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UNITED NATIONS INDUSTRIAL  
DEVELOPMENT ORGANIZATION

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ENGLISH

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PROJECT DOCUMENT

ESTABLISHMENT OF APPLIED POLYMER RESEARCH LABORATORY  
IN THE UNION OF SOVIET APPLIED RESEARCH INSTITUTE

Project: DP/BUR/72/007/A/01/37

14.73-5305

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**UNITED NATIONS DEVELOPMENT PROGRAMME  
Project of the Government of  
THE UNION OF BURMA**

**Title:** Establishment of Applied Polymer Research Laboratory in the Union of Burma Applied Research Institute.

**Number:** BUR/72/007/A/01/37

**Duration:** Five years.

**Sector:** Industry (35)

**Sub-sector:** Establishment and extension of industries: manufacturing (3521)

**Government Co-operating Agency:** MINISTRY OF PLANNING AND FINANCE  
THROUGH  
UNION OF BURMA APPLIED RESEARCH INSTITUTE  
(UBARI)

**Executing Agency:** UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

**Date of submission:** 21 August 1972

**Starting Date:** 1 July 1973

**Government Contributions:** Kyats - 4,551,136

**UNEP Contributions:** U.S. \$832,670

**APPROVED:**

**Sd./ CHIT MOUNG**  
U Chit Mounng,  
Deputy Minister,  
Ministry of Planning and Finance  
On behalf of the Government

**Date: 9 July 1973**

**Sd./ HIMALAYA RANA**  
Himalaya Rana  
Resident Representative, UNEP, Rangoon  
On behalf of the Executing Agency

**Date: 9 July 1973**

**Sd./ HIMALAYA RANA**  
Himalaya Rana  
Resident Representative, UNEP, Rangoon  
On behalf of UNEP

**Date: 9 July 1973**

SECTION I: BACKGROUND AND SUPPORTING INFORMATION

A. JUSTIFICATIONS FOR THE PROJECT

(1) The demand for synthetic polymers in the world is increasing yearly as people are gradually changing over to the use of these polymers for clothing, industrial textiles, domestic utensils and dinnerwares in addition to a host of other domestic, agricultural and industrial uses. Thus the world production of synthetic fibres (such as polyesters) is increasing at the rate of about 30% per annum while that of plastics and resins (such as polypropylene, polyethylene, urea-formaldehyde and melamine-formaldehyde) is increasing at the rate of 20% per annum.

(2) The demands for these products are also increasing in the Union of Burma, as in the rest of the world, due to the convenience and superior qualities of these products. It is very appropriate therefore to consider the establishment of industries for producing suitable polymers in the Union of Burma and also the establishment of polymer research facilities to aid and advise these new industries, particularly since they involve complex chemical and technological factors which should be investigated by scientists and engineers before making the very heavy investments in foreign exchange for the capital equipment for these new industries. In fact, petrochemical industries which produce many of these polymers are some of the most expensive in capital outlay averaging several hundred million U.S. Dollars (in equivalent foreign exchange) for a single petrochemical complex and the associated processing facilities to manufacture the required consumer goods from the intermediate petrochemicals. The Union of Burma has at present some factories which make finished products out of synthetic polymers and these polymers (such as nylon and polyester fibres, polyethylene and polyvinyl chloride granules) all have to be imported with a consequent heavy drain on foreign exchange. Plans are, therefore, underway to establish factories (a) for producing yarns from imported polyester and nylon chips and (b) to manufacture polyester and nylon chips from imported intermediate products.

(3) Due to the fact that these polymers have to be imported, there are restrictions on their use and if they could be manufactured within the country their usage would be increased. With the limited local processing facilities the tonnage of plastic granules required per year is about 6,000 tons costing over two million dollars annually and this is expected to increase to 16,000 tons per year in the next decade. Also the annual import of all textiles is about 100 million square yards (equivalent to 20,000 tons) worth twenty million U.S. Dollars which could be substituted to some extent by synthetic textiles if only they could be produced locally.

(4) The present plastics fabrication industry in the country is in need of technical improvement and expansion in order to supply adequately the needs of the people. The country is also in need of a laboratory and testing facilities to test the raw materials and products and to advise on improvements.

(5) Burma also produces a sizable quantity of natural rubber. As such there exists many local rubber industries manufacturing rubber household goods. The demand for these is increasing every year but due to lack of research facilities, these industries continue to produce low quality products. Therefore due to the pressing need for the production of quality goods, the government envisages the establishment of a laboratory which could provide assistance to the local industries in the manufacture of quality rubber products.

(6) The textile industry is also in a similar situation to the plastics and rubber industries and in addition requires expansion in the synthetic textile production including regenerated cellulose fibre yarns in order to supply the needs of the population which is increasing year after year. In this field, Burma is very fortunate to have enormous reserves of bamboo and tropical hardwoods. This opens a splendid opportunity for the establishment of rayon and other cellulosic yarn industries to meet the requirement of the ever expanding textile industry. Rayon may be turned into cheap clothing and it may also be blended with polyester and cotton for quality clothing. Thus there exists a great need for natural and synthetic polymer research facilities to give technical services to the existing factories and also to advise and assist the proposed new textile industries.

(7) Even now in Burma, plastics and synthetic resins have found innumerable uses, for example, in irrigation, animal and crop protection, utilization of agricultural wastes, and in the building, packaging, paper, plywood and other industries.

(8) Increasing quantities of synthetic fibre products are being used as textiles, ropes, fishing nets, conveyor belts, etc.

(9) It appears that adequate supplies of a wide range of raw materials are available in Burma for the manufacture of polymer goods. It is envisaged that after the establishment of a new refinery, a large supply of naphtha will become available. Also there is a possibility for natural gas production in the country. These constitute the main raw materials for a petrochemical complex leading to the production of polymer products.

(10) The development of plastics and synthetic fibre research will help many existing and planned industries in Burma. For example, synthetic resins are used in the manufacture of paper products requiring high wet strength, e.g. paper towels, napkins, tissues, etc. Also there is a possibility of increasing the production and upgrading of the alkyd resins, produced in this country, for the paint industry. Some of these resins such as urea-formaldehyde and phenol-formaldehyde are invaluable as adhesives in the plywood industry. The production of plastics and synthetic fibre products would consume many by-products of petroleum refining. Burma already has two plants for the manufacture of urea fertiliser. Surplus urea would find extensive use in the manufacture of amino resins, eg. urea-formaldehyde and melamine-formaldehyde, which are used as adhesives, break-resistant crockery, etc. A caustic soda and chlorine plant is already in operation and there are also plans for more factories of the type in connection with pulp and paper manufacture.

(11) As a matter of policy, the Government desires maximum utilization of domestic raw materials by new industries, and it discourages the setting up of new industries based on imported raw materials. It is also desirable to create more employment for the people, and to see that imported goods are increasingly substituted with locally-made goods. The Government is naturally inclined to favour industries that can start production quickly.

(12) However, the development of the polymer industries in Burma has been handicapped by the lack of a sufficient number of skilled personnel and of quality control as well as by the absence of adequate technological and applied research services to industries consuming polymeric materials.

(13) For the above reasons the Government of Burma has proposed to establish an applied polymer research laboratory at the Union of Burma Applied Research Institute, which is a government organization under the Ministry of Planning and Finance.

(14) The reasons for choosing to establish the new applied polymer research laboratory (APRL) at the Union of Burma Applied Research Institute (UBARI) are:- (i) UBARI is the only multidisciplinary applied research institute in Burma established since 1955 for science and technology and is inherently suited for this purpose. (ii) The establishment of APRL within UBARI will bring mutual benefit to APRL and UBARI, because the existing departments of UBARI will provide valuable supporting services to APRL and the facilities of APRL will strengthen UBARI and extend its activities. (iii) Adequate space is available in the land belonging to UBARI for the construction of a building for Applied Polymer Research. (iv) Funds have been allocated to UBARI for use

in constructing buildings and facilities for the Applied Polymer Research Laboratory.

## B. INSTITUTIONAL FRAMEWORK

(15) The Ministry of Planning and Finance, through the UBARI is the cooperating agency for this project. The UBARI, where the APRL is intended to be established, began effective operation, i.e. conduct of research activities on an organised scale, in 1955 and its funds are derived solely from the Government of Burma. Currently its annual budget is approximately US \$ 600,000.

(16) The total present staff numbers 353; of these, 70 are university graduates, holding Ph.D., M.Sc., and B.Sc. degrees. The rest are technicians with varying degrees of sub-professional training. The government has recently approved to strengthen UBARI. Its staff complement will be increased to a total of 604 personnel in the next five years. The UBARI is a multidisciplinary applied research institution with 12 different disciplines which are as follows:-

1. Cellulose & Paper Technology
2. Applied Chemistry
3. Food Technology
4. Pharmaceutical Chemistry
5. Ceramics Technology
6. Metallurgy
7. Physics & Engineering
8. Analytical Chemistry
9. Standards
10. Atomic Energy
11. Technical Information
12. Instrumentation

(17) Each of these disciplines, organised as departments of UBARI, is headed by a senior scientist who has had specialised training in his respective field abroad. Provisions have been made for appropriate additions to the staff for the APRL and the other components of the UBARI.

(18) The UBARI departments are housed in a building complex, numbering 40 in all, on a 36 acre site in Rangoon which leaves ample space for expansion as new fields of investigations are added to the present operation. Each of these buildings have been designed and constructed to suit the operation and the equipment that is intended to be housed. A new building costing approximately US \$ 400,000 is about to be constructed for the APRL. The APRL will operate as a component of the UBARI and



will enjoy the full benefits of the technical services and other facilities of the UBARI. It would, through the UBARI, have a close relationship with the Forest Research Institute, the Myanma Oil Corporation laboratories, the various Universities and Colleges of Burma, and other research institutions and industries in Burma, including paper and rubber industries.

(19) UBARI operates under the supervision and control of the Ministry of Planning and Finance through the Chairman, UBARI, who is assisted by the Board of Directors.

#### C. PROVISIONS FOR GOVERNMENT FOLLOW-UP

(20) Provision for the follow-up of the project would be made through normal budget allocations of the Government to the UBARI. The Government fully recognises the importance of the activities of UBARI to both industry and applied research in Burma.

(21) A decision has been made by the Government to add APRL as a component to the UBARI. The reasons for arriving at this decision are given in (14). As such, plans have been laid for both the provision of staff for the APRL and the strengthening of the UBARI. Drawings have been completed, after consultation with the UNIDO mission which visited UBARI in 1971, and funds allocated for the APRL building.

#### D. OTHER RELATED ACTIVITIES

(22) Since it was realized that establishment of the applied polymer laboratory required advice from foreign experts concerning layout, equipment specifications, proposed programme of work and the kind of technical assistance, financial assistance from UNDP and other sources, the Government forwarded a request through the UNDP Resident Representative Dr. El Maraghi for a UNIDO advisory mission for discussion with the appropriate authorities in Burma.

(23) The United Nations Industrial Development Organization responded by sending a team of three experts, Professor Robert N. Haward (U.K.), Dr. E. Braunsteiner (Austria) and UNIDO staff member Dr. H. May as team leader on a Special Industrial Services Mission to Burma from 2 September to 17 September 1971.

(24) The mission undertook a technical study of requirements of the laboratory in order to establish the present and future needs of polymers in the country taking into consideration the raw material sources and Government industrial development policy. As a result of the study which included plant visits

and discussions, it was decided that a request should be submitted to the UNDP for technical assistance as soon as possible.

(25) The UNIDO mission prepared the list of equipment required for the synthetic polymer research described in this proposal. The equipment for the natural polymer research was listed by the scientists of the UBARI.

#### E. FUTURE UNDP ASSISTANCE

(26) In future as needs arises for unforeseen additions to the present project, bilateral assistance may be sought for specific complementary polymer research activities from the UNDP.

### SECTION II: OBJECTIVES OF THE PROJECT

(27) This project forms part of the approved Country Programme and is closely linked with the expansion programme of the Union of Burma Applied Research Institute.

#### A. LONG-RANGE OBJECTIVES

(28) The demand for synthetic polymers, such as plastics materials, yarns and natural polymers like rayon and rubber is increasing year by year. Burma already has many factories producing these commodities based on imported semi-finished products. Exception to this is rubber industry which is using latex produced in the country. The proposed polymer laboratory will do the research work necessary for the establishment of polymer industries based on indigenous raw materials and give advice to the government in planning of new polymer industries and to provide technical assistance to the existing polymer factories in upgrading the qualities of the products.

#### B. IMMEDIATE OBJECTIVES

(29) To develop an effective well-organized and well-equipped polymer laboratory composed of the following departments in the Union of Burma Applied Research Institute:-

- (a) Thermosetting Resins Department
- (b) Plastics Properties and Processing Department
- (c) Fibre Technology Department
- (d) Rayon Research Department
- (e) Rubber Research Department

- (30) Facilities for rayon and rubber research will be respectively incorporated to the Cellulose & Paper Research Department and the Applied Chemistry Research Department, which will be responsible for effective research. These departments have trained scientists to carry out research in the respective fields.
- (31) To establish a practical-oriented synthetic polymer research programme to collect the data necessary for the establishment of factories producing polymer materials already in use in Burma.
- (32) To train the local scientists in various fields of polymer chemistry.
- (33) To install and operate the urea-formaldehyde resin pilot plant and test-produce as soon as possible. The product will be tested for quality in the existing plywood factories and this experiment is to continue until the plywood engineers are completely satisfied with the result. Based on this a proposal would be drawn up to set up a full-scale urea-formaldehyde factory in Burma for submission to the Ministries of Planning and Finance and Industry.
- (34) To train the local scientists in resin synthesis, formulations and compounding with additives as well as moulding techniques.
- (35) To train the local scientists in the analysis of synthetic fibres and plastics by both chemical and instrumental techniques.
- (36) To train the local scientists in the operation and maintenance of various equipment purchased for polymer research.
- (37) To train the local scientists in mechanical testing of fibres and yarns and in evaluation of testing results especially using Instron Universal Testing Instrument and Uster Evenness Tester.
- (38) The project is primarily technologically-oriented and has no direct investment potential. However, the APRL will yield data of value in stimulating, planning and financing the further development of the plastics, rubber and textile industries in Burma and should, therefore, lead indirectly to an increase in investment in the respective industries.

SECTION III:

WORK PLAN

A. Project Activities

Location

Starting date  
and proposed  
duration

1. Preparatory activities to be carried out by the Government to ensure the timely implementation of the Project

(a) The Government will complete the construction of a three-storeyed laboratory building having floor space of 1500 sq.m., fully furnished with locally available laboratory and office furniture, complete with water, fuel and electrical installations.

UBARI

To be completed  
by September  
1975

(b) Substantial space allowance is made in the undeveloped area for the storage of raw materials and experimental products from the pilot plants and processing laboratories.

UBARI

2. Timing of project activities

(a) (Preliminary) Preparatory activities

The Project Manager will arrive in July 1973 and he will in consultation with the local counterparts carry out the following:-

UBARI

Starting  
July 1973

(i) Draw up a list of equipment necessary for the laboratories and pilot plant so that the equipment will arrive together with the experts.

- |  | Location | Starting date and proposed duration. |
|--|----------|--------------------------------------|
| (ii) Supervise and oversee the construction of the laboratories and installation of utilities. |          |                                      |
| (iii) Draw up tentative work programme for the experts.  |          |                                      |
| (iv) Draw up a training programme to be conducted by experts for the local staff.              |          |                                      |
| (v) Draw up a fellowship programme for the local staff to be sent abroad for further training. |          |                                      |
| <b>(b) <u>Thermo-setting Resins Laboratory</u></b>   |          |                                      |
| (i) Recruit suitable local personnel in time for the arrival of the expert.                    | UBARI    | From January 1974                    |
| (ii) Set up laboratory and pilot plant on the arrival of experts and equipment.                |          | July-Sept. 1974                      |
| (iii) Initiate the work programme agreed upon  |          | From Oct. 1974                       |
| (iv) Experiment and test produce UP on pilot plant scale.                                      |          | From Jan. 1975                       |
| (v) Lay foundation for future work on other resins and free radical polymerisation processes.  |          | From Oct. 1975                       |
| <b>(c) <u>Plastics Properties and Chemical Analysis</u></b>                                    |          |                                      |
| (i) Recruit suitable local personnel in time for the arrival of the expert.                    | UBARI    | From July 1974                       |

	Location	Starting date and proposed duration
(ii) Set up laboratory on the arrival of expert.		Jan - March 1975
(iii) Initiate the work programme of the study of polymer properties.		From April 1975
(iv) Evaluate the resins produced in the UF. programme with standard specifications and to find out best conditions for moulding of these resins.		From April 1975
(v) Extend the testing activities to polymers and plastic products used in local industries.		From July 1975
(vi) Lay foundation for future technical support work in the processing of polymers for the local manufacturers of plastic products.		From Oct. 1975
<b>(d) <u>Fibre Testing Laboratory</u></b>		
(i) Recruit suitable local personnel in time for the arrival of the expert.	UBARI	From July 1974
(ii) Set up a testing laboratory on the arrival of the expert.		Jan - March 1975
(iii) Initiate the work programme for physical and chemical testing of fibres, yarn and textiles and for the study of dyeing and finishing processes of natural and artificial fibres, local as well as imported.		From April 1975
(iv) Extend the activities so as to be able to help the agricultural sector in the grading of cotton and other agricultural fibres and also to assist the industrial sector to improve spinning, weaving, dyeing and finishing processes.		From April 1975

B. Description of UNDP Inputs                      Location      Starting Date      Duration

Assignment of International Staff

11-01 Project Manager                      Rangoon              July-1973              60/mn

He should be a polymer scientist with extensive applied research experience in the plastics and /or synthetic fibre industry. He should be familiar with the organization and conduct of applied research and technical service laboratories and be able to collaborate effectively with research personnel. He must have management experience and be a skilled administrator since his duties will be the overall professional and administrative management of the project.

11-02 Polymer Chemist(Amino-resins) Rangoon              July-1974              18/mn

He should be familiar with the chemistry of urea and melamine-formaldehyde resins. In collaboration with counterpart chemists, he will design and carry out a work programme in synthesizing various amino resins for applications as adhesives, lacquers, paints and resins for paper and textile treatment. He will also train and advise counterpart chemists in scaling up laboratory experiments to pilot plant quantities for commercial evaluation.

	<u>Location</u>	<u>Starting Date</u>	<u>Duration</u>
11-03	<u>Thermosetting plastics technologist (amino-plastics)</u>	Rangoon July 1974	12/mn
	He should have long experience in the production of urea and melamine-formaldehyde moulding powders. He will train his counterparts in resin synthesis, formulations and compounding with additives as well as moulding techniques.		
11-04	<u>Plastics testing expert</u>	Rangoon Jan. 1975	9/mn
	He should be familiar with standard mechanical testing procedures for both fibres (synthetic and natural) and plastics. He will demonstrate to his counterparts the use of testing equipment and advise on various standards to be adopted for fibres and plastics.		
11-05	<u>Fibre technologist</u>	Rangoon Jan. 1975	9/mn
	He should have experience in mechanical testing of single fibre and yarn including the use of specialised equipment such as the Instron Universal Testing Instrument and Uster Evenness Tester. He will train counterparts in mechanical testing of fibres and yarns and in evaluation of testing results.		



	<u>Location</u>	<u>Starting Date</u>	<u>Duration</u>
11-06 <u>Analyst</u>	Rangoon	Jan. 1975	9/mn
He should be an expert in the analysis of synthetic fibres and plastics by both chemical and instrumental techniques and train the counterparts in these techniques.			
11-07 <u>Polymer Chemist (addition polymerization)</u>	Rangoon	July. 1976	12/mn
As a polymer chemist specializing in addition polymerization, he will advise and design a work programme in this field. He will demonstrate and instruct the experimental techniques used especially for polymerization studies on vinyl chloride. Knowledge on processing and testing PVC as well as applications will be desirable.			
11-08 <u>Short-term consultants</u>	Rangoon	As required in 1975, 1976 and 1977.	6/mn
High level specialists are to advise the project in various fields dealing with specialized and specific technical problems as deemed desirable.			

Training Provisions for Staff  
of the APRIL

Fellowships

<u>Subject</u>	<u>Number</u>	<u>Locations</u>	<u>Starting Date</u>	<u>Duration</u>
31-01 Rubber Technology	1	U.K., Japan W. Germany	April 1974	9/mn
31-02 Study tours to uni- versities, research institutes and polymer factories	6	Open	July 1974	9/mn
31-03 Thermosetting Resins	4	U.K., Japan, W. Germany	April 1975	36/mn
31-04 Management	1	"	April 1975	9/mn
31-05 Thermoplastics Resins	4	"	Oct. 1975	36/mn
31-06 Fibre	2	"	April 1976	18/mn
31-07 Polymer Analysis	2	"	April 1976	18/mn
31-08 Rayon Manufacture	1	"	April 1976	9/mn

In addition to the above fellowships, separate arrangements have been made by the Government of Burma to send 12 scholars abroad from 1973 for advanced studies in various fields of high polymers leading to M.Sc. and Ph.D. degrees.

Details of Non-expendable items other than vehicles  
valued in US Dollars

Section	Total	1973	1974	1975	1976	1977
Synthetic Polymer Laboratories	201,700	-	123,300	64,000	14,400	
Natural Polymer	75,000	-	50,000	25,000	-	
	276,700	-	173,300	89,000	14,400	

Details of Non-expendable equipment valued in U.S. Dollars

Section	Total	1973	1974	1975	1976	1977
3 No Vehicles for 7 experts	7,000	7,000	-	-	-	-
	7,000	7,000	-	-	-	-

Details of Expendable items valued in U.S. Dollars

Section	Total	1973	1974	1975	1976	1977	1978
Chemicals and Raw Materials	25,000	-	5,000	5,000	-	7,500	7,500
Spare-parts	44,000	-	5,000	10,000	9,000	10,000	10,000
	69,000	-	10,000	15,000	9,000	17,500	17,500

Details of miscellaneous expenditures valued in U.S. Dollars

Section	Total	1973	1974	1975	1976	1977	1978
Freight and Insurance	36,670	500	19,630	12,130	3,440	500	470
Contingencies	20,000	-	2,000	4,000	4,000	5,000	5,000
	56,670	500	21,630	16,130	7,440	5,500	5,470

Details of non-expendable items other than vehicles  
for possible supply through the USAF contribution

For synthetic polymer research (\$201,700)

Sections: Thermosetting resin department; Plastics properties and processing department and Fibre technology department.

<u>Equipment:</u>	Analytical balance (2)	\$ 2,500
	Balance (Top pan)	400
	Melt indexer	2,000
	Instron Universal Testing Machine	15,000
	Hounsfield Tensometer	5,000
	Milling Machines for test specimen	1,200
	Drying Ovens (3)	3,000
	Vicat Tester	3,000
	Brittleness Tester	2,000
	Autoclaves	3,000
	UV - IR lamps	300
	Electrical conductivity instrument	500
	Tracking resistance apparatus	1,200
	Brabender Plastograph	8,000
	Laboratory hot rolls (electric)	8,000
	Abrasion Tester	2,000
	Flexural Tester	600
	Dimensional Stability tester	1,500
	DTA-TGA apparatus	12,000
	Thermostats	1,000
	pH meters	500
	Furnace	400
	Uster evenness tester	1,500
	Avery impact testers (2)	1,400
	Microscope (hot-stage)	2,000
	Microscope (binocular zoom)	400
	Thermosetting resin pilot plant (Still, filter, mixer, ball-mills and accessories)	30,000
	Compression moulding machine	5,000
	Injection moulding machine for thomosets (plus moulds)	5,000
	Gas Liquid Chromatograph, preparative model	20,000
	IR-Spectrometer	15,000
	UV-Spectrometer	10,000
	Multi-daylight press	4,000
	Moulds for Compression machine	5,000
	Twist tester	150
	Cotton Sorter	1,000

Temperature control and humidity control equipment	\$ 15,000
Automatic Washer	500
Laundrometer	500
Bursting tester	300
Dyeing equipment	1,500
Dyeing equipment (high temperature)	1,500
Crock-meter	200
Fabric Inspection tables	200
Wet processing apparatus	700
Cotton colorimeter	800
Polymer molecular weight determination unit	4,000
Kathetometer	1,000
Micronaire	1,000
Microtome	800
Yarn appearance apparatus	250

Sub-total:- \$ 201,700

**For natural polymer research (\$75,000)**

**Section:** To be incorporated to Cellulose and Paper Research Department and Applied Chemistry Research Department of the Union of Burma Applied Research Institute.

**Equipment:**

Laboratory equipment for making rayon and other cellulose derivatives like polynosic fibre, cellulose acetate, cellulose butyrate, lacquers etc. from dissolving pulp complete with film and yarn extrusion unit and dexanthation unit	\$ 25,000
Laboratory equipment for producing dissolving pulp from indigenous raw materials. One 10lb. digester, Valley and PFI beaters, Sheet-making machine and other auxiliary equipment	\$ 25,000
Laboratory equipment for producing quality rubber products from latex and testing machines for various rubber products	\$ 25,000
	<u>\$ 75,000</u>

Total for non-expendable equipment  
other than vehicles \$ 276,700

Details of non-expendable items  
(vehicles) for possible supply  
through the UNDP Contribution  
Vehicles (for field transport) 7,000

Total for non-expendable equipment:- \$ 283,700

Details of expendable items for  
possible supply through the UNDP  
contribution.

(1) Chemicals and raw materials \$ 25,000

(2) Spareparts \$ 44,000

Total for expendable items:- \$ 69,000

Details of miscellaneous expenditure  
for possible supply through the UNDP  
contribution.

(1) Freight and insurance \$ 36,670

(2) Contingencies \$ 20,000

Sub-total for miscellaneous items:- \$ 56,670

GRAND TOTAL:- \$ 409,370

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PROJECT BUDGET COVERING UNDP CONTRIBUTION

( in U.S. \$ )

Country : BURMA  
 Project No : BUR/ 72 / 007 / A / 01 / 37 /  
 Title : Establishment of Applied Research Laboratories at the  
 Union of Burma Applied Research Institute.

	1972	1973	1974	1975	1976	1977	1978	Total
	n/a	\$	n/a	\$	n/a	\$	n/a	\$
<del>10-PROJECT</del>								
<del>11-PROJECT</del>								
11-01 Project Manager	6	15000	12	30000	12	30000	6	150000
11-02 Polymer Chemist (amino-resins)	6	15000	12	30000			18	45000
11-03 Bore-setting Plastics Technologist (amino-plastics)	6	15000	6	15000			12	30000
11-04 Plastics Testing Expert			9	22500			9	22500
11-05 Fibro Technologist			9	22500			9	22500
11-06 Analyst			9	22500			9	22500
11-07 Polymer Chemist (Addition polymeri- sation)					6	15000	6	30000
11-08 Consultants			2	5000	2	5000	6	15000
<b>Component Total:</b>	<b>6</b>	<b>15,000</b>	<b>24</b>	<b>60,000</b>	<b>20</b>	<b>50,000</b>	<b>135</b>	<b>337,500</b>

1973 1974 1975 1976 1977 1978 Total

**30-31 POLYMER MANUFACTURE**

	1973	1974	1975	1976	1977	1978	Total
31-01 Rubber Technology	-	9	-	-	-	-	9
31-02 Thermosetting Resins	-	-	5050	-	-	-	5050
31-03 Thermosetting Resins	-	-	5050	-	-	-	5050
31-04 Thermosetting Resins	-	-	5050	-	-	-	5050
31-05 Thermosetting Resins	-	-	5050	-	-	-	5050
31-06 Management	-	-	2350	6	2700	-	5050
31-07 Thermoplastic Resins	-	-	2350	6	2700	-	5050
31-08 Thermoplastic Resins	-	-	2350	6	2700	-	5050
31-09 Thermoplastic Resins	-	-	2350	6	2700	-	5050
31-10 Thermoplastic Resins	-	-	-	9	5050	-	5050
31-11 Fibre	-	-	-	9	5050	-	5050
31-12 Fibre	-	-	-	9	5050	-	5050
31-13 Polymer Analysis	-	-	-	9	5050	-	5050
31-14 Polymer Analysis	-	-	-	9	5050	-	5050
31-15 Rayon Manufacture	-	-	-	9	5050	-	5050
31-59 Sub-total	9	9	5050	69	36,050	-	135
32 Group training (Study tour)	9	9	10,050	-	-	-	9
32 Component Total	18	18	15,100	69	36,050	-	144

**40-42 EXPENDABLE**

41 Expendable	-	-	10,000	9,000	17,500	17,500	69,000
42 Non-expendable	7,000	173,300	89,000	14,400	-	-	283,700
Component Total	7,000	183,300	104,000	23,400	17,500	17,500	352,700

**50-56-58 (A) AND INSURANCE (VEHICLES EXCLUDED)**

50-56-58 (A) and insurance (vehicles excluded)	500	19,630	12,130	3,440	500	470	36,670
Contingencies	-	2,000	4,000	4,000	5,000	5,000	20,000
Component Total	500	21,630	16,130	7,440	5,500	5,470	56,670

**Grand Total:-** 22,500 280,030 302,280 116,890 73,000 37,970 832,670



## C. DESCRIPTION OF GOVERNMENT INPUTS

### 1. Financial Obligations

The Government will finance the budget of the APRL project approximately to the amount of Kyats 4,551,136 over the five year period (1973-1977). Budgetary provision for the project would be made through the budget of the UBARI.

### 2. Assignment of National Staff

The main counterpart officer for the project will be one of the Directors of the Institute and a total complement of 20 research staff has been provided for the APRL in the first 2 year period of the project. An additional 20 is to be added in the next three year period. There will be 5 main sections established in the APRL with each section having an appropriate head who will act as a counterpart for the relevant UNDP Expert.

### 3. Training

The Government will assist in the training programmes of the local staff both at home and abroad.

### 4. Government provided supplies and equipment

- (1) It is planned to accommodate the APRL in a new laboratory building to be built in the UBARI Compound.
- (2) The Government will provide locally available expendable and non-expendable equipment to complement the equipment supplied by UNDP.

### 5. Miscellaneous

- (1) The Government will provide funds for internal travels for the UNDP experts and the national staff, considered necessary for the successful execution of the assignment.
- (2) Under the miscellaneous heading are also included various costs such as electricity, water supply, fuel, operating costs of vehicles, internal telephones, local taxes and duties, and contingencies.

Details of buildings to be provided by the Government

1. Residential - No provision has been made for experts and consultants since it is presumed that the UNDP will take care of this matter.
2. Research Building- A three storeyed building having a total floor space area of 1500 square meters fully furnished with locally available laboratory and office furniture and complete with electricity, water, and gas installations.

**UNITED STATES GOVERNMENT**  
**DEPARTMENT OF COMMERCE**  
**OFFICE OF ECONOMIC DEVELOPMENT**

**Project No. :** **DAW-70-0001/001/77**  
**Title :** **Establishment of Applied Research Laboratory at the Dallas of Bureau Applied Research Institute.**

	1975		1976		1977		1978	
	SA	EA	SA	EA	SA	EA	SA	EA
<b>Total</b>	72	100,800	12	16,800	12	16,800	12	16,800
<b>Admin Research Officers</b>	120	109,200	-	-	12	9,600	16	51,200
<b>Research Officer I</b>	168	109,440	-	-	16	16,800	16	16,800
<b>Research Officer</b>	96	658,200	192	57,960	192	63,960	192	48,600
<b>Assistant Research Officer</b>	624	197,880	12	1,572	12	9,720	12	42,480
<b>Laboratory Assistant</b>	480	60,000	-	-	60	1,572	60	1,572
<b>Laboratory Assistant</b>	480	40,000	-	-	60	1,572	60	1,572
<b>Project Total:</b>	2088	1,053,480	156	70,320	228	100,800	228	147,156

**Personnel** Expenses for working in Bureau and abroad included in Project Personnel.

**SA, EA**

**Project Budget (Local currencies) continued**

	1975 Lyats	1976 Lyats	1975 Lyats	1976 Lyats	1977 Lyats	1978 Lyats
<b>EXPENDITURE</b>						
1. Irrecoverable	500,000	-	100,000	100,000	100,000	100,000
2. Non-expendable	-	-	-	-	-	-
3. Laboratory building	2,000,000	742,000	1,000,000	258,000	-	-
<b>Component total:-</b>	<b>2,500,000</b>	<b>742,000</b>	<b>1,100,000</b>	<b>358,000</b>	<b>100,000</b>	<b>100,000</b>
<b>OPERATIONAL EXPENDITURE</b>						
1. Operation and maintenance	487,500	30,000	60,000	112,500	125,000	80,000
2. Sundry	510,150	15,000	435,150	15,000	15,000	15,000
<b>Component total:-</b>	<b>997,650</b>	<b>45,000</b>	<b>495,150</b>	<b>127,500</b>	<b>140,000</b>	<b>95,000</b>
<b>GRAND TOTAL:-</b>	<b>4,551,150</b>	<b>665,320</b>	<b>1,697,570</b>	<b>632,602</b>	<b>472,980</b>	<b>406,624</b>



ANNEX I

ORGANISATION OF THE PROJECT

1. Pending finalisation of the new consolidated Standard Agreement with Governments, the following standard text is to be appended to all project documents.

General responsibilities

2. The Government, the UNDP and the Executing Agency shall jointly be responsible for the execution of the project and the realisation of its objectives as described in Section II of this Project Document.

3. The Government shall provide to the project the national project personnel, training facilities, land, building, equipment and other required services and facilities. It will designate the Government Co-operating Agency named in the cover page of this document, which will hereinafter be referred to as the "Co-operating Agency" and which will be directly responsible for the implementation of the Government contribution to the project.

4. The UNDP undertakes to complement and supplement the Government participation and will provide through the Executing Agency the required expert services, training, equipment and other services within the funds available to the project.

5. Upon commencement of the project the Executing Agency may be requested to assume primary responsibility for project execution. However, that primary responsibility shall be exercised in consultation and in agreement with the Co-operating Agency. Arrangements to this effect shall be stipulated in the project Work Plan as well as for the transfer of this responsibility to the Government or to an entity designated by the Government during the execution of the project.

6. Part of the Government's participation may take the form of a cash contribution to UNDP. In such cases, the Executing Agency will provide the related services and facilities and will account annually to the UNDP and to the Government for the expenditure incurred.

Participation of the Government

7. The Government shall provide to the project the services, equipment and facilities in the quantities and at the times specified in the Work Plan. Budgetary provision - either in kind or in cash - for the Government's participation so specified shall be set forth in the Project Budgets.

8. The Co-operating Agency shall in consultation with the Executing Agency assign a director for the project on a fulltime basis. He shall carry out such responsibilities in the project as are assigned to him by the Co-operating Agency.
9. The estimated cost of items included in the Government contribution, as detailed in the Project Budget, shall be based on the best information available at the time of drafting this project proposal. It is understood that price fluctuations during the period of execution of the project may necessitate an adjustment of said contribution in monetary terms; the latter shall at all times be determined by the value of the services, equipment and facilities required for the proper execution of the project.
10. Within the given number of man-months of personnel services described in the Work Plan minor adjustments of individual assignments of project personnel provided by the Government may be made by the Government in consultation with the Executing Agency, if this is found to be in best interests of the project.
11. The Government shall continue to pay the local salaries and appropriate allowances of national project personnel during the period of their absence from the project while on UNDP fellowships.
12. The Government shall defray any customs duties and pay other charges related to the clearance of project equipment, its transportation, handling, storage and related expenses within the country. It shall be responsible for safe custody of the equipment, its installation and maintenance, insurance and replacement if necessary, after delivery to the project site.
13. The Government shall make available to the project-subject to existing security provisions - any published and unpublished reports, maps, records and other data which are considered necessary to the implementation of the project.
14. The Government shall assist all project personnel in finding suitable housing accommodation at reasonable rents.
15. The services and facilities specified in the Work Plan which are to be provided to the project by the Government by means of a contribution in cash shall be set forth in the Project Budget. Payment of this amount shall be made in local currency to the UNDP in accordance with the Schedule of Payments by the Government.

16. Payment of the abovementioned contribution to the UNDP on or before the dates specified in the Schedule of Payments by the Government is a pre-requisite to commencement or continuation of project operations.

Participation of the UNDP and of the Executing Agency

17. The UNDP shall provide to the project through the Executing Agency the services, equipment and facilities described in the Work Plan. Budgetary provision for the UNDP contribution as specified shall be set forth in the Project Budget.

18. The Executing Agency shall consult with the Government on the candidature of the Project Manager who, under the direction of the Executing Agency, will be responsible in the country for the Executing Agency's participation in the project. The Project Manager shall supervise the experts and other agency personnel assigned to the project, and the on-the-job training of national project personnel. He shall be responsible for the management of all equipment provided to the project from UNDP funds.

19. The Executing Agency, in consultation with the Government, shall assign international staff and other personnel to the project as specified in the Work Plan, select candidates for fellowships and determine standards for the training of national project personnel.

20. Fellowships shall be administered in accordance with the fellowships regulations of the Executing Agency.

21. The Executing Agency may, in agreement with the Government and UNDP, execute part or all of the project by sub-contract. The selection of sub-contractors shall be made, after consultation with the Government, in accordance with the Executing Agency's procedures.

22. All material, equipment and supplies which are purchased from UNDP resources will be used exclusively for the execution of the project, and will remain the property of the UNDP in whose name it will be held by the Executing Agency. Equipment supplied by the UNDP shall be marked with the insignia of the UNDP and of the Executing Agency.

23. Arrangements may be made, if necessary, for a temporary transfer of custody of equipment to local authorities during the lifetime of the project without prejudice to the final transfer.

1/ May also be designated Team Leader or Chief Technical Adviser, as appropriate



24. Prior to completion of UNDP assistance to the project, the Government, the UNDP and the Executing Agency shall consult as to the disposition of all project equipment provided by the UNDP. Title to such equipment shall normally be transferred to the Government, or to an entity nominated by the Government, when it is required for continued operation of the project or for activities following directly therefrom. The UNDP may, however, at its discretion, retain title to part or all of such equipment.

25. At an agreed time after the completion of UNDP assistance to the project, the Government and the UNDP, and if necessary the Executing Agency, shall review the activities continuing from or consequent upon the project with a view to evaluating its results.

#### Facilities, privileges and immunities

##### UNDP and Executing Agency personnel

26. In accordance with the agreement concluded by UNDP and the Government concerning the provision of assistance, the personnel of UNDP and other United Nations organisations associated with the project, shall be accorded facilities, privileges and immunities specified in the said agreement.

##### Sub-contractors and their personnel

27. The Executing Agency's contractors and their personnel (except Government nationals employed locally) shall:

- (a) Be immune from legal process in respect of all acts performed by them in their official capacity in the execution of the project;
- (b) Be immune from national service obligations;
- (c) Be immune together with their spouses and relatives dependent on them from immigration restrictions;
- (d) Be accorded the privileges of bringing into the country reasonable amounts of foreign currency for the purposes of the project or for personal use of such personnel, and of withdrawing any such amounts brought into the country, or in accordance with the relevant foreign exchange regulations, such amounts as may be earned therein by such personnel in the execution of the project;

- (e) Be accorded together with their spouses and relatives dependent on them the same repatriation facilities in the event of international crises as diplomatic envoys.

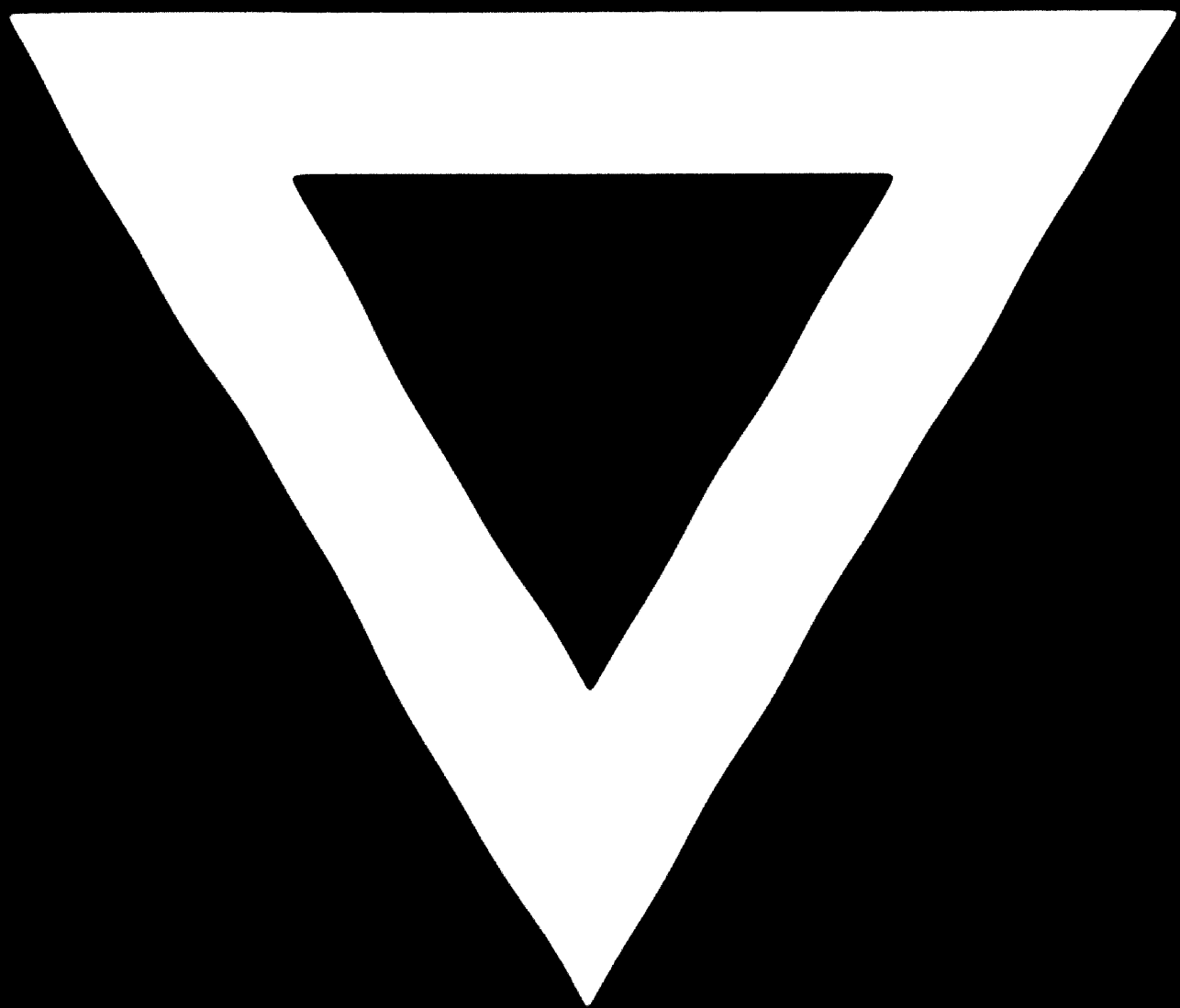
28. All personnel of the Executing Agency's contractors shall enjoy inviolability for all papers and documents relating to the project.

29. The Government shall either exempt from, or bear the cost of any taxes, duties, fees or levies which it may impose on any foreign firm or organisation which may be retained by the Executing Agency and on the foreign personnel of any such firm or organisation in respect of:

- (a) The salaries or wages earned by such personnel in the execution of the project;
- (b) Any equipment, materials and supplies brought into the country for the purposes of the project or which, after having been brought into the country, may be subsequently withdrawn therefrom;
- (c) Any substantial quantities of equipment, materials and supplies obtained locally for the execution of the project, such as, for example, petrol and spare parts for the operation and maintenance of equipment mentioned under (b) above, with the provision that the types and approximate quantities to be exempted and relevant procedures to be followed shall be agreed upon with the Government and, as appropriate, recorded in the Work Plan; and
- (d) As in the case of concessions currently granted to UNDP and Executing Agency's personnel, any property brought, including one privately owned automobile per employee, by the firm or organisation or its personnel for their personal use or consumption or which after having been brought into the country, may subsequently be withdrawn therefrom upon departure of such personnel.

30. The privileges and immunities to which such firm or organisation and its personnel may be entitled, referred to in the paragraphs above, may be waived by the Executing Agency where, in its opinion or in the opinion of the UNDP, the immunity would impede the course of justice and can be waived without prejudice to the successful completion of the project or to the interest of the UNDP or the Executing Agency.

31. The Executing Agency shall provide the Government through the Resident Representative with the list of personnel to whom the privileges and immunities enumerated above shall apply.



**76. 02. 13**