Table-16 Expected Products and Areas for Export (1/2)

J113_1A-Commodity	J113_1B-Area	J113_1C -Channel	J113_2A-Commodity	J113_2B-Area	J113_2C -Channel
COCONUT PROCESSING	SE ASIA	2	TEA PROCESSING	S E ASIA	2
AGRICULTURAL CROP MACHINES	E ASIA, AFRICA	2	STEEL CASTINGS COMPONENTS	DEVELOPED COUNTRIES	1
STEEL OFFICE FURNITURE	EEC COUNTRIES	2			3
RICE MILL MACHIN & SPARES	VIETNAM, PAKISTAN, INDONESIA	2			3
LIGHT WEIGHT SAFES	JAPAN & USA	3			3
STATIONAERY, WIRE NAILS	OVERSEAS	1			3
CHAIRS	EUROPE, ASIA	1			3
LATHE MACHINES	SE ASIA	2	WELDING TRANSFORMERS	AFRICA	3
FURNITURE ARCHITECTURAL		2	BUILDING HARDWARE		3
STEEL FURNITURE (DIFF DES		1			3
HYDRAULIC JACKS	AFRICAN COUNTRIES, SE ASIA	2	STRUCTURAL METAL PRODUCTS	JAPAN, KOREA & SINGAPORE	1
VEHICLE EQUIPMENT	USA	2			3
WATER PUMPS	MALAYSIA, EGYPT	2	CASTINGS	JAPAN	2
AGRO SPRAY	PAKISTAN, EC & MIDDLE EAST	2			3
TEA PROCESSING MACHINERY	AFRICA, MALAYSIA, INDONESIA	2			3
CASTINGS	JAPAN, EC	2			3
CAST COMPO FOR WATER PUMP	EC (ITALY)	1			3
WOOD CARVING & HANDICRAFT	EC	3			3
CUTLERY	EC, AUSTRALIA	2			3
ELECTRONIC EQUIPMENTS		3			3
CANS	UAE	3	PRINTED SHEETS	UAE	3
SOUVENIRS	USA, JAPAN	2	CORPORATE GIFTS	GERMANY	2
FLOPPY TRANSFORMERS	USA, S AFRICA, WEST	3	B & W TV	USA, S AFRICA	3
FREIGNT CONTAINER	SINGAPORE	2			3
HEATR EXCHANGERS	MIDDLE EAST & ASIA	1	RADIATORS	MIDDLE EAST & ASIA	1
TEA MACHINERY	BANGLA, INDONESIA, SOUTH AF	3			3
PRINTED SHEETS	UAE	3	CANS	UAE	3

Table-16 Expected Products and Areas for Export (2/2)

J113_1A-Commodity	J113_1B-Area	J113_1C -Channel	J113_2A-Commodity	J113_2B-Area	J113_2C -Channel
REFRIGERATORS	MALDIVES	3			3
WIRE BASED PRODUCTS		3			3
CUSTOM BUILT PLANT & MACH		2			3
MECHANICAL PLATFORM SCALE	AFRICAN COUNTRIES, M EAST	2	COMPONENTS FOR "1A"	AFRICAN COUNTRIES, M EAST	2
DISTRIBUTION TRANSFORMERS	SE ASIA	2			3
CORRUGATED SHEETS	MALDIVES, AUSTRALIA, EC	3			3
L P GAS CYLINDERS	SE ASIA	2			3
BATTERY CONTAINERS	ASIA, MIDDLE EAST	2			3
LORRIES & BUSES	UK, MIDDLE EAST	2			3
PLATATION MACHINERY	TEA PRODUCING COUNTRIES	3			3
CASTINGS	JAPAN, EUROPE	1			3

Notes: 1: Sub-contracting under foreign munufacturers
2: Through buyers
3: Others

Table-17 Sub-Contract Out (Item No. E102)

Total : Number of companies to be studied
Sub-total : Number of companies who answered to use sub-contractor
1 Ratio of dependence on sub-contractor less than 10%
2 Ratio of dependence on sub-contractor 11 - 30%
3 Ratio of dependence on sub-contractor 31 - 50%
4 Ratio of dependence on sub-contractor 51 - 70%
5 Ratio of dependence on sub-contractor more than 70%

	Total	Sub-total	1	2	3	4	5
Small	25	8	6	0	0	1	1
Medium	13	6	5	1	0	0	0
Large	13	11	9	1	1	0	0
Privatized	3	2	1	1	0	0	0
Sub-total	54	27	21	3	1	1	1
Joint Venture	7	2	0	0	2	0	0
Governmental	5	4	4	0	0	0	0
Total	66	33	25	3	3	1	1

Table-18 Sub-Contract In (Item No. D)

1 Number of companies to be studied
2 Number of companies who made sub-contract work
4 Number of companies who did not get financial support
5 Number of companies who got financial support
7 Number of companies who did not get technical support
8 Number of companies who got technical support
9 Number of companies who answered to the question on sub-contract work
10 Number of companies who have no interest in sub-contract
11 Number of companies who have interest in sub-contract

	1	2	3	4	5	6	7	8	9	10	11
		Sub-	Financial			Technical			Interest		
	Total	contract in	Sub-total	No	Yes	Sub-total	No	Yes	Sub-total	No	Yes
Small	25	4	8	7	1	8	6	2	15	3	12
Medium	13	4	5	3	2	5	4	1	7	1	6
Large	13	2	3	2	1	4	4	0	6	3	3
Privatized	3	1	2	2	0	2	2	0	2	0	2
Sub-total	54	11	18	14	4	19	16	3	30	7	23
Joint Venture	7	1	1	0	1	1	0	1	4	0	4
Governmental	5	0	1	1	0	0	0	0	5	3	2
Total	66	12	20	15	5	20	16	4	39	10	29

Table-19 Improvement (Item No. J106)

Total : Number of companies to be studied
Sub-total : Number of companies who answered to the question on improvement
1 Introduction of new machine
2 Technical training
3 Purchase of patent
4 Contracting of qualified technicians
5 Others, specify
6 Do not

	Total	Sub-total	1	2	3	4	5	6	Market	Quality Improve	Total
Small	25	25	19	16	1	9	4	1			
Medium	13	11	9	7	2	5	1	1			
Large	13	10	7	8	0	1	1	0			
Privatized	3	2	2	2	0	2	0	0			
Sub-total	54	48	37	33	3	17	6	2	1	1	100
Joint Venture	7	7	6	7	2	4	1	0	0	0	20
Governmental	5	5	5	5	0	0	0	0	0	0	10
Total	66	60	48	45	5	21	7	2	1	1	130

Table-20 Interest in New Merchandise or Technology of Foreign Country
(Item No. J107)

Total : Number of companies to be studied
Sub-total : Number of companies who answered to the question on captioned item
1 Much
2 More or less
3 Not so much
4 None

	Total	Sub-total	1	2	3	4
Small	25	25	19	0	5	1
Medium	13	12	12	0	0	0
Large	13	9	8	1	0	0
Privatized	3	3	3	0	0	0
Sub-total	54	49	42	1	5	1
Joint Venture	7	7	6	1	0	0
Governmental	5	5	4	1	0	0
Total	66	61	52	3	5	1

Table-21 List of Enterprises showing Interest to Enter into Industrial Estates (1/2)

	SERNO	CO1	NA_PR1	UN1	QU1	PRIN_1	CLI_1	CO2	NA_PR2	UN2	QU2	PRIN_2	CLI_2
S	10	3822	AGRIC. CROP PROCESSING MACH. EQUP.	3	-1	1569	129	3824	CLAY & TILE MACHINERY	3	-1	1569	129
S	12	3812	STEEL OFFICE FURNITURES	2	-1	3999	249	3812	TABLE CABINET, STEEL	2	-1	3999	249
S	24	3819	PAPER PINS, WIRE NAILS, HAIR CLIPS ETC	1	3	2469	124	0		0	0		
S	37	3811	CONTAINERS	2	5000	3799	399	0		0	0		
S	45	3823	WOOD WORKING MACHINES	2	2	1569	356	3824	LATHE MACHINES & DRILLS	2	1	1569	356
S	48	3812	CHAIRS, TABLES, CUPBOARDS SHOWCASES	1	9	8999	126	3813	SCAFFOLDINGS LADDER	1	9	8999	126
S	55	3812	STEEL FILING CABINETS	2	85	3999	126	3812	STEEL CUPBOARDS	2	90	3999	126
S	59	3822	HYDRAULIC RAM CYLINDERS	9	50	1356	569	3813	HYDRO POWER PROJECTS (DEPENDS ON OCCASIO	9	-1	3579	699
S	60	3819	ALL TYPE OF STEEL FABRICATIONS ROLLING	2	6	3699	699	3819	ROLLING GATES MAKING STEEL TRUSSES	9	30	3699	699
M	2	3822	WATER PUMPS	2	500	1569	125	3823	WOODWORKING M/C	2	3	156	699
M	9	3819	AGRO SPRAYERS	2	2000	3999	567	3819	FORE EXT.	2	50	3999	567
M	16	3824	MACCHINERY FOR LOCAL INDUSTRY	3	-1	6999	399	3813	STRUCTURAL STEEL PRODUCTS	3	-1	3999	169
M	29	0	CIRCULAR SAW BENCH	9	18	9999	999	0	SPINDLE MOULDER	9	12	9999	999
M	32	3829	SEWING MACHINE	2	4500	9999	1237	3832	AUDIO EQUIPMENT	2	700	9999	123
M	49	3832	B & W T V	2	700	1234	123	3832	RADIO CASSETTE RECORDERS	2	3000	9999	999
M	62	3813	UNDERGROUND TANKS STRUCTURAL EQUIPMENTS	9	-1	5399	699	0		0	0		
L	3	3819	MS FREIGHT CONTAINERS 20'	2	10	3679	799	3819	MS OFFICE CONTAINERS 20'	2	10	9999	299
L	36	0	PRINTING SERVICES (EXPORT) PRINTED SHEET	1	4000	3479	2367	3811	CANS AEROSAL CAN	2	-1	3479	236
L	51	0	WIRE MESH, NETTING, WELDED MESH, CHAIN LINK	9	-199	8999	124	0		0	0		
L	70	0	STOOL 9"	9	50	9999	999	0	STOOL 18"	9	100	9999	999
L	26	3829	TEA MACHINERY	2	8	1235	136	0	RUBBER	2	4	1235	999
L	39	3811	GALVANIZED CORRUGATED SHEET	1	450	3479	123	3811	GALVANIZED PLAIN SHEET	1	450	3479	123
S	30	3813	STEEL TRUSSES, PREFAB BUILDINGS	1	10	3999	129	3819	REFUSE COLLECTING BINS LARGE TANKS	1	7	3999	123

CO1: Code: No.

UN1: Unit
1 Tonnage
2 Number of units
3 Specify
9 No answer

QU1: Quantity/ Month

PRIN_1: Principal Process
1 Casting
2 Forging
3 Platework/welding
4 Plating
5 Machining
6 Machinery assembly
7 Press work
8 Others, specifly
9 Others

CLI_1: Client
1 Government
2 Large enterprise (employees: more than 200)
3 Micro, small and medium manufacturer
4 Trader/middleman
5 Retailer
6 Direct to end user
7 Export
9 Others

Table-21 List of Enterprises showing Interest to Enter into Industrial Estates (2/2)

CO3	NA_PR3	UN3	QU3	PRIN_3	CLI_3	CO4	NA_PR4	UN4	QU4	PRIN_4	CLI_4	J101	J102
3822	SERVING AGRI. INDUSTRIAL MACHINERY	3	-1	1569	129	0		0	0			1	15.00
3812	STEEL CUPBOARDS	2	-1	3999	249	3812	STEEL BOOK RACKS	2	-1	3999	249	2	-1.00
0		0	0			0		0	0			1	2.50
0		0	0			0		0	0			2	-1.00
3831	WELDING TRANSFORMERS	2	60	8699	569	3831	BATTERY CHARGERS	2	15	8699	569	1	3.00
3819	DOORS, WINDOWS, GATES ROLLER SHUTTERS	1	9	8999	126	3843	BUS & TRUCK BODIES	1	9	8999	126	1	2.50
3812	STEEL SYNATURE & CABINETS	2	10	3999	129	3812	STEEL RACKS	2	20	3999	126	2	-1.00
0		0	0			0		0	0			1	2.50
3829	REPAIRING ALL TYPES OF MACHINE	9	-1	3699	699	3843	BRAKE LINERS & CLUTCH PLATES	9	400	6999	699	1	1.00
0		0	0			0		0	0			1	25.00
3822	PADDY THESHER	2	30	6999	569	0		0	0			2	-1.00
3819	HYDRAULIC GATES	3	-1	3999	199	0		0	0			1	12.00
0	LATHE (WOOD WORKING)	9	13	9999	999	0	RIB SAW BENCH	9	1	9999	999	1	10.00
3832	TELEVISION	2	2000	9999	123	0		0	0			1	20.00
3832	RADIOS	2	200	9999	999	3832	ELE ORGAN	2	200	9999	999	1	14.00
0		0	0			0		0	0			1	25.00
0		0	0			0		0	0			1	50.00
3811	COLLAPSIBLE TUBS	2	-1	3479	236	3811	CROWN CORKS	2	-1	3479	236	1	7.00
0		0	0			0		0	0			1	60.00
0	STOOL 21"	9	200	9999	999	0	CHAIR A1	2	100	9999	999	1	-1.00
3829	COCONUT	2	3	1235	999	0		0	0			1	30.00
0		0	0			0		0	0			1	-1.00
3824	INDUSTRIAL MACHINERY	2	2	6999	699	3812	STEEL FURNITURE	2	1003	3999	123	1	5.00

J101: Do you have a specific plan
to expand your production?
1 Yes
2 No
9 No answer

J102: If your answer for J101 is
"Yes", amount of total investment

Table-22 Trends in Foundry Production in Asian Countries

(Unit: thousand tons)

Country	1973	1975	1977	1980	1982	1987	1989	1990
Japan	7,776	5,539	6,242	7,350	6,511	6,623	7,782	8,199
China	-	-	4,860	5,371	5,590	6,497	9,600	8,859
Korea	150	185	494	685	655	1,070	1,317	1,395
Taiwan	372	218	279	507	424	1,060	1,183	935
India	446	353	302	349	-	1,400	2,400	-
Thailand	45	25	83	86	100	120	540	600
Malaysia	10	30	30	80	70	100	70	80
Philippines	76	96	95	108	120	120	150	180
Pakistan	-	-	-	90	-	120	440	500
Indonesia	11	30	33	35	35	60	65	80
Singapore	-	25	40	30	35	20	30	35
Hong Kong	5	-	-	51	-	80	90	95
Bangladesh	-	-	-	-	-	100	38	50
Nepal	-	-	-	-	-	2	2	2
Sri Lanka	-	-	-	-	-	8	10	10

Source: Survey by Mr. Isamu Taki, Tokyo International Foundry Engineering Consultant

Table-23 Foundry Production Per Capita in Asian Countries

(Unit: Kg/person, population in million)

Country	Population	Kg/ Person	Major Applications
Japan	123	66.6	Automobiles, industrial machinery, machine tools, shipbuilding, others
China	1,032	8.6	Machine tools, industrial machinery, automobiles, mining equipment, others
Korea	42	32.9	Automobiles, shipbuilding, general machinery, others
Taiwan	20	46.8	Automobiles, shipbuilding, general machinery, machine tools, others
India	812	2.9	Automobiles, general machinery, mining equipment, others
Thailand	56	10.8	Automobiles, cement production equipment, mining equipment, agricultural machinery, others
Malaysia	17	4.7	Mining equipment, rubber machinery, woodworking machinery, automotive parts
Philippines	60	3.0	Cement production equipment, sugar machinery, rubber machinery, fertilizer, others
Pakistan	109	4.6	Mining equipment, cement production equipment, sugar machinery, automotive parts, others
Indonesia	179	0.4	General machinery, pumps, automotive parts, sugar machinery, others
Singapore	3	18.5	Shipbuilding parts, machine tools, cast iron pipes, joints, manholes
Hong Kong	6	35.2	Construction equipment, ship repair, public works
Bangladesh	107	0.5	Agricultural machinery, textile machinery, pipes and joints, sanitary equipment, others
Nepal	18	0.1	Manholes, pump repair, machinery repair, others
Sri Lanka	17	0.6	Agricultural machinery, sewing machines, pumps, cement parts, others

Source: Survey by Mr. Isamu Taki, Tokyo International Foundry Engineering Consultant

Table-24 Trends in Japan's Foundry Exports and Imports to Asian Countries

(Unit: Tons)

Country	Exports/ Imports	1985	1986	1987	1988	1989	1990	1991
China	Imports	14,809	14,795	16,248	26,108	39,042	34,085	63,920
	Exports	2,966	6,819	2,297	2,697	455	7,472	9,484
Korea	Imports	2,470	5,168	6,996	10,103	11,960	7,210	6,305
	Exports	201	345	338	284	232	893	318
Taiwan	Imports	4,061	2,782	3,698	5,731	9,068	9,132	12,014
	Exports	5,162	2,848	6,794	5,045	9,071	13,150	3,206
India	Imports	240	-	-	-	-	2	66
	Exports	1,515	417	307	85	173	288	13
Thailand	Imports	-	-	97	508	638	744	1,290
	Exports	865	39	6,227	2,633	567	583	855
Malaysia	Imports	-	-	-	-	37	21	359
	Exports	1,102	44,401	16,281	3,067	3,753	15,687	9,316
Philippines	Imports	-	18	-	-	20	37	95
	Exports	148	168	9	101	184	164	507
Pakistan	Imports	-	-	-	-	9	-	-
	Exports	24,995	7,827	814	1,255	242	4	9
Indonesia	Imports	-	-	-	-	-	37	62
	Exports	12,587	5,106	16,231	3,584	4,264	1,054	11,902
Singapore	Imports	-	267	51	193	277	293	668
	Exports	12,449	9,986	9,805	9,213	9,335	14,344	14,627
Hong Kong	Imports	-	-	-	1	1,514	121	251
	Exports	10,313	8,640	5,385	4,833	3,738	8,426	9,274
Total	Imports	11,580	23,040	7,090	42,646	62,565	51,682	85,030
	Exports	72,303	86,594	61,788	32,797	31,974	61,165	59,511

Source: Survey by Mr. Isamu Taki, Tokyo International Foundry Engineering Consultant

Table-25 Technical Problems of Foundry and Improvement Measures (1/3)

PRODUCTION MEASURES	PROBLEMS	IMPROVEMENT MEASURES
PATTERN MAKING	(1) Poor workmanship. (Incorrect casting thickness and dimensions, mold & core mismatch, poor cast surface, and inclusion, etc.) (2) Lack of pattern draft. (Mold breakage, incorrect shape of remade part, and sand inclusion) (3) Fillet radius is small and uneven by manual molding. (4) Core box is finished with poor workmanship. Sand floash causes rough surface. (5) Sand sticking to pattern. (6) Wooden patterns are not inspected. (Delaying detection of defect in dimension and shape)	* Improving ability to understand drawings accurately. * Learning pattern design techniques. * Standardization of pattern making. (pattern draft, core print, machining allowance, etc.) * Use of contraction rule. * Improvement of core box making techniques. * Painting of wooden patterns. * Teaching of wooden patterns inspection.
(CAST IRON) MELTING	(1) Character of material is not controlled. (Insufficient material strength, unmachineable coarse grain on machined surface) (Failure to manufacture castings according to customer requirements. Grey iron, Alloyed cast iron, Ductile cast iron, etc.) (2) Tapping temperature of cupola is low. Tapping temperature is not measured. (Casting defects such as cold shut, misrun, porosity, blowholes) (3) Foundry coke needs to be imported and is costly. (4) Foundry pig iron is difficult to import, as a bulk of 1,000 tons is too big. (5) Refractory material for cupola is unknown. (Both imported and locally made ones)	* Learning of correct cupola operation. * Establishment of in-plant test before pouring. (Chill control, CE meter) * Teaching inoculation of cast iron. * Improvement of cupola. * Introduction of induction melting furnace. * Introduction of temperature measuring instruments. * Quality control of raw materials for melting. * Analysis of raw materials. * Collective imports of pig iron, coke and other materials through FDSI. * Appropriate use of refractory materials. * Standardization of melting operation.
(NON-FERROUS METAL)	(6) Non-ferrous castings are made from unknown scraps, not according to standards. (7) Neither anti-oxidization nor degassing of molten metal is performed. (Casting detects such as inclusion of oxidized film and pinholes) (8) No modification is made for Al-Si alloy. (Poor strength not conforming to standards) (9) Cast iron pot for Al melting does not have lining. (Contamination of iron decreases strength and shortens the life of the pot)	* Imports of non-ferrous ingots and mother alloys. * Analysis of chemical imposition. * Standardization of melting operation. * Use of flux. * Implementation of modification and imports of modifying agent. * Lining of cast iron pot.

Table-25 Technical Problems of Foundry and Improvement Measures (2/3)

PRODUCTION MEASURES	PROBLEMS	IMPROVEMENT MEASURES
SAND PREPARATION	(1) Poor quality of green sand. (Frequent casting defects due to poor mixing of sand or repeated use, such as sand inclusion, blowhole, pinhole, scabs, penetration.) (2) Insufficient strength of core sand, insufficient gas vent. (Inefficient handling, damage, casting defect) (3) Poor mold wash (Poor cast furnace, sand penetration) (4) Floor molding, wooden flask, insufficient mold weight. (Poor productivity; casting defects such as poor dimensional accuracy, mold & core mismatch, leakage of molten metal) (5) Key techniques such as gating and feeder heads rely on molders, failing to produce castings with stable quality.	* Learning of green sand quality control techniques. * Use of synthetic molding sand. * Use of mixer. * Use of sand reclaiming and reconditioning equipment. * Teaching of oil sand, CO2 process, organic self-hardening sand. * Teaching of gas ventilation method. * Teaching of mold wash material and method. * Use of metal flask and guide pin. * Use of clamp and mold weight to prevent cope lifting. * Learning of casting plan.
SAND REMOVAL/ FINISHING	(1) Shot blasting is rarely used. (Causing rough cast surface, sticking of sand) (2) Finishing by pedestal grinder. (Inefficient) (3) Very poor finishing of inner surface of castings. (4) Annealing furnace is rarely used. Some want softening anneal.	* Use of storing shot basting. * Use of swing type or angle grinder. * Preparation of sand removing tools. * Installation of annealing furnace.
TESTING/ INSPECTION	(1) Shortage of testing and inspection equipment and tools. (Lack of quality as furnace affects the subsequent process, leading to poor reputation of the foundry industry.) (2) No quality standard is established for user or maker. (3) Quality control data are not available.	* Gaining of knowledge and skills on testing/inspection and quality assurance. * Improvement of testing and inspection facilities. * Utilization of private and public testing organizations. * Exchange of specifications between makers and users. * Establishment and use of industrial standards. * Storage and use of quality record.
EQUIPMENT MAINTENANCE	(1) Equipment is poorly maintained. (Largely due to rain leaking through the roof.) (2) Spare parts are not available. (3) The concept of depreciation for equipment purchase is not well understood. (12.5% on tax law) (4) Equipment maintenance budget is not included in production cost.	* Implementation of periodic maintenance and repair. * Improvement of maintenance standards. * Documentation of consumables and wearing parts, and local production. * Scheduled equipment renewal. * Preventative repair.

Table-25 Technical Problems of Foundry and Improvement Measures (3/3)

PRODUCTION MEASURES	PROBLEMS	IMPROVEMENT MEASURES
PRODUCTION CONTROL	(1) Difficult to keep delivery schedule. (Loss of customer's confidence, and difficult to achieve profit targets) (2) Insufficient control of production cost. (Appropriate price unknown, lack of cost reduction effort) (3) Excess inventory. (Undue financial burden) (4) Materials are not available on demand. (Delay in delivery schedule, unfavorable purchase condition)	* Establishment of order processing system. * Learning of process control technology. (Piling/leveling of work load) * Reduction of defective casting. * Method of establishing standard cost and learning of differential analysis method * Reduction of inventory through collective purchase by FDSI. * Learning of appropriate inventory planning techniques. * Use of FDSI inventory information.

Table-26 Necessary Machinery & Equipment for Foundry Technology Training Centre of Sri Lanka

PROCESS	NECESSARY MACHINERY & EQUIPMENT
PATTERN MAKING	Woodworking lathe and other machineries Surface plate for inspection & inspection tools Contraction scales
Melting & Pouring	Detail drawings of cupola, Blower, and measuring unit High frequency induction furnace (500 & 100 kg with one power unit) Emergency oil pump for tilting furnace Emergency water pump for cooling water Carbon equivalent meter Immersion & optical pyrometer, Optical radiation pyrometer Ladles and preheating equipment
Molding Sand Preparation	Sand mixer Sand reclaiming & reconditioning equipments
Molding	Molding Machine Shell molding machine Molding box
Cleaning & Fettling	Shot Blast Hanging type & angle grinders Abrasive cutoff wheel Annealing furnace (1 x 1 x 2 meter, max. 1,100°C)
Inspection & Testing	Carbon analysing equipment Vacuum emission spectrometer and standard specimen Metallurgical microscope and specimen preparation equipment Thickness gauge, Surface plate & Inspection tools Universal testing machine (30 ton), Hardness testers & Standard test blocks
Transportation, Vehicles & etc.	Overhead crane Fork lift & Shovel loader Car for patrolling consultancy & Pickup truck Desk-top computer Drafting equipment Air compressor

APPENDICES

APPENDIX I

FOUNDRY DEVELOPMENT AND SERVICE INSTITUTE (FDSI)

APPENDIX-I FOUNDRY DEVELOPMENT AND SERVICE INSTITUTE (FDSI)

1) Historical background of FDSI

In early 1988, the Preparatory Mission visited Sri Lanka for reconstruction of the foundry industry. As a result, the mission recommended the upgrading of IDB's foundry and service, and IDB proposed a project to reconstruct the foundry for demonstration, training, and production purposes.

The government considered the proposal and approved it by revising the project's purpose to assistance upon request from the foundry industry.

Then, an additional study on the foundry industry was conducted by National Institute of Business Management (NIBM), followed by a study of UNIDO's Project Formulation Mission.

Because the project focuses on private industries, it needs to be implemented by an organization which is neutral from the government. As a counterpart of the national project, FDSI was established in December 1991 by the foundry industry and its users for the purpose of providing technology and service for both of them.

During the 3-year project, UNIDO sends experts (28.0 man-months) and supply testing and inspection equipment as well as consumables at a budget of $688,000. IDB manages supplied equipment and materials and provides foundry facilities and manpower for FDSI's service. FDSI originally operates within IDB.

By the end of completion of the project, FDSI is expected to become financially independent by providing pay service by experts sent by private enterprises.

Operating fund is provided according to the plan made by the government and UNDP. IDB sends representatives to the board of FDSI and is commissioned by the Ministry of Tourism and Rural Industrial Development. As a result, the project is supervised by IDB as a representative of the government.

2) FDSI's service

By the end of the project, FDSI will provide minimum required testing and inspection equipment, documents, and manpower, and it will provide the following services for pay:

(1) Diagnosis of foundries and advice on improvement
(2) In-plant tests, such as testing of molding sand and scraps
(3) Skill training for foundry practices, and arrangement to other training organizations
(4) Pattern making
(5) Chemical analysis, micrographic testing of castings and metalwork products, and hardness test
(6) Stress relief annealing, and heat treatment
(7) Assistance in production cost analysis and product research and development
(8) Preparation of casting plan including computer-aided solidification analysis
(9) Preparation of computer aided design of castings, patterns, and match plates
(10) Promotion of new technologies including special manufacturing methods
(11) Consultation and advice on casting standards and design
(12) Advice on energy saving and pollution control measures

3) Current situation of FDSI

While the 3-year project has already passed half a year, actual service has not been started because "UNIDO-furnished equipment is not available" or "IDB's foundry does not have sufficient equipment to provide adequate training". Discussion is being made at the committee held monthly and by the Director of National Project.

Committee members are as follows:

Chairman: Major Douglas Wijestingha	- Samuel & Sons Co., Ltd.
V. Jeganathan	- Edna Engineering (Pvt) Ltd.
Lionel Fernendo	- Lanka Loha Hardware Co., Ltd.
P. Deraniiyagela	- Colombo Commercial Co., Ltd.
D. D. Wijemanna	- Walker Sons & Co., Ltd.
N. Jinasena	- Jinasena Casting Ltd.
M. D. P. Dias	- Somasiri Huller Manufactury
A. P. Manchanayaka	- Castwell Foundry & Eng. Ltd.

P. P. Jinadasa	- P.P.P. Jinada Engineering
K. I. Gunasekara	- Gamini Engineering Work
W. J. Anton Fernendo	- Chairman of IDB

(1) FDSI is currently staffed by R.Rodrigo, Director of Project, H.F. Nanayakara from IDB, and a Technical Chief Advisor (TCA) from UNIDO.

(2) The UNIDO TCA stayed for one month between January and February 1992, and will come again at the end of July.

(3) Current membership is less than 20, all of which are private foundries, without any user member.

(4) FDSI is currently reappraising equipment at its discretion to be furnished by UNIDO and has made various changes, e.g., an atomic emission spectroscope would be replaced with a vacuum emission spectrometer, and CAD/CAM was changed to other equipment as FDSI thought it too early. These moves seem to be led by the director who worked at the High-Temperature Material Research Institute U.K. FDSI requested the study team for testing and inspection equipment pamphlets and other materials.

(5) FDSI is procuring inspection equipment to be furnished by UNIDO and intends to attract more membership as soon as it becomes ready to provide inspection service.

(6) FDSI considers imports of raw materials and sub-materials which cannot be purchased by smaller enterprises because of large minimum order.

(7) It is interested in obtaining grinding media production technology and boosting recycling demand by a high-frequency induction furnace.

(8) It intends to change molding sand to synthetic sand.

(9) In response to our question on reconsideration of future plans for IDB's foundry facility, FDSI wants cupola design and design data emphasizing economy .

(10) IDB's foundry currently employs 10 workers because of low production level. Once the work increases, it will shift workers from other sections.

(11) FDSI requests assistance in overseas training for foundry engineers and technicians, in particular short-term (3 months) practical training for technicians at Japanese foundries.

4) Problems facing FDSI

While FDSI is expected to become financially independent at the end of the project by securing revenues from service. However, half a year has passed since the beginning of the project, testing and inspection equipment from UNIDO has not been supplied. Also, technical instructors are UNIDO's experts only, making it difficult to achieve effective technological improvement.

APPENDIX II

SYSTEM DIAGRAMS OF POLICIES FOR SMALL AND MEDIUM ENTERPRISES

APPENDIX-II System Diagrams of Policies for Small and Medium Enterprises
(Based on the outline of policies for small and medium enterprises as of 1989)

Measures for managerial bases

Basic measures

- **Financing for small and medium enterprises**
  - Financing from three government-affiliated financial organs (Small Business Finance Corporation, People's Finance Corporation, and Central Bank for Commercial and Industrial Cooperatives)
  - Investment and financing system for advancement by the Small Business Corporation
- **Credit guarantee**
  - Supplement of credit guarantee for small and medium enterprises by the Credit Insurance Corporation and Credit Guarantee Association
- **Taxation systems related to small and medium enterprises**
  - Financing from three government-affiliated financial organs (Small Business Finance Corporation, People's Finance Corporation, and Central Bank for Commercial and Industrial Cooperatives)
  - Special measures on tax
    - Establishment of the taxation system for promotion of rationalization of office work for small and medium enterprises
    - Extension and expansion of the taxation system for reinforcement of managerial bases of small and medium enterprises
- **Measures for organization**
  - Smaller Industries Organization Law, Law for Cooperatives of Small Businesses,etc.
    - Aid for management of cooperatives by the Central Conference of Small Business Associations
- **Diagnosis and instructions**
  - Small Business Instruction Law
    - Aid for diagnosis and instructions by prefectural bodies

Expansion of managerial resources

- **Training of personnel**
  - Aid for the training by Small Business Colleges, prefectures, etc.
- **Promotion of the use of information**
  - Support for the use of information from the Regional Information Center for Small and Medium Enterprises, Small Business Corporation, etc.
- **Improvement of technical power**
  - Assistance to researches and development of small and medium enterprises,etc.
  - Aid for the training by Small Business Colleges, prefectures, etc.
  - Technical guidance by the Public Testing and Research Institute of each prefecture

Others

- **Measures on the creation of demand by government and public related business**
  - Law for assurance of order receiving of small and medium enterprises Center for Small and Medium enterprises for the government and public related business
- **Measures for preventing bankruptcy**
  - Consultation for preventing bankruptcy, mutual aid for preventing bankruptcy (by the Small Business Corporation)
- **Measures for small and medium subcontract enterprises**
  - Law for Preventing Delays of Payment to Subcontractors

Measures for structural conversion

- **Support for small and medium enterprises to contribute to activation of regional economy**
  - Support for those industries to activate the outlying areas
    - Aid for construction costs for foundation arrangement operations such as research and development aiming at supporting new regional industries performed by the third sector, contribution or financing for advancement, and financing at low interest rates for supporting new businesses of small and medium enterprises
  - (Related matters) Operations for improvement of regional technology, operations of making plans for accumulation of new commerces, etc.
- **Measures to promote fusions**
  - Law for temporary measures for promotion of the exploration of new fields by the fusions of edges knowledges of small and medium enterprises of different fields
    - Aids for the development of new products and new technology by cooperatives of different types of industries (50 cooperatives →70 cooperatives)
    - Investigations, researches, etc. for promotion of circulation in the market of the benefits of fusions
- **Measures for regional small and medium enterprises**
  - Law for temporary measures for promotion of small and medium enterprises in particular regions
    - Aids or financing at a low interest rate for the development of new products and new technology by cooperatives (according to the regional features)
    - Investigation for exploration of new industries for activation of particular regions
  - Local industry promotion measures
    - Aid for new visions for promotion of local industries and the development new products performed by cooperatives
- **Measures for small and medium subcontract enterprises**
  - Measures for structural adjustment for small and medium subcontract enterprises, law for promotion of small and medium subcontract
    - Mediation of subcontract transactions, support to technical development of subcontract enterprises, financing at low interest rates
    - Operations for organizing wide-area commercial discussions, operations for supporting technical improvement of subcontract enterprises
- **Measures for internationalization**
  - Smoothing of overseas direct investments, etc.
    - Advice, offer of information, financing at a low interest rate, exceptions for credit standing, etc. by the Small Business Corporation
- **Measures for business conversion**
  - Law for temporary measures for business conversion of particular small and medium enterprises
    - Aid for the development of new technology and new products by cooperatives

Measures for small and medium enterprises and other measures

- **Measures for small and medium enterprises**
  - Aid for management instructions by the assemblies of commerce and industry and chambers of commerce and industry
    - Subsidies to the cost or assignment fees for instruction of small businesses
  - Small business mutual aid system (Small Business Corporation)
    - Raising of premiums, installed payment, etc. by the amendment of the law
  - Funds for operation (with no security or guarantor)
  - Financing of equipment modernization funds and lease of equipment
- **Measures for circulation and service industries**
  - Activation of shopping streets, use of information by small and medium retailers, enhancement of product procurement power
    - Promotion of the plan of a comprehensive international circulation center (temporary name), making plans for accumulation of new commerces
  - Measures for small and medium service industries

Others

- **Investigation and publicity**
  - Investigation
  - Publicity

APPENDIX III

TRADE OF METAL WORKING PRODUCT IN 1988

APPENDIX-III Trade of Metal Working Product in 1988 (1/2)

	691		694		695		696		697	
	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT
(UNIT: 1,000US$)										
WORLD MARKET ECONOMY	7541751	6418564	5358023	4918308	9793219	8650180	2467072	2147849	5733619	5165697
SAUDI ARABIA	135881	-	24845	-	58566	-	29883	57	151189	1349
(UNIT: %)										
AFRICA	11.6	0.2	3.3	0.2	5.0	0.2	2.8	0.7	3.6	0.6
NORTH AFRICA	6.7	0.1	2.0	0.0	1.9	0.0	0.8	0.7	1.5	0.5
AMERICAS	8.9	8.9	35.3	12.1	22.3	11.6	28.3	7.5	26.3	9.6
LAIA	1.2	0.7	1.6	0.7	3.6	1.1	1.8	3.1	0.8	1.5
CACM	0.3	0.0	0.1	0.0	0.2	0.0	0.1	0.0	0.2	0.0
ASIA	19.5	9.2	8.8	26.1	14.5	18.2	18.5	39.0	17.1	26.9
MIDDLE EAST	6.9	0.9	1.9	0.6	3.2	0.2	4.6	0.2	5.8	1.6
EUROPE	58.7	80.6	51.3	61.1	54.8	69.4	47.2	52.3	50.7	62.2
EEC (TWELVE)	41.0	67.1	39.8	51.3	42.6	52.0	39.3	46.4	41.3	55.6
EFTA	17.1	12.9	11.2	8.9	11.3	16.6	7.4	5.8	8.6	5.4
OCEANIA	1.3	1.0	1.4	0.4	3.5	0.5	3.2	0.6	2.2	0.6

APPENDIX-III Trade of Metal Working Product in 1988 (2/2)

	721		742		821		894	
	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT
(UNIT: 1,000US$)								
WORLD MARKET ECONOMY	6963249	6491708	9018017	8342208	22928345	20439271	19159633	16128377
SAUDI ARABIA	72977	-	201618	2376	409013	4067	185914	-
(UNIT: %)								
AFRICA	5.3	0.0	7.2	0.1	1.5	0.5	1.3	0.1
NORTH AFRICA	2.6	0.0	3.8	0.0	0.5	0.2	0.6	0.0
AMERICAS	25.3	25.6	23.1	16.6	27.0	13.8	41.7	10.8
LAIA	4.2	1.8	4.2	1.2	0.9	1.8	1.1	1.2
CACM	0.4	0.0	0.2	0.0	0.0	0.1	0.1	0.1
ASIA	7.3	5.5	17.9	12.7	9.5	8.3	17.6	52.9
MIDDLE EAST	2.1	0.2	6.6	0.3	3.4	0.2	1.7	0.0
EUROPE	59.2	67.7	49.9	70.3	60.7	77.1	37.1	35.9
EEC (TWELVE)	48.3	59.7	39.0	61.8	46.0	64.9	30.7	29.2
EFTA	10.2	7.7	10.0	8.3	14.4	9.6	6.2	6.3
OCEANIA	3.0	1.1	2.0	0.4	1.3	0.3	2.3	0.3

Notes:
691: STRUCTURES AND PARTS NES
694: STL, COPPR NAILS, NUTS, ETC
695: TOOLS
696: CUTLERY
697: BASE MTL HOUSEHOLD EQUIP
721: AGRIC MACHY, EXC TRACTORS
742: PUMPS FOR LIQUIDS, ETC
821: FURNITURE, PARTS THEREOF
894: TOYS, SPORTING GOODS, ETC

Sources: 1988 International Statistics Yearbook

APPENDIX IV

PROPOSAL FOR METALWORKING TRAINING CENTRES

APPENDIX-IV PROPOSAL FOR METALWORKING TRAINING CENTRES

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APPENDIX-IV PROPOSAL FOR METALWORKING TRAINING CENTRES

As discussed in 1.2 "Current Situation of Metalworking Training Centres" and 2.4.2 1) "Improvement of Training Facilities", metalworking training centres are classified into the following types:

1) Those requiring urgent improvement and upgrading, including foundry, electroplating, and waste water treatment;

2) Those which already have sufficient capacities and require only coordinated activities, e.g., cutting, welding, and sheet metal processing;

3) Those covering the field which does not have much domestic demand and which establishment is considered to be premature, though a request is made by Sri Lanka, such as mold and die (demand for high-grade mold and die does not exist because automobiles and household appliances are mostly imported as manufactured products); and

4) Those requiring further study, such as forging and heat treatment.

On the basis of the above classification, this report recommends the establishment of training centres for foundry process, electroplating, and waste water treatment.

At present, training for foundry process technology is conducted by Industrial Development Board (IDB) under the Ministry of Tourism and Rural Industrial Development, Government Factory (GF) under the Ministry of Housing & Construction, and Vocational Training Centre under the Ministry of Labour. GF is a factory and provides on-the-job training under request from National Apprenticeship and Training Authority (NAITA). GF has a large foundry. On the other hand, a foundry at Vocational Training Centre is at a very primitive level. Finally, IDB's foundry has a cupola for melting iron and two crucible furnaces for melting of non-ferrous metals with size often seen in the country. The facility is operated mainly for training purpose and manufactures own products as required. While GF's foundry has sufficient size, it is primarily operated for commercial production with limited training. Also, its management is strictly controlled by the government with little flexibility in facility improvement and operation, thus not suitable for training. On the other hand, IDB's foundry process training facility is very old except for the crucible furnaces, not suitable for training to teach production techniques required for private foundries.

Training facilities for electroplating are operated by IDB and GF. IDB's facility is old but fairly a large size and performs subcontract work as well as training. GF's facility is very small and can barely process police epaulets, while having no effluent treatment facility. IDB is requesting the addition of several process lines and improvement of a waste water treatment facility.

Both IDB and GF are requesting modernization of their metalworking training centres. In particular, the former focuses on rebuilding of machine tools surface treatment including electroplating and mold and die, and the latter requests overall modernization of metalworking processes.

The following section describes the proposal for a new training centre for foundry and electroplating processes (including waste water treatment). To facilitate understanding, the current situation of foundry and electroplating industries as well as the need for the training centre are described, part of which is duplicated with the main text.

1. Foundry Process Training Centre

1-1 Current Situation of the Foundry Industry

The foundry industry in Sri Lanka consists of 4 government-owned foundries (including privatised ones) visited during the field survey, and 60 medium- and small-scale private foundries. According to product type, 54 foundries reportedly produce grey iron castings, 35 Al-base alloy castings, 37 Cu-base alloy castings, and 1 steel castings. Total production is estimated at 8,000 tons annually, which is equivalent to only 0.5kg per capita the lowest level comparable to Bangladesh, Indonesia, and Nepal. This indicates that the foundry industry in the country is at an infancy level and does not serve as a supporting industry. In fact, the insufficient development of the industry is one of major causes for insufficient growth of machinery and assembly industries.

Poor production of the foundry industry is attributable to lack of export market, a small domestic market due to small population and low income, and absence of assembly industries. Also it is heavily affected by technical problems. In particular, most of foundries cannot produce castings with required quality and have lost confidence of customers due to defective products. As a result, they lack competitiveness due to low productivity and high manufacturing cost. This is reflected in the fact that the foundry industry does not find enough market, while considerable castings are imported. Furthermore, casting parts are mostly imported as completed parts or assembled units to avoid casting defects trouble, thereby to impede the development of related industries.

Meanwhile, medium-scale foundries as part of engineering enterprises have high great interest in manufacture of casting parts for captive consumption and for other companies, and they intend to upgrade equipment and technology. Some of these foundries have already purchased induction furnaces and molding machines, and have started construction of new facilities. However, they do not have engineers nor organizations to teach new technology to field workers, risking the effective and correct use of new facilities and equipment. It is even conceivable that excess capacity and intensive competition may severely damage the industry as a whole.

Production technology and quality improvement are prerequisite to expansion of the market for the foundry industry in the country, and the following approaches are feasible (see 3.1 "Foundry Production and Demand Outlook" for detail):

1) Import substitution
2) Establishment of linkage with major users of castings such as the domestic engineering industry
3) Attraction of foreign machinery and assembly industries
4) Entry to the export market for castings

1-2 Current Situation of Foundry Process Technology

The foundry industry in the country emerged and developed during the colonial period for the purpose of supplying plantation farming machinery. After independence, the industry was nationalised and lost leadership in both management and technology, along with much of export markets and technical exchange with foreign companies. As a result, foundry process technology failed to make advancement from the level 40 years ago, still depending upon intuition and empirical judgment of foundry workers. Meanwhile it was inherited from one worker to another, and in the process, wrong ideas and techniques were incorporated to impede technological advancement or lead it in a wrong direction.

At most of foundries, melting raw materials are mainly scraps with unknown compositions. Composition control of molten metal is not carried out; tapping temperature is determined on the basis of empirical judgment; and treatment of molten metal and in-plant test before pouring are not carried out. Preparation of molding sand, and gating and feeding systems are all left to workers, resulting in unstable quality. Product inspection including in-process testing is carried out visually, without using any equipment. As a result, the foundry industry has disadvantages in the following critical areas, which impede the foundry normal development:

(1) The industry cannot manufacture castings which contain chemical compositions and mechanical properties required by customers.
(2) A high percentage of defect leads to lost confidence of customers, while increasing production cost.
(3) Productivity is very poor to prevent products using castings from having international competitiveness.
(4) Foundry managers do not have an opportunity to obtain technical advice in modification of present practices and facilities.

On the other hand, industrial countries have successfully shifted from dependency on individual skills to scientific operation and management of modern production facilities. In particular, each production process is standardised, and in-process measurement and data control methods are established under leadership of well-educated engineers. Without making transition to scientific operation and management, the foundry industry in the country further lags behind that in industrial countries.

1-3 Need for Foundry Process Training Centre

Development of the foundry industry, as a major supporting industry, can bring the following positive impacts on other industries, thereby contributing to revitalization of manufacturing industries in the country:

1) To promote development and revitalization of machinery and assembly industries;
2) To save foreign currency reserves through import substitution of castings, machine parts, and assembly units;
3) To promote exports of castings, machine parts, and related products;
4) To increase employment opportunities, particularly for male workers; and
5) To improve investment climate for foreign capital.

In reality, however, the foundry industry in Sri Lanka is confined to a small domestic market due to a low technological level, and is now losing the market to imported products. Thus the foundry industry needs to improve its technology and quality if it is to grow and prosper.

The foundry industry is considered as the labor-intensive industry, where technical skills are essential in implementing production techniques backed up by appropriate theory. These production techniques and skills can only be learned in the field, but there are no training facility nor model plant which can provide adequate on-the-job training. Competent engineers and technicians need to be trained through practical experience at a model plant where measurement and testing equipment required for scientific production control are arranged in an efficient manner. Also, foundry owners and managers can plan or receive advice on modification and expansion of their own facilities in the simulated environment at the model plant.

What the foundry industry needs is an actual work place where leaders and instructors can demonstrate practical knowledge and skills in production technology and management. This is only one way to lead the foundry industry to develop under private initiative and in a right direction. At present excellent training facilities and organizations are available for machining, welding, and other metalworking techniques. On the other hand, the following facilities provide training for foundry process technology but all of them are insufficient and deteriorated due to aging, not suitable for the above purpose:

1) IDB (Industrial Development Board)
2) Vocational Training Centre
3) University of Moratuwa
4) Government Factory

1-4 IDB and FDSI (Foundry Development Service Institute)

UNDP/UNIDO's project "Reactivation of the Foundry Industry" provides $688,000 worth of assistance, including provision of total 28 M/M consultants, testing and inspection equipment, and computers, over a 3-year period between December 1991 and the end of 1994.

The implementation body in Sri Lanka is the Ministry of Tourism & Rural Industrial Development, which supervises actual project implementation of IDB that is responsible for development of small- and medium-scale enterprises.

In addition, FDSI (Foundry Development Service Institute) was established as the counterpart to render service for private foundries and their customers. IDB and UNIDO provides assistance for FDSI. Although IDB plans to make its foundry available to FDSI as a training centre, a preliminary survey for the project conducted by UNIDO and NIBM (National Institute of Business Management) also pointed out that the foundry was old and not suitable for training.

After the completion of the project, FDSI plans to finance itself by charging service fees. Under its original plan, FDSI conducts the following service programs:

a) Diagnosis of foundries and advice on improvement
b) In-plant tests, such as testing of molding sand and scraps
c) Skill training for foundry practices, and arrangement to other training organizations
d) Pattern making
e) Chemical analysis, micrographic testing of castings and metalwork products, and hardness test
f) Stress relief annealing, and heat treatment
g) Assistance in production cost analysis and product research and development
h) Preparation of casting plan including computer-aided solidification analysis
i) Preparation of computer aided designing of casting parts, patterns, and match plates
j) Promotion of new technologies including special manufacturing methods
k) Consultation and advice on casting standards and design
l) Advice on energy saving and pollution control measures

For this purpose, the following equipment will be provided:

(a) Molding sand testing equipment
(b) Atomic absorption spectrometer
(c) Metallographic microscope
(d) Portable hardness tester
(e) Immersion pyrometer
(f) Carbon equivalent determinator
(g) Computer hardware & software for CAD
(h) Software for casting design and solidification profile
(i) Ultrasonic, non-destructive testing equipment (Portable)
(j) Spare and replacement parts

(k) Training video films and software

(l) Vehicle for transportation of personnel and equipment for plant visit & process testing

At present, FDSI assigns its national project director to its office established within IDB to evaluate and procure equipment. However, FDSI has not attracted enough membership to secure expected revenues. Also, the proposed training centre - IDB's foundry - does not have sufficient equipment nor instructors, and no service is provided for the time being, producing no service fee. FDSI plans to start consultant service after experts sent by UNIDO have arrived.

The most serious problem facing FDSI is the absence of a foundry which has a sufficient facility and equipment to provide on-the-job training for engineers and technicians. Also UNIDO's experts are assigned for only 3 years, with total 28 man/month. Together with the lack of training facility except for some testing facilities, it is anticipated that FDSI's training program will not produce much results. If the situation continues, FDSI may lose its raison d'étre upon completion of the project.

1-5 Outline of the Proposed Foundry Process Training Centre

The proposed foundry process training centre is designed to provide on-the-job training at a model foundry, while manufacturing new products for import substitution to help finance IDB and FDSI, thereby to maintain a permanent training facility.

1) Location

The proposed training center could be located adjacent to or within the metalworking industrial estate suggested in Action Program (9) in the event that the metalworking industrial estate is to be realized. To build the training centre in the industrial estate offers the following advantages:

(1) It can be used as a metalworking training centre including electroplating operation.

(2) Training facilities for metal mold and die, and heat treatment, which are likely to be required in the future, can be added.

(3) A foundry or foundries which share part of equipment with the training centre can be established.

(4) The industrial centre specially designed for metalworking industries can be developed around the training centre.
(5) A warehouse to control raw materials and sub-materials for all tenant industries, can also be established.

2) Technologies to be transferred

The proposed foundry process training centre will require a model foundry which has an integrated foundry process from pattern making, sand preparation, molding, to melting, pouring, finishing, testing, and inspection. The facility will be used to provide on-the-job training for engineers and technicians, while giving an opportunity for foundry managers to learn about day-to-day management of foundry process.

Technologies that can be transferred at the proposed training centre are as follows:

Pattern making
(1) Understanding of drawings and preparation of full-size setup drawings
(2) Pattern design
(3) Standardization of pattern making (e.g., core print dimensions, pattern draft, machining allowance, contraction rule)
(4) Method of wooden pattern inspection
(5) Method of wooden pattern storage and management

Sand preparation/molding
(1) Method of green sand control
(2) Method of controlling, reclaiming and reconditioning dry sand, CO_2 process, and organic self-hardening sand
(3) Material and method for mold wash
(4) Learning of casting plan
(5) Design and manufacture of metal flask
(6) Machine molding method
(7) Shell molding method

Melting
(1) Design and manufacture of economic cupola
(2) Melting operation of cupola
(3) Melting operation of high-frequency induction furnace
(4) Method of calculation and weighing of raw materials to be charged

(5) In-plant testing before pouring (CE meter, chill control, etc.)
(6) Treatment of molten metal (inoculation of cast iron, degassing and modification of Al-alloy, etc.)
(7) Design and manufacture of ladle

Finishing
(1) Preparation of sand removing tools
(2) Annealing and other heat treatment
(3) Welding repair and salvage of castings

Testing, inspection, quality control
(1) Instrumental analysis of chemical compositions
(2) Material testing (tensile, hardness, transverse test, etc.)
(3) Wall thickness, marking, visual inspection
(4) Non-destructive testing (penetrant, magnetic-particle, radiograph)
(5) Writing of specifications
(6) Casting defect and preventive measures
(7) Quality control of castings

Production control
(1) Order receiving/processing system
(2) Piling/leveling and schedule control
(3) Standard cost and differential analysis
(4) Appropriate inventory plan

Market/Development
(1) Market study
(2) Development of new applications for casting products
(3) Prototyping and development of new products
(4) Export consulting
(5) Overseas technology/market information

3) Required equipment

The model foundry will require the following equipment and tools.

Pattern making
1. Woodworking machinery and accessories

2. Surface plate and marking-off set for inspection
3. Contraction rule for casting

Sand preparation/molding

1. Molding sand tester and accessories
2. Molding sand mixers (for green sand, CO_2 process, and organic self-hardening sand)
3. Oven for dry sand
4. Sand reclaiming and reconditioning equipment
5. Molding machine
6. Shell molding machine (shell core blowing machine)
7. Metal flask
8. Belt and roller conveyer

Melting

1. High-frequency induction furnaces (500kg and 100kg each, single power source) plus emergency hydro and oil pumps
2. Hot blast cupola (detailed drawings; blower, air flow meter, air pressure gauge furnished, and locally manufactured)
3. Carbon equivalent determinator
4. Immersion and optical pyrometers
5. Ladles
6. Preheating equipment
7. Crucible furnaces for melting of non-ferrous alloy (275kg, 150kg)
8. Magnet lifter (with scale)

Finishing

1. Shot blasting machine
2. Swing grinder and angle grinder
3. Wheel grinder for cutting
4. Annealing furnace (inner volume 1 x 1 x 2 m, max. 1,100°C)
5. Air compressor
6. Machine tools for inspection of prototype castings

Testing/inspection

1. Carbon analyzing equipment
2. Vacuum emission spectrometer, standard specimen, and sample preparation equipment

3. Metallurgical microscope, specimen preparation equipment, and heat treatment furnace for small specimen oven
4. Surface plate and marking-off tools for dimensional inspection
5. Thickness gage, ultrasonic thickness meter
6. Universal testing machine, hardness testers, standard test blocks, and file hardness testers
7. Non-destructive testing equipment (magnetic-particle and radiographic tests)

Others

1. Overhead traveling crane
2. Shovel loader
3. Hoist
4. Dust collector

4) Castings to be manufactured at the model foundry

In addition to training, the model foundry should be designed to manufacture and sell various products including ductile iron, alloyed cast iron, and steel castings on a commercial basis to cover maintenance cost and to finance equipment purchase in the future. This will provide an opportunity to learn about the cost accounting system at foundries and help understand how productivity, metal yield, and defective rate affect manufacturing costs in the field, for better foundry operation and management. In addition, manufacture of wooden patterns and testing/inspection can be also included in paid service.

Maximum unit weights of castings that can be produced at the model foundry, according to type of material, are as follows:

	Material	Maximum unit weight (kg)
Cast iron	Grey cast iron	400
	Ductile cast iron	350
	Alloyed cast iron	350
Steel castings	Carbon steel castings	350
	High-strength carbon steel and low-alloy steel castings for structural use	300
	High manganese steel castings	300
Non-ferrous	Copper alloyed castings	150
alloys	Aluminum alloyed castings	100

5) Manpower requirements

1 manager, 3 engineers, 3 wooden pattern makers, 15 foundry workers, 3 mechanics, 2 clerical staff. Because of surplus capacity, additional wooden pattern makers and foundry makers will be employed according to actual load.

6) Land area (approx. 1,000m^2 min.):

Layout and other site conditions should be discussed with an appropriate agency, envisaging a future expansion plan.

7) Utilities (including 1,000kW of electricity supply) will be discussed in the future.

8) Necessary experts will include Team Leader, resident expert and short-term specialists. Training will be executed at management, engineer and technician levels.

2. Electroplating Training Centre

2-1 Current Situation of the Electroplating Industry

As discussed in 1.1.4 "Production Sharing System", the metalworking industry in Sri Lank is not segmented according to individual processes, and most of metalworking enterprises have own electroplating shops, while a few enterprises reportedly specialise in electroplating operation on a subcontract basis. In total, there are approximately 60 electroplating shops in the country. Some of electroplating shops visited by the study team are located in a residential area. Most of shops do not treat their effluent partly because of small size of operation. On the other hand, tool and other makers operating in the export processing zone seem to have sufficient waste water treatment facilities.

Electroplating constitutes the final stage of metalworking process and is indispensable for machinery and other metalwork products. For instance, sanitary metals use copper based alloy castings finished with electroplating, and most of them are currently imported. (ceramic products such as bath tab are locally produced) If the electroplating industry is fostered with emphasis on non-machinery products for the time being, it can serve as a source of import substitution and experts in the future.

As mentioned earlier, most of electroplating shops do not treat their effluent before disposal. While effluent standards are established on the basis of those in the U.K., they are not satisfied at all. If these standards are strictly enforced, many electroplating shops will be out of operation to adversely affect the national economy. If this is done in the near future, electroplating operations in machine shops will become increasingly unprofitable to operate due to additional investment in waste water treatment facilities, and related costs including training and emergency measures. Thus electroplating work is likely to be assigned to outside subcontractors. At the same time, electroplating shops specializing in subcontracting work will face difficulty in having waste water treatment facilities, both technically and financially. One solution is that several companies operate the electroplating works in the metalworking industrial estate and use the common waste water treatment plant which can also be made available to the industries located outside the industrial estate on a contract basis.

2-2 Current State of Electroplating Technology

While the field survey did not cover electroplating technology in detail, the study team visited several electroplating shops that were part of larger metalworking shops. Only one shop mechanised soaking and removing of products in and out of a tank. Other operations were manually performed on the basis of empirical judgment, and products were not subject to thorough inspection. Effluent was discharged without treatment.

2-3 Need for the Electroplating Technology Training Centre

Electroplating technology needs to be improved and upgraded as part of industrial modernization efforts in the country. In particular, products that are currently imported due to poor electroplating quality in the country can be locally produced if electroplating techniques are improved, followed by possibility of exports. Also, automobiles and electrical products are mostly imported at present and demand for their components is limited to repair purposes. If an assembly industry starts operation in the country and parts and components are to be locally produced, advanced electroplating techniques will be required. It is therefore important to learn basic techniques, which would help promote localization of various products.

At present, IDB and GF are conducting training for electroplating techniques. GF has a very small facility with insufficient effluent treatment, not to mention various constraints as the state enterprise. On the other hand, IDB has the electroplating processes consisting of Cr, H.Cr, brass, dull Ni, bright Ni, Cu (acid), barrel Ni, and Ni (cyanide) process lines, each equipped with a $90m^2$ tank. While these lines are very old, they are operated near capacity to meet demand. The waste water treatment facility is made of concrete, and there are cracks in concrete surface with some piping problems.

IDB is requesting the improvement of the waste water treatment facility and the addition of lines for 1) eletro forming, 2) electroplating on plastics, and 3) aluminum anodic oxidation.

Electro forming is the method of electroplating on mother pattern metal and peeling off the product to finish a variety of products, such as statutes of Buddha, Buddhist altar fittings, ornaments for Buddhist altars, statues for souvenir, cosmetic cases, brooches, hair ornaments, and lighting fixtures. Also it is indispensable for production of bellows and other metal molds.

Electroplating on plastics (ABS) is used to form a freshly-looking metal surface on a plastic ABS material with a different color, gloss, and texture by using various types of metals, thereby adding high-grade appearance, good workmanship, workability, metallic look, sense of cleanliness, and/or corrosion resistance. Plated products are used as control knobs and switches of household appliances and TV sets, sewing machines, doors and handles of automobiles, grills, doors and handles of refrigerators, and lids of cosmetics cases.

Aluminum anodic oxidation forms an oxidised film on surface by applying electricity in an electrolystic solution, such as sulfuric acid or oxalic acid, with work pieces as the anode, generally called "anodised aluminum (alumite)". The process is essential in the light industry and is used for a wide range of applications, including cooking pans, pots, kettles, lunch boxes, sash, doors and other building fixture, pens, camera's pressure plates, and name plates.

These lines requested by IDB seem to be useful in manufacturing products to meet domestic demand. Thus, while providing training on relatively a large scale, the lines can also be used for planting operation on a contract basis. In other words, they will not only provide opportunities for trainees to learn abut market development and management of electroplating shops, but create source of income to cover operating cost.

In addition, it is recommended to consider small lines for leadframe electroplating and through hole electroplating on PCB, together with basic testing equipment, to prepare for production of leadframes and printed circuit boards in the future.

However, as noted in Section 2.6.2, IDB's electoplating training facility is highly erroded and insufficient in size, and it is desirable to fully renovate the facilities. The required facilities will therefore be listed for the case of full renovation (Alternative A) and supplemental installation (Alternative B).

In addition to the electroplating process, improvement of the waste water treatment facility is required. The present study only covers the metalworking industry, so that detail of pollution control technology used for other industries is not known. Nevertheless, the situation in the electroplating industry suggests the lack of effective pollution control in other industries. In this connection, it is useful to consider the installation of an inspection facility to study methods for inspection and treatment of effluent from other types of factories, in addition to the waste water treatment facility for electroplating operation.

2-4 Outline of the Proposed Electroplating Technology Training Centre

(1) Location

As noted in 2-1, the proposed electroplating training center could be located in the metalworking industrial estate, together with the waste water treatment facilities.

(2) Technologies to be transferred

(Alternative A): Basic knowledge and almost all electroplating process technologies will be transferred.

(Alternative B): Technology transfer will be carried out for electro forming, electroplating on plastics, and aluminum anodic oxidation by using the proposed new lines with sufficient size of production. In

In addition to production technology, marketing and management techniques are to be transferred. Also, basic technologies related to leadframe electroplating and thorough hole electroplating should be considered in connection with perceived potential demand. Furthermore, an inspection facility to check the quality of waste water treatment by other industries will be added to the waste water treatment facility for the electroplating lines, thereby to ensure transfer of various pollution control techniques.

(3) Required facilities and equipment

(Alternative A)

Electroplating Equipment

Pretreatment line
Cu-Ni-Cr plating line
Hard chromium plating line
Zinc planting line
Aluminium anodising line
ABS plastic plating line
Electroforming line
PCB board plating line
Lead frame plating line
Pretreatment equipment•grinder•buffing machine

Laboratory & Chemicals

Testing & examination equipment for quality control
Analysis reagent for quality analysis
Electroplating chemicals for each plating tank
JIG manufacturing equipment

Waste Water Treatment Equipment & Pollution Control Devices

Waste water treatment equipment
PH meter
Colour meter
Ion exchange
One unit of glassware for experimentation (chemical analysis)
Instruments for experimentation (draft chamber)

(Alternative B)

Name of Line	Max. Loading	Q'ty
Aluminum anodic oxidation line	5 kg	1 unit
Plastic electroplating	0.5 kg	1 unit
Ni, Cu electroforming	0.5 kg	1 unit

PCB through hole electroplating	0.5 kg	1 unit
Leadframe electroplating	0.5 kg	1 unit

Supersonic washing tank	1
Buffing machine	2
Barrel polishing machine	1
Testing and inspection labo.	1 unit
Ion exchanger	1
Drying furnace	2
Cooling unit, heat exchanger	1
Jig making device, etc.	1 unit

Pollution Control Laboratory	
Waste water treatment system (incl. for existing one)	2
Chemicals and reagents	1
Carbon quantitative analyser	1
Emission spectrochemical analyser	1
Total cyanide meter	1
Total chrome meter	1
Atomic absorption flame spectrophotometer	1
PH meter	2
Gas chromatograph	1
COD meter	1
Chromatometer	2
Turbidometer	2
Conductibility meter	1
Water sampler	3
Mud sampler	3
Evaporator	2
Salinometer	1
Ion exchanger	1
Pure water generator	1
Laboratory grasswares	1 set
Laboratory utensils	1 set

3. Common Facilities and Office

Assuming that the two centres are constructed on the same site, the following items are listed as common facilities and equipment, and office equipment.

<u>Common Facilities and Equipment</u>

Emergency electric generator	1
Pressure water tank	1
Air compressor	1
Pick-up truck	1
Fork-lift	1
Minibus	1

Wagon	1
Land crusher	1
Office Equipment	
Micro computer	1
Personal computer	3
Word processor	1
Printing machine	1
Book binding device	1
Copying machine	2
Drafting equipment	10
Audio visual educational equipment	1
Educational material	1
Desks, chairs, tables, racks	1

APPENDIX V

SUBCONTRACTING SYSTEM IN JAPAN

APPENDIX-V SUBCONTRACTING SYSTEM IN JAPAN

1. Subcontractors in Japan (Metalworking)

In the Japanese metalworking industry, specialised subcontractors account for 70% to 80% of medium- and small- scale enterprises, the highest in the electrical equipment and transport equipment industries and the lowest in the metalwork product and precision equipment industries. In the manufacturing industry as a whole, the percentage of subcontracting is 15.9%. But it is 64.1% among enterprises with 300 or more employees. The number of subcontractors per enterprise is, 4 to 9 in the manufacturing industry as a whole, and 50 - 100 for large enterprises with 300 or more employees.

Enterprises ordering subcontracting work - generally referred to as "parent companies" regardless of equity relationship with subcontractors - are divided into distributors and manufacturers of finished products, while subcontractors are classified into parts suppliers, contract processors, and tenant subcontractors. The degree of relationship between the parent companies and subcontractors varies with industries, showing characteristics peculiar to textile, shipbuilding, automobile, and home electric appliance, and other industries.

Prices for subcontracting work are fixed by (1) a parent company at its discretion, (2) a parent company on the basis of quotation offered by a subcontractor, or (3) an agreement between a parent company and a subcontractor. In practice, the parent companies hold pricing leadership in 80% of subcontractors. More than 80% of subcontractors (small- and medium-scale enterprises) maintain more than 10 years of business relationship with their primary customers. Recently, however, more and more subcontractors are diversifying their customers. Types of guidance and assistance provided by the parent companies for their subcontractors are summarised in Figure-1.

Characteristically, most of value added in automobile and electrical equipment industries is produced by small- and medium-scale enterprises. Large enterprises use subcontractors for (1) cost reduction, (2) proprietary technology, (3) flexible response to demand variation, (4) small-lot production, (5) partnership in R&D, or (6) other benefits. There are three types of subcontract work; (1) individual parts or components, (2) unit assemblies, or (3) finished products (OEM), with (3) on the increasing trend.

Compared to other industrial countries, Japan shows the high percentage of subcontracting with long-term relationship. On the other hand, subcontracting work in the U.S. is based on a single-year contract with clear-cut terms and conditions, thus arbitrary pricing and other problems seen in Japan are not likely to occur. Also, small enterprises in the U.S. are mostly independent and may consider technical assistance from customers as an interference. At the same time, there are moves in the U.S. and Europe toward the increase in percentage of subcontracted work, selective qualification of subcontractors, longer contract terms, joint product development efforts, and introduction of the just-in-time production system.

2. Outline of Subcontracting Industry Policy

The government's subcontracting industry policy consists of efforts to normalise subcontract relationship and those to foster small- and medium-scale enterprises. (Figure-2)

(1) Normalization of subcontract relationship

Under the Law for Prevention of Payment Delay and Other Unfair Practices in Subcontracting (special provisions of the Anti-Monopoly Law, the Small and Medium Enterprise Agency and the Fair Trade Commission investigate violations of the law, and issue administrative guidance or warning to a violator, and/or publication of its name.

(2) Fostering of Subcontracting Industry

Under the Law for Promotion of Subcontracting Small and Medium Enterprises, administrative guidance and advice are issued to develop desirable relationship between parent companies and subcontractors. Activities include financial assistance in modernization of subcontracting enterprises, and the matching of potential customers and subcontractors and settlement of disputes by the Subcontracting Industry Promotion Association.

(3) International Subcontracting Information Centre

The information centre is established within the National Association of Subcontracting Industry Promotion to collect and provide information on specialisation and location of Japanese subcontractors for foreign companies who intend to establish production bases in Japan and consider the use of subcontractors.

(4) Structural adjustment

1) Loan programme to facilitate structural adjustment of subcontracting small- and medium-scale enterprises

To facilitate structural adjustment, such as diversification to a new business, low-interest loans are provided by commercial financial institutions or the Central Bank for Commercial and Industrial Associations, under interest subsidy from the Financial Assistance Programme to Strengthen Management Foundation of Small and Medium Enterprises of each prefecture. (Eligibility: A small- or medium-scale enterprise which obtain more than 20% of work from a particular company (parent company), and which subcontract work has decreased by 10% or more from the previous year or is expected to decrease by 15% or more, due to the decrease in domestic production of the parent company) Loan terms: interest rate - 5.2%; maximum amount - ¥20 million; period - 7 years or less for capital investment and 5 years or less for operating fund.

2) Technological Development Assistance Programme to Facilitate Structural Adjustment of Subcontracting Industries (subsidy for investment in technological improvement, with ceiling for each industry group)

Subsidy to cover 1/2 or less of technical development costs in response to diversification of a parent company into a new business, with the amount ranging between ¥5 million and ¥30 million.

3. Subcontracting Small and Medium Enterprise Promotion Association

In 1984 - one year after the enactment of the Basic Small and Medium Enterprise Law, the central government started to encourage each prefectural government to establish the Subcontracting Industry Promotion Association as a public corporation at its own cost, while the central government provides subsidy to cover costs and expenses required for each association's activities. The legal position and role of the associations is specified in the Subcontracting Small and Medium Enterprise Promotion Law, which was enacted in 1970, which defines major activities of the associations as follows:

(1) To act as an intermediary in subcontract.

(2) To provide consultation for a complaint or dispute related to a subcontract, and to refer its settlement to an appropriate organisation or to act as an arbitrator.

(3) To collect and disseminate information required to promote subcontracting small- and medium-scale enterprises.

The relationship and major activities of the associations are summarised in Figure-3. Note that the word "association" is not used in all organisations; some organisations use the name "corporation" and others.

(1) Subcontracting Intermediary Programme (Figure-4)

1) Registration: To register small- and medium-scale enterprises and to update their data periodically. Efforts are made to register enterprises outside a prefecture in order to form a broader base of the subcontracting industry.

2) Intermediary: To investigate and collect information on subcontractors and ordering enterprises, including profiles and contract conditions. To ensure that subcontract work is performed in compliance with standards and criteria specified in the Law for Prevention of Payment Delay and Other Unfair Practices in Subcontracting, and the Subcontracting Small and Medium Enterprise Promotion Law, and each subcontract is performed according to the Basic Subcontract Agreement. To provide information for as many enterprises as possible, the association sponsors the Forum on Issues related to Subcontracting and provide consultation service at municipal governments and on visit for enterprises locating in remote areas.

Also, the Joint Contract Promotion Programme is conducted to enable smaller enterprises to receive order in a relatively large unit. In addition, a variety of programmes are in effect to support small- and medium-scale business enterprises from various aspects; the Business Promotion Programme to secure orders for subcontracting small- and medium-scale enterprises; the Large Project Promotion Programme to support them to obtain work in public works projects and other large contracts; the Subcontracting Industry Technological Improvement Support Programme: to enable them to upgrade their production techniques; consultation service by subcontracting small- and medium-scale enterprise advisors who are familiar with management, technology, and marketing; the Area-wide Business Meeting Promotion Programme; the Own Market Development Support Programme; and Subcontracting Industry Techno Fair.

(2) Consultation to Settle Complaint and Dispute

The Grievance Committee is organised by experts in promotion of subcontracting small- and medium-scale enterprises, including representatives of the prefectural government, the chamber of commerce, the federation of commercial and industrial organisations, the Subcontracting Industry Promotion Association, a parent industry organisation, and a subcontracting industry organisation, and university professors and lawyers.

(3) Investigation and Information Service Programme

Each association provides a variety of information service, including:

1) Order news - Latest information on subcontract order specifying product and schedule

2) Production capacity survey

3) Order prospect survey - To forecast future order

4) Registered capacity survey - To update information on production facilities and equipment of subcontractors

5) Subcontract survey - To monitor subcontract conditions including unit price, payment terms, and type of contract

(4) Others

1) Guidance for subcontracting industries related to factory relocation: Those located in an area subject to the Industrial Relocation Promotion Law

2) Major activities of the National Association of Subcontracting Industry Promotion

a) To collect data and information related to public projects (e.g., information on prospective projects under the National Oil Stockpiling Project and the Power Source Development Project)

b) To analyse unsuccessful contracts in an area and to see an opportunity in other areas

c) To provide training for personnel engaged in promotion of subcontracting small- and medium- scale enterprises

d) To prepare educational materials and source materials related to promotion of subcontracting industry

e) To prepare and disseminate a standard form of contract for subcontracting work

f) To conduct other surveys and research activities

g) International subcontracting intermediary programme: To provide information or act as an intermediary for foreign corporations (including those investing in Japan) who look for subcontractors

Above referenced to "Subcontract Handbook" Ver. 4, February 1992"

Figure V-1 Assistance and Guidance from Parent Companies to Subcontractors

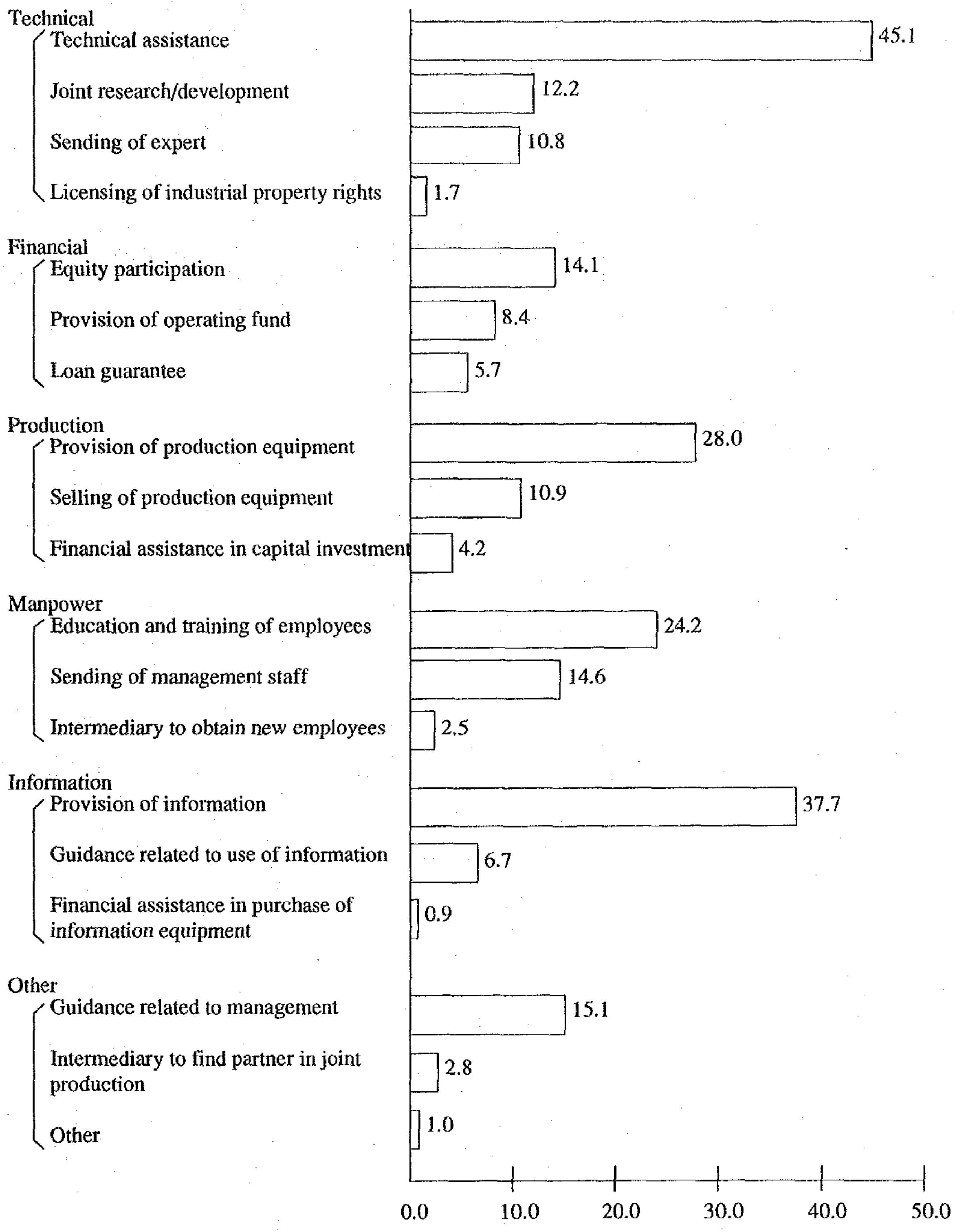
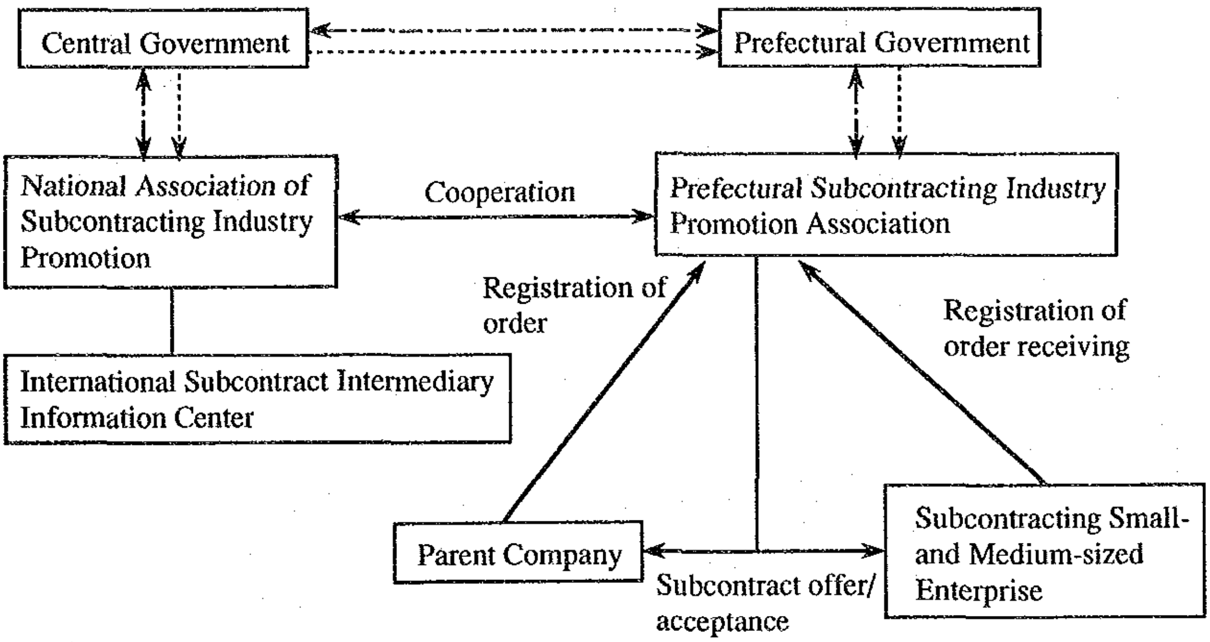


Figure V-2 General Structure of Subcontracting Small and Medium Enterprise Promotion Programs

- **Exclusion of Unfair Subcontracting Practice**
  - Law for Prevention of Payment Delay and Other Unfair Practices in Subcontracting
    - ① Eligibility
      - a. Manufacture or repair ordered by an enterprise with working capital exceeding ¥100 million to an enterprise with working capital of ¥100 million or less.
      - b. Manufacture or repair ordered by an enterprise with working capital exceeding ¥10 million and less than ¥100 million and to an enterprise with working capital of ¥10 million or less
    - ② Acts Subject to Regulation
      - a. Duties of parent companies: Issuing of purchase order, preparation and keeping of purchase document, designation of payment date, and payment of interest for arrears.
      - b. Prohibited acts of parent companies: Rejection of acceptance, delay in payment, cut in payment, forced discount, and others (9 items)
    - ③ Enforcement: Investigation (document + on-spot)→ a serious case is referred to the Fair Trade
    - Subcontract Normalization Committee
    - Workshop on Improvement of Subcontract Practice
- **Promotion of Subcontracting Small- and Medium-sized Enterprises**
  - Subcontracting Small and Medium Enterprise Law
    - Establishment of desirable subcontract practice
      - Enforcement of standards established in the law — Clarification and stabilization of order, normalization of delivery schedule, provision of information and related support for subcontractors in the case of parent company's overseas investment and other changes
    - Modernization of subcontracting industry
      - Promotion project planning program
        - To promote a joint modernization plan for a parent company and its subcontractors (or cooperative). (Integrated modernization) (Industry groups: Metal and machine tools, heavy electrical equipment, household electrical appliances, automobiles and parts, and ships and engines)
        - Public assistance: Financial (low-interest loan by Small Business Finance Corporation) and tax incentives (inclusion of burden charge for common facilities as deductible expenses)
    - Facilitation of subcontract
      - Subcontracting Industry Promotion Association
        - Strengthening of general production
          - Program to hold workshop on promotion of independence of subcontracting industries
          - Program to support technological improvement of subcontracting industry
          - Subcontracting small and medium enterprise advisor program
        - Diversification of customers
          - Independent market exploration support program
          - Subcontracting Industry Techno Fair
          - Area-wide business meeting sponsoring program
          - Subcontract on-line network program
        - Internationalization — International subcontract intermediary program
- **Securing of manpower for subcontracting small- and medium-sized enterprises**
  - Subcontract normalization measures to promote reduction of working hours
- **Facilitation of structural adjustment**
  - Assistance for subcontracting small- and medium-scale enterprises affected by structural adjustment of a parent company
    - Financial assistance program for facilitation of structural adjustment of subcontracting small and medium enterprises (interest rate - 5.2%; commercial financial institutions or the Central Bank for Commercial and Industrial Associations)
  - Promotion technical development — Technological Improvement Subsidy (selected industry groups)
    [Assisting technical development efforts of subcontracting industries affected by structural adjustment of a parent company, thereby to facilitate their diversification into a new business: Subsidy rate: 1/2]

Figure V-3 Mechanism and Major Activities of National and Prefectural Subcontracting Industry Promotion Associations



(Notes) ←·—·→ Administrative guidance and communication for implementation of subcontract promotion measures

··········→ Subsidy to cover costs required for implementation of promotion program

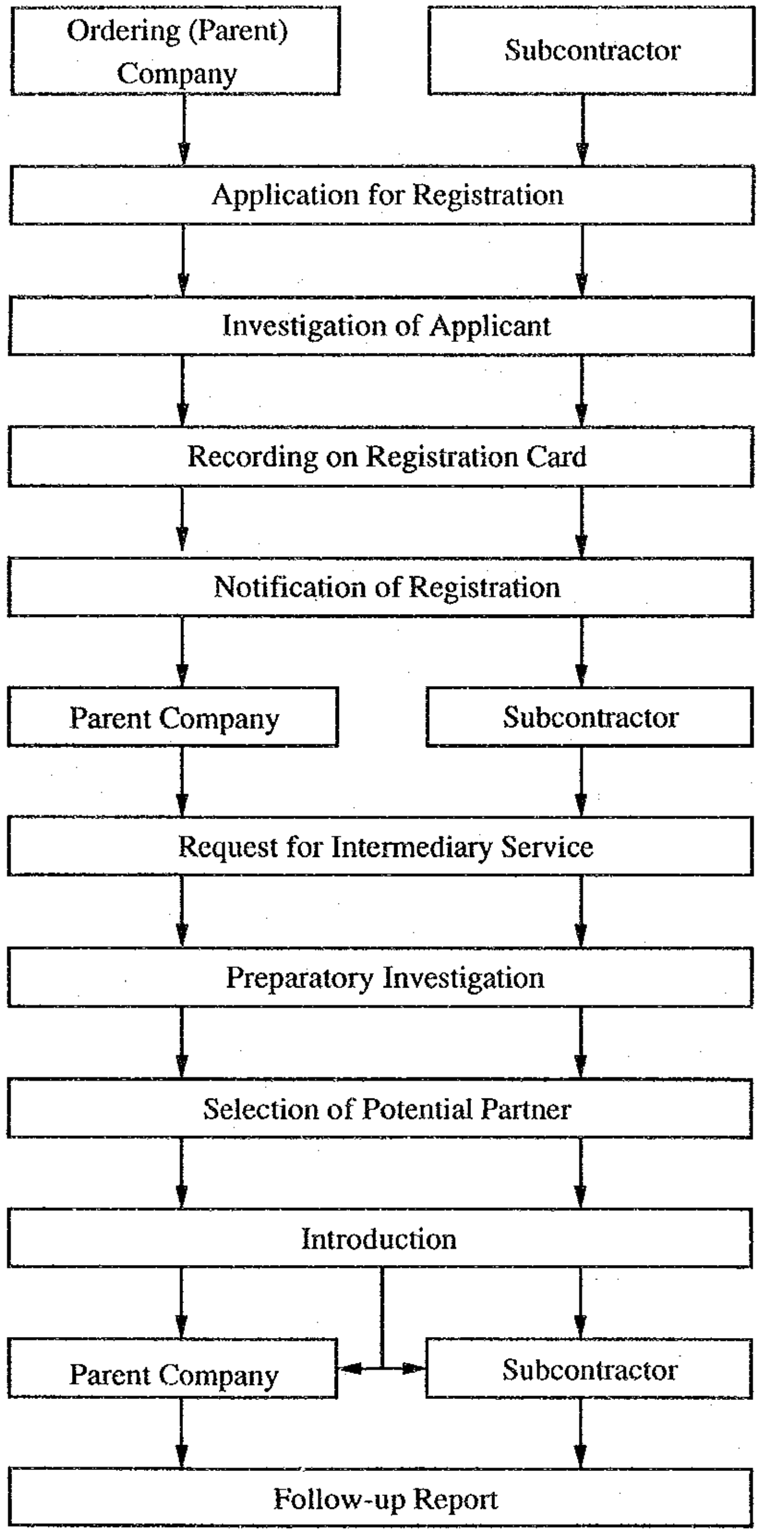
Major Activities (Projects) by National Association

(1) To collect and disseminate data and information on public projects
(2) To coordinate and arrange exchange of subcontract information between prefectural associations
(3) To prepare and disseminate the standard form of subcontract
(4) Education, training, research, and public relations
(5) Intermediary for international subcontract

Major Activities (Projects) by Prefectural Associations

(1) Intermediary for subcontract work
(2) Settlement of complaint and dispute related to subcontract
(3) To collect and disseminate information related to promotion of subcontracting small - and medium-sized enterprises
(4) Guidance and intermediary service for subcontracting industries related to factory relocation
(5) General consultation and guidance

Figure V-4 Subcontract Intermediary Service Procedure



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