 70% of the foundries use a simple "one arm blade" mixer at capacities between 150 and 200 kg per batch. The rest is mixing moulding as well as core-making sand by hand. Apart from one foundry nobody was using pneumatic tools for moulding purposes. Four foundries were using simple handpushed overhead cranes travelling through moulding and melting sections. Moulding boxes were used only in a few shops for heavy castings. The majority applies the "flaskless moulding system" with various sizes of wooden flasks.

Cores are generally made with oil binders so that most of the foundries own the corresponding core drying ovens which are normally heated by coke or gas.

Patterns, patterplates and coreboxes are subcontracted to individual pattern-shops. The qualities are relatively good. Materials are mostly wood with a few aluminium patterns and plates.

2.2.5 Melting equipment

All foundries melt with discontinuously operating cold blast cupolas with internal diameters between 550 and 600 mm. Charging is done manually by 75% of the foundries. The rest operates with simple hoists. Pouring is done by handladles. Other melting equipments apart from ordinary tools are not in use. Conditions of melting equipments are very poor.

2.2.6 Fettling

Castings in general receive before "despatch" a proper cleaning with acceptable results. A small tumbling barrel is owned by 60% of the foundries and every shop has some sort of grinding equipment.

2.2.7 Moulding process

In general the flaskless hand moulding system is used with various sizes of wooden flasks. All moulding is done on the workshop floor. Although the moulding skill is very high - applying even simple gating and riser techniques - the preparation (mixing) of moulding sands is below any standards. No weighing or mixing additives is done. Sand additives like bentonite and coaldust are measured "volumetrically" with obscure boxes and buckets. The sand is virtually prepared through the advice of local "foundry demons". Almost 50% of the casting defects are resulting out of this poor moulding sand preparation habits.

2.2.8 Melting process

The cupola furnaces in use are relatively poor in condition and design but follow however the general idea of cupola melting. For the 550/600 mm type one tuyere row with 4 tuyeres

and a windbelt is common. The windpipe in most of the cases is too short (1m only). In general fan type blowers (approx. 3.5 HP) generate the necessary combustion air. The dimensioning of the cupolas is fair to poor. Weighing equipment and blast air measurement devices are not in use. Slag is tapped out of the iron spout as well at all cupolas examined. The cupolas do all operate at about 60% of capacity only (550mm = 1t/h; 600mm = 1.5 t/h) which is mainly due to inadequate charging practice i.e. excessive metallic charges (up to 400 kg), coke charges up to 30%, coke sizes too small, cupola filling practice, low coke beds etc. To improve individual cupolas will need detail dimension controls first, followed then by related improvement advises and control meltings/operations.

3. RECOMMENDATION

Based on the survey carried out, the discussions with foundry personnel and owners, various institutions and authorities, taking into account the present situation of the small scale foundries in the Ankara region and under consideration of the relocation of the enterprises to a new industrial estate in the near future the following conclusions and recommendation may be proposed.

- (i) Establishment of a foundry development centre/testing laboratories
- (ii) Establishment of an extension service unit

ad (i)

Equipment for testing centre

The proposed equipment has been selected under consideration of maximum utility -as far as practicable for laboratory

equipment- and strictly avoiding sophisticated apparatus and devices. Analysis and tests which can be carried out with the equipments have a direct relationship to the present problems of small-scale foundries. No special education will be required from operating personnel apart from the normal and direct equipment related training. After the testing laboratory becomes operational in 1985 a Tripartite Review Meeting should be held around August 1985 in order to review activities and success levels, and only then a decision should be made about eventual additional equipments and related expansions.

The best suitable temporary location was selected at MKE (State Factory for Mechanical and Chemical Industry, Mamak/Ankara) which is about of 5 km distance from the present area of the foundry industries and about 25 km from the new industrial estate where foundries will shift to, beginning with the second half of 1985 (planned). Once about 25% of the foundries have been relocated, the laboratory should be transferred to the new estate as well.

As the test lab. could not be established directly in the neighbourhood of the foundries it will be absolutely essential to have a car available for all related activities of the centre (see as well justification equipment list D.2).

A tentative layout for the first phase of the foundry testing centre is attached as Annex B. The layout was made for the "first floor" of the State Factory's existing research and training building at Mamak which will be temporarily rented by SIDO. For the design and purchase of laboratory furniture the already installed research laboratories (third floor) of the State Factory may be used as a guideline as these facilities seem to be quite suitable for the testing centre as well.

ad. (ii)

Establishment of extension service unit

With the present technology level of the small-scale foundries the foundry testing centre alone will be of little help. None of the foundry personnel will be in a position to directly transform results and analysis values into appropriate workshop advises and improvements.

The success of the foundry centre will entirely depend on the "extension service crew" which should have an absolute primary function and only use the foundry laboratories as a tool to transfer appropriate technology. This was as well one reason to keep the laboratory facilities at the initial stage at a limited level.

Various institutes, schools and factories have been visited (see ANNEX E) in order to identify the possibility to recruit suitable personnel for the "extension service crew". It was found that at various school levels (academic and vocational) foundry technique is taught and some institutions offer quite suitable practical workshop training facilities as well, specially the Faculty of Education for Technical Teachers at Gazi University.

For the initial stage the following staff may be proposed:

1. Supervision and Management of all Laboratory and Centre activities

One (1) metallurgist/foundry engineer.

Middle East Technical University or Gazi University
(Faculty of Education for Technical Teachers)

2. Extension service

Two (2) metallurgist/foundry engineer.

GAZI University, Faculty of Education for Technical Teachers.

Candidates should have a minimum of 3 years practical experience in foundry industry or 3 years teaching experience at vocational level. Fresh graduates should not be considered for these posts.

3. Laboratory operators

Three (3) graduates from Higher Vocational Training Institutes with specialization in Foundry Technology

4. Administration

One (1) secretary (Turkish and English)

5. Other

Two support staff

Following general activities should be tentatively envisaged for the initial stage of the testing centre. Activities are listed in order of merit.

1. Installation and commissioning of laboratories
2. On-the-job training of laboratory operators and extension officers in the use of equipment and apparatus.
3. Resurvey of a selected number of foundries for detailed dimensioning of various operating equipment and identification of direct technical problems e.g. moulding sand preparation, cupola melting practice etc.

4. Based on above results elaboration and establishment of an extension service programme i.e. direct workshop services, seminars, training programmes, workshop handouts and service feedback system.
5. Regular extension service activities
6. Survey of other regions in Turkey with similar accumulation of small-scale foundries.

Beginning with point 2., assistance and transfer of appropriate technology to foundries should be given absolute priority whenever practicable or requests are made from individual companies, even with the risk that "off-the-job" activities suffer.

EQUIPMENT SPECIFICATION
FOUNDRY DEVELOPMENT CENTRE
FOUNDRY TESTING LABORATORIES

- A. SANDTESTING LABORATORY
- B. METALLOGRAPHIC LABORATORY (sample preparation)
- C. METALLOGRAPHIC LABORATORY (microscope)
- D. CHEMICAL LABORATORY
- E. FOUNDRY WORKSHOP TESTING EQUIPMENT
- F. OTHER
- G. COST CALCULATION
- H. LIST OF SUPPLIERS

A. SANDTESTING LABORATORY

SR. NO.	QUANTITY PIECES	DESCRIPTION	EST. PRICE (US \$)
1	1	SAND SAMPLER sample collector for representative collection of sand samples	408.--
2	10	SAND CONTAINER sample storage	77.--
3	1	LABORATORY SPEED BALANCE balance for all weighing operations	2,347.--
4	1	INFRARED RAPID DRYER determination of moisture contents of moulding sands	1,080.--
5	1	AGITATOR mechanical agitation of sand samples prior processing for determination of fines, clay contents and grain size fractions	1,479.--
6	1	CONTINUOUS CLAY WASHER automatic removal of sand particles smaller than 0.20mm for determination of fines, clay contents and grain size fractions	2,958.--

7	1	LABORATORY SIFTER (incl. siev set DIN 4186) determination of grain size fractions	2,676.--
8	1	LABORATORY MIXER preparation of experimental sand mixtures at laboratory level	5,634.--
9	1	SAND RAMMER preparation of test specimen	2,254.--
10		ACCESSORIES FOR SAND RAMMER	
10.1	1	TRANSVERSE STRENGTH CORE BOX	657.--
10.2	1	TENSILE STRENGTH CORE BOX	634.--
11	1	UNIVERSAL STRENGTH MACHINE testing apparatus for various physical properties of moulding sands	2,254.--
12		ACCESSORIES FOR UNIVERSAL STRENGTH MACHINE	
12.1	1	TRANSVERSE STRENGTH ATTACHMENT	211.--
12.2	1	TENSILE STRENGTH ATTACHMENT	469.--

13	1	PERMEABILITY METER (electrical operated) testing of gas permeability of moulding sands	2,113.--
14		ACCESSORIES FOR PERMEABILITY METER	
14.1	1	CORE PERMEABILITY TUBE testing device for dried specimen	211.--
15	1	DRYING CABINET	1,174.--
16	1	METHYLENBLUE CLAY TESTER (incl. chemicals and glass ware) determination of methylenblue values of bentonites	563.--
17	2	GREEN HARDNESS TESTER sand hardness testing of moulds	117.--
18	1	CORE HARDNESS TESTER testing of core hardness	188.--
19	1	BINOCULAR SANDMICROSCOPE (Ampl. 10, 30, 50 x)	704.--
		TOTAL	
		(US \$)	<u>28,208.--</u>

Note: All items 220V, 50HZ
DIN/ISO - standard and
metric system only

B. METALLOGRAPHIC LABORATORY (sample preparation)

SR. NO.	QUANTITY PIECES	DESCRIPTION	EST. PRICE (US \$)
1	1	CUT-OFF MACHINE cutting of metallographic sam- ples up to a maximum solid diameter of 65 mm	2,544.--
2		ACCESSORIES FOR CUT-OFF MACHINE	750.--
2.1	20 liter	COOLANT FLUID	
2.2	20	CUTTING DISCS cutting discs for "extremely" hard iron materials with large diameter	
2.3	20	CUTTING DISCS cutting discs for hard iron materials with large diameter	
2.4	20	CUTTING DISCS cutting discs for hard iron materials under 25mm diameter	
2.5	20	CUTTING DISCS cutting discs for normal materials hardness with diameter under 25mm	

3		TWIN ROTARY PREGRINDER (400 and 400rpm) grinding of metallographic samples	1,059.--
4	1	TWIN UNIVERSAL POLISHER 150 and 300 rpm Polishing of metallographic samples	912.--
5		ACCESSORIES FOR UNIVERSAL POLISHER	
5.1	1	ATTACHMENT FOR AUTOMATIC SAMPLE POLISHING	74.--
6	1	AUTOMATIC MOUNTING PRESS (automatic pressure and temperature control) mounting of specimen	2,059.--
7		ACCESSORIES FOR AUTOMATIC MOUNTING PRESS	
7.1	2	ACCESSORIES AND SUPPLIES FOR SAMPLE MOUNTING	74.--
8	1	SAMPLE DRYER drying of samples through hot-air flow	221.--
9	2	SAMPLE CABINET (10 drawers)	294.--

10

METALLOGRAPHIC SPECIMEN
COLLECTION

588.--

consisting of:

- a) Introduction to practical metallography
- b) Structures and strength of metals
- c) Metallography of welds
- d) Metallography of castings

CONSUMABLES

11

WATERPROOF SILICON CARBIDE
DISCS

647.--

grain size numbers:

11.1	400	No. - 060
11.2	400	No. - 120
11.3	400	No. - 220
11.4	400	No. - 320
11.5	400	No. - 400
11.6	400	No. - 600
11.7	400	No. - 800

12

50

POLISHING CLOTH, 200 DIA DISCS
ADHESIVE BACK

51.--

13	50	POLISHING NYLON CLOTH 250 DIA	66.--
14	10x5 gr.	POLISHING DIAMOND COMPOUND, 6 MICRON YELLOW	265.--
15		ditto, 1 MICRON BLUE	119.--
16		ditto, 0.25 MICRON GREY	118.--
17	50	POLISHING DIALAP FLUID AEROSOL CAN	132.--
18	20	ALUMINA (WATER BASED), 2 MICRON (500 ml bottles)	294.--
19	5 kg	MOUNTING POWDER BLUE	74.--
20	5 kg	MOUNTING POWDER TRANSPARENT	74.--

TCTAL
 (US \$) 10,414.--

C. METALLOGRAPHIC LABORATORY (microscope)

SR. NO.	QUANTITY PIECES	DESCRIPTION	EST. PRICE (US \$)
1	1	LEITZ METALLUX METALLOGRAPHIC MICROSCOPE (Type 2)	8,955.--
		consisting of:	
	1	1) basic stand	
	1	2) opak with tube lens 00/1x	
	1	3) filter set F	
	1	4) lamp house 50, complete with filter set F	
	1	5) tube FSA (43 dia.)	
	1	6) mechanical stage no 979	
	1	7) dust cover	
	1	8) case for accessories	
	1	9) objective MPL 5x/0.09	
	1	10) objective MPL 10x/0.18	
	1	11) objective MPL 20x/0.40	
	1	12) objective MPL FLUOTAR 50x/0.85	
	1	13) objective MPL 100x/0.90	
	1	14) paired eyepieces GF 10xM	
	1	15) graticul for standard magn. and format lim.	
	1	16) hand press	
	10	17) bars plasticilin mounting material	
	12	18) objective carriers	
	1	19) mains unit, continuously regulating, for connec- tions of halogen lamp 12V 50W to 110-220V, 50HZ incl. connection cable and safety plug	

- 20 20) halogen filament lamp
 12V 50W (spares)
- 1 21) intermediate piece to
 adapt lamp house 100
- 1 22) eyepieces PERIPLAN TL 170
 (dia. 23.2) GF 16x16mm
- 1 23) projections attachment with
 graticul according to
 Snyder graff
- 1 24) lamp housing 100 z (left-
 hand operation)
- 1 25) collector, 2 lenses,
 50 dia. clear
- 1 26) lamp mount for 12V 100W
 tungsten halogen lamp
- 10 27) 12V 100W halogen lamp
- 1 28) heat absorbing filter
- 1 29) eyepiece PERIPLAN
 10x (Brille)
- 1 30) eyepiece PERIPLAN GF 12.5 MF
 with graticul SY2

2 1 MICROPHOTOATTACHMENT WILD MPS 45 2,425.--

consisting of:

- 1 1) eyepiece tube for PERIPLAN
 GF 12.5x, TL 170mm
- 1 2) MSP 51 shutterpiece for
 integrated metering
- 1 3) 0.8x camera back with Pola-
 roid CB 101.31/4 in x 4 1/4 in
 camera objective 0.8x, incl.
 50 boxes POLAROID LAND PAKK
 FILM

TOTAL
(US \$) 11,380.--

D. CHEMICAL LABORATORY

(Quantitative determination of C, Si, Mn, P, S, Cu, Ni, Cr, Mo, Ag)

SR. NO.	QUANTITY PIECES	DESCRIPTION	EST. PRICE (US \$)
1	1	COULOMAT Automatic coulometric determination of carbon and sulphur consisting of :	10,921.--
	1	1) Complete coulometer with digit electronic display of analysis result etc.	
	1	2) Standard type integrating motor panel (1 count corresp. to 2×10^{-7} gr. carbon)	
	1	3) Standard type integrating motor panel (1 count corresp. to 1×10^{-7} gr. sulphur)	
	1	4) Titration panel	
	1	5) Panel for central mains supply	
	1	6) Combustion equipment	
	1	7) Set of gas conduit parts	

2	1	SET OF RECOMMENDED REAGENTS AND CONSUMABLES FOR CARRYING OUT C AND S ANALYSIS WITH THE COULOMAT	1,306.--
3	1	RAPID ANALYTICAL BALANCE (air dumping) Weighing range : 160 gr Readability : 0.1 mg	1,269.--
4	1	ELTIMETER 30 (acc. Büchel) System for quantitative titrations using a constant current passing through twin platinum electrodes consisting of :	3,097.--
	1	1) basic instrument with all accessories	
	1	2) standard titration arm	
	3	3) outlet jets	
	5	4) caoutchouc hose sections	
	5m	5) titration hose	
	1	6) twin platinum electrode P. 88/12 with connection and plug	
	1	7) set of stirring rods	
	1	8) magnetic remover for stirring rods	

	1	9) Electronic motor piston burette with digital reading of the dosed reagent volume	
	1	10) Manual titration regulator	
5	1	MUFFLE FURNACE MAX. TEMP./1000°C Dimensions 175x119x350	1,567.--
6	1	HEATING AND DRYING OVEN Temp. range 40°C-250°C Volume 112 Liters	709.--
7	1	WATER DISTILLING APPARATUS electrically heated 220/380V 50HZ performance 5 ltr/h energy 4 KW	970.--
8	1	SET OF GENERAL LABORATORY APPLICANCES FOR CARRYING OUT THE NECESSARY DETERMINATIONS i.e. glass, porcelain, metals etc.(excl. items listed under SR. NO.2 for COULOMAT)	4,552.--
9	1	SET OF CHEMICALS AND REAGENTS (excl. items listed under SR.NO. 2 for COULOMAT)	3,806.--
10	4	ANALYSIS SPECIMEN 4 different analysis grades of Fe-C alloys with certifi- cate (100 gr bottles)	149.--

11

LABORATORY SUPPORT TOOLS AND
EQUIPMENT

11.1	1	BENCHDRILL max. 0.8KW, drilling cap. approx. 16mm, set of drills 6 -- 25 mm	1,026.--
	1	BENCH GRINDER 2 grinding wheels	448.--
	1	HAND DRILL (TYPE BLACK+DECKER) incl. set of drills	93.--
	1	METAL HANDSAW incl. 50 blades normal mate- rial and 50 blades hard metal	75.--
	1	SET OF MECHANICAL WORKSHOP HANDTOOLS i.e. spanners, screwdriver, hammer etc. incl. one bench clamp (mangel)	187.--
	1	UNIVERSAL ELECTRIC TESTER measuring of voltage, amps, ohms etc.	75.--

Note: prices for support tools
and equipment are indicative

TOTAL
(US \$) 30,150.--

E. FOUNDRY WORKSHOP TESTING EQUIPMENT

SR. NO.	QUANTITY PIECES	DESCRIPTION	EST. PRICE (US \$)
1	1	<p>DIP PYROMETER</p> <p>measuring of temperature of ferrous and non-ferrous materials</p> <p>specification and accessories/ supplies:</p> <p>1) Measuring range 400°C-1750°C</p> <p>2) Thermo-element Pt Rh 10-Pt</p> <p>3) Portable temperature indicator with digital readout power supply mains and battery (rechargeable)</p> <p>4) measuring lance with 3m extension cable for</p> <p>a) Fe-C alloys</p> <p>b) Cu - alloys</p> <p>c) Aluminium</p> <p>(lance for Fe-C alloys with three (3) lance-head contact blocks i.e. receiving and connecting device for measuring tube)</p> <p>5) 2000 pieces measuring devices (tubes)</p>	6,000.--

2

1

DIGITAL CARBON SILICON DETERMI-
NATOR TYPE QUICK CUP

6,500.-

Digital readout of C, Si, CE,
TS, TL incl. build in printer

Accessories/consumables

1) 2 cup holders

2) 2 contact blocks

3) 2 x 5m extension cable

4) 1000 cups with tellurium

5) 100 thermorolls for printer

TOTAL

(US \$) 12,500.--

F. OTHER

SR. NO.	QUANTITY PIECES	DESCRIPTION	EST. PRICE (US \$)
1	1	BRINELL HARDNESS TESTER complete apparatus with optical readout incl. 3 support tables (different), measuring heads/spheres 2.5, 5, 10 mm diameter and standard test bar (measuring spheres each 3 pcs)	2,000.--
2	1	CAR comuting between test center and foundry industry area, test center and new foundry indus- trial estate (under constr.), transportation of test equip- ment and apparatus for on the spot testing in various found- eries and transportation of test pieces from foundries to test center TYPE: Station waggon with 2/3 : 1/3 or 3/4: 1/4 foldable rear seats eg. Volkswagen Variant, Renault 12/18 Station Waggon, Toyota Corona Caravan etc.	8,000.--
TOTAL			(US \$) <u>10,000.--</u>

G. COST CALCULATION

All prices indicated are best estimates and should be taken as a basis for the corresponding purchase procedures.

A. SAND-LABORATORY	-	28,208	US \$
B. METALLOGRAPHY (sample preparation)	-	10,414	US \$
C. METALLOGRAPHY (microscope)	-	11,380	US \$
D. CHEMICAL LABORATORY	-	30,150	US \$
E. WORKSHOP TEST	-	12,500	US \$
F. OTHER	-	10,000	US \$
TOTAL EX WORKS	-	<u>102,653</u>	US \$
Packing, FOB changes etc. 4%	-	4,106	US \$
Transportation (overland) 4%	-	4,106	US \$
	-	<u>110,865</u>	US \$
Insurance 1.5%	-	1,663	US \$
	-	<u>112,528</u>	US \$
GRAND TOTAL CIF	-	<u><u>115,000</u></u>	US \$

H. LIST OF SUPPLIERS

A. SAND-TESTING LABORATORY

1. GEORG FISCHER AG
CH-8201 SCHAFFHAUSEN
SWITZERLAND
2. RIDSDALE CO. LTD.
NEWHAM HALL NEWBY
MIDDLESBOROUGH, CLEVELAND
ENGLAND, TS 8 9EA

B. METALLOGRAPHIC LABORATORY
(sample preparation)

1. METASERV
Metallurgical Services Labs. Ltd.
RELIANT WORKS
BETCHWORTH, SURREY, RH3 7HW
ENGLAND
2. JEAN WIRTZ GmbH + Co. K G
CHARLOTTESTR. 73
4000 DUESSELDORF 1
GERMANY FR

C. METALLOGRAPHIC LAB. (microscope)

1. ERNST LEITZ WETZLAR GmbH
P. O. BOX 2020
D-6330 WETZLAR
GERMANY FR

(LEITZ AUSTRIA)

D. CHEMICAL LABORATORY

1. STROEHLEIN GmbH Co.
P. O. BOX 7829
D-4000 DUESSELDORF 1
GERMANY FR
2. APPLIED RESEARCH LABORATORIES SA
1024 ECUBLENS
SWITZERLAND
3. K+3 GRUBBS INSTRUMENT GmbH
FROSKOENIGWEG 15
4000 DUESSELDORF
GERMANY FR

E. FOUNDRY WORKSHOP TESTING

1. KUENZER GmbH
IM STIFT 6-8
D-5800 HAGEN 5 (Hohenlimburg)
GERMANY FR
2. ELECTRO-NITE N.V.
GROTE BAAN 27a
B-3630 HOUTHALEN
BELGIUM
3. LEEDS NORTHRUP GmbH
FLEHER STR. 32
D-4000 DUESSELDORF 1
GERMANY FR

F. OTHER

1. BRINELL HARDNESS TESTER

a) HAHN and KOLB
KOENIG STR. 14
7000 STUTTGART 1
GERMANY FR

b) GEORG REICHERTER
P. O. BOX 163
7300 ESSLINGEN
GERMANY FR

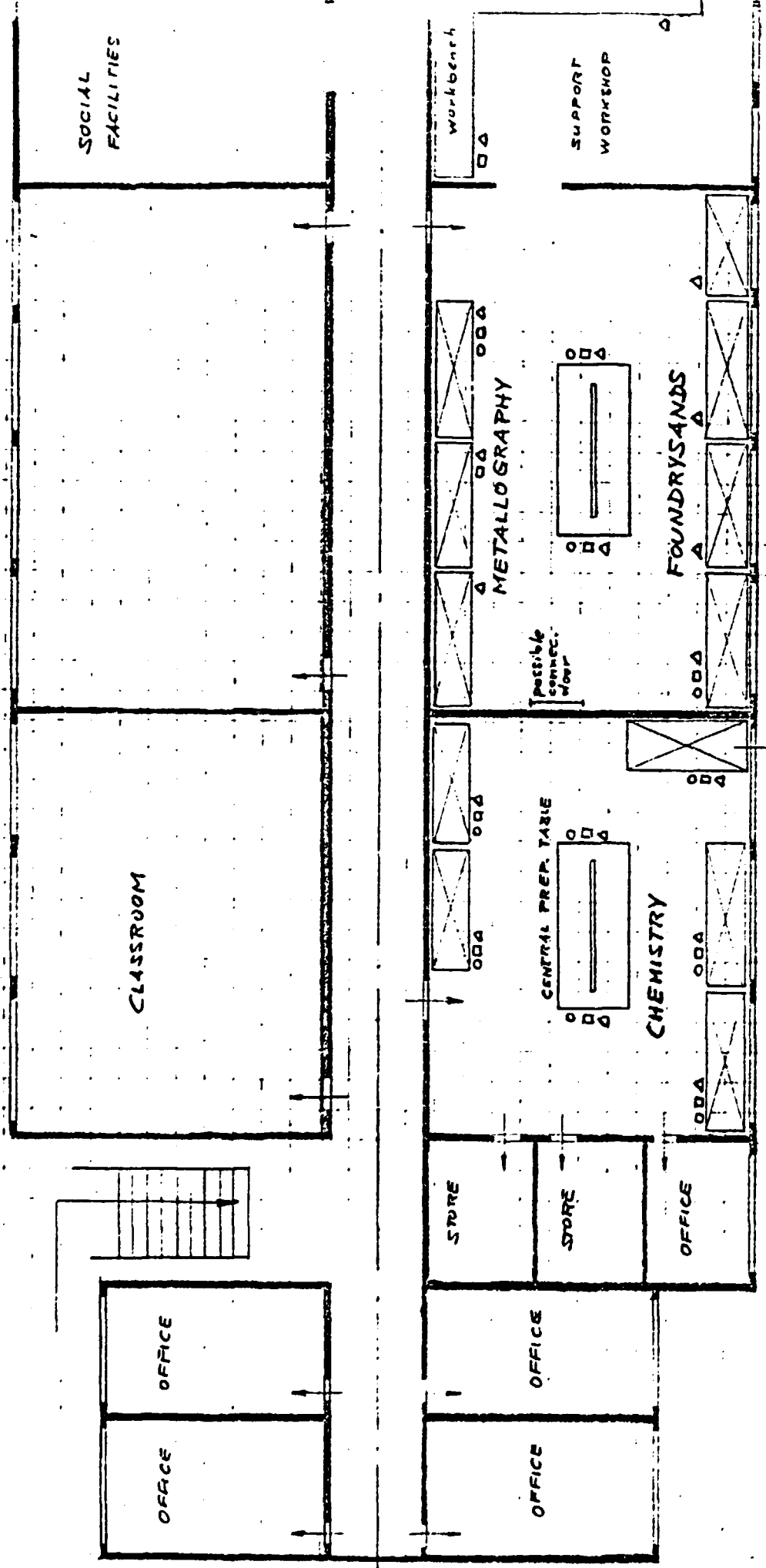
2. CAR

VOLKSWAGEN, RENAULT, TOYOTA etc.

FIRST FLOOR - FOUNDRY DEVELOPMENT CENTRE -
RESEARCH AND TRAINING INSTITUTE
MIKE

ANNEX B

ANKARA / MAMAK



LAY-OUT / SKETCH

SCALE ~ 1:125

(total area ~ 560 m²)

LAB TABLE
 O GAS SUPPLY
 □ WATER " + DRAIN
 △ POWER

OFFICIAL CONTACTSTurkish Government

Mrs. Güler Yalim,	General Director,	SIDO
Mr. Murat Bursa,	Deputy Director,	SIDO
Mr. Gürkan Önbilgin,	Mechanical Eng.,	SIDO
Miss Nilgun Tas,	Metallurgist (under recruitment),	SIDO

UNDP Ankara

Mr. Sarfraz K. Malik,	Resident Representative
Mr. Ganti L. Karasimhan,	SIDFA UNIDO
Mr. H. Toreli,	Programme Officer SIDFA-Office
Mr. D. Bassi-Zambelli,	CTA TUR/80/010

Other

Mr. Necdet Baytas,	Chairman, Foundry Union
Mr. Ziya Karalar,	Chairman Construction Co-operative (new estate)
Mr. Celal Boyar,	Chairman, Foundry Co-operative

LIST OF FOUNDRIES VISITED

1. Alkaya Döküm Sanayi
2. Güçlü Döküm Atölyesi
3. Varol Döküm Atölyesi
4. Piz Dökümhanesi
5. Koçak Dökümhanesi
6. Baysaloğlu Döküm Sanayi
7. Işık Döküm Atölyesi
8. Soyaldız Döküm Atölyesi
9. Sutsan Döküm Atölyesi
10. Boyar Döküm Atölyesi
11. Tekin Döküm Atölyesi
12. Aydıner Döküm Atölyesi
13. Erdoğan Döküm Atölyesi
14. Aydoğan Döküm
15. Aris Döküm Atölyesi
16. Albayrak Döküm Atölyesi
17. Yılmazlar Döküm Atölyesi
18. Ufuk Döküm Atölyesi
19. Karasığaç Döküm Atölyesi
20. Bolat Döküm Atölyesi
21. Alicanbaşgil Döküm Atölyesi
22. Özbudak Döküm Atölyesi
23. Kardeş Döküm Sanayi
24. Seç Döküm Atölyesi
25. Karpın Döküm Atölyesi
26. Güçlü Döküm Sanayi
27. Ayakkım Makina Sanayi ve Ticaret A.Ş.
28. Çiğdem Döküm Sanayi
29. Örnek Döküm Atölyesi
30. Makpar Döküm Atölyesi
31. Tomcan Döküm Atölyesi
32. Cündöküm Atölyesi
33. Fik Döküm Atölyesi
34. Özöker Döküm Atölyesi

Other places visited

1. "METU"
Middle East Technical University, Dept. of Metallurgy
2. GAZI UNIVERSITY,
Faculty of Education for Technical Teachers,
Department of Foundry Technique
3. AKTAS VOCATIONAL SCHOOL FOR TECHNICIANS,
Foundry Section
4. OSTIM INDUSTRIAL ESTATE,
(Middle East Industrial Trading and Exporting Centre)
5. ANKARA AUTOMOBILE REPAIRMENT INDUSTRIAL ESTATE
(Estate under construction)
6. ANKARA FOUNDRY WORKS INDUSTRIAL ESTATE
(Estate under construction)
7. STATE FACTORY FOR MECHANICAL AND CHEMICAL INDUSTRY
(Temporary location of Foundry Centre)

