

MINUTES OF DISCUSSIONS  
THE BASIC DESIGN STUDY ON THE PROJECT FOR THE UP  
GRADATION OF PLASTICS TECHNOLOGY CENTRE  
IN THE ISLAMIC REPUBLIC OF PAKISTAN

In response to a request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "the Pakistan"), the Government of Japan decided to conduct a basic design study on the Project for the Up Gradation of Plastics Technology Centre (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").


JICA sent to Pakistan the Basic Design Study Team (hereinafter referred to as "the Team"), which is headed by Mr. Yamaura Nobuyuki, Resident Representative of JICA Pakistan Office, and is scheduled to stay in the country from 6 October to 3 November, 2003.

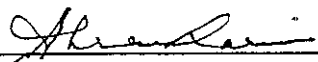
The Team held discussions with the officials concerned of the Government of Pakistan and conducted a field survey at the study area.

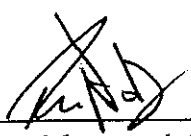
In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets.

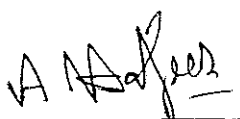
The Team will proceed to further work and prepare the Basic Design Study Report.

Islamabad, October 14<sup>th</sup>, 2003

  
Mr. Yamaura Nobuyuki  
Leader  
Basic Design Study Team  
Resident Representative of JICA Pakistan Office

  
Mr. Ahsan Siddiqi  
General Manager  
Plastics Technology Centre  
The Islamic Republic of Pakistan

  
Mr. Muhammad Ashraf Khan  
Joint Secretary  
Economic Affairs Division  
The Islamic Republic of Pakistan

  
Mr. Abdul Hafeez Chaudhry  
Joint Secretary  
Ministry of Industries and Production  
The Islamic Republic of Pakistan

## ATTACHMENT

### 1. Objectives of the Project

The Project aims at upgrading the function of PTC's technological know-how, skills, and experiences effectively and efficiently, by means of which the Government of Japan procures PIC the equipment mainly in injection molding and extrusion. This contributes toward the development of small and medium enterprises of plastic industry, which leads to better employment opportunities and helping in poverty reduction.

### 2. Project site

The site of the Project is Plastics Technology Centre (PTC), in Karachi.

### 3. Responsible and Implementing Agency

3-1. The Responsible Agency is the Ministry of Industries and Production (MoIP).

3-2. The Implementing Agency is the Plastics Technology Centre (PTC).

Both sides confirmed that in terms of executing proper operation and maintenance of the equipment and facilities as well as enhancing the effectiveness of the Project, PIC should cooperate with the Synthetic Fiber Development & Application Centre (SFDAC) in managing the budget and personnel under joint control.

The organization chart indicating PTC and SFDAC is attached in ANNEX-1

### 4. Items requested by the Pakistani side

Both side confirmed that the content of the equipment should be basically analyzed based upon the modified equipment list proposed by the Pakistani side at the stage of the Preliminary Study conducted in November, 2002. The modified equipment list is attached in ANNEX-2

After a series of discussions on the selection of the equipment based upon the modified equipment list attached in ANNEX-2 and on the necessity of the workshop for the Project, the items described in ANNEX-3 were finally requested by the Pakistani side. Both sides

agreed that the details of the component will be decided based upon the result of further study JICA will assess the appropriateness of the request and will report the findings to the Government of Japan.

## 5. Japan's Grant Aid Scheme

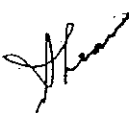
- 5-1. The Pakistani side understood the Japan's Grant Aid Scheme explained by the Team, as described in Annex 4.
- 5-2. The Pakistani side will take the necessary measures, described in Appendix-1 of Annex 4, for the smooth implementation of the Project on condition that the Japan's grant aid is extended to the Project.

## 6. Schedule of the Study


- 6-1. A consultant team will proceed to further studies in Pakistan until the 1<sup>st</sup> of November 2003.
- 6-2. Based on the result of the field survey and analysis, JICA will prepare a Draft Final Report in English and dispatch a team in order to explain the outline of the Basic Design in and around January 2004
- 6-3. In the event of the Draft Final Report being acceptable in principle by the Pakistani side, JICA will complete the Final Report and forward it to the Pakistani side approximately by the end of April 2004.

## 7. Other relevant issues

- 7-1. Basic Criteria for Equipment Selection and Design

 Both sides agreed that the equipment will be examined in accordance with the criteria as attached in ANNEX-5 and the details of the equipment should be finally decided based upon this criteria.

- 7-2. Clarification of activities related to the Project

Both sides confirmed that the major existing activities of PTC related to the Project are Basic Plastic Technology Course(for 3 months), Short Training Courses(1-5 days), Testing 

Services and Consulting Services, which contribute to the development of small and medium enterprises of plastic industry.

The Team suggested that PTC should grasp the market needs of plastic industry more keenly in order to make these activities more practical and beneficial to the small and medium-sized enterprises. In addition, PTC assured to take necessary steps to improve the content of the related programs in proportion to the level of the equipment to be covered by the Project.

#### 7-3. Operation and Maintenance of the Project

PTC agreed to take necessary measures for the proper operation and maintenance of the equipment and facilities to be covered by the Project.

PTC also agreed to allocate the necessary budget for the Project with the support from MoIP.

#### 7-4. Improvement of level of existing technical staff

Both sides assured that PTC should improve the level of existing technical staff or allocate proper qualified technical staff in order to satisfy the requirements outlined in the activities related to the Project.

#### 7-5. The workshop for the Project

After a series of discussion, The Team confirmed that the construction of the workshop was requested by the Pakistani side.

Both sides confirmed that the workshop should be needed for the smooth and proper operation and maintenance of the equipment to be covered by the Project as well as for securing enough space for the activities related to the Project. Both sides agreed that the lay out of the workshop should be decided based upon the result of the further study.

#### 7-6. The existing equipment

Both side confirmed that the existing equipment should be utilized to the maximum for effectiveness of the related activities together with the equipment to be covered by the Project.

#### 7-7. Initial Environment Impact Assessment / Environment Impact Assessment

If environmental clearance is necessary for the Project according to the national regulations, the Pakistani side should take necessary measures to conduct IEIA/EIA as required by the time of Exchange of Note. Both sides agreed that the cost necessary for conducting IEIA/EIA should be borne by the Pakistani side

#### 7-8. Soft component service and necessity of technical cooperation

PTC requested the implementation of the soft component within the scope of the Project in order to properly operate and maintain the equipment and facilities to be covered by the Project. The Japanese side will assess the appropriateness of the request.

PTC recognized the necessity of technical cooperation such as dispatch of technical advisor for training programs and testing services. The Japanese side explained to PTC that no commitment is made regarding the implementation of technical cooperation within the scheme of the Project and PTC side agreed on it.

END

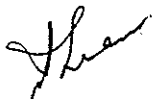
ANNEX-1 : Organization Chart indicating PTC and SFDAC

ANNEX-2 : Modified Equipment List

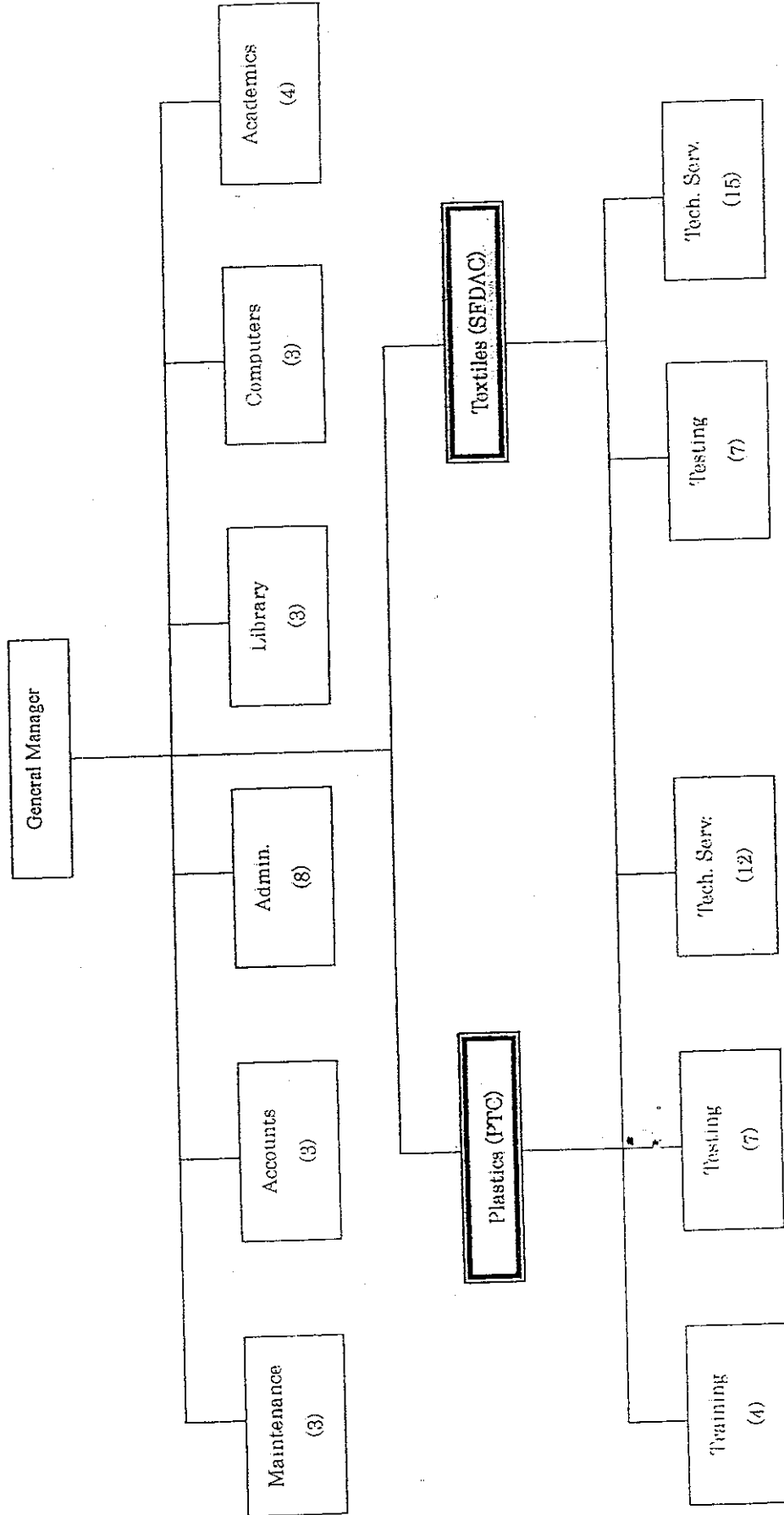
ANNEX-3 : Items Requested by the Pakistani Side

ANNEX-4: The Japan's Grant Aid Scheme

ANNEX-5 : Basic Criteria for Equipment Selection and Design



Plastics Technology Centre (PTC)  
Synthetic Fiber Development and Application Centre (SFDAC)



*Handwritten signatures and initials:*  
A signature on the left, initials 'R' in the middle, and initials 'J' on the right.

## EQUIPMENT LIST

### PLASTICS PIPE MANUFACTURING EQUIPMENT

A.	EQUIPMENT NAME	Qty
1.01	High speed mixer with controls and chutes and valves. Pneumatic controls, Capacity 100 Kg/hour.	1Set
1.02	Mixer/Cooler complete with control, Capacity 100 Kg/hour	1Set
1.03	Discharge bin, Capacity 500 liter	1Set
1.04	Weighing Scale, 0-20 Kgs.	1Set
1.05	Weighing Scale, 0-1 Kg	1Set
2.00	<b>Extrusion Line I</b>	
2.01	Vacuum feeder for hopper, Capacity 25 Kgs/hour	1Set
2.02	Extruder, Twin screw parallel/conical, Dosage feeder , Upto 6" diameter pipes	1Set
2.03	Extrusion Die head, upto 6" dia with die trolley complete	1Set
2.04	Die set, For upto 6" Class C and D	1Set
2.05	Vacuum calibration sleeves, Vacuum sizer	1Set
2.06	Water spray bath, for upto 6" dia pipe	1 Set
2.07	Water Spray Ball, For upto 6" dia pipes	1Set
2.08	Haul off, for upto 6" dia, with measuring and auto thickening device	1Set
2.09	Laser printer jet for pipes	1 Set
2.10	Pipe Saw, upto 6" dia, with Chamfering option	1 Set
2.11	Pipe belling machine, Tooling suitable for rubber ring joints upto 6" dia Tooling for Solvent Cement joints upto 6" dia	1Set
3.00	<b>Extrusion Line II</b>	
3.01	Single screw line for small diameter pipes especially for medical purposes	1 Set
4.00	<b>Plastic Injection Moulding Machine</b>	
4.01	Injection moulding machine (Electric Type), For Pipe fittings Capacity 40-50 Kgs/hour, Clamping force 350 -- 450 Tons	1 Set
4.02	Hooper loader Floor Type, 50 and 75 Kg/hr	2 Sets
5.00	<b>Injection Moulds pressure type fitting</b>	
5.01	Injection Moulds for solvent type pressure fitting B.S.4346/B.S (EN) 2000 One each for: <ul style="list-style-type: none"> <li>▪ (90° elbow, Tees, Valve Socket) 1/2"      1 each</li> <li>▪ (90° elbow, Tees, Valve Socket) 3/4"      1 each</li> <li>▪ (90° elbow, Tees, Valve Socket) 1"      1 each</li> <li>▪ (90° elbow, Tees, Valve Socket) 1 1/4"      1 each</li> <li>▪ (90° elbow, Tees, Valve Socket) 1 1/2"      1 each</li> <li>▪ (90° elbow, Tees, Valve Socket) 2"      1 each</li> </ul>	1 Set
	Option inserts for producing faucet fittings	1 Set
5.02	Injection Moulds for solvent type pressure fitting B.S. 4346/B.S (EN) 2000 One each for: <ul style="list-style-type: none"> <li>▪ (90° elbow, Tees, Valve Socket) 3" dia, 1 each</li> <li>▪ (90° elbow, Tees, Valve Socket) 4" dia, 1 each</li> <li>▪ (90° elbow, Tees, Valve Socket) 6" dia, 1 each</li> </ul>	1 Set
5.03	Injection moulds for SWV fitting, One each for:	2 Sets

	32 mm, 40 mm, 50 mm, (90°/45° elbows) 1 each	
	Reducer 40 x 50, 50 x 75 mm	2 Sets
	Inserts for M/F	1 Set
5.04	Injection Mould fitting for SWV System, B.S 4515/equivalent ISO sweep bend 92 1/2° (3", 4"), sweep branch 92 1/2° (3", 4") bend 135° (3", 4"), branch 135° (3", 4")	1 Set
5.05	I/O and M/F INSERTS, For above fittings	16 Inserts
5.06	Gully trap moulds, 50 mm x 110 mm, 50 mm x 75 mm	1 Set
5.07	Cowl mould 50 mm	1 Set
5.08	P-Trap Moulds (4" dia)	1 Set

### COMPOUNDING WORKSHOP

B.	EQUIPMENT NAME	QTY
1.00	High Speed Mixer, 200 Ltr	1 Set
2.00	Low Speed Cooler, 200 Ltr	1 Set
3.00	Extrusion Feed Hopper, 25 Kg	1 Set
4.00	Twin Screw Extruder, 50 Kg/Hr	1 Set
5.00	Hot Cut Palletizer, 50 Kg/Hr	1 Set
6.00	Metal Detector	1 Set
7.00	Vibrator Motor	1 Set
8.00	Exhaust Fan	1 Set
9.00	DOP Charging Pump, 15 Ltr/Hr	1 Set
10.00	DIOP Charging Pump, 15 Ltr/Hr	1 Set
11.00	DINP/DIDP Transfer pumps	2 Sets

### SUPPORT FACILITY

C.	EQUIPMENT NAME	Qty
1.00	Pipe Crushing equipment	
1.01	PVC pipe crusher, Mouth dimension 750 x 750 mm • Output 100 Kg/hour, Cyclone, Dust collector	1 Set
2.00	Storage tank, 2 M <sup>3</sup> Capacity	1 Set
3.00	Crane Gantry for injection area, (10 Ton) with 10 Ton Hoist	1 Unit
4.00	350.KVA Diesel/Furnace oil Generator	2 Units
5.00	Air conditioner for Laboratory	1 Unit
6.00	Recycling Unit, 15 Kg/hr	1 Unit
7.00	Incinerator, Double Burner Type	1 Unit
8.00	Compressor	2 Units
9.00	Hydraulic Fork Lifter (Hand Type), 1 Ton and 2 Tons, 1 each	1 Unit
10.00	Trolley, 200 Kg	2 Units
11.00	Mould Temperature Cooling	1 Unit
12.00	Mould Temperature Heating	1 Unit
13.00	Material Dryer, 100 Kg	1 Unit
14.00	Auto Color Mixing Unit	1 Unit
15.00	Vacuum Gas Cleaning	1 Unit
16.00	Water and Sewerage Pumps (2 each)	1 Set

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*



## PROCESSING MACHINES

D.	EQUIPMENT NAME	Qty
1.00	Injection Moulding Machine (Liquid Silicone Rubber), Small Unit	1 Unit
2.00	Injection Moulding Machine (Thermoset), Small Unit	1 Unit
3.00	Vacuum Forming, Small Unit	1 Unit
4.00	Sheet Forming With Single Screw Extruder Double Type (Co-Extrusion), Small Unit	1 Unit
5.00	Blow Moulding (Intermittent Type), Small Unit	1 Unit
6.00	Compression Moulding, Medium Unit	1 Unit
7.00	Rubber Extruder, 15 Kg/Hr	1 Unit
8.00	Banbury Mixer, 30 Kg/Hr	1 Unit
9.00	Polymerizer, Lab. Scale Unit	1 Unit
10.00	Calendering Machine, Small Unit	1 Unit

## QUALITY CONTROL & TESTING LAB. EQUIPMENT

E.	EQUIPMENT NAME	Qty
1.00	Short term (1 hour) Hydrostatic testing bath, (20° C test) 5 station type Upto 12" dia	1 Set
2.00	Long term Hydrostatic test, 20-23° C 5 Station type	1 Set
3.00	Long term Hydrostatic test, 60° C bath, 5 Station type	1 Set
4.00	Methylene Chloride Test	1 Set
5.00	Glycerine test - Heat reversion test	1 Set
6.00	Falling ball/weight Impact test equipment, Auto control	1 Set
7.00	Softening point test machine, HDT/VICAT type	1 Set
8.00	Fracture toughness test equipment, 3" to 12" dia	1 Set
9.00	Water quality test lab	1 Set
10.00	Opacity test equipment	1 set
11.00	Outside dia measurement gauges	1 Set
12.00	Pipe wall thickness measurement gauges	1 Set
13.00	Groove dia and internal dia measurement gauges	1 Set
14.00	Fittings internal dia measurement gauge sets	2 Sets
15.00	Pipe Minimum and Maximum outside dia, Measurement system	2 Sets
16.00	Deionize water unit	1 set
17.00	Distillation Apparatus with demineralizer, 1.8 Lts/hr	1 Set
18.00	Universal Testing Machine, 10 Tons	1 Set
19.00	Digital Hardness Tester: Shore A & D, Rockwell Hardness with Stand	1 Set
20.00	Fume Hood (Draft Chamber), 1.2 m wide	1 Set
21.00	Profile Measurement for Extrusion	1 Set
22.00	Thickness Gauge: ASTM-D 374, ASTM-D 5199	1 Set
23.00	Circumference Measurement for Pipe	1 Set
24.00	Graves Tear Test, ASTM-D 1004	1 Set
25.00	Water Extraction, ASTM-D 3083	1 Set
26.00	Water Vapor Transmission, ASTM-D 814	1 Set
27.00	Torque Tear, ASTM-D 751-B	1 Set
28.00	PPT Resistance, ASTM-D 2582	1 Set
29.00	Trapezoidal Tear, ASTM-D 4533	1 Set
30.00	Puncture Resistance, ASTM-D 4833	1 Set
31.00	Humidity Chamber for Testing	1 Set

3 of 5

32.00	Weather Stress Machine	1 Set
33.00	Color Meter for Plastics	1 Set
34.00	Freezer, Chest Type, -30° C	1 Set
35.00	3-D Measuring Machine (3-D MM)	1 Set
36.00	FTNIR with solid and liquid sample preparation accessories, software with DRS, ATR and IR microscopy accessory	1 Set
37.00	Gas Chromatograph with accessories including software and autosampler	1 Set
	▪ Head Space Injector for GC	1 Set
	▪ Molecular Sieve glass and SS columns for GC, 1/8" and 1/4"	3 Sets
	▪ Capillary columns for GC and GC-MS	3 Sets
38.00	Thermal conductivity detector	1 Set
39.00	Thermal Analyzer with TGA and DSC, 1 each	1 Set
40.00	HPLC:	
	▪ Octadecyl (RP-column) for HPLC	3 Sets
	▪ Refractive Index detector for HPLC	1 Set
	▪ Gel permeation columns for HPLC	3 Sets
	▪ Packed column injector for HPLC	1 Set
41.00	Digital Impact Tester, ASTM-D 1822	1 Set
42.00	Creep Tester, ISO-889	1 Set
43.00	Mullen Type Bursting Strength Tester, Upto 2000 KPa	1 Set
44.00	Oxygen Index Tester, ASTM-D 2863	1 Set
45.00	Ozone Ageing Tester, ASTM-D 1149	1 Set
46.00	Automatic Gas Permeability Tester, ASTM-D 1434	1 Set
47.00	Digital Thickness Tester, JIS-K-6250	1 Set
48.00	Thermally Simulated Current Tester, JIS-K-7131	1 Set
49.00	Ultrasonic Flaw Detector	1 Set

## SECOND PLASTIC PROCESSING

F.	EQUIPMENT NAME	Qty
1.00	Slotting Machine suitable for producing Well Screens	1 Set
2.00	Belling Machine, 'O' Rubber Ring	1 Set
3.00	High Frequency Welder	1 Set
4.00	Ultrasonic Welder with accessories	1 Set
5.00	Impact Welder	1 Set
6.00	Chamfering Machine	1 Set
7.00	Threading Machine for inner and outer threading	1 Set
8.00	Drilling Machine	1 Set
9.00	Plumbing Tools for 10 students (Several Types)	1 Set
10.00	Bending Machine	1 Set
11.00	Milling Machine	1 Set
12.00	Wire Coating Machine	1 Set
13.00	Printing Machine for plastic packaging	1 Set

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*

## PLASTICS DESIGN LABORATORY


G.	EQUIPMENT NAME	Qty
1.00	Hardware	
1.01	Computers Pentium 4 for students with one server	25 Sets
1.02	Pentium 4 for teachers	2 Sets
1.03	Laptop Pentium 4 with printer	2 Sets
1.03	Laser Printer, A4	3 Sets
1.04	Laser Printer, A3	1 Set
1.05	Scanner, A3	2 Sets
1.06	Plotter, A1	1 Set
1.07	HUB (with accessories for Network Setup)	2 Sets
2.00	Software: <ul style="list-style-type: none"> <li>▪ Plascam</li> <li>▪ Mould Flow, 3-D Analysis</li> <li>▪ Unigraphics Solutions (Mold/Die Design)</li> <li>▪ Processing/Piping Training</li> <li>▪ ANSYS (Product Development Software)</li> <li>▪ Material Selection</li> <li>▪ Training Software for Extrusion, Injection Moulding, Blow Moulding and Health and Safety in Plastic Processing</li> </ul>	1 Set

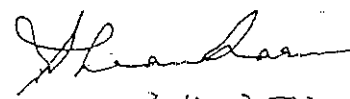
## TRAINING AIDS

H.	EQUIPMENT NAME	Qty
1.00	Multimedia	2 Sets
2.00	Video player and T.V 32", 2 each	1 Set
3.00	Digital Camera with Zoom	1 Set
4.00	Digital Video Camera with portable recorder	1 Set
5.00	Mobile Stand for Camera	1 Set
6.00	DVD player with T.V	1 Set
7.00	Projector for projection of samples	1 Set
8.00	Books, Journals, Videos and CD-Rom (Please see attachment sheet)	
9.00	Testing and Production Standards: JIS, ASTM, BSS, DIN, ISO, 1 each	1 Set

## MAINTENANCE EQUIPMENT

I.	EQUIPMENT NAME	Qty
1.00	Mechanical Tools for maintenance	1 Lot
2.00	Electric and Electronic Tools for maintenance	1 Lot
3.00	Multimeter	1 Set
4.00	Oscilloscope	1 Set
5.00	DC Generator	1 Set
6.00	IC Tester	1 Set
7.00	Circuit Tester	1 Set
8.00	Revolution Counter	1 Set
9.00	Repairing instruments for Computerized equipment	1 Lot
10.00	Special Maintenance Tools for Machines	1Set
11.00	Complete spares set for 2 year normal operation for Machines	1Set


  
 A-4-11

 5 of 5  
 3.12.2002  
 PTC - Karachi  
 Pakistan


## The Items Requested by the Pakistani Side

Equipment		Q'ty
Code No.	Name of Equipment	
<b>Plastics Manufacturing Equipment</b>		
PM-1	High speed mixer with controls and chutes and valves. Pneumatic controls, Capacity 200 liter	1
PM-2	Storage tank, 1.5 ton for Pipe Compounds	1
PM-3	Weighing Scale, 0-50 Kgs, 0-10Kgs, 0-1Kgs	1
PM-4	Folk Lift, 2 ton	1
PM-5	Extruder, Twin screw, parallel, Dosage feeder, Venting up to 6" diameter pipes, counter rotation, 150Kgs/hour	1
PM-6	Extrusion Die head, up to 2- 6" dia with die trolley complete	1
PM-7	Bush & Pin for Pipe, Class D, 2, 3, 4, 6"	1
PM-8	Vacuum calibration sleeves, Vacuum sizer 2, 3, 4, 6"	1
PM-9	Water spray bath, for up to 6" dia pipe, 6m	1
PM-10	Natural drop water bath, for up to 6" dia pipe, 3m	1
PM-11	Haul Off, for up to 2-6" dia, with measuring and auto thickening device, 0-5m/min	1
PM-12	Inkjet Printer for pipes	1
PM-13	Cutter, up to 6" dia, with Chamfering option (disk cutter, 6m)	1
PM-14	Pipe belling machine, Off line Tooling suitable for rubber ring joints up to 6" dia (RR) Tooling for Solvent Cement joints up to 6" dia (TS)	1
PM-15	Single Screw Extruder for small diameter with Pelletizer for Olefin & PET material, 50Kgs/hour	1
PM-16	Injection moulding machine for UPVC (Hydraulic Type), Clamping force 450 Tons	1
PM-17	Injection moulding machine for PET & PC (Electric Type), Clamping force 150 Tons	1
PM-18	Specimen's mould & fabricate	1
PM-19	Hopper loader Floor Type, 150 Kgs/hour	2
PM-20	Injection Moulds for solvent type pressure fitting B.S.4346/B S (EN) 2000 One each for: *(90 °elbow, Tees, Valve Socket) 1"      1 each *(90 °elbow, Tees, Valve Socket) 2"      1 each *(90 °elbow, Tees, Valve Socket) 4"      1 each *(90 °elbow, Tees) 6"                      1 each Reducer, Reducing Tee, 2"x4"              1 each Reducer, Reducing Tee, 4"x6"              1 each Option inserts for producing faucet fittings	1
<b>Compounding Workshop</b>		
C-1	Twin Screw Extruder, 50 Kgs/hour	1
C-2	Hot Cut Palletizer, 50 Kgs/hour	1
C-3	Metal Detector	1
C-4	Vibrator Motor	1
<b>Support Facility</b>		
SF-1	Guranulator for UPVC, Output 100 Kgs/hour, Cyclone, Dust collector, Grain 5-7mm	1
SF-2	Guranulator for PET, PE, PP, Output 20 Kgs/hour, Cyclone, Dust collector	1
SF-3	Storage tank for fittings compound, 200Kgs Capacity	1
SF-4	Crane Gantry (For Injection and Extruder) , 2ton	2

SF-5	Chain Block, 2 ton	2
SF-6	Wooden Floor, 2x2m in Die/Mould Shop	1
SF-7	350KVA Diesel/Furnace oil generator with fuel tank	1
SF-8	150 KVA Diesel/Furnace oil generator with fuel tank	1
SF-9	Air conditioner for laboratory	1
SF-10	Recycling Unit, 15 Kg/hr for PET	1
SF-11	Incinerator, double burner type, Small Unit	1
SF-12	Compressor	2
SF-13	Trolley, 1 ton, 6m	3
SF-14	Chiller with temperature controller for pipe and fittings	1
SF-15	Mould Temperature Controller	1
SF-16	Material Dryer, 110°C, 25Kgs, Vacuum	1
<b>Processing Machines</b>		
P-1	Thermoforming Small Unit	1
P-2	Sheet Forming with single screw extruder double type (Co-Extrusion), Small Unit	1
P-3	Calendering Machine, Small Unit	1
P-4	Blow moulding (stretch injection type), Small Unit	1
P-5	Compression Moulding	1
P-6	Vertical Injection Moulding Machine, 10-20 ton	1
<b>Quality Control &amp; Testing Lab. Equipment</b>		
Q-1	Short term (1 hour) Hydrostatic testing bath, (20°C test) 5 station type up to 12" dia	1
Q-2	Long term Hydrostatic test, 20 - 60°C, one station type, Max. 6", L=1m	1
Q-3	Methylene Chloride Test	1
Q-4	Glycerine test - Heat reversion test	1
Q-5	Falling ball/weight Impact test equipment, Auto control	1
Q-6	Softening point test machine, HDT/VICAT type	1
Q-7	Fracture toughness test equipment, 3" to 6" dia	1
Q-8	Opacity test equipment	1
Q-9	Outside dia measurement gauges	1
Q-10	Pipe wall thickness measurement gauges	1
Q-11	Groove dia and internal dia measurement gauges	1
Q-12	Fittings internal dia measurement gauges sets	2
Q-13	Pipe Minimum and Maximum outside dia, measurement system	2
Q-14	Distillation Apparatus with demineralizer, 1.8 Lts/hr	1
Q-15	Universal Testing Machine, 10 tons	1
Q-16	Digital Hardness Tester: Shore A & D, Rockwell Hardness with Stand	1
Q-17	Profile Measurement for Extrusion	1
Q-18	Thickness Gauge	1
Q-19	Circumference Measurement for Pipe	1
Q-20	Graves Tear Test	1
Q-21	Water Extraction	1
Q-22	Water Vapor Transmission	1
Q-23	Torque Tear	1
Q-24	PPT Resistance	1
Q-25	Trapezoidal Tear	1
Q-26	Puncture Resistance	1
Q-27	Humidity Chamber for Testing (Weather Stress Machine)	1
Q-28	Freezer, Chest Type, -30°C	1

3

*Shear*

*Ad*

*07*

<b>Training Aids</b>		
T-1	Multimedia	2
T-2	Video player and TV 32"	2
T-3	Digital Camera with zoom	1
T-4	Digital Camera with portable recorder	1
T-5	Mobile stand for camera	1
T-6	DVD player with TV	1
T-7	Projector for projection of samples	1
T-8	Books, Journals, Videos and CD-Rom	1
T-9	Testing and Production Standards: JIS, ASTM, BSS, DIN, ISO, 1 each	1
T-10	Copy Machine, A3	2
<b>Maintenance Equipment</b>		
M-1	Tools for maintenance	1
M-3	Multimeter	1
M-4	Oscilloscope	1
M-5	DC Generator	1
M-6	IC Tester	1
M-7	Circuit Tester	1
M-8	Revolution Counter	1
M-9	Repairing instruments for computerized equipment	1

**Facilities**

1	Utilities for Workshop (Water Supply, Electric Power Supply, Air Supply, Vacuum Piping, Exhaust Fan etc.)	
2	Building for Work Shop	

*J. Lee*

*as*

*Kal*

*o*

Q-29	3-D Measuring Machine (3-D MM)	1
Q-30	FTNIR with solid and liquid sample preparation accessories, software with DRS, ATR and IR microscopy accessory	1
Q-31	Gas Chromatograph with accessories including software * Head Space Injector for GC * Molecular Sieve glass and SS columns for GC, 1/8" and 1/4" * Capillary columns for GC and GC-MS	1 1 3 3
Q-32	Thermal conductivity detector	1
Q-33	Thermal Analyzer, TGA & DSC	1
Q-34	HPLC: * Octadecyl (RP column) for HPLC * Refractive Index detector for HPLC * Gel permeation columns for HPLC * Packed column injector for HPLC	3 1 3 1
Q-35	Digital Impact Tester	1
Q-36	Creep Tester, ISO-889	1
Q-37	Mullen Type Bursting Strength Tester, Up to 2000 Kpa	1
Q-38	Oxygen Index Tester	1
Q-39	Ozon Ageing Tester	1
Q-40	Automatic Gas Permeability Tester	1
Q-41	Digital Thickness Tester (Micrometer)	1
Q-42	Thermally Stimulated Current Tester	1
Q-43	Ultrasonic Flaw Detector	1
<b>Second Plastic Processing</b>		
S-1	Ultrasonic Welder with accessories (Gun)	1
S-2	Plumbing Tools for 10 students (Several Types)	1
S-3	Bending Machine	1
S-4	Printing Machine for plastic packaging	1
<b>Plastic Design Laboratory</b>		
PD-1	Computers Pentium 4 for Student	25
PD-2	Pentium 4 for Teachers	2
PD-3	UPS (Uninterrupted Power Supply)	2
PD-4	Laptop computer 4 with printer	2
PD-5	Laser Printer, A4	3
PD-6	Laser Printer, A3	1
PD-7	Scanner, A3	2
PD-8	Plotter, A1	1
PD-9	Server	2
PD-10	Software: * Plascam * Mould Flow, 3-D Analysis * Unigraphics Solutions (Mold/Die Design) * Processing/Piping Training * ANSYS (Product Development Software) * Material Selection * Training Software for Extrusion, Injection Moulding, Blow Moulding and Health and Safety in Plastic Processing	1

## The Japan's Grant Aid Scheme

ANNEX-4

### 1. Japan's Grant Aid System

#### (1) Grant Aid Procedure

1) Japan's Grant Aid Program is executed through the following procedures.

Application (Request made by a recipient country)

Study (Basic Design Study conducted by JICA)

Appraisal & Approval

(Appraisal by the Government of Japan and Approval by Cabinet)

Determination of Implementation

(The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request. If necessary, JICA send a Preliminary Study Mission to the recipient country to confirm the contents of the request.

Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Programme, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

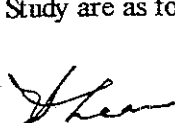
Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

#### (2) Basic Design Study

##### 1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project"), is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:





- a) confirmation of the background, objectives and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation;
- b) evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from the technical, social and economic points of view;
- c) confirmation of items agreed on by both parties concerning the basic concept of the Project;
- d) preparation of a basic design of the Project; and
- e) estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even through they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

## 2) Selection of Consultants

For the smooth implementation of the Study, JICA uses a consulting firm selected through its own procedure (competitive proposal). The selected firm participates in the Study and prepares for a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Project, JICA recommends the same consulting firm which participated in the Study to the recipient country in order to maintain the technical consistency between the Basic Design and Detailed Design.

## (3) Japan's Grant Aid Scheme

### 1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with

the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant" means the one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.

However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability of Japanese taxpayers.

*Hea* 6) Undertakings required to the Government of the recipient country

- a) to secure a lot of land necessary for the construction of the Project and to clear the site;
- b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site;
- c) to ensure prompt unloading and customs clearance at ports of disembarkation in the

recipient country and internal transportation therein of the products purchased under the Grant Aid;

- d) to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;
- e) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;
- f) to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively for the Project; and
- g) to bear all the expenses, other than those covered by the Grant Aid, necessary for the Project.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of recipient country or its designated authority.
- c) Commission of payment will be arranged and covered by the Government of the recipient country.

**2. Necessary measures undertakings by each government**

Major undertakings to be taken by each government is shown in the Appendix-1

Appendix-1 Necessary measures undertakings by each government

No	Items	To be covered by Grant Aid	To be covered by Recipient side
1	To secure land		<input type="radio"/>
2	To clear, level and reclaim the site when needed		<input type="radio"/>
3	To construct gates and fences in and around the site		<input type="radio"/>
4	To construct the parking lot	<input type="radio"/>	
5	To construct roads		
	1) Within the site	<input type="radio"/>	
	2) Outside the site		<input type="radio"/>
6	To construct the building	<input type="radio"/>	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		<input type="radio"/>
	b. The drop wiring and internal wiring within the site	<input type="radio"/>	
	c. The main circuit breaker and transformer	<input type="radio"/>	
	2) Water Supply		
	a. The city water distribution main to the site		<input type="radio"/>
	b. The supply system within the site ( receiving and/or elevated tanks )	<input type="radio"/>	
	3) Drainage		
	a. The city drainage main ( for storm, sewer and others ) to the site		<input type="radio"/>
	b. The drainage system ( for toilet sewer, ordinary waste, storm drainage and others ) within the site	<input type="radio"/>	
	4) Gas Supply		
	a. The city gas main to the site		<input type="radio"/>
	b. The gas supply system within the site	<input type="radio"/>	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame / panel (MDF) of the building		<input type="radio"/>
	b. The MDF and the extension after the frame / panel	<input type="radio"/>	
6) Furniture and Equipment			
a. General furniture		<input type="radio"/>	
b. Project equipment	<input type="radio"/>		
8	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		<input type="radio"/>
	2) Payment commission		<input type="radio"/>

*Hea*

*[Signature]*

*[Signature]*

*[Signature]*

	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
9	1) Marine(Air) transportation of the products from Japan to the recipient country	○	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		○
	3) Internal transportation from the port of disembarkation to the project site	○	
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		○
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts		○
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant		○
13	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for transportation and installation of the equipment		○

*Shan*

*Sh*

*WAP*

*DT*

### Basic Criteria for Equipment Selection and Design

The specifications of the equipment to be procured under the Project will be analyzed and decided based upon the basic criteria described below.

1. To meet the market need for small and medium-sized enterprises in the plastic industry.
2. To satisfy requirements outlined in the programs related to the Project such as Basic Plastic Technology Course, Short Training Courses, Testing Services and Consulting Services.
3. To consider the level of existing technical staff and easiness in operation and maintenance
4. No duplication with the existing equipment.
5. To be able to cover the ISO standards (product quality).

*Hein*

*el*

*Wad*

*D*

**MINUTES OF DISCUSSIONS**  
**THE BASIC DESIGN STUDY ON THE PROJECT FOR THE UP**  
**GRADATION OF PLASTICS TECHNOLOGY CENTRE**  
**IN THE ISLAMIC REPUBLIC OF PAKISTAN**  
**(EXPLANATION ON THE DRAFT FINAL REPORT)**

In October 2003, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Basic Design Study Team on the Project for the Up Gradation of Plastics Technology Centre (hereinafter referred to as "the Project") to the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan"), and through discussions, site surveys and technical examination of the results in Japan, JICA prepared a draft final report of the study.

In order to explain and to consult the Pakistani side on the components of the draft final report, JICA sent to Pakistan the Draft Final Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Ms.Sachiko Misumi, Deputy Resident Representative, JICA Pakistan Office, and is scheduled to stay in the country from 11 February to 19 February, 2004.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Islamabad, February 19<sup>th</sup> , 2004

三 角 幸 子

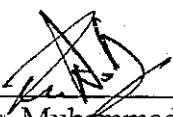
---

Ms. Sachiko Misumi  
Leader  
Draft Final Report Explanation Team  
Senior Deputy Resident Representative  
JICA Pakistan Office



---

Mr. Ahsan Siddiqi  
General Manager  
Plastics Technology Centre  
The Islamic Republic of Pakistan



---

Mr. Muhammad Ashraf Khan  
Joint Secretary  
Economic Affairs Division  
The Islamic Republic of Pakistan



---

Mr. Abdul Hafeez Chaudhry  
Joint Secretary  
Ministry of Industries and Production  
The Islamic Republic of Pakistan

## ATTACHMENT

### 1. Contents of the Draft Final Report

The Pakistani side agreed and accepted in principle the contents of the draft final report proposed by the Team.

### 2. Japan's Grant Aid Scheme

The Pakistani side confirmed the Japan's Grant Aid Scheme explained by the Team and described in ANNEX-4 of the Minutes of Discussions signed by both parties on October 14<sup>th</sup>, 2003.

### 3. Final Report

JICA will prepare a final report in English in accordance with the result of discussions and forward it to the Pakistani side around April 2004.

### 4. Other relevant issues

#### 4-1. Proper Use and Maintenance

Both sides understood that proper use and maintenance of the equipment should be indispensable for their long and effective use. The Pakistani side agreed to execute proper operation and maintenance of the equipment to be covered by the Project by means of allocating administrative and technical personnel and the necessary budget described in the draft final report with the active support from Ministry of Industries and Production.

#### 4-2. Budgetary Measures

The Pakistani side explained that their budget for this Project as per approved PC-1 by Executive Committee of National Economic Council (ECNEC) has already been secured for smooth implementation of the Project. The Pakistani side also agreed to draw up the concrete management plan by the completion of the installation works in order to secure the necessary budget for the recurrent cost of the Project.

#### 4-3. Proper Allocation of Lecturers

Considering the renewal of curricula to be planned under the Project, the Pakistani side agreed to draw up the concrete plan of proper allocation of lecturers to each class for the effective use of the equipment by the completion of the installation works.

#### 4-4. The workshop for the Project

It was pointed out by the Team that the space of existing building is not enough for the implementation of the Project. The proposal of the Team to have separate workshop building of international standard was discussed at some length and it was agreed to provide for a separate workshop building as per layout plan described in the draft final report.





(1) The Team agreed, in principle, that the construction work of the separate workshop should be included in the Project component for securing proper installation of equipment and would be covered by the Japanese side.

(2) The Team explained that the land preparation should be covered by the Pakistani side. The Pakistani side agreed.

#### 4-5. The existing equipment

The Pakistani side agreed that the existing equipment should be secured and utilized effectively for the preliminary training before operating the newly equipment to be covered by the Project.

#### 4-6. Initial Environment Impact Assessment / Environment Impact Assessment

The Pakistani side confirmed that the Project does not require to conduct IEIA/EIA.

#### 4-7. Soft portion of the Project

The component of soft portion of the Project as per detail in PC-1 was reviewed and scope of soft portion was agreed as per detail described in the draft final report. The major aspects of the component are as follows;

- (1) To conduct market survey of local plastic industry to grasp the market needs more keenly by means of implementing the survey in order to establish effective plans for training programs.
- (2) To draw up schedule(s) for training programs and other technical services under the guidance of the Japanese expert based on the estimated number of trainees and allocation plan of lecturers.
- (3) To hold a course the relevance of Quality Control in testing and many techniques of plastics.
- (4) To supervise the project implementation, schedule project activities, prepare tender documents and evaluate the tenders.

#### 4-8. Revision of PC-1

Pakistani side agreed to get the approval of revised PC-1 on time, if necessary.

#### 4-9. Confidentiality of the Draft Final Report


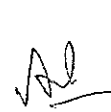
Both sides agreed that the draft final report shall be confidential, be dealt with carefully and not be disclosed to the third parties.

#### 4-10. Necessary Measures to be Taken by the Pakistani Side

The Pakistani side agreed to take necessary measures, described in ANNEX-1 for the smooth implementation of the Project.

END

ANNEX -1 Necessary Measures to be Taken by the Pakistani Side



## Necessary Measures to be Taken by the Pakistani Side

1. To provide necessary assistance in entry, exit and stay for Japanese Nationals and other personnel related to the Project, including issuance of a certificate and/or other documents.
2. To obtain prompt approval and permit related to landing and customs clearance of imported equipment.
3. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Pakistan with respect to the supply of the products and services under the verified contracts.
4. To secure transportation routes and temporary yard for construction materials, site office and container for newly procured equipment from outside to the Project site for installation.
5. To bear the commissions (advising commission of A/P, other necessary financial charges) to banks for the banking services based upon the Banking Arrangement(B/A).
6. To prepare enough budget for regular operation of equipment in order to maintain equipment condition.
7. To allocate enough budget for purchasing of furniture and fixing described in the final report.
8. To improve the level of existing technical staff or allocate proper qualified technical staff in order to satisfy the requirements outlined in the activities related to the Project
9. To provide for infrastructures (electricity and water supply) during the installation and training period to the equipment planed in the Project.

## Appendix-5 Cost Estimation borne by the Recipient country

(1) Temporary fence for store area	
1) Building of temporary fence	112,500Rs
<u>2) Removal of temporary fence</u>	<u>25,000Rs</u>
Subtotal	137,500Rs
(2) Removal of existing fence between PTC and SFDAC	
<u>1) Removal of existing fence</u>	<u>27,000Rs</u>
Subtotal	27,000Rs
(3) Shed for security	
1) Removal of existing shed	6,000Rs
<u>2) Building of new shed</u>	<u>64,000Rs</u>
Subtotal	70,000Rs
(4) Alteration of electric station	
<u>1) Alteration of electric station</u>	<u>100,000Rs</u>
Subtotal	100,000Rs
(5) Furniture	
1) Desk and chair (20sets)	100,000Rs
2) Whiteboard (3 sets)	105,000Rs
3) Table and chairs for testing room	200,000Rs
4) Shelf (4 sets)	92,000Rs
5) Cabinet (2 sets)	102,000Rs
<u>6) Desk and chair (15 sets)</u>	<u>97,500Rs</u>
	696,500Rs
	<u>Total 1,031,000Rs</u>

## Appendix-6 Equipment List

Code No.	Equipment Name	Quantity
<b>A: Compounding Equipment</b>		
NA-1	High speed mixer	1
NA-2	Container	1set
NA-3	Scale	1set
<b>B: Processing Equipment</b>		
NB-1	Extruder for pipe	1
NB-2	Water spray bath	1
NB-3	Natural drop water bath	1
NB-4	Haul off	1
NB-5	Inkjet printer for pipes	1
NB-6	Cutter for pipes	1
NB-7	Pipe belling machine	1
NB-8	Injection moulding machine for medium size fitting	1
NB-9	Injection moulding machine for small size fitting	1
NB-10	Injection moulds for fitting	1set
NB-11	Thermoforming machine	1
NB-12	Blow moulding Machine	1
<b>C: Recycle Equipment</b>		
NC-1	Band saw and crusher	1set
NC-2	Granulator for PVC	1
<b>D: Processing Support Equipment</b>		
ND-1	Folk lift	1
ND-2	Gantry crane	1
ND-3	Trolley	1set
ND-4	Mould temperature controller	1
ND-5	Material dryer	1
ND-6	Vacuum cleaner	1
<b>E: Testing Equipment</b>		
NE-1	Short/Long term Hydrostatic testing bath	1
NE-2	Falling ball impact testet	1
NE-3	HDT test equipment	1
NE-4	Opacity test equipment	1
NE-5	Pipe wall thickness measurement gauges	1
NE-6	Groove and internal dia. measurement gauges	1
NE-7	Fittings internal dia. measurement gauges	1
NE-8	Pipe Min.and Max. outside dia. measurement system	1
NE-9	Distillation apparatus	1
NE-10	Universal testing machine	1
NE-11	Digital hardness tester	1
NE-12	Circumference measurement tester for pipe	1
NE-13	Water Vapor Transmission Measuring Equipment	1
NE-14	Puncture resistance tester	1
NE-15	Humidity chamber for testing (Weather meter)	1
NE-16	Chest type of freezer	1

Code No.	Equipment Name	Quantity
NE-17	FTIR (Fourier Transform Infra Red Spectrophotometer)	1
NE-18	Gas chromatograph	1
NE-19	Thermal Analyzer DSC	1
NE-20	HPLC ( High Performance Liquid Chromatograph)	1
NE-21	Digital impact tester	1
NE-22	Creep tester	1
NE-23	Mullen type bursting strength tester	1
NE-24	Oxygen index tester	1
NE-25	Ozon aging tester	1
NE-26	Automatic gas permeability tester	1
NE-27	Digital thickness tester	1
NE-28	Ultrasonic flaw detector	1

**F: Second Processing Equipment**

NF-1	Ultrasonic welder	1
NF-2	Plumbing tools	1

**G: Educational Support Equipment**

NG-1	Computer for trainees	15
NG-2	Computer for instructor	1
NG-3	UPS (Uninterrupted Power Supply) for computer	1
NG-4	Computer for projector	1
NG-5	Copy	1
NG-6	Server	1
NG-7	Software	1set
NG-8	Multimedia Projector	1set
NG-9	Video/DVD player set	1set
NG-10	Digital video camera set	1set
NG-11	Books	1set
NG-12	Testing and production standards	1set

**H: Maintenance Equipment**

NH-1	Mechanical maintenance tools	1set
NH-2	Multimeter	1
NH-3	Electrical maintenance tools	1set