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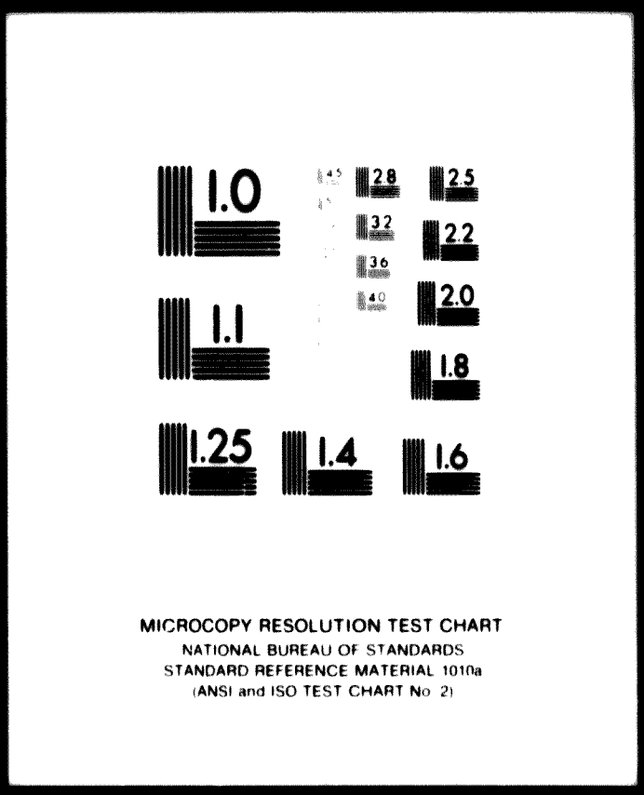
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Report to the Government of Thailand

Establishment of a National Packaging Centre in Thailand

3612

A.C. POULTER

UNIDO TECHNICAL EXPERT

OCTOBER 1971

RESTRICTED

United Nations Industrial Development Organisation

Special Industrial Services

Report to the Government of Thailand on Establishment of a National Packaging Centre in Thailand.

Ministry of Industry

Bangkok

Thailand

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A.C. Poulter, Technical Assistance Expert

October, 1971

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This report has not been cleared with the bureau of Technical Assistance Operations of the United Nations, which does not therefore necessarily share the views expressed.

The report has been read by and agreed with the Counterpart of the Technical Assistance Expert. At the time of duplicating the report has not been seen by the Director General of the Department of Industrial Promotion although the general outline has been discussed with him.

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(a)

THE ESTABLISHMENT OF A NATIONAL PACKAGING CENTRE IN THAILAND

SUMMARY OF REPORT

This report covers a three months visit of a UNIDO Technical Assistance Expert to assist the Government of Thailand by assessing the need for a Thai National Packaging Centre and preparing a blue print for the Centre.

The expert was assigned to the Department of Industrial Promotion and had as his counterpart the Chief of the Packaging Division of the Small Industries Services Institute.

As a result of discussions and visits to industry, Government Departments and with Members of the Thai National Packaging Association it was concluded that there is a need for a packaging centre which would include in its functions packaging information, training package promotion and a technical advisory, and testing service.

Functional and staff structures have been prepared and the operation of each unit is discussed in the report. Job specifications and training schedules are given for middle and senior levels of staff. One section is devoted to the operational sequence for the Centre. Equipment and book lists have been prepared and buildings have also been considered. A section is given to summaries of the revenue and capital costs for the proposed packaging centre.

Proposals have been made regarding further assistance from the United Nations in respect of training fellowships, technical assistance experts and assistance towards the cost of plant and equipment from abroad.

The report has been covered in detail with my counterpart, discuss with the Deputy Director of SISI and briefly with the Director General of the Department of Industrial Promotion.

The conclusions and priorities are listed in section P paragraph 31 onwards.

REPORT

ON

THE ESTABLISHMENT OF A NATIONAL PACKAGING CENTRE IN THAILAND

A. Terms of Reference

1. The national economy of Thailand is expanding rapidly. It is the intention of the Government to increase and diversify the country's exports and wherever possible to enter new markets and in this the packing and presentation of the products is essential for sales. The packaging of products for the home market is far from adequate in many cases. The packaging industry is very diversified and requires assistance in applying basic packaging technology to its needs.

2. The Government of Thailand are considering the possibility of establishing a national packaging centre and at their request UNDP sent a Technical Assistance Expert to Thailand for the period August to October 1971 to advise on the establishment of such a Centre. He was specifically asked to:

   (i) Assess packaging facilities in Thailand.
   (ii) Formulate terms of reference and statutes for the centre taking into account testing and research, standardization, documentation and information, education, promotion of new packaging materials and techniques.
   (iii) Advise on the organizational structure and staff.
   (iv) Provide a detailed specification of the testing equipment.
   (v) Recommend the implementation programme.
   (vi) Recommend any other measures of technical assistance.

   For full terms of reference and job description see Appendix I.

3. At his pre-mission briefing he was asked by the ~~Substantitute~~ Substantive to prepare his report mainly in the form of a request to U.N. for further assistance if this was the wish of the Government of Thailand. He discussed this on arrival at Bangkok and was asked to make his report so that the relevant information would be available for the Government to use as they subsequently decided.

   The Consultant was assigned to the Ministry of Industry and attached to the Packaging Division of the Small Industries Service Institute which is responsible to the Ministry of Industry through the Department of Industrial Promotion. The Expert's counterpart was the Chief of the Packaging Division, Mrs. Orrasa Jirapinyo.

2/...

B. General Outline of Programme

4. Initial enquiries and report reading gave little information on the extent and technical development of the packaging industry. Unfortunately it has not been the subject of a survey as have many other Thai industries. It was therefore necessary to plan a series of visits to Government Departments, producers and users of packages and transport organizations to appraise the industry. These visits occupied about two months. They were followed by work and discussions directly related to the function, structure staffing and buildings for the Centre, the collection of data for and the drafting of the report.

C. Packaging and Packaging Technology in Thailand

5. 1. Package producers and users.
Early meetings were held with the Secretary and members of the Thai Packaging Association, my counterpart, and selected users of packaging to decide a programme of visits to assess:

(i) The level of Packaging in Thailand;
(ii) The present sources of technical knowledge;
(iii) The need and desire for the services of a packaging centre as envisaged in the terms of reference.

6. The companies and other organizations visited are listed in Appendix II. Some 34 visits were made with my counterpart to companies and Government organizations producing packages, to those using packages or interested in their use and to transport organizations. The position can be summarized as follows:

(i) The range of packaging is very large. The high quality departmental stores and self service food stores in Bangkok display goods packed to a good standard. Much is imported but some it produced in Thailand. Packaging in the smaller shops and upcountry will generally he to an appreciably lower standard except for certain proprietary brands of goods.

In the markets and most of the small shops produce is sold in bags which are nand made from newspapers or in banana leaves. This applies to the large bulk of the retail food trade. This type of produce is delivered in bulk in open wicker type baskets with, it is said, a significant loss due to damage. Polyethelene bags are sometimes used in place of paper bags and are frequently used as a retail pack for soft drinks.

(ii) Types of packages. The traditional transport containers are gunny bags, wicker type baskets and wooden crates but corrugated cases, paper sacks, some plastic sacks and metal drums are being increasing used, solid fibreboard cases, fibreboard drums and shrink wrap packaging are not currently used.

Most types of consumer pack can be obtained but with a limited range except for plastic packaging where the range of flexible packs is very limited.

(iii) Availability of raw materials. Gunney bags wicker type baskets and crates are all made from local materials. The production of paper and board for packaging has been increased to meet the current demands of the packaging industry which is quoted as Kraft paper 18,000 tonnes, wrapping papers 14,000 tonnes and carton board 45,000 tonnes per annum with an estimated increase of 43% over the next four years. Speciality papers laminates and foils are imported.

A limited quantity of PVA and PVC are produced in Thailand all other plastics are imported. In 1976 most of the plastics used in packaging materials will be produced in Thailand which will open up the scope for plastic packaging.

(iv) Size of companies. There are few companies employing over 50 people. In most sectors of the industry there are upto about ten medium sized firms and the remainder are under say 5 or 10 employees and often a business within the family. Some of these small firms turn out good quality work but many obtain their orders by producing an inferior product which is not adequate for the job but which sells on price.

(v) Quality and technical ability. As already mentioned many types of package can be produced in Thailand to a high standard. The companies producing such packages in most cases, obtain their technical knowledge and advice from abroad. This may be done through a tie-up with a foreign company, from the company for whom they are producing the packages or from the overseas company who sold the equipment.

There is a need for technical advice to be available to the many package producers and users who have not the advantage of contacts abroad. There is no ready source of [illegible] to stimulate developments in design

(vi) Productivity. During our visits I noticed that several plants were operating well below the output of the equipment. While the potential market is appreciable the present demand for packaging is relatively low. There is a need for package promotion to develop an increasing awareness of the technical and sales appeal aspects of packaging.

(vii) Testing and quality control. With one or two notable exceptions there is very little quality control or testing carried out in the factories visited.

7. 2. <u>The Thai Packaging Association</u>.

The Thai Packaging Association was formed in 1969 with the objects of promoting the packaging industry, spreading information on packaging techniques, providing a forum for the exchange of opinions and technical information and representing the packaging industry within the Kingdom and abroad.

8. It has an ordinary membership of 30 who pay an annual subscription of Baht 500 ($25). It employs one member of staff. Trade associations are not usual in Thailand and the formation and progress of this association reflects the enthusiasm of its officers for the packaging industry. The Association has participated in two packaging seminars.

9. The Association is finding it difficult to increase its membership which probably reflects the fragmented nature of the Thai Packaging industry and the parochial outlook of many of the smaller companies. The Association and the Packaging Division of SISI work very closely together and it is essential that this should continue if and when the Centre is formed. It is not however my opinion that at this stage the Association is strong enough to sponser and raise the funds to operate a National Packaging Centre as envisaged. The help of the Association should be sought in advising and guiding the work of the Centre possibly through advisory panels and also in the training of the staff when appointed and in industrial training courses.

10. If in the long term the Packaging Centre developes satisfactorily and becomes financially self supporting or partially so, the place of the Thai Packaging Association in its management should be reconsidered.

11. 3. <u>Packaging Division of the Small Industries Service Institute (SISI)</u>

This Institute operates under the Department of Industrial Promotion whose functions are set out in the diagram following this paragraph (11). The Department is responsible for the promotion of small and medium sized industries, while the Department of Industrial Works is responsible for the large basic industries. The Department of Science is organized by disciplines to provide support for example work on pulping for the paper and board

12. The objectives of SISI are: to make a continuous appraisal of the small and medium scale industry sector of the economy in terms of its various requirements and to study the feasibility of the promotion of new products and industries.

13. The Packaging Division has been in operation since 1968 and has successfully organized packaging seminars and exhibition. Until recently, due to the capability of the staff available, the work has been directed to creative design but the emphasis has now been shifted to technical design. The Chief of the Division is a graduate industrial designer who has been trained in packaging in Japan and India. She has a staff of four.

14. D. <u>The need for a National Packaging Centre</u>

From my visits and the discussions I have had with Government officials and members of the Thai Packaging Association it is my opinion that there is a need for a Packaging Centre in Thailand performing the functions indicated in my terms of reference. Examples of this need are:

(i) Many products are inadequately packed from the point of view of protection of the goods, hygiene and sales appeal.

(ii) There is generally a lack of knowledge in packaging technology except where this has been obtained from abroad.

(iii) There is no general centre where manufacturers requiring information, advice and testing sources can obtain it.

(iv) The need for such information is increasing with the rapid development of industrialization and the production of new products particularly in the field of food processing.

(v) The drive to use home produced materials in place of imported materials for package production introduces packaging problems.

(vi) The projected expansion of the plastics industry will give increased scope to the packaging industry if the technologists are available.

(vii) There is a need for long term planning based on techno-economic information which a packaging centre should provide.

(viii) The need for packaging for exports to be consistantly of a standard which will allow Thai exports to compete in foreign markets for quality of packaging and presentation. A packaging centre can be particularly useful to companies without design and testing facilities.

(ix) There is need for training in packaging to be programmed

15. During the visits to industry the persons interviewed were asked to say if they considered the functions of the proposed Centre and the Centre itself were required. The replies are given in Appendix III and a summary of them is given below.

Interest Summary % of organizations showing interest in the functions of the proposed packaging centre at different levels	Functions of Proposed Packaging Centre							
	Communication Division			Testing Services Division				overall
	Information	Packaging Promotion	Training	Enquiries & Advisory	Testing	Specific Research & Development	Standards	
1. Considered very desirable	58	18	70	61	30	39	58	42
2. Considered desirable	21	55	12	30	40	49	30	58
3. Uncertain	3	3	3	3	3	6	-	-
4. Not wanted	-	-	-	-	-	-	-	-
5. Opinion not given	18	24	15	6	27	6	12	-

TABLE 1 Summary of interest in Packaging Centre obtained from 34 organizations.

16. It will be seen that a large majority of organizations considered a National Packaging Centre to be desirable or very desirable.

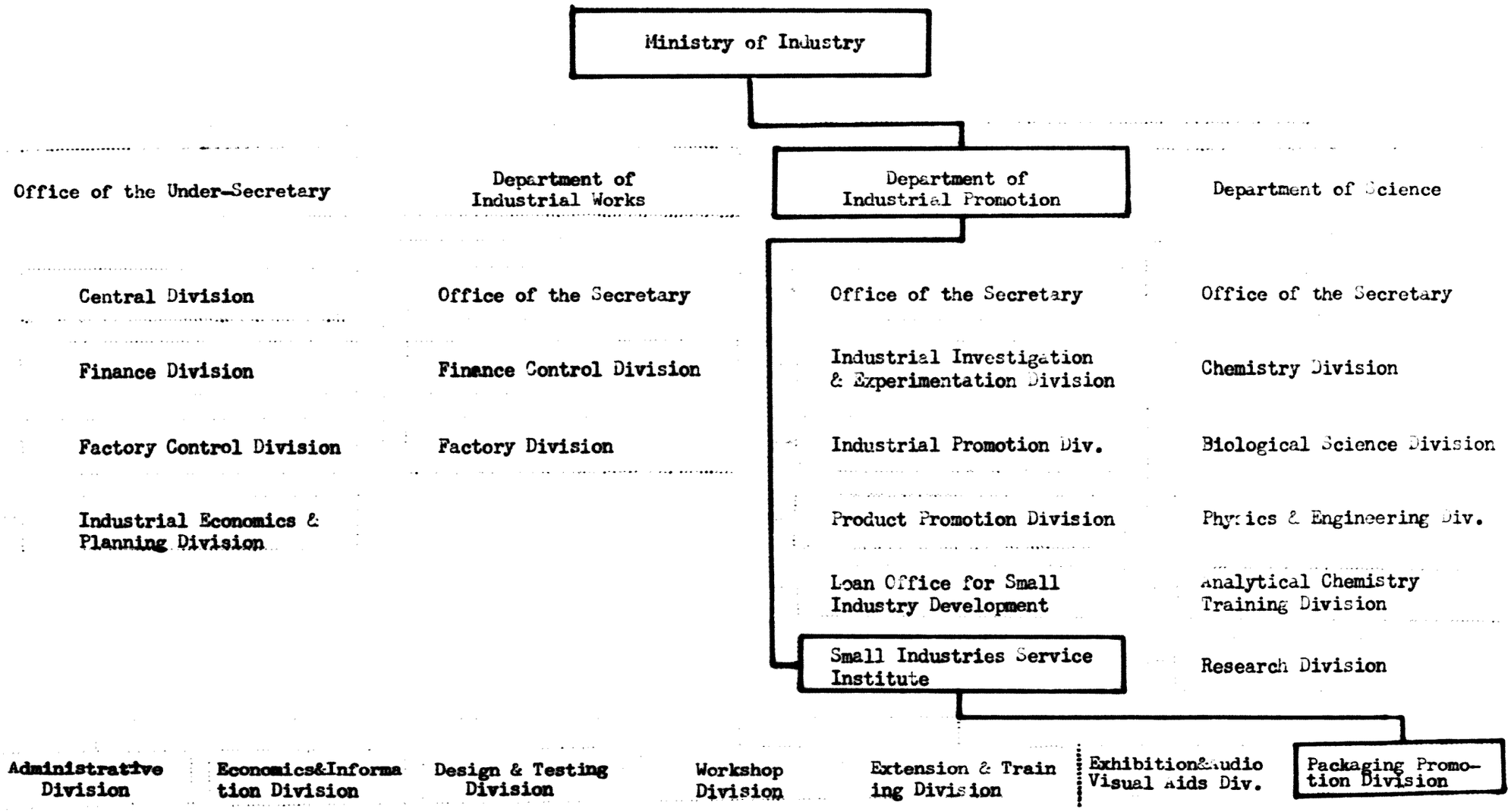
17. E. Basis for the operation of the National Packaging Centre and its location

Many National Packaging Centres operate as industrial associations with or without Government financial support. It has been suggested to me that this might be the basis of operation for the Thai National Packaging Centre which would then form part of the Thai Packaging Association activities. From my comments in paragraphs 7 to 10 it will be appreciated that I do not feel that this would be practical at least for the present time.

Two other possibilities have been considered and rejected. One was to associate the Centre with the Applied Scientific Research Corporation of Thailand. After discussion I did not feel this was a good idea because the emphasis at ASRCT is more towards applied industrial research than that at a packaging centre which is essentially technology with a large measure of practical experience. The other was possibly to associate the Centre with the Department of Science in the Ministry of Industrial Development. The structure of this department is shown in Fig. 1 where it will be seen that the orientation is scientific rather than industrial.

Fig. 1
~~FIGURE 1~~

ORGANIZATION CHART MINISTRY OF INDUSTRY



The logical position seems to me to be in the Department of Industrial Promotion which is specifically concerned with medium and small industries and through SISI with their technological development.

As I will mention in the next section I believe that to be effective a Packaging Centre should be a discrete unit whose staff is solely concerned with serving the packaging industry and that this is apparent to the industry. While I appreciate the cost and staff work load advantages of functions covering a number of industries I believe that for effective operation a small team working exclusively for the packaging industry and for which one man is responsible will give the best results. Whether this team forms a packaging centre within SISI or a parallel organization is not so important as the image to the packaging industry of a centre operated by packaging experts for the packaging industry and responsible to a packaging director. For this reason I favour the name National Packaging Centre rather than Institute or Division. I believe that the Packaging Centre should be closely associated with SISI preferably as a parallel organization under the Department of Industrial Development. It should be located close to or within the same building as SISI. Two schemes for the buildings covering these alternatives are put forward in Section J.4.

18. F. Cooperation between the Packaging Centre and Industry

I have no doubt that there is a real need for the service which the Packaging Centre can give to industry. I have a doubt whether many of the package producers and users will realize the need for the service and make use of it when it is available.

The first and vital task which the Director and staff will have to do is to sell themselves to the industry they have been formed to serve. Technical knowledge is little use stored in the retrieval system of an information centre or the heads of packaging engineers if it is not brought out and applied on the factory floor. For this to happen the staff of the centre must early gain the confidence and respect of the staff of companies in the industry. This is the essential basis for an effective centre and the Director must train his staff to work to this objective from the beginning. This lack of "belonging to the industry" is probably the main failure of Technical institutes generally and the main reason that I feel the centre should function as a discrete unit as outlined in the previous section.

It is vital in building up this relationship that staff understand the importance of treating as confidential things learned in a factory particularly as there is no patent law in Thailand. It is also important that they quickly pick up the practical aspects of the industry. In this connection it would help in building up relationships if through the Thai Packaging Association new packaging staff could be accepted into factories for several weeks familiarization and training. The staff should be spread

Although as a Government financed centre the control must remain with the Ministry of Industry the industry should be integrated with the centre's activities possibly through advisory panels and working parties and their participation in the training schemes.

19. G. Functional Structure for the Centre

My belief in the need for a relatively small compact team to form the Centre is reflected in the functional structure proposed for the National Packaging Centre. This is set out in Fig. 3 which follows paragraph 22~~(1)(1)~~. There are two operating divisions Communications and Technical Services which cover the two main functions of the envisaged work of the Centre.

20. The Communications Division deals with collecting packaging information, selecting and putting into a form that is appropriate to the Thai Packaging Industry and getting it out to the Industry. There are two units in this Division, the Information Services Unit which deals primarily with written information and the Training and Package Promotion Unit which uses visual and aural techniques.

21. The Technical Services Division is designed to provide a professional consultancy service to the Packaging Industry supported by testing services. For convenience of operation and control the Division is divided into three units, the Transport Containers Unit and the Consumer Packaging Unit supported by the Testing Services Unit. The work of the three units is closely connected and they will need to work as a team.

It is proposed that the two divisions should be responsible to a Packaging Director whose office would include administration.

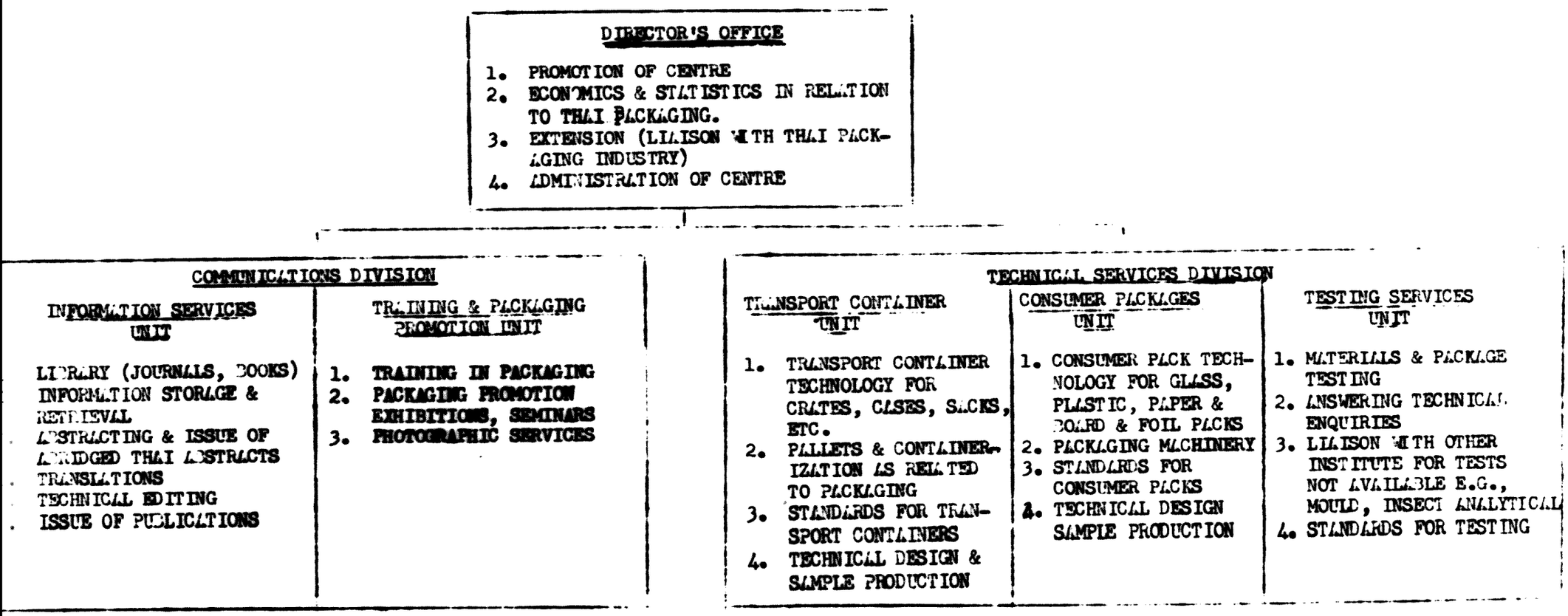
It is appreciated that in the early days of the Centre and depending upon its location some of the service aspects of the Centre could well be provided by the present SISI Administration.

22. The operation of the functions of the Centre are discussed in greater detail below:

(1) Director's Office

(i) Promotion of the Centre. The Chiefs of the two Divisions under the Director must be experienced and competent persons in their fields and capable administrators so that the Director should not need to be involved in the detail of their work but primarily with the overall strategy and planning for the Centre. I believe that one of his prime tasks is to seek to promote that Centre in industry and Government by visits and personal contacts. To assist in this his team includes an extension officer to cover the more routine visits and liaison between the centre and industry and to encourage direct contacts between the staff of the two Divisions and individual companies which is so important.

Fig. 3. FUNCTIONAL STRUCTURE FOR PROPOSED NATIONAL PACKAGING CENTRE



(ii) Economics and statistics in relation to Thai packaging.

The cost of a package rather than its technical suitability is frequently the deciding factor in the choice of a package or packaging system. Apart from the larger users of packages with foreign connections there appears to be little collated information on the economics and statistics of packaging. Such information is necessary for the broad planning and development of the packaging industry in relation to the expanding market for Thai products as well as advice needed by individual companies in the development of their business. It is recommended that the collection of relative data and advice in the field of techno-economics should be a function of the Centre and the direct responsibility of the Director who should have an economics or management training background. It is recommended that his secretary/personal assistant should be competent to assist him in this.

(iii) Administration of Centre.

The administration recommended for the Centre is relatively small and need little comment except to emphasize two points:

(a) That the objective of Administration in a Technological Centre should be to provide an efficient service to the technical divisions so that as much as possible of their time can be devoted to productive work for the industry.

(b) That the typing and secretarial services should not be centralized but should operate at division level in the Technical Services Division and unit level in the Communications Division. In this way the secretaries are in close touch with the staff they serve and can save the technical staff's time on much of the routine administration.

2. <u>Communications Division</u>

Information Services Unit.

As mentioned previously the Communications Divisions operates as two units. The Information Services Unit has the responsibility for collecting packaging information from journals, books and leaflets sorting it and re-issuing that which will be of help to the Thai packaging industry. Specifically it should provide the following services to industry and the staff of the centre.

(1) A Library service

There is a large amount of useful technical information for [illegible] and

in collecting information within the limits of what can be handled by the present staff. To assist in this I have given in appendix IV (a) a list of some 50 books relating to packaging with an abstract of the contents. They are grouped by contents and marked to show which are the preferred buys for the start up of the library. I have also marked those which are recommended for reading for the British Institute of Packaging residential course to the European Packaging Federation Packaging Syllabus. Scientific books and periodicals have not been included as they are generally available at the department of Science Library.

In Appendix IV (b) are given a list of preferred journals for purchase for the library. Lending facilities will have to be arranged for both industry and staff. When the use of the Information Service has been established it will almost certainly be found desirable to obtain the use of a Rank Xerox copying machine.

(2) Information storage and retrieval.

It is suggested that the European Packaging, European Packaging Federation Classification System should be considered for the basic classification system for the library but that a final decision should be left until the Chief of Communications has visited the packaging research and development association in England (PIRA) to study the information and training techniques used there. It is also suggested that an information retrieval system of the 'Pikaboo' type should be considered but here again a final decision should await the visit to PIRA.

(3) Abstracting and the issue of abridged Thai abstracts.

The volume of packaging literature is large so that the reader has to be selective and yet try to avoid missing anything important. To assist in this and also to facilitate the storage and retrieval of information it is necessary to prepare abstracts of all articles of significance in the packaging literature. Fortunately packaging literature is also fairly universal so that abstracts can be prepared and issued from one place. Packaging Abstracts are issued monthly from PIRA they have a wide coverage and include about 200 abstracts a month. They are also available in an advance loose leaf duplicated form issued weekly usually within two weeks of the receipt of the journals. It is recommended

and that when an information storage system is instituted the weekly issues should be considered as an easy way of obtaining fileable abstract copy. The main disadvantage of this system would be that the information would not be in Thai. The retrieval system however could be in Thai and the few cards extracted need only be translated for those who do not read English. This is an easier and less expensive task than attempting to translate all abstracts on receipt.

In addition to forming the basis of the information service it is suggested that a short selection should be made from the monthly issue of items of particular interest to the Thai packaging industry. The corresponding articles should then be reviewed and a summary prepared to form the basis of a duplicated monthly or bi-monthly "Packaging News Bullentin" sent out to the industry in the Thai language. The bullentin should also include interest items on what is going on in the packaging world particularly in South-east Asia and including the work of the Centre. If possible it should also contain a short article on aspect of packaging technology. The bulletin should not be large but should be regular and interesting. Particularly as there is no packaging journal issued in Thailand I feel it should have a significant impact and help to develop it interest in and use of the Centre by the Thai Packaging industry.

(4) Translations

Of necessity there will have to be translations of articles from English into Thai. This can be very time consuming and it is recommended that this should be kept to an absolute minimum particularly so far as the staff of the Centre is concerned who should be expected to read the literature regularly and in English. Where translations are required it is suggested that where possible direct "unpolished" translations should be made on office dictating machines and these needing the information he asked to make their own notes from the recording which can then be stored. It will be found of great assistance in the flow of the work if the abstractor uses a dictating machine for her work and the typist is encouraged to type from it. Provision has been made in the equipment budget for this and a micro film viewer.

A few translation will be required from other than English but it is not suggested that provision would have to be made for this in the Information Unit set up and certainly not in the early stages.

(5) Technical editing and the issue of publications.

As the work of the Centre develops there will be reports on the projects undertaken as distinct from the answering of specific enquiries. It is usually found that such reports require technical editing and seeing through the reproduction system. This work is appropriate to the Information Services Unit and can be done either by the Head of the Unit or an abstractor. In the staff schedule there is included the position of technical editor in the third year. This person would also deal with the issue of the Bulletin and act as a second abstractor but the appointment would only be justified when the workload on the Head of the Unit and the abstractor becomes too great.

23. <u>Training and Package Promotion</u>

(1) Training in packaging.

This is a very important aspect of the work of the Centre, which will have to include training for industry and of the staff of the centre. The industrial side was emphasized by industry, at a number of the visits made. At present there is no regular training course on packaging available in Thailand. It is planned in 1972 to include the packaging of processed food in the food technology training lectures at the Kasetsart University.

Mrs. Orrasa the present Chief of the Packaging Division of SISI has already organized short training courses and seminars in packaging and is competent in this. She is currently organizing a one week seminar for February-March 1972 on plastics in packaging with a seminar leader from abroad. She is also planning to start monthly study groups based on the European Packaging Federation Syllabus resulting from this she hopes to run a two week training course later in that year. It is likely that she will head up the Communications Division and be specifically responsible for the Training and Packaging Promotion Unit. It is my strong recommendation that at the present juncture she should go on a study visit to England of at least 3 months at PIRA, which is the British Association for research and development in packaging. The main purpose of the visit should be to

of training material and also to study the work of the information services of that Institute.

I offer the following comments regarding packaging training in Thailand:

24. Training in the industrial field.

(a) There are no courses available in Thailand covering the field of packaging. Individual companies give 'on the job' training to their employees.

(b) The proposed Packaging Centre should be the accepted authority on training in the field of packaging. They should be in a position to advise and to arrange and conduct training courses at all levels.

(c) Courses for industry are required at least at managerial and operative level.

The actual requirements in the syllabus should be surveyed by the Centre with the cooperation of the Thai Packaging Association. The form of the courses must be suited to the requirement of industry, e.g. whether they are at regular monthly or weekly periods or a two week intensive course also needs to be worked out.

(d) It is suggested that the European Packaging Federation Training Syllabus should be used as a basis for training, the material being selected as appropriate to the level of the course.

A copy of this Syllabus is given in Appendix V to show the extent of the scope for training in the field of packaging technology.

(e) Interest has already been shown by some members of the Thai Packaging Association in the Institute of Packaging (British) Correspondence course based on this syllabus leading to the professional qualification in packaging of the Member of the Institute of Packaging. Possibly study groups based on this course could be started.

(f) I am of the opinion that much of the training material for courses in Thailand should be prepared at the centre by the training staff so that it is directly applicable to Thai needs and in a form and language in which it can be readily appreciated by nationals.

(2) Training of staff at the Centre.

(a) The training of staff joining the Centre in the initial stages, is discussed in Section I.

(b) It is however recommended that the Training Unit should have a continuing responsibility with the Heads of the respective units for the training of existing staff at all levels not only in packaging but in such aspects of their work as report writing, laboratory skills and management. It is worth considering an annual review of the training needs of each member of staff and programming how these needs can be met.

(c) When the Centre is operational it is worth preparing a short induction course for staff joining the Centre.

(3) Packaging Promotion - Exhibitions, Seminars

(a) A second function of this Unit is to co-operate with the Thai Packaging Association in activities for the promotion of better packaging in Thailand. In this connection it is proposed that the Centre should have a permanent but changing exhibition of packaging and that it would also periodically arrange large exhibitions with associated seminars.

(b) As the Centre develops there would be an industrial designer and photographic services to assist in the preparation of training material and exhibitions. The photographer would also be responsible for providing a photographic service to the Centre.

25. . Technical Services Division.

As already stated the function of the Technical Services Division is to provide the packaging industry with a technical enquiry and consultancy service supported by testing services. Fig. 3 shows the break down of the Division into three units with their functions. It is considered that the scope of transport and consumer packaging is too wide for one man to be solely responsible and these are therefore planned as separate units within the Division. It is however considered most important that the staffs of the two units should work very closely together and it will be seen later in the report that the plan is for them to work in one large packaging laboratory. It would be expected that as further packaging engineers are added to the teams they would specialize in specific aspects of the Unit's responsibilities while retaining a competence over the wider field of packaging technology.

26. It will be seen that it is suggested that the responsibility for the packaging aspects of Containerization should be with the Transport Packaging Unit and that for packaging Machinery, which is largely associated with consumer packages, should be with the Consumer Packaging Unit.

27. An important side of the consultancy aspect of each Unit is the functional design of packages and the development and production of prototype packages. These must be of good design from the point of view of the best selection and use of materials, the structure of the package in respect to technical performance and ease of production, and include the aspects of sales appeal and minimum cost. Having in mind that the pack may involve a combination of consumer and transport packages this requires staff with a good knowledge and experience as packaging engineers.

28. It is unlikely that staff will be found with the knowledge and experience required and one of the early tasks on the technical side of the Centre will be to train packing engineers with a practical capability as soon as possible. This aspect should be emphasised when staff training programmes are planned. It may also be an area in which it will be necessary to bring in a short term specialist designer.

29. As already mentioned in section F it is most important that good relations are quickly built up between staff and industry. Also that the senior staff rapidly attain a competance in packaging technology so that the industry will have confidence in them and will be encouraged to use the services of the centre. It will involve hard work, on the part of the staff, to quickly reach this position by making the maximum use of their training period.

30. In addition to specific enquiry and consultancy work from industry, each unit should have a selected number of longer term projects in areas where there is a specific need for developments and improvements. These should cover such aspects as introducing new materials and processes into Thai packaging for example flexible packaging for processed foods, ~~the improved~~ a survey of available timbers for crate making and improved packaging methods for the home and export markets, for example the packaging of fruits and vegetables to reduce damage and loss and to improve storage time. During their visits to Thai companies staff should be encouraged to seek out such projects for consideration.

31. Specifications and standards is another function suggested for the three Units in their respective field. The Head of the Technical Services Division would be responsible for coordinating the specifications and standards work. In certain instances eg. "Terminology" the work might be done in the Communications Division. Currently there are virtually no Thai standards in the fields of package and packaging materials testing and only a few product standards for packages. The recognition of a product standard with a standards mark for acceptable levels of packaging would be a good method of raising the general quality of packaging to an acceptable level. There is an increasing interest for such standards and the Packaging Division of SISI have been asked to suggest suitable packages for standardization and to provide the technical backing for the work of standardization. The position of packaging standards is covered more fully appendix V. which is a short paper prepared. TISI Standards Council.

32. The Testing Services Unit is responsible as their prime function, for providing a materials and package testing service and for arranging for testing work with other institutes where the facilities are not available at the Centre. In selecting equipment for the Testing Unit there have been a deliberate policy of avoiding, as far as possible the duplication of equipment and expertise where this is available elsewhere in Bangkok. For example:

i) No equipment has been suggested for measuring the optical properties of packaging materials as the Paper and Board Group in the Department of Science have Elrepho equipment.

ii) Similarly they have on order a Concora medium tester and although essential for assessing corrugating medium this has been omitted from the Centre's requirements for the initial years.

iii) Infra red spectrophometry and Gas Chromotography required for gas permeability measurements and the detection of contaminant migration from plastics has not been included as the equipment is available in the Applied Scientific Research Corporation or the Department of Science.

iv) Again facilities have not been included for insert and mould attack in packages as these facilities are available elsewhere in Bangkok.

The above omissions result in a saving of about $ 25,000.

33. A function suggested for the Head of the Testing Services is the progressing of technical enquiries. The reason behind this is that the majority of the enquiries will come to the Head of Testing for work anyway and that of the three Unit Heads he is

34. H. Staff Structure for the Centre.

It is worth mentioning three basic aspects before discussing the proposed structure.

i) The success or otherwise of the Centre will depend to a very large measure on the selection of the right persons for the Director and the heads of the Divisions and Units appointed in the first year. Initiative, drive, and a good personality are more important than high academic attainment.

ii) A thorough and carefully planned training is essential as a high proportion of the staff will be without any packaging technology background.

iii) The rate of growth of the staff must be determined by the demand from the industry for more services and not by a scheduled five year scheme. In my view it is most important that the staff should not be recruited faster than they can be trained and usefully employed. The optimum rate of growth is not easy to determine for a new Centre whose work load depends upon the building up of confidence in the industry and I suggest that this aspect should be carefully reviewed each year by the Director before new staff are engaged or equipment is purchased.

35. The Staff structure proposed for the Centre is set out in fig. 4. It will be seen to correspond to the functional structure fig. 3.

Basically there are two chiefs of Divisions under the Director and each is responsible for one of the Units in his or her Division. The head of one of the other units is deputy. It is suggested that the Chief of Communications should have the authority to take necessary decisions for the Centre in his absence.

36. Although year of appointment is shown in the diagram (and tables) it should only be used as a guide as mentioned in (iii) above.

37. Table 3 Appendix * gives an analysis of the staff requirements by position showing proposed Government grade and stage, salary range* and year of appointment. In calculating the salary costs the midpoint of the salary range has been used and an annual salary increase of 5% has been allowed for.

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* Salary range means the range of starting salary.

Fig. 4 STAFF STRUCTURE FOR PROPOSED NATIONAL PACKAGING CENTRE

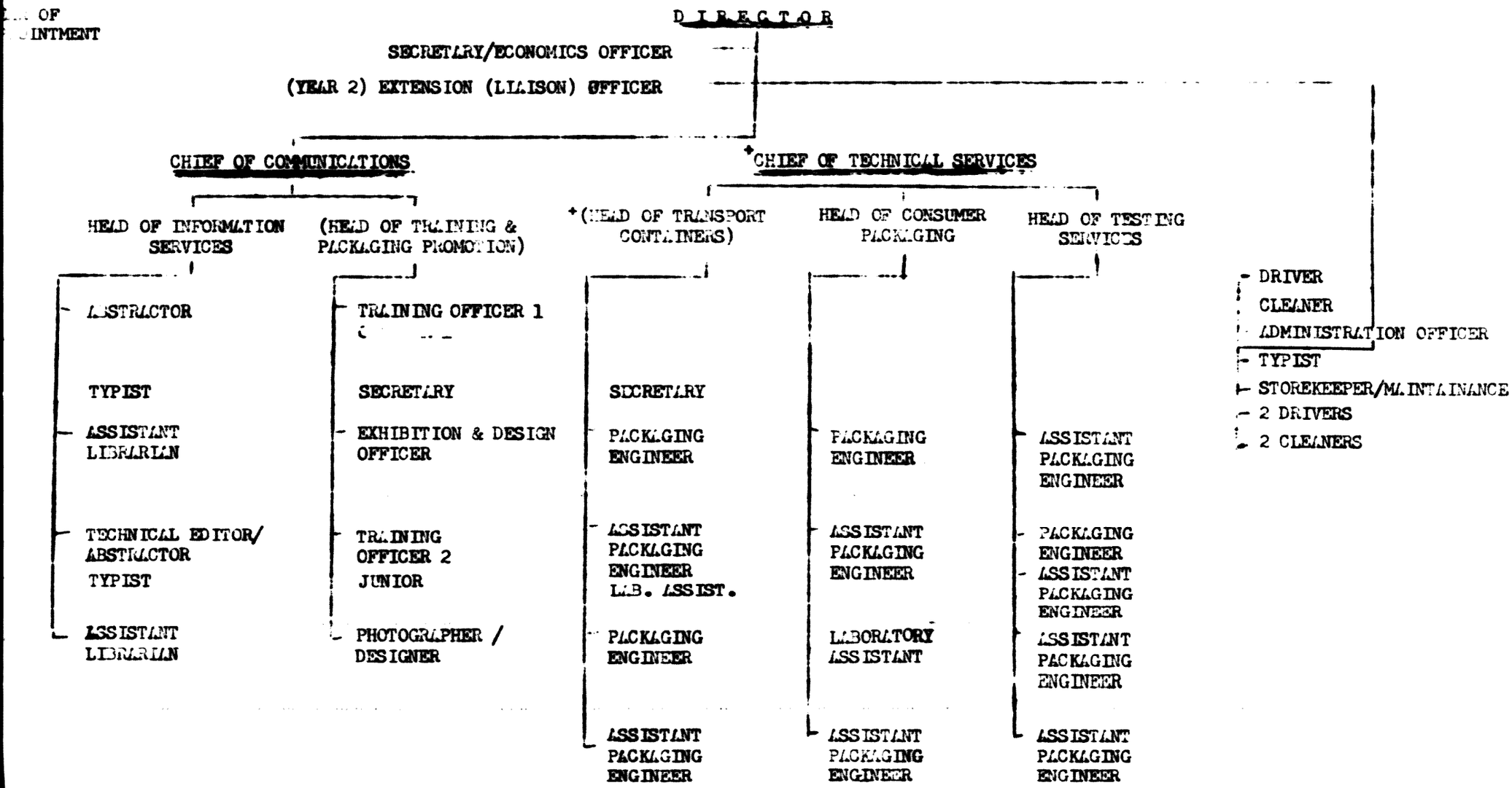


TABLE 2 ANALYSIS OF STAFF REQUIREMENTS BY CATAGORY & YEAR OF APPOINTMENT

DIVISION	CATAGORY OF STAFF	YEAR OF APPOINTMENT 1	2	3	4	5	TOTAL
DIRECTOR'S OFFICE	GRADUATE OR EQUIVALENT	2	2				4
	MIDDLE GRADE TECHNICAL						
	SECRETARY & TYPIST		1				1
	JUNIOR GRADES	2	6				8
	TOTAL	4	9				13
COMMUNICATIONS DIVISION	GRADUATE OR EQUIVALENT	4	1	2			7
	MIDDLE GRADE (TECHNICAL)		1		2		3
	SECRETARY & TYPIST		2	1			3
	JUNIOR GRADES			1			1
	TOTAL	4	4	4	2		14
TECHNICAL SERVICES DIVISION	GRADUATE OR EQUIVALENT	3	2	1	1		7
	MIDDLE GRADE TECHNICAL		1	3	1	3	8
	SECRETARY & TYPIST		1		1		2
	JUNIOR GRADE			1	1		2
	TOTAL	3	4	5	4	3	19
TOTAL FOR CENTRE	GRADUATE OR EQUIVALENT	9	5	3	1		18
	MIDDLE GRADE TECHNICAL		2	3	3	3	11
	SECRETARY & TYPIST		4	1	1		6
	JUNIOR GRADE	2	6	2	1		11
	TOTAL	11	17	9	6	3	46

TABLE 3 ANALYSIS OF STAFF REQUIREMENTS GOVERNMENT BY POSITION SHOWING GRADE, SALARY & YEAR OF APPOINTMENT

DIVISION/UNIT	JOB DESCRIPTION REF.	POSITION	GOVERNMENT GRADE AND STAGE	SALARY RANGE	YEAR OF APPOINTMENT 1	2	3	4	5
DIRECTOR'S OFFICE	1	DIRECTOR	1-3 or 2-1	4,250-5,000 4,400-5,200	X				
	2	SECRETARY/ECONOMIST	3-3	1,400-1,800	X				
	3	EXTENSION OFFICER	2-1	1,300-1,700		X			
	4	ADMINISTRATION OFFICER	3-3	1,400-1,800		X			
	5	RECEPTIONIST/TELEPHONIST	4-3	850-1,050		X			
	6	STOREKEEPER/MAINTAINANCE	4-3	850-1,050		X			
		THREE CLEANERS	4-1	540-660	X	XX			
		THREE DRIVERS	4-2	690-810	X	XX			
		TYPIST	3-1	850-1,050		X			
COMMUNICATIONS DIVISION	7	CHIEF COMMUNICATIONS DIVISION	1-1	2,750-3,351	X				
	8	TRAINING OFFICER 1	3-3	1,400-1,800	X				
	9	EXHIBITION & DESIGN OFFICER	3-3	1,400-1,800		X			
TRAINING AND PACKAGING PROMOTION UNIT	10	TRAINING OFFICER 2	3-3	1,400-1,800			X		
	11	PHOTOGRAPHER/DESIGNER	3-1	850-1,050				X	
		SECRETARY	3-2	1,100-1,300		X			
		JUNIOR	4-3	850-1,050			X		
INFORMATION SERVICES UNIT	12	HEAD INFORMATION	2-3	2,450-3,050	X				
	13	ABSTRACTOR	3-3	1,400-1,800	X				
	14	ASSISTANT LIBRARIAN	3-1	850-1,050		X			
	15	TECHNICAL EDITOR/ABSTRACTOR	3-3	1,400-1,800			X		
	14	ASSISTANT LIBRARIAN	3-1	850-1,050				X	
		TWO TYPISTS	3-1	850-1,050		X	X		

TABLE 3 CONT. ANALYSIS OF STAFF REQUIREMENTS ~~6 YEARLY~~

DIVISION/UNIT	JOB DESCRIPTION REF.	POSITION	GOVERNMENT GRADE AND STAGE	SALARY RANGE	YEAR OF APPOINTMENT 1	2	3	4	5
TECHNICAL SERVICES DIVISION	16	CHIEF TECHNICAL SERVICES	1-1	2,750-3,350	X				
	17	PACKAGING ENGINEER 1	3-3	1,400-1,800		X			
	17	PACKAGING ENGINEER 2	3-3	1,400-1,800				X	
	18	ASSISTANT PACKAGING ENGINEER 1	311	850-1,050			X		
	18	ASSISTANT PACKAGING ENGINEER 2	3-1	850-1,050					X
TRANSPORT CONTAINERS UNIT		LABORATORY ASSISTANT	4-3	850-1,050			X		
		SECRETARY	3-2	1,100-1,300		X			
		TYPIST	4-3	850-1,050				X	
CONSUMER PACKAGING UNIT	19	HEAD CONSUMER PACKAGING UNIT	2-3	2,450-3,050	X				
	17	PACKAGING ENGINEER	3-3	1,400-1,800		X			
	18	ASSISTANT PACKAGING ENGINEER 1	3-1	850-1,050			X		
	18	ASSISTANT PACKAGING ENGINEER 2	3-1	850-1,050					X
		LABORATORY ASSISTANT	4-3	850-1,050				X	
TESTING SERVICES UNIT	20	HEAD TESTING SERVICES UNIT	2-2	1,800-2,300	X				
	17	PACKAGING ENGINEER	3-3	1,400-1,800			X		
	18	ASSISTANT PACKAGING ENGINEER 1	3-1	850-1,050		X			
	18	ASSISTANT PACKAGING ENGINEER 2	3-1	850-1,050			X		
	18	ASSISTANT PACKAGING ENGINEER 3	3-1	850-1,050				X	
	18	ASSISTANT PACKAGING ENGINEER 4	4-3	850-1,050					X

38. A summary of staff requirements is shown in table 2 following paragraph 37 . Year 1 from the start of the Centre will be mainly devoted to training senior staff so that of the eleven staff proposed nine are graduates. The maximum staff envisaged after 5 years is 46 and this would correspond to the build-up for a very successful Centre. In actual practice I think it may be longer before the work load justifies this size of staff.

39. I. Job descriptions, work programmes and training.

1. Job Descriptions

Job descriptions including qualification and experience requirements have been prepared for all senior and middle grade staff and are given in Appendix VII. The job descriptions are numbered 1 - 20 and for ease of reference the number is given against the staff position in Table 3 . The Job descriptions are self explanitory and hardly require comment.

40. 2. Work programmes and training.

The Job Description sheets also contain a three year work programme including training. Again the work programme is self explanitory although at this stage it is essentially indicative of the sort of things which should be done.

41. The training programmes require comment:

i) It is anticipated that the present Chief of the Packaging Division will be Chief of the Communications Division. Job description ref. 7. It is proposed that she should visit PIRA as already mentioned in paragraph 23 so that she can build up her experience in information and training work in advance of the start up of the Centre. This would enable her to prepare for the induction training of those appointed in the first year.

ii) The first year appointments would be the key senior staff for the Centre. It is suggested that their training should consist of

a) Two months familiarisation course in Bangkok consisting of an introductory packaging course by Mrs. Orasa Jirapinyo broken up by visits to Thai packaging firms and a period of two or three weeks in one or two factories with the purpose of becoming acquainted with the level of Thai packaging technology.

b) This would be followed by the three month Indian Course in packaging technology which is held at the Indian Packaging Institute, Bombay.

c) A 2½ to 3 month visit to PIRA U.K. for practical studies in the operation of the functions appropriate to the work of her Division.

d) Short 2 day visits to selected European Institutes on the return journey.

42 The main restricting factor in the selection of courses and external visits is the necessity for these to be in the English language.

43 It is suggested that if possible the six or seven requiring the full training in the first year should go as a party. It is not known if the institutes would be willing to receive them but I think there is a good chance or what the fees would be.

44 It is also suggested that senior technical staff should be encouraged to use the Institute of Packaging (British) correspondence course to obtain their M.Institute Packaging qualification as a professional packaging engineer.

45 It is also suggested that the second year appointments should in the main be trained in Bangkok using on job training courses run by the Centre and periods of on job - training in industry.

46 The training fellowships envisaged are detailed in table 4 and the costs in table 5.

47 In appendix IX are set out some principles and suggestions on the preparation of staff who are going abroad for training.

J. Technical Assistance Experts

48 I would advise that a Technical Assistance Expert should be appointed to advise and assist in the preparation for and start up of the Centre. There are two main reasons:-

i) There is no one in the present Packaging Division or in SISI who has experience in the setting up or in the operation of a technical packaging centre.

ii) That with the exception of the present Chief of the Packaging Division it is probable that the staff appointed will have no previous experience in packaging.

TABLE 3 4

SCHEDULE OF TRAINING FELLOWSHIPS REQUIRED

DIVISION/UNIT	REF	POSITIONS OF STAFF	FIELD OF STUDY	DURATION MONTHS	START DATE	SOURCE OF ASSISTANCE	LOCATION OF TRAINING
DIRECTOR'S OFFICE	1	DIRECTOR	Packaging Technology Course India	3	)		India
			Training in Packaging Institute Management Pira	3	) Year 1	SF or UNIDO	U.K..
			Short visits to European Packaging Institutes	½	)		Europe
	2	EXTENSION OFFICER	Packaging Technology Course - India	3	Year 2	SF or UNIDO	India
COMMUNICATIONS DIVISION	3	CHIEF OF COMMUNICATION	Training in packaging & training techniques Pira	3	) Year 1		U.K.
			Short visits to European Packaging Institutes	½	) (or-1)	UNIDO	Europe
Training & Packaging Promotion.	4	TRAINING OFFICER 1	Packaging Technology Course - India	2	Year 1	SF or UNIDO	India
	5	TRAINING OFFICER 2	Packaging Technology Course - India	3	Year 3	SF or UNIDO	India
Information Services	6	HEAD OF INFORMATION SERVICES	Packaging Technology Course	3	)		India
			Training in Packaging Information Services Pira	3	) Year 1	SF or UNIDO	U.K.
			Short visits to European Packaging Institutes	½	)		Europe
	7	ABSTRACTOR/ TRANSLATOR	Packaging Technology Course - India	3	Year 1	SF or UNIDO	India
TECHNICAL SERVICES DIVISION Transport containers.	8	CHIEF OF TECHNICAL SERVICES	Packaging Technology Course - India	3	)		India
			Training in Packaging Technology - Pira	3	) Year 1	SF or UNIDO	U.K,
			Short visits to European Packaging Institutes	½	)		Europe
Consumer Packaging	9	HEAD OF CONSUMER PACKAGING	Packaging Technology Course - India	3	)		India
			Training in Packaging Technology - Pira	3	) Year 1	SF or UNIDO	U.K.
			Short visits to European Packaging Institutes	½	)		Europe
Testing Services	10	HEAD OF TESTING SERVICES	Packaging Technology Course - India	3	)		India
			Training in Packaging Technology - Pira	3	) Year 1	SF or UNIDO	U.K.
			Short visits to European Packaging Institutes	½	)		Europe

TABLE 5 COST OF PROPOSED TRAINING FELLOWSHIPS

DIVISION/UNIT		POSITION OF STAFF	COSTING GROUP		DURATION MAN/MONTHS	COST U.S. $ YEAR 1	YEAR 2	YEAR 3
DIRECTOR'S OFFICE	1	DIRECTOR	AREA	SUBSIST.	3	900		
				TRAVEL		500		
			INTER-NATIONAL	SUBSIST.	3½	1,575		
				TRAVEL		1,000		
	2	EXTENSION OFFICER	AREA	SUBSIST.	3		900	
				TRAVEL			500	
COMMUNICATIONS DIVISION	3	CHIEF OF COMMUNICATIONS	INTER-NATIONAL	SUBSIST.	3½	1,575		
				TRAVEL		1,000		
Training & Packaging Promotion	4	TRAINING OFFICER 1	AREA	SUBSIST.	3	900		
				TRAVEL		500		
	5	TRAINING OFFICER 2	AREA	SUBSIST.	3			900
				TRAVEL				500
Information Services	6	HEAD OF INFORMATION SERVICES	AREA	SUBSIST.	3	900		
				TRAVEL		500		
			INTER-NATIONAL	SUBSIST.	3½	1,575		
				TRAVEL		1,000		
	7	ABSTRACTOR/TRANSLATOR	AREA	SUBSIST.	3	900		
				TRAVEL		500		
TECHNICAL SERVICES DIVISION	8	CHIEF OF TECHNICAL SERVICES	AREA	SUBSIST.	3	900		
				TRAVEL		500		
Transport Containers			INTER-NATIONAL	SUBSIST.	3½	1,575		
				TRAVEL		1,000		
Consumer Packaging	9	HEAD OF CONSUMER PACKAGING	AREA	SUBSIST.	3	900		
				TRAVEL		500		
			INTER-NATIONAL	SUBSIST.	3½	1,575		
				TRAVEL		1,000		
Testing Services	10	HEAD OF TESTING SERVICES	AREA	SUBSIST.	3	900		
				TRAVEL		500		
			INTER-NATIONAL	SUBSIST.	3½	1,575		
				TRAVEL		1,000		
					TOTAL	25,230	1,400	1,400

GRAND TOTAL $28,030

BASIS FOR COSTS

FELLOWSHIP INTERNATIONAL

SUBSISTANCE	$450 PER MONTH
TRAVEL	1,000

FELLOWSHIP AREA*

SUBSISTANCE	$300 PER MONTH
TRAVEL	500

VALID FOR 1972-3

* INCLUDES INDIA

DATA FROM U.N.D.P. BANGKOK
OCTOBER, 1971

I suggest that the Technical Assistance Experts appointment should start about three months before the appointment of the first years staff and that it should run until about nine months after the Centre is operational. Allowing one year for training this would need an appointment of up to two years. A job description for this Technical Expert is included as number 21 in Appendix VII.

49 It is also recommended that an amount should be allowed for two or three short term T.A. asignments if and where those are required to supplement the experience of the longer term expert in specific aspects of packaging. ~~Table 5~~ Table 6 on the following page is a schedule of the T.A. expert recommended with cost data.

K. Operational Sequence for the Centre

50 There are five operational stages between the present time and the Centre being an operating unit:-

i) Work done at SISI Packaging Division pending a decision of the Thai Government whether to go ahead with the plans for the Centre and of the U.N. as to the assistance it can give.

ii) Preparatory work for the Centre if and when a decision is made to set up a centre.

iii) Training of the senior staff who will form the nucleus of the Centre and concurrently the erection or modification of buildings and the ordering and installation of equipment.

iv) The occupation of the premises and "run in" of the equipment.

v) The start up of the Centre's services to the packaging industry, the development of contacts with industry and the definition of specific projects to provide the help needed.

51 Fig. 2 following this page shows the suggested operational sequence for one year preceeding and for about a year following the effective start up of the Centre. It is not really practical to suggest much more than a broad pattern as the detail will depend upon the decision of the Government as to the future for a centre and then is really the province of the Technical Assistance Expert appointed

TABLE 6 SCHEDULE OF TECHNICAL EXPERT ASSISTANCE RECOMMENDED

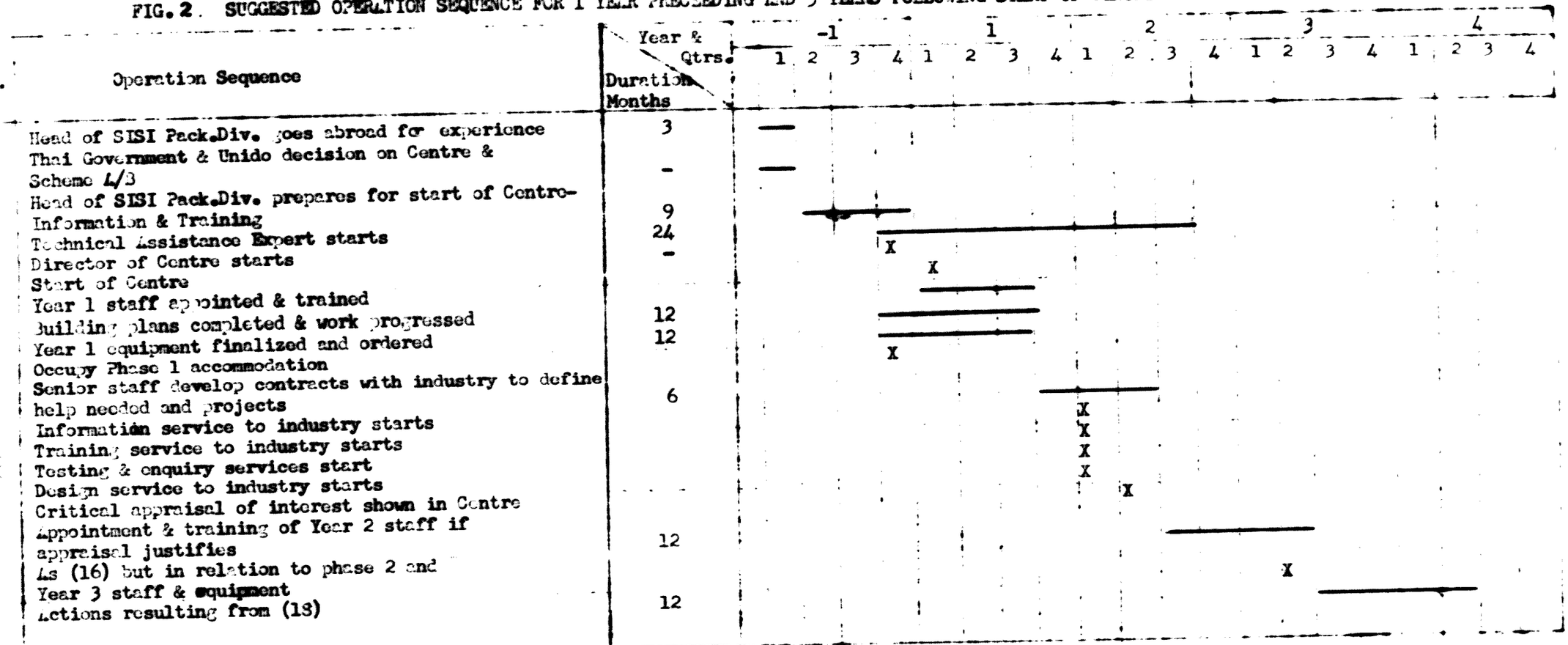
ASSISTANCE REQUIRED	FIELD OF EXPERTISE	DURATION	START DATE	COST DATA		
				YEAR	MAN/MONTHS	COST
1. Technical Assistance Expert to advise and assist with the start up and early operation of the centre as detailed in the T.A. Expert's job description Appendix VII No. 14	The starting up and operation of a packaging centre	2 years	Probably 3 months prior to the start of the centre	Year prior to start of centre	3	7,500
				Year 1	12	30,000
				Year 2	9	22,500
2. Short term Technical Assistance Expert if required to supplement the experience of 1 above in specific areas if and when needed.	Not yet known	6 weeks	Year 2 if required	Year 2	1½	3,750
3. Short term Technical Assistance Expert as 2 above.	Not yet known	6 weeks	Year 2 if required	Year 2	1½	3,750

SUMMARY OF COSTS

	$
Year prior to start of Centre	7,500
Year 1	30,000
Year 2	30,000
Total	$67,500

BASIS FOR COSTS T.A. Expert U.S. $30,000 per year including travel & subsistance valid for years 1972-3.
Data from U.N.D.P. Bangkok, October, 1971

FIG. 2. SUGGESTED OPERATION SEQUENCE FOR 1 YEAR PRECEDING AND 3 YEARS FOLLOWING START OF CENTRE



to guide the Centre through the initial stage of operation. With these qualifications I offer the following suggestions:

i) Present stage. I fully support the intention of SISI to re-orientate the present work of the Packaging Division towards the more technical aspects of packaging.

The main restrictions on the Division are currently:-

a) The staff, except for the Chief of the Division have no knowledge in packaging technology.

b) There is only a very small intake of literature covering packaging technology and no systematised storage of information.

c) There are no laboratory or testing facilities or the expertise to operate such facilities if they were available.

d) There is no experience in the management of a packaging centre or in providing a packaging information service.

52 While it is true that a Packaging Centre is a natural development of the present Packaging Division the various functions of a centre as set out in Section G are complementary and should be available for the centre to operate efficiently. Package and relevant materials testing equipment is relatively expensive and requires air conditioned rooms for operation. Unfortunately packages cannot be effectively evaluated on one testing machine but require a minimum of four or five. This also applied to materials testing although the minimum number of instruments is somewhat higher.

53 Effectively this means that a decision has to be made at Government level whether or not to go ahead with the formation of a Packaging Centre which will involve a considerable expansion of the Packaging Divisions functions, the provision of specialized laboratory facilities and equipment including the modification or consturction of a special room for package testing. This decision is required as soon as practical.

54 i) Pending this decision it is recommended that the work of the

technology and to providing systematic training courses in packaging for industry. As already mentioned under section I (training) it is recommended that the Chief of the ~~Packaging~~ Communication Division should go to Pira, England for experience and further training in this area as soon as possible and on her return should particularly develop these two aspects.

Standards and specification work is also appropriate to the present stage - see appendix VI.

ii) Following a decision to set up a packaging centre the work of the Division would have to include the second stage of preparing for the Centre. Essentially this would involve:-

a) the appointment of a T.A. Expert.

b) the preparation of staff training material and relevant contacts with the packaging industry.

c) arrangements for fellowships and training abroad.

d) the finding and appointment of staff. See job descriptions appendix VII.

iii) Staff training has already been discussed in Section I. So far as the operational sequence is concerned the time of appointment should be arranged so far as possible to allow the first year's staff to attend the Indian Packaging course as a group. If the numbers are sufficient it might be possible to arrange for a special course although I would favour the normal course which gives the opportunities of meeting those concerned with packaging in other countries.

During this training period the Packaging Division (or remaining staff of the Packaging Centre) would be concerned with the buildings for the Centre, section L, and the equipment for the Centre, section M.

57 iv) The planning should be such that when the training is complete the building should be ready for occupation and the equipment

of the Centre (i.e. engagement of the key staff). Two or three months should be allowed for a "running in" period for the laboratories and the Communications Division before the services become operational for the industry. During this period the staff would be starting their contacts with industry.

53 v) The Centre would naturally be "feeling its way" in the critical start up period, when industrial contacts are being formed, testing and enquiry work sought and longer term projects of a development nature appraised. It is not anticipated that the work of the Centre would include basic research.

59 It is most important that there should be critical appraisals of the effectiveness of the Centre and the component units in respect of the help sought and given to industry. These should be made at least annually and on the results should be based the next year's expansion (or contraction) of the Centre and its component units.

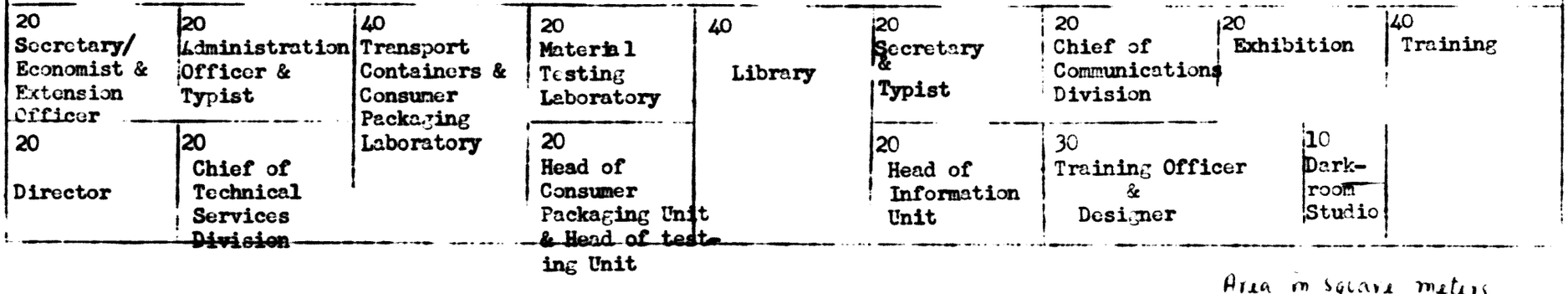
L. Buildings for the Centre.

60 Following discussions with Government representatives two plans have been developed. For each plan there is a first phase which should give adequate accommodation for the first few years of the Centre, and a second phase which would provide the additional space if the Centre expands appreciately.

61 The specialised and relatively expensive aspect of the accommodation is the package testing laboratory which needs to have road access, a high roof, close control of the temperature (27 ± 1 °C) and relative humidity (65 ± 2% relative humidity) and shock bases set into the floor. The buildings have been planned so that the package testing laboratory for phase 1 is adequate for phase 2 in the respective schemes.

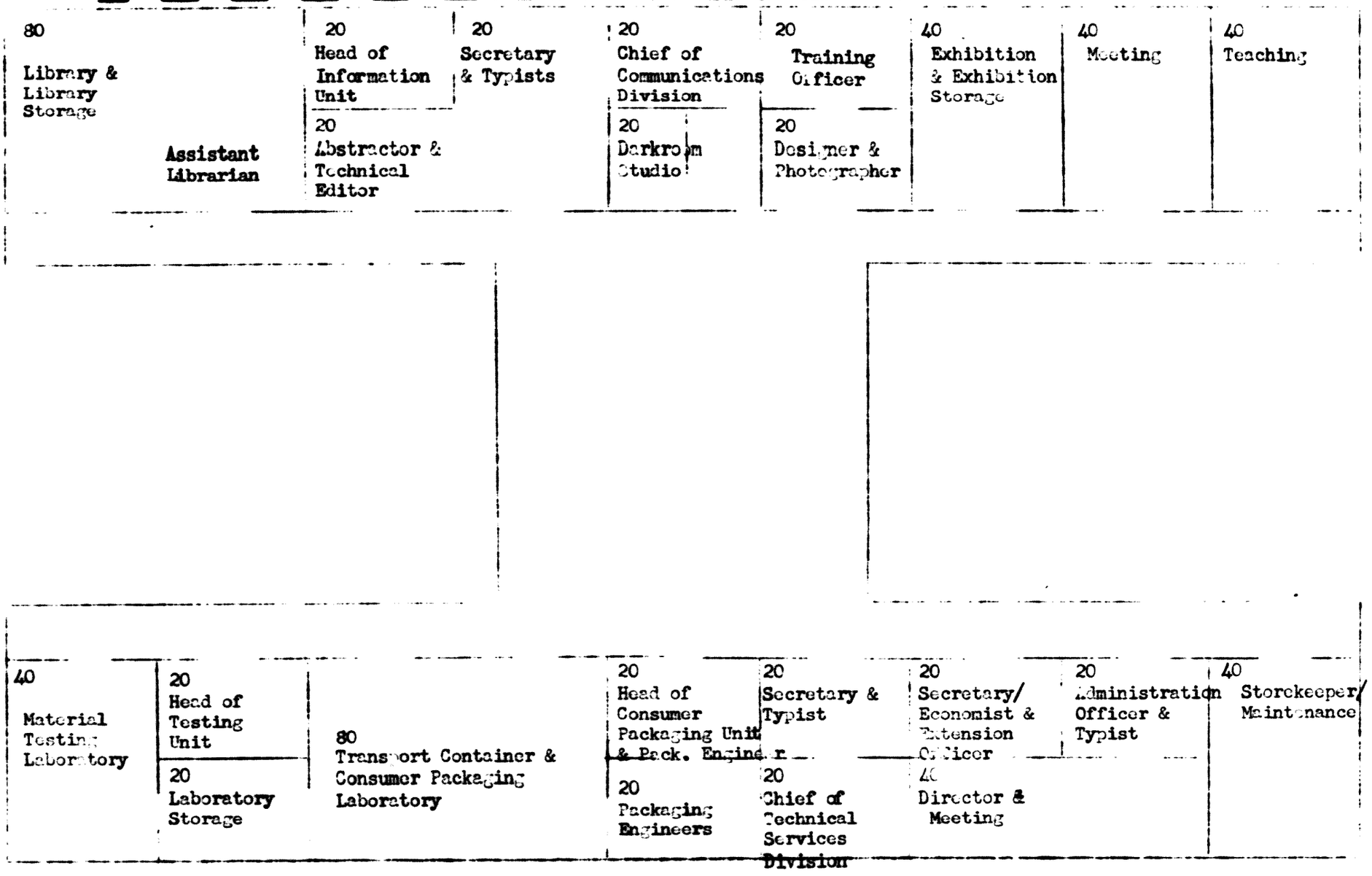
62 The costings given are only initial estimates based on costs per sq. m. supplied by the SISI Architect. In the sketch plans (Figs. 5-10) the figure in each room gives the area of the room in sq. m. and the proposed use is also stated. In assessing the space it should be

FIG. 5 PLAN A PHASE 1



Area in square metres

FIGURE 6 [illegible]



Area in square meters

FIG. 7 PLAN "A" (SISI BUILDING) PHASES 1 & 2
SUGGESTED LAYOUT FOR PACKAGE TESTING LABORATORY (ROOM TO BE CONSTRUCTED AT SISI)

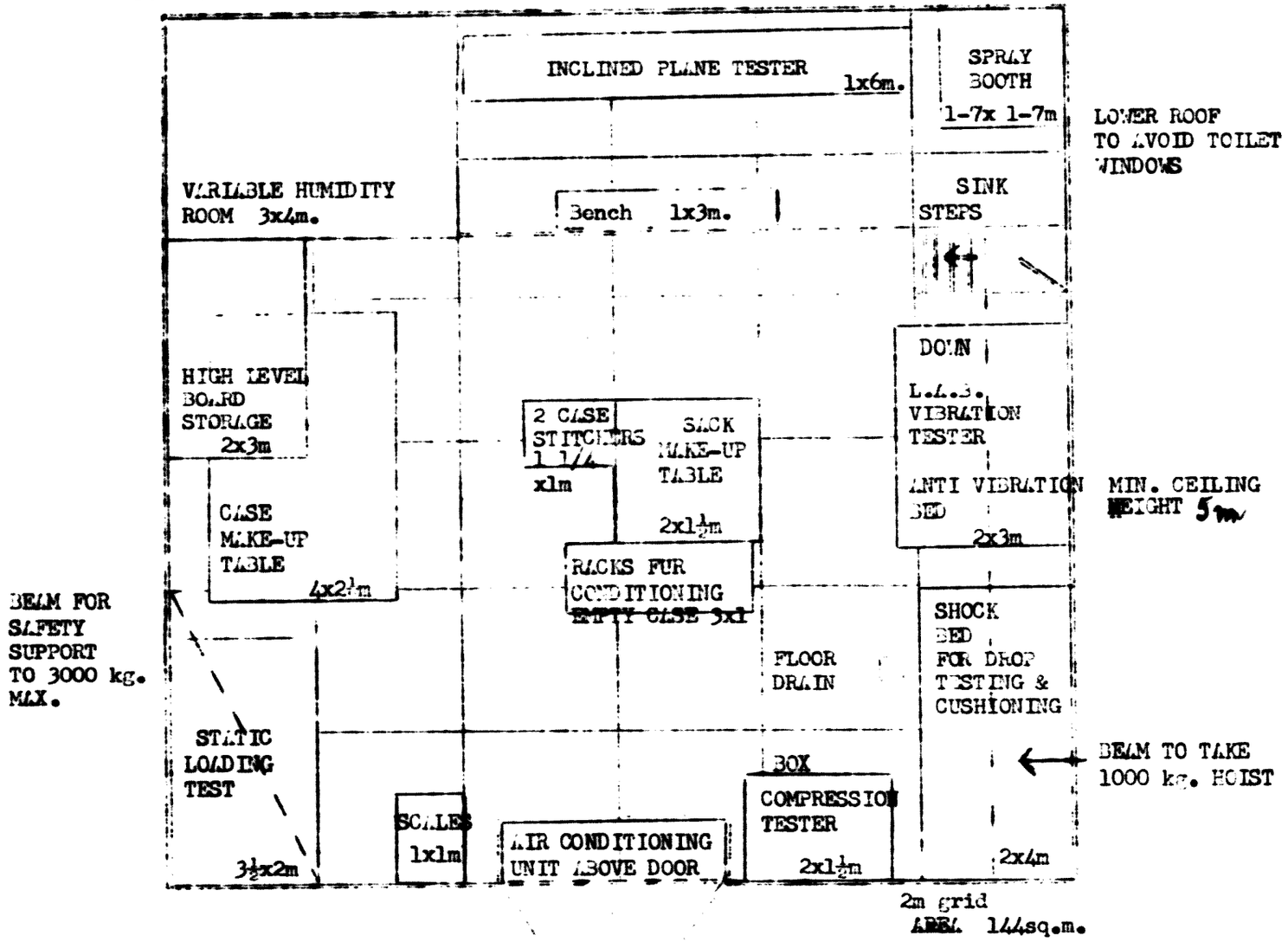
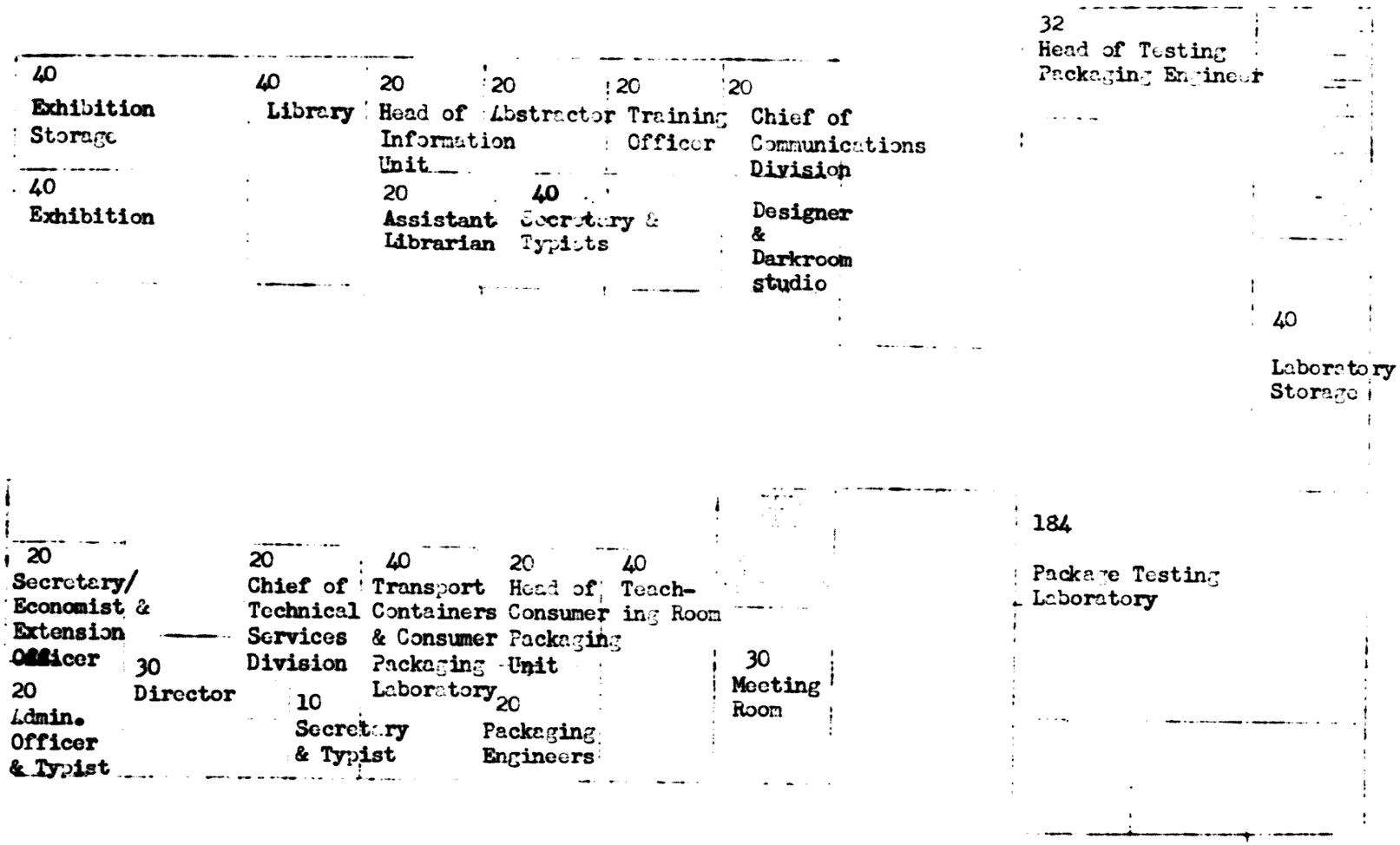
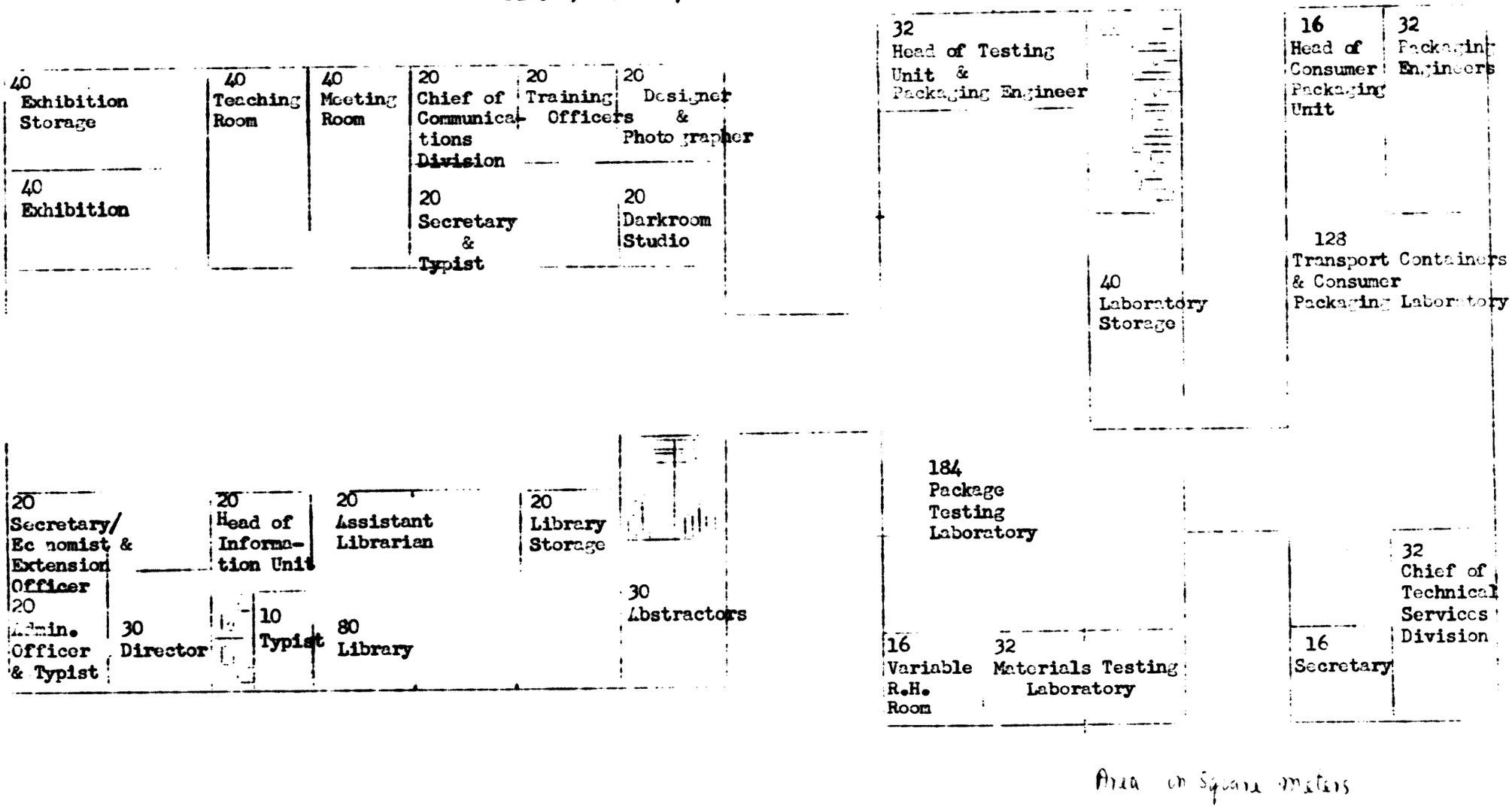


FIG. 8 PLAN B / PHASE 1



Area in Square meters

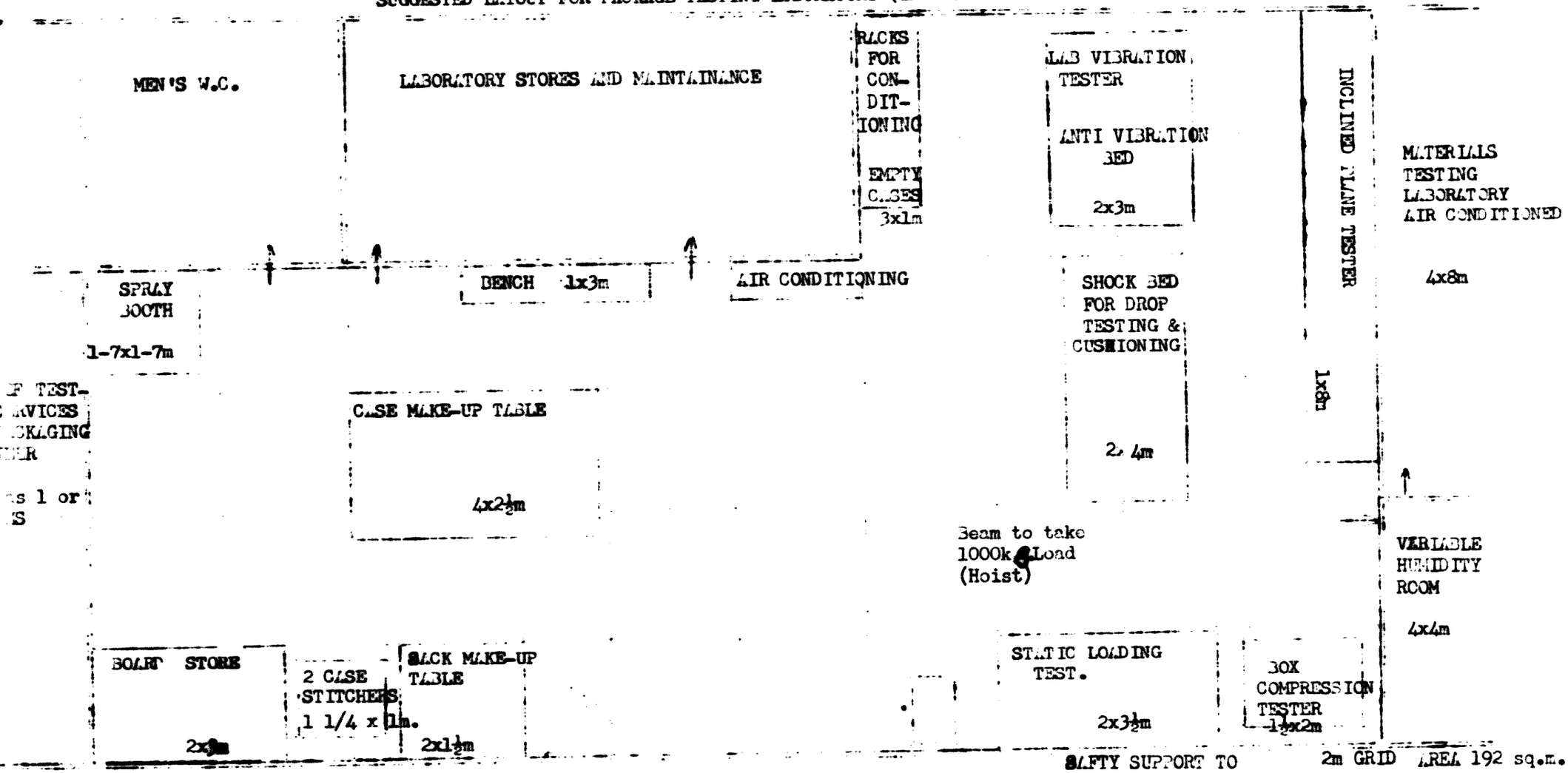
FIG. 9 PLAN B / PHASE 2



Area in Square Meters

PLAN

FIG.10 ~~SCHEME~~ "B" (DESIGN CENTRE) PHASES 1 & 2
SUGGESTED LAYOUT FOR PACKAGE TESTING LABORATORY (IN DESIGN CENTRE WORKSHOP)



bourn in mind that whereas office requirements depend upon the number of staff in a room, laboratory and library space is in the main determined by the nature of the work and the equipment required.

63 It seems normal in Thailand to provide more space per head or for an operation than in a corresponding European institute and this may be due to difference in the climatic ~~conditions~~ conditions. The space proposed is somewhat more than would be used in England but probably a little less than is usual in Thailand. In the case of offices this is a reason for the inclusion of a few additional office air conditioning units.

64 The proposed plans are as follows:

Plan "A" Location of Packaging Centre in the SISI building

i) Phase 1

Accommodation except for package testing would be in the nine bays which form one side of one floor of the present building. This would involve moving out staff of other divisions of SISI from 5 bays. The Packaging Division now occupy four bays. The suggested layout is shown in fig. 5 ~~following~~ preceding this page. A group floor package testing laboratory would have to be built and for convenience of supervision should be as close as possible to the rest of the Centre. A possible solution is to use the space behind the first floor toilets by enclosing the area and providing a solid concrete floor. This has been discussed with the Architect and is considered practical. A layout for the equipment needed and the room is shown in fig. 7. The effective area is about 150 sq. m. which as will be seen from the plan is about the minimum which is practical. See also appendix X. A separate building could be erected behind the SISI building but this would be more remote for supervision and would be more expensive. It should however be considered if Scheme "A" is favoured. It is understood that space is not available in the present SISI workshop.

ii) Phase 2

This involves building an additional floor on the existing SISI building, or half a floor if the phase 1 accommodation is retained. Plan layouts are shown in fig. 6. The package testing laboratory would be as in phase 1.

66 Plan "B" Location of Packaging Centre in the old Industrial Product Design Centre building opposite the present SISI building.

i) Phase 1

In phase 1 the Centre would be housed in the front building except for the Testing Services Unit which would be housed in the workshop immediately behind. Alterations to internal walls would be needed and the workshop would have to be sealed for use as air conditioned space and shock bases would have to be made in the floor. The layout isshown in fig. 8 and the detailed layout of the package testing laboratory in fig. 10. The building is now used as a store and alternative accommodation would have to be found for this.

67 ii) Phase 2

This would involve building a single story laboratory block behind the workshop so that the front building could be used entirely for the Director's Office and the Communications Division. The layout is shown in fig. 9, the arrangement for the Testing Services Unit remains unchanged. In my view it is unlike that this expansion would be required for some considerable time. The space available in Plan B phase 1 is significantly greater than that available in Plan "A" phase 1.

63 A summary of the costs and space provided by plans A and B is given ~~below~~ over, a breakdown of the costs is given in table 10 Section N - Finances. The cost for phase 2 is in addition to phase 1 costs.

		Area-Total sq.m.	Cost for each Phase Baht
PLAN "A" (SISI)	PHASE 1	490	250,000
	PHASE 2	370	1,570,000
PLAN "B" (IPDC)	PHASE 1	300	135,000
	PHASE 2	1,030	550,000

69 My comments on the two plans are:-

Advantages of Plan "A"

i) It does not involve the necessity of finding alternative accommodation for the storage in the IPDC building.

ii) It makes it easier for the Packaging Centre to utilise the SISI services in the early stages.

iii) The SISI is a newer building than the IPDC building.

70 Advantages of Plan "B"

i) The Package Testing Unit facilities are much better than in Plan "A" both as to space and consequent layout of plant in the package testing laboratory and that the Unit is together making supervision easy and more effective.

ii) The estimated cost of conversion is appreciably less for both phase 1 and phase 2.

iii) As the area provided in plan "B" phase 1 is nearly as much as the 2nd phase of plan "A". I think that it is possible that the 2nd phase of plan "B" would never be needed.

iv) The noise from the package testing is less likely to be a nuisance than in the SISI building.

v) In my view it is an advantage to have the Centre housed in a separate building from the point of view of the image to industry as I pointed out earlier in the report.

71 On balance I favour the Plan "B". It should be noted that the initial decision on which plan is accepted should be considered as being final because of the cost of moving and rehousing package testing equipment.

72 M. Equipment for the Centre

The equipment for the Centre has been listed in the following tables.

1.	Office and library furniture	Appendix VIII(a)
2.	Laboratory and special furniture	" (b)
3.	Technical and Scientific equipment including list of suppliers	" (c)
4.	Special Equipment - transport and air conditioning	" (d)

73 The equipment lists have been prepared as follows:-

i) Items of equipment are grouped by Divisions and Units.

ii) The year of purchase is relative to the start of the Centre.

iii) Items produced in Thailand are priced in Baht and listed separately.

iv) Items of foreign origin are priced in U.S. $.

v) The names and addresses of makers or agents of foreign items are listed.

vi) I have estimated a price where an estimate was not available.

vii) Prices of foreign equipment do not include packaging and shipping. A percentage has been added for this in the summary page as well as for cost increases on foreign equipment.

74 Before ordering it will obviously be necessary to obtain up to date estimates. The present estimates and catalogues have been left with the Packaging Division of SISI.

75 As mentioned earlier it is most desirable that the need for equipment for the second and subsequent years should be established before it is purchased. Where significant items of equipment are known to be available in other Thai laboratories this is noted in the lists. As already detailed in section G 3. equipment to the value of about $25,000 relative to the work of the centre is available elsewhere in Bangkok and has not been listed. The summary of the equipment costs is given in table 9 section N- Finances.

76 N. Finances

The details of the items of capital and revenue expenditure are given in the relevant sections

Salaries	Section H table 3
Furniture and Equipment	Appendix 3 VIII
Books and Journals	Appendix / IV
Fellowships	Section I table 5
Technical assistance experts	section J table 6

77 Summaries of expenditure for years 1 to 5 are given in the following tables:-

Table 3 Summary of salary and other revenue cost estimates

Table 9 Summary of furniture, equipment and special equipment costs

Table 10 Buildings - modifications and new construction costs.

which are in this section.

78 A collected summary of all costs is given in table 7 following this sheet. It is set out by years from the start of the centre and is listed under expenditure in Thai Currency and expenditure abroad

O. Further Assistance Needed from the United Nations

79 I believe that a National Centre for Packaging is necessary in Thailand and that without further assistance it is not likely to be achieved in the reasonable future. This is particularly so because of the relatively high cost of the necessary packaging and materials testing equipment.

80 I would recommend that the Government of Thailand should seek further assistance from the United Nations for the following four aspects for which foreign money is required.

1. Fellowships Year 1 42 man-months

Year 2 3 "

Year 3 3 "

See table 5

TABLE 7 SUMMARY OF COSTS
YEARS FROM START OF CENTRE

REFERENCE	ITEM	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
		THAILAND	ABROAD	THAILAND	ABROAD	THAILAND	ABROAD	THAILAND	ABROAD	THAILAND	ABROAD
		Baht	$	Baht	$	Baht	$	Baht	$	Baht	$
	REVENUE EXPENDITURE PER YEAR										
TABLE 8	SALARIES & WAGES	314,000		563,000		716,000		820,000		904,000	
	OTHER REVENUE EXPENDITURE	138,000		248,000		316,000		365,000		398,000	
APPENDIX IV i	BOOKS		1,000		350		150		150		
" IV ii	JOURNALS		400		500		500		500		
TABLE 5	FELLOWSHIPS		7,500 *								
" 6	TECHNICAL ASSISTANCE EXPERTS		30,000		30,000						
	CAPITAL EXPENDITURE										
TABLE 9	FURNITURE AND EQUIPMENT	931,000	53,000	134,300	11,090	104,700	29,340	23,300	6,030	26,500	1,150
TABLE 10	BUILDINGS										
	PLAN "A" PHASE 1	250,000									
	PHASE 2							1570,200			
	PLAN "B" PHASE 1	135,000									
	PHASE 2									550,000	

* Year prior to start up.

TABLE 8 REVENUE EXPENDITURE

SUMMARY OF SALARY AND REVENUE COST ESTIMATES

DIVISION	ITEM	MONTHLY SALARY COSTS (BAHT) FOR YEARS 1	2	3	4	5
DIRECTOR'S OFFICE	NEW STAFF	9,000	8,600			
	PREVIOUS YEAR'S STAFF + 5% INCREASE		500	19,000	20,000	21,000
	TOTALS	9,000	18,100	19,000	20,000	21,000
COMMUNICATIONS DIVISION	NEW STAFF	9,000	5,700	5,100	1,900	
	PREVIOUS YEAR'S STAFF + 5% INCREASE		9,400	15,800	22,000	25,000
	TOTALS	9,000	15,100	20,900	23,900	25,100
TECHNICAL SERVICES DIVISION	NEW STAFF	8,100	5,250	5,400	4,500	2,900
	PREVIOUS YEAR'S STAFF + 5% INCREASE		8,500	14,300	20,700	26,400
	TOTALS	8,100	13,700	19,700	25,200	29,300
CENTRE	MONTHLY TOTALS	26,100	46,900	59,700	69,000	75,300
YEARLY COST ESTIMATES	EQUIVALENT YEARLY TOTALS	31,400	56,300	71,600	82,800	90,400
	ESTIMATED YEARLY REVENUE EXPENDITURE EXCLUDING SALARIES	13,800	24,800	31,600	36,500	39,800
	ESTIMATED TOTAL REVENUE EXPENDITURE	45,200	81,100	103,200	119,300	130,200

BASIS FOR SALARY COSTS

1. The salary ranges used in the analysis of staff requirements are taken from the current government scales used by SISI.
2. The mid salary in each range has been taken as the starting salary for new staff in that range and used to prepare this table.
3. An annual increase equivalent to one stage has been allowed for each year for old staff. This has been taken as 5%.
4. The figures have been rounded to nearest Baht 100.

BASIS FOR REVENUE EXPENDITURE EXCLUDING SALARIES

This has been estimated as an on cost on salaries using the same rates as for SISI in the fiscal year 1971.

LE 9 CAPITAL EXPENDITURE

SUMMARY OF COST BY YEARS FOR OFFICE FURNITURE, LABORATORY FURNITURE, EQUIPMENT, TRANSPORT & AIR CONDITIONING

DIVISION	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5		TOTALS	
	THAILAND	ABROAD	THAILAND	ABROAD	THAILAND	ABROAD	THAILAND	ABROAD	THAILAND	ABROAD	THAILAND	ABROAD
	Baht	$	Baht	$	Baht	$	Baht	$	Baht	$	Baht	$
ICE FURNITURE												
DIRECTOR'S OFFICE	15,400		16,400				6,000				37,800	
COMMUNICATIONS DIVISION	63,100		7,800		31,600		2,900		9,000		114,400	
TECHNICAL SERVICES DIVISION	23,000				2,900		4,400		4,500		34,800	
TOTALS	101,500		24,200		34,500		13,300		13,500		187,000	
ORATORY FURNITURE												
DIRECTOR'S OFFICE												
COMMUNICATIONS DIVISION	21,500				13,000				3,000		37,500	
TECHNICAL SERVICES DIVISION	51,000	600			44,000						94,000	600
TOTALS	72,500	600			57,000				3,000		132,500	600
IPMENT TECHNICAL & SCIENTIFIC												
DIRECTOR'S OFFICE		850	1,000								1,000	850
COMMUNICATIONS DIVISION	5,000	4,740			3,250	855					8,250	5,595
TECHNICAL SERVICES DIVISION	33,061	27,433	15,600	9,600	10,000	23,438	10,000	4,912	10,000	800	78,661	66,183
TOTALS	38,061	33,023	25,600	9,600	13,250	24,293	10,000	4,912	10,000	800	96,911	72,628
ECIAL EQUIPMENT												
ANSPORT VEHICLES	300,000										300,000	
R CONDITIONING PLANT	419,000	14,000	85,000								503,000	14,000
TOTALS	719,000	14,000	85,000								808,000	14,000
TOTALS	931,061	47,623	134,800	9,600	104,750	24,293	23,300	4,912	26,500	800	1224,400	87,228
20% for packing, shipment & price increases to year 1 on items from abroad		10,424		1,920		4,858		982		160		
TOTALS		58,050		11,520		29,151		5,990		960		
5% per year for price increases in ar 2-5 on foreign purchases				570		480		90		190		
FINAL TOTALS	931,061	58,000	134,800	11,090	104,700	29,340	23,300	6,080	26,500	1,150	1220,300	105,900

TABLE 10 CAPITAL EXPENDITURE

CONSTRUCTION AND/OR MODIFICATION TO BUILDINGS FOR PACKAGING CENTRE - PRELIMINARY ESTIMATE OF COSTS

WORK REQUIRED	YEAR PRECEDING PHASE 1 START OF CENTRE		WHEN NEEDED PHASE 2 PROBABLY YEAR 3 4 OR 5		
	Modifications Baht	New building Baht	Modifications Baht	New Building Baht	
SME "A" CENTRE IN PRESENT SISI BUILDING					
PHASE 1. INITIAL ACCOMMODATION					Cost data supplied by SISI architect is based on rate per sq.m. only
Main Building: modifications to walls and doors and revision of sinks in laboratory, utilizing 320sq.m.	27,000				
Package Testing. Constructing a single story building, including a variable humidity room, by enclosing the space above the septic tank. 144sq.m. at 1,500 Baht per sq.m.		216,000			160sq.m. required in addition to present Packaging Division staff area which will mean some re-arrangement of other divisions.
Sink shower booth and 3 phase outlets, steel girder for hoist		10,000			
10% contingencies	3,000				
TOTAL	30,000	220,000			
PHASE 2. WORK IN ADDITION TO PHASE 1					
Construction of 3rd floor on present SISI building, effective space 720 sq.m.				1,427,500	If the space occupied under phase 1 is retained ½ a floor only would be needed.
10% contingencies				142,700	
TOTAL				1,570,200	

TABLE 10 (CONT.) CAPITAL EXPENDITURE

CONSTRUCTION AND/OR MODIFICATION TO BUILDINGS FOR PACKAGING CENTRE - PRELIMINARY ESTIMATE OF COSTS (CONT.)

	YEAR PROCEEDING PHASE 1 START OF CENTRE		WHEN NEEDED PHASE 2 PROBABLY YEAR 3 4 OR 5		
	Modifications	New Building	Modifications	New Building	
	Baht	Baht	Baht	Baht	
SCHEME "B" CENTRE IN FORMER INDUSTRIAL PRODUCT DESIGN CENTRE CLOSE TO SISI BUILDINGS					The present buildings are now used as a store which would have to be accommodated elsewhere.
PHASE 1					
Front Building modification to walls doors and the provision of a sink in the laboratory. Area 560 sq.m.	31,000				
Workshop Building. Cost of sealing to make suitable for air conditioning 300 Baht/sq.m. Area 240 sq.m.	72,000				
Sink, shower booth and 3 phase outlets, steel girder for hoist, construction of shock bases.	20,000				
10% Contingencies	12,000				
TOTAL	135,000				
PHASE 2					
Laboratory extension. Cost of providing an extension at the rear of the workshop area for design/ laboratories. 280 sq.m.				500,000	
10% Contingencies				50,000	
TOTAL				550,000	

2 Technical Assistance	Year prior to		
Experts	Start of Centre	3 man-months	
	Year 1	12	"
	Year 2	12	"
	See table 6		

3. Purchase of Books & Journals from abroad — Summary of costs in table 7 in the preceding finances section

4. Assistance towards the cost of laboratory equipment and special air conditioning plants purchased abroad

F. Conclusions and Priorities

1. Conclusions

81 1. Resulting from visits to a range of Thai companies concerned with packaging Government Departments and members of the Thai Packaging Association I find a need for improved packaging and packaging technology, particularly among companies without contacts abroad.

82 2. There is no central source of packaging information and knowhow and a large majority of those visited were keen that a packaging Centre should be established. With this I am in agreement.

83 3. I am of the opinion that "a keen interest" and making effective use of a Packaging Centre may not be the same. If the Centre is formed I believe the staff have a big selling job to do But I still believe that the Centre should go ahead.

84 4. It is I believe generally agreed that the Thai Packaging Association is not yet strong enough either numerically or financially to sponsor a Packaging Centre and that it should be a Government organization but with close links with the Thai Packaging Association, this is also my view.

85 5. Three organizations have been suggested to me as suitable bases for a Packaging Centre. These are considered in the report and it is my view that it is best for it to develope out of the Packaging Division of the Small Industries Services Institute preferably, becoming a separate but parallel organization within the Department of Industrial Development. In this way it can present the image of a centre exclusively for Packaging headed up by a Director whose job is packaging. This I believe would be of assistance in gaining the confidence and good-will of the industry. I favour the name "The Thai National Packaging Centre".

86 6. I believe and have recommended that the Centre should have two divisions; one responsible for information, training and package promotion and the other for technical services including advisory staff and testing facilities.

87 7. I have suggested a staff of 11 for the first year which could grow to 46 after five years. I believe that the rate of growth of the staff and the purchase of additional equipment must be controlled by the work load from industry.

88 8. Two alternatives have been considered for housing the Centre, the present SISI building with an extension for package testing and the nearby building previously used for the Industrial Product Design Centre. The latter provides more suitable accommodation and would be less expensive to convert.

89 9. The selection and training of the neucleus staff is probably the key to a successful centre and job specifications and training schedules have been prepared.

90 10. It is recommended that senior staff should receive initial training at the Centre and then go to India and England (Pira) for training, in total a period of 3 to 9 months. The present head of the Packaging Division of SISI should go to England (Pira) as soon as possible for experience in information and training techniques.

91 11. It is considered necessary to have the help of a Technical Assistance Expert in the preparation and start up period. For up to 2 years. Additionally provision should be made for several shorter term T.A. experts for specific aspects eg. package design, plastics packaging, economics of packaging which may not be in the field of the longer term experts.

92 12. It is recommended that if the Government of Thailand wish to go ahead with this project that they should seek further United Nations aid for, fellowships, T.A. Expert Assistance and necessary plant and equipment which has to be purchased from abroad.

2. Priorities

93 The following are considered to be aspects in the setting up of the Centre with a high priority.

94 1. To send the present Chief of the Packaging Division (SISI) to England (Pira) for about three months for experience in information and training. This is required to meet present industry needs and in preparation for the start up of the Centre.

95 2. To obtain a decision from the Government of Thailand on whether they wish to go ahead with a packaging centre.

96 3. If they are in favour to apply to the United Nations for Assistance covering fellowships, Technical Assistance Experts and plant and equipment from abroad.

97 4. To make a decision on the buildings to be used for the Centre. and to prepare detailed plans.

98 5. To seek suitable staff for the senior positions in the Centre and a technical assistance expert.

9. Acknowledgements

99 The assignment turned out to be longer than anticipated and the T.A. Expert would like to record his appreciation for the assistance given by the Director and Staff of the Institute.

12.11.71 Appendices

01044
(2 of 2)

Restricted

Ref: THA - (SIS)

Report to the Government of Thailand

Establishment of a National Packaging Centre in Thailand

A.C. POULTER

UNIDO TECHNICAL EXPERT

OCTOBER 1971

LIST OF APPENDICES

I JOB DESCRIPTION FOR TECHNICAL EXPERT

II LIST OF COMPANIES & OTHER ORGANIZATIONS VISITED AND NUMBER OF REGISTERED COMPANIES

III NEED FOR A NATIONAL PACKAGING CENTRE

IV i) BOOK LIST

ii) PERIODICALS LIST

V EUROPEAN PACKAGING FEDERATION TRAINING SYLABUS

VI POSITION OF STANDARDS IN THAILAND

VII STAFF JOB DESCRIPTIONS INCLUDING T.A. EXPERT

VIII EQUIPMENT LISTS

IX PREPARATION OF STAFF GOING ABROAD FOR TRAINING

X NOTES ON PACKAGE TESTING LABORATORY SHOCK BASES

****

APPENDIX I
UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO 11 September, 1970

Request from the Government of the Kingdom of Thailand
for Special Industrial Services

JOB DESCRIPTION
THA-154-A (SIS)

POST TITLE	Consultant on the Establishment of a National Packaging Centre in Thailand.
DURATION	Two months, with possibility of one month's extension.
DATE REQUIRED	As soon as possible
DUTY STATION	Bangkok, with travel within the country
DUTIES	The consultant will be assigned to the Ministry of Industry and will co-operate closely with the Thai Packaging Association. He will advise the Government of Thailand on the establishment of a National Packaging Centre. Specifically, he will be expected to: 1. Assess packaging facilities available in Thailand; 2. Formulate the terms of reference and statutes for the Centre, taking into account, inter alia, the following tasks: testing and research standardization documentation and information education promotion of new packaging materials and techniques packaging economics 3. Advise on the organizational structure and staff recruitment of the Centre; 4. Elaborate the detailed specification of the testing equipment; 5. Recommend the implementation programme of the project; 6. Recommend any other measures of further technical assistance.
QUALIFICATIONS	Packaging technologist or industrial economist, with considerable practical experience in managing a packaging centre dealing with a full range of packaging problems.
LANGUAGE	English
BACKGROUND INFORMATION	One of the characteristic attributes of national economies in developing countries is the growing importance of the packaging industry. This very resilient industrial sector is extremely diversified and needs systematic assistance in developing and modernizing its production processes and packaging techniques. Development of standardization, education and techno-economic information activities is also necessary. In the light of the above, Thai industrial and economic authorities are considering the possibility of establishing

APPENDIX II

LIST OF COMPANIES & OTHER ORGANIZATIONS VISITED
IN ORDER OF VISITING

Dr. Kasem Balajiva
Technological Research Institute
Applied Scientific Research Corporation of Thailand
Bangkhen, Bangkok.
Tel. 791121-30

Mr. Amara Poomiratana
Director
Institute of Food Research and Product Development
Kasetsart University
Bangkhen, Bangkok
Tel. 71026-8

Mr. Suchint Lausangngam
Manager
Kwang Hua Industries Ltd. Part.
50 Soi Sing Fah, Suksawad Road,
Prapadang, Sumutprakarn
Tel. 685123

Mr. Suthas Tajavibulya
Manager
Hiang Seng Fibre Container Co. Ltd.
Chua Plerng Road, Chong Non See
Bangkok
Tel. 863311, 860604, 861401, 860052, 32696

Mr. Supan Jotikabukkana
Sales Manager
The Siam Kraft Paper Co., Ltd.
"Sirinee Building", 4th Floor
518/4 Ploenchit Road
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APPENDIX II (CONT.)

Analysis showing the number of Packaging Manufacturers who are registered with the Ministry of Industry - Office of the Under-Secretary, by type of package.

1. NO. OF COMPANIES REGISTERED

(A) THAI COMPANIES — NOT AVAILABLE

(B) FOREIGN COMPANIES — NOT AVAILABLE

2. NO. OF COMPANIES REGISTERED SUBDIVIDED AS FOLLOWS :

TYPE OF PACKAGE	NATIONAL ANNUAL PRODUCTION (MINIMUM)	NO. OF COMPANIES
WOODEN CRATES	1,460,200 CRATES	90
FIBRES BOARD CASES	200,000 CASES	2
PAPER SACKS & BAGS	92,700,000 SACKS & BAGS	3
PAPER CASES	11,259,800 CASES	10
PLASTIC BAGS	3,292 TONS	72
METAL DRUMS	6,838,586 DRUMS	29
METAL CANS & TUBES	18,909,695 CANS & TUBES	36
FLEXIBLE PACKS	Not available	Not available
GLASS CONTAINER	43,839 TONS	31
MOULDED PLASTIC CONTAINERS	353 TONS	41

Note: This is the summary of information giving the name and address of each company and their annual production.

APPENDIX III

INTEREST COMMENTS ON THE FUNCTIONS FOR THE PROPOSED PACKAGING CENTRE
FROM
INDUSTRY AND GOVERNMENT ORGANIZATIONS

COMMENTS FROM ORGANIZATIONS BY GROUPS		Functions of Proposed Packaging Centre								
		Communications Division			Technical Services Division					
LEVEL OF INTEREST CODE 5. Considered very desirable 4. Considered desirable 3. Uncertain 2. Not wanted 1. Opinion not given		Information	Packaging Promotion	Training	Enquiries And Advisory	Testing	Specific Research Development	Standards	Overall
A. **PACKAGE PRODUCERS**		**LEVEL OF INTEREST**							
18 organizations including manufacturers of:- fibreboard cases cartons sacks and bags wood and metal packaging plastic and flexible packaging glass bottles	1	5	5	5	5	5	5	5	5
	2	5	4	5	4	4	4	5	5
	3	5	4	5	4	4	4	5	5
	4	5	4	5	4	5	4	5	4
	5	4	4	5	4	5	4	5	4
	6	5	5	5	5	5	5	5	5
	7	4	4	3	3	4	3	4	4
	8	3	3	5	5	3	3	4	4
	9	4	4	5	5	5	4	4	5
	10	4	4	5	5	4	4	5	5
	11	5	5	5	5	4	5	5	5
	12	5	4	4	4	4	4	1	4
	13	1	1	5	1	1	1	1	4
	14	5	4	5	5	4	4	4	4
	15	5	4	4	5	4	4	4	4
	16	5	5	5	5	5	5	5	5
	17	4	1	1	4	1	5	1	4
	18	4	5	5	4	4	4	4	4
B. **USERS & USER ORGANIZATIONS**									
10 organizations including:- Users of packages food processing organizations standards organizations industrial development planning	1	1	1	1	5	1	5	5	4
	2	5	4	5	5	4	4	5	5
	3	5	1	1	5	1	4	4	4
	4	5	4	5	5	4	5	4	5
	5	5	4	4	5	5	5	5	5
	6	5	4	5	5	1	5	5	5
	7	4	4	1	4	1	1	5	4
	8	5	4	5	5	5	4	4	4
	9	5	4	5	5	4	4	5	5
	10	1	1	1	1	1	5	1	4
C. **TRANSPORT ORGANIZATIONS**									
5 organizations concerned with transport for home and export markets.	1	1	1	5	5	1	5	5	4
	2	5	4	5	5	5	5	5	4
	3	1	1	5	4	1	4	5	4
	4	5	5	5	5	5	5	5	5
	5	1	1	4	4	4	4	4	4

APPENDIX IV (i)

BOOK LIST FOR INFORMATION SERVICES & COSTS

The following books have been selected to give a general coverage of the field of packaging and packaging materials. A few books have been included covering the related technologies of printing, paper making, containerization and marketing.

Most books recommended for early purchase and the cost has been included in the first year. Those marked O should be considered for subsequent purchase and their cost has been included in the estimates for the second year of the Centre. Books marked * are included in the recommended reading list for the Institute of Packaging (British) residential revision course to the European Packaging Federation training sylabus. Books already at the Packaging Division of SISI Bangkok are marked x. The books have been grouped under the following heading for ease of reference.

Catagory	Page
1. Packaging in General	1
2. Packaging materials & packages	2
i. metals & foils, aerosols.	
ii. paper & board, microbiology of paper	
iii. plastics, packaging films & heatsealing.	
iv. glass	
3. Adhesives	9
4. Coating & proofing	9
5. Testing & quality control	10
6. Food packaging	11
7. Packaging machinery and processes	12
8. Associated technologies	12
i. Containerization & shipping	
ii. Marketing	
iii. Paper making	
iv. Printing & inks	
v. Information Services and training	

Estimated Costs

YEAR 1		
Books listed for purchase in first year of Centre including 25% mark up on prices at time of publishing.	Baht 17,060	or $853
Contingency for additional books for example dictionaries.	2,940	147
Total	Baht 20,000	$1,000
YEAR 2		
Books suggested for purchase in second year of centre including 30% mark up on prices at time of publishing.	Baht 4,300	or $215
Contingency for additional books.	2,700	135
Total	Baht 7,000	or $350
SUBSEQUENT YEARS		
Annual sum for additional books	Baht 3,000	or $150

LIST OF BOOKS

1. Packaging in general.

*x Packaging Institute (U.S.A.)
GLOSSARY OF PACKAGING TERMS
342 Madison Ave, New York 17, N.Y., 1955, 2nd ed., 323pp., $6.75
This edition of the Glossary of Packaging Terms is a revised and extended version of the first edition. The Glossary is arranged like a dictionary, with cross references where necessary, and covers packaging materials, packages of all kinds, machinery, and other subjects relevant to the packaging industry. Registered trade names have been omitted. In the appendix, and attempt has been made to collect details of methods for stating container dimensions and for taking measurements on several types of containers. A list of Packaging Institute Tests Procedures is given.

Hoffmann J.P.A. (editor)
DICTIONARY OF PACKAGING TERMS (German, English, French)
European Packaging Federation. 1 Vere Street, London W.1. 1968, $18.

* Anon
MODERN PACKAGING ENCYCLOPAEDIA
770 Lexington Avenue, New York.

* Anon
PACKING REGULATIONS AND CONDITIONS OF ACCEPTANCE
British Rail Clearing House, London, U.K.

*x Paine, F.A. (editor)
THE FUNDAMENTALS OF PACKAGING
Blackie & Son Ltd., London, 1962, 330pp. £2.10.
During the past year or two several books purporting to be textbooks of packaging have appeared, mostly from America. 'The fundamentals of packaging' is the first to deal primarily with the principles of the subject rather than with the materials which are used in packaging. It is intended to form the basic textbook for the Institute of Packaging's membership examination but it will, undoubtedly, have a wider appeal. It is down-to-earth in approach and packaging jargon is kept to a minimum. The first six chapters deal with general principles, such as the function of containers, adhesion, cushioning and permeability theory. The chapter on adhesion is especially good, whilst that on cushioning explains a difficult subject very clearly, though your reviewer takes leave to doubt some of the G-factor/pulse length, relationships quoted. The chapter on permeability is too long and detailed for a book of this kind. More attention to application of results and less permeability theory would have been an improvement. There are seven chapters dealing with the packaging of special products and some of them, especially the one on pharmaceuticals, are very good. The one on the packaging of heavy machinery is less informative and why for heaven's sake a chapter on pottery and nothing on food? Surely if 16 specialists can be found to contribute to a book it should be possible to find someone to write something on meat products, on bakery and confectionery, or on the rapid developments and apecial problems of fruit and vegetables. The last part of the books is devoted to various ancillary activities such as labelling, printing, quality control, industrial standards, materials handling and package testing, all of which come very much within the purview of the packaging engineer. These are most informative chapters, very well presented though they do contain one or two odd statements. For example, no one knows better than Mr Paine that the vibrating table which he describes in Chapter 20 does not cover the range of amplitudes and frequencies experienced in railway wagons and road vehicles. The index is adequate so far as it was tested but a more extensive bibliography would be a help to students. The book should find a place on the shelves of anyone concerned with packaging; what it does, it does well, whilst leaving room for improvement in the 2nd edition. (C.H.B.)

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* Recommended reading EPF training course
x Packaging Division SISI already have
o Suggest purchase in 2nd year of Centre

British Standards Institute
PACKING CODE - B.S. 1133
British Standards Institute, 101 Pentonville Road, London, N.1.

0 Anon.
TRANSPORT OF DANGEROUS GOODS (1966). VOLS.I, II, & III
United Nations, New York, 1966, 509pp.
These are extracts from recommendations prepared by the United Nations Committee of Experts on the transport of dangerous goods, as amended by the United Nations Committee of Experts for further work on the transport of dangerous goods. They are based largely on existing regulations and on work undertaken by various organizations, and cover the following points: classification and definitions of classes, listing of the principal dangerous goods, labelling and shipping papers. They do not apply to dangerous goods in bulk, which in most countries are subject to a special system of regulations.

* Leonard, Edmund A., M.A.,
THE ECONOMICS OF PACKAGING
The Packaging Institute, Inc., of America
342 Madison Avenue, New York, N.Y. 10017.

* Herdeg, Walter (editor)
PACKAGING - A SURVEY OF PACKAGE DESIGN
Graphis Press, Zurich, Switzerland

Brown, K.
PACKAGE DESIGN ENGINEERING
John Wiley & Sons, New York; Chapman & Hall Ltd., London, 1959, 263 pp.
This book is intended for the package designer or draughtsman and is based on a course of lectures given by the author on 'Industrial Package Design', the aim being to underline the case of basic engineering principles in the design of packages, and the emphasis is rather more on military than commercial packaging. The first eight chapters cover the basic requirements in statics and dynamics, strength of materials and stress analysis which are required for solving structural and dynamic packaging problems and are intended to be suitable for a self-study course-though this would be a very compressed one, and are more useful as a source of basic formulae used later on. Four chapters are devoted to the design characteristics of tension spring, rubber shear mount, pad cushioning and canvas strap suspensions. Four chapters similarly describe corrugated, sheathed crate, plywood and metal shipping containers, and three chapters consider dehumidification and pressurization and package test instrumentation. There is a commendable determination throughout to put design on a quantitative basis, although this occasionally leads to calculations which seem rather elaborate, considering the approximations involved in the basic assumptions, an example of this being an extended calculation on a desiccated pack occupying four pages. More specific references to other sources of information on the topics discussed would have been desirable in a book of this type. Throughout the book is well illustrated with excellent diagrams and many graphs, and should prove a useful addition to the few publications on this subject. G.A.G.

2. Packaging materials and packages

Paine, F.A. (editor)
PACKAGING MATERIALS AND CONTAINERS
Blackie & Son Ltd., London & Glasgow, 1967, 377pp., £3.10
The book, like its companion volume, Fundamentals of Packaging is published under the authority of the Institute of Packaging. It covers in some detail the major types of packaging available today, both for the consumer market and for industry, and gives background coverage of the basic raw material from which the containers are made. It is divided into three sections: (1) shipping containers (wooden cases, crates

and casks; metal drums and pails; fibre drums; solid and corrugated fibreboard cases; jute, plastics film and multiwall paper sacks; bales and bailing); (2) retail units (glass, metal and composite containers; collapsible tubes in metal and plastics; moulded thermoplastics containers; aerosols; rigid boxes; folding boxboard cartons; moulded pulp containers; packaging with flexible materials; aluminium foil in flexible packaging); (3) ancillary materials (forming and filling methods and machines for packaging with flexible materials; paper, plastics and fabric sealing tapes; strapping, wire and other reinforcements; package-cushioning systems; closures).

i. Metals, foils, aerosols.

Langton, J.W.
TIN BOX MANUFACTURE
Canning Publications, 14-15 Coleman St., London, E.C.2, 1957, 192pp
£1.50
The following subjects are discussed: materials, dies, presses and press maintenance, rotary operations, removing raw edges, irregular seamless containers, round (made-up) containers, non-circular (made-up) containers, operational planning, allocation of overheads, labour payment.

Kaiser Aluminium & Chemical Sales Inc.
KAISER ALUMINIUM FOIL
919 N. Michigan Ave., Chicago 11, Ill., 1958, 234pp.
The uses of aluminium foil in the packaging and other industries are reviewed and the properties and production of aluminium foil are described. Information is given on converting the foil (laminating, coating, printing, cutting, welding, soldering, adhesive bonding, etc.).

* Herzka, A., and Pickthall, J.
PRESSURIZED PACKAGING (AEROSOLS)
Butterworths Scientific Publications, London, 1958, 411pp. £3.15
Propellents, valves, filling techniques, laboratory evaluation and formulations for food, perfumery, cosmetics, insecticides, space deodorants, medical preparations, paints and varnishes, paint removers, fire extinguishers, etc. are discussed.

0 Shepherd, H.R. (Editor)
AEROSOLS: SCIENCE AND TECHNOLOGY
Interscience Publishers, New York & London, 1961, xiv, 548pp. £8.45
The contents of this book are: 'Aerosols in modern industry' by H.R. Shepherd; 'Theory and practice of aerosols' by R.C.Downing; 'The metal container' by R.A. Foresman, Jr; 'Glass and plastic containers' by R. H. Thomas; 'Valves' by W.C. Beard, Jr; 'Propellents' by F.T. Reed; 'Laboratory techniques' by M.A. Johnsen; 'Factors in formulation design' by M.J. Root; 'The odour of aerosol products' by E.Sagarin; 'Cosmetics: Fragrance and personal hygiene products' by S. Prussin; 'Hair Cosmetics' by M.G. Brookins; 'Pharmaceutical products' byI. Porush; 'Food aerosols' by W.E. Graham; 'Pesticides' by G.W. Fiero; 'Coating compositions' by F.A. Bower and F.S.Palmer; 'Household and industrial specialties' by N.J.Froot. An appendix gives a summary of U.S. aerosol shipping regulations.

ii. Paper and board, microbiology of paper.

* Young, H.J., Gordon, G.A., and Hine, D.J.
PAPER AND BOARD IN PACKAGING
Pergamon Press, Oxford, 1963, 199pp., £3.50
This book is based on lectures delivered to a Summer School organized jointly by the Manchester College of Science & Technology and the Printing, Packaging & Allied Trades Research Association, in co-operation with the Institute of Packaging, in 1961. The contents are as follows: Industrial packaging in paper and board (A.F. Much); Packaging hazards (G.A. Gordon); The stress-strain behaviour of paper (J.A.S. Newman); The effect of relative humidity and temperature on

the physical properties of paper (J.A.S. Newman); Wet strength papers (F.L. Hudson); Stretchable papers (N.H. Kenney); Biological aspects of packaging with paper and board (D.M. Evans); Adhesion theory (W.C. Wake); adhesives used in packaging (W.J. Opie); Organic coatings and laminates (S.E. Sorrell); Aluminium foil and foil laminates as protective packaging (T.H. Angel); The testing of packaging boards (J.W. Scott); Properties of board required for folding cartons (D.J. Hine); Corrugated containers (F. Tetley); Solid fibreboard containers (W.D. Caldwell); Multiwall paper sacks-a general assessment (M. Rothman).

Anon.
PLASTICS FOR FOOD CONTACT APPLICATIONS. A CODE OF PRACTICE FOR SAFETY IN USE
London: British Plastics Federation and British Industrial Biological Research Association, 1969, £20.00
This code of practice, while reiterating the basic principles of earlier reports published by the British Plastics Federation, includes direct recommendations on the use of the ingredients of plastics to be used for food contact applications, i.e. the manufacture, processing, wrapping, containing, transport or storage of food. It is emphasized that the code is concerned only with the safety in use of plastics materials in contact with foodstuffs in the sense of the migration of a possibly toxic constituent. Although high-molecular weight polymers present no toxic hazard, there may be trace redidues in them of other materials, such as catalysts, used in their manufacture, and therefore specifications of basic polymers are given. Additives which can give rise to a toxic hazard are listed by trade and brand name or by chemical names or types. In each case the quantities of additives which may be employed in a given plastics material for a specified packaging application are shown. The method to be used for obtaining approval from BIBRA of a particular additive not in the specifications is explained.

Mosher, R. H., and Davis, D.S. (editors)
INDUSTRIAL AND SPECIALTY PAPERS. VOL.II-MANUFACTURE
Chemical Publishing Co. Inc., New York, 1968, 330pp., £5.60
This second volume in a three-volume series on paper and the paper-making industry consists of the following contributions: 1. Paper converting machinery (L.W. Egan); 2.Printing inks and processes (S.B. McFarlane Jr); 3. Laminating and the theory of adhesion (F.C. Campins); 4. Saturating agents and papers and resintreated specialties (R.W. Martinek); 6. Evaluation of raw stock, raw materials and specialty papers (D.S. Davis); and 7. Films (J. Eichhorn).

x Paine, F.A. (editor)
PACKAGING MATERIALS AND CONTAINERS
Blackie & Son Ltd., London & Glasgow, 1967, 377 pp. £3.50
The book, like its companion volume, Fundamentals of packaging (..630/2999), is published under the authority of the Institute of Packaging. It covers in some detail the major types of packaging available today, both for the consumer market and for industry, and gives background coverage of the basic raw material from which the containers are made. It is divided into three sections: (1) shipping containers (wooden cases, crates and casks; metal drums and pails; fibre drums; solid and corrugated fibreboard cases; jute, plastics film and multiwall paper sacks; bales and baling); (2) retail units (glass, metal and composite containers; collapsible tubes in metal and plastics; moulded thermoplastics containers; aerosols; rigid boxes; folding boxboard cartons; moulded pulp containers; packaging with flexible materials; aluminium foil in flexible packaging); (3) ancillary materials (forming and filling methods and machines for packaging with flexible materials; paper, plastics and fabric sealing tapes; strapping, wire and other reinforcements; package-cushioning systems; closures).

Anon.
(PAPERS PRESENTED AT CARTONEX-CARTON AND CASEMAKING CONFERENCE
28 Feb. - 3 Mar. 1967)
Converter, Factory Publications Ltd, Hermes House, 89 Blackfriars Rd, London, S.E.1.
The titles of the papers are as follows: Cartons-what the user wants (J.M. Montresor); Carton Board developments (S.W.Kingsnorth); Extending uses of board through coating and lamination (G.J.Cohen, J.M. Collins., P.G.Eggar); Precision converting for mechanised packaging (D.J. Hine); Carton printing-the relationship between inks and processes (D. Bourne, R.G. Kinsman); Waste stripping (J.Edwards, J.P. Ryder); Developments in carton coating methods (R.S. Haven); Advances in carton adhesives and coatings (J.A. Parsons); Cases-what the user wants and what the manufacturer can supply (P.N. Harvey, J.M.Montresor); Developments in the U.K. solid and corrugated fibreboard case industry (M.F. Crow); Comparison of stitching, taping and gluing processes (J.S. Buchanan); Problems in small-batch production of corrugated boxes (B.G. Lawton); Rotary diecutting and printing (C.K. Cumberland); Developments in the corrugator (J.D. Jarman); Stereo mounting and printing (J. Cahen); Feeders for the rotary diecutter (T.D. Bishop); Planning for production in the case industry (P.L. Whiting); Quality control-its purpose, operation and cost (W.J. Reed); Problems of in-plant warehousing and materials handling (H.L. Hazell); Does research and development pay? (I.F. Hendry); Efficient use of personnel (H.A. Pawson). For abstracts of individual papers see Packag. Abstr. no. 6989,6993, 7049, 7069, 7102, 7106, 7129, 7135 and 7302 (all in this issue), and also Print. Abstr. nos. 1514/1967 and 1693/1967.

S & S Corrugated Paper Machinery Co. Inc.
CORRUGATED BOX MANUFACTURERS' HANDBOOK
New York, 3rd ed., 1965, 267pp. $15
The book is arranged in the following sections: plant specifications; corrugating equipment; converting and finishing equipment; speciality equipment; operation; and product design factors. Appendices cover: the development and machinery production of S & S Corrugated Paper Machinery Co. Inc.; Rule 41; and equipment floor plans. There are numerous useful illustrations and diagrams in every section.

Technical Association of the Pulp and Paper Industry
MICROBIOLOGY OF PULP AND PAPER
Tappi Monogr. Ser. no. 15, 155 East 44th St. New York, N.Y., 1955, 282 pp.
This is an extremely useful publication. It is impossible to give more than a brief indication of its contents in the space of a few lines, but the following sections are of particular interest. Chapter I: Introduction to microbiology. ChapterVII: Deterioration of coatings, sizes and adhesives (and its prevention). Chapter VIII: Preservation of paper products. Chapter IX: Paper and paperboard in food packaging. Chapter IX includes a discussion of special chemical treatments for packages for dairy and bakery products, fruit and foods in general, public health aspects and methods of testing. The remaining chapters are headed: Chapter II: The microbiology of pulpwood. Chapter III: Microbiology of fresh water. Chapter IV: Preservation of pulps. Chapter V: Slimes in mill systems and their control. Chapter VI: Microbiology of papermakers' woollen felts. Chapter X: The microbiology of spent sulphite liquor. Chapter XI: Miscellaneous problems. Numerous literature references are also given at the end of each chapter.

iii. Plastics, packaging films, heatsealing, toxicity.

* Briston, J.H., B.Sc., A.R.I.C., A.P.I., M. Inst. Pkg., and Gosselin, C.C., B.Sc., M.Sc.
INTRODUCTION TO PLASTICS
The Hamlyn Group, Hamlyn House, 42 The Centre Feltham, Middlesex, England, price £1.75

* Miles, D.C., A.P.I., L.R.I.C., and Briston, J.H., A.R.I.C., A.P.I., M.Inst. Pkg.,
POLYMER TECHNOLOGY
Temple Press Books, 42 Russell Square, London, W.1., £3.25

Anon.
(PAPERS PRESENTED AT CONFERENCE ON 'ADVANCES IN PACKAGING WITH PLASTICS', 14-16 Nov. 1967)
Plastics Institute, 6 Mandeville Place, London, W.1.
The titles of the papers are as follows: Growth of plastics in Europe (J.F.I. Housz); Plastics in packaging and the consumer (R.C. Roberts); New Polyolefins for packaging (D.A. Williamson); Modifications to PVC for bottle blowing (W.B.Sisson); New polymers and modifications for packaging purposes (M.C. Dixon); Developments in plastics processing machinery with particular application to the packaging industry (R.G. Bird); Expanded polystyrene in packaging-properties and economics (J.S. Harding); Cushioning and corrosion problems (F. H.Bayley); Packaging of fish (R. Hardy and G. Hobbs); Plastics in the packaging of frozen foods (K.R. Fox); Plastics in poultry packaging (M.D. Ranken); Cosmetic powders in plastics (C.D.B. Moon); Plastics as a product in semi-bulk handling (K. Kemsey-Bourne and E. Muir-Smith); Horticultural and other functional chemicals (R.P. Howgego); Storage and transportation of food commodities (D.W. Hall); Assessment of packaging liquids in plastics (D.A. Dean); Concentrated fruit drinks in plastic containers (T.C. Gallant); Packaging of liquid chemicals (D.W. Shorten); Bag-in-box packaging (P.P. Orlowski); The extractability of additives from PVC compounds (C.A. Brighton); Safety of plastics materials in contact with food and medicaments (G.B. West). For abstracts of individual papers see Packag. Abstr. nos. 677, 680, 684, 694, 695, 768, and 872 all in this issue.

Anon.
PROCEEDINGS OF THE FIFTH PACKAGING CONFERENCE, HARROGATE, 13-21 APR. 1967
Chemical Industries Association Ltd, Alembic House, 93 Albert Embankment, London, S.E.1. Nov. 1967, 1[illegible] pp. £2.10
The following papers are included: The properties of plastic materials (J.H. Briston); The processing of plastics materials (J.W. Waters); Toxicity of plastics materials (D.A. Harper); Problems associated with packaging of liquids (M.C. Dixon); Sachets (E.A. Cardall); Blown containers (B.S. Glyde); Liners and bulk containers, (D.W. Shorten); Plastics packaging of solid materials (D.K. Taylor); Woven plastics sacks (J. Dow & F. Wilson); Extruded plastics sacks (D.J. Flatman); Expanded polystyrene in packaging (L.A. Squires); PE.PS and PVC bottles for consumer packaging of chemicals (W.A. Holmes-Walker); Plastics in flexible packaging for consumer goods (A.G. Goodchild); The economics of packaging chemicals with plastics (J.M.Dean); Trends in packaging (D.N. Buttery).

Bender, R.J. (editor)
HANDBOOK OF FOAMED PLASTICS
Lake Publishing Corp., Libertyville, Ill., U.S.A. 1965, 339pp., £5.38
The handbook has 20 sections from different contributors covering most aspects of foamed plastics, including packaging, testing, processing equipment, etc. Charts and tables provide useful data throughout.

The history of printing is followed from the invention of paper, in 105 AD, up to 1950, with the emphasis on innovators and innovations. Illustrations include reproductions of pages from books, and maps showing the spread of printing between 1471-1500 and towns in Italy, Germany, France, Holland and Belgium in which printers were working before 1500. A bibliography and index are given.

* Pinner, S.H. (editor)
MODERN PACKAGING FILMS
Butterworth & Co. (Publishers) Ltd., 88 Kingsway, London, W.C.2., 1967, 249 pp., £2.75
An introductory account of the origins and development of packaging films is followed by chapters dealing with the production methods, advantages and disadvantages and applications of polythylene, polypropylene, polystyrene, and PVC films. Shrink wrapping films of diverse chemical composition are grouped together for comparison, and the special problems of the testing and analysis of thin polymer films are dealth with comprehensively. The problems of printing and adhesion of packaging films are discussed in general terms, and this is followed by an account of the new technique of cold-seal pattern printing of polypropylene and similar films, and by a review of the work in progress in adapting automatic packaging machines to modern packaging films. The book ends with an assessment of their future growth potential.

* Oswin, C.R., and Preston, L.N.
PROTECTIVE WRAPPINGS
J.B. Tratsart Ltd., 154A Greenford Rd., Harrow, Middx, England, 1965, 230pp. £6.30
The contents are divided into six main parts: (1) Wrapping for protection, including lists of products, wrappings, packaging styles and ancillary processes; (2) The wares and their requirements, which broadly considers each of the wares, the problems of packing them and the present solution of these problems; (3) Emballistics, or the science of package-life prediction; (4) Wrappings; (5) Styles of wrapping, which aims to explore the suitability (or unsuitability) of each style for specific purposes; and (6) Non-wrapping uses, arranged according to trade or professional uses.

Zade, H.P.
HEATSEALING AND HIGH-FREQUENCY WELDING OF PLASTICS
Temple Press Ltd., Bowling Green Lane, London, E.C.1., 1959, 211 pp., £1.75
The physical, thermal and electrical properties of weldable plastics (including films) are given. Theoretical aspects of heat-sealing and welding; heat-sealing and welding equipment; and applications of heat-sealing and welding (including packaging) are discussed.

O Anon.
PLASTICS FOR FOOD CONTACT APPLICATIONS. A CODE OF PRACTICE FOR SAFETY IN USE
London: British Plastics Federation and British Industrial Biological Research Association, 1969 £20.00
This code of practice, while reiterating the basic principles of earlier reports published by the British Plastics Federation, includes direct recommendations on the use of the ingredients of plastics to be used for food contact applications, i.e. the manufacture, processing, wrapping, containing, transport or storage of food. It is emphasized that the code is concerned only with the safety in use of plastics materials in contact with foodstuffs in the sense of the migration of a possibly toxic constituent. Although high-molecular weight polymers present no toxic hazard, there may be trace residues in them of other materials, such as catalysis, used in their manufacture, and therefore specifications of basic polymers are given. Additives which can give rise to a toxic hazard are listed by trade and brand name or by chemical names or types. In each case the quantities of additives which may be employed in a given plastics materials for a specified packaging application are shown. The method to be used for obtaining approval from BIBRA of a particular additive not in the specifications is explained.

Brit. Plastics Fed.
SECOND REPORT OF THE TOXICITY SUB-COMMITTEE
47/48 Piccadilly, London, W.1. 1962, 65pp
The principles of assessment of the toxic hazard of plastics materials in contact with food are stated. The toxicity and extractibility of ingredients of plastics materials are discussed. Substances used or proposed for use as ingredients of plastics materials are listed, each substance being graded according to toxicity data. Methods of analysis of representative extractants are given.

iv. Glass

Jones, G.O.
GLASS
Methuen & Co. Ltd., London; John Wiley & Sons, Inc., New York, 1956, 199pp
This monograph discusses the structural chemistry of glasses, crystallization and stability of glasses in relation to structure, properties of glasses near the transformation temperature, behaviour of glass under stress, and properties of metallic ions in glass.

Shand, E.B.
GLASS ENGINEERING HANDBOOK
McGraw-Hill Book Co. Inc., New York, Toronto, London, 2nd ed. 1958, 484 pp., £3.83
This book covers the composition and properties of glass, testing, manufacture, applications (including glass containers) and fibrous glass.

O Moody, B.E., M.A., F. Inst. P., F.S.G.T., M. Inst. Pkg.
PACKAGING IN GLASS
Hutchinson & Co. Ltd., 178-202 Great Portland Street, London, W.1. £3.15

Resuggan, J.C.L.
THE CLEANING AND STERILISATION OF BOTTLES AND OTHER GLASS CONTAINERS
United Trade Press Ltd., London, 1957, 224 pp., £1.00
This book discusses methods; machines; water; detergents; bacteriological considerations; the washing of dairy bottles, brewery bottles and soft drink bottles; some practical problems and case histories.

3. Adhesives

Parker, R.S.R., and Taylor, P.
ADHESION & ADHESIVES
Pergamon Press, Headington Hill Hall, Oxford, 1966, 142pp. £1.25
This book bridges the gap between the standard textbooks and the more specialized books on adhesion. The subject matter deals with the following: A historical survey of adhesives; The nature of adhesion; Surface phenomena and preparation; The testing of adhesives and the design of adhesive joints; The chemistry and physics of polymers; Natural products as adhesives; Rubber-based adhesives; Phenolic resin-based adhesives; Epoxy resin-based adhesives; Vinyl resin-based adhesives; Speciality adhesives; Adhesives bonding of reinforced plastics; Matching adhesives and adherents. A bibliography of more advanced books is provided.

Katz, I.
ADHESIVE MATERIALS
Foster Publishing Co., Long Beach, Calif., U.S.A., 1964, 440 pp. £3.80
Thisbook provides a guide forchoosing suitable adhesives covered by specifications. Part 1 discusses theproperties of adhesives according to their use as paper, wood, rubber, plastics, metal etc. adhesives. A chapter on specification technology gives the source of the various specifications and standards. Part II consists of abstracts giving essential data contained in adhesive material specifications issued mainly by the U.S. Government.

4. Coating and proofing

O Bennett, H.
INDUSTRIAL WAXES, VOL. I: NATURAL AND SYNTHETIC WAXES
Chemical Publishing Co. Inc., 212 Fifth Ave., New York 10, N.Y., U.S.A. 1963, £4.80 324pp.
Information (properties, uses etc.) is given on many types of natural wax (paraffin, microcrystalline, mineral, vegetable, animal) and synthetic wax (fatty alcohols, fatty acids, fatty acid esters and glycerides, hydrogenated oils, chloronaphthalenes, synthetic mineral waxes, synthetic animal waxes and others).

O Bennett, H.
INDUSTRIAL WAXES, VOL. II: COMPOUNDED WAXES AND TECHNOLOGY
Chemical Publishing Co. Inc., 212 Fifth Ave., ew York 10, N.Y., U.S.A. 1963, 289 pp. £4.80
General information is given on the compounding of waxes, with discussion of desirable properties and the special products obtainable with non-waxy substances (ethyl cellulose, resins, rubber etc.). Tests and techniques used in wax technology are described and industrial applications of waxes (in adhesives, coatings, inks, paper etc. and in photomechanical processes) are surveyed.

Western Michigan University
NEW DEVELOPMENTS IN WAX TECHNOLOGY FOR PAPER PACKAGING
Proceedings of a seminar held 26-27 Oct. 1966, Kalamazoo, Michigan, U.S.A. The full texts are given of the following papers: (1) What's ahead in paper technology? (R.A. Diehm); (2) Some advantages and needs of waxed paper packaging as compared to competition (D.G. Magill, Jr); (3) A review of ethylene copolymers for wax modification (S.F. Roth); (4) Some packaging viewpoints of a frozen food packer (J.S. Florin); (5) What's ahead for hot melt coated packaging? (H.C. Eads); (6) The waxed corrugated container in civilian and military applications (M. Hecht); (7) How does waxed paper stack up as a barrier in packaging? (H. Moyer); and (8) Future of petroleum waxes in packagingmaterials for the food industry (synopsis) K.R. Erickson).

Seymour, R.B.
HOT ORGANIC COATINGS
Reinhold Publishing Corp., New York (Chapman & Hall Ltd., London), 1959.
ix, 233 pp. £3.00
The constitution, applications and properties of coatings such as asphalt, pitch, waxes, hydrocarbon resins and cellulose derivatives are described. Many applications in the packaging industry are mentioned. Information on formulation and application techniques is included.

5 Testing and quality control.

Tappi
TAPPI STANDARD SPECIFICATIONS FOR PAPER & PACKAGE TESTING
Technical Association of the Pulp and Paper Industry of America,
360 Lexington Ave., New York 17.

American Society for Testing & Materials
1967 BOOK OF ASTM STANDARDS, PART 15, PAPER; PACKAGING;
CELLULOSE; CASEIN; FLEXIBLE BARRIER MATERIALS
1916 Race St., Philadelphia, Pa 19103, U.S.A., 1967, 893 pp., $14.00
Methods of test are given for paper and paper products, packaging, cellulose and cellulose derivatives, case in and similar protein materials and flexible barrier materials. Some specifications, recommended practices and definitions are included.

Selected Standards from I.S.O., Technical Section of the British Paper & Board Makers Association the British Standards Institute and the Japanese & Indian covering packaging materials and package testing. These are available through the Centre for Thai National Standard Specifications.

* British Standards Institution
STATISTICS IN PAPER TESTING - B.S. 2987
British Standards Institution, 101 Pentonville Road, London, N.1.

* EVALUATION OF PACKAGE PERFORMANCE - proceedings of the PATRAPAK Conference 1964.
The Research Association for the Paper and Board, Printing and Packaging Industries, Randalls Road, Leatherhead, Surrey, England.

* Cowan, L.F., M. Inst. Pkg.
QUALITY CONTROL FOR THE MANAGER
Pergamon Press Ltd., 4 and 5 Fitzroy Square, London, W.1. £0.63

Isenberg, I.H.
PULP AND PAPER MICROSCOPY
Institute of Paper Chemistry, Appleton, Wisc., U.S.A., 3rd ed. 1958,
252 pp., $17.50
The chapters in this book are: 1. Elementary principles of microscope optics. 2. Illumination. 3. Examinations in polarized light 4. Microscopic equipment needed in the pulp and paper mill 5. Micrometry 6. Fibres and fibre elements. 7. The microstructure of the plant cell wall 8. Fibre analysis. Lists of references are given at the end of each chapter.

Institute of Packaging
ODOUR IN PACKAGING
Malcolm House, Empire Way, Wembley Park, Middlesex, England, 1960
231 pp. £1.25
The papers are group under: Quality control and testing; Influence of printing processes, package construction and surface design in relation to odour; Odour problems in ink making; and Methods of minimizing odour.

6. Food Packaging.

Sacharow, S., and Griffin, R.C., Jr.
FOOD PACKAGING. A GUIDE FOR THE SUPPLIER, PROCESSOR, AND DISTRIBUTOR
Westport, Conn. U.S.A.: AVI Publishing Co. Inc., 1970, 412 pp. £7.70
The evolution of food packaging is described and the basic processes used in food preparation discussed. The characteristics and packaging requirements of the following are covered in detail: red meats; poultry and eggs; milk and dairy products; fish and shellfish; fruit and vegetables; fats; and oils; food flavourings and condiments; beverages; sugar, chocolate and confectionery; cereals, bread and baked goods; and snack foods. Statutory and Religious regulations affecting food packaging in the U.S.A. are mentioned.

Heiss, R.
PRINCIPLES OF FOOD PACKAGING. AN INTERNATIONAL GUIDE
Heusenstamm, W. Germany: P. Keppler Verlag KG, by arrangement with Food & Agriculture Organization. 1970, 332 pp. 22.50 D.M.
This book is intended as a practical handbook. It covers the following topics: (1) Basic packaging terminology; (2) Influence of packaging on the shelf life of foodstuffs; (3) Packaging requirements of foodstuffs; (4) Cost of papers, films and foils; (5) Papers suitable for packaging purposes; (6) Regenerated cellulose film for food packaging; (7) Plastics films and heat-sealing methods; (8) Aluminium foils and combinations; (9) Adhesives; (10) Cartons and boxes; (11) Tinplate cans; (12) Glass packages; (13) Plastics containers; (14) Rigid aluminium cans and semi-rigid and flexible aluminium foil laminate containers for heat-sterilization; (15) Types of bags, leak-proofness and forming-filling-closing machines; (16) Shipping sacks (multiwall, polyethylene, jute and woven plastic); (17) Fibreboard shipping containers; (18) Metal drums; (19) Insect-proof and rodent-proof packaging in tropical and sub-tropical areas; (20) Packaging tropical and sub-tropical fruit, vegetables, nuts and dried fruit; (21) Test methods for packaging materials; and (22) Specifications for packaging. Several chapters of the book contain lists of references.

Anon.
SWEDISH INVESTIGATION CONCERNING STANDARD SIZES OF TRANSPORT AND CONSUMER PACKAGES IN THE FOOD TRADE ANDPROPOSALS FOR PACKAGING DIMENSIONS
European Packaging Federation, 1 Vere Street, London, W.1. 1965, $5.00

Anon.
DIRECTORY OF ITALIAN MANUFACTURERS OF PACKAGING AND PACKING MACHINES
Ministero del Commercio con l'Estero, Italian Institute of Foreign Trade, Frome, 31 Old Burlington St., London, W.1., 1967, 100 pp.
The Directory includes an alphabetical list of manufacturers, an alphabetical list of products (in Italian, French, English, German and Spanish), merchandise tables, a manufacturers' directory and commercial information. The use of the Directory is explained in Italian, French, English, German and Spanish.

Bosman, D.L.
EXPORT CITRUS PACKAGING AND A STUDY OF THE SUITABILITY OF SHOOKS PRODUCED FROM SOUTH AFRICAN GROWN PINUS RADIATA AND PINUS PATULA FOR THIS PURPOSE.
D. Sc. Thesis, University of Stellenbosch, S. Africa, 1963, 155+70 pp.
The research discussed in this thesis was aimed at improving the performance of wooden boxes for citrus export, paying special attention to the more extensive use of locally grown timber. Section headings are as follows: Trends in citrus packaging; Conclusions drawn from citrus packaging experiments carried out in South Africa before 1956; Clear wood properties of South African grown timber, Impact nail-holding strength of P. Patula and P. Radiata; Strength of knotty wood: influence

of knots on the strength of shooks of various thicknesses and widths made of South African grown P. Patula and P. Radiata; Relative strength of the standard and modified export citrus boxes; and Resume of recommendations. Numerous illustrations, diagrams, graphs and tables are included.

7. Packaging, Machinery and processes.

Anon.
FIRST INTERNATIONAL ENCYCLOPEDIA ON PACKAGING MACHINES
B. Behr's Verlag GmbH., 2000 Hamburg 22, Averhoffstrasse 10, W, Germany, 1966, 830 pp., £5.00
The encyclopedia is in English, French, German and Italian. The machines are catalogued in 14 sections: weighing, dosing, wrapping, labelling, filling, cartoning, check-weighing, parcelling and palletizing, case erecting and closing, bag-forming, filling and closing, vacuum, closing machines and closing units, and miscellaneous machines and devices. In each section machines are arranged in alphabetical order of manufacturer, and specifications, applications, operation methods and an illustration are given of each machine. Indexes of machines and names and addresses of suppliers are included.

Anon.
FIRST INTERNATIONAL ENCYCLOPEDIA ON PACKAGING MACHINES
(2nd VOLUME)
B. Behr's Verlag GmbH, 2000 Hamburg 22, Averhoffstrasse 10, W. Germany, 1967, 440 pp., £4.10
This is a supplementary volume to the first volume (see Packag. Abstr., vol. 24, no. 6, June 1967, Book notices). It contains only machines which are not included in the first volume or which have been considerably modified since its publication. It is in English, French, German, and Italian.

8. Associated technologies
1. Containerization and shipping

Anon.
REPORT ON CONTAINERISATION
National Joint Council on Materials Handling, Containerisation Study Group, London, July 1967, £1.53
The main objective of the study group which produced this report was the presentation of factors affecting the present or potential users of containers in order to assist them in making a true appreciation of the advantages and disadvantages of using the container for freight movement. It is arranged in the following sections; (1) description of container designs; (2) using containers; (3) availability of containers and the economics of owning/leasing; (4) container handling; (5) filling and emptying containers, and the packaging of the contents; (6) documentation; (7) short survey on published material; and (8) glossary of terms. Many drawings of containers and handling equipment are included.

Anon.
MARKING FOR SHIPPING REPORT
European Packaging Federation, 1 Vere Street, London, W.1. 1964, £3.00

Anon.
STANDARDIZATION OF PACKAGING DIMENSIONS ACCORDING TO A MODULUS SYSTEM BASED UPON THE I.S.O. STANDARD PALLET-SIZES
European Packaging Federation, 1 Vere Street, London, W.1., 1959, £3.00

2. Marketing.

* James, B.G.S.
INTEGRATED MARKETING,
B.T. Batsford Ltd., 4 Fitzhardinge Street, London, W.1. £4.20

* Guss, Leonard M.
PACKAGING IS MARKETING
American Management Association Inc., New York, (Bailey Bros., & Swinfen Ltd., Warner House, Folkestone, Kent, England) £3.55

* Pilditch, James, M. Inst. Pkg.
THE SILENT SALESMAN
Business Publications Ltd., Mercury House, 109-119 Waterloo Road, London, S.E.1., £1.75

3. Paper making

* Anon.
PAPERMAKING
British Paper and Board Makers' Association (inc.), Plough Place, Fetter Lane, London, E.C.4, £1.05

0 Bolam, F. (editor)
THE FORMATION AND STRUCTURE OF PAPER
Technical Section of the British Paper & Board Makers' Assoc., Plough Pl., Fetter Lane, London, E.C.4, 1962, 2 vol., 910 pp. (A270/2982-2)
The papers presented at the symposium on (1) the structure of paper; (2) the effect of structure on the major properties of paper; (3) factors responsible in practice for the structure of paper; (4) aggregates of fibres from a water suspension, are given.

Norris, F.H.
THE NATURE OF PAPER AND BOARD
Sir Isaac Pitman and Sons Ltd., Pitman House, Parker St., Kingsway, London, W.C.2, 1966, 152 pp. plus illustr., £1.00.
Chapter headings are as follows: (I) Introductory, and (II) The nature of paper and board (these chapters deal with the various techniques used in paper and board manufacture and the effect of these techniques on paper and board properties); (III) The determination of quality (relevant properties are listed and a section on assessment of printability is included); (IV) Packing, storage and the effects of humidity; (V) Recurrent faults in paper (a table is included for printing pressmen showing faults, their causes and suggested remedies); (VI) The assessment of colour and colour effects; (VII) Physical paper testing (dealing with some 30 test methods); (VIII) Chemical paper testing (tests for composition of paper, microscopy by fluorescence, identification of sizing, colours and other constituents, and bacteriological properties). A substance table for various grades of paper and a bibliography are included.

4. Printing and inks

* Davis, Alec
PACKAGE AND PRINT (an historical review of packaging)
Faber & Faber Ltd., 24 Russell Square, London, W.C.1. £4.20

* Whetton, H.
PRACTICAL PRINTING AND BINDING
Odhams Press Ltd., Long Acre, London, W.C.2.

* Trade News Ltd.
PRINT AND PACKAGE BUYER
Drummond House, 203-209 Gower St., London, N.W.1., 1965, 176 pp. £2.10
This book includes the following articles: Printing machinery (letterpress, indirect letterpress, flexographic, lithographic, photogravure, screen printing machines) (G.F. Buckler); Process characteristics (letterpress, offset lithographic, collotype, photogravure, screen printing, die-stamping, thermographic printing, xerographic printing, newspaper printing) (G.F. Buckler); Web offset (including lithographic printing plates) (A.F. Waters); Inks and the print buyer (F.W. Stoyle); Graphic reproduction and colour in print (including colour separation and correction, contact screens, camera developments, electronics) (A.C. Head); Process engraving letterpress plates (including electronic engraving, photopolymer plates and duplicate plates (G.F. Buckler); Modern high-gloss finishes (A.G. Latty); Paper and its uses (A. Warren); Preparing copy and checking proofs; Screen printing-improved techniques and new applications (G. Withers); Printing for packaging (E.V. Southam); Aluminium foil (N.A. Lee); Transfers (G. Withers); Bookbinding (L. Darley); The thermographic process; Flexography; Casting-off copy; Impositions. Additional information, mainly in the form of tables, is given on blockmaking charges, paper requirements, Arabic and Roman numerals, approx. number of words to a line, standard sizes and weights of paper, board sizes and envelope sizes. A glossary of trade and technical terms is also included.

* Long, R.P.
PACKAGE PRINTING
Graphic Magazines, Inc., Garden City, New York 11534, 1964, 223 pp.
This book deals with the development and scope of package printing ; the background and applications in packaging of the following processes and how each process works: letterpress (including photo-engraving), offset lithography, gravure, flexography, screen printing, the use of fluorescent printing inks, imprinting, heat transfer printing and bronzing; advantages and limitations of the various processes; how to identify printing; aids to handling of original copy; and developments and future trends. A short bibliography is included.

Coupe, R.R,
SCIENCE OF PRINTING TECHNOLOGY
Cassell & Co. Ltd., London, 1966, 326 pp. £2.00
The chapters of this book cover the following subjects: (1) physical concepts (e.g. nature of matter, changes of state, density); (2) relative humidity and its influence on dimensional changes in paper, air conditioning of press rooms etc.; (3) elementary chemical concepts (e.g. distinction between physical and chemical changes, mixtures and compounds, valency); (4) principles of surface chemistry relevant to lithography; (5) acidity, the pH scale and methods of measurement; (6) basic electrochemistry (electrodeposition of metals, practical considerations of typical plating baths); (7) static electricity; (8) the nature of light, reflection and refraction, lenses and their aberrations, optical density, etc., (9) colour (e.g. colour vision, mixing and measurement, sources of illumination); (10) optical instruments (densitometers, glossmeters) and the use of high-speed cameras and stroboscopes.

Larsen, L.M.
INDUSTRIAL PRINTING INKS
Reinhold Publishing Corp., New York (Chapman & Hall Ltd., London), 1962, 323 pp., £4.00
The chapters of this book are: (1) Printing and drying methods. (2) Dyes and pigments. (3) Ink vehicles. (4) Accessory items for inks (5) Manufacture of printing inks. (6) Paper and other surfaces. (7) The press operation (8) Physics and chemistry of printing inks (9) Testing procedures (10) Printing ink problems (11) Pigment property table. A glossary of terms used in the industry is also included.

Letouzey, V. (English translation by V.G.W. Harrison)
COLOUR AND COLOUR MEASUREMENT IN THE GRAPHIC INDUSTRIES
Pitman, London, 1957, 62 pp., £1.25
The book gives an introduction to colour and colour measurement. The treatment is reasonably simple and non-mathematical and the material has been selected to be use mainly to workers in the printing industries. Part I gives an introduction to colour and explains in detail the mechanisms of additive and subtractive colour mixture. The principles of colour measurement are described in subsequent chapters. Examples are given of the uses of colour measurements in the graphic arts industries and the precautions to be taken when applying the measurements are indicated. The text is fully illustrated with diagrams, many of them in colour. (IJMA)

5. Information services and training.

Classification Committee E.P.F.
CLASSIFICATION SCHEDULE & INDEX FOR PACKAGING DOCUMENTATION
European Packaging Federation, 1 Vere Street, London, W.1., 1966, $10
This classification schedule and index has been prepared for packaging literature and is based on a facit system.

Anon.
INTERNATIONAL DIRECTORY OF ASSOCIATIONS AND ORGANIZATIONS CONCERNED WITH PACKAGING.
European Packaging Federation, 1 Vere Street, London, W.1., 1966
173 pp. $10

Anon.
PACKAGING DIRECTORY (U.K)
The Tudor Press Ltd., 75 Carter Lane, London, E.C.4, 1971 edition.

Anon.
EUROPEAN PACKAGING FEDERATION "BLUEPRINT" FOR PACKAGING EDUCATION
European Packaging Federation, 1 Vere St. London, W.1. 1967, 42pp. $2

INSTITUTE OF PACKAGING (BRITISH) MEMBERSHIP EXAMINATION PAPERS
Institute of Packaging, Malcolona House, Empire Way, Wembley Park, Middlesex, England, 1970.

Title	Country of Issue	Frequency
Mechanical Handling	U.K.	Monthly
Food Technology	U.K.	
Food Engineering	U.K.	Monthly
Indian Food Packer	India	Monthly
Paper Tappi	U.S.A.	Monthly
Plastics * Modern Plastics	U.S.A.	Monthly
Printing British Printer	U.K.	Monthly
Pira Abstracts * Pira Packaging Abstracts	U.K.	Monthly
Pira Paper & Board Abstracts	U.K.	Monthly
Pira Printing Abstracts	U.K.	Monthly

B. PERIODICALS WHICH ALSO CONTAIN MATERIAL OF INTEREST IN CONNECTION WITH PACKAGING

It is not recommended that these should be purchased for the Centre unless they are found to be specifically necessary.

Adhäsion
American Chemical Society, Division of Organic Coatings and Plastics Chemistry, Papers

Anyagmozgatas Csomagolas

Australian Packaging News

Besser Verpacken

Bottler & Packer

British Ceramic Abstracts

British Food Manufacturing Industries Research Association Abstracts

British Glass Industry Researdh Association Digest of Information

Bulletin de l'Institut International du Froid

Canning and Packang

Celloscope

Containerisation International

Converter

Converting Industry

Diemaking Diecutting and Converting

Emballage (Dansk Emballage Tidende)

Emballage (Svensk Emballagetidskrift)

Emballage Digest

Emballage Selection International

Environmental Engineering

European Packaging Digest

Flavour Industry

Flour Milling and Baking Research Association Abstracts

Food and Cosmetics Toxicology

Food and Drug Packaging

Food Preservation Quarterly

Food Processing, Chicago

Food Processing Industry

Food Science and Technology Abstracts

IDE

Industria Conserve

International Paper Board Industry

Journal of Food Science and Technology

Journal of the Science of Food and Agriculture

Materials Handling News

Merchandising Vision

Metron

Modern Materials Handling

New Scientist

New Zealand Packaging

Norske Esker

Notiziario dell'Instituto Italiano Imballaggio

Obaly

Pack

Packung u. Transport

Pakkaus

Paper Technology

Papier & Kunststoff Verarbeiter

Papiers Cartons Complexes

Perfectpac

Plastics & Rubber Weekly

Plastics Today

Pneumatic Packaging

Rapra Abstracts

Savremeno Pakovanje

Sett

Sheet Metal Industries

Shock and Vibration Digest

Svensk Paperstidning

Tin International

Tin-Printer & Box Maker

Tin and Its Uses

Tropical Stored Products Information

United States Government Research & Development Reports

Verpackung

Verpackung aktuell

Verpackungsfolien/Papiere

Verpackungs Magazin

Verpackungs Wirtschaft

Verpakking

World Surface Coating Abstracts

APPENDIX VI

Thai Packaging Standards in relation to the work of the Packaging Centre

Background. There are seven organizations in Thailand which by law are authorized to issue standards. Packaging standards are the responsibility of two of these, the Centre for Thai National Standard Specifications and the Thai Industrial Standards Institute.

The Centre for Thai National Standard Specifications. The Centre for Thai National Standard Specifications was formed in 1965 under the Applied Scientific Research Corporation of Thailand (ASRCT). It is responsible for general standards not product standards. In the packaging field this would include testing conditions and testing methods. They are the official channel for international standards, including I.S.O. representation.

The work of the Centre is controlled by a Council which meets annually. The Council has appointed six advisory and twenty one technical committees to progress the preparation of standards. There is a Technical Committee of 13 for Packaging and Handling of Goods. It includes a representative from the Thai Packaging Association but not from the Packaging Division of SISI, Ministry of Industry. There is also a technical committee on bottles with a membership of eight.

There is only a small staff and no testing facilities. At the end of 1970 4 standards had been published including one on glass milk bottles and 14 were in a draft stage.

The Thai Industrial Standards Institute. The Thai Industrial Standards Institute is part of the Department of Science within the Ministry of Industry. It is responsible by law for standards relating to industrial products including packaging standards which come within this catagory.

There is a technical staff of about 35 with testing facilities and a UN Advisor on standardization. The work of the Institute is controlled by a council which decides which projects shall be undertake and appoints a technical committee for each industrial product to be standardized. Currently there are about 100 committees.

The intention of the Thai Industrial Standards Institute is to issue a standards' mark for products which conform to the approved standard. The issue of such a standard's mark has yet to be established by law.

There is reported to be good co-ordination between the two organizations whose work includes packaging standards.

THAI STANDARDS RELATED TO PACKAGING

A number of Thai Packaging Standards have already been produced. It is now necessary to increase the range and number of standards to ensure that Thai products are adequately packed to reach the consumer in good condition and attractively packed and labeled as appropriate to the market. This is particularly important for exports in competition with foreign products.

Standards for early consideration

1. Basic Standards. These relate to the field of packaging generally and include such aspects as terminology, marking and labeling, dimensional standards and these relating to variation reductions, standard testing methods for packaging materials and packages.

It is considered that work should be progressed on the following items:

a. A standard Thai Packaging Terminology.
There is currently some confusion in the use of packaging terms and the avoidance of this will become increasingly important with the further development of packaging technology.

b. Standards for Shipping Marks and Handling Marks particularly for exports.
These standards would be based on the current Thai and international practices.

c. Standards for the Marking of Transport and Retail Packages.
This would be a standard of practice for the marking of transport and retail packages particularly for information required by law.

d. Testing Methods for Packaging Materials.
It is important that there should be standard Thai test methods for materials used in the production of packages so that materials performance levels can be included in the specification of specific packages. International test methods are generally available for consideration as Thai standards. It is suggested that specific recommendations should be prepared on the tests which need to be standardized after an appraisal has been made of the tests required and the existing standards.

e. Performance tests on transport packages.
The Centre for Thai National Standard Specifications are now considering the Draft ISO Recommendations for performance tests on filled transport packages. These should be progressed for Thai National Standards.

In this connection it should be noted that the draft ISO recommendation 2233/TC122 specifies the temperature and humidity conditions for testing but does not include conditions appropriate for testing in Thailand.

APPENDIX V - MAIN SECTION HEADINGS OF THE EUROPEAN PACKAGING FEDERATION TRAINING SYLLABUS

BLUEPRINT FOR PACKAGING EDUCATION JULY 1967

Contents

Section	
I	Introduction to Packaging
II	The Necessity for Packing
III	Principles of Protection
IV	Packaging Materials
V	Type of Packaging
VI	Accessories for Packaging
VII	Packaging and Production Processes of Packed Goods
VIII	Materials Handling, Movement and Storage
IX	Package Testing and Development
X	Specifications and Quality Measurement for Control
XI	Transport and Insurance
XII	Rationalisation and Standardisation
XIII	Legal Requirements
XIV	Marking, Identification and Labelling
XV	Package Design
XVI	Economics of Packaging
XVII	Applied Packaging

SECTION I [illegible]

1 HISTORICAL BACKGROUND TO PACKAGING

2 DEFINITIONS OF PACKAGING AND PACKING

3 INFLUENCE OF, AND RELATION TO, OTHER OPERATIONS between the design of a product and its delivery to the customer.

4 PACKAGING AS PART OF THE PRODUCTION PROCESS. The influence of packaging considerations on all operations from the initial design or formulation of the product to its use.

Too often the packaging process (including the creation of new types of packaging) is regarded as being a separate problem. The fact that it should be integrated into every process that takes place within the company concerned is neglected.

When considering alterations to types of existing packaging and/or the development of new types, every aspect of the production process must be considered so that the packaging is fully adapted to the needs of this process.

Only by studying the production process as a whole and reviewing critically such aspects as routing and layout, workflow and labour methods and comparing the information thus obtained with the other desiderata of the packaging, will the total project result in providing the data necessary to make a simplification of the production process, an alteration in the product, a simplification of the package and of the packaging, or even in different types of material to be used.

5 PRINCIPLES OF PACKAGING

Enclosure, compatibility, retention, restraint, separation, cushion, clearance, support, position, non-abrasion, weight distribution, suspension, visible product, closure, instructions.

SECTION II THE NECESSITY FOR PACKAGING

1 THE ASSESSMENT AND CHARACTERISTICS OF COMMODITIES (PRODUCTS)

a Physical properties

Physical state; weight; relation between centre of gravity and centre of symmetry; surface finish; fragility; rigidity, etc., i.e. consideration of the product from the point of view of answering the question: "How can this product be damaged mechanically?"

b Chemical properties

Susceptibility to water, water vapour, gases, and odours, i.e. consideration of the product from the point of view of answering the question: "How can this product be damaged by or deteriorate through climatic influences?" With certain products, e.g. food, the mechanism by which deterioration takes place is also of importance. Additionally, the mechanism by which corrosion of metals occurs and its relation to moisture vapour and oxidation should be understood.

Compatibility of the package and its contents. Possible interaction of products with packaging materials, e.g. milk with plastics films and coatings; effect of oils on polyethylene, effect of alkaline creams on collapsible tubes of aluminium; stability of can linings with different foods; suitability of aluminium cans for fish products; migration of plasticizers from plastics into products.

2 THE HAZARDS OF DISTRIBUTION

a Mechanical hazards

Loading and unloading hazards
Hazards of movement in vehicles
Hazards of warehousing

These three main groups should be considered from the point of view of road, rail, sea and river, and air transport.

b Climatic hazards

Exposure to liquid water (rain, sea spray, condensation)
Exposure to humidities likely to cause deterioration
Effects of temperature and temperature changes

c The influence of the method of transport

(whether it be direct or indirect) on the hazards of distribution)
The influence of distribution methods, warehousing techniques, size, weight and shape of packages on handling and movement.

d Methods of assessing journey hazards

By visual and camera observation
By use of shock recording and other instruments

3 MARKETING, MERCHANDISING AND ECONOMIC FACTORS

a The package and the image

The marketing concept - company, brand and product images. The aims of packaging to convey image to consumers of such design that successful projection of a favourable company and product image is made. Criteria for imagery in package development. How the image of an existing product may be altered by packaging changes.

b Packaging and the self-service store

Modern methods of retailing - self-service, rack merchandising, the Supermarket.

c The package and advertising

Products are often identified by advertising and in turn packages advertise the product in the self-service situation. Integration of the advertised product image and the image projected by the pack is essential for success. Consideration of package designs and functional features useful in advertising; colour; shape, etc. Adaptability of packages to advertising media; papers, magazines, radio, T.V. The relation between advertising agent and client. The organisation of an agency.

d The package and the product

Every pack carries and protects the product to some extent, but they become part of what the consumer is purchasing when they dispense, measure, mix or provide other means of product usage. Case histories showing the value of such convenience packaging in [illegible].

e The package and the price of the product

Packaging reflects pricing but cannot alone determine it. Factors in pricing which packaging can influence and the pricing objectives which can be achieved with the aid of suitable packaging. Promotional methods including special offers, coupons, bonuses, premiums.

f Estimating the sales impact of the package.

Value of early testing for consumer preferenceoof possible packages for a given product in preventing mistakes and keeping development costs to a minimum. Need forplanning such consumer tests to obtain valid conclusions.

Discussion of techniques - consumer interviews, demonstrations, home use tests, use of questionnaires. Colour preferences, pack shape, visibility.

Laboratory research on sales impact. Methods of testing packs - identification at a distance, at an angle, the tachisthoscope, eye movement cameras, tests for apparent size, readability, reflectance, design strength, dominance and recall.

SECTION III [illegible] OF UNIT

1. AGAINST MECHANICAL DAMAGE

a. Prevention of shock damage to packaged articles

By distribution of the forces involved
By localisation of shock to specific points
By absorption of shock by cushioning materials

What is 'shock'?

Discussion of deceleration and gravitational forces. Consideration of a package model from the aspect of the energy involved in drops - stopping distance; - impact load, fragility or G-factor - cushion factor. Concept of shock as a complex of deceleration and impulse time.

b. Prevention of vibration damage

c. The origin and prevention of damage caused by compressive forces.

d. Reduction of damage from puncturing and other mechanical hazards

2. AGAINST CLIMATIC DAMAGE

a. Protection against temperature and temperature changes
Typical effects on temperature sensitive products and the remedies, (products such as chocolate, fish, meat, fruit, vegetables, frozen foods, emulsion paints, etc.)

b. Protection against liquid water

Rain, sea spray, condensation

c. Protection against humidity effects

What is water vapour? Definitions of relative and absolute humidity. Effect of temperature changes on humidity. Concept of equilibrium between atmosphere and water-absorbing products.

Changes brought about by moisture: hardening; loss of crispness; crystallisation; formation of hydrates; microbiological changes; chemical and enzymatic reactions. Factors affecting life of packaged goods: products; size / volume of package; atmospheric conditions; resistance of package; etc.

Prevention of corrosion. Effects of corrosion on product as well as package. Importance of cleanliness in packed metal components; cleaning methods; protection of cleaned surfaces; use of desiccants; factors affecting choice of desiccant; calculation of the quantity required for specific examples. Use of water and water vapour barriers; contact and vapour corrosion inhibitors. Rot proof of fabrics.

d. Simple theory of water vapour, gas, and odour permeation through materials

Fick's law of diffusion. Methods of measuring permeability. Pressure change techniques; measurement of pressure rise or fall at atmospheric conditions or by high vacuum methods.

Volume change techniques; measurement of changes in concentration; use of volumetric and gas-chromatographic methods. Consideration of variable factors affecting permeability. Variables of the film-thickness and area exposed.

Factors affecting the diffusion rate and the solubility, e.g. pressure; temperature; nature of film; and nature of the diffusing gas or vapour.

Permeability of coated and laminated materials.

Difference between water vapour, permanent gases and odours as diffusing substances.

e. Protection against light and direct solar radiation

3. AGAINST DAMAGE OR LOSS FROM OTHER ENVIRONMENTAL INFLUENCES

a. Oils and greases

b. Chemical substances

NOTE:
The questions of compatibility between product and packaging material should be discussed here.
(See Section II (i) b.)

c. Odour and flavour changes in foods and cosmetics
Types of odours. Methods of reducing or eliminating odour contamination. Estimation of odours: fatigue; minimum concentration methods. Estimation of flavour contamination. Use of gas chromatography in control of materials.

d. General principles of protection against mould growth and insect attack

Bacteria and fungi: what are they? The conditions necessary for growth. Methods of preventing deterioration by moulds and bacteria.

Insect infestation as typified by moths and beetles. General outline of the life cycle of these two types of insects. Methods of preventing damage. Termites.

Control by fungicides or insecticides: materials used; concentrations; appropriate Food Regulations.

A study of the biological deterioration of selected important packaged materials. Efficiency of various packaging methods, e.g. vacuum packaging of cured meats; fungitoxic vapour phase inhibitors; fungicide-impregnated plastics wrappings; nitrogen pre-packaging of cheese.

Methods of sterilisation.

e. Rodents

Brief description and methods of preventing damage by rats and mice. Importance of good housekeeping in preventing rodent attack.

f. Pilferage

g. Static electricity

h. Development of packages for radioactive materials

i. Effect of ionising radiations on packaging materials

(e.g. metals, polymers and glass); foodstuffs; storage pests and micro-organisms.

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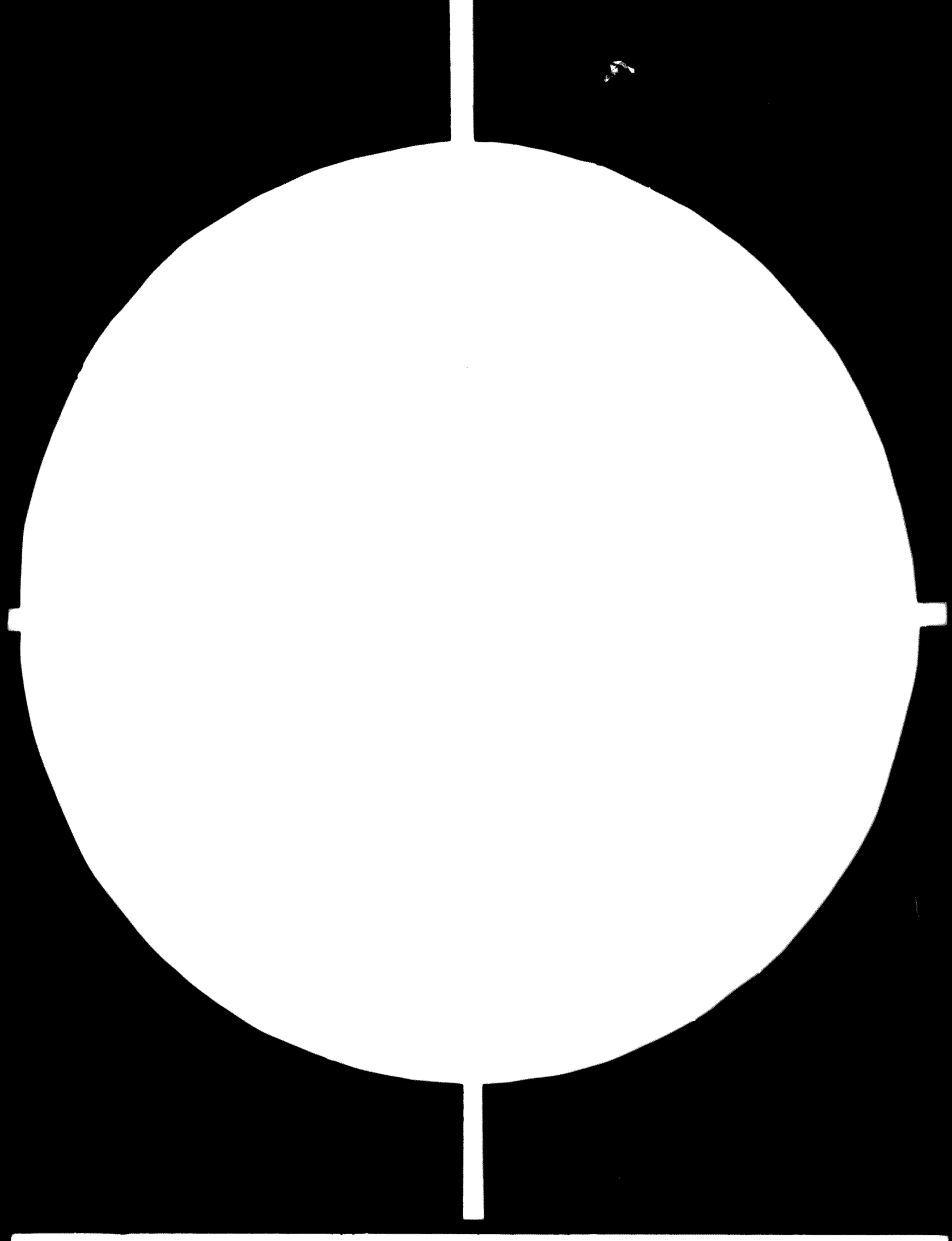


SECTION IV PACKAGING MATERIALS

1. WOOD

   a. General science of timber
   Cell structure etc. Types of timber suitable for packing cases and crates, etc. Protective treatments.

   b. Saw mill methods
   Sizes of timbers. Making of plywood. Making of particle board.

2. PULP, PAPER, PAPERBOARD AND HARDBOARDS

   a. Paper and board making materials

      (i) Fibrous: wood, straw, esparto, bamboo, bagasse, rags, cotton linters, waste paper, etc.

      (ii) Non-fibrous: the importance and use of materials for loading, coating, sizing, colouring, etc.

   b. Pulping processes

      Production of mechanical, chemical and semi-chemical pulps. Special processes, e.g. chemi-mechanical methods.

   c. Stock preparation
   The beating process, refining.

   d. Paper and board making machines
   Fourdrinier machines. Cylinder machines. Inverform machines.

   e. Manufacture of specific products
   e.g. sack kraft paper, liner board and fluting medium for corrugated boards, vegetable parchment and greaseproof papers, folding boxboards, hardboard.

   f. Finishing processes
   e.g. calendering, glazing, slitting.

   g. Mineral coating
   On and off machine processes.

   h. Processes of impregnation, coating and laminating
   To give resistance to water, water vapour, gases, greases and oils.

3. PLASTICS, RUBBERS AND OTHER POLYMERS

The chemical nature, methods of manufacture, physical and chemical properties and the ways in which those properties may be varied for specific uses of: regenerated cellulose fil,; cellulose esters and ethers, rubber and synthetic rubbers; rubber hydrochloride; polyvinyl-chloride, -acetate, -alcohol, and co-polymers; polythene and polypropylene; polystyrene; polyamides and polyesters (Nylon and Terylene in particular); poly-carbonates and poly-acetals; and fluoro carbon polymers (Teflon, Kel-F, etc.)

Where several forms of the material (e.g. moulding powders, film, sheet and expanded foams) exist each should be studied in relation to its actual and potential packaging applications. The use of plasticizers, fillers, stabilizers and similar adjuncts to vary the properties of materials and the methods by which they are incorporated also require study.

The principal properties concerned will include permeability to gases, vapours, odours and water - strength properties, heat resistance, sealing qualities - resistance to oil, abrasion and solvents - printability and electro static tendencies.

4. GLASS

The nature of glass - selection and mixing of raw material for clear and coloured glasses. Description of the processes of manufacture and the manner in which the properties of glass are dependent on its constituents.

5. METALS

The metals normally concerned in packaging are aluminium and its alloys; steel (principally black plate); tin plate, terne plate; tin-lead alloys and similar alloys. Each should be studied sufficiently from the manufacturing aspects to give an appreciation of the problems of container and packaging material production and use.

Surface preparation of metals: Principles of electro deposition. Industrial plating practice: metallic coating processes, e.g. tining, dipping, spraying and phosphating of steel. Anodising of aluminium. Corrosion-resistant paints, lacquers and other organic coatings.

Corrosion: rate and intensity; effect of corrosion product. Aqueous corrosion. Effects of impurities in water, aeration, salts and pH. Corrosion currents; polarisation; inhibitors. Passivity; Cathodic Protection.

Atmospheric corrosion: effects of pollution and bacterial attack. Stress corrosion. Factors affecting the oxidation of materials. Corrosion testing, applications and limitations.

6. WAXES

Properties and manufacture of natural, petroleum, mineral and synthetic waxes. Blending with other materials. Wax emulsions.

7. BITUMASTIC MATERIALS

Origin and nature of bitumastic material. Types used in packaging in case lining felts, (roofing felts) and water resistant papers, etc.

8. TEXTILES (See Section V (ii) e and f).

9. CERAMICS
Purification of raw materials. Throwing; moulding; extrusion pressing and turning. Drying and firing. Stoneware for chemicals, etc.

SECTION V TYPES OF PACKAGING

NOTE: A knowledge is required of: trade terminology; the basic properties of the materials of construction in so far as they affect the behaviour of the finished package; methods of production; styles of container; printing and/or decorating methods; methods of assembly; types of closure and methods of closing; illustrations of use; and probable developments.

1 UNIT PACKAGING

a Metal cans and composite containers

Metal cans: basic types, function and limitations: seamless body, locking corner and built-up body. Shape, basic cost factors. Methods of measuring. Basic closures: friction fit or screw thread engagement; mechanical interlocking; plastics closures; differential (atmosphere) pressure closures. Joints: side seam; body joint; and joint treatments. Tin-box decoration. Colour and colour matching; proofs; register problems. Decoration of rigid tubes.

Can performance: resistance to products, climatic and physical stresses with reference to tests (shelf life, static load and handling tests). Relation between product and can specifications. Properties of easy opening devices, reclosures and requirements for shipping containers for cans.

Composite containers: spiral; straight wound; and sleeve types. Body materials: chipboard; kraft paper. Lining and barrier materials: vegetable parchment; wax laminates; aluminium foil; polythene coated paper; polythene coated aluminium foil; glassine; silicone release papers; VCI coated papers; etc. Types of closure. Cost factors, materials and construction, labelling. Measurement of composite containers. Strength and handling resistance compared with metal cans. Test methods specific to composite containers.

b Glass containers (bottles, jars, ampoules and carboys)

Making glass containers: mixing and melting the raw materials; feeding to the forming machine; forming the container by fully automatic processes; blow and blow system (gravity or suction fed) press and blow system; annealing; semi-automatic forming and hand forming. Tabular containers (ampoules and vials). Quality control, sampling methods and tests. Functional and aesthetic design considerations. Specifications and terminology.

Methods of shipping glass containers: More than any other package type glass is in partnership with its outer case where breakage resistance is concerned. Methods of packing empty and filled glass containers and the principles of obtaining good performance at economic cost. Handling resistance tests and criteria of performance.

c Moulded plastics containers

Moulded thermoplastics containers: blow moulding; injection and extrusion blowing. Injection moulding; thermoforming; vacuum, pressure and matched mould forming. Types and styles of containers: blow moulded, injection moulded and thermoformed bottles, jars, trays, boxes, etc. Closures; screw caps; plug fittings; covers; etc. Materials available for each style and type of container, and the advantages and drawbacks of each.

d Collapsible tubes (metal and plastics)

General description. Limitations on dimensions and materials of fabrication. Production methods: mechanical fabrication and treatment of tube surface (inside and exterior). Types and styles of container and nozzle. Methods of assembly. Types of closure. Packing and handling during transit, before filling and in use.

e Pressurized (or aerosol) containers

Types: surface sprays; space sprays; foams. Components: caps; valves; container body; propellant. Fillings: cold filling; pressure filling. Leak testing; buttoning; spray testing; capping; labelling and packing.

f Folding and rigid paperboard boxes and cartons

Rigid paperboardboxes. Boards used. Cutting blanks; corner cutting and st. ing; paper slotting; box covering; lid/tray boxes. Flanged and envelop wrapped work; hand made boxes; wire stitched boxes. Problems of shrinkage and expansion of boards; curl of paper covers; bowing of boxes; tearing of cover papers. Disadvantages and superiority of rigid boxes in relation to folding boxboard cartons.

Folding boxboard cartons. Preparation of finished art work and drawings. Types of board used and properties required for printing (letterpress, litho, gravure, and flexography) and cutting and creasing (planten press or rotary). Special boards, e.g. cast coated, polythene coated, foil lined, etc. Outline of typical sheet and reel fed presses for printing board, and presses for cutting and creasing. In-line carton production from the reel and separate printing followed by cutting and creasing (considered from the technical and economic aspects). Finishing processes: stripping; gluing (straight line and right angle); windowing; waxing; varnishing; application of heat seal coatings; etc. Styles of carton: glue end; tuck end; hinged lid boxes; semirigid boxes, curved creases; etc. Methods of measurement. Uses for the common carton styles. Methods of testing and quality control. Behaviour of carton board during and after creasing; resistance of creases to folding; effect of storage on crease stiffness and the influence of this on cartoning machines. Variations in carton size during manufacture; relation between board properties and crease behaviour. Cartoning systems and machines for erecting, filling and closing.

g Moulded pulp containers

Methods of manufacture, pressure injection moulding and suction moulding. Choice of process and examples of use. Production of egg trays, unit boxes for eggs, trays for meat and fruit. Use of moulded pulp fitments and packs for shock reduction, with examples. Methods of checking quality, test procedures.

h Flexible packaging

(Papers, paperboards, films, foils and laminates used for wrappers, bags, envelopes, pouches, sachets, trays, bubble packs, blister packs, etc.)

Packages from flexible materials:
Wrappings: styles of wrapping; hand wrapping; assisted hand wrapping; mechanical wrapping.
Bags: styles - satchel; rose bottom; block bottom; self opening satchel; etc. Methods of making and printing bags. Envelopes, pouches and sachets. Materials used and their uses for making packages: paper based; films of cellulose and cellulose acetate; rubber hydrochloride; PVC; polystyrene; polythene; pvdc; nylon; polyesters. Water soluble films for wrapping.

Aluminium foil. Decoration of foil; foil thickness; pinholes and their relation to the rolling process in productions. Foil as a barrier importance of sealing foil packages. Coatings and laminates for foil; selection of foil for protection. Use of foil as an insect varrier in food packs. Strip packaging. Forming and filling methods for packaging with flexible materials. ranswrap type met od. Flowpack type methods horizontal and vertical operation of satchel machines. Thermoforming methods; card packaging; bubble; blister; skin and stretch packing methods. Proolems of print registration; overprinting of weight orprice; methods of arranging easy opening for the customer; vacuum packing and gas flushing; etc.

2 TRANSPORT PACKAGING

a Wooden containers

Timber and plywood cases and crates. Basic types: crate; flush sided case; battened cases; skid-based case. Developments from the basic types -

(a) flush side developments: (i) battened ends only; (ii) framed and panelled ends; (iii) metal edged plywood and collapsible plywood cases; (iv) wire bound wood boxes; and (v) frame end fibreboard cases.

(b) battened case developments: (i) fork lift battened cases; (ii) battened plywood cases; (iii) plywood composite cases.

(c) skid based developments: (i) interior framed (sheathed) wood case; and (ii) interior framed plywood cases (both fitted with skids or sills).

Methods of lining cases for water proofness: metal linings; roofing felts; impregnated papers; etc.
Closing methods: nails; screws; bolts; etc.
Returnable and collapsible cases. Principles of economy in timber and construction methods, and in dimensions.

Wooden containers for fruit and vegetables: tomato trays; apple boxes; citrus boxes; packs for brassicas; fruit punnets; etc. Methods of packing fruit and vegetables in wooden packages. National and international standards and specifications in Europe.
Relation of outer dimensions to pallet and vehicle dimensions. Work of the Inland Transport Committee in Geneva. International pallet sizes.
Wooden casks and plywood kegs: wet and dry cooperage. Methods of making wet and dry casks and plywood drums. Types and styles according to use: wine casks; spirit casks; beer casks; dry casks; plywood kegs with unsealed or sealed vertical joints. Methods of closing.

b <u>Steel and aluminium drums, pails and trays</u>

Raw materials: steel, hot and cold rolling; black iron; stainless steel; coated steels; tin; lead and zinc coatings; aluminium and alloys with magnesium. Manufacturing processes: drum types and standardisation; closures; protective and decorative finishes; painting; decorating and internal linings.

c <u>Fibre drums</u>

Methods of side wall construction; spiral and straight (convolute) winding; drum ends and lids. Types of drum: all fibre drums; flush ends or sides; plug lids or pill box lids; recessed ends; drums with metal case and lids. Closures for full open top drums.
Use of fibre drums; use of barrier linings both in the construction of the drum and as loose liners. Packaging of semi-liquids. Specifications and testing.

d <u>Solid and corrugated fibreboard containers</u>

Materials. Types and constructions for solid boards and corrugated boards. Materials for facings; liners and fluting medium. Manufacture: solid board, operation of the paster. Corrugated board. The single facer, the double backer. Creasing, slotting and delivery ready for the printer/slotter. Making double wall and tri-wall boards.

Case construction; printer slotter; fibre presses; gluers, stitchers and tapers; division cutting; slitter/creasers. Closures; gluing; taping; stitching; stapling.
Uses of fibreboard packages - when to select solid or corrugated material. Methods of testing, assessment and quality control. Effect of manufacturing processes on the performance of cases. Study of the creasing methods and their influence on the compression strength of cases. Effects of damage by crushing of flutes or deformation at creases due to string tying, etc. Influence of water resisting treatments on compression strength. The International Code for specifying styles, etc.

e Sacks (jute, cotton, linen, paper and plastics)

Textile sacks. Introduction - use of jute, hemp and flax. Nomenclature; hessians, tarpaulins, baggings and twilled sackings, and methods of specifying. Finishing treatments; mechanical and chemical. Making sacks and bags, methods of seaming. Standardisation and the Indian Standards Institution's specification. Uses of typical Calcutta standard sacks and bags. Lined sacks and bags. Selection of correct size/type of sack. Methods of closing.

Multi-wall paper sacks and baler bags. Manufacture: the operation of the tuber, Styles of sack: sewn open mouth sacks; valve sacks. Handling of sacks in filling and use, and reasons for failure. Laboratory and field assessment of paper and sack construction. Present and future uses for paper sacks. Baler bags: original use and present trends. Influence of manufacturing and material variables on production and performance of paper sacks, e.g., paper moisture content; tear; fold; rigidity and tensile strength; sack dimensions; construction and type.

Sacks made in plastics film. Historical background. Development of fertilizer packs in PVC and polythene. Comparisons of polythene and PVC. Use of plastics sacks for other products. Methods of manufacture and printing. Storage of empty sacks. Closing and sealing methods. Problems with valved sacks.

f Bales and baling

Definitions; bale; truss. Sequence of operations in making a bale. Coverings. Forming. Compression. Strapping and marking. Typical examples and specifications for covering material and strapping.

3 MISCELLANEOUS

Plastics foams. Earthenware and stoneware containers. Wire and plastic crates.
Use of pallets as shipping containers. Portable silos, tanks and containers for bulk quantities.

SECTION VI ACCESSORIES FOR PACKAGING

1 CUSHIONING SYSTEMS

a Space fillers

Cork; kieselguhr and vermiculite; cellulose wadding; single faced corrugated board; moulded pulp; and shredded paper.

b Resilient materials

Pressed and needle loom felts; rubberized hair; expanded rubbers; expanded polystyrene; poly-urethane foams; wood wool; expanded polythene; sponge and latex foam rubbers; bonded hair and vegetable fibres; rubber shock mounts; linear, leaf, bending and sinuous springs and metal shock mounts.

c Non-resilient systems

Breaking structures; rigid foams; paper honeycomb; expanded polystyrene.

Each material should be studied with reference not only to its cushioning properties but also in respect of such factors as; hygroscopicity; water absorption; possible corrosive effects; resistance to mould attack; lack of dusting; and the temperature range over which it is usable.

Methods of measuring the properties of cushioning materials: use of data in selecting the appropriate material; area; and thickness.

2 REINFORCEMENT METHODS

Materials used: steel wires and straps; rayon; nylon; and poly-propylene. Steel strapping: strength and elongation; considerations in selecting the type, width and thickness of material for any purpose. Hand tools for applying straps. Power strapping tools and machines. . Non-metallic strapping: elongation and elastic recovery; transmission of tension; package conformation; moisture resistance. Types of tool for non-metallic straps. Closures by stapling.

3 ADHESIVES and the principles of adhesion

a Definitions

Adhesive; adherend; setting time; viscosity; tack; mechanical adhesion; specific adhesion

b Mechanism of adhesive bonding

c Factors affecting the strength of bonds.
Reinhart's theory of adhesion.

d Types of adhesives
Aqueous; solvent based; emulsion based; pressure sensitive; heat sensitive; hot melt.
Classification of adhesives: animal; mineral; vegetable; synthetic.

e Adhesives applications
In package making, closing and other operations.

4 PAPER, PLASTICS AND FIBRE SEALING TAPES

Clued (gummed) tapes and self-adhesive (Pressure sensitive) tapes. Gummed tapes: uses, base papers and adhesive coatings. Uses for parcels, cases, etc. General principles for applying. Pressure sensitive tapes: uses and base materials. Cellulose film; cellulose acetate film; PVC; fabrics; moisture resistant papers; reinforced tapes. Availability and best conditions for storage, general economy and principle of efficient application.

5 SEALS, CAPS AND OTHER OPENING AND CLOSING DEVICES

Functions of properly married closure and container finish in bottle, jar, etc. General requirements for a good seal. Mechanics of a good seal: the importance of thread engagement and thread pitch. Applying the correct cap tightening torque. Vacuity or ullage. Closures for: normal seals; vacuum tight seals; pressure seals; and venting seals. Manufacture of closures: metal caps; moulded thermosetting plastics caps; moulded thermo-plastics caps. Choice of material for caps, liners, and wads, and facing materials.

The uses and qualities of continuous thread, lug, crown, press-on and other common cap closures. Functional advantages and limitations of steel, aluminium and plastics closures. Properties of liners, gaskets and linerless caps. Heat, corrosion and product resistance.

SECTION VII PACKAGING AND PRODUCTION PROCESSES OF PACKED GOODS

1 PACKAGING – THE INEVITABLE ELEMENT OF PRODUCTION PROCESSES

Why packaging should be considered as an element of the production process and how it influences its organisation and the goods produced.

2 MECHANISATION OF PACKING PROCESS

a General principles

Packing operations. Technical and economic results of mechanising the packing process.

b Packing processes

Classification of packing processes and machinery for the various operations involved in packing liquid, semi-liquid, granular, powdered and solid products.

Preparation of packages for packing operations, with reference to the appropriate machinery.

Elementary principles of layout and use of weighing, filling, closing and wrapping machines with reference to specific containers such as bottles, cans, folding cartons, bags, sacks and cases.

c Filling and loading operations and appropriate machinery

d Fastening the contents inside the package

Wedging, partitioning, blocking, suspending, padding and similar methods.

e Types of closing equipment

f Labelling operations

Machines and materials.

g Organisation of packing lines

Equipment for the user's packing room.

3 PACKAGING ENGINEERING

Engineering drawing principles and standard drawing practices

(sufficient to understand and be able to read machine drawings) Applications of kinematics and dynamics of rigid and of connected bodies to packaging machinery. Forces and moments in networks. Cams, friction drives, gears. Simple theory of bending and torsion. Principles of press operation: cutting; bending; forming; drawing; and extrusion.

Design principles of engineering elements used in packaging and similar machinery. Static and dynamic unbalance. Simple vibration theory. Experimental measurement of stress and deformation.

Casting, calendering, coating, impregnation, laminating, compressing machines. Critical review of typical packaging machines for forming, filling and closing operations.

SECTION VIII MATERIALS HANDLING, MOVEMENT AND STORAGE

(NOTE: The main emphasis is on in-plant operations)

1 PRINCIPLES

Efficient use of available space. Straight line continuous flow. Reduction to the minimum of the operations of picking up and putting down. Advantage of standardising equipment.

2 MATERIALS AND MOVEMENT

Properties of materials affecting handling. Classes of materials: bulk or unit load. Types of movement: continuous or intermittent.

3 ANALYSIS OF MATERIALS HANDLING PROBLEMS

Determining objective and scope. Collecting data. Use flow process charts in determining method of handling. Costing. Presentation to management.

4 Methods and equipment

Palletization; containerization; unit loads.

5 Losses caused by wrong materials handling

6 Influence of mechanical handling methods on the construction of packages and the choice of packaging materials

Problems associated with receiving packaging materials or containers. Condition on arrival. Are quantities and types of container suited to available handling method? Is packaging adequate but not too great? Re-use; salvage; return or disposal of packing material.

Problems associated with the movement of containers or packaging materials through the production process.

Problems associated with the warehousing, storage and dispatch of filled packages.

7 SELECTION OF EQUIPMENT

Conveyors, hoists, cranes and other lifting gear. Fork trucks and pallets. Definitions: pallet; skid. Types of pallet: wooden, metal; fibreboard; returnable and expendable. Standard sizes. European Packaging Federation Modular System. Factors requiring consideration before adoption of pallet systems. Cost, space, floor loading and ceiling heights. Types of truck.

SECTION IX PACKAGE TESTING AND DEVELOPMENT

1 THE PURPOSE OF TESTS

To predict package performance. To obtain information on the properties of a package. To modify and improve packages in which weaknesses are found. To reduce costs.

2 GENERAL METHODS OF TESTING COMPLETE TRANSPORT PACKAGES

a Investigational or research testing

b Comparative testing

c Assessment or evaluation testing

3 EQUIPMENT FOR AND METHODS OF TESTING PACKAGES, CONTAINERS AND MATERIALS

a Field trials and laboratory tests

For the evaluation of package performance. Use of drop; impact; vibration; compression; stacking; and revolving drum tests.

b Climatic testing:

Water vapour permeability tests. Shelf-life estimation. Use of conditioned rooms and cabinets. Shower tests. Measurement of moisture resistance: methods used; dependence on type of product. Accelerated testing: weight gain/loss; performance tests; half-value period methods.

c Materials tests

Use of standard equipment and methods for testing metal; glass; paper and paperboard; plastics; and adhesives.

Metals: Surface smoothness - Talysurf and other methods; plastic and elastic deformation of metals; macrohardness tests - Vickers, Brinell and Rockwell; Microhardness - Vickers, Knoop, scratch tests; fracture; Creep and fatigue (where relevant to packaging).

Glass: Viscosity; thermal expansion; detection and measurement of strains in glass; electrical properties; refractive index.

Paper and board: Substance (count); caliper; moisture content; burst, tear and tensile strength. Folding and stiffness; Cobb sizing value; oil absorbency (SOAT); pH; chloride and sulphate content. Free sulphur content; printability tests; the IGT tester; board creasing properties, etc.

Plastics:

(a) dimensional: density; bulk density; apparent powder density

(b) thermal: thermal conductivity; coefficient of linear expansion; specific heat; softening point; heat distortion temperature; mould shrinkage; heat sealing.

(c) mechanical: tensile (ultimate tensile strength and yield strength); stress-strain diagrams; flexural and impact strength; tear; hardness; frictional properties; curling.

(d) optical gloss; haze; light transmission; "see-through" clarity; refractive index.

(e) permeability tests: odours; gases; vapours

(f) cup - flow and melt - flow index: environmental stress cracking

(g) identification of plastics: flame, odour and simple chemical tests

Adhesives: The more important measurements, to include at least the following: setting time; viscosity; tack; flexibility; water - resistance; pH; solids content. Performance testing in specific applications, e.g. viscosity requirements for side - seam and bottom adhesives for paper sacks.

4 PACKAGE DEVELOPMENT

a Objectives

Types of development project: cost reduction; new products packaging; package improvement; redesign to improve packing speed, increase sales, or for other reasons.

b Product characteristics and other considerations

Distribution factors and hazards. Limitations of the exercise in terms of cost, i.e. machinery changes, line speeds, tools, etc.

c Designing the prototype

The function of design, graphic and structural. The part the package converter and/or materials supplier plays in the exercise. The making and testing of prototypes: modifications for reasons of cost; efficiency of manufacture; strength; or durability. Estimation of packaging costs.

d Consumer or market testing

The choice of testing techniques to discover consumer preferences, strengths and weaknesses in the design, and the behaviour of functional devices.

e Planning the introduction of the new pack

The various steps starting from the estimation of costs through lead times, specifications and requirements for machinery, sample runs, etc. to the full preparation of the packaging line for production.

f Specifications for purchasing packaging supplies

The functions of a purchasing specification. Importance of co-operation between user and supplier in agreeing requirements and means of achieving them. Definitions of the minor, major and critical defects in quality, and development of methods of test and sampling techniques for quality assessment. Importance of setting realistic levels and of building the quality assurance arrangements on facts, not arbitrary standards.

5 SUBJECTS CLOSELY CONNECTED WITH PACKAGE TESTS AND DEVELOPMENT

a Transport hazards and storage conditions

Use of drop recorder, two-and three-way ride recorder, and other instruments for the measurement of journey hazards. Stress analysis and its use in assessing package behaviour in the laboratory and in use. Observational studies of package handling. Relation between journey hazards data and laboratory testing.

b Package test schedules

European test schedules for fruit and vegetable packs -

DEF 1234, MIL - P- 9024 A. Test schedules operated by the various package testing stations in Europe - TAPPI, ASTM, Packaging Institutes of America test schedules.

c Standardization of instruments

d Standardization of methods

e Methods of solving packaging problems by test procedures

SECTION X SPECIFICATIONS AND QUALITY MEASUREMENT FOR CONTROL

1 Defining package performance

Introduction to the critical factors which define package performance from the functional and marketing viewpoints. How to write these into a specification. A summary of the factors which determine the performance of packages on the packing line and their inclusion in the specification.

2 The user/supplier relationship

Effective packaging requires good contacts and understanding at all levels. Once the agreement to work together has been signed the user and the supplier have formed a partnership with the objective of keeping the packing line running. Good contacts on deliveries, procedures, tolerances, over and under deliveries, etc., are essential. Agreement is necessary on quality measurement and sampling as well as action to be taken in the event of disagreement.

3 Definitions

Standard; specification; code of practice; quality specification; performance specification; tolerances. Writing specifications for packaging materials, components, packages and packing procedures.

4 Quality control

Reasons for quality control:increased production;lower costs per unit; improved morale; better quality.

What is inspection and its relation to quality control: choosing the sample for inspection.

Requirements for successful quality control:role of management and its policy; standards of quality inspection methods and tools; records and their use.

Organisation of quality control department: responsibility; staffing; job descriptions.

Introduction to the theory of statistical methods for quality control. Definitions of variables and attributes, critical, major and minor defects. Simple theory of statistics including calculations of mean values, standard deviation and range, and the proper use of control charts. Statistical sampling and acceptance by sampling versus performance. Single, sequential and continuous sampling plans.

5 Use of quality measurement

in the control of production and use of packaging materials and containers. Illustration by particular reference to:

a Metal cans: summary of the methods in use for sampling, testing and acceptance, including raw materials; coatings; linings; and decoration.

b Glass containers: standard tests, tools and defects peculiar to glass packaging. Methods of sampling, testing and acceptance. Quality measurement for glass packaging necessarily involves closures, labels and shipping containers as well.

c Flexible paper, film and foil packages

The quality aspects of wrappers, envelopes, sachets, bags and sacks. Machine performance and its relation to material properties and the uniformity of those properties from reel to reel.

d Paperboard cartons and fibreboard containers

Functional and appearance defects. Summary of the methods in use for sampling, inspection and acceptance.

e Plastics containers

Defects peculiar to plastics packages - injection moulded, thermoformed or blow moulded. Quality aspects of closures, decoration and graphics.

SECTION XI TRANSPORT AND INSURANCE

1 METHODS OF TRANSPORT

Road; rail; sea and inland waters; air

2 TRANSPORT PRACTICES

Car traffic (truck loads)
Small lots traffic (less than car loads)
Mixed loads for various destinations
Proper loading practices; bracing in freight; ship stowage

3 TRANSPORT REGULATIONS

a The regulations of Company and Manufacturers' Associations

b National regulations

Parcel post; Road transport; Railway freight classification; Packaging regulations and conditions of acceptance for merchandise (other than dangerous goods) by goods trains and passenger trains.

List of dangerous goods and conditions of acceptance: the carriage of dangerous goods and explosives in ships; the poisons regulations; and the perishable goods regulations.

c International regulations

International Convention concerning the carriage of goods by rail (C.I.M.). The R.I.D. - Annexe Number 1 to C.I.M. - concerning dangerous goods. International Air Transport Association (I.A.T.A.) regulations relating to the Carriage of Restricted Articles by air. U.S.A. regulations (Interstate Commerce Commission - ICC Regulations; Consolidated Freight Classification etc.) International Bodies (ONU, CEE, BIT, UIC, IRU, BIC, ISO)

d Regulations for special packages

Dangerous commodities are packed and shipped under a

variety of rules administered by several authorities. A survey of these rules and authorities is needed for packages containing products under pressure; narcotics; corrosive chemicals; inflammable materials; poisons; radio-active substances etc., for transport by rail, road, air, sea, and postal services.

4 INSURANCE

a **Practice in export business**

The "bill of lading" receipt of title to goods. Importance of obtaining a "clean" bill of lading instead of one "claused" with the stigma "insufficiently packed". Specifications and special certificates for export quality packages. Inspection of damaged shipments: natural loss of weight, loss and alteration of content, inadequate packaging. Necessity for the consignee to report loss and damage to insurer's claims agent to obtain general or particular average.

b **Loss prevention**

Loss prevention recommendations to shippers and consignees; port and terminal operators; steamship companies; and underwriters; as adopted by the International Union of Marine Insurance.

Recommendations to shipper for adequate packaging(including that of avoiding external marking or advertising if the product is attractive to thieves).

Insurance Company campaign for improvement in packing to prevent loss and reduce "insurance premiums".

"Receiving report" and "Questionnaire" to overseas buyers and consignees to secure information.

Instructions for proper description of packaging and damage to cargo containers found in bad order (Packaging Committee of the port of New York).

Bulletin "Ports of the World" on Foreign port conditions all over the world (The Insurance Companies of North America, Philadelphia).

c Surveys on damaged goods
Origin of damage: typical damage to which various commodities are liable. (See Lloyds Survey Handbook 1956).

SECTION XII RATIONALISATION AND STANDARDISATION

1 Rationalisation in the field of packaging

a pre-requisite of economic success. Principles of rationalisation and their application to packaging. Examples of package rationalisation.

2 Standardisation in the field of packaging

An important goal of package rationalisation. Advantages of standardisation to manufacturers, converters, and users. The problems of standardisation and how they may be solved. What can be standardised? How are things to be standardised? Who is to standardise?

3 The National Standard Authorities

How various countries produce and operate their National Standards. The use of National Standards in packaging.

4 International Standards

The International Standards organisation and its relation to the standards organisations in member countries. The scope of international package standardisation.

SECTION XIII LEGAL REQUIREMENTS

1 ADMINISTRATIVE REQUIREMENTS

a General requirements (including labelling)

on hygienic packaging for foods and beverages-
Products and permitted packaging materials, colouring material, additives. (List and methods of testing)
Special requirements for some products (e.g. baby foods)
National and international attitude and requirements on the use of plastics.
Necessity to unify rules and requirements and international standards.

b Requirements for dangerous contents

concerning safety, packing, transport and storage of: explosives, flammable and toxic products; compressed gases; and petroleum products.

2 REQUIREMENTS CONCERNING CRIMES AGAINST THE PUBLIC GOOD FAITH (in production, distribution and consumption)

Weights and measures regulations. Depending on the product, various requirements as to weight, count and volume are in effect. The review should cover the development of such laws and regulations, the function of the Weights and Measures Office, and the major points of the regulations in relation to packaging.

Falsification of seals or signs to authenticate, certify or identify
Use of false trade-marks
Sale of a non-genuine food as genuine one
Deceptive packaging

3 LEGAL PROTECTION OF PACKAGE DESIGN

(i)Patents and registered designs

Criteria for patentability; How to apply for a patent or register a design. The work of the Patent Agent and the Patent Office. Procedures for patent searches. Infringements.

(ii) National and international patents

(iii) Protection of package shape as a trade-mark

(iv) Unfair competition (by confusion and misuse of marking and identification in packaging).

SECTION XIV MARKING, IDENTIFICATION AND LABELLING

1 IDENTIFICATION

a Purpose and significance of package identification

Packages must state certain facts about their contents and the packager or distributor. The claims made on the package will affect what else must be stated or may not be stated. Examples of mandatory requirements covering contents, ingredients, supplier and product claims.

b Legal and other regulations for indentification

c Methods

2 MARKING FOR SHIPPING

a Purpose of unified markings for shipping containers

b Pictorial markings for the shipment of non-dangerous goods

c Pictorial markings for the shipment of dangerous goods

d Regulations and standards for marking

e Lettering of packages

3 LABELS AND LABELLING

Function of labels. Plain paper labels; pre-gummed paper labels; thermoplastic and pressure sensitive paper lables. Hand application methods. Semi-and fully-automatic labelling. Adhesives requirements for labels. Effects of print and varnish. Ceramic printing on glass. Pressure sensitive tapes for labelling.

SECTION XV PACKAGE DESIGN

1 GRAPHICS

a Display and sales appeal

Design and assessment of display containers. Sudies on graphics and graphic design and evaluation methods. (See also section II 3f.)

b Packaging, marketing and advertising

The position of advertising agencies in the packaging field. The general principles of test marketing. (See also section II 3c).

c The printing processes

in relation to package design. Inks: pigment; vehicle;driers; additives and their functions. Outline of manufacture and properties of: news inks; letterpress and offset litho inks; gravure and flexographic inks.

Principles of contact printing; relief; planographic; intaglio. Half-tone screen printing. Letterpress; flexography; lithography; gravure; silk screen. Ink drying mechanisms: absorption; precipitation; oxidation and evaporation drying.

Originals for reproduction. Line copy; tints; and colour line. Preparation of half-tone copy. Colour work. Measuring and marking copy. Use of proofs and their limitations in the various media.

Factors affecting the choice of printing process. Requirements of the particular medium- paper; board; plastics; metal; etc.
Colour control, matching and standards.

2 FUNCTIONAL DESIGN

The functions of the outer (shipping) container and the inner (retail) units together with their interaction one with another

SECTION XVI ECONOMICS OF PACKAGING

1 PRINCIPLES

General characteristics of packaging as an economic factor in production and distribution of packed commodities.

2 RELATION OF PACKAGE AND PACKAGING MATERIAL COSTS TO THE NATIONAL ECONOMY

3 PLANNING OF PACKAGES AND PACKAGING MATERIAL REQUIREMENTS

The economics of design. All packages are designed either intentionally or by accident and all aspects of design are cost factors. Good planning of the overall design can reduce cost to an optimum value with both the functional and graphic aspects correctly balanced in the package. Methods of organising designs, stating the objective and phasing and including the place of sketches, models, photography and assistance from package material suppliers.

4 PAKAGE RENOVATION

5 PRINCIPLES AND METHODS OF BUYING RETURNABLE PACKAGES

6 PRINCIPLES OF PACKAGING ECONOMY IN VARIOUS MEDIA FOR UNIT CONTAINERS

a <u>Packaging in glass</u>

Use of stock and private moulds. Purchase or rental of packing line machinery. Costs include moulds; containers; cases; closures; labels. Analysis of the economics of basic stock jar (bottle) costs with examples. Comparison of various types of closure. Effect of required speed on packing lines.

b <u>Packaging in metal</u>

For many products metal and glass compete; in others one

of the two is virtually unchallenged. The economic reasons for both types of situation should be analysed, with examples. Costs of cans (steel, aluminium and composites) in terms of materials costs, and the differentials for weight; coatings; decoration versus labels; opening devices; etc. Equipment costs, rental versus purchase, packing line speeds and manning requirements. Illustrated with specific examples wherever possible.

c Packaging in plastics

Plastics containers have successfully challenged glass and metal for some products, principally in some instances because of cost advantages in large and medium sizes. Costs of plastics bottles and jars, starting with resin cost, and including mould costs; conversion; decoration; and closures.

d Packaging in paper, paperboard and other flexible packaging materials

Economics of envelope; pouch; sachet; and bag packages; carton; and card, (bliser, skin) packaging.

Each examined in relation to cost of materials, decoration, conversion and equipment costs in relation to manning requirements of the packing line. Economics of packing machinery purchase versus rental of packaging systems from package suppliers.

e Use of contract packaging

Much packaging is of a promotional nature, aimed at short tern marketing objectives, and it is frequently economic to accomplish such packaging through contract packaging. Comparison of costs for special price packs; coupons; premium packs; etc. Limitations and the advantages in accounting and control of contract packaging.

7 ECONOMICS OF SHIPPING CONTAINERS

Comparison and best utilisation of various types of outer container with examples illustrating the influence of size dimensions and quality of material.

One-way and returnable packages. Packages on loan, invoiced, and packages with their cost included in the price of the product.

Circulation of packages within the enterprise. Ways of accepting packages from the supplier. Storage of packages. Control of packages on loan. After-use and disposal of packaging.

8 PACKAGING COSTS AS PART OF OVERALL PRODUCTION COST
the latter being considered in its widest sense, including transport, marketing and distribution and freight rates. The relation of packaging cost to loss by damage in transport.

9 COSTING METHODS
Costs of materials; labour; overheads. Distribution costs.

10 OPTIMISATION TRENDS AND METHODS IN PACKAGING

11 BUDGETARY CONTROL IN PACKAGING

12 STATISTICAL DATA
Its necessity and importance in relation to materials and package usage.

SECTION XVII APPLIED PACKAGING

1 MODERN METHODS OF PACKAGING SPECIFIC PRODUCTS

For example:

a Food (see A below and page 38)

b Pharmaceuticals (see B, pages 39 and 40)

c Chemicals (see C, pages 40 and 41)

d Engineering equipment, appliances and machinery (see D, pages 41 and 42)

e Hardware

f Glass, china, pottery, ceramics

g Cosmetics and toiletries

NOTE: The packaging of these products should be studied to illustrate the thinking and principles used in the solution of problems, as well as giving some historical development. One outline for each of the first four is given below. Other approaches could be equally successful in illustrating the points required.

Studies should also be made of such subjects as:

h Packaging for the retail clothing trade

i Packaging for the mail order business

j Packaging for the Defence Services

A Packaging of food

1 The product

Principles of food processing and storage, including heat treatments (sterilisation and pasteurisation); radiation; chemical preservation and anti-biotics; dehydration; low temperature; chilling and quick freezing. Examples of these as applied to fish; fruit and vegetables; meat; poultry; eggs;

milk and milk products; fruit juice and alcoholic beverages. Flour and sugar confectionery.

Principles of canning and bottling processes.

Public Health Standards and other legal controls relating to the preservation and handling of food.

Spoilage mechanisms: Spoilage organism; the product of spoilage; food poisoning. The biochemistry of oxidative and non-oxidative deterioration. Examples.
Equilibrium moisture content/relative humidity relations.
Physical changes such as hardening caused by drying out and loss of crispness due to moisture gain.
Physico -chemical changes such as crystallisation or the formation of hydrates. Auto-oxidation, and browning reactions. Enzymatic changes.

Interaction between container and contents.

2 The packaging materials and containers

Importance of such factors as: water and water vapour permeability; gas and odour transmission rates; compatibility with the product, particularly in respect of odours or toxic components; light transmission;susceptibility to insect attack or mould growth; and printability or other possibility of decoration.

3 The packing operations

Machinery considerations:- machinery already available; for purchase or hire; on contract. Production speeds required. Personnel needed for operations. Costs.

4 The marketing factors

Market locations, including the type of market as well as the climate, etc, Methods of distribution from production units outlets. Hazards of transport and handling. Expected'turnover' or shelf life required.

Net weight and shape of the pack in terms of customer convenience.
Other convenience aspects, such as opening and closing;ease of dispensing; use as a storage container; possible after-use and disposal.
Presentation: 'ability to sell what it protects'
Display and printing (decorative) aspects.

Each of the four aspects should be illustrated by examples from actual packaging histories.

B Packaging of pharmaceuticals

1 The products

An introduction to the major types of product according to their preparation.

a Liquid

(i) Preparations made without maceration or percolation: queous preparations; solutions; syrups; suspensions; and lotions. Non-aqueous preparations: alcoholic; ethereal; glycerin; and oleaginous solutions. Parenteral preparations; ampoules; injections.

(ii) Preparations made with maceration or percolation. Aqueous: infusions and decorations. Non-aqueous: tinctures.

b Solid and semi-solid

(i) Preparations made without maceration or percolation. Medicated and non-medicated applications: ointments; pastes; creams; dressings; and plasters. Powders. Capsules; pills; tablets; pellets; etc.

(ii) Preparations made with maceration or percolation. Extracts and resins.

Spoilage mechanisms: oxidation of such materials as fixed oils; fats; and phenolics (e.g. adrenaline). Hydrolysis of such materials as esters (procaine and atropine). Racemisation, e.g. conversion of l-adrenaline to d-f adrenaline. Effect of light: reduction of silver, mercury and gold salts. Enzyme action: hydrolysis of digitalis glycosides. Microbial action: destruction of penicillin by lactamase producing organisms. Physico -chemical reactions: efflorescence; hygroscopicity; changes of consistency and flow properties in creams and lotions. Absorption or absorption causing reduction in potency. Effects of ionising radiations (X-radiation) on drugs such as heparin, loss of volatiles.

2 Adverse influences, and the manner in which the packaging must be selected to prevent their effect: moisture; heat; light; oxygen; micro-organisms; package compatibility. The importance of the closure (and reclosure in many instances).

3 A review of the requirements for particular packs used in pharmaceuticals.

Glass; plastics; flexible materials; metal containers; pressurised containers. Marking and identification. Testing pharmaceutical packs. Dispensing methods.

C Packaging of chemicals

1 The products

Classification of chemicals according to both physical form and whether they are hazardous or not.

Solids: blocks or lumps; granules, crystals, flakes; powders.
Liquids: freeflowing or viscous. Pastes: stiff or thin.
Gases: permanent, liquified or dissolved.

2 Basic requirements of a pack for chemical products

Safety-security: reduction of hazard; prevention of losses.
Customer convenience: size; weight; closure
Cleanliness
Shelf-life
Cost in relation to value of product
Ease of filling, marking and storage
Re-use value, particularly overseas
Availability
Compatibility of product and container

Statutory regulations for transport by road, rail, sea and river, and air freight.

3 Review of typical packages and packing methods illustrating the usage of the main types of container

Wooden casks and kegs
Metal containers: drums in steel; aluminium alloys; pure aluminium; and other metals
Fibre drums
Jute, paper and plastics sacks
Glass carboys

Semi rigid and collapsible containers utilising plastics sheet, etc.

Intermediate bulk containers

One way versus returnable containers. Bulk transport versus packaged loads.

4 Trends in the marketing of chemicals (including retail)

Use of batch sized containers; influence of materials; handling developments; conveyors; etc.

Retailing of fertilisers; insecticides etc. Use of pressurized containers for sprays, foams, etc.

D Packaging of engineering equipment, appliances and machinery

1 The products

a Production machinery: including textile machinery; printing machinery; machine tools; generators; paper machines; etc.

b Household and office equipment and machines:including domestic central heating plant; air conditioners; washing machines; sewing and knitting machines; refrigerators; cookers; typewriters; office machines; lighting fixtures; etc.

c Vehicles and parts and spares: including car and aero engines; cars; tractors; and associated items. Automative products and aircraft accessories.

d Electrical, electronic, radar and radio, and computers, including telephone exchange and equipments; television transmission and receiving sets.

Design considerations for typical examples of each class of product relating to the packaging problem. Importance of considering packaging during the blueprint stage and of testing the prototype for packaging performance before tooling up for production. Principles of fixture design, studies of the breakdown of large structures into sub units.

Corrosion with reference to complex machinery and its prevention both by design and by temporary protection in transport and storage.

Value analysis and its relation to packaging and packing.

2 The hazards of transport including climatic, handling and storage conditions

Shock and vibration as major causes of damage.
Fragility factors for various equipments.
Lifting and mechanical handling devices and the way to design packs to make best use of them.

3 The design of packaging for the several types of equipment. Restraint; clearance; support; non-abrasion; position; distribution. Selection of the shock reduction system; use of fittings; cushioning materials; etc. Selection of the outer container and the associated climatic protection where required. Importance of including clear and concise unpacking and assembly instructions where necessary. Methods of checking package performance: testing and verification.

2 THE APPROACH TO PACKAGING PROBLEMS

a Organisation of the packaging function.

Responsibility for packaging in the company: four possibilities: (I) a packaging committee of three to five people from various departments of the business; (2) the responsibility assigned to one department; (3) in the smaller business, one person to carry out the whole function; or (4) in special instances, a source outside the company, such as a contract packer, to perform the function.

b Use of sources of information

The main sources are: Literature; European Packaging Federation Classification Schedule and Index; producers and suppliers of packaging materials, containers, and machinery; transport companies; designers; colleagues; packaging exhibitions; packaging organisations; and packaging laboratories.

c Use of checklists

Well prepared checklists can be helpful instruments in developing packages

d Trying out new ideas: Laboratory testing and field trials

Thai Standards related to Packaging - Cont.

f. Dimensional standards for packages.
There is a significant field for standardization in the dimensions of transport packages. This is related to pallets, truck freight car and freight container developments.

It is suggested that action should be taken so that work on the standardization of package dimensions are integrated, at the appropriate time, with these aspects of goods handling and transport.

It is suggested that priority should be given to item 1(a) followed by items 1(b), (d) and (e).

2. Standards for the packaging of specific products. The standards are to ensure that the packages are technically satisfactory and used correctly for the purposes for which they are intended.

The TISI have issued or are preparing standards for glass bottles for aerated water, gunny bags and eleven types of canned food.

It is suggested that in considering further standards the following aspects should be included.

a. The importance of the product in the export field.

b. The importance of the technical aspects of the package which would be specified, e.g. contamination of the product by the packaging materials, protection of the product from transit and storage hazards, safty aspects of the packaging.

c. The frequency of occurence of packaging below an acceptable standard.

d. Overall economic savings, including customer 'goodwill' which can be achieved by standard packaging.

e. The availability in Thailand of the technical knowhow or the extended use of thepackage to ensure a specification which is economically and technically sound.

f. The desire within industry for the particular standard.

g. The suitability of the item for a standards mark.

Thai Standards related to Packaging - Cont.

The selection of further items for standards can be made from suggestions received at random. It would however be preferable to set up a technical committee to prepare specific recommendations. This committee should include representatives from the main user and produces groups for packaging and also for transport. It could be co-ordinated through the Thai Packaging Association and the Packaging Division of SISI.

General

It is appreciated that the work referred to in sections 1 and 2 includes the responsibilities of both the Centre for Thai National Standards Specifications and the Thai Industrial Standards Institute. It is naturally important that the work of the two departments in the field of packaging should be co-ordinated in both scope and timing if the most effective results are to be obtained.

APPENDIX VII

JOB DESCRIPTION
AND
PROVISIONAL WORK & TRAINING PROGRAMMES

Ref. No.	
1	Director of National Packaging Centre
2	Secretary/economics assistant to Director
3	Extension Officer
4	Administration Officer
5	Receptionist
6	Store Keeper
7	Chief of Communications Division
8	Training Officer 1
9	Exhibition/Design Officer
10	2nd Training Officer
11	Photographer/Designer
12	Head of Information Services Unit
13	Abstractor
14	Assistant Librarians 1 & 2
15	Technical Editor/Abstractor
16	Chief of Technical Services Division
17	Packaging Engineers
18	Assistant Packaging Engineers
19	Head of Consumer Packaging Unit
20	Head of Testing Services Unit
21	Technical Assistance Experts

1. DIRECTOR OF NATIONAL PACKAGING CENTRE

Job Grade 1-3 or S-1 Salary Range Baht 4,250-5,000

Phasing 1st year of Centre

1. JOB DESCRIPTION

The Director will be responsible for the successful development and operation of all aspects of the centre. It is anticipated that when established the Centre will operate as an organization within the Department of Industrial Promotion and in parallel with the Small Industries Services Institute and a projected marketing organization. The Director would be responsible to the Director General of the Department of Industrial Promotion either directly or possibly through an executive committee. Until fully established it may be expedient for the Centre to operate within the framework of ISI and utilizing some common services. Responsible to him would be the heads of the Communication and Technical Services Units as well as the Extension officer and the Administration officer.

He would have as his personal responsibility the promotion of the Centre within the packaging industry which it is anticipated would take a large partof his time. He would also be responsible for providing guidance and planning for the future development of the packaging industry and would be the authority in the Centre on industrial economics and statistics related to packaging. He would be responsible for the capital and revenue budgets of the Centre.

2. QUALIFICATIONS AND EXPERIENCE

He should have a university qualification in the field of economics and/or management and should preferably have had training abroad. It is necessary that he should have had several years experience in the application of economics or management skills including responsibility for the management of a department of a significant size. It is essential that he should have iniative and drive and should be able to inspire confidence and enthusiasm in the industry and in the staff of the Centre.

A knowledge of packaging technology is not necessary but an interest in the general field of industrial technology is necessary. He must be reasonably fluent in English as a second language.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 TRAINING PROGRAMME

The first year should be spent in training and familiarization, in preparation for the start up of the packaging centre.
Initially up to three months should be spent at SISI in a study of basic packaging and in study visits of a week or more duration to selected users and producers of packages to become familiar with the position of packaging technology in Thailand.

This should be followed by a training tour abroad of six months duration and including:-

i. General packaging knowledge - Indian Packaging Institute Course - 3 months

ii. Economics and Statistics in the Packaging Industries - Bulgarian Packaging Institute, Niera - 1 month.

iii. Packaging Institute operation and management visits of say two days duration to institutes in Poland, Germany (Munich & Hamburg) Holland.
Visit of five weeks to United Kingdom to study:
   a. At Pira, information, training and management techniques.

   b. At British Institute of Packaging, operation of a professional packaging institute.

   c. Visits to selected packaging companies.

YEAR 2 PREPARATION FOR AND START UP OF PACKAGING CENTRE

i. Direction of the work of the Centre and administrative work following training tour and related to start up of Centre - staff, buildings and equipment.

ii. Work associated with promotion of the Centre with Thai Packaging Industry - visits, etc.

iii. Collection and appraisal of economic and statistical data related to Thai Packaging.

iv. Appraisal of projects appropriate for development work at the Centre.

YEAR 3 DIRECTION OF CENTRE AND ITS FURTHER DEVELOPMENT

i. Review of progress of Centre in relation to:-
   a. Requests for work, information and training from the Packaging Industry.
   b. Effective help given to the Industry.
   c. Re-appraisal of the expansion programme for staff and equipment by sections in the light of a and b above.

ii. Direction of the work of the Centre.

iii. Work associated with promotion of the Centre.

iv. Collection and appraisal of economic and statistical data related to Thai packaging and advising on the development of the industry.

v. Appraisal of projects appropriate for the Centre.

2. SECRETARY / STATISTICS - ECONOMICS ASSISTANT TO DIRECTOR

Job Grade 3-3 Salary Range Baht 1,400-1,800

Phasing 1st year of centre

1. JOB DESCRIPTION

The secretary to the Director would operate as his personal assistant and in addition to undertaking normal secretarial duties would be responsible for collecting and collating of statistical and economic data on packaging under his direction.

2. QUALIFICATIONS & EXPERIENCE

She should have been trained in the handling of statistical and economic data and capable of doing secretarial work.

She should be able to type in English as well as Thai and be able to translate either way. The ability to type from tape would be an advantage but not necessary.

3. TRAINING PROGRAMME

This will depend upon how far her experience meets the job requirements. If training in the handling of statistical and economic data is required this could possibly be arranged through the SISI Economics Division while the Director is abroad.

The training should include a short course run within the Centre on basic packaging and packaging terminology. This could be one hour a week for three months.

3. EXTENSION OFFICER IN THE DIRECTOR'S OFFICE

Job Grade 2-1 Salary Range Baht 1,300-1,700

Phasing 2nd year of centre

1. JOB DESCRIPTION

The Extension Officer will be immediately responsible to the Director to assist him in the promotion of the Centre in the industry and for acting as a liaison officer between the industry and the centre.

It will be his responsibility to carry our programmed contacts and visits across the packaging industry to promote the use of the services offered by the Centre and to bring the staff of the Centre into direct contact with manufacture when appropriate. It will also be his responsibility to keep the senior staff of the Centre aware of specific developments and trends in the packaging industry by routine confidential reports on his visits.

This officer will need a scientific background in physics, chemistry, physical chemistry or possibly chemical engineering with preferably some knowledge of food technology. He will need to have or acquire a broad knowledge of packaging technology but does not need to be a specialist in a particular aspect.

It is essential that he should get on easily with people and that he should inspire confidence and enthusiasm. A knowledge of English is necessary and an ability to speak Chinese would probably be an advantage in establishing confidence with Chinese.

2. QUALIFICATIONS AND EXPERIENCE

He should have a university degree in the sciences providing a basic knowledge in physics, chemistry and mechanics, preferably in physical chemistry. A knowledge of packaging technology and, some knowledge of food processing would help but is not essential.

It is desirable that he should have some previous experience in developing industrial contacts and that his manner and personality is appropriate for this. A good knowledge of English is essential. A knowledge of Chinese would help in his work but is not essential.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (2nd YEAR OF CENTRE) TRAINING

i. 6 months basic training at the centre and by visits to Thai industry.

ii. 3 months training on Indian Packaging Institute Course.

iii. On the job training in Thai industrial liaison work.

YEAR 2 (4th YEAR OF CENTRE) WORK AS EXTENSION OFFICER AND FURTHER TRAINING

i. As for 2nd year.

ii. 2 months visit to selected European Packaging Institute and Companies possibly in Germany, Holland, Bulgaria, Poland and England.

4. ADMINISTRATION OFFICER IN THE DIRECTOR'S OFFICE

Job Grade 3-3 Salary Range Baht 1,400-1,800

Phasing 2nd year of centre (or later)

1. JOB DESCRIPTION

The Administration Officer will be directly responsible to the Director for providing an efficient administration service to the staff of the Centre and one which will free as much as possible of their time for directly productive work.

His duties should include:-

i. General building administration, including cleaning repairs and maintainance for the buildings, services and furniture and security.

ii. Transport including the arranging of transport and the maintainance of vehicles.

iii. Communications including:-
   a. The provision of an efficient receptionist/telephonist service.
   b. The sorting, distribution, collection, and despatch of mail.
   c. The provision of notice boards and the posting of notices.

iv. Stores, purchasing and storage:-
   a. The purchase of stores/ equipment against authorized requisitions.
   b. Passing of invoices against goods received.
   c. Operating a laboratory and office supply store.
   d. Maintaining an inventory of laboratory and office equipment.

v. Personnel:-
   a. Maintainance of staff files.
   b. Co-ordination of papers for staff reviews.
   c. Administration work in connection with the recruitment of new staff.

vi. Planning and Finance:-
   a. Responsibility for the Centre's accounting.
   b. Payment of staff salaries and expenses.
   c. Provision of cost control data required by management.
   d. Collation of annual revenue and capital budgets.

The Administration Officer would be responsible for the work of one, clerk/ typist, one store keeper, handy man, one receptionist/telephone operator and drivers and cleaners.

2. QUALIFICATIONS AND EXPERIENCE

The Administration Officer should have a qualification in accounting or business management and two or three years experience in the administration and accounting for a company or department involving many of the aspects listed above.

His temprement should be such that he can calmly progress a number of jobs at one time with a co-ordinated approach and co-operative manner. His approach to the job should be such that he will be keen to provide an efficient and friendly service to the rest of the Centre.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (2nd YEAR OF CENTRE) INDUCTION & JOB DEVELOPMENT

The first few months would primary be taken up with job induction as a preliminary to the development of procedures and the operation of administration as indicated in the job specification.

YEAR 2 (3rd YEAR OF CENTRE))
) Administration of the Centre.
YEAR 3 (4th YEAR OF CENTRE))

5. RECEPTIONIST - TELEPHONIST IN ADMINISTRATION

Job Grade 4-3 Salary Range Baht 850-1,050

Phasing 2nd year of centre (or later)

1. JOB DESCRIPTION

The receptionist/telephonist would be responsible for the receiving and direction of visitors, for progressing incoming telephone calls and in addition could undertake routine clerical jobs as infill work. Her manner should commend the Centre to visitors.

6. STORE KEEPER / MAINTAINANCE MAN IN ADMINISTRATION

Job Grade 4-3 Salary Range Baht 850-1,

Phasing 2nd year of centre (or later)

1. JOB DESCRIPTION

This job will have two aspects:-

i. The acceptance, storing and issue of stores for the laboratory which it is anticipated should occupy about two hours a day.

ii. Maintainance work required in the building.

It is advised that the man appointed for this job should be a carpenter with general maintainance experience and that he should be given the necessary elementary training in storekeeping. It is suggested that specialist equipment and hazardous chemicals should be the responsibility of the Technical Services Unit.

COMMUNICATIONS DIVISION

7. CHIEF OF COMMUNICATIONS DIVISION

Job Grade 1-1 Salary Range Baht 2,750-3,350

Phasing 1st Year of Centre

1. JOB DESCRIPTION

The Chief of the Communications Division will be responsible to the Director of the Centre for the setting up and efficient operation of this Division. He will also act as Head of one of the two units of the Division and be responsible for its day by day operation. The overall function of the Division is to obtain available information on packaging and to supply it to the Thai Packaging Industry in ways which will be of use to them.

One of the two Units of the Division is the Information Services Unit whose Head is responsible to the Chief of the Division and is also his Deputy. The Unit, when fully operational is planned to have the following functions:-

i. To operate a packaging library covering journals, pamphlets and books appropriate to the subject.

ii. To operate a packaging information indexing and retrieval services.

iii. To issue obridged abstracts on packaging appropriate to the Thai industry.

iv. To arrange for the translation of important articles which are in a foreign language.

v. To provide for the editing and issue of technical reports from the Centre which are for general publication.

The other unit is the Training and Packaging Promotion Unit for which the Head of the Communications Division is also the Unit Head. The function of this Unit covers:-

i. The provision of training courses in packaging technology for the Industry and to a limited extent for the staff of the Centre

ii. The promotion of packaging in Thailand by, for example, exhibitions and Seminars.

iii. A photographic service for the Centre.

2. QUALIFICATIONS AND EXPERIENCE

The Chief of the Communications Unit should be a university graduate in a subject which is relevant to the work of the Training and Packaging Promotion Unit. Desirably he should have had training or experience abroad in these fields.

He should be interested in training and the promotion of technology and ddsign in the Thai Packaging Industry. A knowledge of packaging technology is desirable. English is an essential second language.

The head of this unit must have iniative and drive and the ability to generate enthusiasm in those with whom he has contact.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (1st YEAR OF CENTRE) TRAINING PROGRAMME

The training of the Chief of Communications will depend upon the scope of his knowledge and experience. The training should be planned to ensure that the following aspects have been covered:-

i. A basic knowledge of packaging and familiarization with the Thai Packaging Industry - up to four months.

ii. Training in packaging technology to the level of the European Packaging Federation Sylabus through the British Institute of Packaging Correspondence Course. If necessary this should be preceeded by the Indian Packaging Institute Course.

iii. Training at Pira in U.K. on packaging information service techniques and Packaging training course techniques. Recommended duration 3 months.

iv. Two day visits to selected packaging institutes in Europe say Holland (TNO), Germany Munich and Hamburg and Poland, - ½ month.

YEAR 2 (2nd YEAR OF CENTRE) START UP OF DIVISION

i. General supervision for the start up of the Information Unit.

ii. Detailed supervision of the start of the Training and Packaging Promotion Unit which will in effect be the extension of the work done by the present Packaging Division of SISE.

iii. Planning and preparation for training courses for industry and their presentation with the packaging training officer.

iv. Arranging courses for new members of staff.

v. Planning package promotion work as required including the work of the Exhibition and Design Officer.

vi. Answering packaging industrial design enquiries.

YEAR 3 (3rd YEAR OF CENTRE)

i. Continuing the work outlined for the 2nd year.

ii. Provide training for the second training officer.

COMMUNICATIONS DIVISION

8. 1st TRAINING OFFICER

Job Grade 3-3 Salary Range Baht 1,400-1,800

Phasing 1st Year of Centre

1. JOB DESCRIPTION

The training Officer will be responsible to the Head of the Training and Package Promotion Unit and under him will be responsible for:-

i. The planning of packaging courses and seminars.

ii. The preparation of material for courses and seminars.

iii. The organization of and participation in the Courses and seminars.

iv. The provision of training in packaging required by the staff of the Centre.

2. QUALIFICATIONS & EXPERIENCE

The training officer should have a good basic knowledge of science including physics, mechanics and chemistry and should hold a qualification in the sciences and or in teaching preferably at degree level. A knowledge of packaging is desirable but not essential. It is desirable that his experience should include the preparation and giving of training in a technology.

It is essential that he should be able to distinguish between the relatively unimportant and the important aspects and to present the latter in a simple, clear and attractive way. His knowledge of English as a second language should be good.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (1st YEAR OF CENTRE) TRAINING

The details of his training course must depend upon his knowledge and experience. It should provide for :-

i. 2 months training in Thailand for a preliminary knowledge of Packaging and a familiarization with the Thai Packaging industry.

ii. 3 months for attendance at the Indian Packaging Institute Training Course.

iii. Training in teaching industrial technology course to be decided.

YEAR 2 (2nd YEAR OF CENTRE)

i. Commencing responsibilities as set out in job specification.

ii. Organization of staff courses based on the Institute of Packaging (UK.) Correspondence course to the European Packaging Federation sylabus.

YEAR 3 (3rd YEAR OF CENTRE)

Continuation of the work for the second year.

COMMUNICATIONS DIVISION

9. EXHIBITION & DESIGN OFFICER

Job Grade 3-3

Salary Range 1,400-1,800

Phasing 2nd Year of Centre

1. JOB DESCRIPTION

The Exhibition and Design Officer will be responsible to the Head of the Training and Packaging Promotion Unit for:-

i. The organization of a permanent display of packages at the Centre.

ii. The organization and presentation of periodic packaging exhibitions.

2. QUALIFICATIONS AND EXPERIENCE

The Exhibition and Design Officer should be qualified as an industrial designer preferably with training or experience abroad in the field of graphic art or packaging display. He should have a creative initiative and an ability to plan and progress his projects without close supervision. A good knowledge of English is required as a second language.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (2nd YEAR OF CENTRE) TRAINING & COMMENCEMENT OF JOB

i. Induction to the field of Packaging by training and visits organized by the Centre. 3 months.

ii. Commencement of the functions listed under job description under the supervision of the Head of the Unit.

YEAR 2 (3rd YEAR OF CENTRE)

Carrying out of functions listed under job specification.

YEAR 3 (4th YEAR OF CENTRE)

As 2nd year above.

COMMUNICATIONS DIVISION

10. 2nd TRAINING OFFICER

Job Grade 3-3 Salary Range Baht 1,400-1,800

Phasing 3rd Year of Centre

JOB SPECIFICATION, QUALIFICATIONS & PROVISIONAL WORK PROGRAMME all basically as for first Training Officer except that he will be responsible to the Head of the Training and Packaging Promotion Unit through the Senior Training Officer.

COMMUNICATIONS DIVISION

11. PHOTOGRAPHER/DESIGNER

Job Grade 3-1 Salary Range:Baht 850-1,050

Phasing 4th Year of Centre

1. JOB DESCRIPTION

The photographer will be responsible to the Head of the Training and Packaging Promotion Unit.

He will be responsible for:-

i. Providing a technical photographic service to the Centre.

ii. The preparation of photographic material for training courses.

iii. Assisting the Exhibition and Design Officer in the preparation of exhibitions particularly with the photographic aspects, for which he must have a capability in design.

iv. Providing a technical service for training courses and lectures.

2. QUALIFICATIONS & EXPERIENCE

Preferably the photographer should have a professional qualification in industrial photography and he should have significant experience in technical photograph including colour and cine photography as well as artistic lay out.

3. WORK PROGRAMME

It is not anticipated that the Photographer will require training so that he should be able to carry out the functions given in his job specification from the start of his appointment.

COMMUNICATIONS DIVISION

12. HEAD OF INFORMATION SERVICES UNIT

Job Grade 2-3 Salary Range: Baht 2,450-3,050

Phasing 1st Year of Centre

1. JOB DESCRIPTION

The Head of the Information Services will be responsible to the Head of the Communications Division and will be his deputy.

He will be responsible for all aspects of the planning and progressing of the work of the Unit which is basically to provide an information service from available material appropriate to the needs of the Thai Packaging Industry. The work of the Unit when developed will include the following functions:-

i. The operation of a technical library covering books, journals and pamphlet on packaging.

ii. The operation of a packaging information storage and retrieval system based on the European Packaging Federation classification. This would be used to answer information enquiries from the industry and the staff of the Centre.

iii. Essential abstracting and the production and issue of a Thai Packaging News Sheet including abridged abstracts of selected articles from current litterature. The Pira Packaging Abstracts would be used as a basis for abstracts.

iv. The Unit would arrange for the translation of essential articles into Thai when required and for the translation of articles from other than English when essential.

v. When the Centre is in the position of publishing reports for general circulation the Unit would provide a technical editing service.

vi. The Unit would also be responsible for the reproduction and issue of reports for general circulation.

2. QUALIFICATIONS AND EXPERIENCE

The Head of the Information Services Unit should have a university qualification in librarianship and preferably training in technical information service work with a significant experience in these fields. It would be an advantage if in addition to English as a second language he could read Japanese, German or Russian.

The Head of this Unit should be a capable organizer with iniative and drive. A knowledge of packaging is not necessary in the first instance.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (1st YEAR OF CENTRE) TRAINING

i. Familiarization with packaging and the Thai Packaging Industry. 2 months in Thailand.

ii. General Packaging knowledge - Indian Packaging Course - 3 months.

COMMUNICATIONS DIVISION

13. ABSTRACTOR

Job Grade 3-3 Salary Range: Baht 1,400-1,800

Phasing 1st Year of Centre

1. JOB DESCRIPTION

The abstractor will be responsible to the Head of the Information Services Unit for:-

i. The scanning of packaging literature, particularly that not covered by Pira abstracts and the selection of additional articles if any, for abstracting and preparing the abstracts.

ii. The selection of articles for abstracting for inclusion in a Thai language Packaging News Sheet.

iii. The referencing of abstracts and other card indexed material for insertion in the information retrieval system and its insertion in the system.

iv. The translation of abstracts and articles into Thai when essential but this work should be avoided whenever possible.

v. The progressing of information enquiries.

2. QUALIFICATIONS AND EXPERIENCE

The abstractor should be a competent translator of English into Thai for technical material. He should preferably have experience in abstracting English, technical knowledge of Japanese, German or Russian would be an advantage but a knowledge of packaging technology is not necessary in the first instance. An elementary knowledge of science would be useful.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (1st YEAR OF CENTRE) JOB FAMILIARIZATION & TRAINING

i. To become familiar with the basis of Packaging and the purpose of the job. 2 months in Thailand.

ii. Training in Packaging to provide background needed for job - Packaging Course, Indian Institute - 3 months.

iii. To assist the Head of the Unit in starting the information service.

YEAR 2 (2nd YEAR OF CENTRE)

To carry out the functions of the abstractor as set out in the Job Specification.

YEAR 3 (3rd YEAR OF CENTRE)

i. Work as for year 2

ii. Assistance in training of the Technical Editor.

COMMUNICATIONS DIVISION

14. ASSISTANT LIBRARIANS 1 & 2

Job Grade 3-1 Salary Range: Baht 850-1,050 .

Phasing Assistant 1 Assistant 2

1. JOB DESCRIPTION

The Assistant Librarian is responsible to the head of the Information Services through the abstractor for the day to day operation of the library service including:-

i. The receipt, marking, recording and storing of books and literature.

ii. The physical issuing of books and literature on loan and the recording of their return.

iii. The filing of information cards and for giving assistance to the abstractor in the operation of the information retrieval system and in sorting our material for literature searches.

2. QUALIFICATIONS AND EXPERIENCE

The Assistant Librarian should have had several years experience in library work with associated training in librarianship. A good knowledge of English is necessary.

She should have a systematic approach to her work and be able to work on her own iniative within the scope of her terms of reference.

A higher degree of competence would be required in Assistant librarian 1 than in Assistant librarian 2.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (ASSISTANT 1 2nd YEAR OF CENTRE, ASSISTANT 2 4th YEAR OF CENTRE)

Induction training including a basic knowledge of packaging would be given on the job and would extend over at least the first year. The majority of her time would be on the job under supervision.

YEAR 2 & 3

Carrying out responsibilities listed in the job specification with decreasing supervision.

COMMUNICATIONS DIVISION

15. TECHNICAL EDITOR/ABSTRACTOR

Job Grade 3-3 Salary Range: Baht 1,400-1,800

Phasing 3rd YEAR OF CENTRE

1. JOB DESCRIPTION

The Technical Editor would be responsible to the Head of the Information Service for the following functions:-

i. For providing a technical editing service for publications of the Centre intended for general distribution to the packaging industry.

ii. For progressing the reproduction and issue of such publications and of the Thai Packaging News Sheet.

iii. For working with the abstractor in the abstracting and translation of packaging literature.

2. QUALIFICATIONS AND EXPERIENCE

The Technical Editor should be a competent translator of English into Thai and should be able to express information simply and clearly in Thai and English. It is desirable that he should have a background of science and preferably have had some experience in technical editing and the translation of technical material into Thai.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (3rd YEAR OF CENTRE) TRAINING AND START OF JOB

i. Basic induction course for the job and the packaging industry determined by his previous experience. The training would be in Thailand and largely on job training.

ii. Carrying out his functions as set out in the job description.

YEAR 2 (4th YEAR OF CENTRE))
) As ii. above.
YEAR 3 (5th YEAR OF CENTRE))

TECHNICAL SERVICES DIVISION

16. CHIEF OF TECHNICAL SERVICES DIVISION & HEAD OF TRANSPORT CONTAINERS UNIT

Job Grade 1-1 Salary Range: Baht 2,750-3,350

Phasing 1st Year of Centre

1. JOB DESCRIPTION

The Chief of the Technical Services Division will be responsible to the Director of the Centre for the setting up and the efficient operation of this Division. He will also act as Head of the Transport Containers or Consumer Packaging Unit.

The function of the Division will be to provide a service in packaging technology to industry. This will include testing, design, development and consultancy aspects supported by laboratory facilities.

The three units will be:-

i. Transport Containers.

ii. Consumer Packaging.

iii. Testing Services.

It is suggested that, in the first appointment, the Chief of this Division will act as Head of the Transport Containers Unit and will be responsible for its day by day operation.

This Unit will be responsible for technical Services relating to:-

i. Transport containers e.g., crates, cases, sacks drums.

ii. Pallets and containerization as related to packaging.

iii. Design and sample making of containers.

iv. Standards for transport containers.

2. QUALIFICATIONS AND EXPERIENCE

The Chief of the Technical Services Division should be a university graduate in classical physics or mechanical engineering with preferably some knowledge of chemistry. The experience of post-graduate training in a university abroad would be an advantage. He should have had some years experience in laboratory management in a technical capacity, and should have demonstrated his ability to plan and organize the work of technical staff as well as participating in it. Good English is necessary. A previous knowledge of packaging would be useful but is not essential.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (1st YEAR OF CENTRE) TRAINING

i. Basic training in packaging and familiarization with the Thai Packaging Industry - 2 months.

ii. Attend Indian Packaging Institute Training Course - 3 months.

iii. Training at Pira U.K. in the operation of a Technical Services Unit including package design with special reference to transport containers. 3 months.

iv. Short visits to selected packaging institutes in Europe say Holland (TNO), Germany, Hamburg and Munich, Poland. ½ month.

YEAR 2 (2nd YEAR OF CENTRE)

Start up and operation of the Unit as detailed in the job description.

YEAR 3 (3rd YEAR OF CENTRE)

Continued operation of the Division.

TECHNICAL SERVICES DIVISION

17. PACKAGING ENGINEERS

1	Transport Containers Unit	2nd Year of Centre
1	Consumer Packaging Unit	2nd Year of Centre
1	Testing Services Unit	3rd Year of Centre
1	Transport Containers Unit	4th Year of Centre

Job Grade 3-3 Salary Range: Baht 1,400-1,800

1. JOB DESCRIPTION

Packaging Engineers will be responsible to the Head of their respective units. After training they will be expected to undertake projects and specialize in aspects of the work of the respective unit with only general supervision. They would also be expected to take responsibility for the supervision of junior staff when appropriate to their work.

Their work would be within the scope of the work of the Unit as set out in the job description of the respective Unit Head.

They will be expected to participate in the Centre's training courses for the aspects in which they become experts.

2. QUALIFICATIONS AND EXPERIENCE

A Packaging Engineer should have a university degree in classical physics, mechanical or chemical engineering or physical chemistry. It is desirable that there should be a spread of disciplines among the packaging engineers. Some previous experience in the application of technology is desirable but not essential provided the engineer has the iniative and enthusiam to develope contacts with industry and to progress his experience in packaging engineering during his training period. A good knowledge of English is necessary but a prior knowledge of packaging is not essential.

Packaging Engineers should have the aptitude to study for the M. Inst. Pkg. qualification as professional packaging engineers.

3. PROVISIONAL WORK PROGRAMME

YEAR 1

i. Training Course in basic packaging, familiarization with the Thai Packaging Industry and on job training.

ii. Other training which may be required to provide the skills necessary for the job.

iii. Study for the examination based on the European Packaging Federation training sylabus for the M. Inst. Pkg. qualification for a Professional Packaging Engineer.

iv. Work on the job as instructed by the Head of the Unit.

YEAR 2 AND 3

As items (iii) and (iv) above.

TECHNICAL SERVICES DIVISION

18. ASSISTANT PACKAGING ENGINEERS

1	Testing Services Unit	2nd Year of Centre
1	Transport Containers Unit	3rd Year of Centre
1	Consumer Packaging Unit	3rd " "
1	Testing Services Unit	3rd " "
1	Testing Services Unit	4th " "
1	Transport Containers Unit	5th " "
1	Consumer Packaging Unit	5th " "
1	Testing Services Unit	5th " "

Job Grade 1-7 3-1 Salary Ranges: Baht 850-1,050
8 4-3 Baht 850-1,050

Phasing See above

1. JOB DESCRIPTION

Assistant Packaging Engineers are non-graduate staff whose function is to assist the Packaging Engineer to whom they are assigned in carrying out his work in the Unit. They are responsible to the Head of the Unit through the respective Packaging Engineer.

2. QUALIFICATIONS AND EXPERIENCE

Assistant Packaging Engineers should have a good standard in mathematics and physics/chemistry/mechanics at a technical college or alternatively be a science student at an evening university. A basic knowledge of English is necessary.

They need not have had previous experience in an institute or have a knowledge of packaging. They should have the ability and desire to study packaging technology ultimately to the level of the M. Inst. Pkg. qualification except in the case of a proportion of the assistants in the Testing Services Unit where the work is more routine is nature.

3. PROVISIONAL WORK PROGRAMME

YEAR 1, 2 & 3, on job training while carrying out their work. Basic training in packaging arranged at the Centre as appropriate.

At a suitable stage promising assistant packaging engineers should be encouraged to undertake the Duropean Packaging Federation, packaging course.

TECHNICAL SERVICES DIVISION

19. HEAD OF CONSUMER PACKAGING UNIT

Job Grade 2-3 Salary Range: Baht 2,450-3,050

Phasing 1st Year of Centre

1. JOB DESCRIPTION

Head of the Consumer Packaging Unit will be responsible to the Chief of the Technical Services Division for the efficient operation of the Unit. He should also be considered as the Deputy for the Chief of the Division.

This Unit will be responsible for technical services relating to:-

i. Consumer packaging from glass, tinplate, plastic, paper and board, foil, etc.

ii. Packating techniques for consumer packs including machinery.

iii. Technical design and sample making of consumer packs, where practical.

iv. Standards for consumer packs.

2. QUALIFICATIONS AND EXPERIENCE

The Head of the Consumer Packaging Unit should be a university graduate in classical physics, physical chemistry or mechanical engineering with some knowledge of chemistry. Post graduate training abroad would be an advantage. He should have had some years experience in a technical laboratory or in technical service work and should have demonstrated his ability to plan and control the work of other staff. Good English is necessary. A previous knowledge of packaging would be useful but is not essential.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (1st YEAR OF CENTRE) TRAINING

i. Basic training in packaging and familiazation with the Thai Packaging Industry - 4 months.

ii. Attend Indian Packaging Institute Course - 3 months.

iii. Training at Pira U.K. in the operation of a technical services unit including packaging design with special reference to consumer packaging including visits to factories and machinery manufacturers - 3-4 months.

iv. Short visits to selected packaging institutes in Europe say Holand, TNO, Germany, Hamburg and Munich, Poland - ½ month.

v. He should be expected to train to the level of the European Packaging Federation sylabus and take the M. Inst. Pkg. qualification as a professional packaging engineer.

YEAR 2 (2nd YEAR OF CENTRE)

As detailed in the job specificatioh.

YEAR 3 (3rd YEAR OF CENTRE)

Continued operation of the Division.

TECHNICAL SERVICES DIVISION

20. HEAD OF TESTING SERVICES UNIT

Job Grade 2-2 Salary Range: Baht 1,800-2,300

Phasing 1st Year of Centre

1. JOB DESCRIPTION

The Head of the Testing Services Unit will be responsible to the Chief of the Technical Services Division for the efficient operation of the Unit. The function of the Unit includes the following services:-

i. A package appraisal service including the physical testing of packages.

ii. The testing of packaging materials.

iii. Liaison with other institutes for testing and appraisals not available at the centre for example analytical work, that related to the effect of mould and insect attack in packaging, the testing of the optical properties of packaging materials.

iv. Standards for testing in the field of packaging.

v. The progressing of technical enquiries.

2. QUALIFICATIONS AND EXPERIENCE

The head of the Testing Services Unit should be a university graduate with a degree in inorganic chemistry, physical chemistry, classical physics or possibly a chemical or mechanical engineering. He should have a working knowledge of mechanics and chemistry. Previous experience in a technical laboratory in the testing field would be an advantage.

He should essentially be practical with a broad field of knowledge rather than a specialized knowledge. He should have experience of and abe able to organise the work of other staff.

A good knowledge of English is required but previous knowledge in the field of packaging is not essential.

3. PROVISIONAL WORK PROGRAMME

YEAR 1 (1st YEAR OF CENTRE) TRAINING

i. Basic training in packaging and familiarization with the Thai Packaging Industry - 2 months.

ii. Attendance at the Indian Packaging Institute Training Course - 3 months.

iii. Training at Pira in U.K. in the operation of a Testing Services Unit 3 months.

iv. Short visits to selected packaging institutes in Europe say Holland (TNO), Germany, Hamburg and Munich, Poland. Duration ½ month.

v, He should be expected to train to the level of the European Packaging Federation sylabus and take the M. Inst. Pkg. qualification as a professional packaging engineer.

v. He should be expected to train to the level of the European Packaging Federation sylabus and take the M. Inst. Pkg. qualification as a professional packaging engineer.

YEAR 2 (2nd YEAR OF CENTRE)

Start up and operation of the Division as detailed in the job specification.

YEAR 3 (3rd YEAR OF CENTRE)

Continued operation of the Division.

21. TECHNICAL ASSISTANCE EXPERTS

It is recommended that a Technical Assistance Expert should be appointed to assist in the start up and early operation of the proposed National Packaging Centre. The job description below specifies an expert with a wide experience in the administration training and management aspects of a packaging centre.

It would be advisable to provide for two or three short term visits from experts in specialized aspects of packaging if this is found to be necessary.

JOB DESCRIPTION

Post Title Technical Assistance Expert to assist in the start up and early operation of a National Packaging Centre in Thailand.

Duration 24 months.

Date Required 3 months prior to the start up of the National Packaging Centre.

Duty Station Bangkok, with travel within the country.

Duties The Technical Assistance Expert will be assigned to the Department of Industrial Promotion, the Ministry of Industry and will advise and assist the Packaging Division of the Industries Service Institute and the Director of the National Packaging Centre, when appointed, on the start up and operation of the Centre.

Specifically he will advise on and assist with:-

1. The organization and management of both technical and administration aspects.
2. The scope and operation of a packaging information service.
3. The content, preparation and organization of training courses for both industry and staff.
4. The scope and operation of a technical service department covering transport containers, consumer packaging and testing services.
5. The design of and equipment required for a packaging centre.
6. Project selection and control.

QUALIFICATIONS Packaging technologist or industrial economist with considerable practical experience in managing a packaging centre dealing with a full range of packaging problems. He should have personality, energy and tact.

LANGUAGE English.

BACKGROUND The report Ref. THA-154-A (ISI) October, 1971 on the establishment of a National Packaging Centre in Thailand contains recommendations for the structure and setting up of this centre which will be a natural development of the Packaging Division of the present Industries Service Institute of the Department of Industrial Promotion, the Ministry of Industry.

Much of the first year following the appointment of key staff will be used for obtaining experience and training including visits abroad of up to 6 months. It is anticipated that the present Chief of the Packaging Division of the Small Industries Service Institute will be abroad for additional experience in advance of the appointment of key staff. During the first year of the Centre she would be preparing for the start of the work of the Centre when the key staff are trained.

This would include:-

1. Modifications to building and services.
2. Ordering and installing of equipment.
3. Planning and progressing information services.
4. Planning and preparing of training material for new staff and the packaging industry.

The Technical Assistance Expert would advise and assist in this work and in the subsequent development of the Centre.

APPENDIX VIII

EQUIPMENT LISTS

a) Office and Library furniture

b) Laboratory and special furniture

c) Technical and scientific equipment. Names and addresses of suppliers of equipment from abroad.

d) Transport and air-conditioning

APPENDIX VIII a

EQUIPMENT LIST - OFFICE & LIBRARY FURNITURE — PACKAGING CENTRE — DIRECTOR'S OFFICE COMMUNICATIONS DIVISION - TRAINING & PACKAGE PROMOTION

ITEM	AREA OF SUPPLY YEAR OF PURCHASE COST				SUPPLIER	NOTES
	YEAR 1		YEAR			
	THAILAND	ABROAD	THAILAND	ABROAD		
	Baht	$	Baht	$		
DIRECTOR'S OFFICE						
Directors room including table & chairs	5,900				Local	Cost figures supplied by SISI
Secretary/economics officer including Thai & English typewriters	4,600				"	architect
Extension officer			2 2,900		"	
Administration officer			2 2,900		"	
Secretary/typist			2 4,600		"	
Storekeeper/maintainance including stock			2 6,000		"	
work bench racks and work bench			4 6,000		"	Allows for 100m. shelving
Drivers and cleaners						
Office furniture for T.A. Expert	4,900				"	
COMMUNICATIONS DIVISION (Training and Package Promotion)						
Chief of Communications room including table and chairs	4,900				"	
Secretary to above including Thai & Eglish Typewriters	4,600					
Typist for Training and Packaging Promotion Unit			3 2,900		"	
First training officer	2,900					
Chairs & desk for training rooms	4,000		2 2,000		"	
Exhibition and Design Officer			2 2,900		"	
Chairs and display furniture for exhibition room	8,000		3 10,000		"	
Second training officer			3 2,900		"	
Desk, etc. for photographer			4 2,900		"	

APPENDIX VIII a Cont.

EQUIPMENT LIST - OFFICE & LIBRARY FURNITURE CONT.

COMMUNICATIONS DIVISION CONT.- INFORMATION SERVICES, TECHNICAL SERVICES DIVISION

ITEM	AREA OF SUPPLY / YEAR OF PURCHASE / COST					SUPPLIER	NOTES
	YEAR 1 THAILAND	YEAR 1 ABROAD	YEAR	THAILAND	ABROAD		
	Baht	$		Baht	$		
MUNICATIONS DIVISION CONT. (Information Services)							
Head of Information room including table & chairs	3,900					Local	
Abstractor/translator	2,900					"	
Assistant librarian - Library issue desk	1,500					"	
Technical editor/2nd abstractor			3	2,900		"	
Assistant librarian (2nd)	1,000						
Library & library store, 4 tables 10 chairs , book shelves	15,000		(3	10,000		"	Total 250m. each for library & store over 5 years.
			(5	9,000			
1st typist including English & Thai typewriters			2	2,900		"	
2nd typist including one typewriter			3	2,900		"	
CHNICAL SERVICES DIVISION (Transport Containers Unit)							
Chief of Technical Services room including table & Chairs	4,900					"	
Two packaging engineers - shared office	2,900		4	2,900		"	
Two assistant packaging engineers - writing table in lab.	1,500		5	1,500		"	
(Consumer Packaging Unit)							
Head of Consumer Packaging	3,900					"	
Packaging engineer - office shared with 1 above	2,900					"	
Two assistant packaging engineers - writing table in lab.	1,500		5	1,500		"	
(Testing Services Unit)							
Head of Testing Services	3,900						
Packaging Engineer			3	2,900		"	
Four assistant packaging engineers - table in lab.	1,500		3	1,500		"	
			4	1,500		"	
			5	1,500		"	

APPENDIX 8 b

EQUIPMENT LIST - LABORATORY AND SPECIAL FURNITURE

COMMUNICATIONS & TECHNICAL SERVICES DIVISIONS

ITEM	AREA OF SUPPLY YEAR OF PURCHASE COST					SUPPLIER	NOTES
	YEAR 1 THAILAND	YEAR 1 ABROAD	YEAR	THAILAND	ABROAD		
	Baht	$		Baht	$		Cost of benches by SISI architect unless stated
COMMUNICATIONS DIVISION (Training & Paakaging Promotion)							
Teaching and display furniture	10,000		3	10,000		Local	T.A. Expert's estimate
Drawing board	1,500					"	
Darkroom benches & sinks	7,000					"	3m. with twin steelsink, 3m. dry bench.
(Information Services)							
Card index storage	3,000		3	3,000		"	T.A. Expert's estimate
			5	3,000		"	
CLINICAL SERVICES DIVISION (Transport Containers)							
Laboratory benching & sink - say 40 m., shelving etc.	12,000		3	20,000			15m. Year 1. 25m. Year 3
(Consumer Packaging)							
Laboratory benching & sink - say 40m., & shelving	12,000		3	20,000		"	15m. Year 1. 25m. Year 3
(Testing Services)							
Laboratory benching & sink for package testing lab. say 10m. and shelving	9,000					"	10m. Year 1
Laboratory benching & sink for materials testing labl say 20m. and shelving	13,000		3	4,000		"	15m. Year 1 5m. Year 3
Laboratory fume cupboard including fan extraction as Gallenkamp FV-312 & fan.		600				Gallenkamp	
Balance bench	1,000						
Bench & shelving for store & variable humidity room	3,000					Local	

APPENDIX VIII C

EQUIPMENT LIST - TECHNICAL & SCIENTIFIC

DIRECTOR'S OFFICE
COMMUNICATIONS DIVISION

ITEM	AREA OF SUPPLY YEAR OF PURCHASE COST					SUPPLIER	NOTES
	YEAR 1		YEAR	THAILAND	ABROAD		
	THAILAND	ABROAD					
	Baht	$		Baht	$		
DIRECTOR'S OFFICE							
Calculator for statistics work		850					Model to be chosen attime of purch
Tools for maintainance			2	1,000		Local	
COMMUNICATIONS DIVISION							
Training & Promotion						Local	
Overhead daylight projector RANK/ALDIS		450				Agents	The prices given are Bangkok pric supplied by local dealers and include import duty. It may be possible to obtain more competati prices when ordering. Import duty relief should be sought.
Projector for 36m.m. transparancies		300				"	
Universal 8m.m. projector (ELMO)			3	190		"	
8m.m. Special Cine Camera (ELMO)			3	190		"	
36m.m. camera complete - NIKON FTN.		390				"	
Accessories for above for micro and macro work		180				"	
Portable photographic stands (2 off)		290				"	
Drying cupboard		100				"	
Glazer		50				"	
MAMIYA 50mm. x 60 mm. reflex camera & close up lens			3	310		"	

EQUIPMENT LIST - TECHNICAL & SCIENTIFIC — COMMUNICATIONS DIVISION (CONTINUED)

ITEM	AREA OF SUPPLY YEAR OF PURCHASE COST IN U.S.$ YEAR 1 THAILAND	YEAR 1 ABROAD	YEAR	THAILAND	ABROAD	SUPPLIER	NOTES
	Baht	$		Baht	$		
NING & PROMOTION (CONTINUED)							
Electronic flash - MEGABLITZ		230				Local Agents	The prices given are Bangkok prices supplied by local dealers and include import duty. It may be possible to obtain more competative prices when ordering. Import duty relief should be sought.
Enlarger 35 mm. to 60x50 mm. & accessories for copying		300				"	
Portable projection screen		70				"	
Laboratory tanks, dishes and other small accessories	1,500		3	1,000		"	
Studio lighting and accessories		300				"	
Small tools and accessories for use of designer.	1,500					"	
RMATION SERVICES							
Rank Xerox copying machine Model			1			"	Rental
Microfilm viewer Kodak Model MOTOMATIC			3	2,250		"	Alternatives should be considered at time of ordering.
Office Duplicator Roneo Model 865 & small items of equipment	2,000	11,150					
Three office dictating machines for abstractors Phillips Model L88		330	3		165		2 in year 1, 1 in year 2, Duty Free. Suggest selection made after Chief of Communications Division has visited Pira. T.A. Expert's estimat
Information retrieval system e.g. PICABOO		500				ANSON	

EQUIPMENT LIST - TECHNICAL & SCIENTIFIC — TECHNICAL SERVICES DIVISION

ITEM	AREA OF SUPPLY, YEAR OF PURCHASE COST IN U.S. $					SUPPLIER	NOTES
	YEAR 1		YEAR	THAILAND	ABROAD		
	THAILAND	ABROAD					
NICAL SERVICES DIVISION	Baht	$		Baht	$		
: Much of the equipment would be used by all units but convenience the package testing unit is listed arately.							
SPORT CONTAINERS AND CONSUMER PACKAGING UNITS							
Tools for small laboratory workshop say, bench lathe power drill, linisher, grindstone and hand tools including woodworking tools.	2,500		3		700	Local Agents	Mainly required when ISI workshop not available.
Two drawing boards for package designing.	3.000					Local	Made to order.
Cathetometer (for work with crates) Gallenkamp CD500		160				Gallenkamp	
Stop watch Gallenkamp TR-022		22				"	
Water vapour permeability equipment 20 dishes 50 sq. cm. x 1½ cm. deep	11					Hotton UK.	Tappi or BPBMA Standard
Patra humidity cabinet			3	1,573	1,573	Pira	
Patra carton creasing equipment			3		495	"	
Patra carton board stiffness tester			4		912	"	
Laboratory heatsealer for films			3		3,000	Bland or Sentinal	Prices to be compared at time of purchase
Hand operated heatsealer (limited applications)		50					
Shock measuring equipment for cushioning work			3		7,000	Endevco	This equipment is generally expensi and specialized but is necessary for cushioning studies. I suggest a decision should be made in the light of work requested. Catalogues &tech-nical data have been left with ISI.
Strain viewing equipment for testing glass bottles.			3		340	—	Gas permeability & physical analyti equipment have been omitted as test work can probably be arranged else where.
Sundry small items of equipment & materials required to equip & run a packaging laboratory say.	10,000	1,000	2	10,000	800	—	
			3	10,000	800	—	
			4	10,000	800	—	
			5	10,000	800	—	

EQUIPMENT LIST - TECHNICAL & SCIENTIFIC	TECHNICAL SERVICES DIVISION						
ITEM	AREA OF SUPPLY YEAR OF PURCHASE COST IN U.S. $					SUPPLIER	NOTES
	YEAR 1		YEAR	THAILAND	ABROAD		
	THAILAND	ABROAD					
TECHNICAL SERVICES DIVISION	Baht	$		Baht	$		
PACKAGING SERVICES UNIT							
Equipment for package testing laboratory							
Power hoist for drop test 1000 kg.		350				Local or Lab.	)
Lab. type quick release hook & slings ARH-6-M	500					Lab.	) Spec. Draft ISO 2248
Lab. drop tester model 5D-100		650				Lab.	)
LAB. type vibration table, Model RVT-43-1000		3,500				Lab.	Spec. Draft ISO 2247 check max spec. before ordering.
Inclined plane tester - materials only (ASTM SPEC)	2,000					Local	Spec. Draft ISO 2244
Box compression tester							
Lorentzen & Wettres CTT3000 $13440						LN.) MESS-	Spec. Draft ISO TC122/SC3/152
Tim 17-6 $12,770		12,800				TIM) MER	
Toyo Seiki Seisaku-Sho $5809 & $12,668						Toyo	Reappraise available makes
Avery $14,800						Avery	before ordering
Lab.						Lab.	
Platform scales Avery or other maker 500 k.	5,000					Avery	
Static load compression test equipment materials only	2,000					Local	Spec. Draft ISO 2234
Spray & emersion test. Pump and spray equipment to be resistant to salt water	4,000					Local	Spec. ASTMD 951
Base sample making table			2		1,600		Details awaited

NOTE: Quotations have been obtained for most items from Messmer of London and Toyo Seiki Seisaku - Sho Ltd. of Tokyo. The former I know and they meet international standards. The latter are unknown to me but would result in a saving of about 1/3 on Messmer's prices . I have left both catalogues & prices at Bangkok and the position should be re-assessed before any orders are placed with a view to buying the cheaper equipment.

EQUIPMENT LIST - TECHNICAL & SCIENTIFIC	TECHNICAL SERVICES DIVISION						
ITEM	AREA OF SUPPLY YEAR OF PURCHASE COST IN US $					SUPPLIER REF. PAGE	NOTES
	YEAR 1		YEAR	THAILAND	ABROAD		
	THAILAND	ABROAD					
Box stitcher bottom BOSTITCH 14B	Baht	$	3	Baht	1,700	Local	
Box Stitcher - side H15			3		2,000	"	
Box strapping equipment		300					
Tape dispenser		300				"	
Racks for board & case storage)							
Sack make up table) materials only			2	5,000		Local	
Sack filling device)							
Sack sewing machine (hand)			3		360	Vickers	If required
Stillage truck, stillages & pallets)							
Sack barrow)	4,000					Local	
Flat trolley)							
ment for materials testing laboratory		400				Messmer	Thickness ISO R536
Dead weight dial micrometer No. 21		400					Bulking ISO R438
Packet micrometer No. 200/1M		20				"	
Perkins Mullen Bursting Strength tester No. 252		1,400				"	Use Tappi T403 TU63 T807 SU64
Diaphragms for above Ref. JUMBO & USPER 3 of each		10				"	
Schopper Dalen Type Bursting Strength Tester No. 82D		907				"	Basic instrument but available Dept. of Science.
Compressor pump for above Ref. No. 823		228				"	
Lorentzen & Wettmes strength tester No. 01(132)		2,052				"	Available at Dept. of Science ISO Standard at boting stage use BS 4415
Paper guillotine No. 803/1		58				"	
Cardboard quillotine No. 66		192				"	
Elemendorf tearing tester No. 1652		730				"	ISO at voting stage use BS 4469
Frank puncture strength tester No.190			3		1,640	"	Only if found necessary
Concora medium fluter No. 300			4		3,200	"	Only if volume of work justifies Dept. of Science expect to get.
Flat crush and rings stiffness 936		740				"	Dept. of Science expect to get but worth duplicating.
Attactments for above		72				"	Use Tappi T472 M 51 T808 SU 64

APPENDIS VIII C (CONT.)

EQUIPMENT LIST - TECHNICAL & SCIENCE	TECHNICAL SERVICES DIVISION						
ITEM	AREA OF SUPPLY YEAR OF PURCHASE COST IN U.S. $					SUPPLIER REF. PAGE	NOTES
	YEAR 1		YEAR	THAILAND	ABROAD		
	THAILAND	ABROAD					
	Baht	$		Baht	$		
Kenley stiffness tester			3		720	Messmer	Only if found necessary. Dept. of Science have a partial equivalent.
Gurley - Hill SPS Tester No. 4190			3		804	"	Only if necessary Dept. of Science have one. Use BS4420.
Bendtsen smoothness tester No. 301			3		900	"	Only if found to be necessary use BS2925.
Gurley - Cobb sizing tester No. 4180		87				"	ISO R535.
Templates for sample cutting		70				"	
Low sensitively laboratory balances say Gallenkamp BC110		300				Gallenkamp	
Analytical balance reading to 0-1mg. & weights Gallenkamp Ref. BL-580		420				"	Paper basic weight ISO R536 assess market before ordering.
Furnace for ashing Gallenkamp Model FR510			3		200	"	
Whirling Hygrometer Gallenkamp Hv200							
3 Thermo hygrographs (for air conditional rooms)							
Gallenkamp TK155 (0-5° C) & charts		300				"	
Low powered binocular microscope		140				"	Consider Japanese make when ordering.
Student type research microscope & accessories			3		450	"	———— " ————
Fibre staining equipment			3		50	"	
pH meter Gallenkamp Model EJ-515			3		346	"	Use BS 2924
Colour matching box (materials only)			2	600		"	Make from local materials
Moisture meter			3		360	Marconi	
Cans for moisture content of paper	50					Local	Moisture content ISO R287
Laboratory oven Gallenkamp Ref. OV-010		175				Gallenkamp	operates upto 200 °C.

APPENDIX 8 C

NAMES & ADDRESSES OF SUPPLIERS OF LISTED EQUIPMENT
WHERE THERE IS NOT A BANGKOK OFFICE

NAME OF SUPPLIER	ADDRESS
1. Geo. Anson & Co. Ltd.	South Bank Street, London, S.E. 1.
2. Bland International Packaging	Reddicap Trading Estate, Sutton Coldfield Warwickshire, England.
3. Endevco	801 South Arroyo Park Way, Pasadena, California 91109 U.S.A.
4. A. Gallenkamp & Co. Ltd.	P.O. Box 290 Christopher Street, London, E.C.2 P 2ER.
5. W.H. Holton & Co. Ltd.	Marlborough Works, New Road, Studley, Warwickshire England.
6. LAD. Corporation	P.O. Box 9, Skaneateles, New York 13152.
7. H.E. Messmer Ltd.	144c Offord Road, London, N.1.
8. Packaging Industries Inc.	Airport Road, Hyannis, Massachusetts 02601, U.S.A.
9. Pira	Randalls Road, Leatherhead, Surrey, England.
10. Testing Machines Inc.	400, Bayview Avenue, Amityville L.I., New York 11701.
11. Toyo Seiki Seisaku-Sho Ltd.	15, 5-chome, Takinogawa, Kita-Ku, Osaka, Japan.
12. Vibro-meter Corporation	Tribourg, Switzerland.

APPENDIX VIII D

CAPITAL EQUIPMENT LIST - TRANSPORT AIR CONDITIONING — PACKAGING CENTRE

ITEM	AREA OF SUPPLY / YEAR OF PURCHASE / COST					NOTES
	YEAR 1		YEAR	THAILAND	ABROAD SUPPLIER	
	THAILAND	ABROAD				
	Baht	$		Baht	$	
DIRECTOR'S OFFICE						
Motor Car for Director	100,000					
Room airconditioners (four) - rooms 20sq.m.	34,000		2	34,000	Local	2 in Year 1, 2 in Year 2
COMMUNICATIONS DIVISION						
Estate car for personnel and goods	100,000					
Room air conditioners (four) - rooms 20sq.m.	34,000		2	34,000		2 in Year 1, 2 in Year 2
TECHNICAL SERVICES DIVISION						
Estate car for personnel and goods	100,000					
Room airconditioners (four)-rooms 20 sq.m.	51,000		2	17,000		3 in Year 1, 1 in Year 2
Airconditioning plant to maintain controlled atmosphere 27 ± 1 °C 65 ± 2% RH in package testing laboratory 150/200 sq.m.		8,500			Carrier, Bangkok	Approximate costs for items 3-5 obtained from Carrier Engineering Bangkok.
Air conditioning plant to maintain above conditions in materials testing laboratory 20 sq.m. (plant for 40sq.m.)		3,000				
Air conditioning plant for variable humidity room 0 °C to 40 ± 1 °C and up to 90 ± 2% RH - 10 sq.m.		2,500				

Appendix IX SUGGESTIONS ON THE PREPARATION OF STAFF WHO ARE GOING ABROAD FOR TRAINING

I am convinced that the success of the Institute depends basically on the selection and training of staff which is particularly important for those who will operate the technical services.

I have put down the following thoughts is the hope that they will be of use.

1. The prime purpose of training packaging engineering staff at PIRA is to gain practical experience in design testing and development work not currently available in Thailand so that on returning they can effectively

   (a) operate as packaging engineers & interpret test results in practical terms;

   (b) train further staff to do the same;

2. The skills to be learned in the period of training are far more than how to carry out tests, they are how to interpret and apply the results of tests to improve package design and performance.

3. This knowledge needs considerable time to acquire and it is essential that the maximum time and concentration is available for this purpose within the period of training.

4. I would expect that the method of training of PIRA would be to attach the trainee to staff doing practical testing and development work in the appropriate fields so that he or she can be fully involved in various types of work.

5. The purpose of the exercise would not be to gain "back knowledge" and industrial background which can be obtained previously in Thailand and on the Indian Packaging Course.

6. It is useful to bear in mind that institutes usually accept staff for training in the spirit of trying to help a new institute. It is bound to be an inconvinience to the training institute which, the more or less nominal fee does not cover.

7. For the above reasons I believe that staff sent abroad should have a period of pre-training to ensure.

   That they knew the language sufficiently to

   (I) understand speech at normal speed and still have time to think and participate in discussions about what is being done.

   (II) Know most packing terms in the foreign language;

   (III) to be able to read and speak the language at

APPENDIX X

PACKAGE TESTING LABORATORY

Shock and Vibration Bases

Two reinforced concrete bases are required to isolate the building from shock and vibration.

The first is required for the vibration tester.

The minimum bed size is 2x3 metres, the weight of the tester is approximately 1000 kg. and the maximum load on the vibrating table is 1000 kg. although the latter will normally be below 100kg. The maximum frequency is 300 cycles per minute and the amplitude is 2.5 cms. It is suggested that the concrete bed should be at least 1.2 m thick and that it should be isolated from the floor and foundations by at least 2 cms thick of vibration insulation e.g. specially designed rubber mats under the base.- New Pi

An isolated reinforced concrete base is also required for drop testing. This should be 2x4 metres and designed for dropping loads up to 500 kg from a height of up to 1.3 metres. The loads will usually be of the order of 50 kg.

The base should be designed to meet the ISO second draft proposal No. T.C. 122/SC3/119 "Vertical impact tests on complete filled transport packages by dropping".

The main relevant requirements are:-

1. "The impact surface should be integral with a mass at least 50 times that of the test package;
2. The impact surface must be level so that no two points on its surface* differ in level by more than 2 mm;
3. The surface must not deform by more than 1 mm when 1 cm^2 is loaded with 10 kg statically anywhere.

It is suggested that the concrete bed should be at least 0.5 m thick and should be isolated from the floor and foundations by at least 2 cm of vibration insulation material.

The architect / Structural Engineer should specify these bases having in mind the building design and the anticipated shocks.

Static Loading Test

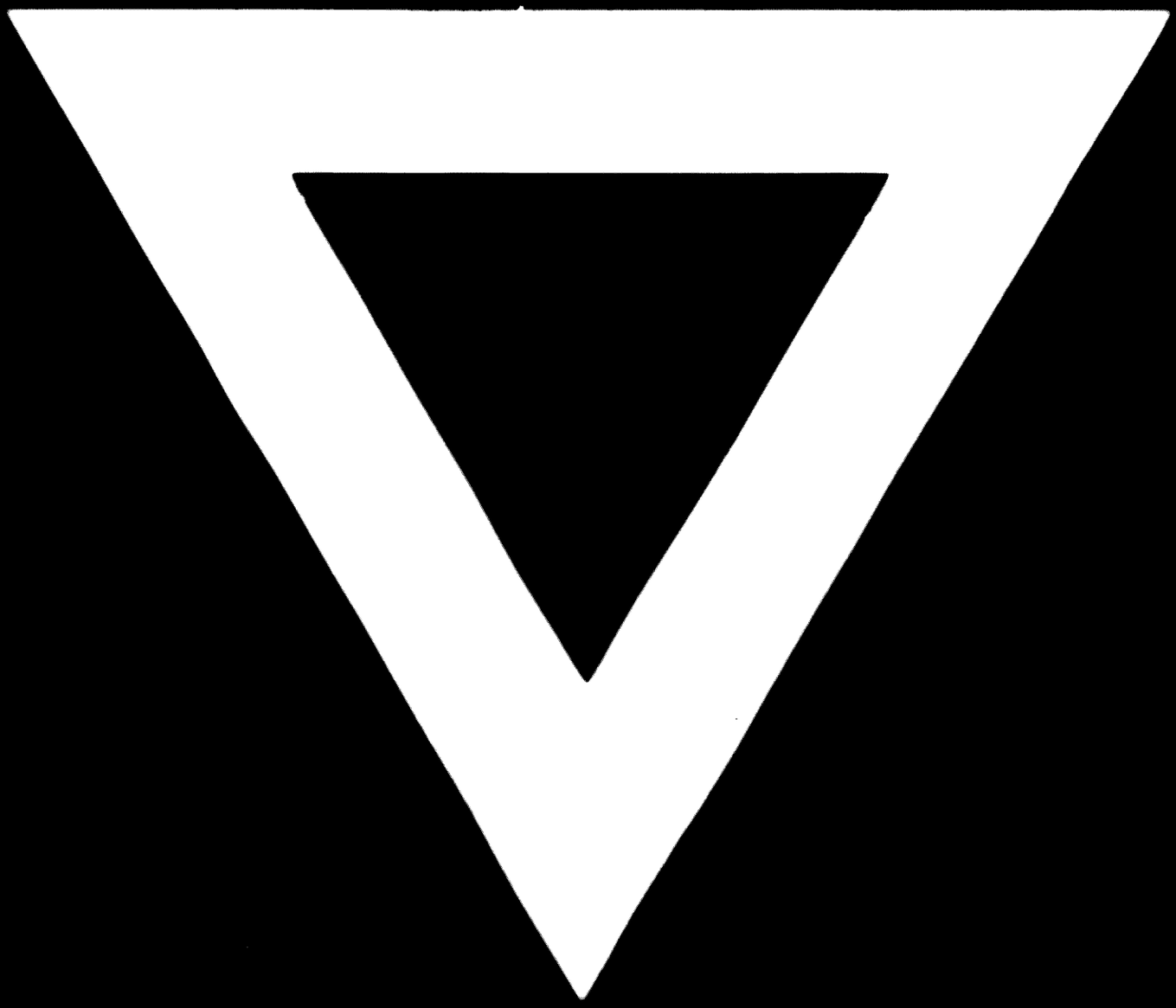
The safty beam over the static loading test area is to provide a means of restraining loads, placed on cases, from slipping and becoming a hazard if a case collapses unevenly. The estimated maximum load on cases is 3000 kg.

The floor on which the packages are stacked should meet the ISO second draft proposal No. T.C. 122/SC3/110 "Stacking Test for complete filled transport packages" of which NIER. has a copy.

The main relevant requirements are:-

1. The horizontal surface should be level, so that the difference in height between the highest and the lowest points does not exceed 2 mm and rigid.
2. A concrete floor at least 15 cms thick is suitable.

J-935



86.01.14
AD.87.04
ILL5.5+10