

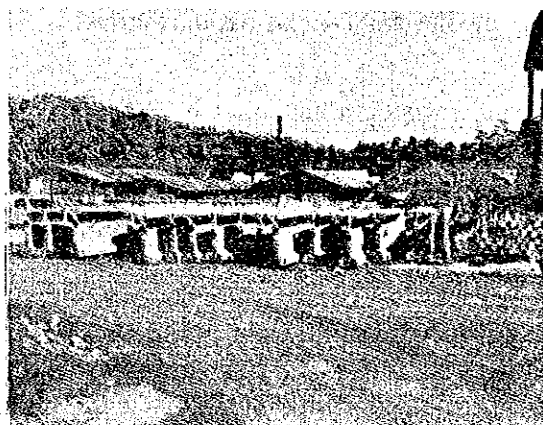
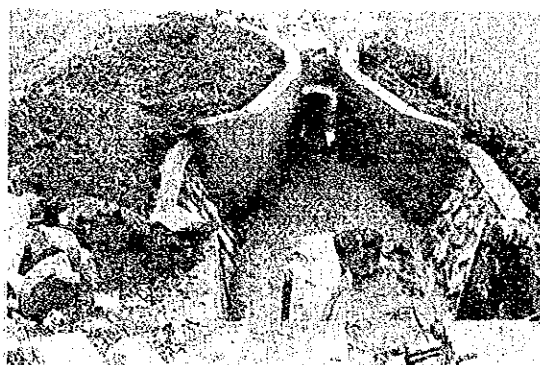
6. 人間居住研究所パンフレット

6-1 概要

6-2 PCB

6-3 ALA

SCIENCE AND TECHNOLOGY IN THE PUBLIC WORKS



AGENCY FOR RESEARCH AND DEVELOPMENT
MINISTRY OF PUBLIC WORKS
Jalan Patimura 20 - Kebayoran Baru - Phone: 715062, 715083 - Jakarta

H I S T O R Y

Introduction

Verse 3, 4 and 5 of Al Alaq of the Holy Quran refer how Allah teaches man to always learn what he does not know yet, and be in that way an 'ulama' a scholar or a man of learning. Science and technology is a field that man can learn universally, and Public Works belongs to such a field. It has a wide range for scientific and technological learning to back up the construction of various infrastructure.

Technology may be a change agent for social development, in which through Public Works channels, same objectives and goals are being made. Furthermore, in the contact of the national development on science and technology, many results of research conducted in the Public Works research institutes have received national recognition. The progress of science and technology is indeed an integrated part of the total national development.

It is worth mentioning that actual research activities of Public Works interest went back to 1925 in the field of road engineering.

A greater part of the community is already familiar for a long time with a lot of achievements of the Public Works supporting the development of national infrastructure such as :

- the construction of irrigation works, dams and reservoirs which are a backbone for the fulfilment of the food programme of the nation.
- the construction of roads and bridges to support the national economy.
- the construction of building and housing, including sanitation and infrastructure, to improve the quality of life of the nation.

It should be mentioned that the achievements in the field of Public Works are obtained through research and development, but on the other hand still a lot of problems should be faced, and to meet these, research and development should be promoted in accordance with the development of science and technology and the need of society.

Taking this into consideration, it can be concluded that the establishment of the Agency for Research and Development has been the right decision, especially where the need of the society in this field will increase, and also in accordance with the development of research and development of the Public Works itself.

Institute of Hydraulic Engineering

In 1936, a Hydrodinamisch Laboratorium (Dutch) was established at Technische Hoogeschool Bandung, at present known as Bandung Institute of Technology. The management of this laboratory was entrusted to an Indonesian engineer, Mr. Agus Prawiranata. This marks the first stage of research in the field of hydrology.

Historically the development in this field of research can be briefly described as follows :

- 1939 : A laboratory for applied activities was constructed as an addition to the laboratory for basic research.
- 1947 : Those two laboratories which had been joined together bearing the name Laboratory for Hydraulic Engineering was united with the Laboratory for Road Engineering.
- 1950 : It became an Experimental Station consisting of a Hydraulic Engineering laboratory and Soil and Road investigation laboratory and a Dams and Hydrology Laboratory.
- 1951 -
1953 : During this period the Experimental Station was divided into two divisions, namely the Soil and Road Investigation Laboratory and Hydraulic Laboratory. Then the Soil and Road Investigation Laboratory was integrated into the Road and Bridges Service, while the Hydraulic Laboratory was integrated into the Hydraulic Engineering Office.
- 1960 : The Experimental Station for Hydraulics, Hydrology and Hydrometry fell directly under the Ministry of Public Works and Power, and was called the Experimental Station of Hydraulic, Big Dams and Hydrology.
- 1964 : Above-mentioned Station obtained a new name and was called Experimental Station of Hydraulic Research.
- 1966 -
1974 : The three offices were united bearing the name Lembaga Penyelidikan Masalah Air (LPMA) or Hydraulic Research Institute.
- 1974 : As a follow-up of the Presidential Decree, LPMA was changed into Direktorat Penyelidikan Masalah Air (DPMA) or Directorate of Hydraulic Research.
- 1984 : Based on another Presidential Decree DPMA became Pusat Penelitian dan Pengembangan Pengairan or Institute of Hydraulic Engineering.

Institute of Road Engineering

Research activities in the field of road engineering has already been carried out since 1925 when private associations "Nederland Indische Wegenvereniging (NIWV) /Netherland Indies Road Association, which established a "Centraal Proefstation en Studie Bureau op Wegengebied"/Central Road Research and Study Bureau in Bandung. The development of NIWV is as follows :

- 1928 : Proposed by NIWV, a prototype road was constructed in the campus of Bandung Institute of Technology.
- 1929 : A "Laboratorium voor Wegen Constructie"/Laboratory for Road Construction was established; its present name is "Sub Directorate of Road Technique".
- 1932 : A "Laboratorium voor Grondmechanica"/Laboratory for Soil Mechanics was established; its present name is "Sub Directorate of Geo Technique".
- 1942 -
- 1945 : During the Japanese occupation, Dutch terminology was changed into Japanese, but the laboratory was still located at the Bandung Institute of Technology campus.
- 1945 -
- 1949 : All laboratories under the auspices of "Department van Verkeer en Waterstaat"/Department of Traffic and Public Works were united, and became "Instituut voor Wegen en Waterbouwkundige Onderzoekingen"(IWWO)/Road and Hydraulic Construction Research Institute.
- 1949 -
- 1963 : IWWO became "Hydraulic and Soil Research Institute" (1949), then "Experimental Station for Technical Research" and later on "Experimental Station for Soil and Road Research" (1953).
- 1963 -
- 1967 : Its name became "Soil and Road Research Institute"/Lembaga Penyelidikan Tanah dan Jalan (1963) and then "Lembaga Penyelidikan Masalah Tanah dan Jalan" (1965).
- 1967 -
- 1968 : Based on the Decree of the Minister of Public Works and Electric Power, a Lembaga Penyelidikan Masalah Tanah dan Jalan or Soil and Road Research Institute was established.
- 1968 -
- 1974 : This Institute was then developed into a Pusat Penelitian Direktorat Jenderal Bina Marga or "Research Centre for the Directorate General of Roads and Bridges".
- 1974 -
- 1984 : In 1974 the Research Centre was developed into a Direktorat Penyelidikan Masalah Tanah dan Jalan or "Directorate of Soil and Road Research" by Presidential Decree.
- 1984 : By Presidential Decree it became a Pusat Penelitian Tanah dan Jalan or "Institute of Road Engineering".

Institute of Human Settlements

In 1953, by the Minister of Public Works and Electric Power decree a "Lembaga Penyelidikan Masalah Bangunan" (LPMB)/"Building Research Institute" was established, with Mr. K. Hadinoto as the first Director. It was at that time constituted as a foundation, but then it obtained the status as Government Office, up to this moment. The further development of Institute of Human Settlements is as follows:

- 1953 : By the Minister of Public Works and Electric Power decree a "Lembaga Penyelidikan Masalah Bangunan"(LPMB) / "Building Research Institute" was established. It was still in the form of a foundation.
- 1955 : Based on the intersecretariat meeting of ECAFE (now ESCAP), the Building Research Institute functioned also as a U.N. Regional Housing Centre for the ESCAP region, covering the hot humid area.
- 1960 : In conducting its task to develop non-traditional and non-conventional building materials, the Institute obtained aid in the form of a laboratory, for this purpose from the United Nations.
- 1966 : LPMB officially became a Government Office under the auspices of the Ministry of Public Works and Electric Power.
- 1975 : LPMB became a "Direktorat Penyelidikan Masalah Bangunan"(DPMB) /"Directorate of Building Research" by Ministerial Decree.
- 1979 : DPMB/"Directorate of Building Research in its function as a U.N. Regional Housing Centre, developed as a U.N. Regional Centre for Research on Human Settlements, which was decided in the 35th ESCAP meeting in Manilla.
- 1984 : By Presidential Decree, DPMB/"Directorate of Building Research was appointed as a "Pusat Penelitian dan Pengembangan Pemukiman"/"Institute of Human Settlements" under the auspices of the Agency for Research and Development, Ministry of Public Works.

AGENCY FOR RESEARCH AND DEVELOPMENT

Badan Penelitian dan Pengembangan Pekerjaan Umum/"Agency for Research and Development" was established in 1984 by Presidential Decree No. 15, 1984 and Decree of the Minister of Public Works No. 21/KPTS/1984.

The establishment of this Agency is a historical fact, which was based on the development of science and technology in Indonesia and especially the development of the research institutes within the Public Works.

The Agency's organisation consists of 4 second-level organisations, i.e. :

1. The Secretariat of the Agency, a general assistant to Director General and an executive responsible for management research.
2. Institute of Hydraulic Engineering (IHE), an executive responsible among others for research and development of water resources, hydrology and hydraulic structures, rivers, geo-technical engineering, environment and water quality development, conservation and water system.
3. Institute of Road Engineering (IRE), an executive responsible among others for research and development of road and traffic engineering, geo-technical engineering and road engineering.
4. Institute of Human Settlements (IHS), an executive responsible among others for research and development of building materials, buildings and houses, building safety, potable water and sanitation.

Based on the above organisation structure the activities of the Agency is performed in the following programmes :

1. Research
 - a. Applied Research, aimed at creating innovations needed for the input of Ministry's policy.
 - b. Standardization, aimed at creating public works construction standard in Indonesia.

2. Scientific support

- a. Technical investigation, aimed at acquiring accurate technical data for engineering design.
- b. Technical Advisory, aimed at problem solving.
- c. Quality Control, aimed at accuracy of technical data for field control.

3. Dissemination of research results

- a. Scientific meeting, aimed at introducing new engineering process and procedure and cooperation with other institutions in the field of research and technology.
- b. Publication, aimed at spreading up the results of research and scientific support to other institutions.

Scientific supports done by the Agency are of two natures :

- (a) Engineering support aimed at Directorate Generals.
- (b) Administrative support aimed at Secretariat and Inspectorate Generals.

Therefore, the scientific support programme of the Agency is compiled on the Secretariat/Inspectorate/Directorate Generals needs.

In other words the activities of the Agency are generally similar to those of other first-level organisations within the ministry. The distinguishing point is the emphasis in which :

- The Directorate Generals emphasizes on the execution and implementation, and
- The Agency emphasizes on the research and development to support the execution and implementation.

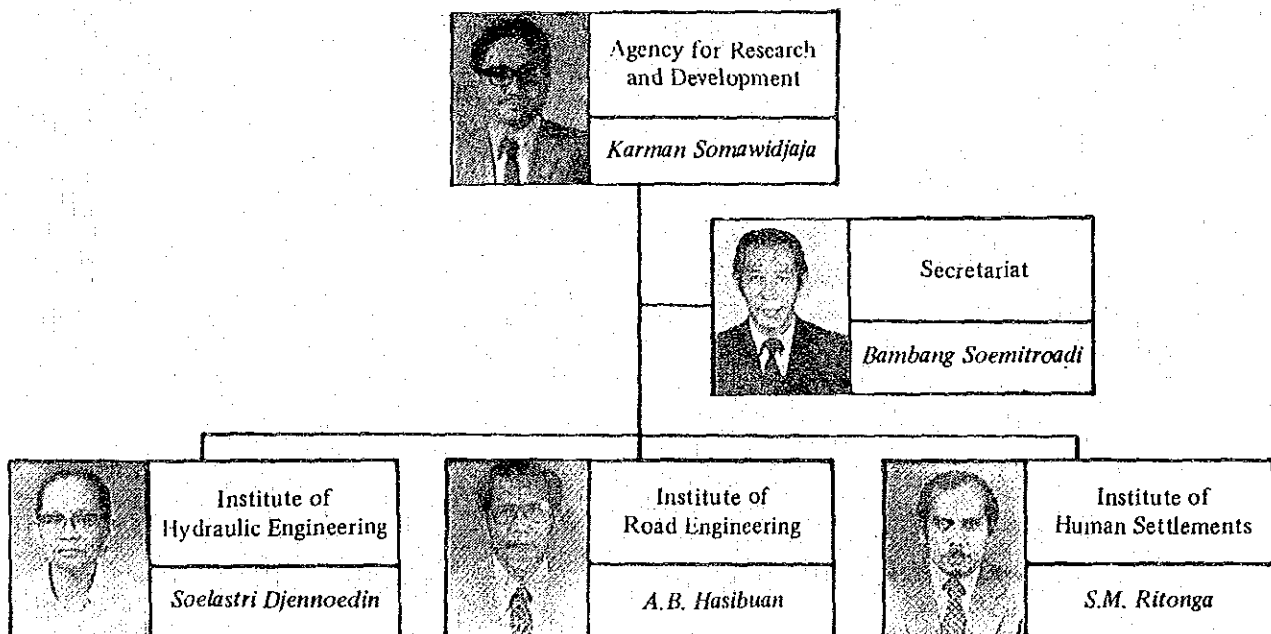
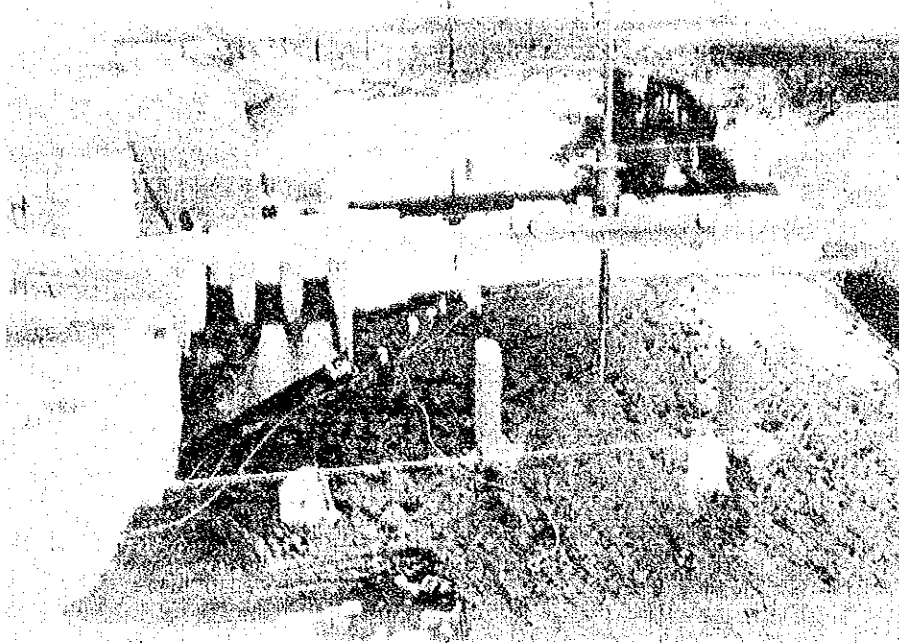
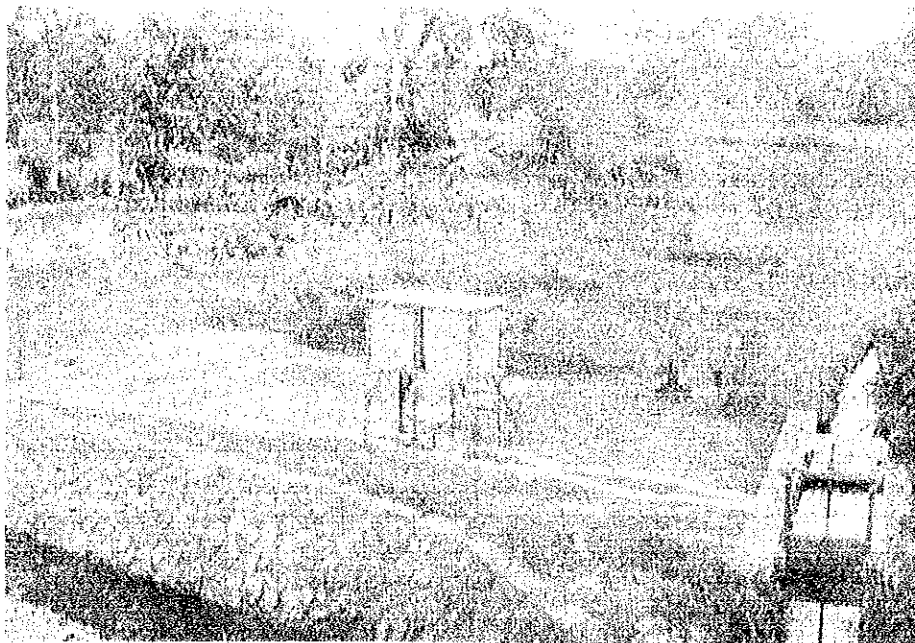


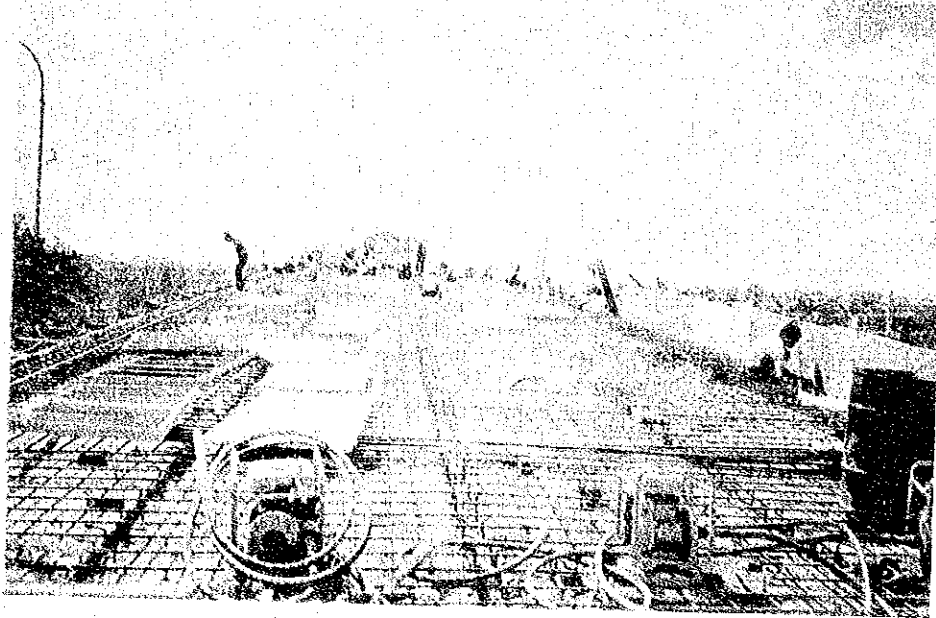
Fig. 1 : Agency for Research and Development



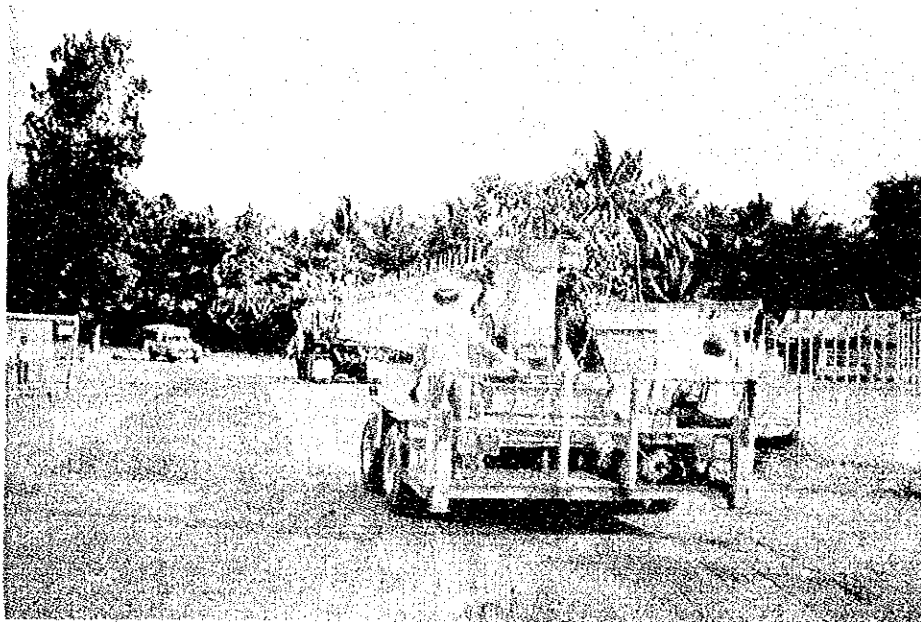
A model dam being tested by Institute of Hydraulic Engineering.



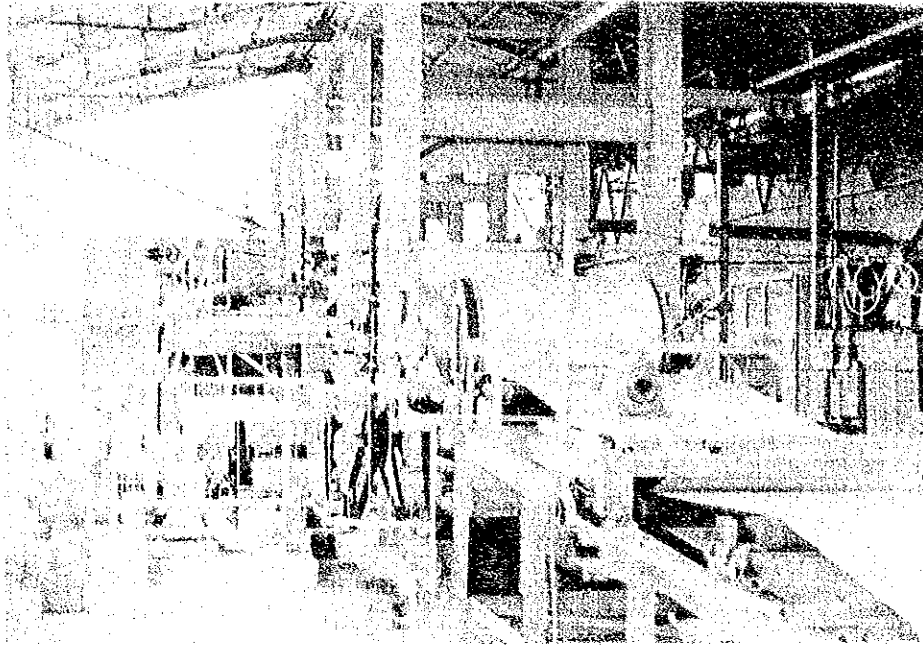
A pilot plant designed by Institute of Hydraulic Engineering to overcome water pollution due to industrial waste.



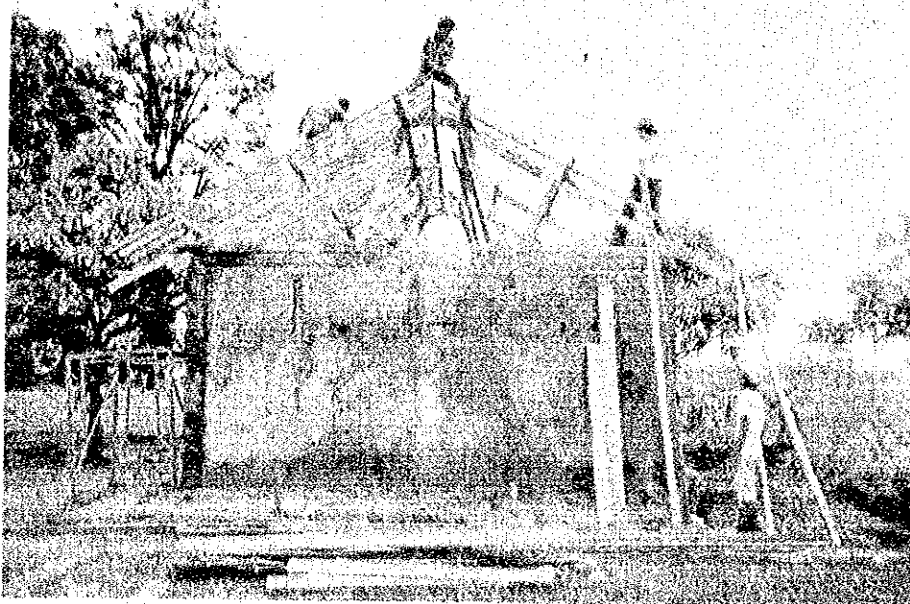
Finishing pavement of a bridge under supervision of Institute of Road Engineering.



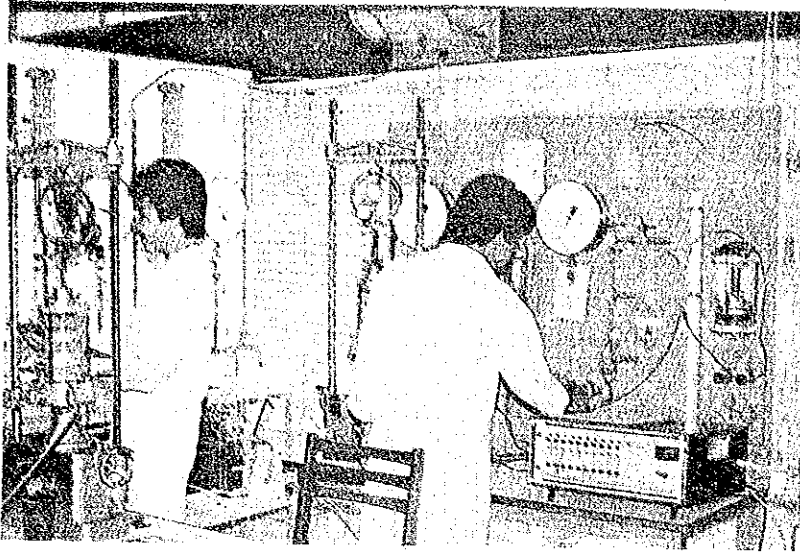
Transportation of a hollow beam, for bridge construction.



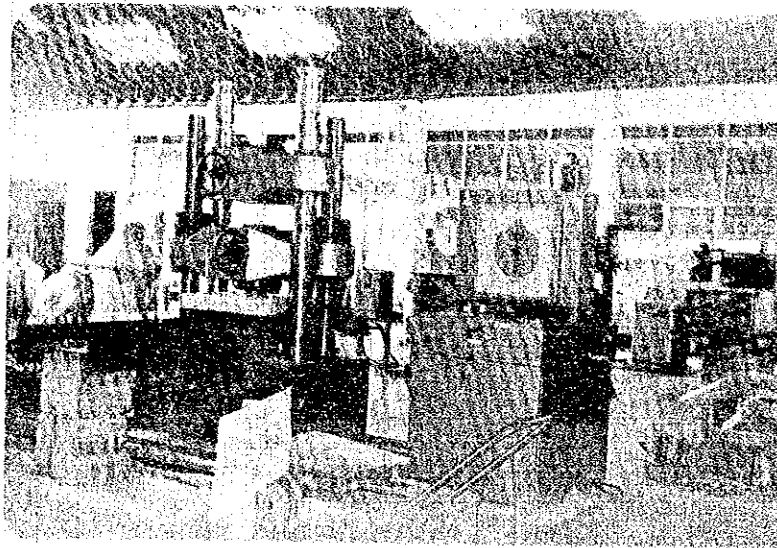
Pulp cement board pilot plant at the premises of Institute of Human Settlements.



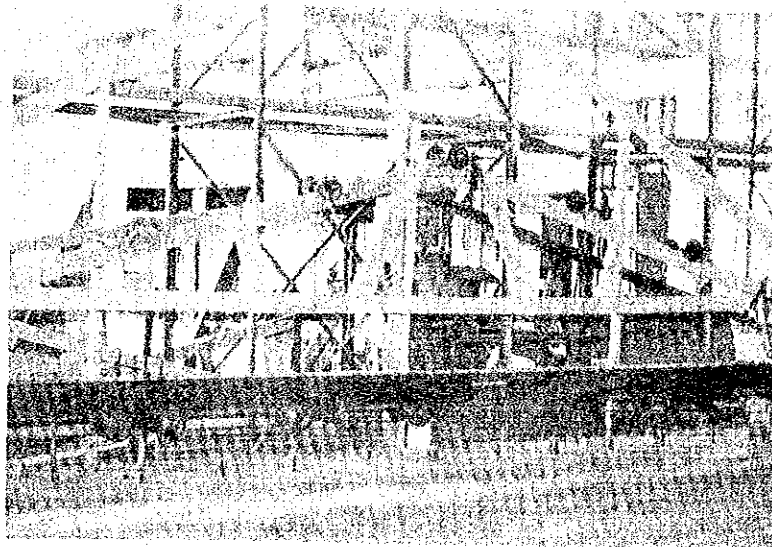
Cyclone resistant prototype house designed by Institute of Human Settlements.



Activities at the Land Mechanics Laboratory of the Institute of Hydraulic Engineering.



Laboratory to test pressure and force at Institute of Road Engineering.



Construction Laboratory at Institute of Human Settlements.

Secretariat of Agency for Research and Development

In fulfilling its task the Secretariat should give technical and administrative services to all units within the Agency.

The Secretariat conducts its duties through the following divisions :

- a. Planning Division has the task to arrange R & D programme, conduct inventory, monitoring, prepare standard, and evaluate the application of construction standards. It should also manage foreign aid administration.
- b. Information Management Division conducts monitoring, evaluation and reporting of programme implementation and presents data and statistics. Scientific co-operation, documentation and library activities are also under its responsibility.
- c. Personnel Division has the task to arrange formation, need, recruitment, mutation and development of personnel. It has also the task in organisation and management matters.
- d. Finance Division carries out its task to manage financial matters, including treasury, budget and verification, according to the rules and regulations.
- e. General Affairs Division manages administration and household affairs, including the management of supply and inventory.

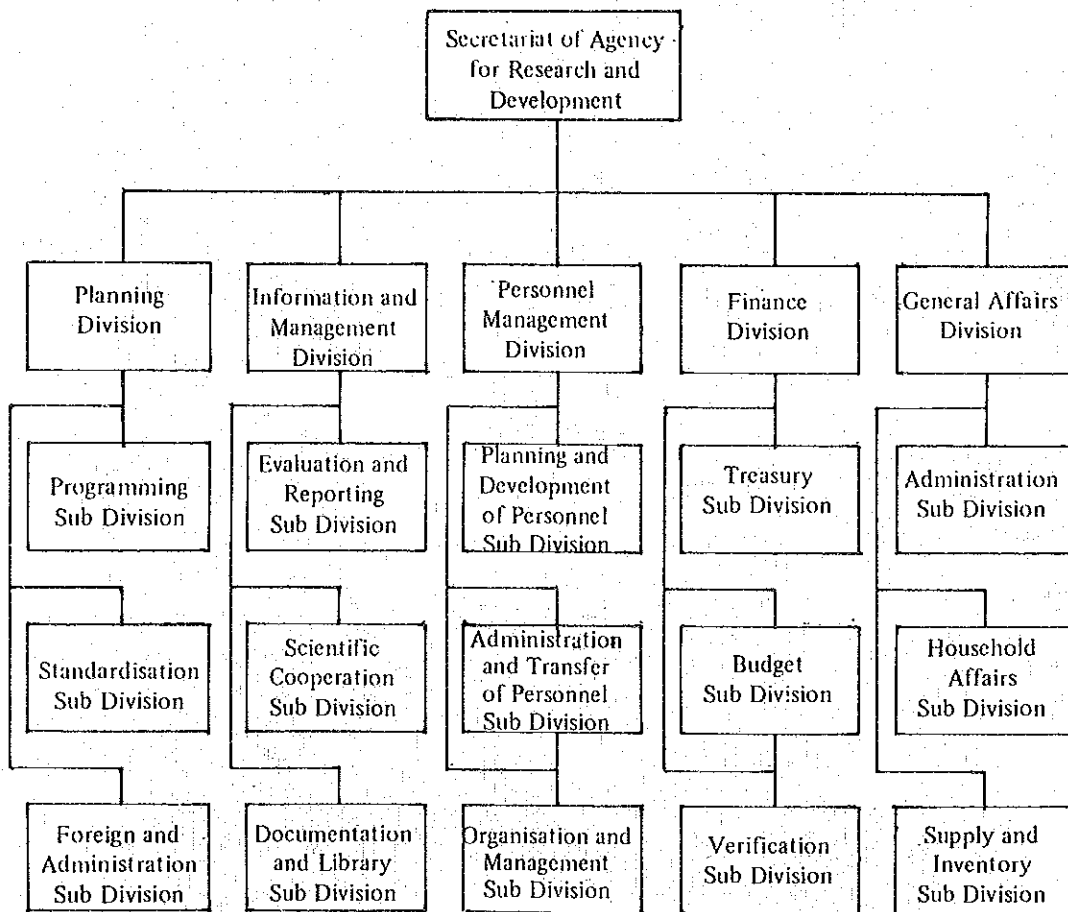


Fig. 2 : Secretariat of Agency for Research and Development.

Institute of Hydraulic Engineering

In carrying out its task the Institute of Hydraulic Engineering conducts research and development, in which the following Divisions participate :

- a. **Administration Division** carries out activities, which comprise planning and operation, finance, logistics and equipment. It also manages personnel and general affairs.
- b. **Hydraulics and Hydraulic Structures Division** conducts research and development comprising models of canals, dams, etc. in the framework of developing prototypes of hydraulic structures. Field and laboratory activities are frequently carried out. Research is conducted to be able to overcome flood and erosion problems.
- c. **Conservation and Water Systems Division** carries out research amongst others on the water debit problem, climatology, sedimentation and the water level.
- d. **Environment and Water Quality Division** carries out research on water quality and sediment. It investigates and analyses among others oxygen in polluted water. The construction of pilot plants to overcome pollution is also the task of this Division.
- e. **Technology and Dissemination Division** has the task to compile, analyse and disseminate data on research results. It also prints publications, disseminate information through a library, frame standards and technical data and carries out scientific cooperation, for example with developed countries, international organisations such as UNDP, World Bank etc.
- f. In addition, six **Experimental Stations** have been established comprising the following fields : Hydrology, Hydraulics, Geotechnics, Sediment Control, Rivers and Construction of Hydraulic Structures. The purpose is to do surveys, laboratory and field tests, to extend technical services and develop the technology in the mentioned respective fields.

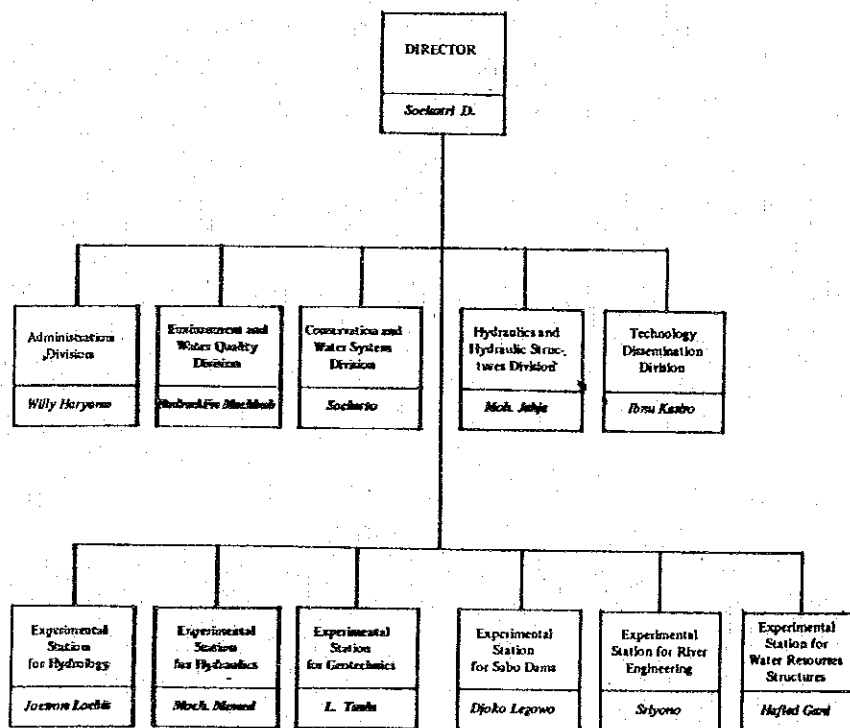


Fig. 3 : Institute of Hydraulic Engineering

Institute of Road Engineering

In its function, the Institute conducts research and development in many fields, and the following Divisions participate :

- a. Administration and Operation Division carries out its function equally as the Division of the Institute of Hydraulic Engineering.
- b. Traffic Engineering Division conducts research and development comprising parking and general transportation, measurement of speed on the highway etc. Research is also carried out on traffic violation, accidents and excess of cargo.
- c. Road Construction Division conducts research, development and investigations on quality of foundations, investigation of soil for the construction of roads and bridges, road construction using asphalt etc.
- d. Road Engineering Division conducts research and development on concrete, steel, wood and composite. As an example can be taken research on the construction of cement roads and hollow beams for bridges.
- e. Documentation Technology Dissemination Division has the same function as the one at Institute of Hydraulic Engineering.
- f. Besides above-mentioned Divisions, two Experimental Stations have been established, namely Experimental Station for Roads and Experimental Station for Soil Investigation. The purpose of their establishment is the same as that of the experimental stations at the Institute of Hydraulic Engineering.

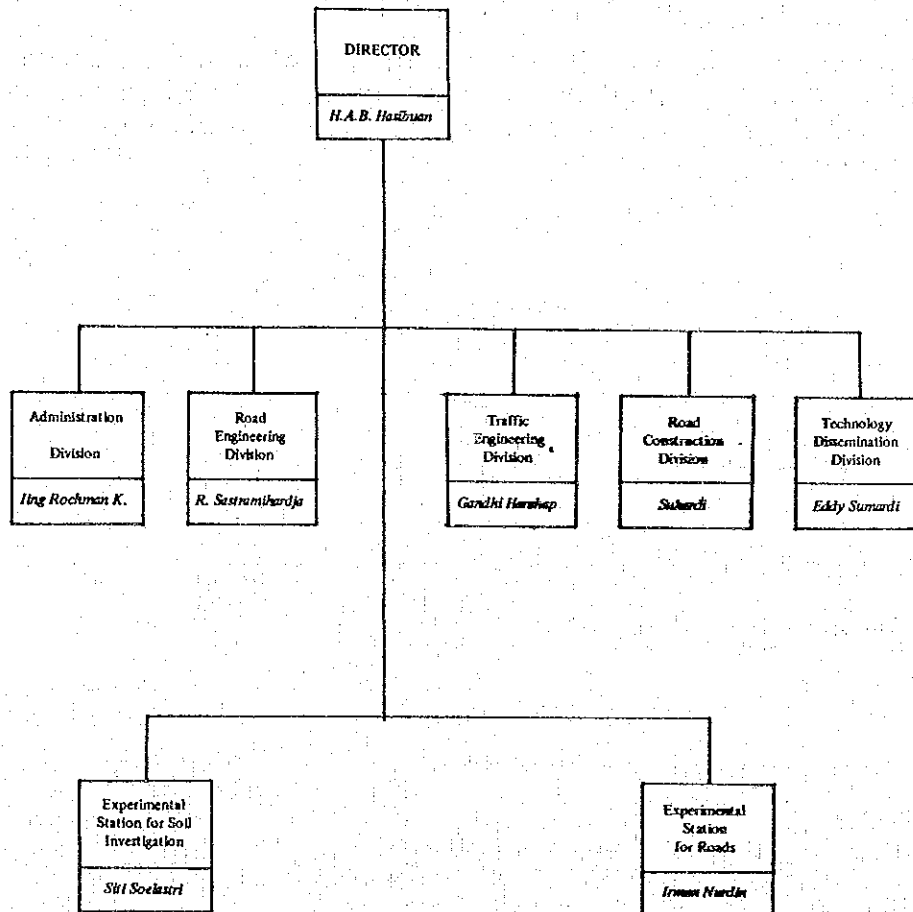


Fig. 4. The Organisation of Institute of Road Engineering

Institute of Human Settlements

Equal to the afore-mentioned Institutes, the Institute of Human Settlements has also an important function in the field of Public Works, which can be seen from the tasks to be conducted by the following Divisions :

- a. Administration Division has the same task as the division in the afore-mentioned institutes, only in this case the human settlement aspect is stressed.
- b. Building Materials Division conducts research and development in the field of building materials for example research on concrete for concrete blocks, paving blocks and tiles. For wall components, research has been conducted on particle board, pulp cement board. The use of sand and volcano ejection were also a research objects.
- c. Building Construction and Structure Division conducts amongst others research and development on earthquake resistant construction of houses/buildings, cyclone resistant houses, roof trusses construction, research on building fire safety, schools, buildings for transmigration areas, footpath construction, construction of water reservoirs, etc.
- d. Environment and Sanitation Engineering Division conducts among others research and development on designs of storeyed houses, such as maisonettes, flats, etc. including houses built by Perumnas (National Urban Development Corporation). Other activities conducted were the construction of water purifying installation, models, such as the "Cikapayang" mini type drinking water installation, individual installation for the purification of peat water in Kalimantan, the use of worms for refuse disposal, construction of double pit toilet etc.
- e. Technology Dissemination Division conducts the same activities as those of the other Institutes.
- f. The Institute of Human Settlements has two experimental stations in its organisation namely Experimental Station for Housing and Building and Experimental Station for Sanitary Engineering, and in addition Experimental Sub Stations for local building materials located in Medan, Cilacap, Semarang, Yogyakarta, Denpasar, and Ujungpandang. Their function is the same as those in the two former mentioned Institutes.

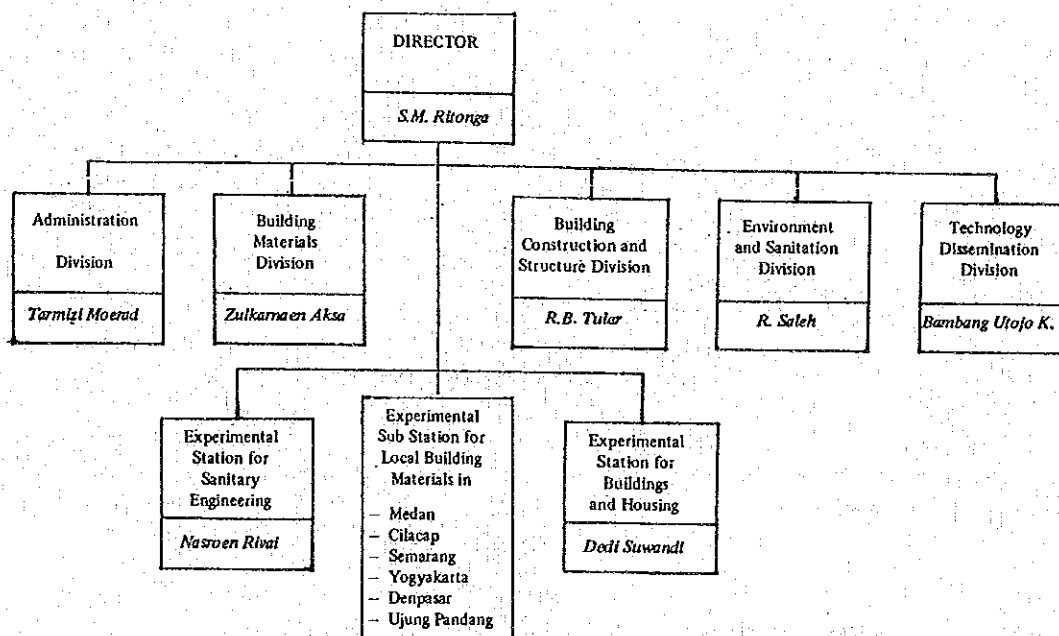


Fig. 5. The Organisation of Institute of Human Settlements

Development of Laboratories

The increased activities in each institute influences the need to develop the quality and facilities of the laboratories.

The most important laboratories developed by the three institutes are as follows:

- a. At the Institute of Hydraulic Engineering :
 - Water Observation Laboratory
 - Sediment Observation Laboratory
 - Hydrometeorology Laboratory
 - Water requirement field laboratory
 - Geohydrology Laboratory
 - Soil Dynamics Laboratory
 - Soil Mechanics Laboratory
 - Geology Technique Laboratory
- b. At the Institute of Road Engineering :
 - Road Material Laboratory
 - Bridge Construction Laboratory
 - Asphalt Investigation Laboratory
 - Provincial Laboratories of several types have been developed (27 laboratories)
- c. At the Institute of Human Settlements :
 - Potable Water Laboratory
 - Environmental Sanitation Laboratory
 - Structural Testing Laboratory
 - Fire Testing Laboratory
 - Material Testing Laboratory.

Research staff at the Agency for Research and Development

Indonesia is a developing country in the field of technology, and efforts towards the achievement of research of high quality within the scope of the realization of the National Development Plan should be aimed at improving the scientific infrastructure, and at raising the status of scientific resources by providing the necessary manpower for research, and the creation of a scientific atmosphere within the society. Taking into consideration the development of science and technology in the field of Public Works, the Agency has taken steps to prepare the scientists as researchers.

The scientists have their qualifications in several fields, ranging from technical to social sciences, consisting of Bachelors, Masters and those with Ph.D. degrees, who are accordingly placed in the Secretariat and Institutes.

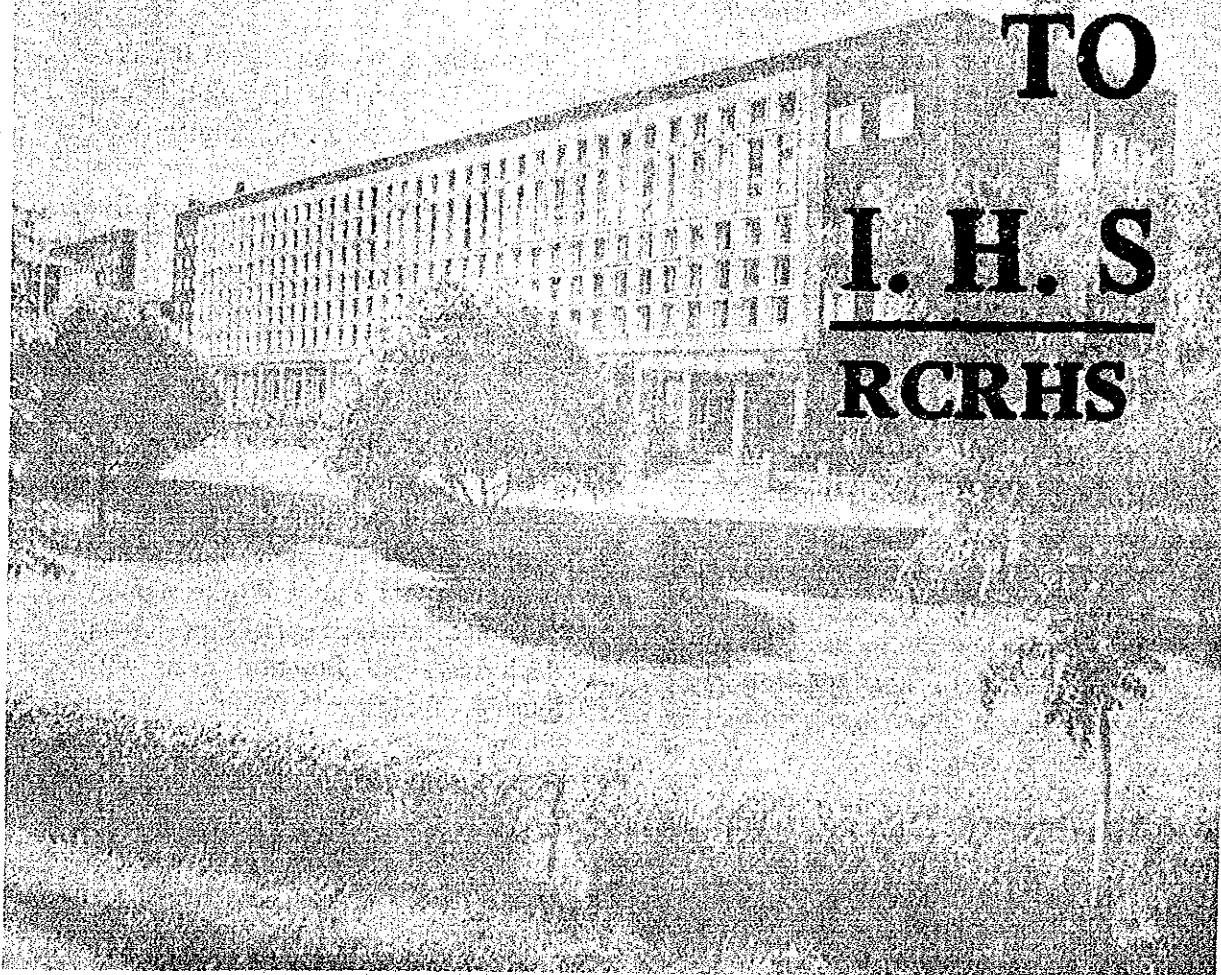
The whole amount of employees at the Agency reaches 1199, while the amount of researchers is 494. The Secretariat has 28 researchers, Institute of Hydraulic Engineering 238, Institute of Road Engineering 146 and Institute of Human Settlements 101 researchers.

In its effort to promote research and development, the Agency has not only developed the facilities for research, but it has also made effort to promote the quality of the researchers.



INSTITUTE OF HUMAN SETTLEMENTS
AGENCY FOR RESEARCH AND DEVELOPMENT
MINISTRY OF PUBLIC WORKS
84, Jl. Tamansari—Indonesia; Telp.: 81082/83; Telex: 28327 DBR BD IA

WELCOME
TO
I. H. S
RCRHS



**Welcome
to the Institute of Human Settlements & U.N. Regional Centre
for Research on Human Settlements**



Mr. S. M. Ritonga
Director Institute of Human Settlements

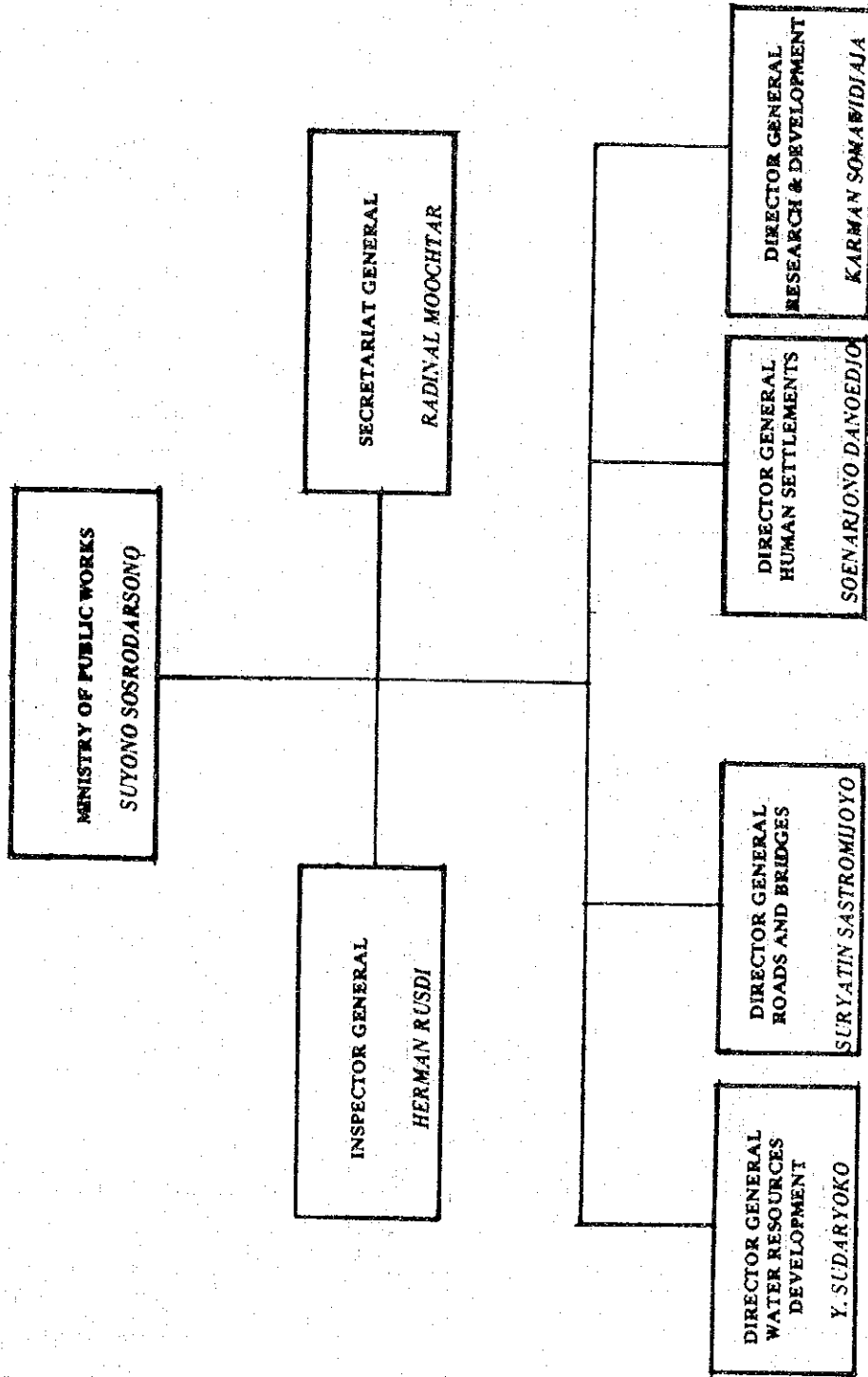
The Institute of Human Settlements was established in 1953. It was called then the Building Research Institute (Lembaga Penyelidikan Masalah Bangunan-bangunan).

In 1955 when the Inter Secretariat of ECAFE (now ESCAP) held its Working Meeting in Bandung, there was a proposal to establish two regional housing centres in Southeast Asia, one in India to serve the arid tropical area and the other in Indonesia to cover the hot humid area. Upon respective Government's decision, the National Building Organization in New Delhi-India and the Institute of Building Research in Bandung-Indonesia were assigned thus to also function as a U.N. Regional Housing Centre for the ESCAP region.

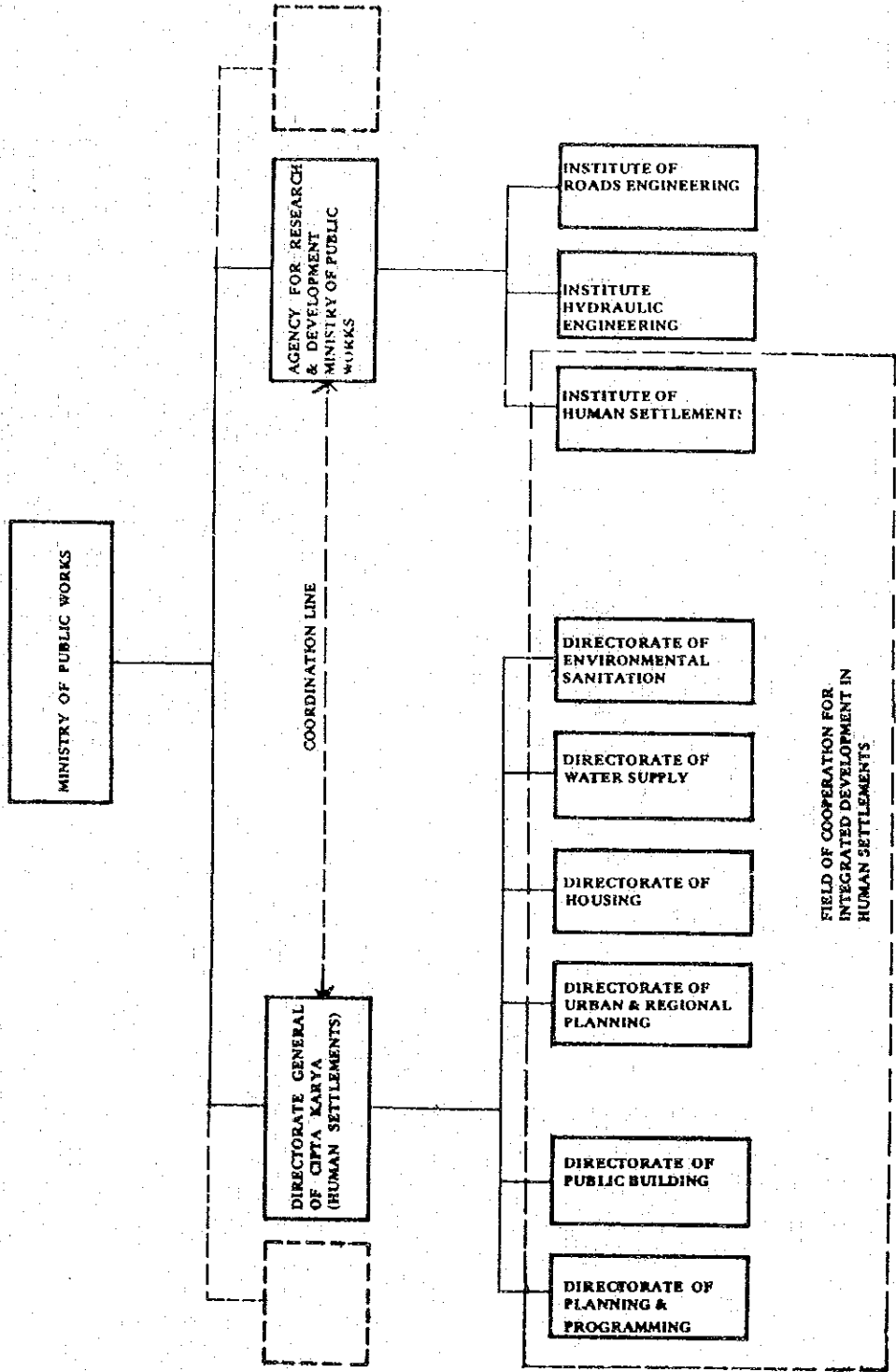
Presently, as follow up to the Presidential Decree no 15/1984, (April 1984), the Institute of Human Settlements is one of the three research institutes within the Agency of Research and Development of the Ministry of Public Works.

Prior to the decree, the Institute of Human Settlements was known as the Directorate of Building Research under another mother organization within the Ministry of Public Works, namely the Directorate General of Cipta Karya, which task and function deals with Housing, Building, Planning, Water Supply, Sanitation and Urban & Regional Development.

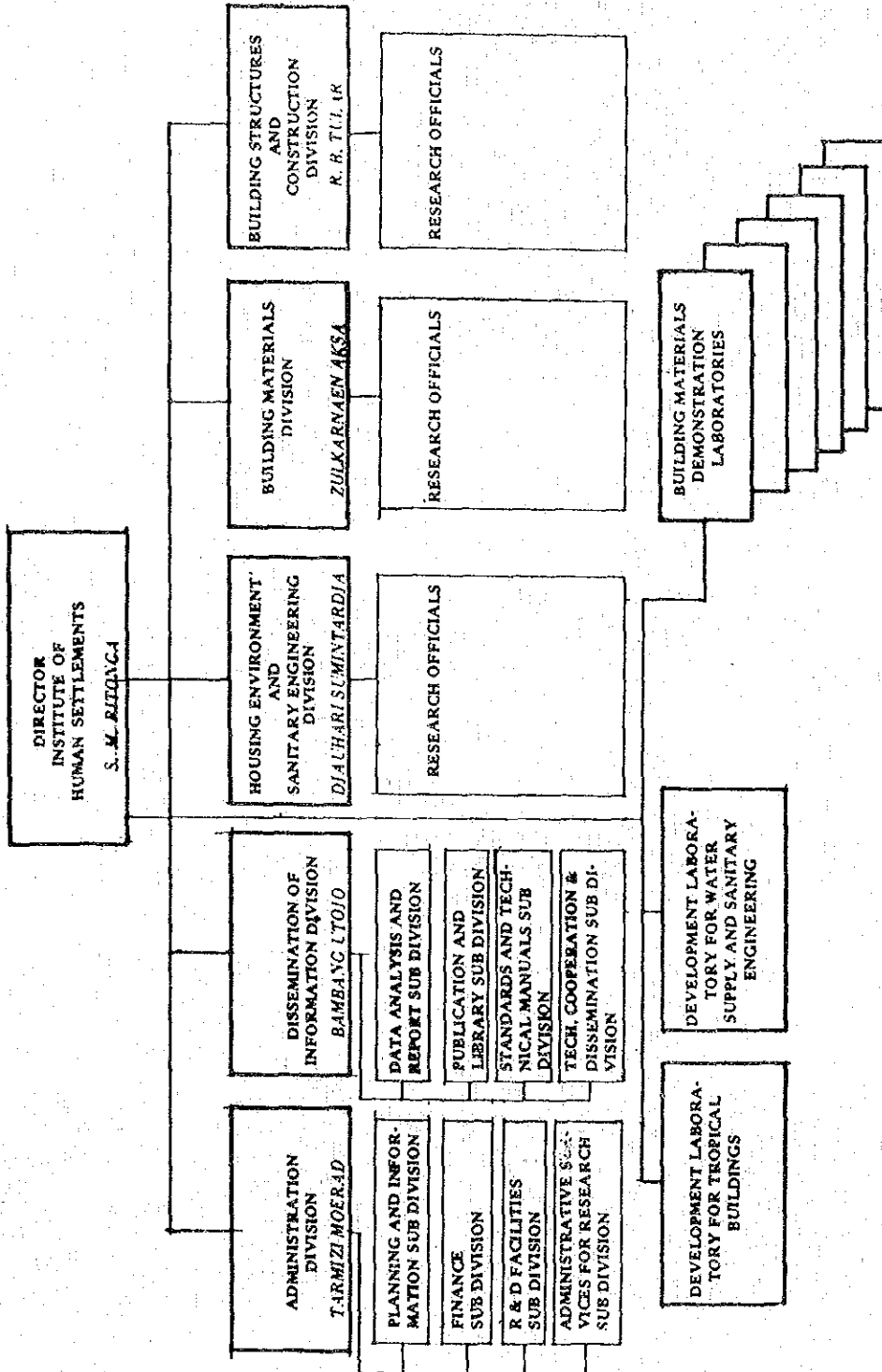
ORGANIZATION CHART
OF
THE MINISTRY OF PUBLIC WORKS



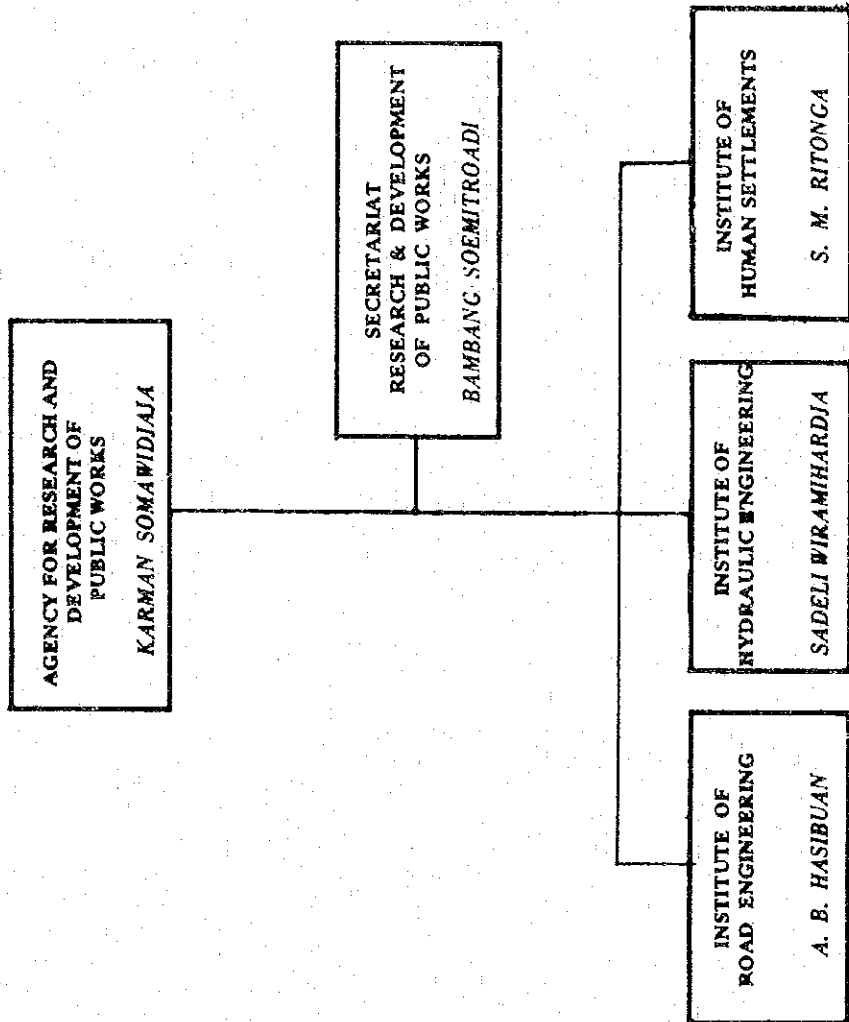
FIELD OF COORDINATION CHART
 BETWEEN
 THE DIRECTORATES OF THE DIRECTOR GENERAL OF HUMAN SETTLEMENTS (CIPTA KARYA)
 AND
 THE INSTITUTE OF HUMAN SETTLEMENTS OF THE AGENCY FOR R & D PUBLIC WORKS



ORGANIZATION CHART
OF
THE INSTITUTE OF HUMAN SETTLEMENTS



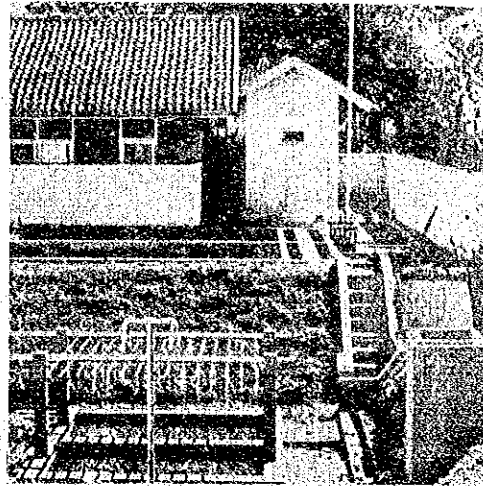
ORGANIZATION CHART
OF
THE AGENCY FOR RESEARCH & DEVELOPMENT
MINISTRY OF PUBLIC WORKS



The Institute of Human Settlements continues to support the Directorate General of Cipta Karya with research activities and has in fact adjusted its organization structure to reflect the fields of interests which concern Directorates of above mentioned Directorate General.

The divisions within the Institute are as follows :

- o Administration Division
- o Dissemination of Information Division
- o Housing Environment and Sanitary Engineering Division
- o Building Materials Division
- o Building Structures and Construction Division.



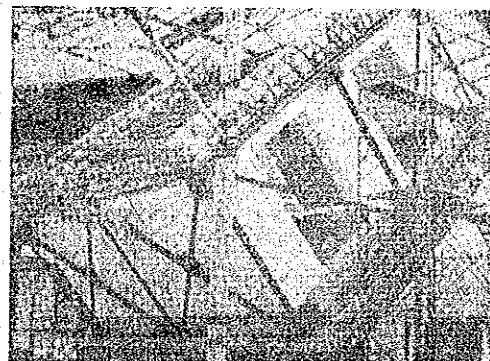
Small scale water supply project



Mobile laboratory for building tests, designed by I.H.S.



Institute of Human Settlements Library



Low cost housing test with tilting table

The first two Divisions are operational in the management and the other three are the so called research divisions.

In addition there are two development workshops/laboratories.

These are :

- o The Development laboratory for tropical building,
- o The Development laboratory for Water Supply & Sanitation.

Areas covered by the Institute of Human Settlements research activities are among other things Housing, Building Materials, Building Structure and Construction.

Various studies and investigations on subjects relevant to the Institute's interest, and which final products are in the form of concepts, standards or even full scale pilot and demonstration projects, are also being intensively carried out.

The Institute of Human Settlements cooperation with various international agencies such as with United Nations Organization bodies (UNESCO, UNDP, WHO, etc) as well as with research institutes from development countries (IHS--Netherland; BRI--Japan etc).

Government investment in the Institute of Human Settlements to date (per January 1984) is estimated over \$ 3.000.000.

1. Land :

- a. For Office, Laboratory and Pilot Plants \pm 28.000M²
- b. For Prototype Housing Project \pm 30.000 M²
- c. For Particle Board Pilot Plant \pm 30.000 M².

2. Building and Houses :

- a. Office inclusive furniture
- b. Houses for staff.

3. Equipment :

- a. Office (drawing boards, etc.)
- b. Laboratory

Personnel

1. Full timers :

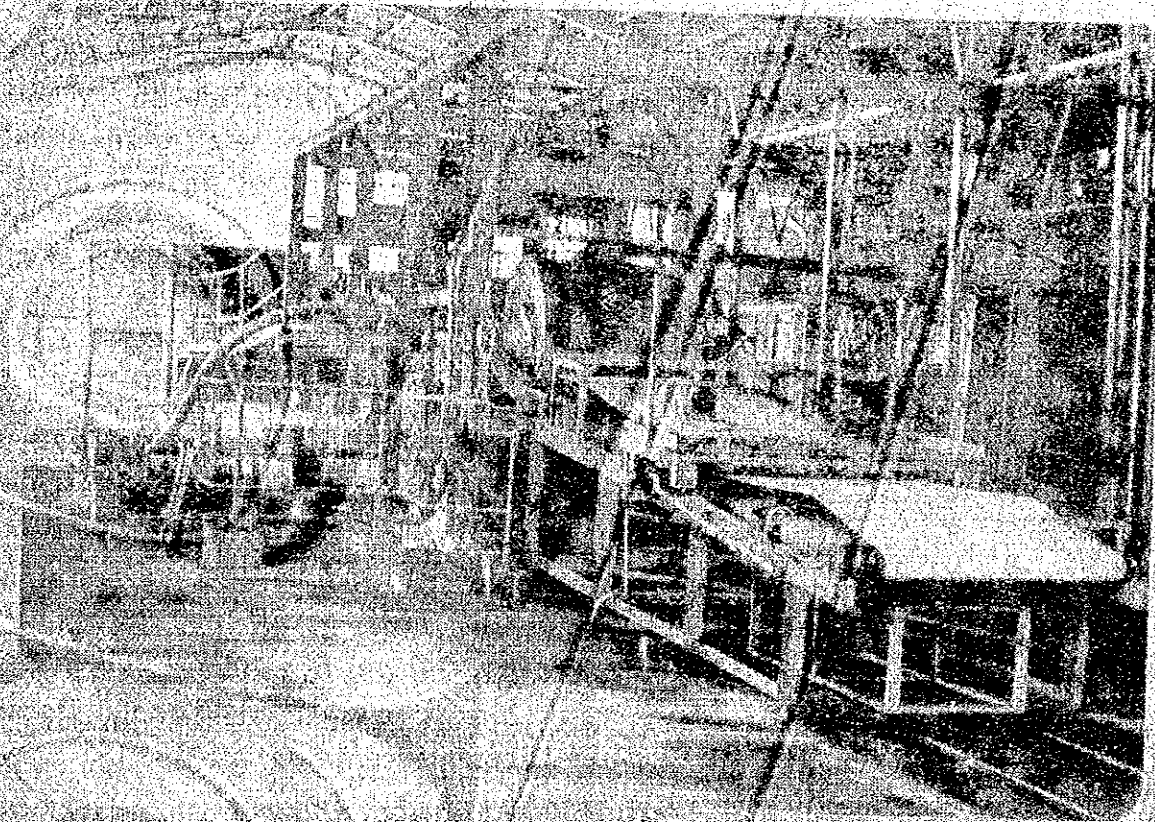
- 81 Senior Research Staff Members
- 65 Supporting Technicians
- 131 Administrative Personnel
- 6 Senior Administrative Staff

2. Part timers :

- 11 Technicians
- 3 Administrative Personnel



PULP CEMENT BOARD



DIRECTORATE OF BUILDING RESEARCH
Ministry of Public Works
Directorate General of Housing, Building, Planning and Urban Development

REGIONAL CENTRE FOR RESEARCH ON HUMAN SETTLEMENTS

United Nations
Economic and Social Commission for Asia and The Pacific (ESCAP)



Jalan Tamansari 84 (Terminal Post 15) - Bandung, Indonesia - Phone: 8108281083 - Cable: HEHOCE
Telex number: 28327 DBR BD IA

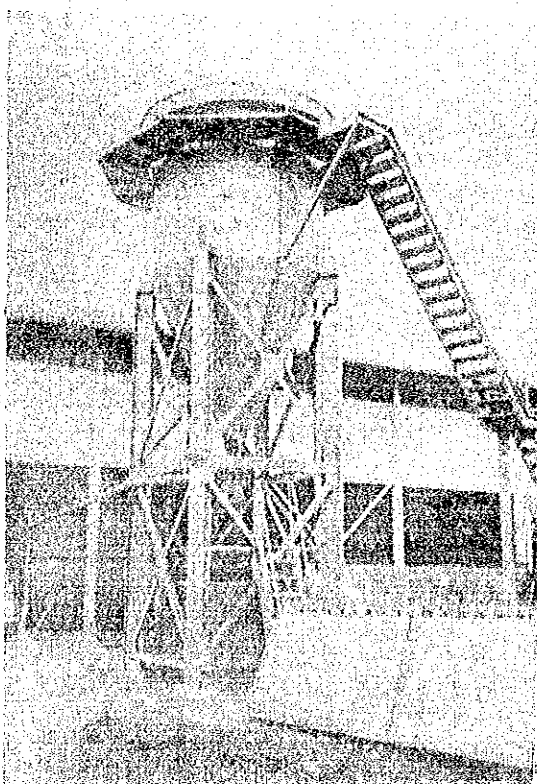
UDC: 691.146

PROJECT OBJECTIVES

In order to develop cheap building materials for supporting Indonesia's low-cost housing construction programmes, DBR is developing the pulp cement board process. In this process readily available waste materials such as paper, cardboard, waste wood and sugar cane can be processed into board with the addition of other readily available inorganic materials such as cement, trass, pozzolanic lime and asbestos.

PROJECT STATUS

- With the assistance of the Japanese Government, DBR has installed and is developing a pilot pulp cement board plant at its laboratory site in Bandung, West Java.
- This project is financed jointly by the Indonesian and Japanese Governments. Technical assistance and the provision of machinery are financed by the Japanese Government through the Japanese International Cooperation Agency (JICA). The Indonesian Government finances building and installation.



Water reservoir for the PCB plant

PROGRAMME FOR IMPLEMENTATION

- Installation of machinery was completed in 1980.
- During 1981 the implementation programme included trial production and test of products, investigation of raw materials and of local conditions.
- At present the programme includes raw material assessment, trial product analysis and research into the reinforcement of natural fibres.
- Future work will include quality control, research into finished product processing, cost studies, product development and the writing of an operational manual.

PROGRESS REPORT

- The pilot plant has been installed and is operating in Bandung.
- *Budget 1980/1981;*
 - Indonesia Rp. 93.000.000 for building and installation
 - Japan US\$. 926.000 for machinery and technical assistance.
- *Duration of project,* This project was started in July 1978 and is projected to run until July 1982.
- *Process.* Based on the PCB machinery at present at DBR, the process is as follows :

Raw or waste materials are mixed with inorganic materials in a mixer/pulper machine to make slurry. This slurry then enters the rolling machine in the wet state and wet boards are produced. These are then cured for two weeks by placing them on a flat surface and covering them with plastic. This prevents exposure to weather. The boards are then dried in sunshine conditions for 2 to 3 days, After cutting to size they are ready for use or storage.

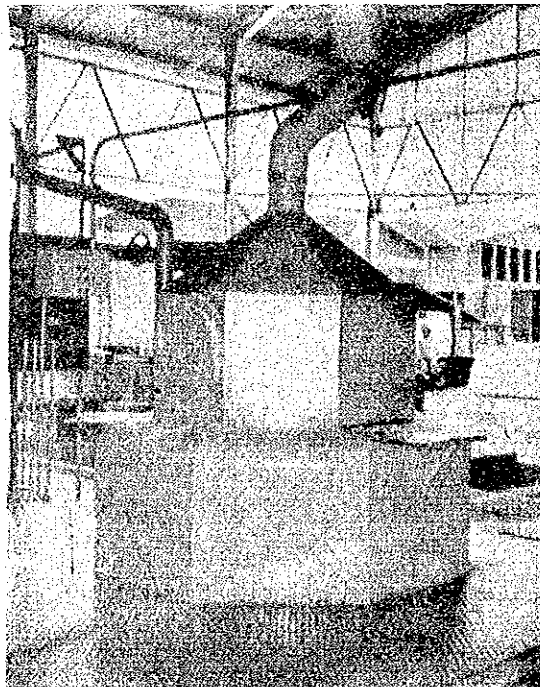
- *Output and board dimensions.*

Boards are produced with the following dimensions :

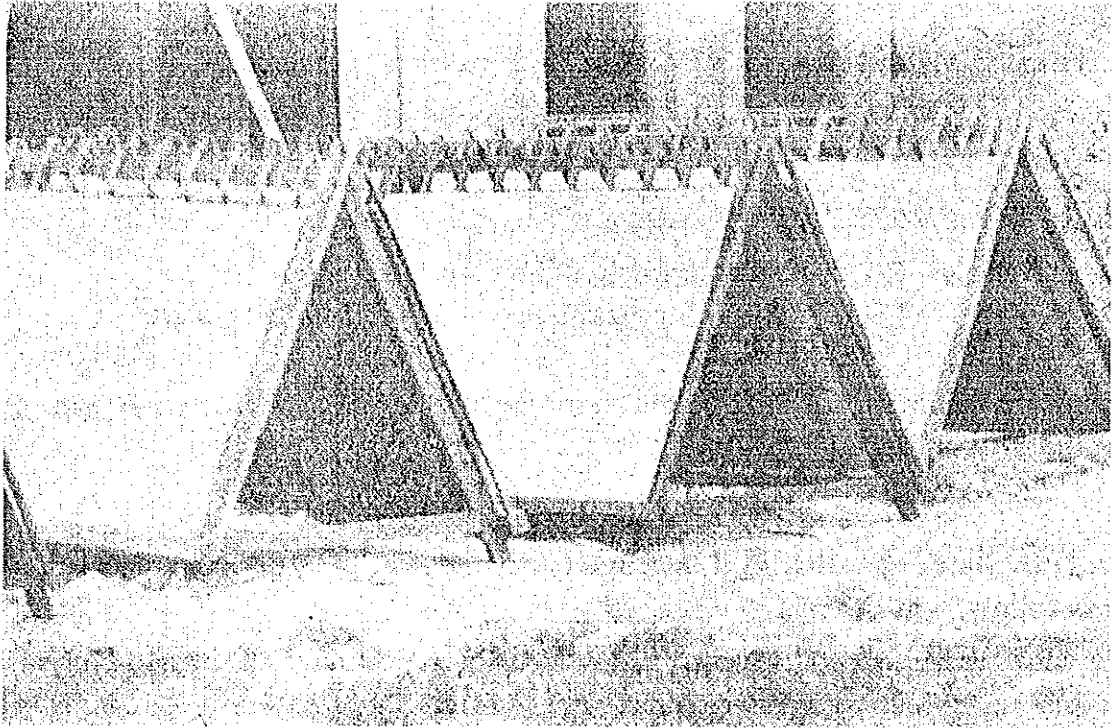
 - Length : 180 cm
 - Width : 90 cm
 - Thickness : 0,4 or 0,6 cm

At present DBR has achieved a production rate of 50 boards per hour, but it is believed that a production capacity of 250 boards per hour will be able to be achieved.

- *Applications.* Pulp cement board will be used for wall and ceiling panels for low-cost houses.



The slurry is prepared in this mixer/pulper machine



Pulp cement board drying on racks in the sun



Storage of the completed pulp cement boards

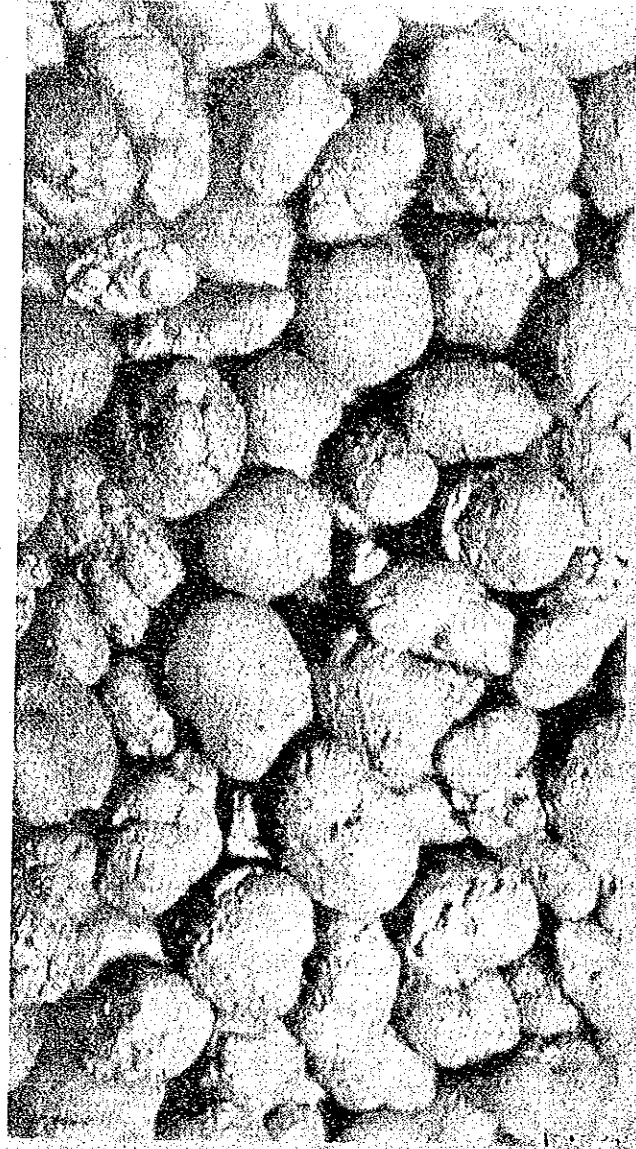
FUTURE PROGRAMME

It is hoped to expand the range of machines used with the pulp cement board plant in order to increase production capacity and efficiency. Further research will be carried out into the possible use of other materials such as the waste from the textile and sugar cane industries.

Research Progress Information

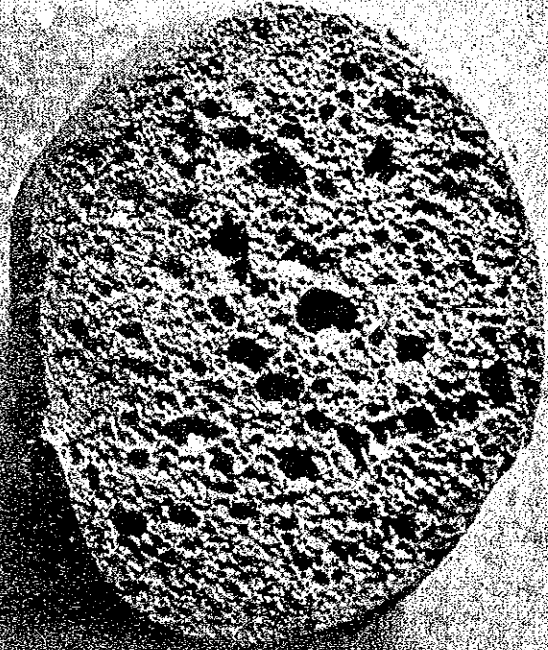
UDC : 691.322


2



ALWA

Artificial
Light-
Weight
Aggregate



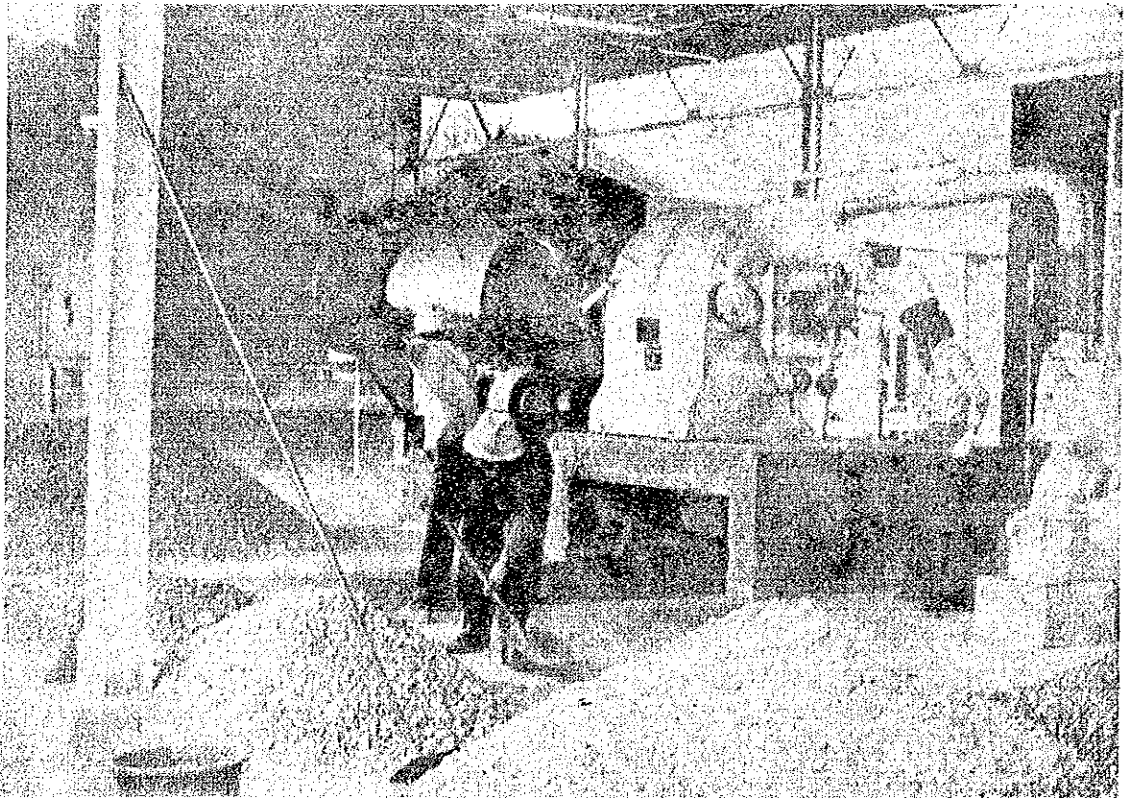
 **DIRECTORATE OF BUILDING RESEARCH**
MINISTRY OF PUBLIC WORKS
Directorate General of Housing, Building, Planning and Urban Development
REGIONAL CENTRE FOR RESEARCH ON HUMAN SETTLEMENTS
UNITED NATIONS
Economic and Social Commission for Asia and The Pacific (ESCAP)
125, Race Course Road, Singapore 139068. Phone: 8179741083. Telex: REROC
Fax: Number: 28371. 048-80-1A

PROJECT OBJECTIVES

- The development of new lightweight building materials in connection with the development of local raw materials that are readily available in Indonesia for instance clay, shale, obsidian.
- Increasing popular awareness of such building materials in the widest sense, with the aim to develop houses using low-cost construction methods. e.g. high rise buildings, mass-produced housing.
These materials can primarily be used to replace natural gravel or crushed stone in areas where these latter are in short supply, but where there are abundant supplies of clay, shale or obsidian.

PROJECT STATUS

- One of building materials development activities of the Directorate of Building Research (DBR) is an ALWA pilot production plant at Cilacap in Central Java.
- The ALWA project was started in 1976
- This project is financed through the National Development Budget.
- This project will continue to be financed in this way until it is capable of financing itself.



The rotary kiln in operation

PROGRAM FOR IMPLEMENTATION

Research into prototype building materials methods through :

- Production of prototype lightweight hollow blocks which have high mechanical strength and production costs as low as possible.
- Production of prototype lightweight pre-cast building components with mechanical strengths within a given range, and which can be used with both labour and capital intensive construction methods.
- Further research into several kinds of lightweight concrete structural components with costs lower than conventional concrete components, whilst still retaining strength, rigidity and ductility characteristics.

PROGRESS REPORT

- A pilot plant has been built at Cilacap in Central Java.
- The total capital costs for the erection of this pilot plant are as follows.
 - Land = Rp. 25.600.000,—
 - Buildings = Rp. 64.400.000,—
 - Machinery = Rp. 67.000.000,—
 - Machinery installations = Rp. 15.000.000,—
and transport
 - Electrical installation = Rp. 20.000.000,—
 - Expert salaries and costs (from Onoda Engineering Company. This item paid by UNIDO).
- *Process.*

Raw materials (e.g. shale) are fired under exact temperature and time conditions to produce an artificial lightweight aggregate (ALWA), which complies with JIS standards.
This firing technique uses rotary kiln technology.
- *Output*

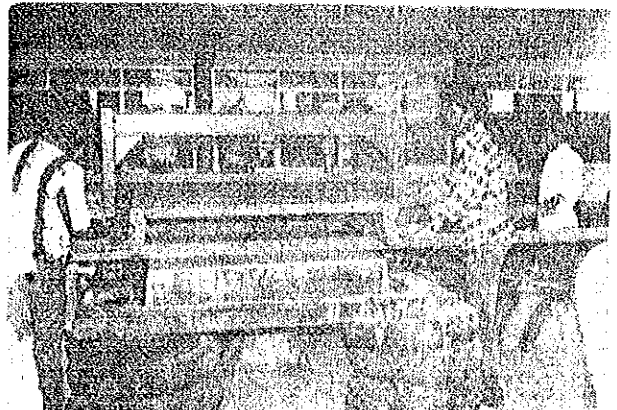
Normal capacity of ALWA is 1 ton/hour.
- *Applications*

DBR has developed several prototype maisonettes and school buildings which use ALWA as a building material. ALWA is used for floor and wall components.

FUTURE PROGRAMME

As mentioned before, this project has up to now been financed through the Indonesian National Development Plan. It has already been agreed however, that the Japanese Government, through JICA will provide further machinery under the KTA-18 programme.

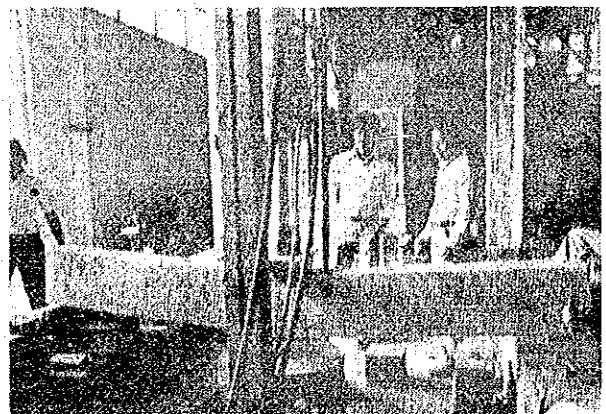
An ALWA pre-cast load bearing wall component



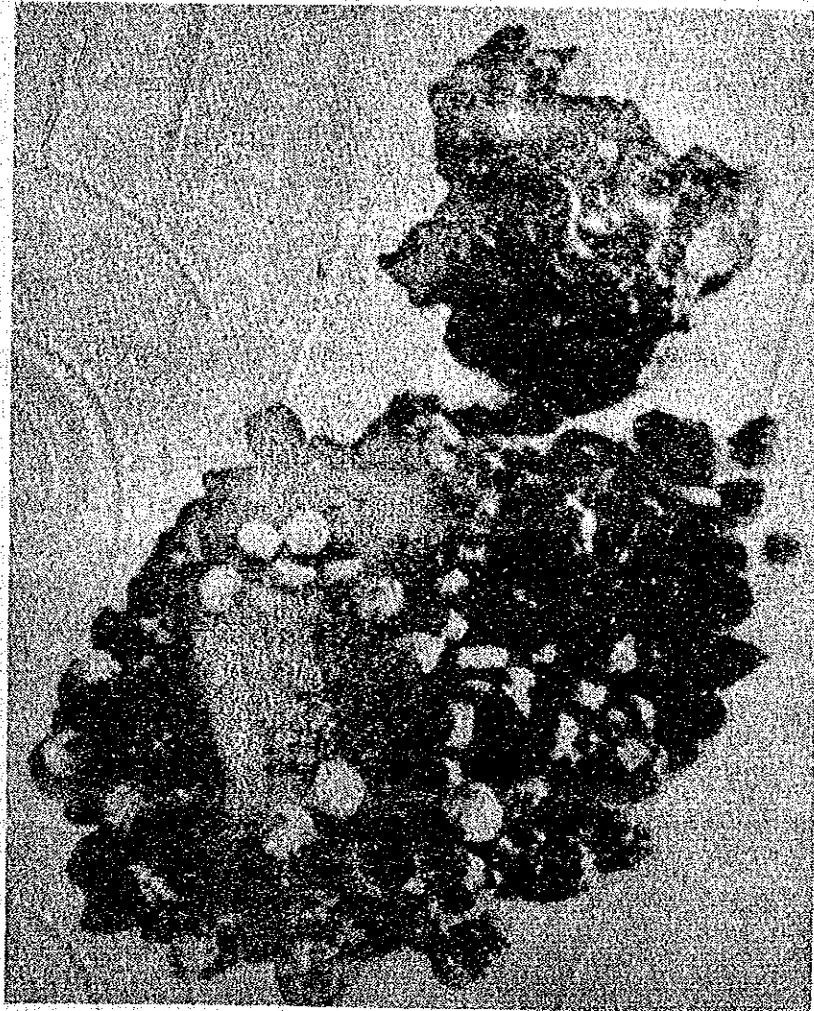
The casting process for load bearing wall components



Bending strength test for an ALWA structural component.



EXPANDED CLAY (LIGHTWEIGHT AGGREGATE)



INSTITUTE OF HUMAN SETTLEMENTS
AGENCY FOR RESEARCH AND DEVELOPMENT
MINISTRY OF PUBLIC WORKS
84, Jl. Tamansari—Indonesia; Telp.: 81082/83; Telex: 28327 DBR BD IA

1. General

Expanded clay aggregate is a type of artificial lightweight aggregate made of a certain type of clay which will expand several times its original volume when burnt at high temperature

The raw material (the clay) is dried and crushed to smaller pieces. The particles are separated and classified into several fractions in accordance with the particle size. Each fraction is then heated in a rotary kiln at 1200°C. followed by cooling to room temperature. The final product is again classified into proper particle size fractions by sieving.

The following types of clay can be used as raw material for artificial lightweight aggregate (ALWA) :

- . expanded shale
- . oil shale
- . carbonaceous clay

ALWA is used in the production of lightweight aggregate concrete. Depending on the density of the aggregate, lightweight aggregate concrete can be used for structural as well as non-structural purposes

2. Typical Alwa produced by the Institute of Human Settlements has the following technical data :

a. Physical properties

Fraction	Particle size (mm)	Volume weight (t/m ³)	Specific gravity	Water absorption (%)	Weight loss (%)
Fine	5	1,00	1,62	10	3.7
Coarse	5-20	0,75	1.25	8	5.0

b. Chemical analysis

SiO ₂	66 – 70%
4L ₂ O ₃	16 – 18%
Fe ₂ O ₃	4.6 – 5.6%
C ₂ O	2.0 – 4.0%
MgO	1.6 – 2.8%
Na ₂ O	1.5 – 1.7%
Loss on ignition	0.2 – 0.3%

c. Soundness in chemical reagent :

- . In Anhydrous sulfuric acid 0
- . In Hydrochloric Acid 0

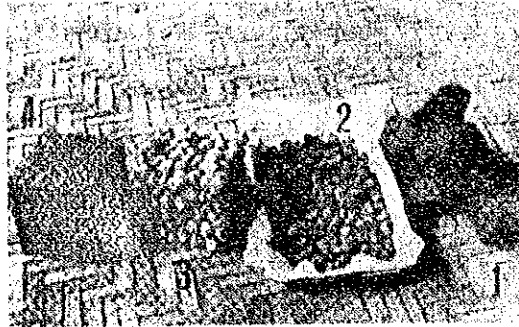
3. Properties of lightweight aggregate concrete compared to normal concrete

- . Equal in drying shrinkage
- . Equal in creep
- . Slightly lower "young modulus of elasticity"
- . smaller thermal conductivity
- . Better heat resistance
- . More or less equal in shear and tensile strengths
- . More or less equal in "Poison Ratio"
- . Better strength/weight ratio

4. Advantages for Construction material :

- . Reduce dead weight of the building and result in more economic structural elements (less consumption of steel reinforcement)
- . Easier handling of larger components/elements
- . Lower consumption of energy in the operation of the building
- . Competitive construction cost of high-rise buildings.

IP--291084



Photos : 1. Shale, raw material for Alwa
2. Bloated shale after burning
3,4. Test cubes made of lightweight aggregate concrete (LAC).

The series of information sheet is intended to disseminate the results or findings of research works and experimental activities carried out by the Institute of Human Settlements (formerly known as Directorate of Building Research) in Bandung – Indonesia, in the field of :

- Building materials (production and application)
- Building structure and construction
- Sanitary Engineering
- Low cost housings
- Human Settlements

Detailed information about the content of this information sheet can be obtained from the Institute of Human Settlements

7. セルローズ研究所パンフレット



DEPARTMENT OF INDUSTRY
AGENCY FOR INDUSTRIAL RESEARCH AND DEVELOPMENT
INSTITUTE FOR RESEARCH AND DEVELOPMENT OF
CELLULOSE INDUSTRIES

Jalan Raya Dayeuhkolot 158. P.O. Box 194. Bandung -- Indonesia

Phones : (022) 50623 & 438810

**INTRODUCTION TO INSTITUTE FOR RESEARCH
AND DEVELOPMENT OF CELLULOSE INDUSTRIES**

CONTENTS

	Page
P R E F A C E -----	i
1. INTRODUCTION -----	1
2. ORGANIZATION -----	2
3. RESEARCH AND DEVELOPMENT ACTIVITIES -----	6
3.1. Budget -----	6
3.2. Submission of Proposals -----	7
3.3. Research and Development -----	9
4. TRANSFER OF TECHNOLOGY -----	11
5. INDUSTRIAL DESIGN ENGINEERING -----	12
6. STANDARDIZATION -----	12
7. STATUS OF RESEARCHER -----	13
8. S U M M A R Y -----	14
Annex 1 : Facilities -----	15
Annex 2 : List of Researches -----	17

1. INTRODUCTION

The Institute for Research and Development of Cellulose Industries (IRDCLI) is one of the nine institutes subordinated under Agency for Industrial Research and Development (AIRD), Department of Industry. As the other institutes do, IRDCLI has its national position which has a sectoral scope of activity, namely research and development in the field of cellulose technology.

IRDCLI was established in 1968, as an integration of formerly existing two institutions, namely Rayon Pilot Project and Rayon Institute Project. Formerly, these two institutions were established with the objective to back up research, development and engineering in the field of rayon manufacturing technology. In line with the climate development occurred in Indonesia, however, these institutions were considered to integrate becoming an institute with comprehensive scope of activity to manage research and development in the field of cellulose technology.

Thus, from the beginning IRDCLI has directed its activities to research and development in the field of technology on pulping, paper making, rayon manufacturing and other cellulose derivatives as well. As a consequence IRDCLI has to perform also other activities linked with cellulose industries such as question of pollution caused by cellulose industries, industrial services, transfer of technology, training, standardization, etc.

To meet its function, namely : to perform research, to promote the technical development and to provide technical advices in the field of cellulose technology, the activities performed by IRDCLI will comprise aspects as follows :

1. To conduct applied research, development and engineering activities on utilization of Indonesian fibrous resources including their residues as raw materials for cellulose industries
2. To conduct studies on pollution abatement caused by cellulose industries

3. To furnish engineering and consulting services to the cellulose industries
4. To conduct training for industrial personnels and to perform technology transfer through many kinds of scientific meetings
5. To promote cellulose technology by mutual cooperation with other agencies both nationally and internationally
6. To prepare draft and to promote Indonesian Industrial Standards in cellulose sector

2. ORGANIZATION

As has been mentioned, IRDCLI is under management of the Agency for Industrial Research and Development which is subordinated under Department of Industry. In the organization there are also laboratories which are spread over many regions.

Governmental Head Office is coordinative and macro-aspects oriented whereas the institute and laboratories are more concerned with executive matters and micro-aspects oriented. The institutes and laboratories are generally situated in the region.

There is a difference in criteria between institute and laboratory. Generally, the institutes have national scope of activities with sectoral specific aspect, whereas the laboratories have regional one with the objectives to support regional development. Consequently, there is a difference in the budgeting. Generally speaking the institute receives budget more than that received by the laboratory.

As can be shown in the Chart 1, a lot of research and development are conducted in nine institutes and nine laboratories. The institutes manage special aspects in their own sector, and the activities carried out by the laboratories are more concerned with general aspects although some of them have specific focus of activity.

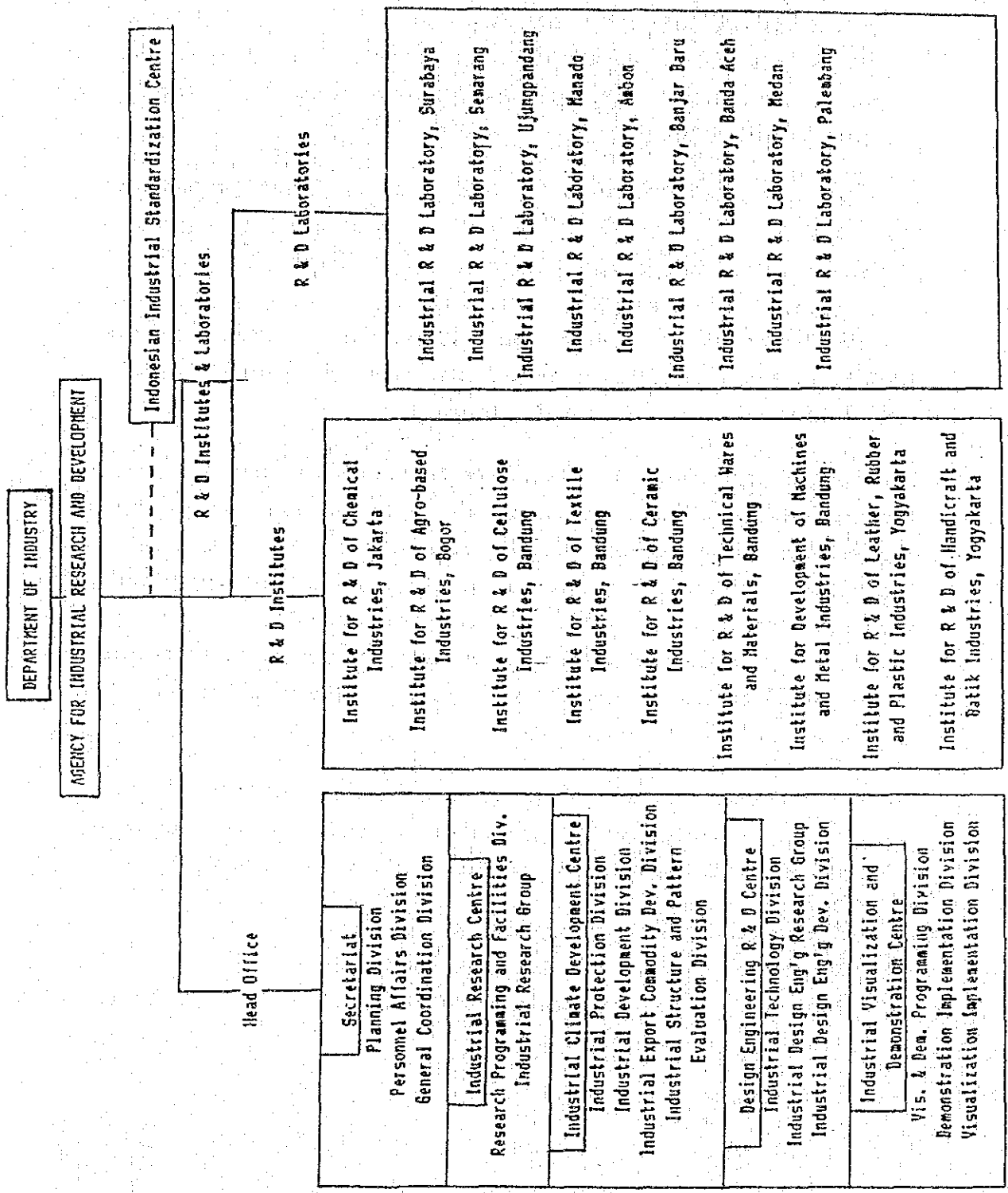


Chart 1. Organization of AIRD

Beside the above mentioned institutions in the organization, existed an institution which conduct standardization. It is sub-ordinated under Secretariat General, Department of Industry, however, operationally it is managed by the AIRD since drafting of the standards and many other softwares are in the capability of AIRD. In terms of the demand and implementation, however, the standards are managed by Directorate Generals, existing in the Department organization.

Chart 2 shows the IRDCLI organization. It is important to feature that in each division of research and development exists a group of researchers, who are working accordingly in their own field. These clusters are thus positioned in the functional pattern. On the other hand the other parts such as Division of Engineering and Technology Transfer, Administration Department and Installation Unit will follow the structural pattern.

Position of personnels who are in the functional pattern are not institutionalized in the organization. Their career will be managed through the achievement in the scientific field by credit points. On the other hand personnels who are following the structural pattern get their position institutionally. Their career are managed mainly through seniority or period of existence in the organization. However, their rank can also be fastened in line with their position occupied.

To foster the life of the organization it is essential to have support mainly needed facilities. Generally speaking, the facilities owned by IRDCLI are very limited, and can be classified as :

- Equipments to back up research in laboratory
- Equipments to back up pilot-scale experiments
- Equipments to support other activities such as for utilities, training, engineering, etc.

More detailed information on this matter can be seen in Annex 1.

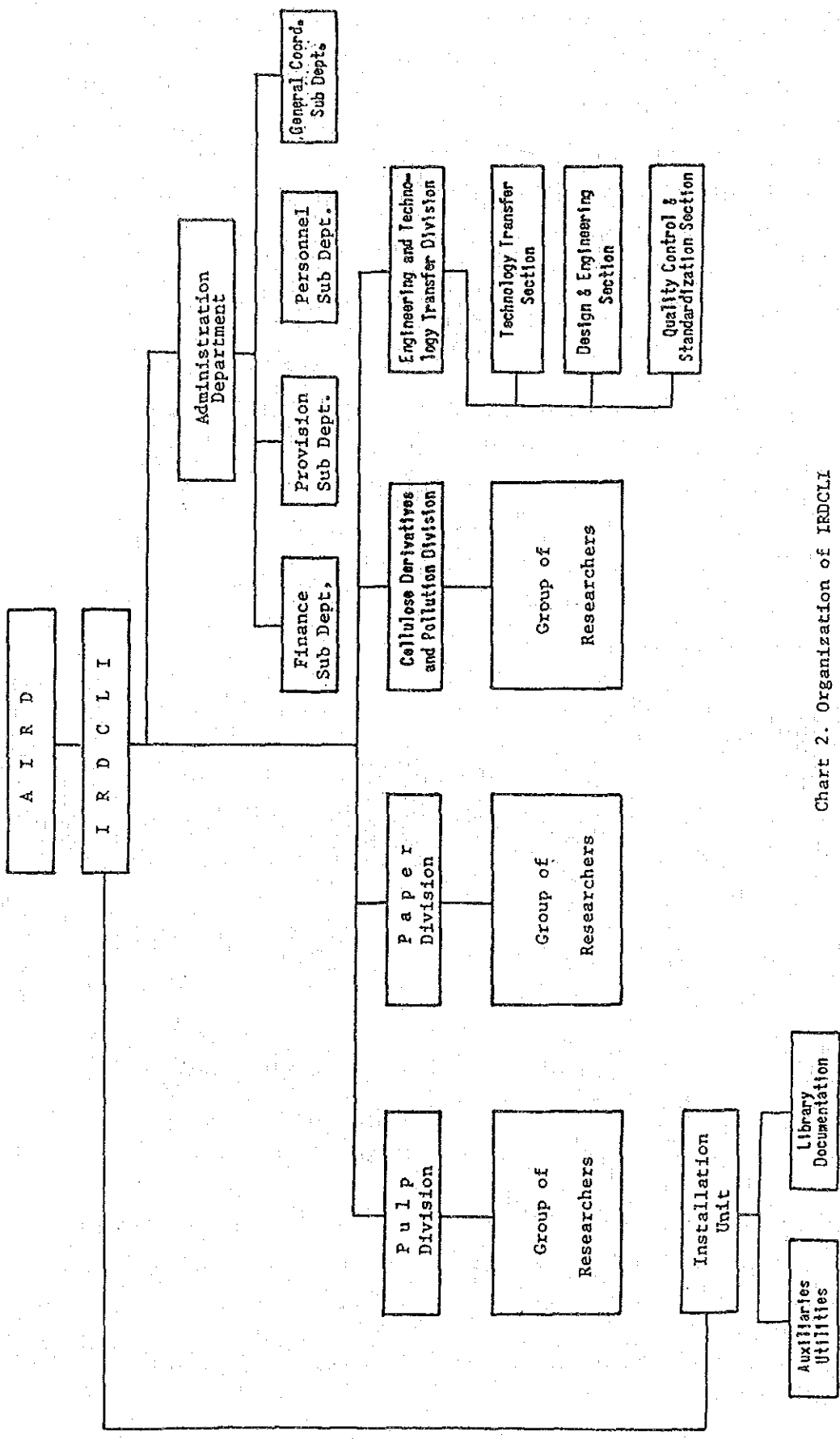


Chart 2. Organization of IRDCLI

3. RESEARCH AND DEVELOPMENT ACTIVITIES

3.1. Budget

The resources to run the research activities will be originated from :

a. Development Budget

The availability of this resource is linked with the Governmental Development Programme through linkage of Five Year Development Plan. The quota will be depended upon the availability of the Government Budget and determined by state economy situation. Generally speaking, the better the situation the better quota will be obtained.

b. Routine Budget

This resource comes annually from the Government to maintain the activities in the organization. Nearly 65 % of this amount is used to cover personnel salary. The budget for research and development and technical services expenses occupy only some 6 % of the routine budget. The rest is used to cover other overhead cost.

Because of the little amount of budget quota, the research and development activities are so limited that only those in relatively smaller scope can be carried out.

c, Contract Research

This resource coming from this kind of activity is generally sufficient to cover all the expenses needed. The cooperation is set up between the institute and other institution either Government or private institution.

The research has to be accomplished in a certain period of time

and meets scope of activity stated in the contract.

The positive impact yielded from this kind of research is that the result will be directly implemented by the company requesting the activity, so that psychologically will give some kind of satisfaction to the people involved in the research activities. In other words this kind of activity will encourage researchers and the organization can be running well. Therefore, this kind of cooperation should be fostered and is expected to enhance continuously.

d. International Cooperation

Research activities can be as the result of international cooperation, where generally the expenses are financed by a certain foreign country or by an international institution. This cooperation will result some positive impacts such as establishing good inter-state relation as well as nation one, the result of the activity can be utilized mutually by the two countries, practical international experiences can be experienced by researchers in terms of : making comparative study on research management, experience in using of equipments and individual relationship between the two nations.

3.2. Submission of Proposals

The mechanism to propose project proposal can be differentiated from one to another.

a. Projects Funded by Development Budget

Topics of research and development or other kind of activity, normally are proposed by researchers. The proposals then will be discussed in the institute in a plenary session. The objective is to evaluate them in terms of benefit, relevance and other

factors which are in line with the government policy as well as the focus of activity of the institute. The proposals approved by management are then submitted to the AIRD for further evaluation with the emphasis of, again, the relevance of national benefit and financial ability as well. After being approved as recommended proposals, they will be submitted to Directorate General of Finance through Secretariat General, Department of Industry. They will be assessed further whether a topic of project will be accepted.

b. Projects Funded by Routine Budget

Principally the procedure of proposing project proposals which will be funded by routine budget has no difference compared to the above mentioned. The difference is that they are not intensively assessed since the quota is relatively not much. Prior intensive discussion takes place in the institute by considering the benefit and relevance to the government policy.

c. Projects with Cooperation Basis

This kind of project is based on negotiation. In general the project initiator comes from outside or other company. When the idea has been considered by the institute and presumed to be able to conduct, then the Terms of Reference (TOR) will be prepared. The institute will propose a budget planning and after being approved by the ordering company, a mutual agreement contract will be prepared as the basis to work.

It is also possible that the proposal is initiated by the institute, then tendered to the industries. In this case the topic has to be in line with the industry's interest. Therefore, this procedure should be backed up by a survey or sending.

d. International Cooperation

International cooperation may comprise various matters including research projects.

Setting up an international cooperation is highly depending upon the potency and institute's interest and motivated by the need in a certain matter. A lot of such cooperation can be pioneered by close relation between institutions even by well established individual contacts.

Proposing a project can be initiated by either foreign institute or Indonesian institute, normally as the result of survey done by fact finding mission or other kinds of contacts.

Foreign countries which used to have cooperation with IRDCLI are Federal Republic of Germany, France, Finland, Japan and United Nations.

3.3. Research and Development

In accordance with the government policy on industrialization, the activities performed by IRDCLI are to be directed mainly to conduct applied research and development. This features arose for the following main reason :

- urgent need to pursue development in terms of economy and industrialization in the country
- the availability of research facilities is still very limited
- basic researches have been more concentrated in other institutions
- basic knowledge and science for the time being can be backed up by existing scientific literatures

In more concrete statement and as has been mentioned, IRDCLI will then concentrate in : to conduct applied reserach and development.

on utilization of Indonesian fibrous resources including their residues as raw materials for cellulose industries and activities which can be linked with this aspect such as studies on pollution abatement brought about by cellulose industries and other relevant matters.

In terms of technological need, basic research has a very important role. It will strengthen technological background basically, the research results will be more convincing so that evaluation can be done more perfectly to foster the development of technology concerned. Basic research is also essential to accommodate and comprehend the development in the field of cellulose technologies especially those which are so sophisticated. Therefore, beside the emphasis of applied research, the basic research will not be set aside as far as it is possible to conduct.

The following fields of interest undertaken by IEDCLI should be backed up by basic researches :

- Better understanding in various processes of delignification including organosolv pulping and bio-chemical pulping
- Study on the reactivity and crystallinity of cellulose and hemicellulose
- Study on the behaviour of lignin during various pulping and bleaching processes
- Improvement over lignin utilization
- Better understanding in the various processes in rayon manufacturing
- Better understanding in carboxymethylation of cellulose and other cellulose derivatives production processes and their properties
- Study on the mechanism of hydration and dehydration of cellulose in paper sheet making
- Study on the chemical modifications to improve dimensional and

physical properties of rayon fibres

- Treatment of the effluents from pulping and paper making
- Study on the characteristic of synthetic pulps in non-woven fibres

Researches having been carried out in IRDCLI are listed in Annex 2.

Concerning international cooperation especially between IRDCLI and Japan can be mentioned :

- a. Grant from Japanese Government through cooperation with JICA ;
Development of Building Materials by Effective Use of Locally Available Raw Materials (KTA-18), 1978 - 1983.
- b. Grant from Japanese Government through cooperation with IPRI ;
Research on the Utilization of Inutilized Plant Materials,
1981 - 1984.

4. TRANSFER OF TECHNOLOGY

Manifestation of this aspect comprised training, symposium, seminar, technical meeting, forum of discussion, exhibition, publication, etc.

The financial resource to organize these activities may originate from the government budget received by the institute in each fiscal year, or will be funded by other side demanding these programmes. An integrated finance by the two companies is also a probability to meet a mutual interest.

Up to the moment IRDCLI is able to organize such activity each year, especially symposium and exhibition. This forum introduce and feature the result of researches carried out by the institute with the objective to transfer technologies achieved by the researchers. Publications are made frequently in the scientific

journal namely " Berita Selulosa " as well as in newspaper and other kind of mass media.

Other sorts of meeting can only be organized, generally through sponsoring by other organization which are interested in the relevant matter.

The main objective of these scientific meetings and publication is to introduce results of researches carried out by the institute especially to the relevant industries, and to foster their development. The forum, especially technical meeting and discussion, can be utilized by the participants for exchanging information and experiences and solve technical problem faced by the industries.

5. INDUSTRIAL DESIGN ENGINEERING

One of the government programme is to develop domestic product including equipments for industrial purposes. The main objective of this programme is to encourage consumer to use domestic commodities, so that the volume of import can be reduced and the volume of export can be increased. It means that the devisa can be conserved to support national economical development.

To support this programme IRDCLI has made some efforts to enhance its ability in the field of industrial design engineering which comprised process, equipment and plant design. The abilities owned by IRDCLI to a certain extent have been developed, especially to service medium scale industries.

6. STANDARDIZATION

Other government programme is to establish Indonesian Industrial Standards, which comprise specification of commodity, testing and method. In this case IRDCLI was appointed to prepare drafts for

standards especially in cellulose sector. The drafts, eventually, will be officialized by the Minister after being discussed in many forums which are attended by producers, consumers and relevant institutions. Up to this moment some 2245 standards had been established and out of this figure 114 standards are in the sector of cellulose, which are composed of 39 standards of specification and 75 standards of testing, analysis and method.

7. STATUS OF RESEARCHER

In 1977 some 13,500 persons were concerned in Science and Technology Sector in Indonesia. This number increased by 1983 to some 28,000 persons. Out of this figure only several thousands of personnels were officially acknowledged by Government. They spread over many institutions and companies over many Departments (Ministries).

In Department of Industries the existence of researchers is just not a long time ago. Up to this moment the number of researchers in this Department who are officially appointed is quite little. Major part of this number are working in IRDCLI.

One who is interested in becoming an official researcher must meet many certain requirements, principally he or she has to be able to yield scientific results. These scientific matters will be evaluated by Agency for Science with credit point system basis. This Agency decides whether a person is accepted to be a researcher.

The evaluation will be submitted to Department of Industry to officialize.

Many proposals on this matter proposed by some institutes at the moment have been underway.

8. SUMMARY

IRDCLI has carried out its function actively on the basis of governmental mission.

Research and development dominate its activities and the support to back up these activities in terms of the availability of researcher and expertise seemed to be fairly adequate. On the other hand, however, the budget obtained and facilities owned by the institute are considered to be much less to pursue more perfect results. In this case financial aid and any other kind of sponsoring will be of a great expectancy.

FACILITIES

- (1). Pulp Division
 - * Raw Material Laboratory (standard equipments)
 - * Pulp Laboratory (standard equipments)
 - * Pulp Pilot Plant :
 - capacity : 750 kgs/day of dissolving pulp or
1500 kgs/day bleached paper pulp
 - has a 8 M³ stainless steel digester; a five stage
bleaching unit; a wet lap machine and a pulp drier
 - * Pulp Cement Board
 - capacity : 2500 kgs/day unbleached pulp

- (2). Paper Division
 - * Paper Laboratory (standard equipments)
 - * Testing Laboratory (standard testing equipments)

- (3). Cellulose Derivatives & Pollution Division
 - * Rayon and Cellulose Derivatives Laboratory (standard equipments)
 - * Pollution Laboratory (standard equipments)
 - * Rayon Test Plant which has a capacity of 2 kgs viscose
per batch
 - * Rayon Pilot Plant which has a capacity of 500 kgs/day
rayon staple fiber of 1,5 denier or 300 kgs/day rayon
tirecord of 1650 denier or 30-75 kgs/day rayon filament
of 100-300 denier
 - * Waste Water Treatment

- (4). Engineering and Technology Transfer Division
 - * Design and Engineering Section
 - * Quality Control and Standardization Section
 - * Technology Transfer Section
 - * Computer Facilities
 - * Training Room Facilities

(5). Auxiliary

* Service Units :

- Water Purification Unit (160 M³/hr)
- Steam Boiler (70 tons/day of 3 and 13 atm)
- Emergency Diesel Generating Set (2 x 200 KVA)
- Auxiliaries : compressed air vacuum & water cooling
- Maintenance workshop

(6). Information

- * Library with more than 5037 books and 86 journals;
Standard Collection of 1977 titles (both national &
international standards)
- * Duplicatory and copying facilities
- * Publication of the Institute's journal : "Berita Selulosa"
- * Data and Report documentation

SYMPO II, 1978

1. The Availability of printing and writing paper in Indonesia.
2. Some notes on the cooking of bast fibres.
3. The role of H-factor in the sulphate pulping process.
4. Penetration of NaOH cooking liquor to several wood species and factors influencing.
5. Grafting on cellulose.
6. Manufacture of crimp HWM-rayon.
7. Viscose spinning at a room temperature.
8. Manufacture of crimp dull rayon in pilot scale.
9. Effect of microorganism on raw material in storage.
10. Extractives of several hardwoods.
11. Survey on Sesayap River; A study on the possibility of utilizing its water for pulp and paper mill.
12. Some logging methods practiced in Kalimantan.
13. Study on the loss of salt in the process in CRI electrolytic plant.
14. Water purification for paper mill.
15. Question on power for paper machine in Basuki Rachmat Pulp and Paper Mill.

SYMPO III, 1981

1. Ash content of some fibrous raw materials and their problems.
2. Study on the pilot scale pulping of *Gliricidia maculata*.
3. Study on the pulping of "Flamboyant".
4. Study on the thermomechanical pulping of rosella (*Hibiscus sabdariffa*).
5. Rami as raw material for paper making.
6. Potency of cellulose resource in South Sumatra Province.
7. High Yield Pulping of waste wood from South Sumatra Province.
8. Study on the pulping of cotton tree.
9. Water preservation in the pulp bleaching process.
10. Effect of grammature to the calculation of paper sheet strength.
11. Utilization of lignin for particle board.
12. Development of small scale board industries in Tasikmalaya.
13. The effect of Kraft pulp and paper mill effluent on plants.
14. Study on the manufacture of hollow rayon.
15. Rayon fibres from waste cotton.
16. Cellulose grafting by using methyl metacrylate.

SYMPO IV, 1982

1. Utilization of corn stalk for pulp.
2. Utilization of kaso plant for pulp.
3. Experiences on the pilot scale kraft pulping of Pinus merkusii.
4. Wet pressing on pulp sheet.
5. Problem of drainage in the preparation of pulp sheet.
6. Black liquors of some cooking process.
7. Study on woodwaste in South Kalimantan Province.
8. The role and ability of CRI to manage training programme to support the development of cellulose industries.
9. The effect of chip size on the characteristic of kraft pulp.
10. Bleaching of high yield pulp.
11. Effect of pulp consistency in refining on the characteristic of Pinus merkusii pulp.
12. Effect of "Vessel" on the "picking" of paper surface.
13. An attempt to improve rosin size quality.
14. Reforestation in South Sumatra Province and its possibility to support an establishment of rayon industry.
15. Rayon fibres from Pinus merkusii dissolving pulp.
16. Grafting of cellulose by using acrylic acid monomer.
17. The effect of rotting fungi substrate on pulp wood during storage.
18. The effect of fungi growth on kraft lignin media to the deterioration of raw material during storage.
19. Study on pulping of Pinus merkusii to produce dissolving pulp.
20. Effect of kind of pulp and filler on the PCB (Pulp Cement Board) quality.
21. Study on pilot scale pulping of Kaliandra.
22. Water recycling in the pulp bleaching process.
23. Monitoring of pulp and paper mill effluent quality.
24. Cooperation between IRDCLI and PT. Sunda Raya, involving : plant design and engineering, improvements, layout, water purification and others.
25. Projection and perspective of cellulose industries by the end of Pelita IV (The 4th Five Year Development Plan).
26. Design of an electronic pulp consistency regulator.

SYMPO V 1983

1. Potency of waste wood in Jambi Province.
2. Some aspects on cellulose crystallinity and assessibility.
3. Gelam wood as pulp and paper raw material.
4. Prospect on utilizing Enceng Gondok for paper.
5. The possibility of utilizing tobacco tree for pulp and paper.
6. Pulping process of Kisabun wood (*Felicitium Decipiens*).
7. High Yield Pulp from *Albizia Falcataria*.
8. Chemical analysis and characteristic of *Pinus merkusii* of many ages.
9. Survey on waste wood transportation methods in Central Kalimantan.
10. Wood working industry development in South Kalimantan.
11. Effect of additive on the characteristic of cotton paper.
12. Study on Carbon tention.
13. Initial wet strength of long fibre pulp and with other pulp blended.
14. Spectrophotometrical determination of pectin in non-wood raw material.

SYMPO VI, 1984

1. Manufacturing of rayon fibres from several kinds of hardwood pulp.
2. Manufacturing of rayon fibres from mixed *Pinus merkusii* and *Albizia falcataria* pulp.
3. Study on the use of agricultural waste for pulp cement board (PCB).
4. Study on the effectivity of using coagulant in waste water treatment.
5. Study on the use of active carbon in waste water treatment.
6. Water quality index of some rivers in West Java Province.
7. Test of permanency of some cultural papers.
8. Humidity and temperature regulation in a paper testing room.
9. System closure of paper machine in several paper mills.
10. Study on energy conservation in a paper machine.
11. Location of Aceh Paper Mill from the viewpoint of transportation.
12. Potency of Bintangur wood from Jambi for pulp and paper.
13. Some problems in the storage method of bagasse.
14. The change in chemical composition of bagasse during storage.
15. Analysis of Klason lignin of some raw materials.
16. Pulping of *Eucalyptus* species.
17. Pilot scale pulping of mixed waste wood from Jambi.

18. Effort on improvement of cornstalk pulp quality.
19. Effect of soda and anthraquinone concentration in the pulping of tobacco tree.
20. Bleaching methods of palm leaf stem pulp.
21. Study on satin white manufacturing.
22. Effect of aid chemicals on the initial wet strength of paper sheet.

SYMPO VII, 1985

1. Preliminary study on the utilization of fungi for reducing colour of waste water.
2. High Yield pulping from waste wood.
3. Rayon fibre from mixed hardwood dissolving pulp.
4. Parameters in the preparation of rosin size.
5. Effect of sulphur dioxide on animal life.
6. Appropriate technology for pulping of agricultural waste for rural area.
7. Effect of storage on chemical composition of *Pinus merkusii* and *Albizia falcataria*.
8. Pulping of *Pinus merkusii* by soda - anthraquinone process.
9. Comparative study on economy by using *Albizia falcataria*.
10. Degumming process of rami.
11. Effect of pulp kind and freeness on the quality of pulp cement board (PCB).
12. Refining of long fibre pulp to improve its strength characteristic.
13. Microbiological deterioration of *Pinus merkusii* and *Albizia falcataria* chips during storage.
14. Monitoring of local rayon fibre quality.
15. Effect of storage on the physical characteristic of rayon fibre.
16. Situation of pulp and paper industries in the 3rd Five Year Development Plan.
17. Utilization of straw pulp for medium paper.
18. Study on the use of Harmide B-15 additive in paper making.
19. Effect of storage of *Pinus merkusii* and *Albizia falcataria* chips on the yield and paper quality.

SYMPO VIII, 1986

1. Utilization of pineapple leaf for pulp and paper.
2. Preliminary study on utilization of waste sago tree (*Metroxylan* spp.) for pulp.
3. Study on lignin of several kinds of pulp.
4. Experiment to reduce pitch in Meranti wood (*Shorea* spp.).
5. De-inking of waste paper by flotation process.
6. Effect of modified tapioca on paper strength.
7. Use of polyacrylamide in the paper making by using local pulp.
8. Manufacturing of high quality rayon by using high alpha pulp.
9. Manufacturing of filtering material for rayon viscose.
10. Waste wood for energy substitution in pulp and paper industry.
11. Design of board machine for small scale industry.
12. Comparative study on economy of bagasse as energy and as raw material.
13. Utilization of waste fibre sludge as a media for single cell protein production.
14. Recovery of alum from sludge of waste water treatment.
15. Waste water treatment by activated sludge.
16. Design of an aerator.
17. Design of a hydropulper.

SYMPO IX, 1987

1. Pulping of cornstalk for fluting medium.
2. Study on several bamboo species as long-fibre raw material.
3. Study on pulping of *Eucalyptus microcorys*.
4. Study on bleaching of *Albizia falcataria* pulp by considering environmental aspects.
5. Delignification velocity in sulfate process pulping of *Eucalyptus alba*, *Eucalyptus saligna* and *Albizia falcataria*.
6. The effect of raw material pretreatment on high yield pulping.
7. Straw pulp as raw material for ceiling.
8. Economical value of straw.
9. Solving pitch problem in using Meranti pulp for paper.
10. Experiment on using strength agents for paper making.
11. Effect of dispersants in de-inking process by washing.

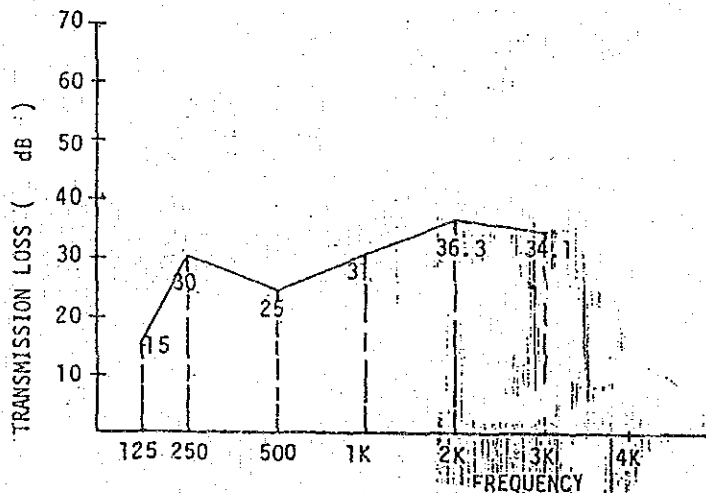
12. Effect of composition of coagulating bath on the rayon fibre quality.
 13. The utilization of sludge of waste water treatment as a growth media for fungie.
 14. Physiological acclimation of *Daphnia carinata* King in pulp mill effluent.
 15. Effect of SO₂ on plant life.
 16. Elimination of toxic material in pulp and paper mill effluent by foam formation.
 17. Utilization of microorganism activities for treatment of toxic pulp and paper mill effluent.
 18. Design of cooking process regulator by computer system.
-

8. PCB 試驗結果

RESULT OF TESTING ON PCB FROM EXPERIMENT

Composition No.		I	II	III	JIS Standard A - 5414	
Raw Materials (%)	Cement	45.5	31.7	55.4	52	
	Pulp	12.5	12.9	12.9	13	
	Asbestos (import)	5.0	4.8	-	5	
	Asbestos (local)	-	-	4.8	-	
	Limestone powder	5.0	21.8	26.9	30	
	Slaked lime	5.9	-	-	-	
	Trass (Pozzolanic)	26.1	4.0	-	-	
	Limepozzolan Cement	-	24.8	-	-	
Result of test	Bulk Density (g/cm ³)	0.95	1.08	1.05	1.0 min	
	Water content (%)	13.4	9.00	6.80	8.0 max.	
	Water Absorption (%)	51.1	42.1	40.50	50.0 max.	
	Bending strength	//	106.09	103.04	96.00	94.0 min..
		⊥	59.0	60.0	80.00	57.0 min.
	Change in length (%)	Swelling	0.09	0.04	0.01	0.25 max.
Shrinking		-0.13	0.14	0.02	0.025 max.	

2. TRANSMISSION LOSS FOR PCB 6 mm thickness



3. HEAT OF CONDUCTIVITY PCB 6 mm thickness

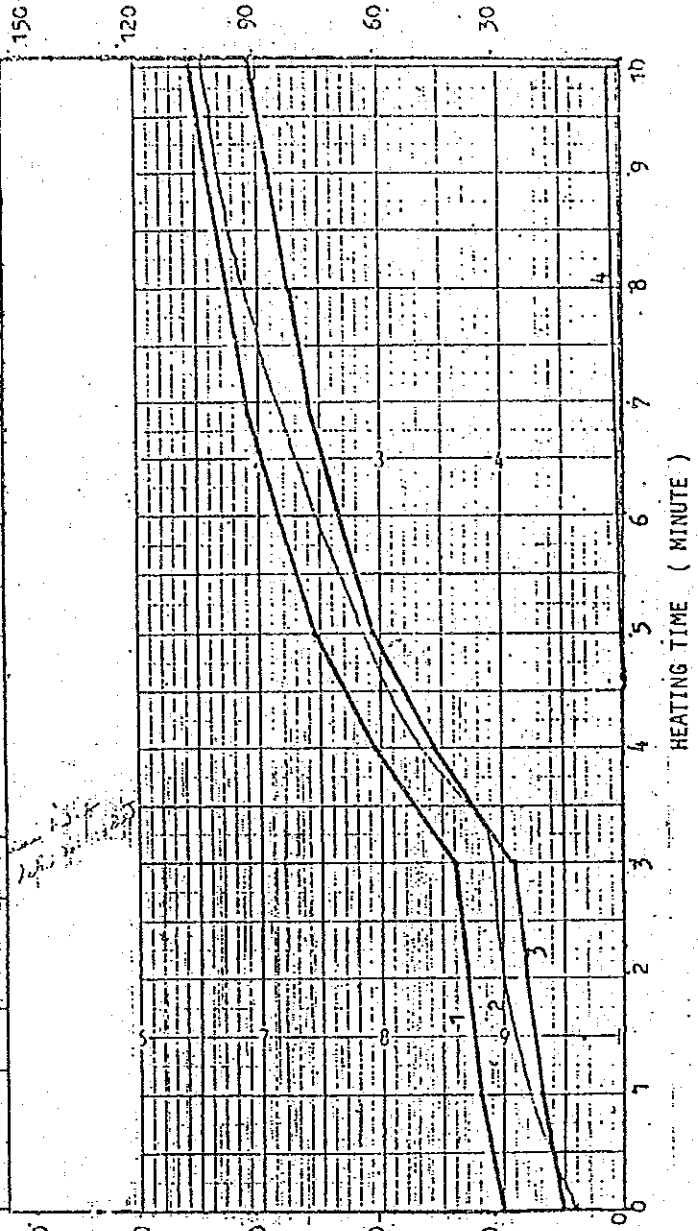
K = 0.232 - 0.278 Watt/m²C.

FIRE TEST LABORATORY
 INSTITUTE OF HUMAN SETTLEMENTS
 AGENCY FOR RESEARCH AND DEVELOPMENT
 MINISTRY OF PUBLIC WORKS

Office : Jalan Turangga No. 5, Phone : 421168 - 51065 Bandung

RESULT OF SURFACE TEST

Specimen	Testing date
PULP CEMENT - BOARD IHS PROD.	24 August 1984
Weight before heating (gr)	Weight after heating (gr)
370.5	330.3
Weight loss (gr)	Room temperature (°C)
40.2	26
R E S U L T	
Temperature time area td. 0 (°C . Min)	Cross time of standard temperature (Min)
0	-
Density of smoke released (CA)	G l o w (second)
3	
Maximum temperature behind specimen	(°C)



R E M A R K :

Initial temperature : 40°C
 Finish temperature : 344°C
 No. 1 : Standard temperature
 No. 2 : Specimen temperature
 No. 3 : Exhaust temperature
 No. 4 : Smoke curve.

Classification

PCB is classified as non-combustible materials.

FIRE TEST LABORATORY
 INSTITUTE OF HUMAN SETTLEMENTS
 AGENCY FOR RESEARCH AND DEVELOPMENT

Office. : Jalan Turangga No. 5, Phone : 421168 - 51065 Bandung.

Test Number : 45.

RESULT OF NON COMBUSTIBILITY TEST

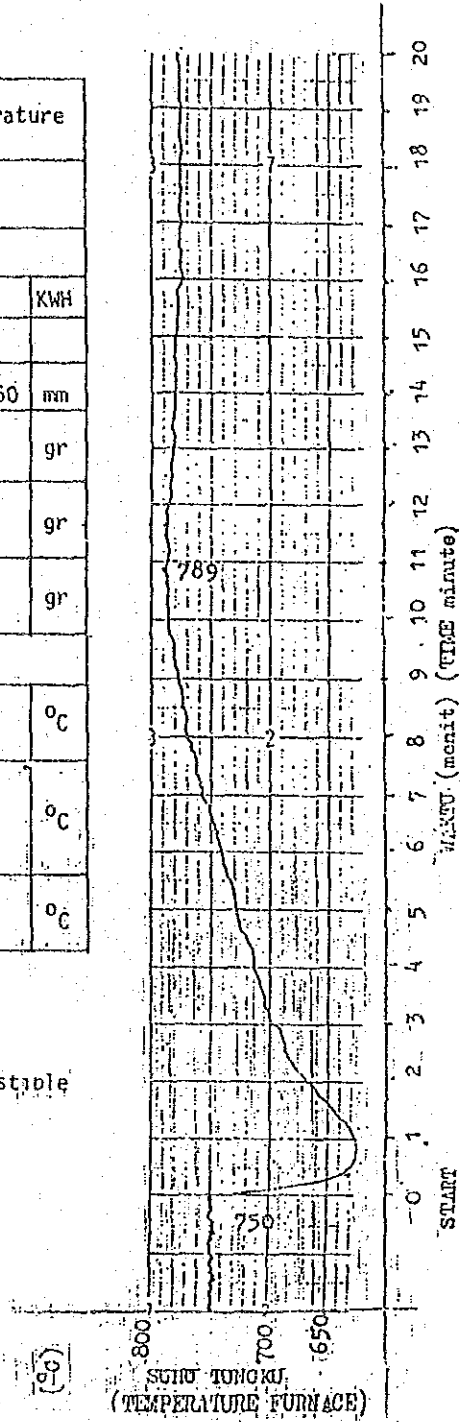
Specimen	Testing date	Room temperature (°C)	
PULP CEMENT BOARD IHS PROD	19 Sept. 1984	27	
HEATING CONDITION			
Electric power	1.5	KWH	
SPECIMEN			
Dimension	40 x 40 x 50	mm	
Weight before heating	96.87	gr	
Weight after heating	72.56	gr	
Weight loss	24.13	gr	
R E S U L T			
Initial furnace temperature	750	°C	
Maximum furnace temperature during test	789	°C	
Temperature difference Δt	39	°C	

REMARK :

Classification :

Pulp Cement Board is classified as non combustible material.

$$\Delta t < 50^{\circ}\text{C}$$



9. 機材要望リスト

THE MACHINERY NEEDED TO BE PROVIDED IN ORDER
TO TRANSFER THE TECHNOLOGY ON THE THEME
AS FOLLOWS.

Item	Name of equipment	Specification	Amount	Purpose	Remark
1.	Drying machine	150 sheet/hr	1 unit	For drying PCB	A
2.	Laminating machine	400 x 600 mm	1 unit	Laminating PCB product	A
3.	Printing machine	400 x 600 mm	1 unit	Printing PCB product	A
4.	Making roll	Ø 700 mm, 1250 mm length	1 unit	Making PCB	B
5.	Sanding machine	2400 x 1000 mm	1 unit	Sanding PCB	A
6.	Synchronizer apparatus for generator set	270 KVA, 220 V, 3 phase	1 set	Can use Gen. Set I or Gen. Set II	B
7.	Hydrolic press (manual)	4 ton cap table 400 mm stroke 100 mm	1 unit	Making PCB in Laboratory	B
8.	Change length apparatus	Type DG 328 linear gauge 0,01-10 mm Width frame: 450x60 mm	1 unit	Measuring shrinkage and swelling	B
9.	Stirrer	Length 800 mm input 0,5 KW 220 V, 50 Hz	1 unit	Mixing polyacrylamide	B

Remarks : A = most needed
B = very important
C = if possible

KTA 18 PROJECTS

ON THE DEVELOPMENT OF BUILDING MATERIALS

BY THE EFFECTIVE USE OF LOCALLY AVAILABLE BUILDING MATERIALS
IN THE REPUBLIC OF INDONESIA

I.1. Request for repair of the machinery and equipment provided by Japan and for providing spare parts and consumables.

a. Name of the machinery and equipment needed to be repaired by the Japanese experts : n o n e

b. Name of the spare parts and the consumables needed to be provided :

- Impeller of concrete plant 1 set (A)
Mixer MTC 12 M 5
- Thermo-couple for muffle furnace 2 (A)
Temp. 1200 C
- Hydraulic hose for MTC - 700 all set (A)
Semi auto block machine
- Motor brake simplator BM 224 2 (A)
- Magnetic contactor TOGAMI
- a. FAK 10 U 10 (A)
- b. FAK 20 U 5 (A)
- Belt for belt feeder 1 (A)
Model HBM - 863 A Sumitomo
(2,5 T/H x 0,4 x 2-L)
- Rectifier Miki Pulley 10 (A)
BEM - A - 27 , AC 400 v - DC 190

c. Those spare parts are not available in Indonesia and also needed specialized repaired .

2. Request for supplementary technical cooperation

a. Themes which needed supplementary technical cooperation by the Japanese short-term experts and the contents of

the task of the experts as follows :

- Experts for repairing
- Experts for development of energy alternative (oil to coal) of ALA product.

b. Name of the machinery needed to be provided in order to transfer the technology on the theme as follows :

- Mould box MTC - 700
 - a. 10 cm block 1 set (B)
 - b. 15 cm block 1 set (B)
- Cylinder mould C - 19 A 20 (B)
(ϕ 15 X 30) cm MARUTO
- Cubical mould (15 X 15) cm 20 (B)
- Moveable air compressor 1 (B)
- Hand lift truck size : L = 1879 m/m
W = 600 m/m
H = 254 m/m
- Bucket car (600 X 900 X 300) m/m

c. The counterpart personal for the after care programme as follows :

- Mr. Supranggono, 35 years, male, researcher of B.M
- Mr. Purwito, 38 years, male, researcher of B.M
- Mr. Subardjo, 44 years, male, researcher of b.M

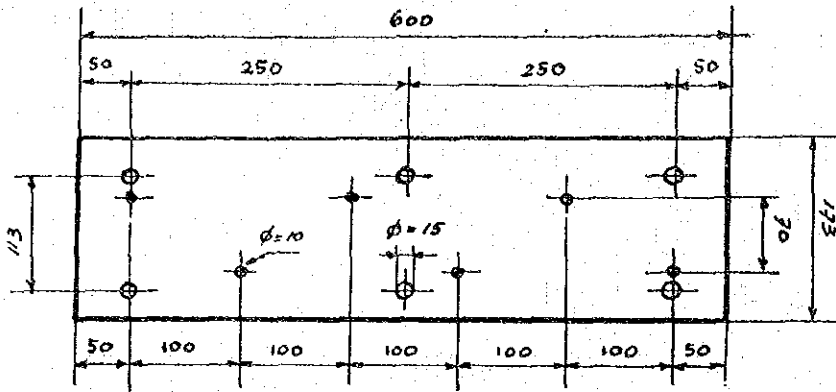
III. Other related items.

1. Budgetary condition of Institute of Human Settlements and perspective of its defrayal of local cost expences for the implementation of the aftercare programme.
2. The present position and activities of the former counterparts personal of the projects as follows:
 - Mr. Supranggono : Chief of Experimental Sub Station for local building materials in Cilacap.

EQUIPMENTS TO BE PROVIDED BY THE GOVERNMENT OF JAPAN
THROUGH JICA

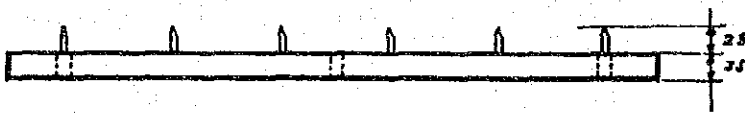
Item	Name of Equipment	Specification	Amount	Purpose
1.	<u>Equipment for Supplemental Technical Guidance</u>			
1.1.	Bursting Strength Tester	Mullen Type Bursting Tester; High Pressure Type Pressure Gauge : 0 - 50 kgf/cm ² 0 - 70 kgf/cm ² Pressure Speed : 170 ± 20 ml/min Motor : 200 W.220V.	1 set	For testing the bursting strength of pulp
1.2.	Bending Tester	Strograph Type Load range : max. 500 kgf Load indicating accuracy : 1,0 % Cross head stroke : approx. 1100 mm Cross head speed : 0,5 - 500 mm/min Recorder : X-T type chart width : 250 mm x 15 m Electric source : 220 V 50 Hz	1 set	For testing the bending strength of Pulp Cement Board
1.3.	Kenaf fibre cutter	Enable to vary the speed of cutter or the speed of feeder, to produce kenaf fibre of 50 mm length	1 set	The existing motor drive : - Cutter drive : 7.5 Kw 380 V 6 pole - Feeder I drive : 2.2 Kw 380 V 4 hole - Feeder II drive 2.2 Kw 380 V 6 pole
1.4.	Water meter	To be installed for 4 in pipe	1 set	To measure the fresh water quantity used for pulping process
1.5.	Bagasse Shredder	see attached drawing	1 set (3 pcs)	For bagasse shredding

Item	Name of Equipment	Specification	Amount	Purpose
1.6.	Temperature indicator & recorder (Stationary installed)	For temperature range of 0 - 250°C		To measure and record the heating temperature in the rotating digester
2.	<u>Spare Parts for the Machinery and Equipment</u>			
2.1.	Cutter blades	Special size for cutting machine	1 set	For straw cutting
2.2.	Grinder for cutter blades	Outside dia. 25 cm Inside dia. 2 cm Width dia. 1.5 cm	2 sets	For cutter blades sharpener
2.3.	Conveyor belt	0.3 x 47 x 250 cm 0.5 x 47 x 121 cm 0.7 x 50 x cm	2 sets 1 set 1 set	For feeder of cutting machine For cutting machine For conveyor
2.4.	Wet machine felt	1275 x 14100 mm	1 set	For wet machine
2.5.	Blower	To increase the blowing capacity of the duster	1 set	The existing blower motor : 3.7 Kw 380 V 4 pole
2.6.	Vacuum pump	Toshiba Seiki Co. GSL - 400 motor : 0.75 Kw 380 V 14 w rpm	1 set	For PCB sheet former apparatus
2.7.	Control Valve	Tsubakimoto Chain Co. Osaka Form : tt-EGB Frame : SG Motor : 380 V 50 Hz 4 pole rotor : D	1 set	For fresh water level control
2.8.	Temperature Detector	Temperature range of 0 - 300°C	1 set	For rotary digester
2.9.	Crane shaft	See attached drawing	1 set	For Nissan motor car
2.10.	Refiner blades	No. 1 and No. 2	2 sets	For defiberation
2.11.	Refiner blades	No. 5 and No. 6	2 sets	For fibrillization



**SHREDDER
FOR BAGASSE**

(ALL DIMENSION IN MM)

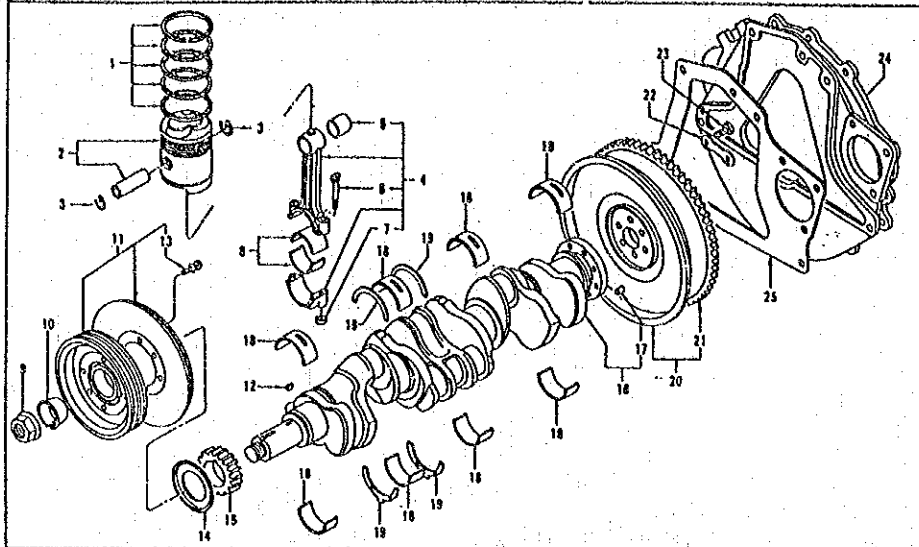


SECTION No.

106-1

PISTON, CRANKSHAFT & FLYWHEEL (SD33)

NOTE



S	KEY NO	PART NO.	DESCRIPTION	QTY	UNIT	APPLIED MODEL	APPLIED DATE			FORMER
							FROM	UP TO	ICR	
X	101	12033-J2201	RING SET-PISTON STD SIZE 1	1	1	8033				
	201	12033-C6810	RING SET-PISTON STD SIZE 1	1	1	8033	1091			12033-J2202
	201	12010-J6317	PISTON SET	6	1	8033				
X	301	12033-37600	RING-SNAP, PISTON PIN	12	10	8033				
	401	12100-37882	ROD ASSY-CONNECTING	6	1	8033				
	501	12100-37802	ROD ASSY-CONNECTING	6	1	8033				12100-37652
	601	12030-37800	BUSH-SMALL END	4	4	8033				
	601	12106-37802	BOLT-CONNECTING ROD	12	10	8033				
	701	12113-37801	NUT-CONNECTING ROD	12	10	8033				
	801	12117-78210	BUSH-CONNECTING ROD 10.75 UNDER SIZE 1	12	8	8033				
	801	12117-78211	BUSH-CONNECTING ROD 10.25 UNDER SIZE 1	12	8	8033				
	801	12117-78212	BUSH-CONNECTING ROD 10.60 UNDER SIZE 1	12	8	8033				
	801	12117-78213	BUSH-CONNECTING ROD 10.75 UNDER SIZE 1	12	8	8033				
	801	12117-78214	BUSH-CONNECTING ROD 11.00 UNDER SIZE 1	12	8	8033				
	901	12308-61503	NUT-CRANKSHAFT	1	2	8033				
	1001	12307-61601	BUSH-CONE	1	1	8033				
	1101	12303-C6800	PULLEY-CRANKSHAFT	1	1	8033				
	1201	12003-C6601	PULLEY-CRANKSHAFT POWER STEERING 1	1	1	0715933				
	1201	12306-78200	KEY	2	10	8033				
	1301	08120-81602	BOLT-HEX HD, 8X1.25	6	20	8033				

PUB. NO. C-0370L

106 - 1

REVISED: DECEMBER 1982

JICA